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03.13-06/01/96-01417

# Remedial Investigation
# Operable Unit 2

for

# Marine Corps Air Station

Cherry Point, North Carolina

## Volume IV - Appendices K and L

## Atlantic Division
## Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0211

June 1996

**Brown & Root Environmental**

A Division of Halliburton NUS Corporation

03.13-06/01/96-01417

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# REMEDIAL INVESTIGATION
# OPERABLE UNIT 2
# FOR
# MARINE CORPS AIR STATION
# CHERRY POINT, NORTH CAROLINA

## Volume IV - Appendices K and L

## COMPREHENSIVE LONG-TERM
## ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

**Submitted to:**
**Atlantic Division**
**Environmental Restoration Branch, Code 1823**
**Naval Facilities Engineering Command**
**1510 Gilbert Street**
**Norfolk, Virginia 23511-2699**

**Submitted by:**
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**CONTRACT NUMBER N62472-90-D-1298**
**CONTRACT TASK ORDER 0211**

**JUNE 1996**

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# APPENDIX K.1

## FIELD DATA SHEETS
## MARINE CORPS AIR STATION CHERRY POINT
## OPERABLE UNIT 2
## April 12 and 13, 1995

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: U.S. Marine Corps  Application Number: _____  Project Name: Cherry Point Marine Air Station

State: N.C.  County: Craven Co. N.C.  Legal Description:  Range: _____

Date: April 13, 1995  Plot No.: wet D61 wetland  Section: _____

10' on the wetland side of the line

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)].

Indicate species with observed morphological or known physiological adaptations with an asterisk.

| Species | Indicator Status | Species | Indicator Status |
|---|---|---|---|
| Trees | | Herbs | |
| 1. Red Maple | FAC | 7. Lizard tail | OBL |
| 2. Sweetbay | FACW | 8. Jewelweed | |
| 3. | | 9. Impatiens sp. ~~Pellitora~~ | FACW |
| Saplings/shrubs | | Woody vines | |
| 4. Alder | FAC or FACW | 10. Moscadine | FAC |
| 5. Sweetbay | FACW | 11. | |
| 6. | | 12. | |

% of species that are OBL, FACW, and/or FAC: 100%. Other indicators: _____.

Hydrophytic vegetation: Yes ✓ No _____. Basis: > 50% FAC

Soil

Series and phase: SuD Suffolk loamy sand 10-30% slope  On hydric soils list? Yes _____ No ✓.

Mottled: Yes ✓; No _____. Mottle color: 10 YR 5/6; Matrix color: 10 YR 3/2

Gleyed: Yes ✓ No_____. Other indicators: Gleyed at 6" Root Rhizospheres. Oxygen

Hydric soils: Yes ✓ No _____; Basis: mottles present, chroma at matrix < 2

Oil at ≈ 10 inches  Gleyed at 6"

Hydrology

Inundated: Yes _____ No ✓. Depth of standing water: _____.

Saturated soils: Yes ✓; No _____. Depth to saturated soil: water in hole at 7"

Other indicators: Saturation at surface

Wetland hydrology: Yes ✓; No _____. Basis: Saturation at Surface.

Atypical situation: Yes _____; No ✓.

Normal Circumstances?: Yes ✓ No _____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: Robert Abernethy

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: U.S. Marine Corps  Application Number: _____  Project Name: Cherry Point Marine Air Station

State: N.C.  County: Craven Co. N.C.  Legal Description:  Range: _____

Date: April , 1995  Plot No.: wetD 61 upland  Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

| Species | Indicator Status | Species | Indicator Status |
|---|---|---|---|
| Trees | | Herbs | |
| 1. Southern Red oak | FACU | 7. | |
| 2. Hickory Carya sp. ? Glabra (not positive) | FACU | 8. None | |
| 3. | | 9. | |
| Saplings/shrubs | | Woody vines | |
| 4. Quercus sp. | | 10. muscadine | FAC |
| 5. | | 11. | |
| 6. | | 12. | |

% of species that are OBL, FACW, and/or FAC: 50%. Other indicators: _____.

Hydrophytic vegetation: Yes _____ No ✓. Basis: The Dominant canopy trees were Southern Red oak FACU and some Hickorys. < 50% FAC

Soil

Series and phase: SND  On hydric soils list? Yes _____ No ✓.

Mottled: Yes _____; No ✓. Mottle color: _____; Matrix color: 10 YR 6/3 at 2-4 inch

Gleyed: Yes _____ No ✓. Other indicators: no mottles at 30 inches.

Hydric soils: Yes _____ No ✓; Basis: A Horizon 2 inches gray sand 10 YR 5/1 No organics then 10 inches at 10 YR 6/3 sandy loam

Hydrology

Inundated: Yes _____ No ✓. Depth of standing water: _____.

Saturated soils: Yes _____; No ✓. Depth to saturated soil: _____.

Other indicators: No saturation at 30 inches.

Wetland hydrology: Yes _____; No ✓. Basis: _____.

Atypical situation: Yes _____; No ✓.  no oil at 30 inches

Normal Circumstances?: Yes ✓ No _____.

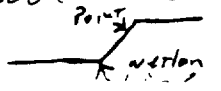
Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Point Taken 8' from wetland line  Determined by: Robert Abernethy

5 vertical feet above wetland

B5



DATA FORM 1

WETLAND DETERMINATION

Applicant Name: U.S. Marine Corps  Application Number: _____  Project Name: Cherry Point Marine Air Station

State: N.C.  County: Craven Co. N.C.  Legal Description:  Range: _____

Date: April 13, 1995  Plot No.: wet D1 upland  Section: _____

Same as wet A1 upland

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)].

Indicate species with observed morphological or known physiological adaptations with an asterisk.

| Species | Indicator Status | Species | Indicator Status |
|---|---|---|---|
| Trees | | Herbs | |
| 1. loblolly Pine | FAC | 7. netted chainfern woodwardia areolata | OBL |
| 2. Magnolia Virginiana | FACW | 8. | |
| 3. | | 9. | |
| Saplings/shrubs | | Woody vines | |
| 4. Sweetgum | FAC+ | 10. Muscadine vitus | FAC |
| 5. Red Cedar | FAC U | 11. | |
| 6. Wax myrtle | FAC+ | 12. | |

% of species that are OBL, FACW, and/or FAC: 95% Other indicators: _____.

Hydrophytic vegetation: Yes ✓ No _____. Basis: > 50% FAC

Soil

Series and phase: SUD Suffolk Loamy Sand  On hydric soils list? Yes _____ No ✓.

Mottled: Yes _____; No ✓. Mottle color: _____; Matrix color: E horizon at 4-14 inches was 10YR 6/3

Gleyed: Yes _____ No ✓. Other indicators: _____.

Hydric soils: Yes _____ No ✓; Basis: no mottles or saturation chroma over 2

Hydrology

Inundated: Yes _____ No ✓. Depth of standing water: _____.

Saturated soils: Yes _____; No ✓. Depth to saturated soil: No Saturation at 24 inches

Other indicators: _____.

Wetland hydrology: Yes _____; No ✓. Basis: No Saturation at 24 inches

Atypical situation: Yes _____; No ✓.

Normal Circumstances?: Yes ✓ No _____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: Robert Abernethy

over

This point is in a fringe of woods between the wetlands adjacent to Slocum creek and the mowed lawn surrounding the polishing pond. The point this 48 feet WNW of well 10 GW 04. The point is characteristic of the entire wooded slope south to the new pipeline.

This point is 16 feet upslope of the wetland line at WET D1 and approximately 3 vertical feet above the wetland. There is a gully that drains surface runoff from around the polishing ponds that has deposited 1-2 inches of sand in the wetlands at point "WET D1 wetland."

WET D1 is 64 feet WNW of well 10 GW 04

coon tracks, Beaver cuttings, Deer tracks, common crow, grackle, Killdeer, Osprey, Canada Goose

The slope is dominated by varies species of hickory and oak including Southern red oak, loblolly Pine, American holly, and sweetgum round out the canopy. Sparse understory of Cornus florida, Sweet bay, hickory, and muscadine vines (Vitus).

wet D1 and
wet A 1 are the same
flag Line A goes to OU3
Line D goes to OU2

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: U.S. Marine Corps  Application Number: _____  Project Name: Cherry Point Marine Air Station

State: N.C.  County: Craven Co. N.C.  Legal Description:  Range: _____

Date: April 13, 1995  Plot No.: wetD1 wetland 9 feet downslope from wetD1 Flag  Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)].
Indicate species with observed morphological or known physiological adaptations with an asterisk.

| Species | Indicator Status | Species | Indicator Status |
|---|---|---|---|
| **Trees** | | **Herbs** | |
| 1. Blackgum | FAC | 7. Blue flag Iris | OBL |
| 2. Bald cypress | OBL | 8. woodwardia areolata | OBL |
| 3. Red maple | FAC | 9. Lizard tail | OBL |
| **Saplings/shrubs** | | **Woody vines** | |
| 4. Sweetbay | FACW | 10. VA creeper | FAC |
| 5. Wax myrtle | FAC+ | 11. | |
| 6. Sweetgum | FAC+ | 12. | |

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: _____.

Hydrophytic vegetation: Yes ✓ No _____. Basis: _____

Soil

Series and phase: ~~SE~~ SUD  On hydric soils list? Yes ~~✓~~ No ✓.

Mottled: Yes _____; No ✓. Mottle color: _____; Matrix color: 10YR 2 1

Gleyed: Yes _____ No ✓. Other indicators: 6 inches of Black organic muck over sand

Hydric soils: Yes ✓ No _____; Basis: Black organic muck over Sand.

Hydrology

Inundated: Yes _____ No ✓. ~~Depth of standing water~~: ~~16~~ 16 inches to water in hole

Saturated soils: Yes _____; No _____. Depth to saturated soil: 8 inches to Saturation

Other indicators: _____.

Wetland hydrology: Yes ✓; No _____. Basis: saturation in top 12 inches

Atypical situation: Yes _____; No ✓.

Normal Circumstances?: Yes ✓ No _____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: Robert Abernethy

Approximately 1-2 inchs of sand have washed out into the fringe wetland and covered the black organic soils.

There is some trash along the slope and 2 buried tires at the base. However, the trash is very deteriorated ~~tore~~ household bottles, and cans and is probably not associated with a landfill.

This data point is 9 feet downslope of the wetland line and the wetland line labeled "Wet #D1" is 75 feet from the edge of the water.

This fringe wetland is dominated by Bald cypress up to 20 inchs thick above the butt swell. There is no standing water or evidence of standing water.

Beaver sign is common and fresh
Cardinal
Brown Thrasher
Blue-Gray Gnatcatcher
Chickadee
Ruby-crowned Kinglet
Deer tracks
Raccoon tracks

Otter + Nutria would be expected

# APPENDIX K.2

## PLANT AND ANIMAL SPECIES OBSERVATION LISTS
## MARINE CORPS AIR STATION CHERRY POINT
## OPERABLE UNIT 2
## April 12 and 13, 1995

**PLANT SPECIES OBSERVED ON MCAS CHERRY POINT OU-2**
**DURING APRIL 12 and 13, 1995 SITE VISIT**

| Common Name | Scientific Name | Plant Community |
|---|---|---|
| Alder | *Alnus* sp. | 3 |
| American elm | *Ulmus americana* | 4 |
| American holly | *Ilex opaca* | 4 |
| Bald cypress | *Taxodium distichum* | 3 |
| Blackberry | *Rubus* sp. | 1 |
| Black cherry | *Prunus serotina* | 1 |
| Black gum | *Nyssa sylvatica* | 3 |
| Black willow | *Salix nigra* | 1,3 |
| Blue flag iris | *Iris virginica* | 3 |
| Broom sedge | *Andropogon* sp. | 1 |
| Cat brier | *Smilax* sp. | 1,3,4 |
| Cattail | *Typha* sp. | 1,3 |
| Cinnamon fern | *Osmunda cinnamomea* | 3 |
| Cow itch vine | *Campsis radicans* | 1 |
| Dogwood | *Cornus florida* | 4 |
| Eastern red cedar | *Juniperus virginiana* | 1,2,4 |
| Fescue | *Festuca* sp. | 1,5 |
| Giant cane | *Arundinaria gigantea* | 3,4 |
| Goldenrod | *Solidago* sp. | 1 |
| Groundsel-tree | *Baccharis halimifolia* | 1 |
| Jewel-weed | *Impatiens* sp. | 3 |
| Lizard's tail | *Saururus cernuus* | 3 |
| Loblolly pine | *Pinus taeda* | 1,2,3,4 |
| Marsh mallow | *Hibiscus* sp. | 6 |
| Muscadine grapevine | *Vitis* sp . | 3,4 |
| Netted chain fern | *Woodwardia areolata* | 3,4 |
| Poke | *Phytolacca americana* | 1 |
| Red maple | *Acer rubrum* | 3,4 |
| Royal fern | *Osmunda regalis* | 3 |
| Pignut hickory | *Carya glabra* | 4 |
| Sedge | *Juncus effusus* | 1 |
| Southern red oak | *Quercus falcata* | 4 |
| Sweet bay | *Magnolia virginiana* | 3,4 |
| Sweetgum | *Liquidambar styraciflua* | 3,4 |
| Tulip poplar | *Liriodendron tuliperfera* | 3,4 |
| Virginia creeper | *Parthenocissus quinquefolia* | 3,4 |
| Wax myrtle | *Myrica cerifera* | 1,3,4 |

**Key to Plant Communities:**

1. **Old Field**
2. **Second Growth Loblolly Pine**
3. **Coastal Plain Small Stream Swamp**
4. **Mesic Mixed Hardwood Forest**
5. **Mowed Grass Lawn**

## ANIMAL SPECIES OBSERVED ON MCAS CHERRY POINT OU-2
## DURING APRIL 12 and 13, 1995 SITE VISIT

| Common Name | Scientific Name | Plant Community |
|---|---|---|
| **MAMMALS** | | |
| Beaver | *Castor canadensis* | 3,4 |
| Eastern cottontail | *Sylvilagus floridanus* | 1,3,4 |
| Gray squirrel | *Sciurus carolinensis* | 3,4 |
| Raccoon | *Procyon lotor* | 1,2,3,4 |
| White-tailed deer | *Odocoileus virginiansis* | 1,2,3,4 |
| **BIRDS** | | |
| American crow | *Corvus brachyrhynchos* | 1,2,3,4,5 |
| Blue-gray gnatcatcher | *Polioptila caerulea* | 3,4 |
| Brown thrasher | *Toxostoma rufum* | 3,4 |
| Canada goose | *Branta canadensis* | 5 |
| Carolina chickadee | *Parus carolinensis* | 3,4 |
| Carolina wren | *Thryothorus ludovicianus* | 3,4 |
| Common grackle | *Quiscalus quiscula* | 3,4,5 |
| Killdeer | *Charadrius vociferus* | 5 |
| Mockingbird | *Mimus polyglottus* | 1 |
| Mourning dove | *Zenaida macroura* | 5 |
| Northern cardinal | *Cardinalis cardinalis* | 3,4 |
| Osprey | *Pandion haliaetus* | 5 |
| Pileated woodpecker | *Dryocopus pileatus* | 3,4 |
| Red-tailed hawk | *Buteo jamaicensis* | 1,5 |
| Ruby-crowned kinglet | *Regulus calendula* | 3,4 |
| Turkey vulture | *Cathartes aura* | 1,2,3,4,5 |
| **REPTILES** | | |
| Green anole | *Anolis carolinensis* | 3 |
| Eastern box turtle | *Terrapene carolina* | 3,4 |

Key to Plant Communities:

1. Old Field
2. Second Growth Loblolly Pine
3. Coastal Plain Small Stream Swamp
4. Mesic Mixed Hardwood Forest
5. Mowed Grass Lawn

# APPENDIX K.3

## A BIOLOGICAL EVALUATION OF METAL CONTAMINATION IN SLOCUM CREEK, NORTH CAROLINA (FLEMING AND HIGHTOWER, 1995)

# A BIOLOGICAL EVALUATION OF METAL CONTAMINATION IN SLOCUM CREEK, NORTH CAROLINA

FINAL REPORT

TO THE

Cherry Point Marine Air Station
U.S. Marine Corps

through
Interagency Agreement No. 14xxx-85012-080
and
Cooperative Agreement No. 14-16-0009-1568
Research Work Order No. 6

Submitted by

W. James Fleming

and

Joseph E. Hightower

North Carolina Cooperative Fish and Wildlife Research Unit
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Raleigh, North Carolina 27695

May, 1995

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## Executive Summary

Metal enriched sediments may pose a threat to both human health and to the ecology of aquatic systems. A recent report has documented that sediments from Slocum Creek at Cherry Point, NC are significantly enriched by a variety of metals including mercury, chromium, cadmium, and lead, all of which are considered to be among the more toxic of the heavy metals. In response to that report, the Cherry Point Marine Air Station funded this study to examine the potential effects of heavy metal contaminants on the health of the biological resources in Slocum Creek.

We began with a review of all available data on metal concentrations in the biotic and abiotic components of Slocum Creek. Data were available for fish, sediments and water collected in 1983, and for fish collected in 1985 and 1990. We found these data useful for comparing metal concentrations in fish from Slocum Creek to available standards for human health, but not for determining the availability of metals to fish or for determining whether fish from Slocum Creek were more contaminated than fish from nearby areas in which there was no significant metal enrichment.

Guidelines or standards have been established in some political regions (state, country, etc.) to protect human health from metal contamination in fish. These guidelines, often presented as action limits or action levels, do not pinpoint concentrations with known toxicity to humans. Instead they represent estimates based on scientific data and mathematical models of toxicity projected over a lifetime of consumption. These models are generally conservative, designed to offer maximum protection for individuals consuming fish. There is no consensus on acceptable models for calculating human risk factors, thus acceptable concentrations for metals in consumable fish have not been agreed upon. As with many other states, the State of North Carolina does not have predetermined guidelines for taking action to protect human health from metal residues in fish. The State of North Carolina establishes action limits for metal residues in fish tissues on a case-by-case basis. Thus it is not possible to compare metal burdens in fish from Slocum Creek against North Carolina action

limits. The Federal Drug Administration has a published action limit for only one metal (mercury).

None of the fish fillets collected in Slocum Creek during 1983, 1985, or 1990 exceeded the US Food and Drug Administration's action limit for mercury. However, metal concentrations in fish from Slocum Creek often exceeded guidelines used in other countries to protect human health. Country-specific guidelines for acceptable metal residues in human food stuffs vary widely, often by one to two orders of magnitude. Thus to assess metals in fish from Slocum Creek against the various international action limits, we made our comparisons based on the guidelines with the lowest and highest action limits in use throughout the world. Slocum fish samples from 1983, 1985, and 1990 exceeded the minimum recommended international action limits for arsenic (10% of samples), chromium (40%), copper (10%), lead (10%), mercury (43%), and zinc (7%). Action levels of metals at the high end of the range used by the international community were exceeded only for copper (2% of the samples).

We conducted ecological studies on Slocum Creek from 1991 to 1993. The studies included both field and laboratory investigations to evaluate the ecological health of Slocum Creek and to define the geographic extent of sediment toxicity and elevated metal concentrations in fish. Our approach was to assess a variety of toxicological, ecological, physiological and pathological variables in samples collected from Slocum Creek and to compared them to samples collected at sites selected to represent non-metal enriched habitats of the lower Neuse River system.

We tested the toxicity of surface waters from Slocum and Hancock Creeks to a number of biological organisms. We found no consistent "hot spots" of toxicity and noted no differences between creeks. However, many of the sediment samples collected in Slocum, Hancock, and Goose Creeks were toxic to a suite of biological organisms. Some sediment samples were rated as "extremely toxic", while others were non-toxic to test organisms. The incidence of samples demonstrating toxicity was not higher in samples collected in Slocum Creek compared to Hancock and Goose Creeks even though sediments from Hancock and Goose Creeks are not enriched with

metals. This suggests that sediment toxicity is widespread in the lower Neuse River system and that the toxicity is not related to metal enrichment. Total extractable metal concentrations in sediments did not correlate well with the toxicity of sediments to biological organisms used in our tests. This suggests that the toxicity may be due to the presence of other toxic substances (such as ammonia or hydrogen sulfide), complex interactions of multiple toxicants, or chemical and physical variables that affect the bioavailability of metals in sediments.

Livers of brown bullheads from Slocum, Hancock, and Goose Creeks were analyzed for metals. Metal concentrations in fish from all three creeks were considered to be low. Average metal concentrations in brown bullheads from Slocum Creek were not different from those in the other two creeks. However, the proportion of fish from each creek that had detectable concentrations of metals did differ for some elements. We also found no differences in metal concentrations in brown bullheads collected from the East Prong, West Prong, and mainstem of Slocum Creek. These data support a hypothesis that metal concentrations in brown bullheads from Slocum Creek do not reflect the metal enrichment of sediments in the creek.

Ecological assessments demonstrated no major differences among Slocum, Hancock, and Goose Creeks. The number of species collected was similar among creeks and similar to estuarine sites throughout Chesapeake Bay. Age composition, survival, and growth for brown bullhead and white catfish were similar among Slocum, Hancock, and Goose Creeks and similar to published results for other systems. Pumpkinseed growth differed significantly among creeks, but growth within Slocum Creek was better than published results from other coastal North Carolina populations. We found relatively few older pumpkinseed within Slocum Creek, which could be due to contaminants or to fishing pressure.

Length-weight relationships for brown bullhead and white catfish were similar among creeks and to published results. The liver weight:body weight ratio, which is often elevated in fish exposed to metals and other contaminants, was low for brown bullhead in all three study creeks compared to other areas. Hematological and pathological evidence suggest that there are differences among fish from Slocum

Creek, Hancock Creek and the Neuse River at New Bern and Hog Island. However, the magnitude and pattern of these differences do not indicate that fish from Slocum Creek are unhealthy relative to fish from the other study sites.

Our results suggest that the enhanced levels of metals present in the sediments of Slocum Creek have not resulted in ecological damage at the level of resolution used in our tests. We speculate that the metals present in the sediments of Slocum Creek are not readily available to fish or their prey. The bioavailability of metals from sediments in Slocum Creek is probably regulated by physical and chemical properties of the sediments which we have not attempted to define. Activities that might alter existing chemical and physical properties of sediments could increase the availability of metals to aquatic organisms and result in adverse ecological consequences. An understanding of factors controlling the bioavailability of metals from Slocum Creek sediments is recommended to assist in projecting potential impacts of future projects affecting Slocum Creek.

## Background

The Neuse River Basin, encompassing all or part of 18 counties, is the second largest river basin lying entirely within the State of North Carolina, with a drainage area estimated at 6,192 square miles. The watershed for the Neuse River lies within two of the State's three physiographic regions. The upper third of the watershed lies within the Piedmont region and the lower two-thirds lies within the Coastal Plain. The river traverses the fall line midway between Raleigh and Smithfield.

The distribution of soil types and erosion of the soil from the Neuse River watershed are major factors contributing to both turbidity and color of the rivers and streams. In the Havelock area where this study was conducted, the land is largely swamp and pocosin. The soils contain a high percentage of organic matter and very little clay. Most streams within the area exhibit a dark brown stain resulting from the leaching of humic acids from the swampy areas.

Our primary study site was Slocum Creek, which lies within Craven County and borders the town of Havelock and the Cherry Point Marine Air Station. Slocum Creek receives treated sewage and industrial effluent from the air station. The industrial effluent contains metal residues, fuels, oils and greases, and organics produced by activities such as electroplating, metal cleaning, conversion coating of aluminum, and engine testing (C.T. Main 1989). In addition, disposal sites adjacent to the creek received wastes including paints, organic solvents, waste oil and plating sludges from the early 1970s until 1984 (C.T. Main 1989). Wastewater from the town of Havelock, North Carolina also enters into Slocum Creek upstream of the Cherry Point outfall.

Riggs (1991) reported significant metal enrichment in the sediments of Slocum Creek compared to other sites sampled in the lower Neuse River and its tributaries. Sediment enrichment factors varied considerably within Slocum Creek, with the highest enrichment factors occurring in the East Branch (East Prong) and the upper portion of mainstream Slocum Creek. Metals were enriched to a lesser degree in the surface sediments of the West Branch (Southwest Prong). Riggs (1991) calculated a mean enrichment factor (EF) compared to trimmed mean levels for the lower Neuse River for each element by segment of

Slocum Creek. Within East Branch, the EFs were: cadmium (14.4 X), molybdenum (4.2 X), chromium (6.5 X), mercury (2.8 X), lead (4.8 X), copper (7.5 X), nickel (2.2 X), and zinc (2.9 X). The enrichment factor was lower within mainstream Slocum Creek except for mercury (6.4 X). Riggs reported minimal enrichment of sediments in the lower portion of Slocum Creek and in Goose and Hancock Creeks, which served as reference sites in this study.

The objectives of this study were:

1. Synthesize available information on metal residues in fish, sediments and water in Slocum Creek. Provide an interpretive database on metal concentrations found in fish in Slocum Creek.

2. Evaluate the ecological health of the fish fauna within Slocum Creek.

3. Detect the presence of biologically available contaminants through use of biomarkers and bioassay protocols.

4. Determine the concentrations of metals in fish and other substrates to establish statistically valid estimates of degrees of geographical contamination.

The work presented in this report represents a multifaceted approach to assessment of contaminants in Slocum Creek, including not only analytical chemistry but also indicators of fish and community health. The report is organized into five sections addressing various aspects of the study. Each section is written to stand relatively alone with its own introduction, methods, results, and discussion sections, as well as literature cited and appendices as appropriate. A brief final section highlights the overall findings of the studies and makes recommendations to assist in the design of operational activies of the Marine Corp Air Station at Cherry Point regarding Slocum Creek.

## Literature Cited

C.T. Main, Inc. 1989. Engineering report for sewage and industrial waste treatment: Contract No. N62470-88-R-5865 with the U.S. Marine Corps, Cherry Point, NC. (Cited in Riggs et al. 1990).

Riggs, S.R., J.T. Bray, E.R. Powers, J.C. Hamilton, D.V. Ames, D.D. Yeates, K.L. Owens, S.L. Lucas, J.R. Watson, and H.M. Williamson. 1991. Heavy metal in organic-rich muds of the Neuse River Estuary System. Albemarle -Pamlico Estuarine Study, East Carolina University, Greenville, N.C. Project No. 90-07

Note: This chapter is presented as it was originally submitted to the Marine Corps in the first project report. Because this chapter was originally written to stand alone, it includes an executive summary specific to the chapter.

# EXECUTIVE SUMMARY

The Cherry Point Marine Air Station near Havelock, North Carolina is located on a peninsula bounded by Slocum Creek on the west, the Neuse River on the north, and Hancock Creek on the east. Industrial and domestic waste and surface runoff from the Air Station have been channeled into Slocum Creek after receiving various degrees of treatment including the removal of some toxic substances. Concerns about the potential accumulation of toxic materials in Slocum Creek prompted three exploratory surveys of biotic and abiotic components of the creek. In 1983, fish, sediments and water were collected and analyzed for organic and inorganic contaminants. Fish were again sampled in 1985 and 1990 and analyzed for metals.

Metal analyses were conducted at three laboratories. Some details of the analyses have been lost or are uncertain. However, the analytical methods employed were based on inductively coupled plasma or atomic absorption spectroscopy following sample digestion in weak acids. These methods were appropriate for assessing potential contamination of ecological systems. No significant irregularities in the analytical data were noted.

The sampling protocols for 1983, 1985, and 1990 lacked a statistically valid sampling design to do more than indicate the presence of metal contaminants in Slocum Creek. Therefore, it is not possible to use existing data to identify sources of contaminants within the Slocum Creek watershed, compare contaminant burdens among fish species or age classes, or compare differences among years on collection locations.

There is no manual or concensus of opinion on acceptable metal residues in fish that governs the actions of state agencies responsible for protecting fish-consuming populations from metal contaminants. The State of North Carolina has no predetermined guidelines for action limits (maximum allowable concentrations for human consumption) of metals in fish from the State's waters. North Carolina establishes action limits for contaminants in fish tissues on a case-by-case basis. Thus it is not possible to compare metal burdens in fish from Slocum Creek against North Carolina action limits. Some states have established action limits, but a published report compiling and assessing these guidelines is not available. The Federal Drug Agency has a published action limit for only one metal (mercury).

International action limits for metals in fish for human consumption have been compiled. These action limits are not uniform among nations and may vary by up to two orders of magnitude.

When compared to the lowest international action limit for each metal, fish fillets from Slocum Creek exceeded the limit for arsenic (10% of the 42 fillet samples), chromium (40%), copper (10%), lead (10%), mercury (43%) and zinc (7%). Only copper (2%) exceeded the higher international action limits. None of the fillets exceeded the FDA action limit of 1 ppm for mercury.

## PROJECT OBJECTIVES

The objectives of this project were twofold. The first was to compile available databases on metal contaminants in Slocum Creek and to reduce this information to tables for easy reference. The second was to provide an interpretive information base for metal residues in fish fillets from Slocum Creek for comparison with action limits established to protect human health.

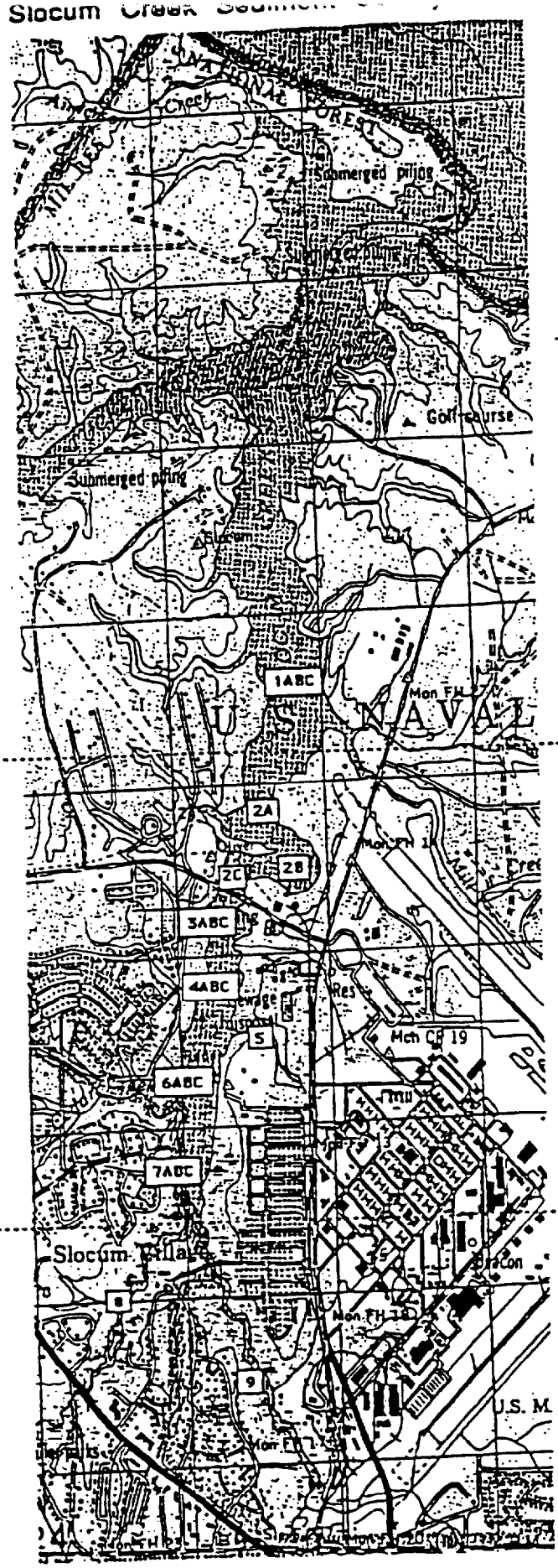
## EXISTING DATABASE ON METALS IN SLOCUM CREEK

### Sample Collections

Fish, sediment, and water samples were analyzed from collections made in 1983. Fish samples were sampled again in 1985 and 1990. The existing database is a compilation of contaminant surveys conducted to gain insight into the possible contamination of the Slocum Creek system. The database is composed of chemical data on a limited number of samples collected in a relatively independent manner. There was no attempt to standardize collection locations or fish species. The sampling design does not allow for further objectives, such as comparison among years or locations.

Even though statistical comparisons among locations is not advisable, it is desirable to present the metal data with some reference to sample locations. To facilitate this, Slocum Creek was arbitrarily divided into three zones (Figure 1). These zones represent about equal division of Slocum Creek between its junction with the Neuse River and Highway 70. The major biological division between these zones is the salinity gradient, which may be expected to affect species distribution and possibly metal uptake. The lower zone is the most saline (probably up to 5 ppt salt, but yearly salinity data are not available). The middle zone is a transition zone in which salinity is less than in the lower zone. The salt line or wedge between fresh and salt water probably migrates within this zone following rainfall events and tidal activities. The upper zone is hyposaline or fresh water. Distribution and types of samples analyzed are presented in Table 1.

The limitations of the existing database are many. Specific comments on the databases referenced to substrate type follow.




LOWER ZONE

MIDDLE ZONE

UPPER ZONE

Figure 1. Sediment sample locations by zone (Lower = mile 0-2.5; Middle = mile 2.6-4.5; Upper = mile 4.6-5.5) in Slocum Creek, 1983.

Table 1. Number of sample locations for sediment, water, and fish collected for metal analyses within Slocum Creek. Sample locations were grouped into three zones: lower (L); middle (M); and upper (U)[a].

| | Sediments | | | Water | | | Fish | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | L | M | U | L | M | U | L | M | U |
| 1983 | 3 | 16 | 2 | 6 | 17 | 6 | 0 | 3 | 0 |
| 1985 | NA[b] | NA | NA | NA | NA | NA | 0 | 1 | 2 |
| 1990 | NA | NA | NA | NA | NA | NA | 1 | 2 | 2 |

[a] See Figure 1 for zone boundaries
[b] No samples collected

Sediments: Sediment chemistry is notably variable, even when samples are collected in close proximity to each other. Samples collected only a few feet apart can have dramatically different levels of environmental contaminants, organic matter, and can differ in particle size. The sediment database for Slocum Creek is limited by the number of sites sampled and replications per site. The number and distribution of sample locations were sufficient for a preliminary examination of sediment contamination in Slocum Creek. However, meaningful comparisons among locations cannot be made due to the small number of replications.

The available database consists only of data collected in 1983.

Water: Water chemistry can be very transient in nature. Influx of effluent runoff from rainfall events, tides, etc. can significantly alter the contaminant profiles. Slocum Creek samples were collected only once per location, and only at a limited number of locations. Sampling design was sufficient for a point-in-time survey, but does not address fluxes in metals that should be expected in aquatic systems.

Sample locations were few, probably yielding an inaccurate assessment of Slocum Creek as a whole. The influences of other water quality and physical parameter data (pH, salinity, alkalinity, etc.) were not addressed with respect to metal concentrations or their effects on the bioavailability of metals.

The available database consists only of data collected in 1983.

Fish: There was no consistent sampling strategy between years or locations. Repetitive collection sites and a species focus were not incorporated into survey design. Samples collected tended to be those that were available, representing a composite of species and size classes. The existing database is therefore considered insufficient for comparison of metal concentrations among years (1983, 1985, 1990) and locations (within Slocum Creek). It is probably sufficient for an intuitive, but nonscientific assessment of metal concentrations in Slocum Creek compared to other coastal creeks and rivers.

Analytical Chemistry.

Samples collected in 1983 were analyzed by two contract laboratories (Table 2). Samples collected in 1985 and 1990 were analyzed by the North Carolina Division of Environmental Management, Raleigh, NC. Metal determinations were determined by inductively coupled plasma (ICP) spectrometry (1983 samples) and atomic absorption (AA) spectrometry (1985 and 1990 samples). Both methods are equally good in specificity, but generally the AA method is more sensitive (can detect smaller quantities of metals). Sensitivity levels for the 1983 samples were relatively high (i.e. very small amounts of metals were detectable); therefore, we question whether the contract lab really used ICP rather than AA. However, since either method has sufficient sensitivity to detect harmful metal concentrations in the substrates examined, this speculation has little bearing on the interpretation of reported values.

The method of sample digestion can have a great influence on detectable metal residues in sediments and water. Weak acid digestion yields "bioavailable" metals. Bioavailable metals are those that are not locked into inorganic mineral structures. Bioavailable metals include metals in water, detritus, biological tissues, and those adsorbed to organic and inorganic particulate matter. They are in a form that may be acquired and absorbed by biological organisms and are of the greatest importance in evaluating biological and health impacts. To date, all metal determinations for Slocum Creek samples have been based on weak acid digestion of substrates.

The limits of analytical sensitivity were not clear in all cases (Table 3). In general, the analytical detection limits were sufficient to detect levels of metals that might be of concern.

## PRESENTATION OF METAL CONCENTRATIONS

Metal concentrations are presented by substrate. For each substrate, three primary data reduction schemes are used. First, the percent of the samples above the analytical detection limit is presented. This indicates the number of samples in which metals were even minimally detected. Second, the highest and lowest metal concentrations are presented as the "extreme concentrations." This demonstrates the variability in the occurrence of metal concentration among samples. Frequently, the lower extreme value will be the

Table 2. Laboratories performing metal analyses on Slocum Creek samples.

| Year | Substance | Laboratory[a] |
|---|---|---|
| 1983 | Water | Centec Analy. Services |
| | Sediment | Centec Analy. Services |
| | Fish | Rocky Mountain Analytical |
| 1985 | Fish | NC Division of Environ. Mgmt. |
| 1990 | Fish | NC Division of Environ. Mgmt. |

[a]See appendix for complete address

Table 3. Analytical detection limits (ppm) for metals in sediment, water, and fish collected in Slocum Creek, 1983.

| | Sample type | | |
|---|---|---|---|
| Metal | Sediment | Water | Fish |
| Aluminum | UNK[a] | NA[b] | NA |
| Antimony | 0.3 | NA | NA |
| Arsenic | NA | NA | 1.0 |
| Berylium | 5.0 | 0.02 | NA |
| Cadmium | 5.0 | 0.02 | 0.01 |
| Chromium | UNK | 0.05 | 0.25 |
| Copper | 5.0 | 0.1 | 0.1 |
| Iron | NA | 0.02 | NA |
| Lead | UNK | 1.0 | 0.5 |
| Mercury | 0.20 | NA | 0.02 |
| Nickel | 50 | 0.1 | 0.5 |
| Selenium | 2.0 | NA | 1.0 |
| Silver | 5.0 | UNK | NA |
| Thallium | 0.3 | NA | NA |
| Zinc | UNK | 0.02 | UNK |

[a] Unknown for this analysis (i.e. not reported), but all samples were above detection limits

[b] No metal analysis performed

analytical detection limit. Third, an average or mean metal concentration was calculated if more than half of the samples had detectable concentrations of individual metals. Because chemical data seldom conform to patterns of normal distribution, data transformations are used to normalize the data for statistical manipulation and presentation. In general, analytical chemistry data on metals are highly skewed to the left, meaning that there are many more low values than high ones. Logarithmic transformations are commonly used to normalize data of this type. This type of transformation tends to minimize the influence of a small number of higher values. Using logarithmic transformations of metal concentrations, geometric means were calculated, the antilogarithm of this mean was taken and is presented as the geometric mean in the tables. For these calculations, metal concentrations below the limits of analytical detection were assigned a numerical value of half the detection level.

## METAL CONCENTRATIONS IN SEDIMENTS

Sediment samples from 21 sampling locations were analyzed (Table 1). All samples were collected in 1983. Collection locations for these samples are shown in Figure 1. A summary of metal concentrations in sediments showed great variation both within and among sample zones (Table 4).

## METAL CONCENTRATIONS IN WATER

Water samples from 29 sampling locations were analyzed (Table 1). All samples were collected in 1983. Collection locations for these samples are shown in Figure 2. Lead and cadmium were not found in water. Chromium was reported in only one sample (Table 5). These three chemicals, along with mercury (which was not included in the metal analyses of water in 1983), are the more toxic of the heavy metals and are usually of greatest concern to regulatory agencies.

## METAL CONCENTRATIONS IN FISH

Whole fish samples from three sampling locations were collected for analyses in both 1983 and 1985 (Figure 3). Five locations were

Table 4. Number of sediment samples analyzed, percent of samples with metal concentrations greater than the analytical detection limits, and extreme concentrations (lowest and highest concentrations) of metals from Slocum Creek 1983. Geometric means are presented in ( ) if more than 50% of the samples contained concentrations above the detection limits.

| Metal | Zone | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lower | | | Middle | | | Upper | | |
| | No. | % | Extreme Conc. | No. | % | Extreme Conc. | No. | % | Extreme Conc. |
| Aluminum | 3 | 100 | 36600-50700 (44500) | 16 | 100 | 1260-39900 (12382) | 1 | 100 | 44200 |
| Antimony | 3 | 0 | >0.30 | 16 | 38 | <0.30-0.84 | 1 | 100 | 0.50 |
| Arsenic | 0 | | | 6 | 100 | 5.16-73.10 (22.9) | 1 | 100 | 58 |
| Berylium | 3 | 0 | <5.0[a] | 16 | 0 | <5.0[a] | 1 | 0 | <5.0[a] |
| Cadmium | 3 | 67 | 6.3-7.4 (6.8) | 16 | 25 | <5.0[a]-27.4 | 1 | 100 | 47 |
| Chromium | 3 | 100 | 85-94 (88.3) | 16 | 100 | 3.8-303 (50.0) | 1 | 100 | 440 |
| Copper | 3 | 33 | <5.0[a]-21 | 16 | 38 | <5.0[a]-154 | 1 | 100 | 75.3 |
| Lead | 3 | 100 | 60-83 (72.1) | 16 | 100 | 9.6-127 (44.5) | 1 | 100 | 264 |
| Mercury | 3 | 100 | 0.30-0.75 (0.50) | 16 | 100 | <2.0[a]-2.2 (0.50) | 1 | 100 | 1.6 |
| Nickel | 3 | 0 | <50[a] | 16 | 0 | <50[a] | 1 | 0 | <50[a] |
| Selenium | 3 | 0 | <2.0[a] | 14 | 0 | <2.0[a] | 1 | 0 | <2.0[a] |
| Thallium | 3 | - | <0.30[a] | 16 | 6 | <0.30[a]-054 | 1 | 0 | <0.30[a] |
| Zinc | 3 | 100 | 35-165 (60.8) | 16 | 100 | 7.2-416 (33.1) | 1 | 100 | 74 |

[a] Detection limit

Slocum Creek Water Survey 1983

Figure 2. Water sample locations by zone (Lower = mile 0-2.5; Middle = mile 2.6-4.5; Upper = mile 4.6-5.5) in Slocum Creek, 1983.

LOWER ZONE

MIDDLE ZONE

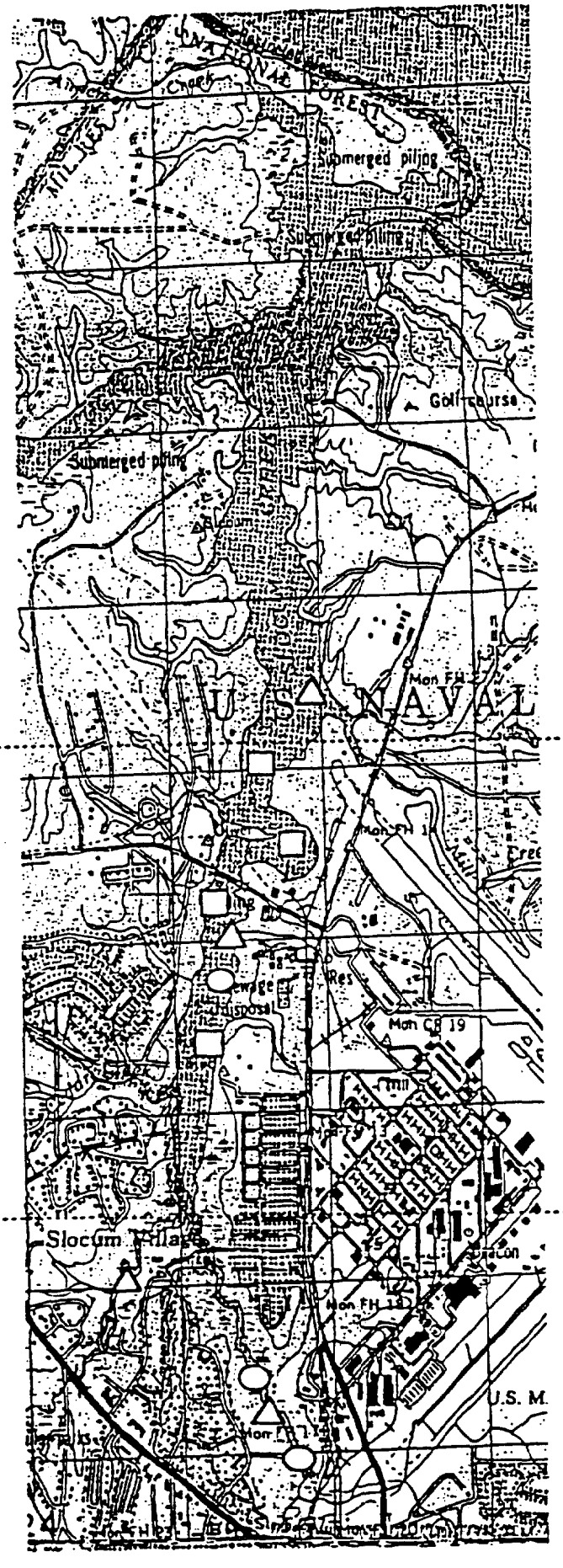
UPPER ZONE

Table 5. Number of water samples analyzed, percent of samples with metal concentrations greater than the analytical detection limits, and extreme concentrations (lowest and highest concentrations) of metals from Slocum Creek 1983. Geometric means are presented in ( ) if more than 50% of the samples contained concentrations above the detection limits.

| Metal | Zone | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lower | | | Middle | | | Upper | | |
| | No. | % | Extreme Conc. | No. | % | Extreme Conc. | No | % | Extreme Conc. |
| Berylium | 6 | 0 | <0.02[a] | 16 | 0 | <0.02[a] | 6 | 0 | <0.02[a] |
| Cadmium | 6 | 0 | <0.02[a] | 16 | 0 | <0.02[a] | 6 | 0 | <0.02[a] |
| Chromium | 6 | 0 | <0.05[a] | 16 | 19 | 0.09-1.2 | 6 | 0 | <0.05[a] |
| Copper | 6 | 0 | <0.10[a] | 16 | 25 | <0.10-0.13 | 6 | 17 | 0.13-0.25 |
| Iron | 6 | 100 | 0.55-3.0 (1.73) | 16 | 94 | 0.19-5.5 (0.87) | 6 | 83 | 0.19-2.2 (0.71) |
| Lead | 6 | 0 | <1.0[a] | 16 | 0 | <1.0[a] | 6 | 0 | <1.0[a] |
| Nickel | 6 | 33 | <0.1[a]-0.12 | 16 | 37 | 0.12-0.68 | 6 | 33 | 0.13-0.25 |
| Zinc | 6 | 0 | UNK | 16 | 6 | 0.60 | 6 | 17 | 0.07 |

[a] Detection limit

Slocum Creek Fish Survey




□ 1983
○ 1985
△ 1990

Figure 3. Fish sample locations by zone (Lower = mile 0-2.5; Middle = mile 2.6-4.5; Upper = mile 4.6-5.5) in Slocum Creek 1983, 1985, 1990.

LOWER ZONE

MIDDLE ZONE

UPPER ZONE

sampled in 1990. Sample collections appeared to be based on an opportunistic sampling strategy that did not require specificity in species and age classes collected. Thus available data are based on multiple species (Table 6) and size classes. The use of this database is therefore extremely limited in that differences among collection locations, species, and years cannot be determined. Relationships between metal concentrations and size cannot be explored.

Metal concentrations in whole fish are presented without regard for variables other than year and zone (Tables 7, 8 and 9). Within and among zone variability was high for most metals. Extreme concentrations (low and high) tended to be consistent among years for individual metals.

Metal concentrations in whole fish from Slocum Creek were compared against national averages (Table 10), as reported in the National Contaminant Biomonitoring Program (Lowe et al., 1985). Geometric means and extreme values for the national program include sites that could be judged low to high in metal contamination. Slocum Creek values fall within the extreme values presented for most metals.

## ACTION LIMITS FOR METALS IN FISH FOR HUMAN CONSUMPTION

### Action Limits for Metals as Established by State, Federal and International Organizations

Action limits for allowable metal residues in fish and shellfish for human consumption have been established by some state and federal agencies. However, the number of metals for which action limits have been adopted by these agencies is surprisingly low (Table 11). The Federal Drug Administration has established an action level for only one metal (mercury). The World Health Organization compiled a listing of international action limits for metals (Table 12). The international action limits for individual metals differ by as much as two orders of magnitude among countries.

### Methods for Establishing Limits

The establishment of critical limits for metal concentrations in fish to be consumed by humans is far from an exact science. This is because

Table 6. Fish species collected from Slocum Creek and number of whole and fillet samples analyzed for metal concentrations.

| Year | Area | Species | Sample Type: Whole Fish | Sample Type: Fish Fillet |
|---|---|---|---|---|
| 1983 | Middle | Largemouth bass | 11 | 0 |
| | | Pumpkinseed | 12 | 0 |
| | | Golden shiner | 4 | |
| 1985 | Middle | Longnose gar | 2 | 3 |
| | | Lizardfish | 1 | 0 |
| | | Summer flounder | 2 | 0 |
| | | White catfish | 3 | 0 |
| | Upper | Longnose gar | 2 | 7 |
| | | White catfish | 4 | 1 |
| 1990 | Lower | Longnose gar | 3 | 2 |
| | | Gizzard shad | 3 | 3 |
| | | Striped mullet | 0 | 4 |
| | | Striped bass | 0 | 1 |
| | Middle | Longnose gar | 2 | 1 |
| | | White perch | 0 | 1 |
| | | Brown bullhead | 0 | 2 |
| | | Gizzard shad | 3 | 3 |
| | Upper | Largemouth bass | 1 | 7 |
| | | Bowfin | 1 | 1 |
| | | Striped mullet | 0 | 7 |
| | | Gizzard shad | 3 | 3 |
| | | Pumpkinseed | 0 | 3 |
| | | Carp | 1 | 0 |
| | | Black crappie | 0 | 1 |
| | | Chain pickerel | 0 | 3 |
| | | Creek chubsucker | 1 | 0 |
| | | Golden shiner | 1 | 0 |
| | | Longnose gar | 1 | 0 |
| | | Yellow perch | 0 | 1 |

Table 7. Number of whole fish analyzed, percent of samples with metal concentrations greater than the analytical detection limits, and extreme concentrations (lowest and highest concentrations) of metals from Slocum Creek 1983 (upper and lower zones were not sampled in 1983). Geometric means are presented if more than 50% of the samples contained concentrations above detection limits.

| | Middle Zone | | | |
|---|---|---|---|---|
| Metal | No. Samples | %≥ Det. Limit | Extreme conc. | Geometric means |
| Cadmium | 27 | 48 | < 0.1[b] - 0.45 | - |
| Chromium | 27 | 100 | 0.37 - 3.6 | 0.88 |
| Copper | 27 | 7 | <.010[b]-1.4 | - |
| Lead | 27 | 15 | < 0.50[b]-1.2 | - |
| Mercury | 27 | 0 | <0.02[b] | - |
| Nickel | 27 | 85 | <0.50[b]-75 | 3.95 |
| Zinc[a] | 27 | 100 | 9.6 - 40 | 9.84 |

[a]Detection limit not reported
[b]Detection limit

Table 8. Number of whole fish analyzed, percent of samples with metal concentrations greater than the analytical detection limits, and extreme metal concentrations (ppm wet weight) in the middle and upper zones of Slocum Creek 1985 (the lower zone of Slocum Creek was not sampled in 1985). Geometric means are presented in ( ) if more than 50% of the samples contained concentrations above the detection limits.

| | Middle Zone | | | Upper Zone | | |
|---|---|---|---|---|---|---|
| Metals | No. Samples | %≥Det. Limit | Extreme Conc. | No. Samples | %≥Det. Limit | Extreme Conc. |
| Cadmium | 8 | 0 | <0.01[a] | 6 | 33 | <0.10[a]-.15 |
| Chromium | 8 | 0 | <0.25[a] | 6 | 0 | <0.25[a] |
| Copper | 8 | 100 | 0.13-.043 (0.25) | 6 | 100 | 0.22-1.4 (0.52) |
| Lead | 8 | 0 | <0.50[a] | 6 | 0 | <0.50[a] |
| Mercury | 8 | 100 | 0.02-0.37 (0.08) | 6 | 83 | .05-0.51 (0.12) |
| Nickel | 8 | 0 | <1.0[a] | 6 | 0 | <0.50[a] |
| Selenium | 8 | 0 | <1.0[a] | 6 | 0 | <1.0[a] |
| Zinc | 8 | 100 | 4.0-14 (8.15) | 6 | 100 | 5.9-18 (8.89) |

[a]Detection limit

Table 9. Number of whole fish analyzed, percent of samples with metal concentrations greater than the analytical detection limits, and extreme concentrations (ppm wet weight, lowest and highest concentrations) of metals in the lower (L), middle (M) and upper (U) zones of Slocum Creek, 1990. Geometric means are presented in ( ) if more than 50% of the samples contained concentrations above the detection limits.

| | Lower zone | | | Middle zone | | | Upper zone | | |
|---|---|---|---|---|---|---|---|---|---|
| Metal | No. Samples | %≥Det. Limit | Extreme Values | No. Samples | %≥Det. Limit | Extreme Values | No. Samples | %≥Det. Limit | Extreme Values |
| Arsenic | 6 | 17 | <1.0[a]-1.0 | 5 | 0 | <1.0[a] | 9 | 0 | <1.0[a] |
| Cadmium | 6 | 17 | <0.10[a]-0.25 | 5 | 0 | <0.10[a] | 9 | 33 | <0.10[a]-0.30 |
| Chromium | 6 | 100 | 3.2-4.4 (3.91) | 5 | 100 | 0.75-4.0 (1.34) | 9 | 22 | <0.25[a]-0.92 |
| Copper | 6 | 100 | 0.30-13 (1.07) | 5 | 100 | 0.14-0.65 (0.40) | 9 | 100 | 0.20-25 (.68) |
| Lead | 6 | 17 | <0.50[a]-0.96 | 5 | 0 | <0.50[a] | 9 | 11 | <0.5[a]-0.91 |
| Mercury | 6 | 100 | 0.04-0.25 (.144) | 5 | 100 | 0.02-.25 (.114) | 9 | 100 | 0.03-0.25 (.079) |
| Nickel | 6 | 17 | <0.5[a]-2.1 | 5 | 0 | <0.50[a] | 9 | 18 | <0.50[a] |
| Selenium | 6 | 0 | <1.0[a] | 5 | 0 | <1.0[a] | 9 | 0 | <1.0[a] |
| Zinc | 6 | 100 | 6.4-13 (8.80) | 5 | 100 | 2.6-7.8 (5.60) | 9 | 91 | 5.6-49 (12.2) |

[a]Detection limit

Table 10. Comparison of metal concentrations (ppm wet weight) in whole fish from Slocum Creek, 1990 with those reported nationwide in the 1984 National Contaminant Biomonitoring Program by Lowe et al. (1985).

| | Slocum Creek | | NCBP | |
|---|---|---|---|---|
| | Geometric mean[b] | Extreme Conc. | Geometric mean | Extreme Conc. |
| Arsenic | | <1.0[a]-1.3 | 0.14 | 0.01-1.51 |
| Cadmium | | <0.10[a]-0.30 | 0.03 | 0.00-0.21 |
| Copper | .71 | 0.10[a]-160 | 0.65 | 0.17-23.1 |
| Lead | | 0.50[a]-3.4 | 0.11 | 0.01-4.88 |
| Mercury | | 0.02[a]-0.29 | 0.10 | 0.01-0.29 |
| Selenium | | <1.0[a] | 0.42 | 0.11-2.30 |
| Zinc | 8.88 | 1.1-91 | 22 | 9.6-80 |

[a] Detection limit

[b] Geometric means are presented for Slocum Creek only if more than 50% of the samples had metal concentrations above analytical detection limits.

Table 11. Action levels for heavy metals in fish fillets in selected states, 1991[a].

| | Metals (ppm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Country | As | Cd | Cr | Cu | Hg | Pb | Sb | Se | Zn |
| California | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| Florida | 1.0-1.5 | 1.0-1.5 | 1.0-1.5 | 1.0-1.5 | <5 | 1.0-1.5 | ** | ** | ** |
| Louisiana | ** | 6.6 | ** | 71.0 | .12 | 13.0 | ** | ** | 590 |
| Michigan | ** | ** | ** | ** | .5 | ** | ** | ** | ** |
| Minnesota | ** | ** | ** | ** | .16 | ** | ** | ** | ** |
| New Jersey | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| New York | ** | 0.3 | ** | ** | ** | 0.1 | ** | ** | ** |
| North Carolina[b] | | | | | | | | | |
| Pennsylvania | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| Wisconsin | ** | ** | ** | ** | 0.5 | ** | ** | ** | ** |

** Indicate compliance with FDA action levels (Note: FDA only has established action limits for mercury; however, states responded as indicated, possibly indicating lack of necessity and thus familiarity.

[a]Data compiled by personal communication with state representatives (see Appendix for contact list).

[b]North Carolina establishes action levels on a case by case basis; no specific values are available.

Table 12. Compilation of legal limits for hazardous metals in fish and fishery products[a].

| | Metals (ppm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Country | As | Cd | Cr | Cu | Hg | Pb | Sb | Se | Zn |
| Australia | 1.0,1.5[c] | 0.2-5.5 | | 10-70 | 0.5,1.0 | 1.5-5.5 | 1.5 | 1.0,2.0 | 40-1,000 |
| Brazil | | | | | 0.5[c] | | | | |
| Canada | 3.5 | | | | 0.5 | 0.5 | | | |
| Chile | 0.12,1.0 | 0.5 | | 10 | | 2.0 | | 0.05,0.3 | 100 |
| Denmark | | | | | 0.5 | | | | |
| Ecuador | 1.0 | | | 10 | 1.0 | 5.0 | | | |
| Finland | 5.0 | | | | 1.0 | 2.0 | | | |
| France | | | | | 0.5,0.7 | | | | |
| Germany | | 0.5 | | | 1.0 | 0.5 | | | |
| Greece | | | | | 0.7 | | | | |
| Hong Kong | 1.4-10 | 2.0 | 1.0 | | 0.5 | 6.0 | 1.0 | | |
| India | 1.0 | | | 10 | 0.5[d] | 5.0 | | | 50 |
| Israel | | | | | 0.5 | | | | |
| Italy | | | | | 0.7[c] | 2.0 | | | |
| Japan | | | | | 0.3,0.4[d] | | | | |
| Korea | | | | | 0.5 | | | | |
| Netherlands | | 0.5-1.0 | | | 1.0[c] | 0.5,2.0 | | | |
| New Zealand | 1.0 | 1.0 | | 30 | 0.5[c] | 2.0 | 1.0 | 2.0 | 40 |
| Philippines | 30 | | | | 0.5 | 0.5 | | | |
| Poland | 4.0 | | | 10-30 | | 1.0-2.0 | | | 30-50 |
| Spain | | | | | 0.5 | | | | |
| Sweden | | | | | 1.0[d] | 1.0-2.0 | | | |
| Switzerland | | 0.1 | | | 0.5 | 1.0 | | | |
| Thailand | 2.0 | | | 20 | 0.5 | 1.0 | | | |
| United Kingdom | 1.0 | | | 20 | | 2.0-10 | | | 50 |
| United States[b] | | | | | 1.0[d] | | | | |
| U.S.S.R. | | | | | 0.2-1.0 | | | | |
| Venezuela | 0.1 | 0,0.1 | | 10 | 0.1-0.5 | 2.0 | | | |
| Zambia | 3.5-5.0 | | | 100 | 0.2-0.3 | 0.5-10 | | | 100 |
| Range | | | | | | | | | |
| Minimum | 0.1 | 0.5 | 1.0 | 10 | 0.1 | 0.5 | 1.0 | 0.05 | 30 |
| Maximum | 10 | 5.5 | 1.0 | 100 | 1.0 | 10 | 1.5 | 2.0 | 1,000 |

[a]Table compilation presented in EPA Rept. No. 503/8-89-002 1989 from the data of Nauen (1983); U.S. Food and Drug Administration (1982, 1984).

[b]Limit varies among states.

[c]Inorganic.

[d]Total.

Table 13. Consumption rates of fish and shellfish in the United States.

| Grams per day | Description |
|---|---|
| 6.5 | The average consumption of fish and shellfish from estuarine and fresh waters by the U.S. population (EPA, 1980) |
| 20 | The average consumption of fish and shellfish from marine, estuarine, and fresh waters by the U.S. population (USDA, 1984). |
| 41.7 | The average consumption of fish and shellfish from marine, estuarine, and fresh waters by the population of North Carolina (Ken Rudo, personal communication). |
| 165 | The average consumption of fish and shellfish from marine, estuarine, and fresh waters by the 99.9th percentile of the US population (Finch, 1983). Represents the "reasonable worst case" based on the assumption that some individuals would consume fish at a rate equal to the combined consumption of red meat, poultry, fish and shellfish in the U.S. (EPA, 1977-78). |

the direct measurement of human health risks is possible only in certain limited circumstances in which there are clearly adverse effects (acute poisoning resulting in hospitalization or death, for example). The long latency period for response to many chemicals, the complex interaction of metal and other chemicals in human food chains, and methods of exposure other than dietary complicate the assessment of direct effects.

Federal action limits for metals were drafted for the regulation of food for interstate commerce. When setting regulations, the federal agencies review not only health effects, but also economic impacts of their actions. Therefore, federal action limits should not be interpreted as minimum effect levels. These federal regulations were not intended to protect localized subpopulations of recreational anglers that may consume fish at a rate substantially above the national per capita average (EPA, 1989).

The State of North Carolina has no established action limits for metals in fish to be consumed by humans (Ken Rudo, pers. comm.). Instead, the State prefers to act on a case-by-case basis after examining the metal of interest, its location within the state, and the potential for human consumption of fish from that area. Canada has developed a similar approach, issuing specific action limits and health advisories on a lake-by-lake basis (Allan Johnson, pers. comm.).

Mathematical risk assessment models have been constructed for the use of state and federal regulatory agencies, but these are often modified by the agencies. The State of North Carolina uses the following equation to establish maximum allowable concentrations for harmful substances:

Reference Dose X Body Weight X Fish Consumed/Day.

This is the basic risk model used by most agencies. However, beyond this there is little standardization. Reference doses are estimates of the daily exposure to human populations that is unlikely to produce an adverse health effect during a lifetime. Ways to calculate these doses vary greatly. The body weight used in the equation is typically 70 kg, representing an average weight for adult males. Differences in body weights between individuals, sexes, or ages are not always considered. Figures for fish consumption per day are not standardized, and different consumption rates are used in individual risk assessment models (Table 13).

## Comparison of Metal Residues in Fish Fillets from Slocum Creek with Action Limits

Metal residues in fish fillets from Slocum Creek, (1983, 1984, and 1990 combined) were compared against the lowest and highest action limits in use by countries throughout the world. The minimum action limits were exceeded for arsenic, chromium, copper, lead, mercury and zinc, but not for other metals (Table 14). The higher action limits (less conservative limits for protection of human health) were exceeded only for copper (2%). The FDA action limit of 1 ppm for mercury was not exceeded in any samples. Fish fillets used in this analysis were from a variety representing all fish trophic levels. From the samples available, we could detect no trend for one species or trophic level to contribute disproportionally to the number of samples with metal residues greater than those specified in the action limits.

Table 14. Comparison of metal concentrations in fish fillets from Slocum Creek, 1990 with international standards established to protect human health. Comparisons are made with lowest and highest international standards as reported in Table 12.

| | Extreme limits of international standards | % Slocum Creek samples ≥ minimum standard | % Slocum Creek samples ≥ maximum standard |
|---|---|---|---|
| Arsenic | 0.1-10 | 10 | 0 |
| Cadmium | 0[a]-5.5 | 0 | 0 |
| Chromium | 1.0 | 40 | [b] |
| Copper | 10.0-100 | 10 | 2 |
| Lead | 0.5-10 | 10 | 0 |
| Mercury | 0.1-1.0 | 43 | 0 |
| Zinc | 30-1,000 | 7 | 0 |

[a]No samples above detection limit of 0.01
[b]Only one standard is presented

## REFERENCES

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FDA. 1984. Polychlorinated biphenyls (PCBs) in fish and shellfish; reduction of tolerances; final decision. U.S. Food and Drug Administration. Federal Register, Vol. 49, No. 100, pp. 21514-21520.

Lowe, T. P., T. W. May, W. G. Brumbaugh, and D. A. Kane. 1985. National Contaminant Biomonitoring Program: Concentrations of seven elements in freshwater fish, 1978-1981. Arch. Environ. Contam. Toxicol. 14, 363-388.

Nauen, C. E. 1983. Compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products. FAO Fisheries Circular No. 164. Food and Agriculture Organization of the United Nations, Rome, Italy.

# APPENDICES

Appendix 1. State agency representatives contacted for information on metal action limits.

1. California
   Gerald Pollack, Dept. Health Services
   (916) 323-9667

2. Florida
   Homer Royal, Bureau of Fisheries Research
   (904) 357-6631

3. Louisiana
   Cindy Crittenmeeker, DEQ, Water Resources
   (504) 342-6363

4. Michigan
   John Hesse, Ctr. Env. Health Studies
   (517) 335-8350

5. Minnesota
   Jack Strypek, DNR
   (612) 296-6157

6. New Jersey
   John McClain, Div. Fish, Game & Wildlife
   (609) 748-2020

7. New York
   Tony Forti, Dept. Env. Conser.
   (518) 458-6405

8. North Carolina
   Ken Rudo, Dept. Env. Health and Nat'l Resources
   (919) 733-3410

9. Pennsylvania
   Bob Hesser, Fishery Resources
   (814) 359-5100

10. Wisconsin
    Jim Amrhein, DNR
    (608) 266-5325

Appendix 2. Sediment and water database for Slocum Creek, 1983.

Sediment and Water database, Slocum Creek, 1983

| SAMPLENO | DATE | LOCATION | SUBST | AG | BE | CD | CR | CU | NI |
|---|---|---|---|---|---|---|---|---|---|
| 31229 | 8/23/83 | MC1A | SED | . | . | 6.29 | 84.70 | . | . |
| 31230 | 8/23/83 | MC1B | SED | . | . | . | 86.10 | . | . |
| 31231 | 8/23/83 | MC1C | SED | . | . | 7.40 | 94.30 | 21.30 | . |
| 31232 | 8/23/83 | OP2B | SED | . | . | . | 96.00 | . | . |
| 31233 | 8/23/83 | OP2C | SED | . | . | . | 88.20 | 16.60 | . |
| 31234 | 8/23/83 | OP2A | SED | . | . | . | 94.40 | . | . |
| 31235 | 8/23/83 | BWP3C | SED | . | . | . | 7.27 | . | . |
| 31236 | 8/23/83 | ANL4A | SED | . | . | . | 3.80 | . | . |
| 31237 | 8/23/83 | ANL4B | SED | . | . | . | 28.40 | . | . |
| 31238 | 8/23/83 | ANL4C | SED | . | . | 7.97 | 145.00 | 23.70 | . |
| 31239 | 8/23/83 | TG5 | SED | . | . | . | 7.61 | . | . |
| 31240 | 8/23/83 | OL6A | SED | . | . | . | 70.90 | . | . |
| 31241 | 8/23/83 | OL6B | SED | . | . | 15.30 | 180.00 | 22.00 | . |
| 31242 | 8/23/83 | OL6C | SED | 33.3 | . | 15.20 | 303.00 | 35.00 | . |
| 31243 | 8/23/83 | F7A | SED | . | . | . | 121.00 | . | . |
| 31244 | 8/23/83 | F7B | SED | . | . | 27.40 | 266.00 | 38.00 | . |
| 31245 | 8/23/83 | F7C | SED | . | . | . | 51.80 | . | . |
| 31246 | 8/23/83 | SB9 | SED | . | . | 46.80 | 440.00 | 75.30 | . |
| 31247 | 8/23/83 | NR | WATER | . | . | . | . | . | . |
| 31248 | 8/23/83 | TC | WATER | . | . | . | . | . | 0.12 |
| 31249 | 8/23/83 | TC | WATER | . | . | . | . | . | . |
| 31250 | 8/23/83 | TC | WATER | . | . | . | . | . | . |
| 31251 | 8/23/83 | MC | WATER | . | . | . | . | . | . |
| 31252 | 8/23/83 | MC | WATER | . | . | . | . | . | . |
| 31253 | 8/23/83 | MC | WATER | . | . | . | . | . | 0.12 |
| 31254 | 8/23/83 | OP | WATER | . | . | . | . | . | 0.20 |

| SAMPLENO | PB | ZN | AL | FE | SE | AS | SB | TL | HG |
|---|---|---|---|---|---|---|---|---|---|
| 31229 | 75.00 | 165.00 | 47600 | . | . | . | . | . | 0.555 |
| 31230 | 60.00 | 39.30 | 50700 | . | . | . | . | . | 0.304 |
| 31231 | 83.20 | 34.60 | 36600 | . | . | . | . | . | 0.747 |
| 31232 | 56.40 | 30.00 | 32400 | . | . | . | . | . | 0.746 |
| 31233 | 41.70 | 29.10 | 19000 | . | . | . | 0.332 | . | 0.362 |
| 31234 | 105.00 | 26.80 | 39900 | . | . | . | 0.840 | . | 0.712 |
| 31235 | 21.00 | 12.60 | 1340 | . | . | . | . | . | . |
| 31236 | 12.60 | 7.84 | 1260 | . | . | . | . | . | . |
| 31237 | 9.56 | 34.80 | 7420 | . | . | . | . | . | 0.248 |
| 31238 | 59.20 | 26.20 | 32800 | . | . | . | 0.474 | . | 2.160 |
| 31239 | 33.40 | 7.23 | 5580 | . | . | . | . | . | 0.237 |
| 31240 | 71.00 | 37.80 | 30900 | . | . | . | . | . | 0.416 |
| 31241 | 54.00 | 52.50 | 36800 | . | . | . | 0.540 | 0.54 | 1.200 |
| 31242 | 91.00 | 48.00 | 36400 | . | . | 73.10 | 0.607 | . | 2.120 |
| 31243 | 47.50 | 35.70 | 19200 | . | . | 28.00 | 0.475 | . | 0.627 |
| 31244 | 127.00 | 31.00 | 32800 | . | . | 51.20 | . | . | . |
| 31245 | 38.10 | 7.76 | 5900 | . | . | 5.16 | . | . | 0.765 |
| 31246 | 264.00 | 73.80 | 44200 | . | . | 58.20 | 0.501 | . | 1.620 |
| 31247 | . | . | . | 0.73 | . | . | . | . | . |
| 31248 | . | . | . | 2.90 | . | . | . | . | . |
| 31249 | . | . | . | 0.55 | . | . | . | . | . |
| 31250 | . | . | . | 0.73 | . | . | . | . | . |
| 31251 | . | . | . | 3.05 | . | . | . | . | . |
| 31252 | . | . | . | 2.45 | . | . | . | . | . |
| 31253 | . | . | . | 3.05 | . | . | . | . | . |
| 31254 | . | . | . | 2.75 | . | . | . | . | . |

Sediment and Water database, Slocum Creek, 1983

| SAMPLENO | DATE | LOCATION | SUBST | AG | BE | CD | CR | CU | NI |
|---|---|---|---|---|---|---|---|---|---|
| 31255 | 8/23/83 | OP | WATER | . | . | . | . | . | . |
| 31256 | 8/23/83 | OP | WATER | . | . | . | . | . | . |
| 31257 | 8/23/83 | TG | WATER | . | . | . | . | . | . |
| 31258 | 8/23/83 | D5B | WATER | . | . | . | . | . | . |
| 31259 | 8/23/83 | D5C | WATER | . | . | . | . | . | . |
| 31260 | 8/23/83 | TG | WATER | . | . | . | . | . | . |
| 31261 | 8/23/83 | TG | WATER | . | . | . | . | . | . |
| 31261 | 8/24/83 | D6B | WATER | . | . | . | . | 0.10 | 0.26 |
| 31262 | 8/23/83 | TG | WATER | . | . | . | . | . | . |
| 31262 | 8/24/83 | TG | WATER | . | . | . | . | 0.13 | . |
| 31263 | 8/23/83 | TG | WATER | . | . | . | . | . | 0.12 |
| 31263 | 8/24/83 | TG | WATER | . | . | . | . | 0.10 | 0.12 |
| 31264 | 8/23/83 | TG | WATER | . | . | . | . | . | 0.12 |
| 31264 | 8/24/83 | D8A | WATER | . | . | . | . | 0.10 | 0.12 |
| 31265 | 8/23/83 | TG | WATER | . | . | . | . | . | 0.12 |
| 31266 | 8/23/83 | TG | WATER | . | . | . | . | . | . |
| 31267 | 8/23/83 | F9A | WATER | . | . | . | . | . | . |
| 31268 | 8/23/83 | F9B | WATER | . | . | . | 0.39 | . | 0.37 |
| 31269 | 8/23/83 | F9C | WATER | . | . | . | 0.09 | . | . |
| 31270 | 8/23/83 | WP10 | WATER | . | . | . | . | . | 0.25 |
| 31271 | 8/23/83 | SB11 | WATER | . | . | . | . | . | . |
| 31272 | 8/23/83 | SB12 | WATER | . | . | . | . | . | . |
| 31273 | 8/23/83 | SB13 | WATER | . | . | . | . | . | . |
| 31273 | 8/24/83 | SC | WATER | . | . | . | . | 0.10 | 0.13 |
| 31274 | 8/23/83 | SHB14 | WATER | . | . | . | . | . | . |
| 31275 | 8/23/83 | SHB15 | WATER | . | . | . | . | . | . |

| SAMPLENO | PB | ZN | AL | FE | SE | AS | SB | TL | HG |
|---|---|---|---|---|---|---|---|---|---|
| 31255 | . | . | . | 0.73 | . | . | . | . | . |
| 31256 | . | . | . | 0.55 | . | . | . | . | . |
| 31257 | . | . | . | 0.19 | . | . | . | . | . |
| 31258 | . | . | . | 0.91 | . | . | . | . | . |
| 31259 | . | . | . | 0.19 | . | . | . | . | . |
| 31260 | . | . | . | 0.37 | . | . | . | . | . |
| 31261 | . | . | . | 0.37 | . | . | . | . | . |
| 31261 | . | . | . | 0.37 | . | . | . | . | . |
| 31262 | . | . | . | 0.55 | . | . | . | . | . |
| 31262 | . | . | . | 0.55 | 0.014 | . | . | . | . |
| 31263 | . | . | . | 3.40 | . | . | . | . | . |
| 31263 | . | . | . | 3.40 | . | . | . | . | . |
| 31264 | . | . | . | 0.37 | . | . | . | . | . |
| 31264 | . | . | . | 0.37 | 0.011 | . | . | . | . |
| 31265 | . | . | . | 0.19 | . | . | . | . | . |
| 31266 | . | . | . | 0.73 | . | . | . | . | . |
| 31267 | . | . | . | 2.15 | . | . | . | . | . |
| 31268 | . | . | . | 5.00 | . | . | . | . | . |
| 31269 | . | . | . | 5.50 | . | . | . | . | . |
| 31270 | . | 0.07 | . | 2.20 | . | . | . | . | . |
| 31271 | . | . | . | . | . | . | . | . | . |
| 31272 | . | . | . | 0.19 | . | . | . | . | . |
| 31273 | . | . | . | 1.18 | . | . | . | . | . |
| 31273 | . | . | . | 1.18 | . | . | . | . | . |
| 31274 | . | . | . | 0.19 | . | . | . | . | . |
| 31275 | . | . | . | 1.18 | . | . | . | . | . |

Sediment and Water database, Slocum Creek, 1993

| SAMPLENO | DATE | LOCATION | SUBST | AG | BE | CD | CR | CU | NI |
|---|---|---|---|---|---|---|---|---|---|
| 31276 | 8/23/83 | LS | WATER | . | . | . | 1.25 | . | 0.68 |
| 31277 | 8/24/83 | 3A | SED | . | . | . | 26.60 | . | . |
| 31277 | 8/24/83 | 3A | SEDIMENT | . | . | . | 26.60 | . | . |
| 31278 | 8/24/83 | 3B | SED | . | . | . | 12.80 | 154.00 | . |
| 31278 | 8/24/83 | 3B | SEDIMENT | . | . | . | 12.80 | 154.00 | . |

| SAMPLENO | PB | ZN | AL | FE | SE | AS | SB | TL | HG |
|---|---|---|---|---|---|---|---|---|---|
| 31276 | . | 0.60 | . | . | . | . | . | . | . |
| 31277 | 105 | 399.00 | 13300 | . | . | 40.90 | . | . | 1.700 |
| 31277 | 105 | 399.00 | 13300 | . | . | . | . | . | . |
| 31278 | 23 | 416.00 | 2650 | . | . | 6.59 | . | . | 0.518 |
| 31278 | 23 | 416.00 | 2650 | . | . | . | . | . | . |

Appendix 3. Fish database for Slocum Creek, all years.

Fish database, Slocum Creek, All Years

| SAMPLE NO | DATE | LOCATION | SPECIES | LENGTH | WEIGHT | TYPE | HG | AS | CD | CR | CU | NI | PB | ZN | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5062 | 5/3/83 | MC-CC | LMB | 21.0 | 140.0 | W | . | . | 0.180 | 0.70 | . | 15.0 | . | 14.0 | . |
| 5063 | 5/3/83 | MC-CC | LMB | 21.4 | 140.0 | W | . | . | . | 0.72 | . | 3.2 | . | 12.0 | . |
| 5064 | 5/3/83 | MC-CC | LMB | 23.7 | 170.0 | W | . | . | 0.150 | 1.00 | . | 19.0 | . | 16.0 | . |
| 5065 | 5/3/83 | MC-CC | LMB | 21.5 | 180.0 | W | . | . | . | 0.43 | . | 2.0 | . | 13.0 | . |
| 5066 | 5/3/83 | MC-CC | LMB | 22.8 | 180.0 | W | . | . | 0.100 | 2.30 | . | 11.0 | 0.88 | 14.0 | . |
| 5067 | 5/3/83 | MC-CC | LMB | 22.2 | 160.0 | W | . | . | 0.200 | 0.60 | . | 75.0 | . | 11.0 | . |
| 5068 | 5/3/83 | MC-CC | LMB | 37.0 | 800.0 | W | . | . | 0.075 | 3.60 | . | 12.0 | . | 11.0 | . |
| 5069 | 5/3/83 | MC-CC | LMB | 36.8 | 780.0 | W | . | . | 0.100 | 0.50 | 1.30 | 30.0 | . | 14.0 | . |
| 0610 | 5/3/83 | MC-CC | LMB | 36.0 | 680.0 | W | . | . | . | 0.72 | . | 3.6 | . | 16.0 | . |
| 0611 | 5/3/83 | MC-CC | LMB | 37.4 | 870.0 | W | . | . | . | 0.37 | . | 12.0 | . | 9.6 | . |
| 50612 | 5/3/83 | MC-CC | LMB | 24.2 | 230.0 | W | . | . | . | 0.45 | . | 3.8 | . | 13.0 | . |
| 0625 | 5/3/83 | MC-CC | Sf | 19.5 | 200.0 | W | . | . | 0.130 | 1.90 | . | 30.0 | 0.70 | 25.0 | . |
| 0626 | 5/3/83 | MC-CC | Sf | 18.0 | 120.0 | W | . | . | 0.100 | 1.50 | . | 2.7 | . | 20.0 | . |
| 50627 | 5/3/83 | MC-CC | Sf | 21.0 | 260.0 | W | . | . | 0.075 | 1.80 | . | 2.0 | . | 24.0 | . |
| 50628 | 5/3/83 | MC-CC | Sf | 19.5 | 180.0 | W | . | . | 0.075 | 1.30 | . | 22.0 | . | 20.0 | . |
| 0629 | 5/3/83 | MC-CC | Sf | 17.3 | 180.0 | W | . | . | 0.075 | 0.86 | . | 1.6 | . | 18.0 | . |
| 50630 | 5/3/83 | MC-CC | Sf | 17.5 | 110.0 | W | . | . | 0.050 | 0.77 | . | 3.6 | . | 16.0 | . |
| 50631 | 5/3/83 | MC-CC | Sf | 17.5 | 150.0 | W | . | . | 0.450 | 1.50 | . | 5.7 | . | 21.0 | . |
| 0632 | 5/3/83 | MC-CC | Sf | 20.5 | 220.0 | W | . | . | 0.130 | 1.10 | . | 2.8 | . | 18.0 | . |
| 3 | 5/3/83 | MC-CC | Sf | 17.4 | 140.0 | W | . | . | 0.130 | 0.95 | . | 26.0 | . | 17.0 | . |
| 50634 | 5/3/83 | MC-CC | Sf | 17.6 | 140.0 | W | . | . | 0.180 | 0.67 | . | 1.9 | . | 18.0 | . |
| 0635 | 5/3/83 | MC-CC | Sf | 17.9 | 140.0 | W | . | . | 0.100 | 1.30 | . | 10.0 | . | 20.0 | . |
| 0636 | 5/3/83 | MC-CC | Sf | 18.5 | 161.0 | W | . | . | 0.180 | 0.83 | . | 3.2 | . | 18.0 | . |
| 50649 | 5/5/83 | CC | GS | 12.0 | 15.0 | W | . | . | 0.050 | 0.54 | . | . | . | 40.0 | . |
| 50650 | 5/5/83 | CC | GS | 13.0 | 20.0 | W | . | . | 0.075 | 0.37 | 1.40 | . | . | 29.0 | . |
| 0651 | 5/5/83 | CC | GS | 14.5 | 25.0 | W | . | . | . | 0.49 | . | . | 0.98 | 30.0 | . |
| 50652 | 5/5/83 | CC | GS | 19.0 | 55.0 | W | . | . | 0.100 | 1.10 | . | . | 1.20 | 32.0 | . |
| 50661 | 5/20/83 | OP | Cb | 14.8 | 157.5 | | . | . | 0.050 | . | 3.30 | . | 0.53 | 29.0 | . |
| 0662 | 5/20/83 | OP | Cb | 17.5 | 180.0 | | . | . | 0.050 | . | 1.90 | . | . | 23.0 | . |
| 0663 | 5/20/83 | OP | Cb | 13.2 | 88.3 | | . | . | 0.050 | . | 2.60 | . | . | 25.0 | . |
| 50670 | 5/20/83 | OP | Cl | 6.8 | . | | . | . | 0.230 | 0.81 | 2.30 | 1.7 | 0.50 | 13.0 | . |
| 50671 | 5/20/83 | OP | Cl | 7.0 | . | | . | . | 0.330 | 0.82 | 3.00 | 1.5 | 0.50 | 14.0 | . |
| 50672 | 5/20/83 | OP | Cl | 6.3 | . | | . | . | 0.300 | 0.47 | 2.40 | 1.1 | 0.50 | 16.0 | . |
| 50673 | 5/20/83 | OP | Cl | 6.0 | . | | . | . | 0.300 | 1.10 | 3.20 | 1.1 | . | 17.0 | . |
| 88501 | 8/8/85 | DsWWTP | LG | 59.5 | 522.0 | F | 0.08 | . | . | . | 0.15 | . | . | 3.1 | . |
| 88502 | 8/8/85 | DsWWTP | LG | 66.1 | 820.0 | F | 0.11 | . | . | . | 0.12 | . | . | 2.5 | . |
| 88503 | 8/8/85 | DsWWTP | LG | 70.5 | 1018.0 | W | 0.37 | . | . | . | 0.21 | . | . | 4.0 | . |
| 88504 | 8/8/85 | DsWWTP | LG | 72.7 | 1049.0 | F | 0.19 | . | 0.470 | . | 4.30 | . | . | 57.0 | . |
| 88505 | 8/8/85 | DsWWTP | LG | 78.8 | 1083.0 | W | 0.29 | . | . | . | 0.16 | . | . | 11.0 | . |
| 88506 | 8/8/85 | DsWWTP | Lf | 31.1 | 182.0 | W | 0.02 | . | . | . | 0.13 | . | . | 14.0 | . |
| 88507 | 8/8/85 | DsWWTP | SF | 33.1 | 403.0 | W | 0.07 | . | . | . | 0.20 | . | . | 12.0 | . |
| 88508 | 8/8/85 | DsWWTP | SF | 27.5 | 231.0 | W | 0.06 | . | . | . | 0.27 | . | . | 11.0 | . |
| 88509 | 8/8/85 | DsWWTP | WCf | 17.4 | 204.0 | W | 0.06 | . | . | . | 0.37 | . | . | 7.4 | . |
| 88510 | 8/8/85 | DsWWTP | WCf | 30.6 | 328.0 | W | 0.05 | . | . | . | 0.43 | . | . | 6.9 | . |
| 11 | 8/8/85 | DsWWTP | WCf | 33.3 | 409.0 | W | 0.09 | . | . | . | 0.40 | . | . | 10.0 | . |
| 12 | 8/8/85 | EPUsSB | LG | 55.5 | 361.0 | F | 0.06 | . | . | . | 0.16 | . | . | 6.6 | . |
| 88513 | 8/8/85 | EPUsSB | LG | 59.3 | 450.0 | F | 0.20 | . | . | . | 0.36 | . | . | 8.6 | . |
| 88514 | 8/8/85 | EPUsSB | LG | 59.8 | 445.0 | W | 0.50 | . | . | . | 0.90 | . | . | 18.0 | . |
| 88515 | 8/8/85 | EPUsSB | LG | 60.5 | 453.0 | W | 0.51 | . | 0.150 | . | 1.40 | . | . | 11.0 | . |

Fish database, Slocum Creek, All Years

| AMPLENO | DATE | LOCATION | SPECIES | LENGTH | WEIGHT | TYPE |
|---|---|---|---|---|---|---|
| 88516 | 8/8/85 | EPUsSB | LG | 63.3 | 572 | F |
| 88517 | 8/8/85 | EPUsSB | WCf | 31.1 | 313 | W |
| 88518 | 8/8/85 | EPUsSB | WCf | 31.8 | 369 | W |
| 88519 | 8/8/85 | EPDsSB | LG | 57.0 | 364 | F |
| 88520 | 8/8/85 | EPDsSB | LG | 58.5 | 433 | F |
| 88521 | 8/8/85 | EPDsSB | LG | 65.4 | 670 | F |
| 88522 | 8/8/85 | EPDsSB | LG | 68.4 | 734 | F |
| 88523 | 8/8/85 | EPDsSB | WCf | 31.7 | 380 | F |
| 88524 | 8/8/85 | EPDsSB | WCf | 32.2 | 1130 | W |
| 88525 | 8/8/85 | EPDsSB | WCf | 34.4 | 455 | W |
| 59001 | 5/22/90 | MC | LG | 76.5 | 1850 | W1 |
| 59002 | 5/22/90 | MC | LG | 76.5 | 1850 | W1 |
| 59003 | 5/22/90 | MC | LG | 79.5 | 1575 | W1 |
| 59004 | 5/22/90 | MC | LG | 72.0 | 1250 | F1 |
| 59005 | 5/22/90 | MC | LG | 79.0 | 1600 | F1 |
| 59006 | 5/22/90 | MC | GS | 33.3 | 425 | WC3 |
| 59007 | 5/22/90 | MC | GS | 32.0 | 350 | W1 |
| 59008 | 5/22/90 | MC | GS | 31.0 | 350 | W1 |
| 59009 | 5/22/90 | MC | GS | 32.0 | 400 | F1 |
| 59010 | 5/22/90 | MC | GS | 32.0 | 350 | F1 |
| 59011 | 5/22/90 | MC | GS | 31.5 | 325 | FC3 |
| 59012 | 5/22/90 | MC | SM | 34.0 | 400 | F1 |
| 59013 | 5/22/90 | MC | SM | 33.0 | 375 | F1 |
| 59014 | 5/22/90 | MC | SM | 32.0 | 325 | F1 |
| 59015 | 5/22/90 | MC | SM | 29.0 | 275 | F1 |
| 59016 | 5/22/90 | MC | SM | 44.5 | 1125 | F1 |

| SAMPLENO | HG | AS | CD | CR | CU | NI | PB | ZN | |
|---|---|---|---|---|---|---|---|---|---|
| 88516 | 0.13 | . | . | . | 0.39 | . | . | 5.5 | . |
| 88517 | 0.05 | . | . | . | 0.55 | . | . | 7.3 | . |
| 88518 | 0.08 | . | . | . | 0.42 | . | . | 5.9 | . |
| 88519 | 0.20 | . | . | . | 0.43 | . | . | 4.6 | . |
| 88520 | 0.10 | . | . | . | 0.21 | . | . | 3.8 | . |
| 88521 | 0.07 | . | . | . | 0.16 | . | . | 3.3 | . |
| 88522 | 0.21 | . | 0.12 | . | 0.25 | . | . | 6.6 | . |
| 88523 | 0.07 | . | . | . | 0.38 | . | . | 10.0 | . |
| 88524 | 0.06 | . | . | . | 0.31 | . | . | 7.7 | . |
| 88525 | 0.06 | . | . | . | 0.22 | . | . | 7.5 | . |
| 59001 | 0.13 | 1.0 | . | 3.90 | 1.00 | . | . | 8.0 | . |
| 59002 | 0.04 | . | . | 4.40 | 1.10 | . | . | 6.4 | . |
| 59003 | 0.11 | . | 0.25 | 4.10 | 13.10 | 2.1 | 0.70 | 14.0 | . |
| 59004 | 0.12 | . | . | 3.40 | 97.00 | 1.8 | 3.40 | 56.0 | . |
| 59005 | 0.11 | . | . | 3.30 | 19.00 | . | 0.82 | 12.0 | . |
| 59006 | . | . | . | 3.90 | 0.59 | . | . | 9.8 | . |
| 59007 | . | . | . | 3.20 | 0.30 | . | . | 7.7 | . |
| 59008 | . | . | . | 4.10 | 0.61 | 0.5 | 0.26 | 9.6 | . |
| 59009 | . | . | . | 3.30 | 160.00 | 1.9 | 6.20 | 91.0 | . |
| 59010 | . | . | . | 4.10 | 85.00 | 1.3 | 3.10 | 50.0 | . |
| 59011 | . | . | . | 4.50 | 0.27 | . | . | 4.6 | . |
| 59012 | . | 1.3 | . | 4.20 | 0.69 | . | . | 5.7 | . |
| 59013 | . | 1.0 | . | 4.30 | 0.31 | . | . | 4.7 | . |
| 59014 | . | . | . | 4.10 | 0.19 | . | . | 3.4 | |
| 59015 | . | . | . | 3.90 | 0.20 | . | . | 3.8 | |
| 59016 | 0.07 | . | . | 4.30 | 0.25 | . | . | 4.3 | . |

Fish database, Slocum Creek, All Years

| SAMPLE NO | DATE | LOCATION | SPECIES | LENGTH | WEIGHT | TYPE | HG | AS | CD | CR | CU | NI | PB | ZN | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59017 | 5/22/90 | CP | LG | 75.0 | 1500 | W1 | 0.12 | . | . | 4.00 | . | . | . | 7.8 | . |
| 59018 | 5/22/90 | CP | LG | 75.5 | 1250 | W1 | 0.13 | . | . | 1.10 | 0.14 | . | . | 2.6 | . |
| 59019 | 5/22/90 | CP | LG | 74.0 | 1200 | F1 | 0.16 | . | . | 0.96 | 0.25 | . | . | 5.1 | . |
| 59020 | 5/22/90 | CP | WP | 28.5 | 475 | F1 | 0.27 | 1.2 | . | 1.10 | 0.18 | . | . | 3.6 | . |
| 59021 | 5/22/90 | CP | BB | 36.0 | 800 | F1 | . | . | . | 1.20 | . | . | . | 2.8 | . |
| 59022 | 5/22/90 | CP | BB | 36.0 | 800 | F1 | . | . | . | 1.10 | . | . | . | 2.0 | . |
| 59023 | 5/22/90 | CP | GS | 35.0 | 500 | W | . | . | . | 0.75 | 0.48 | . | . | 6.6 | . |
| 59024 | 5/22/90 | CP | GS | 38.0 | 750 | W | 0.02 | . | . | 1.10 | 0.60 | . | . | 7.4 | . |
| 59025 | 5/22/90 | CP | GS | 40.0 | 850 | F | . | . | . | 0.39 | . | . | . | 1.9 | . |
| 59026 | 5/22/90 | CP | GS | 39.0 | 750 | F | . | . | . | 0.36 | 0.66 | . | . | 2.6 | . |
| 59027 | 5/22/90 | CP | GS | 34.8 | 460 | FC5 | . | . | . | 0.27 | . | . | . | 1.7 | . |
| 59028 | 5/22/90 | CP | GS | 33.5 | 450 | WC6 | . | . | . | 1.20 | 0.31 | . | . | 7.7 | . |
| 59029 | 5/22/90 | EP | LMB | 17.0 | 55 | W | 0.07 | . | . | 0.70 | 0.47 | . | . | 7.0 | . |
| 59030 | 5/22/90 | EP | LMB | 30.0 | 460 | F | 0.23 | . | . | 1.30 | . | . | . | 3.1 | . |
| 59031 | 5/22/90 | EP | LMB | 29.0 | 375 | F | 0.18 | . | . | 1.10 | . | . | . | 8.9 | . |
| 59032 | 5/22/90 | EP | LMB | 29.0 | 375 | F | 0.14 | . | . | 1.10 | . | . | . | 4.8 | . |
| 59033 | 5/22/90 | EP | Bf | 46.0 | 1000 | F | 0.17 | . | . | 1.20 | . | . | . | 2.2 | . |
| 59034 | 5/22/90 | EP | Bf | 50.0 | 1250 | W | 0.11 | . | . | 0.92 | 2.20 | . | . | 5.6 | . |
| 59035 | 5/22/90 | EP | SM | 39.0 | 650 | F | 0.03 | . | . | 0.43 | . | . | . | 2.6 | . |
| 036 | 5/22/90 | EP | SM | 36.0 | 600 | F | . | . | . | . | . | . | . | 1.1 | . |
| 59037 | 5/22/90 | EP | SM | 36.0 | 550 | F | . | . | . | 0.67 | . | . | . | 2.3 | . |
| 59038 | 5/22/90 | EP | SM | 38.0 | 700 | F | 0.02 | . | . | 0.73 | . | . | . | 2.1 | . |
| 59039 | 5/22/90 | EP | SM | 32.0 | 400 | F | . | . | . | 0.21 | . | . | . | 1.4 | . |
| 59040 | 5/22/90 | EP | Ps | 17.0 | 150 | F | 0.05 | . | . | 0.59 | . | . | . | 5.8 | . |
| 59041 | 5/22/90 | EP | Ps | 20.0 | 200 | F | 0.12 | . | . | 0.58 | 0.10 | . | . | 6.6 | . |
| 59042 | 5/22/90 | EP | Cp | 70.2 | 5250 | W | 0.08 | . | 0.21 | . | 1.00 | . | . | 45.0 | . |
| 59043 | 5/22/90 | WP | Cp | 70.2 | 5250 | W | 0.05 | . | 0.23 | . | 1.00 | . | . | 49.0 | . |
| 59044 | 5/22/90 | WP | LMB | 36.0 | 800 | F | 0.25 | . | . | . | 0.14 | . | . | 4.5 | . |
| 59045 | 5/22/90 | WP | LMB | 32.0 | 550 | F | 0.29 | . | . | 0.30 | . | . | . | 5.4 | . |
| 59046 | 5/22/90 | WP | LMB | 33.0 | 500 | F | 0.23 | . | . | 0.30 | . | . | . | 7.4 | . |
| 59047 | 5/22/90 | WP | LMB | 19.0 | 90 | F | 0.11 | . | . | . | 0.10 | . | . | 7.7 | . |
| 59048 | 5/22/90 | WP | BC | 27.0 | 400 | F | 0.12 | . | . | . | . | . | . | 4.5 | . |
| 59049 | 5/22/90 | WP | CP | 53.0 | 100 | F | 0.10 | . | . | . | . | . | . | 3.4 | . |
| 59050 | 5/22/90 | WP | CP | 43.0 | 500 | F | 0.27 | . | . | . | . | . | . | 7.8 | . |
| 59051 | 5/22/90 | WP | CP | 30.0 | 150 | F | 0.26 | . | . | . | . | . | . | 3.1 | . |
| 59052 | 5/22/90 | WP | YP | 25.0 | 200 | F | 0.22 | . | . | . | . | . | . | 3.1 | . |
| 59053 | 5/22/90 | WP | GS | 34.0 | 500 | W | . | . | . | . | 0.43 | . | . | 11.0 | . |
| 59054 | 5/22/90 | WP | GS | 37.0 | 500 | W | . | . | . | . | 0.50 | . | . | 8.7 | . |
| 59055 | 5/22/90 | WP | GS | 32.0 | 350 | F | . | . | . | . | 0.39 | . | . | 6.0 | . |
| 59056 | 5/22/90 | WP | GS | 35.0 | 400 | F | 0.03 | . | . | . | 0.37 | . | . | 5.6 | . |
| 59057 | 5/22/90 | WP | GS | 33.5 | 400 | FC3 | . | . | . | . | 0.30 | . | . | 3.8 | . |
| 59058 | 5/22/90 | WP | SM | 33.0 | 450 | F | . | 1.0 | . | . | 0.12 | . | . | 7.1 | . |
| 59059 | 5/22/90 | WP | SM | 30.0 | 300 | F | . | . | . | . | 0.19 | . | . | 14.0 | . |
| 59060 | 5/22/90 | WP | Ps | 15.0 | 100 | F | 0.02 | . | . | . | . | . | . | 5.5 | . |
| 59061 | 5/22/90 | WP | CC | 25.0 | 275 | W | 0.03 | . | . | . | 0.20 | . | . | 6.6 | . |
| 59062 | 5/22/90 | WP | GS | 19.5 | 68 | WC2 | 0.03 | . | . | . | 25.00 | . | 0.91 | 28.0 | . |
| 59063 | 5/22/90 | WP | LG | 77.0 | 1450 | W. | 0.07 | . | 0.30 | . | 1.10 | . | . | 9.3 | . |

Appendix 4. Fillets exceeding minimum standards for metal residues.

NUMBER OF FILETS EXCEEDING INTERNATIONAL MINIMUM STANDARD
FOR AT LEAST ONE METAL

1:03 Wednesday, July 31, 1991

Analysis Variable : CONTAM

| N Obs | N | Sum | % |
|---|---|---|---|
| 54 | 54 | 34.0000000 | 63 |

NUMBER OF FILETS EXCEEDING INTERNATIONAL MINIMUM STANDARD
FOR AT LEAST ONE METAL

1:03 Wednesday, July 31, 1991

| OBS | SAMPLENO | CONTAM |
|---|---|---|
| 1 | 88501 | 0 |
| 2 | 88502 | 1 |
| 3 | 88504 | 1 |
| 4 | 88512 | 0 |
| 5 | 88513 | 1 |
| 6 | 88516 | 1 |
| 7 | 88519 | 1 |
| 8 | 88520 | 0 |
| 9 | 88521 | 0 |
| 10 | 88522 | 1 |
| 11 | 88523 | 0 |
| 12 | 59004 | 1 |
| 13 | 59005 | 1 |
| 14 | 59009 | 1 |
| 15 | 59010 | 1 |
| 16 | 59011 | 1 |
| 17 | 59012 | 1 |
| 18 | 59013 | 1 |
| 19 | 59014 | 1 |
| 20 | 59015 | 1 |
| 21 | 59016 | 1 |
| 22 | 59019 | 1 |
| 23 | 59020 | 1 |
| 24 | 59021 | 1 |
| 25 | 59022 | 1 |
| 26 | 59025 | 0 |
| 27 | 59026 | 0 |
| 28 | 59027 | 0 |
| 29 | 59030 | 1 |
| 30 | 59031 | 1 |
| 31 | 59032 | 1 |
| 32 | 59033 | 1 |
| 33 | 59035 | 0 |
| 34 | 59036 | 0 |
| 35 | 59037 | 0 |
| 36 | 59038 | 0 |
| 37 | 59039 | 0 |
| 38 | 59040 | 0 |
| 39 | 59041 | 1 |
| 40 | 59044 | 1 |
| 41 | 59045 | 1 |
| 42 | 59046 | 1 |
| 43 | 59047 | 1 |
| 44 | 59048 | 1 |
| 45 | 59049 | 0 |
| 46 | 59050 | 1 |
| 47 | 59051 | 1 |
| 48 | 59052 | 1 |
| 49 | 59055 | 0 |
| 50 | 59056 | 0 |
| 51 | 59057 | 0 |
| 52 | 59058 | 1 |
| 53 | 59059 | 0 |
| 54 | 59060 | 0 |

0 = Fillet did not exceed minimum standards for metals.

1 = Fillet had 1 or more metals exceeding minimum standards.

Fish filet samples used in comparision to international standards N=54. Number of filets exceeding minimum standard for at least one metal n=34.

| #S | SAMPLENO | AS | CD | CR | CU | PB | HG | ZN |
|---|---|---|---|---|---|---|---|---|
| 1 | 88501 | . | . | . | 0.15 | . | 0.08 | 3.1 |
| 2 | 88502 | . | . | . | 0.12 | . | 0.11 | 2.5 |
| 3 | 88504 | . | 0.47 | . | 4.30 | . | 0.19 | 57.0 |
| 4 | 88512 | . | . | . | 0.16 | . | 0.06 | 6.6 |
| 5 | 88513 | . | . | . | 0.36 | . | 0.20 | 8.6 |
| 6 | 88516 | . | . | . | 0.29 | . | 0.13 | 5.5 |
| 7 | 88519 | . | . | . | 0.43 | . | 0.20 | 4.6 |
| 8 | 88520 | . | . | . | 0.21 | . | 0.10 | 3.8 |
| 9 | 88521 | . | . | . | 0.16 | . | 0.07 | 3.3 |
| 10 | 88522 | . | 0.12 | . | 0.25 | . | 0.21 | 6.6 |
| 11 | 88523 | . | . | . | 0.38 | . | 0.07 | 10.0 |
| 12 | 59004 | . | . | 3.40 | 77.00 | 3.40 | 0.12 | 56.0 |
| 13 | 59005 | . | . | 3.30 | 19.00 | 0.82 | 0.11 | 12.0 |
| 14 | 59009 | . | . | 3.30 | 160.00 | 6.20 | . | 91.0 |
| 15 | 59010 | . | . | 4.10 | 85.00 | 3.10 | . | 50.0 |
| 16 | 59011 | . | . | 4.50 | 0.27 | . | . | 4.6 |
| 17 | 59012 | 1.3 | . | 4.20 | 0.69 | . | . | 5.7 |
| 18 | 59013 | 1.0 | . | 4.30 | 0.31 | . | . | 4.7 |
| 19 | 59014 | . | . | 4.10 | 0.19 | . | . | 3.4 |
| 20 | 59015 | . | . | 3.90 | 0.20 | . | . | 3.8 |
| 21 | 59016 | . | . | 4.30 | 0.25 | . | 0.07 | 4.3 |
| 22 | 59019 | . | . | 0.96 | 0.25 | . | 0.16 | 5.1 |
| | 59020 | 1.2 | . | 1.10 | 0.18 | . | 0.27 | 3.6 |
| | 59021 | . | . | 1.20 | . | . | . | 2.8 |
| 25 | 59022 | . | . | 1.10 | . | . | . | 2.0 |
| 26 | 59025 | . | . | 0.39 | . | . | . | 1.9 |
| 27 | 59026 | . | . | 0.36 | 0.66 | . | . | 2.6 |
| 28 | 59027 | . | . | 0.27 | . | . | . | 1.7 |
| 29 | 59030 | . | . | 1.30 | . | . | 0.23 | 3.1 |
| 30 | 59031 | . | . | 1.10 | . | . | 0.18 | 8.9 |
| 31 | 59032 | . | . | 1.10 | . | . | 0.14 | 4.8 |
| 32 | 59033 | . | . | 1.20 | . | . | 0.17 | 2.2 |
| 33 | 59035 | . | . | 0.43 | . | . | 0.03 | 2.6 |
| 34 | 59036 | . | . | . | . | . | . | 1.1 |
| 35 | 59037 | . | . | 0.67 | . | . | . | 2.3 |
| 36 | 59038 | . | . | 0.73 | . | . | 0.02 | 2.1 |
| 37 | 59039 | . | . | 0.21 | . | . | . | 1.4 |
| 38 | 59040 | . | . | 0.59 | . | . | 0.05 | 5.8 |
| 39 | 59041 | . | . | 0.58 | 0.10 | . | 0.12 | 6.6 |
| 40 | 59044 | . | . | . | 0.14 | . | 0.25 | 4.5 |
| 41 | 59045 | . | . | 0.30 | . | . | 0.29 | 5.4 |
| 42 | 59046 | . | . | 0.30 | . | . | 0.23 | 7.4 |
| 43 | 59047 | . | . | . | 0.10 | . | 0.11 | 7.7 |
| 44 | 59048 | . | . | . | . | . | 0.12 | 4.5 |
| 45 | 59049 | . | . | . | . | . | 0.10 | 3.4 |
| 46 | 59050 | . | . | . | . | . | 0.27 | 7.8 |
| 47 | 59051 | . | . | . | . | . | 0.26 | 3.1 |
| 48 | 59052 | . | . | . | . | . | 0.22 | 3.1 |
| | 59055 | . | . | . | 0.39 | . | . | 6.0 |
| | 59056 | . | . | . | 0.37 | . | 0.03 | 5.6 |
| 51 | 59057 | . | . | . | 0.30 | . | . | 3.8 |
| 52 | 59058 | 1.0 | . | . | 0.12 | . | . | 7.1 |
| 53 | 59059 | . | . | . | 0.19 | . | . | 14.0 |
| 54 | 59060 | . | . | . | . | . | 0.02 | 5.5 |

Appendix 5. Abbreviations used for Appendices No's. 2, 3, and 4.

APPENDIX 5. Abbreviatons for metals listed in data output for sediment, water, and fish.

| ABBREVIATION | METAL |
|---|---|
| Al | Aluminum |
| Sb | Antimony |
| As | Arsenic |
| Be | Berylium |
| Cd | Cadmium |
| Cr | Chromium |
| Cu | Copper |
| Fe | Iron |
| Pb | Lead |
| Hg | Mercury |
| Ni | Nickel |
| Se | Selenium |
| Ag | Silver |
| Tl | Thallium |
| Zn | Zinc |

Appendix 5. Abbreviations found in data output for fish and shellfish.

## I. FISH

| ABBREVIATION | SPECIES |
|---|---|
| BC | Black Crappie |
| Bf | Bowfin |
| BB | Brown Bullhead |
| Cp | Common Carp |
| CP | Chain Pickerel |
| CC | Creek Chubsucker |
| GS | Gizzard Shad |
| GS | Golden Shiner ( 2nd to last fish 1990 only) |
| LMB | Largemouth Bass |
| Lf | Lizzardfish |
| LG | Longnose Gar |
| Ps | Pumkinseed Sunfish |
| SB | Striped Bass |
| SM | Striped Mullet |
| Sf | Summer Flounder |
| WCf | White Catfish |
| WP | White Perch |
| YP | Yellow Perch |

## II. SHELLFISH

| | |
|---|---|
| Cb | Crab |
| Cl | Clam |

# Bioassay Assessment of Water and Sediment Toxicity

## Introduction

Tests that examine the direct toxicity of test samples (sediments, water, etc.) on living organisms are called bioassays. A variety of organisms are commonly used for bioassay tests, including bacteria, invertebrates, and plants. Bioassays have earned a place in toxicity screening and evaluation because they examine endpoints of biological interest, and because they frequently detect toxicity from a variety of toxicants, thus painting a broad picture of toxicity rather than chemical specific portrayals of toxicity. In addition, they integrate the combined effects of all toxicants present with other physical and chemical components of the test matrix. Thus the inclusion of one or more bioassays enhances toxicity assessments based solely on analytical chemical techniques. It is generally recommended that a suite of bioassays be used in toxicity evaluations because of differences in the sensitivities of test organisms.

We employed several bioassay protocols to determine the toxicity of both sediments and water from Slocum, Hancock, and Goose Creeks, as well as sites in the Neuse River. Our initial objective was to determine if there were distinct patterns of toxicity suggesting that sediments and water from Slocum Creek were more likely to be toxic than were similar samples from the other locations. Secondly, we wanted to see if the toxicity observed in sediment samples could be attributed to metal enrichment known to occur in Slocum Creek.

## Methods

### Water and sediment field sampling

Water samples were collected in February (42 sites), May (41 sites) and November (42 sites), 1991 from sites in Slocum Creek, Hancock Creek, and the Neuse River, near Havelock, North Carolina (Figure 1). If water depth was < 1 m, one sample was collected per

site in a chemically clean jar immersed midway in the water column. Sample jars were capped at that depth, then brought to the surface, labeled and stored on ice until assayed. If water depth was ≥ 1 m, two samples were taken. One was collected about 40 cm below the water surface and the other from the bottom. Bottom water samples were collected with a Van Dorn sampler.

Sediment samples were collected in October-November, 1990 and June, 1992 from 43 sites in Slocum Creek, Hancock Creek, and the Neuse River (Figure 2). Sediments were collected from 10 sites in Goose Creek in June of 1992 (Figure 3). Sediments were collected using a stainless steel sediment sampler which extracted a core consisting of the upper 10 - 15 cm of sediment. Sediment samples were placed in individual plastic bags and porewater collected under vacuum with a 50 ml syringe as described by Winger and Lasier (1990). Porewater extracts were stored on ice until assayed. Plastic bags containing sediments were then sealed for storage until used in bulk sediment tests.

At all water and sediment sampling stations, we recorded date and time of the collection, water depth, temperature, salinity, conductivity, dissolved oxygen and pH. Salinity and pH of pore water were recorded.

## Bioassays

Bioassays used to assess toxicity differed for different samples. All samples were tested with the Microtox bioassay. The lettuce seed bioassay was conducted on sediment porewater samples from 1992. A select subset of 19 sediment samples were tested by an aquatic plant bioassay and an invertebrate bioassay.

### Microtox Bioassay

The Microtox bioassay is a commercially available test that measures the luminescence of a marine bacteria *(Photobacterium phosphoreum)* to detect and quantify (on a relative scale) the toxicity of water samples. The amount of light emitted by the bacteria is related to its metabolic rate which slows when exposed to

concentrations of toxic compounds. We used Microbic's 100% bioassay protocol in which undiluted pore water (100% porewater) is run in a dilution series of the sample. The amount of light produced by the bacteria at the various sample dilutions (after 5 and 15 minutes of incubation with the sample) are used to calculate a sample dilution that causes a 50% reduction in the amount of light emitted by the bacteria compared to a reference sample. The dilution or concentration that causes the calculated 50% reduction in luminescence is called the Effective Concentration 50, or EC50. The EC50 is the standard unit of measure for this assay. The most toxic samples will have the lowest EC50 values. Non-toxic samples will yield EC50 values of 100% or more.

We assayed both surface water and sediment pore water samples using the Microtox procedure. In 1992, we modified our procedures from the standard operating procedures used on water and 1990 sediment samples. In 1992 we gently aerated porewater samples for 30 min prior to assay. This was done to volatilize hydrogen sulfide which we detected by odor to be present in many samples. Hydrogen sulfide is a potent toxic agent to the marine bacteria used in the assay (Jacobs et al. 1992). We acknowledge that aeration likely volatilized some other potentially toxic substances (if present) thus reducing the resolution of the assay for the 1992 samples compared to the 1990 samples.

To assign a toxicity rating to the EC50 values, we used a toxicity scale (Table 1), recommended by Dr. Mary Henry, Minnesota Cooperative Fish and Wildlife Research Unit. Surface water samples were simply assigned a rating of toxic (EC50$\leq$50%), moderately toxic (51%<E50$\leq$99 %), or non toxic (EC50$\geq$100%).

Lettuce Seed Bioassay

A lettuce seed bioassay was added to our porewater evaluations in June, 1992. Germination and root elongation of lettuce seeds exposed to water samples was assessed. Our previous work has demonstrated that salinity $\geq$ 7 ppt depresses root elongation in lettuce seeds. Therefore we only tested samples with salinities <7 ppt. Lettuce seeds (10/petri dish) were placed on filter papers

saturated with 5 ml of porewater or distilled water (controls). Three replicate dishes/treatment were wrapped with foil and allowed to incubate for 7 d at room temperature. Mean root elongation and percent germination were determined for each treatment. Data were analyzed and are presented with reference to concurrently tested controls (% control = 100*[Sample Mean / Control Mean]). Toxicity ratings for lettuce seed root elongation data were based on a calibration curve for root elongation in response to salinity (Figure 4).

*Chironomus* Bioassay

*Chironomus tentans* is a midge larvae that is common in many benthic sediments. Static, 10 d *C. tentans* sediment toxicity tests were conducted under the direction of Dr. Mary Henry, Minnesota Cooperative Fish and Wildlife Reseatch Unit. This bioassay was conducted on the 19 sediment subsamples. Each subsample served as a treatment; fifteen test chambers (50 ml polypropylene centrifuge tubes) served as the replicates for each treatment. After taring the centrifuge tubes, 7.5 g of wet weight sample sediment was added to each tube. The control test chambers contained 7.5 g of silica sand that had been sieved through a 90 µm mesh (sieve #170). Each tube was then filled with approximately 40 ml of deionized water, such that the water level reached the 50 ml mark. The caps were tightly screwed onto the tubes and the test chambers placed into a Corning® Styrofoam packing crate. Each set of fifteen tubes was rotated upside down and back again five times, assuring uniform mixing. The capped tubes were set upright in their packing crates, allowing the sediments to settle for 24 h. After 24 h the caps were removed, and the aeration manifold was assembled and attached to each assay set. Using one air pump per 15 tubes, all tubes were aerated for 24 h through Pasteur® pipettes at a flow rate of 3-4 bubbles per second. Caution was taken not to aerate the tubes so vigorously as to lose more than 10 ml of assay water per day, as this rate of evaporation could create a vacuum and cause loss of aeration.

After aerating 24 h, one 2nd instar larva was placed in each tube. In order to minimize any influences of size selection across treatments, larvae were added to the first row of five assay units, then

the following rows, two through five, in succession. The larvae were all of the same general size, motility and color. After all larvae were placed on the sediment surface, 0.1 ml of assay food was added to each tube, and enough deionized water was added to return the water level to the 50 ml mark The aeration manifold was replaced on top of each assay set, and test chambers aerated at a rate of 3-4 bubbles per second. Everyday, each larva was fed 0.1 ml of assay food, and the water level was returned to the 50 ml mark by adding deionized water. On the tenth day the contents of each tube were emptied individually onto a benthos sorting screen. The sediment was carefully probed, and the larva located. If, after a complete inspection, no larva was found, that individual was entered on data sheets as "dead not found". All live larvae from a treatment were deposited in a single, labeled, aluminum ashing pan and dried in a convection oven for 24 h at 80° C. Each individual, dried larva was then weighed on an analytical balance to the nearest 0.1 mg. The measured endpoint was percent reduction in weight relative to larvae in control sediments. Mortality was recorded as a value of 100% reduction in weight. Results were converted to % control biomass for comparison purposes.

Plant Growth Bioassay

We developed and employed a bioassay procedure using sago pondweed *(Potamogeton pectinatus)*, a submersed aquatic macrophyte. Submersed aquatic macrophytes are important components of aquatic systems but have not often been included in batteries of bioassays used to evaluate the toxicity of sediments. The addition of the sago pondweed bioassay to our assay series provided a broader perspective on the toxicity of sediments. The assay we developed focused on plant growth as the endpoint.

*Plant cultures:* Axenic cultures of sago pondweed clones were propagated as needed to maintain healthy, pathogen-free specimens for bioassays (Ailstock et al.,1991). Sago pondweed clones exhibited morphological features similar to natural plants (Ailstock et al. 1991). Plants were maintained in 25 ml Murashige Minimal Organic (MMO)

media (Carolina Biological) supplemented with 1% (w/v) sucrose (pH adjusted to 5.0) in 25 x 150 mm culture tubes. Prior to experiments, sago pondweed cuttings were placed in fresh MMO+sucrose media and incubated at 23°C for 2 weeks. Plants were cultured under full spectrum fluorescent lighting (95 $\mu mol/m^2/sec$ PAR; 16 h of light, 8 h of dark). Plants were screened for pathogens and uniformity prior to beginning experiments. Initial plant weights averaged 0.275 g.

*Experimental Test System:* The experimental test system consisted of one gallon (3.8 L) glass jars filled with moderately hard reconstituted deionized water (Ailstock et al. 1991). Sago pondweed, planted in 150 ml polystyrene beakers filled with sediment, were submerged in the jars. A layer of silt (~3 mm) and then sand (~7mm) was placed over the sediments to minimize nutrient/contaminant loss to the water column from the sediments. An air compressor supplied air via pipettes connected to tubing. Plants were maintained under full spectrum fluorescent lighting (95 $\mu mol/m^2/sec$ PAR; 16 h of light, 8 h of dark). Room temperature ranged between 22-25°C.

*Growth Studies:* Sago pondweed cuttings were planted in the field sediments and control artificial sediments (Walsh et al. 1992), with 8 plants/treatment. Prior to planting, sediments were injected with 5 ml of MMO nutrient solution to assure at least a minimal nutrient content capable of supporting plant growth. At 21 d, plants were rinsed and blotted dry and final fresh weights were recorded. Change in fresh weight relative to controls were calculated. Due to limited space, we could not test all sediments at once. Threfore, sediments from the 19 sites were randomly assigned to one of five runs, each run with its own control. Plant bioassays were conducted from August-December, 1992.

**Evaluation of toxicity in relation to physical and chemical qualities of sediments**

Microtox and lettuce seed bioassay results from sediments collected in June, 1992, were used to select 19 sediments for further testing (Figures 5,6,7). These sediments were selected to represent

a range of toxicities as we sought to examine the potential influences of the physical and elemental composition of sediments on bioassay results (i.e. are metal concentrations in sediments correlated with bioassay results). Duplicate subsamples of these sediments were placed in I-Chem® chemically cleaned jars and stored at -20° C. One set was sent to the Minnesota Cooperative Fish and Wildlife Research Unit for *Chironomus tentans* bioassay testing. The other was saved for analytical chemistry.

No single bioassay is known to be sensitive to all toxicants and therefore multiple bioassay procedures are usually recommended when dealing with unidentified sources and types of pollutants. To supplement the Microtox and lettuce seed bioassays, we conducted the sago pondweed and *Chironomus* toxicity assessments on bulk sediment from these 19 sites. The additional bioassays complemented the Microtox and lettuce seed bioassays in that they expanded the number of taxa and life stages examined.

**Analytical chemistry**

The 19 sediment samples subjected to the broader array of bioassays were analyzed for total organic carbon (TOC), total petroleum hydrocarbons (TPH), grain size, acid volatile sulfides (AVS) and 17 metals. Analyses were performed by Geochemical and Environmental Research Group, Texas A & M University under a contract and quality assurance and control program established by the Patuxent Analytical Control Facility (PACF), U.S. Fish and Wildlife Service (Appendix C-1). The PACF was established by the Fish and Wildlife Service to assure analytical quality control and assurance for all Fish and Wildlife analytical samples. The contractors are required to perform under a set of Standard Operating Procedures, with specified performance on duplicate and spiked samples.

The details of the analytical methods are included in Appendix C-1. Sediments were digested in acids to achieve the extraction of total metals from sediments. Metal analytes, except for mercury were quantified by Inductively Coupled Plasma emission techniques. Mercury was quantified by Graphite Furnace and Cold Vapor Atomic

Absorption. Methods for analyses of TOC, TPH, grain size, and AVS are presented in Appendix C-1.

Metal concentrations are reported on a dry weight basis. Analytical sensitivities for each sample differed slightly based on the amount of sediment submitted. These limits of sensitivity were established for samples based on fresh weights. Conversion of analytical detection limits to a dry weight basis, coupled with the differences in the amount of sediment submitted for analyses, resulted in apparently different analytical detection limits for each sample and therefore potentially among sites. However, these differences are actually minimal and were not considered in the statistical analyses of the data. Actual levels of sensitivities for each sample are presented in the analytical report (Appendix C-1).

### Statistical analyses

We used a variety of statistical analyses to explore the bioassay data. A student's t-test and analysis of variance with mean separation by Tukey's test were used for parametric comparisons of bioassay responses to the various sediments. The occurrence of sediment physical and chemical parameters was compared by Chi-square analysis. We used correlation analyses and interactive stepwise linear regression to explore relationships among bioassays and to examine the important sediment variables that demonstrate relationships with bioassay results. For all tests, we used a = 0.05.

## Results

### Microtox bioassay: water column

Microtox EC50 values for 5 and 15 minute bioassays on water column samples were comparable and therefore only data for the 15 minute bioassay are presented and discussed. Water depth varied by sampling period within creeks and therefore the number and locations of sample sites for which we had water column samples from the surface and bottom differed between sample periods. Thus it is not possible to adequately compare surface and bottom waters except at a very superficial level. In general, the toxicity of waters at

the surface matched those on the bottom (73% of 23 site X date sample series). When toxicities differed between samples collected from the surface and bottom, surface samples were more toxic 75% of the time (Table 2, Appendix C-2).

There were 26 sampling sites in Slocum Creek, four in the Neuse River, and 12 in Hancock Creek (Figure 1). The proportion of samples demonstrating some toxicity in each of these three locations in February was 46, 100, and 42% respectively (Figure 8, Table 2). Toxicity yielding EC50 values < 50% were only seen in Slocum Creek. The pattern of toxicity in Slocum Creek was focused on the Tucker Creek and mid-reaches of Slocum Creek proper (mile 2.2-3.8).

Fewer water samples collected in May (5/42) and October-November (3/41) demonstrated toxicity than did samples collected in February (21/42) (Figure 9, 10). In no case was toxicity noted at a single site across all time periods (Table 2).

**Microtox bioassay: sediment porewater**

In contrast to water column samples, a high percentage of the sediment porewater samples exhibited some degree of toxicity in response to the Microtox bioassay (Table 3). Toxicity was detected in 67% of the 1990 samples and 76% of the 1991 samples. In 1990 the number of samples in which toxicity was detected by creek were: Slocum Creek, 18/25 (72%); Hancock Creek, 10/12 (83%), and Neuse River 0/5 (0%). In 1992 the number of samples in which toxicity was detected by creek were: Slocum Creek, 20/26 (81%); Hancock Creek, 10/11 (91%); Neuse River 1/5 (20%); and Goose Creek 8/10 (80%;Table 4). With the exception of the Neuse River samples, there were no within year differences in the occurrence of toxicity among creeks.

Microtox bioassays of sediment toxicity for the two sampling dates generally agreed with each other for individual sites. Of the 41 sites tested in both sampling years, the assignment of a toxic or not toxic rating did not change between years for 35 sites. There were 5 sites that were assessed as not toxic in 1990 that exhibited toxicity in 1992 (Table 3).

Sediment samples from many of the sites sampled demonstrated low EC50 values, suggesting that the samples were extremely toxic rather than minimally toxic (Table 4, Figures 11, 12, 13). Microtox EC50 data for 1990 and 1992 sampling events are provided in Appendix C-2 and C-3.

**Lettuce seed bioassays: sediment porewater**

We detected no toxicity for any of the porewater samples assessed by seed germination tests. In contrast, 31 of 39 samples exhibited reduced root elongation as compared to control samples (Table 4). We were concerned that salinity by itself might be a factor in the test for root elongation. However, we regressed the root elongation data against the salinity measured in sample porewater and found no data correlation. Lettuce seed root elongation and germination are listed in Appendix C-3.

We compared results from the Microtox and root elongation bioassays (Table 4). Microtox samples grouped as toxic or non toxic agreed with the results for lettuce seed assays (28/39 samples) 72% of the time. Of the 11 times they did not agree, Microtox revealed toxicity and root elongation no toxicity for 5 of the sites (Table 4).

**Toxicity in relation to physical and chemical qualities of sediments**

The 19 sediments selected for this study were screened from the above samples to represent a range of toxicities and collection sites. The samples were actually subsamples of those used for the above studies rather than samples collected from the same sites at a different time. The samples are identified to collection site in Table 5. Chemical and physical analyses demonstrated that the samples were heterogeneous with regard to physical and chemical factors (Tables 8, 9), as had been suggested by the screening that we had conducted in the selection of these samples. For example, extreme concentrations of some metals are as follows: aluminum, 769-36,749 ppm; chromium, <1-135 ppm; iron, 682-30,857 ppm; mercury, <1-0.32 ppm; manganese, 11-234 ppm; and zinc, <5-190.9 ppm. TPH range from 0.13-12.79 ppm (Table 9).

Sago pondweed grew well in our test conditions. Mean growth of sago pondweed (% change in fresh weight relative to control) ranged from 37 - 169% across all treatments (Table 5). However, one of our five runs, involving samples GC1, GC5, SC13, SC25, and a control became fouled with an algae that apparently reduces the growth of all plants included in the run. Therefore, all comparisons between runs were made on variables expressed as a percentage of the control of that run. We assigned a toxic status to 10 sites based on overall plant growth (mean percent change in fresh weight relative to control at 21 d). This toxic status was relatively arbitrarily assigned based on the variability observed in control plants (standard deviations) and the distribution of growth observed relative to controls. To this end, we considered sediments to be toxic if they produced plant growth (change in fresh weight relative to controls at 21 days) that was $\leq$ 56% of that of plants grown on control sediments (Table 6). Although we use the term toxic, we cannot be sure that plant growth was actually reduced as a toxic response. Supplemental data (not presented here) indicate that nutrients may have been limiting in some samples even though we augmented all sediments with an equal amount of nutrients. Additional data on the plant growth experiments are presented in Appendix C-4.

The *Chironomus* bioassay yielded a wide range (0-111%) of biomass values relative to controls (Table 5). A Slocum Creek sample, SC12 was the most toxic with no individuals surviving the test period.

The Microtox bioassay produced EC50 values ranging from 0.48 to $\geq$ 100% and from 0.73 to $\geq$100% for the 5 and 15 min assays (Table 5). Lettuce seed percent germination (as percent control) ranged between 80.8 - 103.8% (Table 5). Lettuce seed root elongation (as percent control) ranged from 23.2 - 137.2% (Table 5).

A graphical representation of the responses of bioassay organisms to the 19 sediments is presented in Figure 14. For comparison of the several bioassays against each other, we took a conservative approach that defined toxicity as a significant response, rather than small deviations from the response of organisms to control substrates. Again, classification decisions were made in an

arbitrary fashion using our knowledge of the test procedures and the inherent variability of organism responses in each bioassay. We settled on calling responses toxic if the response variable was reduced by $\geq 50\%$ compared to organisms cultured in control substrates.

Out of the 19 sites tested, the number of toxic responses per assay were: Microtox = 14; lettuce seed root elongation = 9; sago pondweed growth = 7; *Chironomus* = 2; and lettuce seed germination = 0 (Table 6). We compared the percentage of times the bioassays agreed with each other (Table 6) and calculated a correlation coefficient based on the actual numerical values of the individual bioassays (Table 7). The highest percent agreement and correlation coefficient among assays was for lettuce seed root elongation and Microtox bioassays. Microtox and lettuce seed root elongation agreed 74% of the time with an R square of 0.79. *Chironomus* and lettuce seed germination bioassay results only agreed with Microtox results 26% of the time. Root elongation and plant growth had the lowest correlation coefficient (R square = 0.03) when all bioassays were compared against each other (Table 7).

To examine the relationship between toxicity and the physical and chemical properties of the test sediments we conducted an interactive stepwise linear regression based on the variables identified in Tables 9 and 10. By systematically removing variables from the models, we developed a model that provided the highest R square. In all cases, the models developed were relatively simple, with only two to three variables explaining most of the variability in toxicity (Table 10). Manganese was the only significant variable that was associated with a reduction in organism's response relative to control's response in the Microtox, lettuce seed, and sago pondweed bioassays. Total petroleum hydrocarbon was the only significant variable that was associated with a reduction in *C. tentans* biomass. All other variables that were significant components of the toxicity models exhibited positive effects on the toxicity response variables (i.e. reduced toxicity). Analyses of this type may be revealing, but also may be misleading. Mathematical models of this type are inherently burdened with assumptions and statistically based sampling errors.

For example, correlations between the significant model variables and other unmeasured variables may exist in which the unmeasured variable is actually responsible for the observed effects. In short, these regression models do not demonstrate cause and effect, but do aid in the development of hypotheses to explain observed phenomena.

**Discussion**

Bioassays conducted on the water column clearly indicated that the surface water in Slocum and Hancock Creeks, at least for the time periods sampled, demonstrated little toxicity. Sample sites that did demonstrate toxicity in one sample period did not consistently produce toxicity across all sample periods. Therefore, water column bioassays do not support the hypothesis that water from Slocum Creek is more toxic than that from Hancock Creek. Since the presence of toxins in the water column is often transient in both time and space (note the differences between the first and third sampling periods), it is possible that a more rigorous sampling schedule could yield information on potential pulses of toxicants entering the system.

Sediments are generally more temporally stable as contaminant sinks and sources. As such they reflect not only current contaminant inputs, but also past inputs. Depending on the physical and chemical nature of the sediments and surface water, sediments may supply contaminants to relatively uncontaminated surface water to achieve a chemical equilibrium between the two matrices. Our water bioassays did not detect widespread toxicity either spatially or temporally, suggesting that the sediment may not be contributing substantial quantities of metals to the water column. An alternate hypothesis is that the resolution of our test procedures were not sufficient to detect the contaminants present in the water column.

In contrast to surface waters, bulk sediments and sediment interstitial porewater exhibited widespread toxicity throughout Slocum, Hancock, and Goose Creeks. The detected toxicity was relatively reproducible through time. The incidence of toxicity in sediments was not greater in Slocum Creek compared to Goose and

Hancock Creek, suggesting that the metal enrichment reported in Slocum Creek was not necessarily responsible for the observed toxicity. We suspect that some of the toxicity observed with the Microtox bioassay was the result of hydrogen sulfide, which was readily detectable by odor in many samples, or perhaps ammonia. However, these rather volatile chemicals probably do not explain the lettuce seed root elongation results. The root elongation tests were conducted under conditions that would facilitate the volatilization of volatile compounds (petri dishes had a large surface area to volume, and tests were conducted over a period of time that would seem to be sufficient to allow the escape of the volatiles from the water.

We developed models to explain the toxicity of sediment and porewater based on sediment chemistry and physical factors. The models did not indicate that the metal enrichment of Slocum Creek, as reported by Riggs et al. 1991, was directly responsible for the observed toxicity in the bioassays. However, the presence of total metals in water and sediment does not necessarily mean that the metals are available to aquatic organisms (Luoma 1983). Metal analyses for the current study were for total metals, not bioavailable metals. The bioavailability and toxicity of pollutants in aquatic systems is influenced by water and sediment chemistry as well as physical factors (Larsson et al. 1992, Di Toro et al. 1992). For example, the degree of toxicity for the same concentration of a sediment-borne metal may be manipulated by altering sediment composition (Adams et al. 1985, Swartz et al. 1985, Kemp and Swartz 1986). Factors that may influence the bioavailability of metals include the presence of cations, pH, redox potential, and temperature (Luoma 1983) as well as sediment grain size and organic matter. Larsson et al. (1992) reported that humic acid in the water was inversely correlated with levels of pollutants in fish from 61 lakes in Scandinavia. Several reports indicate that biological effects are related to the divalent metal activity in water (Sunda and Guillard 1976, Borgmann 1983).

Di Toro et al. (1992) used a series of invertebrate bioassays to assess the toxicity of cadmium and nickel-spiked marine and freshwater sediments. Their results suggest that cadmium and nickel

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Table 1. Microtox $EC_{50}$ toxicity rating scale.

| Toxicity Rating | EC50 |
|---|---|
| no toxicity | ≥ 100% |
| slight toxicity | 80-99% |
| moderate toxicity | 60-70% |
| toxic | 40-59% |
| very toxic | 20-39% |
| extremely toxic | 0-19% |

Table 2. Summary of water toxicity assessed with the Microtox bioassay, 1991. Toxicity was ranked as N = non toxic; M = 50<EC50<100 = moderate toxicity; and T = EC50<50 = toxic. Blanks indicate no samples were taken.

| Site | Water Surface Date 1 2/4-2/6/91 | Water bottom Date 1 2/4-2/6/91 | Water surface Date 2 5/22-5/23/91 | Water Bottom Date 2 5/22-5/23/91 | Water surface Date 3 10/25-11/8/91 | Water Bottom Date 3 10/25-11/8/91 |
|---|---|---|---|---|---|---|
| 1 | T | | N | | N | |
| 2 | N | | N | | N | |
| 3 | | | N | | N | |
| 4 | T | | N | | M | |
| 5 | M | | N | | N | |
| 6 | T | | N | | N | |
| 7 | T | | N | | N | |
| 8 | N | | N | | N | |
| 9 | N | | N | | M | |
| 10 | N | N | M | M | N | N |
| 11 | N | | N | | N | |
| 12 | N | N | N | N | N | N |
| 13 | N | N | N | | N | |
| 14 | N | N | N | N | N | N |
| 15 | N | | N | | N | |
| 16 | N | | N | | N | |
| 17 | M | | N | | N | |
| 18 | N | | N | | N | |
| 19 | M | | N | | N | |
| 20 | N | | N | | N | |
| 21 | M | M | N | | N | |
| 22 | M | | N | | N | |
| 23 | M | | N | | N | |
| 24 | N | | N | | N | |
| 25 | T | | N | | M | |
| 26 | M | | N | N | N | |
| 27 | M | | N | | N | |
| 28 | M | | M | | N | |
| 29 | M | | N | | N | |
| 30 | M | | N | | N | |
| 31 | N | M | | | N | |
| 32 | M | | M | | N | |
| 33 | M | | M | | N | |
| 34 | M | M | N | | N | |
| 35 | N | N | N | | N | N |
| 36 | N | | N | | N | |
| 37 | N | N | N | | N | N |
| 38 | M | N | N | | N | |
| 39 | N | | N | | N | N |
| 40 | N | | M | N | N | |
| 41 | M | N | N | | N | N |
| 42 | N | | N | | N | |
| 43 | | | | | | |

Table 3. Comparison of microtox pore water toxicity results for for 43 sites in Slocum Creek (SC), Hancock Creek (HC), and the Neuse River (NR). Samples demonstrating toxicity are indicated by T, no toxicity by NT. Blank spaces indicate that the sample was not assayed.

| Site | Oct/Nov 1990 | June 1992 |
|---|---|---|
| SC1 | T | NT |
| SC2 | T | T |
| SC3 | T | T |
| SC4 | NT | T |
| SC5 | NT | NT |
| SC6 | NT | NT |
| SC7 | NT | NT |
| SC8 | T | T |
| SC9 | T | T |
| SC10 | T | T |
| SC11 | T | T |
| SC12 | T | T |
| SC13 | T | T |
| SC14 | T | T |
| SC15 | | T |
| SC16 | NT | NT |
| SC17 | T | T |
| SC18 | T | T |
| SC19 | T | T |
| SC20 | T | T |
| SC21 | T | T |
| SC22 | NT | T |
| SC23 | T | T |
| SC24 | T | T |
| SC25 | T | T |
| SC26 | NT | T |
| NR27 | NT | T |
| NR28 | NT | NT |
| NR29 | NT | NT |
| NR30 | NT | NT |
| NR31 | NT | NT |
| HC32 | T | T |
| HC33 | T | T |
| HC34 | T | T |
| HC35 | T | T |
| HC36 | T | T |
| HC37 | NT | NT |
| HC38 | T | T |
| HC39 | T | T |
| HC40 | NT | T |
| HC41 | T | |
| HC42 | T | T |
| HC43 | T | T |

Table 4. Toxicity ratings of Microtox ($EC_{50}$ results for 5 and 15 min. bioassays) and lettuce seed root elongation (% control) performed on porewater from sediment samples collected from the Neuse River (NR), and Slocum (SC), Hancock (HC), and Goose (GC) Creeks, North Carolina, June, 1992.

| Site | Microtox | | Root Elongation (% control) |
|---|---|---|---|
| | 5 min | 15 min | |
| SC1 | no toxicity | no toxicity | no toxicity |
| SC2 | extreme tox | extreme tox | toxic |
| SC3 | very toxic | very toxic | toxic |
| SC4 | extreme tox | extreme tox | toxic |
| SC5 | no toxicity | no toxicity | toxic |
| SC6 | no toxicity | no toxicity | toxic |
| SC7 | no toxicity | no toxicity | toxic |
| SC8 | extreme tox | extreme tox | toxic |
| SC9 | extreme tox | extreme tox | toxic |
| SC10 | moderate tox | moderate tox | no toxicity |
| SC11 | toxic | toxic | no toxicity |
| SC12 | no toxicity | no toxicity | no toxicity |
| SC13 | no toxicity | no toxicity | toxic |
| SC14 | toxic | moderate tox | no toxicity |
| SC15 | very toxic | toxic | no toxicity |
| SC16 | no toxicity | no toxicity | no toxicity |
| SC17 | very toxic | very toxic | toxic |
| SC18 | extreme tox | extreme tox | toxic |
| SC19 | extreme tox | extreme tox | toxic |
| SC20 | extreme tox | extreme tox | toxic |
| SC21 | very tox | extreme tox | toxic |

Table 4 cont'd.

| Site | Microtox 5 min | Microtox 15 min | Root Elongation (% control) |
|---|---|---|---|
| SC22 | toxic | toxic | toxic |
| SC23 | extreme tox | extreme tox | toxic |
| SC24 | no toxicity | slight toxicity | toxic |
| SC25 | extreme tox | extreme tox | toxic |
| SC26 | extreme tox | extreme tox | nd* |
| NR27 | moderate tox | moderate tox | nd |
| NR28 | no toxicity | no toxicity | nd |
| NR29 | no toxicity | no toxicity | nd |
| NR30 | no toxicity | no toxicity | nd |
| NR31 | no toxicity | no toxicity | nd |
| HC32 | extreme tox | extreme tox | nd |
| HC33 | extreme tox | extreme tox | nd |
| HC34 | extreme tox | extreme tox | nd |
| HC35 | very toxic | very toxic | nd |
| HC36 | extreme tox | extreme tox | toxic |
| HC37 | no toxicity | no toxicity | toxic |
| HC38 | extreme tox | extreme tox | toxic |
| HC39 | very toxic | very toxic | toxic |
| HC40 | extreme tox | extreme tox | toxic |
| HC42 | moderate tox | slight tox | no toxicity |
| HC43 | extreme tox | extreme tox | toxic |
| GC1 | extreme tox | extreme tox | extreme tox |
| GC2 | extreme tox | extreme tox | toxic |

Table 4 cont'd.

| Site | Microtox 5 min | Microtox 15 min | Root Elongation (% control) |
|---|---|---|---|
| GC3 | extreme tox | extreme tox | toxic |
| GC4 | extreme tox | extreme tox | toxic |
| GC5 | extreme tox | extreme tox | toxic |
| GC6 | extreme tox | extreme tox | toxic |
| GC7 | very toxic | very toxic | toxic |
| GC8 | no toxicity | no toxicity | nd |
| GC9 | extreme tox | extreme tox | nd |
| GC10 | no toxicity | no toxicity | nd |

*Salinity was >7‰ for these sites, therefore lettuce seed bioassays were not performed.

Table 5. Sago pondweed biomass (change in fresh weight relative to control at 21d), *Chironomus tentans* , Microtox, and lettuce seed bioassay results on sediment and porewater samples collected from Slocum (SC), Hancock (HC), and Goose (GC) Creeks, North Carolina, June, 1992.

| Site | Plant Growth | Microtox ($EC_{50}$) | | Lettuce Seed | | *C. tentans* Biomass (% Control) |
|---|---|---|---|---|---|---|
| | | 5 min | 15 min | Germination (% Control) | Root Elongation (% Control) | |
| GC1 | 51.8 ± 26.3 | 7.4 (5.8-9.3) | 8.8 (6.6-11.9) | 80.8 ± 11.5 | 23.2 ± 15.0 | 108.4 |
| GC2 | 42.4 ± 20.6 | 10.2 (8.6-12.1) | 11.3 (10.2-12.6) | 98.1 ± 8.2 | 32.2 ± 11.9 | 90.6 |
| GC3 | 50.9 ± 24.1 | 4.5 (2.2-8.1) | 4.3 (2.3-8.1) | 103.8 ± 0 | 37.6 ± 15.8 | 86.7 |
| GC4 | 46.9 ± 13.8 | 3.5 (1.9-6.2) | 4.8 (2.4-9.7) | 103.5 ± 11.6 | 47.3 ± 27.5 | 38.6 |
| GC5 | 52.2 ± 35.9 | 1.2 (0.45-3.3) | 2.6 (1.5-4.6) | 103.8 ± 20.0 | 38.6 ± 13.0 | 65.1 |
| HC37 | 56.5 ± 15.1 | 100 | 100 | 94.9 ± 11.7 | 75.4 ± 5.9 | 93.7 |
| HC38 | 56.5 ± 18.5 | 6.4 (3.2-12.7) | 1.7 (.075-3.8) | 101.7 ± 0 | 73.4 ± 3.1 | 84.5 |
| HC39 | 69.9 ± 31.0 | 22.9 (19.1-27.7) | 23.6(18.9-29.4) | 101.7 ± 0 | 53.6 ± 1.6 | 98.1 |
| HC40 | 47.4 ± 17.1 | 5.5 (3.6-8.5) | 8.5 (5.7-12.6) | 98.3 ± 5.9 | 57.3 ± 2.6 | 104.9 |
| HC43 | 36.9 ± 24.3 | 10.5 (7.9-13.9) | 9.7 (7.9-12) | 88.2± 15.5 | 47.0 ± 3.7 | 108.0 |
| SC11 | 62.2 ± 14.6 | 55.3 (44.9-68.1) | 54.6 (41.6-71.6) | 91.6 ± 0 | 116.2 ± 27.0 | 64.6 |
| SC12 | 168.7 ± 76.1 | 91.7 (75.6-111.3) | 95.4 (76.2-119.3) | 101.7 ± 0 | 108.6 ± 6.2 | 0 |
| SC13 | 48.8 ± 25.2 | 58.2 (38-89.2) | 76.4 (65.7-88.9) | 101.7 ± 0 | 75.9 ± 4.0 | 62.3 |
| SC16 | 52.8 ± 19.9 | 100 | 100 | 91.6 ± 17.6 | 137.2 ± 6.7 | 86.7 |
| SC19 | 93.7 ± 43.5 | 14.1 (9.2-21.5) | 14.7 (9.4-23.1) | 94.9 ± 11.7 | 42.5 ± 2.9 | 83.1 |
| SC20 | 62.9 ± 20.5 | 4.2 (2.2-8) | 5 (2.0-8.5) | 91.6 ± 10.2 | 44.5 ± 2.4 | 65.6 |
| SC25 | 95.7 ± 25.0 | 14.7 (8.9-24.4) | 14.7 (8.4-25.6) | 98.3 ± 5.9 | 37.3 ± 2.4 | 82.9 |
| SC4 | 50.8 ± 21.5 | 0.48 (0.11-2.1) | 0.73 (0.03-16.7) | 91.6 ± 10.2 | 46.4 ± 2.8 | 111.2 |
| SC8 | 100.8 ± 49.4 | 9.7 (7.9-11.8) | 9.9 (7.9-12.3) | 98.3 ± 5.9 | 53.1 ± 2.0 | 89.5 |

Table 6. Comparison of lettuce seed, Chironomus, plant growth, and Microtox bioassays performed on 19 sediment or porewater samples collected from Slocum, Hancock, and Goose Creeks, North Carolina, June 4-6, 1992.

| | | Y Variables | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lettuce Seed | | | | | | | | | | | | | | |
| | | Root Elongation | | | Germination | | | Chironomus | | | Plant Growth | | | Microtox | | |
| X Variables | # Sites Toxic / 19 Sites | A | B | C | A | B | C | A | B | C | A | B | C | A | B | C |
| Root Elongation‡ | 9 | 100.0 | 0 | 0 | 52.6 | 47.4 | 0 | 42.1 | 47.4 | 10.5 | 63.2 | 15.8 | 21.1 | 73.7 | 0 | 26.3 |
| Germination£ | 0 | 52.6 | 0 | 47.4 | 100.0 | 0 | 0 | 89.5 | 0 | 10.5 | 47.4 | 0 | 5.3 | 26.3 | 0 | 73.7 |
| Chironomus¥ | 2 | 42.1 | 10.5 | 47.4 | 89.5 | 10.5 | 0 | 100.0 | 0 | 0 | 47.4 | 0 | 52.6 | 26.3 | 5.3 | 68.4 |
| Plant Growth† | 10 | 63.2 | 21.1 | 10.5 | 47.4 | 52.6 | 0 | 47.4 | 47.4 | 5.3 | 100.0 | 0 | 0 | 57.9 | 10.5 | 31.6 |
| Microtox∫ | 14 | 73.7 | 26.3 | 0 | 26.3 | 73.7 | 0 | 26.3 | 68.4 | 5.3 | 57.9 | 31.6 | 10.5 | 100.0 | 0 | 0 |

A=percentage of times X and Y agreed on whether or not sample was toxic
B=percentage of times X toxic when Y showed no toxicity
C=percentage of times X was not toxic when Y showed toxicity
‡Percent of samples with mean root elongation relative to control ≤ 50%.
£Percent of samples with mean % germination ≤ 50%.
¥Percent of samples with mean biomass relative to control ≤ 50%.
†Percent of samples with mean growth (% change in fresh weight relative to control at 21 d) ≤ 54.65%.
∫Percent of samples with EC50 ≤ 50%. Results for 5 and 15 min. bioassays were identical.

Table 7. Correlation coefficients of plant growth, *Chironomus tentans*, Microtox, and lettuce seed bioassays performed on sediments or porewater samples collected from Slocum, Hancock, and Goose Creeks, North Carolina, June, 1992.

| | | | | Lettuce Seed | |
|---|---|---|---|---|---|
| | Plant Growth | *C. tentans* | Microtox | Percent Germination | Root Elongation |
| Plant Growth† | 1.0000 | -0.3320 | 0.1121 | 0.1523 | 0.0291 |
| *C. tentans* ¥ | -0.3320 | 1.0000 | -0.3799 | -0.2909 | -0.4155 |
| Microtox*f* | 0.1121 | -0.3799 | 1.0000 | 0.2333 | 0.7931 |
| Percent Germination‡ | 0.1523 | -0.2909 | 0.2333 | 1.0000 | 0.3809 |
| Root Elongation£ | 0.0291 | -0.4155 | 0.7931 | 0.3809 | 1.0000 |

†Percent change in fresh weight relative to control at 21 d for sago pondweed.
¥Percent control biomass.
*f* $EC_{50}$ for 15 min assay.
‡Percent germination relative to control.
£Root elongation relative to control.

Table 8. Total organic carbon (TOC), acid volatile sulfides (AVS), and physical properties of selected sediments from Slocum, Hancock, and Goose Creek, 1992.

| Creek | Sample | % Clay | % Sand | % Silt | % Moisture | TOC | AVS |
|---|---|---|---|---|---|---|---|
| Goose | GC1 | 26.6 | 44.4 | 29.0 | 84.6 | 11.54 | 56 |
| Goose | GC2 | 35.0 | 38.8 | 26.3 | 88.1 | 13.25 | 110 |
| Goose | GC3 | 17.9 | 76.1 | 6.0 | 76.4 | 5.22 | 678 |
| Goose | GC4 | 43.3 | 45.9 | 10.8 | 87.0 | 12.89 | 15 |
| Goose | GC5 | 28.4 | 63.5 | 8.1 | 86.9 | 21.41 | 10 |
| Hancock | HC37 | 5.9 | 89.7 | 4.4 | 32.4 | 1.14 | 936 |
| Hancock | HC38 | 0.0 | 44.9 | 55.1 | 87.8 | 21.14 | 83 |
| Hancock | HC39 | 51.6 | 14.1 | 34.4 | 76.3 | 9.68 | 135 |
| Hancock | HC40 | 13.2 | 75.9 | 11.0 | 70.0 | 12.57 | 88 |
| Hancock | HC43 | 2.5 | 97.0 | 0.5 | 26.9 | 0.21 | 10 |
| Slocum | SC11 | 10.7 | 82.9 | 6.4 | 64.7 | 3.77 | 78 |
| Slocum | SC12 | 43.7 | 23.9 | 32.4 | 46.0 | 2.89 | 78 |
| Slocum | SC13 | 3.4 | 96.0 | 0.6 | 20.8 | 0.26 | 20 |
| Slocum | SC16 | 10.5 | 86.4 | 3.2 | 66.8 | 7.01 | 47 |
| Slocum | SC19 | 31.4 | 16.0 | 52.6 | 85.5 | 16.76 | 208 |
| Slocum | SC20 | 38.0 | 29.0 | 32.9 | 83.0 | 12.51 | 138 |
| Slocum | SC25 | 44.6 | 31.8 | 23.6 | 81.7 | 12.76 | 67 |
| Slocum | SC4 | 8.3 | 88.5 | 3.2 | 39.2 | 2.08 | 750 |
| Slocum | SC8 | 32.8 | 32.8 | 34.5 | 69.4 | 7.2 | 258 |

Table 9. Elemental composition and total petroleum hydrocarbons of selected sediments from Slocum, Hancock, and Goose Creeks, NC, 1992.

| Creek | Sample | Al | As | Cd | Cr | Cu | Fe | Hg | Mn | Ni | Pb | Se | Zn | TPH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Goose | GC1 | 19046 | 5.14 | 0.49 | 20.17 | 14.42 | 23804 | 0.16 | 179 | 15.53 | 20.4 | <1 | 82.1 | 2.09 |
| Goose | GC2 | 29476 | 6.57 | <0.2 | 16.85 | 4.2 | 15655 | <0.1 | 94 | 10.26 | 11.7 | <1 | 16.3 | 2.48 |
| Goose | GC3 | 9443 | 2.91 | 0.36 | 8.79 | 5 | 11808 | 0.11 | 128 | 7.95 | 16 | <1 | 53.1 | 2.24 |
| Goose | GC4 | 28306 | 5.38 | <0.2 | 23.58 | 8.08 | 25941 | 0.11 | 115 | 11.09 | 14.4 | <1 | 31.6 | 3.82 |
| Goose | GC5 | 33776 | 0.87 | <0.2 | 14.05 | 6.17 | 11021 | 0.14 | 144 | 6.22 | 11.9 | <1 | 34.8 | 6.91 |
| Hancock | HC37 | 3843 | 1.1 | <0.2 | 5.4 | 4.79 | 4785 | 0.1 | 47 | <5 | 20.7 | <1 | 8.3 | 0.25 |
| Hancock | HC38 | 12542 | 1.47 | <0.2 | 11.47 | 5.15 | 10194 | 0.11 | 77 | 7.25 | 12.2 | <1 | 25.2 | 7.36 |
| Hancock | HC39 | 36749 | 4.61 | 0.74 | 40.88 | 13.8 | 30857 | 0.14 | 192 | 11.36 | 37.9 | <1 | 395 | 0.99 |
| Hancock | HC40 | 9770 | 2.48 | 0.24 | 9.26 | 4.05 | 9989 | <0.1 | 49 | <5 | 29.6 | <1 | 26.1 | 2.33 |
| Hancock | HC43 | 769 | <0.5 | <0.2 | <1 | <1 | 682 | <0.1 | 16 | <5 | <5 | <1 | <5 | 0.13 |
| Slocum | SC11 | 6830 | 2.55 | 10.39 | 135.67 | 14.24 | 9927 | <0.1 | 41 | 9.91 | 57.1 | <1 | 64.3 | 11.34 |
| Slocum | SC12 | 24233 | 7.3 | 7.30 | 102.11 | 18.33 | 15354 | 0.17 | 45 | 8.19 | 69.4 | <1 | 83.7 | 12.79 |
| Slocum | SC13 | 911 | 0.81 | 0.24 | 4.01 | <1 | 979 | <0.1 | 11 | <5 | 5.3 | <1 | 9.5 | 1.24 |
| Slocum | SC16 | 7682 | 2.28 | 0.24 | 8.42 | 1.12 | 6106 | <0.1 | 26 | <5 | 35 | <1 | 40.2 | 2.93 |
| Slocum | SC19 | 12727 | 3.68 | 4.61 | 74.6 | 21.63 | 14729 | 0.23 | 158 | 15.28 | 39.4 | 1.79 | 89.8 | 11.87 |
| Slocum | SC20 | 34996 | 4.76 | 1.52 | 45.93 | 12.98 | 24970 | 0.16 | 234 | 14.82 | 25.3 | <1 | 64.4 | 4.47 |
| Slocum | SC25 | 22814 | 2.57 | <0.2 | 18.07 | 4.36 | 12379 | 0.16 | 58 | 7.26 | 15.5 | <1 | 26.5 | 4.24 |
| Slocum | SC4 | 3439 | 0.97 | 1.13 | 12.04 | 8.47 | 3965 | 0.13 | 70 | <5 | 44.3 | <1 | 44.2 | 1.04 |
| Slocum | SC8 | 19871 | 3.33 | 3.65 | 61.6 | 20.14 | 22746 | 0.32 | 206 | 13.26 | 105.3 | <1 | 190.9 | 0.37 |

Table 10. Physical and chemical sediment variables significantly ($P \leq 0.05$) contributing to toxicity models for four bioassays. The total model tested by interactive, stepwise linear regression was based on the following variables: % sand, % clay, % silt, total organic carbon (TOC), acid volatile sulfides, the log of the following elements: Al, As, B, Cd, Cr, Cu, Fe, Hg, Mn, Mg, Ni, Pb, Zn; and the log of total petroleum hydrocarbons (LTPH). Positive correlation coefficients are indicated with a "+" and negative with a "-" sign. Blanks indicate that the variable was not a statistically significant component of the model.

| | Microtox 5 min. test | Sago Pondweed | Root Elongation | Chironomus |
|---|---|---|---|---|
| % Clay | | + | | |
| TOC | | | | + |
| Log TPH | | | | - |
| Log Cr | + | | | |
| Log Mn | - | - | - | |
| Log Pb | | | + | |
| Log Hg | | + | | |
| Model R square | 0.74 | 0.75 | 0.65 | 0.45 |

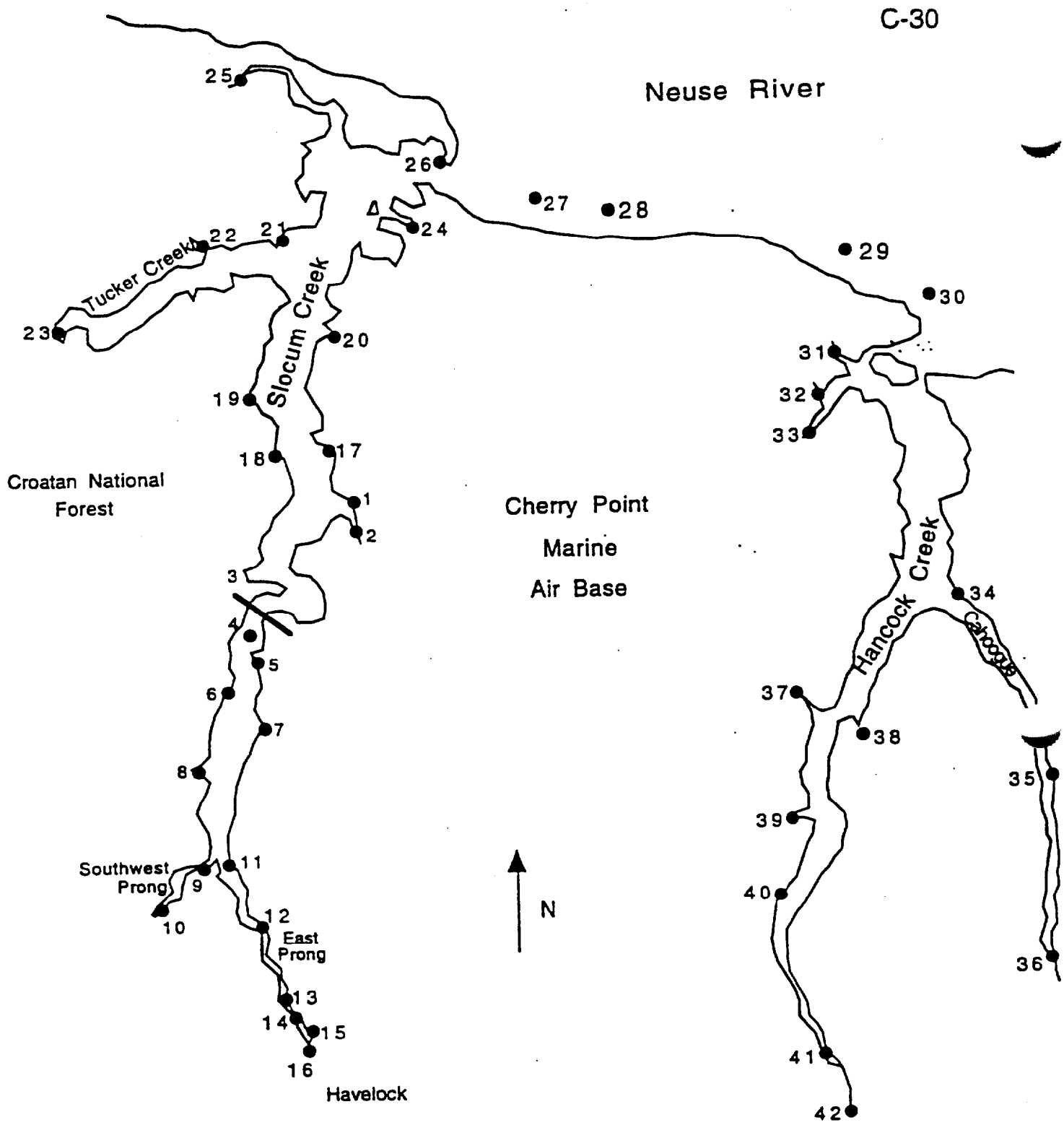


Figure 1. Water sampling sites in the Neuse River, Slocum Creek, and Hancock Creek, North Carolina.

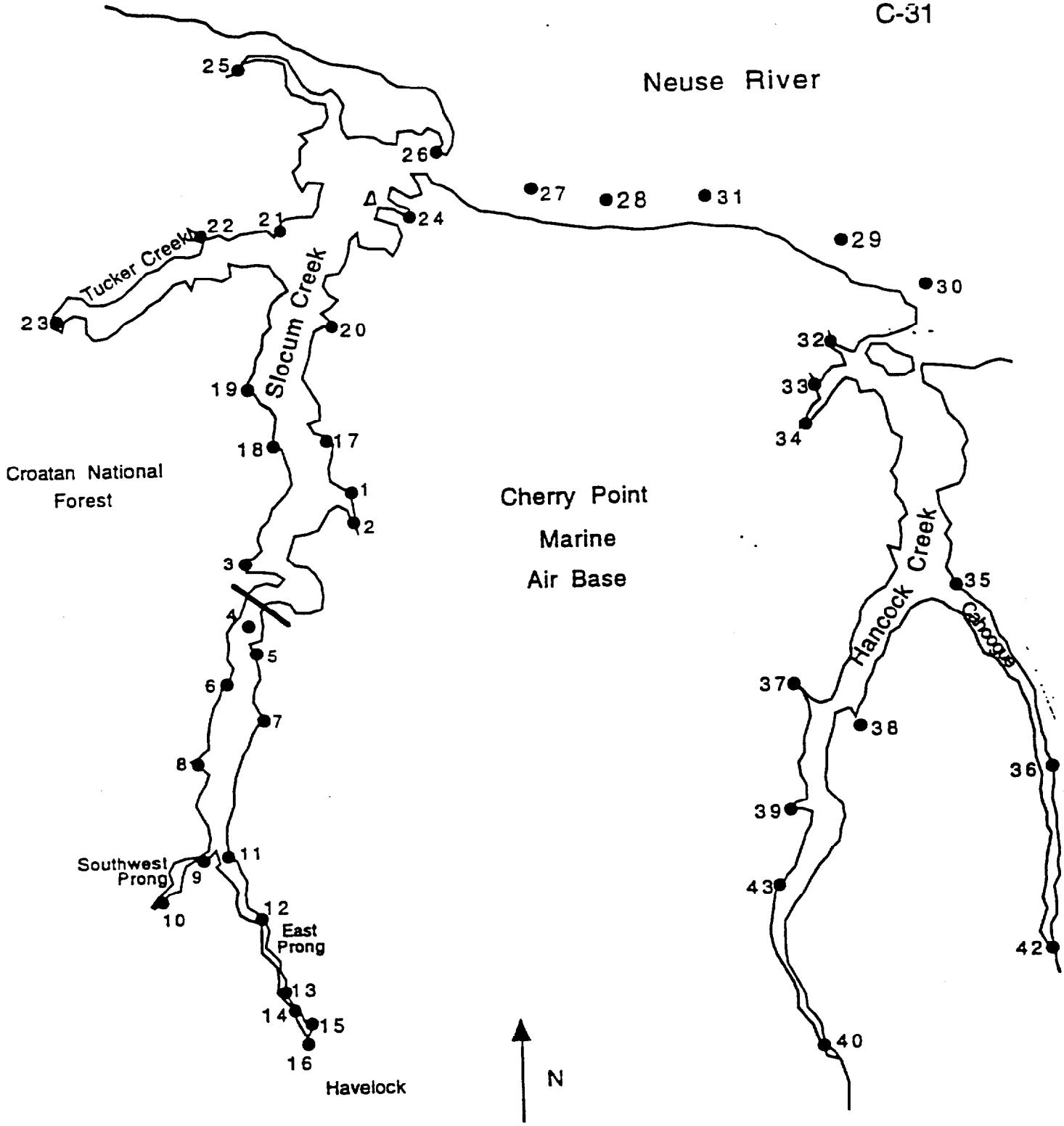


Figure 2. Sediment sampling sites in the Neuse River, Slocum Creek, and Hancock Creek, North Carolina.

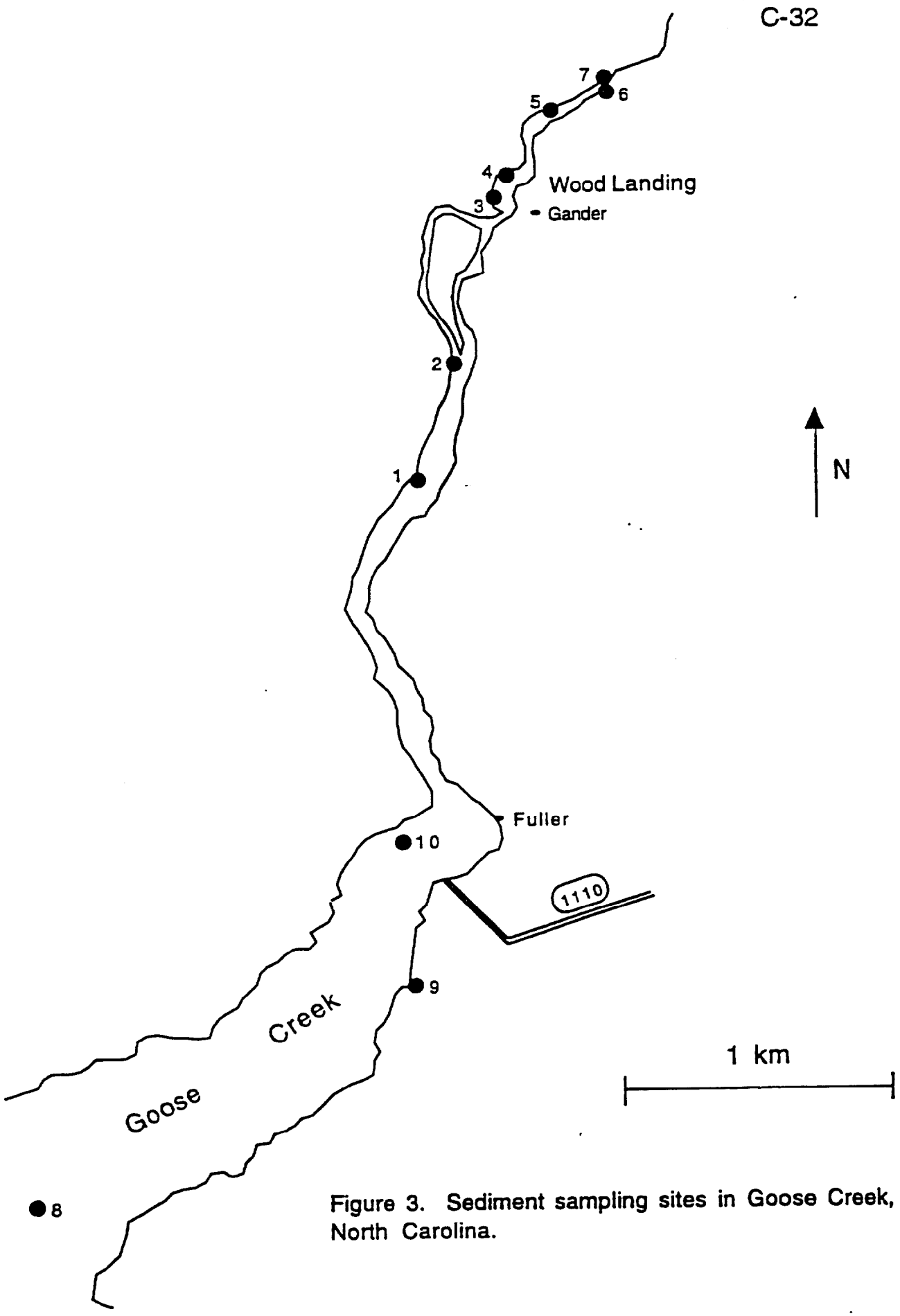


Figure 3. Sediment sampling sites in Goose Creek, North Carolina.

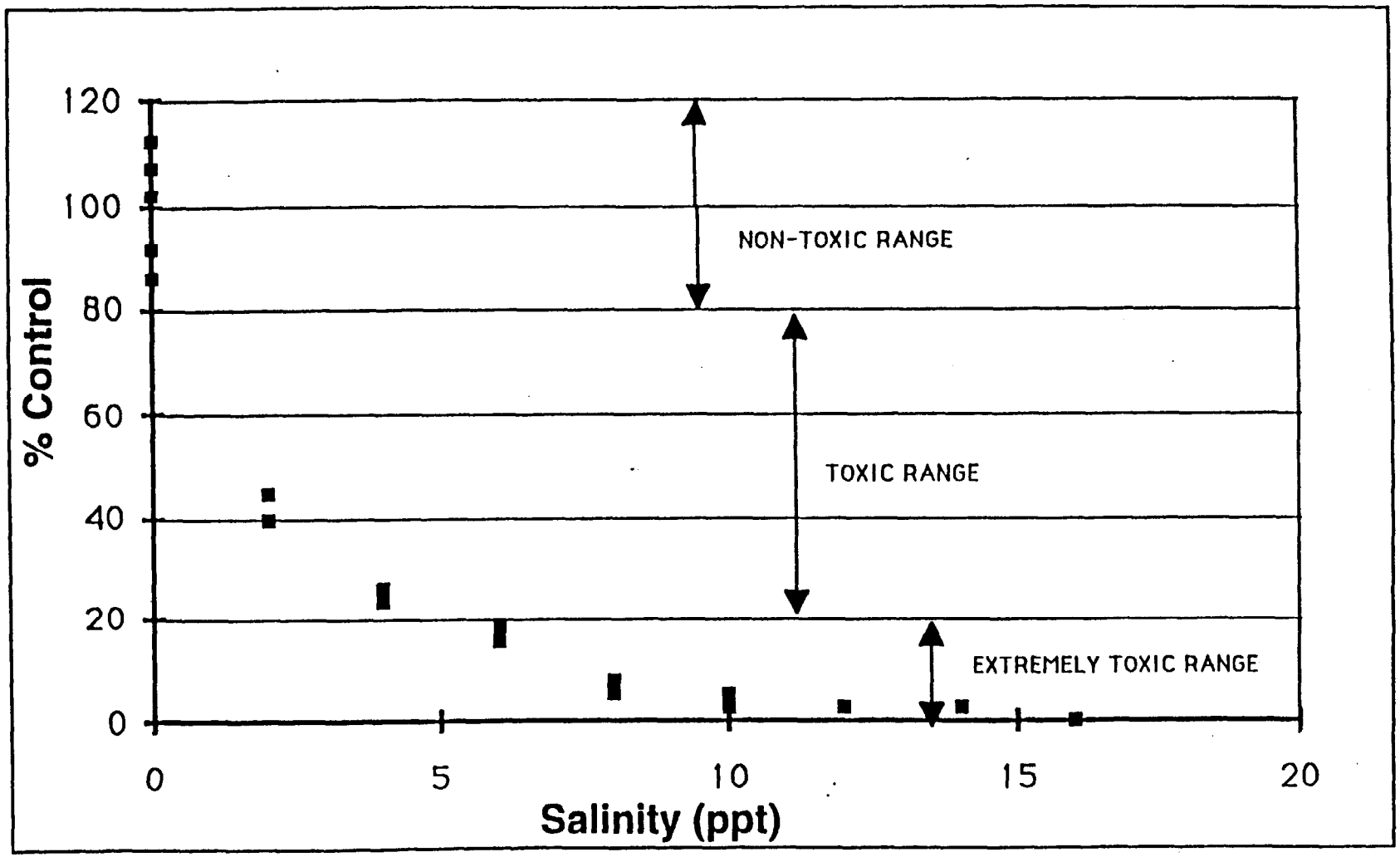


Figure 4. Calibration of toxicity ratings for lettuce seed root elongation bioassays based on root elongation in response to salinity. Elongation is expressed as a percent of control (0 ppt) plants. The non-toxic range was determined as the mean for control values ± 2 standard deviations.

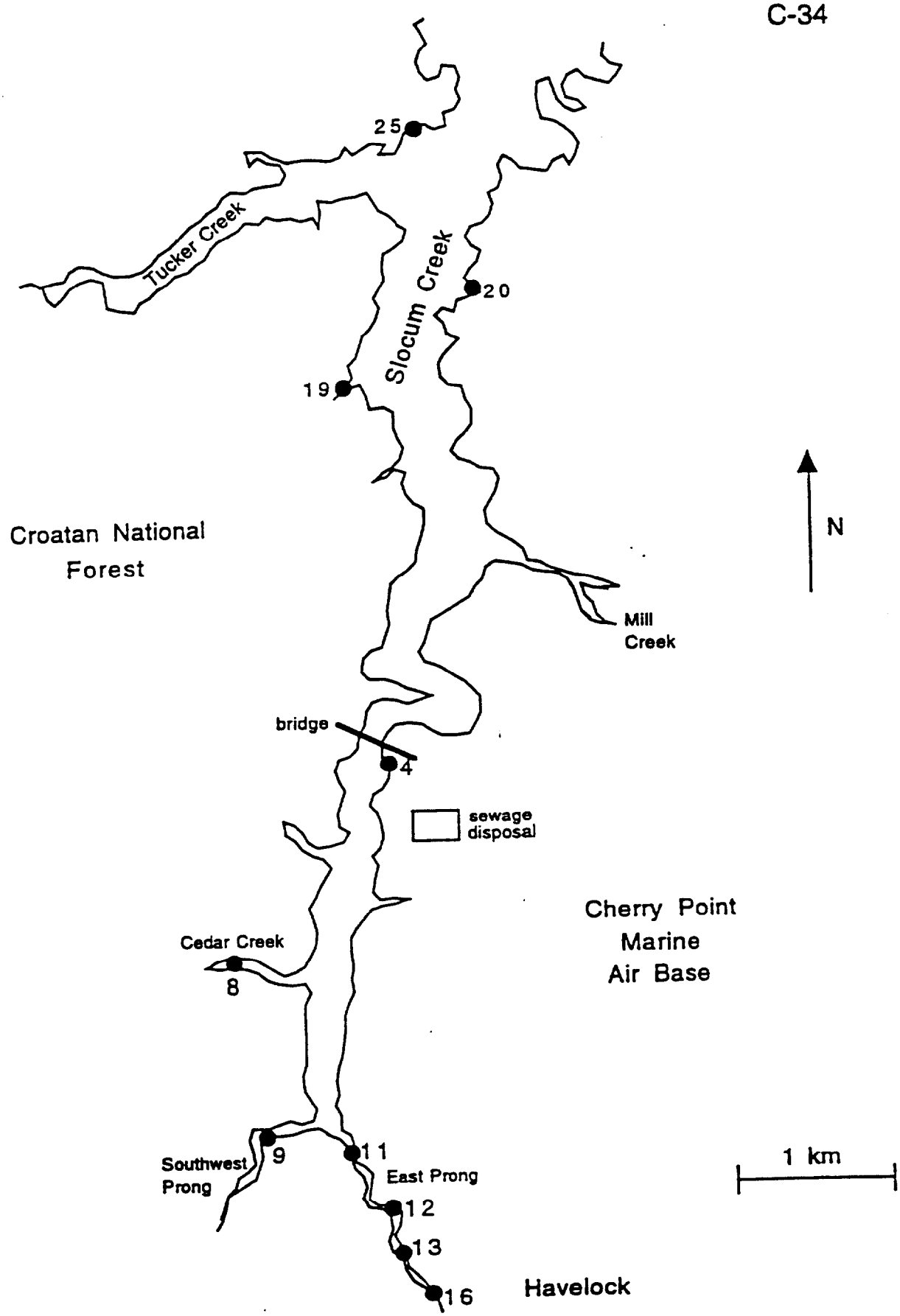


Figure 5. Selected sampling sites in Slocum Creek from which sediments were analyzed for physical and chemical variables and toxicity.

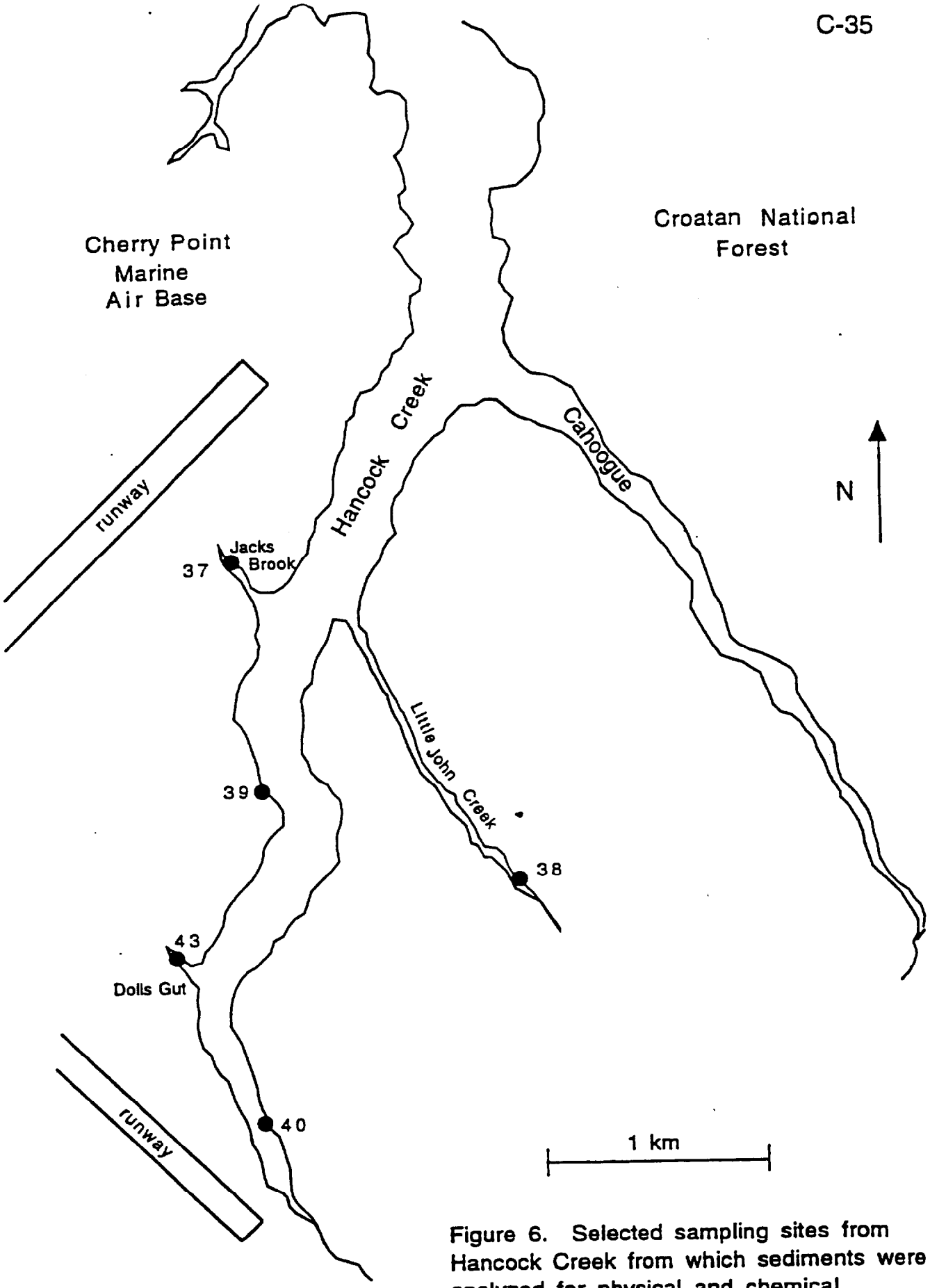


Figure 6. Selected sampling sites from Hancock Creek from which sediments were analyzed for physical and chemical variables and toxicity.

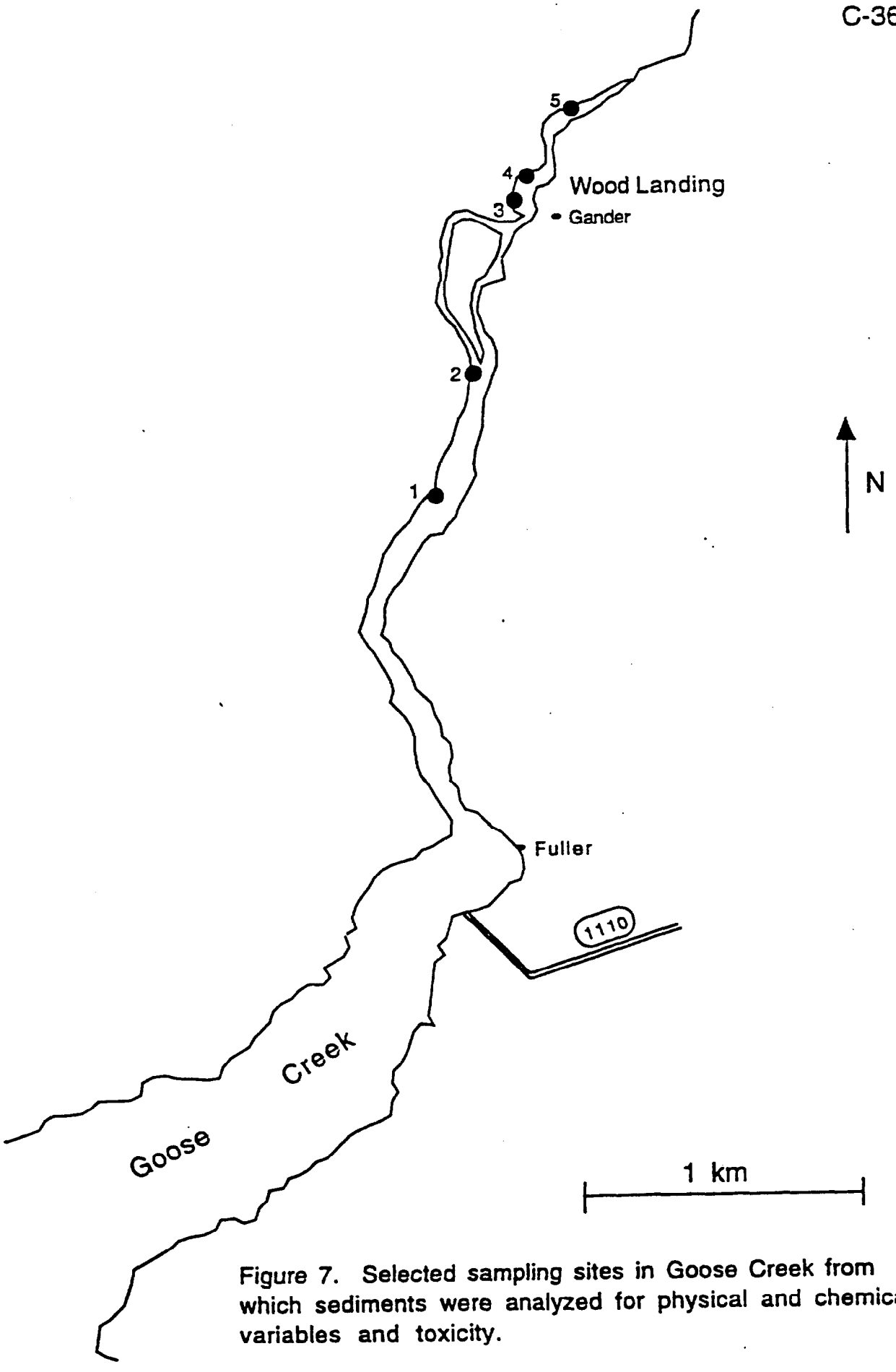


Figure 7. Selected sampling sites in Goose Creek from which sediments were analyzed for physical and chemical variables and toxicity.

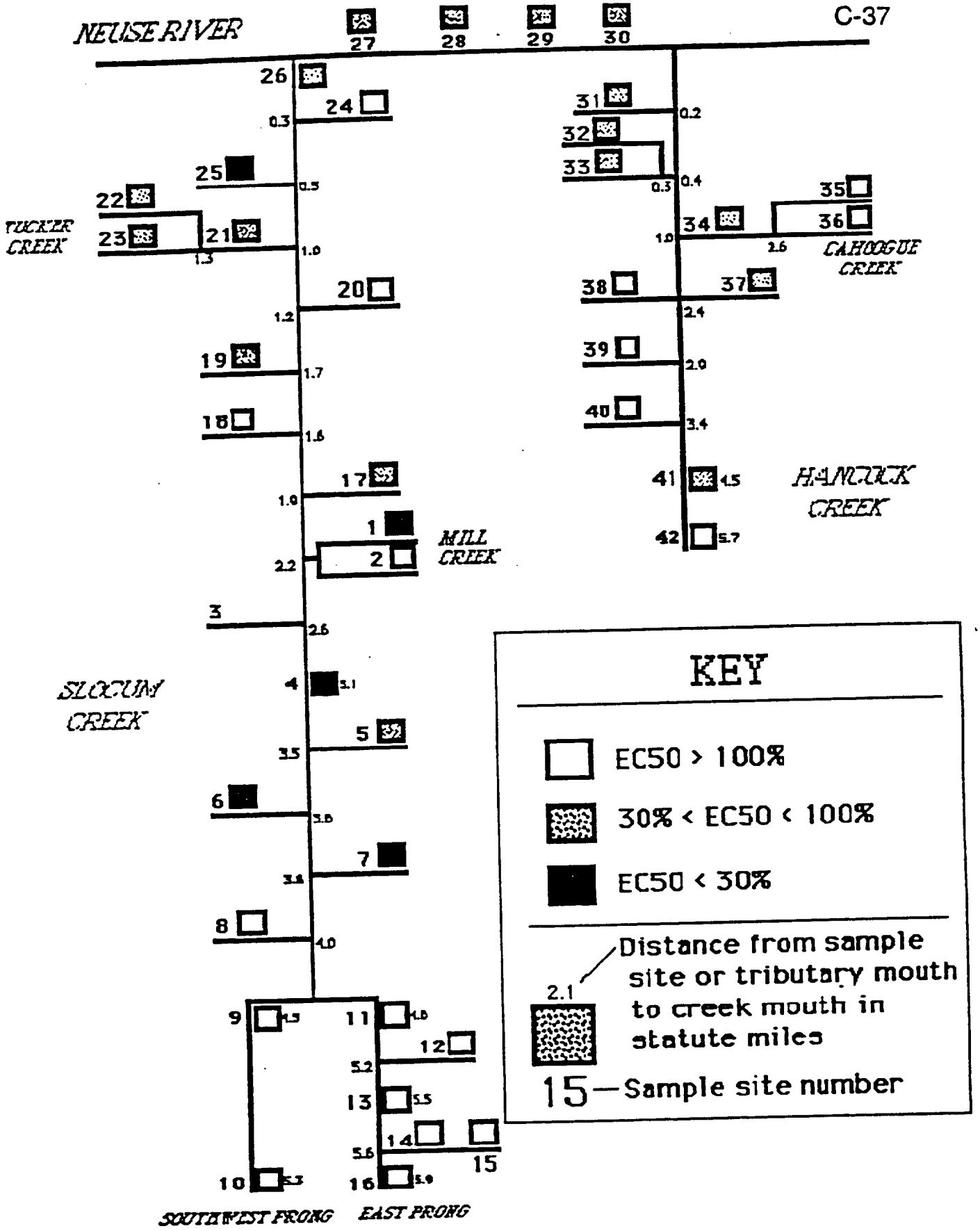


Figure 8. Surface water toxicity (1 m below surface) of water samples collected from Slocum and Hancock Creeks and the Neuse River 2/7/91. The 15 minute Microtox bioassay was used to determine toxicity.

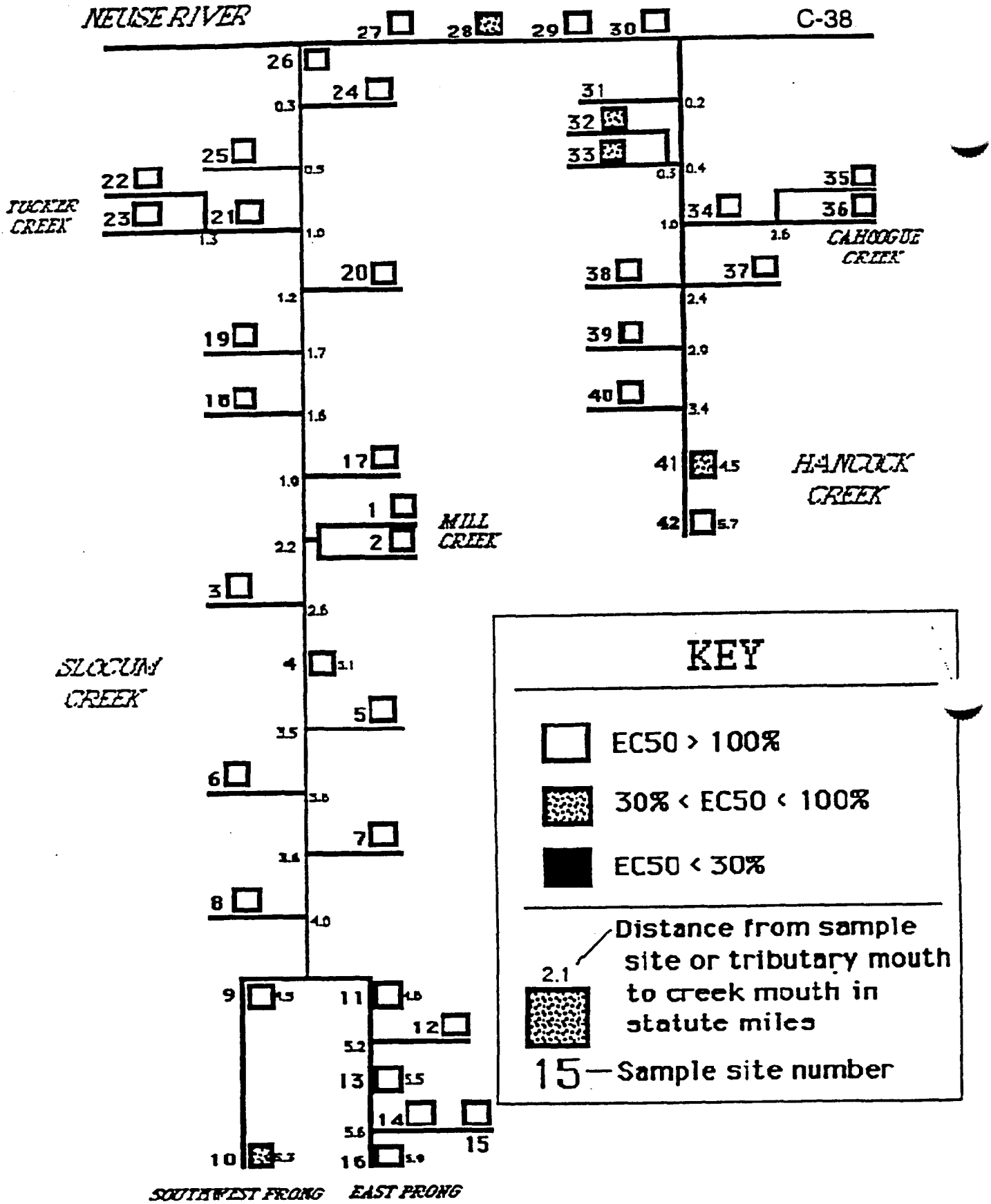


Figure 9. Surface water toxicity (1 m below surface) of water samples collected from Slocum and Hancock Creeks and the Neuse River 5/23/91. The 15 minute Microtox bioassay was used to determine toxicity.

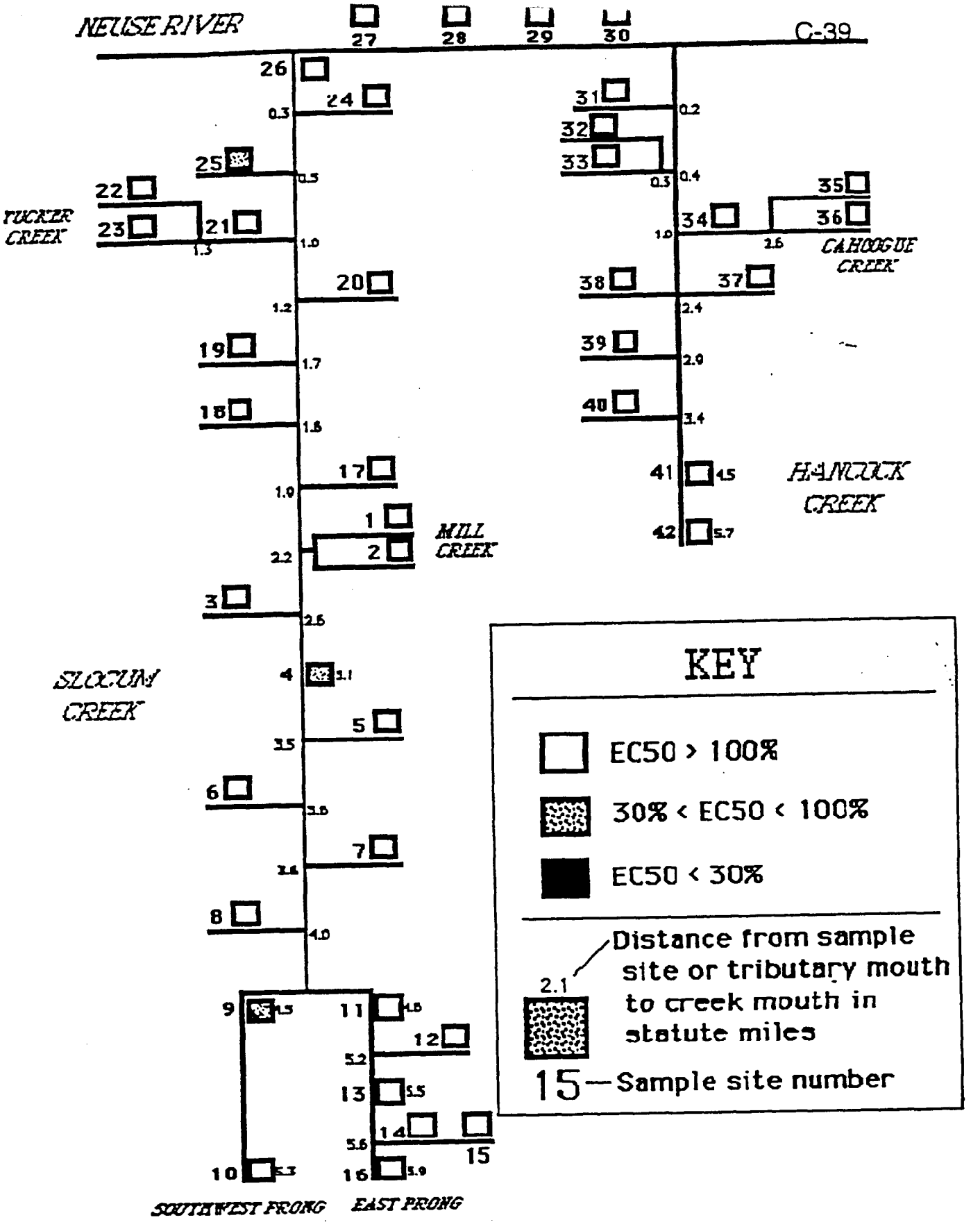


Figure 10. Surface water toxicity (1 m below surface) of water samples collected from Slocum and Hancock Creeks and the Neuse River, November 1991. The 15 minute Microtox bioassay was used to determine toxicity.

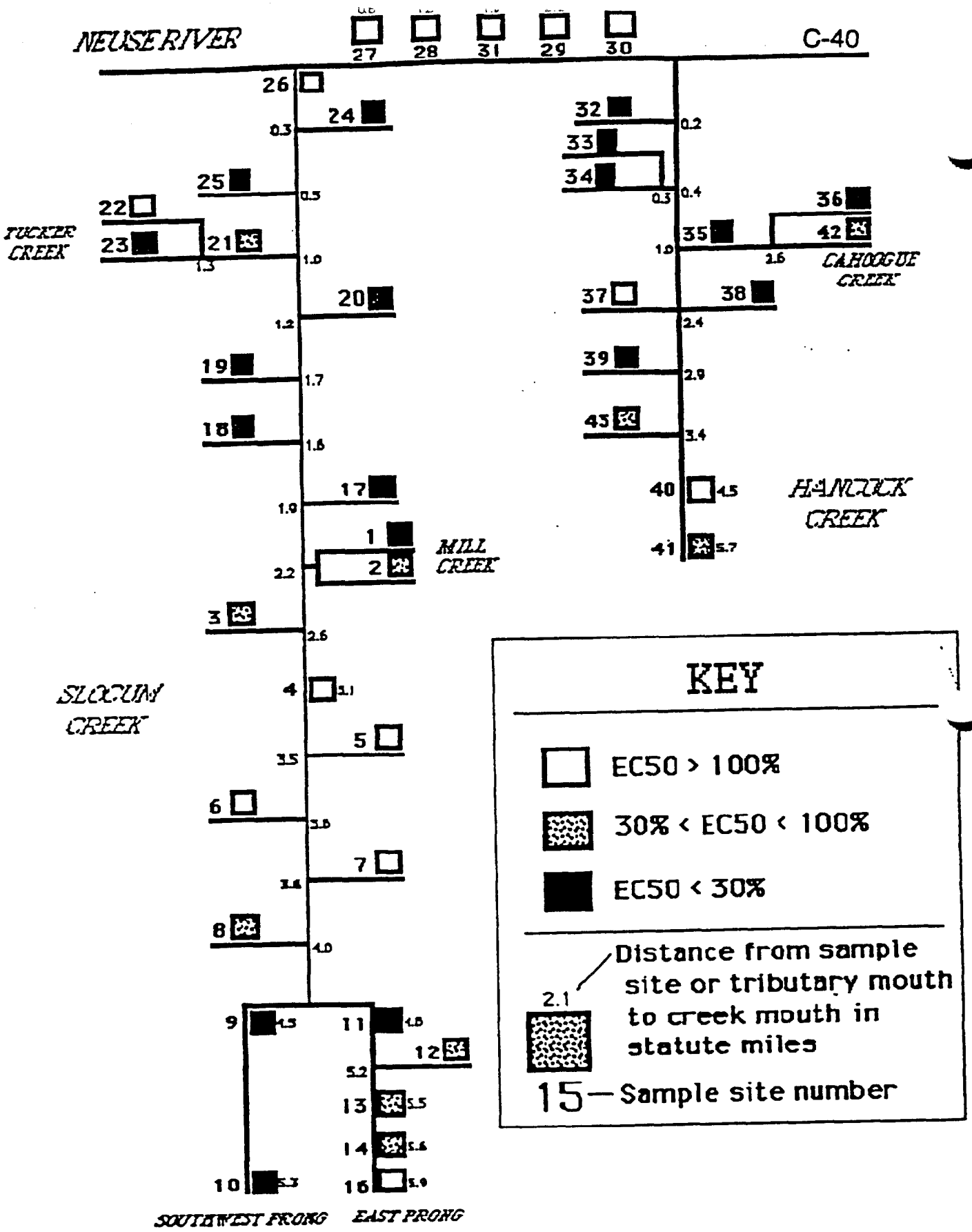


Figure 11. Pore water toxicity of sediments collected from Slocum and Hancock Creeks and the Neuse River, Oct/Nov 1990. The 15 minute Microtox bioassay was used to determine toxicity.

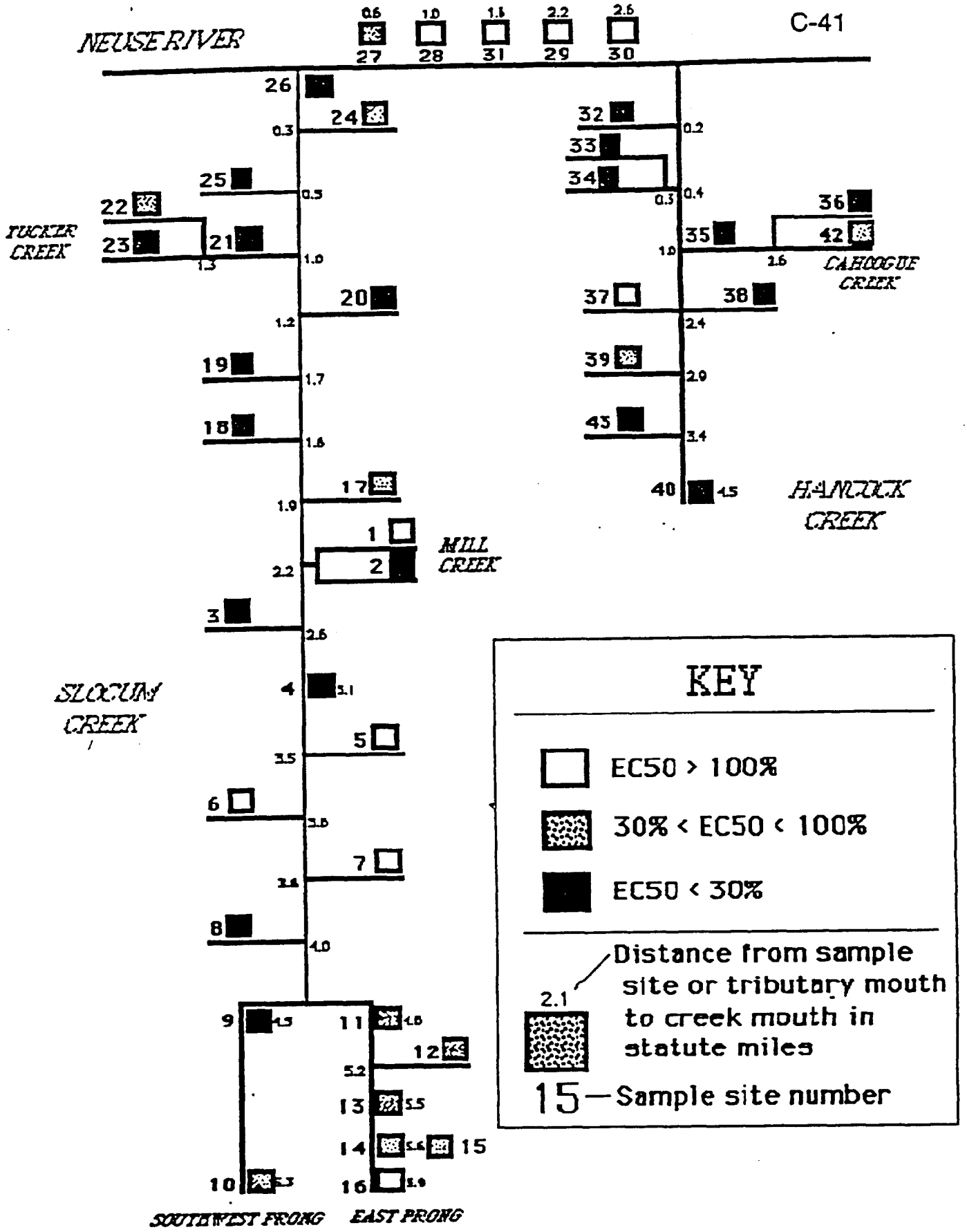


Figure 12. Pore water toxicity of sediments collected from Slocum and Hancock Creeks and the Neuse River, June 1992. The 15 minute Microtox bioassay was used to determine toxicity.

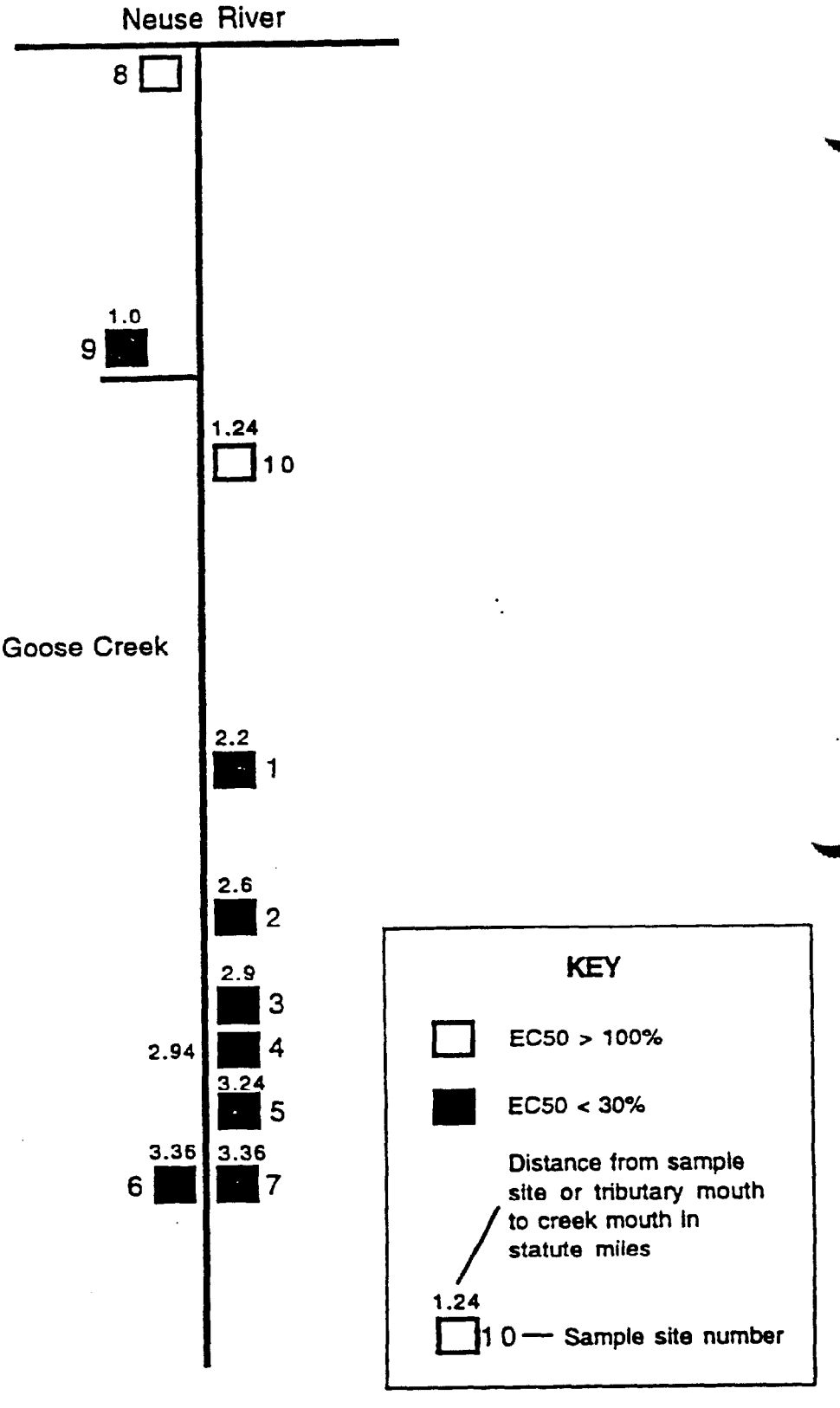


Figure 13. Pore water toxicity of sediments collected from Goose Creek 6/11/92. The 15 minute Microtox bioassay was used to determine toxicity.

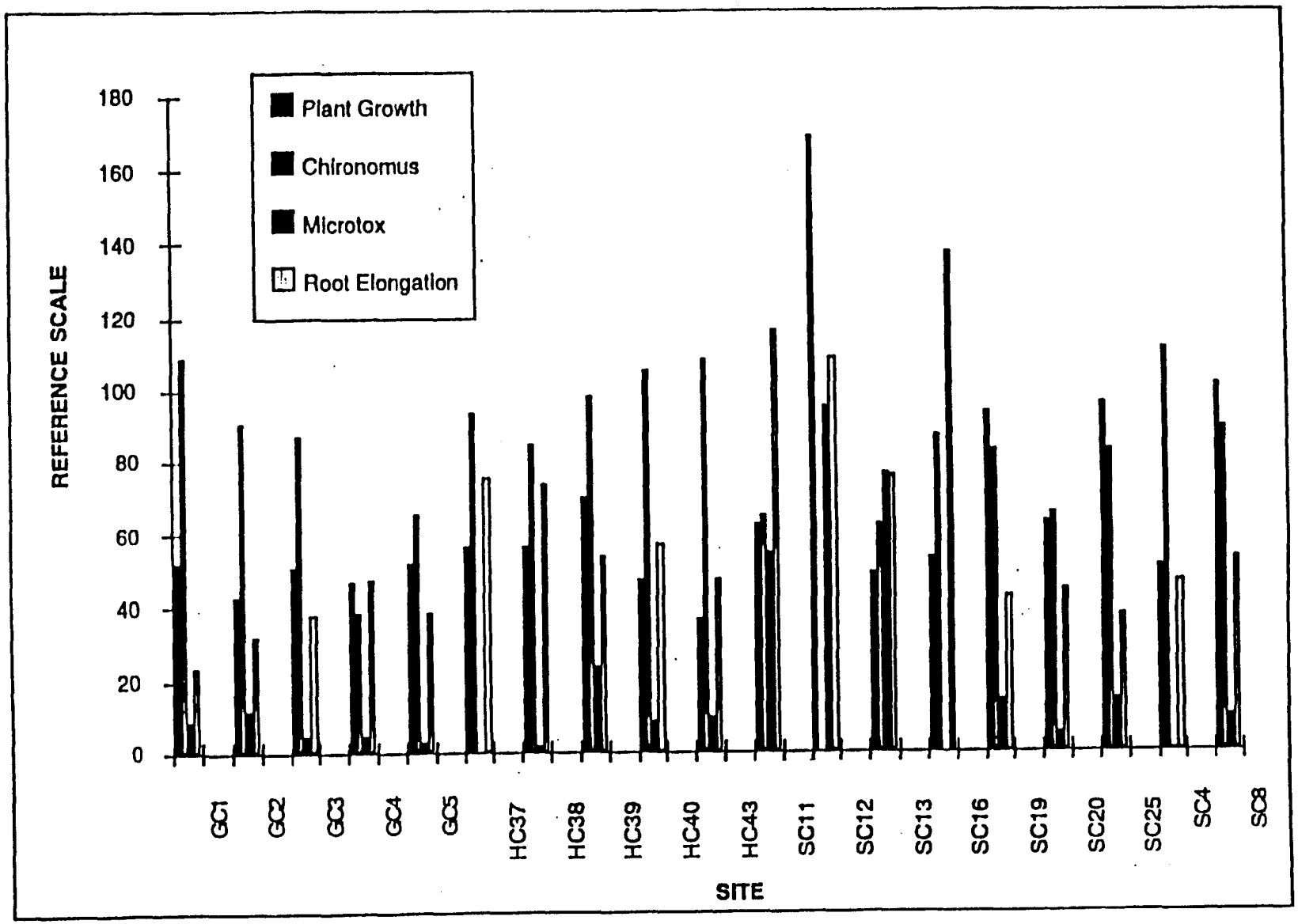


Figure 14. Comparison of sago pondweed growth bioassay, Chironomus bioassay, lettuce seed root elongation bioassay, and Microtox 15 minute bioassay. Microtox is expressed as EC50 values and all other bioassays are expressed as a percent of bioassay controls.

Appendix C-1

Analytical chemistry report for 19 sediments collected from Slocum, Hancock, and Goose Creeks, June 1992.

ECDMS ANALYTICAL REPORT (6)

15-Jul-94

Catalog: 8610001 Regional Study Id: R8-93-RWO6 Purchase Order: PACF-3-0004

User Id: R8NCSC Submitter: W. James Fleming - Raleigh, NC

Lab Name: Geochemical & Environmental Research Group, Texas A&M (GERG)

Report Includes the Following Sections:

- Weight, % Moisture, % Lipid, Total Suspended Solids
- Soil / Sediment Parameters
- Contaminant Concentrations
- Procedural Blanks
- Duplicates
- Reference Materials
- Spike Recoveries
- Comments (Result Modifers and QA/QC Comments)
- Analytical Methods

Catalog: 8610001 Lab Name: GERG 15-Jul-94 Purchase Order: PACF-3-0004
Page: 1

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS

| Sample Number | Sample Matrix | Sample Weight (g) | Percent Moisture | Percent Lipid | Total Suspended Solids ( % ) |
|---|---|---|---|---|---|
| GC1 | Sediments | | 84.64 | | |
| GC2 | Sediments | | 88.05 | | |
| GC3 | Sediments | | 76.4 | | |
| GC4 | Sediments | | 86.98 | | |
| GC5 | Sediments | | 86.92 | | |
| HC37 | Sediments | | 32.36 | | |
| HC38 | Sediments | | 87.75 | | |
| HC39 | Sediments | | 76.27 | | |
| HC40 | Sediments | | 69.95 | | |
| HC43 | Sediments | | 26.94 | | |
| SC11 | Sediments | | 64.72 | | |
| SC12 | Sediments | | 45.99 | | |
| SC13 | Sediments | | 20.78 | | |
| SC16 | Sediments | | 66.83 | | |
| SC19 | Sediments | | 85.52 | | |
| SC20 | Sediments | | 82.95 | | |
| SC25 | Sediments | | 81.7 | | |
| SC4 | Sediments | | 39.15 | | |
| SC8 | Sediments | | 69.41 | | |

SOIL / SEDIMENT PARAMETERS

| Sample Number | Percent TVS | Percent TOC | Particle Size %Sand | %Silt | %Clay |
|---|---|---|---|---|---|
| GC1 | | 11.54 | 44.44 | 28.99 | 26.57 |
| GC2 | | 13.25 | 38.75 | 26.25 | 35 |
| GC3 | | 5.22 | 76.13 | 5.97 | 17.9 |
| GC4 | | 12.89 | 45.85 | 10.83 | 43.32 |
| GC5 | | 21.41 | 63.47 | 8.12 | 28.41 |
| HC37 | | 1.14 | 89.66 | 4.43 | 5.91 |
| HC38 | | 21.14 | 44.93 | 55.07 | 0 |
| HC39 | | 9.68 | 14.09 | 34.36 | 51.55 |
| HC40 | | 12.57 | 75.89 | 10.96 | 13.15 |
| HC43 | | .21 | 96.98 | .5 | 2.52 |
| SC11 | | 3.77 | 82.91 | 6.41 | 10.68 |
| SC12 | | 2.89 | 23.88 | 32.44 | 43.68 |
| SC13 | | .26 | 95.95 | .62 | 3.43 |
| SC16 | | 7.01 | 86.36 | 3.15 | 10.49 |
| SC19 | | 16.76 | 16.03 | 52.62 | 31.35 |
| SC20 | | 12.51 | 29.04 | 32.94 | 38.02 |
| SC25 | | 12.76 | 31.76 | 23.62 | 44.62 |
| SC4 | | 2.08 | 88.51 | 3.19 | 8.3 |
| SC8 | | 7.2 | 32.76 | 34.48 | 32.76 |

CONTAMINANT CONCENTRATIONS

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| AVS | GC1 | Sediments | 56 | 10 | 8.6016 | 1.536 |
| | GC2 | Sediments | 110 | 10 | 13.145 | 1.195 |
| | GC3 | Sediments | 678 | 10 | 160.008 | 2.36 |
| | GC4 | Sediments | 15 | 10 | 1.953 | 1.302 |
| | GC5 | Sediments | < 10 | 10 | < 1.308 | 1.308 |
| | HC37 | Sediments | 936 | 10 | 633.1104 | 6.764 |
| | HC38 | Sediments | 83 | 10 | 10.1675 | 1.225 |
| | HC39 | Sediments | 135 | 10 | 32.0355 | 2.373 |
| | HC40 | Sediments | 88 | 10 | 26.444 | 3.005 |
| | HC43 | Sediments | < 10 | 10 | < 7.306 | 7.306 |
| | SC11 | Sediments | 78 | 10 | 27.5184 | 3.528 |
| | SC12 | Sediments | 78 | 10 | 42.1278 | 5.401 |
| | SC13 | Sediments | 20 | 10 | 15.844 | 7.922 |
| | SC16 | Sediments | 47 | 10 | 15.5899 | 3.317 |
| | SC19 | Sediments | 208 | 10 | 30.1184 | 1.448 |
| | SC20 | Sediments | 138 | 10 | 23.529 | 1.705 |
| | SC25 | Sediments | 67 | 10 | 12.261 | 1.83 |
| | SC4 | Sediments | 750 | 10 | 456.375 | 6.085 |
| | SC8 | Sediments | 258 | 10 | 78.9222 | 3.059 |
| Al | GC1 | Sediments | 19046 | 10 | 2925.4656 | 1.536 |
| | GC2 | Sediments | 29476 | 10 | 3522.382 | 1.195 |
| | GC3 | Sediments | 9443 | 10 | 2228.548 | 2.36 |
| | GC4 | Sediments | 28306 | 10 | 3685.4412 | 1.302 |
| | GC5 | Sediments | 33776 | 10 | 4417.9008 | 1.308 |
| | HC37 | Sediments | 3843 | 10 | 2599.4052 | 6.764 |
| | HC38 | Sediments | 12542 | 10 | 1536.395 | 1.225 |
| | HC39 | Sediments | 36749 | 10 | 8720.5377 | 2.373 |
| | HC40 | Sediments | 9770 | 10 | 2935.885 | 3.005 |
| | HC43 | Sediments | 769 | 10 | 561.8314 | 7.306 |
| | SC11 | Sediments | 6830 | 10 | 2409.624 | 3.528 |
| | SC12 | Sediments | 24233 | 10 | 13088.2433 | 5.401 |
| | SC13 | Sediments | 911 | 10 | 721.6942 | 7.922 |
| | SC16 | Sediments | 7682 | 10 | 2548.1194 | 3.317 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Al | SC19 | Sediments | 12727 | 10 | 1842.8696 | 1.448 |
| | SC20 | Sediments | 34996 | 10 | 5966.818 | 1.705 |
| | SC25 | Sediments | 22814 | 10 | 4174.962 | 1.83 |
| | SC4 | Sediments | 3439 | 10 | 2092.6315 | 6.085 |
| | SC8 | Sediments | 19871 | 10 | 6078.5389 | 3.059 |
| As | GC1 | Sediments | 5.14 | .5 | .789504 | .0768 |
| | GC2 | Sediments | 6.57 | .5 | .785115 | .05975 |
| | GC3 | Sediments | 2.91 | .5 | .68676 | .118 |
| | GC4 | Sediments | 5.38 | .5 | .700476 | .0651 |
| | GC5 | Sediments | .87 | .5 | .113796 | .0654 |
| | HC37 | Sediments | 1.1 | .5 | .74404 | .3382 |
| | HC38 | Sediments | 1.47 | .5 | .180075 | .06125 |
| | HC39 | Sediments | 4.61 | .5 | 1.093953 | .11865 |
| | HC40 | Sediments | 2.48 | .5 | .74524 | .15025 |
| | HC43 | Sediments | < .5 | .5 | < .3653 | .3653 |
| | SC11 | Sediments | 2.55 | .5 | .89964 | .1764 |
| | SC12 | Sediments | 7.3 | .5 | 3.94273 | .27005 |
| | SC13 | Sediments | .81 | .5 | .641682 | .3961 |
| | SC16 | Sediments | 2.28 | .5 | .756276 | .16585 |
| | SC19 | Sediments | 3.68 | .5 | .532864 | .0724 |
| | SC20 | Sediments | 4.76 | .5 | .81158 | .08525 |
| | SC25 | Sediments | 2.57 | .5 | .47031 | .0915 |
| | SC4 | Sediments | .97 | .5 | .590245 | .30425 |
| | SC8 | Sediments | 3.33 | .5 | 1.018647 | .15295 |
| Cd | GC1 | Sediments | .49 | .2 | .075264 | .03072 |
| | GC2 | Sediments | < .2 | .2 | < .0239 | .0239 |
| | GC3 | Sediments | .36 | .2 | .08496 | .0472 |
| | GC4 | Sediments | < .2 | .2 | < .02604 | .02604 |
| | GC5 | Sediments | < .2 | .2 | < .02616 | .02616 |
| | HC37 | Sediments | < .2 | .2 | < .13528 | .13528 |
| | HC38 | Sediments | < .2 | .2 | < .0245 | .0245 |
| | HC39 | Sediments | .74 | .2 | .175602 | .04746 |
| | HC40 | Sediments | .24 | .2 | .07212 | .0601 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cd | HC43 | Sediments | < .2 | .2 | < .14612 | .14612 |
| | SC11 | Sediments | 10.39 | .2 | 3.665592 | .07056 |
| | SC12 | Sediments | 7.3 | .2 | 3.94273 | .10802 |
| | SC13 | Sediments | .24 | .2 | .190128 | .15844 |
| | SC16 | Sediments | .24 | .2 | .079608 | .06634 |
| | SC19 | Sediments | 4.61 | .2 | .667528 | .02896 |
| | SC20 | Sediments | 1.52 | .2 | .25916 | .0341 |
| | SC25 | Sediments | < .2 | .2 | < .0366 | .0366 |
| | SC4 | Sediments | 1.13 | .2 | .687605 | .1217 |
| | SC8 | Sediments | 3.65 | .2 | 1.116535 | .06118 |
| Cr | GC1 | Sediments | 20.17 | 1 | 3.098112 | .1536 |
| | GC2 | Sediments | 16.85 | 1 | 2.013575 | .1195 |
| | GC3 | Sediments | 8.79 | 1 | 2.07444 | .236 |
| | GC4 | Sediments | 23.58 | 1 | 3.070116 | .1302 |
| | GC5 | Sediments | 14.05 | 1 | 1.83774 | .1308 |
| | HC37 | Sediments | 5.4 | 1 | 3.65256 | .6764 |
| | HC38 | Sediments | 11.47 | 1 | .405075 | .1225 |
| | HC39 | Sediments | 40.88 | 1 | 9.700824 | .2373 |
| | HC40 | Sediments | 9.26 | 1 | 2.78263 | .3005 |
| | HC43 | Sediments | < 1 | 1 | < .7306 | .7306 |
| | SC11 | Sediments | 135.67 | 1 | 47.864376 | .3528 |
| | SC12 | Sediments | 102.11 | 1 | 55.149611 | .5401 |
| | SC13 | Sediments | 4.01 | 1 | 3.176722 | .7922 |
| | SC16 | Sediments | 8.42 | 1 | 2.792914 | .3317 |
| | SC19 | Sediments | 74.6 | 1 | 10.80208 | .1448 |
| | SC20 | Sediments | 45.93 | 1 | 7.831065 | .1705 |
| | SC25 | Sediments | 18.07 | 1 | 3.30681 | .183 |
| | SC4 | Sediments | 12.04 | 1 | 7.32634 | .6085 |
| | SC8 | Sediments | 61.6 | 1 | 18.84344 | .3059 |
| Cu | GC1 | Sediments | 14.42 | 1 | 2.214912 | .1536 |
| | GC2 | Sediments | 4.2 | 1 | .5019 | .1195 |
| | GC3 | Sediments | 5 | 1 | 1.18 | .236 |
| | GC4 | Sediments | 8.08 | 1 | 1.052016 | .1302 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cu | GC5 | Sediments | 6.17 | 1 | .807036 | .1308 |
| | HC37 | Sediments | 4.79 | 1 | 3.239956 | .6764 |
| | HC38 | Sediments | 5.15 | 1 | .630875 | .1225 |
| | HC39 | Sediments | 13.8 | 1 | 3.27474 | .2373 |
| | HC40 | Sediments | 4.05 | 1 | 1.217025 | .3005 |
| | HC43 | Sediments | <1 | 1 | <.7306 | .7306 |
| | SC11 | Sediments | 14.24 | 1 | 5.023872 | .3528 |
| | SC12 | Sediments | 18.33 | 1 | 9.900033 | .5401 |
| | SC13 | Sediments | <1 | 1 | <.7922 | .7922 |
| | SC16 | Sediments | 1.12 | 1 | .371504 | .3317 |
| | SC19 | Sediments | 21.63 | 1 | 3.132024 | .1448 |
| | SC20 | Sediments | 12.98 | 1 | 2.21309 | .1705 |
| | SC25 | Sediments | 4.36 | 1 | .79788 | .183 |
| | SC4 | Sediments | 8.47 | 1 | 5.153995 | .6085 |
| | SC8 | Sediments | 20.14 | 1 | 6.160826 | .3059 |
| Fe | GC1 | Sediments | 23804 | 10 | 3656.2944 | 1.536 |
| | GC2 | Sediments | 15655 | 10 | 1870.7725 | 1.195 |
| | GC3 | Sediments | 11808 | 10 | 2786.688 | 2.36 |
| | GC4 | Sediments | 25941 | 10 | 3377.5182 | 1.302 |
| | GC5 | Sediments | 11021 | 10 | 1441.5468 | 1.308 |
| | HC37 | Sediments | 4785 | 10 | 3236.574 | 6.764 |
| | HC38 | Sediments | 10194 | 10 | 1248.765 | 1.225 |
| | HC39 | Sediments | 30857 | 10 | 7322.3661 | 2.373 |
| | HC40 | Sediments | 9989 | 10 | 3001.6945 | 3.005 |
| | HC43 | Sediments | 682 | 10 | 498.2692 | 7.306 |
| | SC11 | Sediments | 9927 | 10 | 3502.2456 | 3.528 |
| | SC12 | Sediments | 15354 | 10 | 8292.6954 | 5.401 |
| | SC13 | Sediments | 979 | 10 | 775.5638 | 7.922 |
| | SC16 | Sediments | 6106 | 10 | 2025.3602 | 3.317 |
| | SC19 | Sediments | 14729 | 10 | 2132.7592 | 1.448 |
| | SC20 | Sediments | 24970 | 10 | 4257.385 | 1.705 |
| | SC25 | Sediments | 12379 | 10 | 2265.357 | 1.83 |
| | SC4 | Sediments | 3965 | 10 | 2412.7025 | 6.085 |
| | SC8 | Sediments | 22746 | 10 | 6958.0014 | 3.059 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Hg | GC1 | Sediments | .16 | .1 | .024576 | .01536 |
| | GC2 | Sediments | <.1 | .1 | <.01195 | .01195 |
| | GC3 | Sediments | .11 | .1 | .02596 | .0236 |
| | GC4 | Sediments | .11 | .1 | .014322 | .01302 |
| | GC5 | Sediments | .14 | .1 | .018312 | .01308 |
| | HC37 | Sediments | <.1 | .1 | <.06764 | .06764 |
| | HC38 | Sediments | .11 | .1 | .013475 | .01225 |
| | HC39 | Sediments | .14 | .1 | .033222 | .02373 |
| | HC40 | Sediments | <.1 | .1 | <.03005 | .03005 |
| | HC43 | Sediments | <.1 | .1 | <.07306 | .07306 |
| | SC11 | Sediments | <.1 | .1 | <.03528 | .03528 |
| | SC12 | Sediments | .17 | .1 | .091817 | .05401 |
| | SC13 | Sediments | <.1 | .1 | <.07922 | .07922 |
| | SC16 | Sediments | <.1 | .1 | <.03317 | .03317 |
| | SC19 | Sediments | .23 | .1 | .033304 | .01448 |
| | SC20 | Sediments | .16 | .1 | .02728 | .01705 |
| | SC25 | Sediments | .16 | .1 | .02928 | .0183 |
| | SC4 | Sediments | .13 | .1 | .079105 | .06085 |
| | SC8 | Sediments | .32 | .1 | .097888 | .03059 |
| Mn | GC1 | Sediments | 179 | 5 | 27.4944 | .768 |
| | GC2 | Sediments | 94 | 5 | 11.233 | .5975 |
| | GC3 | Sediments | 128 | 5 | 30.208 | 1.18 |
| | GC4 | Sediments | 115 | 5 | 14.973 | .651 |
| | GC5 | Sediments | 144 | 5 | 18.8352 | .654 |
| | HC37 | Sediments | 47 | 5 | 31.7908 | 3.382 |
| | HC38 | Sediments | 77 | 5 | 9.4325 | .6125 |
| | HC39 | Sediments | 192 | 5 | 45.5616 | 1.1865 |
| | HC40 | Sediments | 49 | 5 | 14.7245 | 1.5025 |
| | HC43 | Sediments | 16 | 5 | 11.6896 | 3.653 |
| | SC11 | Sediments | 41 | 5 | 14.4648 | 1.764 |
| | SC12 | Sediments | 45 | 5 | 24.3045 | 2.7005 |
| | SC13 | Sediments | 11 | 5 | 8.7142 | 3.961 |
| | SC16 | Sediments | 26 | 5 | 8.6242 | 1.6585 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mn | SC19 | Sediments | 158 | 5 | 22.8784 | .724 |
| | SC20 | Sediments | 234 | 5 | 39.897 | .8525 |
| | SC25 | Sediments | 58 | 5 | 10.614 | .915 |
| | SC4 | Sediments | 70 | 5 | 42.595 | 3.0425 |
| | SC8 | Sediments | 206 | 5 | 63.0154 | 1.5295 |
| Ni | GC1 | Sediments | 15.53 | 5 | 2.385408 | .768 |
| | GC2 | Sediments | 10.26 | 5 | 1.22607 | .5975 |
| | GC3 | Sediments | 7.95 | 5 | 1.8762 | 1.18 |
| | GC4 | Sediments | 11.09 | 5 | 1.443918 | .651 |
| | GC5 | Sediments | 6.22 | 5 | .813576 | .654 |
| | HC37 | Sediments | <5 | 5 | <3.382 | 3.382 |
| | HC38 | Sediments | 7.25 | 5 | .888125 | .6125 |
| | HC39 | Sediments | 11.36 | 5 | 2.695728 | 1.1865 |
| | HC40 | Sediments | <5 | 5 | <1.5025 | 1.5025 |
| | HC43 | Sediments | <5 | 5 | <3.653 | 3.653 |
| | SC11 | Sediments | 9.91 | 5 | 3.496248 | 1.764 |
| | SC12 | Sediments | 8.19 | 5 | 4.423419 | 2.7005 |
| | SC13 | Sediments | <5 | 5 | <3.961 | 3.961 |
| | SC16 | Sediments | <5 | 5 | <1.6585 | 1.6585 |
| | SC19 | Sediments | 15.28 | 5 | 2.212544 | .724 |
| | SC20 | Sediments | 14.82 | 5 | 2.52681 | .8525 |
| | SC25 | Sediments | 7.26 | 5 | 1.32858 | .915 |
| | SC4 | Sediments | <5 | 5 | <3.0425 | 3.0425 |
| | SC8 | Sediments | 13.26 | 5 | 4.056234 | 1.5295 |
| Pb | GC1 | Sediments | 20.4 | 5 | 3.13344 | .768 |
| | GC2 | Sediments | 11.7 | 5 | 1.39815 | .5975 |
| | GC3 | Sediments | 16 | 5 | 3.776 | 1.18 |
| | GC4 | Sediments | 14.4 | 5 | 1.87488 | .651 |
| | GC5 | Sediments | 11.9 | 5 | 1.55652 | .654 |
| | HC37 | Sediments | 20.7 | 5 | 14.00148 | 3.382 |
| | HC38 | Sediments | 12.2 | 5 | 1.4945 | .6125 |
| | HC39 | Sediments | 37.9 | 5 | 8.99367 | 1.1865 |
| | HC40 | Sediments | 29.6 | 5 | 8.8948 | 1.5025 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Pb | HC43 | Sediments | < 5 | 5 | < 3.653 | 3.653 |
| | SC11 | Sediments | 57.1 | 5 | 20.14488 | 1.764 |
| | SC12 | Sediments | 69.4 | 5 | 37.48294 | 2.7005 |
| | SC13 | Sediments | 5.3 | 5 | 4.19866 | 3.961 |
| | SC16 | Sediments | 35 | 5 | 11.6095 | 1.6585 |
| | SC19 | Sediments | 39.4 | 5 | 5.70512 | .724 |
| | SC20 | Sediments | 25.3 | 5 | 4.31365 | .8525 |
| | SC25 | Sediments | 15.5 | 5 | 2.8365 | .915 |
| | SC4 | Sediments | 44.3 | 5 | 26.95655 | 3.0425 |
| | SC8 | Sediments | 105.3 | 5 | 32.21127 | 1.5295 |
| Se | GC1 | Sediments | < 1 | 1 | < .1536 | .1536 |
| | GC2 | Sediments | < 1 | 1 | < .1195 | .1195 |
| | GC3 | Sediments | < 1 | 1 | < .236 | .236 |
| | GC4 | Sediments | < 1 | 1 | < .1302 | .1302 |
| | GC5 | Sediments | < 1 | 1 | < .1308 | .1308 |
| | HC37 | Sediments | < 1 | 1 | < .6764 | .6764 |
| | HC38 | Sediments | < 1 | 1 | < .1225 | .1225 |
| | HC39 | Sediments | < 1 | 1 | < .2373 | .2373 |
| | HC40 | Sediments | < 1 | 1 | < .3005 | .3005 |
| | HC43 | Sediments | < 1 | 1 | < .7306 | .7306 |
| | SC11 | Sediments | < 1 | 1 | < .3528 | .3528 |
| | SC12 | Sediments | < 1 | 1 | < .5401 | .5401 |
| | SC13 | Sediments | < 1 | 1 | < .7922 | .7922 |
| | SC16 | Sediments | < 1 | 1 | < .3317 | .3317 |
| | SC19 | Sediments | 1.79 | 1 | .259192 | .1448 |
| | SC20 | Sediments | < 1 | 1 | < .1705 | .1705 |
| | SC25 | Sediments | < 1 | 1 | < .183 | .183 |
| | SC4 | Sediments | < 1 | 1 | < .6085 | .6085 |
| | SC8 | Sediments | < 1 | 1 | < .3059 | .3059 |
| Total Petroleum Hydrocarbons | | | | | | |
| | GC1 | Sediments | 2.091503 | | .32 | |
| | GC2 | Sediments | 2.479339 | | .3 | |
| | GC3 | Sediments | 2.237443 | | .49 | |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Total Petroleum Hydrocarbons | | | | | | |
| | GC4 | Sediments | 3.816794 | | .5 | |
| | GC5 | Sediments | 6.909091 | | .76 | |
| | HC37 | Sediments | .247093 | | .17 | |
| | HC38 | Sediments | 7.363636 | | .81 | |
| | HC39 | Sediments | .990099 | | .2 | |
| | HC40 | Sediments | 2.332362 | | .8 | |
| | HC43 | Sediments | .130548 | | .1 | |
| | SC11 | Sediments | 11.335616 | | 3.31 | |
| | SC12 | Sediments | 12.789784 | | 6.51 | |
| | SC13 | Sediments | 1.242158 | | .99 | |
| | SC16 | Sediments | 2.932331 | | 1.17 | |
| | SC19 | Sediments | 11.865672 | | 1.59 | |
| | SC20 | Sediments | 4.469697 | | .59 | |
| | SC25 | Sediments | 4.237288 | | 1 | |
| | SC4 | Sediments | 1.039604 | | .63 | |
| | SC8 | Sediments | .372671 | | .12 | |
| Zn | GC1 | Sediments | 82.1 | 5 | 12.61056 | .768 |
| | GC2 | Sediments | 16.3 | 5 | 1.94785 | .5975 |
| | GC3 | Sediments | 53.1 | 5 | 12.5316 | 1.18 |
| | GC4 | Sediments | 31.6 | 5 | 4.11432 | .651 |
| | GC5 | Sediments | 34.8 | 5 | 4.55184 | .654 |
| | HC37 | Sediments | 8.3 | 5 | 5.61412 | 3.382 |
| | HC38 | Sediments | 25.2 | 5 | 3.067 | .6125 |
| | HC39 | Sediments | 395 | 5 | 93.7335 | 1.1865 |
| | HC40 | Sediments | 26.1 | 5 | 7.84305 | 1.5025 |
| | HC43 | Sediments | <5 | 5 | <3.653 | 3.653 |
| | SC11 | Sediments | 64.3 | 5 | 22.68504 | 1.764 |
| | SC12 | Sediments | 83.7 | 5 | 45.20637 | 2.7005 |
| | SC13 | Sediments | 9.5 | 5 | 7.5259 | 3.961 |
| | SC16 | Sediments | 40.2 | 5 | 13.33434 | 1.6585 |
| | SC19 | Sediments | 89.8 | 5 | 13.00304 | .724 |
| | SC20 | Sediments | 64.4 | 5 | 10.9802 | .8525 |
| | SC25 | Sediments | 26.5 | 5 | 4.8495 | .915 |
| | SC4 | Sediments | 44.2 | 5 | 26.8957 | 3.0425 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Zn | SC8 | Sediments | 190.9 | 5 | 58.39631 | 1.5295 |

PROCEDURAL BLANKS

| Analyte | Lab Sample Number | Result Total UG |
|---|---|---|
| % Moisture | BLANK-A | |
| | BLANK-B | |
| | BLANK-C | |
| AVS | BLANK-A | < 10 |
| | BLANK-B | < 10 |
| | BLANK-C | < 10 |
| Al | BLANK-A | < 10 |
| | BLANK-B | < 10 |
| | BLANK-C | < 10 |
| As | BLANK-A | .73 |
| | BLANK-B | < .5 |
| | BLANK-C | .54 |
| Cd | BLANK-A | < .2 |
| | BLANK-B | < .2 |
| | BLANK-C | < .2 |
| Cr | BLANK-A | < 1 |
| | BLANK-B | < 1 |
| | BLANK-C | < 1 |
| Cu | BLANK-A | < 1 |
| | BLANK-B | < 1 |
| | BLANK-C | < 1 |
| Fe | BLANK-A | < 10 |
| | BLANK-B | < 10 |
| | BLANK-C | < 10 |
| Hg | BLANK-A | < .1 |
| | BLANK-B | < .1 |
| | BLANK-C | < .1 |

PROCEDURAL BLANKS (Cont.)

| Analyte | Lab Sample Number | Result Total UG |
|---|---|---|
| Mn | BLANK-A | < 5 |
| | BLANK-B | < 5 |
| | BLANK-C | < 5 |
| Ni | BLANK-A | < 5 |
| | BLANK-B | < 5 |
| | BLANK-C | < 5 |
| Pb | BLANK-A | < 5 |
| | BLANK-B | < 5 |
| | BLANK-C | < 5 |
| Se | BLANK-A | < 1 |
| | BLANK-B | < 1 |
| | BLANK-C | < 1 |
| Zn | BLANK-A | < 5 |
| | BLANK-B | < 5 |
| | BLANK-C | < 5 |

DUPLICATES

| Analyte | Sample Number | Sample Matrix | Initial Result (ppm / %) | Duplicate Result (ppm / %) | Average | Relative % Difference |
|---|---|---|---|---|---|---|
| % Moisture | GC4 | Sediments | 86.98 % | 87.2 % | 87.09 | 0.25 |
| | HC37 | Sediments | 32.36 % | 33.76 % | 33.06 | 4.23 |
| | SC12 | Sediments | 45.99 % | 48 % | 46.995 | 4.28 |
| AVS | GC4 | Sediments | 15 Dry | 14 Dry | 14.5 | 6.9 |
| | HC37 | Sediments | 936 Dry | 972 Dry | 954 | 3.77 |
| Al | GC4 | Sediments | 28306 Dry | 15832 Dry | 22069 | 56.52 |
| | HC37 | Sediments | 3843 Dry | 4546 Dry | 4194.5 | 16.76 |
| As | GC4 | Sediments | 5.38 Dry | 6.74 Dry | 6.06 | 22.44 |
| | HC37 | Sediments | 1.1 Dry | 1.33 Dry | 1.215 | 18.93 |
| Cd | GC4 | Sediments | <.2 Dry | <.2 Dry | 0.1 | 0 |
| | HC37 | Sediments | <.2 Dry | <.2 Dry | 0.1 | 0 |
| Cr | GC4 | Sediments | 23.58 Dry | 16.53 Dry | 20.055 | 35.15 |
| | HC37 | Sediments | 5.4 Dry | 6.58 Dry | 5.99 | 19.7 |
| Cu | GC4 | Sediments | 8.08 Dry | 4.02 Dry | 6.05 | 67.11 |
| | HC37 | Sediments | 4.79 Dry | 6.27 Dry | 5.53 | 26.76 |
| Fe | GC4 | Sediments | 25941 Dry | 23710 Dry | 24825.5 | 8.99 |
| | HC37 | Sediments | 4785 Dry | 6077 Dry | 5431 | 23.79 |
| Grain Size-Clay | GC4 | Sediments | 43.32 % | 44.57 % | 43.945 | 2.84 |
| | SC12 | Sediments | 43.68 % | 43.4 % | 43.54 | 0.64 |
| Grain Size-Sand | GC4 | Sediments | 45.85 % | 43.27 % | 44.56 | 5.79 |
| | SC12 | Sediments | 23.88 % | 21.54 % | 22.71 | 10.3 |
| Grain Size-Silt | GC4 | Sediments | 10.83 % | 12.16 % | 11.495 | 11.57 |
| | SC12 | Sediments | 32.44 % | 35.06 % | 33.75 | 7.76 |

DUPLICATES (Cont.)

| Analyte | Sample Number | Sample Matrix | Initial Result (ppm / %) | Duplicate Result (ppm / %) | Average | Relative % Difference |
|---|---|---|---|---|---|---|
| Hg | GC4 | Sediments | .11 Dry | .12 Dry | 0.115 | 8.7 |
| | HC37 | Sediments | <.1 Dry | <.1 Dry | 0.05 | 0 |
| Mn | GC4 | Sediments | 115 Dry | 89 Dry | 102 | 25.49 |
| | HC37 | Sediments | 47 Dry | 60 Dry | 53.5 | 24.3 |
| Ni | GC4 | Sediments | 11.09 Dry | 8.28 Dry | 9.685 | 29.01 |
| | HC37 | Sediments | <5 Dry | <5 Dry | 2.5 | 0 |
| Pb | GC4 | Sediments | 14.4 Dry | 15.2 Dry | 14.8 | 5.41 |
| | HC37 | Sediments | 20.7 Dry | 26.3 Dry | 23.5 | 23.83 |
| Se | GC4 | Sediments | <1 Dry | <1 Dry | 0.5 | 0 |
| | HC37 | Sediments | <1 Dry | <1 Dry | 0.5 | 0 |
| Tot. Organic Carbon | | | | | | |
| | GC4 | Sediments | 12.89 % | 12.78 % | 12.835 | 0.86 |
| | SC12 | Sediments | 2.89 % | 2.96 % | 2.925 | 2.39 |
| Zn | GC4 | Sediments | 31.6 Dry | 24.2 Dry | 27.9 | 26.52 |
| | HC37 | Sediments | 8.3 Dry | 11 Dry | 9.65 | 27.98 |

REFERENCE MATERIALS

* Certified 95%

| Lab Analyte | Sample Number | S.R.M. ID | S.R.M. Name | Reference Value (ppm / %) | Confidence Interval | Result (ppm / %) | Percent Recovery |
|---|---|---|---|---|---|---|---|
| Al | BCSS-A | NRCC BCSS-1 | | 20237 Dry | | | |
| | BCSS-B | NRCC BCSS-1 | | 19164 Dry | | | |
| As | BCSS-A | NRCC BCSS-1 | Sediment | 11.1 Dry | 1.4 | 9.77 Dry | 88.02 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 11.1 Dry | 1.4 | 9.92 Dry | 89.37 |
| Cd | BCSS-A | NRCC BCSS-1 | Sediment | .25 Dry | .4 | .22 Dry | 88 |
| | BCSS-B | NRCC BCSS-1 | Sediment | .25 Dry | .4 | .23 Dry | 92 |
| Cr | BCSS-A | NRCC BCSS-1 | Sediment | 123 Dry | 14 | 60.35 Dry | 49.07 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 123 Dry | 14 | 59.5 Dry | 48.37 |
| Cu | BCSS-A | NRCC BCSS-1 | Sediment | 18.5 Dry | 2.7 | 18.23 Dry | 98.54 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 18.5 Dry | 2.7 | 16.87 Dry | 91.19 |
| Fe | BCSS-A | NRCC BCSS-1 | | 26761 Dry | | | |
| | BCSS-B | NRCC BCSS-1 | | 31275 Dry | | | |
| Hg | BEST-A | NRCC BEST-1 | Sediment | .092 Dry | .009 | <.1 Dry | 108.7 |
| | BEST-B | NRCC BEST-1 | Sediment | .092 Dry | .009 | <.1 Dry | 108.7 |
| | BEST-C | NRCC BEST-1 | Sediment | .092 Dry | .009 | <.1 Dry | 108.7 |
| | BEST-D | NRCC BEST-1 | Sediment | .092 Dry | .009 | <.1 Dry | 108.7 |
| Mn | BCSS-A | NRCC BCSS-1 | Sediment | 229 Dry | 15 | 215 Dry | 93.89 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 229 Dry | 15 | 235 Dry | 102.62 |
| Ni | BCSS-A | NRCC BCSS-1 | Sediment | 55.3 Dry | 3.6 | 62.03 Dry | 112.17 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 55.3 Dry | 3.6 | 54.15 Dry | 97.92 |
| Pb | BCSS-A | NRCC BCSS-1 | Sediment | 22.7 Dry | 3.4 | 19.69 Dry | 86.74 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 22.7 Dry | 3.4 | 19.34 Dry | 85.2 |

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

* Certified 95%

| Lab Analyte | Sample # | S.R.M. ID | S.R.M. Name | Reference Value (ppm / %) | Confidence Interval | Result (ppm / %) | Percent Recovery |
|---|---|---|---|---|---|---|---|
| Se | BCSS-A | NRCC BCSS-1 | Sediment | .43 Dry | .06 | < 1 Dry | 232.56 |
| | BCSS-B | NRCC BCSS-1 | Sediment | .43 Dry | .06 | < 1 Dry | 232.56 |
| Zn | BCSS-A | NRCC BCSS-1 | Sediment | 119 Dry | 12 | 121.8 Dry | 102.35 |
| | BCSS-B | NRCC BCSS-1 | Sediment | 119 Dry | 12 | 120 Dry | 100.84 |

* Only certified analytes list a confidence interval - all others are considered reference values.

SPIKE RECOVERIES

| Analyte | Sample Number | Sample Matrix | Spike Level (ppm / %) | Amount Recovered (ppm / %) | * Spike / Background | Percent Recovery |
|---|---|---|---|---|---|---|
| AVS | SC12 | Sediments | 687 Dry | 675 Dry | 8.81 | 98.25 |
| | SC16 | Sediments | 1142 Dry | 1104 Dry | 24.3 | 96.67 |
| As | SC12 | Sediments | 12.4 Dry | 12.26 Dry | 1.7 | 98.87 |
| | SC16 | Sediments | 12.2 Dry | 12.22 Dry | 5.35 | 100.16 |
| Cd | SC12 | Sediments | 4.3 Dry | 4.09 Dry | 0.59 | 95.12 |
| | SC16 | Sediments | 4.2 Dry | 4.33 Dry | 17.5 | 103.1 |
| Cr | SC12 | Sediments | 49.8 Dry | 48.32 Dry | 0.49 | 97.03 |
| | SC16 | Sediments | 48.8 Dry | 58.79 Dry | 5.8 | 120.47 |
| Cu | SC12 | Sediments | 49.8 Dry | 47.37 Dry | 2.72 | 95.12 |
| | SC16 | Sediments | 48.8 Dry | 49.22 Dry | 43.57 | 100.86 |
| Fe | SC12 | Sediments | 14938 Dry | 15883 Dry | 0.97 | 106.33 |
| | SC16 | Sediments | 14646.3 Dry | 15107 Dry | 2.4 | 103.15 |
| Hg | SC12 | Sediments | .5 Dry | 0.57 Dry | 2.94 | 114 |
| | SC16 | Sediments | .5 Dry | 0.7 Dry | 5 | 140 |
| Mn | SC12 | Sediments | 507.9 Dry | 480 Dry | 11.29 | 94.51 |
| | SC16 | Sediments | 498 Dry | 534 Dry | 19.15 | 107.23 |
| Ni | SC12 | Sediments | 186.7 Dry | 160.67 Dry | 22.8 | 86.06 |
| | SC16 | Sediments | 183.1 Dry | 226.72 Dry | 36.62 | 123.82 |
| Pb | SC12 | Sediments | 12.4 Dry | 9.9 Dry | 0.18 | 79.84 |
| | SC16 | Sediments | 12.2 Dry | 14.2 Dry | 0.35 | 116.39 |
| Se | SC12 | Sediments | 49.8 Dry | 46.56 Dry | 49.8 | 93.49 |
| | SC16 | Sediments | 48.8 Dry | 51.15 Dry | 48.8 | 104.82 |

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

| Analyte | Sample Number | Sample Matrix | Spike Level (ppm / %) | Amount Recovered (ppm / %) | * Spike / Background | Percent Recovery |
|---|---|---|---|---|---|---|
| Zn | SC12 | Sediments | 298.8 Dry | 304.5 Dry | 3.57 | 101.91 |
| | SC16 | Sediments | 292.9 Dry | 320.1 Dry | 7.29 | 109.29 |

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

COMMENTS (RESULT MODIFERS AND QA/QC COMMENTS)

| Analyte | Sample Number | Result Modifier |
|---|---|---|

- NO DATA EXIST FOR THIS SECTION.

| QA/QC Comments |
|---|
| APPROVAL, EC |

ANALYTICAL METHODS

| Method Code | Method Description |
|---|---|
| 002 | LABORATORY: Geochemical & Environmental Research Group, Texas A&M |

Tissue, Sediment and Water Mercury

II. Mercury was determined by EPA method 245.5 with minor revisions. Sediment samples can be analyzed either freeze dried or on a wet basis. Sediment samples are homogenized by mixing before subsampling. The tissue samples were homogenized in the original sample containers with a Tekar Tissumizer and subsampled. Water samples are acidified (0.5% v/v with high purity nitric acid, $HNO_3$) in the original sample bottle. For sediments a 0.5 to 1.0 gram sample (dry weight) was used. For tissues a 1.5 to 2.0 gram sample (wet weight) was used. For water the sample size is 20 ml.

For tissue and sediment, the sample is weighed into a 50 ml polypropylene centrifuge tube. 2.5 ml of concentrated sulfuric acid ($H_2SO_4$) and 1.5 ml of concentrated nitric acid ($HNO_3$) were added and the samples heated in a water bath at 90 C for 15 min. After cooling 10 ml of distilled water and 15 ml of mixture of 3.3% (w/w) potassium permanganate ($KMnO_4$), and 1.7% (w/w) potassium persulfate ($K_2S_2O_8$) were added to each tube and the samples heated in a water bath at 90 C for 30 min. After cooling 5 ml of 10% (w/w) hydroxylamine hydrochloride ($NH_2OH$ HC1) was added to reduce excess permanganate and the volume brought to 35 ml with distilled water.

For water samples, the sample is weighed into a 50 ml polypropylene centrifuge tube, 1 ml of concentrated $H_2SO_4$ is added and the solution mixed vigorously with a vortex stirrer. Then 4.5 ml of the KMnOr/$K_2S_2O_8$ is added and the resulting mixture heated in a 90 C water bath for 2 hours. After cooling, 1.5 ml of a 10% (w/w) hydroxylamine hydrochloride ($NH_2OH$ HC1) solution is added, sample volume adjusted to a constant volume with distilled water and the resulting solution mixed vigorously.

ANALYTICAL METHODS (Cont.)

| Method Code | Method Description |
|---|---|
| 002 | Mercury is determined by a modification of the method of Hatch and Ott (1968). A portion of the digest solution is placed in a sealed container. To this is added 0.4 ml of 10% (w/w) stannous chloride (SnCl2). Mercury is reduced to the elemental state and aerated from solution into an atomic absorption spectrophotometer where its concentration is measured. |

References

1. "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis." Document Number ILM01.0 USEPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.

2. "Interim Method for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue," USEPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, Aug. 1977, Revised Oct. 1980.

3. Hatch, W.R. and Ott, W.L., "Determination of Sub-Microgram Quantities of Mercury in Solution by a Flameless Atomic Absorption Technique", Analytical Chemistry 40,14 p 2085-2087 (1968).

003 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

% Dry Weight

III. Approximately 1 gram of wet sample is weighed into a clean, labeled, preweighed 10 ml beaker. The beaker is placed in a forced air oven at approximately 75 degrees Celsius for 24 hours. The beaker with the dry sample is then weighed and the % dry weight is calculated by the formula:

$$\frac{(\text{wt. dry sample and beaker}) - (\text{wt. beaker})\ (100)}{}$$

ANALYTICAL METHODS (Cont.)

| Method Code | Method Description |
|---|---|
| 003 | (wt. wet sample and beaker) - (wt. beaker) |

006 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

Grain Size

VI. A small aliquot of sediment is treated with 30% hydrogen peroxide to remove organic coating from grains. A dispersing agent is then added to the sample. The sand/mud fractions are then separated using a 63 micron sieve. The sand fraction (>63 microns) is retained on the screen and the mud fraction (silt and clay <63 microns) is washed into a 1 (one) liter volumetric cylinder. The sand fraction is dried, sieved on a 63 micron screen and weighed. The sediment which passes through the screen a second time is added to the 1 liter cylinder. The mud fraction is analyzed by stirring the cylinder and sampling 20 ml aliquots at 4 and 8 phi intervals. The 4 and 8 phi samples are dried and weighed. The % sand, silt, and clay fractions are determined on a dry weight basis.

010 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

Total Organic Carbon-Coulometrics

X. The second method (Coulometrics) also burns sediment under an oxygen atmosphere to produce carbon dioxide gas. This gas is bubbled through an electrochemical cell, where a reaction between the $CO_2$ and the cell solution produces a color change. This solution is then electrically backtitrated to the endpoint. The amount of electricity (coulombs) used to reach this endpoint is directly proportional to the amount of organic carbon in the sample. The concentration of inorganic carbon is determined using the same detector, but the $CO_2$ is produced by acidifying the sample in a closed environment.

ANALYTICAL METHODS (Cont.)

| Method Code | Method Description |
|---|---|

012 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

Total Petroleum Hydrocarbons

XII. Follow Method number 001 or Method number 004 for the extraction of sediment or tissues. After the extract has passed through an alumina column remove a known volume and rotovap to dryness. Bring the volume of the dried aliquot to 1 ml with methylene chloride and weigh a 100 microliter aliquot. The concentration of Total Petroleum Hydrocarbons is calculated by the formula:

$$\frac{\text{(wt. 100 ul aliquot) (total volume)}}{\text{(sample wt.) (\% removed for aliquot)}}$$

013 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

Acid Volume Sulfide (AVS)

XIII. Acid volatile sulfide (AVS) is defined as sulfides that are converted to H2S upon exposure to 1N HCl at room temperature for 1 hour. Approximately 10 grams of wet sediment are acidified with 1N HCl, and reactive sulfides that are converted to gaseous H2S are trapped as Ag2S and measured gravimetrically.

020 LABORATORY: Geochemical & Environmental Research Group, Texas A&M

Trace Method Total Sediment BOMB Digest

XX. Sediments are digested in heavy-walled, screw-cap Teflon Bombs with concentrated nitric acid, concentrated hydrofluoric acid and 4.5% boric acid added sequentially with separate 6-12 hour oven heating (120 deg. C) after each addition. This procedure results in a total digestion with

ANALYTICAL METHODS (Cont.)

| Method Code | Method Description |
|---|---|
| 020 | all trace elements present in the sediment sample being solubilized. Most metals in the digestate are determined by graphite furnace AAS, in which electrical heating is used to produce an atomic cloud. Some elements are typically in high enough concentration (e.g. Mn, Zn) to be determined by flame AAS. Mercury is determined by cold vapor atomic absorption spectrometry (AAS), in which Sn2+ is used to reduce Hg0. |

Appendix C-2

Microtox data for water samples collected February, May, and November, 1991 and porewater from sediments collected in October-November, 1990.

SLOCUM CREEK FIRST WATER SURVEY (SCWA) 2-7-91 ASSAY SUMMARY TABLE

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 (ppm) | pH | Salin. (ppt) | Condu. (mS/m) | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2/4/91 | 16:00 | <0.3m | 15.2 | 10.2 | 7.76 | 0.6 | 108 | 12.0 | 3-56 | 0.16 | |
| 2 | 2/4/91 | 16:12 | <0.3m | 16.0 | 9.6 | 7.12 | 0.6 | 60 | >100% | --- | --- | |
| 3 | 2/5/91 | 9:03 | <0.3m | 11.0 | 8.5 | --- | 1.0 | 152 | --- | --- | --- | Pipetting error |
| 4 | 2/5/91 | 9:10 | <0.3m | 11.5 | 9.3 | 6.77 | 1.0 | 115 | 15.5 | 12-20 | 0.45 | |
| 5 | 2/5/91 | 9:17 | <0.3m | 11.0 | 9.5 | 6.76 | 0.7 | 130 | 42.0 | 23-75 | 0.84 | |
| 6 | 2/5/91 | 9:22 | <0.3m | 11.0 | 10.7 | 6.64 | 0.4 | 98 | 8.2 | 4-16 | 0.36 | |
| 7 | 2/5/91 | 9:27 | <0.3m | 10.4 | 9.6 | 6.59 | 0.3 | 79 | 23.9 | 14-40 | 0.67 | |
| 8 | 2/5/91 | 9:34 | <0.3m | 10.0 | 7.8 | 6.71 | 0.3 | 70 | >100% | --- | 1.17 | |
| 9 | 2/5/91 | 9:44 | <0.3m | 9.9 | 8.8 | 5.73 | 0.1 | 55 | >100% | --- | 0.48 | |
| 10A | 2/5/91 | 9:52 | surface | 10.0 | 8.6 | 4.50 | 0.0 | 96 | >100% | --- | 0.49 | |
| 10B | 2/5/91 | 9:52 | 1.1m | 10.0 | 8.2 | 4.48 | 0.0 | 100 | >100% | --- | 0.49 | |
| 11 | 2/5/91 | 10:10 | <0.3m | 11.0 | 8.4 | 6.90 | 0.0 | 18 | >100% | --- | 0.76 | |
| 12A | 2/5/91 | 10:20 | surface | 14.9 | 7.3 | 7.28 | 0.0 | 25 | >100% | --- | --- | |
| 12B | 2/5/91 | 10:20 | 1.0m | 14.9 | 6.9 | 7.30 | 0.0 | 25 | >100% | --- | --- | |
| 13A | 2/5/91 | 10:34 | surface | 14.9 | 8.7 | 7.75 | 0.0 | 190 | >100% | --- | --- | |
| 13B | 2/5/91 | 10:34 | 1.0m | 12.0 | 7.3 | 7.59 | 0.0 | 100 | >100% | --- | --- | |
| 14A | 2/5/91 | 10:42 | surface | 12.0 | 7.5 | 6.85 | 0.0 | 100 | >100% | --- | --- | |
| 14B | 2/5/91 | 10:42 | 1.0m | 11.5 | 7.2 | 6.85 | 0.0 | 100 | >100% | --- | --- | |
| 15 | 2/6/91 | 14:50 | <0.3m | 14.2 | 10.6 | 7.09 | 0.0 | 19 | >100% | --- | --- | |
| 16 | 2/6/91 | 15:55 | <0.3m | 12.5 | 10.6 | 6.39 | 0.0 | 8 | >100% | --- | 0.59 | |
| 17 | 2/5/91 | 11:05 | <0.3m | 12.2 | 12.4 | 7.11 | 1.0 | 150 | 95.7 | 33-277 | 0.71 | |
| 18 | 2/5/91 | 11:19 | <0.3m | 12.9 | 14.8 | 6.44 | 1.0 | 260 | >100% | --- | --- | |
| 19 | 2/5/91 | 11:35 | <0.3m | 11.2 | 13.2 | 7.02 | 3.0 | 340 | 40.8 | 27-61 | 0.75 | |
| 20 | 2/5/91 | 11:50 | <0.3m | 11.8 | 12.6 | 7.71 | 3.2 | 469 | >100% | --- | 1.10 | |
| 21A | 2/4/91 | 16:20 | surface | 14.5 | 14.6 | 8.86 | 3.9 | 490 | 99.2 | 39-252 | 0.84 | |
| 21B | 2/4/91 | 16:20 | 1.0m | 13.5 | 14.6 | 8.85 | 3.9 | 550 | 95.8 | 31-294 | 1.11 | |
| 22 | 2/5/91 | 13:40 | <0.3m | 15.0 | 11.9 | 7.32 | 3.5 | 465 | 69.1 | 37-128 | 0.51 | |

SCMA ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 | pH | Salin. p/th | Condu. | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 2/5/91 | 14:00 | <0.3m | 14.9 | 12.3 | 7.24 | 2.9 | 286 | 35.6 | 22-57 | 0.59 | |
| 24 | 2/5/91 | 14:20 | <0.3m | 16.0 | 8.4 | 7.00 | 4.9 | 600 | >100% | — | — | |
| 25 | 2/5/91 | 14:45 | <0.3m | 15.5 | 12.0 | 7.44 | 4.8 | 420 | 27.6 | 7-103 | 0.33 | |
| 26 | 2/4/91 | 16:45 | <0.3m | 13.2 | 12.0 | 7.50 | 2.2 | 300 | 44.4 | 42-47 | 0.79 | |
| 27 | 2/4/91 | 17:00 | <0.3m | 12.0 | 12.1 | 7.37 | 1.9 | 282 | 57.9 | 50-67 | 1.35 | |
| 28 | 2/4/91 | 17:12 | <0.3m | 9.7 | 12.1 | 7.34 | 3.0 | 365 | 73.1 | 26-207 | 1.03 | |
| 29 | 2/4/91 | 17:24 | <0.3m | 12.1 | 11.0 | 7.26 | 2.2 | 318 | 66.2 | 37-117 | 0.79 | |
| 30 | 2/6/91 | 17:30 | <0.3m | 10.0 | 12.4 | 7.28 | 4.3 | 560 | 38.9 | 27-56 | 0.61 | |
| 31A | 2/6/91 | 13:50 | surface | 15.5 | 8.7 | 7.39 | 2.1 | 320 | >100% | — | — | |
| 31B | 2/6/91 | 13:50 | 0.8m | 15.5 | 6.2 | 7.15 | 4.0 | 500 | 89.3 | 15-536 | 0.84 | |
| 32 | 2/6/91 | 14:14 | <0.3m | 15.0 | 11.5 | 7.20 | 3.5 | 490 | 49.0 | 19-129 | 0.67 | |
| 33 | 2/6/91 | 9:50 | <0.3m | 12.2 | 7.8 | 6.96 | 3.1 | 450 | 56.4 | 15-218 | 0.71 | |
| 34A | 2/6/91 | 10:50 | surface | 12.1 | 11.4 | 7.16 | 3.9 | 469 | 51.5 | 16-166 | 0.72 | |
| 34B | 2/6/91 | 10:50 | 1.2m | 12.5 | 9.3 | 6.96 | 5.2 | 690 | 54.7 | 15-204 | 0.66 | |
| 34BA | 2/6/91 | 10:50 | 1.2m | — | — | — | — | — | 52.0 | 26-106 | 0.70 | |
| 35A | 2/6/91 | 11:30 | surface | 10.5 | 7.8 | 6.84 | 0.0 | 20 | >100% | — | — | |
| 35B | 2/6/91 | 11:30 | 1.0m | 11.6 | 0.5 | 6.67 | 2.0 | 322 | >100% | — | — | |
| 36 | 2/6/91 | 16:20 | <0.3m | 12.1 | 12.0 | 6.42 | 0.0 | 10 | >100% | — | — | |
| 37A | 2/6/91 | 12:00 | surface | 11.8 | 6.7 | 6.40 | 0.3 | 100 | >100% | — | 0.52 | |
| 37B | 2/6/91 | 12:00 | 1.0m | 13.6 | 5.6 | 6.48 | 3.5 | 410 | >100% | — | — | |
| 38 | 2/6/91 | 12:30 | <0.3m | 15.0 | 8.4 | 7.06 | 3.5 | 500 | 56.9 | 44-73 | 0.94 | |
| 39 | 2/6/91 | 12:48 | <0.3m | 14.0 | 5.2 | 6.52 | 1.5 | 150 | >100% | — | — | |
| 40 | 2/6/91 | 13:00 | <0.3m | 13.2 | 9.2 | 6.78 | 0.8 | 90 | >100% | — | 0.35 | |
| 41A | 2/6/91 | 13:15 | surface | 12.0 | 7.5 | 5.71 | 0.2 | 49 | 71.3 | 12-422 | 0.81 | |
| 41B | 2/6/91 | 13:15 | 1.2m | 12.0 | 4.6 | 6.59 | 4.2 | 520 | >100% | — | — | |
| 42 | 2/6/91 | 16:09 | <0.3m | 11.8 | 8.6 | 4.77 | 0.0 | 7 | >100% | — | 0.27 | |
| 24S | 2/6/91 | 14:20 | <0.3m | — | — | 7.59 | — | — | 0.7 | 0-9999+ | 0.21 | |

SCWA ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 | pH | Salin. p/th | Condu. | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24SA | 2/6/91 | 14:20 | <0.3m | " " | " " | 7.59 | ---- | ---- | 0.2 | 0-2157 | 0.49 | |
| 25S | 2/6/91 | 14:45 | <0.3m | ---- | ---- | 7.76 | ---- | ---- | 1.8 | 0-7 | 0.65 | |
| 25SA | 2/6/91 | 14:45 | <0.3m | " " | " " | 7.76 | ---- | ---- | 5.2 | 1-20 | 0.62 | |
| 32S | 2/6/91 | 14:14 | <0.3m | ---- | ---- | 7.59 | ---- | ---- | 2.6 | 0-877 | 0.39 | |
| 32SA | 2/6/91 | 14:14 | <0.3m | " " | " " | 7.59 | ---- | ---- | 1.8 | 0-31 | 0.35 | |

SLOCUM CREEK SECOND WATER SURVEY (SCWB) 5-22-91 ASSAY SUMMARY TABLE

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 (ppm) | pH | Salin. (ppt) | Condu. (mS/m) | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5/21/91 | 14:17 | 0.6 | 25.0 | 2.4 | 6.86 | 5.4 | 900 | >100% | — | — | |
| 2 | 5/21/91 | 14:10 | 0.8 | 24.0 | 5.7 | 7.14 | 5.8 | 1000 | >100% | — | — | |
| 3 | 5/21/91 | 14:25 | 0.8 | 24.0 | 3.8 | 7.04 | 4.0 | 680 | >100% | — | — | |
| 4 | 5/21/91 | 14:22 | 1.0 | 25.0 | 8.3 | 7.45 | 3.5 | 600 | >100% | — | — | |
| 5 | 5/21/91 | 14:36 | 1.0 | 24.0 | 8.8 | 7.32 | 2.5 | 430 | >100% | — | — | |
| 6 | 5/21/91 | 14:40 | 0.8 | 25.0 | 7.0 | 7.32 | 2.5 | 400 | >100% | — | — | |
| 7 | 5/21/91 | 14:44 | 0.3 | 24.0 | 7.5 | 7.11 | 2.0 | 340 | >100% | — | — | |
| 8 | 5/22/91 | 10:00 | 0.4 | 20.0 | 2.8 | 6.68 | 0.1 | 55 | >100% | — | — | recommend 100% |
| 9 | 5/22/91 | 10:05 | 1.0 | 21.0 | 4.9 | 6.43 | 0.0 | 34 | >100% | — | 0.91 | |
| 10A | 5/22/91 | 10:15 | surface | 21.0 | 6.5 | 5.91 | 0.0 | 8 | 47.0 | 0-200000 | 0.82 | |
| 10B | 5/22/91 | 10:15 | 2.0 | 20.0 | 6.4 | 5.89 | 0.0 | 15 | 72.0 | 0-500000 | 0.67 | |
| 11 | 5/22/91 | 10:30 | 1.0 | 22.0 | 4.5 | 6.88 | 0.0 | 24 | >100% | — | — | |
| 12A | 5/22/91 | 10:40 | surface | 22.0 | 5.2 | 7.12 | 0.0 | 25 | >100% | — | — | |
| 12B | 5/22/91 | 10:40 | 1.2 | 22.0 | 5.6 | 7.15 | 0.0 | 25 | >100% | — | — | |
| 13 | 5/22/91 | 10:47 | 0.6 | 22.0 | 4.3 | 6.91 | 0.0 | 19 | >100% | — | — | |
| 14A | 5/22/91 | 10:51 | surface | 22.0 | 4.2 | 6.87 | 0.0 | 15 | >100% | — | — | |
| 14B | 5/22/91 | 10:51 | 2.0 | 20.0 | 3.0 | 6.52 | 0.0 | 11 | >100% | — | — | |
| 15 | 5/23/91 | 13:50 | 0.8 | 26.0 | 8.4 | 7.17 | 0.0 | 25 | >100% | — | — | |
| 16 | 5/23/91 | 15:20 | 1.0 | 24.0 | 6.1 | 6.43 | 0.0 | 6 | >100% | — | 0.44 | |
| 17 | 5/21/91 | 11:50 | 0.4 | 24.0 | 5.2 | 7.06 | 5.6 | 1000 | >100% | — | — | |
| 18 | 5/21/91 | 14:00 | 0.7 | 23.0 | 3.1 | 6.38 | 2.2 | 300 | >100% | — | — | |
| 19 | 5/21/91 | 11:25 | 0.5 | 23.0 | 4.1 | 6.55 | 2.5 | 380 | >100% | — | 0.91 | |
| 20 | 5/21/91 | 11:15 | 0.5 | 25.0 | 0.8 | 6.61 | 7.6 | 1280 | >100% | — | — | |
| 21 | 5/21/91 | 10:50 | 0.5 | 23.0 | 6.5 | 7.77 | 7.1 | 1250 | >100% | — | — | |
| 22 | 5/21/91 | 10:55 | 0.6 | 23.0 | 2.4 | 6.80 | 6.0 | 700 | >100% | — | — | |
| 23 | 5/21/91 | 11:05 | 0.7 | 22.0 | 2.6 | 6.75 | 2.7 | 420 | >100% | — | — | |
| 24 | 5/21/91 | 9:55 | 0.3 | 28.0 | 0.8 | 6.95 | 7.0 | 1300 | >100% | — | — | |

SCWB ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 (ppm) | pH | Salin. (ppt) | Condu. (mS/m) | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 5/21/91 | 10:25 | 0.7 | 20.0 | 5.0 | 6.23 | 0.0 | 20 | >100% | --- | 0.65 | |
| 26A | 5/21/91 | 10:10 | surface | 22.0 | 7.7 | 8.06 | 7.5 | 1200 | >100% | --- | --- | |
| 26B | 5/21/91 | 10:10 | 1.0 | 22.0 | 7.7 | 8.18 | 7.5 | 1200 | >100% | --- | --- | |
| 27 | 5/22/91 | 11:20 | 0.3 | 25.0 | 11.8 | 7.91 | 7.2 | 1250 | >100% | --- | --- | |
| 28 | 5/22/91 | 11:25 | 0.5 | 25.0 | 11.9 | 7.93 | 7.5 | 1300 | 81.8 | 1-4511 | 1.68 | |
| 29 | 5/22/91 | 11:30 | 0.5 | 24.0 | 11.2 | 8.18 | 8.2 | 1350 | >100% | --- | --- | |
| 30 | 5/22/91 | 11:40 | 0.2 | 25.0 | 11.9 | 7.88 | 8.5 | 1420 | >100% | --- | --- | |
| 32 | 5/23/91 | 10:10 | 0.3 | 22.0 | 5.5 | 7.17 | 7.0 | 1100 | 88.0 | 44-178 | 1.35 | |
| 33 | 5/23/91 | 10:18 | 0.2 | 25.0 | 5.0 | 7.08 | 5.8 | 1000 | 58.5 | 23-150 | 0.59 | |
| 34 | 5/23/91 | 10:28 | 0.5 | 25.0 | 7.5 | 7.07 | 6.0 | 1020 | >100% | --- | --- | |
| 35 | 5/23/91 | 11:03 | 1.0 | 25.0 | 3.8 | 6.66 | 0.1 | 70 | >100% | --- | --- | |
| 36 | 5/23/91 | 15:00 | 1.0 | 20.0 | 4.2 | 6.63 | 0.0 | 12 | >100% | --- | --- | |
| 37 | 5/23/91 | 11:42 | 1.0 | 23.0 | 4.9 | 6.57 | 2.5 | 320 | >100% | --- | --- | |
| 38 | 5/23/91 | 11:55 | 0.2 | 26.0 | 10.2 | 7.38 | 2.0 | 80 | >100% | --- | --- | |
| 39 | 5/23/91 | 12:50 | 0.6 | 27.0 | 9.2 | 6.69 | 5.0 | 1000 | >100% | --- | --- | |
| 40 | 5/23/91 | 12:33 | 0.5 | 25.0 | 8.5 | 6.79 | 0.0 | 5 | >100% | --- | 1.13 | |
| 41A | 5/23/91 | 12:15 | surface | 24.0 | 1.5 | 6.28 | 5.0 | 900 | 87.6 | 60-127 | 0.87 | |
| 41B | 5/23/91 | 12:15 | 1.5 | 24.0 | 0.3 | 6.73 | 7.0 | 1100 | >100% | --- | 0.35 | |
| 42 | 5/23/91 | 14:50 | 1.0 | 20.0 | 6.3 | 5.61 | 0.0 | 4 | >100% | --- | 0.33 | |

SLOCUM CREEK FIRST SEDIMENT SERIES (SCA) 9/26/90 ASSAY SUMMARY TABLE

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 9/26 | | <1m | 100% | 9/27 | < 1% | — | N/A | N/A | — | Saturated toxic levels |
| A2 | 9/26 | | <1m | 100% | 9/27 | 54.3 | 25-116 | N/A | N/A | 0.79 | |
| A3 | 9/26 | | 2m | 100% | 9/27 | < 1% | — | N/A | N/A | — | Saturated toxic levels |
| A4 | 9/26 | | 2m | 100% | 9/27 | — | — | N/A | N/A | — | Pippeting error |
| A5 | 9/26 | | 1m | 100% | 9/27 | 38.5 | 21-72 | N/A | N/A | 0.82 | |
| A6 | 9/26 | | <1m | 100% | 9/27 | 47.9 | 23-98 | N/A | N/A | 0.87 | |
| A7 | 9/26 | | 4m | 100% | 9/27 | — | — | N/A | N/A | — | Pippeting error |
| A8 | 9/26 | | 4m | 100% | 9/27 | 71.9 | 48-108 | N/A | N/A | 0.96 | |
| A9 | 9/26 | | 5m | 100% | 9/27 | 28.9 | 21-40 | N/A | N/A | 0.86 | |

SLOCUM CREEK SECOND SEDIMENT SERIES (SCB) 10/25/90 ASSAY SUMMARY TABLE

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1A | 10/25 | acdgF | 1m | stand. | 10/26 | 16.9 | 10-30 | 5.9 | 3-10 | 0.72 | |
| 1B | 10/25 | acdgF | 1m | stand. | 10/26 | 4.6 | 2-13 | 22.0 | 8-61 | 0.75 | |
| 2A | 10/25 | acdgF | 1.5m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 2AD | 10/25 | acdgF | 1.5m | 100% | 10/29 | >100% | — | — | — | — | (Dup) " " " " |
| 2B | 10/25 | acdgF | 1m | stand. | 10/26 | 5.8 | 4-8 | 17.1 | 13-23 | 0.71 | |
| 3A | 10/25 | acdG | 1m | stand. | 10/26 | 37.6 | 19-73 | 2.7 | 1-5 | 0.52 | |
| 3B | 10/25 | acdG | 1m | stand. | 10/26 | 89.2 | 8-1030 | 1.1 | 0-13 | 0.38 | |
| 4A | 10/25 | A | <1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 4B | 10/25 | A | <1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 5A | 10/25 | Acdf | <1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 5B | 10/25 | Acdf | 1.5m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 6A | 10/25 | acdg | 1.5m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 6B | 10/25 | acdg | 1.5m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 7A | 10/25 | acdG | 1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 7B | 10/25 | acdG | <1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |

SCB ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8A | 10/25 | Acdf | 1m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 8B | 10/25 | Acdf | 1m | stand. | 10/26 | <1% | — | — | — | 0.18 | Saturated toxic levels |
| 8BD | 10/25 | Acdf | 1m | stand. | 10/29 | 6.2 | 4-10 | 16.1 | 10-25 | 0.82 | (Duplicate assay) |
| 8BA | 10/25 | Acdf | 1m | stand. | 10/29 | 5.8 | 5-7 | 17.1 | 14-20 | 0.90 | (Alt) St. assay w/22% |
| 9A | 10/25 | aCdF | 1.5m | stand. | 10/26 | 2.4 | 1-6 | 41.6 | 17-101 | 0.56 | |
| 9B | 10/25 | aCdF | 1.5m | stand. | 10/26 | <1% | — | — | — | 0.16 | Saturated toxic levels |
| 10A | 10/25 | aCDFG | 2m | stand. | 10/26 | 6.9 | 4-11 | 14.4 | 9-23 | 0.64 | |
| 10B | 10/25 | aCDFG | 2m | stand. | 10/26 | 6.4 | 4-11 | 15.5 | 9-27 | 0.62 | |
| 11A | 10/25 | CDfG | 1m | stand. | 10/26 | 11.1 | 10-12 | 9.1 | 8-10 | 0.82 | |
| 11B | 10/25 | CDfG | 1m | stand. | 10/26 | 37.0 | 31-45 | 2.7 | 2-3 | 0.84 | |
| 12A | 10/25 | AcDfg | 1.5m | stand. | 10/26 | 57.0 | 36-89 | 1.8 | 1-3 | 0.70 | |
| 12B | 10/25 | AcDfg | 1.5m | 100% | 10/26 | >100% | — | — | — | 0.71 | |
| 13A | 10/25 | CdFG | 1.5m | 100% | 10/26 | >100% | — | — | — | 1.36 | |
| 13B | 10/25 | CdFG | 1.5m | Stand. | 10/26 | 22.3 | 16-30 | 4.5 | 3-6 | 0.55 | |
| 14A | 10/25 | CDFg | 1.5m | 100% | 10/26 | >100% | — | — | — | — | Light level ^ w/conc. |
| 14B | 10/25 | CDFg | 1.5m | Stand. | 10/26 | 1.75 | 0-142 | 57.2 | 1-4635 | 0.40 | |
| 15A | — | — | — | — | — | — | — | — | — | — | Unable to sample |
| 15B | — | — | — | — | — | — | — | — | — | — | Unable to sample |
| 16A | 10/25 | abc | <1m | 100% | 10/26 | >100% | — | — | — | 0.96 | |
| 16B | 10/25 | abc | <1m | 100% | 10/26 | >100% | — | — | — | 0.78 | |

SLOCUM CREEK THIRD SEDIMENT SERIES (SCC) 11/7/90 ASSAY SUMMARY TABLE

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17A | 11/5 | CdGf | <1m | Stand. | 11/6 | 27.1 | 20-36 | 3.7 | 3-5 | 0.93 | |
| 17B | 11/5 | CdGf | <1m | Stand. | 11/6 | 8.9 | 7-12 | 11.2 | 8-15 | 0.61 | |
| 18A | 11/5 | CdGF | 1m | Stand. | 11/6 | 4.5 | 3-7 | 22.3 | 15-33 | 0.97 | |
| 18AA | 11/5 | CdGF | 1m | Stand. | 11/6 | 1.6 | 1-2 | 60.8 | 46-81 | 0.52 | (Alt) St. assay w/22% |

SCC ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18B | 11/5 | CdGF | 1m | Stand. | 11/6 | 4.1 | 0-154 | 24.1 | 1-897 | 0.83 | |
| 18BA | 11/5 | CdGF | 1m | Stand. | 11/6 | 2.7 | 1-6 | 37.4 | 18-78 | 0.91 | (Alt) St. assay w/22% |
| 19A | 11/5 | CdGF | <1m | Stand. | 11/6 | 6.5 | 4-12 | 15.4 | 8-28 | 1.74 | |
| 19B | 11/5 | CdGF | <1m | Stand. | 11/6 | 7.0 | 3-17 | 14.2 | 6-35 | 1.24 | |
| 20A | 11/5 | CdGF | <1m | Stand. | 11/6 | 10.6 | 5-23 | 9.4 | 4-20 | 1.40 | |
| 20B | 11/5 | CdGF | <1m | Stand. | 11/6 | 6.9 | 4-13 | 14.4 | 8-26 | 1.67 | |
| 21A | 11/5 | CdGF | <1m | Stand. | 11/6 | 60.8 | 50-74 | 1.6 | 1-2 | 1.21 | |
| 21AA | 11/5 | CdGF | <1m | 100% | 11/6 | 96.9 | 41-231 | 1.0 | 0-2 | 1.22 | (Alt) 100% assay |
| 21B | 11/5 | CdGF | <1m | Stand. | 11/6 | >100% | — | — | — | — | |
| 21BA | 11/5 | CdGF | <1m | 100% | 11/6 | >100% | — | — | — | — | (Alt) 100% assay |
| 22A | 11/5 | CdGF | 2m | Stand. | 11/6 | >100% | — | — | — | — | Light level ^ w/conc. |
| 22AA | 11/5 | CdGf | 2m | 100% | 11/6 | >100% | — | — | — | — | (Alt) " " " " |
| 22B | 11/5 | CdGf | 2m | Stand. | 11/6 | >100% | — | — | — | — | Light level ^ w/conc. |
| 22BA | 11/5 | CdGF | 2m | 100% | 11/6 | >100% | — | — | — | — | (Alt) " " " " |
| 23A | 11/5 | CdGF | 1m | Stand. | 11/6 | 25.2 | 24-27 | 4.0 | 4-4 | 1.21 | |
| 23AD | 11/5 | CdGF | 1m | Stand. | 11/6 | 25.2 | 13-51 | 4.0 | 2-8 | 1.26 | (Duplicate assay) |
| 23B | 11/5 | CdGF | 1m | Stand. | 11/6 | 11.9 | 10-14 | 8.4 | 7-10 | 0.91 | |
| 23BD | 11/5 | CdGF | 1m | Stand. | 11/6 | 11.3 | 9-15 | 8.9 | 7-12 | 1.19 | (Duplicate assay) |
| 24A | 11/5 | CdGF | <1m | Stand. | 11/6 | 13.4 | 0-406 | 7.5 | 0-228 | 2.17 | |
| 24AA | 11/5 | CdGF | <1m | Stand. | 11/6 | 8.0 | 3-19 | 12.4 | 5-29 | 1.71 | (Alt) St. assay w/22% |
| 24B | 11/5 | CdGF | <1m | Stand. | 11/6 | 6.4 | 0-234 | 15.5 | 0-566 | 2.03 | |
| 24BA | 11/5 | CdGF | <1m | Stand. | 11/6 | 4.3 | 1-34 | 23.5 | 3-188 | 2.12 | (Alt) St. assay w/22% |
| 25A | 11/7 | CdGF | 1m | Stand. | 11/8 | 6.1 | 2-23 | 16.4 | 4-62 | 0.98 | |
| 25B | 11/7 | CdGF | 1m | Stand. | 11/8 | 6.8 | 6-8 | 14.6 | 12-18 | 0.83 | |
| 26A | 11/7 | Ac | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 26B | 11/7 | Ac | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 27A | 11/7 | AcE | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |

SCC ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25B | 11/7 | CdGF | 1m | Stand. | 11/8 | 6.8 | 6-8 | 14.6 | 12-18 | 0.83 | |
| 26A | 11/7 | Ac | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 26B | 11/7 | Ac | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 27A | 11/7 | AcE | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 27B | 11/7 | AcE | 2m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 28A | 11/7 | BCE | 1.5m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 28B | 11/7 | BCE | 1.5m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 29A | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 29B | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 30A | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 30B | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 31A | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |
| 31B | 11/7 | aBCE | 1m | Stand. | 11/8 | >100% | — | — | — | — | Light level ^ w/conc. |

SLOCUM CREEK FOURTH SEDIMENT SERIES (SCD) 11-20-90 ASSAY SUMMARY TABLE

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32A | 11-20 | CdFG | <1m | Stand. | 11-21 | 3.2 | 1-16 | 31.7 | 6-164 | 0.61 | |
| 32AA | 11-20 | CdFG | <1m | Stand. | 11-21 | 2.4 | 2-3 | 40.8 | 31-54 | 0.74 | (Alt) St. assay w/16% |
| 32B | 11-20 | CdFG | <1m | Stand. | 11-21 | 14.0 | 11-17 | 7.1 | 6-9 | 0.98 | |
| 32BD | 11-20 | CdFG | <1m | Stand. | 11-21 | 17.8 | 16-20 | 5.6 | 5-6 | 1.08 | (Duplicate assay) |
| 33A | 11-20 | CdFG | <1m | Stand. | 11-21 | 1.7 | 0-10 | 57.5 | 10-332 | 0.51 | |
| 33B | 11-20 | CdFG | <1m | Stand. | 11-21 | 4.2 | 3-5 | 23.7 | 19-30 | 0.72 | |
| 34A | 11-20 | CDFg | <1m | Stand. | 11-21 | 3.7 | 0-785 | 26.8 | 0-5619 | 0.42 | |
| 34AA | 11-20 | CDFg | <1m | Stand. | 11-21 | 2.3 | 1-7 | 42.7 | 14-129 | 0.74 | (Alt) St. assay w/16% |
| 34B | 11-20 | CDFg | <1m | Stand. | 11-21 | 8.9 | 5-17 | 11.3 | 6-22 | 0.58 | |
| 35A | 11-20 | CdfG | 1m | Stand. | 11-21 | 14.3 | 10-20 | 7.0 | 5-10 | 0.67 | |
| 35B | 11-20 | CdfG | 1m | Stand. | 11-21 | 7.6 | 4-16 | 13.2 | 6-29 | 0.51 | |

SCD ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date Coll. | Bottom Type | Water Depth | Assay Type | Date Run | EC50 Value | 95% C.I. | Toxic. Units | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 36A | 11-20 | aCDF | 1m | Stand. | 11-21 | 18.5 | 15-23 | 5.4 | 4-7 | 0.83 | |
| 36AD | 11-20 | aCDF | 1m | Stand. | 11-21 | 22.5 | 17-29 | 4.4 | 3-6 | 1.06 | (Duplicate assay) |
| 36B | 11-20 | aCDF | 1m | Stand. | 11-21 | 0.7 | 0-100 | 151.0 | 1-22881 | 0.47 | |
| 36BA | 11-20 | aCDF | 1m | Stand. | 11-21 | 1.1 | 1-2 | 92.6 | 47-183 | 0.71 | (Alt) St. assay w/16% |
| 37A | 11-20 | CDfg | 1m | Stand. | 11-21 | >100% | — | — | — | — | Light level ^ w/conc. |
| 37AA | 11-20 | CDfg | 1m | 100% | 11-21 | >100% | — | — | — | — | (Alt) " " " " |
| 37B | 11-20 | CDfg | 1m | Stand. | 11-21 | >100% | — | — | — | — | Light level ^ w/conc. |
| 37BA | 11-20 | CDfg | 1m | 100% | 11-21 | >100% | — | — | — | — | (Alt) " " " " |
| 38A | 11-20 | aCD | 1m | Stand. | 11-21 | 0.7 | 0-546 | 135.5 | 0-100121 | 0.31 | |
| 38AA | 11-20 | aCD | 1m | Stand. | 11-21 | 2.3 | 2-3 | 43.5 | 30-62 | 0.62 | (Alt) St. assay w/16% |
| 38B | 11-20 | aCD | 1m | Stand. | 11-21 | 7.6 | 4-16 | 13.2 | 6-27 | 0.69 | |
| 39A | 11-20 | CDPg | 1m | Stand. | 11-21 | 0.2 | 0-614 | 406.2 | 0-101289 | 0.23 | |
| 39AA | 11-20 | CDPg | 1m | Stand. | 11-21 | 2.0 | 1-6 | 50.1 | 18-139 | 0.52 | (Alt) St. assay w/16% |
| 39B | 11-20 | CDPg | 1m | Stand. | 11-21 | 5.4 | 4-8 | 18.4 | 13-26 | 0.60 | |
| 40A | 11-20 | acDg | 1m | Stand. | 11-21 | >100% | — | — | — | — | Light level ^ w/conc. |
| 40B | 11-20 | acDg | 1m | Stand. | 11-21 | >100% | — | — | — | — | Light level ^ w/conc. |
| 41A | 11-20 | aCD | 1m | Stand. | 11-21 | 25.1 | 15-43 | 4.0 | 2-7 | 1.60 | |
| 41B | 11-20 | aCD | 1m | Stand. | 11-21 | 43.5 | 19-97 | 2.3 | 1-5 | 1.29 | |
| 42A | 11-20 | aCD | 1m | Stand. | 11-21 | 62.0 | 5-744 | 1.6 | 0-19 | 1.41 | |
| 42AA | 11-20 | aCD | 1m | 100% | 11-21 | >100% | — | — | — | 0.91 | (Alt.) 100% Assay |
| 42AAD | 11-20 | aCD | 1m | 100% | 11-21 | >100% | — | — | — | 1.10 | (Duplicate assay) |
| 42B | 11-20 | aCD | 1m | Stand. | 11-21 | 62.0 | 46-84 | 1.6 | 1-2 | 1.09 | |
| 43A | 11-20 | aCDfg | 1m | Stand. | 11-21 | 6.3 | 5-8 | 15.8 | 13-19 | 0.89 | |
| 43B | 11-20 | aCDfg | 1m | Stand. | 11-21 | >100% | — | — | — | 0.90 | |
| 43BA | 11-20 | aCDfg | 1m | 100% | 11-21 | >100% | — | — | — | — | (Alt.) 100% Assay |

SLOCUM CREEK THIRD WATER SURVEY (SCWC) 10-25-91 ASSAY SUMMARY TABLE

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 (ppm) | Salin. (ppt) | Condu. (mS/m) | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10/25/91 | 11:45 | 0.5m | 19.0 | 8.0 | 1.8 | 2800 | >100% | — | — | |
| 2 | 10/25/91 | 12:00 | 0.5m | 20.0 | 9.5 | 1.8 | 2700 | >100% | — | — | |
| 3 | 10/25/91 | 12:10 | 0.75 | 20.0 | 8.9 | 2.0 | 2900 | >100% | — | 0.79 | |
| 4 | 10/25/91 | 12:20 | 0.5m | 20.0 | 9.0 | 0.5 | 800 | >100% | — | 0.64 | |
| 5 | 10/25/91 | 2:45 | 1.0m | 21.0 | 10.0 | 0.0 | 550 | >100% | — | — | |
| 6 | 10/25/91 | 12:30 | <0.25m | 21.0 | 10.5 | 0.2 | 650 | >100% | — | — | |
| 7 | 10/25/91 | 12:37 | 0.5m | 21.0 | 12.4 | 0.0 | 420 | >100% | — | — | |
| 8 | 10/25/91 | 12:45 | 0.25m | 20.0 | 7.0 | 0.5 | 460 | >100% | — | — | |
| 9 | 10/25/91 | 1:00 | 1.0m | 20.0 | 12.4 | 0.0 | 140 | >100% | — | — | |
| 10A | 10/25/91 | 1:40 | surface | 19.0 | 8.8 | 0.0 | 59 | >100% | — | 0.28 | |
| 10B | 10/25/91 | 1:40 | 3.0m | 19.0 | 8.6 | 0.0 | 60 | >100% | — | 0.71 | |
| 11 | 10/25/91 | 2:00 | 0.5m | 24.0 | 14.8 | 0.2 | 230 | >100% | — | — | |
| 12A | 10/25/91 | 2:05 | surface | 22.0 | 5.2 | 0.0 | 250 | >100% | — | — | |
| 12B | 10/25/91 | 2:05 | 2.0m | 21.0 | 0.6 | 0.0 | 260 | >100% | — | — | |
| 13A | 10/25/91 | 2:30 | surface | 22.0 | 7.6 | 0.0 | 220 | >100% | — | — | |
| 13B | 10/25/91 | 2:30 | 1.0m | 21.0 | 0.7 | 0.0 | 100 | >100% | — | — | |
| 14A | 10/25/91 | 2:20 | surface | 20.0 | 8.2 | 0.0 | 200 | >100% | — | — | |
| 14B | 10/25/91 | 2:20 | 3.0m | 16.0 | 0.8 | 0.0 | 130 | >100% | — | — | |
| 15 | 10/25/91 | 3:15 | 0.25m | 14.5 | — | 0.0 | 19 | >100% | — | 0.77 | |
| 16 | 10/25/91 | 4:05 | 1.0m | 12.5 | — | 0.0 | 10.5 | >100% | — | 0.75 | |
| 17 | 10/25/91 | 3:15 | 0.5m | 20.0 | 12.0 | 3.0 | 4500 | >100% | — | — | |
| 18 | 10/25/91 | 3.25 | 0.5m | 20.0 | 10.8 | 3.0 | 4600 | >100% | — | 0.21 | |
| 19 | 10/25/91 | 3:48 | 0.25m | 22.0 | 14.0 | 4.0 | 6200 | >100% | — | — | |
| 20 | 10/25/91 | 3:33 | 1.0m | 21.0 | 8.4 | 4.0 | 7000 | >100% | — | 0.44 | |
| 21 | 10/25/91 | 4:00 | 0.75m | 22.0 | 12.4 | 4.8 | 7500 | >100% | — | — | |
| 22 | 10/25/91 | 4:10 | 0.5m | 23.0 | 11.8 | 4.0 | 6000 | >100% | — | — | |
| 23 | 10/25/91 | 4:55 | 0.75m | 22.0 | 12.0 | 3.5 | 5200 | >100% | — | — | |

SCMC ASSAY SUMMARY TABLE CONTINUED

| Sample Number | Date col/run | Time | Water Depth | Temp. (C) | dO2 | Salin. p/th | Condu. | EC50 Value | 95% C.I. | Slope | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 10/25/91 | 5:30 | 0.5m | 23.0 | 14.6 | 6.0 | 9500 | >100% | — | — | |
| 25 | 10/25/91 | 5:15 | 0.5m | 21.0 | 5.4 | 3.5 | 5500 | 78.02% | 14-426 | 1.98 | |
| 26 | 10/25/91 | 5:40 | 1.0m | 21.0 | 12.2 | 6.3 | 10000 | >100% | — | — | |
| 27 | 11/7/91 | 10:43 | 1.0m | 12.5 | 13.2 | 7.5 | 10000 | >100% | — | — | |
| 28 | 11/7/91 | 10:45 | 1.0m | 12.5 | 14.0 | 8.0 | 10000 | >100% | — | — | |
| 29 | 11/7/91 | 11.02 | 1.0m | 12.5 | 14.0 | 8.0 | 10500 | >100% | — | — | |
| 30 | 11/7/91 | 11:12 | 1.0m | 13.0 | 14.0 | 8.0 | 10500 | >100% | — | — | |
| 31 | 11/7/91 | 11:28 | 1.0m | 13.0 | 13.5 | 8.0 | 10500 | >100% | — | — | |
| 32 | 11/7/91 | 11.35 | 1.0m | 14.0 | 9.0 | 8.25 | 11000 | >100% | — | — | |
| 33 | 11/7/91 | 11:40 | 1.0m | 15.0 | 8.8 | 7.0 | 11000 | >100% | — | — | |
| 34 | 11/7/91 | 11:47 | 1.0m | 13.0 | 13.0 | 7.5 | 10000 | >100% | — | — | |
| 35A | 11/7/91 | 12:00 | surface | 13.0 | 8.8 | 5.5 | 7000 | >100% | — | — | |
| 35B | 11/7/91 | 10:50 | 2.5m | 13.0 | 9.3 | 5.5 | 7500 | >100% | — | — | |
| 36 | 11/7/91 | 3:50 | 1.0m | 12.5 | — | 0.0 | 16.5 | >100% | — | — | |
| 37A | 11/7/91 | 12:47 | surface | 14.0 | 8.8 | 5.0 | 7000 | >100% | — | — | |
| 37B | 11/7/91 | 12:47 | 2.0m | 13.0 | 11.0 | 6.0 | 8000 | >100% | — | — | |
| 38 | 11/7/91 | 1:39 | 0.5m | 14.5 | 12.5 | 6.0 | 8000 | >100% | — | — | |
| 39A | 11/7/91 | 1:45 | surface | 14.0 | — | 5.5 | 7500 | >100% | — | — | |
| 39B | 11/7/91 | 1:45 | 2.0m | 13.0 | — | 6.0 | 7800 | >100% | — | — | |
| 40 | 11/7/91 | 2:00 | 1.0m | 14.0 | — | 5.0 | 7000 | >100% | — | — | |
| 41A | 11/7/91 | 2:05 | surface | 14.0 | — | 3.25 | 4500 | >100% | — | — | |
| 41B | 11/7/91 | 2:05 | 3.0m | 14.0 | — | 3.25 | 4500 | >100% | — | — | |
| 42 | 11/7/91 | 3:35 | 1.0m | 12.0 | — | 0.0 | 5 | >100% | — | 0.12 | |

Appendix C-3

Porewater bioassay results for Microtox and lettuce seed germination and root elongation studies, Slocum Creek project, June 1992.

Appendix C-3. Pore water bioassay results for Microtox and lettuce seed germination and root elongation studies, Slocum Creek project, June, 1992.

| Site | Date Collected | Date Analyzed | Salinity | EC50 | CI | Germination as % Control | Root Length as % Control |
|---|---|---|---|---|---|---|---|
| SC 1 | 6/3/92 | 6/4/92 | 6.5 | >100 | | 96.7 | 81.6 |
| | | | | >100 | | | |
| SC 2 | 6/3/92 | 6/4/92 | 6.12 | 10.1 | 8.9-11.3 | 100 | 68.6 |
| | | | | 10.5 | 9.6-11.5 | | |
| SC 3 | 6/3/92 | 6/4/92 | 5.2 | 24.3 | 20.3-29.2 | 93.3 | 55.0 |
| | | | | 25.4 | 22.0-29.4 | | |
| SC 4 | 6/3/92 | 6/3/92 | 4.2 | 0.48 | .11-2.1 | 90 | 46.4 |
| | | | | 0.73 | .03-16.7 | | |
| SC 4 ** | 6/3/92 | 6/22/92 | | 0.8 | .25-2.6 | | |
| | | | | 0.01 | .005-.31 | | |
| SC 5 | 6/3/92 | 6/3/92 | 7 | >100 | | 100 | 70.4 |
| | | | | >100 | | | |
| SC 6 | 6/3/92 | 6/3/92 | 5.5 | >100 | | 90 | 79.3 |
| | | | | >100 | | | |
| SC 7 | 6/3/92 | 6/3/92 | 5 | >100 | | 96.7 | 75.3 |
| | | | | >100 | | | |
| SC 8 | 6/3/92 | 6/3/92 | 5.8 | 9.7 | 7.9-11.8 | 96.7 | 53.2 |
| | | | | 9.9 | 7.9-12.3 | | |
| SC 8 ** | 6/3/92 | 6/22/92 | | 27.2 | 24.8-29.7 | | |
| | | | | 15.4 | 14.3-16.6 | | |
| SC 9 | 6/3/92 | 6/3/92 | 2.8 | 14.4 | 10.3-19.9 | 90 | 59.6 |
| | | | | 14 | 9.6-20.4 | | |
| SC 10 | 6/3/92 | 6/3/92 | 0.5 | 66.6 | 61.5-72.0 | 100 | 125.4 |
| | | | | 63.7 | 53.9-75.3 | | |
| SC 11 | 6/3/92 | 6/3/92 | 3.9 | 55.3 | 44.9-68.1 | 90 | 116.2 |
| | | | | 54.6 | 41.6-71.6 | | |
| SC 11 ** | 6/3/92 | 6/22/92 | | >100 | | | |
| | | | | >100 | | | |
| SC 12 | 6/3/92 | 6/4/92 | 1 | 91.7 | 75.6-111.3 | 100 | 108.6 |
| | | | | 95.4 | 76.2-119.3 | | |
| SC 12 ** | 6/3/92 | 6/22/92 | | >100 | | | |
| | | | | >100 | | | |
| SC13 | 6/3/92 | 6/3/92 | 1 | 58.2 | 38.0-89.2 | 100 | 75.9 |
| | | | | 76.4 | 65.7-88.9 | | |
| SC 13 ** | 6/3/92 | 6/22/92 | | >100 | | | |
| | | | | >100 | | | |
| SC 14 | 6/3/92 | 6/3/92 | 0.05 | 58.9 | 52.9-65.3 | 100 | 107.2 |
| | | | | 61.8 | 55.2-69.0 | | |
| SC 15 | 6/5/92 | 6/5/92 | 0.5 | 30.5 | 27.8-33.5 | 100 | 147.4 |
| | | | | 42.1 | 37.5-47.3 | | |
| SC16 | 6/5/92 | 6/5/92 | 0.5 | >100 | | 90 | 137.2 |
| | | | | >100 | | | |
| SC 16 ** | 6/5/92 | 6/22/92 | | >100 | | | |
| | | | | >100 | | | |
| SC 17 | 6/3/92 | 6/4/92 | 7.2 | 31 | 29.3-32.8 | 86.7 | 55.9 |
| | | | | 38.3 | 34.4-42.6 | | |

Appendix C-3 cont'd.

| Site | Date Collected | Date Analyzed | Salinity | EC50 | CI | Germination as % Control | Root Length as % Control |
|---|---|---|---|---|---|---|---|
| HC 37 ** | 6/4/92 | 6/22/92 | | >100 | | | |
| | | | | >100 | | | |
| HC 38 | 6/4/92 | 6/4/92 | 3 | 6.4 | 3.2-12.7 | 100 | 73.4 |
| | | | | 1.7 | .075-3.8 | | |
| HC 38 ** | 6/4/92 | 6/22/92 | | 18.8 | 14.6-24.2 | | |
| | | | | 0.39 | .05-3.1 | | |
| HC 39 | 6/4/92 | 6/4/92 | 8 | 22.9 | 19.1-27.7 | 100 | 53.6 |
| | | | | 23.6 | 18.9-29.4 | | |
| HC 39 ** | 6/4/92 | 6/22/92 | | 37.8 | 32.4-44.6 | | |
| | | | | 35.3 | 31.3-39.9 | | |
| HC 40 | 6/4/92 | 6/4/92 | 6.5 | 5.5 | 3.6-8.5 | 96.7 | 57.3 |
| | | | | 8.5 | 5.7-12.6 | | |
| HC 40 ** | 6/4/92 | 6/22/92 | 6.5 | 22.9 | 16.3-32.2 | | |
| | | | | 17.6 | 13.4-23.2 | | |
| HC 42 | 6/5/92 | 6/5/92 | 0 | 72.6 | 60.7-86.8 | 96.7 | 149.1 |
| | | | | 91.7 | 60.8-138.3 | | |
| HC 43 | 6/4/92 | 6/4/92 | 5 | 10.5 | 7.9-13.9 | 86.7 | 47.0 |
| | | | | 9.7 | 7.9-12.0 | | |
| HC 43 ** | 6/4/92 | 6/22/92 | | 10.2 | 5.4-19.3 | | |
| | | | | 5.9 | 2.4-14.7 | | |
| GC 1 | 6/11/92 | 6/12/92 | 2.5 | 7.4 | 5.8-9.3 | 56.7 | 15.7 |
| | | | | 8.8 | 6.6-11.9 | | |
| GC 1 ** | 6/11/92 | 6/22/92 | | 22.7 | 18.1-28.4 | | |
| | | | | 23.6 | 20.6-26.9 | | |
| GC 2 | 6/11/92 | 6/12/92 | 2 | 10.2 | 8.6-12.1 | 90 | 34.5 |
| | | | | 11.3 | 10.2-12.6 | | |
| GC 2 ** | 6/11/92 | 6/22/92 | | 14.4 | 10.1-20.5 | | |
| | | | | 11.3 | 6.9-18.4 | | |
| GC 3 | 6/11/92 | 6/12/92 | 0.5 | 4.5 | 2.2-8.1 | 90 | 40.4 |
| | | | | 4.3 | 2.3-8.1 | | |
| GC 3 ** | 6/11/92 | 6/22/92 | | 20.1 | 13.7-29.4 | | |
| | | | | 12.5 | 7.1-22.2 | | |
| GC 4 | 6/11/92 | 6/12/92 | 0.5 | 3.5 | 1.9-6.2 | 86.7 | 51.5 |
| | | | | 4.8 | 2.4-9.7 | | |
| GC 4 ** | 6/11/92 | 6/22/92 | | 3.2 | 1.8-5.7 | | |
| | | | | 0.14 | .03-.56 | | |
| GC 5 | 6/11/92 | 6/12/92 | 0 | 1.2 | 0.45-3.3 | 90 | 41.6 |
| | | | | 2.6 | 1.5-4.6 | | |
| GC 5 ** | 6/11/92 | 6/22/92 | | 59.8 | 47.0-76.1 | | |
| | | | | 45.3 | 35.3-58.1 | | |
| GC 6 | 6/11/92 | 6/12/92 | 0 | 7.9 | 4.3-14.3 | 100 | 83.1 |
| | | | | 8.7 | 5.5-13.8 | | |
| GC 7 | 6/11/92 | 6/12/92 | 0.5 | 23.7 | 21.0-26.7 | 93.3 | 59.4 |
| | | | | 28.5 | 25.4-31.9 | | |
| GC 8 | 6/11/92 | 6/12/92 | 10.5 | >100 | | | |
| | | | | >100 | | | |

Appendix C-3 cont'd.

| Site | Date Collected | Date Analyzed | Salinity | EC50 | CI | Germination as % Control | Root Length as % Control |
|---|---|---|---|---|---|---|---|
| GC 9 | 6/11/92 | 6/12/92 | 10.5 | 12.8 | 9.2-17.5 | | |
| | | | | 11.6 | 6.8-19.7 | | |
| GC 10 | 6/11/92 | 6/12/92 | 11.5 | >100 | | | |
| | | | | >100 | | | |

** Samples selected for plant growth study, original pore water samples were re-run at the time the plant growth study was set up.

Appendix C-4

Growth and biomass measurements of sago pondweed grown in sediments collected from Slocum (SC), Hancock (HC) and Goose (GC) Creeks, North Carolina, June 1992.

Appendix C-4. Growth and biomass measurements of sago pondweed grown in sediments collected from Slocum (SC), Hancock (HC), and Goose (GC) Creeks, North Carolina, June, 1992.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| CONTROL | 1 | 21 | 0.34 | 4.69 | 140.1 | 1279.4 | 74.4 | 8 | 59.3 | 0.578 |
| CONTROL | 1 | 21 | 0.21 | 3.63 | 108.4 | 1628.6 | 94.7 | 12 | 42 | 0.48 |
| CONTROL | 1 | 21 | 0.16 | 4.35 | 129.9 | 2618.8 | 152.2 | 11 | 46.4 | 0.498 |
| CONTROL | 1 | 21 | 0.39 | 4.52 | 135.0 | 1059.0 | 61.6 | 8 | 41.2 | 0.552 |
| CONTROL | 1 | 21 | 0.2 | 3.51 | 104.8 | 1655.0 | 96.2 | 8 | 65 | 0.375 |
| CONTROL | 1 | 21 | 0.26 | 4.66 | 139.2 | 1692.3 | 98.4 | 13 | 41.5 | 0.553 |
| CONTROL | 1 | 21 | 0.21 | 3.54 | 105.7 | 1585.7 | 92.2 | 13 | 46.2 | 0.411 |
| CONTROL | 1 | 21 | 0.24 | 0.7 | 20.9 | 191.7 | 11.1 | 5 | 44.5 | 0.057 |
| HC39 | 1 | 21 | 0.69 | 4.97 | 148.4 | 620.3 | 36.1 | 13 | 52.5 | 0.793 |
| HC39 | 1 | 21 | 0.22 | 2.56 | 76.4 | 1063.6 | 61.8 | 9 | 39.1 | 0.369 |
| HC39 | 1 | 21 | 0.31 | 3.18 | 95.0 | 925.8 | 53.8 | 9 | 43.2 | 0.34 |
| HC39 | 1 | 21 | 0.18 | 2.85 | 85.1 | 1483.3 | 86.2 | 7 | 56 | 0.384 |
| HC39 | 1 | 21 | 0.35 | 3.98 | 118.9 | 1037.1 | 60.3 | 15 | 50.4 | 0.549 |
| HC39 | 1 | 21 | 0.14 | 1.67 | 49.9 | 1092.9 | 63.5 | 11 | 42.1 | 0.182 |
| HC39 | 1 | 21 | 0.32 | 3.32 | 99.1 | 937.5 | 54.5 | 10 | 37 | 0.444 |
| HC39 | 1 | 21 | 0.16 | 3.67 | 109.6 | 2193.8 | 127.5 | 11 | 59.5 | 0.478 |
| SC12 | 1 | 21 | 0.3 | 6.41 | 191.4 | 2036.7 | 118.4 | 9 | 62.2 | 0.616 |
| SC12 | 1 | 21 | 0.16 | 7.24 | 216.2 | 4425.0 | 257.2 | 14 | 62.5 | 0.813 |
| SC12 | 1 | 21 | 0.22 | 5.87 | 175.3 | 2568.2 | 149.3 | 12 | 63.5 | 0.591 |
| SC12 | 1 | 21 | 0.11 | 5.32 | 158.9 | 4736.4 | 275.3 | 9 | 54.3 | 0.516 |
| SC12 | 1 | 21 | 0.1 | 5.42 | 161.9 | 5320.0 | 309.2 | 8 | 65.2 | 0.493 |
| SC12 | 1 | 21 | 0.12 | 5.34 | 159.5 | 4350.0 | 252.9 | 10 | 64.9 | 0.426 |
| SC12 | 1 | 21 | 0.21 | 4.82 | 143.9 | 2195.2 | 127.6 | 8 | 49.2 | 0.457 |
| SC12 | 1 | 21 | 0.14 | 4.33 | 129.3 | 2992.9 | 174.0 | 11 | 54 | 0.369 |
| SC4 | 1 | 21 | 0.7 | 4.05 | 120.9 | 478.6 | 27.8 | 9 | 43 | 0.585 |
| SC4 | 1 | 21 | 0.2 | 1.71 | 51.1 | 755.0 | 43.9 | 5 | 47.2 | 0.207 |
| SC4 | 1 | 21 | 0.17 | 1.92 | 57.3 | 1029.4 | 59.8 | 6 | 48 | 0.237 |
| SC4 | 1 | 21 | 0.18 | 2.7 | 80.6 | 1400.0 | 81.4 | 8 | 45.2 | 0.397 |
| SC4 | 1 | 21 | 0.22 | 3.04 | 90.8 | 1281.8 | 74.5 | 11 | 44.1 | 0.491 |
| SC4 | 1 | 21 | 0.22 | 3.18 | 95.0 | 1345.5 | 78.2 | 12 | 50.5 | 0.409 |
| SC4 | 1 | 21 | 0.3 | 2.69 | 80.3 | 796.7 | 46.3 | 10 | 38.6 | 0.379 |
| SC4 | 1 | 21 | 0.3 | 2.41 | 72.0 | 703.3 | 40.9 | 6 | 51.1 | 0.274 |
| SC11 | 2 | 21 | 0.18 | 1.52 | 41.9 | 744.4 | 82.5 | 9 | 43 | 0.175 |
| SC11 | 2 | 21 | 0.25 | 1.18 | 32.5 | 372.0 | 41.2 | 5 | 27 | 0.116 |
| SC11 | 2 | 21 | 0.5 | 2.98 | 82.1 | 496.0 | 55.0 | 13 | 42 | 0.4 |
| SC11 | 2 | 21 | 0.2 | 1.95 | 53.7 | 875.0 | 96.9 | 9 | 30 | 0.183 |
| SC11 | 2 | 21 | 0.25 | 1.61 | 44.4 | 544.0 | 60.3 | 8 | 32 | 0.151 |
| SC11 | 2 | 21 | 0.3 | 2.08 | 57.3 | 593.3 | 65.7 | 9 | 35 | 0.246 |
| SC11 | 2 | 21 | 0.3 | 1.96 | 54.0 | 553.3 | 61.3 | 8 | 25.6 | 0.242 |
| SC11 | 2 | 21 | 0.36 | 2.41 | 66.4 | 569.4 | 63.1 | 7 | 38.5 | 0.334 |
| SC20 | 2 | 21 | 0.26 | 1.72 | 47.4 | 561.5 | 62.2 | 9 | 28.8 | 0.231 |
| SC20 | 2 | 21 | 0.29 | 1.62 | 44.6 | 458.6 | 50.8 | 5 | 38.5 | 0.151 |
| SC20 | 2 | 21 | 0.19 | 2.02 | 55.7 | 963.2 | 106.7 | 8 | 44.9 | 0.222 |
| SC20 | 2 | 21 | 0.2 | 1.94 | 53.5 | 870.0 | 96.4 | 9 | 32.5 | 0.238 |
| SC20 | 2 | 21 | 0.33 | 2.51 | 69.2 | 660.6 | 73.2 | 6 | 27.1 | 0.276 |
| SC20 | 2 | 21 | 0.19 | 0.85 | 23.4 | 347.4 | 38.5 | 3 | 31 | 0.065 |
| SC20 | 2 | 21 | 0.16 | 1.28 | 35.3 | 700.0 | 77.6 | 7 | 30 | 0.124 |
| SC20 | 2 | 21 | 0.3 | 2.25 | 62.0 | 650.0 | 72.0 | 5 | 35.5 | 0.274 |
| HC38 | 2 | 21 | 0.17 | 1.58 | 43.5 | 829.4 | 91.9 | 5 | 29.5 | 0.168 |
| HC38 | 2 | 21 | 0.13 | 0.69 | 19.0 | 430.8 | 47.7 | 3 | 33.8 | 0.059 |
| HC38 | 2 | 21 | 0.24 | 1.27 | 35.0 | 429.2 | 47.5 | 5 | 35.1 | 0.167 |
| HC38 | 2 | 21 | 0.11 | 0.41 | 11.3 | 272.7 | 30.2 | 2 | 26 | 0.036 |
| HC38 | 2 | 21 | 0.44 | 2.47 | 68.1 | 461.4 | 51.1 | 8 | 36.4 | 0.294 |
| HC38 | 2 | 21 | 0.22 | 1.71 | 47.1 | 677.3 | 75.0 | 10 | 41.6 | 0.21 |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| HC38 | 2 | 21 | 0.18 | 1.62 | 44.6 | 800.0 | 88.6 | 5 | 43 | 0.156 |
| HC38 | 2 | 21 | 0.28 | 1.38 | 38.0 | 392.9 | 43.5 | 7 | 38 | 0.141 |
| GC3 | 2 | 21 | 0.24 | 1.06 | 29.2 | 341.7 | 37.9 | 5 | 23.5 | 0.11 |
| GC3 | 2 | 21 | 0.25 | 1.25 | 34.4 | 400.0 | 44.3 | 6 | 33.2 | 0.156 |
| GC3 | 2 | 21 | 0.13 | 1.54 | 42.4 | 1084.6 | 120.2 | 8 | 39 | 0.162 |
| GC3 | 2 | 21 | 0.16 | 1.26 | 34.7 | 687.5 | 76.2 | 9 | 31.5 | 0.173 |
| GC3 | 2 | 21 | 0.23 | 1.67 | 46.0 | 626.1 | 69.4 | 6 | 40.6 | 0.246 |
| GC3 | 2 | 21 | 0.15 | 0.83 | 22.9 | 453.3 | 50.2 | 4 | 45.5 | 0.11 |
| GC3 | 2 | 21 | 0.12 | 0.73 | 20.1 | 508.3 | 56.3 | 6 | 35.2 | 0.099 |
| GC3 | 2 | 21 | 0.27 | 1.64 | 45.2 | 507.4 | 56.2 | 8 | 35.4 | 0.255 |
| CONTROL | 2 | 21 | 0.5 | 6.66 | 183.5 | 1232.0 | 136.5 | 15 | 46 | 0.583 |
| CONTROL | 2 | 21 | 0.42 | 3.5 | 96.5 | 733.3 | 81.3 | 12 | 41.7 | 0.321 |
| CONTROL | 2 | 21 | 0.55 | 5.41 | 149.1 | 883.6 | 97.9 | 14 | 48.8 | 0.671 |
| CONTROL | 2 | 21 | 0.29 | 3.78 | 104.2 | 1203.4 | 133.3 | 10 | 51.4 | 0.431 |
| CONTROL | 2 | 21 | 0.2 | 2.17 | 59.8 | 985.0 | 109.1 | 11 | 42.9 | 0.172 |
| CONTROL | 2 | 21 | 0.42 | 4.54 | 125.1 | 981.0 | 108.7 | 12 | 46 | 0.449 |
| CONTROL | 2 | 21 | 0.51 | 4.55 | 125.4 | 792.2 | 87.8 | 13 | 44 | 0.573 |
| CONTROL | 2 | 21 | 0.21 | 2.56 | 70.5 | 1119.0 | 124.0 | 9 | 44.5 | 0.231 |
| CONTROL | 3 | 21 | 0.26 | 3.21 | 126.0 | 1134.6 | 155.3 | 9 | 36.5 | 0.434 |
| CONTROL | 3 | 21 | 0.39 | 2.68 | 105.2 | 587.2 | 80.4 | 7 | 45.5 | 0.327 |
| CONTROL | 3 | 21 | 0.2 | 1.9 | 74.6 | 850.0 | 116.3 | 7 | 41 | 0.151 |
| CONTROL | 3 | 21 | 0.31 | 2.33 | 91.5 | 651.6 | 89.2 | 10 | 64 | 0.323 |
| CONTROL | 3 | 21 | 0.44 | 3.9 | 153.1 | 786.4 | 107.6 | 12 | 34 | 0.402 |
| CONTROL | 3 | 21 | 0.32 | 1.91 | 75.0 | 496.9 | 68.0 | 10 | 29.8 | 0.194 |
| CONTROL | 3 | 21 | 0.41 | 1.64 | 64.4 | 300.0 | 41.1 | 3 | 35.2 | 0.127 |
| CONTROL | 3 | 21 | 0.35 | 2.23 | 87.6 | 537.1 | 73.5 | 6 | 39.2 | 0.229 |
| SC19 | 3 | 21 | 0.29 | 2.17 | 85.2 | 648.3 | 88.7 | 9 | 41 | 0.23 |
| SC19 | 3 | 21 | 0.45 | 4.21 | 165.3 | 835.6 | 114.4 | 9 | 34 | 0.394 |
| SC19 | 3 | 21 | 0.26 | 2.24 | 88.0 | 761.5 | 104.2 | 6 | 41 | 0.212 |
| SC19 | 3 | 21 | 0.28 | 1.19 | 46.7 | 325.0 | 44.5 | 7 | 33 | 0.098 |
| SC19 | 3 | 21 | 0.13 | 2.23 | 87.6 | 1615.4 | 221.1 | 7 | 62 | 0.229 |
| SC19 | 3 | 21 | 0.3 | 2.49 | 97.8 | 730.0 | 99.9 | 5 | 57 | 0.252 |
| SC19 | 3 | 21 | 0.16 | 1.43 | 56.1 | 793.8 | 108.6 | 6 | 41 | 0.152 |
| SC19 | 3 | 21 | 0.42 | 2.34 | 91.9 | 457.1 | 62.6 | 10 | 32 | 0.289 |
| HC37 | 3 | 21 | 0.28 | 1.84 | 72.2 | 557.1 | 76.3 | 7 | 49.5 | 0.272 |
| HC37 | 3 | 21 | 0.32 | 1.91 | 75.0 | 496.9 | 68.0 | 8 | 31.5 | 0.222 |
| HC37 | 3 | 21 | 0.28 | 1.54 | 60.5 | 450.0 | 61.6 | 5 | 41 | 0.21 |
| HC37 | 3 | 21 | 0.34 | 1.48 | 58.1 | 335.3 | 45.9 | 6 | 25.7 | 0.204 |
| HC37 | 3 | 21 | 0.32 | 1.62 | 63.6 | 406.3 | 55.6 | 6 | 30.5 | 0.241 |
| HC37 | 3 | 21 | 0.41 | 2.16 | 84.8 | 426.8 | 58.4 | 6 | 43.5 | 0.249 |
| HC37 | 3 | 21 | 0.57 | 2.78 | 109.2 | 387.7 | 53.1 | 10 | 32 | 0.389 |
| HC37 | 3 | 21 | 0.35 | 1.89 | 74.2 | 440.0 | 60.2 | 6 | 37 | 0.266 |
| SC8 | 3 | 21 | 0.51 | 2.73 | 107.2 | 435.3 | 59.6 | 10 | 53 | 0.297 |
| SC8 | 3 | 21 | 0.56 | 5.44 | 213.6 | 871.4 | 119.3 | 9 | 78.5 | 0.568 |
| SC8 | 3 | 21 | 0.14 | 1.11 | 43.6 | 692.9 | 94.8 | 8 | 41.5 | 0.133 |
| SC8 | 3 | 21 | 0.33 | 1.64 | 64.4 | 397.0 | 54.3 | 5 | 40.7 | 0.152 |
| SC8 | 3 | 21 | 0.29 | 3.71 | 145.7 | 1179.3 | 161.4 | 8 | 50 | 0.496 |
| SC8 | 3 | 21 | 0.27 | 1.96 | 77.0 | 625.9 | 85.7 | 7 | 43.5 | 0.271 |
| SC8 | 3 | 21 | 0.14 | 1.79 | 70.3 | 1178.6 | 161.3 | 9 | 40.5 | 0.207 |
| SC8 | 3 | 21 | 0.4 | 4.06 | 159.4 | 915.0 | 125.2 | 10 | 59.5 | 0.429 |
| GC4 | 3 | 21 | 0.53 | 1.81 | 71.1 | 241.5 | 33.1 | 7 | 41 | 0.255 |
| GC4 | 3 | 21 | 0.43 | 1.86 | 73.0 | 332.6 | 45.5 | 5 | 36 | 0.243 |
| GC4 | 3 | 21 | 0.25 | 1.25 | 49.1 | 400.0 | 54.7 | 7 | 29.7 | 0.179 |
| GC4 | 3 | 21 | 0.14 | 0.83 | 32.6 | 492.9 | 67.5 | 5 | 22.7 | 0.113 |
| GC4 | 3 | 21 | 0.14 | 0.88 | 34.6 | 528.6 | 72.3 | 4 | 30 | 0.111 |
| GC4 | 3 | 21 | 0.41 | 1.93 | 75.8 | 370.7 | 50.7 | 7 | 39 | 0.258 |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| GC4 | 3 | 21 | 0.62 | 2.46 | 96.6 | 296.8 | 40.6 | 7 | 36 | 0.303 |
| GC4 | 3 | 21 | 0.27 | 0.64 | 25.1 | 137.0 | 18.8 | 3 | 31 | 0.0573 |
| CONTROL | 4 | 21 | 0.32 | 4.08 | 158.3 | 1175.0 | 117.0 | 10 | 47.2 | 0.376 |
| CONTROL | 4 | 21 | 0.21 | 2.17 | 84.2 | 933.3 | 92.9 | 6 | 56.2 | 0.223 |
| CONTROL | 4 | 21 | 0.21 | 3 | 116.4 | 1328.6 | 132.3 | 8 | 53.6 | 0.398 |
| CONTROL | 4 | 21 | 0.38 | 4.44 | 172.2 | 1068.4 | 106.4 | 10 | 45 | 0.549 |
| CONTROL | 4 | 21 | 0.24 | 3.95 | 153.2 | 1545.8 | 153.9 | 9 | 54.2 | 0.446 |
| CONTROL | 4 | 21 | 0.15 | 2.04 | 79.1 | 1260.0 | 125.5 | 8 | 59 | 0.217 |
| CONTROL | 4 | 21 | 0.24 | 3.12 | 121.0 | 1200.0 | 119.5 | 9 | 52 | 0.328 |
| CONTROL | 4 | 21 | 0.31 | 1.72 | 66.7 | 454.8 | 45.3 | 5 | 38.5 | 0.137 |
| GC2 | 4 | 21 | 0.28 | 1.06 | 41.1 | 278.6 | 27.7 | 5 | 30 | 0.093 |
| GC2 | 4 | 21 | 0.2 | 1.65 | 64.0 | 725.0 | 72.2 | 6 | 36.5 | 0.199 |
| GC2 | 4 | 21 | 0.17 | 0.93 | 36.1 | 447.1 | 44.5 | 4 | 38.5 | 0.085 |
| GC2 | 4 | 21 | 0.28 | 1.69 | 65.6 | 503.6 | 50.1 | 9 | 25 | 0.197 |
| GC2 | 4 | 21 | 0.15 | 0.98 | 38.0 | 553.3 | 55.1 | 6 | 31 | 0.1 |
| GC2 | 4 | 21 | 0.28 | 0.63 | 24.4 | 125.0 | 12.4 | 2 | 30 | 0.054 |
| GC2 | 4 | 21 | 0.25 | 1.95 | 75.6 | 680.0 | 67.7 | 4 | 44 | 0.222 |
| GC2 | 4 | 21 | 0.14 | 0.47 | 18.2 | 235.7 | 23.5 | 2 | 29.3 | 0.04 |
| SC16 | 4 | 21 | 0.16 | 1.43 | 55.5 | 793.8 | 79.0 | 9 | 20 | 0.199 |
| SC16 | 4 | 21 | 0.16 | 0.86 | 33.4 | 437.5 | 43.6 | 3 | 28.8 | 0.11 |
| SC16 | 4 | 21 | 0.13 | 1.01 | 39.2 | 676.9 | 67.4 | 7 | 19.5 | 0.153 |
| SC16 | 4 | 21 | 0.15 | 1.27 | 49.3 | 746.7 | 74.3 | 8 | 34.5 | 0.18 |
| SC16 | 4 | 21 | 0.34 | 1.57 | 60.9 | 361.8 | 36.0 | 8 | 31.5 | 0.216 |
| SC16 | 4 | 21 | 0.21 | 1.28 | 49.6 | 509.5 | 50.7 | 5 | 36.3 | 0.131 |
| SC16 | 4 | 21 | 0.35 | 2.77 | 107.4 | 691.4 | 68.8 | 7 | 41.5 | 0.393 |
| SC16 | 4 | 21 | 0.12 | 0.93 | 36.1 | 675.0 | 67.2 | 4 | 23 | 0.109 |
| HC40 | 4 | 21 | 0.3 | 2.33 | 90.4 | 676.7 | 67.4 | 9 | 37 | 0.325 |
| HC40 | 4 | 21 | 0.32 | 1.62 | 62.8 | 406.3 | 40.5 | 4 | 40 | 0.155 |
| HC40 | 4 | 21 | 0.26 | 1.74 | 67.5 | 569.2 | 56.7 | 4 | 32.2 | 0.231 |
| HC40 | 4 | 21 | 0.23 | 1.2 | 46.5 | 421.7 | 42.0 | 3 | 31.5 | 0.115 |
| HC40 | 4 | 21 | 0.21 | 0.47 | 18.2 | 123.8 | 12.3 | 1 | 32 | 0.042 |
| HC40 | 4 | 21 | 0.33 | 2.17 | 84.2 | 557.6 | 55.5 | 8 | 29.5 | 0.224 |
| HC40 | 4 | 21 | 0.3 | 2.4 | 93.1 | 700.0 | 69.7 | 7 | 44 | 0.291 |
| HC40 | 4 | 21 | 0.25 | 1.5 | 58.2 | 500.0 | 49.8 | 6 | 31.5 | 0.147 |
| HC43 | 4 | 21 | 0.35 | 2.98 | 115.6 | 751.4 | 74.8 | 8 | 33.5 | 0.353 |
| HC43 | 4 | 21 | 0.17 | 0.43 | 16.7 | 152.9 | 15.2 | 3 | 24.2 | 0.043 |
| HC43 | 4 | 21 | 0.28 | 0.63 | 24.4 | 125.0 | 12.4 | 3 | 26.5 | 0.064 |
| HC43 | 4 | 21 | 0.26 | 2.06 | 79.9 | 692.3 | 68.9 | 9 | 35 | 0.264 |
| HC43 | 4 | 21 | 0.15 | 0.61 | 23.7 | 306.7 | 30.5 | 6 | 18 | 0.056 |
| HC43 | 4 | 21 | 0.31 | 0.84 | 32.6 | 171.0 | 17.0 | 6 | 29 | 0.116 |
| HC43 | 4 | 21 | 0.35 | 0.44 | 17.1 | 25.7 | 2.6 | 4 | 19.1 | 0.053 |
| HC43 | 4 | 21 | 0.28 | 1.24 | 48.1 | 342.9 | 34.1 | 7 | 29 | 0.119 |
| CONTROL | 5 | 21 | 0.25 | 1.68 | 119.5 | 572.0 | 132.1 | 5 | 43 | 0.15 |
| CONTROL | 5 | 21 | 0.19 | 0.64 | 45.5 | 236.8 | 54.7 | 3 | 20 | 0.08 |
| CONTROL | 5 | 21 | 0.23 | 0.57 | 40.6 | 147.8 | 34.1 | 2 | 24.2 | 0.05 |
| CONTROL | 5 | 21 | 0.19 | 0.42 | 29.9 | 121.1 | 27.9 | 1 | 20.5 | 0.05 |
| CONTROL | 5 | 21 | 0.15 | 0.33 | 23.5 | 120.0 | 27.7 | 2 | 18.5 | 0.03 |
| CONTROL | 5 | 21 | 0.2 | 2.4 | 170.7 | 1100.0 | 254.0 | 7 | 42 | 0.27 |
| CONTROL | 5 | 21 | 0.32 | 4.62 | 328.7 | 1343.8 | 310.3 | 13 | 38.5 | 0.49 |
| CONTROL | 5 | 21 | 0.2 | 1.59 | 113.1 | 695.0 | 160.5 | 7 | 38.5 | 0.17 |
| GC1 | 5 | 21 | 0.4 | 1.74 | 123.8 | 335.0 | 77.3 | 4 | 34 | 0.16 |
| GC1 | 5 | 21 | 0.34 | 0.67 | 47.7 | 97.1 | 22.4 | 1 | 26.3 | 0.06 |
| GC1 | 5 | 21 | 0.3 | 0.57 | 40.6 | 90.0 | 20.8 | 3 | 21.3 | 0.05 |
| GC1 | 5 | 21 | 0.32 | 1.03 | 73.3 | 221.9 | 51.2 | 4 | 32.5 | 0.1 |
| GC1 | 5 | 21 | 0.48 | 1.9 | 135.2 | 295.8 | 68.3 | 7 | 30.5 | 0.22 |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| GC1 | 5 | 21 | 0.53 | 2.04 | 145.1 | 284.9 | 65.8 | 8 | 34 | 0.2 |
| GC1 | 5 | 21 | 0.23 | 0.52 | 37.0 | 126.1 | 29.1 | 3 | 28 | 0.04 |
| GC1 | 5 | 21 | 0.4 | 1.41 | 100.3 | 252.5 | 58.3 | 4 | 28.4 | 0.15 |
| GC5 | 5 | 21 | 0.25 | 0.57 | 40.6 | 128.0 | 29.6 | 2 | 29.4 | 0.05 |
| GC5 | 5 | 21 | 0.16 | 0.9 | 64.0 | 462.5 | 106.8 | 6 | 27 | 0.1 |
| GC5 | 5 | 21 | 0.17 | 0.3 | 21.3 | 76.5 | 17.7 | 1 | 19.2 | 0.11 |
| GC5 | 5 | 21 | 0.35 | 1.24 | 88.2 | 254.3 | 58.7 | 7 | 28.5 | 0.03 |
| GC5 | 5 | 21 | 0.32 | 2.01 | 143.0 | 528.1 | 121.9 | 5 | 36 | 0.28 |
| GC5 | 5 | 21 | 0.19 | 0.41 | 29.2 | 115.8 | 26.7 | 2 | 40.5 | 0.04 |
| GC5 | 5 | 21 | 0.22 | 1.32 | 93.9 | 500.0 | 115.4 | 5 | 40 | 0.15 |
| GC5 | 5 | 21 | 0.33 | 0.77 | 54.8 | 133.3 | 30.8 | 4 | 33.5 | 0.07 |
| SC13 | 5 | 21 | 0.15 | 0.56 | 39.8 | 273.3 | 63.1 | 3 | 27.5 | 0.07 |
| SC13 | 5 | 21 | 0.17 | 0.36 | 25.6 | 111.8 | 25.8 | 3 | 23 | 0.04 |
| SC13 | 5 | 21 | 0.36 | 1.42 | 101.0 | 294.4 | 68.0 | 6 | 34.5 | 0.16 |
| SC13 | 5 | 21 | 0.36 | 1.47 | 104.6 | 308.3 | 71.2 | 7 | 33.5 | 0.17 |
| SC13 | 5 | 21 | 0.21 | 0.57 | 40.6 | 171.4 | 39.6 | 2 | 28.5 | 0.05 |
| SC13 | 5 | 21 | 0.29 | 1.43 | 101.7 | 393.1 | 90.8 | 7 | 36.7 | 0.19 |
| SC13 | 5 | 21 | 0.33 | 1.11 | 79.0 | 236.4 | 54.6 | 5 | 26.8 | 0.14 |
| SC13 | 5 | 21 | 0.43 | 1.95 | 138.7 | 353.5 | 81.6 | 6 | 38 | 0.22 |
| SC25 | 5 | 21 | 0.39 | 3.11 | 221.3 | 697.4 | 161.0 | 7 | 38 | 0.25 |
| SC25 | 5 | 21 | 0.26 | 0.66 | 47.0 | 153.8 | 35.5 | 2 | 33 | 0.06 |
| SC25 | 5 | 21 | 0.29 | 0.92 | 65.5 | 217.2 | 50.2 | 4 | 30.5 | 0.09 |
| SC25 | 5 | 21 | 0.2 | 0.46 | 32.7 | 130.0 | 30.0 | 2 | 19.6 | 0.04 |
| SC25 | 5 | 21 | 0.2 | 1.08 | 76.8 | 440.0 | 101.6 | 5 | 37.5 | 0.1 |
| SC25 | 5 | 21 | 0.43 | 1.25 | 88.9 | 190.7 | 44.0 | 5 | 32 | 0.11 |
| SC25 | 5 | 21 | 0.14 | 0.83 | 59.0 | 492.9 | 113.8 | 4 | 30.1 | 0.08 |
| SC25 | 5 | 21 | 0.3 | 2.46 | 175.0 | 720.0 | 166.2 | 8 | 37 | 0.23 |
| CONTROL | 1 | 7 | 0.11 | 0.26 | 70.27 | 136.4 | 155.0 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.19 | 0.25 | 67.57 | 31.6 | 35.9 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.15 | 0.25 | 67.57 | 66.7 | 75.8 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.29 | 0.55 | 148.65 | 89.7 | 101.9 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.16 | 0.42 | 113.51 | 162.5 | 184.7 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.31 | 0.49 | 132.43 | 58.1 | 66.0 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.2 | 0.29 | 78.38 | 45.0 | 51.1 | nd | nd | nd |
| CONTROL | 1 | 7 | 0.21 | 0.45 | 121.62 | 114.3 | 129.9 | nd | nd | nd |
| SC12 | 1 | 7 | 0.37 | 0.83 | 224.32 | 124.3 | 141.3 | nd | nd | nd |
| SC12 | 1 | 7 | 0.23 | 0.8 | 216.22 | 247.8 | 281.6 | nd | nd | nd |
| SC12 | 1 | 7 | 0.41 | 0.72 | 194.59 | 75.6 | 85.9 | nd | nd | nd |
| SC12 | 1 | 7 | 0.13 | 0.22 | 59.46 | 69.2 | 78.7 | nd | nd | nd |
| SC12 | 1 | 7 | 0.26 | 0.47 | 127.03 | 80.8 | 91.8 | nd | nd | nd |
| SC12 | 1 | 7 | 0.22 | 0.53 | 143.24 | 140.9 | 160.1 | nd | nd | nd |
| SC12 | 1 | 7 | 0.18 | 0.42 | 113.51 | 133.3 | 151.5 | nd | nd | nd |
| SC12 | 1 | 7 | 0.15 | 0.31 | 83.78 | 106.7 | 121.2 | nd | nd | nd |
| HC39 | 1 | 7 | 0.17 | 0.63 | 170.27 | 270.6 | 307.5 | nd | nd | nd |
| HC39 | 1 | 7 | 0.3 | 0.55 | 148.65 | 83.3 | 94.7 | nd | nd | nd |
| HC39 | 1 | 7 | 0.2 | 0.71 | 191.89 | 255.0 | 289.8 | nd | nd | nd |
| HC39 | 1 | 7 | 0.15 | 0.56 | 151.35 | 273.3 | 310.6 | nd | nd | nd |
| HC39 | 1 | 7 | 0.21 | 0.33 | 89.19 | 57.1 | 64.9 | nd | nd | nd |
| HC39 | 1 | 7 | 0.16 | 0.3 | 81.08 | 87.5 | 99.4 | nd | nd | nd |
| HC39 | 1 | 7 | 0.21 | 0.79 | 213.51 | 276.2 | 313.9 | nd | nd | nd |
| HC39 | 1 | 7 | 0.16 | 0.36 | 97.30 | 125.0 | 142.0 | nd | nd | nd |
| SC4 | 1 | 7 | 0.38 | 1.19 | 321.62 | 213.2 | 242.2 | nd | nd | nd |
| SC4 | 1 | 7 | 0.27 | 0.87 | 235.14 | 222.2 | 252.5 | nd | nd | nd |
| SC4 | 1 | 7 | 0.57 | 0.82 | 221.62 | 43.9 | 49.8 | nd | nd | nd |
| SC4 | 1 | 7 | 0.15 | 0.43 | 116.22 | 186.7 | 212.1 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| SC4 | 1 | 7 | 0.21 | 0.66 | 178.38 | 214.3 | 243.5 | nd | nd | nd |
| SC4 | 1 | 7 | 0.13 | 0.15 | 40.54 | 15.4 | 17.5 | nd | nd | nd |
| SC4 | 1 | 7 | 0.23 | 0.67 | 181.08 | 191.3 | 217.4 | nd | nd | nd |
| SC4 | 1 | 7 | 0.2 | 0.46 | 124.32 | 130.0 | 147.7 | nd | nd | nd |
| SC11 | 2 | 7 | 0.3 | 0.55 | 78.85 | 83.3 | 78.5 | nd | nd | nd |
| SC11 | 2 | 7 | 0.1 | 0.19 | 27.24 | 90.0 | 84.7 | nd | nd | nd |
| SC11 | 2 | 7 | 0.38 | 0.76 | 108.96 | 100.0 | 94.2 | nd | nd | nd |
| SC11 | 2 | 7 | 0.24 | 0.52 | 74.55 | 116.7 | 109.9 | nd | nd | nd |
| SC11 | 2 | 7 | 0.21 | 0.58 | 83.15 | 176.2 | 165.9 | nd | nd | nd |
| SC11 | 2 | 7 | 0.29 | 0.72 | 103.23 | 148.3 | 139.6 | nd | nd | nd |
| SC11 | 2 | 7 | 0.23 | 0.43 | 61.65 | 87.0 | 81.9 | nd | nd | nd |
| SC11 | 2 | 7 | 0.4 | 0.92 | 131.90 | 130.0 | 122.4 | nd | nd | nd |
| SC20 | 2 | 7 | 0.23 | 0.63 | 90.32 | 173.9 | 163.8 | nd | nd | nd |
| SC20 | 2 | 7 | 0.54 | 1.38 | 197.85 | 155.6 | 146.5 | nd | nd | nd |
| SC20 | 2 | 7 | 0.3 | 0.54 | 77.42 | 80.0 | 75.3 | nd | nd | nd |
| SC20 | 2 | 7 | 0.39 | 0.93 | 133.33 | 138.5 | 130.4 | nd | nd | nd |
| SC20 | 2 | 7 | 0.1 | 0.25 | 35.84 | 150.0 | 141.2 | nd | nd | nd |
| SC20 | 2 | 7 | 0.15 | 0.39 | 55.91 | 160.0 | 150.7 | nd | nd | nd |
| SC20 | 2 | 7 | 0.45 | 0.71 | 101.79 | 57.8 | 54.4 | nd | nd | nd |
| SC20 | 2 | 7 | 0.18 | 0.37 | 53.05 | 105.6 | 99.4 | nd | nd | nd |
| HC38 | 2 | 7 | 0.21 | 0.61 | 87.46 | 190.5 | 179.4 | nd | nd | nd |
| HC38 | 2 | 7 | 0.17 | 0.62 | 88.89 | 264.7 | 249.3 | nd | nd | nd |
| HC38 | 2 | 7 | 0.32 | 0.5 | 71.68 | 56.3 | 53.0 | nd | nd | nd |
| HC38 | 2 | 7 | 0.36 | 0.9 | 129.03 | 150.0 | 141.2 | nd | nd | nd |
| HC38 | 2 | 7 | 0.27 | 0.39 | 55.91 | 44.4 | 41.8 | nd | nd | nd |
| HC38 | 2 | 7 | 0.14 | 0.31 | 44.44 | 121.4 | 114.3 | nd | nd | nd |
| HC38 | 2 | 7 | 0.15 | 0.25 | 35.84 | 66.7 | 62.8 | nd | nd | nd |
| HC38 | 2 | 7 | 0.29 | 0.66 | 94.62 | 127.6 | 120.1 | nd | nd | nd |
| GC3 | 2 | 7 | 0.18 | 0.4 | 57.35 | 122.2 | 115.1 | nd | nd | nd |
| GC3 | 2 | 7 | 0.14 | 0.21 | 30.11 | 50.0 | 47.1 | nd | nd | nd |
| GC3 | 2 | 7 | 0.62 | 1.14 | 163.44 | 83.9 | 79.0 | nd | nd | nd |
| GC3 | 2 | 7 | 0.11 | 0.18 | 25.81 | 63.6 | 59.9 | nd | nd | nd |
| GC3 | 2 | 7 | 0.4 | 0.72 | 103.23 | 80.0 | 75.3 | nd | nd | nd |
| GC3 | 2 | 7 | 0.17 | 0.31 | 44.44 | 82.4 | 77.5 | nd | nd | nd |
| GC3 | 2 | 7 | 0.2 | 0.33 | 47.31 | 65.0 | 61.2 | nd | nd | nd |
| GC3 | 2 | 7 | 0.39 | 0.76 | 108.96 | 94.9 | 89.3 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.38 | 0.83 | 119.00 | 118.4 | 111.5 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.37 | 0.81 | 116.13 | 118.9 | 112.0 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.34 | 0.66 | 94.62 | 94.1 | 88.6 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.35 | 0.84 | 120.43 | 140.0 | 131.8 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.4 | 0.98 | 140.50 | 145.0 | 136.5 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.32 | 0.58 | 83.15 | 81.3 | 76.5 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.22 | 0.39 | 55.91 | 77.3 | 72.8 | nd | nd | nd |
| CONTROL | 2 | 7 | 0.28 | 0.49 | 70.25 | 75.0 | 70.6 | nd | nd | nd |
| SC8 | 3 | 7 | 0.45 | 0.67 | 85.49 | 48.9 | 39.2 | nd | nd | nd |
| SC8 | 3 | 7 | 0.32 | 0.88 | 112.28 | 175.0 | 140.3 | nd | nd | nd |
| SC8 | 3 | 7 | 0.43 | 0.94 | 119.94 | 118.6 | 95.1 | nd | nd | nd |
| SC8 | 3 | 7 | 0.19 | 0.36 | 45.93 | 89.5 | 71.8 | nd | nd | nd |
| SC8 | 3 | 7 | 0.18 | 0.37 | 47.21 | 105.6 | 84.6 | nd | nd | nd |
| SC8 | 3 | 7 | 0.31 | 0.5 | 63.80 | 61.3 | 49.2 | nd | nd | nd |
| SC8 | 3 | 7 | 0.18 | 0.4 | 51.04 | 122.2 | 98.0 | nd | nd | nd |
| SC8 | 3 | 7 | 0.22 | 0.33 | 42.11 | 50.0 | 40.1 | nd | nd | nd |
| SC19 | 3 | 7 | 0.64 | 0.88 | 112.28 | 37.5 | 30.1 | nd | nd | nd |
| SC19 | 3 | 7 | 0.39 | 0.73 | 93.14 | 87.2 | 69.9 | nd | nd | nd |
| SC19 | 3 | 7 | 0.24 | 0.4 | 51.04 | 66.7 | 53.5 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| SC19 | 3 | 7 | 0.43 | 0.56 | 71.45 | 30.2 | 24.2 | nd | nd | nd |
| SC19 | 3 | 7 | 0.3 | 0.36 | 45.93 | 20.0 | 16.0 | nd | nd | nd |
| SC19 | 3 | 7 | 0.69 | 1.22 | 155.66 | 76.8 | 61.6 | nd | nd | nd |
| SC19 | 3 | 7 | 0.31 | 0.32 | 40.83 | 3.2 | 2.6 | nd | nd | nd |
| SC19 | 3 | 7 | 0.29 | 0.35 | 44.66 | 20.7 | 16.6 | nd | nd | nd |
| HC37 | 3 | 7 | 0.13 | 0.16 | 20.41 | 23.1 | 18.5 | nd | nd | nd |
| HC37 | 3 | 7 | 0.4 | 0.63 | 80.38 | 57.5 | 46.1 | nd | nd | nd |
| HC37 | 3 | 7 | 0.25 | 0.3 | 38.28 | 20.0 | 16.0 | nd | nd | nd |
| HC37 | 3 | 7 | 0.3 | 0.71 | 90.59 | 136.7 | 109.6 | nd | nd | nd |
| HC37 | 3 | 7 | 0.27 | 0.38 | 48.48 | 40.7 | 32.7 | nd | nd | nd |
| HC37 | 3 | 7 | 0.18 | 0.28 | 35.73 | 55.6 | 44.6 | nd | nd | nd |
| HC37 | 3 | 7 | 0.44 | 0.53 | 67.62 | 20.5 | 16.4 | nd | nd | nd |
| HC37 | 3 | 7 | 0.3 | 0.51 | 65.07 | 70.0 | 56.1 | nd | nd | nd |
| GC4 | 3 | 7 | 0.29 | 0.37 | 47.21 | 27.6 | 22.1 | nd | nd | nd |
| GC4 | 3 | 7 | 0.63 | 1.05 | 133.97 | 66.7 | 53.5 | nd | nd | nd |
| GC4 | 3 | 7 | 0.29 | 0.43 | 54.86 | 48.3 | 38.7 | nd | nd | nd |
| GC4 | 3 | 7 | 0.37 | 0.44 | 56.14 | 18.9 | 15.2 | nd | nd | nd |
| GC4 | 3 | 7 | 0.3 | 0.55 | 70.18 | 83.3 | 66.8 | nd | nd | nd |
| GC4 | 3 | 7 | 0.44 | 0.66 | 84.21 | 50.0 | 40.1 | nd | nd | nd |
| GC4 | 3 | 7 | 0.6 | 1.4 | 178.63 | 133.3 | 106.9 | nd | nd | nd |
| GC4 | 3 | 7 | 0.53 | 0.76 | 96.97 | 43.4 | 34.8 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.34 | 0.91 | 116.11 | 167.6 | 134.4 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.3 | 1.03 | 131.42 | 243.3 | 195.1 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.21 | 0.4 | 51.04 | 90.5 | 72.6 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.28 | 0.46 | 58.69 | 64.3 | 51.6 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.36 | 0.78 | 99.52 | 116.7 | 93.6 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.53 | 1.15 | 146.73 | 117.0 | 93.8 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.22 | 0.39 | 49.76 | 77.3 | 62.0 | nd | nd | nd |
| CONTROL | 3 | 7 | 0.52 | 1.15 | 146.73 | 121.2 | 97.2 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.18 | 0.35 | 77.99 | 94.4 | 103.6 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.3 | 0.7 | 155.99 | 133.3 | 146.2 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.25 | 0.42 | 93.59 | 68.0 | 74.6 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.19 | 0.32 | 71.31 | 68.4 | 75.0 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.28 | 0.63 | 140.39 | 125.0 | 137.1 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.24 | 0.51 | 113.65 | 112.5 | 123.4 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.18 | 0.28 | 62.40 | 55.6 | 60.9 | nd | nd | nd |
| CONTROL | 4 | 7 | 0.22 | 0.38 | 84.68 | 72.7 | 79.7 | nd | nd | nd |
| GC2 | 4 | 7 | 0.14 | 0.36 | 80.22 | 157.1 | 172.3 | nd | nd | nd |
| GC2 | 4 | 7 | 0.22 | 0.45 | 100.28 | 104.5 | 114.6 | nd | nd | nd |
| GC2 | 4 | 7 | 0.34 | 0.74 | 164.90 | 117.6 | 129.0 | nd | nd | nd |
| GC2 | 4 | 7 | 0.12 | 0.23 | 51.25 | 91.7 | 100.5 | nd | nd | nd |
| GC2 | 4 | 7 | 0.16 | 0.2 | 44.57 | 25.0 | 27.4 | nd | nd | nd |
| GC2 | 4 | 7 | 0.14 | 0.26 | 57.94 | 85.7 | 94.0 | nd | nd | nd |
| GC2 | 4 | 7 | 0.19 | 0.41 | 91.36 | 115.8 | 127.0 | nd | nd | nd |
| GC2 | 4 | 7 | 0.17 | 0.35 | 77.99 | 105.9 | 116.1 | nd | nd | nd |
| SC16 | 4 | 7 | 0.25 | 0.49 | 109.19 | 96.0 | 105.3 | nd | nd | nd |
| SC16 | 4 | 7 | 0.29 | 0.54 | 120.33 | 86.2 | 94.5 | nd | nd | nd |
| SC16 | 4 | 7 | 0.28 | 0.38 | 84.68 | 35.7 | 39.2 | nd | nd | nd |
| SC16 | 4 | 7 | 0.24 | 0.5 | 111.42 | 108.3 | 118.8 | nd | nd | nd |
| SC16 | 4 | 7 | 0.37 | 0.58 | 129.25 | 56.8 | 62.2 | nd | nd | nd |
| SC16 | 4 | 7 | 0.25 | 0.62 | 138.16 | 148.0 | 162.3 | nd | nd | nd |
| SC16 | 4 | 7 | 0.21 | 0.44 | 98.05 | 109.5 | 120.1 | nd | nd | nd |
| SC16 | 4 | 7 | 0.51 | 1.13 | 251.81 | 121.6 | 133.3 | nd | nd | nd |
| HC40 | 4 | 7 | 0.17 | 0.33 | 73.54 | 94.1 | 103.2 | nd | nd | nd |
| HC40 | 4 | 7 | 0.35 | 0.94 | 209.47 | 168.6 | 184.8 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| HC40 | 4 | 7 | 0.36 | 0.65 | 144.85 | 80.6 | 88.3 | nd | nd | nd |
| HC40 | 4 | 7 | 0.26 | 0.48 | 106.96 | 84.6 | 92.8 | nd | nd | nd |
| HC40 | 4 | 7 | 0.29 | 0.44 | 98.05 | 51.7 | 56.7 | nd | nd | nd |
| HC40 | 4 | 7 | 0.31 | 0.51 | 113.65 | 64.5 | 70.7 | nd | nd | nd |
| HC40 | 4 | 7 | 0.23 | 0.57 | 127.02 | 147.8 | 162.1 | nd | nd | nd |
| HC40 | 4 | 7 | 0.2 | 0.6 | 133.70 | 200.0 | 219.3 | nd | nd | nd |
| HC43 | 4 | 7 | 0.18 | 0.19 | 42.34 | 5.6 | 6.1 | nd | nd | nd |
| HC43 | 4 | 7 | 0.23 | 0.43 | 95.82 | 87.0 | 95.3 | nd | nd | nd |
| HC43 | 4 | 7 | 0.25 | 0.41 | 91.36 | 64.0 | 70.2 | nd | nd | nd |
| HC43 | 4 | 7 | 0.17 | 0.3 | 66.85 | 76.5 | 83.8 | nd | nd | nd |
| HC43 | 4 | 7 | 0.43 | 0.91 | 202.79 | 111.6 | 122.4 | nd | nd | nd |
| HC43 | 4 | 7 | 0.32 | 0.45 | 100.28 | 40.6 | 44.5 | nd | nd | nd |
| HC43 | 4 | 7 | 0.21 | 0.4 | 89.14 | 90.5 | 99.2 | nd | nd | nd |
| HC43 | 4 | 7 | 0.42 | 0.55 | 122.56 | 31.0 | 33.9 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.4 | 0.65 | 130.00 | 62.5 | 85.4 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.33 | 0.64 | 128.00 | 93.9 | 128.3 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.23 | 0.38 | 76.00 | 65.2 | 89.1 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.35 | 0.68 | 136.00 | 94.3 | 128.8 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.17 | 0.28 | 56.00 | 64.7 | 88.4 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.24 | 0.41 | 82.00 | 70.8 | 96.8 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.25 | 0.39 | 78.00 | 56.0 | 76.5 | nd | nd | nd |
| CONTROL | 5 | 7 | 0.32 | 0.57 | 114.00 | 78.1 | 106.7 | nd | nd | nd |
| GC1 | 5 | 7 | 0.35 | 0.62 | 124.00 | 77.1 | 105.4 | nd | nd | nd |
| GC1 | 5 | 7 | 0.52 | 0.86 | 172.00 | 65.4 | 89.3 | nd | nd | nd |
| GC1 | 5 | 7 | 0.2 | 0.28 | 56.00 | 40.0 | 54.6 | nd | nd | nd |
| GC1 | 5 | 7 | 0.25 | 0.28 | 56.00 | 12.0 | 16.4 | nd | nd | nd |
| GC1 | 5 | 7 | 0.45 | 0.55 | 110.00 | 22.2 | 30.4 | nd | nd | nd |
| GC1 | 5 | 7 | 0.24 | 0.39 | 78.00 | 62.5 | 85.4 | nd | nd | nd |
| GC1 | 5 | 7 | 0.23 | 0.33 | 66.00 | 43.5 | 59.4 | nd | nd | nd |
| GC1 | 5 | 7 | 0.2 | 0.27 | 54.00 | 35.0 | 47.8 | nd | nd | nd |
| GC5 | 5 | 7 | 0.21 | 0.35 | 70.00 | 66.7 | 91.1 | nd | nd | nd |
| GC5 | 5 | 7 | 0.48 | 0.78 | 156.00 | 62.5 | 85.4 | nd | nd | nd |
| GC5 | 5 | 7 | 0.31 | 0.39 | 78.00 | 25.8 | 35.3 | nd | nd | nd |
| GC5 | 5 | 7 | 0.35 | 0.46 | 92.00 | 31.4 | 42.9 | nd | nd | nd |
| GC5 | 5 | 7 | 0.32 | 0.36 | 72.00 | 12.5 | 17.1 | nd | nd | nd |
| GC5 | 5 | 7 | 0.35 | 0.48 | 96.00 | 37.1 | 50.7 | nd | nd | nd |
| GC5 | 5 | 7 | 0.34 | 0.56 | 112.00 | 64.7 | 88.4 | nd | nd | nd |
| GC5 | 5 | 7 | 0.25 | 0.34 | 68.00 | 36.0 | 49.2 | nd | nd | nd |
| SC13 | 5 | 7 | 0.38 | 0.61 | 122.00 | 60.5 | 82.7 | nd | nd | nd |
| SC13 | 5 | 7 | 0.28 | 0.49 | 98.00 | 75.0 | 102.5 | nd | nd | nd |
| SC13 | 5 | 7 | 0.33 | 0.62 | 124.00 | 87.9 | 120.1 | nd | nd | nd |
| SC13 | 5 | 7 | 0.23 | 0.34 | 68.00 | 47.8 | 65.3 | nd | nd | nd |
| SC13 | 5 | 7 | 0.21 | 0.38 | 76.00 | 81.0 | 110.6 | nd | nd | nd |
| SC13 | 5 | 7 | 0.24 | 0.49 | 98.00 | 104.2 | 142.3 | nd | nd | nd |
| SC13 | 5 | 7 | 0.16 | 0.17 | 34.00 | 6.3 | 8.5 | nd | nd | nd |
| SC13 | 5 | 7 | 0.42 | 0.88 | 176.00 | 109.5 | 149.6 | nd | nd | nd |
| SC25 | 5 | 7 | 0.21 | 0.29 | 58.00 | 38.1 | 52.0 | nd | nd | nd |
| SC25 | 5 | 7 | 0.28 | 0.38 | 76.00 | 35.7 | 48.8 | nd | nd | nd |
| SC25 | 5 | 7 | 0.42 | 0.68 | 136.00 | 61.9 | 84.6 | nd | nd | nd |
| SC25 | 5 | 7 | 0.21 | 0.43 | 86.00 | 104.8 | 143.1 | nd | nd | nd |
| SC25 | 5 | 7 | 0.25 | 0.48 | 96.00 | 92.0 | 125.7 | nd | nd | nd |
| SC25 | 5 | 7 | 0.13 | 0.29 | 58.00 | 123.1 | 168.1 | nd | nd | nd |
| SC25 | 5 | 7 | 0.46 | 0.74 | 148.00 | 54.2 | 74.0 | nd | nd | nd |
| SC25 | 5 | 7 | 0.31 | 0.56 | 112.00 | 80.6 | 110.2 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.11 | 2.44 | 72.86 | 2118.2 | 123.1 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| CONTROL | 1 | 21 | 0.14 | 1.88 | 56.14 | 1242.9 | 72.2 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.15 | 2.46 | 73.46 | 1540.0 | 89.5 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.19 | 4.19 | 125.12 | 2105.3 | 122.4 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.23 | 4.2 | 125.42 | 1726.1 | 100.3 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.12 | 2.19 | 65.40 | 1725.0 | 100.3 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.13 | 3.29 | 98.25 | 2430.8 | 141.3 | nd | nd | nd |
| CONTROL | 1 | 21 | 0.11 | 3.33 | 99.44 | 2927.3 | 170.2 | nd | nd | nd |
| HC39 | 1 | 21 | 0.39 | 3.79 | 113.18 | 871.8 | 50.7 | nd | nd | nd |
| HC39 | 1 | 21 | 0.19 | 3.57 | 106.61 | 1778.9 | 103.4 | nd | nd | nd |
| HC39 | 1 | 21 | 0.52 | 3.93 | 117.36 | 655.8 | 38.1 | nd | nd | nd |
| HC39 | 1 | 21 | 0.24 | 1.69 | 50.47 | 604.2 | 35.1 | nd | nd | nd |
| HC39 | 1 | 21 | 0.25 | 2.75 | 82.12 | 1000.0 | 58.1 | nd | nd | nd |
| HC39 | 1 | 21 | 0.14 | 2.75 | 82.12 | 1864.3 | 108.4 | nd | nd | nd |
| HC39 | 1 | 21 | 0.13 | 3 | 89.59 | 2207.7 | 128.3 | nd | nd | nd |
| SC12 | 1 | 21 | 0.49 | 4.94 | 147.52 | 908.2 | 52.8 | nd | nd | nd |
| SC12 | 1 | 21 | 0.14 | 3.38 | 100.93 | 2314.3 | 134.5 | nd | nd | nd |
| SC12 | 1 | 21 | 0.11 | 4.48 | 133.78 | 3972.7 | 230.9 | nd | nd | nd |
| SC12 | 1 | 21 | 0.24 | 6.62 | 197.69 | 2658.3 | 154.5 | nd | nd | nd |
| SC12 | 1 | 21 | 0.17 | 4.61 | 137.66 | 2611.8 | 151.8 | nd | nd | nd |
| SC12 | 1 | 21 | 0.13 | 3.68 | 109.89 | 2730.8 | 158.7 | nd | nd | nd |
| SC12 | 1 | 21 | 0.15 | 2.32 | 69.28 | 1446.7 | 84.1 | nd | nd | nd |
| SC12 | 1 | 21 | 0.25 | 2.83 | 84.51 | 1032.0 | 60.0 | nd | nd | nd |
| SC4 | 1 | 21 | 0.21 | 2.4 | 71.67 | 1042.9 | 60.6 | nd | nd | nd |
| SC4 | 1 | 21 | 0.44 | 2.6 | 77.64 | 490.9 | 28.5 | nd | nd | nd |
| SC4 | 1 | 21 | 0.34 | 5.05 | 150.80 | 1385.3 | 80.5 | nd | nd | nd |
| SC4 | 1 | 21 | 0.32 | 2.3 | 68.68 | 618.8 | 36.0 | nd | nd | nd |
| SC4 | 1 | 21 | 0.16 | 1.19 | 35.54 | 643.8 | 37.4 | nd | nd | nd |
| SC4 | 1 | 21 | 0.15 | 2.21 | 65.99 | 1373.3 | 79.8 | nd | nd | nd |
| SC4 | 1 | 21 | 0.31 | 2.02 | 60.32 | 551.6 | 32.1 | nd | nd | nd |
| SC4 | 1 | 21 | 0.33 | 2.88 | 86.00 | 772.7 | 44.9 | nd | nd | nd |
| SC11 | 1 | 21 | 1.1 | 4.97 | 148.41 | 351.8 | 20.5 | nd | nd | nd |
| SC11 | 2 | 21 | 0.24 | 1.88 | 51.81 | 683.3 | 75.7 | nd | nd | nd |
| SC11 | 2 | 21 | 0.25 | 1.63 | 44.92 | 552.0 | 61.2 | nd | nd | nd |
| SC11 | 2 | 21 | 0.34 | 1.64 | 45.19 | 382.4 | 42.4 | nd | nd | nd |
| SC11 | 2 | 21 | 0.19 | 0.94 | 25.90 | 394.7 | 43.7 | nd | nd | nd |
| SC11 | 2 | 21 | 0.31 | 1.87 | 51.53 | 503.2 | 55.8 | nd | nd | nd |
| SC11 | 2 | 21 | 0.22 | 1.32 | 36.38 | 500.0 | 55.4 | nd | nd | nd |
| SC11 | 2 | 21 | 0.23 | 1.63 | 44.92 | 608.7 | 67.4 | nd | nd | nd |
| SC20 | 2 | 21 | 0.2 | 1.41 | 38.86 | 605.0 | 67.0 | nd | nd | nd |
| SC20 | 2 | 21 | 0.41 | 2.33 | 64.21 | 468.3 | 51.9 | nd | nd | nd |
| SC20 | 2 | 21 | 0.22 | 1.21 | 33.34 | 450.0 | 49.9 | nd | nd | nd |
| SC20 | 2 | 21 | 0.35 | 2.01 | 55.39 | 474.3 | 52.5 | nd | nd | nd |
| SC20 | 2 | 21 | 0.23 | 1.3 | 35.83 | 465.2 | 51.5 | nd | nd | nd |
| SC20 | 2 | 21 | 0.18 | 1.56 | 42.99 | 766.7 | 84.9 | nd | nd | nd |
| SC20 | 2 | 21 | 0.21 | 1.31 | 36.10 | 523.8 | 58.0 | nd | nd | nd |
| SC20 | 2 | 21 | 0.5 | 2.05 | 56.49 | 310.0 | 34.3 | nd | nd | nd |
| HC38 | 2 | 21 | 0.28 | 1.44 | 39.68 | 414.3 | 45.9 | nd | nd | nd |
| HC38 | 2 | 21 | 0.32 | 2.65 | 73.03 | 728.1 | 80.7 | nd | nd | nd |
| HC38 | 2 | 21 | 0.32 | 1.74 | 47.95 | 443.8 | 49.2 | nd | nd | nd |
| HC38 | 2 | 21 | 0.53 | 2.54 | 70.00 | 379.2 | 42.0 | nd | nd | nd |
| HC38 | 2 | 21 | 0.2 | 1.04 | 28.66 | 420.0 | 46.5 | nd | nd | nd |
| HC38 | 2 | 21 | 0.25 | 1.2 | 33.07 | 380.0 | 42.1 | nd | nd | nd |
| HC38 | 2 | 21 | 0.19 | 1.03 | 28.38 | 442.1 | 49.0 | nd | nd | nd |
| HC38 | 2 | 21 | 0.11 | 0.81 | 22.32 | 636.4 | 70.5 | nd | nd | nd |
| GC3 | 2 | 21 | 0.47 | 2.53 | 69.72 | 438.3 | 48.6 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| GC3 | 2 | 21 | 0.3 | 1.12 | 30.86 | 273.3 | 30.3 | nd | nd | nd |
| GC3 | 2 | 21 | 0.25 | 0.56 | 15.43 | 124.0 | 13.7 | nd | nd | nd |
| GC3 | 2 | 21 | 0.15 | 0.64 | 17.64 | 326.7 | 36.2 | nd | nd | nd |
| GC3 | 2 | 21 | 0.19 | 1.17 | 32.24 | 515.8 | 57.1 | nd | nd | nd |
| GC3 | 2 | 21 | 0.23 | 0.94 | 25.90 | 308.7 | 34.2 | nd | nd | nd |
| GC3 | 2 | 21 | 0.3 | 1.29 | 35.55 | 330.0 | 36.6 | nd | nd | nd |
| GC3 | 2 | 21 | 0.14 | 0.66 | 18.19 | 371.4 | 41.2 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.6 | 4.68 | 128.97 | 680.0 | 75.3 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.32 | 3.75 | 103.34 | 1071.9 | 118.8 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.22 | 2.7 | 74.41 | 1127.3 | 124.9 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.32 | 1.38 | 38.03 | 331.3 | 36.7 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.3 | 3.4 | 93.70 | 1033.3 | 114.5 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.38 | 2.52 | 69.45 | 563.2 | 62.4 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.27 | 2.77 | 76.33 | 925.9 | 102.6 | nd | nd | nd |
| CONTROL | 2 | 21 | 0.42 | 3.69 | 101.69 | 778.6 | 86.3 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.43 | 3.97 | 155.88 | 823.3 | 112.7 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.36 | 3.87 | 151.95 | 975.0 | 133.4 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.37 | 2.05 | 80.49 | 454.1 | 62.1 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.29 | 1.98 | 77.74 | 582.8 | 79.8 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.34 | 3.42 | 134.28 | 905.9 | 124.0 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.26 | 1.24 | 48.69 | 376.9 | 51.6 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.49 | 1.12 | 43.98 | 128.6 | 17.6 | nd | nd | nd |
| CONTROL | 3 | 21 | 0.15 | 3.3 | 129.57 | 2100.0 | 287.4 | nd | nd | nd |
| SC19 | 3 | 21 | 0.21 | 1.55 | 60.86 | 638.1 | 87.3 | nd | nd | nd |
| SC19 | 3 | 21 | 0.35 | 1.68 | 65.96 | 380.0 | 52.0 | nd | nd | nd |
| SC19 | 3 | 21 | 0.32 | 1.46 | 57.33 | 356.3 | 48.8 | nd | nd | nd |
| SC19 | 3 | 21 | 0.35 | 2.15 | 84.42 | 514.3 | 70.4 | nd | nd | nd |
| SC19 | 3 | 21 | 0.31 | 1.6 | 62.82 | 416.1 | 57.0 | nd | nd | nd |
| SC19 | 3 | 21 | 0.13 | 1.01 | 39.66 | 676.9 | 92.6 | nd | nd | nd |
| SC19 | 3 | 21 | 0.28 | 2.48 | 97.37 | 785.7 | 107.5 | nd | nd | nd |
| SC19 | 3 | 21 | 0.14 | 1.56 | 61.25 | 1014.3 | 138.8 | nd | nd | nd |
| HC37 | 3 | 21 | 0.24 | 1.4 | 54.97 | 483.3 | 66.2 | nd | nd | nd |
| HC37 | 3 | 21 | 0.2 | 1.36 | 53.40 | 580.0 | 79.4 | nd | nd | nd |
| HC37 | 3 | 21 | 0.28 | 1.46 | 57.33 | 421.4 | 57.7 | nd | nd | nd |
| HC37 | 3 | 21 | 0.42 | 2.45 | 96.20 | 483.3 | 66.2 | nd | nd | nd |
| HC37 | 3 | 21 | 0.29 | 0.7 | 27.48 | 141.4 | 19.3 | nd | nd | nd |
| HC37 | 3 | 21 | 0.28 | 1.32 | 51.83 | 371.4 | 50.8 | nd | nd | nd |
| HC37 | 3 | 21 | 0.42 | 2.08 | 81.67 | 395.2 | 54.1 | nd | nd | nd |
| HC37 | 3 | 21 | 0.53 | 1.76 | 69.10 | 232.1 | 31.8 | nd | nd | nd |
| SC8 | 3 | 21 | 0.26 | 2.35 | 92.27 | 803.8 | 110.0 | nd | nd | nd |
| SC8 | 3 | 21 | 0.34 | 1.93 | 75.78 | 467.6 | 64.0 | nd | nd | nd |
| SC8 | 3 | 21 | 0.31 | 5.41 | 212.42 | 1645.2 | 225.2 | nd | nd | nd |
| SC8 | 3 | 21 | 0.26 | 1.31 | 51.44 | 403.8 | 55.3 | nd | nd | nd |
| SC8 | 3 | 21 | 0.34 | 2 | 78.53 | 488.2 | 66.8 | nd | nd | nd |
| SC8 | 3 | 21 | 0.18 | 1.69 | 66.36 | 838.9 | 114.8 | nd | nd | nd |
| SC8 | 3 | 21 | 0.28 | 1.61 | 63.21 | 475.0 | 65.0 | nd | nd | nd |
| SC8 | 3 | 21 | 0.3 | 1.4 | 54.97 | 366.7 | 50.2 | nd | nd | nd |
| GC4 | 3 | 21 | 0.32 | 1.71 | 67.14 | 434.4 | 59.5 | nd | nd | nd |
| GC4 | 3 | 21 | 0.3 | 1.25 | 49.08 | 316.7 | 43.3 | nd | nd | nd |
| GC4 | 3 | 21 | 0.28 | 1.31 | 51.44 | 367.9 | 50.3 | nd | nd | nd |
| GC4 | 3 | 21 | 0.18 | 0.79 | 31.02 | 338.9 | 46.4 | nd | nd | nd |
| GC4 | 3 | 21 | 0.44 | 2.05 | 80.49 | 365.9 | 50.1 | nd | nd | nd |
| GC4 | 3 | 21 | 0.31 | 1.52 | 59.68 | 390.3 | 53.4 | nd | nd | nd |
| GC4 | 3 | 21 | 0.31 | 0.99 | 38.87 | 219.4 | 30.0 | nd | nd | nd |
| GC4 | 3 | 21 | 0.49 | 1.73 | 67.93 | 253.1 | 34.6 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| CONTROL | 4 | 21 | 0.28 | 2.46 | 95.42 | 778.6 | 77.5 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.16 | 2.97 | 115.20 | 1756.3 | 174.9 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.17 | 1.5 | 58.18 | 782.4 | 77.9 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.29 | 2.31 | 89.60 | 696.6 | 69.4 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.15 | 1.56 | 60.51 | 940.0 | 93.6 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.27 | 3.36 | 130.33 | 1144.4 | 114.0 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.24 | 2.19 | 84.95 | 812.5 | 80.9 | nd | nd | nd |
| CONTROL | 4 | 21 | 0.13 | 0.38 | 14.74 | 192.3 | 19.1 | nd | nd | nd |
| GC2 | 4 | 21 | 0.16 | 0.62 | 24.05 | 287.5 | 28.6 | nd | nd | nd |
| GC2 | 4 | 21 | 0.2 | 0.95 | 36.85 | 375.0 | 37.3 | nd | nd | nd |
| GC2 | 4 | 21 | 0.14 | 0.98 | 38.01 | 600.0 | 59.7 | nd | nd | nd |
| GC2 | 4 | 21 | 0.12 | 0.84 | 32.58 | 600.0 | 59.7 | nd | nd | nd |
| GC2 | 4 | 21 | 0.19 | 1.41 | 54.69 | 642.1 | 63.9 | nd | nd | nd |
| GC2 | 4 | 21 | 0.19 | 0.6 | 23.27 | 215.8 | 21.5 | nd | nd | nd |
| GC2 | 4 | 21 | 0.16 | 0.95 | 36.85 | 493.7 | 49.2 | nd | nd | nd |
| GC2 | 4 | 21 | 0.1 | 0.15 | 5.82 | 50.0 | 5.0 | nd | nd | nd |
| SC16 | 4 | 21 | 0.21 | 0.83 | 32.19 | 295.2 | 29.4 | nd | nd | nd |
| SC16 | 4 | 21 | 0.12 | 0.39 | 15.13 | 225.0 | 22.4 | nd | nd | nd |
| SC16 | 4 | 21 | 0.16 | 1.2 | 46.55 | 650.0 | 64.7 | nd | nd | nd |
| SC16 | 4 | 21 | 0.24 | 1.19 | 46.16 | 395.8 | 39.4 | nd | nd | nd |
| SC16 | 4 | 21 | 0.3 | 1.24 | 48.10 | 313.3 | 31.2 | nd | nd | nd |
| SC16 | 4 | 21 | 0.32 | 1.48 | 57.41 | 362.5 | 36.1 | nd | nd | nd |
| SC16 | 4 | 21 | 0.19 | 1.11 | 43.05 | 484.2 | 48.2 | nd | nd | nd |
| SC16 | 4 | 21 | 0.19 | 1.85 | 71.76 | 873.7 | 87.0 | nd | nd | nd |
| HC40 | 4 | 21 | 0.16 | 1.14 | 44.22 | 612.5 | 61.0 | nd | nd | nd |
| HC40 | 4 | 21 | 0.2 | 0.52 | 20.17 | 160.0 | 15.9 | nd | nd | nd |
| HC40 | 4 | 21 | 0.21 | 1.07 | 41.50 | 409.5 | 40.8 | nd | nd | nd |
| HC40 | 4 | 21 | 0.2 | 0.78 | 30.25 | 290.0 | 28.9 | nd | nd | nd |
| HC40 | 4 | 21 | 0.18 | 1.09 | 42.28 | 505.6 | 50.3 | nd | nd | nd |
| HC40 | 4 | 21 | 0.14 | 0.84 | 32.58 | 500.0 | 49.8 | nd | nd | nd |
| HC40 | 4 | 21 | 0.1 | 0.79 | 30.64 | 690.0 | 68.7 | nd | nd | nd |
| HC40 | 4 | 21 | 0.28 | 1.68 | 65.16 | 500.0 | 49.8 | nd | nd | nd |
| HC43 | 4 | 21 | 0.2 | 1.55 | 60.12 | 675.0 | 67.2 | nd | nd | nd |
| HC43 | 4 | 21 | 0.18 | 0.32 | 12.41 | 77.8 | 7.7 | nd | nd | nd |
| HC43 | 4 | 21 | 0.17 | 0.84 | 32.58 | 394.1 | 39.2 | nd | nd | nd |
| HC43 | 4 | 21 | 0.25 | 0.82 | 31.81 | 228.0 | 22.7 | nd | nd | nd |
| HC43 | 4 | 21 | 0.3 | 2.48 | 96.19 | 726.7 | 72.4 | nd | nd | nd |
| HC43 | 4 | 21 | 0.21 | 1.21 | 46.93 | 476.2 | 47.4 | nd | nd | nd |
| HC43 | 4 | 21 | 0.17 | 0.62 | 24.05 | 264.7 | 26.4 | nd | nd | nd |
| HC43 | 4 | 21 | 0.4 | 2.49 | 96.58 | 522.5 | 52.0 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.22 | 1.19 | 84.66 | 440.9 | 101.8 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.22 | 0.58 | 41.26 | 163.6 | 37.8 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.36 | 0.75 | 53.36 | 108.3 | 25.0 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.34 | 0.97 | 69.01 | 185.3 | 42.8 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.45 | 3.3 | 234.77 | 633.3 | 146.2 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.22 | 0.47 | 33.44 | 113.6 | 26.2 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.27 | 2.45 | 174.30 | 807.4 | 186.4 | nd | nd | nd |
| CONTROL | 5 | 21 | 0.22 | 0.53 | 37.71 | 140.9 | 32.5 | nd | nd | nd |
| GC1 | 5 | 21 | 0.3 | 0.96 | 68.30 | 220.0 | 50.8 | nd | nd | nd |
| GC1 | 5 | 21 | 0.28 | 0.31 | 22.05 | 10.7 | 2.5 | nd | nd | nd |
| GC1 | 5 | 21 | 0.27 | 0.64 | 45.53 | 137.0 | 31.6 | nd | nd | nd |
| GC1 | 5 | 21 | 0.21 | 0.93 | 66.16 | 342.9 | 79.2 | nd | nd | nd |
| GC1 | 5 | 21 | 0.39 | 0.88 | 62.61 | 125.6 | 29.0 | nd | nd | nd |
| GC1 | 5 | 21 | 0.37 | 1.46 | 103.87 | 294.6 | 68.0 | nd | nd | nd |
| GC1 | 5 | 21 | 0.27 | 1.34 | 95.33 | 396.3 | 91.5 | nd | nd | nd |

Appendix C-4 cont'd.

| Treatment | Run | Days | Initial Fresh Weight (g) | Final Fresh Weight (g) | Fresh Wt. as % Control | %Change Fresh Wt. | %Change Fresh Wt. as % Control | Number of Rhizomes | Longest Leaf Length(cm) | Dry Wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| GC1 | 5 | 21 | 0.19 | 0.87 | 61.89 | 357.9 | 82.6 | nd | nd | nd |
| GC5 | 5 | 21 | 0.24 | 0.7 | 49.80 | 191.7 | 44.3 | nd | nd | nd |
| GC5 | 5 | 21 | 0.25 | 0.6 | 42.69 | 140.0 | 32.3 | nd | nd | nd |
| GC5 | 5 | 21 | 0.18 | 0.26 | 18.50 | 44.4 | 10.3 | nd | nd | nd |
| GC5 | 5 | 21 | 0.26 | 0.46 | 32.73 | 76.9 | 17.8 | nd | nd | nd |
| GC5 | 5 | 21 | 0.38 | 1.53 | 108.85 | 302.6 | 69.9 | nd | nd | nd |
| GC5 | 5 | 21 | 0.35 | 0.96 | 68.30 | 174.3 | 40.2 | nd | nd | nd |
| GC5 | 5 | 21 | 0.19 | 0.81 | 57.63 | 326.3 | 75.3 | nd | nd | nd |
| GC5 | 5 | 21 | 0.31 | 0.81 | 57.63 | 161.3 | 37.2 | nd | nd | nd |
| SC13 | 5 | 21 | 0.36 | 1.17 | 83.24 | 225.0 | 51.9 | nd | nd | nd |
| SC13 | 5 | 21 | 0.3 | 0.55 | 39.13 | 83.3 | 19.2 | nd | nd | nd |
| SC13 | 5 | 21 | 0.2 | 0.85 | 60.47 | 325.0 | 75.0 | nd | nd | nd |
| SC13 | 5 | 21 | 0.27 | 0.36 | 25.61 | 33.3 | 7.7 | nd | nd | nd |
| SC13 | 5 | 21 | 0.3 | 1.03 | 73.28 | 243.3 | 56.2 | nd | nd | nd |
| SC13 | 5 | 21 | 0.18 | 0.35 | 24.90 | 94.4 | 21.8 | nd | nd | nd |
| SC13 | 5 | 21 | 0.19 | 0.44 | 31.30 | 131.6 | 30.4 | nd | nd | nd |
| SC13 | 5 | 21 | 0.21 | 0.43 | 30.59 | 104.8 | 24.2 | nd | nd | nd |
| SC25 | 5 | 21 | 0.23 | 1.31 | 93.20 | 469.6 | 108.4 | nd | nd | nd |
| SC25 | 5 | 21 | 0.27 | 2.44 | 173.59 | 803.7 | 185.6 | nd | nd | nd |
| SC25 | 5 | 21 | 0.41 | 2.35 | 167.19 | 473.2 | 109.2 | nd | nd | nd |
| SC25 | 5 | 21 | 0.2 | 1.45 | 103.16 | 625.0 | 144.3 | nd | nd | nd |
| SC25 | 5 | 21 | 0.19 | 0.72 | 51.22 | 278.9 | 64.4 | nd | nd | nd |
| SC25 | 5 | 21 | 0.43 | 1.07 | 76.12 | 148.8 | 34.4 | nd | nd | nd |
| SC25 | 5 | 21 | 0.19 | 0.9 | 64.03 | 373.7 | 86.3 | nd | nd | nd |
| SC25 | 5 | 21 | 0.34 | 1.49 | 106.00 | 338.2 | 78.1 | nd | nd | nd |

nd=data not collected

## Metal Concentrations in Brown Bullheads

Brown bullheads *(Ictalurus nebulosus)* are bottom dwelling fish that feed on both live and decaying plant and animal materials. They are frequently in contact with sediments which may hold enriched sources of metals and other contaminants. Their unique position in the food chain, benthic-dwelling habits, and tolerance for low quality water make them excellent subjects for assessing the local impacts of contaminants. Brown bullheads as well as other catfish have been reported to harbor elevated concentrations of a variety of metallic and organic contaminants in their tissues (Johnston and Baumann 1989, Baumann et al. 1987, Murphy et al.1978, Kim et al. 1989, Winger et al. 1990, Heit and Klusek 1985). In addition, brown bullheads and other Ictalurids taken from contaminated waters present a variety of physiological responses and pathological lesions associated with exposure to toxic chemicals (Gallagher and Di Giulio 1989, Maccubbin and Ersing 1991, Brown et al. 1973, Bowser et al. 1990).

Our preliminary surveys demonstrated that brown bullheads were relatively abundant in Slocum Creek and nearby creeks in the lower Neuse River. Based on their abundance and rather common use in aquatic contaminant assessments, we focused on the brown bullhead as the principle species for study. In this report section we quantify the relative degree of contamination of brown bullheads within Slocum Creek, and among Slocum and Goose and Hancock Creeks. Our specific objectives were: 1) to determine if metal concentrations in brown bullheads from Slocum Creek are different than those two relatively uncontaminated creeks (Hancock and Goose Creeks); 2) to determine if there is a difference in metal concentrations in brown bullheads within specific areas of Slocum Creek (East Prong, Southwest Prong, and mainstem).

### Methods

Brown bullheads were captured by hook and line, fike nets, and electroshocking during the summer of 1992. Samples were collected

from Goose Creek, Hancock Creek and three portions of Slocum Creek (Figure 1, 2). A subsample of these fish was selected to achieve about 10 fish per site. Length, weight, and gross pathological lesions were noted on all fish and are reported in other sections of this report.

Analytical work on metals in fish has generally been focused on whole bodies or muscle tissue rather than analyses of liver and kidney tissues (examples: Heit and Klusek 1985, Winger et al. 1990, Murphy et al. 1978, Giesy and Wiener 1977). This is probably because of the desire to link residues in fish with human and wildlife food chains. Because the present study was designed to examine the relative degree of metal contamination among creeks, we targeted liver and kidney for analyses in order to obtain better resolution and greater biological interpretation.

Analytical sensitivity is independent of tissue type. Better resolution (fewer negative values or values below the analytical detection limit) is obtained by sampling tissues that tend to accumulate contaminants rather than those that do not. In general, liver and kidney tissue of terrestrial vertebrates are better accumulators of metal contaminants than is muscle, and therefore, these tissues are typically targeted for metal analyses. Less work has been done with metal accumulation in various organs of fish. Available reports on this topic suggest that metals do accumulate in fish liver and kidney (Garofano and Hirshfield 1982, McKim et al. 1976, McFarlane and Franzin 1980) and that the concentrations may be higher than those in whole bodies or other tissues (Berg and Burns 1985, Burrows and Krenkel 1973, Weisbart 1973). There is also some indication that metal concentrations in liver better reflect long term exposure to low levels of metals than do other tissues (Benedetti et al.1989) and that loss rates of some metals from liver and kidney are less than for whole bodies (Weisbart 1973).

We chose to work primarily with liver rather than kidney because of its larger size, which provides some analytical benefits. However, a small number of kidney samples were also analyzed to compare the accumulation of metals in kidney and liver tissues from the same individuals.

Most fish collected and used in the residue samples were 325-

400 mm in length. Analytical samples were collected at necropsy. Samples of liver and head kidney were frozen in chemically cleaned glass jars (ICHEM®, Fisher Scientific). Instruments were repeatedly cleaned in distilled water, acetone, and then hexane as samples were being collected.

Samples were analyzed under contracts established by the U. S. Fish and Wildlife Service, Patuxent Analytical Control Facility (PACF), Laurel, MD. The PACF was established by the Fish and Wildlife Service to assure analytical quality control and assurance for all Fish and Wildlife analytical samples. The contractors are required to perform under a set of Standard Operating Procedures, with specified performance on duplicate and spiked samples.

The details of the analytical methods are included in Appendix D-1. The 17 analytes quantified were aluminum, boron, barium, beryllium, cadmium, chromium, copper, iron, mercury, magnesium, manganese, molybdenum, nickel, lead, strontium, vanadium, and zinc. All of these analytes were quantified by Inductively Coupled Plasma emission techniques, except for mercury. Mercury was quantified by Graphite Furnace and Cold Vapor Atomic Absorption.

Metal concentrations are reported on a dry weight basis. Analytical sensitivities for each sample differed slightly based on the amount of tissue submitted. These limits of sensitivity were established for samples based on fresh weights. Conversion of analytical detection limits to a dry weight basis, coupled with the differences in the amount of tissue submitted for analyses, resulted in apparently different analytical detection limits for each sample and therefore among sites. However, these differences are considered minimal and were not considered in the statistical analyses of the data. Actual levels of sensitivities for each sample are presented in the analytical report (Appendix D-1).

The proportion of samples with detectable metal analytes was compared among sites using Pearson's Chi-square tests. If the proportion of samples with detectable residues per site was ≥50%, the data were log normalized and geometric means calculated. It was not considered useful to present geometric means when the proportion of samples with analytes was <50%. When all sites of interest had

samples with analytes was <50%. When all sites of interest had detectable residues ≥50%, we compared among sites using a one-way ANOVA with Tukey's test for differences among means. For these parametric statistics we used half the analytical detection limit as the value for non-detects. The relationship between metals was examined by correlation analysis. We used multivariate analysis of variance (MANOVA) to examine whether the combination of (log-transformed) metal residues was distinguishable among creeks. Our analysis was based on 14 elements; we excluded beryllium, barium, and nickel which were rarely detected. To examine the potential influence of fish age/size on metal residues we regressed age, size, and length against the same 14 elements used in the MANOVA test. For all statistical tests, we set $\alpha = 0.05$.

## RESULTS

### Comparison of metal residues among creeks

All metal analytes except barium and beryllium were detectable in one or more brown bullhead livers from Goose, Hancock, and Slocum Creeks (Figure 3, Table 1). Copper, iron, magnesium, manganese, strontium, and zinc occurred in all samples analyzed. The occurrence of individual metals differed significantly by creek for aluminum, cadmium, and vanadium. In every case where the occurrence of individual metals differed significantly, the proportion of samples containing detectable residues was highest in samples from Slocum Creek.

Using our established criteria for comparison of average metal concentrations (≥50% of the samples from each site with detectable levels of individual metals), we were able to test 9 metals for differences among creeks (Table 1). Differences among creeks were not significant for aluminum, boron, iron, and manganese. Metals that differed significantly among creeks were copper, mercury, magnesium, strontium, and zinc. In no case were metal concentrations higher in fish from Slocum Creek compared to other creeks (Table 1).

Correlation coefficients for metal concentrations in liver were

concentration of individual metals were not linked with those of other metals.

The MANOVA test was used to distinguish patterns of overall metal concentrations among creeks. These overall patterns are based on all metals analyzed rather than individual metals. Our MANOVA test indicated that the overall pattern of log-transformed residue levels differed significantly among creeks. To illustrate the differences, we plotted multivariate least-squares means for the canonical variables, which are linear combinations of the original variables based on the multivariate model being fitted (Figure 4). The plotted point for each creek represents the mean canonical score for all fish analyzed from that creek (centroid); each circle represents a 95% confidence region about that centroid (SAS Institute Inc.). Overlapping confidence regions would indicate that fish from the three creeks did not have distinguishable overall patterns of metal residues. In our case, however, confidence regions were clearly distinct, indicating that fish from different creeks can be characterized by the metals that they contain. Some of the elements accounting for the among-creek differences were Zn, Fe, Mg, Cu, and Hg.

**Comparison of metal residues within reaches of Slocum Creek**

Using univariate approaches, we did not detect any differences in the occurrence of metal residues among bullheads from the different reaches of Slocum Creek (Figure 5, Table 3). Likewise, there were no differences in the average metal concentrations among bullheads from the three reaches (Table 3). Using a multivariate approach, we found that fish from the three reaches of Slocum Creek differed significantly in the overall pattern of metal concentrations present. The significance level varied from 0.004 to 0.129 for the four approximate F tests; thus the absolute magnitude of the difference is unclear. However, the centroid plot (Figure 6) suggests that fish from the three reaches can be characterized by the pattern of metal residues within the liver. Elements contributing most strongly to the differences among reaches were Zn, Mg, Cd, and Cu.

**Metal Residues in Liver vs. Kidney**

We analyzed 11 kidney samples for comparison with liver tissues. In general, the occurrence of detectable residues and average residue levels were similar between liver and kidney tissues, or were higher in liver than for kidney (Table 4). The major exception to this was cadmium, which averaged about 5X higher in kidney than in liver from the same individuals. Zinc also tended to be higher in kidneys than in livers.

Metal residues in livers and kidneys generally showed a high degree of correlation (Table 5). The correlation between kidney and liver was negative for zinc, but was positive otherwise for metals in which a high degree of interrelatedness was observed.

**Metal residues in relation to fish age and size**

Fish subjected to chemical analyses were of relatively uniform length for Slocum (365 mm) and Hancock Creeks (351 mm) , but mean length for fish from Goose Creek (298 mm) was significantly less than for Slocum and Hancock Creeks. For metals that are positively correlated with fish size, the differences in fish size among the three creeks would result in a size dependent elevation of mean metal concentrations fish from Slocum and Hancock Creeks compared to Goose Creek. Thus for these metals, the size bias tends to overestimate the relative metal concentrations in Slocum and Hancock Creeks compared to Goose Creek.

Based on data from all creeks combined, iron was the only element in the liver that was positively correlated with age, length, and weight (Figure 7). Chromium and magnesium concentrations in the liver were negatively correlated with age, length and weight. Liver manganese, molybdenum, and strontium concentrations were negatively correlated with length and weight.

Metal concentrations in kidneys were less well correlated with age, length, and weight than were those in the liver (Figure 7). Cadmium and vanadium were positively correlated with length and weight, respectively.

Our kidney samples were all collected from Slocum Creek fish; however, liver samples were taken from fish from all three creeks. Thus, the correlations we obtained could be affected by differences among creeks. To address this concern, we also determined correlations for liver samples from Slocum Creek fish only. We found that correlations between age and metal concentration tended to be positive, although the correlation was significant only for aluminum (Figure 8). Cadmium, mercury, and vanadium were positively correlated with fish length whereas manganese was negatively correlated. For fish weight, cadmium and mercury were positively correlated; both manganese and molybdenum showed negative correlations.

## DISCUSSION

Riggs (1991) reported significant metal enrichment in the sediments of Slocum Creek compared to other sites sampled in the Lower Neuse River and its tributaries. Sediment enrichment factors varied considerably within Slocum Creek, with the highest enrichment factors occurring in East Branch (East Prong) and the upper portion of Slocum Creek (the section that we identified as the mainstem). Metals were also enriched in the surface sediments of the West Branch (Southwest Prong), but the enrichment was not as great as for the East Branch and the Upper Slocum areas. Riggs (1991) calculated a mean enrichment factor (EF) for each element by segment of Slocum Creek. Within East Branch, the EFs were: cadmium (14.4 X), molybdenum (4.2 X), chromium (6.5 X), mercury (2.8 X), lead (4.8 X), copper (7.5 X), nickel (2.2 X), and zinc (2.9 X). Enrichment factors in mainstem Slocum Creek were lower except for mercury (6.4 X). Riggs et al. (1991) reported minimal enrichment of sediments in the lower portion of Slocum Creek and in Goose and Hancock Creeks.

The current study was designed to optimize the potential for discriminating differences in metal concentrations in fish from several locations in the lower Neuse River. Fish from Slocum Creek were collected from the three areas that Riggs et al. (1991) identified as most contaminated based on sediment enrichment calculations. Our

choice of liver rather than muscle as the tissue of choice for analytical chemistry was designed to increase our resolution to discriminate differences in metal concentrations among sites. We optimized our experimental design to emphasize a single species, and to the extent practical, we standardized the size classes of fish included in our sample.

Based on this rigorous experimental design, we found little to indicate that fish from Slocum Creek were more contaminated with metals than fish from Hancock and Goose Creeks. The occurrence of metal concentrations above the minimum analytical detection limit was higher in Slocum Creek for some metals, but the concentrations of these metals were generally low. Mean metal concentrations in fish from Slocum Creek were not higher than for the other two creeks, and in some instances were significantly lower. Within the three sampled portions of Slocum Creek there were no differences in occurrence or average metal concentrations.

It is reasonable to ask why brown bullheads from Slocum Creek do not harbor higher metal concentrations than those from other creeks, even though sediments in Slocum Creek are enriched by a number of metals. There are several potential explanations for this. Fish may move between creeks and thus their metal concentrations do not reflect that of their current environment. Several points argue against this hypothesis. First, the turnover and movement of brown bullhead populations would have to be substantial within each creek. We believe that the salinity gradient from Goose, Hancock, and Slocum Creeks to the lower Neuse River provides a physiological barrier to the movement of fish. Smith (1971) as cited by Jones et al. (1978) reported finding brown bullheads at salinities up to 10 ppt in tidal tributaries of the Delaware River. Salinity that we recorded in the mouths of Slocum, Hancock, and Goose Creeks, as well as in the Neuse River, frequently approached or exceeded 10 ppt. Second, even species that are extremely mobile (migratory waterfowl for example), in aggregate reflect relative contamination of their local environments (Fleming and Atkeson 1980, Fleming and O'Shea 1980). Third, although we did not specifically examine fish movement pattern as part of this study, we used multivariate analyses to characterize the

overall metal patterns or "fingerprints" among sampling sites. We would expect that relatively non-mobile fish populations would develop distinctive metal fingerprints, whereas highly mobile populations that frequently interchange individuals would not have a distinctive pattern of metal residues. Our multivariate analyses indicate that there are distinct patterns of metal contamination that characterize each area studied. Therefore we are left with the conclusion that the movement of fish among study areas is not a major factor contributing to the similarities of metal concentrations among study sites.

An alternate hypothesis to explain the similarity in metal concentrations among sites is that although metals are enriched in the upper sediments of Slocum Creek, they are not bioavailable. The bioavailability of metals is a complex issue that requires the integration of physical and chemical properties of sediments and water with the types of organisms present. A description of factors controlling the bioavailability of metals in Slocum Creek was beyond the scope of this study. However, we offer the following observations. Ionic metals readily complex with organic materials, rendering metals less available to biological organisms. Our non-random subset of sediments from Slocum Creek (those we selected for metal analyses) were rich in organic materials. Metal ions combine with sulfides to form relatively insoluble metal sulfides that are not generally biologically available. We frequently smelled hydrogen sulfides while working in the field with fresh samples. Acid volatile sulfides were present in sediment samples analyzed for metals. This anecdotal and quantitative finding of sulfides in sediments is probably influential in the bioavailability of metals from sediments to biological organisms.

The analytical work performed for this study was conducted on liver and kidney tissues. These tissues generally concentrate metal contaminants to higher levels than do muscle or whole body, thereby providing improved resolution in the detection and quantification of metals in fish. For example, mercury levels in liver and kidney were 2 to 7 times higher than those in whole fish exposed to methylmercury (Burrows and Krenkel, 1973). Because an objective of this study was simply to determine if there were differences in fish from different sites, we wanted the highest level of resolution that we could obtain. Our

selection of liver tissue proved to be beneficial as most metals concentrated to a higher level in liver than in kidney. The drawback to our reliance on analyses of kidney and liver tissues is that there is little literature against which to compare residues or to interpret the biological consequences of the observed metal concentrations.

Several elements that are classified as metals are essential to physiological function and good health. For example, iron is essential in several bodily functions including the synthesis of hemoglobin. The mere presence of measurable amounts of metals in the organs of fish is not to be interpreted as a threat to the health of fish or to animals that eat fish, including man. However, even essential elements when acquired in higher amounts than necessary for the biochemical homeostasis, may prove detrimental to fish as well as other organisms. Because there is little literature to provide a proper interpretation of metal concentrations in bullheads or other fish, our biological interpretation of these data are limited to the physiologic, histologic, and survival data that are described elsewhere in this report.

Previous studies have demonstrated significant correlations of metal residues in fish with fish size. Mercury concentrations in white sucker *(Catostomus commersoni)* and brown bullhead dorsal muscle were significantly correlated with fish size, while zinc was negatively correlated with size in white suckers (Heit and Klusek 1985). The 12 other elements were not significantly correlated with size in either fish species. We did detect a positive correlation for cadmium and mercury concentrations within the liver versus length and weight for Slocum Creek brown bullhead. The only element positively correlated with length, weight, and age was aluminum. However, our study design was not optimized to detect size and age influences on metal concentrations. Our objective was to compare metal concentrations among creeks which required a sampling design that achieved equity among creeks with regard to fish size and age. We consider the potential for age, weight, and length to influence the interpretation of our site to site comparisons of metal concentrations to be low.

## CONCLUSIONS

Metal concentrations in the liver tissue of brown bullheads were compared among Slocum, Hancock, and Goose Creeks, as well as among three sites within Slocum Creek. Fish from Slocum Creek had an equal or higher percentage of sampled fish with metal concentrations above analytical detection limits compared to other creeks. However, metal concentrations were not higher in Slocum Creek compared to Goose and Hancock Creeks. Metal concentrations within reaches of Slocum Creek did not differ significantly. These data suggest that the higher incidence of detectable metal concentrations in Slocum Creek compared to Goose and Hancock Creeks is the result of a shift of metal concentrations from below analytical detection limits to concentrations minimally above those limits. Overall, the data support the conclusion that metal concentrations in brown bullheads do not reflect the creek- and location-specific metal enrichment of sediments as reported by Riggs (1991). It is hypothesized that the bioavailability of metals from the sediments to food chains is limited due to existing physical and chemical factors present in the sediments of Slocum Creek.

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Table 1. Geometric means, minimum and maximum values (ppm dry wt.), and occurrence (% of samples with metals above minimum detection limit) of metals in the livers of brown bullheads collected from Goose, Hancock, and Slocum Creeks, NC, 1991-92. Means for individual metals that are followed by different letters are significantly different ($p<0.05$). Comparison of geometric means for individual metals among creeks was only attempted if all three creeks had reportable geometric means meeting the following criterion. Geometric means were not calculated if fewer than 50% of the samples contained metals above the minimum analytical detection limit. Columns with bold numbers in the occurrence rows indicate that there was a significant difference in occurrence among creeks. Ba, Be, and Ni were not included in the table because of their infrequent occurrence.

| | | Al | B | Cd | Cr | Cu | Fe | Hg | Mg | Mn | Mo | Pb | Sr | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GOOSE** | GEOMEANS | 11.3 | 1.61 | | | 50 A | 921 | 0.31 A | 797 A | 5.11 | | | 3.53 A | | 113 A |
| | MINIMUM | <3.77 | 0.37 | <0.06 | <0.24 | 23 | 377 | <0.14 | 548 | 2.35 | <0.31 | <0.24 | 1.20 | <0.31 | 66 |
| | MAXIMUM | 48 | 4.97 | 1.53 | 2.07 | 77 | 3235 | 0.94 | 1220 | 10 | 2.34 | 6.83 | 16 | 1.96 | 153 |
| | OCCURRENCE | **50** | 80 | **30** | 20 | 100 | 100 | 90 | 100 | 100 | 40 | 30 | 100 | **30** | 100 |
| **HANCOCK** | GEOMEANS | 12.9 | 2.03 | | | 26 B | 1731 | 0.18 B | 761 AB | 5.60 | 0.69 | 0.68 | 1.98 AB | | 100 AB |
| | MINIMUM | <2.56 | 1.05 | <0.05 | <0.24 | 5.99 | 922 | 0.12 | 566 | 3.98 | <0.24 | <0.24 | 1.51 | <0.24 | 57 |
| | MAXIMUM | 1089 | 5.27 | 0.24 | 0.78 | 104 | 2355 | 0.33 | 974 | 8.65 | 2.13 | 1.73 | 2.51 | 1.22 | 180 |
| | OCCURRENCE | **70** | 100 | **30** | 20 | 100 | 100 | 100 | 100 | 100 | **70** | 60 | 100 | **30** | 100 |
| **SLOCUM** | GEOMEANS | 11.8 | 1.23 | 0.29 | | 37 AB | 2186 | 0.22 AB | 658 B | 6.08 | 0.66 | 0.67 | 1.63 B | | 97 B |
| | MINIMUM | <3.39 | 0.25 | <0.05 | <0.24 | 12 | 877 | 0.10 | 519 | 2.48 | <0.25 | <0.24 | 0.59 | <0.24 | 64 |
| | MAXIMUM | 27 | 4.00 | 2.25 | 0.97 | 94 | 4143 | 0.66 | 867 | 14 | 1.69 | 18.53 | 5.34 | 2.46 | 147 |
| | OCCURRENCE | **90** | 90 | **93** | 42 | 100 | 100 | 100 | 100 | 100 | 74 | 55 | 100 | **62** | 100 |

Table 2. Correlation coefficients for metal concentrations in livers of fish from Slocum, Hancock, and Goose Creeks, NC, 1991-1992.

| Al | B | Cd | Cr | Cu | Fe | Hg | Mg | Mn | Mo | Pb | Sr | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0000 | 0.1052 | 0.2802 | 0.0215 | 0.1460 | 0.1516 | 0.1449 | -0.0037 | 0.0264 | 0.1781 | 0.3137 | 0.0831 | 0.3129 | 0.3122 |
| | 1.0000 | 0.0364 | 0.2408 | -0.1106 | -0.1317 | -0.1052 | 0.3815 | 0.0486 | 0.1743 | 0.1956 | 0.4273 | 0.2275 | -0.1024 |
| | | 1.0000 | 0.0803 | 0.1034 | 0.2241 | 0.1727 | -0.0447 | 0.1864 | 0.2107 | 0.4544 | 0.0026 | 0.4342 | 0.1042 |
| | | | 1.0000 | 0.2148 | -0.5110 | -0.0539 | 0.5109 | 0.2604 | 0.1656 | 0.2338 | 0.2512 | 0.0434 | 0.2128 |
| | | | | 1.0000 | -0.0216 | 0.1337 | 0.0743 | -0.1197 | 0.3244 | 0.1449 | 0.0960 | 0.2038 | 0.7001 |
| | | | | | 1.0000 | 0.1423 | -0.4453 | 0.0019 | 0.0714 | 0.0281 | -0.2953 | 0.2108 | -0.1048 |
| | | | | | | 1.0000 | -0.0044 | -0.2719 | -0.0206 | -0.0853 | 0.1083 | 0.3415 | 0.2120 |
| | | | | | | | 1.0000 | 0.2181 | 0.1944 | 0.3914 | 0.5627 | -0.0721 | 0.3501 |
| | | | | | | | | 1.0000 | 0.3993 | 0.1678 | -0.0041 | 0.0074 | -0.0107 |
| | | | | | | | | | 1.0000 | 0.1168 | -0.0238 | 0.3059 | 0.4223 |
| | | | | | | | | | | 1.0000 | 0.2484 | 0.1814 | 0.2139 |
| | | | | | | | | | | | 1.0000 | 0.2407 | 0.1156 |
| | | | | | | | | | | | | 1.0000 | 0.1616 |
| | | | | | | | | | | | | | 1.0000 |

Table 3. Geometric means, minimum and maximum values (ppm dry wt.), and occurrence (% of samples with metals above minimun detection limit) of metals in the livers of brown bullheads collected from three reaches of Slocum Creek, NC, 1991-92. Geometric means and the occurrence of individual metals were not different ($p<0.05$) among reaches for any metal. Comparison of metals among creeks was only attempted if all three creeks had reportable geometric means meeting the following criterion. Geometric means were not calculated if fewer than 50% of the samples contained metals above the minimum analytical detection limit. Ba, Be, and Ni were not included in the table because of their infrequent occurrence.

| | | Al | B | Cd | Cr | Cu | Fe | Hg | Mg | Mn | Mo | Pb | Sr | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EAST** | GEOMEANS | 13 | 1.16 | 0.34 | 0.46 | 31 | 2142 | 0.22 | 695 | 7.38 | 0.53 | 0.98 | 1.90 | 0.44 | 91 |
| | MINIMUM | 4.14 | 0.30 | 0.05 | 0.25 | 13 | 1310 | 0.11 | 556 | 3.61 | 0.25 | 0.25 | 0.83 | 0.24 | 64 |
| | MAXIMUM | 21 | 2.69 | 2.25 | 0.97 | 67 | 2879 | 0.57 | 811 | 14.00 | 1.64 | 19.00 | 4.74 | 1.07 | 128 |
| | OCCURRENCE | 90 | 90 | 90 | 50 | 100 | 100 | 100 | 100 | 100 | 50 | 70 | 100 | 40 | 100 |
| **MAINSTEM** | GEOMEANS | 12 | 1.48 | 0.31 | 0.35 | 36 | 2066 | 0.24 | 638 | 5.45 | 0.66 | 0.55 | 1.42 | 0.83 | 94 |
| | MINIMUM | 3.39 | 0.68 | 0.07 | 0.24 | 12 | 877 | 0.10 | 519 | 2.48 | 0.25 | 0.25 | 0.59 | 0.34 | 65 |
| | MAXIMUM | 27 | 3.63 | 1.10 | 0.59 | 64 | 4143 | 0.66 | 769 | 10.00 | 1.22 | 2.33 | 2.87 | 1.97 | 128 |
| | OCCURRENCE | 80 | 100 | 90 | 30 | 100 | 100 | 100 | 100 | 100 | 80 | 40 | 100 | 80 | 100 |
| **WEST** | GEOMEANS | 11 | 1.11 | 0.23 | 0.37 | 44 | 2345 | 0.20 | 643 | 5.62 | 0.82 | 0.57 | 1.62 | 0.67 | 105 |
| | MINIMUM | 6.28 | 0.25 | 0.11 | 0.24 | 25 | 1449 | 0.10 | 560 | 3.93 | 0.25 | 0.25 | 1.00 | 0.25 | 91 |
| | MAXIMUM | 23 | 4.00 | 0.44 | 0.63 | 94 | 3568 | 0.59 | 867 | 7.71 | 1.69 | 1.85 | 5.34 | 2.46 | 147 |
| | OCCURRENCE | 100 | 82 | 100 | 45 | 100 | 100 | 100 | 100 | 100 | 91 | 54 | 100 | 73 | 100 |

Table 4. The occurrence and concentrations of 17 metals in the liver and head kidney of brown bullheads, Slocum Creek, 1991-1992. Geometric means are presented only if 50% or more of the samples had metal concentrations above the analytical detection limit. For statistical comparisons, NSD = no significant difference (P≤0.1).

| | | Al | B | Ba | Be | Cd | Cr | Cu | Fe | Hg | Mg | Mn | Mo | Ni | Pb | Sr | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kidney | % Occurrence | 36 | 73 | 0 | 9 | 100 | 18 | 100 | 100 | 55 | 100 | 100 | 0 | 9 | 18 | 100 | 64 | 100 |
| | Geometric Mean | | 1.72 | | | 1.01 | | 6.87 | 1357 | 0.12 | 653 | 4.25 | | | | 2.85 | 1.08 | 69 |
| | Minimum conc. | 3.58 | 0.36 | 0.34 | 0.07 | 0.33 | 0.34 | 3.35 | 890 | 0.04 | 466 | 2.31 | 0.34 | 0.34 | 0.34 | 1.85 | 0.40 | 50 |
| | Maximum conc. | 19.6 | 10.7 | 0.83 | 0.34 | 2.20 | 1.49 | 24.4 | 2963 | 0.40 | 802 | 12.8 | 0.83 | 1.48 | 2.93 | 4.74 | 4.29 | 94 |
| Liver | % Occurrence | 82 | 100 | 0 | 0 | 82 | 36 | 100 | 100 | 100 | 100 | 100 | 82 | 18 | 45 | 100 | 55 | 100 |
| | Geometric Mean | 10.3 | 1.92 | | | 0.22 | | 42.5 | 2225 | 0.21 | 650 | 5.86 | 0.78 | | | 2.01 | 0.58 | 99 |
| | Minimum conc. | 3.39 | 0.6 | 0.24 | 0.05 | 0.25 | 0.24 | 26.8 | 877 | 0.10 | 556 | 3.61 | 0.25 | 0.24 | 0.25 | 1.00 | 0.25 | 83 |
| | Maximum conc. | 26.6 | 4.00 | 0.46 | 0.09 | 0.44 | 0.97 | 66.5 | 4143 | 0.59 | 811 | 13 | 1.69 | 2.60 | 2.33 | 5.34 | 2.13 | 114 |
| Comparisons | % Occurrence (a) | | ≤0.1 | | | NSD | | NSD | NSD | ≤0.05 | NSD | NSD | | | | NSD | NSD | NSD |
| | Geometric Mean (b) | | ≤0.1 | | | ≤0.05 | | ≤0.05 | ≤0.05 | ≤0.1 | NSD | ≤0.1 | | | | ≤0.1 | ≤0.1 | ≤0.05 |

(a) Chi square test for the proportion of samples with detectable metal concentrations in liver and kidney.
(b) Student's T test on log transformed metal concentrations in liver and kidney.

Table 5. Correlation coefficients for metal concentrations in the livers and head kidneys of brown bullheads from Slocum Creek. Only elements that were above detection limits in more than 50% each of liver and kidney samples are presented.

| Element | Correlation Coefficient | Significance Level |
|---|---|---|
| B | 0.07 | 0.84 |
| Cd | 0.86 | 0.01 |
| Cu | -0.18 | 0.59 |
| Fe | 0.50 | 0.11 |
| Hg | 0.72 | 0.01 |
| Mg | 0.56 | 0.07 |
| Mn | 0.67 | 0.02 |
| Sr | 0.58 | 0.06 |
| V | 0.86 | 0.00 |
| Zn | -0.61 | 0.05 |

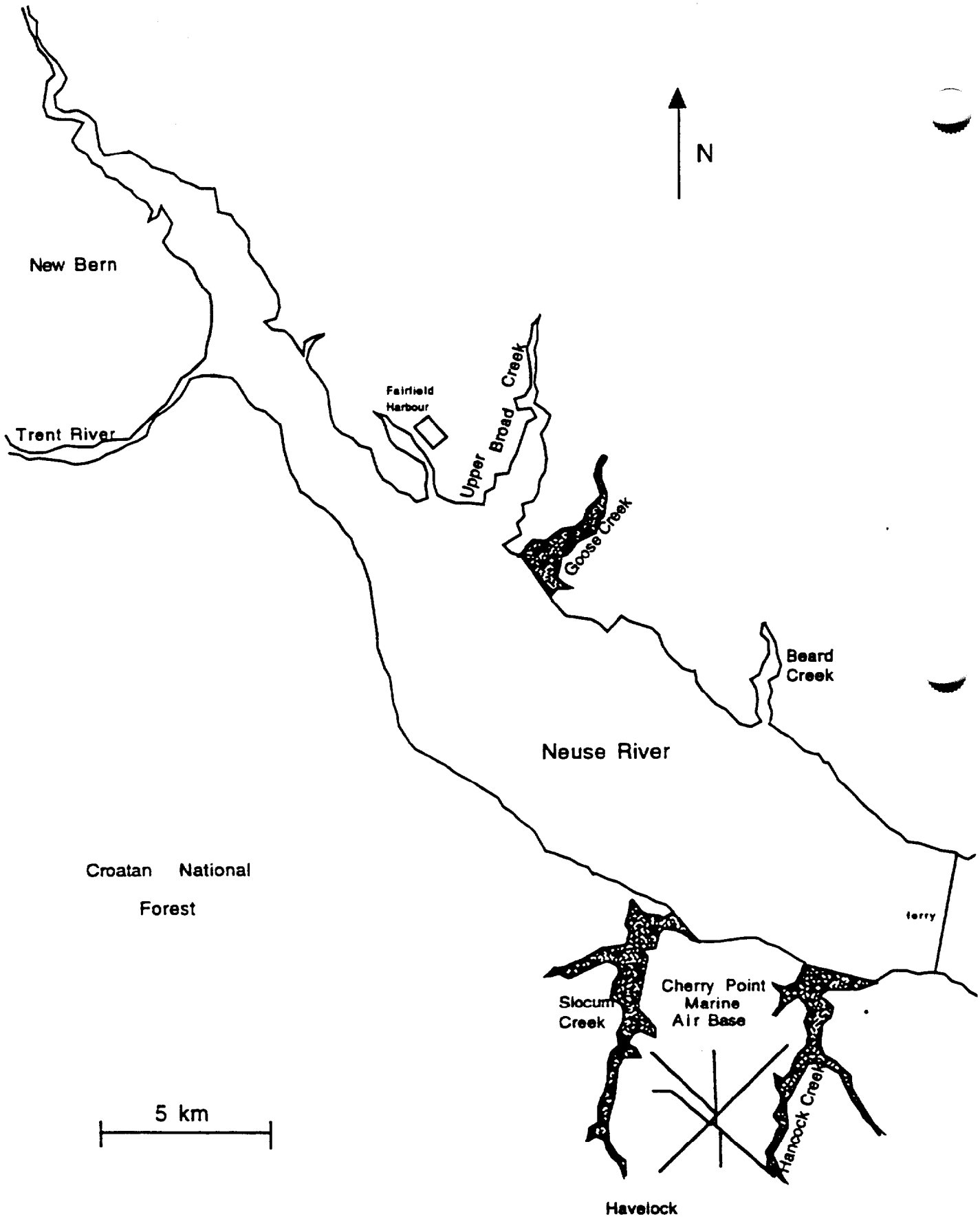



Figure 1. Locations of creeks from which brown bullheads were collected in 1992 for metal analyses.

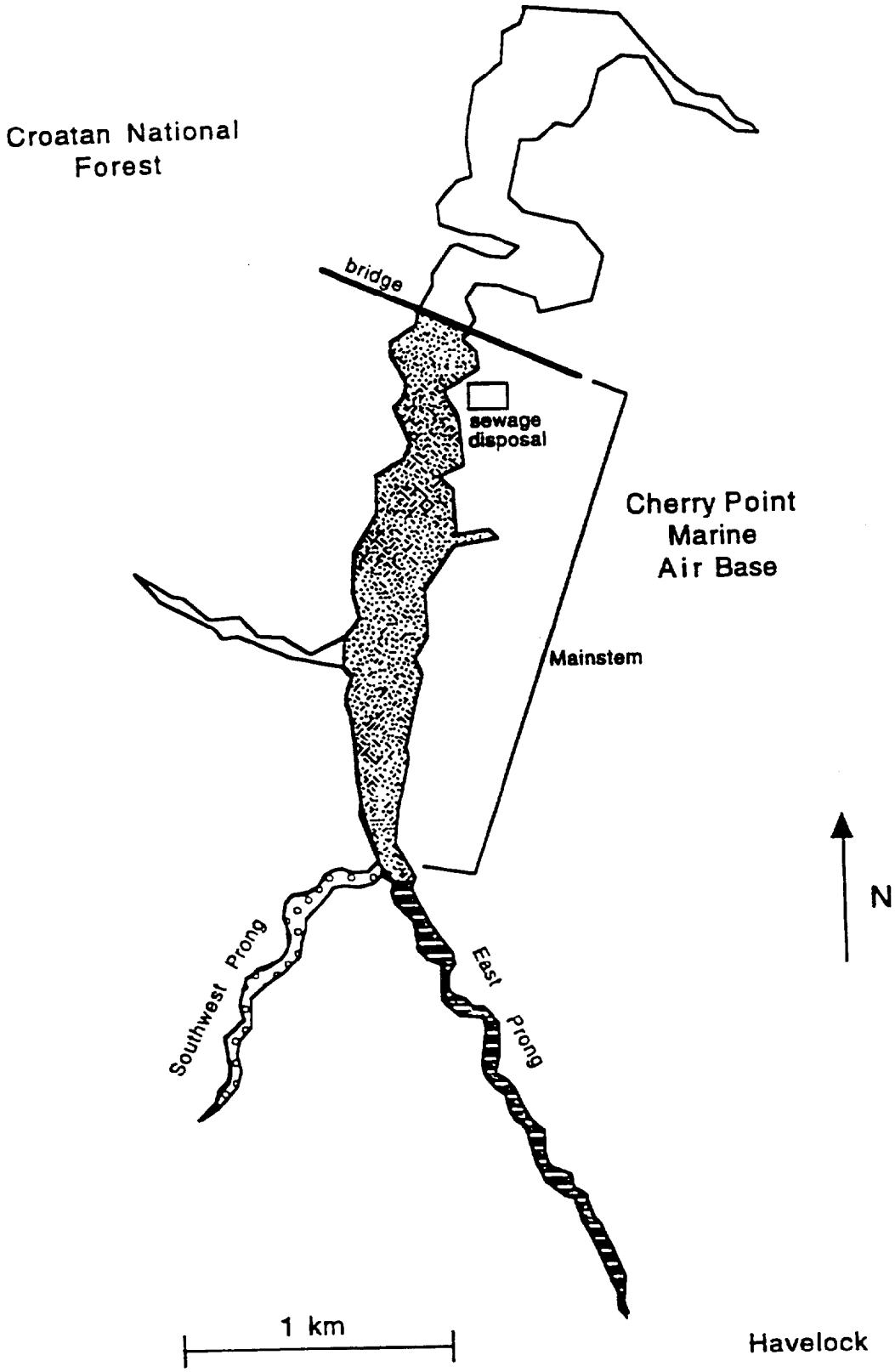
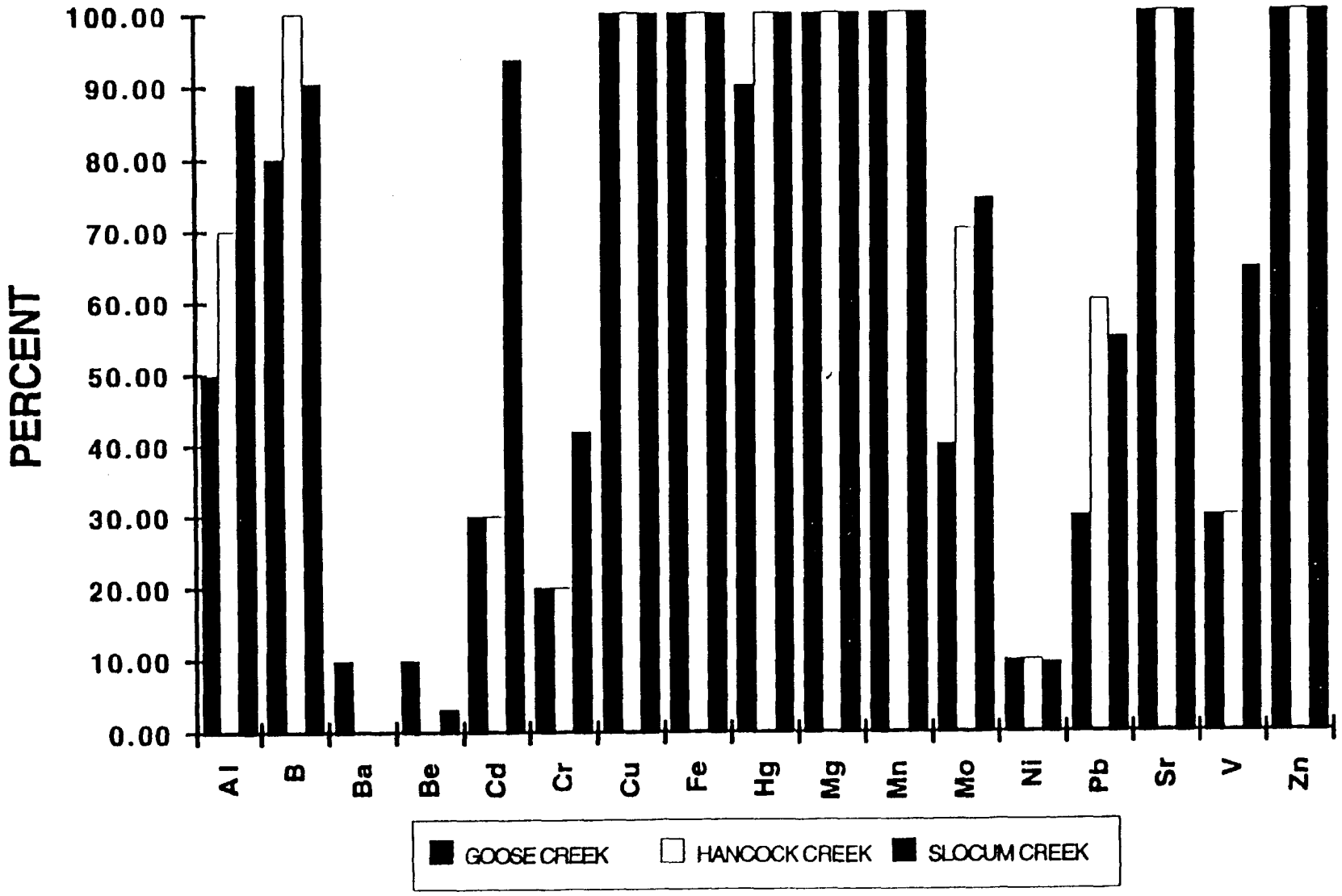



Figure 2. Portions of Slocum Creek from which brown bullheads were collected in 1992 for metal analyses.

Figure 3. Occurrence of 17 metals in liver tissue from brown bullheads collected from Slocum, Hancock, and Goose Creeks, NC, 1991-1992.


PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Al
B
Ba
Be
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Ni
Pb
Sr
V
Zn
GOOSE CREEK
HANCOCK CREEK
SLOCUM CREEK

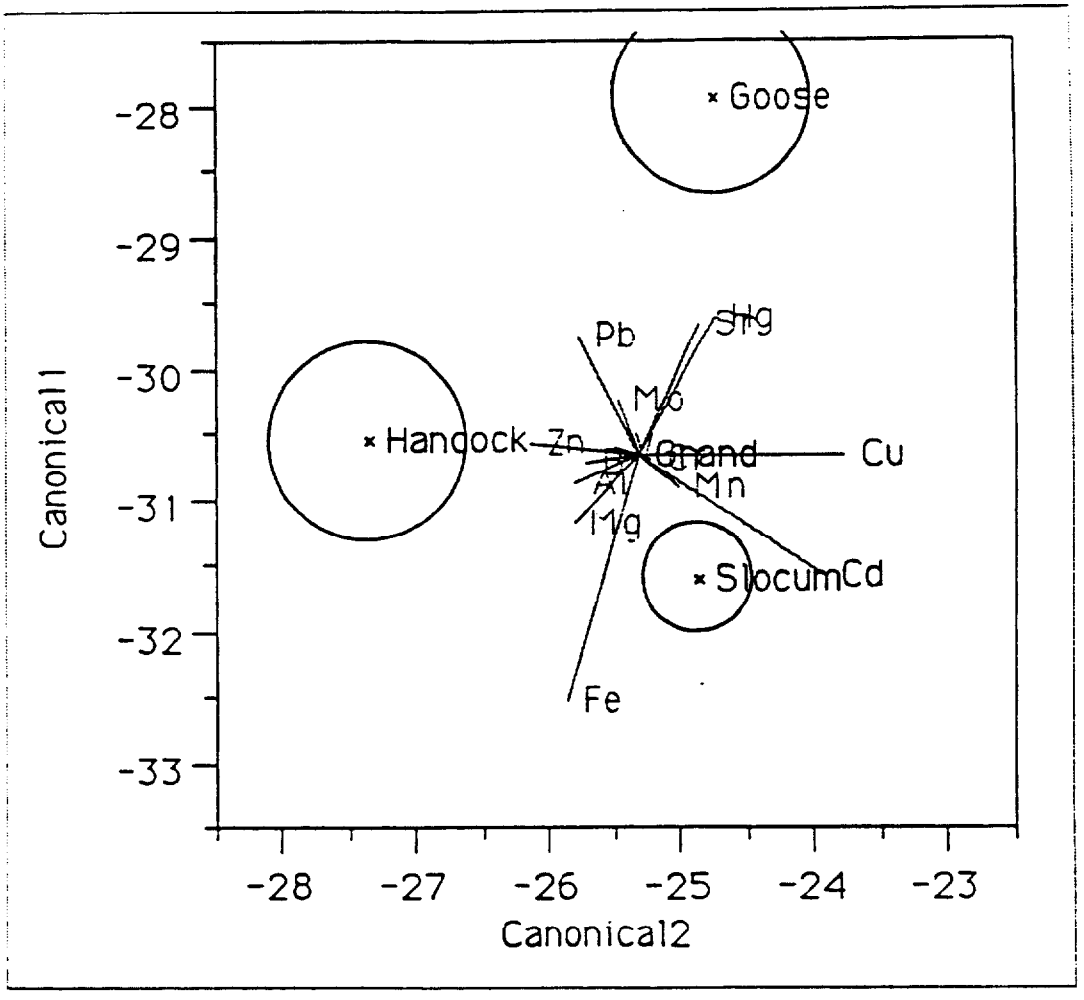
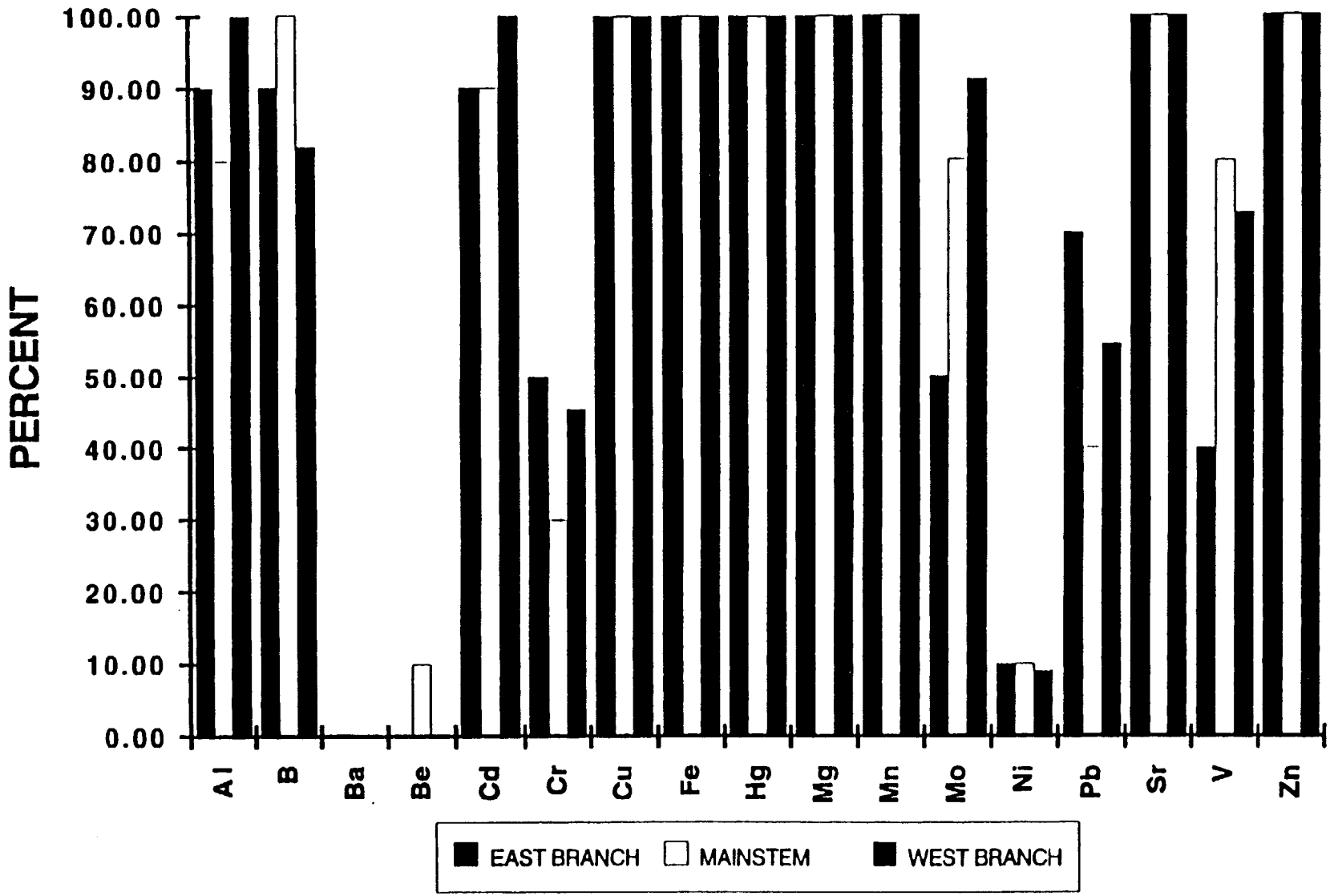



Figure 4. Centroid plot of metal residues in brown bullheads among Slocum, Hancock, and Goose Creeks.

Figure 5. Occurrence of 17 metals in liver tissue from brown bullheads collected from the East Branch, Southwest Branch, and mainstem of Slocum Creek, NC, 1991-1992.


PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Al
B
Ba
Be
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Ni
Pb
Sr
V
Zn
EAST BRANCH
MAINSTEM
WEST BRANCH

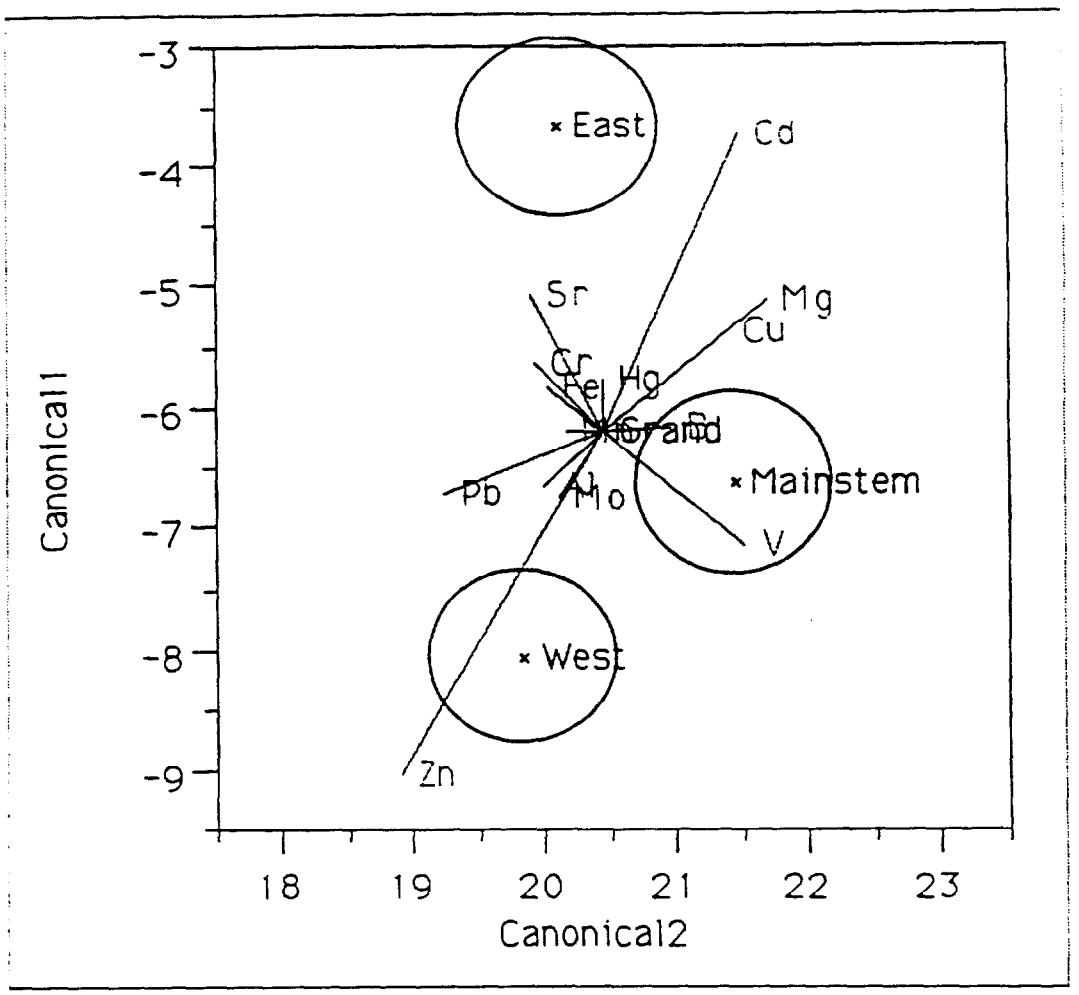
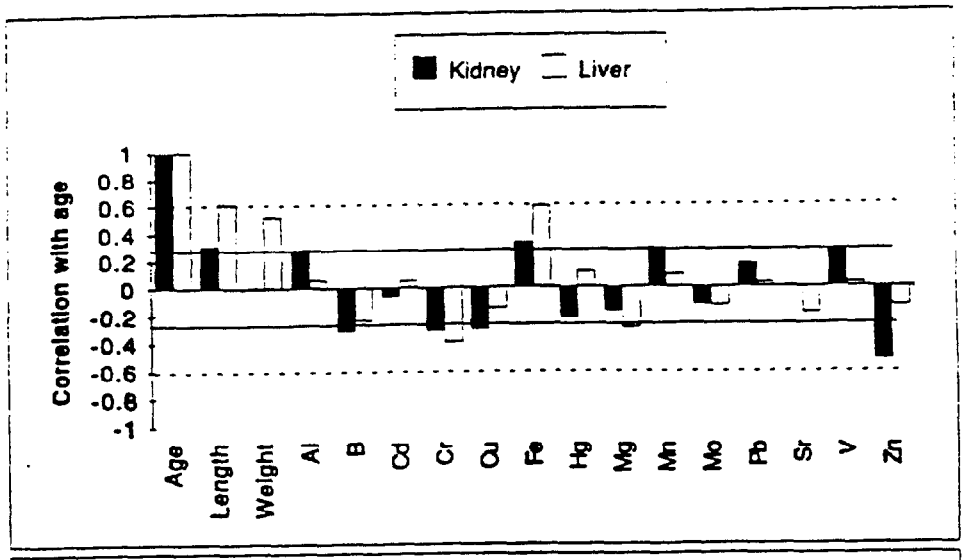
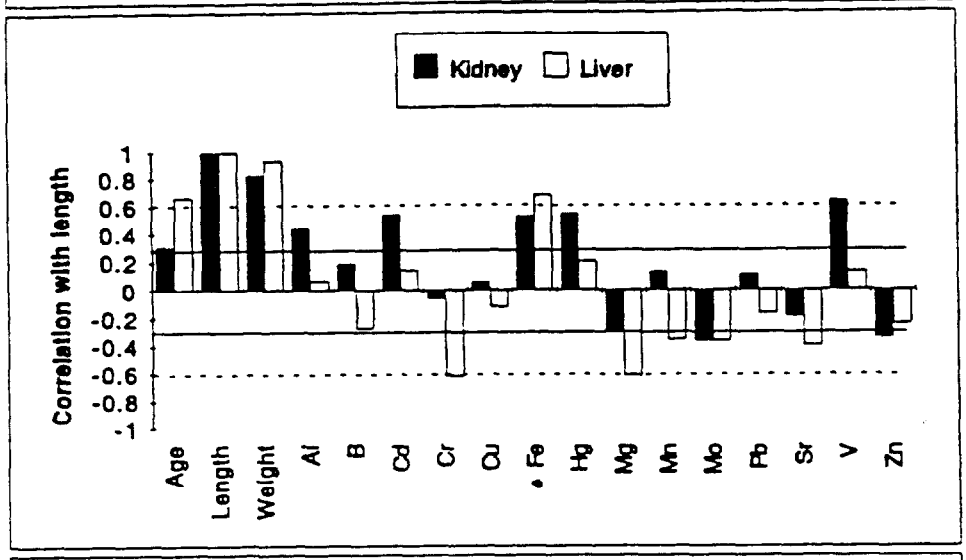



Figure 6. Centroid plot of metal residues in brown bullheads among the three reaches of Slocum Creek.

Figure 7. Correlation for brown bullhead kidney and liver tissue between metal concentration and age (upper panel), length (center panel), and weight (lower panel). Dashed and solid lines indicate statistically significant correlations for kidney and liver tissue respectively.


Kidney
Liver
Correlation with age
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
Age
Length
Weight
Al
B
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Pb
Sr
V
Zn


Kidney
Liver
Correlation with length
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
Age
Length
Weight
Al
B
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Pb
Sr
V
Zn

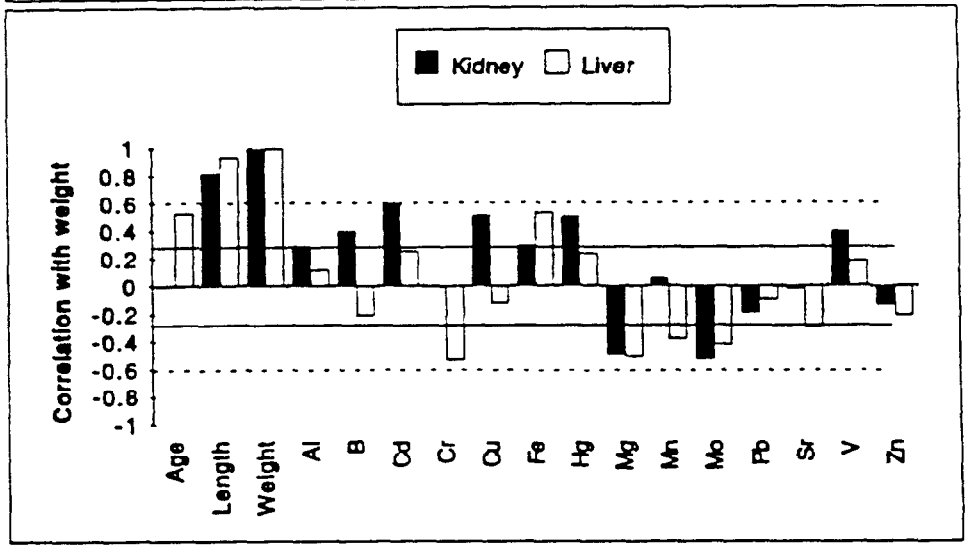
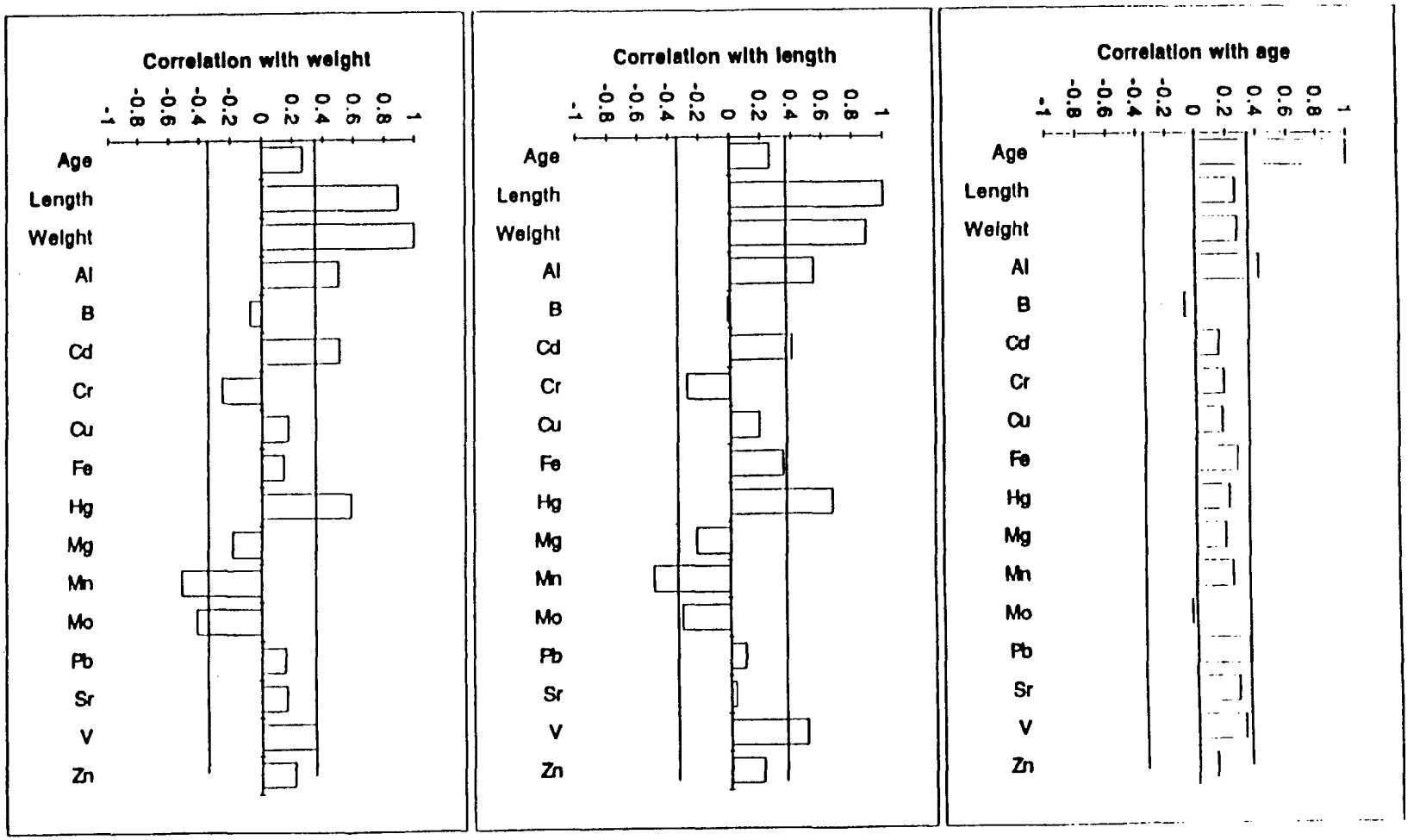

Kidney
Liver
Correlation with weight
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
Age
Length
Weight
Al
B
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Pb
Sr
V
Zn

Figure 8. Correlation for Slocum Creek brown bullhead liver tissue between metal concentrations and age (upper panel), length (center panel), and weight (lower panel). Horizontal lines indicate statistically significant correlations.


Correlation with weight
Correlation with length
Correlation with age
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Age
Length
Weight
Al
B
Cd
Cr
Cu
Fe
Hg
Mg
Mn
Mo
Pb
Sr
V
Zn

# APPENDIX D-1

Analytical report for metal concentrations in liver and kidneys of brown bullheads.

ECDMS ANALYTICAL REPORT (6)

23-Jun-94

Catalog: 8610011 Regional Study Id: R8-93-RW06 Purchase Order: PACF-3-0023

User Id: R8NCSC Submitter: W. James Fleming - Raleigh, NC

Lab Name: Research Triangle Institute (RTI)

Report Includes the Following Sections:

- Weight, % Moisture, % Lipid, Total Suspended Solids
- Soil / Sediment Parameters
- Contaminant Concentrations
- Procedural Blanks
- Duplicates
- Reference Materials
- Spike Recoveries
- Comments (Result Modifers and QA/QC Comments)
- Analytical Methods

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS

| Sample Number | Sample Matrix | Sample Weight (g) | Percent Moisture | Percent Lipid | Total Suspended Solids ( % ) |
|---|---|---|---|---|---|
| 303K | Kidney | 1.47 | 78.12 | | |
| 355K | Kidney | 2.86 | 78.12 | | |
| 443K | Kidney | 3.85 | 78.12 | | |
| 444K | Kidney | 3.86 | 78.12 | | |
| 447K | Kidney | 3.16 | 78.12 | | |
| 499K | Kidney | 2.56 | 78.12 | | |
| 505K | Kidney | 4.32 | 78.12 | | |
| 539K | Kidney | 6.72 | 74.26 | | |
| 544K | Kidney | 4.99 | 78.12 | | |
| 557K | Kidney | 5.35 | 78.12 | | |
| 561K | Kidney | 8.65 | 81.97 | | |
| 240 | Liver | 10.86 | 76.98 | | |
| 242 | Liver | 7.99 | 79.47 | | |
| 244 | Liver | 4.19 | 77.72 | | |
| 245 | Liver | 9.22 | 82.1 | | |
| 261 | Liver | 12.18 | 78.08 | | |
| 265 | Liver | 2.62 | 77.72 | | |
| 266 | Liver | 4.3 | 77.72 | | |
| 271 | Liver | 3.96 | 77.72 | | |
| 272 | Liver | 1.38 | 77.72 | | |
| 275 | Liver | 1.26 | 77.72 | | |
| 300B | Liver | 1.72 | 77.72 | | |
| 301 | Liver | 4.87 | 77.72 | | |
| 302 | Liver | 5.34 | 77.72 | | |
| 303 | Liver | 9.26 | 76.78 | | |
| 321 | Liver | 10.43 | 80.06 | | |
| 322 | Liver | 5.38 | 77.72 | | |
| 324 | Liver | 3.83 | 77.72 | | |
| 354 | Liver | 6.2 | 75 | | |
| 355 | Liver | 8.58 | 74.13 | | |
| 360 | Liver | 15.3 | 76.27 | | |
| 361 | Liver | 15.37 | 80.42 | | |
| 389 | Liver | 1.13 | 77.72 | | |
| 443 | Liver | 6.75 | 74.96 | | |

WEIGHT, % MOISTURE, % LIPID, TOTAL SUSPENDED SOLIDS (Cont.)

| Sample Number | Sample Matrix | Sample Weight (g) | Percent Moisture | Percent Lipid | Total Suspended Solids ( % ) |
|---|---|---|---|---|---|
| 444 | Liver | 8.05 | 77.72 | | |
| 445 | Liver | 19.29 | 77.66 | | |
| 447 | Liver | 12.22 | 74.3 | | |
| 448 | Liver | 9.32 | 77.58 | | |
| 499 | Liver | 4.56 | 77.72 | | |
| 501 | Liver | 7.74 | 76.1 | | |
| 503 | Liver | 10.57 | 78.71 | | |
| 504 | Liver | 10.45 | 81.44 | | |
| 505 | Liver | 10.58 | 79.87 | | |
| 539 | Liver | 11.28 | 78.55 | | |
| 544 | Liver | 8.13 | 81.55 | | |
| 557 | Liver | 9.11 | 81.78 | | |
| 561 | Liver | 15.35 | 82.28 | | |
| A10 | Liver | 2.26 | 77.72 | | |
| A18 | Liver | 5.28 | 77.72 | | |
| A2 | Liver | 8.74 | 75.17 | | |
| A20 | Liver | 5.32 | 77.72 | | |
| A21 | Liver | 6.72 | 76.34 | | |
| A22 | Liver | 8.91 | 78.9 | | |
| A23 | Liver | 9.77 | 75.74 | | |
| A25 | Liver | 7.78 | 77.72 | | |
| A26 | Liver | 13.57 | 77.16 | | |
| A3 | Liver | 11.67 | 68.81 | | |
| A32 | Liver | 3.46 | 77.72 | | |
| A38 | Liver | 3.83 | 77.72 | | |
| A5 | Liver | 8.2 | 77.72 | | |
| A8 | Liver | 9.31 | 77.72 | | |
| A9 | Liver | 1.69 | 77.72 | | |

SOIL / SEDIMENT PARAMETERS

| Sample Number | Percent TVS | Percent TOC | Particle Size %Sand | %Silt | %Clay |
|---|---|---|---|---|---|

- NO DATA EXIST FOR THIS SECTION.

CONTAMINANT CONCENTRATIONS

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Al | 303K | Kidney | < 16.559415 | 16.559415 | < 3.6232 | 3.6232 |
| | 355K | Kidney | < 10.7586837 | 10.7586837 | < 2.354 | 2.354 |
| | 443K | Kidney | < 7.1636197 | 7.1636197 | < 1.5674 | 1.5674 |
| | 444K | Kidney | 7.893053 | 7.8258684 | 1.727 | 1.7123 |
| | 447K | Kidney | < 9.3500914 | 9.3500914 | < 2.0458 | 2.0458 |
| | 499K | Kidney | < 12.2463437 | 12.2463437 | < 2.6795 | 2.6795 |
| | 505K | Kidney | 19.5658135 | 9.0251371 | 4.281 | 1.9747 |
| | 539K | Kidney | < 10.7296 | 10.7296 | < 2.761799 | 2.761799 |
| | 544K | Kidney | 13.5100548 | 6.8171846 | 2.956 | 1.4916 |
| | 557K | Kidney | 13.8254113 | 7.2225777 | 3.025 | 1.5803 |
| | 561K | Kidney | < 8.0386 | 8.0386 | < 1.4493596 | 1.4493596 |
| | 240 | Liver | 8.729 | 4.7985 | 2.0094158 | 1.1046147 |
| | 242 | Liver | 10.74 | 4.7801 | 2.204922 | .9813545 |
| | 244 | Liver | 9.2549372 | 7.3339318 | 2.062 | 1.634 |
| | 245 | Liver | 20.61 | 4.8544 | 3.68919 | .8689376 |
| | 261 | Liver | 19.2 | 4.8263 | 4.20864 | 1.057925 |
| | 265 | Liver | < 12.0915619 | 12.0915619 | < 2.694 | 2.694 |
| | 266 | Liver | 11.8716338 | 6.1790844 | 2.645 | 1.3767 |
| | 271 | Liver | < 7.5359066 | 7.5359066 | < 1.679 | 1.679 |
| | 272 | Liver | 38.016158 | 18.2154399 | 8.47 | 4.0584 |
| | 275 | Liver | < 22.806553 | 22.806553 | < 5.0813 | 5.0813 |
| | 300B | Liver | < 15.4982047 | 15.4982047 | < 3.453 | 3.453 |
| | 301 | Liver | 14.9147217 | 5.5493716 | 3.323 | 1.2364 |
| | 302 | Liver | 11.3240575 | 5.7899461 | 2.523 | 1.29 |
| | 303 | Liver | 19.42 | 4.9116 | 4.509324 | 1.1404735 |
| | 321 | Liver | 17.01 | 4.9702 | 3.391794 | .9910579 |
| | 322 | Liver | < 5.1238779 | 5.1238779 | < 1.1416 | 1.1416 |
| | 324 | Liver | < 7.935368 | 7.935368 | < 1.768 | 1.768 |
| | 354 | Liver | 9.006 | 4.9116 | 2.2515 | 1.2279 |
| | 355 | Liver | 7.649 | 4.9603 | 1.9787963 | 1.2832296 |
| | 360 | Liver | 6.842 | 4.845 | 1.6236066 | 1.1497185 |
| | 361 | Liver | 11.38 | 4.9505 | 2.228204 | .9693079 |
| | 389 | Liver | < 22.0884201 | 22.0884201 | < 4.9213 | 4.9213 |
| | 443 | Liver | 8.246 | 4.9603 | 2.0647984 | 1.2420591 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| A1 | 444 | Liver | < 9.1526032 | 9.1526032 | < 2.0392 | 2.0392 |
| | 445 | Liver | 13.7 | 4.9505 | 3.06058 | 1.1059417 |
| | 447 | Liver | 6.276 | 4.8356 | 1.612932 | 1.2427492 |
| | 448 | Liver | 11.51 | 5 | 2.580542 | 1.121 |
| | 499 | Liver | < 6.7841113 | 6.7841113 | < 1.5115 | 1.5115 |
| | 501 | Liver | 14.83 | 4.931 | 3.54437 | 1.178509 |
| | 503 | Liver | 16.03 | 4.8828 | 3.412787 | 1.0395481 |
| | 504 | Liver | 18.88 | 4.902 | 3.504128 | .9098112 |
| | 505 | Liver | 26.55 | 4.817 | 5.344515 | .9696621 |
| | 539 | Liver | 10.3 | 4.99 | 2.20935 | 1.070355 |
| | 544 | Liver | 23.48 | 5.6689 | 4.33206 | 1.0459121 |
| | 557 | Liver | 15.85 | 4.9213 | 2.88787 | .8966609 |
| | 561 | Liver | 11.35 | 4.9505 | 2.01122 | .8772286 |
| | A10 | Liver | < 8.8913824 | 8.8913824 | < 1.981 | 1.981 |
| | A18 | Liver | 48.3842011 | 5.3689408 | 10.78 | 1.1962 |
| | A2 | Liver | 10.18 | 4.8544 | 2.527694 | 1.2053475 |
| | A20 | Liver | 11.8357271 | 5.0228905 | 2.637 | 1.1191 |
| | A21 | Liver | 7.225 | 4.9505 | 1.709435 | 1.1712883 |
| | A22 | Liver | 14.61 | 4.8828 | 3.08271 | 1.0302708 |
| | A23 | Liver | 15.3 | 4.99 | 3.71178 | 1.210574 |
| | A25 | Liver | 8.3438061 | 7.3626571 | 1.859 | 1.6404 |
| | A26 | Liver | 17.09 | 4.9116 | 3.903356 | 1.1218094 |
| | A3 | Liver | 18.07 | 4.9213 | 5.636033 | 1.5349535 |
| | A32 | Liver | 1088.8689408 | 8.6315081 | 242.6 | 1.9231 |
| | A38 | Liver | 7.4012567 | 7.3967684 | 1.649 | 1.648 |
| | A5 | Liver | 20.2468582 | 6.478456 | 4.511 | 1.4434 |
| | A8 | Liver | 14.8653501 | 5.997307 | 3.312 | 1.3362 |
| | A9 | Liver | < 8.2751346 | 8.2751346 | < 1.8437 | 1.8437 |
| B | 303K | Kidney | 1.7106947 | 1.6558501 | .3743 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | < .7824497 | .7824497 | < .1712 | .1712 |
| | 447K | Kidney | 1.0173675 | .9351005 | .2226 | .2046 |
| | 499K | Kidney | 2.524223 | 1.2248629 | .5523 | .268 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| B | 505K | Kidney | 3.2294333 | .9026508 | .7066 | .1975 |
| | 539K | Kidney | 10.7 | 1.073 | 2.75418 | .2761902 |
| | 544K | Kidney | 2.5063985 | .6819013 | .5484 | .1492 |
| | 557K | Kidney | 2.190585 | .7221207 | .4793 | .158 |
| | 561K | Kidney | 6.292 | .8039 | 1.1344476 | .1449432 |
| | 240 | Liver | 5.269 | .4798 | 1.2129238 | .11045 |
| | 242 | Liver | 2.257 | .478 | .4633621 | .0981334 |
| | 244 | Liver | 1.4578097 | .7333932 | .3248 | .1634 |
| | 245 | Liver | .9096 | .4854 | .1628184 | .0868866 |
| | 261 | Liver | 1.208 | .4826 | .2647936 | .1057859 |
| | 265 | Liver | 2.1184919 | 1.2091562 | .472 | .2694 |
| | 266 | Liver | 2.1728007 | .6180431 | .4841 | .1377 |
| | 271 | Liver | 2.0345601 | .7535907 | .4533 | .1679 |
| | 272 | Liver | 4.9685817 | 1.8213645 | 1.107 | .4058 |
| | 275 | Liver | 3.8078995 | 2.2805206 | .8484 | .5081 |
| | 300B | Liver | 3.7414722 | 1.5498205 | .8336 | .3453 |
| | 301 | Liver | 2.0830341 | .5547576 | .4641 | .1236 |
| | 302 | Liver | .9977558 | .5789946 | .2223 | .129 |
| | 303 | Liver | 3.634 | .4912 | .8438148 | .1140566 |
| | 321 | Liver | 1.978 | .497 | .3944132 | .0991018 |
| | 322 | Liver | 1.0529623 | .5125673 | .2346 | .1142 |
| | 324 | Liver | 1.8774686 | .7935368 | .4183 | .1768 |
| | 354 | Liver | .928 | .4912 | .232 | .1228 |
| | 355 | Liver | .5986 | .496 | .1548578 | .1283152 |
| | 360 | Liver | 1.579 | .4845 | .3746967 | .1149719 |
| | 361 | Liver | 1.343 | .495 | .2629594 | .096921 |
| | 389 | Liver | 4.9102334 | 2.2087074 | 1.094 | .4921 |
| | 443 | Liver | 3.633 | .496 | .9097032 | .1241984 |
| | 444 | Liver | 1.5601436 | .9151706 | .3476 | .2039 |
| | 445 | Liver | 2.601 | .495 | .5810634 | .110583 |
| | 447 | Liver | 1.244 | .4836 | .319708 | .1242852 |
| | 448 | Liver | 1.683 | .5 | .3773286 | .1121 |
| | 499 | Liver | .9573609 | .6781867 | .2133 | .1511 |
| | 501 | Liver | .7354 | .4931 | .1757606 | .1178509 |
| | 503 | Liver | < .4883 | .4883 | < .1039591 | .1039591 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| B | 504 | Liver | 1.622 | .4902 | .3010432 | .0909811 |
| | 505 | Liver | 3.291 | .4817 | .6624783 | .0969662 |
| | 539 | Liver | .9708 | .499 | .2082366 | .1070355 |
| | 544 | Liver | 3.998 | .5669 | .737631 | .1045931 |
| | 557 | Liver | 2.687 | .4921 | .4895714 | .0896606 |
| | 561 | Liver | 2.662 | .495 | .4717064 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |
| | A18 | Liver | 1.1189408 | .5368043 | .2493 | .1196 |
| | A2 | Liver | .69 | .4854 | .171327 | .1205248 |
| | A20 | Liver | 1.3604129 | .5022442 | .3031 | .1119 |
| | A21 | Liver | < .495 | .495 | < .117117 | .117117 |
| | A22 | Liver | 3.149 | .4883 | .664439 | .1030313 |
| | A23 | Liver | 1.08 | .499 | .262008 | .1210574 |
| | A25 | Liver | 1.2558348 | .7360862 | .2798 | .164 |
| | A26 | Liver | .742 | .4912 | .1694728 | .1121901 |
| | A3 | Liver | .6839 | .4921 | .2133084 | .153486 |
| | A32 | Liver | 1.4201077 | .8631059 | .3164 | .1923 |
| | A38 | Liver | < .7396768 | .7396768 | < .1648 | .1648 |
| | A5 | Liver | 1.0372531 | .6476661 | .2311 | .1443 |
| | A8 | Liver | < .5996409 | .5996409 | < .1336 | .1336 |
| | A9 | Liver | 1.3105925 | .8276481 | .292 | .1844 |
| Ba | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | < .7824497 | .7824497 | < .1712 | .1712 |
| | 447K | Kidney | < .9351005 | .9351005 | < .2046 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |
| | 505K | Kidney | < .9026508 | .9026508 | < .1975 | .1975 |
| | 539K | Kidney | < 1.073 | 1.073 | < .2761902 | .2761902 |
| | 544K | Kidney | < .6819013 | .6819013 | < .1492 | .1492 |
| | 557K | Kidney | < .7221207 | .7221207 | < .158 | .158 |
| | 561K | Kidney | < .8039 | .8039 | < .1449432 | .1449432 |
| | 240 | Liver | < .4798 | .4798 | < .11045 | .11045 |
| | 242 | Liver | < .478 | .478 | < .0981334 | .0981334 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Ba | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | < .4854 | .4854 | < .0868866 | .0868866 |
| | 261 | Liver | < .4826 | .4826 | < .1057859 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | 2.1521544 | 1.8213645 | .4795 | .4058 |
| | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | < 1.5498205 | 1.5498205 | < .3453 | .3453 |
| | 301 | Liver | < .5547576 | .5547576 | < .1236 | .1236 |
| | 302 | Liver | < .5789946 | .5789946 | < .129 | .129 |
| | 303 | Liver | < .4912 | .4912 | < .1140566 | .1140566 |
| | 321 | Liver | < .497 | .497 | < .0991018 | .0991018 |
| | 322 | Liver | < .5125673 | .5125673 | < .1142 | .1142 |
| | 324 | Liver | < .7935368 | .7935368 | < .1768 | .1768 |
| | 354 | Liver | < .4912 | .4912 | < .1228 | .1228 |
| | 355 | Liver | < .496 | .496 | < .1283152 | .1283152 |
| | 360 | Liver | < .4845 | .4845 | < .1149719 | .1149719 |
| | 361 | Liver | < .495 | .495 | < .096921 | .096921 |
| | 389 | Liver | < 2.2087074 | 2.2087074 | < .4921 | .4921 |
| | 443 | Liver | < .496 | .496 | < .1241984 | .1241984 |
| | 444 | Liver | < .9151706 | .9151706 | < .2039 | .2039 |
| | 445 | Liver | < .495 | .495 | < .110583 | .110583 |
| | 447 | Liver | < .4836 | .4836 | < .1242852 | .1242852 |
| | 448 | Liver | < .5 | .5 | < .1121 | .1121 |
| | 499 | Liver | < .6781867 | .6781867 | < .1511 | .1511 |
| | 501 | Liver | < .4931 | .4931 | < .1178509 | .1178509 |
| | 503 | Liver | < .4883 | .4883 | < .1039591 | .1039591 |
| | 504 | Liver | < .4902 | .4902 | < .0909811 | .0909811 |
| | 505 | Liver | < .4817 | .4817 | < .0969662 | .0969662 |
| | 539 | Liver | < .499 | .499 | < .1070355 | .1070355 |
| | 544 | Liver | < .5669 | .5669 | < .1045931 | .1045931 |
| | 557 | Liver | < .4921 | .4921 | < .0896606 | .0896606 |
| | 561 | Liver | < .495 | .495 | < .087714 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Ba | A18 | Liver | < .5368043 | .5368043 | < .1196 | .1196 |
| | A2 | Liver | < .4854 | .4854 | < .1205248 | .1205248 |
| | A20 | Liver | < .5022442 | .5022442 | < .1119 | .1119 |
| | A21 | Liver | < .495 | .495 | < .117117 | .117117 |
| | A22 | Liver | < .4883 | .4883 | < .1030313 | .1030313 |
| | A23 | Liver | < .499 | .499 | < .1210574 | .1210574 |
| | A25 | Liver | < .7360862 | .7360862 | < .164 | .164 |
| | A26 | Liver | < .4912 | .4912 | < .1121901 | .1121901 |
| | A3 | Liver | < .4921 | .4921 | < .153486 | .153486 |
| | A32 | Liver | < .8631059 | .8631059 | < .1923 | .1923 |
| | A38 | Liver | < .7396768 | .7396768 | < .1648 | .1648 |
| | A5 | Liver | < .6476661 | .6476661 | < .1443 | .1443 |
| | A8 | Liver | < .5996409 | .5996409 | < .1336 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Be | 303K | Kidney | < .3313528 | .3313528 | < .0725 | .0725 |
| | 355K | Kidney | < .2152651 | .2152651 | < .0471 | .0471 |
| | 443K | Kidney | < .143053 | .143053 | < .0313 | .0313 |
| | 444K | Kidney | < .1563071 | .1563071 | < .0342 | .0342 |
| | 447K | Kidney | < .1869287 | .1869287 | < .0409 | .0409 |
| | 499K | Kidney | < .2449726 | .2449726 | < .0536 | .0536 |
| | 505K | Kidney | .3368373 | .1805302 | .0737 | .0395 |
| | 539K | Kidney | < .2146 | .2146 | < .055238 | .055238 |
| | 544K | Kidney | < .1361974 | .1361974 | < .0298 | .0298 |
| | 557K | Kidney | < .1444241 | .1444241 | < .0316 | .0316 |
| | 561K | Kidney | < .1608 | .1608 | < .0289922 | .0289922 |
| | 240 | Liver | < .096 | .096 | < .0220992 | .0220992 |
| | 242 | Liver | < .0956 | .0956 | < .0196267 | .0196267 |
| | 244 | Liver | < .1467684 | .1467684 | < .0327 | .0327 |
| | 245 | Liver | < .0971 | .0971 | < .0173809 | .0173809 |
| | 261 | Liver | < .0965 | .0965 | < .0211528 | .0211528 |
| | 265 | Liver | < .241921 | .241921 | < .0539 | .0539 |
| | 266 | Liver | < .1234291 | .1234291 | < .0275 | .0275 |
| | 271 | Liver | < .1508079 | .1508079 | < .0336 | .0336 |
| | 272 | Liver | 1.5767504 | .3644524 | .3513 | .0812 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Be | 275 | Liver | < .4560144 | .4560144 | < .1016 | .1016 |
| | 300B | Liver | < .3101436 | .3101436 | < .0691 | .0691 |
| | 301 | Liver | < .1108618 | .1108618 | < .0247 | .0247 |
| | 302 | Liver | < .1157989 | .1157989 | < .0258 | .0258 |
| | 303 | Liver | < .0982 | .0982 | < .022802 | .022802 |
| | 321 | Liver | < .0994 | .0994 | < .0198204 | .0198204 |
| | 322 | Liver | < .1023339 | .1023339 | < .0228 | .0228 |
| | 324 | Liver | < .1588869 | .1588869 | < .0354 | .0354 |
| | 354 | Liver | < .0982 | .0982 | < .02455 | .02455 |
| | 355 | Liver | < .0992 | .0992 | < .025663 | .025663 |
| | 360 | Liver | < .0969 | .0969 | < .0229944 | .0229944 |
| | 361 | Liver | < .099 | .099 | < .0193842 | .0193842 |
| | 389 | Liver | < .4416517 | .4416517 | < .0984 | .0984 |
| | 443 | Liver | < .0992 | .0992 | < .0248397 | .0248397 |
| | 444 | Liver | < .1831239 | .1831239 | < .0408 | .0408 |
| | 445 | Liver | < .099 | .099 | < .0221166 | .0221166 |
| | 447 | Liver | < .0967 | .0967 | < .0248519 | .0248519 |
| | 448 | Liver | < .1 | .1 | < .02242 | .02242 |
| | 499 | Liver | < .1355476 | .1355476 | < .0302 | .0302 |
| | 501 | Liver | < .0986 | .0986 | < .0235654 | .0235654 |
| | 503 | Liver | < .0977 | .0977 | < .0208003 | .0208003 |
| | 504 | Liver | < .098 | .098 | < .0181888 | .0181888 |
| | 505 | Liver | < .0963 | .0963 | < .0193852 | .0193852 |
| | 539 | Liver | < .0998 | .0998 | < .0214071 | .0214071 |
| | 544 | Liver | < .1134 | .1134 | < .0209223 | .0209223 |
| | 557 | Liver | < .0984 | .0984 | < .0179285 | .0179285 |
| | 561 | Liver | < .099 | .099 | < .0175428 | .0175428 |
| | A10 | Liver | < .1777379 | .1777379 | < .0396 | .0396 |
| | A18 | Liver | < .1072711 | .1072711 | < .0239 | .0239 |
| | A2 | Liver | < .0971 | .0971 | < .0241099 | .0241099 |
| | A20 | Liver | < .1005386 | .1005386 | < .0224 | .0224 |
| | A21 | Liver | < .099 | .099 | < .0234234 | .0234234 |
| | A22 | Liver | < .0977 | .0977 | < .0206147 | .0206147 |
| | A23 | Liver | < .0998 | .0998 | < .0242115 | .0242115 |
| | A25 | Liver | < .1472172 | .1472172 | < .0328 | .0328 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Be | A26 | Liver | < .0982 | .0982 | < .0224289 | .0224289 |
| | A3 | Liver | .1153 | .0984 | .0359621 | .030691 |
| | A32 | Liver | < .1728007 | .1728007 | < .0385 | .0385 |
| | A38 | Liver | < .1481149 | .1481149 | < .033 | .033 |
| | A5 | Liver | < .1297127 | .1297127 | < .0289 | .0289 |
| | A8 | Liver | < .1198384 | .1198384 | < .0267 | .0267 |
| | A9 | Liver | < .1656194 | .1656194 | < .0369 | .0369 |
| Cd | 303K | Kidney | 1.6393967 | .3313528 | .3587 | .0725 |
| | 355K | Kidney | .7760512 | .2152651 | .1698 | .0471 |
| | 443K | Kidney | .3615174 | .143053 | .0791 | .0313 |
| | 444K | Kidney | 1.6393967 | .1563071 | .3587 | .0342 |
| | 447K | Kidney | 1.3021024 | .1869287 | .2849 | .0409 |
| | 499K | Kidney | .3340951 | .2449726 | .0731 | .0536 |
| | 505K | Kidney | 2.1147166 | .1805302 | .4627 | .0395 |
| | 539K | Kidney | .3894 | .2146 | .1002316 | .055238 |
| | 544K | Kidney | 1.4364717 | .1361974 | .3143 | .0298 |
| | 557K | Kidney | 1.3606033 | .1444241 | .2977 | .0316 |
| | 561K | Kidney | 2.197 | .1608 | .3961191 | .0289922 |
| | 240 | Liver | .1488 | .096 | .0342538 | .0220992 |
| | 242 | Liver | < .0956 | .0956 | < .0196267 | .0196267 |
| | 244 | Liver | < .1467684 | .1467684 | < .0327 | .0327 |
| | 245 | Liver | .166 | .0971 | .029714 | .0173809 |
| | 261 | Liver | .5265 | .0965 | .1154088 | .0211528 |
| | 265 | Liver | < .241921 | .241921 | < .0539 | .0539 |
| | 266 | Liver | < .1234291 | .1234291 | < .0275 | .0275 |
| | 271 | Liver | < .1508079 | .1508079 | < .0336 | .0336 |
| | 272 | Liver | 1.529623 | .3644524 | .3408 | .0812 |
| | 275 | Liver | < .4560144 | .4560144 | < .1016 | .1016 |
| | 300B | Liver | < .3101436 | .3101436 | < .0691 | .0691 |
| | 301 | Liver | .1315081 | .1108618 | .0293 | .0247 |
| | 302 | Liver | .1319569 | .1157989 | .0294 | .0258 |
| | 303 | Liver | .4425 | .0982 | .1027485 | .022802 |
| | 321 | Liver | < .0994 | .0994 | < .0198204 | .0198204 |
| | 322 | Liver | < .1023339 | .1023339 | < .0228 | .0228 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cd | 324 | Liver | < .1588869 | .1588869 | < .0354 | .0354 |
| | 354 | Liver | .1991 | .0982 | .049775 | .02455 |
| | 355 | Liver | .168 | .0992 | .0434616 | .025663 |
| | 360 | Liver | .2378 | .0969 | .0564299 | .0229944 |
| | 361 | Liver | .1076 | .099 | .0210681 | .0193842 |
| | 389 | Liver | < .4416517 | .4416517 | < .0984 | .0984 |
| | 443 | Liver | .177 | .0992 | .0443208 | .0248397 |
| | 444 | Liver | .3254039 | .1831239 | .0725 | .0408 |
| | 445 | Liver | .4844 | .099 | .108215 | .0221166 |
| | 447 | Liver | .2262 | .0967 | .0581334 | .0248519 |
| | 448 | Liver | .1473 | .1 | .0330247 | .02242 |
| | 499 | Liver | < .1355476 | .1355476 | < .0302 | .0302 |
| | 501 | Liver | .2034 | .0986 | .0486126 | .0235654 |
| | 503 | Liver | .3593 | .0977 | .076495 | .0208003 |
| | 504 | Liver | .2441 | .098 | .045305 | .0181888 |
| | 505 | Liver | .3905 | .0963 | .0786077 | .0193852 |
| | 539 | Liver | < .0998 | .0998 | < .0214071 | .0214071 |
| | 544 | Liver | .4377 | .1134 | .0807557 | .0209223 |
| | 557 | Liver | .384 | .0984 | .0699648 | .0179285 |
| | 561 | Liver | .3006 | .099 | .0532663 | .0175428 |
| | A10 | Liver | < .1777379 | .1777379 | < .0396 | .0396 |
| | A18 | Liver | .4452424 | .1072711 | .0992 | .0239 |
| | A2 | Liver | .3283 | .0971 | .0815169 | .0241099 |
| | A20 | Liver | .3339318 | .1005386 | .0744 | .0224 |
| | A21 | Liver | .3416 | .099 | .0808226 | .0234234 |
| | A22 | Liver | .3905 | .0977 | .0823955 | .0206147 |
| | A23 | Liver | .525 | .0998 | .127365 | .0242115 |
| | A25 | Liver | .5704668 | .1472172 | .1271 | .0328 |
| | A26 | Liver | .1747 | .0982 | .0399015 | .0224289 |
| | A3 | Liver | 1.098 | .0984 | .3424662 | .030691 |
| | A32 | Liver | < .1728007 | .1728007 | < .0385 | .0385 |
| | A38 | Liver | < .1481149 | .1481149 | < .033 | .033 |
| | A5 | Liver | 2.2549372 | .1297127 | .5024 | .0289 |
| | A8 | Liver | .4120287 | .1198384 | .0918 | .0267 |
| | A9 | Liver | .1656194 | .1656194 | .0369 | .0369 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cr | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | < .7824497 | .7824497 | < .1712 | .1712 |
| | 447K | Kidney | < .9351005 | .9351005 | < .2046 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |
| | 505K | Kidney | < .9026508 | .9026508 | < .1975 | .1975 |
| | 539K | Kidney | 1.494 | 1.073 | .3845556 | .2761902 |
| | 544K | Kidney | < .6819013 | .6819013 | < .1492 | .1492 |
| | 557K | Kidney | < .7221207 | .7221207 | < .158 | .158 |
| | 561K | Kidney | .8736 | .8039 | .1575101 | .1449432 |
| | 240 | Liver | .7437 | .4798 | .1711997 | .11045 |
| | 242 | Liver | < .478 | .478 | < .0981334 | .0981334 |
| | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | .4877 | .4854 | .0872983 | .0868866 |
| | 261 | Liver | .6691 | .4826 | .1466667 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | 2.0704668 | 1.8213645 | .4613 | .4058 |
| | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | < 1.5498205 | 1.5498205 | < .3453 | .3453 |
| | 301 | Liver | < .5547576 | .5547576 | < .1236 | .1236 |
| | 302 | Liver | < .5789946 | .5789946 | < .129 | .129 |
| | 303 | Liver | .562 | .4912 | .1304964 | .1140566 |
| | 321 | Liver | .5647 | .497 | .1126012 | .0991018 |
| | 322 | Liver | < .5125673 | .5125673 | < .1142 | .1142 |
| | 324 | Liver | < .7935368 | .7935368 | < .1768 | .1768 |
| | 354 | Liver | .6274 | .4912 | .15685 | .1228 |
| | 355 | Liver | < .496 | .496 | < .1283152 | .1283152 |
| | 360 | Liver | < .4845 | .4845 | < .1149719 | .1149719 |
| | 361 | Liver | .5689 | .495 | .1113906 | .096921 |
| | 389 | Liver | < 2.2087074 | 2.2087074 | < .4921 | .4921 |
| | 443 | Liver | .5739 | .496 | .1437046 | .1241984 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cr | 444 | Liver | < .9151706 | .9151706 | < .2039 | .2039 |
| | 445 | Liver | < .495 | .495 | < .110583 | .110583 |
| | 447 | Liver | < .4836 | .4836 | < .1242852 | .1242852 |
| | 448 | Liver | .6015 | .5 | .1348563 | .1121 |
| | 499 | Liver | < .6781867 | .6781867 | < .1511 | .1511 |
| | 501 | Liver | .5108 | .4931 | .1220812 | .1178509 |
| | 503 | Liver | < .4883 | .4883 | < .1039591 | .1039591 |
| | 504 | Liver | < .4902 | .4902 | < .0909811 | .0909811 |
| | 505 | Liver | < .4817 | .4817 | < .0969662 | .0969662 |
| | 539 | Liver | .5824 | .499 | .1249248 | .1070355 |
| | 544 | Liver | < .5669 | .5669 | < .1045931 | .1045931 |
| | 557 | Liver | .9651 | .4921 | .1758412 | .0896606 |
| | 561 | Liver | < .495 | .495 | < .087714 | .087714 |
| | A10 | Liver | 1.5192998 | .8891382 | .3385 | .1981 |
| | A18 | Liver | < .5368043 | .5368043 | < .1196 | .1196 |
| | A2 | Liver | < .4854 | .4854 | < .1205248 | .1205248 |
| | A20 | Liver | < .5022442 | .5022442 | < .1119 | .1119 |
| | A21 | Liver | .5423 | .495 | .1283082 | .117117 |
| | A22 | Liver | < .4883 | .4883 | < .1030313 | .1030313 |
| | A23 | Liver | .6354 | .499 | .154148 | .1210574 |
| | A25 | Liver | < .7360862 | .7360862 | < .164 | .164 |
| | A26 | Liver | < .4912 | .4912 | < .1121901 | .1121901 |
| | A3 | Liver | .5914 | .4921 | .1844577 | .153486 |
| | A32 | Liver | < .8631059 | .8631059 | < .1923 | .1923 |
| | A38 | Liver | < .7396768 | .7396768 | < .1648 | .1648 |
| | A5 | Liver | < .6476661 | .6476661 | < .1443 | .1443 |
| | A8 | Liver | < .5996409 | .5996409 | < .1336 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Cu | 303K | Kidney | 5.6170018 | 1.6558501 | 1.229 | .3623 |
| | 355K | Kidney | 4.6435101 | 1.0758684 | 1.016 | .2354 |
| | 443K | Kidney | 3.3532907 | .7161792 | .7337 | .1567 |
| | 444K | Kidney | 5.8500914 | .7824497 | 1.28 | .1712 |
| | 447K | Kidney | 5.0868373 | .9351005 | 1.113 | .2046 |
| | 499K | Kidney | 6.3436929 | 1.2248629 | 1.388 | .268 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cu | 505K | Kidney | 5.9597806 | .9026508 | 1.304 | .1975 |
| | 539K | Kidney | 6.426 | 1.073 | 1.6540524 | .2761902 |
| | 544K | Kidney | 6.0283364 | .6819013 | 1.319 | .1492 |
| | 557K | Kidney | 17.1617916 | .7221207 | 3.755 | .158 |
| | 561K | Kidney | 24.43 | .8039 | 4.404729 | .1449432 |
| | 240 | Liver | 10.14 | .4798 | 2.334228 | .11045 |
| | 242 | Liver | 20 | .478 | 4.106 | .0981334 |
| | 244 | Liver | 8.6445242 | .7333932 | 1.926 | .1634 |
| | 245 | Liver | 25.61 | .4854 | 4.58419 | .0868866 |
| | 261 | Liver | 25.91 | .4826 | 5.679472 | .1057859 |
| | 265 | Liver | 48.3842011 | 1.2091562 | 10.78 | .2694 |
| | 266 | Liver | 23.3303411 | .6180431 | 5.198 | .1377 |
| | 271 | Liver | 48.7881508 | .7535907 | 10.87 | .1679 |
| | 272 | Liver | 35.8168761 | 1.8213645 | 7.98 | .4058 |
| | 275 | Liver | 69.524237 | 2.2805206 | 15.49 | .5081 |
| | 300B | Liver | 34.2549372 | 1.5498205 | 7.632 | .3453 |
| | 301 | Liver | 5.9874327 | .5547576 | 1.334 | .1236 |
| | 302 | Liver | 43.016158 | .5789946 | 9.584 | .129 |
| | 303 | Liver | 49.19 | .4912 | 11.421918 | .1140566 |
| | 321 | Liver | 49.77 | .497 | 9.924138 | .0991018 |
| | 322 | Liver | 34.6499102 | .5125673 | 7.72 | .1142 |
| | 324 | Liver | 46.3195691 | .7935368 | 10.32 | .1768 |
| | 354 | Liver | 31.06 | .4912 | 7.765 | .1228 |
| | 355 | Liver | 38.39 | .496 | 9.931493 | .1283152 |
| | 360 | Liver | 41.41 | .4845 | 9.826593 | .1149719 |
| | 361 | Liver | 42.47 | .495 | 8.315626 | .096921 |
| | 389 | Liver | 68.7612208 | 2.2087074 | 15.32 | .4921 |
| | 443 | Liver | 49.2 | .496 | 12.31968 | .1241984 |
| | 444 | Liver | 50.8976661 | .9151706 | 11.34 | .2039 |
| | 445 | Liver | 37.37 | .495 | 8.348458 | .110583 |
| | 447 | Liver | 53.76 | .4836 | 13.81632 | .1242852 |
| | 448 | Liver | 36.85 | .5 | 8.26177 | .1121 |
| | 499 | Liver | 38.981149 | .6781867 | 8.685 | .1511 |
| | 501 | Liver | 38.13 | .4931 | 9.11307 | .1178509 |
| | 503 | Liver | 24.79 | .4883 | 5.277791 | .1039591 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Cu | 504 | Liver | 40.56 | .4902 | 7.527936 | .0909811 |
| | 505 | Liver | 27.51 | .4817 | 5.537763 | .0969662 |
| | 539 | Liver | 36.66 | .499 | 7.86357 | .1070355 |
| | 544 | Liver | 45.51 | .5669 | 8.396595 | .1045931 |
| | 557 | Liver | 66.5 | .4921 | 12.1163 | .0896606 |
| | 561 | Liver | 26.85 | .495 | 4.75782 | .087714 |
| | A10 | Liver | 61.8043088 | .8891382 | 13.77 | .1981 |
| | A18 | Liver | 39.7800718 | .5368043 | 8.863 | .1196 |
| | A2 | Liver | 26.23 | .4854 | 6.512909 | .1205248 |
| | A20 | Liver | 94.4344704 | .5022442 | 21.04 | .1119 |
| | A21 | Liver | 53.76 | .495 | 12.719616 | .117117 |
| | A22 | Liver | 11.68 | .4883 | 2.46448 | .1030313 |
| | A23 | Liver | 21.92 | .499 | 5.317792 | .1210574 |
| | A25 | Liver | 48.518851 | .7360862 | 10.81 | .164 |
| | A26 | Liver | 50.48 | .4912 | 11.529632 | .1121901 |
| | A3 | Liver | 63.54 | .4921 | 19.818126 | .153486 |
| | A32 | Liver | 104.443447 | .8631059 | 23.27 | .1923 |
| | A38 | Liver | 76.7504488 | .7396768 | 17.1 | .1648 |
| | A5 | Liver | 61.5798923 | .6476661 | 13.72 | .1443 |
| | A8 | Liver | 22.4820467 | .5996409 | 5.009 | .1336 |
| | A9 | Liver | 13.2495512 | .8276481 | 2.952 | .1844 |
| Fe | 303K | Kidney | 2201.0968921 | 33.11883 | 481.6 | 7.2464 |
| | 355K | Kidney | 1068.5557587 | 21.5178245 | 233.8 | 4.7081 |
| | 443K | Kidney | 1000 | 14.3272395 | 218.8 | 3.1348 |
| | 444K | Kidney | 1048.4460695 | 15.6521938 | 229.4 | 3.4247 |
| | 447K | Kidney | 1354.6617916 | 18.7006399 | 296.4 | 4.0917 |
| | 499K | Kidney | 890.3107861 | 24.4931444 | 194.8 | 5.3591 |
| | 505K | Kidney | 2963.8939671 | 18.0502742 | 648.5 | 3.9494 |
| | 539K | Kidney | 1423 | 21.4592 | 366.2802 | 5.5235981 |
| | 544K | Kidney | 1257.7696527 | 13.6348263 | 275.2 | 2.9833 |
| | 557K | Kidney | 1417.2760512 | 14.4451554 | 310.1 | 3.1606 |
| | 561K | Kidney | 1286 | 16.0772 | 231.8658 | 2.8987192 |
| | 240 | Liver | 955.1 | 9.5969 | 219.86402 | 2.2092064 |
| | 242 | Liver | 1891 | 9.5602 | 388.2223 | 1.9627091 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Fe | 244 | Liver | 1958.2585278 | 14.6678636 | 436.3 | 3.268 |
| | 245 | Liver | 2487 | 9.7087 | 445.173 | 1.7378573 |
| | 261 | Liver | 1596 | 9.6525 | 349.8432 | 2.115828 |
| | 265 | Liver | 1650.8078995 | 24.182675 | 367.8 | 5.3879 |
| | 266 | Liver | 892.2800718 | 12.3577199 | 198.8 | 2.7533 |
| | 271 | Liver | 697.486535 | 15.0718133 | 155.4 | 3.358 |
| | 272 | Liver | 693.8958707 | 36.4313285 | 154.6 | 8.1169 |
| | 275 | Liver | 376.7055655 | 45.6131059 | 83.93 | 10.1626 |
| | 300B | Liver | 1903.0520646 | 30.9968582 | 424 | 6.9061 |
| | 301 | Liver | 921.9030521 | 11.0987433 | 205.4 | 2.4728 |
| | 302 | Liver | 2248.6535009 | 11.5798923 | 501 | 2.58 |
| | 303 | Liver | 1905 | 9.8232 | 442.341 | 2.280947 |
| | 321 | Liver | 2355 | 9.9404 | 469.587 | 1.9821158 |
| | 322 | Liver | 2273.3393178 | 10.247307 | 506.5 | 2.2831 |
| | 324 | Liver | 2171.9030521 | 15.8711849 | 483.9 | 3.5361 |
| | 354 | Liver | 2277 | 9.8232 | 569.25 | 2.4558 |
| | 355 | Liver | 1929 | 9.9206 | 499.0323 | 2.5664592 |
| | 360 | Liver | 2280 | 9.6899 | 541.044 | 2.2994133 |
| | 361 | Liver | 1449 | 9.901 | 283.7142 | 1.9386158 |
| | 389 | Liver | 460.05386 | 44.1763914 | 102.5 | 9.8425 |
| | 443 | Liver | 2067 | 9.9206 | 517.5768 | 2.4841182 |
| | 444 | Liver | 3153.9497307 | 18.3047576 | 702.7 | 4.0783 |
| | 445 | Liver | 2050 | 9.901 | 457.97 | 2.2118834 |
| | 447 | Liver | 1933 | 9.6712 | 496.781 | 2.4854984 |
| | 448 | Liver | 3234 | 10 | 725.0628 | 2.242 |
| | 499 | Liver | 877.4685817 | 13.5682226 | 195.5 | 3.023 |
| | 501 | Liver | 3192 | 9.8619 | 762.888 | 2.3569941 |
| | 503 | Liver | 2792 | 9.7656 | 594.4168 | 2.0790962 |
| | 504 | Liver | 3535 | 9.8039 | 656.096 | 1.8196038 |
| | 505 | Liver | 4143 | 9.6339 | 833.9859 | 1.9393041 |
| | 539 | Liver | 1922 | 9.98 | 412.269 | 2.14071 |
| | 544 | Liver | 3568 | 11.3379 | 658.296 | 2.0918426 |
| | 557 | Liver | 2598 | 9.8425 | 473.3556 | 1.7933035 |
| | 561 | Liver | 2204 | 9.901 | 390.5488 | 1.7544572 |
| | A10 | Liver | 548.9228007 | 17.7827648 | 122.3 | 3.962 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Fe | A18 | Liver | 3235.1885099 | 10.7374327 | 720.8 | 2.3923 |
| | A2 | Liver | 1407 | 9.7087 | 349.3581 | 2.4106702 |
| | A20 | Liver | 2723.967684 | 10.0453321 | 606.9 | 2.2381 |
| | A21 | Liver | 1494 | 9.901 | 353.4804 | 2.3425766 |
| | A22 | Liver | 2205 | 9.7656 | 465.255 | 2.0605416 |
| | A23 | Liver | 2153 | 9.98 | 522.3178 | 2.421148 |
| | A25 | Liver | 2879.2639138 | 14.7253142 | 641.5 | 3.2808 |
| | A26 | Liver | 1934 | 9.8232 | 441.7256 | 2.2436189 |
| | A3 | Liver | 1421 | 9.8425 | 443.2099 | 3.0698758 |
| | A32 | Liver | 1465.8886894 | 17.2630162 | 326.6 | 3.8462 |
| | A38 | Liver | 1039.497307 | 14.7935368 | 231.6 | 3.296 |
| | A5 | Liver | 2714.0933573 | 12.956912 | 604.7 | 2.8868 |
| | A8 | Liver | 2115.3500898 | 11.994614 | 471.3 | 2.6724 |
| | A9 | Liver | 1309.6947935 | 16.5498205 | 291.8 | 3.6873 |
| Hg | 303K | Kidney | < .249543 | .249543 | < .0546 | .0546 |
| | 355K | Kidney | < .1078611 | .1078611 | < .0236 | .0236 |
| | 443K | Kidney | < .071755 | .071755 | < .0157 | .0157 |
| | 444K | Kidney | .1759598 | .0781536 | .0385 | .0171 |
| | 447K | Kidney | .1608775 | .0936929 | .0352 | .0205 |
| | 499K | Kidney | < .1732176 | .1732176 | < .0379 | .0379 |
| | 505K | Kidney | .1115174 | .0904936 | .0244 | .0198 |
| | 539K | Kidney | .2017 | .1706 | .0519176 | .0439124 |
| | 544K | Kidney | .3994516 | .0680987 | .0874 | .0149 |
| | 557K | Kidney | .2097806 | .0722121 | .0459 | .0158 |
| | 561K | Kidney | < .1577 | .1577 | < .0284333 | .0284333 |
| | 240 | Liver | .1287 | .096 | .0296267 | .0220992 |
| | 242 | Liver | .1319 | .0954 | .0270791 | .0195856 |
| | 244 | Liver | .2894973 | .0731598 | .0645 | .0163 |
| | 245 | Liver | .2403 | .0958 | .0430137 | .0171482 |
| | 261 | Liver | .1766 | .0965 | .0387107 | .0211528 |
| | 265 | Liver | .3249551 | .1202873 | .0724 | .0268 |
| | 266 | Liver | .2428187 | .061939 | .0541 | .0138 |
| | 271 | Liver | .1503591 | .0754039 | .0335 | .0168 |
| | 272 | Liver | .3159785 | .2549372 | .0704 | .0568 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Hg | 275 | Liver | < .2854578 | .2854578 | < .0636 | .0636 |
| | 300B | Liver | .2181329 | .1912029 | .0486 | .0426 |
| | 301 | Liver | .2010772 | .0556553 | .0448 | .0124 |
| | 302 | Liver | .6566427 | .0578995 | .1463 | .0129 |
| | 303 | Liver | .1626 | .0978 | .0377557 | .0227092 |
| | 321 | Liver | .179 | .0977 | .0356926 | .0194814 |
| | 322 | Liver | .1220826 | .051167 | .0272 | .0114 |
| | 324 | Liver | .3307899 | .0794434 | .0737 | .0177 |
| | 354 | Liver | .1321 | .0986 | .033025 | .02465 |
| | 355 | Liver | .183 | .0992 | .0473421 | .025663 |
| | 360 | Liver | .1574 | .0965 | .037351 | .0228995 |
| | 361 | Liver | .2444 | .0978 | .0478535 | .0191492 |
| | 389 | Liver | .4335727 | .2935368 | .0966 | .0654 |
| | 443 | Liver | .1006 | .0994 | .0251902 | .0248898 |
| | 444 | Liver | .2737882 | .0915619 | .061 | .0204 |
| | 445 | Liver | .2591 | .099 | .0578829 | .0221166 |
| | 447 | Liver | .1295 | .0992 | .0332815 | .0254944 |
| | 448 | Liver | .1481 | .099 | .033204 | .0221958 |
| | 499 | Liver | .0982944 | .0677738 | .0219 | .0151 |
| | 501 | Liver | .1461 | .0971 | .0349179 | .0232069 |
| | 503 | Liver | .3001 | .0975 | .0638913 | .0207578 |
| | 504 | Liver | .2897 | .098 | .0537683 | .0181888 |
| | 505 | Liver | .3635 | .0971 | .0731726 | .0195462 |
| | 539 | Liver | .5693 | .0996 | .1221149 | .0213642 |
| | 544 | Liver | .5867 | .0973 | .1082462 | .0179519 |
| | 557 | Liver | .2164 | .099 | .0394281 | .0180378 |
| | 561 | Liver | .1094 | .098 | .0193857 | .0173656 |
| | A10 | Liver | .2899461 | .1279174 | .0646 | .0285 |
| | A18 | Liver | .9447935 | .05386 | .2105 | .012 |
| | A2 | Liver | .3301 | .0954 | .0819638 | .0236878 |
| | A20 | Liver | .2194794 | .0502693 | .0489 | .0112 |
| | A21 | Liver | .16 | .098 | .037856 | .0231868 |
| | A22 | Liver | .1627 | .0996 | .0343297 | .0210156 |
| | A23 | Liver | .1347 | .0996 | .0326782 | .024163 |
| | A25 | Liver | .3110413 | .0736086 | .0693 | .0164 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Hg | A26 | Liver | .4787 | .0992 | .1093351 | .0226573 |
| | A3 | Liver | .3347 | .0967 | .1043929 | .0301607 |
| | A32 | Liver | .1238779 | .0861759 | .0276 | .0192 |
| | A38 | Liver | .3105925 | .0740575 | .0692 | .0165 |
| | A5 | Liver | .2410233 | .064632 | .0537 | .0144 |
| | A8 | Liver | .2360862 | .0601436 | .0526 | .0134 |
| | A9 | Liver | .1651706 | .1265709 | .0368 | .0282 |
| Mg | 303K | Kidney | 801.6453382 | 33.11883 | 175.4 | 7.2464 |
| | 355K | Kidney | 588.6654479 | 21.5178245 | 128.8 | 4.7081 |
| | 443K | Kidney | 554.3875686 | 14.3272395 | 121.3 | 3.1348 |
| | 444K | Kidney | 696.5265082 | 15.6521938 | 152.4 | 3.4247 |
| | 447K | Kidney | 683.2723949 | 18.7006399 | 149.5 | 4.0917 |
| | 499K | Kidney | 765.9963437 | 24.4931444 | 167.6 | 5.3591 |
| | 505K | Kidney | 760.511883 | 18.0502742 | 166.4 | 3.9494 |
| | 539K | Kidney | 764.5 | 21.4592 | 196.7823 | 5.5235981 |
| | 544K | Kidney | 465.7221207 | 13.6348263 | 101.9 | 2.9833 |
| | 557K | Kidney | 559.8720293 | 14.4451554 | 122.5 | 3.1606 |
| | 561K | Kidney | 633.5 | 16.0772 | 114.22005 | 2.8987192 |
| | 240 | Liver | 698 | 9.5969 | 160.6796 | 2.2092064 |
| | 242 | Liver | 565.5 | 9.5602 | 116.09715 | 1.9627091 |
| | 244 | Liver | 778.2764811 | 14.6678636 | 173.4 | 3.268 |
| | 245 | Liver | 771.7 | 9.7087 | 138.1343 | 1.7378573 |
| | 261 | Liver | 778.9 | 9.6525 | 170.73488 | 2.115828 |
| | 265 | Liver | 871.6337522 | 24.182675 | 194.2 | 5.3879 |
| | 266 | Liver | 698.8330341 | 12.3577199 | 155.7 | 2.7533 |
| | 271 | Liver | 899.9102334 | 15.0718133 | 200.5 | 3.358 |
| | 272 | Liver | 1219.9281867 | 36.4313285 | 271.8 | 8.1169 |
| | 275 | Liver | 1153.5008977 | 45.6131059 | 257 | 10.1626 |
| | 300B | Liver | 945.6912029 | 30.9968582 | 210.7 | 6.9061 |
| | 301 | Liver | 974.4165171 | 11.0987433 | 217.1 | 2.4728 |
| | 302 | Liver | 675.0448833 | 11.5798923 | 150.4 | 2.58 |
| | 303 | Liver | 742 | 9.8232 | 172.2924 | 2.280947 |
| | 321 | Liver | 664 | 9.9404 | 132.4016 | 1.9821158 |
| | 322 | Liver | 761.2208259 | 10.247307 | 169.6 | 2.2831 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mg | 324 | Liver | 858.6175943 | 15.8711849 | 191.3 | 3.5361 |
| | 354 | Liver | 673.2 | 9.8232 | 168.3 | 2.4558 |
| | 355 | Liver | 641.2 | 9.9206 | 165.87844 | 2.5664592 |
| | 360 | Liver | 724.8 | 9.6899 | 171.99504 | 2.2994133 |
| | 361 | Liver | 747.7 | 9.901 | 146.39966 | 1.9386158 |
| | 389 | Liver | 975.3141831 | 44.1763914 | 217.3 | 9.8425 |
| | 443 | Liver | 649.5 | 9.9206 | 162.6348 | 2.4841182 |
| | 444 | Liver | 683.1238779 | 18.3047576 | 152.2 | 4.0783 |
| | 445 | Liver | 556.6 | 9.901 | 124.34444 | 2.2118834 |
| | 447 | Liver | 570.1 | 9.6712 | 146.5157 | 2.4854984 |
| | 448 | Liver | 657.1 | 10 | 147.32182 | 2.242 |
| | 499 | Liver | 736.535009 | 13.5682226 | 164.1 | 3.023 |
| | 501 | Liver | 768.7 | 9.8619 | 183.7193 | 2.3569941 |
| | 503 | Liver | 592.3 | 9.7656 | 126.10067 | 2.0790962 |
| | 504 | Liver | 586.7 | 9.8039 | 108.89152 | 1.8196038 |
| | 505 | Liver | 602.8 | 9.6339 | 121.34364 | 1.9393041 |
| | 539 | Liver | 811.4 | 9.98 | 174.0453 | 2.14071 |
| | 544 | Liver | 587.9 | 11.3379 | 108.46755 | 2.0918426 |
| | 557 | Liver | 617 | 9.8425 | 112.4174 | 1.7933035 |
| | 561 | Liver | 556.1 | 9.901 | 98.54092 | 1.7544572 |
| | A10 | Liver | 613.5547576 | 17.7827648 | 136.7 | 3.962 |
| | A18 | Liver | 599.6409336 | 10.7374327 | 133.6 | 2.3923 |
| | A2 | Liver | 519.2 | 9.7087 | 128.91736 | 2.4106702 |
| | A20 | Liver | 866.6965889 | 10.0453321 | 193.1 | 2.2381 |
| | A21 | Liver | 559.9 | 9.901 | 132.47234 | 2.3425766 |
| | A22 | Liver | 533.3 | 9.7656 | 112.5263 | 2.0605416 |
| | A23 | Liver | 728 | 9.98 | 176.6128 | 2.421148 |
| | A25 | Liver | 760.7719928 | 14.7253142 | 169.5 | 3.2808 |
| | A26 | Liver | 678.4 | 9.8232 | 154.94656 | 2.2436189 |
| | A3 | Liver | 619.6 | 9.8425 | 193.25324 | 3.0698758 |
| | A32 | Liver | 727.5583483 | 17.2630162 | 162.1 | 3.8462 |
| | A38 | Liver | 548.0251346 | 14.7935368 | 122.1 | 3.296 |
| | A5 | Liver | 758.0789946 | 12.956912 | 168.9 | 2.8868 |
| | A8 | Liver | 610.8617594 | 11.994614 | 136.1 | 2.6724 |
| | A9 | Liver | 608.6175943 | 16.5498205 | 135.6 | 3.6873 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mn | 303K | Kidney | 5.1416819 | 1.3249543 | 1.125 | .2899 |
| | 355K | Kidney | 2.964808 | .8606033 | .6487 | .1883 |
| | 443K | Kidney | 3.5507313 | .5731261 | .7769 | .1254 |
| | 444K | Kidney | 6.1151737 | .6261426 | 1.338 | .137 |
| | 447K | Kidney | 4.7166362 | .7481718 | 1.032 | .1637 |
| | 499K | Kidney | 3.6796161 | .9798903 | .8051 | .2144 |
| | 505K | Kidney | 3.3756856 | .7221207 | .7386 | .158 |
| | 539K | Kidney | 2.688 | .8584 | .6918912 | .2209522 |
| | 544K | Kidney | 5.23766 | .5452468 | 1.146 | .1193 |
| | 557K | Kidney | 12.833638 | .5776965 | 2.808 | .1264 |
| | 561K | Kidney | 2.306 | .6431 | .4157718 | .1159509 |
| | 240 | Liver | 3.98 | .3839 | .916196 | .0883738 |
| | 242 | Liver | 5.102 | .3824 | 1.0474406 | .0785067 |
| | 244 | Liver | 4.5825853 | .5866248 | 1.021 | .1307 |
| | 245 | Liver | 7.909 | .3883 | 1.415711 | .0695057 |
| | 261 | Liver | 11.3 | .3861 | 2.47696 | .0846331 |
| | 265 | Liver | 3.5013465 | .9672352 | .7801 | .2155 |
| | 266 | Liver | 2.3451526 | .4941652 | .5225 | .1101 |
| | 271 | Liver | 5.7226212 | .6027828 | 1.275 | .1343 |
| | 272 | Liver | 8.451526 | 1.4573609 | 1.883 | .3247 |
| | 275 | Liver | 10.1570916 | 1.8245063 | 2.263 | .4065 |
| | 300B | Liver | 7.2531418 | 1.2396768 | 1.616 | .2762 |
| | 301 | Liver | 8.6490126 | .4438959 | 1.927 | .0989 |
| | 302 | Liver | 6.2791741 | .4631957 | 1.399 | .1032 |
| | 303 | Liver | 5.281 | .3929 | 1.2262482 | .0912314 |
| | 321 | Liver | 4.542 | .3976 | .9056748 | .0792814 |
| | 322 | Liver | 4.6543986 | .4097846 | 1.037 | .0913 |
| | 324 | Liver | 6.6831239 | .6346499 | 1.489 | .1414 |
| | 354 | Liver | 6.745 | .3929 | 1.68625 | .098225 |
| | 355 | Liver | 6.614 | .3968 | 1.7110418 | .1026522 |
| | 360 | Liver | 6.216 | .3876 | 1.4750568 | .0919775 |
| | 361 | Liver | 4.602 | .396 | .9010716 | .0775368 |
| | 389 | Liver | 5.9245961 | 1.7670557 | 1.32 | .3937 |
| | 443 | Liver | 7.713 | .3968 | 1.9313352 | .0993587 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mn | 444 | Liver | 8.1597846 | .7320467 | 1.818 | .1631 |
| | 445 | Liver | 4.5 | .396 | 1.0053 | .0884664 |
| | 447 | Liver | 4.531 | .3868 | 1.164467 | .0994076 |
| | 448 | Liver | 6.437 | .4 | 1.4431754 | .08968 |
| | 499 | Liver | 6.1894075 | .5426391 | 1.379 | .1209 |
| | 501 | Liver | 6.254 | .3945 | 1.494706 | .0942855 |
| | 503 | Liver | 5.286 | .3906 | 1.1253894 | .0831587 |
| | 504 | Liver | 5.096 | .3922 | .9458176 | .0727923 |
| | 505 | Liver | 6.336 | .3854 | 1.2754368 | .077581 |
| | 539 | Liver | 3.614 | .3992 | .775203 | .0856284 |
| | 544 | Liver | 3.931 | .4535 | .7252695 | .0836708 |
| | 557 | Liver | 12.98 | .3937 | 2.364956 | .0717321 |
| | 561 | Liver | 3.875 | .396 | .68665 | .0701712 |
| | A10 | Liver | 4.6499102 | .7114004 | 1.036 | .1585 |
| | A18 | Liver | 4.5915619 | .4295332 | 1.023 | .0957 |
| | A2 | Liver | 2.479 | .3883 | .6155357 | .0964149 |
| | A20 | Liver | 5.8078995 | .4017056 | 1.294 | .0895 |
| | A21 | Liver | 6.241 | .396 | 1.4766206 | .0936936 |
| | A22 | Liver | 10.21 | .3906 | 2.15431 | .0824166 |
| | A23 | Liver | 9.194 | .3992 | 2.2304644 | .0968459 |
| | A25 | Liver | 5.7540395 | .5888689 | 1.282 | .1312 |
| | A26 | Liver | 4.221 | .3929 | .9640764 | .0897384 |
| | A3 | Liver | 3.04 | .3937 | .948176 | .122795 |
| | A32 | Liver | 5.964991 | .6903052 | 1.329 | .1538 |
| | A38 | Liver | 5.6149013 | .5915619 | 1.251 | .1318 |
| | A5 | Liver | 4.0368043 | .5184022 | .8994 | .1155 |
| | A8 | Liver | 14.0394973 | .4798025 | 3.128 | .1069 |
| | A9 | Liver | 9.8159785 | .6620287 | 2.187 | .1475 |
| Mo | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | < .7824497 | .7824497 | < .1712 | .1712 |
| | 447K | Kidney | < .9351005 | .9351005 | < .2046 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mo | 505K | Kidney | < .9026508 | .9026508 | < .1975 | .1975 |
| | 539K | Kidney | < 1.073 | 1.073 | < .2761902 | .2761902 |
| | 544K | Kidney | < .6819013 | .6819013 | < .1492 | .1492 |
| | 557K | Kidney | < .7221207 | .7221207 | < .158 | .158 |
| | 561K | Kidney | < .8039 | .8039 | < .1449432 | .1449432 |
| | 240 | Liver | < .4798 | .4798 | < .11045 | .11045 |
| | 242 | Liver | < .478 | .478 | < .0981334 | .0981334 |
| | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | < .4854 | .4854 | < .0868866 | .0868866 |
| | 261 | Liver | 1.635 | .4826 | .358392 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | < 1.8213645 | 1.8213645 | < .4058 | .4058 |
| | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | 2.1252244 | 1.5498205 | .4735 | .3453 |
| | 301 | Liver | .6175943 | .5547576 | .1376 | .1236 |
| | 302 | Liver | < .5789946 | .5789946 | < .129 | .129 |
| | 303 | Liver | .8839 | .4912 | .2052416 | .1140566 |
| | 321 | Liver | .9059 | .497 | .1806365 | .0991018 |
| | 322 | Liver | .8083483 | .5125673 | .1801 | .1142 |
| | 324 | Liver | 1.061939 | .7935368 | .2366 | .1768 |
| | 354 | Liver | .7779 | .4912 | .194475 | .1228 |
| | 355 | Liver | .5934 | .496 | .1535126 | .1283152 |
| | 360 | Liver | .7709 | .4845 | .1829346 | .1149719 |
| | 361 | Liver | < .495 | .495 | < .096921 | .096921 |
| | 389 | Liver | 2.3438061 | 2.2087074 | .5222 | .4921 |
| | 443 | Liver | 1.058 | .496 | .2649232 | .1241984 |
| | 444 | Liver | .9869838 | .9151706 | .2199 | .2039 |
| | 445 | Liver | < .495 | .495 | < .110583 | .110583 |
| | 447 | Liver | 1.255 | .4836 | .322535 | .1242852 |
| | 448 | Liver | .8516 | .5 | .1909287 | .1121 |
| | 499 | Liver | .7360862 | .6781867 | .164 | .1511 |
| | 501 | Liver | .8007 | .4931 | .1913673 | .1178509 |
| | 503 | Liver | .8404 | .4883 | .1789212 | .1039591 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Mo | 504 | Liver | .8281 | .4902 | .1536954 | .0909811 |
| | 505 | Liver | 1.216 | .4817 | .2447808 | .0969662 |
| | 539 | Liver | < .499 | .499 | < .1070355 | .1070355 |
| | 544 | Liver | 1.691 | .5669 | .3119895 | .1045931 |
| | 557 | Liver | .9316 | .4921 | .1697375 | .0896606 |
| | 561 | Liver | < .495 | .495 | < .087714 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |
| | A18 | Liver | .7199282 | .5368043 | .1604 | .1196 |
| | A2 | Liver | .5414 | .4854 | .1344296 | .1205248 |
| | A20 | Liver | 1.2428187 | .5022442 | .2769 | .1119 |
| | A21 | Liver | .5947 | .495 | .140706 | .117117 |
| | A22 | Liver | 1.16 | .4883 | .24476 | .1030313 |
| | A23 | Liver | .8899 | .499 | .2158897 | .1210574 |
| | A25 | Liver | .7899461 | .7360862 | .176 | .164 |
| | A26 | Liver | .6872 | .4912 | .1569565 | .1121901 |
| | A3 | Liver | .5069 | .4921 | .1581021 | .153486 |
| | A32 | Liver | 1.4084381 | .8631059 | .3138 | .1923 |
| | A38 | Liver | .8886894 | .7396768 | .198 | .1648 |
| | A5 | Liver | < .6476661 | .6476661 | < .1443 | .1443 |
| | A8 | Liver | .7728905 | .5996409 | .1722 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Ni | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | < .7824497 | .7824497 | < .1712 | .1712 |
| | 447K | Kidney | < .9351005 | .9351005 | < .2046 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |
| | 505K | Kidney | 1.4794333 | .9026508 | .3237 | .1975 |
| | 539K | Kidney | < 1.073 | 1.073 | < .2761902 | .2761902 |
| | 544K | Kidney | < .6819013 | .6819013 | < .1492 | .1492 |
| | 557K | Kidney | < .7221207 | .7221207 | < .158 | .158 |
| | 561K | Kidney | < .8039 | .8039 | < .1449432 | .1449432 |
| | 240 | Liver | < .4798 | .4798 | < .11045 | .11045 |
| | 242 | Liver | < .478 | .478 | < .0981334 | .0981334 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Ni | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | < .4854 | .4854 | < .0868866 | .0868866 |
| | 261 | Liver | < .4826 | .4826 | < .1057859 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | 7.7603232 | 1.8213645 | 1.729 | .4058 |
| | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | < 1.5498205 | 1.5498205 | < .3453 | .3453 |
| | 301 | Liver | .7782765 | .5547576 | .1734 | .1236 |
| | 302 | Liver | < .5789946 | .5789946 | < .129 | .129 |
| | 303 | Liver | < .4912 | .4912 | < .1140566 | .1140566 |
| | 321 | Liver | < .497 | .497 | < .0991018 | .0991018 |
| | 322 | Liver | < .5125673 | .5125673 | < .1142 | .1142 |
| | 324 | Liver | < .7935368 | .7935368 | < .1768 | .1768 |
| | 354 | Liver | < .4912 | .4912 | < .1228 | .1228 |
| | 355 | Liver | < .496 | .496 | < .1283152 | .1283152 |
| | 360 | Liver | < .4845 | .4845 | < .1149719 | .1149719 |
| | 361 | Liver | < .495 | .495 | < .096921 | .096921 |
| | 389 | Liver | < 2.2087074 | 2.2087074 | < .4921 | .4921 |
| | 443 | Liver | .671 | .496 | .1680184 | .1241984 |
| | 444 | Liver | < .9151706 | .9151706 | < .2039 | .2039 |
| | 445 | Liver | < .495 | .495 | < .110583 | .110583 |
| | 447 | Liver | < .4836 | .4836 | < .1242852 | .1242852 |
| | 448 | Liver | < .5 | .5 | < .1121 | .1121 |
| | 499 | Liver | < .6781867 | .6781867 | < .1511 | .1511 |
| | 501 | Liver | < .4931 | .4931 | < .1178509 | .1178509 |
| | 503 | Liver | < .4883 | .4883 | < .1039591 | .1039591 |
| | 504 | Liver | < .4902 | .4902 | < .0909811 | .0909811 |
| | 505 | Liver | < .4817 | .4817 | < .0969662 | .0969662 |
| | 539 | Liver | < .499 | .499 | < .1070355 | .1070355 |
| | 544 | Liver | < .5669 | .5669 | < .1045931 | .1045931 |
| | 557 | Liver | < .4921 | .4921 | < .0896606 | .0896606 |
| | 561 | Liver | 2.596 | .495 | .4600112 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Ni | A18 | Liver | < .5368043 | .5368043 | < .1196 | .1196 |
| | A2 | Liver | < .4854 | .4854 | < .1205248 | .1205248 |
| | A20 | Liver | < .5022442 | .5022442 | < .1119 | .1119 |
| | A21 | Liver | < .495 | .495 | < .117117 | .117117 |
| | A22 | Liver | < .4883 | .4883 | < .1030313 | .1030313 |
| | A23 | Liver | < .499 | .499 | < .1210574 | .1210574 |
| | A25 | Liver | < .7360862 | .7360862 | < .164 | .164 |
| | A26 | Liver | < .4912 | .4912 | < .1121901 | .1121901 |
| | A3 | Liver | .7558 | .4921 | .235734 | .153486 |
| | A32 | Liver | < .8631059 | .8631059 | < .1923 | .1923 |
| | A38 | Liver | < .7396768 | .7396768 | < .1648 | .1648 |
| | A5 | Liver | < .6476661 | .6476661 | < .1443 | .1443 |
| | A8 | Liver | < .5996409 | .5996409 | < .1336 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Pb | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | < .7161792 | .7161792 | < .1567 | .1567 |
| | 444K | Kidney | .8537477 | .7824497 | .1868 | .1712 |
| | 447K | Kidney | < .9351005 | .9351005 | < .2046 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |
| | 505K | Kidney | 2.9346435 | .9026508 | .6421 | .1975 |
| | 539K | Kidney | < 1.073 | 1.073 | < .2761902 | .2761902 |
| | 544K | Kidney | < .6819013 | .6819013 | < .1492 | .1492 |
| | 557K | Kidney | < .7221207 | .7221207 | < .158 | .158 |
| | 561K | Kidney | < .8039 | .8039 | < .1449432 | .1449432 |
| | 240 | Liver | 1.435 | .4798 | .330337 | .11045 |
| | 242 | Liver | < .478 | .478 | < .0981334 | .0981334 |
| | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | 1.112 | .4854 | .199048 | .0868866 |
| | 261 | Liver | .9113 | .4826 | .199757 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | 6.8267504 | 1.8213645 | 1.521 | .4058 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Pb | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | < 1.5498205 | 1.5498205 | < .3453 | .3453 |
| | 301 | Liver | .6566427 | .5547576 | .1463 | .1236 |
| | 302 | Liver | < .5789946 | .5789946 | < .129 | .129 |
| | 303 | Liver | .8082 | .4912 | .187664 | .1140566 |
| | 321 | Liver | .5144 | .497 | .1025714 | .0991018 |
| | 322 | Liver | .5556553 | .5125673 | .1238 | .1142 |
| | 324 | Liver | < .7935368 | .7935368 | < .1768 | .1768 |
| | 354 | Liver | 1.597 | .4912 | .39925 | .1228 |
| | 355 | Liver | < .496 | .496 | < .1283152 | .1283152 |
| | 360 | Liver | 1.732 | .4845 | .4110036 | .1149719 |
| | 361 | Liver | 1.064 | .495 | .2083312 | .096921 |
| | 389 | Liver | < 2.2087074 | 2.2087074 | < .4921 | .4921 |
| | 443 | Liver | .6579 | .496 | .1647382 | .1241984 |
| | 444 | Liver | < .9151706 | .9151706 | < .2039 | .2039 |
| | 445 | Liver | 1.324 | .495 | .2957816 | .110583 |
| | 447 | Liver | .7072 | .4836 | .1817504 | .1242852 |
| | 448 | Liver | 1.34 | .5 | .300428 | .1121 |
| | 499 | Liver | < .6781867 | .6781867 | < .1511 | .1511 |
| | 501 | Liver | 1.567 | .4931 | .374513 | .1178509 |
| | 503 | Liver | < .4883 | .4883 | < .1039591 | .1039591 |
| | 504 | Liver | < .4902 | .4902 | < .0909811 | .0909811 |
| | 505 | Liver | 2.334 | .4817 | .4698342 | .0969662 |
| | 539 | Liver | < .499 | .499 | < .1070355 | .1070355 |
| | 544 | Liver | < .5669 | .5669 | < .1045931 | .1045931 |
| | 557 | Liver | < .4921 | .4921 | < .0896606 | .0896606 |
| | 561 | Liver | .5034 | .495 | .0892025 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |
| | A18 | Liver | 1.5219928 | .5368043 | .3391 | .1196 |
| | A2 | Liver | < .4854 | .4854 | < .1205248 | .1205248 |
| | A20 | Liver | 1.8532316 | .5022442 | .4129 | .1119 |
| | A21 | Liver | < .495 | .495 | < .117117 | .117117 |
| | A22 | Liver | < .4883 | .4883 | < .1030313 | .1030313 |
| | A23 | Liver | 1.259 | .499 | .3054334 | .1210574 |
| | A25 | Liver | 2.056553 | .7360862 | .4582 | .164 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Pb | A26 | Liver | < .4912 | .4912 | < .1121901 | .1121901 |
| | A3 | Liver | < .4921 | .4921 | < .153486 | .153486 |
| | A32 | Liver | 1.7293537 | .8631059 | .3853 | .1923 |
| | A38 | Liver | .790395 | .7396768 | .1761 | .1648 |
| | A5 | Liver | 18.5278276 | .6476661 | 4.128 | .1443 |
| | A8 | Liver | 1.3388689 | .5996409 | .2983 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Sr | 303K | Kidney | 3.0904936 | .6622486 | .6762 | .1449 |
| | 355K | Kidney | 2.4908592 | .4305302 | .545 | .0942 |
| | 443K | Kidney | 1.9616088 | .2865631 | .4292 | .0627 |
| | 444K | Kidney | 1.8468921 | .3130713 | .4041 | .0685 |
| | 447K | Kidney | 2.4090494 | .3738574 | .5271 | .0818 |
| | 499K | Kidney | 4.356947 | .4899452 | .9533 | .1072 |
| | 505K | Kidney | 4.3066728 | .3610603 | .9423 | .079 |
| | 539K | Kidney | 1.962 | .4292 | .5050188 | .1104761 |
| | 544K | Kidney | 3.2125229 | .2728519 | .7029 | .0597 |
| | 557K | Kidney | 4.7394881 | .2888483 | 1.037 | .0632 |
| | 561K | Kidney | 2.723 | .3215 | .4909569 | .0579665 |
| | 240 | Liver | 1.51 | .1919 | .347602 | .0441754 |
| | 242 | Liver | 1.941 | .1912 | .3984873 | .0392534 |
| | 244 | Liver | 2.3954219 | .2935368 | .5337 | .0654 |
| | 245 | Liver | 2.311 | .1942 | .413669 | .0347618 |
| | 261 | Liver | 1.594 | .1931 | .3494048 | .0423275 |
| | 265 | Liver | 3.8267504 | .483842 | .8526 | .1078 |
| | 266 | Liver | 4.8204668 | .247307 | 1.074 | .0551 |
| | 271 | Liver | 11.3061041 | .3016158 | 2.519 | .0672 |
| | 272 | Liver | 16.3868941 | .728456 | 3.651 | .1623 |
| | 275 | Liver | 6.7818671 | .9124776 | 1.511 | .2033 |
| | 300B | Liver | 2.5094255 | .6198384 | .5591 | .1381 |
| | 301 | Liver | 2.293088 | .2221724 | .5109 | .0495 |
| | 302 | Liver | 2.3859964 | .2315978 | .5316 | .0516 |
| | 303 | Liver | 1.283 | .1965 | .2979126 | .0456273 |
| | 321 | Liver | 1.92 | .1988 | .382848 | .0396407 |
| | 322 | Liver | 2.0718133 | .2051167 | .4616 | .0457 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Sr | 324 | Liver | 2.0610413 | .317325 | .4592 | .0707 |
| | 354 | Liver | 1.326 | .1965 | .3315 | .049125 |
| | 355 | Liver | .9994 | .1984 | .2585448 | .0513261 |
| | 360 | Liver | 1.743 | .1938 | .4136139 | .0459887 |
| | 361 | Liver | 2.028 | .198 | .3970824 | .0387684 |
| | 389 | Liver | 2.7298025 | .8837522 | .6082 | .1969 |
| | 443 | Liver | 1.162 | .1984 | .2909648 | .0496794 |
| | 444 | Liver | 1.3527828 | .3662478 | .3014 | .0816 |
| | 445 | Liver | 1.292 | .198 | .2886328 | .0442332 |
| | 447 | Liver | 1.388 | .1934 | .356716 | .0497038 |
| | 448 | Liver | 1.392 | .2 | .3120864 | .04484 |
| | 499 | Liver | 2.7351885 | .271544 | .6094 | .0605 |
| | 501 | Liver | 1.759 | .1972 | .420401 | .0471308 |
| | 503 | Liver | 1.695 | .1953 | .3608655 | .0415794 |
| | 504 | Liver | 2.937 | .1961 | .5451072 | .0363962 |
| | 505 | Liver | 2.868 | .1927 | .5773284 | .0387905 |
| | 539 | Liver | 1.912 | .1996 | .410124 | .0428142 |
| | 544 | Liver | 5.341 | .2268 | .9854145 | .0418446 |
| | 557 | Liver | 2.794 | .1969 | .5090668 | .0358752 |
| | 561 | Liver | 3.447 | .198 | .6108084 | .0350856 |
| | A10 | Liver | 1.19614 | .3554758 | .2665 | .0792 |
| | A18 | Liver | 1.8056553 | .2145422 | .4023 | .0478 |
| | A2 | Liver | .5881 | .1942 | .1460252 | .0482199 |
| | A20 | Liver | 1.1781867 | .2010772 | .2625 | .0448 |
| | A21 | Liver | 1.032 | .198 | .2441712 | .0468468 |
| | A22 | Liver | .8112 | .1953 | .1711632 | .0412083 |
| | A23 | Liver | 1.383 | .1996 | .3355158 | .048423 |
| | A25 | Liver | 1.0381508 | .2944345 | .2313 | .0656 |
| | A26 | Liver | 1.3 | .1965 | .29692 | .0448806 |
| | A3 | Liver | .9622 | .1969 | .3001102 | .0614131 |
| | A32 | Liver | 1.6009874 | .3451526 | .3567 | .0769 |
| | A38 | Liver | 1.6804309 | .295781 | .3744 | .0659 |
| | A5 | Liver | 4.7351885 | .2589767 | 1.055 | .0577 |
| | A8 | Liver | 1.6005386 | .2396768 | .3566 | .0534 |
| | A9 | Liver | .8348294 | .3307899 | .186 | .0737 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| V | 303K | Kidney | < 1.6558501 | 1.6558501 | < .3623 | .3623 |
| | 355K | Kidney | < 1.0758684 | 1.0758684 | < .2354 | .2354 |
| | 443K | Kidney | .8825411 | .7161792 | .1931 | .1567 |
| | 444K | Kidney | .9794333 | .7824497 | .2143 | .1712 |
| | 447K | Kidney | 1.3528336 | .9351005 | .296 | .2046 |
| | 499K | Kidney | < 1.2248629 | 1.2248629 | < .268 | .268 |
| | 505K | Kidney | 2.9314442 | .9026508 | .6414 | .1975 |
| | 539K | Kidney | 1.103 | 1.073 | .2839122 | .2761902 |
| | 544K | Kidney | 4.2870201 | .6819013 | .938 | .1492 |
| | 557K | Kidney | 1.3400366 | .7221207 | .2932 | .158 |
| | 561K | Kidney | < .8039 | .8039 | < .1449432 | .1449432 |
| | 240 | Liver | < .4798 | .4798 | < .11045 | .11045 |
| | 242 | Liver | .5953 | .478 | .1222151 | .0981334 |
| | 244 | Liver | < .7333932 | .7333932 | < .1634 | .1634 |
| | 245 | Liver | < .4854 | .4854 | < .0868866 | .0868866 |
| | 261 | Liver | < .4826 | .4826 | < .1057859 | .1057859 |
| | 265 | Liver | < 1.2091562 | 1.2091562 | < .2694 | .2694 |
| | 266 | Liver | < .6180431 | .6180431 | < .1377 | .1377 |
| | 271 | Liver | < .7535907 | .7535907 | < .1679 | .1679 |
| | 272 | Liver | 1.9609515 | 1.8213645 | .4369 | .4058 |
| | 275 | Liver | < 2.2805206 | 2.2805206 | < .5081 | .5081 |
| | 300B | Liver | < 1.5498205 | 1.5498205 | < .3453 | .3453 |
| | 301 | Liver | < .5547576 | .5547576 | < .1236 | .1236 |
| | 302 | Liver | .782316 | .5789946 | .1743 | .129 |
| | 303 | Liver | .8869 | .4912 | .2059382 | .1140566 |
| | 321 | Liver | 1.215 | .497 | .242271 | .0991018 |
| | 322 | Liver | < .5125673 | .5125673 | < .1142 | .1142 |
| | 324 | Liver | < .7935368 | .7935368 | < .1768 | .1768 |
| | 354 | Liver | .5524 | .4912 | .1381 | .1228 |
| | 355 | Liver | < .496 | .496 | < .1283152 | .1283152 |
| | 360 | Liver | 1.12 | .4845 | .265776 | .1149719 |
| | 361 | Liver | .6313 | .495 | .1236085 | .096921 |
| | 389 | Liver | < 2.2087074 | 2.2087074 | < .4921 | .4921 |
| | 443 | Liver | .6244 | .496 | .1563498 | .1241984 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| V | 444 | Liver | < .9151706 | .9151706 | < .2039 | .2039 |
| | 445 | Liver | 1.435 | .495 | .320579 | .110583 |
| | 447 | Liver | .5209 | .4836 | .1338713 | .1242852 |
| | 448 | Liver | .9712 | .5 | .217743 | .1121 |
| | 499 | Liver | < .6781867 | .6781867 | < .1511 | .1511 |
| | 501 | Liver | .9514 | .4931 | .2273846 | .1178509 |
| | 503 | Liver | 1.411 | .4883 | .3004019 | .1039591 |
| | 504 | Liver | 2.455 | .4902 | .455648 | .0909811 |
| | 505 | Liver | 1.968 | .4817 | .3961584 | .0969662 |
| | 539 | Liver | < .499 | .499 | < .1070355 | .1070355 |
| | 544 | Liver | 2.125 | .5669 | .3920625 | .1045931 |
| | 557 | Liver | .7758 | .4921 | .1413508 | .0896606 |
| | 561 | Liver | < .495 | .495 | < .087714 | .087714 |
| | A10 | Liver | < .8891382 | .8891382 | < .1981 | .1981 |
| | A18 | Liver | .9708259 | .5368043 | .2163 | .1196 |
| | A2 | Liver | .581 | .4854 | .1442623 | .1205248 |
| | A20 | Liver | < .5022442 | .5022442 | < .1119 | .1119 |
| | A21 | Liver | < .495 | .495 | < .117117 | .117117 |
| | A22 | Liver | .8041 | .4883 | .1696651 | .1030313 |
| | A23 | Liver | .5472 | .499 | .1327507 | .1210574 |
| | A25 | Liver | < .7360862 | .7360862 | < .164 | .164 |
| | A26 | Liver | 1.148 | .4912 | .2622032 | .1121901 |
| | A3 | Liver | 1.18 | .4921 | .368042 | .153486 |
| | A32 | Liver | < .8631059 | .8631059 | < .1923 | .1923 |
| | A38 | Liver | < .7396768 | .7396768 | < .1648 | .1648 |
| | A5 | Liver | 1.0709156 | .6476661 | .2386 | .1443 |
| | A8 | Liver | .9438959 | .5996409 | .2103 | .1336 |
| | A9 | Liver | < .8276481 | .8276481 | < .1844 | .1844 |
| Zn | 303K | Kidney | 72.0749543 | 3.3117002 | 15.77 | .7246 |
| | 355K | Kidney | 65.9506399 | 2.1517367 | 14.43 | .4708 |
| | 443K | Kidney | 57.8610603 | 1.4328154 | 12.66 | .3135 |
| | 444K | Kidney | 74.6800731 | 1.5653565 | 16.34 | .3425 |
| | 447K | Kidney | 78.702011 | 1.8702011 | 17.22 | .4092 |
| | 499K | Kidney | 75.3656307 | 2.4492687 | 16.49 | .5359 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Zn | 505K | Kidney | 73.857404 | 1.8048446 | 16.16 | .3949 |
| | 539K | Kidney | 66.33 | 2.1459 | 17.073342 | .5523547 |
| | 544K | Kidney | 50.4570384 | 1.3633455 | 11.04 | .2983 |
| | 557K | Kidney | 64.6252285 | 1.4446984 | 14.14 | .3161 |
| | 561K | Kidney | 93.69 | 1.6077 | 16.892307 | .2898683 |
| | 240 | Liver | 56.85 | .9597 | 13.08687 | .2209229 |
| | 242 | Liver | 62.82 | .956 | 12.896946 | .1962668 |
| | 244 | Liver | 73.967684 | 1.4667864 | 16.48 | .3268 |
| | 245 | Liver | 88.59 | .9709 | 15.85761 | .1737911 |
| | 261 | Liver | 83.02 | .9653 | 18.197984 | .2115938 |
| | 265 | Liver | 104.8473968 | 2.4183124 | 23.36 | .5388 |
| | 266 | Liver | 66.2926391 | 1.2356373 | 14.77 | .2753 |
| | 271 | Liver | 86.3554758 | 1.5071813 | 19.24 | .3358 |
| | 272 | Liver | 115.2154399 | 3.6431777 | 25.67 | .8117 |
| | 275 | Liver | 141.7414722 | 4.5614901 | 31.58 | 1.0163 |
| | 300B | Liver | 122.3967684 | 3.0996409 | 27.27 | .6906 |
| | 301 | Liver | 132.989228 | 1.1099641 | 29.63 | .2473 |
| | 302 | Liver | 108.3931777 | 1.1579892 | 24.15 | .258 |
| | 303 | Liver | 100.8 | .9823 | 23.40576 | .2280901 |
| | 321 | Liver | 112.5 | .994 | 22.4325 | .1982036 |
| | 322 | Liver | 97.2172352 | 1.0246858 | 21.66 | .2283 |
| | 324 | Liver | 118.3572711 | 1.5870736 | 26.37 | .3536 |
| | 354 | Liver | 94.54 | .9823 | 23.635 | .245575 |
| | 355 | Liver | 99.65 | .9921 | 25.779455 | .2566563 |
| | 360 | Liver | 96.83 | .969 | 22.977759 | .2299437 |
| | 361 | Liver | 103.2 | .9901 | 20.20656 | .1938616 |
| | 389 | Liver | 122.8007181 | 4.4178636 | 27.36 | .9843 |
| | 443 | Liver | 103.4 | .9921 | 25.89136 | .2484218 |
| | 444 | Liver | 101.4362657 | 1.8303411 | 22.6 | .4078 |
| | 445 | Liver | 85.41 | .9901 | 19.080594 | .2211883 |
| | 447 | Liver | 104.9 | .9671 | 26.9593 | .2485447 |
| | 448 | Liver | 98.55 | 1 | 22.09491 | .2242 |
| | 499 | Liver | 96.9928187 | 1.3568223 | 21.61 | .3023 |
| | 501 | Liver | 106.6 | .9862 | 25.4774 | .2357018 |
| | 503 | Liver | 90.91 | .9766 | 19.354739 | .2079181 |

CONTAMINANT CONCENTRATIONS (Cont.)

| Analyte | Sample Number | Sample Matrix | Result (ppm Dry Wt.) | Detection Limit (ppm Dry Wt.) | Result (ppm Wet Wt.) | Detection Limit (ppm Wet Wt.) |
|---|---|---|---|---|---|---|
| Zn | 504 | Liver | 97.82 | .9804 | 18.155392 | .1819622 |
| | 505 | Liver | 82.61 | .9634 | 16.629393 | .1939324 |
| | 539 | Liver | 92.98 | .998 | 19.94421 | .214071 |
| | 544 | Liver | 114.3 | 1.1338 | 21.08835 | .2091861 |
| | 557 | Liver | 105.4 | .9843 | 19.20388 | .1793395 |
| | 561 | Liver | 90.06 | .9901 | 15.958632 | .1754457 |
| | A10 | Liver | 127.6032316 | 1.7782765 | 28.43 | .3962 |
| | A18 | Liver | 110.2333932 | 1.0736086 | 24.56 | .2392 |
| | A2 | Liver | 82.4 | .9709 | 20.45992 | .2410745 |
| | A20 | Liver | 146.9030521 | 1.0044883 | 32.73 | .2238 |
| | A21 | Liver | 108.3 | .9901 | 25.62378 | .2342577 |
| | A22 | Liver | 64.5 | .9766 | 13.6095 | .2060626 |
| | A23 | Liver | 88.42 | .998 | 21.450692 | .2421148 |
| | A25 | Liver | 109.4254937 | 1.4726212 | 24.38 | .3281 |
| | A26 | Liver | 153.3 | .9823 | 35.01372 | .2243573 |
| | A3 | Liver | 128 | .9843 | 39.9232 | .3070032 |
| | A32 | Liver | 180.0718133 | 1.7262118 | 40.12 | .3846 |
| | A38 | Liver | 131.0143627 | 1.4793537 | 29.19 | .3296 |
| | A5 | Liver | 127.513465 | 1.295781 | 28.41 | .2887 |
| | A8 | Liver | 74.1472172 | 1.1992819 | 16.52 | .2672 |
| | A9 | Liver | 64.0035907 | 1.6548474 | 14.26 | .3687 |

PROCEDURAL BLANKS

| Analyte | Lab Sample Number | Result Total UG |
|---|---|---|
| Al | 219201 | 2.15 |
| | 219401 | .02 |
| | 219761 | 3.37 |
| B | 219201 | .51 |
| | 219401 | .12 |
| | 219761 | 0 |
| Ba | 219201 | .06 |
| | 219401 | .03 |
| | 219761 | .14 |
| Be | 219201 | 0 |
| | 219401 | 0 |
| | 219761 | .02 |
| Cd | 219201 | 0 |
| | 219401 | 0 |
| | 219761 | .01 |
| Cr | 219201 | .07 |
| | 219401 | .09 |
| | 219761 | .07 |
| Cu | 219201 | 0 |
| | 219401 | 0 |
| | 219761 | .02 |
| Fe | 219201 | 4.71 |
| | 219401 | 0 |
| | 219761 | 2.74 |
| Hg | 219191 | 0 |
| | 219391 | 0 |
| | 219611 | 0 |

PROCEDURAL BLANKS (Cont.)

| Analyte | Lab Sample Number | Result Total UG |
|---|---|---|
| Hg | 219751 | 0 |
| Mg | 219201 | 1.97 |
| | 219401 | 1.6 |
| | 219761 | 3.18 |
| Mn | 219201 | .08 |
| | 219401 | .04 |
| | 219761 | .12 |
| Mo | 219201 | .24 |
| | 219401 | .04 |
| | 219761 | .08 |
| Ni | 219201 | 0 |
| | 219401 | .02 |
| | 219761 | .11 |
| Pb | 219201 | 0 |
| | 219401 | 0 |
| | 219761 | 0 |
| Sr | 219201 | .04 |
| | 219401 | .04 |
| | 219761 | .09 |
| V | 219201 | 0 |
| | 219401 | .02 |
| | 219761 | .06 |
| Zn | 219201 | .08 |
| | 219401 | .11 |
| | 219761 | .02 |

DUPLICATES

| Analyte | Sample Number | Sample Matrix | Initial Result (ppm / %) | | Duplicate Result (ppm / %) | | Average | Relative % Difference |
|---|---|---|---|---|---|---|---|---|
| Al | 539K | Kidney | < 10.7296 | Dry | 13.28 | Dry | 9.3224 | 84.91 |
| | 360 | Liver | 6.842 | Dry | 6.356 | Dry | 6.599 | 7.36 |
| | A2 | Liver | 10.18 | Dry | 10.85 | Dry | 10.515 | 6.37 |
| B | 539K | Kidney | 10.7 | Dry | 9.66 | Dry | 10.18 | 10.22 |
| | 360 | Liver | 1.579 | Dry | 2.051 | Dry | 1.815 | 26.01 |
| | A2 | Liver | .69 | Dry | < .7353 | Dry | 0.528825 | 60.96 |
| Ba | 539K | Kidney | < 1.073 | Dry | < 1.0417 | Dry | 0.528675 | 2.96 |
| | 360 | Liver | < .4845 | Dry | < .4817 | Dry | 0.24155 | 0.58 |
| | A2 | Liver | < .4854 | Dry | < .7353 | Dry | 0.305175 | 40.94 |
| Be | 539K | Kidney | < .2146 | Dry | < .2083 | Dry | 0.105725 | 2.98 |
| | 360 | Liver | < .0969 | Dry | < .0963 | Dry | 0.0483 | 0.62 |
| | A2 | Liver | < .0971 | Dry | < .1471 | Dry | 0.06105 | 40.95 |
| Cd | 539K | Kidney | .3894 | Dry | .425 | Dry | 0.4072 | 8.74 |
| | 360 | Liver | .2378 | Dry | .1286 | Dry | 0.1832 | 59.61 |
| | A2 | Liver | .3283 | Dry | .3064 | Dry | 0.31735 | 6.9 |
| Cr | 539K | Kidney | 1.494 | Dry | < 1.0417 | Dry | 1.007425 | 96.6 |
| | 360 | Liver | < .4845 | Dry | < .4817 | Dry | 0.24155 | 0.58 |
| | A2 | Liver | < .4854 | Dry | < .7353 | Dry | 0.305175 | 40.94 |
| Cu | 539K | Kidney | 6.426 | Dry | 6.523 | Dry | 6.4745 | 1.5 |
| | 360 | Liver | 41.41 | Dry | 39.47 | Dry | 40.44 | 4.8 |
| | A2 | Liver | 26.23 | Dry | 28.84 | Dry | 27.535 | 9.48 |
| Fe | 539K | Kidney | 1423 | Dry | 1402 | Dry | 1412.5 | 1.49 |
| | 360 | Liver | 2280 | Dry | 2224 | Dry | 2252 | 2.49 |
| | A2 | Liver | 1407 | Dry | 1490 | Dry | 1448.5 | 5.73 |
| Hg | 539K | Kidney | .2017 | Dry | .209 | Dry | 0.20535 | 3.55 |
| | 245 | Liver | .2403 | Dry | .2288 | Dry | 0.23455 | 4.9 |

DUPLICATES (Cont.)

| Analyte | Sample Number | Sample Matrix | Initial Result (ppm / %) | | Duplicate Result (ppm / %) | | Average | Relative % Difference |
|---|---|---|---|---|---|---|---|---|
| Hg | 360 | Liver | .1574 | Dry | .1542 | Dry | 0.1558 | 2.05 |
| | 544 | Liver | .5867 | Dry | .5664 | Dry | 0.57655 | 3.52 |
| | A2 | Liver | .3301 | Dry | .3443 | Dry | 0.3372 | 4.21 |
| Mg | 539K | Kidney | 764.5 | Dry | 777.8 | Dry | 771.15 | 1.72 |
| | 360 | Liver | 724.8 | Dry | 727.5 | Dry | 726.15 | 0.37 |
| | A2 | Liver | 519.2 | Dry | 562.1 | Dry | 540.65 | 7.93 |
| Mn | 539K | Kidney | 2.688 | Dry | 3.036 | Dry | 2.862 | 12.16 |
| | 360 | Liver | 6.216 | Dry | 6.185 | Dry | 6.2005 | 0.5 |
| | A2 | Liver | 2.479 | Dry | 2.59 | Dry | 2.5345 | 4.38 |
| Mo | 539K | Kidney | < 1.073 | Dry | < 1.0417 | Dry | 0.528675 | 2.96 |
| | 360 | Liver | .7709 | Dry | 1.339 | Dry | 1.05495 | 53.85 |
| | A2 | Liver | .5414 | Dry | .7507 | Dry | 0.64605 | 32.4 |
| Ni | 539K | Kidney | < 1.073 | Dry | < 1.0417 | Dry | 0.528675 | 2.96 |
| | 360 | Liver | < .4845 | Dry | < .4817 | Dry | 0.24155 | 0.58 |
| | A2 | Liver | < .4854 | Dry | < .7353 | Dry | 0.305175 | 40.94 |
| Pb | 539K | Kidney | < 1.073 | Dry | < 1.0417 | Dry | 0.528675 | 2.96 |
| | 360 | Liver | 1.732 | Dry | 1.199 | Dry | 1.4655 | 36.37 |
| | A2 | Liver | < .4854 | Dry | < .7353 | Dry | 0.305175 | 40.94 |
| Sr | 539K | Kidney | 1.962 | Dry | 1.877 | Dry | 1.9195 | 4.43 |
| | 360 | Liver | 1.743 | Dry | 1.735 | Dry | 1.739 | 0.46 |
| | A2 | Liver | .5881 | Dry | .6373 | Dry | 0.6127 | 8.03 |
| V | 539K | Kidney | 1.103 | Dry | 1.141 | Dry | 1.122 | 3.39 |
| | 360 | Liver | 1.12 | Dry | .9989 | Dry | 1.05945 | 11.43 |
| | A2 | Liver | .581 | Dry | < .7353 | Dry | 0.474325 | 44.98 |
| Zn | 539K | Kidney | 66.33 | Dry | 67.6 | Dry | 66.965 | 1.9 |
| | 360 | Liver | 96.83 | Dry | 96.01 | Dry | 96.42 | 0.85 |
| | A2 | Liver | 82.4 | Dry | 89.66 | Dry | 86.03 | 8.44 |

## REFERENCE MATERIALS

| Analyte | Lab Sample Number | S.R.M. ID | S.R.M. Name | * Certified Reference Value (ppm / %) | 95% Confidence Interval | Result (ppm / %) | Percent Recovery |
|---|---|---|---|---|---|---|---|
| Al | 219171 | NIST 1577a | Bovine Liver | 2 Dry | | < 4.8077 Dry | 240.38 |
| | 219381 | NIST 1577a | Bovine Liver | 2 Dry | | < 4.902 Dry | 245.1 |
| | 219781 | NIST 1577a | Bovine Liver | 2 Dry | | < 4.7801 Dry | 239 |
| | 219801 | NIST 1577a | Bovine Liver | 2 Dry | | 15.05 Dry | 752.5 |
| B | 219171 | NIST 1577a | | | | .7202 Dry | |
| | 219381 | NIST 1577a | | | | .8816 Dry | |
| | 219781 | NIST 1577a | | | | < .478 Dry | |
| | 219801 | NIST 1577a | | | | 2.218 Dry | |
| Ba | 219171 | NIST 1577a | | | | < .4808 Dry | |
| | 219381 | NIST 1577a | | | | < .4902 Dry | |
| | 219781 | NIST 1577a | | | | < .478 Dry | |
| | 219801 | NIST 1577a | | | | < .4902 Dry | |
| Be | 219171 | NIST 1577a | | | | < .0962 Dry | |
| | 219381 | NIST 1577a | | | | < .098 Dry | |
| | 219781 | NIST 1577a | | | | < .0956 Dry | |
| | 219801 | NIST 1577a | | | | < .098 Dry | |
| Cd | 219171 | NIST 1577a | Bovine Liver | .44 Dry | .06 | .4624 Dry | 105.09 |
| | 219381 | NIST 1577a | Bovine Liver | .44 Dry | .06 | .3634 Dry | 82.59 |
| | 219781 | NIST 1577a | Bovine Liver | .44 Dry | .06 | .4121 Dry | 93.66 |
| | 219801 | NIST 1577a | Bovine Liver | .44 Dry | .06 | .4801 Dry | 109.11 |
| Cr | 219171 | NIST 1577a | | | | .7766 Dry | |
| | 219381 | NIST 1577a | | | | .6228 Dry | |
| | 219781 | NIST 1577a | | | | .9209 Dry | |
| | 219801 | NIST 1577a | | | | .7352 Dry | |
| Cu | 219171 | NIST 1577a | Bovine Liver | 158 Dry | 7 | 158 Dry | 100 |

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

| Analyte | Lab Sample Number | S.R.M. ID | S.R.M. Name | * Certified Reference Value (ppm / %) | 95% Confidence Interval | Result (ppm / %) | Percent Recovery |
|---|---|---|---|---|---|---|---|
| Cu | 219381 | NIST 1577a | Bovine Liver | 158 Dry | 7 | 138 Dry | 87.34 |
| | 219781 | NIST 1577a | Bovine Liver | 158 Dry | 7 | 137.7 Dry | 87.15 |
| | 219801 | NIST 1577a | Bovine Liver | 158 Dry | 7 | 140.2 Dry | 88.73 |
| Fe | 219171 | NIST 1577a | Bovine Liver | 194 Dry | 20 | 192.3 Dry | 99.12 |
| | 219381 | NIST 1577a | Bovine Liver | 194 Dry | 20 | 161.5 Dry | 83.25 |
| | 219781 | NIST 1577a | Bovine Liver | 194 Dry | 20 | 189 Dry | 97.42 |
| | 219801 | NIST 1577a | Bovine Liver | 194 Dry | 20 | 179.4 Dry | 92.47 |
| Hg | 219622 | NIST 1577a | Bovine Liver | .004 Dry | .002 | .6318 Dry | 15795 |
| | 219181 | NRCC DORM-1 | Dogfish Muscle | .798 Dry | .074 | .6751 Dry | 84.6 |
| | 219411 | NRCC DORM-1 | Dogfish Muscle | .798 Dry | .074 | .7128 Dry | 89.32 |
| | 219791 | NRCC DORM-1 | Dogfish Muscle | .798 Dry | .074 | .6392 Dry | 80.1 |
| | 219811 | NRCC DORM-1 | Dogfish Muscle | .798 Dry | .074 | .6849 Dry | 85.83 |
| Mg | 219171 | NIST 1577a | Bovine Liver | 600 Dry | 15 | 603.5 Dry | 100.58 |
| | 219381 | NIST 1577a | Bovine Liver | 600 Dry | 15 | 464.3 Dry | 77.38 |
| | 219781 | NIST 1577a | Bovine Liver | 600 Dry | 15 | 548.3 Dry | 91.38 |
| | 219801 | NIST 1577a | Bovine Liver | 600 Dry | 15 | 496.2 Dry | 82.7 |
| Mn | 219171 | NIST 1577a | Bovine Liver | 9.9 Dry | .8 | 11.05 Dry | 111.62 |
| | 219381 | NIST 1577a | Bovine Liver | 9.9 Dry | .8 | 9.174 Dry | 92.67 |
| | 219781 | NIST 1577a | Bovine Liver | 9.9 Dry | .8 | 10.11 Dry | 102.12 |
| | 219801 | NIST 1577a | Bovine Liver | 9.9 Dry | .8 | 10.23 Dry | 103.33 |
| Mo | 219171 | NIST 1577a | Bovine Liver | 3.5 Dry | .5 | 3.931 Dry | 112.31 |
| | 219381 | NIST 1577a | Bovine Liver | 3.5 Dry | .5 | 3.448 Dry | 98.51 |
| | 219781 | NIST 1577a | Bovine Liver | 3.5 Dry | .5 | 3.845 Dry | 109.86 |
| | 219801 | NIST 1577a | Bovine Liver | 3.5 Dry | .5 | 3.94 Dry | 112.57 |
| Ni | 219171 | NIST 1577a | | | | < .4808 Dry | |
| | 219381 | NIST 1577a | | | | < .4902 Dry | |

* Only certified analytes list a confidence interval - all others are considered reference values.

REFERENCE MATERIALS (Cont.)

| Analyte | Lab Sample Number | S.R.M. ID | S.R.M. Name | * Certified Reference Value (ppm / %) | 95% Confidence Interval | Result (ppm / %) | Percent Recovery |
|---|---|---|---|---|---|---|---|
| Ni | 219781 | NIST 1577a | | | | < .478 Dry | |
| | 219801 | NIST 1577a | | | | .5592 Dry | |
| Pb | 219171 | NIST 1577a | Bovine Liver | .135 Dry | .015 | 1.145 Dry | 848.15 |
| | 219381 | NIST 1577a | Bovine Liver | .135 Dry | .015 | < .4902 Dry | 363.11 |
| | 219781 | NIST 1577a | Bovine Liver | .135 Dry | .015 | < .478 Dry | 354.07 |
| | 219801 | NIST 1577a | Bovine Liver | .135 Dry | .015 | < .4902 Dry | 363.11 |
| Sr | 219171 | NIST 1577a | Bovine Liver | .138 Dry | .003 | .2019 Dry | 146.3 |
| | 219381 | NIST 1577a | Bovine Liver | .138 Dry | .003 | .2501 Dry | 181.23 |
| | 219781 | NIST 1577a | Bovine Liver | .138 Dry | .003 | < .1912 Dry | 138.55 |
| | 219801 | NIST 1577a | Bovine Liver | .138 Dry | .003 | .5081 Dry | 368.19 |
| V | 219171 | NIST 1577a | Bovine Liver | .099 Dry | .008 | < .4808 Dry | 485.66 |
| | 219381 | NIST 1577a | Bovine Liver | .099 Dry | .008 | < .4902 Dry | 495.15 |
| | 219781 | NIST 1577a | Bovine Liver | .099 Dry | .008 | < .478 Dry | 482.83 |
| | 219801 | NIST 1577a | Bovine Liver | .099 Dry | .008 | < .4902 Dry | 495.15 |
| Zn | 219171 | NIST 1577a | Bovine Liver | 123 Dry | 8 | 124.5 Dry | 101.22 |
| | 219381 | NIST 1577a | Bovine Liver | 123 Dry | 8 | 100.2 Dry | 81.46 |
| | 219781 | NIST 1577a | Bovine Liver | 123 Dry | 8 | 112.1 Dry | 91.14 |
| | 219801 | NIST 1577a | Bovine Liver | 123 Dry | 8 | 105.2 Dry | 85.53 |

* Only certified analytes list a confidence interval - all others are considered reference values.

SPIKE RECOVERIES

| Analyte | Sample Number | Sample Matrix | Spike Level (ppm / %) | | Amount Recovered (ppm / %) | | * Spike / Background | Percent Recovery |
|---|---|---|---|---|---|---|---|---|
| Al | 561K | Kidney | 3268 | Dry | 2867 | Dry | 400 | 87.73 |
| | 261 | Liver | 1930 | Dry | 1995.8 | Dry | 100.52 | 103.41 |
| | 361 | Liver | 1957 | Dry | 1934.62 | Dry | 171.97 | 98.86 |
| | 561 | Liver | 1949 | Dry | 1985.65 | Dry | 171.72 | 101.88 |
| B | 561K | Kidney | 328.8 | Dry | 282.908 | Dry | 52.26 | 86.04 |
| | 261 | Liver | 194.2 | Dry | 200.292 | Dry | 160.76 | 103.14 |
| | 361 | Liver | 196.9 | Dry | 193.857 | Dry | 146.61 | 98.45 |
| | 561 | Liver | 196.1 | Dry | 182.138 | Dry | 73.67 | 92.88 |
| Ba | 561K | Kidney | 328.1 | Dry | 287.1 | Dry | 401.59 | 87.5 |
| | 261 | Liver | 193.8 | Dry | 208.4 | Dry | 401.57 | 107.53 |
| | 361 | Liver | 196.5 | Dry | 198.6 | Dry | 401.68 | 101.07 |
| | 561 | Liver | 195.7 | Dry | 193.5 | Dry | 401.6 | 98.88 |
| Be | 561K | Kidney | 326.8 | Dry | 284 | Dry | 2000 | 86.9 |
| | 261 | Liver | 193 | Dry | 199.1 | Dry | 2000 | 103.16 |
| | 361 | Liver | 195.7 | Dry | 191.9 | Dry | 2001.02 | 98.06 |
| | 561 | Liver | 194.9 | Dry | 191.3 | Dry | 1998.97 | 98.15 |
| Cd | 561K | Kidney | 328.1 | Dry | 295.803 | Dry | 149.34 | 90.16 |
| | 261 | Liver | 193 | Dry | 186.1735 | Dry | 366.57 | 96.46 |
| | 361 | Liver | 196.5 | Dry | 187.4924 | Dry | 1826.21 | 95.42 |
| | 561 | Liver | 195.7 | Dry | 202.1994 | Dry | 651.03 | 103.32 |
| Cr | 561K | Kidney | 332 | Dry | 300.0264 | Dry | 380.04 | 90.37 |
| | 261 | Liver | 196.1 | Dry | 196.3309 | Dry | 293.08 | 100.12 |
| | 361 | Liver | 198.8 | Dry | 193.8311 | Dry | 349.45 | 97.5 |
| | 561 | Liver | 198 | Dry | 198.5 | Dry | 406.32 | 100.25 |
| Cu | 561K | Kidney | 328.1 | Dry | 273.87 | Dry | 13.43 | 83.47 |
| | 261 | Liver | 193 | Dry | 200.19 | Dry | 7.45 | 103.73 |

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

| Analyte | Sample Number | Sample Matrix | Spike Level (ppm / %) | | Amount Recovered (ppm / %) | | * Spike / Background | Percent Recovery |
|---|---|---|---|---|---|---|---|---|
| Cu | 361 | Liver | 196.5 | Dry | 192.63 | Dry | 4.63 | 98.03 |
| | 561 | Liver | 195.7 | Dry | 196.55 | Dry | 7.29 | 100.43 |
| Fe | 561K | Kidney | 3271 | Dry | 2794 | Dry | 2.54 | 85.42 |
| | 261 | Liver | 1932 | Dry | 1901 | Dry | 1.21 | 98.4 |
| | 361 | Liver | 1959 | Dry | 1780 | Dry | 1.35 | 90.86 |
| | 561 | Liver | 1951 | Dry | 2023 | Dry | 0.89 | 103.69 |
| Hg | 355K | Kidney | 1.97 | Dry | 9.2778793 | Dry | 4.37 | 470.96 |
| | 321 | Liver | 1.97 | Dry | 1.812 | Dry | 11.01 | 91.98 |
| | 361 | Liver | 1.93 | Dry | 1.9126 | Dry | 7.9 | 99.1 |
| | 445 | Liver | 1.98 | Dry | 1.8109 | Dry | 7.64 | 91.46 |
| Mg | 561K | Kidney | 3268 | Dry | 2863.5 | Dry | 5.16 | 87.62 |
| | 261 | Liver | 1930 | Dry | 1809.1 | Dry | 2.48 | 93.74 |
| | 361 | Liver | 1957 | Dry | 1803.3 | Dry | 2.62 | 92.15 |
| | 561 | Liver | 1949 | Dry | 2056.9 | Dry | 3.5 | 105.54 |
| Mn | 561K | Kidney | 327.8 | Dry | 293.794 | Dry | 142.15 | 89.63 |
| | 261 | Liver | 193.6 | Dry | 194.2 | Dry | 17.13 | 100.31 |
| | 361 | Liver | 196.3 | Dry | 189.798 | Dry | 42.66 | 96.69 |
| | 561 | Liver | 195.5 | Dry | 197.325 | Dry | 50.45 | 100.93 |
| Mo | 561K | Kidney | 327.4 | Dry | 292.1 | Dry | 400.73 | 89.22 |
| | 261 | Liver | 193.4 | Dry | 194.365 | Dry | 118.29 | 100.5 |
| | 361 | Liver | 196.1 | Dry | 189.7 | Dry | 400.86 | 96.74 |
| | 561 | Liver | 195.3 | Dry | 196.9 | Dry | 400.78 | 100.82 |
| Ni | 561K | Kidney | 1638 | Dry | 1467 | Dry | 2004.9 | 89.56 |
| | 261 | Liver | 967.6 | Dry | 944.7 | Dry | 2004.97 | 97.63 |
| | 361 | Liver | 980.8 | Dry | 929.6 | Dry | 2004.91 | 94.78 |
| | 561 | Liver | 977 | Dry | 992.504 | Dry | 376.35 | 101.59 |

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

SPIKE RECOVERIES (Cont.)

| Analyte | Sample Number | Sample Matrix | Spike Level (ppm / %) | | Amount Recovered (ppm / %) | | * Spike / Background | Percent Recovery |
|---|---|---|---|---|---|---|---|---|
| Pb | 561K | Kidney | 1639 | Dry | 1475 | Dry | 2006.12 | 89.99 |
| | 261 | Liver | 968.3 | Dry | 919.8887 | Dry | 1062.55 | 95 |
| | 361 | Liver | 981.6 | Dry | 923.236 | Dry | 922.56 | 94.05 |
| | 561 | Liver | 977.8 | Dry | 1025.4966 | Dry | 1942.39 | 104.88 |
| Sr | 561K | Kidney | 326.8 | Dry | 282.077 | Dry | 120.01 | 86.31 |
| | 261 | Liver | 193 | Dry | 209.306 | Dry | 121.08 | 108.45 |
| | 361 | Liver | 195.7 | Dry | 198.272 | Dry | 96.5 | 101.31 |
| | 561 | Liver | 194.9 | Dry | 193.653 | Dry | 56.54 | 99.36 |
| V | 561K | Kidney | 327.1 | Dry | 292.9 | Dry | 400.37 | 89.54 |
| | 261 | Liver | 193.2 | Dry | 197.9 | Dry | 400.33 | 102.43 |
| | 361 | Liver | 195.9 | Dry | 191.6687 | Dry | 310.31 | 97.84 |
| | 561 | Liver | 195.1 | Dry | 194.6 | Dry | 400.37 | 99.74 |
| Zn | 561K | Kidney | 335.9 | Dry | 283.11 | Dry | 3.59 | 84.28 |
| | 261 | Liver | 198.5 | Dry | 192.08 | Dry | 2.39 | 96.77 |
| | 361 | Liver | 201.2 | Dry | 191 | Dry | 1.95 | 94.93 |
| | 561 | Liver | 200.4 | Dry | 217.74 | Dry | 2.23 | 108.65 |

* For a spike to be a valid measure of method accuracy, this ratio must be higher than 1.0.

COMMENTS (RESULT MODIFERS AND QA/QC COMMENTS)

| Analyte | Sample Number | Result Modifier |
|---|---|---|
| % Moisture | 244 | RESULT NOT MEASURED- AVERAGE VALUE REPORTED |
| | 265 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 266 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 271 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 272 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 275 | RESULT NOT MEASURED - AVERAGE VALUE REPORRED |
| | 300B | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 301 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 302 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 303K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 322 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 324 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 355K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 389 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 443K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 444 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 444K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 447K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 499 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 499K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 505K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 544K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | 557K | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A10 | RESULT NOT MEASURED- AVERAGE VALUE REPORTED |
| | A18 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A20 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A25 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A32 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A38 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A5 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A8 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |
| | A9 | RESULT NOT MEASURED - AVERAGE VALUE REPORTED |

COMMENTS (RESULT MODIFERS AND QA/QC COMMENTS) (Cont.)

QA/QC Comments

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For the following samples there was insufficient sample to perform a moisture determination:

303K, 355K, 443K, 444K, 447K, 499K, 505K, 544K, 557K, 244, 265, 266, 271, 272, 275, 300B, 301, 302, 322, 324, 389, 444, 499, A10, A18, A20, A25, A32, A38, A5, A8, A9

For the Kidney samples, an average(n=2) of 78.12% was used to estimate dry weight concentrations.

For the liver samples, an average(n=28) of 77.72% was used to estimate dry weight concentrations.

APPROVED.

ANALYTICAL METHODS

| Method Code | Method Description |
|---|---|
| 001 | LABORATORY: Research Triangle Institute |

I. Homogenization. Tissue samples are prehomogenized using a food processor. A portion of the tissue sample (or sediment) is then freeze dried for determination of moisture content and ground to 100 mesh with a mill.

002 LABORATORY: Research Triangle Institute

II. Preconcentration Digestion for Inductively Coupled Plasma Emission (ICP) Measurement. Using a CEM microwave oven, 0.5 g of freeze dried tissue is heated in a capped 120 mL Teflon vessel in the presence of 5 mL of Baker Instra-Analyzed nitric acid for three minutes at 120 watts, three minutes at 300 watts, and 35 minutes at 450 watts. The vessel contents are then allowed to cool and the cap is removed and rinsed carefully with 3 ml of HNO3 adding the rinsings to the vessels contents. The uncapped vessel is then returned to the microwave oven and heated until the vessel contents are less than 1 mL in volume. The contents are carefully rinsed with laboratory pure water into a 5 ml glass volumetric vessel and made to volume with additional laboratory pure water. The flask contents are then immediately transferred to a clean plastic centrigure or auto sampler tube and centrifuged for 1 minute to precipitate the suspended matter. The sample is now ready for ICP analysis.

003 LABORATORY: Research Triangle Institute

III. Digest for ICP Measurement. Using a CEM microwave oven, 0.25 to 0.5 g. of freeze dried sample is heated in a capped 120 ml Teflon vessel in the presence of 5 ml of Baker Instra-Analyzed nitric acid for three minutes at 120 watts, three minutes at 300 watts, and fifteen minutes at 450 watts. The residue is then diluted to 50 ml with D.I. water.

ANALYTICAL METHODS (Cont.)

| Method Code | Method Description |
|---|---|
| 004 | LABORATORY: Research Triangle Institute<br><br>IV. Digestion for Graphite Furnace and Cold Vapor Atomic Absorption (GFAA) Measurement. Using a CEM microwave oven, 0.25 to 0.5 g of freeze dried sample is heated in a capped 120 ml Teflon vessel in the presence of 5 ml of Baker Instra-Analyzed nitric acid for three minutes at 120 watts, three minutes at 300 watts, and fifteen minutes at 450 watts. The residue is then diluted to 50 ml with laboratory pure water. |
| 006 | LABORATORY: Research Triangle Institute<br><br>VI. ICP. ICP measurements are made using a Leeman Labs Plasma Spec I sequential or ES2000 simultaneous spectrometer. |
| 008 | LABORATORY: Research Triangle Institute<br><br>VIII. Cold Vapor Atomic Absorption (CVAA). Hg measurements are conducted using $SnCl_4$ as the reducing agent. A Leeman PS200 Hg Analyzer is employed. |

# APPENDIX D-2

**Metal concentrations in liver tissue from individual brown bullheads from Slocum, Hancock, and Goose Creeks, 1992.**

| | | Location | Collection | Fish Length | ppm (dry weight) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fish# | Creek | within creek | Date | (mm) | Al | B | Ba | Be | Cd | Cr | Cu | Fe | Hg | Mg | Mn | Mo | Ni | Pb | Sr | V | Zn |
| 265 | Goose | | 8/3/92 | 294 | 6.05 | 2.12 | 0.61 | 0.12 | 0.12 | 0.61 | 48.4 | 1651 | 0.32 | 872 | 3.50 | 0.61 | 0.61 | 0.61 | 3.83 | 0.61 | 105 |
| 266 | Goose | | 8/3/92 | 355 | 11.87 | 2.17 | 0.31 | 0.06 | 0.06 | 0.31 | 23.3 | 892 | 0.24 | 699 | 2.35 | 0.31 | 0.31 | 0.31 | 4.82 | 0.31 | 66 |
| 271 | Goose | | 8/3/92 | 334 | 3.77 | 2.03 | 0.38 | 0.08 | 0.08 | 0.38 | 48.8 | 697 | 0.15 | 900 | 5.72 | 0.38 | 0.38 | 0.38 | 11.31 | 0.38 | 86 |
| 272 | Goose | | 8/4/92 | 227 | 38.02 | 4.97 | 2.15 | 1.58 | 1.53 | 2.07 | 35.8 | 694 | 0.32 | 1220 | 8.45 | 0.91 | 7.76 | 6.83 | 16.39 | 1.96 | 115 |
| 275 | Goose | | 8/3/92 | 206 | 11.41 | 3.81 | 1.14 | 0.23 | 0.23 | 1.14 | 69.5 | 377 | 0.15 | 1154 | 10.16 | 1.14 | 1.14 | 1.14 | 6.78 | 1.14 | 142 |
| 389 | Goose | | 10/25/92 | 216 | 11.05 | 4.91 | 1.11 | 0.22 | 0.22 | 1.11 | 68.8 | 460 | 0.43 | 975 | 5.92 | 2.34 | 1.11 | 1.11 | 2.73 | 1.11 | 123 |
| A10 | Goose | | 8/24/92 | 255 | 4.45 | 0.45 | 0.45 | 0.09 | 0.09 | 1.52 | 61.8 | 549 | 0.29 | 614 | 4.65 | 0.45 | 0.45 | 0.45 | 1.20 | 0.45 | 128 |
| A18 | Goose | | 8/24/92 | 356 | 46.38 | 1.12 | 0.27 | 0.06 | 0.45 | 0.27 | 39.8 | 3235 | 0.94 | 600 | 4.59 | 0.72 | 0.27 | 1.52 | 1.81 | 0.97 | 110 |
| A28 | Goose | | 8/24/92 | 437 | 17.09 | 0.74 | 0.25 | 0.05 | 0.17 | 0.25 | 50.5 | 1934 | 0.48 | 678 | 4.22 | 0.69 | 0.25 | 0.25 | 1.30 | 1.15 | 153 |
| A38 | Goose | | 8/24/92 | • | 7.40 | 0.37 | 0.37 | 0.08 | 0.08 | 0.37 | 76.8 | 1040 | 0.31 | 548 | 5.61 | 0.89 | 0.37 | 0.79 | 1.68 | 0.37 | 131 |
| 240 | Hancock | | 8/9/92 | 383 | 8.73 | 5.27 | 0.24 | 0.05 | 0.15 | 0.74 | 10.1 | 955 | 0.13 | 698 | 3.98 | 0.24 | 0.24 | 1.44 | 1.51 | 0.24 | 57 |
| 242 | Hancock | | 8/9/92 | 383 | 10.74 | 2.28 | 0.24 | 0.05 | 0.05 | 0.24 | 20.0 | 1891 | 0.13 | 566 | 5.10 | 0.24 | 0.24 | 0.24 | 1.94 | 0.60 | 63 |
| 244 | Hancock | | 8/9/92 | 377 | 9.25 | 1.46 | 0.37 | 0.08 | 0.08 | 0.37 | 8.6 | 1958 | 0.29 | 778 | 4.58 | 0.37 | 0.37 | 0.37 | 2.40 | 0.37 | 74 |
| 301 | Hancock | | 10/24/92 | 310 | 14.91 | 2.08 | 0.26 | 0.06 | 0.13 | 0.28 | 6.0 | 922 | 0.20 | 974 | 8.65 | 0.62 | 0.78 | 0.66 | 2.29 | 0.28 | 133 |
| 321 | Hancock | | 10/24/92 | 387 | 17.01 | 1.98 | 0.25 | 0.05 | 0.05 | 0.56 | 49.8 | 2355 | 0.18 | 664 | 4.54 | 0.91 | 0.25 | 0.51 | 1.92 | 1.22 | 113 |
| 322 | Hancock | | 10/24/92 | 333 | 2.56 | 1.05 | 0.26 | 0.05 | 0.05 | 0.26 | 34.7 | 2273 | 0.12 | 761 | 4.65 | 0.81 | 0.26 | 0.56 | 2.07 | 0.26 | 97 |
| 324 | Hancock | | 10/24/92 | 329 | 3.97 | 1.88 | 0.40 | 0.08 | 0.08 | 0.40 | 46.3 | 2172 | 0.33 | 859 | 6.68 | 1.06 | 0.40 | 0.40 | 2.06 | 0.40 | 118 |
| 360 | Hancock | | 10/24/92 | 393 | 6.84 | 1.56 | 0.24 | 0.05 | 0.24 | 0.24 | 41.4 | 2280 | 0.16 | 725 | 6.22 | 0.77 | 0.24 | 1.73 | 1.74 | 1.12 | 97 |
| 300B | Hancock | | 10/24/92 | 314 | 7.75 | 3.74 | 0.78 | 0.16 | 0.16 | 0.78 | 34.3 | 1903 | 0.22 | 946 | 7.25 | 2.13 | 0.78 | 0.78 | 2.51 | 0.78 | 122 |
| A32 | Hancock | | 8/25/92 | 309 | 1089.00 | 1.42 | 0.43 | 0.09 | 0.09 | 0.43 | 104.4 | 1466 | 0.12 | 728 | 5.96 | 1.41 | 0.43 | 1.73 | 1.60 | 0.43 | 180 |
| 245 | Slocum | East | 8/4/92 | • | 20.61 | 0.91 | 0.25 | 0.05 | 0.17 | 0.49 | 25.6 | 2487 | 0.24 | 772 | 7.91 | 0.25 | 0.25 | 1.11 | 2.31 | 0.25 | 89 |
| 261 | Slocum | East | 8/3/92 | 325 | 19.20 | 1.21 | 0.24 | 0.05 | 0.53 | 0.67 | 25.9 | 1596 | 0.18 | 779 | 11.30 | 1.64 | 0.24 | 0.91 | 1.59 | 0.24 | 83 |
| 539 | Slocum | East | 10/23/92 | 377 | 10.30 | 0.97 | 0.25 | 0.05 | 0.05 | 0.58 | 36.7 | 1922 | 0.57 | 811 | 3.61 | 0.25 | 0.25 | 0.25 | 1.91 | 0.25 | 93 |
| 557 | Slocum | East | 7/31/92 | 359 | 15.85 | 2.69 | 0.25 | 0.05 | 0.38 | 0.97 | 66.5 | 2598 | 0.22 | 617 | 12.98 | 0.93 | 0.25 | 0.25 | 2.79 | 0.76 | 105 |
| 561 | Slocum | East | 8/3/92 | 353 | 11.35 | 2.66 | 0.25 | 0.05 | 0.30 | 0.25 | 26.9 | 2204 | 0.11 | 556 | 3.88 | 0.25 | 2.60 | 0.50 | 3.45 | 0.25 | 90 |
| A23 | Slocum | East | 8/26/92 | 349 | 15.30 | 1.08 | 0.25 | 0.05 | 0.53 | 0.64 | 21.9 | 2153 | 0.13 | 728 | 9.19 | 0.89 | 0.25 | 1.26 | 1.38 | 0.55 | 86 |
| A25 | Slocum | East | 8/26/92 | 394 | 8.34 | 1.26 | 0.37 | 0.08 | 0.57 | 0.37 | 48.5 | 2879 | 0.31 | 761 | 5.78 | 0.79 | 0.37 | 2.06 | 1.04 | 0.37 | 109 |
| A8 | Slocum | East | 8/5/92 | 378 | 14.87 | 0.30 | 0.30 | 0.06 | 0.41 | 0.30 | 22.5 | 2115 | 0.24 | 611 | 14.04 | 0.77 | 0.30 | 1.34 | 1.60 | 0.94 | 74 |
| A5 | Slocum | East | 8/5/92 | 405 | 20.25 | 1.04 | 0.33 | 0.07 | 2.25 | 0.33 | 61.6 | 2714 | 0.24 | 758 | 4.04 | 0.33 | 0.33 | 18.53 | 4.74 | 1.07 | 128 |
| A9 | Slocum | East | 8/5/92 | 307 | 4.14 | 1.31 | 0.42 | 0.09 | 0.17 | 0.42 | 13.3 | 1310 | 0.17 | 609 | 9.82 | 0.42 | 0.42 | 0.42 | 0.83 | 0.42 | 64 |
| 302 | Slocum | Mainstem | 10/23/92 | 400 | 11.32 | 1.00 | 0.29 | 0.06 | 0.13 | 0.29 | 43.0 | 2249 | 0.66 | 675 | 6.28 | 0.29 | 0.29 | 0.29 | 2.39 | 0.76 | 106 |
| 303 | Slocum | Mainstem | 10/23/92 | 359 | 19.42 | 3.63 | 0.25 | 0.05 | 0.44 | 0.56 | 49.2 | 1905 | 0.16 | 742 | 5.28 | 0.88 | 0.25 | 0.81 | 1.28 | 0.89 | 101 |
| 444 | Slocum | Mainstem | 10/30/92 | 361 | 4.58 | 1.56 | 0.46 | 0.09 | 0.33 | 0.46 | 50.9 | 3154 | 0.27 | 683 | 6.16 | 0.99 | 0.46 | 0.46 | 1.35 | 0.46 | 101 |
| 445 | Slocum | Mainstem | 10/30/92 | 429 | 13.70 | 2.60 | 0.25 | 0.05 | 0.48 | 0.25 | 37.4 | 2050 | 0.26 | 557 | 4.50 | 0.25 | 0.25 | 1.32 | 1.29 | 1.44 | 85 |
| 499 | Slocum | Mainstem | 10/23/92 | 272 | 3.39 | 0.96 | 0.34 | 0.07 | 0.07 | 0.34 | 39.0 | 877 | 0.10 | 737 | 6.19 | 0.74 | 0.34 | 0.34 | 2.74 | 0.34 | 97 |
| 501 | Slocum | Mainstem | 10/23/92 | 355 | 14.83 | 0.74 | 0.25 | 0.05 | 0.20 | 0.51 | 38.1 | 3192 | 0.15 | 789 | 6.25 | 0.80 | 0.25 | 1.57 | 1.76 | 0.95 | 107 |
| 505 | Slocum | Mainstem | 10/30/92 | 380 | 26.55 | 3.29 | 0.24 | 0.05 | 0.39 | 0.24 | 27.5 | 4143 | 0.36 | 603 | 6.34 | 1.22 | 0.24 | 2.33 | 2.87 | 1.97 | 83 |
| A2 | Slocum | Mainstem | 8/4/92 | 420 | 10.18 | 0.69 | 0.25 | 0.05 | 0.33 | 0.25 | 26.2 | 1407 | 0.33 | 519 | 2.48 | 0.54 | 0.25 | 0.25 | 0.59 | 0.58 | 82 |
| A22 | Slocum | Mainstem | 8/26/92 | 382 | 14.81 | 3.15 | 0.25 | 0.05 | 0.39 | 0.25 | 11.7 | 2205 | 0.16 | 533 | 10.21 | 1.16 | 0.25 | 0.25 | 0.81 | 0.80 | 65 |
| A3 | Slocum | Mainstem | 8/4/92 | 409 | 16.07 | 0.68 | 0.25 | 0.12 | 1.10 | 0.59 | 63.5 | 1421 | 0.33 | 620 | 3.04 | 0.51 | 0.76 | 0.25 | 0.96 | 1.16 | 128 |
| 354 | Slocum | West | 10/23/92 | 351 | 9.01 | 0.93 | 0.25 | 0.05 | 0.20 | 0.63 | 31.1 | 2277 | 0.13 | 673 | 6.75 | 0.76 | 0.25 | 1.60 | 1.33 | 0.55 | 95 |
| 355 | Slocum | West | 10/23/92 | 342 | 7.65 | 0.60 | 0.25 | 0.05 | 0.17 | 0.26 | 38.4 | 1929 | 0.16 | 641 | 6.61 | 0.50 | 0.25 | 0.25 | 1.00 | 0.25 | 100 |
| 361 | Slocum | West | 10/24/92 | 417 | 11.38 | 1.34 | 0.25 | 0.05 | 0.11 | 0.57 | 42.5 | 1449 | 0.24 | 748 | 4.60 | 0.25 | 0.25 | 1.06 | 2.03 | 0.63 | 103 |
| 443 | Slocum | West | 10/30/92 | 342 | 8.25 | 3.63 | 0.25 | 0.05 | 0.18 | 0.57 | 49.2 | 2067 | 0.10 | 650 | 7.71 | 1.06 | 0.67 | 0.66 | 1.16 | 0.62 | 103 |
| 447 | Slocum | West | 10/30/92 | 350 | 6.28 | 1.24 | 0.24 | 0.05 | 0.23 | 0.24 | 53.8 | 1933 | 0.13 | 570 | 4.53 | 1.28 | 0.24 | 0.71 | 1.39 | 0.52 | 105 |
| 448 | Slocum | West | 10/30/92 | 356 | 11.51 | 1.68 | 0.25 | 0.05 | 0.15 | 0.60 | 36.9 | 3234 | 0.15 | 657 | 6.44 | 0.85 | 0.25 | 1.34 | 1.39 | 0.97 | 99 |
| 503 | Slocum | West | 10/30/92 | 394 | 16.03 | 0.25 | 0.25 | 0.05 | 0.36 | 0.25 | 24.8 | 2792 | 0.30 | 592 | 5.29 | 0.84 | 0.25 | 0.25 | 1.70 | 1.41 | 91 |
| 504 | Slocum | West | 10/30/92 | 390 | 16.88 | 1.62 | 0.25 | 0.05 | 0.24 | 0.25 | 40.6 | 3535 | 0.29 | 687 | 5.10 | 0.83 | 0.25 | 0.25 | 2.94 | 2.46 | 98 |
| 544 | Slocum | West | 7/31/92 | 398 | 23.48 | 4.00 | 0.29 | 0.06 | 0.44 | 0.29 | 45.5 | 3568 | 0.59 | 588 | 3.93 | 1.69 | 0.29 | 0.29 | 5.34 | 2.13 | 114 |
| A20 | Slocum | West | 8/26/92 | 375 | 11.84 | 1.36 | 0.25 | 0.05 | 0.33 | 0.25 | 94.4 | 2724 | 0.22 | 867 | 5.81 | 1.24 | 0.25 | 1.85 | 1.18 | 0.25 | 147 |
| A21 | Slocum | West | 8/26/92 | 365 | 7.23 | 0.25 | 0.25 | 0.05 | 0.34 | 0.54 | 53.8 | 1494 | 0.16 | 560 | 6.24 | 0.59 | 0.25 | 0.25 | 1.03 | 0.25 | 108 |

# Effects of heavy metal contamination on fish species composition, growth, and mortality in a North Carolina tidal creek

Mildred A. Hayman and Joseph E. Hightower

## Introduction

The sediments of Slocum Creek, North Carolina are known to be contaminated by several heavy metals. A recent study by Riggs et al. (1990) detected sediment levels of cadmium, molybdenum, chromium, and lead greater than any previously found in North Carolina estuaries, as well as high sediment levels of copper, mercury, nickel, phosphorus, and zinc. The goal of this study was to determine if the fish fauna of Slocum Creek had been affected by these contaminants.

Fish are considered to be valuable indicators of habitat quality because they represent a variety of trophic levels, provide an integrative view of the watershed environment, and are a measure of habitat quality that the public can relate to (Karr 1981). Populations of susceptible species may suffer high mortality or poor health in contaminated environments. For example, Baumann et al. (1990) found a population of brown bullhead in a heavily polluted tributary of Lake Erie to have a truncated age structure and a high incidence of liver carcinoma as compared to other populations. Bowser et al. (1991) found high incidences of skin and oral papillomas in brown bullhead in a metal-contaminated New York reservoir. Fish exposed to contaminants may also have altered relative organ weights and lower condition factors (weight/length$^3$) as compared to non-stressed fish (Goede and Barton 1990). Adams et al. (1992) demonstrated that population-level responses such as growth can be valuable in assessing contaminant effects. To assess biological effects on Slocum Creek fishes, we compared Slocum Creek to two reference creeks using three approaches: (1) overall species composition; (2) health of two target species, pumpkinseed (*Lepomis gibbosus*) and brown bullhead (*Ameiurus nebulosus*), using a gross-necropsy based

health assessment; and (3) population age structure, mortality, and growth of these two target species.

## Study Areas

Our three study creeks were Slocum and Hancock Creeks in Craven County, North Carolina (NC) and Goose Creek in Pamlico County, NC (Figure 1). All are tributaries of the lower Neuse River, which flows into Pamlico Sound. Salinity varies spatially and temporally within the creeks due to fresh water inflow, wind and precipitation. A strong salt wedge typically extends into the upper portions of all three creeks. Although lunar tidal action is minimal, water level may fluctuate greatly in these creeks due to wind direction and velocity. For reasons discussed below, the study was confined to the upper portions of the three creeks.

Slocum Creek runs through Cherry Point Marine Air Station, and receives treated sewage and industrial effluent from the air station. The industrial effluent contains metal residues, fuels, oils and greases, and organics produced by activities such as electroplating, metal cleaning, conversion coating of aluminum, and engine testing (C.T. Main 1989). In addition, disposal sites adjacent to the creek received wastes including paints, organic solvents, waste oil and plating sludges from the early 1970s until 1984 (C.T. Main 1989). Wastewater from the town of Havelock, North Carolina also enters into Slocum Creek upstream of the Cherry Point outfall.

In addition to the Riggs et al (1990) study mentioned previously, North Carolina Division of Environmental Management (NCDEM) and U.S. Marine Corps (USMC) studies conducted from 1981-84 and summarized by Gallagher and Di Giulio (1989) detected elevated levels of copper, chromium, cadmium, mercury, nickel, and zinc in Slocum Creek sediments, fish, and shellfish. The USMC study also detected elevated levels of pesticides, PCBs, and volatile organic compounds in fish and shellfish tissues. As volatile organics have a short residence time in aquatic systems, the presence of organic compounds in fish tissues may reflect continued leaching from disposal sites (Gallagher and Di Giulio 1989).

the upper regions of all three creeks in March 1991, but as the summer progressed, salinity increased to much higher levels in Hancock and Goose Creeks than in Slocum Creek (Table 1). The lower salinities in Slocum Creek may be due in part to the fresh water inflow into Slocum Creek from the Cherry Point and Havelock sewage outfalls.

## Methods

### Selection of species

We chose two species, brown bullhead and pumpkinseed, for health assessment. Because of their primarily benthic diet (Keast and Webb 1966, Keast 1985), brown bullhead may accumulate contaminants through the ingestion of sediment along with potentially contaminated benthic prey items. In addition, brown bullhead have been observed burrowing into soft bottom sediments in aquaria (Loeb 1964); this habit may increase their exposure to sediment contaminants. Several recent studies have examined the effects of single contaminants or pollutant mixtures on brown bullhead in laboratory and field situations (Benedetti et al. 1989, Baumann et al. 1990, Baumann et al. 1991, Gallagher and Di Giulio 1989). Gallagher and Di Giulio's work is particularly relevant as it focused on brown bullhead in Slocum and Hancock Creeks. Of fourteen brown bullhead sampled from Slocum Creek, three had multiple lip lesions and four had discolored or fatty livers. None of the brown bullhead taken from Hancock Creek exhibited these conditions. In addition, brown bullhead from Slocum Creek had a significantly greater liver weight:body weight ratio than those from Hancock Creek (Gallagher and Di Giulio 1989).

Pumpkinseed are very abundant in all three creeks, and are easily caught with fyke nets, making large sample sizes easily obtainable. Although the species is not strictly a benthic feeder, insect larvae and other benthic organisms constitute a substantial portion of its diet (Fox and Keast 1990).

One consideration in selecting a target species is whether that fish is a permanent resident of one of the study sites. Brown bullhead have been reported to move over long distances within lakes and

rivers (McCammon and Seeley 1961, Rawstron 1967, Hale et al. 1986). Movement may be more restricted in tidal creeks, however, because the maximum observed salinity reported for brown bullhead was 10 parts per thousand (ppt) (Smith 1971, cited in Jones et al. 1978). Pumpkinseed have been reported to occur in salinities up to 18.7 ppt (Hildebrand and Schroeder 1928, cited in Jones et al. 1978), although Lippson and Lippson (1984) suggested that pumpkinseed occured infrequently in waters 10 ppt or greater. Based on these salinity preferences, we believe it is unlikely that the two target species moved between creeks in significant numbers.

We have also included some results for white catfish, another common Ictalurid in the lower Neuse River. Although less abundant in our samples than brown bullhead, Nelson and Little (1985) collected substantially more white catfish than any other Ictalurid at sites about 15 km upstream of New Bern. White catfish feed predominately on fish (Steven 1959, cited in Carlander 1969), and might therefore be less directly impacted by contaminated sediments than brown bullhead.

**Collection**

Sampling was conducted during three periods from early spring to late summer of 1992 (Table 1). To obtain a wide range of species, we collected samples using fyke nets, experimental monofilament gill nets (12, 25, 37, 50, and 62 mm bar mesh panels), and electrofishing. We were unsuccessful in attempts to use seines to collect young-of-year fishes, because of the soft mud bottom and numerous submerged snags encountered.

Sample sites, corresponding to 200-meter segments of shoreline, were selected randomly in each creek. Five random sites per creek were selected for each of the three gear types. Within a gear type, sites were selected without replacement, but sites were replaced before selecting sites for the next gear type. Sample sites were re-selected for each sampling period.

For each fyke or gill net sample, the net was set at a site for 48 hours, and checked four times (morning and afternoon) within that period. For each electrofishing sample, the shoreline of a selected

site was sampled for 600 seconds. Identical sampling effort was used for each sampling period in each creek, except that electrofishing could not be conducted during the July 27-August 4 sampling period because of prohibitively high salinities in Goose and Hancock Creeks (Table 1).

All pumpkinseed and brown bullhead were placed on ice when captured, and subsequently frozen for later age determination and health assessment. Some brown bullhead were necropsied fresh in the field so that livers could be frozen immediately in liquid nitrogen for mixed function oxidase (MFO) analysis.

For all other species captured, we identified the fish to species, measured total length to the nearest millimeter, and noted any external lesions, parasites, or other abnormalities. All non-target species were released alive when possible. Representative individuals from unknown species were collected for positive identification.

Because the above sampling methods yielded fewer brown bullhead than expected, we also collected brown bullhead using baited jug lines (single baited hooks suspended from free-floating plastic jugs) and baited trot lines. During June 24-June 26, 1992, we set 200 jug lines for one night in each creek (five jugs at each of 40 random sites). Brown bullhead caught on these jug lines were necropsied fresh in the field, and their livers were frozen for MFO analysis. Brown bullhead collected with baited trot lines during October 22-25 and October 29-November 1, 1992 were frozen for later necropsy.

**Fish health assessment**

Fish health assessment for brown bullhead and pumpkinseed followed the general protocol outlined by Goede and Barton (1990). Because of frequent large sample sizes, "full" necropsies were performed on the first five fish randomly selected from a sample, and "short" necropsies were performed on the remaining fish. For "full" necropsies, we measured total length to the nearest millimeter, whole carcass (uneviscerated) weight to the nearest gram, and liver, spleen, and gonad weights to the nearest 0.01 gram, and determined sex of

fish. Ratings were assigned for presence and severity of fin, dermal, oral, and gill lesions; lesions or abnormal appearence of liver and kidney; degree of liver discoloration; and relative parasite load of heart (pumpkinseed only), liver, and kidney. For "short" necropsies, we recorded length, whole carcass weight, liver and gonad weights, and sex of fish. Otoliths were collected from both species, and pectoral and dorsal fish spines were collected from brown bullhead.

**Age determination**

As in earlier studies of Ictalurid age and growth (Sneed 1951, Marzolf 1955, Turner 1980, Rubec and Qadri 1982, Crumpton et al. 1984, Quinn 1988, Blouin and Hall 1990), we used cross-sections taken from pectoral spines to estimate brown bullhead ages. Turner (1980) validated use of cross-sections cut from the articulating process for flathead catfish (*Pylodictis olivaris)*, based on 16 known-age fish and six fish aged when tagged and after recapture the following year. Crumpton et al. (1984) reported that comparable ages were obtained from the articulating process, basal recess, and mid-spine regions of brown bullhead, channel catfish (*Ictalurus punctatus*), and white catfish pectoral spines. They recommended using mid-spine sections to avoid removing entire spines in order to determine age. Using a low speed saw, we obtained sections from both the articulating process and mid-spine regions of the right pectoral spine, except in cases where that spine was damaged. Each section was affixed to a glass slide and examined under transmitted light using a dissecting scope. We generally found the sections from the articulating process to be more readable and often noted obvious annuli that were missing on sections from the mid-spine region.

Recent studies of Centrarchid age and growth have been based on ages obtained using both scales(Olmsted and Kilambi 1978, Hudson and Bulow 1984, Week 1984, Galloway and Kilambi 1988, Fox and Keast 1991) and otoliths (Taubert and Tranquilli 1982, Perry and Tranquilli 1984, Hoyer et al. 1985, Boxrucker 1986, Crawford et al. 1989, Hammers and Miranda 1991). Several of the recent studies have recommended otoliths rather than scales, for reasons such as: (1) easier to identify annuli, (2) fewer false annuli, and (3) higher

precision. We estimated pumpkinseed ages by counting annual growth rings on whole otoliths. Otoliths were submersed in water in a black dish and examined under reflected light.

For each species, we fitted von Bertalanffy growth curves to observed age and length data for each creek and sex:

$$L_a = L_\infty\left(1 - e^{-k(a-t_0)}\right)$$

where $L_a$ represents length at age a, $L_\infty$ is the asymptotic or maximum size, K is the Brody growth coefficient (growth rate toward the maximum), and $t_0$ is the age at which the fish would have had zero length (if it had always grown in the manner described by the equation) (Ricker 1975). In order to fit lengths to ages of fish caught in different months, we expressed fish age as the age in years, plus a fraction corresponding to the proportion of the year between January 1 and the sampling period. This method followed the convention of assigning a birthdate of January 1 to fish in the Northern Hemisphere.

**Analysis**

We conducted all statistical tests at the 95% significance level. For linear models, we tested for differences among groups (e.g., creeks or sexes) using analysis of covariance. For nonlinear models, we used a reduced sum of squares test (Ratkowsky 1983) to compare among groups. Contingency table analyses were used to test for differences in frequency among categorical variables (e.g. presence of external lesions versus creek).

We compared fish species composition among creeks using our catches from standardized fyke netting, gill neting, and electrofishing. Total catches by species were compared among creeks using the graphical approach Carmichael et al. (1992) used to compare catches among Chesapeake Bay tributaries.

For brown bullhead, we used a catch curve analysis (Ricker 1975) to estimate the total instantaneous mortality rate (Z) and annual survival rate ($e^{-Z}$) for ages fully vulnerable to the sampling gear. Our analyses of age composition and mortality were restricted to October 1992 data for Hancock and Slocum Creeks, as sample sizes were inadequate for other creek-period-gear combinations.

Sample sizes were not adequate to examine sex-related differences in mortality, although Sinnott and Ringler (1987) reported a higher mortality rate for female than male brown bullhead.

We used length and weight data obtained from necropsied brown bullhead to determine whether differences existed between sexes or among creeks. We also compared liver weight:body weight rations and the relative frequencies of gross external lesions on the skin and within the oral cavity. Because the liver weight:body weight relationship can vary seasonally (Chambers and Yarbrough 1979, Sloof et al. 1983) and sample sizes were inadequate at other times, we limited our analysis of fish condition to October 1992 data only.

## Results

### Fish Community Analysis

We collected 35 species from Hancock Creek, 33 from Slocum Creek, and 26 from Goose Creek (Table 2-3). The more common species occurred in all three creeks in similar proportions (Table 3, Figure 2). Two seasonally important marine species, Atlantic menhaden and spot, and the resident species pumpkinseed were the three most common species in all creeks. We found substantial differences in species composition by gear type (Table 4). For example, American menhaden, gizzard shad, and longnose gar were captured almost exclusively in gill nets, whereas pumpkinseed were rarely caught in gill nets but were common in electrofishing and fyke net samples.

### Brown bullhead life history characteristics

#### Age composition and survival

Although sample sizes were small (Table 5), age and length distributions for brown bullhead were generally similar in October 1992 samples from Hancock and Slocum Creeks (Figures 3-4). Based on pooled catches from all gears and periods, fish from Hancock and Slocum Creeks tended to be larger and older than those from Goose Creek (Figures 3-4).

Assuming that brown bullhead were fully recruited to the sampling gear at about age 4, we estimated that the total instantaneous mortality rate (Z) was 1.04 (SE=1.04) for Hancock Creek and 0.51 (SE=0.10) for Slocum Creek (Figure 5). Neither estimate was significantly different from 0 because of the small number of observations. Based on these preliminary estimates of mortality, the corresponding annual survival estimates would be 0.35 for Hancock Creek and 0.60 for Slocum Creek.

Growth

Von Bertalanffy curves for the three creeks fitted the age-length data moderately well although there was substantial variability in length at age (Figure 6). Some of the variability was likely due to ageing error, as fin sections were sometimes difficult to interpret and had many marks that we assumed to be false annuli. In our within-creek comparisons, curves for female and male brown bullhead were significantly different only for Slocum Creek, which had a higher asymptotic size for males (Table 6, Figure 6). When our sex-specific curves were compared across creeks, we found no difference for females but a significant difference for males. That difference appeared to be due primarily to the estimates of $L_\infty$, which ranged from 411 mm for Slocum Creek to 331 mm for Goose Creek.

For comparison with our results, we also fitted von Bertalanffy curves to mean length-at-age data for Muskellunge Lake, New York (Sinnott and Ringler 1987) and the Little River, Oklahoma (Finnell et al. 1956, cited by Carlander 1969) (Table 6). For the Muskellunge Lake data, we found that asymptotic size was larger for males than females but the difference was not significant.

Condition

For the two creeks with adequate sample sizes (Hancock and Slocum), we found no significant difference in length-weight relationship between sexes. Earlier studies (Blumer 1985, Rubec and Qadri 1982) also found no sex-related difference in the length-weight relationship. Based on these results, we compared fitted lines for all three creeks using pooled data from both sexes. The resulting

analysis of covariance indicated no significant difference among creeks, which is consistent with a graphical interpretation that observations for the three creeks are very similar (Figure 8). The linear model using ln(length) accounted for 98% of the variability in ln(weight).

We found no differences among creeks in the relative frequencies of either skin or oral lesions, neither of which was common in October samples (Tables 7-8). Skin lesions were relatively common in June samples from Hancock Creek, but that pattern did not persist in October samples.

We found significant differences between sexes and among creeks in the liver weight-body weight relationship. For fish of a given body weight, liver weight was typically higher for female than male brown bullhead (Figure 8). We fitted separate linear models by sex and determined that creek differences persisted for females (Figure 9). The slope relating liver weight to body weight was highest for Slocum Creek fish, although the lines for Goose and Slocum Creeks were similar. The difference in linear models among creeks was not significant for males (Figure 10). However, only two male brown bullhead were collected in Goose Creek in October samples, so the power of the test was low.

For comparison with previous studies, we also examined liver weight:body weight ratios (the hepatosomatic index or HSI), based on necropsy of frozen fish collected in October 1992 and fresh fish collected in June-July 1991 (Table 9). For 1992 samples, sex and creek differences were both significant based on an analysis of variance. HSI was highest for Goose Creek, intermediate for Slocum Creek, and lowest for Hancock Creek. When analyzed separately by sex, creek differences were significant for male but not female fish.

## White catfish life history characteristics

### Age composition and survival

Sample sizes were not adequate to test differences in age composition among creeks, as the small numbers collected were obtained using several gears over several periods (Table 10). Plots

of catch data pooled over period, gear type, and sex suggest that age distributions were generally similar among creeks (Figure 11). Using age four as the age of full recruitment, we fitted catch curves to the pooled datasets and found no significant differences in mortality rate among creeks (Figure 12). The estimated instantaneous total mortality rate (Z) for all three creeks was 0.41, which corresponded to an annual survival rate of 0.66.

Growth

Sample sizes were not adequate to fit von Bertalanffy curves separately by creek and sex. We fitted a single model to pooled age-length data from all creeks and sexes but were only able to obtain a converged solution by using average size at age for all creeks and sexes (Table 11, Figure 13). For comparison with our results, we also fitted a von Bertalanffy curve to age-length data from Santee-Cooper Lake, South Carolina (Stevens 1959) (Table 11). We were unable to fit a von Bertalanffy curve to published age-length data for the Patuxent River, Maryland, because growth was essentially linear over the reported range of ages (Schwartz and Jachowski 1965). A linear model relating size to age accounted for essentially all variability in length ($r^2$=0.99) for the Patuxent River data (Table 11).

Length-weight relationships

Sample sizes by creek, period, and sex were small for white catfish so we were unable to test for differences in the length-weight relationship among creeks. The plotted length-weight data were similar among creeks (Figure 14), and a linear model using ln(length) accounted for 92% of the variability in ln(weight). The fitted model was ln(weight)=-12.14943+3.16720 ln(length).

## Pumpkinseed life history characteristics

Growth

Von Bertalanffy growth curves provided a good fit to the pumpkinseed age and growth data (Figures 15-16). Growth curves for female and male pumpkinseed differed significantly in all three creeks, with females having a higher asymptotic size and lower growth rate (Table 12). We tested for creek differences using sex-specific curves and found significant differences among creeks for both sexes. For comparison with our results, we also fitted von Bertalanffy curves to estimates of mean size at age for pumpkinseed from the Perquimans and Chowan Rivers (Kornegay et al. 1994) (Table 12). Growth at ages 1-5 was essentially linear within the Perquimans River, resulting in unreliable estimates of asymptotic size and growth rate.

# Discussion

## Fish Community Analysis

Numerous prior studies have shown that habitat alteration, including increased levels of pollution, can effect fish species composition (Karr 1981, Karr et al. 1986, Karr et al. 1987, Fausch et al. 1990, Jordan et al. 1991). More tolerant species, such as generalized benthic feeders or certain planktonic feeders, can comprise a large fraction of the total fish assemblage in degraded environments (Miller et al. 1988).

Based on our standardized sampling, we saw no clear evidence of reduced habitat quality within Slocum Creek. Our estimates of species richness (26-35 species collected) were similar among creeks, and Carmichael et al. (1992) reported similar levels of species richness (23-48 species) in seine and trawl samples from Chesapeake Bay tributaries. The combination of gears that we used probably collected most of the larger species occurring within the study areas, although had seining been possible, additional small species would likely have been collected.

We did find that Atlantic menhaden and gizzard shad were considerably more common in Slocum Creek than in the other two creeks (Table 3). Jordan et al. (1991) classified those species as pollution-tolerant, although gizzard shad was given an intermediate tolerance rating in the North Carolina Index of Biotic Integrity (J. Overton, North Carolina Division of Environmental Management, unpublished report). Dominance by planktonic feeders such as shad (Clupeidae) and anchovies (Engraulidae) can indicate degraded conditions, although high catches may also be a result of the schooling behavior of a transient visitor (Miller et al. 1988, Carmichael et al.1992).

Anadromous species (particularly catches of juveniles) have been used as indicators of good water quality because of their sensitive early life stages and reduced abundance in degraded systems (Jordan et al. 1991, Carmichael et al.'1992). In the North Carolina Index of Biotic Integrity, anadromous adults were classified as having an intermediate tolerance rating. In our catches of anadromous adults or subadults, we found that alewife were more common within Slocum Creek, whereas striped bass, hickory shad, and American shad were found only within Goose or Hancock Creeks. Our catches of anadromous species were small in all cases, so the differences among creeks could be due to chance or differences in salinity. Hawkins (1980) reported that Slocum Creek was an important spawning area for the anadromous complex referred to as river herring. That complex is comprised of alewife and blueback herring (*Alosa aestevalis*), with the latter species accounting for about 85%of the total in the Neuse River (Hawkins 1980). Hawkins (1980) found that most spawning sites for hickory shad and American shad were upstream of New Bern; thus the absence of those species in Slocum Creek samples is not surprising. Baker (1968) reported that adult striped bass and river herring occurred within Goose, Hancock, and Slocum Creeks. He also reported that American shad occurred within Goose and Hancock Creeks, but not within Slocum Creek.

**Brown bullhead life history characteristics**

Age composition and survival

One indication of a contaminant effect is a truncated age distribution. We estimated that 61% of the age-3+ fish were age 5 or older in Hancock Creek, compared to 43% in Slocum Creek. In comparison, Baumann et al. (1990) found that age-5+ fish represented only 1-7% of fish 250 mm and larger in the heavily polluted Black River, compared to 34-68% from a reference site. (They excluded fish smaller than 250 mm total length because Baumann et al. (1987) found that fish younger than age 3 rarely had liver tumors.) Sinnott and Ringler (1987) used trap nets, a gill net, a boat-mounted electroshocker, and angling to collect brown bullhead within a eutrophic (but presumably uncontaminated) New York lake. Their age data indicated that brown bullhead age 5 and older comprised 27% of the fish age 3 and older. Thus, our estimates were generally similar to values from uncontaminated sites. The difference we observed between creeks was due primarily to the catch of age-4 versus age-5 fish in the two creeks (Figure 3). That difference could be due to a number of factors: small sample sizes, ageing error, differences in year-class strength, presence of contaminants, or differences in angler harvest.

A related approach for establishing a contaminant effect would be based on the estimated survival rate of adults. Our estimates for fish ages 4-6 were 0.35 for Hancock Creek and 0.60 for Slocum Creek. These estimates should be viewed as first approximations, as sample sizes were in some cases lower than the recommended minimum of five individuals per age class (Van Den Avyle 1993). Despite the small sample sizes, the Slocum Creek data appeared to be consistent with the assumption that mortality rate was constant for fish ages 4-6 (Figure 5). The estimates for both creeks were comparable to those obtained in other systems not affected by contaminants. Sinnott and Ringler (1987) reported survival rates of 0.33 and 0.26 for male and female brown bullhead, respectively, from Muskellunge Lake, New York. McCammon and Seeley (1961) used tag returns over a five-year period to estimate an annual survival rate

of 0.76 in Clear Lake, California. Rawston (1967) used tag return data for a two-year period to estimate an annual survival rate of 0.52 for Folsom Lake, California.

In comparison to the Hancock and Slocum Creek brown bullhead, Goose Creek fish tended to be smaller and younger (Figures 3-4). The similar patterns for age and length distributions suggests that ageing error was not a major source of bias in comparing among creeks. The difference could be due to period or gear type, however, as July-August fyke netting accounted for a majority of the Goose Creek fish, whereas most Hancock and Slocum Creek fish were obtained by October hook-and-line sampling. Nelson and Little (1985) collected significantly larger white catfish using trotlines and electrofishing than using hoop nets.

Growth

Our estimates of asymptotic size were consistent with the results from Muskellunge Lake, New York and the Ottawa River (Table 6). The estimate of asymptotic size for the Little River was based on fish ages 1-5 only, so it should not be considered reliable. Our estimates of size at ages 4-5 were similar to those obtained by Finnell et al. (1956).

Fish from our study areas reached their maximum size much more rapidly than did fish from the other areas, assuming that our age data were approximately correct (Table 6, Figure 17). It is not unreasonable that growth rates from North Carolina tidal creeks would be greater than those from more northern waters, but a lower K also was obtained for the Oklahoma data. An alternative explanation could be ageing error, although our age estimates would have to be several years too low to account for the difference. For example, asymptotic size was reached at about age 5 in our study areas, compared to about age 10-15 for Ottawa River and Muskellunge Lake fish. One relevant difference is that, in the earlier studies, back-calculated lengths were used to fit growth curves, so estimates of size at younger ages were available. We restricted our analysis to observed size at age; consequently, we had few estimates of size at ages 1-2 that would constrain our estimates of K. Better estimates of

K could be obtained for our study area by sampling specifically for smaller brown bullhead, but unless the age data for older fish were grossly in error, growth rate will remain higher than observed in the earlier studies. Based on these results, we see no evidence of a contaminant effect on growth of brown bullhead from Slocum Creek.

Condition

The relationship between fish length and weight is commonly used as a measure of fish condition (Anderson and Gutreuter 1983). Our estimated length-weight relationship for brown bullhead from Goose, Hancock, and Slocum Creeks was similar to other published relationships (Figure 18). Smaller fish from our sites tended to weigh less than fish from other areas, but larger fish were generally heavier than fish of the same size in other systems. A slope of about 3 indicates average condition; thus, the estimated slope for this study (3.4) indicated fish that were increasingly robust with size. Fish from two Ottawa River sites (Kettle Island Bay and Upper Duck Island) were clearly in poor condition (Figure 18), which illustrates that the length-weight relationship can be an effective measure of habitat quality. Those sites were in the vicinity of a paper mill and wood-fiber blanketed much of the substrate in that region (Rubec and Qadri 1982). Note that our results were obtained from frozen specimens and would slightly underestimate weight at length for fresh fish. Rubec and Qadri (1982) reported that frozen brown bullhead lost 1.4% of their total length and 8.7% of their original weight. Note also that some differences among studies could be due to when fish were collected. We used fish collected in October, compared to July--August for Rubec and Qadri (1982) and May-July for Sinnott and Ringler (1987). The date of collection was not available for the study conducted by Priegel (1966).

Another indication of a degraded environment is an increase in the incidence of lesions and tumors (Karr 1981, Baumann et al. 1987, 1990, 1991; Baumann 1992). We found that skin and oral lesions were uncommon on brown bullhead collected in October sampling, and no differences among creeks were detected. Skin lesions were

more common in June samples but our sample sizes were inadequate to characterize a seasonal effect.

An increase in fish liver weight relative to body weight has also been observed in contaminated systems. Baumann et al. (1991) found brown bullhead liver weight:body weight ratios to vary significantly among sites within the Great Lakes basin. Fabacher and Baumann (1985) found significantly higher liver weight:body weight ratios in the contaminated Black River than at a reference site. Adams et al. (1992) found that redbreast sunfish liver weight:body weight ratios were significantly higher at two contaminated sites than at a reference site. Of particular interest for this study, Gallagher and Di Giulio (1989) reported that Slocum Creek brown bullhead had significantly higher liver weight:body weight ratios than did brown bullhead collected from Hancock Creek.

Our analyses suggested that liver weight:body weight ratios were lower in Hancock Creek than in Goose and Slocum Creeks, although the significance level varied depending on the analytical approach used. Of greater relevance is the observation that our estimated means were in all cases substantially lower than those obtained in earlier studies from contaminated sites (Table 9). For example, within the Great Lakes basin, the Fox, Menominee, Cuyahoga, and Black Rivers were reported to be contaminated and mean HSI ranged from 0.020 to 0.035 in those systems. Gallagher and Di Giulio (1989) reported a much higher value for Slocum Creek than we obtained, although sexes were pooled in that study and sample sizes were small. We found significant differences between sexes in both liver weight:body weight regression equations and HSIs, with values for female brown bullhead being somewhat higher. The time of collection was not available for all earlier studies so some differences could also be due to seasonal changes. Ratios tend to be lowest just prior to spawning when gonads comprise a large proportion of total body weight (Chambers and Yarbrough 1979). Our estimates from October 1992 should represent a conservative assessment of contaminant effects, since spawning typically occurs in early spring to early summer (see Blumer 1985 and references therein). Another potential difference may be the mixture of

contaminants to which fish from different systems have been exposed. Heavy metals have been the contaminants of primary concern within Slocum Creek, whereas Adams et al. (1992) evaluated sites contaminated by PCBs and mercury, and sites within the Great Lakes basin had combinations of heavy metals, polynuclear aromatic hydrocarbons, and polychlorinated aromatic compounds (Baumann et al. 1991).

**White catfish life history characteristics**

Age composition and survival

Although sample sizes were small, it appeared that age composition was generally similar among creeks. Our preliminary estimate of annual survival was 0.66, based on samples pooled over creeks, gears, and sexes. That value is comparable to estimates of 0.55 and 0.81 obtained through tagging studies for white catfish from California reservoirs (McCammon and Seeley 1961, Rawstron 1967). Based on these results, we see no obvious indication that contaminants have reduced the survival of white catfish within Slocum Creek.

Growth

We found substantial variability in the age:length relationship for white catfish from Goose, Hancock, and Slocum Creeks and encountered difficulty in fitting a von Bertalanffy curve to the data (Figure 13). The difficulty may have been due in part to the wide range of ages for fish 300-400 mm in length, probably due to ageing error. The growth pattern appeared to be particularly anomalous for male white catfish from Goose Creek. A better fit would have been obtained if we had collected some age-1 fish and older fish for which growth had clearly slowed. The latter group would better constrain our estimates of asymptotic size.

Fish that were estimated to be ages 2-8 from Goose, Hancock, and Slocum Creeks were generally larger than fish from Santee-Cooper Lake (Figure 13), although asymptotic size was similar (Table 7). If misageing was occurring, the difference in growth

curves would imply that fish from our study were 1-2 years older than we estimated. Fish from our study sites were considerably larger than fish of the same ages from the Patuxent River, Maryland (Figure 13). Our interpretation of these results is that white catfish within our study sites show rapid growth, or have been underaged by at least 1-2 years. Either result would be uncharacteristic of a highly contaminated system. Sample sizes were inadequate to compare growth models among creeks, but the age-length data from Slocum Creek were similar to those from Goose and Hancock Creeks. Thus, we see no evidence of a contaminant effect in the results for white catfish.

Length-weight relationships

Our length-weight data for white catfish were similar among study sites. The relationship obtained by fitting pooled data from all creeks and sexes (Figure 14) was similar to a published relationship for Alabama waters (Swingle 1965, cited in Carlander 1969). Fish from Slocum, Hancock, and Goose Creeks tended to be slightly heavier than fish of comparable size from Alabama waters.

**Pumpkinseed life history characteristics**

Growth

We detected consistent differences between sexes and among creeks in von Bertalanffy growth curves for pumpkinseed. Asymptotic size was greater for females than males in all three creeks. In comparing among creeks, the largest asymptotic sizes were for Goose Creek fish and the smallest were for Slocum Creek fish; however, the Slocum Creek estimates may be biased by the lack of older fish. We did not collect any pumpkinseed age five or older from Slocum Creek, and age-4 fish only comprised 4% of the total. We also collected fewer large pumpkinseed in Slocum Creek than in the two reference creeks, so the lack of old fish was probably not due to ageing error.

The estimate of asymptotic size for Chowan River pumpkinseed was slightly larger than the values we obtained for Goose, Hancock,

and Slocum Creeks (Table 12, Figure 19). Additional older fish would need to be collected from the Perquimans River in order to reliably estimate asymptotic size and growth rate within that system. Although predicted size at age one for Perquimans and Chowan River fish was similar to the values we obtained for Hancock and Slocum Creeks, fish ages 2-4 from our study sites were considerably larger than the estimates Kornegay et al. (1994) obtained. The difference could indicate that we consistently missed the second annulus on the otoliths. However, pumpkinseed otoliths appeared to be very easy to interpret, so we suspect that the difference in size at age was due to faster growth within our tidal creeks.

## Conclusions

To determine if the fish fauna of Slocum Creek had been affected by high sediment levels of contaminants, we compared fish resources within Slocum Creek and two nearby reference creeks at the assemblage, population, and individual levels. At the assemblage level, we found species composition to be similar among creeks. The number of species collected was similar to estuarine sites within Chesapeake Bay. At the population level, we found age composition, survival and growth of brown bullhead and white catfish to be similar among creeks and to published results from other systems. Pumpkinseed growth differed significantly among creeks, but growth within Slocum Creek was better than published results from other coastal North Carolina populations. We found relatively few older pumpkinseed within Slocum Creek, which could be due to contaminants or to fishing pressure. At the individual level, length-weight relationships for brown bullhead and white catfish were similar among creeks and to published results. The liver weight:body weight ratio, which is a widely used indicator of contaminant effects in fish, was low for brown bullhead in all three study creeks compared to other areas.

Studies from other contaminated systems have shown the approaches we used to be effective in documenting contaminant effects on fish. We conclude that there is no evidence to support significant contaminant effects on fish within Slocum Creek.

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Table 1. Mean salinity and temperature for standardized fyke netting, gill netting, and electrofishing in Goose, Hancock, and Slocum Creeks conducted during 1992. Salinity and temperature values are means and standard deviations (SD) for sampled sites during each period.

| | | Salinity | | | | Temperature | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | | Surface | SD | Bottom | SD | Surface | SD | Bottom | SD |
| Mar 2-17 | Goose | 2.8 | 2.2 | 5.4 | 2.4 | 12.2 | 1.8 | 13.1 | 1.0 |
| | Hancock | 2.8 | 1.6 | 5.0 | 1.3 | 26.1 | 2.3 | 26.2 | 1.6 |
| | Slocum | 1.3 | 1.3 | 4.2 | 2.1 | 20.1 | 2.9 | 20.7 | 2.5 |
| Jun 2-14 | Goose | 2.2 | 1.5 | 9.6 | 1.5 | 23.2 | 1.4 | 22.8 | 0.6 |
| | Hancock | 6.2 | 0.7 | 6.8 | 0.6 | 27.2 | 1.3 | 25.7 | 1.3 |
| | Slocum | 1.1 | 1.1 | 3.7 | 1.2 | 23.0 | 1.7 | 20.7 | 2.7 |
| Jul 27-Aug 4 | Goose | 9.1 | 0.8 | 10.9 | 1.5 | 29.2 | 0.9 | 28.3 | 0.9 |
| | Hancock | 10.5 | 1.0 | 10.6 | 1.1 | 31.3 | 0.8 | 30.0 | 0.4 |
| | Slocum | 6.5 | 1.6 | 7.7 | 0.9 | 30.4 | 1.5 | 29.1 | 1.9 |
| Oct 22-31 | Goose | 8.9 | 0.9 | 9.1 | 0.9 | 18.0 | 1.7 | 17.7 | 1.1 |
| | Hancock | 6.5 | 1.6 | 6.9 | 0.8 | 18.9 | 1.6 | 18.9 | 1.2 |
| | Slocum | 4.2 | 9.0 | 5.0 | 1.0 | 16.4 | 2.3 | 17.8 | 0.9 |

Table 2. Common and scientific names (Robins et al. 1991) of the species collected by fyke netting, gill netting, and electrofishing within Goose, Hancock, and Slocum Creeks during March-August, 1992.

| Species | Scientific name |
|---|---|
| Atlantic menhaden | *Brevoortia tyrannus* |
| Spot | *Leiostomus xanthurus* |
| Pumpkinseed | *Lepomis gibossus* |
| Striped mullet | *Mugil cephalus* |
| Gizzard shad | *Dorosoma cepedianum* |
| Longnose gar | *Lepisosteus osseus* |
| Redear sunfish | *Lepomis microlophus* |
| Bluegill | *Lepomis macrochirus* |
| Black crappie | *Pomoxis nigromaculatus* |
| Largemouth bass | *Micropterus salmoides* |
| Golden shiner | *Notemigonus crysoleucas* |
| Atlantic croaker | *Micropogon undulatus* |
| White catfish | *Ameiurus catus* |
| Brown bullhead | *Amieurus nebulosus* |
| Flier | *Centrarchus macropterus* |
| Chain pickerel | *Esox niger* |
| Red drum | *Sciaenops ocellata* |
| Pinfish | *Lagodon rhomboides* |
| Creek chubsucker | *Erimyzon oblongus* |
| Southern flounder | *Paralichthys lethostigma* |
| American eel | *Anguilla rostrata* |
| Yellow perch | *Perca flavescens* |
| Carp | *Cyprinus carpio* |
| White perch | *Morone americana* |
| Bowfin | *Amia calva* |
| Alewife | *Alosa pseudoharengus* |
| Inland silverside | *Menidia beryllina* |
| Warmouth | *Lepomis gulosus* |
| Eastern mosquitofish | *Gambusia spp.* |

Table 2 continued.

| Species | Scientific name |
|---|---|
| Redbreast sunfish | *Lepomis auritus* |
| Hogchoker | *Trinectes maculatus* |
| Threadfin shad | *Dorosoma petenense* |
| Redfin pickerel | *Esox americanus* |
| Striped bass | *Morone saxatilis* |
| Bluefish | *Pomatomus saltatrix* |
| Spotted sea trout | *Cynoscion nebulosus* |
| Bluespotted sunfish | *Enneacanthus gloriosus* |
| Hickory shad | *Alosa mediocris* |
| Silver perch | *Bairdiella chrysura* |
| American shad | *Alosa sapidissima* |
| Atlantic needlefish | *Strongylura marina* |
| Ladyfish | *Elops saurus* |

Table 2 continued.

| Species | Scientific name |
|---|---|
| Redbreast sunfish | *Lepomis auritus* |
| Hogchoker | *Trinectes maculatus* |
| Threadfin shad | *Dorosoma petenense* |
| Redfin pickerel | *Esox americanus* |
| Striped bass | *Morone saxatilis* |
| Bluefish | *Pomatomus saltatrix* |
| Spotted sea trout | *Cynoscion nebulosus* |
| Bluespotted sunfish | *Enneacanthus gloriosus* |
| Hickory shad | *Alosa mediocris* |
| Silver perch | *Bairdiella chrysura* |
| American shad | *Alosa sapidissima* |
| Atlantic needlefish | *Strongylura marina* |
| Ladyfish | *Elops saurus* |

Table 3. Total number of fish collected by species and creek using fyke nets, gill nets, and electrofishing during March-August, 1992.

| Species | Catch Slocum Cr. | Catch Hancock Cr. | Catch Goose Cr. | Total catch |
|---|---|---|---|---|
| Atlantic menhaden | 1787 | 585 | 247 | 2619 |
| Spot | 360 | 152 | 397 | 909 |
| Pumpkinseed | 268 | 461 | 344 | 1073 |
| Striped mullet | 267 | 74 | 77 | 418 |
| Gizzard shad | 124 | 55 | 26 | 205 |
| Longnose gar | 97 | 107 | 42 | 246 |
| Redear sunfish | 39 | 0 | 2 | 41 |
| Bluegill | 38 | 13 | 45 | 96 |
| Black crappie | 38 | 2 | 0 | 40 |
| Largemouth bass | 36 | 48 | 82 | 166 |
| Golden shiner | 26 | 19 | 1 | 46 |
| Atlantic croaker | 19 | 16 | 1 | 36 |
| White catfish | 17 | 1 | 21 | 39 |
| Brown bullhead | 15 | 14 | 22 | 51 |
| Flier | 15 | 6 | 2 | 23 |
| Chain pickerel | 14 | 11 | 2 | 27 |
| Red drum | 12 | 2 | 2 | 16 |
| Pinfish | 11 | 3 | 19 | 33 |
| Creek chubsucker | 11 | 4 | 0 | 15 |
| Southern flounder | 10 | 18 | 45 | 73 |
| American eel | 9 | 12 | 2 | 23 |
| Yellow perch | 8 | 8 | 60 | 76 |
| Carp | 8 | 5 | 0 | 13 |
| White perch | 7 | 4 | 0 | 11 |
| Bowfin | 7 | 1 | 1 | 9 |
| Alewife | 6 | 0 | 2 | 8 |
| Inland silverside | 6 | 2 | 0 | 8 |
| Warmouth | 4 | 4 | 8 | 16 |
| Eastern mosquitofish | 4 | 0 | 0 | 4 |
| Redbreast sunfish | 3 | 0 | 0 | 3 |
| Hogchoker | 2 | 0 | 0 | 2 |

Table 3 continued.

| Species | Catch Slocum Cr. | Catch Hancock Cr. | Catch Goose Cr. | Total catch |
|---|---|---|---|---|
| Threadfin shad | 2 | 0 | 0 | 2 |
| Redfin pickerel | 1 | 0 | 0 | 1 |
| Striped bass | 0 | 1 | 7 | 8 |
| Bluefish | 0 | 6 | 0 | 6 |
| Spotted sea trout | 0 | 6 | 0 | 6 |
| Bluespotted sunfish | 0 | 2 | 2 | 4 |
| Hickory shad | 0 | 3 | 1 | 4 |
| Silver perch | 0 | 3 | 0 | 3 |
| American shad | 0 | 1 | 0 | 1 |
| Atlantic needlefish | 0 | 1 | 0 | 1 |
| Ladyfish | 0 | 1 | 0 | 1 |

Table 4. Total number of fish collected by species and gear from Goose, Hancock, and Slocum Creeks combined during March-August, 1992.

| Species | Catch Electroshock | Catch Fyke Net | Catch Gill Net | Total catch |
|---|---|---|---|---|
| Atlantic menhaden | 2 | 5 | 2612 | 2619 |
| Spot | 83 | 8 | 818 | 909 |
| Pumpkinseed | 485 | 574 | 14 | 1073 |
| Striped mullet | 53 | 13 | 352 | 418 |
| Gizzard shad | 1 | 6 | 198 | 205 |
| Longnose gar | 3 | 16 | 227 | 246 |
| Redear sunfish | 37 | 4 | 0 | 41 |
| Bluegill | 25 | 68 | 3 | 96 |
| Black crappie | 6 | 15 | 19 | 40 |
| Largemouth bass | 95 | 30 | 41 | 166 |
| Golden shiner | 5 | 10 | 31 | 46 |
| Atlantic croaker | 12 | 0 | 24 | 36 |
| White catfish | 4 | 6 | 29 | 39 |
| Brown bullhead | 13 | 32 | 6 | 51 |
| Flier | 3 | 18 | 2 | 23 |
| Chain pickerel | 22 | 2 | 3 | 27 |
| Red drum | 9 | 0 | 7 | 16 |
| Pinfish | 26 | 1 | 6 | 33 |
| Creek chubsucker | 9 | 3 | 3 | 15 |
| Southern flounder | 10 | 48 | 15 | 73 |
| American eel | 23 | 0 | 0 | 23 |
| Yellow perch | 25 | 50 | 1 | 76 |
| Carp | 8 | 3 | 2 | 13 |
| White perch | 3 | 3 | 5 | 11 |
| Bowfin | 4 | 1 | 4 | 9 |
| Alewife | 0 | 1 | 7 | 8 |
| Inland silverside | 8 | 0 | 0 | 8 |
| Warmouth | 5 | 9 | 2 | 16 |
| Eastern mosquitofish | 4 | 0 | 0 | 4 |
| Redbreast sunfish | 3 | 0 | 0 | 3 |

Table 4 continued.

| Species | Catch Electroshock | Catch Fyke Net | Catch Gill Net | Total catch |
|---|---|---|---|---|
| Hogchoker | 2 | 0 | 0 | 2 |
| Threadfin shad | 0 | 0 | 2 | 2 |
| Redfin pickerel | 1 | 0 | 0 | 1 |
| Striped bass | 0 | 1 | 7 | 8 |
| Bluefish | 0 | 0 | 6 | 6 |
| Spotted sea trout | 0 | 0 | 6 | 6 |
| Bluespotted sunfish | 3 | 0 | 1 | 4 |
| Hickory shad | 0 | 0 | 4 | 4 |
| Silver perch | 0 | 0 | 3 | 3 |
| American shad | 0 | 0 | 1 | 1 |
| Atlantic needlefish | 0 | 0 | 1 | 1 |
| Ladyfish | 0 | 0 | 1 | 1 |

Table 5. Number of brown bullhead collected by creek, period, and sex.

| Sex | Period | Goose | Hancock | Slocum | Total |
|---|---|---|---|---|---|
| Female | Mar | 0 | 0 | 0 | 0 |
| | Jun | 0 | 6 | 5 | 11 |
| | Jul/Aug | 6 | 0 | 0 | 6 |
| | Oct | 5 | 12 | 18 | 35 |
| | Total | 11 | 18 | 23 | 52 |
| Male | Mar | 0 | 0 | 1 | 1 |
| | Jun | 4 | 9 | 3 | 16 |
| | Jul/Aug | 13 | 0 | 3 | 16 |
| | Oct | 2 | 23 | 12 | 37 |
| | Total | 19 | 32 | 19 | 70 |

Table 6. Von Bertalanffy growth parameters for various populations of brown bullhead.

| Location | Sex | $L_\infty$ (mm) | K | $t_0$ | Study |
|---|---|---|---|---|---|
| Goose Creek | female | 355.0 | 0.508 | 0.03 | present study |
| | male | 330.5 | 1.077 | 0.68 | |
| | combined | 334.8 | 0.908 | 0.61 | |
| Hancock Creek | female | 351.2 | 2.097 | 2.22 | |
| | male | 370.4 | 1.330 | 2.03 | |
| | combined | 363.2 | 1.569 | 2.11 | |
| Slocum Creek | female | 357.3 | 2.343 | 2.33 | |
| | male | 410.8 | 0.314 | -3.77 | |
| | combined | 370.8 | 1.759 | 1.72 | |
| All creeks combined | female | 357.7 | 0.845 | 0.78 | |
| | male | 391.8 | 0.547 | 0.35 | |
| | combined | 375.2 | 0.655 | 0.53 | |
| Upper Ottawa River | combined | 386.6 | 0.284 | -0.40 | Rubec and |
| Lower Ottawa River | combined | 325.7 | 0.222 | -1.16 | Qadri 1982 |
| Hawkesbury | combined | 371.7 | 0.216 | -1.36 | |
| Muskellunge Lake | female | 343.4 | 0.256 | -0.96 | Sinnott and |
| | male | 397.7 | 0.190 | -1.20 | Ringler 1987 |
| | combined | 387.3 | 0.196 | -1.21 | |
| Little River, OK | combined | 543.3 | 0.227 | 0.20 | Finnell et al. 1956 |

Table 7. Incidence of skin lesions for brown bullhead collected from Goose, Hancock, and Slocum Creeks during March-October, 1992.

| | | Skin lesion categories | | | | |
|---|---|---|---|---|---|---|
| Period | Creek | None | Single | Few | Many | Total |
| March | Goose | | | | | |
| | Hancock | | | | | |
| | Slocum | 1 | 0 | 1 | 0 | 2 |
| June | Goose | 2 | 1 | 0 | 1 | 4 |
| | Hancock | 4 | 3 | 2 | 6 | 15 |
| | Slocum | 5 | 0 | 0 | 3 | 8 |
| Jul/Aug | Goose | 13 | 5 | 0 | 1 | 19 |
| | Hancock | | | | | |
| | Slocum | 0 | 2 | 0 | 1 | 3 |
| Oct | Goose | 5 | 1 | 0 | 1 | 7 |
| | Hancock | 29 | 4 | 0 | 1 | 34 |
| | Slocum | 22 | 6 | 2 | 0 | 30 |

Table 9. Mean liver weight:body weight ratio (HSI) and standard error (SE) by sex and creek for brown bullhead collected from Goose, Hancock, and Slocum Creeks during 1991-1992, compared to estimates from previous studies. Results from the present study for 1991 and 1992 were based on necropsy of fresh and frozen fish, respectively.

| Location | Sex | n | Mean HSI | SE | Study |
|---|---|---|---|---|---|
| Goose Creek | Female | 5 | 0.017 | 0.001 | Present:1992 |
| | Male | 2 | 0.018 | 0.002 | |
| Hancock Creek | Female | 11 | 0.016 | 0.001 | |
| | Male | 23 | 0.013 | 0.001 | |
| Slocum Creek | Female | 18 | 0.017 | 0.001 | |
| | Male | 12 | 0.015 | 0.001 | |
| Hancock Creek | Female | 4 | 0.012 | 0.001 | Present:1991 |
| | Male | 1 | 0.010 | NA | |
| Slocum Creek | Female | 5 | 0.011 | 0.002 | |
| | Male | 2 | 0.014 | 0.000 | |
| Hog Island | Female | 4 | 0.015 | 0.001 | |
| | Male | 1 | 0.014 | NA | |
| New Bern | Female | 2 | 0.014 | 0.006 | |
| Fox R. | Unspec. | 31 | 0.022 | NA | Baumann et al. 1991 |
| Menominee R. | | 39 | 0.020 | NA | |
| Munuscong L. | | 68 | 0.026 | NA | |
| Cuyahoga R. | | 71 | 0.026 | NA | |
| Black R. | Female | 22 | 0.034 | 0.002 | Fabacher and Baumann 1985 |
| | Male | 10 | 0.035 | 0.003 | (fish without liver |
| Buckeye Lake | Female | 6 | 0.020 | 0.004 | parasites or tumors) |
| | Male | 15 | 0.020 | 0.002 | |
| Hancock Creek | Unspec. | 4 | 0.019 | 0.002 | Gallagher and Di Giulio 1989 |
| Slocum Creek | | 6 | 0.029 | 0.002 | |

Table 10. Number of white catfish collected by creek, period, and sex.

| Sex | Period | Goose | Hancock | Slocum | Total |
|---|---|---|---|---|---|
| Female | Mar | 0 | 0 | 0 | 0 |
| | Jun | 10 | 1 | 2 | 13 |
| | Jul/Aug | 4 | 4 | 0 | 8 |
| | Oct | 0 | 3 | 0 | 3 |
| | Total | 14 | 8 | 2 | 24 |
| Male | Mar | | | | |
| | Jun | 6 | 4 | 6 | 16 |
| | Jul/Aug | 3 | 2 | 0 | 5 |
| | Oct | 1 | 2 | 1 | 4 |
| | Total | 10 | 8 | 7 | 25 |

Table 11. Fitted growth models for Goose, Hancock, and Slocum Creeks versus Santee-Cooper Lake (Stevens 1959) and the Patuxent River (Schwartz and Jachowski 1965). For the Patuxent River data, the fitted model was length=$b_0$+$b_1$•age.

| Location | Parameter | Estimate | Study |
|---|---|---|---|
| Goose, Hancock, Slocum | $L_\infty$ (mm) | 776.1 | present study |
| | K | 0.073 | |
| | $t_0$ | -4.07 | |
| Santee-Cooper Lake | $L_\infty$ (mm) | 786.4 | Stevens |
| | K | 0.102 | |
| | $t_0$ | -0.022 | |
| Patuxent River | Intercept ($b_0$) | 74.7 | Schwartz and Jachowski |
| | Slope ($b_1$) | 34.2 | |

Table 12. Von Bertalanffy growth parameters for pumpkinseed collected from Goose, Hancock and Slocum Creeks, compared to curves fitted to age-length data for Perquimans River and Chowan River pumpkinseed (sexes combined; Kornegay et al. 1994).

| Location | Sex | n | $L_\infty$ | K | $t_0$ | Study |
|---|---|---|---|---|---|---|
| Goose Ck. | Female | 164 | 192.3 | 0.576 | -0.20 | Present |
| | Male | 171 | 183.9 | 0.752 | -0.20 | |
| Hancock Ck. | Female | 176 | 187.5 | 0.701 | 0.43 | |
| | Male | 273 | 179.2 | 1.198 | 0.81 | |
| Slocum Ck. | Female | 125 | 175.2 | 0.800 | 0.42 | |
| | Male | 137 | 173.7 | 1.147 | 0.64 | |
| Perquimans R. | Combined | 82 | 554.8 | 0.067 | -1.02 | Kornegay et al. |
| Chowan R. | Combined | 112 | 208.3 | 0.369 | 0.16 | |

Figure 1. Location of study areas where fishery sampling was conducted.

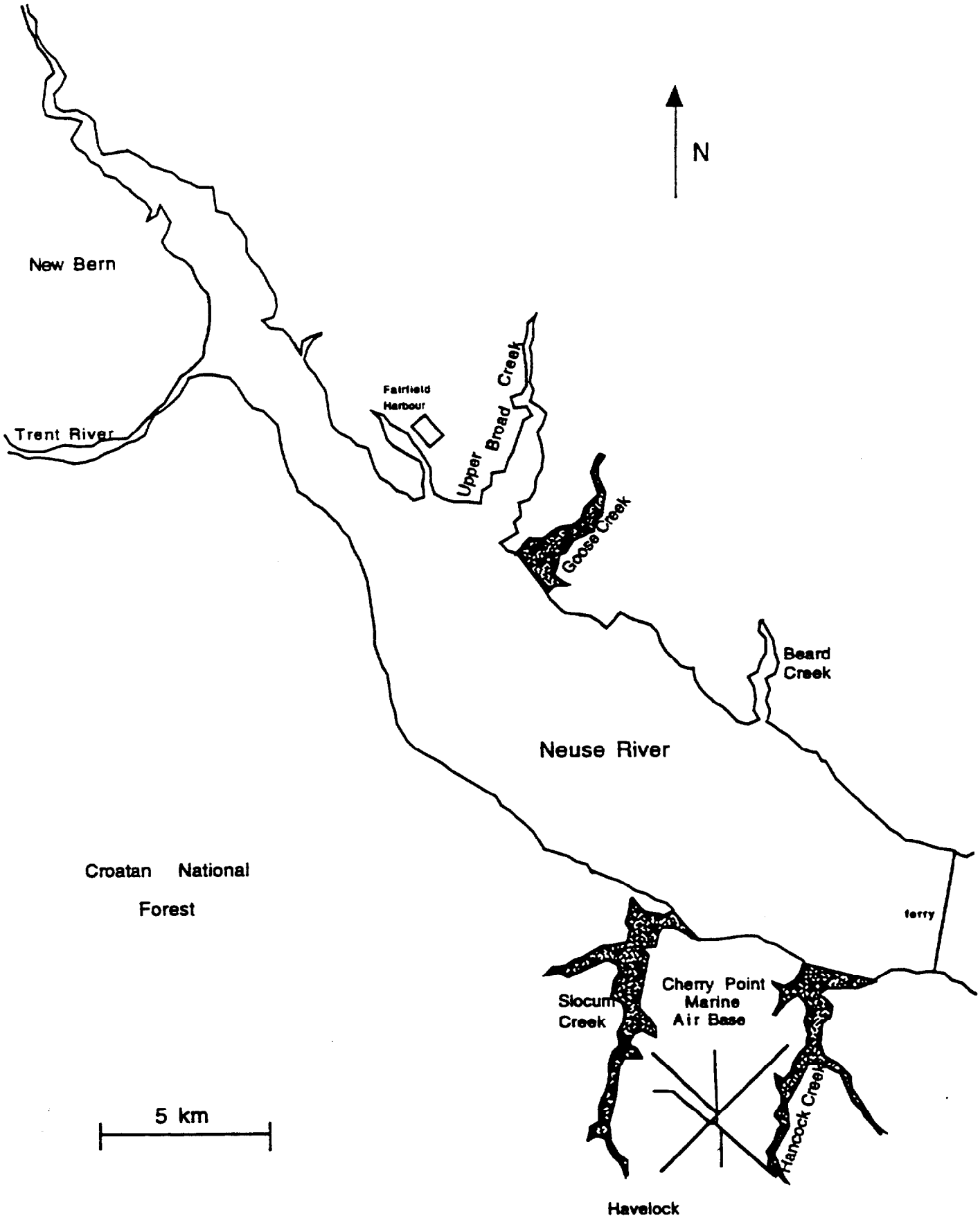

N
New Bern
Trent River
Fairfield Harbour
Upper Broad Creek
Goose Creek
Beard Creek
Neuse River
Croatan National Forest
ferry
Slocum Creek
Cherry Point Marine Air Base
Hancock Creek
5 km
Havelock

Figure 2. $Log_{10}$(catch) by species and creek. The species are ordered based on catches from Slocum Creek. Species that were not collected in Slocum Creek were ordered based on their average catch rates for the remaining creeks.

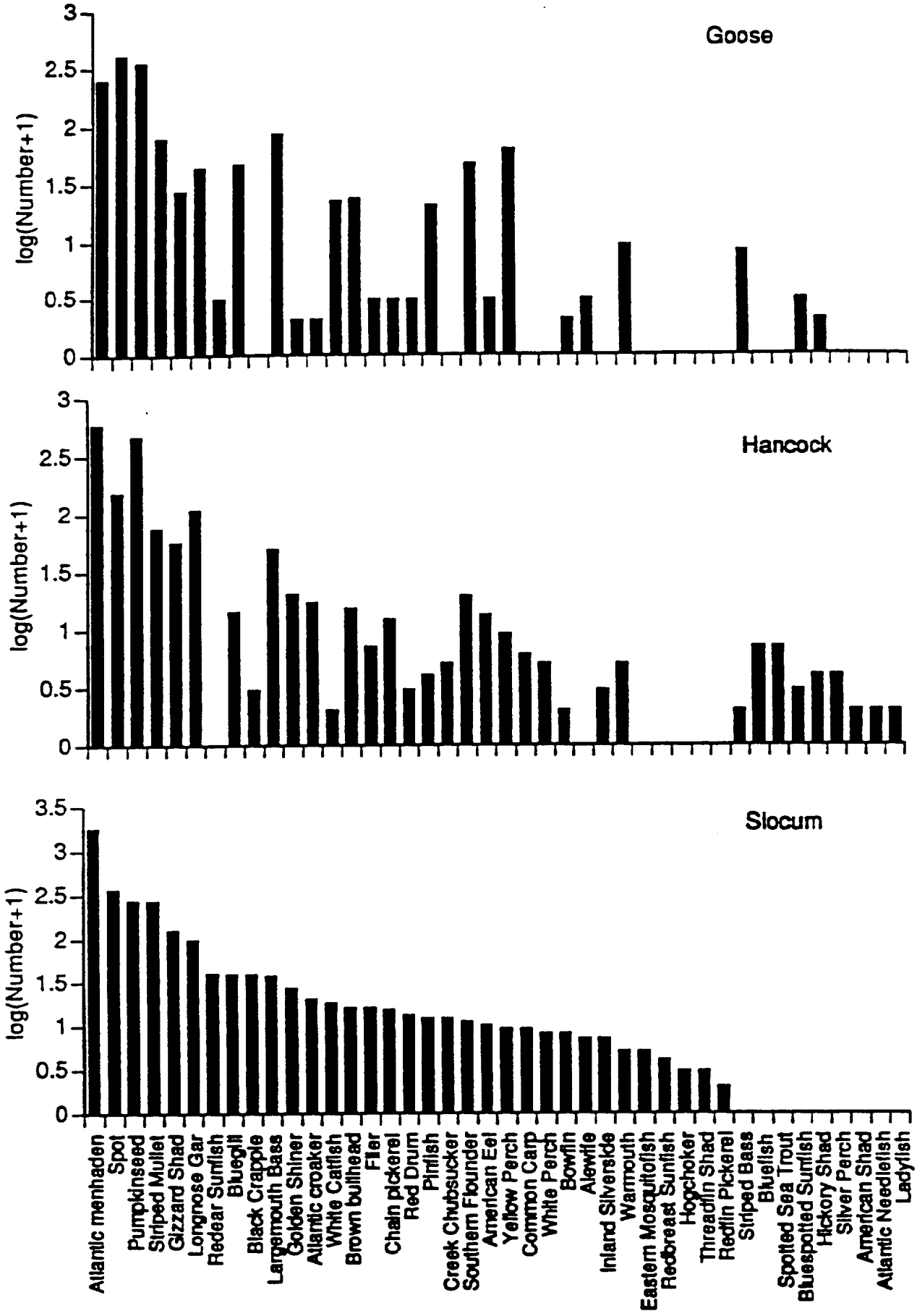
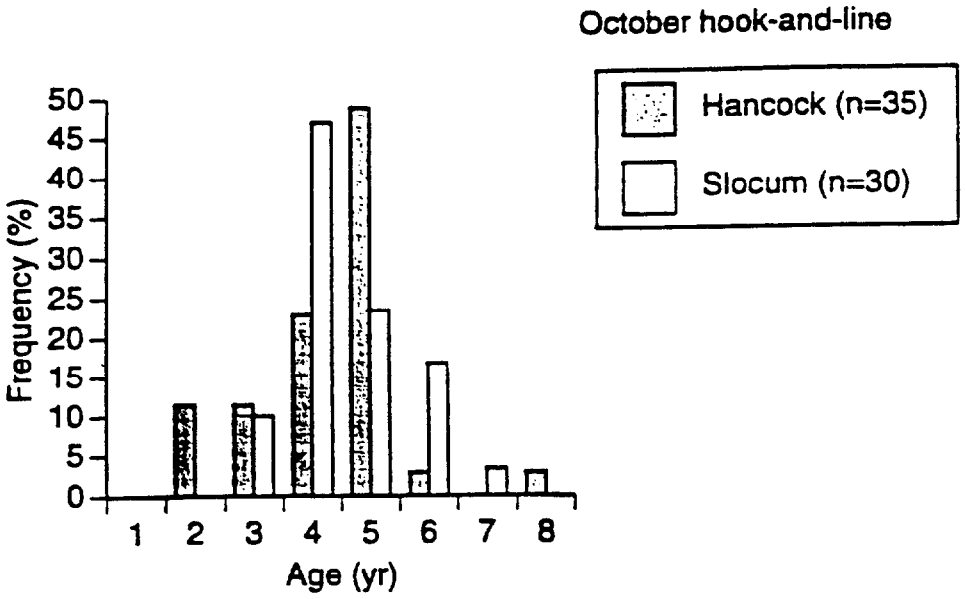
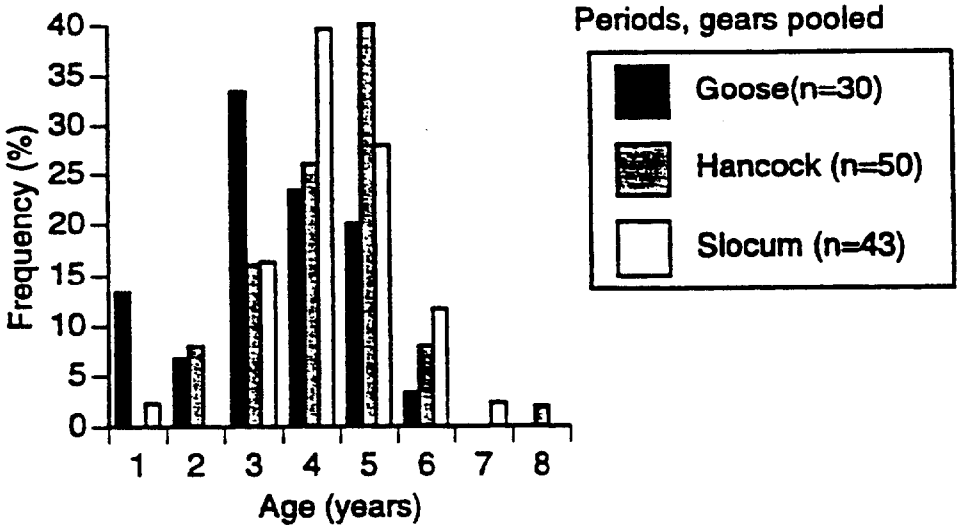

Goose
Hancock
Slocum
log(Number+1)
0
0.5
1
1.5
2
2.5
3
3.5
Atlantic menhaden
Spot
Pumpkinseed
Striped Mullet
Gizzard Shad
Longnose Gar
Redear Sunfish
Bluegill
Black Crappie
Largemouth Bass
Golden Shiner
Atlantic croaker
White Catfish
Brown bullhead
Filer
Chain pickerel
Red Drum
Pinfish
Creek Chubsucker
Southern Flounder
American Eel
Yellow Perch
Common Carp
White Perch
Bowfin
Alewife
Inland Silverside
Warmouth
Eastern Mosquitofish
Redbreast Sunfish
Hogchoker
Threadfin Shad
Redfin Pickerel
Striped Bass
Bluefish
Spotted Sea Trout
Bluespotted Sunfish
Hickory Shad
Silver Perch
American Shad
Atlantic Needlefish
Ladyfish

Figure 3. Age distributions for brown bullhead from Hancock and Slocum Creeks (sexes combined) collected by hook-and-line sampling during October 1992 (upper panel); from Goose, Hancock, and Slocum Creeks using samples from all periods, gears, and sexes (center panel); and Muskellunge Lake, New York (lower panel: Sinnott and Ringler 1987). Results provided by Sinnott and Ringler (1987) are based on pooled trap net, gill net, electrofishing, and angler samples.


October hook-and-line
Hancock (n=35)
Slocum (n=30)
Frequency (%)
Age (yr)


Periods, gears pooled
Goose(n=30)
Hancock (n=50)
Slocum (n=43)
Frequency (%)
Age (years)

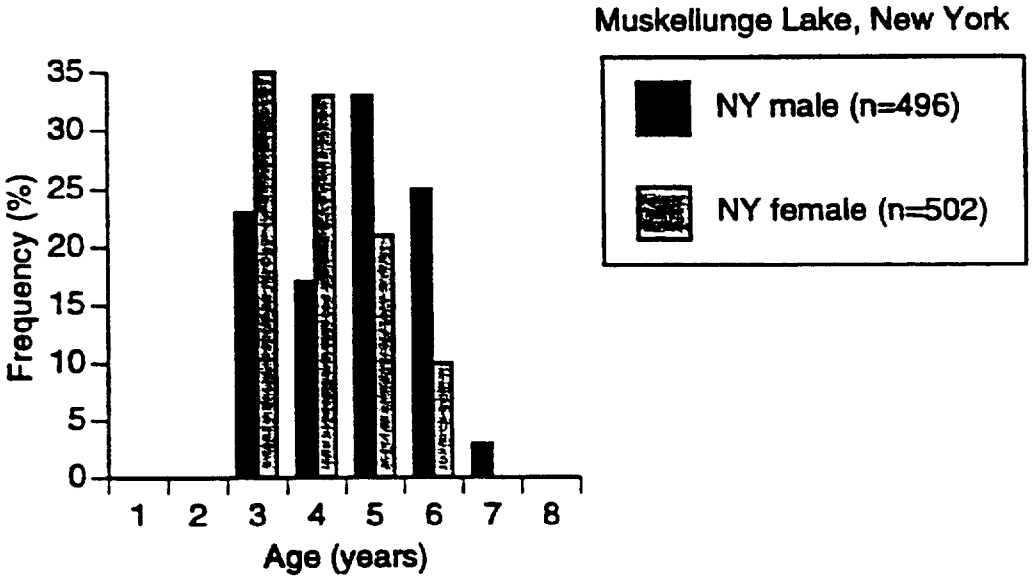
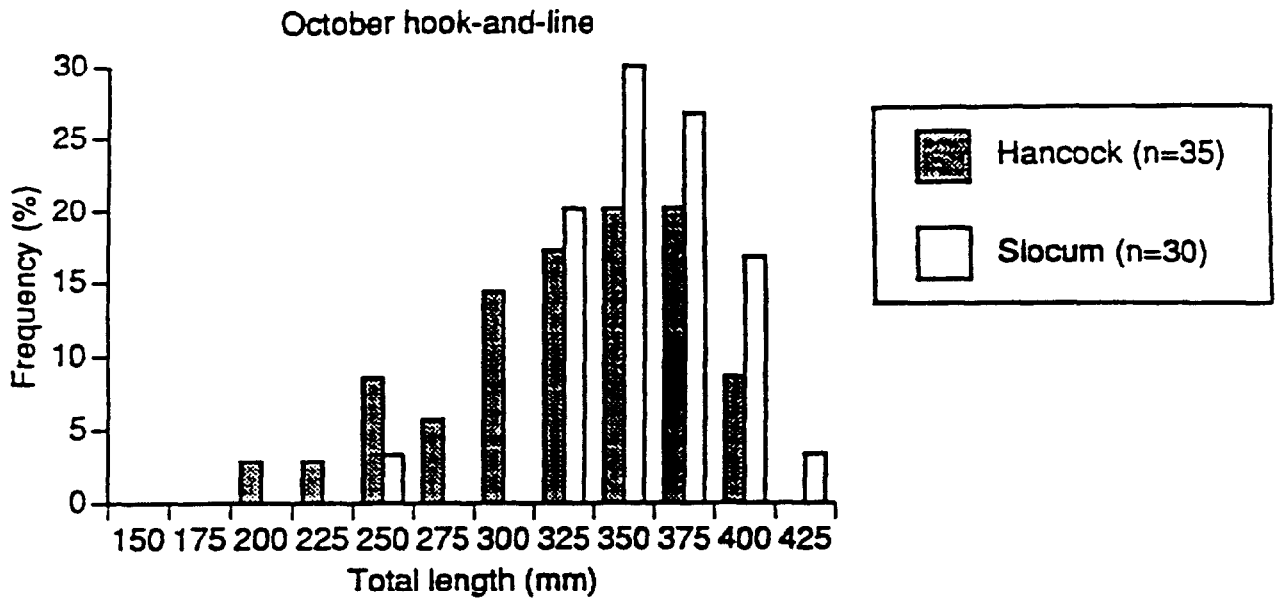

Muskellunge Lake, New York
NY male (n=496)
NY female (n=502)
Frequency (%)
Age (years)

Figure 4. Length composition data for brown bullhead from October 1992 hook-and-line samples (upper panel) and from all periods and gears combined (lower panel). Goose Creek data was excluded from the upper panel because of the small sample size.


October hook-and-line
Frequency (%)
30
25
20
15
10
5
0
150 175 200 225 250 275 300 325 350 375 400 425
Total length (mm)
Hancock (n=35)
Slocum (n=30)

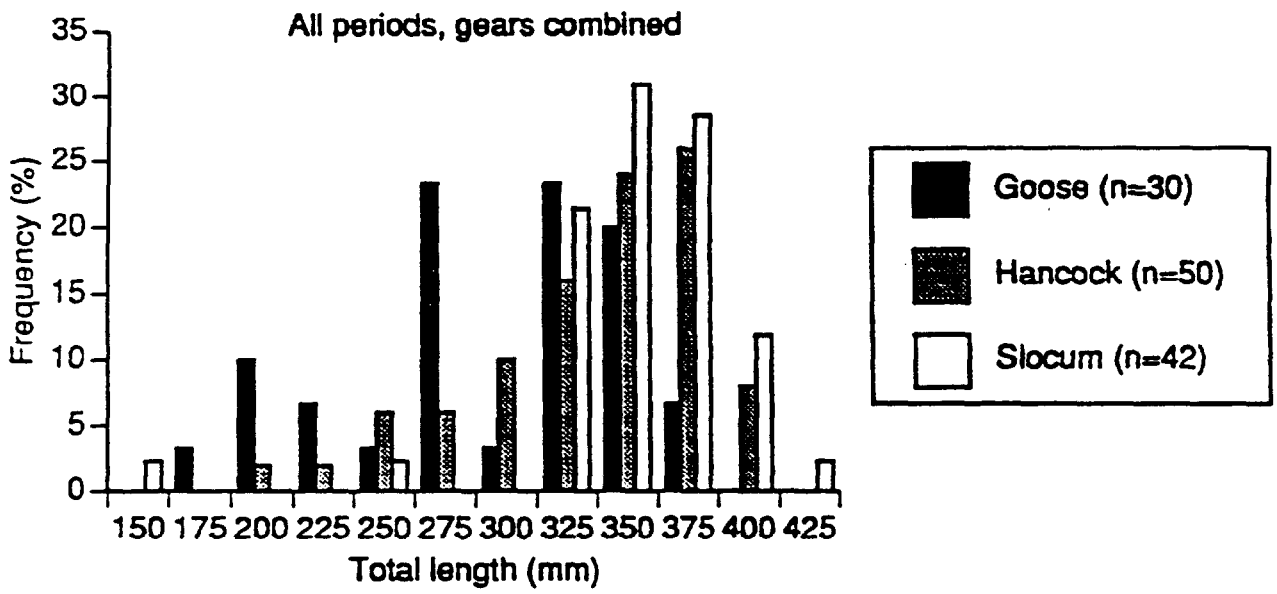
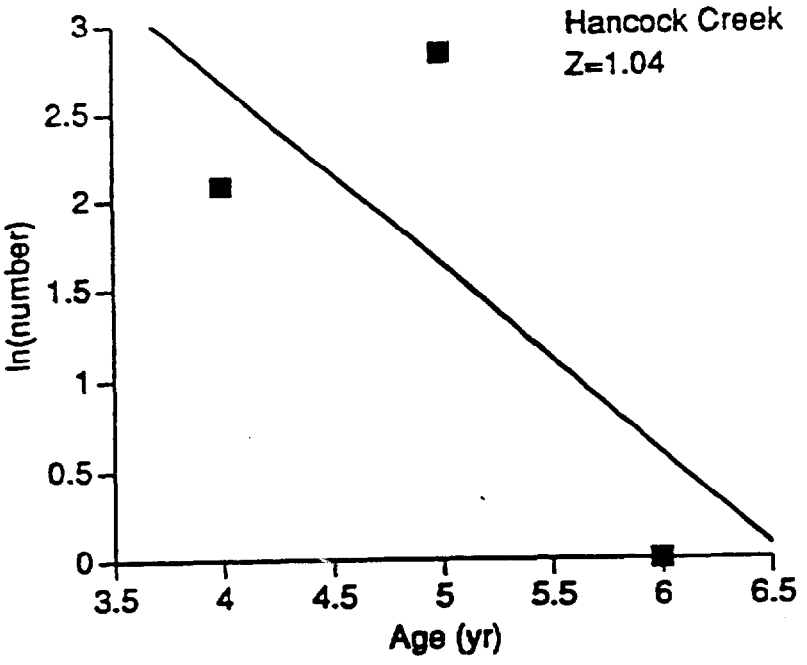

All periods, gears combined
Frequency (%)
35
30
25
20
15
10
5
0
150 175 200 225 250 275 300 325 350 375 400 425
Total length (mm)
Goose (n=30)
Hancock (n=50)
Slocum (n=42)

Figure 5. Estimates of total mortality for Hancock and Slocum Creeks, based on a catch curve analysis of October 1992 hook-and-line samples.


Hancock Creek
Z=1.04
ln(number)
3
2.5
2
1.5
1
0.5
0
3.5
4
4.5
5
5.5
6
6.5
Age (yr)

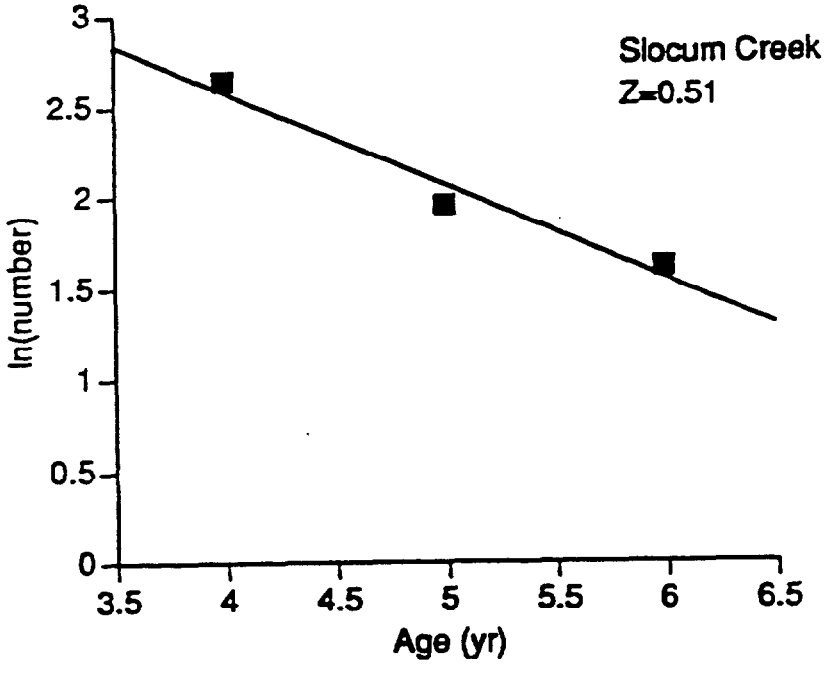

Slocum Creek
Z=0.51
ln(number)
3
2.5
2
1.5
1
0.5
0
3.5
4
4.5
5
5.5
6
6.5
Age (yr)

Figure 6. Age-length relationships for male and female brown bullhead collected from Goose, Hancock, and Slocum Creeks. The fitted von Bertalanffy curves are based on pooled data from both sexes except for Slocum Creek where curves for male (dotted) and female (solid) fish were significantly different.

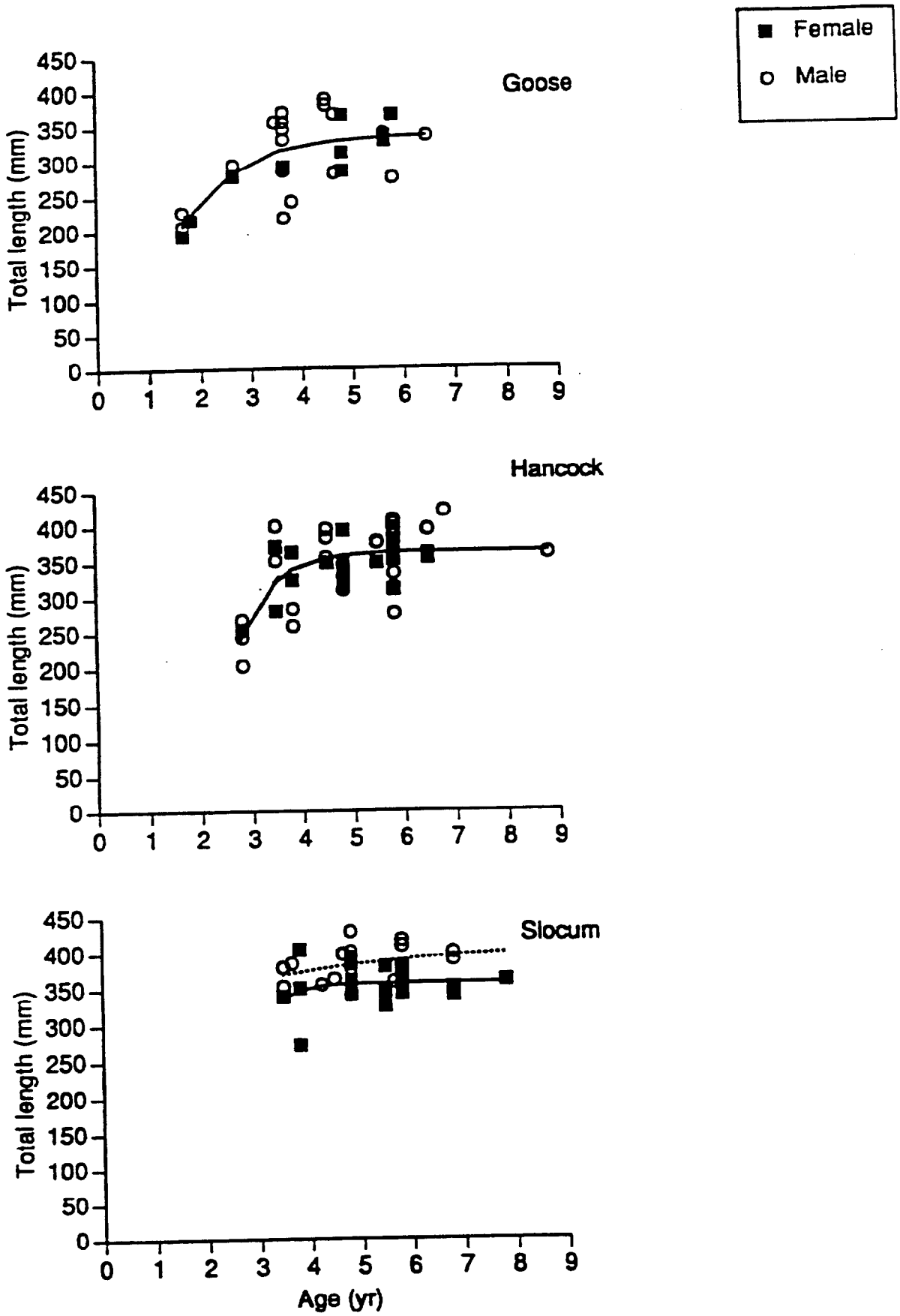

Female
Male
Goose
Hancock
Slocum
Total length (mm)
Age (yr)
0
50
100
150
200
250
300
350
400
450
0
1
2
3
4
5
6
7
8
9

Figure 7. Length and weight data for brown bullhead collected in October 1992 from Goose, Hancock, and Slocum Creeks. Data for both sexes are included. The curve represents a least-squares fit between ln(length) and ln(weight), using pooled data from all three creeks.

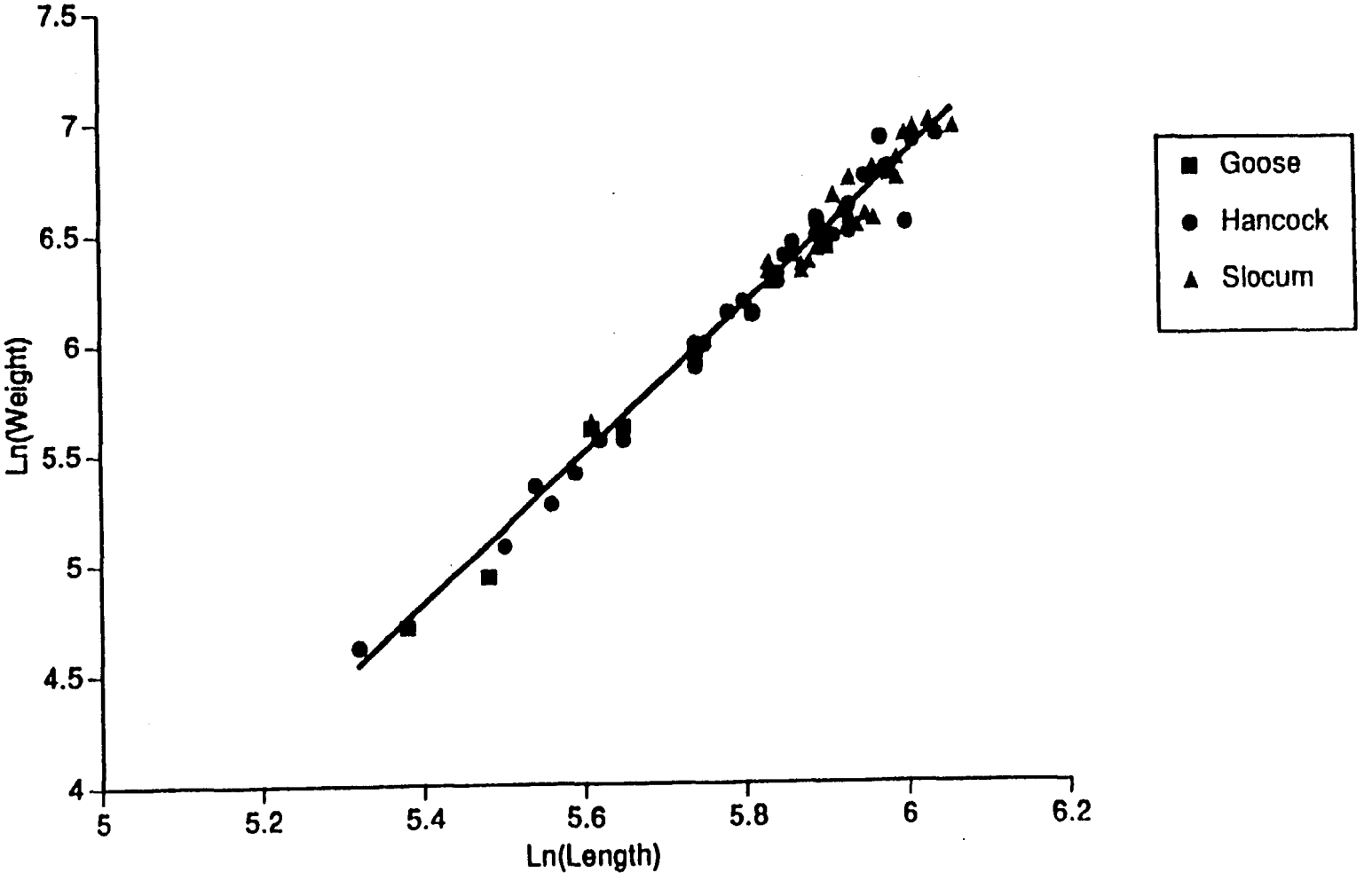

7.5
7
6.5
6
5.5
5
4.5
4
Ln(Weight)
5
5.2
5.4
5.6
5.8
6
6.2
Ln(Length)
Goose
Hancock
Slocum

Figure 8. Liver weight:body weight data for female and male brown bullhead collected in October 1992 from Goose, Hancock, and Slocum Creeks.

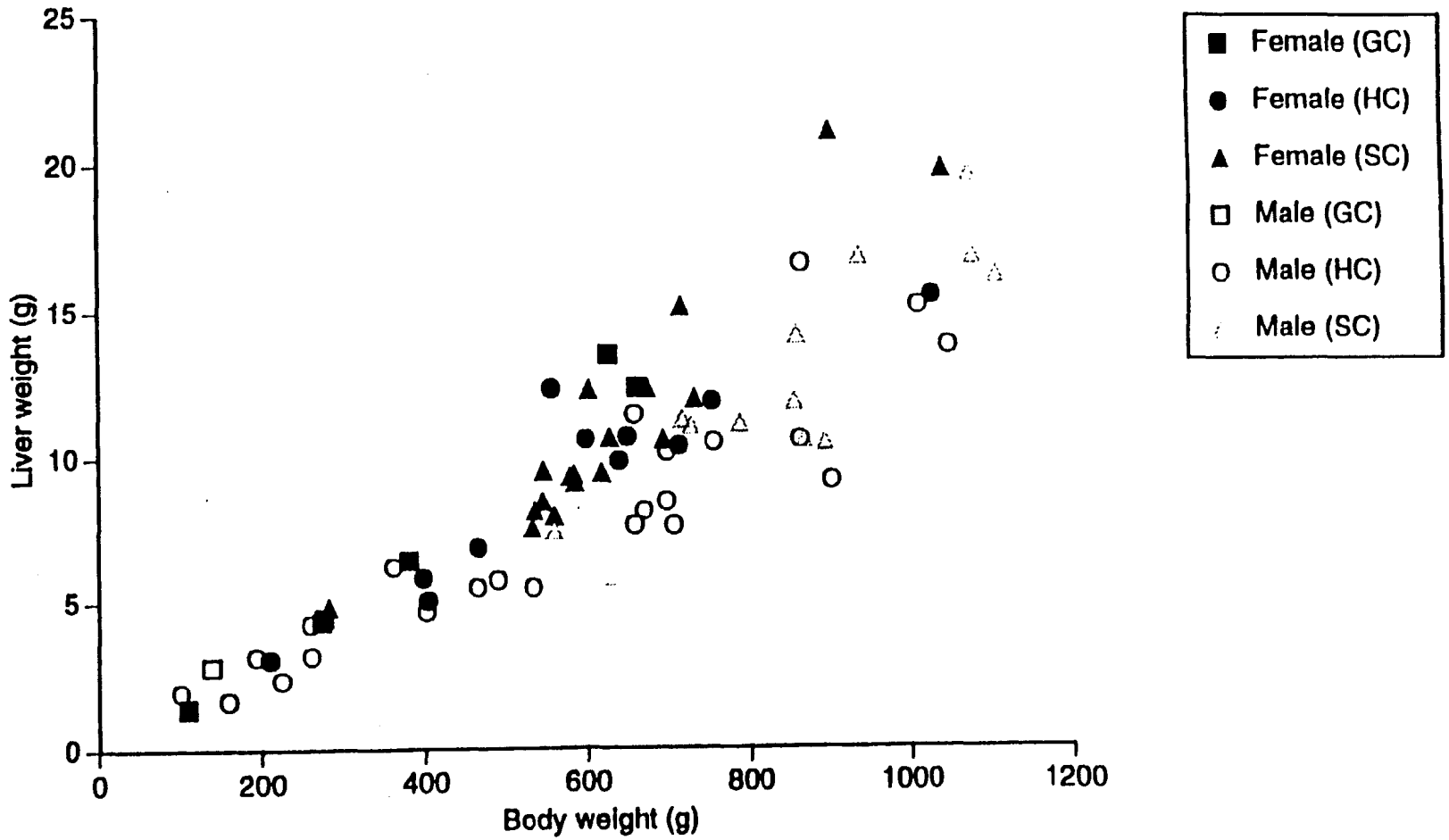

Liver weight (g)
25
20
15
10
5
0
0
200
400
600
800
1000
1200
Body weight (g)
Female (GC)
Female (HC)
Female (SC)
Male (GC)
Male (HC)
Male (SC)

Figure 9. Relationship between liver weight and body weight for female brown bullhead collected in October 1992 from Goose, Hancock, and Slocum Creeks. Fitted linear models differed significantly among creeks.

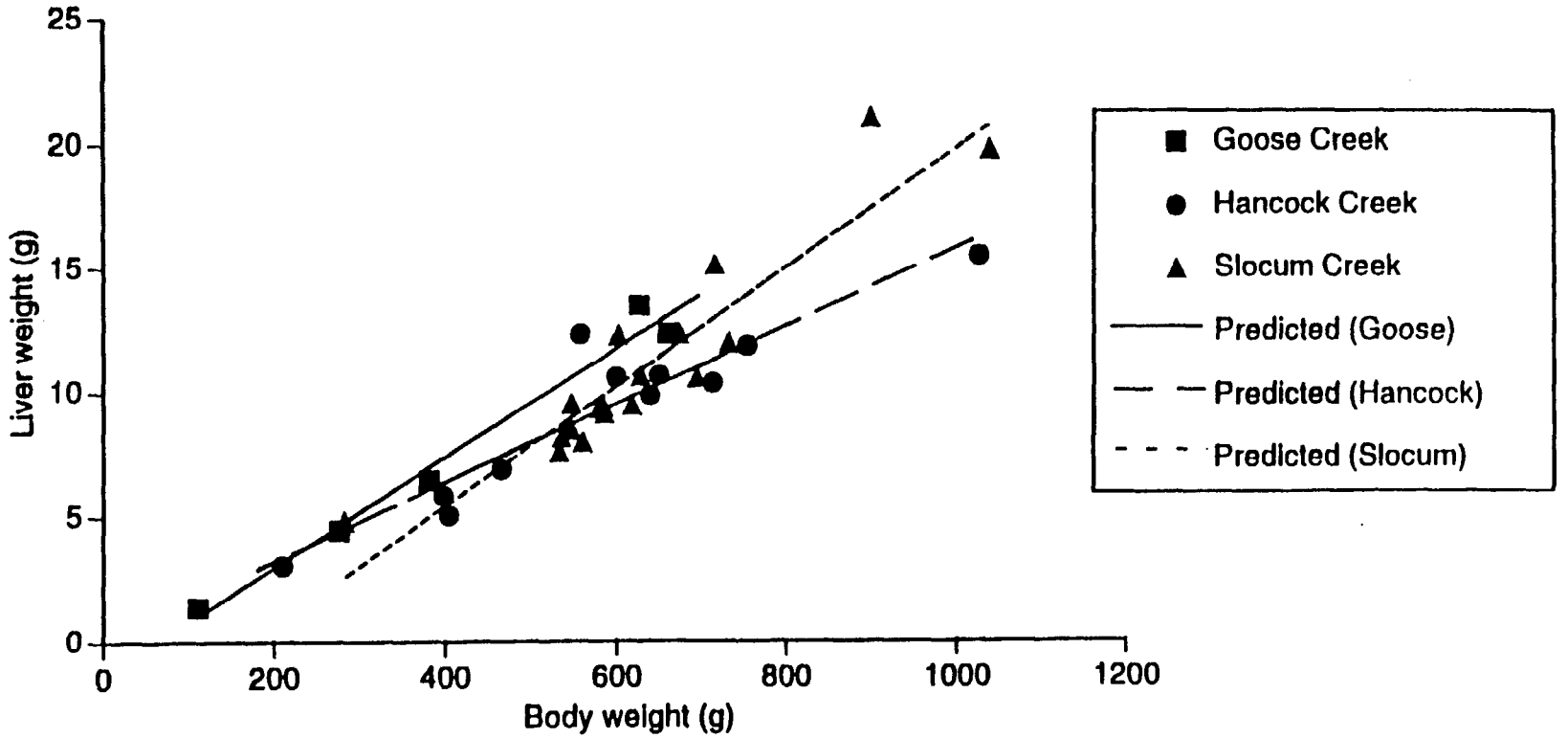

25
20
15
10
5
0
Liver weight (g)
0
200
400
600
800
1000
1200
Body weight (g)
Goose Creek
Hancock Creek
Slocum Creek
Predicted (Goose)
Predicted (Hancock)
Predicted (Slocum)

Figure 10. Relationship between liver weight and body weight for male brown bullhead collected in October 1992 from Goose, Hancock, and Slocum Creeks. Fitted linear models were not significantly different among creeks so a single model was fitted to the pooled data.

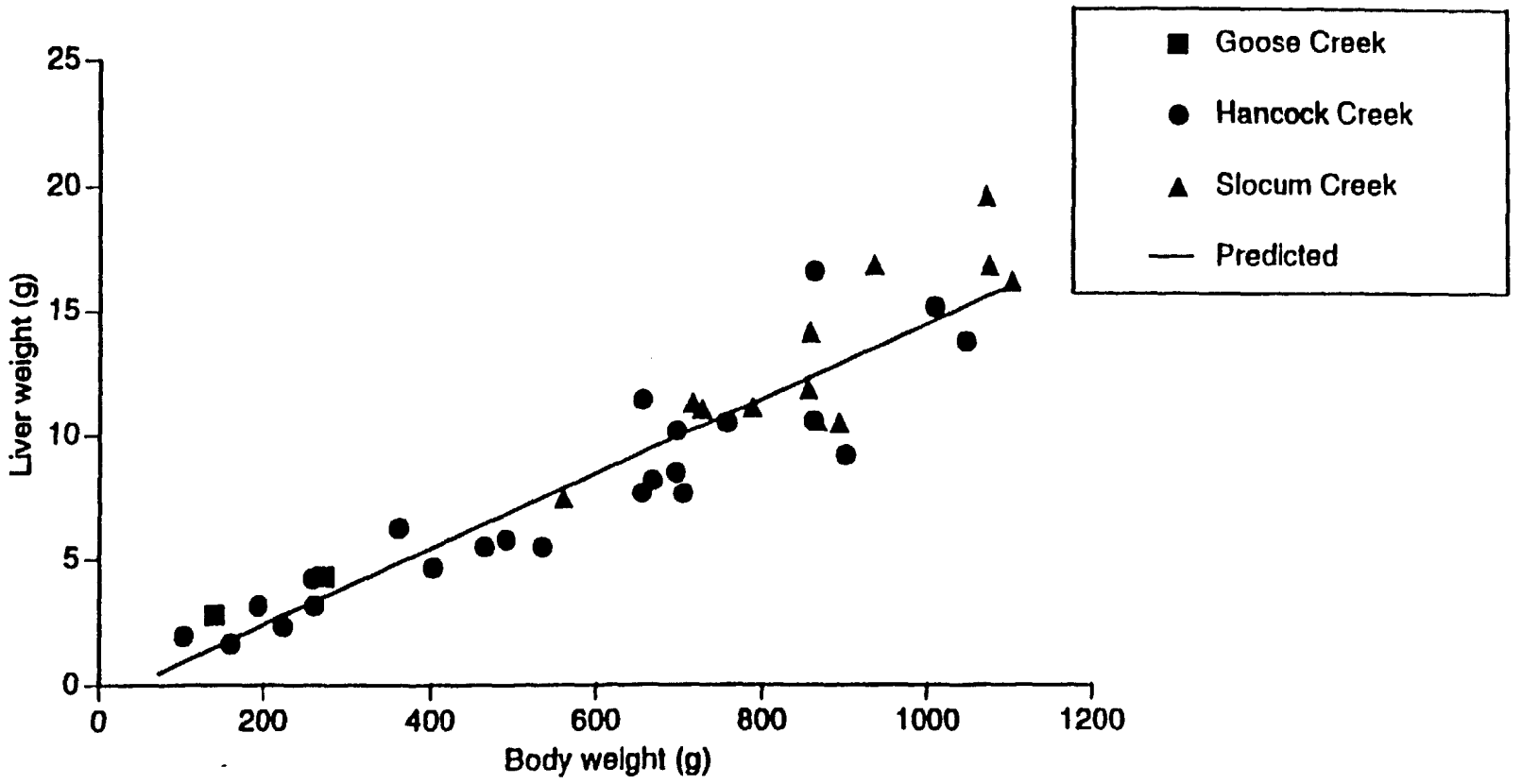

Goose Creek
Hancock Creek
Slocum Creek
Predicted
Liver weight (g)
Body weight (g)
0
5
10
15
20
25
0
200
400
600
800
1000
1200

Figure 11. Age composition data for white catfish collected from Goose, Hancock, and Slocum Creeks. Data were pooled over sexes, gears, and periods because of small sample sizes.

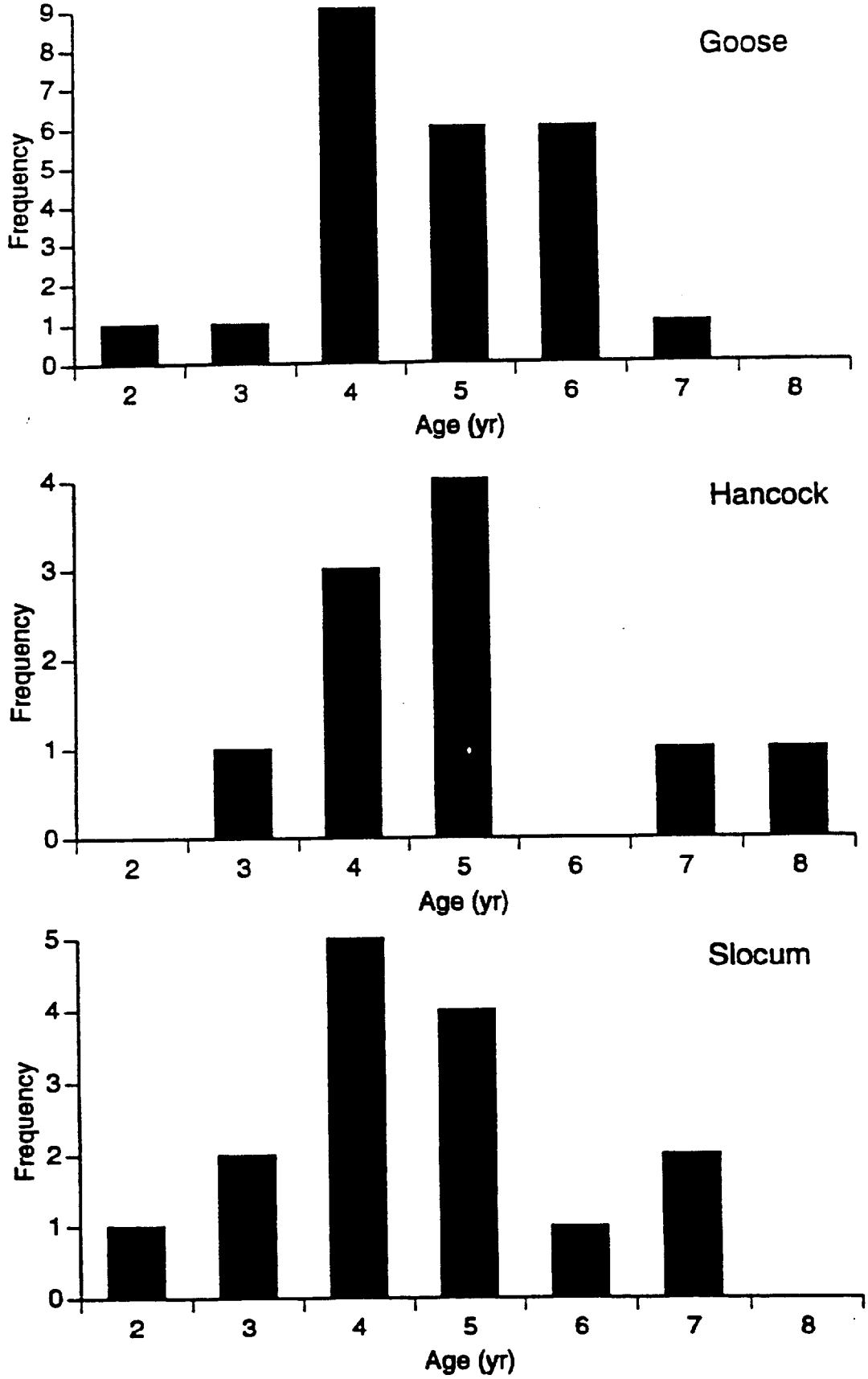

Goose
Frequency
0
1
2
3
4
5
6
7
8
9
2
3
4
5
6
7
8
Age (yr)
Hancock
Frequency
0
1
2
3
4
2
3
4
5
6
7
8
Age (yr)
Slocum
Frequency
0
1
2
3
4
5
2
3
4
5
6
7
8
Age (yr)

Figure 12. Catch curves fitted to white catfish catch data from Goose, Hancock, and Slocum Creeks. Catches were pooled over sexes, gears, and periods because of small sample sizes. Fish ages four and older were assumed to be fully vulnerable to the standardized set of gears used to sample within each creek.

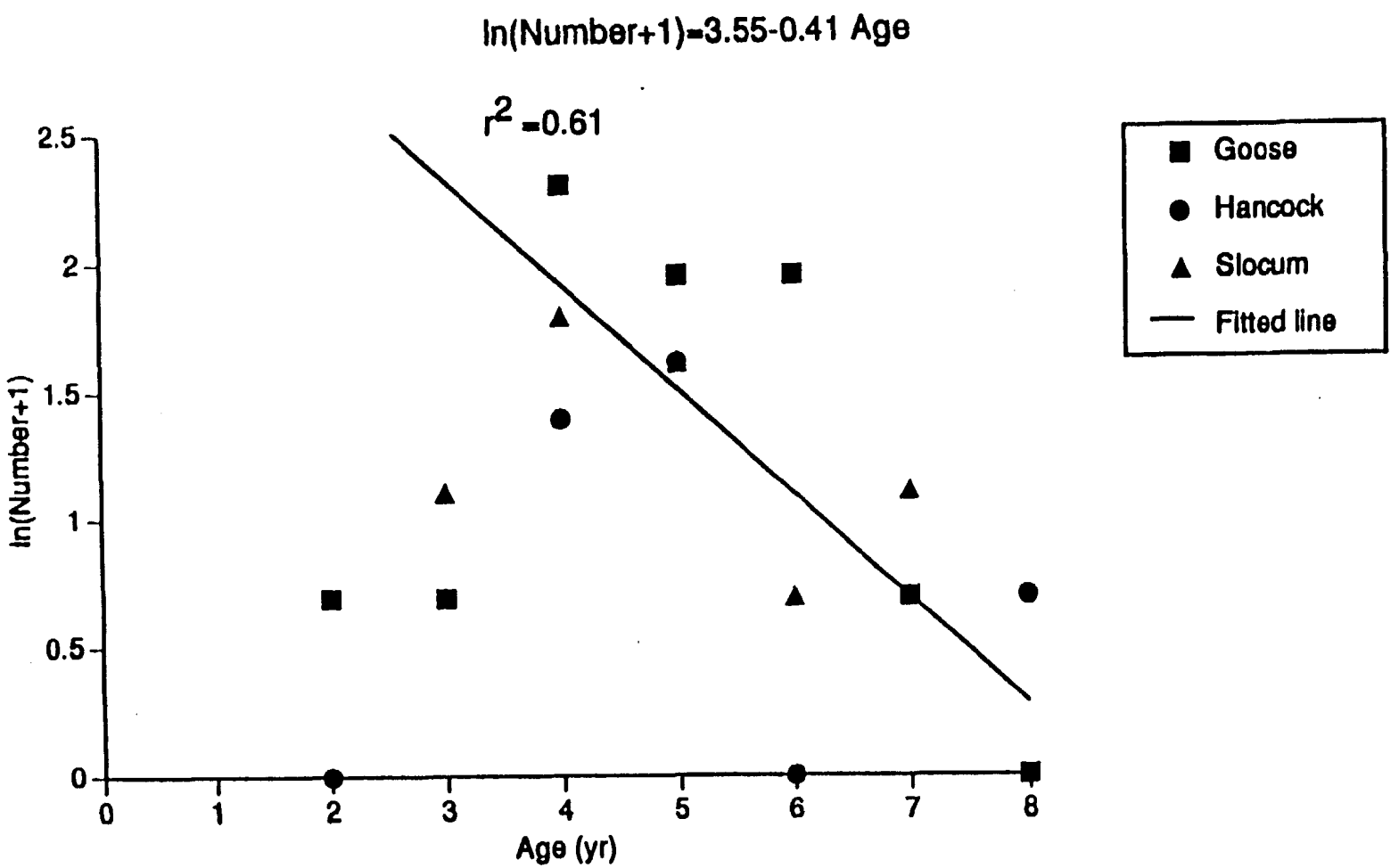
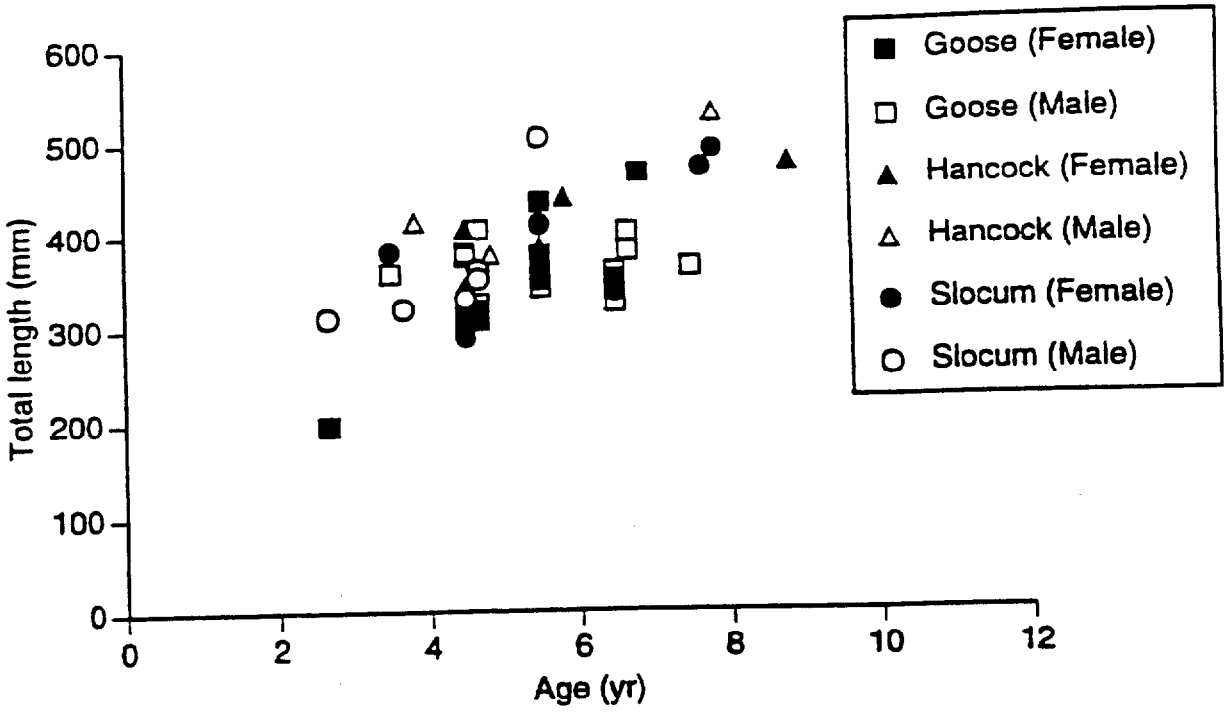

ln(Number+1)=3.55-0.41 Age
r2 =0.61
2.5
2
1.5
1
0.5
0
ln(Number+1)
0
1
2
3
4
5
6
7
8
Age (yr)
Goose
Hancock
Slocum
Fitted line

Figure 13. Upper panel: age-length data for white catfish from Goose, Hancock, and Slocum Creeks. Lower panel: mean length at age over creeks and sexes and fitted von Bertalanffy curve for Goose, Hancock, and Slocum Creeks; a von Bertalanffy curve for white catfish from Santee-Cooper Lake (Stevens 1959); and a linear regression relating length and age for Patuxent River fish (Schwartz and Jachowski 1965).


Goose (Female)
Goose (Male)
Hancock (Female)
Hancock (Male)
Slocum (Female)
Slocum (Male)
Total length (mm)
Age (yr)
0
100
200
300
400
500
600
0
2
4
6
8
10
12

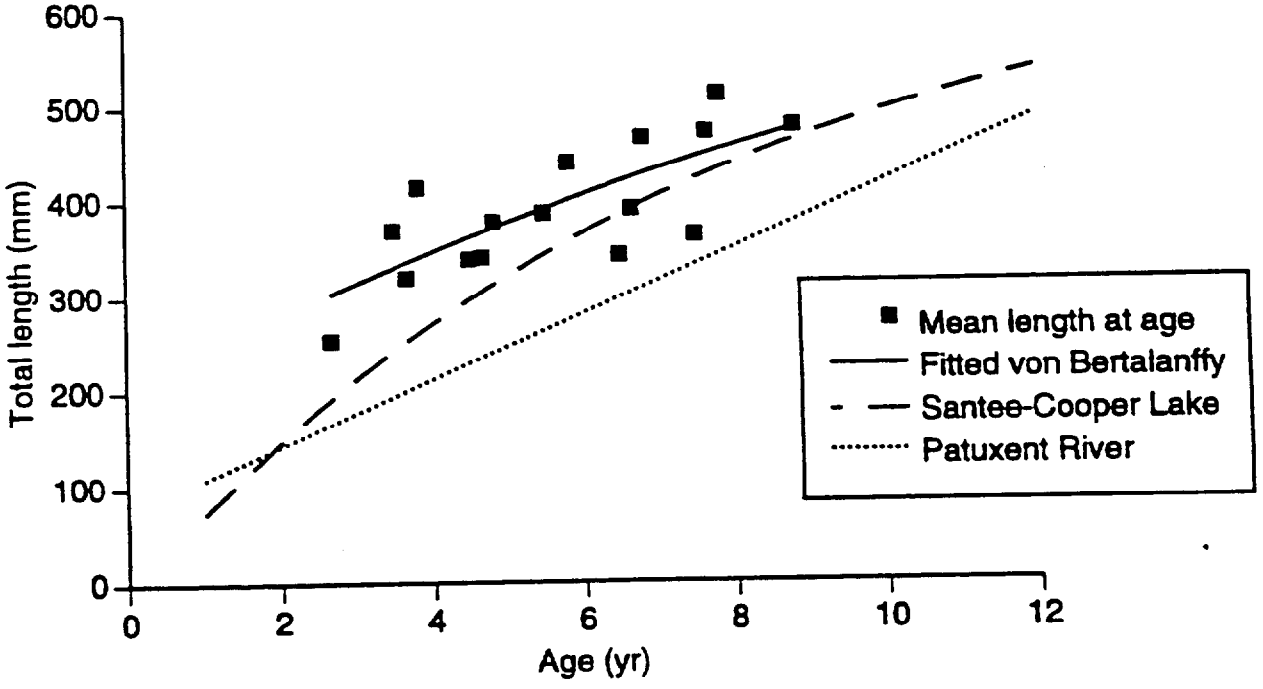

Mean length at age
Fitted von Bertalanffy
Santee-Cooper Lake
Patuxent River
Total length (mm)
Age (yr)
0
100
200
300
400
500
600
0
2
4
6
8
10
12

Figure 14. Length and weight data for white catfish from Goose, Hancock, and Slocum Creeks; a least-squares fit between ln(length) and ln(weight) using pooled data from all three creeks; and a published relationship for Alabama white catfish (Swingle 1965, cited in Carlander 1969).

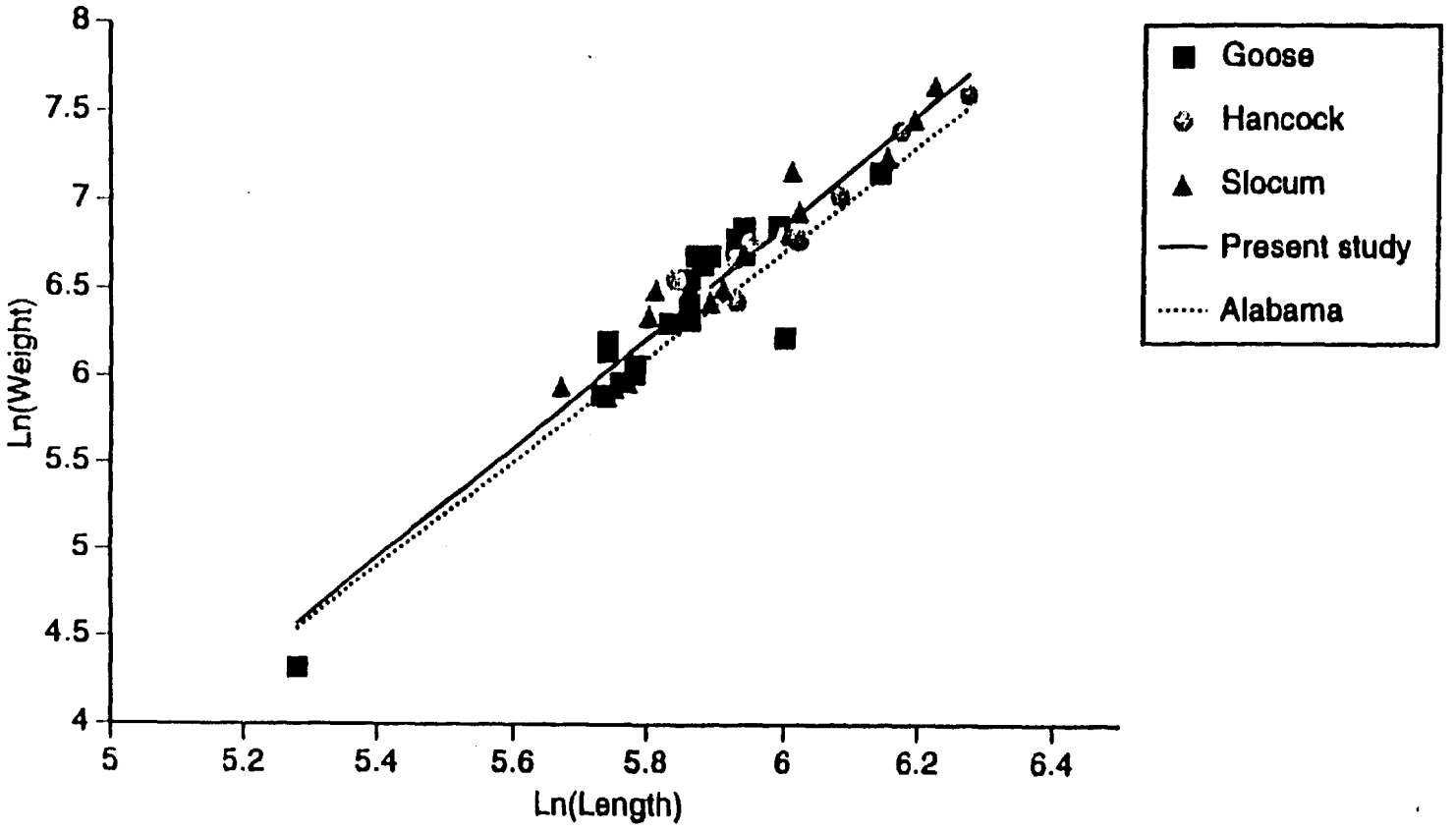
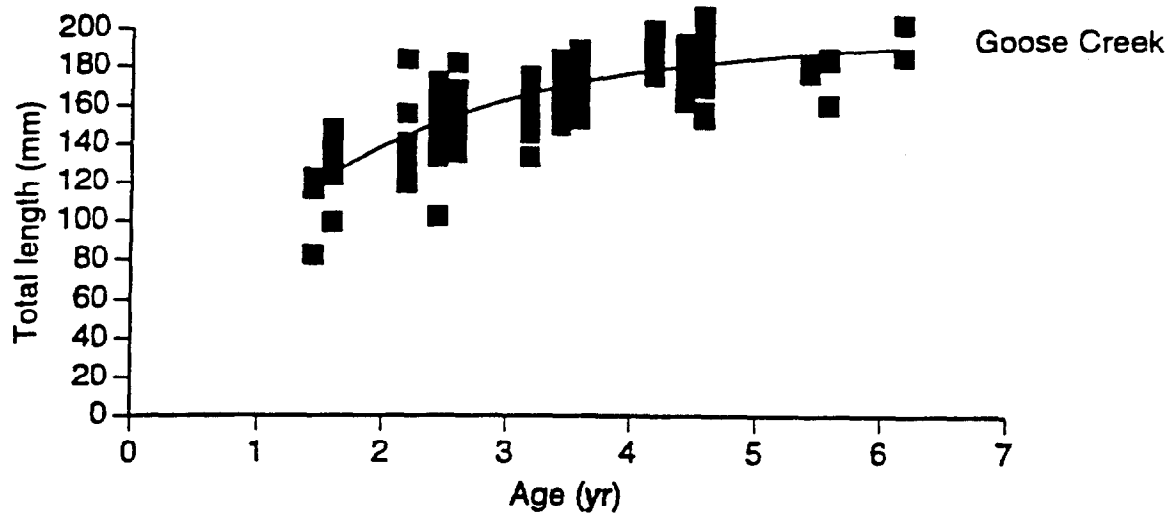
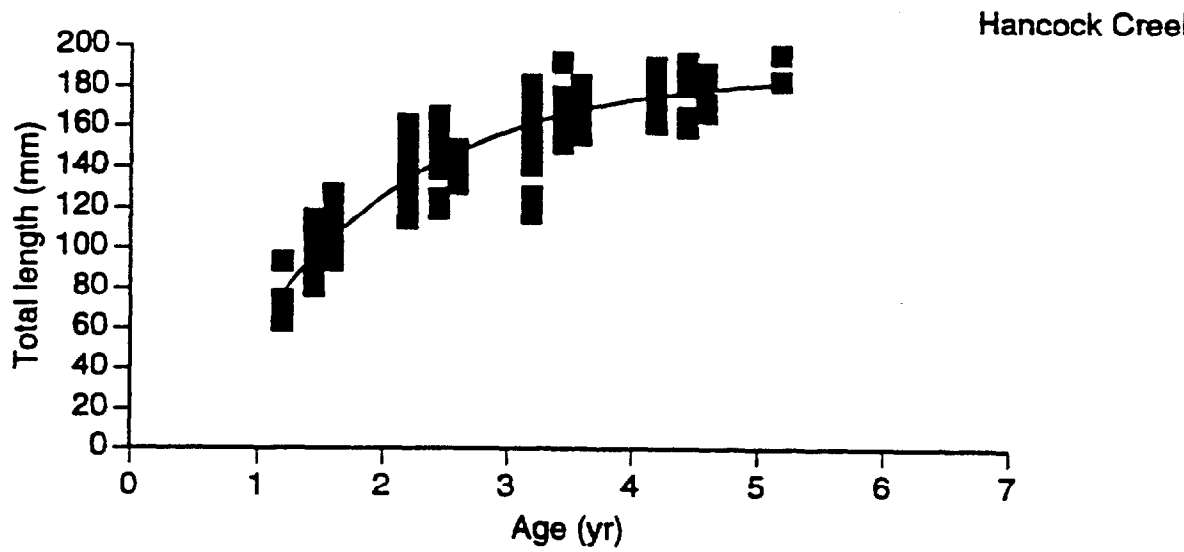

8
7.5
7
6.5
6
5.5
5
4.5
4
Ln(Weight)
5
5.2
5.4
5.6
5.8
6
6.2
6.4
Ln(Length)
Goose
Hancock
Slocum
Present study
Alabama

Figure 15. Age-length relationships for female pumpkinseed collected from Goose, Hancock, and Slocum Creeks. The fitted von Bertalanffy curves were significantly different among creeks and between sexes.


Goose Creek
Total length (mm)
200
180
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
Age (yr)


Hancock Creek
Total length (mm)
200
180
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
Age (yr)

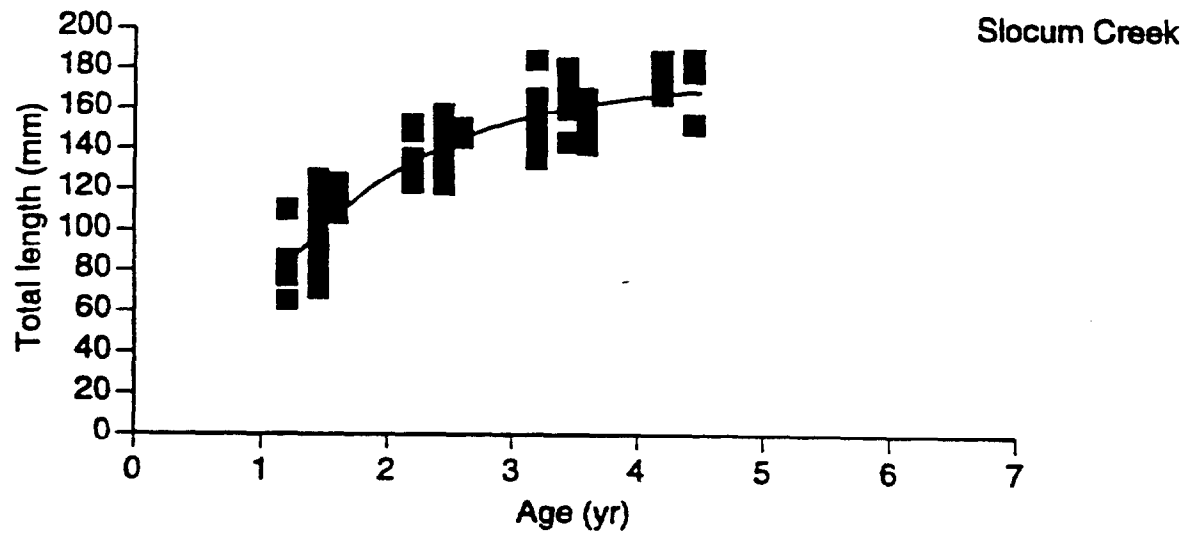
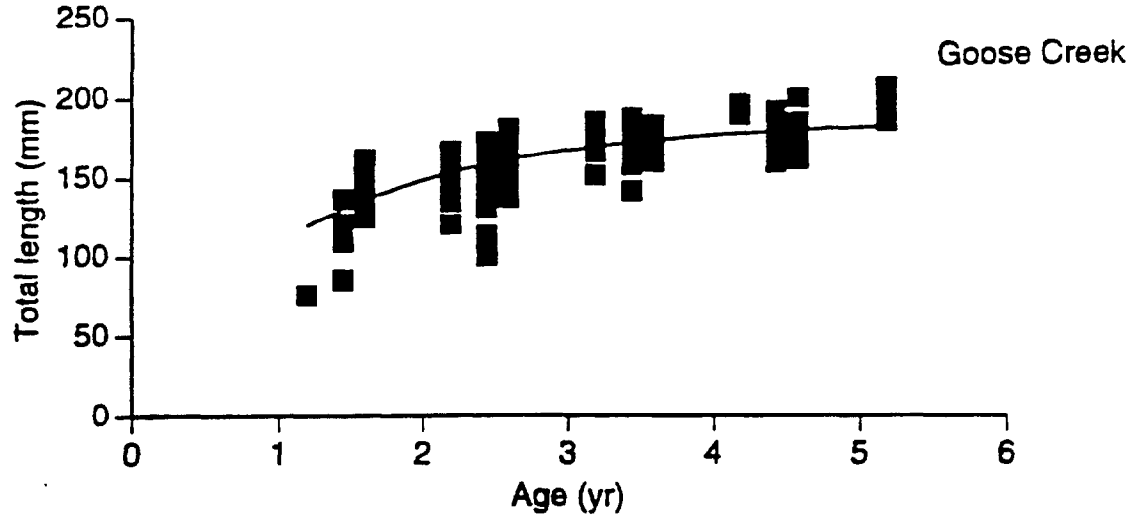
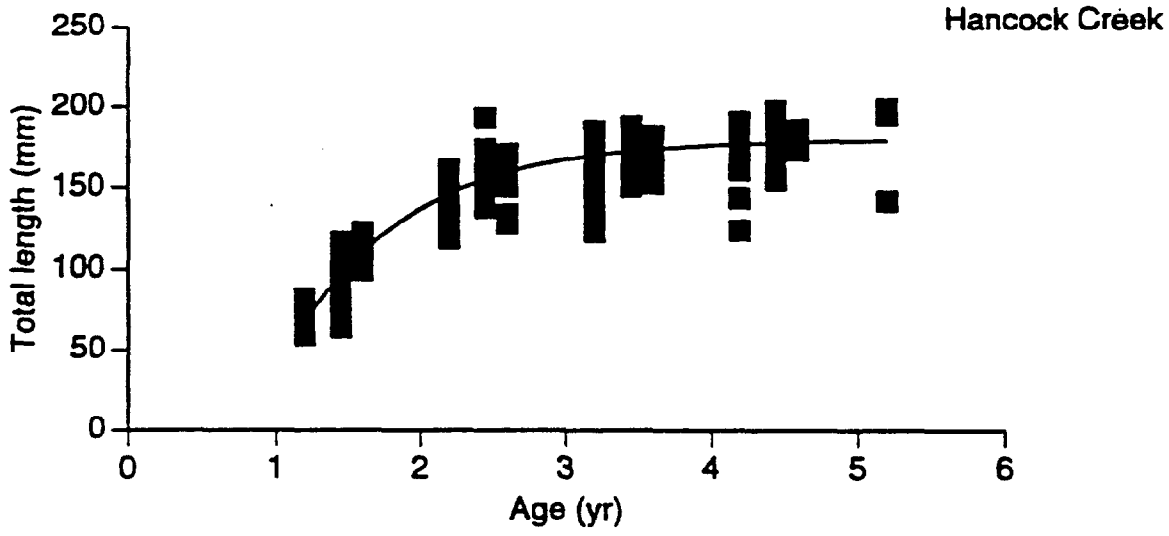

Slocum Creek
Total length (mm)
200
180
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
Age (yr)

Figure 16. Age-length relationships for male pumpkinseed collected from Goose, Hancock, and Slocum Creeks. The fitted von Bertalanffy curves were significantly different among creeks and between sexes.


Goose Creek
Total length (mm)
250
200
150
100
50
0
0
1
2
3
4
5
6
Age (yr)


Hancock Creek
Total length (mm)
250
200
150
100
50
0
0
1
2
3
4
5
6
Age (yr)

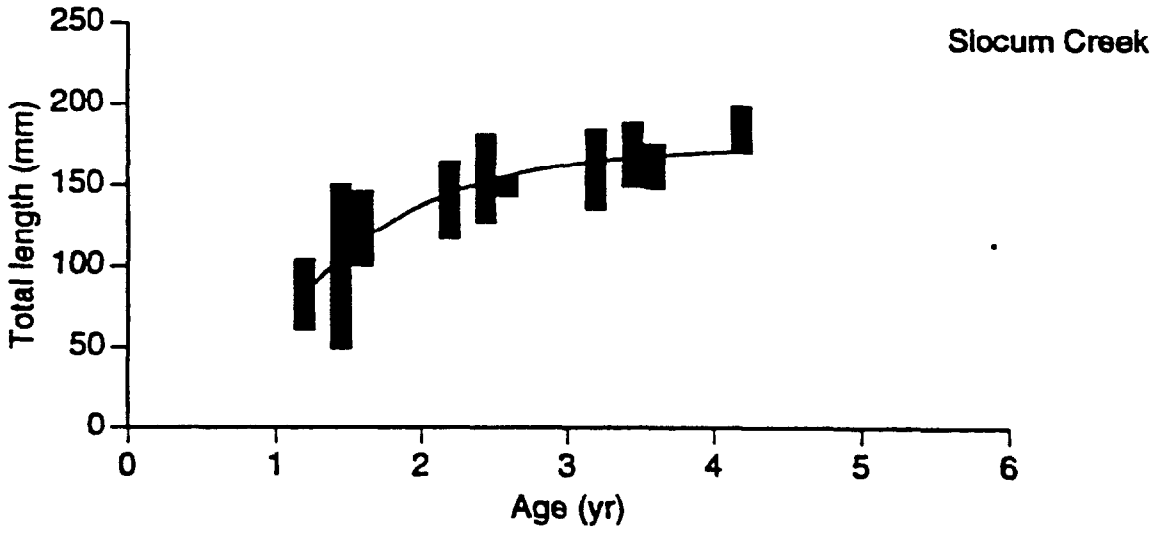

Slocum Creek
Total length (mm)
250
200
150
100
50
0
0
1
2
3
4
5
6
Age (yr)

Figure 17. Fitted von Bertalanffy curves for Goose, Hancock, and Slocum Creeks (pooled over creeks for female, creek-specific for males), compared to published curves (Ottawa River: Rubec and Qadri 1982) or curves fitted to published age-length data (Little River: Finnell et al. 1956; Muskellunge Lake: Sinnott and Ringler 1987).

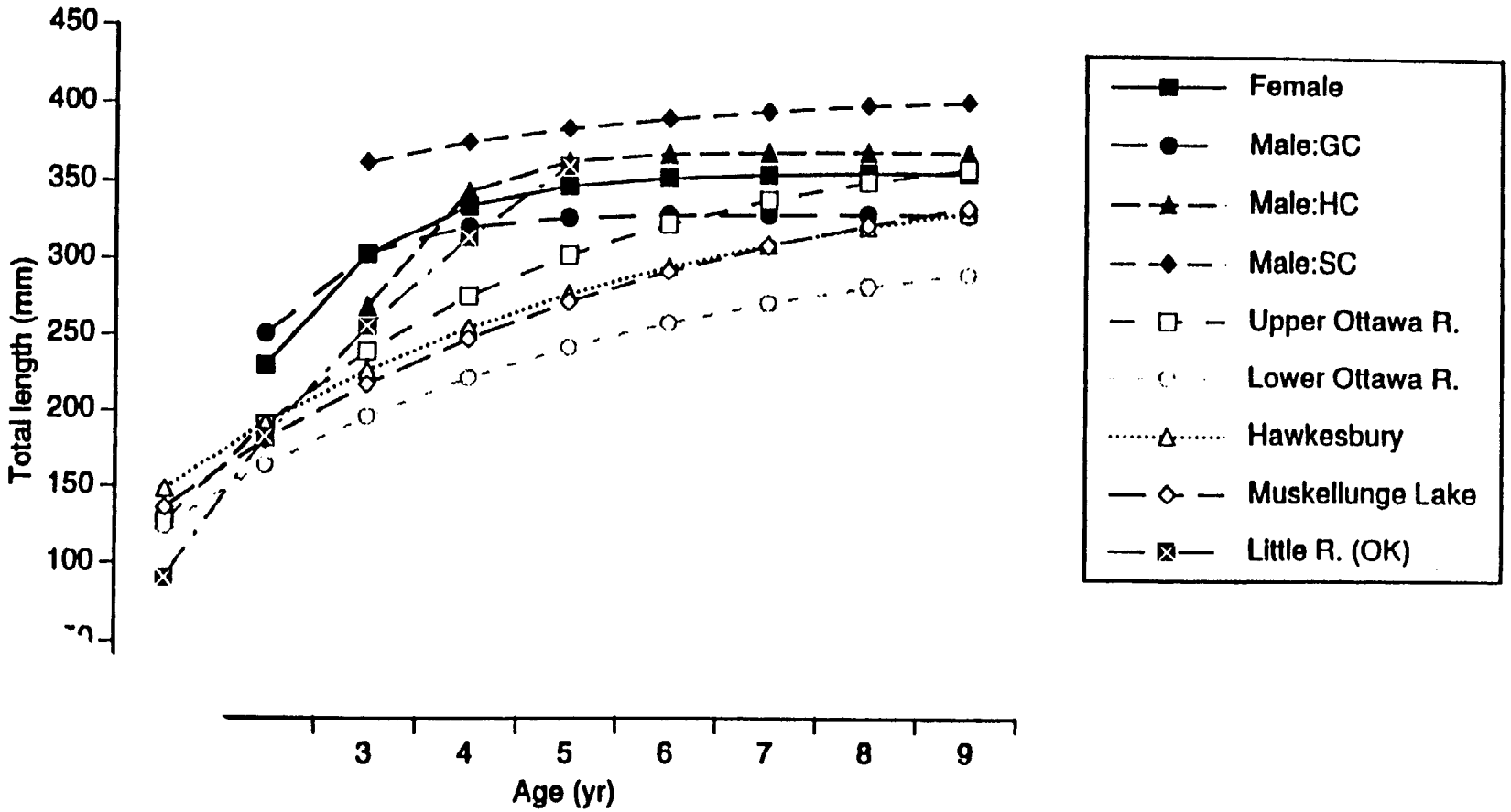

Total length (mm)
450
400
350
300
250
200
150
100
3
4
5
6
7
8
9
Age (yr)
Female
Male:GC
Male:HC
Male:SC
Upper Ottawa R.
Lower Ottawa R.
Hawkesbury
Muskellunge Lake
Little R. (OK)

Figure 18. Length-weight relationship for brown bullhead from Goose, Hancock, and Slocum Creeks, compared to published relationships from Wisconsin (Priegel 1966, cited in Carlander 1969), New York (Sinnott and Ringler 1987), and Ottowa (Rubec and Qadri 1982).

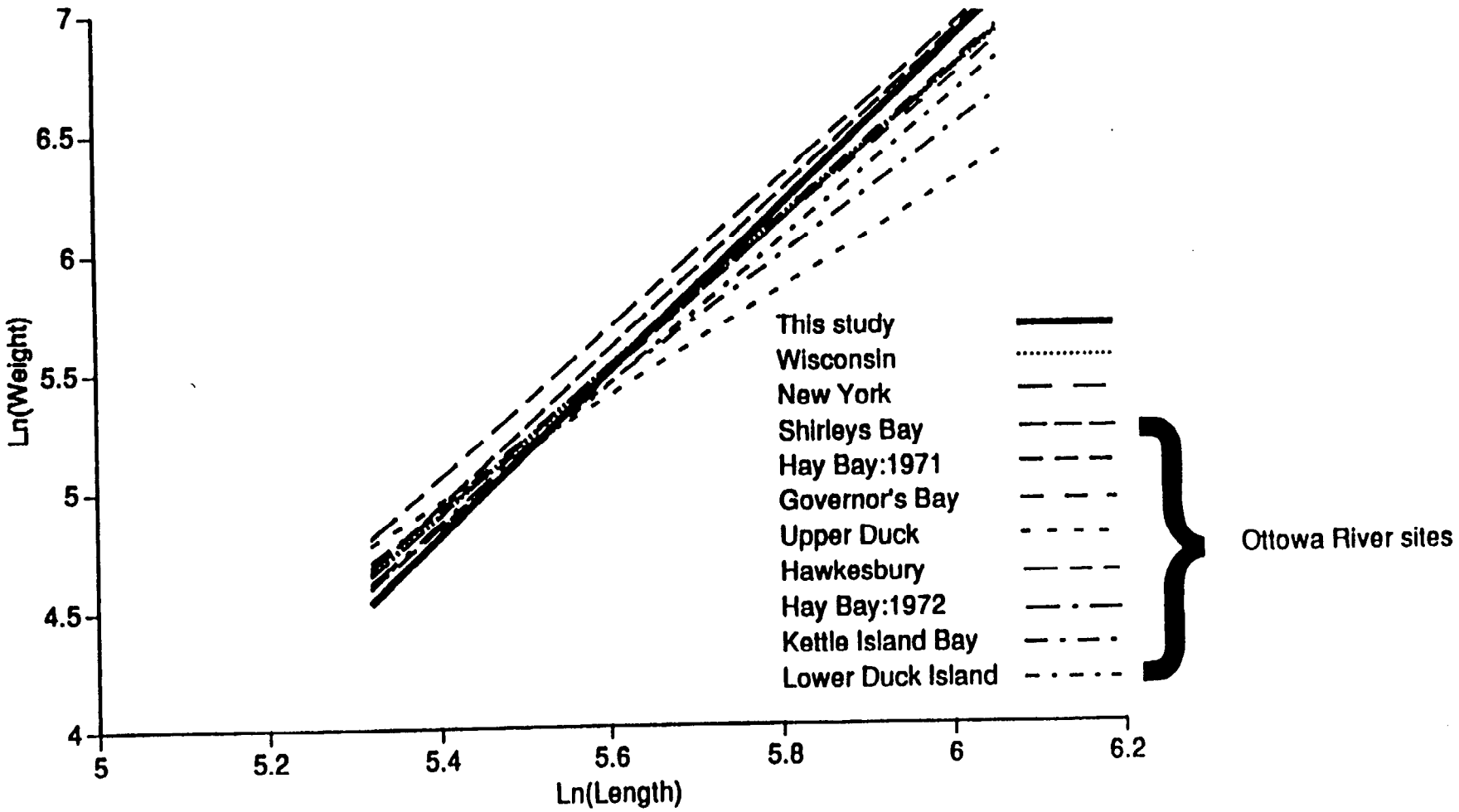
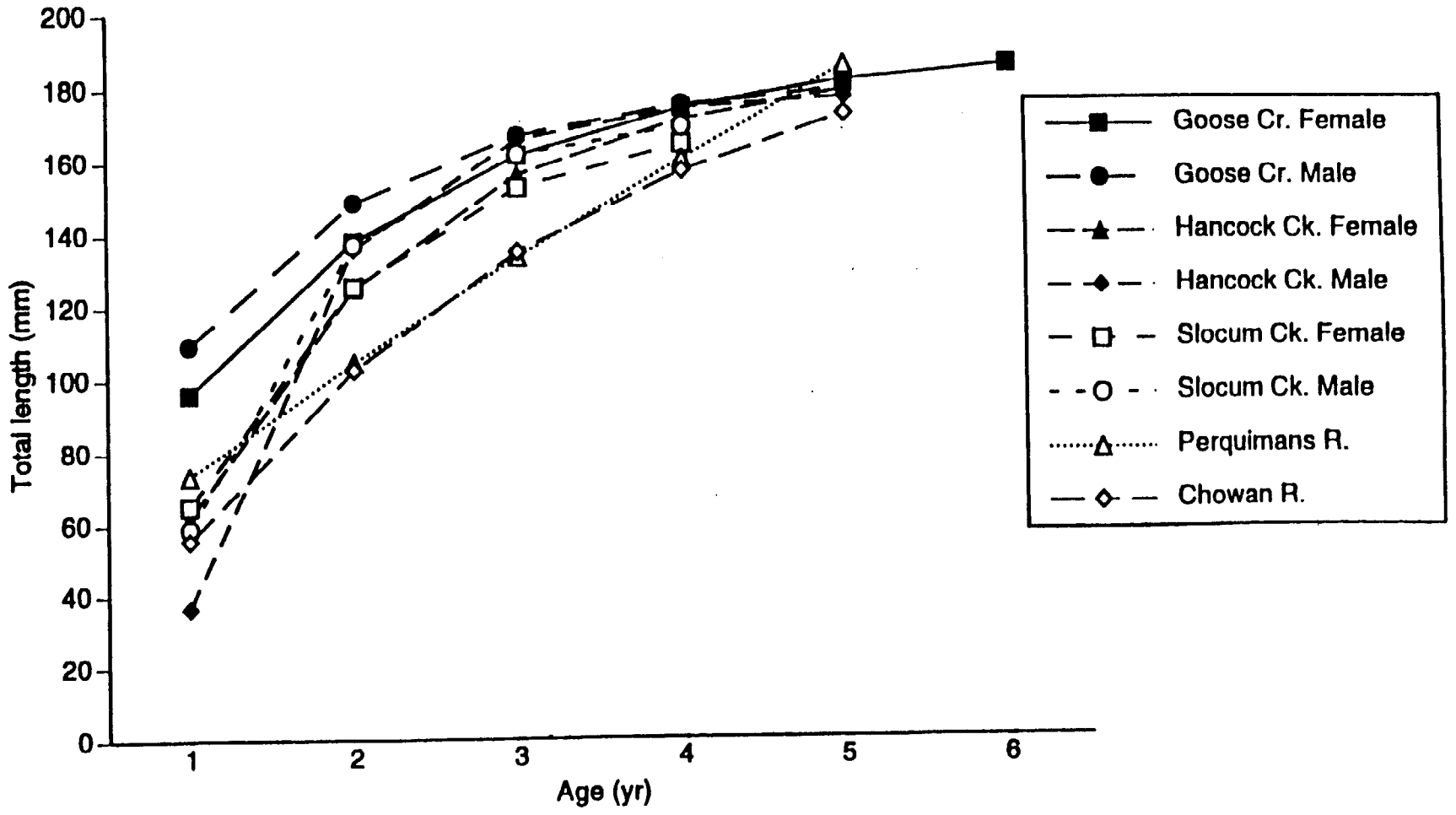

7
6.5
6
5.5
5
4.5
4
Ln(Weight)
5
5.2
5.4
5.6
5.8
6
6.2
Ln(Length)
This study
Wisconsin
New York
Shirleys Bay
Hay Bay:1971
Governor's Bay
Upper Duck
Hawkesbury
Hay Bay:1972
Kettle Island Bay
Lower Duck Island
Ottowa River sites

Figure 19. Age-length relationships for female and male pumpkinseed collected from Goose, Hancock, and Slocum Creeks, compared to curves fitted to age-length data for Perquimans River and Chowan River pumpkinseed (sexes combined; Kornegay et al. 1994).


Total length (mm)
200
180
160
140
120
100
80
60
40
20
0
1
2
3
4
5
6
Age (yr)
Goose Cr. Female
Goose Cr. Male
Hancock Ck. Female
Hancock Ck. Male
Slocum Ck. Female
Slocum Ck. Male
Perquimans R.
Chowan R.

# Assessment of Fish Health at Slocum Creek, NC

Assessments of the physiological and pathological status of fish are often the focus of ecological investigations of aquatic system health (Heath 1987). The advantage of this approach is that sublethal effects are more sensitive indicators of contaminant stress than is death which occurs at higher contaminant concentrations. Thus, physiological and pathological indicators of contaminant stress may be useful in identifying contaminant-stressed systems for which overt indicators of contaminant stress have not yet been discovered. If it has been previously discovered that contaminants are present in a habitat, system, etc., physiological and pathological indicators also may help to elucidate whether contaminants are available to the biota (ie. are biota being exposed to bioavailable sources of contaminants?).

Our objective was to discover whether physiological and pathological indicators of contaminant stress were present in fish from Slocum Creek. Baseline values for these indicators were established from collections and examinations of fish from two other sites in the Lower Neuse River, sites that were not identified with metal-enriched sediments. In addition, a site near a source of metal enrichment at New Bern was sampled for comparison with Slocum Creek.

## Methods

Fish were collected from four study sites in June, 1991 (Figure 1). Slocum Creek is enriched with metals (Riggs et al., 1991) and possibly other contaminants and was the main focus of the study. For the purposes of this study, Hancock Creek and the Hog Island sites are considered to be a reference areas. Hancock Creek has a similar fish composition to Slocum Creek and is the tributary of the lower Neuse River that is closest to Slocum Creek. Riggs et al. (1991) did not note any appreciable metal enrichment of the sediments of Hancock Creek. Hog Island is above New Bern and has not been previously associated with metal enrichment. We also collected fish from the Bridgeton area of the Neuse River at New Bern, an area identified with electroplating

waste and enhanced sediment metal concentrations (Riggs et al. 1991).

At each site we attempted to collect ten individuals of comparable size for each of three species. The species we selected for study were brown bullhead (*Amieurus nebulosus)*, pumpkinseed (*Lepomis gibossus*), and largemouth bass (*Micropterus salmoides*). Each of these species occupies distinctively different ecological niches and has distinctively different food habits. Fish were collected by electro-shocking.

Fish stunned by electroshocking were immediately dipped up and placed in a large container of water on the shocking boat. A courier boat transported fish from the shocking boat to the processing area approximately every 15 min in a manner that provided for fish being quickly processed when they arrived at the riverside processing center.

Immediately before processing, fish were anesthetized with MS222. A blood sample was collected from the caudal vein on the ventral side of the vertebral column. Fish were then killed by severing the spinal cord, weighed, and necropsied. During necropsy, any gross external and internal lesions were noted, the liver was weighed, and gill, liver, kidney, spleen and stomach tissue were preserved in buffered formalin for histological examination. The necropsy procedures followed the general procedures outlined by Goede and Barton (1990).

Hematological variables were quantified at the North Carolina College of Veterinary Medicine. Fish blood was analyzed for a standard suit of clinical variables including red blood cell number (RBC), plasma protein (pp), hemoglobin (Hgb), aspartate aminotransferase (AST), alanine aminotransferase ( ALT), alkaline phosphatase (ALP), ion content (Na, K, and Cl), total $CO_2$ ($TCO_2$). glucose (glu), osmolality (osmolal), and packed cell volume (PVC).

Tissues for histological examination were prepared following routine procedures and stained with hematoxylin and eosin. Slides were examined by light microscopy. Tissue pathology was categorized into the most frequently observed lesion types. Lesions were scored on a relative, but subjective basis. All slides of the same tissue were read by one pathologist to avoid reader basis. Scoring criteria are

presented in tables in which results are presented.

Categorical data were examined by Chi square analysis. Parametric data were analyzed by analysis of variance using Tukey's test to separate means. All tests were conducted at $\alpha = 0.05$.

## Results

Collection histories and fish sizes are presented in Tables 1-3. Approximately 10 fish of each species were collected at each site except at New Bern where only two brown bullheads were captured. External lesions were not generally remarkable, except for cutaneous ulcerations that occurred in all species, but especially brown bullheads. There were no detectable patterns with regard to the geographic occurrence of the ulcerations. Many of the fish presented small white foci in the liver and spleen, but also in the kidney and heart (especially for pumpkinseeds). These foci were assumed to be protozoan parasites or intermediate life stages of helminth parasites. This speculation was confirmed upon histopathological examination.

One of the most remarkable observations in all species and across all sites was the frequent finding of yellow livers during the gross necropsy. Such coloration is typical of livers that are storing excessive amounts of lipids, and thus are termed "fatty livers". Histopathological examination confirmed the widespread occurrence of lipid vacuoles in hepatocytes.

Quantification and analyses of parasite burdens and fatty livers was attempted on histopathological examination and analyses of the gross necropsy data were not pursued.

Hepatosomatic indices were examined by two-way analysis of variance using location and sex as main effect variables (Table 4). Sex was not significant in these analyses, therefore we tested each species for location effects disregarding sex. When we disregarded sex, we also were able to include individuals for which sex was not determined. There were location differences in the hepatosomatic index for brown bullheads, but not for largemouth bass or pumpkinseeds. Brown bullheads from Hog Island tended to have higher liver to body weight ratios than for other sites.

**Histopathology**

The number of data points for each tissue, location, and species varied, even though the number of fish samples collected were relatively similar. Some tissues were subdivided for other analyses and insufficient tissue remained for histology. Some slides did not present well for reading. Histological findings and scoring categories and criteria are presented in Tables 5 through 19.

Contingency table analyses of liver response variables are presented in Table 20. The extent of parasite pathology differed significantly among creeks for pumpkinseeds. Examination of the response counts used in the contingency table analysis indicates that parasite scores for pumpkinseed livers from Hog Island were higher than for all other sites (Table 21). Response counts also differed among creeks for livers scored relative to the amount of vacuolization with lipids (fatty livers) for brown bullheads. However, the analysis includes only two samples from Hancock Creek (Table 22). We feel that this is insufficient information to confirm among-location differences in this case. Melanomacrophage counts did not differ among locations for pumpkinseeds or largemouth bass, but was significantly less in brown bullheads from Slocum Creek compared to Hog Island and Hancock Creek (Table 23).

Contingency table analyses of spleen response variables are presented in Table 24. Parasites scores for largemouth bass appeared to be higher at Hog Island (Table 25). Ellipsoidal and melanomacrophage aggregates in brown bullheads were significantly different among creeks with the counts from Slocum Creek being the highest (Table 26).

Contingency table analyses of kidney response variables are presented in Table 27. Parasite pathology tended to score higher at Hog Island for pumpkinseeds (Table 28). Parasite scores were also significantly different for largemouth bass, but there was not an apparent site trend (Table 29). Eosinophillic infiltration was significantly different among creeks for brown bullheads (with Hancock Creek and New Bern tending to have higher scores), but not for other species (Table 30).

Renal melanomacrophage counts were significantly different among creeks for pumpkinseeds and brown bullheads but not for largemouth bass. Slocum Creek pumpkinseeds had significantly higher counts than for other collection locations (Table 31). Hancock Creek brown bullheads had significantly lower counts than for other collection locations.

We noted no significant differences among collection locations in stomach histopathology (Table 17-19).

Contingency table analyses of gill histopathological response variables are presented in Table 32. Telangiectasis response counts tended to show lower scores for Hog Island pumpkinseeds than for other sites (Table 33). Parasite scoring was significant for both largemouth bass and brown bullheads, although site specific trends were not consistent between species (Tables 34-35)

**Hematological Findings**

We quantified 13 hematological variables for each of the three species (Tables 36-38). Among location differences were detected for five, four, and three variables in pumpkinseeds, largemouth bass, and brown bullheads, respectively (Table 39). There were no distinctive patterns relating these differences across species with regard to potential location effects. In no case was the same variable significantly different among locations for all three species. When two species exhibited location differences for a variable (5 cases), separation of means by location were not completely consistent between species.

There were 12 species X variable combinations that exhibited differences among locations. Of these 12, fish from Slocum Creek differed on one, four, and six occasions from those collected at New Bern, Hog Island, and Hancock Creek, respectively. Thus there were fewer differences between the two metal enriched sampling areas than between Slocum and the two non-enriched sampling locations. However, the two non-enriched sampling areas differed from each other with the exact same frequency as did Slocum and Hancock Creeks.

**Discussion**

Histopathological and hematological investigations have been frequently used in evaluations of ecosystem health. Metals and other environmental contaminants are known to cause a variety of physiological and histological responses as demonstrated both in field and laboratory studies. Baseline values for most of these variables are not available or are influenced by factors that may not be standardized during sample collections (water temperature, time of year, etc.; see Hinton et al. 1992). Therefore interpretation of these biomarkers in field situations is dependent on comparisons with samples collected concurrently at control or reference locations (examples: Bowser et al. 1990, Blazer et al. 1994, Gallagher and Di Giulio 1989, Kim et al. 1989, Baumann et al. 1990) or along gradients of contamination (Adams et al. 1992).

We selected Hancock Creek and the Hog Island area of the Neuse River as our reference sites. Sediment surveys for metal concentrations indicate minimal metal enrichment of Hancock Creek. Distributional patterns of metal concentrations in sediments at New Bern indicate that our Hog Island study site was not within areas characterized as metal enriched (Riggs et al. 1991). However, no analytical data exists that specifically documents the absence of metal enrichment at Hog Island.

An increase in liver weight in relation to body weight has been reported for brown bullheads (Baumann et al. 1991, Gallagher and Di Giulio 1989), sunfish (Adams et al. 1992) and other species (Fletcher et al. 1982) from contaminated areas compared to those from uncontaminated sites. We found liver:body weight ratios were not elevated in Slocum Creek for any of the three species that we sampled. This is in contrast to work reported by Gallagher and Di Giulio (1989) who reported higher liver:body weight ratios in brown bullheads from Slocum Creek compared to Hancock Creek. However, Gallagher and Di Giulio's report was based on a small number of fish.

Histopathological investigations with light microscopy led to no conclusive evidence that fish from Slocum were suffering from contaminant stress. The most commonly occurring types of lesions in

fish from Slocum Creek (parasitic infections, fatty livers, etc.) were the same as in fish from the other locations. The prevalence of these findings and our histological scoring of lesions did produce differences among locations, but these differences were not generally consistent among species nor were they strongly indicative of poor health.

Our pathological investigation was conducted as a relatively quick screening procedure that should have been able to detect overt indicators of differences in fish health. This level of resolution is appropriate for field investigations of the type we conducted although more specialized techniques are available that potentially target lesions specific to particular classes of contaminants, often at the ultracellular level. We feel that major differences among populations, signifying significant contaminant-based problems, would have surfaced even with the relatively small sample size in our study. However, small shifts in physiological and pathological responses would probably have gone undetected with our sample sizes as the ability to discriminate the prevalence of lesions among populations is partially a function of the number of animals examined and the severity of the lesion.

Although not considered conclusive evidence of contaminant exposure, we found melanomacrophage numbers in kidney and spleen of brown bullheads to be higher in Slocum Creek than for other sites. Melanomacrophage aggregates are focal accumulations of pigmented macrophages found in the liver, spleen, and head kidney of fish . They function to sequester foreign material and cellular debris (Blazer et al. 1994) and are involved in immune responses (Ellis et al. 1976, Ferguson 1976). Although the number and size of melanomacrophages may be affected by fish age, nutrition, disease, and state of health, responses have also been related to contaminant exposure. Melanomacrophages in brown bullheads appear to be more responsive to contaminants than are phage cells in several other species (Blazer et al. 1994). An increase in brown bullhead splenic melanomacrophage aggregate numbers and size correlated well with higher sediment organic contaminant levels and higher tissue PCB levels (Blazer et al. 1994). Bowser et al. (1990) reported an increase in hepatic melanomacrophages in brown bullheads at a site known to have high concentrations of PCBs and heavy metals compared to a

reference site.

Although splenic and renal melanomacrophage numbers were higher in Slocum Creek than for other sites, hepatic melaomacrophage numbers were lower. We had expected that hepatic melanomacrophage numbers would have mirrored the differences seen between Slocum Creek and the other study sites.

Our data demonstrate melanomacrophage responses in brown bullheads from Slocum Creek that are consistent with findings reported for brown bullheads from other contaminated environments. However, factors other than contaminants may also cause melanomacrophage responses so we cannot be sure whether the responses were contaminant related or not. More detailed investigations would be required to confirm the melanomacrophage differences among sites and to examine the relationship of the counts to contaminants present. The pathological consequences of elevated melanomacrophage numbers are not fully understood.

Gallagher and Di Giulio (1989) reported that 3/10 (year = 1985) and 1/4 (year = 1986) brown bullheads from Slocum Creek had fatty livers versus 0/4 bullheads from Hancock Creek. They suggested a potential link between the contamination of Slocum Creek and the prevalence of fatty livers. A variety of organic solvents, and potentially other contaminants, may induce alterations in lipid metabolism and potentially result in fatty livers. Our data do not support the finding of Gallagher and Di Giulio (1989) that fatty livers were more common in brown bullheads from Slocum Creek than in Hancock Creek. We found that 8/10 livers from Hancock Creek were fatty versus 8/8 for Slocum Creek. Fatty livers were also observed in largemouth bass and pumpkinseeds outside of Slocum Creek. The widespread occurrence of fatty livers from Hog Island to Hancock Creek suggests that contaminants present Slocum Creek may not be the sole potential cause for the fatty livers observed in Slocum Creek.

Hematocrits, red blood cell counts, and hemoglobin have been demonstrated to differ in fish undergoing thermal stress (Houston et al. 1976) and as a function of body condition (Esch and Hazen 1980). Hematological data demonstrated no conclusive evidence that fish from Slocum Creek were physiologically stressed or unhealthy.

Differences were observed among collection locations, but Slocum was no more likely to be different from Hancock Creek than the two reference areas were to be different from each other. Overall, the magnitude of the differences seemed small.

Comparable hematological data for these species in other locations is scarce. For largemouth bass, packed cell volume and hemoglobin values across all sites averaged slightly less than those presented by Esch and Hazen (1980). Plasma glucose in fish from the lower Neuse River basin had glucose levels that exceeded the maximum level of 95 mg/dL reported by Dean and Goodnight (1964). Sodium values were similar to those reported for largemouth bass by Hazen et al. (1978), but potassium values were only one third of those that they reported. Ion concentrations in pumpkinseeds were similar to those reported by Grant et al. (1970).

**Conclusions**

Hematological and pathological evidence suggests that there are differences among Slocum Creek, Hancock Creek, the Neuse River at New Bern, and the Neuse River at Hog Island. The magnitude and pattern of these differences among creeks and among species do not indicate that fish from Slocum Creek are unhealthy relative to fish from the other study sites. Melanomacrophage numbers, one of the histopathological variables with a relatively good link to contaminant stress, were elevated in kidney and spleen, but not liver tissue from brown bullheads in Slocum Creek. The elevated number in kidney and spleen may indicate exposure to contaminants (type unidentified) at a sufficient level to elicit a physiological response. However, a cause and effect link was not established between contaminant exposure and melanomacrophage numbers in this study. Fatty livers, a pathological condition which has been associated with contaminant exposure and has been previously reported for bullheads from Slocum Creek, were found in all study areas, not just Slocum Creek. Liver:body weight ratios, which are also reported to become elevated in response to contaminants, were not higher in fish from Slocum Creek than for other sites.

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Table 1. Collection and gross necropsy data for pumpkinseeds collected in the lower Neuse River, 1991.

| Date Collected | Sample No. | Site | Sex | Total Length (mm) | Fresh Weight (g) | Liver Weight (g) | External Lesions |
|---|---|---|---|---|---|---|---|
| 6/27/91 | HC-32 | Hancock Ck. | Male | 185 | 130 | 0.84 | N |
| 6/27/91 | HC-33 | Hancock Ck. | Female | 163 | 89 | 0.54 | N |
| 6/27/91 | HC-34 | Hancock Ck. | Female | 155 | 82 | 0.48 | N |
| 6/27/91 | HC-36 | Hancock Ck. | Female | 157 | 84 | 0.58 | N |
| 6/27/91 | HC-37 | Hancock Ck. | Female | 177 | 125 | 0.96 | N |
| 6/27/91 | HC-38 | Hancock Ck. | Male | 174 | 110 | 0.96 | N |
| 6/27/91 | HC-39 | Hancock Ck. | Male | 156 | 85 | 0.67 | N |
| 6/27/91 | HC-40 | Hancock Ck. | Female | 175 | 118 | 0.90 | N |
| 6/27/91 | HC-41 | Hancock Ck. | Female | 164 | 101 | 0.85 | N |
| 6/27/91 | HC-59 | Hancock Ck. | Female | 182 | 114 | 1.01 | N |
| 7/13/91 | NB-101 | Hog Island | Male | 177 | 114 | 1.10 | Y |
| 7/13/91 | NB-102 | Hog Island | Unknown | 160 | 82 | 0.70 | N |
| 7/13/91 | NB-103 | Hog Island | Male | 175 | 108 | | N |
| 7/13/91 | NB-104 | Hog Island | Female | 155 | 83 | | Y |
| 7/13/91 | NB-105 | Hog Island | Male | 160 | 87 | 0.50 | Y |
| 7/13/91 | NB-106 | Hog Island | Female | 150 | 68 | 0.56 | Y |
| 7/13/91 | NB-107 | Hog Island | Male | 176 | 119 | 1.16 | Y |
| 7/13/91 | NB-109 | Hog Island | Female | 160 | 88 | 0.56 | Y |
| 7/13/91 | NB-110 | Hog Island | Female | 175 | 109 | 0.67 | Y |
| 7/13/91 | NB-114 | Hog Island | Male | 173 | 111 | | N |
| 7/12/91 | NB-61 | New Bern | Female | 158 | 76 | 0.62 | N |
| 7/12/91 | NB-62 | New Bern | Male | 200 | 148 | 1.21 | Y |
| 7/12/91 | NB-63 | New Bern | Female | 169 | 96 | 0.68 | Y |
| 7/12/91 | NB-64 | New Bern | Female | 177 | 115 | 1.15 | N |
| 7/12/91 | NB-65 | New Bern | Female | 166 | 97 | 0.87 | N |
| 7/12/91 | NB-68 | New Bern | Male | 160 | 82 | | N |
| 7/12/91 | NB-69 | New Bern | Female | 166 | 97 | 1.39 | N |
| 7/12/91 | NB-70 | New Bern | Female | 176 | 116 | 1.00 | N |
| 7/12/91 | NB-73 | New Bern | Male | 150 | 75 | 0.47 | N |
| 7/12/91 | NB-76 | New Bern | Male | 165 | 92 | 0.52 | N |

Table (cont.)

| Date Collected | Sample No. | Site | Sex | Total Length (mm) | Fresh Weight (g) | Liver Weight (g) | External Lesions |
|---|---|---|---|---|---|---|---|
| 6/26/91 | SC-4 | Slocum Ck. | Male | 174 | 107 | 0.71 | N |
| 6/26/91 | SC-5 | Slocum Ck. | Male | 161 | 89 | 0.65 | N |
| 6/26/91 | SC-6 | Slocum Ck. | Male | 172 | 107 | 0.53 | N |
| 6/26/91 | SC-11 | Slocum Ck. | Male | 161 | 100 | 0.80 | N |
| 6/26/91 | SC-12 | Slocum Ck. | Male | 163 | 89 | 0.53 | N |
| 6/26/91 | SC-14 | Slocum Ck. | Male | 164 | 91 | 0.73 | N |
| 6/26/91 | SC-15 | Slocum Ck. | Male | 183 | 132 | 0.88 | N |
| 6/26/91 | SC-16 | Slocum Ck. | Male | 180 | 107 | 0.75 | N |
| 6/26/91 | SC-23 | Slocum Ck. | Male | 157 | 85 | 0.81 | N |
| 6/26/91 | SC-29 | Slocum Ck. | Female | 171 | 105 | 1.41 | N |
| 6/26/91 | SC-30 | Slocum Ck. | Male | 163 | 83 | 0.56 | N |
| 6/26/91 | SC-13 | Slocum Ck. | Male | 480 | 1468 | 13.08 | N |

Table 2. Collection and gross necropsy records for largemouth bass collected from the lower Neuse River, 1991.

| Date Collected | Sample No. | Site | Total Sex | Fresh Length (mm) | Liver Weight (g) | External Weight (g) | External Lesions |
|---|---|---|---|---|---|---|---|
| 6/27/91 | HC-31 | Hancock Ck. | Female | 244 | 201 | 1.50 | N |
| 6/27/91 | HC-35 | Hancock Ck. | Female | 285 | 343 | 3.10 | N |
| 6/27/91 | HC-42 | Hancock Ck. | Male | 313 | 418 | 4.20 | N |
| 6/27/91 | HC-45 | Hancock Ck. | Female | 279 | 254 | 2.20 | N |
| 6/27/91 | HC-50 | Hancock Ck. | Unknown | 212 | 123 | 1.13 | N |
| 6/27/91 | HC-55 | Hancock Ck. | Unknown | 239 | 174 | 1.61 | N |
| 6/27/91 | HC-56 | Hancock Ck. | Male | 283 | 305 | 3.77 | N |
| 6/27/91 | HC-57 | Hancock Ck. | Female | 287 | 343 | 2.95 | N |
| 6/27/91 | HC-58 | Hancock Ck. | Female | 277 | 264 | 2.51 | N |
| 6/27/91 | HC-60 | Hancock Ck. | Female | 350 | 599 | 9.03 | N |
| 7/12/91 | NB-91 | Hog Island | Female | 320 | 419 | 2.52 | Y |
| 7/12/91 | NB-92 | Hog Island | Female | 332 | 515 | 3.93 | N |
| 7/12/91 | NB-94 | Hog Island | Female | 325 | 447 | 4.48 | N |
| 7/12/91 | NB-95 | Hog Island | Female | 321 | 438 | 5.66 | Y |
| 7/12/91 | NB-97 | Hog Island | Female | 293 | 293 | 2.22 | Y |
| 7/12/91 | NB-98 | Hog Island | Female | 364 | 608 | 3.73 | Y |
| 7/12/91 | NB-99 | Hog Island | Female | 380 | 633 | 4.82 | Y |
| 7/13/91 | NB-100 | Hog Island | Unknown | 365 | 622 | 4.25 | Y |
| 7/13/91 | NB-108 | Hog Island | Female | 355 | 556 | 3.34 | Y |
| 7/13/91 | NB-111 | Hog Island | Female | 395 | 829 | 9.07 | N |
| 7/13/91 | NB-116 | Hog Island | Male | 402 | 823 | 11.72 | N |
| 7/12/91 | NB-66 | New Bern | Unknown | 287 | 281 | 0.12 | N |
| 7/12/91 | NB-67 | New Bern | Female | 296 | 308 | 2.44 | N |
| 7/12/91 | NB-72 | New Bern | Unknown | 190 | 90 | 0.68 | N |
| 7/12/91 | NB-74 | New Bern | Female | 382 | 712 | 3.98 | N |
| 7/12/91 | NB-77 | New Bern | Female | 221 | 121 | 1.10 | N |
| 7/12/91 | NB-78 | New Bern | Female | 373 | 744 | 6.53 | N |
| 7/12/91 | NB-79 | New Bern | Unknown | 312 | 384 | 4.29 | N |
| 7/12/91 | NB-80 | New Bern | Male | 335 | 531 | 3.21 | Y |
| 7/12/91 | NB-81 | New Bern | Female | 360 | 683 | 11.43 | N |
| 7/12/91 | NB-82 | New Bern | Female | 403 | 924 | 6.00 | Y |
| 6/26/91 | SC-1 | Slocum Ck. | Female | 340 | 507 | 5.30 | N |

Table (cont.)

| Date Collected | Sample No. | Site | Total Sex | Fresh Length (mm) | Liver Weight (g) | External Weight (g) | External Lesions |
|---|---|---|---|---|---|---|---|
| 6/26/91 | SC-2 | Slocum Ck. | Female | 321 | 412 | 2.18 | N |
| 6/26/91 | SC-3 | Slocum Ck. | Female | 357 | 779 | 12.93 | N |
| 6/26/91 | SC-10 | Slocum Ck. | Female | 385 | 805 | none | Y |
| 6/26/91 | SC-17 | Slocum Ck. | Male | 235 | 190 | 2.14 | N |
| 6/26/91 | SC-18 | Slocum Ck. | Female | 289 | 304 | 2.33 | N |
| 6/26/91 | SC-24 | Slocum Ck. | Female | 243 | 200 | 1.61 | N |
| 6/26/91 | SC-26 | Slocum Ck. | Male | 312 | 383 | 2.20 | Y |
| 6/26/91 | SC-27 | Slocum Ck. | Male | 292 | 258 | 1.15 | N |
| 6/26/91 | SC-28 | Slocum Ck. | Female | 302 | 412 | 3.82 | N |

Table 3. Collection and gross necropsy data on brown bullheads collected in the lower Neuse River, 1991.

| Date Collected | Sample No. | Site | Sex | Total Length (mm) | Fresh Weight (g) | Liver Weight (g) | External Lesions |
|---|---|---|---|---|---|---|---|
| 6/27/91 | HC-43 | Hancock Ck. | Unknown | 316 | 461 | 5.05 | N |
| 6/27/91 | HC-44 | Hancock Ck. | Male | 410 | 1089 | 10.77 | N |
| 6/27/91 | HC-46 | Hancock Ck. | Female | 312 | 471 | 5.25 | N |
| 6/27/91 | HC-47 | Hancock Ck. | Female | 340 | 585 | 8.03 | N |
| 6/27/91 | HC-48 | Hancock Ck. | Unknown | 310 | 423 | 3.92 | N |
| 6/27/91 | HC-49 | Hancock Ck. | Unknown | 287 | 308 | 3.32 | N |
| 6/27/91 | HC-51 | Hancock Ck. | Unknown | 321 | 473 | 4.80 | N |
| 6/27/91 | HC-52 | Hancock Ck. | Unknown | 305 | 383 | 4.13 | N |
| 6/27/91 | HC-53 | Hancock Ck. | Female | 281 | 293 | 3.40 | N |
| 6/27/91 | HC-54 | Hancock Ck. | Female | 301 | 357 | 3.98 | N |
| 7/12/91 | NB-93 | Hog Island | Female | 333 | 494 | 7.15 | |
| 7/12/91 | NB-96 | Hog Island | Male | 290 | 318 | 4.34 | |
| 7/13/91 | NB-112 | Hog Island | Female | 328 | 445 | 6.50 | Y |
| 7/13/91 | NB-113 | Hog Island | Female | 350 | 543 | 8.00 | |
| 7/13/91 | NB-115 | Hog Island | Female | 356 | 579 | 9.60 | N |
| 7/13/91 | NB-117 | Hog Island | Unknown | 340 | 556 | 8.40 | Y |
| 7/12/91 | NB-71 | New Bern | Female | 340 | 369 | 6.67 | Y |
| 7/12/91 | NB-75 | New Bern | Female | 406 | 693 | 6.99 | Y |
| 6/26/91 | SC-7 | Slocum Ck. | Female | 145 | 886 | 9.64 | N |
| 6/26/91 | SC-8 | Slocum Ck. | Female | 391 | 898 | 7.79 | N |
| 6/26/91 | SC-9 | Slocum Ck. | Female | 373 | 816 | 11.14 | N |
| 6/26/91 | SC-19 | Slocum Ck. | Female | 352 | 620 | 7.13 | N |
| 6/26/91 | SC-20 | Slocum Ck. | Male | 380 | 760 | 10.84 | N |
| 6/26/91 | SC-21 | Slocum Ck. | Unknown | 388 | 853 | 11.45 | N |
| 6/26/91 | SC-22 | Slocum Ck. | Male | 330 | 498 | 6.85 | N |
| 6/26/91 | SC-25 | Slocum Ck. | Female | 448 | 959 | 11.07 | Y |

Table 4. Liver to body weight ratios for three species of fish collected from the lower Neuse River Basin, June, 1991.

| Species | Site | Sex | N | Liver/Body | Standard Error |
|---|---|---|---|---|---|
| Brown Bullhead | Hancock Creek | F | 4 | 0.012 | 0.001 |
| | | M | 1 | 0.010 | |
| | | All* | 10 | 0.011 | 0.000 |
| | Hog Island | F | 4 | 0.015 | 0.001 |
| | | M | 1 | 0.014 | |
| | | All* | 6 | 0.015 | 0.001 |
| | New Bern | F | 2 | 0.014 | 0.001 |
| | Slocum Creek | F | 5 | 0.011 | 0.001 |
| | | M | 2 | 0.014 | 0.001 |
| | | All* | 8 | 0.012 | 0.001 |
| Largemouth Bass | Hancock Creek | F | 6 | 0.010 | 0.001 |
| | | M | 2 | 0.011 | 0.001 |
| | | All | 10 | 0.010 | 0.001 |
| | Hog Island | F | 9 | 0.008 | 0.001 |
| | | M | 1 | 0.014 | |
| | | All | 11 | 0.009 | 0.001 |
| | New Bern | F | 6 | 0.010 | 0.001 |
| | | M | 1 | 0.006 | |
| | | All | 10 | 0.008 | 0.001 |
| | Slocum Creek | F | 7 | 0.010 | 0.001 |
| | | M | 3 | 0.007 | 0.001 |
| | | All | 10 | 0.009 | 0.001 |
| Pumpkinseed | Hancock Creek | F | 7 | 0.007 | 0.001 |
| | | M | 3 | 0.008 | 0.001 |
| | | All | 10 | 0.007 | |
| | Hog Island | F | 4 | 0.007 | 0.001 |
| | | M | 5 | 0.008 | 0.001 |
| | | All | 10 | 0.008 | 0.000 |
| | New Bern | F | 6 | 0.010 | 0.001 |
| | | M | 4 | 0.007 | 0.001 |
| | | All | 10 | 0.008 | 0.001 |
| | Slocum Creek | F | 1 | 0.013 | |
| | | M | 10 | 0.007 | 0.001 |
| | | All | 11 | 0.008 | 0.001 |

* Statistically different among locations.

Table 5. Histopathology scoring of liver tissue from pumpkinseeds (PS) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Liver Necrosis | Liver Inflammation | Liver Melano-macrophage | Liver Fatty | Liver Parasites |
|---|---|---|---|---|---|---|
| 4 PS | Slocum Creek | 0 | 1 | 7 | 0 | 0 |
| 4 PS | Slocum Creek | 0 | 0 | 1 | 0 | 0 |
| 6 PS | Slocum Creek | 0 | 0 | 6 | 0 | 0 |
| 11 PS | Slocum Creek | 0 | 2 | 1 | 0 | 0 |
| 12 PS | Slocum Creek | 0 | 0 | 6 | 0 | 1 |
| 14 PS | Slocum Creek | 0 | 1 | 1 | 0 | 2 |
| 15 PS | Slocum Creek | 0 | 0 | 6 | 0 | 0 |
| 16 PS | Slocum Creek | 0 | 0 | 3 | 0 | 0 |
| 23 PS | Slocum Creek | 2 | 1 | 1 | 0 | 1 |
| 29 PS | Slocum Creek | 1 | 3 | 18 | 0 | 0 |
| 30 PS | Slocum Creek | 0 | 0 | 8 | 0 | 0 |
| 32 PS | Hancock Creek | 0 | 1 | 0.5 | 0 | 0 |
| 33 PS | Hancock Creek | 1 | 1 | 0.5 | 0 | 0 |
| 34 PS | Hancock Creek | 2 | 2 | 1.5 | 0 | 3 |
| 36 PS | Hancock Creek | 0 | 0 | 3 | 1 | 0 |
| 37 PS | Hancock Creek | 0 | 0 | 3 | 0 | 1 |
| 38 PS | Hancock Creek | 0 | 1 | 1 | 1 | 0 |
| 39 PS | Hancock Creek | 0 | 0 | 5 | 0 | 1 |
| 40 PS | Hancock Creek | 1 | 1 | 3 | 0 | 1 |
| 41 PS | Hancock Creek | 1 | 0 | 0 | 1 | 1 |
| 59 PS | Hancock Creek | 0 | 0 | 7 | 0 | 0 |
| 61 PS | New Bern | 0 | 0 | 3 | 1 | 0 |
| 62 PS | New Bern | 0 | 0 | 6 | 1 | 0 |
| 63 PS | New Bern | 1 | 0 | 5 | 0 | 0 |
| 64 PS | New Bern | 0 | 0 | 1.5 | 2 | 1 |
| 65 PS | New Bern | 0 | 0 | 2 | 0 | 0 |
| 68 PS | New Bern | 0 | 0 | 1 | 0 | 0 |
| 69 PS | New Bern | 0 | 0 | 3 | 1 | 0 |
| 70 PS | New Bern | 0 | 0 | 2 | 0 | 0 |
| 73 PS | New Bern | 0 | 0 | 0 | 1 | 1 |
| 101 PS | Hog Island | 1 | 1 | 4.5 | 0 | 2 |
| 102 PS | Hog Island | 0 | 0 | 1 | 0 | 0 |
| 103 PS | Hog Island | 0 | 1 | 2 | 0 | 1 |
| 104 PS | Hog Island | 0 | 0 | 3 | 1 | 1 |
| 105 PS | Hog Island | 0 | 0 | 1 | 0 | 1 |
| 106 PS | Hog Island | 0 | 0 | 3.5 | 0 | 1 |
| 107 PS | Hog Island | 0 | 0 | 1 | 2 | 2 |
| 109 PS | Hog Island | 0 | 1 | 4 | 0 | 2 |
| 110 PS | Hog Island | 0 | 0 | 10 | 0 | 1 |
| 114 PS | Hog Island | 1 | 1 | 4 | 1 | 2 |

*Parasites: 0 = absent, 1 = mild, 2 = moderate, 3 = severe
Necrosis: 0 = absent, 1, = mild, 2 = moderate, 3 = severe
Melanomacrophage: Average number per 8-10 high power fields

Table 6. Histopathology scoring of liver tissue from largemouth bass (LMB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Liver Necrosis | Liver Inflammation | Liver Melano-macrophage | Liver Fatty | Liver Parasites |
|---|---|---|---|---|---|---|
| 1 LMB | Slocum Creek | 0 | 1 | 2 | 0 | 0 |
| 2 LMB | Slocum Creek | 0 | 0 | 2 | 2 | 1 |
| 3 LMB | Slocum Creek | 0 | 0 | 0.5 | 3 | 0 |
| 10 LMB | Slocum Creek | 0 | 0 | 8 | 1 | 0 |
| 17 LMB | Slocum Creek | 0 | 0 | 0 | 1 | 1 |
| 18 LMB | Slocum Creek | 0 | 1 | 2 | 0 | 1 |
| 24 LMB | Slocum Creek | 0 | 0 | 0 | 1 | 0 |
| 26 LMB | Slocum Creek | 0 | 2 | 2 | 0 | 3 |
| 27 LMB | Slocum Creek | 0 | 2 | 4 | 0 | 1 |
| 28 LMB | Slocum Creek | 0 | 1 | 1.5 | 2 | 2 |
| 31 LMB | Hancock Creek | 0 | 0 | 0 | 2 | 0 |
| 35 LMB | Hancock Creek | 0 | 0 | 0.5 | 2 | 2 |
| 42 LMB | Hancock Creek | 0 | 2 | 0 | 1 | 0 |
| 45 LMB | Hancock Creek | 0 | 0 | 3 | 0 | 1 |
| 50 LMB | Hancock Creek | 2 | 2 | 0 | 3 | 0 |
| 55 LMB | Hancock Creek | 0 | 0 | 0 | 0 | 1 |
| 56 LMB | Hancock Creek | 0 | 0 | 0 | 3 | 2 |
| 57 LMB | Hancock Creek | 0 | 0 | 0.5 | 2 | 1 |
| 58 LMB | Hancock Creek | 0 | 1 | 0 | 3 | 0 |
| 60 LMB | Hancock Creek | 0 | 0 | 1 | 3 | 0 |
| 66 LMB | New Bern | 0 | 2 | 3 | 0 | 0 |
| 67 LMB | New Bern | 0 | 0 | 0 | 3 | 0 |
| 72 LMB | New Bern | 0 | 0 | 0 | 0 | 0 |
| 74 LMB | New Bern | 0 | 0 | 5 | 0 | 1 |
| 78 LMB | New Bern | 0 | 0 | 1 | 3 | 0 |
| 79 LMB | New Bern | 0 | 0 | 0 | 3 | 0 |
| 80 LMB | New Bern | 0 | 2 | 8 | 0 | 1 |
| 81 LMB | New Bern | 0 | 0 | 1.5 | 3 | 1 |
| 82 LMB | New Bern | 0 | 1 | 4 | 1 | 1 |
| 91 LMB | Hog Island | 0 | 1 | 3 | 0 | 2 |
| 92 LMB | Hog Island | 0 | 0 | 0.5 | 1 | 0 |
| 94 LMB | Hog Island | 1 | 0 | 0 | 3 | 1 |
| 95 LMB | Hog Island | 1 | 0 | 0 | 3 | 1 |
| 97 LMB | Hog Island | 0 | 0 | 0 | 1 | 1 |
| 98 LMB | Hog Island | 0 | 1 | 3.5 | 2 | 1 |
| 99 LMB | Hog Island | 0 | 0 | 1 | 2 | 2 |
| 100 LMB | Hog Island | 0 | 0 | 5 | 2 | 1 |
| 108 LMB | Hog Island | 0 | 0 | 2 | 0 | 0 |
| 111 LMB | Hog Island | 0 | 0 | 4 | 3 | 0 |

*Parasites: 0 = absent, 1 = mild, 2 = moderate, 3 = severe
Necrosis: 0 = absent, 1, = mild, 2 = moderate, 3 = severe
Melanomacrophage: Average number per 8-10 high power fields

Table 7. Histopathology scoring of liver tissue from brown bullheads (BB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Liver Necrosis | Liver Inflammation | Liver Melano-macrophage | Liver Fatty | Liver Parasites |
|---|---|---|---|---|---|---|
| 7 BB | Slocum Creek | 0 | 1 | 5 | 1 | 0 |
| 8 BB | Slocum Creek | 0 | 0 | 0 | 1 | 0 |
| 9 BB | Slocum Creek | 0 | 0 | 10 | 3 | 0 |
| 19 BB | Slocum Creek | 2 | 2 | 3 | 1 | 0 |
| 20 BB | Slocum Creek | 2 | 2 | 5 | 3 | 0 |
| 21 BB | Slocum Creek | 2 | 0 | 1 | 2 | 0 |
| 22 BB | Slocum Creek | 2 | 1 | 0 | 1 | 1 |
| 25 BB | Slocum Creek | 2 | 1 | 4 | 2 | 0 |
| 43 BB | Hancock Creek | 0 | 1 | 0 | 2 | 0 |
| 44 BB | Hancock Creek | 0 | 1 | 1 | 2 | 0 |
| 46 BB | Hancock Creek | 0 | 0 | 0 | 3 | 0 |
| 47 BB | Hancock Creek | 0 | 2 | 0.5 | 2 | 0 |
| 48 BB | Hancock Creek | 2 | 1 | 0 | 0 | 0 |
| 49 BB | Hancock Creek | 2 | 2 | 0 | 1 | 0 |
| 51 BB | Hancock Creek | 1 | 1 | 0 | 1 | 0 |
| 52 BB | Hancock Creek | 1 | 0 | 0 | 1 | 0 |
| 53 BB | Hancock Creek | 0 | 0 | 0 | 0 | 0 |
| 54 BB | Hancock Creek | 0 | 0 | 0 | 2 | 0 |
| 71 BB | New Bern | 0 | 2 | 10 | 0 | 0 |
| 76 BB | New Bern | 0 | 1 | 3 | 0 | 0 |
| 93 BB | Hog Island | 0 | 1 | 7 | 1 | 0 |
| 96 BB | Hog Island | 0 | 0 | 0 | 1 | 0 |
| 112 BB | Hog Island | 0 | 1 | 0.5 | 1 | 0 |
| 113 BB | Hog Island | 0 | 2 | 4 | 2 | 0 |
| 115 BB | Hog Island | 2 | 0 | 15 | 2 | 0 |
| 116 BB | Hog Island | 1 | 0 | 15 | 3 | 0 |
| 117 BB | Hog Island | 0 | 0 | 0 | 3 | 0 |

*Parasites: 0 = absent, 1 = mild, 2 = moderate, 3 = severe
Necrosis: 0 = absent, 1, = mild, 2 = moderate, 3 = severe
Melanomacrophage: Average number per 8-10 high power fields

Table 8. Histopathology scoring of spleen tissue from pumpkinseeds (PS) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Elipsoid + Melano-macrophage (total) | Spleen Cell Condition | Level Parasites |
|---|---|---|---|---|
| 4 PS | Slocum Creek | 33 | Ab | 0 |
| 5 PS | Slocum Creek | 50 | N | 0 |
| 6 PS | Slocum Creek | 45 | Act | 0 |
| 11 PS | Slocum Creek | 55 | N | 0 |
| 12 PS | Slocum Creek | 19 | N | 0 |
| 14 PS | Slocum Creek | 42 | Ab | 0 |
| 15 PS | Slocum Creek | 55 | N | 0 |
| 16 PS | Slocum Creek | 45 | Act | 0 |
| 23 PS | Slocum Creek | 39 | N | 0 |
| 29 PS | Slocum Creek | 11 | Ab | 0 |
| 30 PS | Slocum Creek | 23 | Act | 0 |
| 32 PS | Hancock Creek | 19 | Act | 0 |
| 33 PS | Hancock Creek | 15 | Ab | 1 |
| 34 PS | Hancock Creek | 19 | N | 0 |
| 36 PS | Hancock Creek | 39 | N | 0 |
| 37 PS | Hancock Creek | 30 | N | 0 |
| 38 PS | Hancock Creek | 27 | Ab | 0 |
| 39 PS | Hancock Creek | 3 | Ab | 1 |
| 40 PS | Hancock Creek | 9 | N | 0 |
| 41 PS | Hancock Creek | 47 | N | 0 |
| 59 PS | Hancock Creek | 65 | Ab | 1 |
| 61 PS | New Bern | 30 | N | 0 |
| 62 PS | New Bern | 38 | Ab | 0 |
| 63 PS | New Bern | 29 | Ab | 0 |
| 64 PS | New Bern | 23 | N | 0 |
| 65 PS | New Bern | 35 | N | 0 |
| 68 PS | New Bern | 22 | Ab | 1 |
| 69 PS | New Bern | 41 | Ab | 2 |
| 70 PS | New Bern | 64 | Ab | 1 |
| 73 PS | New Bern | 39 | Ab | 1 |
| 76 PS | New Bern | 34 | Ab | 1 |
| 101 PS | Hog Island | 16 | Ab | 1 |
| 102 PS | Hog Island | 19 | Ab | 1 |
| 103 PS | Hog Island | 48 | Ab | 1 |
| 104 PS | Hog Island | 37 | N | 0 |
| 105 PS | Hog Island | 33 | N | 0 |
| 106 PS | Hog Island | 37 | N | 0 |
| 107 PS | Hog Island | 23 | Ab | 1 |

Table (cont.)

| Fish Id. # | Site Location | Elipsoid + Melano-macrophage (total) | Spleen Cell Condition | Level Parasites |
|---|---|---|---|---|
| 109 PS | Hog Island | 42 | N | 0 |
| 110 PS | Hog Island | 30 | N | 0 |
| 114 PS | Hog Island | 28 | Ab | 1 |

*Cell Condition: N=normal, Ab=abnormal, Act=activated
Parasites: 0=Absent, 1=mild, 2=moderate, 3=severe

Table 9. Histopathology scoring of spleen tissue from largemouth bass (LMB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Elipsoid + Melano-macrophage (total) | Spleen Cell Condition | Level Parasites |
|---|---|---|---|---|
| 1 LMB | Slocum Creek | 41 | N | 0 |
| 2 LMB | Slocum Creek | 23 | Ab | 1 |
| 3 LMB | Slocum Creek | 29 | N | 0 |
| 10 LMB | Slocum Creek | 32 | Ab | 1 |
| 17 LMB | Slocum Creek | 28 | Ab | 1 |
| 18 LMB | Slocum Creek | 34 | Ab | 1 |
| 24 LMB | Slocum Creek | 29 | Ab | 1 |
| 26 LMB | Slocum Creek | 39 | Ab | 1 |
| 27 LMB | Slocum Creek | 21 | N | 0 |
| 28 LMB | Slocum Creek | 10 | Ab | 0 |
| 31 LMB | Hancock Creek | 17 | Ab | 1 |
| 35 LMB | Hancock Creek | 19 | Ab | 0 |
| 42 LMB | Hancock Creek | 39 | N | 0 |
| 45 LMB | Hancock Creek | 10 | Ab | 1 |
| 50 LMB | Hancock Creek | 4 | Ab | 1 |
| 55 LMB | Hancock Creek | 20 | Ab | 1 |
| 56 LMB | Hancock Creek | 17 | N | 0 |
| 57 LMB | Hancock Creek | 26 | Ab | 1 |
| 58 LMB | Hancock Creek | 44 | Ab | 1 |
| 60 LMB | New Bern | 5 | Ab | 0 |
| 66 LMB | New Bern | 40 | Ab | 0 |
| 67 LMB | New Bern | 26 | Ab | 1 |
| 72 LMB | New Bern | 10 | Ab | 1 |
| 74 LMB | New Bern | 16 | Ab | 1 |
| 77 LMB | New Bern | 14 | Ab | 0 |
| 78 LMB | New Bern | 13 | N | 0 |
| 79 LMB | New Bern | 21 | N | 0 |
| 80 LMB | New Bern | 27 | N | 0 |
| 81 LMB | New Bern | 25 | N | 0 |
| 82 LMB | New Bern | 32 | Ab | 0 |
| 91 LMB | Hog Island | 37 | Ab | 2 |
| 92 LMB | Hog Island | 24 | Ab | 1 |
| 94 LMB | Hog Island | 21 | Ab | 1 |
| 95 LMB | Hog Island | 19 | ab | 1 |
| 97 LMB | Hog Island | 25 | Ab | 2 |
| 98 LMB | Hog Island | 16 | Ab | 1 |
| 99 LMB | Hog Island | 15 | Ab | 1 |
| 100 LMB | Hog Island | 19 | Ab | 1 |

Table (cont.)

| Fish Id. # | Site Location | Elipsoid + Melano-macrophage (total) | Spleen Cell Condition | Level Parasites |
|---|---|---|---|---|
| 108 LMB | Hog Island | 25 | Ab | 1 |
| 111 LMB | Hog Island | 26 | Ab | 1 |

*Cell Condition: N=normal, Ab=abnormal, Act=activated
Parasites: 0=Absent, 1=mild, 2=moderate, 3=severe

Table 10. Histopathology scoring of spleen tissue from brown bullhead (BB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Elipsoid + Melano-macrophage (total) | Spleen Cell Condition | Level Parasites |
|---|---|---|---|---|
| 7 BB | Slocum Creek | 40 | Act | 0 |
| 8 BB | Slocum Creek | 35 | N | 0 |
| 9 BB | Slocum Creek | 43 | N | 0 |
| 19 BB | Slocum Creek | 34 | N | 0 |
| 20 BB | Slocum Creek | 23 | N | 0 |
| 21 BB | Slocum Creek | 38 | N | 0 |
| 22 BB | Slocum Creek | 35 | N | 0 |
| 25 BB | Slocum Creek | 26 | N | 0 |
| 43 BB | Hancock Creek | 23 | N | 0 |
| 44 BB | Hancock Creek | 29 | Ab | 0 |
| 46 BB | Hancock Creek | 25 | N | 0 |
| 47 BB | Hancock Creek | 26 | N | 0 |
| 48 BB | Hancock Creek | 41 | Ab | 0 |
| 49 BB | Hancock Creek | 23 | N | 0 |
| 51 BB | Hancock Creek | 20 | N | 0 |
| 52 BB | Hancock Creek | 28 | N | 0 |
| 53 BB | Hancock Creek | 35 | N | 0 |
| 54 BB | Hancock Creek | 26 | N | 0 |
| 71 BB | New Bern | 13 | Ab | 0 |
| 75 BB | New Bern | NT | NT | NT |
| 93 BB | Hog Island | 35 | N | 0 |
| 96 BB | Hog Island | 18 | N | 0 |
| 112 BB | Hog Island | 27 | N | 1 |
| 113 BB | Hog Island | 16 | N | 0 |
| 115 BB | Hog Island | 25 | N | 0 |
| 116 BB | Hog Island | 31 | N | 0 |
| 117 BB | Hog Island | 17 | N | 0 |

*NT: No Tissue, but included in gross necropsy data
Cell Condition: N=normal, Ab=abnormal, Act=activated
Parasites: 0=Absent, 1=mild, 2=moderate, 3=severe

Table 11. Histopathology scoring of kidney tissue from pumpkinseeds (PS) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Tubular Necrosis | Melano-macrophages | Eosinophilic granules | Parasites |
|---|---|---|---|---|---|
| 4 PS | Slocum Creek | 0 | <1 | 2 | 1 |
| 5 PS | Slocum Creek | 0 | <1 | 1 | 0 |
| 6 PS | Slocum Creek | 0 | 1 | 1 | 2 |
| 11 PS | Slocum Creek | 0 | <1 | 2 | 1 |
| 12 PS | Slocum Creek | NT | NT | NT | NT |
| 14 PS | Slocum Creek | 0 | 1 | 2 | 0 |
| 15 PS | Slocum Creek | 0 | <1 | 3 | 3 |
| 16 PS | Slocum Creek | 0 | 1 | 1 | 3 |
| 23 PS | Slocum Creek | 0 | <1 | 2 | 2 |
| 29 PS | Slocum Creek | 0 | 3 | 1 | |
| 30 PS | Slocum Creek | 0 | 1.5 | 2 | 0 |
| 32 PS | Hancock Creek | 0 | <1 | 4 | 2 |
| 33 PS | Hancock Creek | 0 | <1 | 2 | 0 |
| 34 PS | Hancock Creek | 0 | <1 | 2 | 1 |
| 36 PS | Hancock Creek | 0 | <1 | 2 | 1 |
| 37 PS | Hancock Creek | 0 | <1 | 1 | 1 |
| 38 PS | Hancock Creek | 0 | <1 | 3 | 0 |
| 39 PS | Hancock Creek | 1 | <1 | 1 | 3 |
| 40 PS | Hancock Creek | 0 | <1 | 3 | 0 |
| 41 PS | Hancock Creek | 0 | 0 | 2 | 1 |
| 59 PS | Hancock Creek | 0 | <1 | 0 | 1 |
| 61 PS | New Bern | 0 | 0 | 2 | 0 |
| 62 PS | New Bern | 0 | <1 | 1 | 0 |
| 63 PS | New Bern | 0 | 0 | 3 | 1 |
| 64 PS | New Bern | 0 | <1 | 3 | 1 |
| 65 PS | New Bern | 0 | <1 | 2 | 1 |
| 68 PS | New Bern | 0 | <1 | 3 | 2 |
| 69 PS | New Bern | 0 | <1 | 2 | 1 |
| 70 PS | New Bern | NT | NT | NT | NT |
| 73 PS | New Bern | 0 | 0 | 3 | 0 |
| 76 PS | New Bern | 0 | 0 | 2 | 1 |
| 101 PS | Hog Island | 0 | <1 | 3 | 2 |
| 102 PS | Hog Island | 0 | <1 | 0 | 2 |
| 103 PS | Hog Island | 0 | <1 | 0 | 3 |
| 104 PS | Hog Island | 1 | 1 | 2 | 3 |
| 105 PS | Hog Island | 0 | <1 | 3 | 3 |
| 106 PS | Hog Island | 0 | <1 | 0 | 1 |
| 107 PS | Hog Island | 0 | <1 | 2 | 3 |
| 109 PS | Hog Island | 0 | <1 | 1 | 3 |

Table (cont.)

| Fish Id. # | Site Location | Tubular Necrosis | Melano-macrophages | Eosinophilic granules | Parasites |
|---|---|---|---|---|---|
| 110 PS | Hog Island | 0 | <1 | 1 | 3 |
| 114 PS | Hog Island | 0 | 0 | 2 | 2 |

*NT : No Tissue, but included in gross necropsy data
Tubular Necrosis: 0=absent,1=mild,2=moderate,3=severe
Melanomacrophage: Average number per 8-10 high power fields
Eosinophilic granules: 0=absent, 1=mild, 2=moderate, 3=severe
Parasites: 0=absent, 1=mild, 2=moderate, 3=severe

Table 12. Histopathology scoring of kidney tissue from largemouth bass (LMB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Tubular Necrosis | Melano-macrophages | Eosinophilic granules | Parasites |
|---|---|---|---|---|---|
| 1 LMB | Slocum Creek | 0 | 1 | 1 | 0 |
| 2 LMB | Slocum Creek | 0 | 2 | 1 | 2 |
| 3 LMB | Slocum Creek | 0 | <1 | 2 | 1 |
| 10 LMB | Slocum Creek | 0 | 1 | 1 | 3 |
| 17 LMB | Slocum Creek | 0 | 1 | 1 | 3 |
| 18 LMB | Slocum Creek | 0 | <1 | 1 | 2 |
| 24 LMB | Slocum Creek | 0 | <1 | 1 | 0 |
| 26 LMB | Slocum Creek | 1 | 2 | 0 | 3 |
| 27 LMB | Slocum Creek | 0 | 1 | 0 | 0 |
| 28 LMB | Slocum Creek | 0 | <1 | 0 | 0 |
| 31 LMB | Hancock Creek | 0 | <1 | 2 | 1 |
| 35 LMB | Hancock Creek | 0 | <1 | 2 | 2 |
| 42 LMB | Hancock Creek | 0 | <1 | 2 | 1 |
| 45 LMB | Hancock Creek | 0 | <1 | 1 | 1 |
| 50 LMB | Hancock Creek | 0 | <1 | 1 | 0 |
| 55 LMB | Hancock Creek | 0 | <1 | 0 | 1 |
| 56 LMB | Hancock Creek | NT | NT | NT | NT |
| 57 LMB | Hancock Creek | 0 | 1 | 2 | 1 |
| 58 LMB | Hancock Creek | 0 | <1 | 1 | 0 |
| 60 LMB | New Bern | 0 | <1 | 0 | 0 |
| 66 LMB | New Bern | 0 | <1 | 2 | 1 |
| 67 LMB | New Bern | 0 | <1 | 2 | 3 |
| 72 LMB | New Bern | 0 | <1 | 4 | 3 |
| 74 LMB | New Bern | 0 | <1 | 2 | 1 |
| 77 LMB | New Bern | 0 | 0 | 2 | 0 |
| 78 LMB | New Bern | 0 | <1 | 3 | 1 |
| 79 LMB | New Bern | 0 | 1 | 4 | 1 |
| 80 LMB | New Bern | 0 | 1 | 0 | 0 |
| 81 LMB | New Bern | 0 | <1 | 3 | 2 |
| 82 LMB | New Bern | 0 | <1 | 3 | 2 |
| 91 LMB | Hog Island | 0 | 1 | 3 | 3 |
| 92 LMB | Hog Island | 0 | <1 | 0 | 2 |
| 94 LMB | Hog Island | 0 | <1 | 2 | 2 |
| 95 LMB | Hog Island | 0 | <1 | 1 | 3 |
| 97 LMB | Hog Island | 0 | 1 | 0 | 3 |
| 98 LMB | Hog Island | 0 | 1 | 2 | 2 |
| 99 LMB | Hog Island | 0 | <1 | 1 | 3 |
| 100 LMB | Hog Island | 0 | 1 | 0 | 2 |
| 108 LMB | Hog Island | 0 | <1 | 1 | 2 |

Table (cont.)

| Fish Id. # | Site Location | Tubular Necrosis | Melano-macrophages | Eosinophilic granules | Parasites |
|---|---|---|---|---|---|
| 111 LMB | Hog Island | 0 | <2 | 1 | 1 |

*NT : No Tissue, but included in gross necropsy data
Tubular Necrosis: 0=absent,1=mild,2=moderate,3=severe
Melanomacrophage: Average number per 8-10 high power fields
Eosinophilic granules: 0=absent, 1=mild, 2=moderate, 3=severe
Parasites: 0=absent, 1=mild, 2=moderate, 3=severe

Table 13. Histopathology scoring of kidney tissue from brown bullhead (BB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Tubular Necrosis | Melano-macrophages | Eosinophilic granules | Parasites |
|---|---|---|---|---|---|
| 7 BB | Slocum Creek | 0 | 3 | 1 | 2 |
| 8 BB | Slocum Creek | 0 | 4 | 0 | 0 |
| 9 BB | Slocum Creek | 0 | 4 | 1 | 0 |
| 19 BB | Slocum Creek | 0 | 1 | 1 | 1 |
| 20 BB | Slocum Creek | 0 | 3 | 1 | 0 |
| 21 BB | Slocum Creek | 0 | 3 | 0 | 0 |
| 22 BB | Slocum Creek | 0 | 1 | 0 | 0 |
| 25 BB | Slocum Creek | 0 | 2 | 0 | 2 |
| 43 BB | Hancock Creek | 0 | <1 | 1 | 0 |
| 44 BB | Hancock Creek | 0 | 1 | 0 | 0 |
| 46 BB | Hancock Creek | 0 | 1 | 2 | 0 |
| 47 BB | Hancock Creek | 0 | <1 | 1 | 0 |
| 48 BB | Hancock Creek | 0 | <1 | 3 | 0 |
| 49 BB | Hancock Creek | 0 | 1 | 2 | 0 |
| 51 BB | Hancock Creek | 0 | 1 | 2 | 0 |
| 52 BB | Hancock Creek | 0 | <1 | 0 | 0 |
| 53 BB | Hancock Creek | 0 | <1 | 1 | 0 |
| 54 BB | Hancock Creek | 0 | <1 | 2 | 0 |
| 71 BB | New Bern | 0 | 2 | 3 | 0 |
| 75 BB | New Bern | 0 | 3 | 4 | 0 |
| 93 BB | Hog Island | 0 | 2 | 0 | 0 |
| 96 BB | Hog Island | 0 | <1 | 0 | 0 |
| 112 BB | Hog Island | 0 | 2 | 0 | 0 |
| 113 BB | Hog Island | 0 | 3 | 2 | 0 |
| 115 BB | Hog Island | 0 | 3 | 0 | 0 |
| 116 BB | Hog Island | 0 | 4 | 0 | 0 |
| 117 BB | Hog Island | 0 | 2 | 0 | 0 |

*Tubular Necrosis: 0=absent,1=mild,2=moderate,3=severe
Melanomacrophage: Average number per 8-10 high power fields
Eosinophilic granules: 0=absent, 1=mild, 2=moderate, 3=severe
Parasites: 0=absent, 1=mild, 2=moderate, 3=severe

Table 14. Histopathology scoring of gill tissue from pumpkinseeds (PS) from four portions of the lower Neuse River, 1991.*

| Fish Id # | Site Location | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|---|
| 4 PS | Slocum Creek | 0 | 0 | 0 |
| 5 PS | Slocum Creek | 1 | 1 | 0 |
| 6 PS | Slocum Creek | 1 | 2 | 0 |
| 11 PS | Slocum Creek | 1 | 1 | T |
| 12 PS | Slocum Creek | NT | NT | NT |
| 14 PS | Slocum Creek | 0 | 2 | P |
| 15 PS | Slocum Creek | 1 | 1 | 0 |
| 16 PS | Slocum Creek | 0 | 1 | T |
| 23 PS | Slocum Creek | 0 | 1 | 0 |
| 29 PS | Slocum Creek | 0 | 2 | P |
| 30 PS | Slocum Creek | 0 | 1 | 0 |
| 32 PS | Hancock Creek | 0 | 1 | T |
| 33 PS | Hancock Creek | 1 | 2 | T |
| 34 PS | Hancock Creek | 0 | 1 | T |
| 36 PS | Hancock Creek | 1 | 1 | 0 |
| 37 PS | Hancock Creek | 1 | 1 | t |
| 38 PS | Hancock Creek | 1 | 1 | 0 |
| 39 PS | Hancock Creek | 1 | 1 | 0 |
| 40 PS | Hancock Creek | 0 | 2 | 0 |
| 41 PS | Hancock Creek | 0 | 0 | 0 |
| 59 PS | Hancock Creek | 0 | 0 | 0 |
| 61 PS | New Bern | 2 | 2 | 0 |
| 62 PS | New Bern | NT | NT | NT |
| 63 PS | New Bern | 1 | 2 | 0 |
| 64 PS | New Bern | 2 | 1 | 0 |
| 65 PS | New Bern | 0 | 2 | P,T |
| 68 PS | New Bern | 0 | 0 | 0 |
| 69 PS | New Bern | 1 | 2 | 0 |
| 70 PS | New Bern | 0 | 1 | T |
| 73 PS | New Bern | 0 | 3 | T |
| 76 PS | New Bern | 1 | 3 | T |
| 101 PS | Hog Island | 0 | 1 | 0 |
| 102 PS | Hog Island | 0 | 1 | 0 |
| 103 PS | Hog Island | NT | NT | NT |
| 104 PS | Hog Island | 0 | 3 | 0 |
| 105 PS | Hog Island | 0 | 2 | T |
| 106 PS | Hog Island | 0 | 1 | 0 |
| 107 PS | Hog Island | 0 | 2 | 0 |
| 109 PS | Hog Island | 0 | 3 | 0 |
| 110 PS | Hog Island | 0 | 3 | T |

Table (cont.)

| Fish Id # | Site Location | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|---|
| 113 PS | Hog Island | 0 | 4 | 0 |
| 114 PS | Hog Island | 0 | 2 | 0 |

*NT: No Tissue, but included in gross necropsy data
Condition: 0=no lesion, 3-more diffuse tissue
Parasites: T=tapeworm, P=protozoa, M=myxosporidean

Table 15. Histopathology scoring of gill tissue from largemouth bass (LMB) from four portions of the lower Neuse River, 1991.*

| Fish Id # | Site Location | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|---|
| 1 LMB | Slocum Creek | NT | NT | NT |
| 2 LMB | Slocum Creek | NT | NT | NT |
| 3 LMB | Slocum Creek | 3 | 1 | P |
| 10 LMB | Slocum Creek | 1 | 2 | 0 |
| 17 LMB | Slocum Creek | 0 | 1 | M |
| 18 LMB | Slocum Creek | 1 | 1 | P |
| 24 LMB | Slocum Creek | 0 | 0 | 0 |
| 26 LMB | Slocum Creek | 1 | 2 | T |
| 27 LMB | Slocum Creek | 0 | 2 | P |
| 28 LMB | Slocum Creek | 0 | 2 | P |
| 31 LMB | Hancock Creek | 0 | 0 | 0 |
| 35 LMB | Hancock Creek | 0 | 0 | 0 |
| 42 LMB | Hancock Creek | 0 | 1 | 0 |
| 45 LMB | Hancock Creek | 0 | 1 | 0 |
| 50 LMB | Hancock Creek | 0 | 2 | 0 |
| 55 LMB | Hancock Creek | 0 | 0 | 0 |
| 56 LMB | Hancock Creek | 0 | 1 | 0 |
| 57 LMB | Hancock Creek | 1 | 1 | 0 |
| 58 LMB | Hancock Creek | 0 | 1 | 0 |
| 60 LMB | Hancock Creek | 0 | 0 | 0 |
| 66 LMB | New Bern | 0 | 1 | 0 |
| 67 LMB | New Bern | 0 | 0 | M |
| 72 LMB | New Bern | 0 | 2 | T,P |
| 74 LMB | New Bern | 1 | 2 | T |
| 77 LMB | New Bern | 0 | 1 | 0 |
| 78 LMB | New Bern | 0 | 1 | 0 |
| 79 LMB | New Bern | 0 | 0 | 0 |
| 80 LMB | New Bern | 0 | 1 | 0 |
| 81 LMB | New Bern | 0 | 0 | M |
| 82 LMB | New Bern | 0 | 1 | 0 |
| 91 LMB | Hog Island | 0 | 0 | 0 |
| 92 LMB | Hog Island | 0 | 0 | 0 |
| 94 LMB | Hog Island | 0 | 0 | 0 |
| 95 LMB | Hog Island | 0 | 0 | 0 |
| 97 LMB | Hog Island | 1 | 1 | M |
| 98 LMB | Hog Island | 0 | 1 | P |
| 99 LMB | Hog Island | 0 | 1 | N |
| 100 LMB | Hog Island | 0 | 2 | 0 |
| 108 LMB | Hog Island | 0 | 1 | 0 |

Table (cont.)

| Fish Id # | Site Location | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|---|
| 111 LMB | Hog Island | 1 | 1 | T |

*NT: No Tissue, but included in gross necropsy data
Condition: 0=no lesion, 3-more diffuse tissue
Parasites: T=tapeworm, P=protozoa, M=myxosporidean

Table 16. Histopathology scoring of gill tissue from brown bullheads (BB) from four portions of the lower Neuse River, 1991.*

| Fish Id # | Site Location | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|---|
| 7 BB | Slocum Creek | 0 | 3 | 0 |
| 8 BB | Slocum Creek | 1 | 1 | 0 |
| 9 BB | Slocum Creek | 1 | 3 | 0 |
| 19 BB | Slocum Creek | 0 | 3 | T |
| 20 BB | Slocum Creek | 1 | 2 | 0 |
| 21 BB | Slocum Creek | 1 | 3 | 0 |
| 22 BB | Slocum Creek | 1 | 2 | 0 |
| 25 BB | Slocum Creek | 1 | 3 | T |
| 43 BB | Hancock Creek | 1 | 3 | 0 |
| 44 BB | Hancock Creek | 2 | 3 | 0 |
| 46 BB | Hancock Creek | 1 | 2 | 0 |
| 47 BB | Hancock Creek | 2 | 4 | 0 |
| 48 BB | Hancock Creek | 1 | 2 | 0 |
| 49 BB | Hancock Creek | 2 | 2 | 0 |
| 51 BB | Hancock Creek | 1 | 2 | 0 |
| 52 BB | Hancock Creek | 0 | 2 | 0 |
| 53 BB | Hancock Creek | 0 | 2 | T |
| 54 BB | Hancock Creek | 0 | 1 | 0 |
| 71 BB | New Bern | 0 | 4 | T,C |
| 75 BB | New Bern | 2 | 3 | M |
| 93 BB | Hog Island | 0 | 4 | 0 |
| 96 BB | Hog Island | 0 | 3 | 0 |
| 112 BB | Hog Island | 0 | 3 | 0 |
| 115 BB | Hog Island | 2 | 3 | 0 |
| 116 BB | Hog Island | 1 | 3 | 0 |
| 117 BB | Hog Island | 1 | 3 | 0 |

*Condition: 0=no lesion, 3-more diffuse tissue
Parasites: T=tapeworm, P=protozoa, M=myxosporidean

Table 17. Histopathology scoring of stomach tissue from pumpkinseeds (PS) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Hemorrhage Classification | Parasites Y/N |
|---|---|---|---|
| 4 PS | Slocum Creek | 0 | N |
| 5 PS | Slocum Creek | 0 | N |
| 6 PS | Slocum Creek | NT | NT |
| 11 PS | Slocum Creek | 0 | Y |
| 12 PS | Slocum Creek | 0 | Y |
| 14 PS | Slocum Creek | 0 | Y |
| 15 PS | Slocum Creek | NT | NT |
| 16 PS | Slocum Creek | 0 | N |
| 23 PS | Slocum Creek | 0 | N |
| 29 PS | Slocum Creek | 0 | N |
| 30 PS | Slocum Creek | 0 | N |
| 32 PS | Hancock Creek | 0 | N |
| 33 PS | Hancock Creek | 0 | Y |
| 34 PS | Hancock Creek | 0 | N |
| 36 PS | Hancock Creek | NT | NT |
| 37 PS | Hancock Creek | NT | NT |
| 38 PS | Hancock Creek | NT | NT |
| 39 PS | Hancock Creek | 0 | Y |
| 40 PS | Hancock Creek | 0 | N |
| 41 PS | Hancock Creek | 0 | N |
| 59 PS | Hancock Creek | 0 | Y |
| 61 PS | New Bern | 0 | N |
| 62 PS | New Bern | 0 | N |
| 63 PS | New Bern | 0 | N |
| 64 PS | New Bern | 0 | N |
| 65 PS | New Bern | 0 | N |
| 68 PS | New Bern | 0 | Y |
| 69 PS | New Bern | 0 | Y |
| 70 PS | New Bern | 0 | Y |
| 73 PS | New Bern | 0 | N |
| 76 PS | New Bern | 0 | N |
| 101 PS | Hog Island | 0 | N |
| 102 PS | Hog Island | 0 | N |
| 103 PS | Hog Island | 0 | Y |
| 104 PS | Hog Island | 0 | N |
| 105 PS | Hog Island | 0 | N |
| 106 PS | Hog Island | 0 | N |
| 107 PS | Hog Island | 0 | Y |
| 109 PS | Hog Island | 0 | Y |

Table (cont.)

| Fish Id. # | Site Location | Hemorrhage Classification | Parasites Y/N |
|---|---|---|---|
| 110 PS | Hog Island | 0 | N |
| 114 PS | Hog Island | NT | NT |

*NT: No Tissue, but included in gross necropsy data

Hemorrhage: 0=absent 1=focal 2=multifocal

Parasitic Cysts Present (Y) Absent (N)

Table 18. Histopathology scoring of stomach tissue from largemouth bass (LMB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Hemorrhage Classification | Parasites Y/N |
|---|---|---|---|
| 1 LMB | Slocum Creek | 0 | Y |
| 2 LMB | Slocum Creek | 0 | N |
| 3 LMB | Slocum Creek | NT | NT |
| 10 LMB | Slocum Creek | 0 | Y |
| 17 LMB | Slocum Creek | 0 | Y |
| 18 LMB | Slocum Creek | 0 | N |
| 24 LMB | Slocum Creek | 0 | N |
| 26 LMB | Slocum Creek | 0 | N |
| 27 LMB | Slocum Creek | 1 | N |
| 28 LMB | Slocum Creek | 0 | N |
| 31 LMB | Hancock Creek | 0 | Y |
| 35 LMB | Hancock Creek | 0 | Y |
| 42 LMB | Hancock Creek | 0 | N |
| 45 LMB | Hancock Creek | 0 | N |
| 50 LMB | Hancock Creek | 1 | N |
| 55 LMB | Hancock Creek | 0 | N |
| 56 LMB | Hancock Creek | 0 | N |
| 57 LMB | Hancock Creek | 0 | N |
| 58 LMB | Hancock Creek | 0 | N |
| 60 LMB | Hancock Creek | 0 | N |
| 66 LMB | New Bern | 0 | Y |
| 67 LMB | New Bern | 0 | N |
| 72 LMB | New Bern | 0 | N |
| 74 LMB | New Bern | 0 | N |
| 77 LMB | New Bern | 0 | N |
| 78 LMB | New Bern | 0 | N |
| 79 LMB | New Bern | 0 | N |
| 80 LMB | New Bern | 0 | Y |
| 81 LMB | New Bern | NT | NT |
| 82 LMB | New Bern | 0 | N |
| 91 LMB | Hog Island | 0 | N |
| 92 LMB | Hog Island | 0 | N |
| 94 LMB | Hog Island | 0 | N |
| 95 LMB | Hog Island | 0 | N |
| 97 LMB | Hog Island | 0 | N |
| 98 LMB | Hog Island | 0 | N |
| 99 LMB | Hog Island | 1 | N |
| 100 LMB | Hog Island | 0 | N |
| 108 LMB | Hog Island | 0 | N |

Table (cont.)

| Fish Id. # | Site Location | Hemorrhage Classification | Parasites Y/N |
|---|---|---|---|
| 111 LMB | Hog Island | NT | NT |

*NT: No Tissue, but included in gross necropsy data
Hemorrhage: 0=absent 1=focal 2=multifocal
Parasitic Cysts Present (Y) Absent (N)

Table 19. Histopathology scoring of stomach tissue from brown bullhead (BB) from four portions of the lower Neuse River, 1991.*

| Fish Id. # | Site Location | Hemorrhage Classification | Parasites Y/N |
|---|---|---|---|
| 7 BB | Slocum Creek | 0 | N |
| 8 BB | Slocum Creek | 0 | N |
| 9 BB | Slocum Creek | 0 | N |
| 19 BB | Slocum Creek | 0 | N |
| 20 BB | Slocum Creek | 0 | N |
| 21 BB | Slocum Creek | 2 | N |
| 22 BB | Slocum Creek | 0 | N |
| 25 BB | Slocum Creek | 0 | Y |
| 43 BB | Hancock Creek | 1 | N |
| 44 BB | Hancock Creek | 1 | N |
| 46 BB | Hancock Creek | 0 | N |
| 47 BB | Hancock Creek | 0 | N |
| 48 BB | Hancock Creek | 0 | N |
| 49 BB | Hancock Creek | 2 | N |
| 51 BB | Hancock Creek | 0 | N |
| 52 BB | Hancock Creek | 0 | N |
| 53 BB | Hancock Creek | 0 | N |
| 54 BB | Hancock Creek | 0 | N |
| 71 BB | New Bern | 0 | N |
| 75 BB | New Bern | 0 | Y |
| 93 BB | Hog Island | 0 | N |
| 96 BB | Hog Island | 0 | N |
| 112 BB | Hog Island | 0 | N |
| 113 BB | Hog Island | NT | NT |
| 115 BB | Hog Island | 0 | N |
| 116 BB | Hog Island | 0 | N |
| 117 BB | Hog Island | 0 | N |

*NT: No Tissue, but included in gross necropsy data

Hemorrhage: 0=absent 1=focal 2=multifocal

Parasitic Cysts Present (Y) Absent (N)

Table 20. Contingency table analyses of liver histopathological variables in three species of fish collected from the lower Neuse River Basin, 1991. Histopathological scoring criteria and raw data are provided in Tables 5, 6, and 7.

| Species | Necrosis | Inflammation | Fatty Liver | Parasites |
|---|---|---|---|---|
| Pumpkinseeds | NSD | NSD | NSD | SD |
| Largemouth Bass | NSD | NSD | NSD | NSD |
| Brown Bullheads | NSD | NSD | SD | NSD |

Table 21. Response counts for liver parasite scoring in pumpkinseeds collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 5.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 5 | 1 | 7 | 8 |
| 1 | 4 | 5 | 2 | 2 |
| 2 | 0 | 4 | 0 | 1 |
| 3 | 1 | 0 | 0 | 0 |

Table 22. Response counts for liver fatty vacuolization for brown bullheads collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 7.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 2 | 0 | 2 | 0 |
| 1 | 3 | 3 | 0 | 4 |
| 2 | 4 | 2 | 0 | 2 |
| 3 | 1 | 2 | 0 | 2 |

Table 23. Mean counts of liver melanomacrophages in the livers of three species of fish from the lower Neuse River Basin, 1991. Means followed by different letters within species groups are significantly different.

| Species | Location | N | Mean | | Standard Error |
|---|---|---|---|---|---|
| Brown Bullheads | Hancock Creek | 2 | 6.50 | A | 2.22 |
| | Hog Island | 7 | 5.93 | A | 2.59 |
| | Slocum Creek | 18 | 1.64 | B | 1.66 |
| Largemouth Bass | Hancock Creek | 19 | 1.45 | | 1.49 |
| | Hog Island | 10 | 1.90 | | 1.37 |
| | Slocum Creek | 10 | 2.20 | | 1.54 |
| Pumpkinseed | Hancock Creek | 10 | 2.45 | | 1.49 |
| | Hog Island | 10 | 3.40 | | 1.64 |
| | New Bern | 9 | 2.61 | | 1.38 |
| | Slocum Creek | 11 | 5.27 | | 2.24 |

Table 24. Contingency table analyses of spleen histopathological variables in three species of fish collected from the lower Neuse River Basin, 1991. Histopathological scoring criteria and raw data are provided in Tables 8, 9, and 10.

| Species | Condition | Parasites |
|---|---|---|
| Pumpkinseeds | NSD | NSD |
| Largemouth Bass | NSD | SD |
| Brown Bullheads | SD | NSD |

Table 25. Response counts for spleen parasite scoring in largemouth bass collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 9.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 3 | 0 | 8 | 4 |
| 1 | 6 | 8 | 3 | 6 |
| 2 | 0 | 2 | 0 | 0 |

Table 26. Mean counts of elipsoids and melanomacrophages in the spleen of three species of fish form the lower Neuse River Basin, 1991. Means followed by different letters within species groups are significantly different.

| Species | Location | N | Mean | Standard Error |
|---|---|---|---|---|
| BB | HC | 10 | 27.6 A | 2.49 |
| BB | NB-C | 7 | 24.1 A | 2.72 |
| BB | NB-D | 1 | 13.0 A | |
| BB | SC | 8 | 34.2 B | 2.60 |
| LMB | HC | 9 | 21.78 | 3.58 |
| LMB | NB-C | 10 | 22.70 | 2.52 |
| LMB | NB-D | 11 | 20.82 | 3.22 |
| LMB | SC | 10 | 28.60 | 3.01 |
| PS | HC | 10 | 27.30 | 4.33 |
| PS | NB-C | 10 | 31.30 | 3.19 |
| PS | NB-D | 10 | 35.50 | 3.45 |
| PS | SC | 11 | 37.91 | 3.84 |

Table 27. Contingency table analyses of kidney histopathological variables in three species of fish collected from the lower Neuse River Basin, 1991. Histopathological scoring criteria and raw data are provided in Tables 11, 12, and 13.

| Species | Tubular Necrosis | Eosinophilic Infiltration | Parasites |
|---|---|---|---|
| Pumpkinseeds | NSD | NSD | SD |
| Largemouth Bass | | | |
| Brown Bullheads | NSD | SD | NSD |

Table 28. Response counts for kidney parasite scoring in pumpkinseeds collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 11.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 3 | 0 | 3 | 3 |
| 1 | 5 | 1 | 5 | 2 |
| 2 | 1 | 3 | 1 | 2 |
| 3 | 1 | 6 | 0 | 2 |

Table 29. Response counts for kidney parasites in largemouth bass collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 12.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 2 | 0 | 3 | 4 |
| 1 | 5 | 1 | 4 | 1 |
| 2 | 1 | 5 | 2 | 2 |
| 3 | 0 | 4 | 2 | 3 |

Table 30. Response counts for kidney esonophillic infiltration in brown bullheads collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 13.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 2 | 6 | 0 | 4 |
| 1 | 3 | 0 | 0 | 4 |
| 2 | 4 | 1 | 0 | 0 |
| 3 | 1 | 0 | 1 | 0 |
| 4 | 0 | 0 | 1 | 0 |

Table 31. Mean melanomacrophages in the kidney of three species of fish from the lower Neuse River Basin, 1991. Means followed by different letters within species groups are significantly different.

| Species | Location | N | Mean | | SE |
|---|---|---|---|---|---|
| Brown Bullhead | Hancock Ck. | 10 | 0.40 | A | 0.72 |
| | Hog Island | 7 | 2.29 | B | 1.12 |
| | New Bern | 2 | 2.50 | B | 0.84 |
| | Slocum Creek | 8 | 2.62 | B | 1.09 |
| Largemouth Bass | Hancock Ck. | 8 | 0.13 | | 0.59 |
| | Hog Island | 10 | 0.44 | | 0.73 |
| | New Bern | 11 | 0.18 | | 0.64 |
| | Slocum Creek | 10 | 0.90 | | 0.84 |
| Pumpkinseed | Hancock Ck. | 10 | 0.00 | A | 0.00 |
| | Hog Island | 10 | 0.10 | A | 0.56 |
| | New Bern | 9 | 0.00 | A | 0.00 |
| | Slocum Creek | 10 | 0.95 | B | 0.91 |

Table 32. Contingency table analyses of gill histopathological variables in three species of fish collected from the lower Neuse River Basin, 1991. Histopathological scoring criteria and raw data are provided in Tables 14, 15, and 16.

| Species | Telangiectasis | Epithelial | Parasites |
|---|---|---|---|
| Pumpkinseeds | SD | NSD | NSD |
| Largemouth Bass | NSD | NSD | SD |
| Brown Bullheads | NSD | NSD | SD |

Table 33. Response counts for telangiectasis in gill filaments of brown bullheads collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 16.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 5 | 10 | 4 | 6 |
| 1 | 5 | 0 | 3 | 4 |
| 2 | 0 | 0 | 2 | 0 |

Table 34. Response counts for gill parasite scoring in largemouth bass collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 15.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 10 | 6 | 6 | 2 |
| 1 | 0 | 4 | 4 | 6 |

Table 35. Response counts for gill parasite scoring in brown bullheads collected from the lower Neuse River Basin, 1991. Scoring criteria are provided in Table 16.

| Histopath Score | Hancock Creek | Hog Island | New Bern | Slocum Creek |
|---|---|---|---|---|
| 0 | 9 | 6 | 0 | 6 |
| 1 | 1 | 0 | 2 | 2 |

Table 36. Blood variables in pumpkinseed collected from four locations in the lower Neuse River, 1991.

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| AST | Mean | 97.4 | 87.5 | 95.73 | 95 |
| (IU/L) | SD | 46.12 | 45.16 | 94.05 | 61.85 |
| | N | 10 | 10 | 11 | 9 |
| ALT | Mean | 34.7 | 20 | 18.45 | 34 |
| (IU/L) | SD | 23.94 | 12.75 | 12.51 | 27.81 |
| | N | 10 | 10 | 11 | 9 |
| ALP | Mean | 17 | 9.9 | 13.27 | 15.33 |
| (IU/L) | SD | 8.63 | 9.19 | 6.07 | 13.39 |
| | N | 9 | 10 | 11 | 9 |
| Na | Mean | 153.78 | 151.1 | 155 | 148.67 |
| (mmol/L) | SD | 4.12 | 5.24 | 5.81 | 6.32 |
| | N | 9 | 10 | 11 | 9 |
| K | Mean | 3.59 | 4.66 | 2.93 | 3.71 |
| (mmol/L) | SD | 1 | 1.08 | 1.72 | 1.54 |
| | N | 9 | 10 | 11 | 9 |
| | Significant Diff. | AB | A | B | AB |
| Cl | Mean | 99.11 | 100.1 | 95.36 | 90 |
| (mmol/L) | SD | 4.59 | 6.67 | 3.61 | 4.33 |
| | N | 9 | 10 | 11 | 9 |
| | Significant Diff. | A | A | AB | B |
| TCO2 | Mean | 4.22 | 4.1 | 3.45 | 11.78 |
| (mmol/L) | SD | 2.39 | 2.28 | 1.21 | 2.86 |
| | N | 9 | 10 | 11 | 9 |
| | Significant Diff. | A | A | A | B |
| Glucose | Mean | 154.67 | 152.4 | 123.82 | 122.56 |
| (mg/DL) | SD | 31.43 | 45.34 | 23.49 | 42.24 |
| | N | 9 | 10 | 11 | 9 |
| Osmolality | Mean | 307.4 | 305.2 | 297.46 | 286.83 |
| (Mosm) | SD | 12.6 | 22.33 | 8.07 | 13.88 |
| | N | 9 | 10 | 11 | 6 |
| PCV | Mean | 30.4 | 25.67 | 34 | 29.22 |
| (%) | SD | 4.12 | 6.87 | 5.98 | 6.36 |
| | N | 10 | 9 | 11 | 9 |
| | Significant Diff. | AB | B | A | AB |

Table (cont.)

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| Protein | Mean | 5.3 | 4.59 | 5.71 | 4.84 |
| (G/DL) | SD | 0.84 | 0.61 | 0.9 | 0.33 |
| | N | 10 | 9 | 11 | 10 |
| | Significant Diff. | AB | B | A | B |
| Hemoglobin | Mean | 7.22 | 5.96 | 6.79 | 6.22 |
| (G/DL) | SD | 1.18 | 1.35 | 1.12 | 1.52 |
| | N | 9 | 9 | 11 | 10 |
| RBC | Mean | 2.06 | 1.88 | 2.4 | 2.41 |
| (x10E6) | SD | 0.24 | 0.61 | 0.24 | 0.43 |
| | N | 3 | 4 | 6 | 4 |

Table 37. Blood variables in largemouth bass collected from four locations in the lower Neuse River, 1991.

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| AST | Mean | 41 | 32.9 | 26.8 | 30.8 |
| (IU/L) | SD | 31.12 | 25.05 | 19.97 | 29.25 |
| | N | 10 | 10 | 10 | 10 |
| ALT | Mean | 4 | 3.5 | 3.1 | 7.2 |
| (IU/L) | SD | 2.16 | 2.01 | 3.03 | 7.74 |
| | N | 10 | 10 | 10 | 10 |
| ALP | Mean | 48.2 | 57.6 | 53.5 | 42.7 |
| (IU/L) | SD | 13.44 | 14.05 | 11.07 | 8.22 |
| | N | 10 | 10 | 10 | 10 |
| | Significant Diff. | AB | A | AB | B |
| Na | Mean | 156.4 | 156.3 | 157.5 | 150.5 |
| (mmol/L) | SD | 3.2 | 4.06 | 5.74 | 9.66 |
| | N | 10 | 10 | 10 | 10 |
| K | Mean | 1.02 | 0.95 | 0.88 | 0.89 |
| (mmol/L) | SD | 0.5 | 0.57 | 0.54 | 0.56 |
| | N | 10 | 10 | 10 | 10 |
| Cl | Mean | 118.1 | 123.2 | 113.4 | 105.3 |
| (mmol/L) | SD | 5.93 | 7.5 | 6.1 | 6.25 |
| | N | 10 | 10 | 10 | 10 |
| | Significant Diff. | AB | A | B | C |
| TCO2 | Mean | 5.9 | 5.4 | 5.4 | 8 |
| (mmol/L) | SD | 2.69 | 2.22 | 1.65 | 3.92 |
| | N | 10 | 10 | 10 | 10 |
| Glucose | Mean | 176.5 | 195.3 | 136 | 187 |
| (mg/DL) | SD | 41.15 | 42.78 | 60 | 92.81 |
| | N | 10 | 10 | 10 | 10 |
| Osmolality | Mean | 318.5 | 317 | 311.7 | 316.2 |
| (Mosm) | SD | 6.82 | 3.97 | 8.87 | 13.22 |
| | N | 10 | 10 | 10 | 10 |
| PCV | Mean | 35.22 | 37.88 | 37.4 | 37.8 |
| (%) | SD | 3.35 | 8.36 | 4.06 | 5.37 |
| | N | 9 | 9 | 10 | 10 |
| Protein | Mean | 5.69 | 6.06 | 6.43 | 6.11 |
| (G/DL) | SD | 0.7 | 0.78 | 0.61 | 0.73 |
| | N | 9 | 9 | 10 | 10 |

Table (cont.)

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| Hemoglobin (G/DL) | Mean | 8.11 | 7.09 | 7.58 | 6.55 |
| | SD | 0.65 | 0.67 | 1.05 | 0.81 |
| | N | 9 | 10 | 10 | 10 |
| | Significant Diff. | A | BC | AC | B |
| RBC (x10E6) | Mean | 2.46 | 2.29 | 2.57 | 2.63 |
| | SD | 0.31 | 0.16 | 0.31 | 0.21 |
| | N | 8 | 9 | 10 | 10 |
| | Significant Diff. | AB | A | AB | B |

Table 38. Blood variables in brown bullhead collected from four locations in the lower Neuse River, 1991.

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| AST | Mean | 175.3 | 167.5 | 177.75 | 213.7 |
| (IU/L) | SD | 70.24 | 67.18 | 48.06 | 47.05 |
| | N | 8 | 2 | 8 | 10 |
| ALT | Mean | 3.38 | 0 | 1 | 2.2 |
| (IU/L) | SD | 7.56 | 0 | 1.41 | 1.03 |
| | N | 8 | 2 | 8 | 10 |
| ALP | Mean | 20.63 | 20 | 18.5 | 24.6 |
| (IU/L) | SD | 10.51 | 0 | 12.34 | 8.68 |
| | N | 8 | 2 | 8 | 10 |
| Na | Mean | 127.5 | 123.5 | 127.75 | 128.2 |
| (mmol/L) | SD | 10.31 | 4.95 | 9.82 | 3.2 |
| | N | 8 | 2 | 2 | 10 |
| K | Mean | 3.29 | 3.2 | 2.7 | 3.07 |
| (mmol/L) | SD | 0.46 | 0 | 0.26 | 0.64 |
| | N | 8 | 2 | 8 | 10 |
| Cl | Mean | 112.75 | 112.5 | 114.25 | 110.8 |
| (mmol/L) | SD | 5.28 | 3.54 | 5.78 | 2.15 |
| | N | 8 | 2 | 8 | 10 |
| TCO2 | Mean | 4.75 | 7.5 | 4.25 | 7.8 |
| (mmol/L) | SD | 1.49 | 0.71 | 1.39 | 3.52 |
| | N | 8 | 2 | 8 | 10 |
| | Significant Diff. | AB | AB | A | B |
| Glucose | Mean | 85.63 | 86.5 | 72 | 99.7 |
| (mg/DL) | SD | 40.1 | 2.12 | 16.45 | 19.02 |
| | N | 8 | 2 | 8 | 10 |
| Osmolality | Mean | 264.88 | 265.5 | 269.38 | 266.1 |
| (Mosm) | SD | 11.36 | 3.54 | 11.36 | 5.36 |
| | N | 8 | 2 | 8 | 10 |
| PCV | Mean | 28.29 | 24 | 33.13 | 42.4 |
| (%) | SD | 4.54 | 0 | 8.27 | 4.06 |
| | N | 7 | 1 | 8 | 10 |
| | Significant Diff. | A | A | A | B |
| Protein | Mean | 4.23 | 4.3 | 4.75 | 4.56 |
| (G/DL) | SD | 0.26 | 0 | 0.88 | 0.29 |
| | N | 7 | 1 | 8 | 10 |

Table (cont.)

| | | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|---|
| Hemoglobin | Mean | 6.96 | 6.5 | 9.23 | 9.8 |
| (G/DL) | SD | 1.3 | 0.14 | 2.16 | 0.89 |
| | N | 7 | 2 | 8 | 10 |
| | Significant Diff. | C | BC | AB | A |
| RBC | Mean | 1.41 | 1.31 | 1.54 | 1.82 |
| (x10E6) | SD | 0.43 | 0 | 0.3 | 0.16 |
| | N | 7 | 1 | 8 | 10 |

Table 39. Blood variables exhibiting significant difference between sample sites.

| Variable | New Bern | Hog Island | Slocum Cr. | Hancock Cr. |
|---|---|---|---|---|
| ALP | Largemouth bass - AB | Largemouth bass - A | Largemouth bass - AB | Largemouth bass - B |
| K | Pumpkinseed - AB | Pumpkinseed - A | Pumpkinseed - B | Pumpkinseed - AB |
| Cl | Largemouth bass - AB<br>Pumpkinseed - A | Largemouth bass - A<br>Pumpkinseed - A | Largemouth bass - B<br>Pumpkinseed - AB | Largemouth bass - C<br>Pumpkinseed - B |
| TCO2 | Brown bullhead - AB<br>Pumpkinseed - A | Brown bullhead - AB<br>Pumpkinseed - A | Brown bullhead - A<br>Pumpkinseed - A | Brown bullhead - B<br>Pumpkinseed - B |
| PCV | Brown bullhead - A<br>Pumpkinseed - AB | Brown bullhead - A<br>Pumpkinseed - B | Brown bullhead - A<br>Pumpkinseed - A | Brown bullhead - B<br>Pumpkinseed - AB |
| Protein | Pumpkinseed - AB | Pumpkinseed - B | Pumpkinseed - A | Pumpkinseed - B |
| Hemoglobin | Largemouth bass - A<br>Brown bullhead - C | Largemouth bass - BC<br>Brown bullhead - BC | Largemouth bass - AC<br>Brown bullhead - AB | Largemouth bass - B<br>Brown bullhead - A |
| RBC | Largemouth bass - AB | Largemouth bass - A | Largemouth bass - AB | Largemouth bass - B |

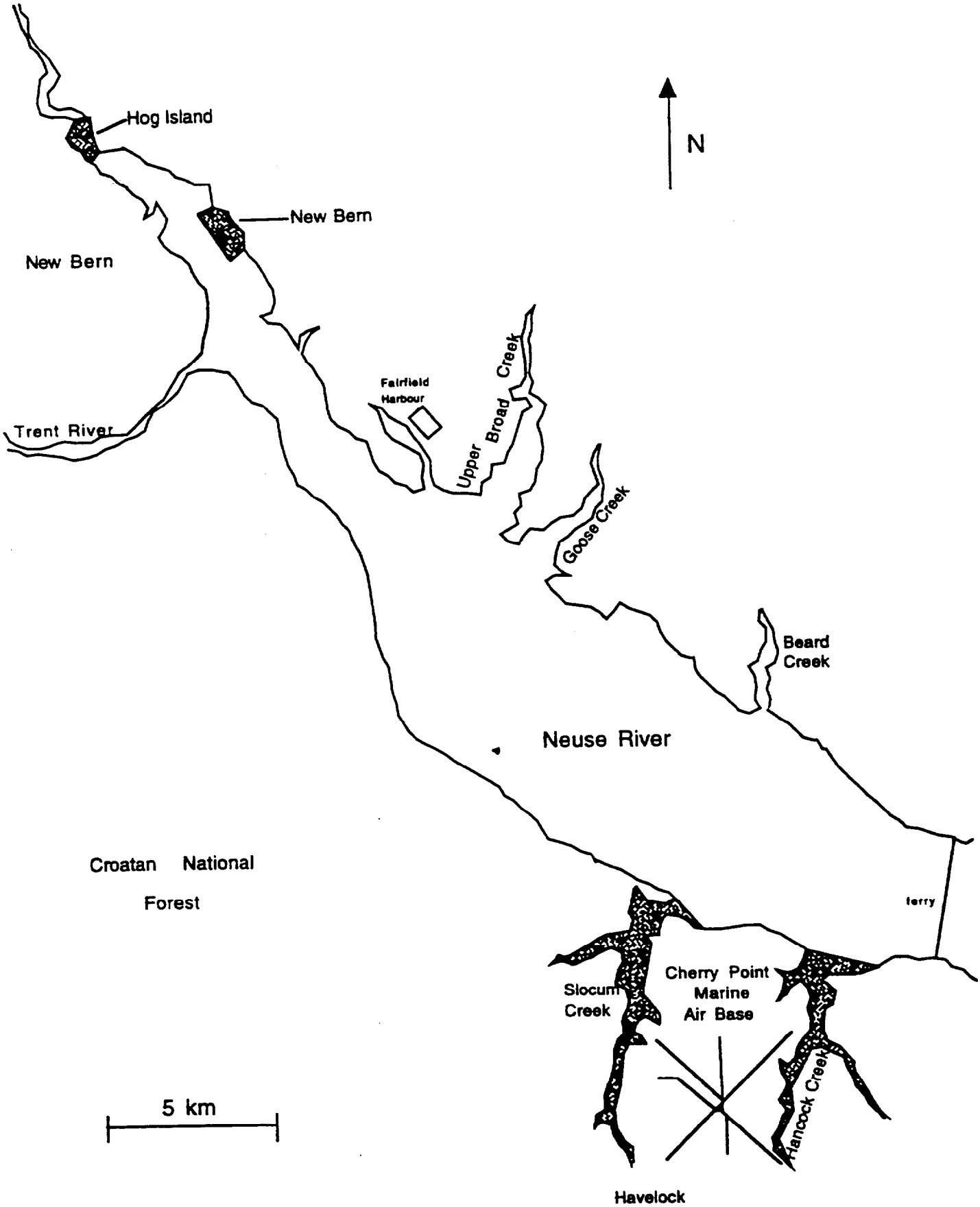


Figure 1. Fish collection locations, 1991.

## Summary

This study was conducted to determine the potential effects of metal enrichment in Slocum Creek on the health of the biological resources in the creek. It was conducted in two phases. In the first phase we examined the existing data on organic and metal contaminants in fish from Slocum Creek. We found these data incomplete and collected in a fashion that did not allow for statistical evaluation. From these data it was not even possible to determine if contaminant concentrations in fish were elevated compared to fish collected in other portions of the lower Neuse River, or elsewhere. However, because these early chemical analyses were conducted on the edible portions of fish, we were able to compare reported metal concentrations with existing guidelines for human consumption.

In the second phase of the study, we evaluated the health of the Slocum Creek fish population and ecosystem. We assessed a variety of toxicological, ecological, physiological and pathological variables and compared them among fish collected from Slocum Creek and other sites selected to represent non-metal enriched habitats. Field components of these studies were conducted during 1991, 1992, and 1993.

## Review and evaluation of studies conducted prior to the current study

1. Marine Corps-sponsored studies conducted prior to the current study appeared to be analytically sound, yet lacking in experimental design characteristics that would support an assessment of contamination in Slocum Creek relative to other sites.

2. The State of North Carolina has no predetermined guidelines for maximum allowable metal concentrations intended for human consumption, therefore it is not possible to compare metal concentrations in fish flesh from Slocum Creek against state standards.

3. International guidelines have been recommended for metal concentrations in fish to be consumed by humans. Fish from Slocum

Creek collected prior to 1991 exceeded the recommended international action limit for arsenic (10% of samples), chromium (40%), copper (10%), lead (10%), mercury (43%), and zinc (7%).

4. The Food and Drug Administration has an established guideline of 1 ppm (dry wt.) mercury in fish. None of the fillets exceeded the FDA action limit of 1ppm (dry wt.) for mercury.

**Current Study**

1. Metal concentrations in brown bullheads from Slocum Creek were not different from those in Hancock and Goose Creeks.

2. Metal concentrations in brown bullheads from the East Prong, Southwest Prong, and mainstem of Slocum Creek were not different.

3. Salinity data and patterns of metal residues in brown bullheads suggest that movement of fish among sampling sites was minimal and would not explain the apparent lack of differences in metal concentrations among creeks.

4. Metal concentrations in brown bullheads do not reflect metal enrichment of sediments as reported by Riggs (1991).

5. Bioassays of surface water from Slocum and Hancock Creeks demonstrated little toxicity with no consistent "hot spots" of toxicity noted and no differences among creeks.

6. Bioassays of sediments and sediment porewater demonstrated differences in sensitivities among tests organisms.

7. Sediment samples exhibiting varying degrees of toxicity to biological organisms were found in all creeks. Some samples were extremely toxic, while others were non-toxic to our suite of test organisms. The incidence of samples demonstrating toxicity was not higher in samples collected in Slocum, compared to Hancock and

Goose Creeks. Thus we found no evidence that sediments from Slocum Creek were more toxic than those from Hancock and Goose Creeks.

8. Sediment and sediment porewater bioassay results did not correlate well with total extractable metal concentrations in sediments, suggesting the presence of toxic substances other than those measured (such as ammonia or hydrogen sulfide), complex interactions of multiple toxicants at multiple sites in the lower Neuse River system, or chemical and physical variables that affect the bioavailability of metals in sediments.

9. Fish species composition was similar among Slocum, Hancock, and Goose Creeks. The number of species collected was similar among creeks and similar to estuarine sites throughout Chesapeake Bay.

10. Age composition, survival, and growth for brown bullhead and white catfish was similar among Slocum, Hancock, and Goose Creeks and similar to published results for other systems.

11. Pumpkinseed growth differed significantly among creeks, but growth within Slocum Creek was better than published results from other coastal North Carolina populations. We found relatively few older pumpkinseed within Slocum Creek, which could be due to contaminants or to fishing pressure.

12. Length-weight relationships for brown bullhead and white catfish were similar among creeks and to published results. The liver weight:body weight ratio, which is a widely used indicator of contaminant effects in fish, was low for brown bullhead in all three study creeks compared to other areas.

13. Hematological and pathological evidence suggest that there are differences among Slocum Creek, Hancock Creek and the Neuse River at New Bern and Hog Island. However, the magnitude and pattern of these differences do not indicate that fish from Slocum Creek are

unhealthy relative to fish from the other study sites.

## Recommendations

1. The results of our study indicate that the enhanced levels of metals present in the sediments of Slocum Creek are not readily bioavailable to fish. The reasons for the low bioavailability were not investigated but most likely are linked to other physical and chemical properties of the sediments. Disturbances to Slocum Creek sediments may alter the physical and chemical properties of the sediments that currently appear to be sequestering the metals in sediments, and thus preventing the metals from accumulating in biological tissues. Likewise, changing the physical or chemical properties of the waters of Slocum Creek could alter the bioavailability of metals. We strongly recommend that projects that might alter the chemical and physical properties of sediments and waters of Slocum Creek be thoroughly evaluated with respect to potential influences on metal bioavailability. For example, a shift in the discharge site for the sewage treatment plant at Cherry Point from Slocum Creek to the Neuse River may influence the salinity, and potentially other chemical and physical properties in the surface waters of Slocum Creek. Construction projects that disturb sediments over large areas of Slocum Creek may also result in pH shifts as well as other changes that may result in an increase in the bioavailability of metals from sediments to the biota.

2. The factors controlling metal bioavailability in Slocum Creek are not known. In anticipation of current (the change of the treated sewage discharge site from Slocum Creek to the Neuse River) and future events that may alter the chemical and physical properties of sediments, it is recommended that mechanisms controlling the bioavailability of metals from sediments be investigated and modeled. These models should be included in future environmental assessments for all proposed projects impacting Slocum Creek.

3. Bioassay results revealed a considerable number of sediment samples from Slocum, Goose, and Hancock Creeks that demonstrated toxicity. This was an unexpected finding. It is recommended that the nature of this toxicity be investigated, including its causes and distribution in the lower Neuse River. This might be most effectively accomplished in concert with Recommendation No. 2.

4. Remediation of the metal enrichment in Slocum Creek should not be considered at this time. The physical and chemical properties of sediments seem to be minimizing the bioavailablity of metals to fish.

# APPENDIX K.4

# FISH AND WILDLIFE MANAGEMENT PLAN, MARINE CORPS AIR STATION, CHERRY POINT, N.C. (ROGERS, 1990)

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# INTRODUCTION

This plan succeeds the 1978 Long Range Fish and Wildlife Management Plan. The purpose of this plan is to provide a document outlining the basic principles and objectives that guide the program. The current status of fish and wildlife resources at MCAS Cherry Point is provided. A description of the fish and wildlife resources and wildlife habitat types is found in the basic text of the Multiple-Use Natural Resources Plan (MUNRP). This Fish and Wildlife Plan is not designed to be a wildlife management "cookbook". Because many management techniques are continually being revised or updated, only a few are described in detail. New techniques and ideas will be continually incorporated into the program in accordance with the Marine Corps Order P1100.8B requirement that the Fish and Wildlife Management Program be "active and progressive".

This plan differs significantly from the 1978 plan. In 1978, many of the programs described herein either did not exist or were just getting started. Emphasis has evolved from inventory of resources and establishment of basic policy to the improvement of existing programs and planning for new initiatives. However, there will continue to be a need for basic inventory work, especially in conjunction with new programs.

Detailed work plans will be contained in the Annual Operational Plan (AOP) that is submitted each year to Headquarters Marine Corps (HQMC). The MUNRP, the Fish and Wildlife Management Plan, and the AOP are designed to work together and fulfill the planning requirements of MCO P1100.8B and the Sikes Act (Natural Resources and Fish and Wildlife Management on Military Reservations).

At the present time, MCOLF Oak Grove, MCOLF Atlantic, MCALF Bogue, and the Piney Island Bombing Range (BT-11), are managed using the same objectives and policies contained in this plan. Separate plans or ammendments for these areas will be developed as needed.

## HISTORY OF FISH AND WILDLIFE MANAGEMENT
## AT
## MCAS CHERRY POINT

Military personnel have enjoyed the wildlife resources of MCAS Cherry Point since 1941, when the station was constructed. Early game management efforts consisted primarily of controlling the use of areas by hunters and keeping records of game harvested. These functions were shared by the Provost Marshal's Office (PMO) and the Cherry Point Hunting and Fishing Association (CPHFA). Wildlife law enforcement duties were the responsibility of PMO. At times the Chief Game Warden was also the president of the CPHFA.

Bartlett Pond was constructed in 1953, and Catfish Pond was built in 1962. Duck Pond was constructed in 1967. All the ponds were stocked with fish, although Duck Pond was originally planned as a waterfowl management area. Additional history of the ponds is included in the fishery management section.

In 1963, a system of wildlife food plots was established. The plots consisted mostly of annual type seed mixtures planted in open areas around the runways. A 1972 report of 88 acres is apparently the maximum amount that was planted. The program continued sporadically until 1980. The three acres of food plots planted that year were abandoned on the recommendation of a Bird Aircraft Strike Hazard (BASH) Team Report. The BASH team was concerned that food plots next to the runways would lure animals and birds into the path of aircraft on the runways. In 1981, a new system of food plots was started. All plots are now located away from the runways.

In 1964, a professional forester was hired. Fish and wildlife management practices were instituted as part of the the Forest Management Plan. These included saving wildlife den trees and establishing unlogged buffer zones along streams and ponds. Fisheries management assistance from the U.S. Fish and Wildlife Service began about this same time and continued until 1981 when federal budget cutbacks cancelled the program. North Carolina Wildlife Resources Commission (NCWRC) personnel took over responsibility of providing technical fisheries management assistance.

In 1968, a Long Term Fish and Wildlife Management Plan was completed by the Naval Facilities Engineering Command for MCAS Cherry Point.

In 1972, an ecologist was hired to oversee the wildlife and forestry programs, and to begin an environmental protection program. In 1974, a wildlife biologist was hired, primarily to manage an overpopulated deer herd that was interfering with aircraft operations. Intensive management of the deer herd and other wildlife resources began. Data collection systems were started. Wildlife law enforcement responsiblity was transferred from PMO to the new Natural Resources and Environmental Affairs (NREA) Division. Resource inventories and work on the MUNRP was completed in 1980.

An environmental engineer was hired in 1981, relieving the wildlife biologist of pollution control duties. For the first

time, MCAS Cherry Point had a full time professional responsible for the fish and wildlife program.

When MCOLF Oak Grove was transfered from MCAS New River to MCAS Cherry Point in 1983, NREA began a wildlife management program at the 900 acre airfield.

Program responsibility for outlying fields was consolidated under the Fish and Wildlife Division with the publication of Air Station Order P1710.1K (SOP for Hunting, Fishing, Trapping, and Boating at MCAS Cherry Point and Outlying Fields) in 1985. The revised order opened MCOLF Atlantic Field for hunting after being closed for many years.

## BASIC OBJECTIVES

The basic objectives of the the Fish and Wildlife program have not changed since the original 1968 plan. They are stated and briefly explained below:

1. **Protect the fish and wildlife resources of MCAS Cherry Point.** All native wildlife species and their habitats must be protected if management programs are to succeed. Protection often does not mean preservation of the "status quo". As an example, for a greatly overpopulated deer herd near the brink of starvation, protection might mean reducing the herd size to a level more compatible with the available habitat.
Protection from overexploitation is the result of proper harvest regulations and effective wildlife law enforcement. Protection from unecessary habitat destruction is the result of an aggressive environmental impact review process and integrated land use/natural resource planning.

2. **Make fish and wildlife resources available on a continuing basis.** Sound management allows consistent use of a resource on a yearly basis. Unmanaged resosurces are often subject to the "boom or bust" process, with little of no availablity during lean years.

3. **Enhance fish and wildlife resources.** Many populations of wildlife species can be managed to stabilize or increase their numbers and availablity. For example, a fish pond, fertilized in the proper manner, can produce three to five times more fish than an unmanaged pond. A decision to try to enhance a fish or wildlife resource is based on the objectives and policies of the program, demand by sportsmen and wildlife enthusiasts, and the availability of manpower and funds. Specific enhancement programs are described in the species management sections.

4. **Participate in the multiple use of Marine Corps property.** Active coordination of the Fish and Wildlife program with development, training, forestry, and other uses is the only way to ensure that fish and wildlife resources are not unecessarily sacrificed. MCAS Cherry Point has an active coordination program.

## FISH AND WILDLIFE POLICY

The following policy statements will be used to guide the fish and wildlife management program.

1. **Emphasize native species with a high potential for response to management techniques.** This policy is a basic economic decision. Trying to manage or increase populations of fish or wildlife species that are not well adapted to existing habitat is expensive. Emphasis will be placed on native species that are known to respond to management techniques.

2. **Fish and wildlife resources will be available on a fair and equal basis.** Hunting and fishing opportunities will be equally available to all persons qualified to participate. When hunting or fishing pressure must be limited, a lottery or a first-come, first-served policy will be used. Wildlife areas will be made available to non-consumptive users of wildlife such as bird watchers and wildlife photographers.

3. **Feral animal populations will be controlled.** Cats, dogs, and other domestic animals are commonly abandoned in forested areas. Those that survive can become serious, unnatural predators or competitors of native species. More importantly, feral animals act as an uninoculated carriers of diseases that can be transmitted to wild and domestic animals as well as humans. Fish and Wildlife Division personnel will control feral animals by trapping, or by shooting when necessary. Live trapped animals will be euthanized in a humane manner.

4. **Put-and-take stocking of game animals will not be used as a management technique.** Survival of game farm animals in the wild is low and the cost per animal is high. This policy does not prevent the restocking of native wild animals into areas where good habitat is available. It also is not meant to prevent the use of pen raised birds for dog training purposes.

5. **MCAS Cherry Point will use an environmental impact review process to eliminate unecessary impacts on fish and wildlife species and their habitat.** Environmental assessment and review regulations contained in the National Environmental Policy Act (NEPA) and MCO P1100.8B will be used to minimize impacts on fish and wildlife resources due to development, training, or other activities.

## GAME MANAGEMENT

**Background.** Most of the game species native to eastern North Carolina are present at MCAS Cherry Point. This is due to the wide variety of habitat types that are present. Each game species or type will be covered by a separate section. It is not usually possible to manage for one species without affecting another. These interrelationships will be pointed out in the text.

**Management Goals.** The primary goal of the game management program is to provide a continuing source of the benefits that result from healthy populations of native game species. Hunting is just one of the ways that people utilize these animals. Just observing some of the more visible species such as deer or waterfowl, provides enjoyment to many people.

Some of the game species, such as deer, can cause damage to property or habitat when their populations reach high levels. The basic challenge of the wildlife manager is to maintain the populations of these species at a level that provides utilization and enjoyment without causing significant problems.

**Management Program.** A basic management program for any game species has three parts:

1. Collecting the biological data needed to make management decisions.

2. Regulating exploitation of the species (seasons, limits, manner of taking).

3. Managing habitat.

The complexity and intensity of each part depends on the species.

The game animals are divided as follows:

| | |
|---|---|
| Big Game | White-tailed deer<br>Black bear<br>Wild Turkey |
| Small Game | Gray squirrel<br>Mourning dove<br>Rabbits<br>Bobwhite quail<br>Waterfowl |
| Furbearers | Raccoon<br>Gray fox<br>River otter<br>Opossum<br>Muskrat<br>Beaver<br>Nutria<br>Bobcat |

## BIG GAME
### White-tailed deer (Odocoileus virginianus)

**Background.** The white-tailed deer is the most popular game animal at MCAS Cherry Point. In 1986, 85% of all hunter effort was for deer. Deer hunting has been popular with station personnel since the station was constructed in 1941. According to old records, the deer harvest in 1961 and 1962 was 21 and 29 animals. During this period, most of the station was dense woodland. Starting in 1964, logging operations thinned the forest and cleared large areas to expand the safety zones adjacent to the runways. The new growth of shrubs and herbaceous plants greatly increased the food supply for deer. The deer herd increased and became a hazard to aircraft operations. According to Grady Barnes, then district biologist for the NCWRC, unsuccessful attempts were made to tranquilize deer with dart guns fired from helicopters, in order to transport the deer off base. In 1971, station personnel, assisted by Gary Woodyard and his wildlife students from Wayne Community College, conducted a drive census. The result was a population estimate of 1,000 animals. The NCWRC reccommended an immediate reduction of the herd. Large, organized deer hunts were held during the next four years. A record 161 deer were harvested in 1973. The condition of the deer was generally noted as poor, but accurate records were not kept until 1977. The deer census conducted in 1975 estimated the herd at 250 animals. Drive census data is not always accurate, but it does indicate that there was a significant reduction in the herd from 1971 to 1975. It is interesting to note that although hunters killed 463 deer during 1971-74, an estimated 1,600 deer would have had to die during the same period to account for the reduction in the herd. This figure demonstrates the potential for waste of a natural resource that can occur in an over-populated, underhunted deer herd. Most of those 1600 animals probably died as young fawns, were hit by vehicles, or succumbed to a variety of diseases that infect deer, such as epizootic hemorrhagic disease (EHD). Also known as bluetongue, EHD is a viral disease that can significantly affect overpopulated deer herds with animals in poor condition.

Intensive, scientific deer herd management started in 1977. By this time, MCAS Cherry Point employed a professional wildlife biologist to manage the herd. The collection of biological data from every deer killed by hunters was initiated. This information, along with census data, abomasal parasite counts, and analysis of kill statistics provided the basis for determining the required harvest to keep the herd size under control.

Deer herd management took another step forward in 1982 when the NCWRC granted a request to allow the Commanding General to set the dates of the either-sex deer season, based on a recommendation by the MCAS Cherry Point wildlife biologist. The flexibility now exists to insure that a proper harvest of deer takes place each year.

A tremendous amount of data has been collected during the past ten years. Much of the data collected was used to justify longer either-sex seasons. A recent analysis indicated that the herd has stabilized at an optimum level of about 400-500 animals. In 1987, collection of abomasal parasite count data and reproductive

information was discontinued. Although this information can be useful to a deer herd manager, staffing levels did not allow fc continuing this type of data collection in the face of increase responsibilities for new initiatives in other areas.

**Management Goals.** The deer herd management program has three basic goals:

1. Maintain the size of the herd at a level that reduces the possibility of deer-aircraft collisions on the runways.

2. Provide recreation in the form of deer hunting and deer watching.

3. Keep the size of the herd at a level that promotes good health and physical condition, and maintains the quality of the habitat.

**Management Program.**

1. **Data Collection.** The following methods will be used to form a data base upon which management decisions will be made.

a. **Deer Drive Census.** The drive census is a basic tool that gives the deer herd manager two important types of information. It gives a rough estimate of the total number of deer, and it also provides information as to whether the herd is increasing, decreasing, or remaining stable. Technically, the deer drive should be considered an index rather than a census because it is more accurate in showing relative changes in the herd than it is in enumerating the total number of deer. The deer drive takes place in wooded areas along roads or power lines. A description of the drive census method used is included in the appendix.

b. **Deer Herd Reconstruction.** Using the kill records from previous years privides another method of estimating herd size. The technique used at MCAS Cherry Point follows the method described by Downing (1980). It provides a good estimate of minimum herd size. It also provides information on the sex ratio and age class composition that the deer drive census does not.

c. **Deer Harvest/Mortality Information.** An effort is made to collect the following information from every deer that is killed by hunters or that dies from other causes:

- Date
- Location
- Age
- Sex
- Dressed Weight
- Cause of death
- Antler size
- Kidney fat
- Remarks (tumors, abnormalities, etc.)

The success rate in collecting this data is very high; nearly 100% for hunter killed deer. For deer that die of other causes, the success rate in collecting sex and age information is near 95%.

2. **Regulated hunting.** Air Station Order P1710.1K governs the methods and areas for hunting. An Air Station Bulletin is published annually to set the season dates within the framework provided by the NCWRC. These regulations are generated and enforced by the MCAS Cherry Point Fish and Wildlife Division. They are consistent with North Carolina laws and regulations. An effort is made to balance the control of hunters with the freedom necessary for an enjoyable hunt. Individual hunting is given priority over large organized hunts for special groups. Hunters are free to chose their hunting areas, on a first-come, first-served basis. The number of hunters allowed in each area is limited to one hunter per 33 acres. All hunters must check in and out at the Game Warden office, and report all game killed. Legal weapons are shotgun, muzzleloading (black powder) rifles and shotguns, and bow and arrow. Bow hunting and muzzleloader hunting is encouraged through special seasons. Either-sex hunting is the norm, and quotas are set to prevent excessive harvest in any one area. The regulations are flexible enough to allow the wildlife manager to control the harvest and meet the goals of the program.

3. **Habitat Management.** Every undeveloped area at MCAS Cherry Point is used by deer at least part of the year. As a result, habitat management needs are extensive rather thatn intensive. The best method of influencing deer habitat on a large scale is by the integration of wildlife values into the forestry management program. Forestry practices affect 1,000 to 2,000 acres of land each year, primarily through logging and prescribed burning. Prescriptions for forestry compartments due for timber sales are prepared by the Forestry Division with input from the Fish and Wildlife Division. Silvicultural practices that are frequently recommended and used include the retention of important mast producing tree species such as red and white oak, and the preservation of mixed hardwood/pine forest as opposed to the conversion of mixed stands to pure pine. Prescribed burning practices that are done with wildlife habitat in mind include keeping fire out of hardwood forest habitat and burning non-forest areas to rejuvenate native grasses, herbs and shrubs that provide grazing and browsing for deer. These practices will continue to be the basis for extensive deer habitat management in the future.

A small amount of planting, less than 10 acres per year, is done to provide winter forage for deer. Winter wheat is the most common planting. Plots from 1/2 acre to 2 acres are planted in various locations. In addition to winter grazing forage for deer, when the wheat ripens in June, the seed provides food for doves, quail, and songbirds.

**Future Management Considerations.** For many intensively managed deer herds, the next logical step after reducing the herd to a level that is compatible with the carrying capacity of the land is the consideration of a trophy management program. In most of

these programs, additional restrictions reduce the kill of young bucks, allowing more to grow to trophy size. Overall herd size still kept under control by removing does. Trophy management w. be considered if a system can be found that is compatible with th goals of the program.

## BIG GAME
### Black bear (Ursus americanus)

**Background.** The black bear is a big game animal that occurs at MCAS Cherry Point. Black bears have a very large home range. It is unlikely that there are any animals that restrict their movements to MCAS Cherry Point. They are normally seen along Hancock Creek or in the Station Ordnance Area. They are not present in large numbers.

**Management.** The hunting seson on bears is closed at MCAS Cherry Point, and it appears that this is the only management practice necessary or practical at this time.

## BIG GAME
## Wild turkey (Meleagris gallopavo)

**Background.** The wild turkey is a shy bird that does well in large forest areas that have an adequate supply of mast producing trees. It also requires some open areas for brood rearing and nesting. Turkeys travel in flocks of 10-20 birds during most of the year. They roost in large trees at night. Their eyesight is remarkable and for that reason they prefer open woods where they can use their eyesight to advantage. The traditional hunting season in North Carolina is during the spring mating season when the adult males ("toms") can be called by imitating the calls of a hen turkey.

A few turkeys occur at MCAS Cherry point and are seen occasionally. The present population is probably 1-3 birds. Apparently, they are so scattered that they cannot form a viable flock. Only one sighting of a hen with young birds has been reported during 1980-1989. Almost all sightings are of individual birds.

The habitat at MCAS Cherry Point was evaluated in 1986 by Brian Hyder, then Turkey Project Leader for the NCWRC. He felt that the habitat was adequate to sustain a sizeable flock of turkeys. He also speculated that even though turkeys presently occur, stocking a flock of 10-20 birds could be all that was needed to get the birds "over the hump".

A few birds were stocked at the Cherry Point - Pinecliff area during the early 1970's, but the hunting season was not closed ar most of the birds were probably shot. In fact, three of the birds were shot at MCAS Cherry Point the year after stocking. The season is presently closed.

**Management Goals.** The management goal for wild turkeys is to establish a self-sustaining flock. The NCWRC has proposed a stocking, but the number of areas that can be stocked in one year is limited. It is hoped that a stocking in the area will take place within the next two years.

**Management Program.** The few wild turkeys present are being managed by protecting them. The season will remain closed until a viable flock can be established, and is large enough to sustain an annual harvest.

Free running or feral dogs are believed to be a serious detriment to the establishment of wild turkey flocks. Feral dogs are not present in large numbers due to the policy on controlling feral animals. This policy will have to be continued and possibly emphasized if wild turkeys are stocked.

It is illegal to release pen raised wild turkeys or turkeys from game farm stock in the wild in North Carolina. They can carry diseases that are potentially devastating to wild turkeys. Under no circumstances will pen raised birds be released at MCAS Cherry Point.

Habitat for wild turkeys is being managed by retaining mast producing trees in mixed pine/hardwood stands, and limiting

logging in hardwood stands and hardwood bottoms. Creation of wildlife openings is done during logging cycles. Sufficient habitat should be present when birds are stocked in the area.

## SMALL GAME
### Gray squirrel (Sciurus carolinensis)

**Background.** The gray squirrel is an important game animal at MCAS Cherry Point. It is normally the most sought after small game animal and usually ranks first or second in numbers harvested. The squirrel is a forest animal and thrives only where mature mast producing trees such as oak and hickory are present. Both pure hardwood and mixed hardwood/pine stands can be good habitat. Pure pine stands are not considered good habitat, but many of the pine stands at MCAS Cherry Point are intersected by hardwood drains or stream bottoms that provide habitat. A very important component of squirrel habitat is the presence of den trees.

**Management.** Because squirrels are so dependent on trees for food and habitat, forest management and squirrel habitat are synonymous. In most cases, forest management as practiced at MCAS Cherry Point enhances or preserves gray squirrel habitat. A select cut that leaves mature mast producing trees and den trees and bottomland hardwoods, is the most commonly prescribed silvicultural treatment. Quality squirrel habitat is the result.

Data collection for squirrels is limited to harvest data from hunters.

Special seasons, management areas, or artificial nest structures are not necessary to maintain good numbers of squirrels at MCAS Cherry Point. Hunting pressure, though heavy, does not appear to be a limiting factor on squirrel numbers.

## SMALL GAME
### Mourning dove (Zenaidura macroura)

**Background.** The mourning dove is an important small game animal at MCAS Cherry Point. In numbers harvested, it is usually second only to the gray squirrel and it occasionally ranks number one. The reasons for its popularity include the present high population level throughout the Southeast region and the fact that the dove season is traditionally the first hunting season to open (early September). Local breeding birds are present year round and migratory flocks occur from August-February. The mourning dove is a migratory game bird and as such is regulated by the U.S. Fish and Wildlife Service.

Doves are seed eaters and they feed by picking seeds off the ground. As a rule, they will not pull seeds off seed heads of plants or kernels off of an ear of corn. Agricultural areas adjacent to forest with trees for nesting and roosting make ideal dove habitat. They readily feed on grain scattered in agricultural fields after harvest. Doves are one of the game animals that have prospered due to modern agricultural practices. Doves are prolific breeders. The young birds mature in a very short time, and the adults can rear multiple broods of nestlings during one breeding season.

**Management.** Habitat management for doves at MCAS Cherry Point consists primarily of planting millet and other small grains to provide feeding areas. One 20 acre dove field and 3-4 small 1/2 acre plots are planted each year, and hunting in these areas is usually very good in September.

Data collection on doves includes surveys of numbers of birds near management areas, and harvest data.

Enforcement of the NCWRC hunting regulations, which are set within the framework provided by the USFWS, appears to be adequate to protect doves at MCAS Cherry Point. Regulation of hunting pressure at the dove field is required for a safe and enjoyable hunt, and to prevent the field from being "burned out" on opening day. Hunting is limited to two days per week, from 1200-1800, and the number of hunters is limited to 20 at one time. This gives the birds a chance to use the field undisturbed between hunts, helping to prolong their stay in the area. In some years, however, the majority of the birds will migrate out of the area before the end of the hunting season.

## SMALL GAME

### Bobwhite quail (Colinus virginianus)

**Background.** The Bobwhite quail has a long history as a gamebird in the South. Its habit of forming coveys of 8-25 birds and holding well for pointing dogs makes it popular with upland small game hunters. The bobwhite is basically a farmland bird. It prefers open fields and woods with patches of thick escape cover and a plentiful supply of annual weeds and wild legumes to provide seeds for food. Unfortunately, this type of habitat is limited at MCAS Cherry Point. Some areas that have good quail habitat include the Catfish Pond/Duck Pond/stables area, the dove field, and some of the runway clear zones. Overall, the quail population at MCAS Cherry Point is relatively low, and the highest recorded harvest is 95 birds in 1979, or one bird for every 73 acres. Harvests of one bird per 10 acres are not uncommon in good habitat.

**Management.** Attempting to significantly increase the overall population of quail at MCAS Cherry Point to provide more hunting recreation is not a practical management goal for MCAS Cherry Point. Drastic changes would have to be made in the forest management plan. Much of the present timber would have to be cut to provide the open areas necessary for good quail habitat. Therefore, the goal for management of quail will be to provide some small areas of quality quail habitat. In addition, food plots to help concentrate quail during the hunting season will continue to be added to the present system of wildlife food plots. Perrennial plantings such as bicolor lespedeza will be emphasized to reduce maintenance costs. Prescribed buring of pine forest areas every two or three years will be continued to help reduce the invasion of woody shrubs and young trees that shade out seed-producing quail food plants. The use of a heavy disc harrow and/or roller chopper may be appropriate in some areas to stimulate the production of annual plants and provide nesting and brood rearing areas. Based on existing covey counts and a 50% harvest rate, the hunting areas of MCAS Cherry Point should be able to supply a harvest of up to 100 birds during a good hatching year without harming the population.

## SMALL GAME

### Cottontail (Silvilagus floridanus)
### Marsh Rabbit (Silvilagus palustris)

**Background.** The cottontail is widely ditributed in various species and subspecies, throughout most of the country. The marsh rabbit is limited to the Southeast coastal plain. Marsh rabbit habitat consists of low areas that contain marshes, swamps, or creek bottoms. The cottontail occurs more often in upland areas, but there is a considerable amount of overlap in their habitat requirements.

Like the Bobwhite quail, the cottontail thrives where there is a combination of farmland, woodlots, and brushy escape cover. The habitat for rabbits at MCAS Cherry Point is fair. Populations are not high, but are present in huntable numbers in several areas. Harvests are low, with a record of 79 animals taken in 1979.

**Management.** Large scale management for rabbits would not be very practical, for the same reasons as mentioned in the section on Bobwhite quail. Creating quality habitat on a small scale, however, is feasible, especially when done in conjunction with other activities. For example, when clearing a small food plot for deer or doves, the brush and small trees can be piled to provide escape cover for rabbits. This will help rabbits use the food plot without exposing themselves to predation.

Present North Carolina regulations on limits and seasons for rabbits are adequate for protection of the resource at present. In fact, the rabbit harvest could probably be increased without hurting the population. Rabbits are an annual crop. If not harvested by hunters, 50-80% of the population will be taken by predators or die of other causes.

The management goal will be to provide qualilty habitat when it can be done economically and in conjunction with management for other species. Large scale management to try to increase rabbit populations will not be attempted.

## SMALL GAME
### Waterfowl

**Background.** The term "waterfowl" includes ducks, geese, mergansers, and coots. A list of the species recorded at MCAS Cherry Point is included in the Appendix.

Waterfowl are migratory birds, breeding mostly in the North Central United States and in Canada. They winter in the continental U.S. and in Mexico. Migration patterns and breeding areas depend on the species involved. The wood duck is the only species that regularly breeds in the Cherry Point area. The brackish waters around Cherry Point provide good wintering habitat for diving ducks like canvasbacks, scaup, and ruddy ducks. They feed primarily on small clams in the open waters of the Neuse River, Slocum Creek, and Hancock Creek. Wood ducks feed along the smaller freshwater tributaries and roost in beaver ponds and other deep freswater areas with overhead cover. Mergansers feed on fish and are common in open water areas. Geese are very scarce. A small resident flock of Canada geese is present.

Waterfowl hunting is popular at MCAS Cherry Point. Hunting pressure varies with the number of birds that migrate into the area during the hunting season. In some years, waterfowl hunting is second only to deer hunting. The season is short, only 30 days, split into three parts.

**Management.** Waterfowl management at MCAS Cherry Point is mostly for wood ducks. A small number of nesting boxes are provided ne- good brood rearing habitat. All nest boxes have good predator guards and are maintained yearly.

A greentree resevoir was created in 1986 as mitigation for waterfowl wintering habitat lost due to construction of the Ordnance Loading Pad. The area is managed by varying the water level. The water level is raised during November-February, to allow waterfowl to feed on acorns and other foods. The area is drained the rest of the year to prevent the trees from dying. Some trees have been removed to make the area more attractive to waterfowl.

Wildlife law enforcement is an important waterfowl management tool. Waterfowl can be very suceptible to excessive harvest under certain conditions. For example, wood ducks concentrate in large numbers at their roost sites. They can be easily shot in large numbers as they return to the roost shortly after dark. A strictly controlled hunting program at MCAS Cherry Point has prevented excessive illegal kills of this type. Seasons and bag limits are set by the NCWRC within the framework provided by the USFWS. No further restrictions appear to be necessary.

**Further Development for Waterfowl.** It appears that the expanding beaver population and resulting flooded areas will provide additional waterfowl habitat in the future. There are several methods of managing beaver ponds to increase their value to waterfowl. These techniques will be used where the location of the pond will not cause the birds to become a hazard to aircraft

A 5 acre storm water detention pond was constructed near the Hancock Village housing area in 1988. The pond has some potential

for development as a resting area or a feeding area for ringnecked ducks.

Wetland protection policies that increase the number of mitigation projects required may allow for creation of wetlands that are beneficial to waterfowl.

## FURBEARERS

**Background.** A furbearer is an animal whose pelt is used for the production of clothing. Pelt prices vary considerably depending on species, quality, size of the pelt, and market demand. As a result, trapping and hunting pressure can vary greatly from year to year.

Some of the furbearers are hunted as game animals in addition to being trapped for their fur, and some furbearers are included in the animal damage control section due to their high potential for property damage.

Trapping at MCAS Cherry Point is allowed with box-type live traps only. The use of leghold or killer type traps is restricted due to concern that pets and hunting dogs might be inadvertently caught and injured. Exceptions are granted in special cases where there is no other practical way to remove animals causing damage.

**Management.**

**Raccoon.** The raccoon is an important furbearer and game animal at MCAS Cherry Point. Raccoons are hunted at night with trailing hounds or trapped with live traps. The habitat at MCAS Cherry Point is excellent and populations have been high for several years. Management for this species consists of preserving den trees and wetland habitat. Fur prices are low at present, and demand for raccoon pelts is low. The present level of harvest does not appear to be affecting the population. Hunting and trapping for this animal is encouraged due to its high disease a. nuisance potential (see animal damage control section).

**Gray Fox.** The gray fox was a game animal and furbearer at MCAS Cherry Point until 1979, when the NC General Assembly closed the fox hunting and trapping season for all methods except killing with dogs. The closure was in response to political pressure from fox hunters that use hounds to run foxes for sport. Fox populations rose to high levels, and two outbreaks of distemper were suspected at MCAS Cherry Point between 1980-1987. A distemper outbreak in gray foxes was confirmed in 1989 while NCWRC personnel were studying gray fox scent station surveys at MCAS Cherry Point. Fox trapping and hunting seasons are now opening under a confusing variety of county laws, state laws, and NCWRC regulations. Fox hunting and trapping at MCAS Cherry Point will remain closed until completion of the Gray fox research project by NCWRC personnel.

**River otter.** Otters are common at MCAS Cherry Point. They are found most frequently along the streams and tributaries of Hancock and Slocum Creek. There is very little trapping pressure for otters in this area, although the pelts usually bring a good price. Several otters have been killed by vehicles at MCAS Cherry Point over the last 10 years. No specific management practices for otters have been implemented, but protection of water quality wetlands, and riparian habiatat greatly benefits the species.

**Opossum.** Opossums are plentiful, and are frequently caught by raccoon trappers. Most are released alive. Very few are shot by raccoon hunters. The pelt is not valuable at this time.

**Muskrat.** Muskrats are rare at MCAS Cherry Point. There is no trapping pressure at this time. Wetland areas in some states are managed specifically for muskrat fur production, but there do not appear to be any wetlands at Cherry Point suitable for this type of management.

**Beaver.** Beavers moved into the Cherry Point area about 1980, and have been expanding rapidly. At least seven known colonies exist at this time. Beaver ponds create valuable habitat for waterfowl, especially wood ducks. There has been a noticible increase in the wood duck breeding and wintering population that corresponds with the increase in beaver ponds. Beaver ponds also serve as sediment traps and can improve the water quality. Beaver management is covered in detail in the animal damage control section.

**Nutria.** Nutria are present at MCAS Cherry Point in very low numbers. Management practices specifically for nutria have not been implemented.

**Bobcat.** Bobcat are also present in low numbers. There is a hunting and trapping season, but there are no records of any being harvested. It is not practical to try to catch them in live traps. Management practices specifically for bobcat have not been implemented.

## ANIMAL DAMAGE AND NUISANCE CONTROL

**Background.** The animal damage and nuisance control program is one of the most visible programs to those persons at MCAS Cherry Point that do not hunt or fish. The Fish and Wildlife Division responds to about one hundred requests for assistance with wild animals every year. Many more requests are handled over the phone. It is our policy to investigate and attempt to resolve every request. It would be impossible to list every type of animal-human conflict or problem that has occurred. The more common "problem animals" and management implications are listed by species or group.

**Management.**

**Raccoon.** The raccoon is the number one nuisance problem at MCAS Cherry Point. Their boldness and the fact that there is good habitat throughout the base creates a high potential for conflicts. Many of the complaints involve minor problems such as knocked over garbage cans and dug-up garden beds. However, the raccoon is a vector for rabies and serious outbreaks of raccoon rabies in Maryland and Georgia are spreading. High raccoon populations near dense human populations are cause for concern. In 1987, a Cherry Point resident was bitten and received treatment for rabies when the raccoon escaped. Raccoons also serve as a vector for distemper and parvovirus. Management at this time consists of encouraging hunting and trapping, lending live traps to housing area residents for capture of nuisance animals, and education of housing residents as to the potential dangers of contact with raccoons. All raccoons suspected of being diseased are reported to the Station veterinarian for examination.

**Beaver.** Beavers have a high potential for property damage and nuisance due to their industrious dam-building activities. The most common problems involve plugging culverts and flooding roads or timber. The beaver population at MCAS Cherry point has started to cause some minor problems. Complaints from the City of Havelock that a beaver dam on Shop Branch was flooding private property were temporarily resolved by removing a section of the dam. Further investigation revealed that the siltation of the swamp between the beaver dam and Highway 101 was actually the cause of the problem.

Control of nuisance beavers will continue to be necessary. Authorizing a trapper to use steel traps during the trapping season will be considered as a low cost way to remove nuisnance animals. Control measures will be used only in those areas where damage to property is occurring or there is a high potential for damage or interference with station operations. The control program will be coordinated with the NCWRC.

**Muskrat.** Muskrats occasionally cause problems in the sewage treatment ponds, by burrowing into and weakening the dikes. Authorizing a trapper to use steel traps to remove the animals during the trapping season has been sucessful and will continue.

**Deer.** Large numbers of deer on the runways can cause deer/aircraft accidents. An increase in deer/vehicle accidents can also result from an overpopulation of deer. The most effective control measure is the proper management of the deer herd as outlined in the Big Game section of this plan. Food plots or other pracitces that might attract deer to the runways will not be implemented.

**Pigeons.** Pigeons and their droppings have caused nuisance and sanitation problems in several of the aircraft hangers and other buildings. Trapping has been tried with limited success. The most effective control method used so far is the authorization of a "pigeon patrol" to use pellet guns to kill the birds. Those not killed are usually harassed to the point that they leave. Unfortunately, the physical structure of the hangers does not lend itself to construction of physical barriers to the birds, which would be the most effective and permanent solution.

**Seagulls.** Seagulls and other birds can cause considerable operational problems for aircraft. Control measures will consist primarily of complying with the Air Station Bulletin on Bird Aircraft Strike Hazard contained in the appendix.

**Snakes.** "Snake calls" are very common from the housing areas during the summer months. Snakes are caught and relocated. Most calls involve non-poisonous snakes.

## NON-GAME ANIMAL MANAGEMENT

**Background.** Non-game animals are defined simply as all those birds, reptiles, amphibians and mammals that are not game species, or on the State or Federal lists of threatened or endangered species. Non-game animals include hundreds of species. Traditionally, management has been done only for those species that are a special interest for individuals or groups. Good examples are the Eastern bluebird and the purple martin. People commonly build and erect nest houses for both of these species in order to increase the population in their area.

Most wildlife research has been done for game animals, because hunters have been willing to pay the bill, and because game animals are economically important by virtue of the money hunters spend on equipment, food, lodging, and licenses. Interest in non-game management is increasing, and North Carolina has a non-game "tax checkoff" program to provide funds.

**Management.** There are no species-specific management plans for any non-game animals in place at present. Many of the game management practices also benefit non-game animals. For example, preserving den trees for gray squirrels helps the population of flying squirrels. Nest boxes for wood ducks are often used by screech owls. Wheat planted for doves feeds sparrows and other songbirds. Present staff and funding levels do not allow an extensive non-game program. A few projects have been done on a cooperative basis with groups like the Boy Scouts. Bluebird boxes have been installed and maintained.

## ENDANGERED SPECIES MANAGEMENT

**Background.** Endangered Species management is defined as management for those species that are listed as threatened or endangered by the USFWS under the Endangered Species Act or listed as threatened, endangered, or of special concern by the State of North Carolina.

Section 7 of the Endangered Species Act requires that federal agencies carry out programs for the conservation of endangered and threatened species that are listed in the Act and occur on property under their control. In coordination with the Department of the Interior or Department of Commerce, as appropriate, all actions will be evaluated for impact on endangered species.

Surveys for red-cockaded woodpecker (RCW), bald eagle, and american alligator have been carried out at MCAS Cherry Point. A field survey for endangered species was done at MCOLF Oak Grove in conjunction with the Environmental Impact Statement (EIS) for the Forward Training Facility. A field survey for red-cockaded woodpecker was done at the Piney Island Bombing range in conjunction with the EIS for the Mid-Atlantic Electronic Warfare Range.

No formal survey for plants or other species than those listed above have been done. At this time, the highest potential for finding listed species is probably at MCALF Atlantic. MCALF Atlantic contains at least two vegetative community types that typically contain rare plant species; pine savanna and carolina bays.

There is no critical habitat identified for any listed species on any MCAS Cherry Point Property. Listed species that are known to occur on MCAS Cherry Point property are discussed separately:

**Bald Eagle.** The bald eagle is listed as endangered by the USFWS. One or two birds will use the Slocum Creek and Neuse River areas occasionally during migrations through the state. The normal length of stay varies greatly from a few days to 2-3 months. Adult and immature birds have been sighted. There are no known nests.

**American alligator.** The alligator is listed as threatened by similarity of appearance to the american crocidile by the USFWS, and as threatened by the State of North Carolina. Alligators are permanent residents of the creeks and marshes surrounding MCAS Cherry Point. A rough estimate of the population would be 4-6 animals. One nest or group of young is observed every 2-3 years, primarily in the Jack's Branch area of Hancock Creek.

**Red-cockaded woodpecker.** The red-cockaded woodpecker is listed as endangered by the USFWS and the State of North Carolina. A survey for RCW was done in 1979 as part of the preparation of the original Multiple-Use Natural Resources Management Plan. No active colonies were found. In 1984, two abandoned cavity trees were discovered during a timber marking operation. During the summer of 1987, two pine trees in the Station Ordnance Area were observed that appeared to be evidence of recent activity by a RCW. The area has been monitored on a regular basis. There was one

unconfirmed sighting of the bird. The activity stopped in late summer. Informal consultation with the USFWS resulted in a request that the area continue to be monitored. A survey of the surrounding area was done in 1988, and no evidence of the bird was found.

**Brown pelican.** This bird is listed by North Carolina as being of special concern. It is common in some years at MCAS Cherry Point, MCALF Bogue, and the Piney Island Bombing range.

**Coopers Hawk.** This bird is listed by North Carolina as being of special concern. It occurs rarely at MCAS Cherry Point.

**Glossy ibis.** This bird is listed by North Carolina as being of special concern. It occurs in the marshes of the Piney Island Bombing Range.

A number of additional listed species occur in the rivers and sounds adjacent to MCAS Cherry Point property. Although not responsible for their management, the Marine Corps has the responsiblity to evaluate the effect of projects that may impact the animals or their habitat. One example is the loggerhead turtle, that occurs in the sounds and rivers adjacent to MCAS Cherry Point property.

**Management.** Management for the above species at this time consists of monitoring the populations and reviewing all projects and activities for adverse impacts.

All endangered species are protected by AirStaO P1710.1K, and the game warden staff assists state and federal authorities in the enforcement of the Endangered Species Act.

## FISHERIES MANAGEMENT

**Management Goals.** The overall goal of the fisheries management program is to provide quality recreational fishing for military personnel and their dependents, civilian employees, and the public as guests. A secondary goal is to provide an esthetically pleasing pond environment where families or individuals can conveniently fish with a minimum investment in equipment. Trophy or competition fishing is not a goal of the program.

**Management Program.** The present program consists of the intensive management of four fresh water ponds. Each pond is managed as a complete ecosytem, which includes maintaining the physical structure of the pond, monitoring water quality, managing the fish, and monitoring activity that takes place in the watershed.

In addition to pond management, the Fish and Wildlife Division assists local fishermen organizations, the NCWRC, and the NC Division of Marine Fisheries with habitat projects and regulation enforcement on the waters adjacent to Cherry Point.

## BARTLETT POND

**History.** Bartlett Pond construction started in 1953, and was completed in 1956. Another, smaller pond was created just below the original pond in 1964. In 1979, a contractor rebuilt the lower dam and removed the original dam, creating a single, larger pond. An original stocking of largemouth bass, bluegill, and redear sunfish in 1979 and 1980 failed, producing a pond with only a stunted population of bluegill. In addition, a drought delayed the filling of the pond and caused problems with alligatorweed. A decision was made to drain the pond, remove the existing fish population, and spray the alligatorweed with an approved herbicide. The pond was refilled in 1982 and stocked with bass, bluegill, redear sunfish, and channel catfish. Since then the pond has produced excellent fishing, and bass up to 7-1/2 pounds and channel catfish up to 13 pounds have been caught. Special size and creel limits (number of fish per person per day), have prevented over harvest of bass and catfish.

Continuing problems of overpopulation of bluegill and poor reproduction of largemouth bass were combatted by shoreline rotenone treatment to reduce numbers of small bluegill, and by stocking additional fingerling and adult bass over a three year period. The program was sucessful, and bass reproduction has been excellent. Fewer bluegills are present and their average size is larger.

**Management.** Bartlett Pond is being managed for largemouth bass with bluegill and redear sunfish and channel catfish as addition. species. Special regulations allow the taking of only one 16 incn or larger bass per day per person. This prevents an over harvest of bass. This regulation will stay in effect as long as the emphasis is on bass production. The pond will be sampled each summer to determine bass and bluegill spawning success. Additional bass will be stocked if necessary. Bluegill numbers will be controlled with rotenone as necessary. Channel catfish, which normally do not reproduce well in small ponds, will be stocked from the Main Gate Pond as they are available.

Aquatic weeds, particularly alligatorweed, have been a problem in this pond. Alligatorweed flea beetles have been used as a control measure, and will continue to be used when are available. Approved aquatic herbicides will be used if necessary.

Increasing fishing pressure and vehicle traffic has caused some erosion problems around the pond. One area was reshaped and reseeded in 1987. Changes in the traffic pattern and parking areas will be made as necessary to reduce erosion and siltation problems.

A fish feeder was installed in 1985. Supplemental feeding to increase growth rates of fish is done from March to October.

The pond has been regularly fertilized since 1983. Fertilization is used to increase fish production and reduce problems with aquatic weeds. A bloom of planktonic microscopic algae stimulated by the fertilizer colors the water a pea-soup green and prevents light from reaching the bottom of the pond. Seeds and seedlings of aquatic plants have difficulty becoming established under the low light conditions. Some types of filamentous algae ("pond

scum") that grow on the bottom and then float to the surface are also controlled. A heavy scum of a cold water algae that forms in April and May is not controlled by this method, but this particular species disappears when the water warms up in June, and is only a temporary problem. Non-toxic algacides will be used to help break up the floating mats if necessary to make fishing easier.

**Physical and Limnological Information.** Bartlett Pond is approximately 4.5 surface acres in size. The deepest point, near the riser pipe, is 13 feet deep. The average pH is 6.5. Average alkalinity is 40 mg/l. Dissolved oxygen levels are normally sufficient down to a depth of six or seven feet during the summer. No fish kills have been recorded. Maximum recorded surface temperature is 95F. Deep water normally remains in the low 70's during the hottest part of the summer. The water level normally drops a foot or two during summer droughts. The trash rack is a deep water draw-off design with a drain valve.

## CATFISH POND

**History.** Catfish Pond was constructed in 1962. Originally named "Snake Pond", the name was changed in 1973. A horse stable and pasture was constructed in the watershed of the pond about 1970. Drainage from the pastures produces nutrients that contribute to eutrophication and water quality problems. Low dissolved oxygen levels occurred during the summer, and aquatic weeds have caused considerable problems also. In 1985, the dam was rebuilt and a water control structure installed to replace a simple overflow pipe. The pond was stocked with largemouth bass, bluegill, redear sunfish, and channel catfish. The pond was reopened to fishing on 12 July 1986. Fishing was excellent for large bluegill and small largemouth bass.

During the summer of 1986, low oxygen levels required emergency aeration to prevent a serious fishkill. A paddlewheel aerator was constructed and used sucessfully. In addition, a temporary aerator/circulator device using a surplus air compressor and a homemade diffuser was installed. A more powerful commercially manufactured unit was installed in 1987. Since then, summer water quality has improved significantly.

**Management.** Catfish Pond is being managed primarily to provide fishing for large bluegill and redear sunfish. Historically, overpopulation of bluegill has not been a problem. This may be due to the limited spawning area available. Lower reproduction results in less competition for food, and the fish grow faster ar reach larger sizes. The limit on bass is one 16" or larger fish per day per person. There is no size or creel limit on bluegill or redear sunfish. The limit on channel catfish is four fish per day, 14 inches or larger. Bluegill and channel catfish are supplementally fed with floating pellets dispensed by an automatic fish feeder.

The pond is sampled during the summer to determine growth and reproductive success of sunfish and largemouth bass. Water quality is monitored frequently, especially during warm weather. Supplemental stockings of channel catfish from the Main Gate Pond are made to maintain good fishing for this species, which does not readily reproduce in small ponds. Fish 8-12 inches long are required for stocking because bass will eliminate smaller fish.

Due to water quality and aquatic weed problems, fertilizer cannot always be applied to the pond in "textbook" fashion as it is used in Bartlett Pond. Applications of fertilizer when large amounts of macrophytes are present will only increase the problem. Fertilizer has been used when conditions are favorable, stimulating a bloom of planktonic algae that clouds the water and prevents growth of filamentous algae and submerged aquatic plants. The plankton also creates additional food at the bottom of the food chain and increases fish production.

Aquatic weed management is an integrated system using mechanical, biological, and chemical methods. In 1986, 75 triploid white amur (grass carp) were stocked to help control an infestation of submerged aquatic plants. Some control was noted, but it is believed that some of the fish may have died during the summer of 1986 when disolved oxygen problems were noted. Another

stocking was done in 1988 with much better results. Alligatorweed flea beatles are released on an annual basis if they are available. They have provided a low cost way of reducing annual growth of alligatorweed, an emergent plant that is not readily controlled by white amur. Applications of non-toxic copper based algacides were sucessful in reducing filamentous algae in 1987, and will be continued when needed. More poerful herbicides will be used on emergent weeds like alligatorweed and smartweed only if necessary.

Mechanical methods of weed control, utilizing a large rake pulled from a shore based bulldozer winch, were very sucessful in opening up a thick stand of smartweed in 1986, just prior to opening the pond for fishing.

**Physical and Limnological Information.** Catfish Pond is approximately 5.0 surface acres. The deepest point is in the center of the pond at 11 feet. The average pH is 6.5. Average alkalinity is 45 mg/l. Dissolved oxygen levels can become critical during June and July. Several fish kills have occurred as a result. Before installation of the aerator/circulator Catfish Pond did not stratify in the classical sense, but did exhibit a definite negative grade in the oxygen and temperature profiles from surface to bottom from May-September. This condition was easily disrupted by summer storms, resulting in a mixing of the pond and a temporary reduction of oxygen levels. The compressor system circulates pond water, reducing temperature and oxygen differences between surface and bottom waters. The resulting isothermal condition helps to stabilize the pond against the effect of summer storms.

## DUCK POND

**History.** Duck Pond was constructed in 1969 as a greentree resevoir for waterfowl. Unfortunately, the dam was not fitted with the drain valve that is essential to managing a waterfowl impoundment. Greentree resevoirs must be drained during the spring and summer months to allow the oaks and other waterfowl food producing trees to survive. In the case of Duck Pond, it quickly became a "brown tree" resevoir as the flooded, standing trees died. The value of the area for waterfowl was greatly reduced, and fishing was nearly impossible due to the jumble of stumps and fallen trees.

A program was initiated in 1974 to drain the pond, remove the fallen timber, and rebuild the dam. The project took three years to complete. The dam was rebuilt by Marine Corps Engineers under the supervision of the local Soil Conservation Service (SCS) agent, Howard Garner. The SCS also provided the construction design. The pond was stocked with largemouth bass, bluegill, and redear sunfish. Fishing was only fair for bass due to a slow growth rate. Fishing for bluegill was good on occasion. Remaining stumps and underwater snags still made navigation difficult.

In 1986, the pond was drained to remove some of the remaining stumps and snags and to reshape the upper end of the pond. Many of the bass were netted and transferred to Bartlett Pond while the pond was draining. Several weeks of removing and/or burning stumps and fallen timber was followed by removal of the remaining small fish, using rotenone. The pond was refilled and stocked with 4,000 channel catfish. An automatic feeder was installed. In the fall of 1987 and 1988, rainbow trout were stocked for a spring put and take fishery. The 6-8" trout grew to 9-13" over the winter, and fishing was allowed starting on March 1. In both years, it was felt that all the available fish were caught by the end of the month. Summer temperatures are much too high for trout survival. Largemouth bass were stocked in 1988 to control bluegills that had escaped the fish removal in 1986.
The trout program was discontinued because it was felt that the Largemouth bass would eat the fingerling trout.

**Management.** Duck Pond is very different, both physically and chemically, from Bartlett and Catfish Ponds. Duck Pond is a woodland pond with a large forested watershed. There are no buildings within 1000' of the water. The water is of much lower fertility and has a brownish, humic color.

Management will focus on maintaining a bass/bluegill fishery. Original stockings of channel catfish did not do well, and are not planned for the future. Fertilization of the pond is not practcal due to the low alkalinty. The pond is limed every 3-4 years to increase fish growth and survival. Size limits on the fish will be the same as Bartlett and Catfish Ponds. Water quality and fish growth and reproduction will be sampled each year.

Aquatic weeds have not been a significant problem due to the steep banks and dark water, but alligatorweed is present and may

require some control. Submerged aquatic plants cause minor problems in some years, and the pond will be evaluated for a stocking of white amur.

The pond's status as a quiet, woodland pond will continue to be maintained. Some road access realignment is planned to reduce vehicle traffic adjacent to the pond. This will help reduce the erosion problems that are being experienced at Bartlett Pond.

**Physical and Limnological Information.** Duck Pond is about 7.5 surface acres in size. The water has an average alkalinity of 10 mg/l and a pH of 6.0. The deepest spot, near the dam, is 15 feet deep. The watershed is large for the size of the pond, and as a result the pond stays full except during extreme droughts. The pond has a high flushing rate and treatments such as liming do not last as long as they would in Catfish or Bartlett Ponds. The water control is a simple riser tube with trash rack and drain valve.

## MAIN GATE POND

**History.** The Main Gate Pond was constructed about 1977 as part of a beautification and landscaping project. No fishing has been allowed. In 1984, the pond was sampled for water quality to determine the potential for raising channel catfish. The water chemistry and oxygen levels appeared adequate. The pond was partially drained and existing fish removed. The pond was stocked with 1,400, 3-4" channel catfish. The fish were hand fed a commercial fish food until June, 1985, when netting and electrofishing were used to remove the fish for transfer to Bartlett Pond. About 350, 8-14" fish were transferred. Stumps and snags on the bottom made netting difficult. Lack of a proper water control structure necessitated the use of pumps to lower the water level. Growth rates and survival of the initial stocking were good enough to justify the expenditure of funds to make the operation more efficient. In 1986, HQMC funds were provided and a contractor installed a flashboard riser type structure. The water level can now be lowered without having to use pumps. an automatic fish feeder was installed. While the pond was drained for construction, Fish and Wildlife Division personnel removed a large number of stumps and snags from the bottom. The pond was refilled and stocked with 1,000 channel catfish fingerlings in November 1986.

**Management.** The pond is managed as a grow-out pond for channel catfish. Fingerlings are stocked and raised to 8-12" for transf to Bartlett and Catfish Ponds. The pond is treated with rotenone to remove wild fish before stocking, when necessary. No fishing will be allowd in the pond. The pond area has a flock of domestic ducks and geese that do not seem to be bothered by the fish raising operation.

**Physical and Limnological Information.** The Main Gate Pond is 0.84 surface acres with a volume of about 2.52 acre feet. The alkalinity is about 100 mg/l and the pH was measured at 8.0 on 29 July 1985. The deepest point is about 5' near the water control structure. Oxygen levels are sufficient for fish throughout the water column, even during the summer. Apparently wind action prevents the pond from stratifying.

## WILDLIFE LAW ENFORCEMENT

Wildlife law enforcement is a cooperative effort at MCAS Cherry Point. U.S. Fish and Wildlife Service agents, NCWRC enforcement officers, MCAS Fish and Wildlife Division Game Wardens, and MCAS Military Police all have jurisdiction.

The MCAS Game Wardens assigned to the Fish and Wildlife Division of the NREA Department are the primary wildlife law enforcement personnel. State and federal authorities have the right to initiate investigations at MCAS Cherry Point, but in most cases, violations are referred to them through Station authorities.

The present T/O provides five billets for Game Wardens, four military and one civilian. Two of the military billets are Fleet Assistance Program (FAP) billets that provide personnel for one year assignments. A single billet for a civilian Chief Game Warden was added to the T/O after a manpower review in 1985. A ceiling point for the position has not been provided so the billet was never filled.

The Game Warden positions are not full time law enforcement positions. The Game Warden staff provides manpower for a variety of Fish and Wildlife and Forestry projects. These include maintenance of forest access roads, prescribed burning, planting wildlife food plots, pond maintenance, and animal damage control. A hunter check station is manned by the wardens seven days a week from 1 September until 1 Jan.

Training is provided in-house and by the DOD Game Warden School. Funding is provided by CMC for the DOD School. Emphasis on technical training has been increased, and this trend will be continued.

Violators of AirStaO P1710.1K (SOP for Hunting, Fishing, Trapping and Boating at MCAS Cherry Point and Outlying Fields) appear before the Station Inspector. Typical penalties involve loss of privileges for 1-12 months. Violations of state or federal regulations are referred to the NCWRC and prosecuted through the state court system. This system has proven to be very satisfactory. Cases involving endangered species are referred to the USFWS.

## FUTURE PLANS, PRIORITIES, AND RECOMMENDATIONS

Two important changes have been implemented since the 1978 Fish and Wildlife Management Plan. Fish and game management programs have been improved and stabilized by providing a professional biologist with full-time wildlife program duties. Prior to 1981, the wildlife biologist and game wardens spent considerable time performing pollution control duties. A continuing source of funds through HQMC has also had a significant stabilizing influence. As a result of these changes, discontinuous wildlife projects have evolved into stable programs. Ongoing programs provide a much greater success rate and return for time and money invested.

A second major accomplishment has been the integration of fish and wildlife management programs into the overall facilities planning, development, and management process at MCAS Cherry Point. Better coordination and more support from other departments has helped protect fish and wildlife resources and created a stronger program.

The fish and wildlife program now has a much better base from which to expand and improve. At the present staffing level, emphasis will be on improving existing programs. In some cases, existing programs have been altered to allow more work on a new program. For example, some data collection work associated with the deer management program was recently reduced to allow an increased focus on small game management. All new projects and programs will be evaluated for their impact on existing programs.

New programs in the planning stages, recommendations for improvements, and deficiencies in existing programs are listed below:

**Staffing.** Filling the vacant Chief Game Warden billet would significantly improve the wildlife law enforcement program. A civilian billet provides more continuity and helps justify a higher level of training. Because the game warden staff is involved in all parts of the fish and wildlife and forestry programs, a civilian supervisor would benefit a number of programs, not just law enforcement. Rapid turnover of military personnel is a major impediment to maintaining a fully trained, experienced staff. Filling the Chief Game Warden Billet would also free the Fish and Wildlife Manager from daily supervision and training of the game warden staff. More time for planning and improvement of programs would result.

**Big Game.** Establishment of a healthy flock of wild turkeys is the number one priority. Efforts will be made to obtain birds for stocking from the NCWRC. Evaluation of trophy deer management programs will be another priority.

**Small Game.** Increased effort for small game management will be concentrated on MCOLF Oak Grove. Increased potential for waterfowl management at MCAS Cherry Point will probably result from the increase in habitat created by an expanding beaver population. It is not known at this time whether or not the funds and staff will be available to exploit this opportunity, or what type of work would be most beneficial.

**Endangered Species.** A survey for endangered species, especially plants, is needed to assist MCAS Cherry Point in complying with federal and state requirements. Plans are allready being made to contract with the NC Natural Heritage Program to conduct the surveys.

**Non-game wildlife.** An increased public awareness of fish and wildlife resources at MCAS Cherry Point is a goal of the non-game program. At present staffing levels, a program for outdoor education cannot be developed or implemented. The potential exists for an interpretive nature trail and outdoor education center at the Bartlett Pond area.

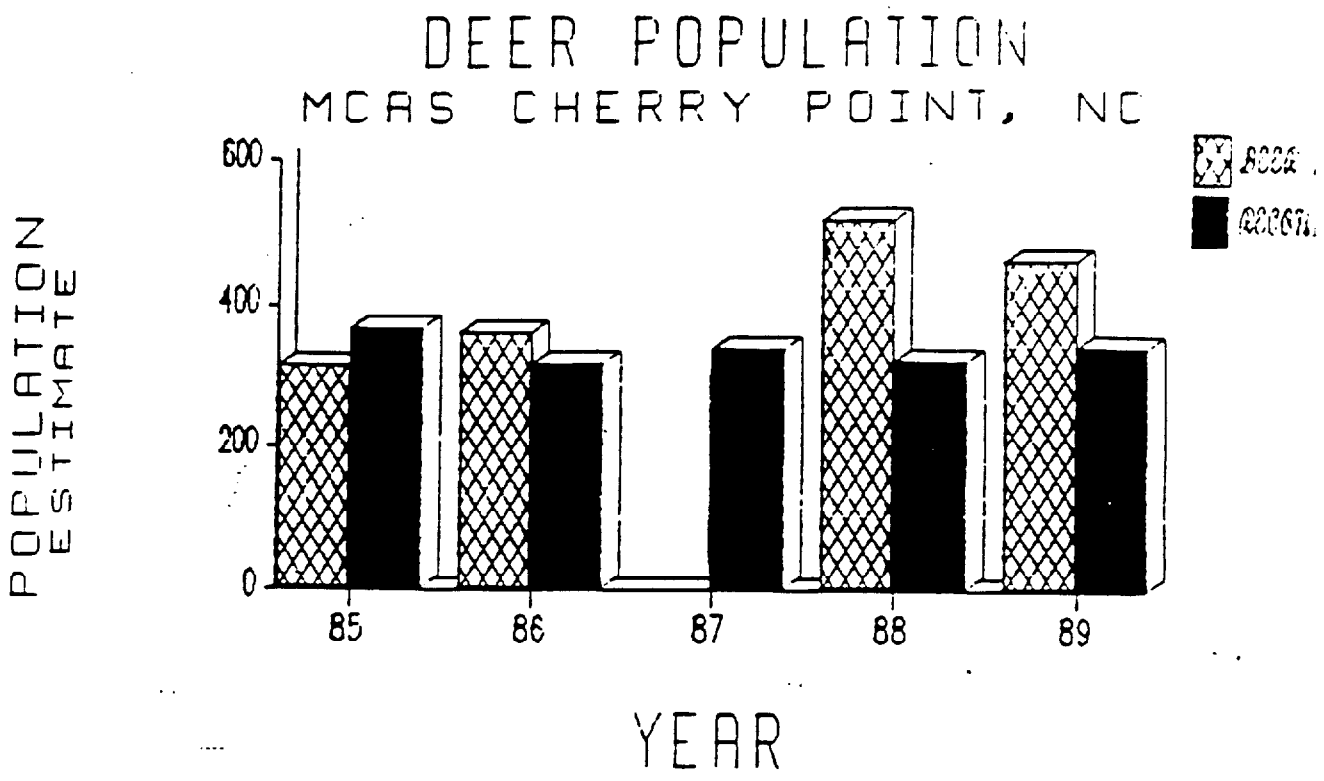
**Furbearer Management and Animal Damage Control.** Monitoring and managing the expanding beaver population is a new program that should be manageable with present resources.

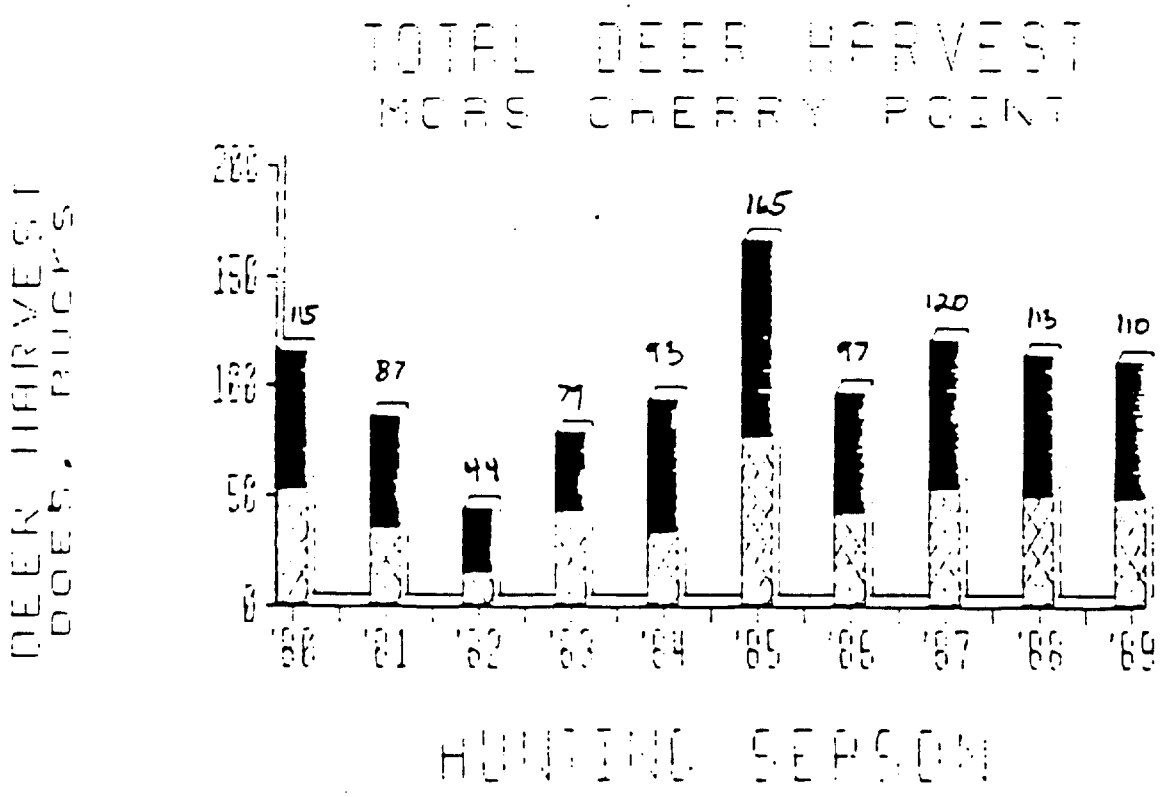
**Fisheries Management.** Improving the water quality at Catfish Pond will be a high priority project. In addition, it is recommended that the game warden staff be relieved of their responsibility for mowing the grassed areas around the ponds. This work should be performed by a mowing contractor, giving the warden staff more time for other projects.

DEER DRIVE CENSUS
MARINE CORPS AIR STATION, CHERRY POINT

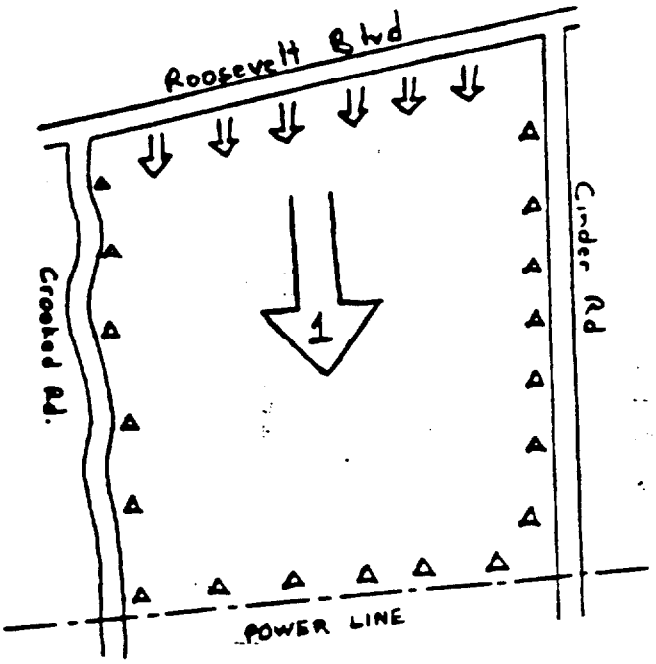
| YEAR | ACRES DRIVEN | # DEER OBSERVED | POPULATION ESTIMATE* | RECONSTRUCTION |
|---|---|---|---|---|
| 71 | 394 | 46 | 700 | |
| 72 | 473 | 71 | 900 | |
| 73 | | | 505 | |
| 74 | | | | |
| 75 | | | 240 | |
| 76 | | | | |
| 77 | 251 | 14 | 333 | |
| 78 | 411 | 37 | 545 | |
| 79 | 385 | 37 | 577 | |
| 80 | NO DRIVE | | | |
| 81 | 240 | 21 | 525 | |
| 82 | 302 | 18 | 357 | |
| 83 | 247 | 17 | 413 | |
| 84 | 95 | 6 | 379 | |
| 85 | 247 | 13 | 316 | 370 |
| 86 | 247 | 15 | 364 | 320 |
| 87 | NO DRIVE | | | 340 |
| 88 | 209 | 18 | 517 | 322 |
| 89 | 209 | 16 | 459 | 344 |

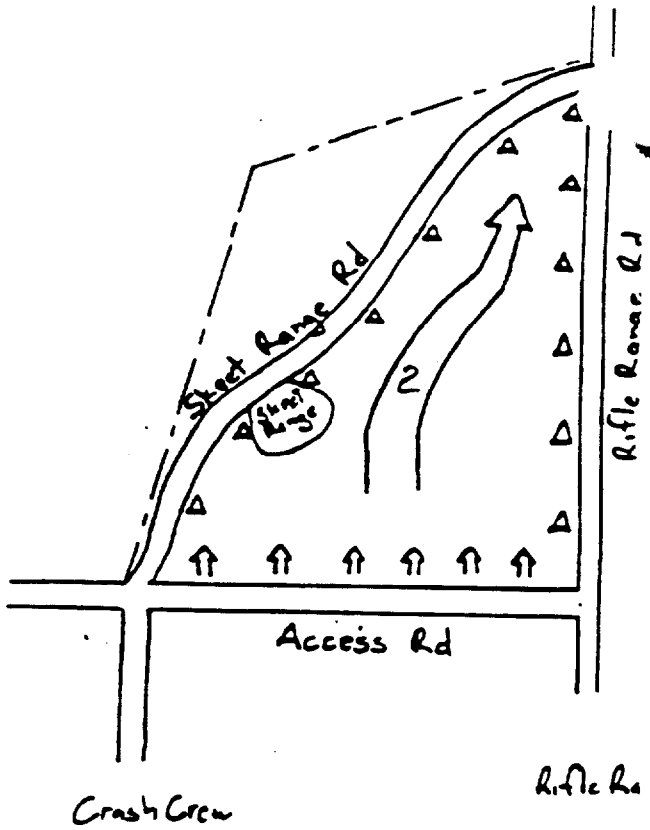
* ASSUMES 6000 ACRES OF HABITAT

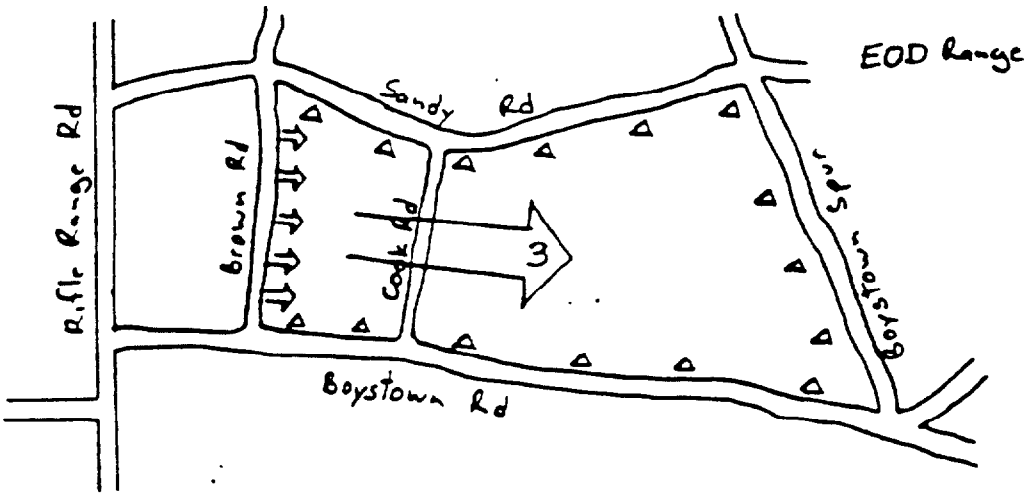

DEER POPULATION
MCAS CHERRY POINT, NC
POPULATION ESTIMATE
600
400
200
0
85
86
87
88
89
YEAR


TOTAL DEER HARVEST
MCAS CHERRY POINT
200
150
100
50
0
115
87
44
71
93
165
97
120
113
110
'80
'81
'82
'83
'84
'85
'86
'87
'88
'89
HUNTING SEASON

# DEER DRIVE CENSUS AREAS



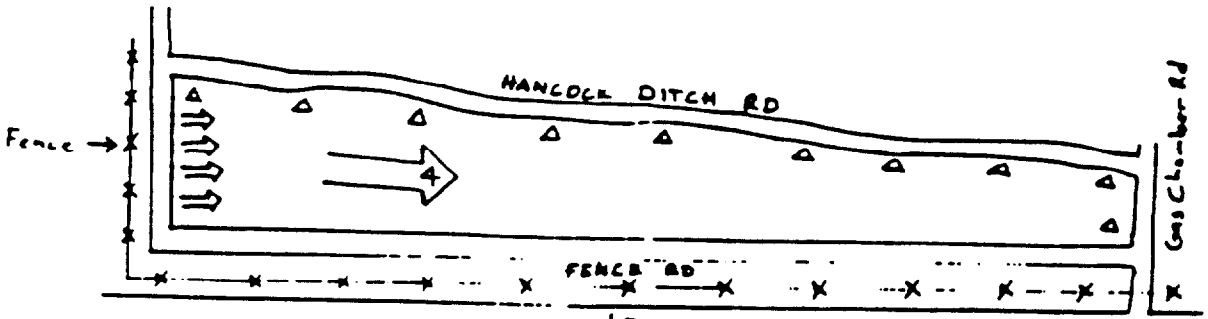

LEGEND

△ Standers

⇑ Drivers

⇑ Direction of Drive

Standers! Face are driven and count your right.



# Deer Drive Instructions

## Standers

1. Facing area being driven, count all deer that pass between you and the stander on your right.
2. Be sure you can see the standers on both sides of you. Adjust your position if needed.
3. Be alert for deer that may pass by without crossing the road.
4. Do not leave your position until picked up.

## Drivers

1. Make as much noise as possible while driving
2. Keep your spacing! Do not bunch up. Try t keep pace with the other drivers.
3. Count any deer that pass between you and the driver on your right.
4. Do not start driving until given the signal to s

## APPENDIX B

### Waterfowl Species Occurring at MCAS Cherry Point

**Common**

Wood duck
Ruddy duck
Greater scaup
Lesser scaup
Canvasback
Bufflehead
Hooded Merganser
Red-breasted merganser
Ringnecked duck
Black scoter
Surf scoter

**Rare**

Shoveler
Green-winged teal Blue-winged teal
Mallard
Wigeon
Gadwall
Common merganser
Redhead
Tundra swan
Cananda goose
Black duck
Coot

GAME HARVEST - WMA, CHERRY POINT

| YEAR | 61 | 62 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPECIES: | | | | | | | | | | | | | | | | | | | | | | |
| Deer - Bucks | - | - | - | 63 | 66 | 39 | 25 | 38 | 18 | 51 | 67 | 62 | 52 | 28 | 36 | 60 | 88 | 55 | 67 | 63 | 61 | |
| Does | - | - | - | 60 | 95 | 64 | 0 | 0 | 49 | 39 | 54 | 53 | 35 | 16 | 43 | 33 | 77 | 42 | 53 | 50 | 49 | |
| Total | 21 | 29 | 26 | 123 | 161 | 103 | 25 | 38 | 97 | 90 | 121 | 115 | 87 | 44 | 79 | 93 | 165 | 97 | 120 | 113 | 110 | |
| Dove | 185 | 193 | 0 | 0 | 0 | 0 | 0 | 1 | - | 14 | 23 | 17 | 314 | 598 | 563 | 117 | 256 | 268 | 578 | 883 | 527 | |
| Squirrel | 193 | 606 | 346 | 287 | 232 | 142 | 298 | 366 | 394 | 162 | 568 | 422 | 258 | 336 | 390 | 310 | 325 | 593 | 643 | 310 | 295 | |
| Quail | 21 | 47 | 9 | 0 | 13 | 10 | 1 | 2 | 41 | 77 | 95 | 35 | 14 | 35 | 18 | 15 | 16 | 8 | 31 | 6 | 7 | |
| Waterfowl | - | - | 10 | 0 | 18 | 5 | 40 | 21 | - | 13 | 4 | 45 | 431 | 94 | 65 | 64 | 53 | 84 | 154 | 133 | 136 | |
| Rabbit | 20 | 66 | 1 | 1 | 25 | 2 | 2 | 5 | 27 | 63 | 79 | 50 | 33 | 48 | 18 | 3 | 11 | 12 | 65 | 28 | 30 | |
| Fox | - | - | 0 | 1 | 4 | 1 | 3 | 3 | 5 | 3 | 3 | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Raccoon Shot / Trap | - | - | - | - | 0 | 2 | 4 | 2 | 17/23 | 0/14 | 0/10 | 0/32 | 1/50 | 3/28 | 32/2 | 31/1 | 65/9 | 37/3 | 77/3 | 51/ | 20/ | |
| Opossum Shot / Trap | - | - | - | - | - | - | - | - | - | 0/81 | 0/38 | 0/13 | 0/10 | 0/98 | 0 | 0/0 | 1/0 | 0/1 | 0 | 0 | 0 | |
| Crow | - | - | - | - | - | - | - | - | - | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | |
| Turkey | - | - | - | - | 3 | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Woodcock / Snipe | - | - | - | - | - | - | - | - | - | 0 | 8 | 11 | 5 | 2 | 12 | 5/2 | 1/3 | 1/2 | 5/5 | 2/0 | 1/1 | |
| HUNTER USE DATA: | | | | | | | | | | | | | | | | | | | | | | |
| No. Licensed Hunters (FY ) | - | - | 506 | 690 | 455 | - | - | - | - | 406 | 395 | 498 | 507 | 437 | 401 | 586 | 709 | 803 | 668 | 629 | 620 | |
| Total # Hunting Trips | 1[illegible] | 922 | 2341 | 1836 | 1815 | 1799 | 1[illegible] | 1896 | 2470 | 2520 | 3996 | 1382 | 3863 | 3519 | 4169 | 5389 | 6739 | 6199 | 5423 | 5197 | 4628 | |
| Total # Bow Trips | - | - | - | - | - | - | 113 | 122 | - | - | 536 | 604 | 515 | 609 | 752 | 1010 | 549 | 1497 | 997 | 1051 | 971 | |
| Other Deer Mortality | - | - | - | 5 | 9 | - | - | - | 12 | 14 | 15 | 6 | 4 | 8 | 8 | 15 | 19 | 10 | 10 | 4 | 3 | |
| Road Kills | - | - | - | 9 | 17 | - | - | - | 6 | 8 | 14 | 12 | 1 | 7 | 5 | 10 | 12 | 21 | 14 | 8 | 15 | |
| Total Misc. Mortality | - | - | - | 14 | 26 | - | - | - | 18 | 22 | 29 | 18 | 5 | 15 | 13 | 25 | 30 | 31 | 24 | 12 | 19 | |

# APPENDIX K.5

## INVENTORY OF THE RARE SPECIES, NATURAL COMMUNITIES, AND CRITICAL AREAS OF THE CHERRY POINT MARINE CORPS AIR STATION SECTION 3 (LEBLOND ET AL., 1994)

# INVENTORY OF THE RARE SPECIES, NATURAL COMMUNITIES, AND CRITICAL AREAS OF THE CHERRY POINT MARINE CORPS AIR STATION, NORTH CAROLINA

By

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Edited by
Inge K. Smith

For the

North Carolina Natural Heritage Program
Division of Parks and Recreation
Department of Environment, Health, and Natural Resources
Raleigh, North Carolina 27611

June 1994

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## III. MARINE CORPS AIR STATION CHERRY POINT

### A. GENERAL LAND USE

Marine Corps Air Station (MCAS) Cherry Point was authorized in 1941, and was created from private land and land belonging to the U.S. Forest Service (land west of Slocum Creek). Among the private land were 4,911 acres belonging to the North Carolina Pulp Co. It is known that some land was in agricultural use, but acreage is unknown.

MCAS Cherry Point comprises 11,700 acres, of which 6336 acres (54%) is forested. The remainder is in military use for operations, training, maintenance, construction, supply, housing, support facilities, and utilities. The majority of military use facilities are located in the central and south-central portions of the Air Station. The majority of forested lands are located in the northwest, north-central, and southeast portions of the Air Station. Much of the forested land is used for training purposes. Pine is the dominant canopy tree, with Loblolly Pine (Pinus taeda) covering about 4,000 acres. Mixed pine and hardwoods cover about 1,200 acres. Some forested lands are managed for natural and scenic values. These include major road corridors; riparian, beach, and bluff areas along the major river and creek systems, including their tributaries; areas containing federally designated endangered, threatened, or rare species; and forests adjacent to some residential areas and the Air Station golf course. Other forested lands are managed for even-age timber production, and to enhance wildlife populations, such as by maintaining wildlife food plots. Although there is a recent history of prescribed winter burning in MCAS Cherry Point forests, shrub dominance of the ground layer and the near-absence of Wiregrass (Aristida stricta) indicate a long historical period without fire. It is also possible that land uses, such as agriculture, prior to the establishment of the Air Station contributed to the loss of Wiregrass.

### B. CLIMATE

MCAS Cherry Point experiences hot and humid subtropical summers and cool temperate winters with below-freezing periods. Rainfall occurs throughout the year, but snow accumulation is rare. According to data recorded from 1951 to 1977 at New Bern, N.C. (ca. 10 miles northwest of the Air Station), the average annual temperature is 62.6° F. Average temperature is highest in July (79.4° F) and lowest in January (45.2° F). Average annual precipitation is 54.5 inches, with an average of 30 inches (55%) falling during the May-September vegetation growth season.

## C. PHYSIOGRAPHY, TOPOGRAPHY, AND GEOLOGY

The land surface of MCAS Cherry Point is part of the Talbot Terrace Plain formed of unconsolidated sediment deposits. These sediments were deposited and reshaped during several cycles of coastal emergence and submergence from the Cretaceous period to the present. It is characterized by broad, flat terraces between the major stream valleys. The terraces slope rather abruptly to stream and tributary valleys, tending to be steeply sloped near outlets, and more shallowly sloped inland. Elevation ranges from sea level along the shores of the Neuse River, Slocum Creek, and Hancock Creek, to 25-33 feet on the terraces between the stream systems. The terraces primarily support pine forests, the stream slopes support hardwood forests, and the small stream floodplains support cypress-hardwood forests. Freshwater marshes fringe the Neuse River, Slocum Creek, Hancock Creek, and their major tributaries. A few small ponds are located in forested areas of the terraces.

## D. HYDROLOGY

The action and chemistry of water are critical elements in shaping the terrain and regulating natural community types. In the terrestrial and palustrine freshwater communities, the volume, seasonality, duration, and periodicity of precipitation strongly influence natural community structure and composition. Soil moisture is regulated by topography, substrate composition, and elevation above groundwater. Groundwater is near or at the surface in the broad, level terraces. The soils are poorly drained due to the low relief and the water retention capacity of loam. The best drained soils are above the slopes along the stream valleys.

The many small tributaries of the larger creeks are fed by groundwater, and stream flow is intermittent, especially inland. Although precipitation is greater during the growing season, this increase is offset by evapotranspiration, the combination of evaporation and the release of water vapor by plants during photosynthesis (transpiration). Groundwater and small stream levels therefore tend to be higher during winter. The Neuse River, Slocum Creek, Hancock Creek, and their larger tributaries are drowned valleys subject to daily freshwater (to slightly brackish) tidal fluctuations. These drainage systems are occasionally flooded by storm tides.

## E. SOILS

The soils of the broad interstream terraces are poorly drained. Their topsoils are composed of loamy sand or sandy loam, and are strongly to very strongly acid. The dominant soil types on the terraces are Rains, Goldsboro, Onslow, and Lynchburg. These soils support pine forest, including the Wet Pine Flatwoods (Wet Ultisol Variant) community.

The better-drained stream slope topsoils are composed of loamy sand over a sandy clay loam subsoil, and are strongly to very strongly acid. Sudfolk loamy sand is the dominant slope soil type, and primarily supports the Mesic Mixed Hardwood Forest community type.

The floodplains of small streams above tidal influence contain poorly to very poorly drained soils composed of mucky and sandy loams that are strongly to extremely acid. Masontown mucky loam and Muckalee sandy loam are the dominant soil types in small stream floodplains, and support the Coastal Plain Small Stream Swamp (Blackwater Subtype) community type.

Low upland terraces adjacent to the Neuse River and the larger creeks contain moderately well drained soils composed of lightly acid to very strongly acid loamy sand. Seabrook loamy sand is the dominant soil type, and supports the Coastal Fringe Evergreen Forest community type.

Shoreline flats along the Neuse River, larger creeks, and mouths of tributaries contain soils subject to daily tidal flooding. They are composed of slightly acid to moderately alkaline muck. Lafitte muck is the dominant soil type, and supports the Tidal Freshwater Marsh (Oligohaline Variant) community.

## F. NATURAL DISTURBANCES

Prehistorically, natural fires likely were an important component of the pine communities dominating the broad interstream terraces. This is inferred from the soil types, the current domination by pine, and the remnant populations of such fire-dependent species as Longleaf Pine (*Pinus palustris*) and Spring Goldenrod (*Solidago verna*). The current domination by Loblolly Pine and the near-absence of Wiregrass suggest an extended period of fire suppression historically. Fire is the dominant natural influence in Longleaf Pine communities. In wet pinelands, fire suppresses Loblolly Pine, hardwood trees, and shrubs, and favors a diverse herb layer. Although the historical natural fire frequency at any given site is not known, the average is believed to be every 3-5 years for Longleaf Pine communities. This frequency is optimal for Longleaf Pine reproduction. Also critical to community structure and composition is the seasonality of fire. Although natural fires can occur at any time of the year, the dominant natural fire season is May to July. It is these growing season fires that most suppress hardwood development and favor the diverse herb layer characteristic of Longleaf Pine communities.

The hardwood forests of small stream slopes and the Loblolly Pine forests of larger stream terraces are not fire-dependent communities, as they are naturally protected from fire by their position in the landscape.

Shorelines of the Neuse River, the larger creeks, and the mouths of their tributaries are subject to storm floods. These floods are short-term events, but can impact shoreline communities, particularly if salt levels are increased. Impacts are most likely to occur above the mouths of small tributaries, where more frequent storm flooding would favor the Tidal Freshwater Marsh community, and less frequent flooding would favor the Small Stream Swamp community.

## G. NATURAL COMMUNITIES AND RARE ANIMAL AND PLANT SPECIES

### 1. Summary of Exemplary Natural Communities and Rare Species.

The following exemplary natural communities and rare animal and plant species occur at MCAS Cherry Point:

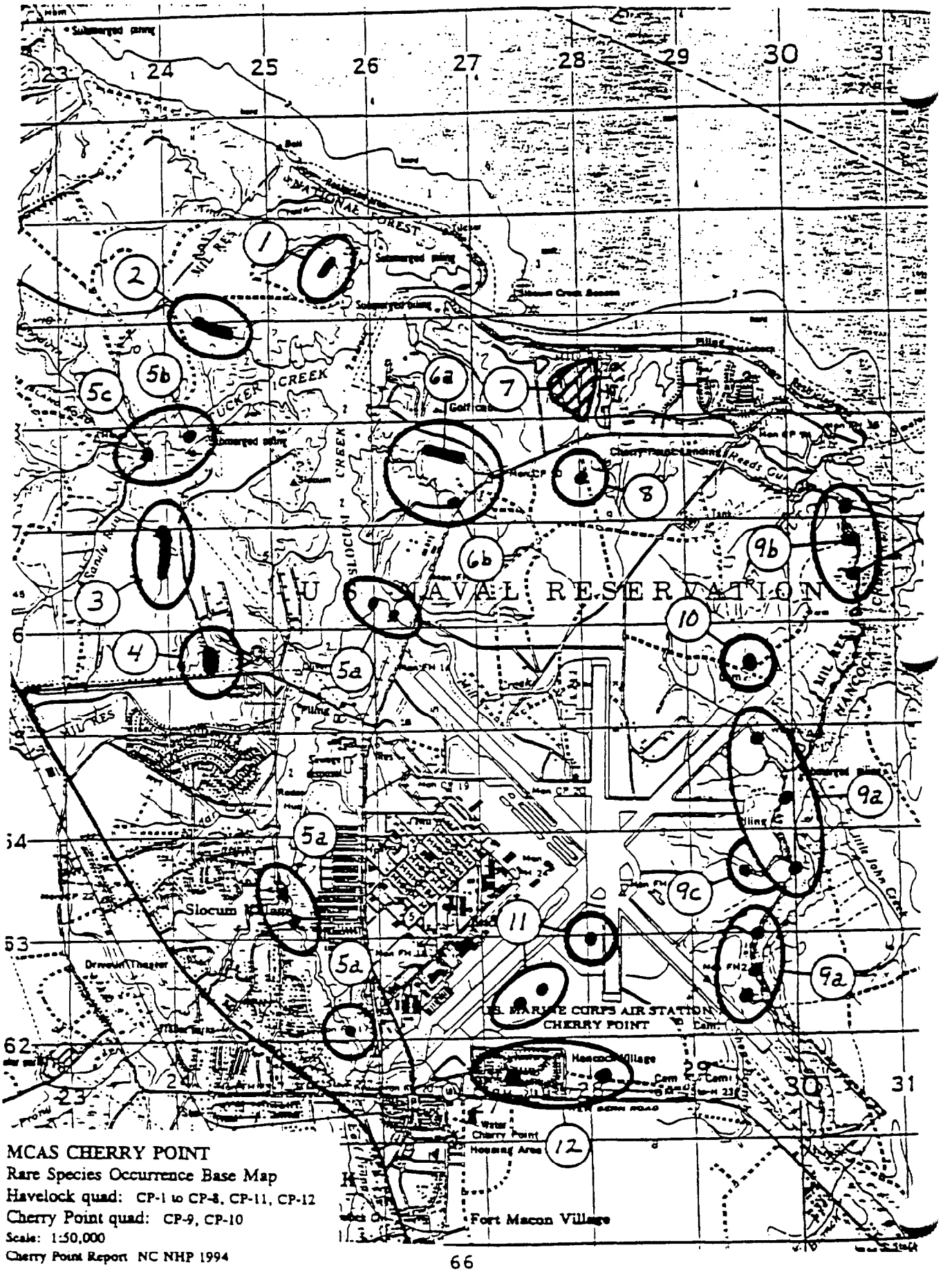
| EXEMPLARY NATURAL COMMUNITIES | NATURAL AREA |
|---|---|
| Coastal Fringe Evergreen Forest | Tucker Creek |
| Mesic Mixed Hardwood Forest | Tucker Creek |
| Tidal Freshwater Marsh (Oligohaline Variant) | Tucker Creek |

**RARE ANIMALS**

| COMMON NAME (LATIN NAME) CRITICAL AREA NAME | QUAD | SITE | STATUS US/NC |
|---|---|---|---|
| Black Bear (*Ursus americanus*) | | | SR |
| Hancock Creek | Cherry Point | CP-9c | |
| American Alligator (*Alligator mississippiensis*) | | | T/T |
| Slocum Creek & Tributaries | Havelock | CP-5a | |
| Hancock Creek | Cherry Point | CP-9a | |
| Pigmy Rattlesnake (*Sistrurus miliarius miliarius*) | | | SR |
| NC 101 Housing Area | Havelock | CP-12 | |
| Bridle Shiner (*Notropis bifrenatus*) | | | SC |
| Slocum Creek & Tributaries | Havelock | CP-5b | |
| Graceful Clam Shrimp (*Lynceus gracilicornis*) | | | SR |
| Half-acre Pond | Cherry Point | CP-10 | |

**RARE PLANTS**

| COMMON NAME (LATIN NAME) CRITICAL AREA NAME | QUAD | SITE | STATUS US/NC |
|---|---|---|---|
| a Gerardia (*Agalinis sp. 1*, possible new species) | | | none |
| Live Oak Point | Cherry Point | CP-9b | |
| Chapman's Sedge (*Carex chapmanii*) | | | C2/C |
| Miry Branch | Havelock | CP-3 | |
| North Prong Bartlett Creek | Havelock | CP-6a | |
| Ridge and Ravine Creeks | Havelock | CP-7 | |
| Tucker Creek Tributary | Havelock | CP-2 | |
| Anderson Creek Tributary | Havelock | CP-1 | |
| Winged Seedbox (*Ludwigia alata*) | | | SR |
| Sandy Run | Havelock | CP-5c | |
| Spring Goldenrod (*Solidago verna*) | | | C2/E |
| Orange Road Flatwoods | Havelock | CP-4 | |
| Bartlett Pond Powerline | Havelock | CP-6b | |
| Cinder Road Flatwoods | Havelock | CP-8 | |
| Area 4 Flatwoods | Havelock | CP-11 | |




MCAS CHERRY POINT
Rare Species Occurrence Base Map
Havelock quad: CP-1 to CP-8, CP-11, CP-12
Cherry Point quad: CP-9, CP-10
Scale: 1:50,000
Cherry Point Report NC NHP 1994

## 2. Natural Communities

A natural community is defined as a distinct and reoccurring assemblage of populations of plants, animals, bacteria, and fungi naturally associated with each other and their physical environment. A natural community thus combines biological and habitat elements. It is important to note that only land in an approximately natural state (i.e., with a structure and composition resulting from natural processes) is classified as a natural community.

Loblolly Pine dominates much of the forested land on the broad interstream terraces of MCAS Cherry Point. Based on soil types and relict species components, it is probable that the indigenous natural community type over much of the terrace lands is the Wet Pine Flatwoods (Wet Ultisol Variant) community, in which Longleaf Pine and Wiregrass are prominent or dominant. This community type is poorly developed at MCAS Cherry Point, possibly due to an extended historical period of fire suppression, or to some prior land use such tree farming or agriculture. The best examples of the Wet Pine Flatwoods community are found west of Orange Road in the Ordnance Area, where Longleaf Pine remains an important component of the canopy; Wiregrass, however, is essentially absent from the ground layer.

The slopes, low terraces, valleys, and shorelines of the major drainage systems of MCAS Cherry Point have been less impacted by current and former land uses, and extensive areas of good to excellent natural communities remain. The Mesic Mixed Hardwood Forest community type occupies the slopes above the small tributary streams flowing into the tidal creeks. Important components of this community include Sweet Gum (*Liquidambar styraciflua*), White Oak (*Quercus alba*), Pignut Hickory (*Carya glabra*), Beech (*Fagus grandifolia*), American Holly (*Ilex opaca*), and Flowering Dogwood (*Cornus florida*).

The inland floodplains of the tributary streams are dominated by the Coastal Plain Small Stream Swamp (Blackwater Subtype) community type. Important components of this community include Swamp Tupelo (*Nyssa biflora*), Baldcypress (*Taxodium distichum*), Red Maple (*Acer rubrum*), and Sweet Gum.

The Tidal Freshwater Marsh (Oligohaline Variant) community forms a fringe along the edges of the Neuse River, Slocum Creek, Hancock Creek, and their larger tributaries. Important components of this community include Big Cordgrass (*Spartina cynosuroides*), Black Needlerush (*Juncus roemerianus*), and Cattail (*Typha latifolia*).

Low upland terraces along the larger tidal creeks support the Coastal Fringe Evergreen Forest community type. Important components of this community include Loblolly Pine, Live Oak (*Quercus virginiana*), Sand Laurel Oak (*Q. hemisphaerica*), Yaupon (*Ilex vomitoria*), and Spanish Moss (*Tillandsia usneoides*).

The Mesic Mixed Hardwood Forest, Coastal Plain Small Stream Swamp, Tidal Freshwater Marsh, and Coastal Fringe Evergreen Forest communities are best developed and most extensive in the Tucker Creek and Anderson Creek drainage systems located in the northwest portion of MCAS Cherry Point. The creek and tributary valleys and adjacent slopes of this area have been proposed as the Tucker Creek Natural Area. Most of this area lies outside current intensive military use areas, and serves primarily as a recreation and forest management area. The southern portion of the proposed natural area lies with the Air Station Ordnance Area. Also included is an outlying area named the Ridge and Ravine Creeks located north from Roosevelt Blvd. to the Neuse River between the road to the Officers Club and the road to the BOQ.

The Tidal Freshwater Marsh (Oligohaline Variant), Coastal Fringe Evergreen Forest, and Mesic Mixed Hardwood Forest communities in the Tucker Creek Natural Area have been determined to be exemplary natural communities.

High quality Tidal Freshwater Marsh habitat also occurs along Hancock Creek and its tributaries, particularly along Still Gut. A disturbed Coastal Fringe Evergreen Forest community is located on the barrier island at the mouth of Hancock Creek.

The natural community types summarized in this section are described more fully in Chapter X.B, "Summary Abstracts for Natural Community Types." The proposed Tucker Creek Natural Area is described in Chapter X.A, "Natural Area Descriptions."

3. Rare Animals

a) **Mammals.**

Black Bear (Ursus americanus), NC Significantly Rare. A Black Bear sighting has been documented at MCAS Cherry Point near Hancock Creek, and bears and bear signs have been casually observed on occasion in all uninhabitated areas of the installation.

b) **Reptiles and Amphibians.**

American Alligator (Alligator mississippiensis), US Threatened/NC Threatened. The American Alligator occurs regularly on and adjacent to MCAS Cherry Point. It is common along the mainstream and larger tributaries of Slocum and Hancock creeks. However, the larger population and the best habitats are associated with Hancock Creek and its tributaries and backwaters. A range of alligator size classes from post-hatchlings to adults indicates active reproduction and the presence of suitable habitat for all life stages on the base. Night surveys from a boat on Hancock and Slocum creeks and their tributaries using a 2,000,000 candle power spotlight detected 12 alligators during about nine hours and 15 minutes of survey time. An annual census of alligators in

Slocum and Hancock creeks on MCAS Cherry Point could be accomplished without a large commitment of time and personnel, and could provide an index of abundance that would help determine the health of the population through time. A census, plus protection of any nest sites that might be found, and enforcement of existing laws protecting the alligator appears to be the best management strategy.

Carolina Pigmy Rattlesnake (Sistrurus miliarius miliarius), NC Significantly Rare. The Carolina Pigmy Rattlesnake is normally found in Wet Pine Flatwoods, Mesic Pine Flatwoods, Xeric Sandhill Scrub, and Pine/Scrub Oak Sandhill habitats. Transition zones between upland habitats and wetlands appear to be important areas for this snake. It has been found on MCAS Cherry Point as recently as 1988 - 1989 (William Rogers, personal communication). It should be found relatively infrequently at MCAS Cherry Point because of the generally low quality and extent of preferred natural communities. Recovery of natural community structure through a variety of techniques, including controlled burns, should improve conditions for this snake.

Other listed or candidate amphibians and reptiles that have not been found but could occur on MCAS Cherry Point are: Carolina Gopher Frog (Rana c. capito), Mimic Glass Lizard (Ophisaurus mimicus), and Southern Hognose Snake (Heterodon simus). Information about the distribution, habitat, and biology of these species is contained in Chapter X.D.

c) **Freshwater Fishes.**

Bridle Shiner (Notropis bifrenatus, NC Special Concern). The Bridle Shiner was documented from Tucker Creek in 1960. It has not been relocated since, and the record is now considered historical. Habitat includes mud-bottomed pools of creeks, often in vegetation. The Tucker Creek population may have been impacted by an increase in salinity from 3.3 ppt. to 8 ppt., which was documented by Rhode, et al. 1979. The species should be looked for in areas with a lower salinity. Tucker Creek is the only site in North Carolina where this species has been recorded.

d) **Crustaceans.**

Graceful Clam Shrimp (Lynceus gracilicornis, NC Significantly Rare). The Graceful Clam Shrimp was documented from a natural temporary pool along the northwest side of the northeast extension of the runway complex. The pond is about one-half acre in size, and straddles the pine forest/runway border. Eggs of the shrimp are drought resistant and remain viable for several years (Taylor 1992). This species is dependent on ephemeral or temporary pools and ponds, and would be lost from the site if the

pond were filled or average water table levels were lowered. The Graceful Clam Shrimp has been found at several Coastal Plain sites in North Carolina, but is otherwise known only from four counties in Texas and one in Florida.

More detailed information about the biology and habitat of rare animals occurring at MCAS Cherry Point is contained in Chapter X.D, "Summary Abstracts for Rare Animals," and Chapter X.E, "Rare Species Population Inventory Reports."

4. Rare Plants

a) **Vascular Plants.** Three rare vascular plant species were documented from MCAS Cherry Point: Chapman's Sedge (*Carex chapmanii*, U.S. Candidate/N.C. Candidate), Winged Seedbox (*Ludwigia alata*, N.C. Significantly Rare), and Spring Goldenrod (*Solidago verna*, U.S. Candidate/N.C. Endangered).

Chapman's Sedge (*Carex chapmanii*) occurs in the Coastal Plain Small Stream Swamp community, where it is found at the upper edge of the floodplains of small streams inland from the reach of tidal influence. Five populations were located: at Miry Branch, at a tributary of Tucker Creek, a tributary of Anderson Creek, Bartlett Creek, and at a tributary of the Neuse River near the BOQ. Continued protection of slopes and streambeds will enhance conditions for this species. Additional surveys of the extensive system of small tributaries associated with the Slocum Creek and Hancock Creek drainages will likely locate additional populations.

Winged Seedbox (*Ludwigia alata*) occurs in the Tidal Freshwater Marsh community, where it is found in the low-herb zone behind the taller graminoids like Big Cordgrass and Black Needlerush. One population was located: at the mouth of Sandy Run where the powerline corridor crosses Tucker Creek. Management for this species requires monitoring of water quality in tidal creeks, and protection from loss of habitat associated with recreational activities (e.g., boat ramps).

Spring Goldenrod (*Solidago verna*) occurs in the Wet Pine Flatwoods (Wet Ultisol Variant) community, where it is found in recently burned woodlands, thinned woodlands, woodland edges created by a roadbed and a powerline corridor, and in a clearing in the runway complex. Four populations were located: along the edge of and in woods adjacent to Orange Road in the Ordnance Area; in a powerline corridor southwest of Bartlett Pond; in woods off Cinder Road south of Roosevelt Blvd.; and in a runway complex clearing and adjacent woods between the runway complex and the housing area located on road NC 101. This species is fire-dependent for reproduction, and the Wet Pine Flatwoods habitat should be burned every 3-5(-7?) years. The optimum natural burning period is May to July. This fire regime will suppress the woody understory and improve conditions for herbaceous species. Fire in Wet Pine Flatwoods habitat that has

not been burned for several years may reveal additional populations of Spring Goldenrod currently dormant.
An undetermined and possibly undescribed species of gerardia (Agalinis genus) was found in the Tidal Freshwater Marsh habitat along Hancock Creek at Live Oak Point during this survey (LeBlond 1993). Because of the complexity of this genus, the taxonomic status of the Hancock Creek entity could not be determined prior to the release of this report. This potentially new gerardia is treated as Agalinis species 1 by the N.C. Natural Heritage Program, which has placed it on the plant species Watch List until its taxonomic status is determined. It is recommended that the shoreline and adjacent slopes of Hancock Creek and its tributaries be protected for maintenance of the Tidal Freshwater Marsh community and upland ecotone. (NOTE: although technically not a rare species, Agalinis species 1 is accorded a critical area description in the following section due to its potentially high significance.)

More detailed information about the biology and habitat of rare plants occurring at MCOLF Atlantic is contained in Chapter X.C, "Summary Abstracts for Rare Plants," and Chapter X.E, "Rare Species Population Inventory Reports."

b) **Nonvascular Plants.** Nonvascular plants were not covered in this inventory.

## H. CRITICAL AREA DESCRIPTIONS

### 1. Introduction - Organization of Information

This chapter contains location maps and descriptions of each discrete critical area containing at least one species recognized as rare at the federal or state level. The information is organized as follows.

**MAPS:** Approximate boundaries of each critical area are indicated on a photocopy of the U.S. Geological Survey (USGS) topographic quad (100%).

**SITE NAME:** In most cases, this is based on a prominent natural or manmade topographic feature in the immediate vicinity.

**MAP NUMBER:** The identifying number for the site on the critical area map.

**LOCATION:** In most cases, the location of a site relative to a topographic feature, usually a road, within 0.05 mile.

**SIZE:** The approximate acreage of the critical area.

**DATES OF INVESTIGATION:** Dates that sites were surveyed during the current inventory. Prior rare plant and animal observation dates are recorded here when known.

**OBSERVERS:** Names of the researchers or observers who documented the occurrence of a rare species or natural community at the site.

**NATURAL COMMUNITIES:** The names of all natural communities known to occur at the site. Schafale and Weakley 1990 is the source of the descriptions and names used to determine the natural community types occurring in MCAS Cherry Point.

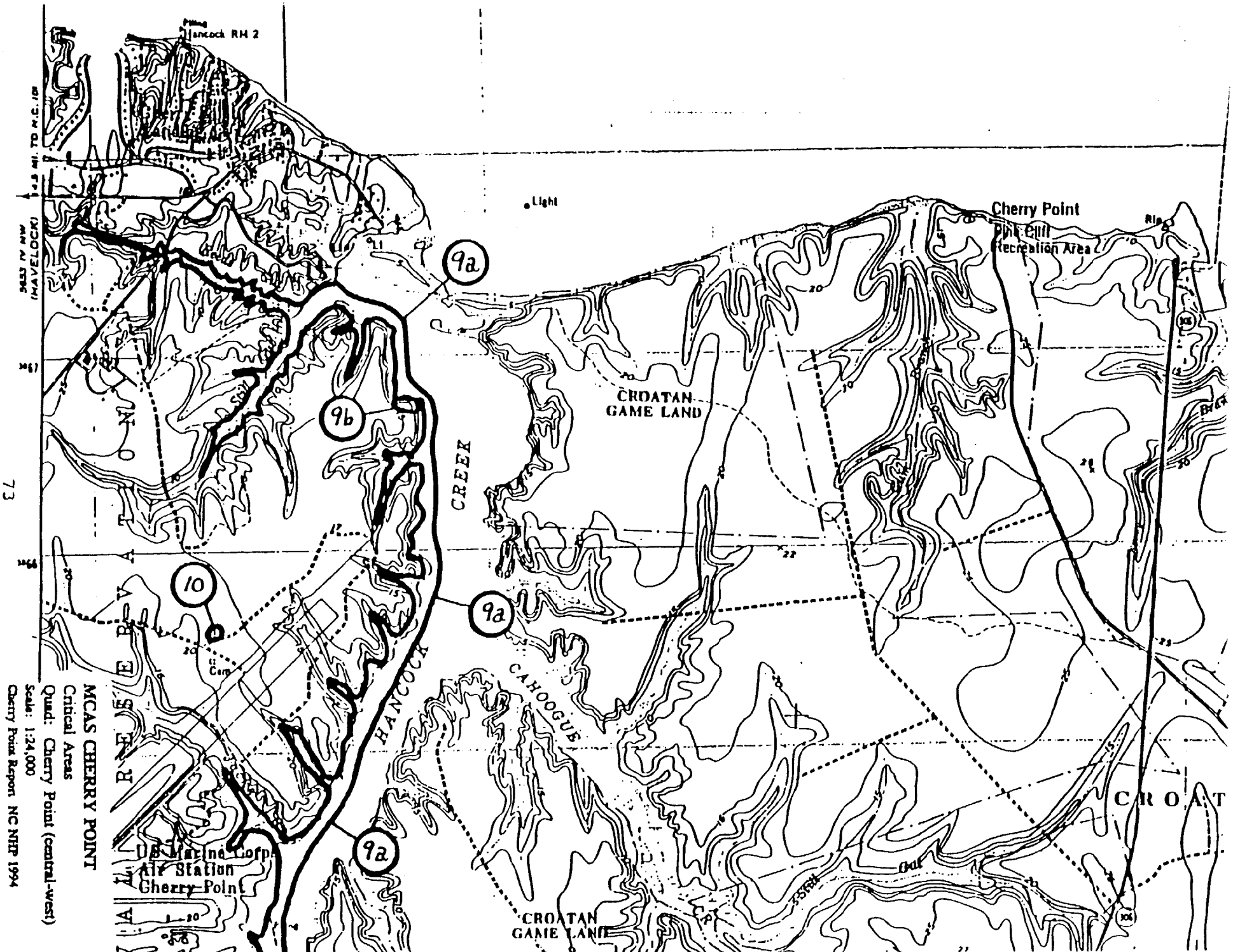
**QUALITY AND INTEGRITY OF NATURAL COMMUNITY:** A description of the quality and condition of the habitat and plant association, including any outstanding features.

**EVIDENT AND POTENTIAL DISTURBANCES AND THREATS:** A description of known and potential impacts to the site, including direct impacts (e.g., plow lines, mowing) and indirect impacts (e.g., fire suppression).

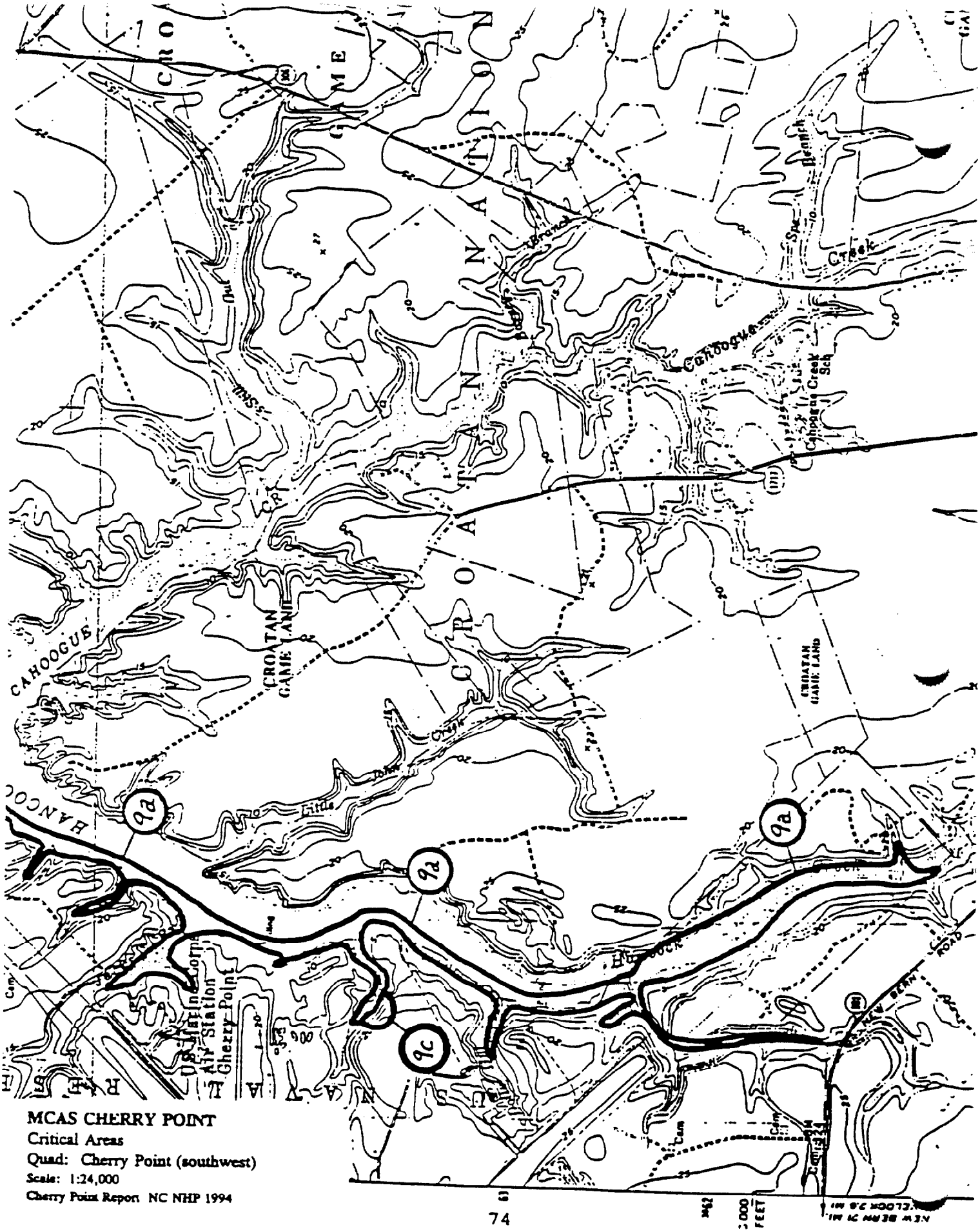
**MANAGEMENT NEEDS:** A description of methods and procedures that will restore, maintain or improve natural conditions and processes at the site.

**ELEMENT OCCURRENCES:** A listing of all rare animals and plants documented at the site, followed by a listing of any exemplary natural communities documented at the site. The rare animals and plants are categorized by Federal (US) and State Rare (NC) status.

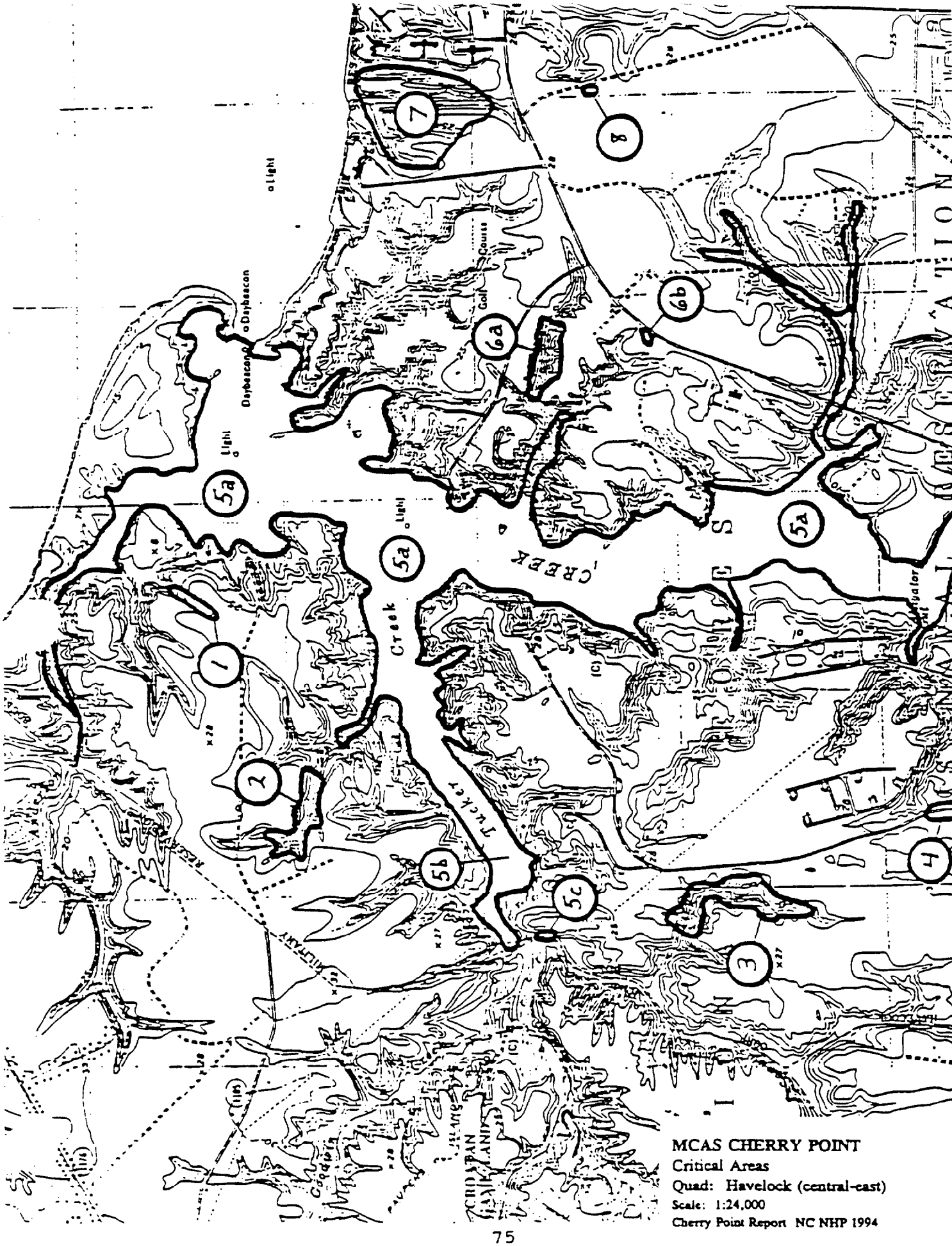
**REPORT REFERENCE:** Refer to Chapter X.B, "Summary Abstracts for Natural Community Types," for descriptions of exemplary natural communities that occur at the site. Refer to Chapter X.A, "Natural Area Descriptions," if the site occurs in a described natural area. Chapter X.C (plants) and X.D (animals) should be consulted for information on specific rare plants and animals.



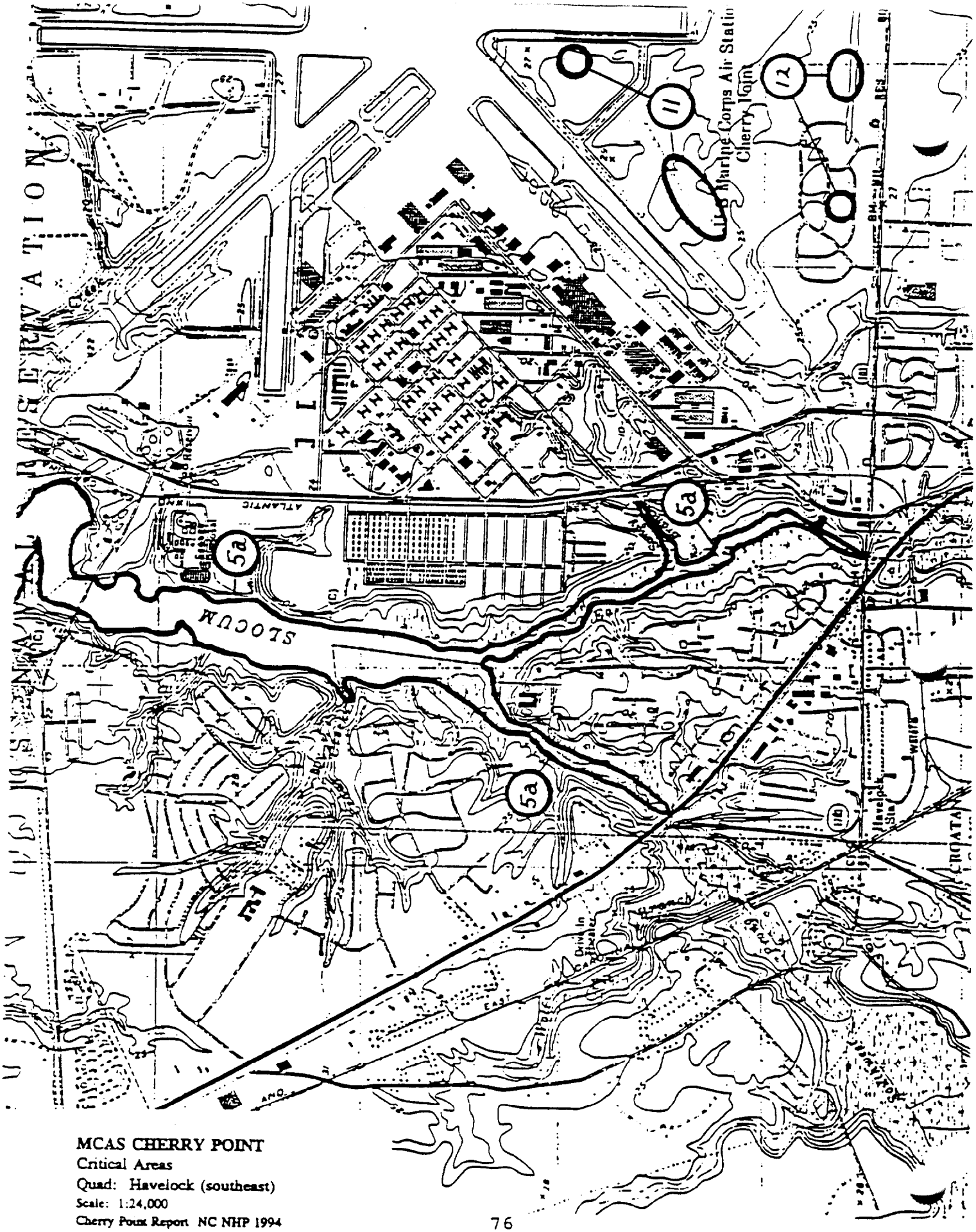

MCAS CHERRY POINT
Critical Areas
Quad: Cherry Point (central-west)
Scale: 1:24,000
Cherry Point Report NC NHP 1994




**MCAS CHERRY POINT**
Critical Areas
Quad: Cherry Point (southwest)
Scale: 1:24,000
Cherry Point Report NC NHP 1994




**MCAS CHERRY POINT**
Critical Areas
Quad: Havelock (central-east)
Scale: 1:24,000
Cherry Point Report NC NHP 1994




**MCAS CHERRY POINT**
Critical Areas
Quad: Havelock (southeast)
Scale: 1:24,000
Cherry Point Report NC NHP 1994

2. Critical Area Descriptions and Maps for MCAS Cherry Point

SITE NAME: Hancock Creek

MAP NUMBER: CP-9a and CP-9c.

LOCATION: Hancock Creek and tributaries from confluence with the Neuse River to road NC 101.

SIZE: Undetermined. The linear extent of Hancock Creek and its tributaries within the critical area is about 10 miles.

DATES OF INVESTIGATION: ca. 1982; 93-5-3, 5-10, 9-15, 9-16, 9-17

OBSERVERS: R.R. Swaisgood, A.L. Braswell, W. Rogers, C. Cheshire, R.J. LeBlond.

NATURAL COMMUNITY: Tidal Freshwater Marsh is the dominant community type. Lesser amounts of the following community types are also present: Coastal Plain Small Stream Swamp, Coastal Plain Semipermanent Impoundment (beaver pond), and Cypress--Gum Swamp.

SOILS: Primarily Lafitte muck

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: The Tidal Freshwater Marsh is in good to excellent condition.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Some accumulation of trash and debris associated with human activities is present. Adjacent development could increase siltation within the drainage system, which could impact alligator habitat or nesting.

MANAGEMENT NEEDS: The quality of aquatic, shoreline, and adjacent habitats needs to be monitored and protected. Base personnel should be educated about the critical status of the alligator.

ELEMENT OCCURRENCES
ANIMALS
US: *Alligator mississippiensis*
NC: *Ursus americanus*

SITE NAME: Live Oak Point

MAP NUMBER: CP-9b.

LOCATION: North shore of Live Oak Point, on west shore of Hancock Creek 0.45 mile due southeast of the mouth of Still Gut.

SIZE: 1/10 acre, an extent of shoreline 150′ x 25′.

DATES OF INVESTIGATION: 93-9-15, 9-17

OBSERVERS: R.J. LeBlond, W. Rogers.

NATURAL COMMUNITY: Tidal Freshwater Marsh

SOILS: Lafitte muck at base of Norfolk loamy fine sand upland.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: The fringing marsh is in good condition, but poorly developed due to the narrowness of the habitat cause by the upslope gradient. Element (Agalinis species 1) occurs in the forb zone between the taller shoreline graminoids and the upland slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Site could be impacted by disturbance to uplands causing erosion of bank, and by impacts to the water quality of Hancock Creek.

MANAGEMENT NEEDS: Disturbance to the upland bank should avoided. It is recommended that the site be protected as part of a management plan for protection of all of the marshlands of Hancock Creek.

ELEMENT OCCURRENCES
PLANTS
NC Watch List: Agalinis species 1

SITE NAME: Half-acre Pond

MAP NUMBER: CP-10.

LOCATION: Off northwest side of northeast extension of runway complex, 0.1 mile north of cemetery mapped on quad. Pond is at UTM 296656.

SIZE: Pond is 0.5 acre.

DATE OF INVESTIGATION: 93-4-20

OBSERVER: A.L. Braswell

NATURAL COMMUNITY: Temporary pond (Vernal Pool).

SOILS: Goldsboro loamy fine sand (possibly a Lynchburg fine sandy loam inclusion).

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: The pond is a natural depression, but has been impacted by clearing for the runway apron. Half of the basin lies in the clearing, the other half in the pine forest.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Site has been impacted by exposure from clearing for runway apron. The critical, temporary nature of the pond is vulnerable to filling and to activities that alter groundwater levels.

MANAGEMENT NEEDS: Site should be monitored frequently for sedimentation impacts and changes in pH. Disturbances such as ditching, vegetation clearing, or logging should be avoided in the vicinity of the pond.

ELEMENT OCCURRENCES
ANIMALS
NC: Lynceus gracilicornis

SITE NAME: Slocum Creek and Tributaries

MAP NUMBER: CP-5a AND CP-5b.

LOCATION: Slocum Creek from Anderson Creek upstream to the crossing of Southwest Prong and East Prong by road U.S. 70, including Anderson Creek, Tucker Creek, and Mill Creek. Portions of the area occur within the proposed Tucker Creek Natural Area.

SIZE: Undetermined. The linear extent of Slocum Creek and its tributaries within the critical area is about 14 miles.

DATES OF INVESTIGATION: 93-6-16, 8-18, 9-17

OBSERVERS: A.L. Braswell, R.R. Swaisgood, C. Cheshire, NREA personnel.

NATURAL COMMUNITY: Tidal Freshwater Marsh is the dominant community type. Lesser amounts of the following community types are also present: Coastal Plain Small Stream Swamp, Coastal Plain Semipermanent Impoundment (beaver pond), and Cypress--Gum Swamp.

SOILS: Primarily Lafitte muck

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Along Slocum Creek proper, natural community quality and integrity is poor to moderate. It is good to excellent along Anderson Creek, Tucker Creek, Southwest Prong, East Prong, and Mill Creek.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Along Slocum Creek, there is much disturbance associated with wastewater outfall, stormwater discharge, and recreational facilities and activity, including accumulation of trash and debris. There is potential for an increase in impacts from current disturbances.

MANAGEMENT NEEDS: Impacts to Slocum Creek from wastewater and stormwater discharge, and from trash and debris, need to be mitigated. Base personnel should be educated about the critical status of the alligator.

ELEMENT OCCURRENCES
ANIMALS
US: *Alligator mississippiensis*
NC: *Notropis bifrenatus*

SITE NAME: Miry Branch

MAP NUMBER: CP-3.

LOCATION: Tributary of Sandy Run located 0.1 mile west of Orange Road in the Ordnance Area 0.5-1 mile north of Slocum Blvd. Area occurs within the proposed Tucker Creek Natural Area.

SIZE: 27 acres

DATES OF INVESTIGATION: 93-5-12, 10-7

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Coastal Plain Small Stream Swamp, Mesic Mixed Hardwood Forest.

SOILS: Suffolk loamy sand grading upslope/upstream into Onslow loamy sand. The floodplain is probably a Masontown mucky fine sandy loam/Muckalee sandy loam inclusion.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Grades from moderate to good downslope, and from good to excellent downstream. Chapman's Sedge (Carex chapmanii) most frequently occurs at the ecotone of the floodplain and the base of the slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Some logging of uplands between stream and Orange Road. No other impacts observed. Any new construction on adjacent terrace could lead to sedimentation and water quality impacts.

MANAGEMENT NEEDS: Slopes and floodplain should be managed for natural structure and composition.

ELEMENT OCCURRENCES
PLANTS
US: Carex chapmanii

SITE NAME: North Prong Bartlett Creek (name derived from Bartlett Pond)

MAP NUMBER: CP-6a.

LOCATION: Tributary of Slocum Creek located 0.1 mile south of Monroe Drive 0.05-0.5 mile west of Roosevelt Blvd.

SIZE: 16 acres

DATES OF INVESTIGATION: 93-5-17, 10-25

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Coastal Plain Small Stream Swamp, Mesic Mixed Hardwood Forest.

SOILS: Masontown mucky fine sandy loam/ Muckalee sandy loam grading upslope to Suffolk loamy sand.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Floodplain in good to excellent condition, but slopes and crest appear to have been historically disturbed. Chapman's Sedge (Carex chapmanii) most frequently occurs at the ecotone of the floodplain and the base of the slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Runoff potential where Munroe Dr. crosses prong, which would introduce sediments, nutrients, and pollutants into streambed.

MANAGEMENT NEEDS: Slopes and floodplain should be managed for natural structure and composition. Any impacts from road crossing should be mitigated.

ELEMENT OCCURRENCES
PLANTS
US: Carex chapmanii

SITE NAME: Ridge and Ravine Creeks

MAP NUMBER: CP-7.

LOCATION: Small tributaries of the Neuse River north from Roosevelt Blvd. between Officers Club and BOQ area. Included as an outlier of the proposed Tucker Creek Natural Area.

SIZE: 58 acres

DATES OF INVESTIGATION: 93-5-17, 10-25; 94-1-7.

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Coastal Plain Small Stream Swamp, Mesic Mixed Hardwood Forest.

SOILS: Masontown mucky fine sandy loam/Muckalee sandy loam grading upslope to Suffolk loamy sand.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Condition of floodplain is low to good, the slopes and summits in moderate to excellent condition. Chapman's Sedge (Carex chapmanii) most frequently occurs at the ecotone of the floodplain and the base of the slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Streambeds near Roosevelt Blvd. have been channelized, and receive runoff. Some disturbance to uplands near Roosevelt Blvd. (clearings, alien species).

MANAGEMENT NEEDS: Road runoff should be directed into catch-basins rather than streambeds. Site should be protected from further impacts to floodplain and adjacent slopes.

ELEMENT OCCURRENCES
- PLANTS
  - US: Carex chapmanii
- NATURAL COMMUNITIES
  - Mesic Mixed Hardwood Forest

SITE NAME: Tucker Creek Tributary

MAP NUMBER: CP-2.

LOCATION: North side tributary of Tucker Creek 0.9 mile due northeast of west side base boundary at Tucker Creek. Area occurs within the proposed Tucker Creek Natural Area.

SIZE: 14 acres

DATE OF INVESTIGATION: 93-9-30

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Coastal Plain Small Stream Swamp, Mesic Mixed Hardwood Forest.

SOILS: Masontown mucky fine sandy loam/Muckalee sandy loam grading upslope to Suffolk loamy sand.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: The floodplain and slopes are in good to excellent condition. Floodplain is narrow and influenced by the mesic hardwood community. Chapman's Sedge (Carex chapmanii) most frequently occurs at the ecotone of the floodplain and the base of the slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: No impacts observed.

MANAGEMENT NEEDS: Slopes and floodplain should be managed for natural structure and composition.

ELEMENT OCCURRENCES
- PLANTS
  - US: Carex chapmanii
- NATURAL COMMUNITIES
  - Mesic Mixed Hardwood Forest

SITE NAME: Anderson Creek Tributary

MAP NUMBER: CP-1.

LOCATION: Tributary off southwest side of Anderson Creek 0.65 mile southeast of west side base boundary at Anderson Creek. Area occurs within the proposed Tucker Creek Natural Area.

SIZE: 7 acres

DATES OF INVESTIGATION: 93-5-12, 9-30

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Coastal Plain Small Stream Swamp, Mesic Mixed Hardwood Forest.

SOILS: Mapped as Autryville loamy sand, but probably a Suffolk and/or Masontown/Muckalee inclusion.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Floodplain and slopes in moderate to good condition, but upper slopes and summits show signs of historical disturbance. Upstream floodplain narrow and influenced by mesic hardwood community. Chapman's Sedge (Carex chapmanii) most frequently occurs at the ecotone of the floodplain and the base of the slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Old clearings and thickets present above stream valley, possibly from past timber management and/or training activities.

MANAGEMENT NEEDS: Slopes and floodplain should be managed for natural structure and composition.

ELEMENT OCCURRENCES
- PLANTS
  - US: Carex chapmanii
- NATURAL COMMUNITIES
  - Mesic Mixed Hardwood Forest

SITE NAME: Sandy Run

MAP NUMBER: CP-5c.

LOCATION: East shore marsh of Sandy Run where crossed by powerline corridor 0.1 mile south of conjunction with Tucker Creek. Area occurs within the proposed Tucker Creek Natural Area.

SIZE: 2 acres

DATE OF INVESTIGATION: 93-10-7

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Tidal Freshwater Marsh (Oligohaline Variant)

SOILS: Lafitte muck

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Conditions good, but site indirectly impacted by clearing of adjacent powerline corridor, thereby improving light conditions. Overall marsh area in excellent condition. Winged Seedbox (*Ludwigia alata*) occurs in the wet, forb-dominated ecotone between the taller marsh graminoids and the upland slope.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Adjacent uplands, including low slope, cleared for powerline corridor. Removal of adjacent woody vegetation undoubtedly has improved light conditions for herbaceous species.

MANAGEMENT NEEDS: Maintenance of powerline corridor should avoid direct impacts to upland/marsh ecotone. Disturbance of soil surface should be prevented to protect site from erosion/sedimentation.

ELEMENT OCCURRENCES
- PLANTS
  - NC: *Ludwigia alata*
- NATURAL COMMUNITIES
  - Tidal Freshwater Marsh (Oligohaline Variant)

SITE NAME: Orange Road Flatwoods

MAP NUMBER: CP-4.

LOCATION: Orange Road shoulders and adjacent west side flatwoods, from powerline corridor at Slocum Blvd. to 400 feet north of Slocum Blvd. Site within the Ordnance Area.

SIZE: 2 acres

DATES OF INVESTIGATION: 92-7-16; 93-5-27, 10-7

OBSERVERS: R.J. LeBlond, J.O. Fussell, W. Rogers.

NATURAL COMMUNITY: Wet Pine Flatwoods (Wet Ultisol Variant)

SOILS: Lynchburg fine sandy loam, approaching ecotone with Onslow loamy sand.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Condition moderately poor due to apparent historical extended period of fire suppression. Spring Goldenrod (Solidago verna) occurs along road shoulders with a few plants in adjacent flatwoods. Recent prescribed burn will initiate recovery if followed by more periodic burns. Some Longleaf Pine (Pinus palustris) persists in the canopy.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Fire suppression evident in canopy dominance by Loblolly Pine (P. taeda), dense shrub understory, low herb diversity, and near-absence of Wiregrass (Aristida stricta).

MANAGEMENT NEEDS: Flatwoods should be burned every 3-5 years, preferably during the May to July natural fire peak period. Growing season burns will reduce the shrub understory and favor herbaceous species. Solidago verna is fire-dependent for reproduction.

ELEMENT OCCURRENCES
PLANTS
US: Solidago verna

SITE NAME: Bartlett Pond Powerline

MAP NUMBER: CP-6b.

LOCATION: Powerline corridor southwest from Roosevelt Blvd. north of graded road passing south of Bartlett Pond, the corridor reaching the graded road 0.1 mile west of Roosevelt Blvd. Site is located in powerline corridor midway between Roosevelt Blvd. and graded road.

SIZE: 1 acre

DATE OF INVESTIGATION: 93-11-12

OBSERVER: J.O. Fussell

NATURAL COMMUNITY: None

SOILS: Goldsboro loamy fine sand at ecotone with Norfolk loamy fine sand.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Low. Site is an artificially maintained powerline corridor.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Spring Goldenrod (Solidago verna) is favored by removal of woody vegetation, but plants are vulnerable to soil disturbances and growing season vegetation removal.

MANAGEMENT NEEDS: Powerline corridor maintenance should be performed during the October to March dormant season. Equipment that disturbs the soil surface should not be used.

ELEMENT OCCURRENCES
PLANTS
US: Solidago verna

SITE NAME: Cinder Road Flatwoods

MAP NUMBER: CP-8.

LOCATION: Flatwoods off west side of Cinder Road 0.225 mile south of Roosevelt Blvd.

SIZE: 1 acre

DATE OF INVESTIGATION: 93-5-27

OBSERVER: R.J. LeBlond

NATURAL COMMUNITY: Wet Pine Flatwoods (Wet Ultisol Variant)

SOILS: Rains fine sandy loam.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Low. Site appears to have undergone an extended period of fire suppression. Only a single individual of Spring Goldenrod (Solidago verna) was found. Recent prescribed burn will initiate recovery if followed by more periodic burns.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Fire suppression evident from absence of Longleaf Pine in the canopy, sparse herbaceous ground layer, and absence of Wiregrass.

MANAGEMENT NEEDS: Flatwoods should be burned every 3-5 years, preferably during the May to July natural fire peak period. Growing season burns will reduce the shrub understory and favor herbaceous species. Spring Goldenrod is fire-dependent for reproduction.

ELEMENT OCCURRENCES
PLANTS
US: Solidago verna

SITE NAME: Area 4 Flatwoods

MAP NUMBER: CP-11.

LOCATION: Runway complex clearing and adjacent flatwoods in Hunting Area 4 near south side of base, north of housing area on NC 101.

SIZE: 20 acres

DATES OF INVESTIGATION: 93-8-16, 12-15; 94-1-7.

OBSERVERS: W. Rogers, R.J. LeBlond.

NATURAL COMMUNITY: Wet Pine Flatwoods (Wet Ultisol Variant).

SOILS: Rains fine sandy loam.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Low to moderate. A portion of the Spring Goldenrod (Solidago verna) population occurs in an artificially maintained clearing associated with the runway complex. The portion of the Spring Goldenrod population in the wooded area has been impacted by timber thinning and fire suppression. However, Longleaf Pine remains an important component of the canopy. Thinned areas have an open understory, while unthinned areas have a dense understory.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Maintenance of the runway complex clearing can disrupt the flowering/fruiting cycle of Spring Goldenrod. The flatwoods have been impacted by clearings and slash associated with timber harvesting. Some areas show evidence of fire suppression by the dense understory.

MANAGEMENT NEEDS: To optimize Spring Goldenrod reproduction, the runway clearing microsite should not be mowed or otherwise disturbed during the April-September growth and reproduction period. The flatwoods should be burned every 3-5 years, preferably during the May to July natural fire peak period. Growing season burns will reduce the shrub understory and favor herbaceous species. Spring Goldenrod (Solidago verna) is a fire-adapted species.

ELEMENT OCCURRENCES
PLANTS
US: Solidago verna

SITE NAME: NC 101 Housing Area

MAP NUMBER: CP-12.

LOCATION: Southeastern portion of MCAS Cherry Point 0.15 mile north of NC 101, from housing area to 0.15 mile east of housing area. One microsite is located centrally in the housing area, the other 0.15 mile east of the housing area eastern boundary. Habitat with moderate potential for the element (*Sistrurus miliarius*) extends eastward to Hancock Creek wetlands.

SIZE: 50 acres

DATES OF INVESTIGATION: ca. 1988/89; 93-5-24

OBSERVERS: W. Rogers, A.L. Braswell, R.R. Swaisgood.

NATURAL COMMUNITY: None. Grassy areas and disturbed Loblolly Pine/mixed hardwoods.

SOILS: Rains fine sandy loam and Rains-Urban land complex.

QUALITY AND INTEGRITY OF NATURAL COMMUNITY: Site disturbed, no natural community present.

EVIDENT AND POTENTIAL DISTURBANCES AND THREATS: Area has experienced fire suppression and wide-scale land use impacts. Area is small and with much human habitation.

MANAGEMENT NEEDS: Area impractical for effective natural habitat recovery. Base personnel and dependents should be educated about the habits and critical status of the Carolina Pigmy Rattlesnake.

ELEMENT OCCURRENCES
ANIMALS
NC: *Sistrurus miliarius*

# APPENDIX K.6

# TOXICITY PROFILES FOR CONTAMINANTS OF POTENTIAL CONCERN
# MARINE CORPS AIR STATION
# CHERRY POINT, NC

## 1.0 ALUMINUM

Although present in food in varying amounts, aluminum (Al) is not an essential element for mammals. The aluminum content of plants typically depends on the soil aluminum concentration and ranges from 10 to 30 mg/kg fresh weight; studies have indicated that this element stimulates the growth of several pasture plant species (Hackett, 1962). As summarized in Venugopal and Luckey (1978), aluminum is not readily absorbed through the skin and gastrointestinal absorption of ingested aluminum is poor due to the transformation of aluminum salts into insoluble aluminum phosphate. The lack of accumulation of aluminum in animals with age or of any increase in tissue levels of aluminum following fairly high dietary intake, suggests that mammals posses a homeostatic mechanism for this element. For most terrestrial organisms, aluminum compounds are generally not harmful and are considered to be toxicologically inert, except in cases of high experimental doses or prolonged inhalation (Venugopal and Luckey, 1978).

Data on the toxicity of aluminum to aquatic organisms is somewhat limited. USEPA (1988) stated that freshwater organisms should not be adversely affected if aluminum concentrations do not exceed 87 $\mu$g/L when pH is between 6.5 and 9.0. Some studies have shown that the acute toxicity of aluminum increases with pH, whereas other studies found the opposite to be true (USEPA, 1988). The occurrence of pH effects in fish depends on aluminum and calcium concentrations in the water. Laboratory studies have established that low pH is toxic to fish, that aluminum concentrations found in acidified waters (particularly inorganic monomeric aluminum) are toxic, and that calcium is ameliorative (Suter, 1993).

Sublethal effects were also reviewed by USEPA (1988). It was found that 169 $\mu$g Al/L at a pH of 6.5 to 6.6 caused a 24 percent reduction in the growth of young brook trout (*Salvelinus fontinalis*). Cleveland et al. (1991) determined that brook trout accumulated significantly higher aluminum residues at pH 5.3 than at pH 6.1 or pH 7.2. They also determined that elimination of aluminum during depuration was more rapid at pH 5.3 than at pH 6.1 or pH 7.2. Data reported in USEPA (1988) indicated this metal does not bioconcentrate; bioconcentration factors range from 50 to 231 for brook trout (geometric mean value = 82).

## 2.0 ANTIMONY

Antimony is frequently associated with nonferrous ore deposits and is commonly encountered in industrial environments, including smelters. It is considered a nonessential metal and is easily taken up by plants if present in a soluble form (Kabata-Pendias and Pendias, 1992). There are no reports of plant toxicity resulting from uptake of antimony. Plants growing in soils contaminated by industrial emissions may be expected to contain elevated levels of antimony.

## 3.0 ARSENIC

Arsenic is a relatively common element; its industrial uses primarily center on the manufacture of pesticides, wood preservatives, and growth stimulants for plants and animals (USFWS, 1988). The chemistry of arsenic in water is complex and is a function of chemical, biological, and geochemical reactions that interact to control the concentration, oxidation state, and form of arsenic in water (USEPA, 1984). Arsenic exists in four oxidation states, both as inorganic and organic forms. Its bioavailability and toxicity are significantly influenced by the physical and chemical forms of arsenic tested, route of exposure, dose, and species of animal tested (USFWS, 1988). Inorganic forms are generally regarded as being more toxic than organic forms, and trivalent forms are more toxic than pentavalent species (USFWS, 1988; USEPA, 1984). Tests conducted to date indicate that this contaminant does not readily bioconcentrate (USEPA, 1984).

Arsenic is a constituent of most plants, but little is known about its biochemical role. In general, arsenic availability to plants is highest in coarse-textured soils having little colloidal material and little ion exchange capacity and lowest in fine textured soils high in clay, organic material, iron, calcium, and phosphate (USFWS, 1988). Reports suggest that plants absorb arsenic passively via the roots with water and that this metal is readily taken up by various plant species (Thoresby and Thornton, 1979). Apparently, arsenic is translocated in plants since its concentration in grain also has been reported (Kabata-Pendias and Pendias, 1992). Except for locations where arsenic content is high, (e.g., around smelters) arsenic is distributed throughout the plant body in non-toxic amounts (USFWS, 1988).

## 4.0 BARIUM

The concentration of barium (Ba) in natural waters is controlled by the solubility of barite ($BaSO_4$), a fairly common mineral. Other factors influencing barium solubility in natural waters include metal oxides or hydroxides (Hem, 1970). Sulfates also govern the solubility of barium in soil as do carbonates, and it is strongly adsorbed to clays. Although commonly reported in plant tissues, it is apparently a nonessential component (Kabata-Pendias and Pendias, 1992). While barium is readily taken up by plants in acidic soil, few reports exist regarding its toxicity to plants. Chaundry et al. (1977) reported 1 to 2 percent barium (dry weight) in plants as highly toxic while 220 mg Ba/kg (ash-free dry weight) has been reported to be moderately toxic (Shacklette et al., 1978). Calcium, magnesium, and sulfur appear to act antagonistically with barium, and may serve to reduce its toxicity (Kabata-Pendias and Pendias, 1992).

## 5.0 CADMIUM

To date, no evidence exists to suggest that cadmium (Cd) is either biologically essential or beneficial (Venugopal and Luckey, 1978; USFWS, 1985). Freshwater biota are particularly sensitive to this heavy metal; concentrations as low as 0.8 to 9.9 $\mu$g Cd/L produce lethality among insects, crustaceans, and fish (USFWS, 1985; USEPA, 1985a). This heavy metal does not bioconcentrate to an appreciable extent; bioconcentration data listed in USEPA (1985a) for freshwater species range from 3 (brook trout) to 4,190 (caddisfly; *Hydropsyche betteni*) with a geometric mean value of 404.

Elemental cadmium (Cd) is insoluble in water, although its chloride and sulfate salts are freely soluble (USFWS, 1985). The availability of cadmium to aquatic biota from their immediate physical and chemical environs depends on numerous factors, including adsorption and desorption rates of cadmium from terrigenous materials, pH, Eh, chemical speciation, and many other modifiers. Adsorption and desorption processes are likely to be major factors in controlling the concentration of cadmium in natural waters and tend to counteract changes in the concentration of cadmium ions in solution (USFWS, 1985). Water hardness also alters the bioavailability of cadmium. Adsorption and desorption rates of cadmium are rapid on mud solids and particles of clay, silica, humic material, and other naturally occurring solids. It should be borne in mind that mobility and availability of cadmium, like most heavy metals, is a function of a large number of interrelated factors (e.g., CEC). Beyer et al. (1985) demonstrated that only a small portion of all metals measured in the soil become incorporated into plant foliage and suggested that most of the metal contamination detected in biota came from aerial deposition.

Compared to aquatic biota, mammals and birds are relatively less sensitive to cadmium exposure. Adult mallards fed a diet containing up to 200 mg Cd/kg survived and exhibited no loss in body weight, although egg production of laying hens was suppressed (White and Finely, 1978). The lowest oral doses producing lethality among mammals were 250 and 150 mg Cd/kg body weight in rats and guinea pigs, respectively (USEPA, 1985a).

## 6.0 CHLORDANE (ALPHA AND GAMMA)

Chlordane was used extensively until most uses were banned in 1988. Due to its long half-life and ability to concentrate in biological materials, it is still widely distributed in fish in the United States (USEPA, 1980a).

Like other organochlorine pesticides, chlordane bioaccumulates in biological materials. It is highly lipophilic and readily absorbed via all routes. Oxidative metabolation of chlordane results in the production of a number of metabolites, including oxychlordane, which is very persistent in body fat. Reductive

dehalogenation of the chlordane forms free radicals hypothesized to contribute significantly to chlordane's toxicity (USEPA, 1994a).

Reduced fertility and survivability in mice and rats has occurred at chlordane doses of 25 and 16 mg/kg, respectively. These chronic effects may be associated with reduced binding of progesterone in the endometrium or with altered metabolism and circulating levels of steroid hormones (USEPA, 1994a).

## 7.0 CHROMIUM

Chromium VI generally does not exist in biological systems, as it is reduced rapidly to chromium III. Chromium VI, however, is much more toxic to living systems than chromium III. Several studies exist regarding the toxicity of chromium VI in mammals. Mice given oral doses of 57, 120, and 234 mg CrVI/kg-day during early gestation experienced increased preimplantation and postimplantation losses, along with decreased litter size (Trivedi et al., 1989). A LOAEL of 57 mg/kg-day was reported for reproductive effects. A decrease in motor activity was seen in rats given oral doses of chromium VI at 98 mg/kg-day for 28 days, and a NOAEL of 9.8 mg/kg-day was reported for these effects (Diaz-Mayans et al., 1986). In addition, mice fed potassium dichromate at 4.6 mg/kg-day exhibited reduced sperm count after 7 weeks, and morphologically altered sperm at 9.1 mg/kg-day after 7 weeks (Zahid et al., 1990). Since Diaz-Mayans et al. (1986) established a clear dose-response relationship, the NOAEL was chosen for derivation of a benchmark value in mammals.

Only one avian study exists for chromium VI. Chickens were fed diets up to 100 ppm chromium VI and no adverse effects on survival or growth were observed after 32 days, suggesting a NOAEL of 100 ppm (Rosomer et al., 1961). A multitude of studies exist on the effects of chromium VI on fish. Since the NAWQC value of 0.011 mg/L was the most conservative value, it is the benchmark value for forage, small, and large fish. For fish and terrestrial organisms, the data show that chromium VI does not effectively bioaccumulate.

## 8.0 DDT ANALOGS

DDT has not been marketed in the United States since 1972, but is ubiquitous due to its widespread use in previous decades and its relatively long half-life. DDT's close structural analogs, DDE and DDD, are metabolites of DDT and have also been formulated as pesticides in the past (Hayes, 1982). Because of its persistent nature, coupled with its hydrophobic properties and solubility in lipids, DDT and its metabolites are concentrated from water by aquatic organisms at all trophic levels. It also readily enters the food web and is bioaccumulated by organisms at higher trophic levels (USEPA, 1980b).

DDT is intermediate in toxicity to fish in comparison to other chlorinated hydrocarbon pesticides. It is less toxic that aldrin, dieldrin, endrin and toxaphene, but more toxic than chlordane, lindane and methoxychlor (USEPA, 1980b). Invertebrates are, for the most part, more sensitive than fish species, but the range of species LC50s for macroinvertebrates (10,000) is much greater than that for fish (300). The least sensitive species listed in USEPA (1980b) was a stonefly (*Pteronarcys californica*) with a 96 h LC50 of 1.8 mg/L. Week-old crayfish were the most sensitive reported species (LC50 = 0.00018 mg/L) although 10-week old crayfish of the same species had an LC50 of 0.003 mg/L. USEPA (1980b) reported that of the species for which data were available, yellow perch was the most sensitive freshwater species tested (96 h LC50 of 0.6 $\mu$g/L) where as the least sensitive species was the goldfish (96 LC50 = 180 $\mu$g/L).

Bioconcentration factors from laboratory tests with DDT and saltwater organisms ranged from 1200 to 76300 for fish and shellfish, respectively (USEPA, 1980b).

Data for DDE indicate that long-term dietary dosage at 2.8 to 3.0 mg/kg DDE (wet weight) can have adverse effects on reproduction of mallards, black ducks, and screech owls. Species that feed on saltwater animals containing DDT and its metabolites have exhibited reductions in their reproductive capacity (Rand and Petrocelli, 1985). Anderson et al. (1975) studied the impacts of DDT in northern anchovies (a species with a high lipid content) on the reproductive success of brown pelicans. The concentrations of this contaminant steadily declined in anchovies over this 5-year study and pelican reproduction improved; the authors concluded that even the lowest concentrations detected in anchovies (0.15 mg/kg) and the subsequent 97 mg/kg concentration in pelican eggs was unacceptably high, because pelican eggshell thickness was still too low and pelican recruitment was still not high enough to sustain a stable population.

## 9.0 DIELDRIN

Dieldrin has been one of the most widely used and distributed pesticides in the United States. Once released in to the environment, aldrin readily transforms into dieldrin (USEPA, 1980c). Based on concerns related to human health toxicity, USEPA banned aldrin and dieldrin from most uses 1974; production was terminated in 1987. However, as a result of the relatively long half-life of dieldrin, it continues to be detected nationwide (USEPA, 1994a). Like other organochlorine pesticides, dieldrin is lipophilic and is ultimately stored primarily in fat and tissues with lipid components. Mammalian sex and species differences have been reported in the metabolism and tissue distribution of dieldrin; males appear to metabolize and excrete dieldrin more rapidly than females (USEPA, 1994a).

Aquatic toxicity tests have demonstrated that dieldrin in concentrations as low as 1.1 to 9.9 $\mu$g/L were acutely toxic to sensitive fish species (e.g., rainbow trout). Goldfish represent more resistant species; 96-h LC50 = 41 $\mu$g/L. Saltwater species are even more sensitive to dieldrin; concentrations as low as 0.28 to

50 $\mu$g/L were acutely toxic to saltwater invertebrates. All saltwater fish species were sensitive to acute exposures to either aldrin or dieldrin (USEPA, 1980c).

## 10.0 HEPTACHLOR EPOXIDE

Heptachlor epoxide is a breakdown product of the organochlorine pesticides, heptachlor and chlordane. It is a contaminant of both products (USEPA, 1994a). It is more toxic than either parent compound. Although most uses of heptachlor were suspended in 1978 and chlordane was removed from the market in 1988, heptachlor epoxide continues to be a widespread contaminant due to its relatively long biological half-life. Based on animal and limited human data, heptachlor epoxide is absorbed through the GI tract and is found primarily in the liver, bone marrow, brain, and fat, although it is distributed widely to other tissues as well. Heptachlor epoxide has a high affinity for adipose tissue.

## 11.0 MANGANESE

Manganese (Mn) does not occur naturally as a metal but is found in various salts and minerals, frequently in association with iron compounds (USEPA, 1986). Manganese is a vital micronutrient for both plants and animals. McKee and Wolfe (1963) summarized the data concerning the toxicity of manganese to freshwater life. Manganese ions rarely occur in concentrations above 1 mg/L. The reported tolerance values for freshwater organisms range from 1.5 to >1000 mg Mn/L.

## 12.0 MERCURY

In a recent review of the hazards of mercury (Hg) to fish, wildlife, and invertebrates, USFWS (1987) noted that mercury and its compounds have no known biological function. Its presence is regarded as undesirable and potentially hazardous. It is a mutagen, teratogen, and carcinogen. Forms of mercury with relatively low toxicity can be transformed into forms with very high toxicity through biological and other processes. Methylmercury can be bioconcentrated in organisms and biomagnified through food chains, returning mercury to upper trophic level consumers in a concentrated form. Bioconcentration factors for methylmercury range from 10,000 for brook trout to 81,670 for fathead minnows (*Pimephales promelas*); the geometric mean value of bioconcentration values listed in USEPA (1985b) for freshwater organisms is 25,400. For all organisms tested, early developmental stages were the most sensitive, and organomercury compounds – especially methylmercury – were more toxic than inorganic forms. Numerous biotic and abiotic factors modify the toxicity of mercury compounds, sometimes by an order of magnitude or more, but mechanisms of action are unclear (USFWS, 1987).

The chemical speciation of mercury (Hg) is probably the most important variable influencing ecotoxicology of Hg, but Hg speciation is complicated, especially in natural environments (Boudou and Ribeyre, 1983; USFWS, 1987). Most mercury entering aquatic systems is inorganic (Hg II) although recent studies have measured methylated mercury ($CH_3HgH^+$) in rain and surface runoff (Bloom and Watras, 1989; Lee and Hultberg, 1990). Methyl mercury is the major form of mercury in fish; methylation of inorganic mercury takes place in the terrestrial environment, the water column, and in sediment. The net amount of methyl mercury in an aquatic system is the result not only of its rate of formation, but also the result of the rates of those processes that alter the availability of inorganic mercury for methylation and methyl mercury decomposition (demethylation) (Winfrey and Rudd, 1990).

Inorganic mercury readily adsorbs to inorganic and organic particles as well as dissolved organic carbon (DOC) (Benes and Havelik, 1979; Rudd and Turner, 1983; Rodgers et al., 1984). The degree and extent of this binding, while not well understood, will affect the availability of mercury for methylation. Methylation of mercury in most aquatic systems is thought to be primarily a function of microbiological activity in the sediment (Winfrey and Rudd, 1990). Rates of methylation peak at the sediment-water interface and decrease in the overlying water and subsurface sediment (Korthals and Winfrey, 1987). Reduced pH also appears to increase the availability of methylated mercury by expediting its release from sediment into the water column.

## 13.0 POLYCHLORINATED BIPHENYLS (AROCLOR 1260)

Polychlorinated biphenyls (PCBs) are a mixture of chlorinated biphenyl chemicals which occur individually as 209 congeners, comprised of various chlorine substitution patterns. PCBs are closely related to many chlorinated hydrocarbon pesticides (e.g, DDT, dieldrin, and aldrin) in their chemical, physical, and toxicological properties and in their widespread occurrence in the aquatic environment (Nimmo, 1985). Mixtures of PCBs were marketed under the trade name Aroclor, with a numeric designation that indicated their chlorine content. Although production and use was banned in 1979, the chemical group is extremely persistent in the environment and bioaccumulates through the foodchain. There is evidence that the most potent, dioxin-like PCB congeners are preferentially accumulated in higher organisms. Additional research indicates that there is evidence that PCB risks increase with increased chlorination because more highly chlorinated PCBs are retained more efficiently in fatty tissues (USEPA, 1994b). The non-ortho-substituted coplanar PCB congeners, and some of the mono-ortho-substituted congeners, have been shown to exhibit dioxin-like effects. There is increasing evidence that many of the toxic effects of PCBs result from alterations in hormonal function. Consequently, the aggregate toxicity of a PCB mixture may increase as it moves up the foodchain (USEPA, 1993).

The three main effects of PCB exposure on terrestrial wildlife are mortality, decreased reproductive success, and behavioral modifications (USEPA, 1993). Mink (*Mustela vison*) appear to be among the most sensitive species to the toxic effects of PCBs (Gillette et al., 1987). Single oral doses of PCBs administered to mink have produced $LD_{50}$ values of 750 mg/kg for Aroclor-1221 and 4,000 mg/kg for Aroclor-1254 (Aulerich and Ringer, 1977; Ringer, 1983). The primary chronic effect documented as a result of dietary exposure to PCBs has been decreased reproductive success, as evidenced by reduced whelping rates, fetal death, and reduced growth among the young. Based on a review of available data, USEPA determined that 30 $\mu$g/kg/d represented an NOEL value for reproductive effects of Aroclor-1254 (USEPA, 1993).

Birds have been shown to be more resistant than mammalian species to the acute effects of PCBs. PCB doses greater than 200 ppm in the diet (10 mg/kg body weight) caused some mortality among northern bobwhite (*Colinus virginians*), mallards (*Anas plythynchos*), and ring-necked pheasants (*Phasianus colchicus*). PCBs provided to these birds at dietary concentrations of 1,500 ppm (100 mg/kg body weight) caused extensive mortality. Exposure to PCBs resulted in some mortality among all the avian species tested, with lethal concentrations depending on the length of exposure and the particular PCB mixture (Aulerich et al., 1973). For all avian species, PCB residue concentrations of at least 310 mg/kg fresh weight in the brain were associated with an increased likelihood of death from PCB poisoning (USFWS, 1986a). An evaluation of the results of various toxicity studies performed on a number of bird species led USEPA (1993) to conclude that 0.18 mg/kg/body weight represented an appropriate NOEL for avian wildlife.

## 14.0 SELENIUM

Selenium (Se) is the most strongly enriched element in coal, being present as an organoselenium compound, a chelated species, or an adsorbed element. On combustion of coal, the sulfur dioxide formed reduces the selenium to elemental Se (USFWS, 1986b). Selenium is an element that is required in trace amounts by some organisms. While considered to be an essential element for plants and animals, Se is toxic at higher concentrations (Masscheleyn and Patrick, 1993).

Selenium biogeochemistry is complex and governed by many factors. The solubility of minerals containing Se, the complexing ability of solid and soluble ligands, microbiologically mediated oxidation-reduction reactions, methylation, and volatilization are all potential processes controlling Se concentration, mobility, and toxicity in both the aquatic and sedimentary environment (Masscheleyn and Patrick, 1993). The quantification of Se species present at the sediment-water interface and the extent of species transformations are critical to understanding Se biogeochemical behavior and its biotic and abiotic reactivity. According to Masscheleyn and Patrick (1993), redox potential and pH are the most important parameters determining chemical speciation and stability of Se in aquatic systems. Its chemistry resembles that of sulfur (S).

Selenium, like S, can exist in four different oxidation states: selenide (Se -II), elemental selenium (Se0), selenite (Se IV) and selenate (Se VI).

It has been suggested that selenite is more toxic than selenate, particularly to early life stages and that these effects are most pronounced at elevated temperatures. Also, Se salts may be converted to methylated forms by microorganisms, and these forms are readily accumulated by freshwater vertebrates (USEPA, 1987a). Se is readily taken up and transferred in the aquatic food chain. The high availability and intrinsic toxicity of Se oxyanions to aquatic organisms, plants, and wildlife make Se a harmful trace element. At high concentrations, detoxification by means of the formation of volatile metallothien and subsequent excretion become increasingly important (Masscheleyn and Patrick, 1993).

Selenium metabolism and degradation is significantly modified by interaction with heavy metals, agricultural chemicals, microorganisms, and a variety of physicochemical factors. Results of laboratory studies and field investigations with fish, mammals, and birds have led to the general agreement that elevated concentrations of Se in diet or water are associated with reproductive abnormalities, including congenital malformations, selective bioaccumulation by the organisms, and growth retardation (USFWS, 1986b).

Accumulation of Se by aquatic organisms is highly variable. In short-term tests, exposures to concentrations ranging from 0.015 to 3.3 $\mu$g Se/L, resulted in biological concentration factors of 460 for the mosquito fish (*Gambusia* sp.) to 32,000 for a freshwater gastropod (Nassos et al., 1980). Selenium accumulation is modified by water temperature, age of the organism, organ or tissue specificity, mode of administration, and other factors (USEPA, 1987a).

In a lake in North Carolina receiving selenium (as flyash waste from a coal-fired power station), reproduction of green sunfish (*Lepomis cyanellus*) failed, and the population declined markedly. In these fish, Se levels were elevated in liver and other tissues; kidney, heart, liver, and gills exhibited altered histopathology and blood chemistry. It is probable that Se uptake by plankton [containing 41 to 97 parts per million (ppm) dry weight] from the lake water [9 to 12 parts per billion (ppb)] introduced Se into the foodchain where it ultimately reached levels in fish through biomagnification (Cumbie and van Horn, 1978).

## 15.0 SILVER

Numerous studies have indicated that free soluble silver (Ag) is among the most toxic metals to freshwater organisms. In most natural waters, the monovalent form of silver is of greatest concern. Silver may exist as a simple hydrated monovalent ion, or it may exist in various degrees of association with inorganic ions such as sulfate, bicarbonate, or nitrate (USEPA, 1980d). Silver is more toxic in soft water than in hard water (USEPA, 1980d). The sorption of silver by manganese dioxide, various ferric compounds, and clay minerals

and its subsequent partitioning by the sediment layer is strongly pH dependent (Dyck, 1968). Olcott (1950) administered 0.1 percent silver nitrate to rats in drinking water for 218 days. Upon necropsy, advanced pigmentation and ventricular hypertrophy were observed, although the hypertrophy was not attributed to silver toxicity.

Silver exhibits a limited ability to bioconcentrate. Bioconcentration factors for freshwater species reported by USEPA (1980d) ranged from <1 for bluegill sunfish (*Lepomis macrochirus*) to 240 for a mayfly (*Ephemeralla grandis)* with a geometric mean bioconcentration factor of 57.

## 16.0 THALLIUM

Thallium is considered highly toxic. Acute ingestion by laboratory animals induced gastroenteritis, neuropathy, and renal and liver damage, while chronic ingestion causes alopecia (Kazantzis, 1986). Rats treated with thallium compounds for 90 days experienced liver damage (USEPA, 1994a).

## 17.0 VANADIUM

Vanadium (V) is an ubiquitous element, frequently associated with petroleum refining and products. It is also used in the hardening of steel, production of pigments, and the manufacture of insecticides. It is common in many foods, particularly milk, cereals, and vegetables. While the majority of vanadium encountered in mammals is stored in fatty tissue, bone and teeth contribute to the body burden (Amdur et al. 1991). It has been postulated that homeostatic processes exist for this element in that normal tissue levels can be maintained in the face of excessive uptake. The toxic action of vanadium in mammals is largely confined to the respiratory tract. Acute vanadium poisoning via ingestion is characterized by effects on the nervous system, hemorrhage, and respiratory distress (Amdur et al. 1991). No reports exist regarding vanadium phytoxicity under field conditions. However, experimental greenhouse studies have indicated that concentrations of 140 mg/kg in the soil and 0.5 mg/kg in the nutrient solution may be toxic to plants (Kabata-Pendias and Pendias 1992).

## 18.0 ZINC

Zinc is the fourth most widely used metal in the world and its major uses are for galvanizing steel, producing alloys, and as an ingredient in paints and rubber. Zinc occurs in many forms in natural waters and sediment. At pH 6.0, the dominant forms of dissolved zinc are the free ion (98 percent) and zinc sulfate, whereas at pH 9.0, the dominant forms are the mono-hydroxide ion (78 percent), zinc carbonate (16 percent), and the free ion (6 percent). Like many other cationic metals, the concentration of dissolved zinc is a function of both water hardness and pH (USEPA, 1987b).

Although zinc is an essential micronutrient for all living organisms, acute values for freshwater invertebrates range from 32 to 40,930 $\mu$g/L and those for fish range from 66 to 40,900 $\mu$g/L. Chronic values for invertebrates have been reported at concentrations as low as 46.7 $\mu$g/L while exposure of fish to 36.4 $\mu$g/L has resulted in chronic toxicity. Acute and chronic toxicity of this metal is a function of water hardness (USEPA, 1987b).

## 19.0 OTHER CONTAMINANTS

No data were available regarding the toxicity or environmental fate of 1,1-dichloroethane, chloroethane, and 4-nitrophenol.

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RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 9.64E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 2.78E-02 |
| Barium | | | 1.08E-01 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.20E-02 |
| Chromium | | | 1.06E-02 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.37E-04 |
| Lead | | | 6.45E-04 |
| Manganese | | | 5.07E-03 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 2.92E-05 |
| Selenium | | | 4.67E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.96E-04 |
| Zinc | | | 3.54E-04 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 9.45E-04 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 3.41E-05 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 3.53E-04 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 1.27E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 1.58E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 3.70E-05 |
| Bis(2-ethylhexyl)phthalate | | | 3.19E-04 |
| Chlorobenzene | | | 3.57E-02 |
| Cis-1,2-Dichloroethane | | | 2.15E-04 |
| Vinyl Chloride | | | 5.73E-03 |
| Aldrin | | | 4.87E-04 |
| Endrin | | | 1.06E-03 |
| Lindane | | | 1.46E-05 |
| Heptachlor Epoxide | | | 9.25E-04 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 2.37E-01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 4.74E-02 |
| Antimony | | | 4.39E+00 |
| Arsenic | | | 9.85E-02 |
| Barium | | | 5.99E-01 |
| Beryllium | | | 3.37E-03 |
| Cadmium | | | 9.47E-01 |
| Chromium | | | 1.17E-01 |
| Cobalt | | | 2.59E-03 |
| Copper | | | 3.58E-02 |
| Lead | | | 2.62E-02 |
| Manganese | | | 1.83E-02 |
| Mercury | | | 4.34E-03 |
| Nickel | | | 2.62E-03 |
| Selenium | | | 2.60E-02 |
| Silver | | | 9.23E-01 |
| Vanadium | | | 2.05E-03 |
| Zinc | | | 1.87E-01 |
| Toluene | | | 6.55E-06 |
| Xylene | | | 6.29E-04 |
| Benzo(a)pyrene | | | 2.96E-03 |
| Di-N-octylphthalate | | | 8.98E-02 |
| Flouranthene | | | 3.99E-05 |
| Pyrene | | | 4.28E-03 |
| 4,4'-DDD | | | 3.70E-04 |
| 4,4'-DDE | | | 4.03E-04 |
| 4,4'-DDT | | | 2.56E-04 |
| Alpha-Chlordane | | | 6.53E-06 |
| Aroclor 1254 | | | 8.07E-05 |
| Aroclor 1260 | | | 3.75E-02 |
| Dieldrin | | | 1.24E-02 |
| Endosulfan I | | | 1.32E-03 |
| Endrin aldehyde | | | 2.26E-03 |
| Heptachlor | | | 7.42E-05 |
| Gamma-Chlordane | | | 5.68E-05 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.05E-02 |
| Thallium | | | 1.55E-01 |
| | | | |
| TOTAL | | | 7.75E+00 |

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.59E+03 | | | | | | | 2.45E+01 | | 1.00E+00 | 1.00E+00 | 2.45E+01 |
| Water | 4.95E-01 | | | | | 4.82E-02 | | | | 1.00E+00 | 1.00E+00 | 4.82E-02 |
| Food-an. | 8.35E-01 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.98E+00 | | | | 2.37E-01 | | | | | 1.00E+00 | 1.00E+00 | 2.37E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.30E+00 | | | | | | | 1.23E-02 | | 1.00E+00 | 1.00E+00 | 1.23E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.28E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.90E-02 | | | | 5.49E-03 | | | | | 1.00E+00 | 1.00E+00 | 5.49E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.59E+03 | 2.45E+01 | 5.00E+00 | 4.90E+00 | |
| Water | 4.95E-01 | 4.82E-02 | 5.00E+00 | 9.64E-03 | |
| Food | 3.82E+00 | 2.37E-01 | 5.00E+00 | 4.74E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.96E+00 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E+00 | 1.23E-02 | 1.25E-03 | 9.84E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Food | 6.94E-02 | 5.49E-03 | 1.25E-03 | 4.39E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.42E+01 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.60E+00 | | | | | | | 1.39E-02 | | 1.00E+00 | 1.00E+00 | 1.39E-02 |
| Water | 3.60E-03 | | | | | 3.50E-04 | | | | 1.00E+00 | 1.00E+00 | 3.50E-04 |
| Food-an. | 6.93E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.56E-02 | | | | 1.24E-03 | | | | | 1.00E+00 | 1.00E+00 | 1.24E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.54E+01 | | | | | | | 1.36E-01 | | 1.00E+00 | 1.00E+00 | 1.36E-01 |
| Water | 5.60E-02 | | | | | 5.45E-03 | | | | 1.00E+00 | 1.00E+00 | 5.45E-03 |
| Food-an. | 5.83E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.81E-01 | | | | 3.03E-02 | | | | | 1.00E+00 | 1.00E+00 | 3.03E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.60E+00 | 1.39E-02 | 1.26E-02 | 1.10E+00 | |
| Water | 3.60E-03 | 3.50E-04 | 1.26E-02 | 2.78E-02 | |
| Food | 1.63E-02 | 1.24E-03 | 1.26E-02 | 9.85E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.23E+00 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.54E+01 | 1.36E-01 | 5.06E-02 | 2.68E+00 | |
| Water | 5.60E-02 | 5.45E-03 | 5.06E-02 | 1.08E-01 | |
| Food | 3.82E-01 | 3.03E-02 | 5.06E-02 | 5.99E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.39E+00 |

| Contaminant and Form | Test Species | Lab Test Results (mg/kg/day) | Endpoint Species | Scaling Factor (Prod. of 1/UFs) | Estimated Wild-life NOAEL (mg/kg/day) |
|---|---|---|---|---|---|
| Aluminum | Rat | 5.00E+01 | Cottontail | 1.00E-01 | 5.00E+00 |
| Antimony | Mouse | 1.25E+00 | Cottontail | 1.00E-03 | 1.25E-03 |
| Arsenic | Mouse | 1.26E+00 | Cottontail | 1.00E-02 | 1.26E-02 |
| Barium | Rat | 5.06E+00 | Cottontail | 1.00E-02 | 5.06E-02 |
| Beryllium | Rat | 6.60E-01 | Cottontail | 1.00E-01 | 6.60E-02 |
| Cadmium | Mouse | 2.52E+00 | Cottontail | 1.00E-02 | 2.52E-02 |
| Chromium | Mouse | 4.60E+00 | Cottontail | 1.00E-02 | 4.60E-02 |
| Cobalt | Rat | 1.57E+02 | Cottontail | 1.00E-03 | 1.57E-01 |
| Copper | Rat | 6.60E+01 | Cottontail | 1.00E-01 | 6.60E+00 |
| Lead | Rat | 8.00E+00 | Cottontail | 1.00E-01 | 8.00E-01 |
| Manganese | Rat | 8.80E+01 | Cottontail | 1.00E-01 | 8.80E+00 |
| Mercury | Mouse | 1.32E+01 | Cottontail | 1.00E-01 | 1.32E+00 |
| Nickel | Rat | 4.00E+01 | Cottontail | 1.00E-01 | 4.00E+00 |
| Selenium | Mouse | 7.50E-01 | Cottontail | 1.00E-01 | 7.50E-02 |
| Silver | Rat | 1.81E+02 | Cottontail | 1.00E-04 | 1.81E-02 |
| Vanadium | Rat | 1.14E+01 | Cottontail | 1.00E-01 | 1.14E+00 |
| Zinc | Rat | 1.60E+02 | Cottontail | 1.00E-01 | 1.60E+01 |
| Toluene | Mouse | 2.60E+02 | Cottontail | 1.00E-01 | 2.60E+01 |
| Xylene | Mouse | 2.06E+00 | Cottontail | 1.00E-01 | 2.06E-01 |
| Benzo(a)pyrene | Mouse | 1.00E+01 | Cottontail | 1.00E-02 | 1.00E-01 |
| Di-N-octylphthalate | Mouse | 5.50E+02 | Cottontail | 1.00E-01 | 5.50E+01 |
| Flouranthene | Mouse | 1.25E+02 | Cottontail | 1.00E-01 | 1.25E+01 |
| Pyrene | Mouse | 7.50E+01 | Cottontail | 1.00E-03 | 7.50E-02 |
| 4,4'-DDD | Rat | 8.00E-01 | Cottontail | 1.00E-01 | 8.00E-02 |
| 4,4'-DDE | Rat | 8.00E-01 | Cottontail | 1.00E-01 | 8.00E-02 |
| 4,4'-DDT | Rat | 8.00E-01 | Cottontail | 1.00E-01 | 8.00E-02 |
| Alpha-Chlordane | Mouse | 4.58E+00 | Cottontail | 1.00E-01 | 4.58E-01 |
| Aroclor 1254 | Mouse | 1.35E+00 | Cottontail | 1.00E-02 | 1.35E-02 |
| Aroclor 1260 | Mouse | 1.35E+00 | Cottontail | 1.00E-02 | 1.35E-02 |
| Dieldrin | Rat | 2.00E-01 | Cottontail | 1.00E-02 | 2.00E-03 |
| Endosulfan I | Rat | 1.50E+00 | Cottontail | 1.00E-02 | 1.50E-02 |
| Endrin aldehyde | Mouse | 9.00E-01 | Cottontail | 1.00E-02 | 9.00E-03 |
| Heptachlor | Rat | 8.00E-01 | Cottontail | 1.00E-01 | 8.00E-02 |
| Gamma-Chlordane | Mouse | 4.58E+00 | Cottontail | 1.00E-01 | 4.58E-01 |
| Benzene | Mouse | 2.63E+02 | Cottontail | 1.00E-02 | 2.63E+00 |
| Bis(2-ethylhexyl)phthalate | Mouse | 1.83E+01 | Cottontail | 1.00E-01 | 1.83E+00 |
| Chlorobenzene | Beagle | 2.73E+01 | Cottontail | 1.00E-03 | 2.73E-02 |
| Cis-1,2-Dichloroethane | Mouse | 4.52E+02 | Cottontail | 1.00E-03 | 4.52E-01 |
| Vinyl Chloride | Rat | 1.70E+00 | Cottontail | 1.00E-02 | 1.70E-02 |
| Aldrin | Rat | 2.00E-01 | Cottontail | 1.00E-01 | 2.00E-02 |
| Endrin | Mouse | 9.20E-01 | Cottontail | 1.00E-02 | 9.20E-03 |
| Lindane | Rat | 8.00E+00 | Cottontail | 1.00E-01 | 8.00E-01 |
| Heptachlor Epoxide | Beagle | 2.00E-02 | Cottontail | 1.00E-02 | 2.00E-04 |
| Methylene chloride | Rat | 5.85E+00 | Cottontail | 1.00E-02 | 5.85E-02 |
| Thallium | Rat | 7.40E-01 | Cottontail | 1.00E-03 | 7.40E-04 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 4.90E+00 |
| Antimony | | | 9.84E+00 |
| Arsenic | | | 1.10E+00 |
| Barium | | | 2.68E+00 |
| Beryllium | | | 2.27E-02 |
| Cadmium | | | 4.24E-01 |
| Chromium | | | 1.74E+00 |
| Cobalt | | | 2.49E-02 |
| Copper | | | 9.64E-03 |
| Lead | | | 1.96E-01 |
| Manganese | | | 2.46E-02 |
| Mercury | | | 1.46E-03 |
| Nickel | | | 2.94E-03 |
| Selenium | | | 6.99E-02 |
| Silver | | | 6.20E-01 |
| Vanadium | | | 4.60E-02 |
| Zinc | | | 1.40E-02 |
| Toluene | | | 4.46E-06 |
| Xylene | | | 9.60E-05 |
| Benzo(a)pyrene | | | 1.28E-02 |
| Di-N-octylphthalate | | | 6.51E-06 |
| Flouranthene | | | 1.15E-04 |
| Pyrene | | | 2.57E-02 |
| 4,4'-DDD | | | 1.56E-03 |
| 4,4'-DDE | | | 1.53E-03 |
| 4,4'-DDT | | | 1.08E-03 |
| Alpha-Chlordane | | | 1.04E-04 |
| Aroclor 1254 | | | 1.11E-02 |
| Aroclor 1260 | | | 2.50E-01 |
| Dieldrin | | | 3.48E-02 |
| Endosulfan I | | | 1.68E-03 |
| Endrin aldehyde | | | 6.36E-03 |
| Heptachlor | | | 1.34E-04 |
| Gamma-Chlordane | | | 2.33E-04 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.10E-03 |
| Thallium | | | 2.60E+01 |
| | | | |
| TOTAL | | | 4.81E+01 |

# DOSE CALCULATIONS FOR EASTERN COTTONTAIL

## MEAN CONCENTRATION

| Predicted Mean Chemical Concentration by Media (mg/kg) | | | | |
|---|---|---|---|---|
| Chemical | Ingestion | | | |
| | Soil | Water | Food-Animal | Food-Veget. |
| Aluminum | 4.59E+03 | 4.95E-01 | 8.35E-01 | 2.98E+00 |
| Antimony | 2.30E+00 | 0.00E+00 | 4.28E-04 | 6.90E-02 |
| Arsenic | 2.60E+00 | 3.60E-03 | 6.93E-04 | 1.56E-02 |
| Barium | 2.54E+01 | 5.60E-02 | 5.83E-04 | 3.81E-01 |
| Beryllium | 2.80E-01 | 0.00E+00 | 3.98E-05 | 2.80E-03 |
| Cadmium | 2.00E+00 | 3.10E-03 | 3.15E-04 | 3.00E-01 |
| Chromium | 1.50E+01 | 5.00E-03 | 6.82E-04 | 6.75E-02 |
| Cobalt | 7.30E-01 | 0.00E+00 | 3.46E-04 | 5.11E-03 |
| Copper | 1.19E+01 | 9.30E-03 | 7.97E-02 | 2.98E+00 |
| Lead | 2.93E+01 | 5.30E-03 | 1.64E-03 | 2.64E-01 |
| Manganese | 4.05E+01 | 4.58E-01 | 3.73E-03 | 2.03E+00 |
| Mercury | 3.60E-01 | 0.00E+00 | 5.44E-03 | 7.20E-02 |
| Nickel | 2.20E+00 | 1.20E-03 | 3.33E-03 | 1.32E-01 |
| Selenium | 9.80E-01 | 3.60E-03 | 2.57E-03 | 2.45E-02 |
| Silver | 2.10E+00 | 0.00E+00 | 2.14E-03 | 2.10E-01 |
| Vanadium | 9.80E+00 | 2.30E-03 | 3.10E-03 | 2.94E-02 |
| Zinc | 4.18E+01 | 5.82E-02 | 8.78E+00 | 3.76E+01 |
| Toluene | 2.17E-02 | 0.00E+00 | 9.00E-08 | 2.14E-03 |
| Xylene | 3.70E-03 | 2.00E-03 | 1.85E-07 | 1.63E-03 |
| Benzo(a)pyrene | 2.40E-01 | 0.00E+00 | 1.02E-03 | 3.72E-03 |
| Di-N-octylphthalate | 6.70E-02 | 0.00E+00 | 1.80E-01 | 6.21E+01 |
| Flouranthene | 2.70E-01 | 0.00E+00 | 1.93E-04 | 6.27E-03 |
| Pyrene | 3.60E-01 | 0.00E+00 | 6.56E-03 | 4.04E-03 |
| 4,4'-DDD | 2.34E-02 | 2.80E-05 | 8.90E-05 | 3.72E-04 |
| 4,4'-DDE | 2.29E-02 | 0.00E+00 | 5.39E-05 | 4.06E-04 |
| 4,4'-DDT | 1.61E-02 | 2.90E-04 | 5.99E-05 | 2.57E-04 |
| Alpha-Chlordane | 8.90E-03 | 0.00E+00 | 1.42E-02 | 3.76E-05 |
| Aroclor 1254 | 2.80E-02 | 0.00E+00 | 1.35E-05 | 1.37E-05 |
| Aroclor 1260 | 6.30E-01 | 0.00E+00 | 1.83E-02 | 6.37E-03 |
| Dieldrin | 1.30E-02 | 2.60E-04 | 8.15E-06 | 3.11E-04 |
| Endosulfan I | 4.70E-03 | 0.00E+00 | 1.17E-07 | 2.49E-04 |
| Endrin aldehyde | 1.07E-02 | 0.00E+00 | 6.71E-06 | 2.56E-04 |
| Heptachlor | 2.00E-03 | 1.30E-04 | 1.89E-07 | 7.47E-05 |
| Gamma-Chlordane | 2.00E-02 | 0.00E+00 | 6.67E-05 | 3.27E-04 |
| Benzene | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | 0.00E+00 | 6.00E-03 | 0.00E+00 | 0.00E+00 |
| Chlorobenzene | 0.00E+00 | 1.00E-02 | 0.00E+00 | 0.00E+00 |
| Cis-1,2-Dichloroethane | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Vinyl Chloride | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Aldrin | 0.00E+00 | 1.00E-04 | 0.00E+00 | 0.00E+00 |
| Endrin | 0.00E+00 | 1.00E-04 | 0.00E+00 | 0.00E+00 |
| Lindane | 0.00E+00 | 1.20E-04 | 0.00E+00 | 0.00E+00 |
| Heptachlor Epoxide | 0.00E+00 | 1.90E-06 | 0.00E+00 | 0.00E+00 |
| Methylene chloride | 1.20E-02 | 0.00E+00 | 8.27E-09 | 7.76E-03 |
| Thallium | 3.60E+00 | 0.00E+00 | 1.74E-02 | 1.44E-03 |

| Predicted Maximum Chemical Concentration by Media (mg/kg) | | | | |
|---|---|---|---|---|
| Chemical | Ingestion | | | |
| | Soil | Water | Food-Animal | Food-Veget. |
| Aluminum | 1.30E+04 | 4.95E-01 | 2.37E+00 | 8.45E+00 |
| Antimony | 3.60E+00 | 0.00E+00 | 6.70E-04 | 1.08E-01 |
| Arsenic | 1.71E+01 | 3.60E-03 | 4.56E-03 | 1.03E-01 |
| Barium | 1.03E+02 | 5.60E-02 | 2.36E-03 | 1.55E+00 |
| Beryllium | 2.80E-01 | 0.00E+00 | 3.98E-05 | 2.80E-03 |
| Cadmium | 6.40E+00 | 3.10E-03 | 1.01E-03 | 9.60E-01 |
| Chromium | 5.12E+01 | 5.00E-03 | 2.33E-03 | 2.30E-01 |
| Cobalt | 1.60E+00 | 0.00E+00 | 7.58E-04 | 1.12E-02 |
| Copper | 5.08E+01 | 9.30E-03 | 3.40E-01 | 1.27E+01 |
| Lead | 7.65E+01 | 5.30E-03 | 4.28E-03 | 6.89E-01 |
| Manganese | 2.11E+02 | 4.58E-01 | 1.94E-02 | 1.06E+01 |
| Mercury | 1.00E+00 | 0.00E+00 | 1.51E-02 | 2.00E-01 |
| Nickel | 5.40E+00 | 1.20E-03 | 8.16E-03 | 3.24E-01 |
| Selenium | 3.20E+00 | 3.60E-03 | 8.40E-03 | 8.00E-02 |
| Silver | 3.70E+00 | 0.00E+00 | 3.77E-03 | 3.70E-01 |
| Vanadium | 2.42E+01 | 2.30E-03 | 7.66E-03 | 7.26E-02 |
| Zinc | 2.09E+02 | 5.82E-02 | 4.39E+01 | 1.88E+02 |
| Toluene | 4.20E-02 | 0.00E+00 | 1.74E-07 | 4.15E-03 |
| Xylene | 1.10E-02 | 2.00E-03 | 5.51E-07 | 4.85E-03 |
| Benzo(a)pyrene | 2.40E-01 | 0.00E+00 | 1.02E-03 | 3.72E-03 |
| Di-N-octylphthalate | 6.70E-02 | 0.00E+00 | 1.80E-01 | 6.21E+01 |
| Flouranthene | 2.70E-01 | 0.00E+00 | 1.93E-04 | 6.27E-03 |
| Pyrene | 3.60E-01 | 0.00E+00 | 6.56E-03 | 4.04E-03 |
| 4,4'-DDD | 4.30E-02 | 2.80E-05 | 1.64E-04 | 6.83E-04 |
| 4,4'-DDE | 6.90E-02 | 0.00E+00 | 1.62E-04 | 1.22E-03 |
| 4,4'-DDT | 3.50E-02 | 2.90E-04 | 1.30E-04 | 5.59E-04 |
| Alpha-Chlordane | 2.70E-02 | 0.00E+00 | 4.30E-02 | 1.14E-04 |
| Aroclor 1254 | 2.80E-02 | 0.00E+00 | 1.35E-05 | 1.37E-05 |
| Aroclor 1260 | 6.30E-01 | 0.00E+00 | 1.83E-02 | 6.37E-03 |
| Dieldrin | 2.30E-02 | 2.60E-04 | 1.44E-05 | 5.50E-04 |
| Endosulfan I | 7.60E-03 | 0.00E+00 | 1.88E-07 | 4.03E-04 |
| Endrin aldehyde | 2.70E-03 | 0.00E+00 | 2.12E-06 | 6.46E-04 |
| Heptachlor | 2.00E-03 | 1.30E-04 | 1.89E-07 | 7.47E-05 |
| Gamma-Chlordane | 2.90E-02 | 0.00E+00 | 9.67E-05 | 4.75E-04 |
| Benzene | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | 0.00E+00 | 6.00E-03 | 0.00E+00 | 0.00E+00 |
| Chlorobenzene | 0.00E+00 | 1.00E-02 | 0.00E+00 | 0.00E+00 |
| Cis-1,2-Dichloroethane | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Vinyl Chloride | 0.00E+00 | 1.00E-03 | 0.00E+00 | 0.00E+00 |
| Aldrin | 0.00E+00 | 1.00E-04 | 0.00E+00 | 0.00E+00 |
| Endrin | 0.00E+00 | 1.00E-04 | 0.00E+00 | 0.00E+00 |
| Lindane | 0.00E+00 | 1.20E-04 | 0.00E+00 | 0.00E+00 |
| Heptachlor Epoxide | 0.00E+00 | 1.90E-06 | 0.00E+00 | 0.00E+00 |
| Methylene chloride | 1.20E-02 | 0.00E+00 | 8.27E-09 | 7.76E-03 |
| Thallium | 6.70E+00 | 0.00E+00 | 3.24E-02 | 2.68E-03 |

# APPENDIX K.7

# DOSE CALCULATIONS

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 1.50E-03 | | 1.00E+00 | 1.00E+00 | 1.50E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.80E-03 | | | | 2.23E-04 | | | | | 1.00E+00 | 1.00E+00 | 2.23E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.00E+00 | | | | | | | 1.07E-02 | | 1.00E+00 | 1.00E+00 | 1.07E-02 |
| Water | 3.10E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 3.15E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.00E-01 | | | | 2.39E-02 | | | | | 1.00E+00 | 1.00E+00 | 2.39E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 1.50E-03 | 6.60E-02 | 2.27E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Food | 2.84E-03 | 2.23E-04 | 6.60E-02 | 3.37E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.61E-02 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E+00 | 1.07E-02 | 2.52E-02 | 4.24E-01 | |
| Water | 3.10E-03 | 3.02E-04 | 2.52E-02 | 1.20E-02 | |
| Food | 3.00E-01 | 2.39E-02 | 2.52E-02 | 9.47E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.38E+00 |

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.50E+01 | | | | | | | 8.02E-02 | | 1.00E+00 | 1.00E+00 | 8.02E-02 |
| Water | 5.00E-03 | | | | | 4.87E-04 | | | | 1.00E+00 | 1.00E+00 | 4.87E-04 |
| Food-an. | 6.82E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.75E-02 | | | | 5.37E-03 | | | | | 1.00E+00 | 1.00E+00 | 5.37E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 7.30E-01 | | | | | | | 3.90E-03 | | 1.00E+00 | 1.00E+00 | 3.90E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.46E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 5.11E-03 | | | | 4.06E-04 | | | | | 1.00E+00 | 1.00E+00 | 4.06E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chromium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.50E+01 | 8.02E-02 | 4.60E-02 | 1.74E+00 | |
| Water | 5.00E-03 | 4.87E-04 | 4.60E-02 | 1.06E-02 | |
| Food | 6.82E-02 | 5.37E-03 | 4.60E-02 | 1.17E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.87E+00 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.30E-01 | 3.90E-03 | 1.57E-01 | 2.49E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Food | 5.46E-03 | 4.06E-04 | 1.57E-01 | 2.59E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.74E-02 |

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.19E+01 | | | | | | | 6.36E-02 | | 1.00E+00 | 1.00E+00 | 6.36E-02 |
| Water | 9.30E-03 | | | | | 9.05E-04 | | | | 1.00E+00 | 1.00E+00 | 9.05E-04 |
| Food-an. | 7.97E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.98E+00 | | | | 2.37E-01 | | | | | 1.00E+00 | 1.00E+00 | 2.37E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.93E+01 | | | | | | | 1.57E-01 | | 1.00E+00 | 1.00E+00 | 1.57E-01 |
| Water | 5.30E-03 | | | | | 5.16E-04 | | | | 1.00E+00 | 1.00E+00 | 5.16E-04 |
| Food-an. | 1.64E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.64E-01 | | | | 2.10E-02 | | | | | 1.00E+00 | 1.00E+00 | 2.10E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.19E+01 | 6.36E-02 | 6.60E+00 | 9.64E-03 | |
| Water | 9.30E-03 | 9.05E-04 | 6.60E+00 | 1.37E-04 | |
| Food | 3.05E+00 | 2.37E-01 | 6.60E+00 | 3.58E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.56E-02 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.93E+01 | 1.57E-01 | 8.00E-01 | 1.96E-01 | |
| Water | 5.30E-03 | 5.16E-04 | 8.00E-01 | 6.45E-04 | |
| Food | 2.65E-01 | 2.10E-02 | 8.00E-01 | 2.62E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.23E-01 |

| Manganese | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.05E+01 | | | | | | | 2.17E-01 | | 1.00E+00 | 1.00E+00 | 2.17E-01 |
| Water | 4.58E-01 | | | | | 4.46E-02 | | | | 1.00E+00 | 1.00E+00 | 4.46E-02 |
| Food-an. | 3.73E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.03E+00 | | | | 1.61E-01 | | | | | 1.00E+00 | 1.00E+00 | 1.61E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 1.92E-03 | | 1.00E+00 | 1.00E+00 | 1.92E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.44E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.20E-02 | | | | 5.73E-03 | | | | | 1.00E+00 | 1.00E+00 | 5.73E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.05E+01 | 2.17E-01 | 8.80E+00 | 2.46E-02 | |
| Water | 4.58E-01 | 4.46E-02 | 8.80E+00 | 5.07E-03 | |
| Food | 2.03E+00 | 1.61E-01 | 8.80E+00 | 1.83E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.80E-02 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 1.92E-03 | 1.32E+00 | 1.46E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Food | 7.74E-02 | 5.73E-03 | 1.32E+00 | 4.34E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.80E-03 |

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.20E+00 | | | | | | | 1.18E-02 | | 1.00E+00 | 1.00E+00 | 1.18E-02 |
| Water | 1.20E-03 | | | | | 1.17E-04 | | | | 1.00E+00 | 1.00E+00 | 1.17E-04 |
| Food-an. | 3.33E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.32E-01 | | | | 1.05E-02 | | | | | 1.00E+00 | 1.00E+00 | 1.05E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 9.80E-01 | | | | | | | 5.24E-03 | | 1.00E+00 | 1.00E+00 | 5.24E-03 |
| Water | 3.60E-03 | | | | | 3.50E-04 | | | | 1.00E+00 | 1.00E+00 | 3.50E-04 |
| Food-an. | 2.57E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.45E-02 | | | | 1.95E-03 | | | | | 1.00E+00 | 1.00E+00 | 1.95E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.20E+00 | 1.18E-02 | 4.00E+00 | 2.94E-03 | |
| Water | 1.20E-03 | 1.17E-04 | 4.00E+00 | 2.92E-05 | |
| Food | 1.35E-01 | 1.05E-02 | 4.00E+00 | 2.62E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.59E-03 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E-01 | 5.24E-03 | 7.50E-02 | 6.99E-02 | |
| Water | 3.60E-03 | 3.50E-04 | 7.50E-02 | 4.67E-03 | |
| Food | 2.71E-02 | 1.95E-03 | 7.50E-02 | 2.60E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.01E-01 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.10E+00 | | | | | | | 1.12E-02 | | 1.00E+00 | 1.00E+00 | 1.12E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.14E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.10E-01 | | | | 1.67E-02 | | | | | 1.00E+00 | 1.00E+00 | 1.67E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 9.80E+00 | | | | | | | 5.24E-02 | | 1.00E+00 | 1.00E+00 | 5.24E-02 |
| Water | 2.30E-03 | | | | | 2.24E-04 | | | | 1.00E+00 | 1.00E+00 | 2.24E-04 |
| Food-an. | 3.10E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.94E-02 | | | | 2.34E-03 | | | | | 1.00E+00 | 1.00E+00 | 2.34E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.10E+00 | 1.12E-02 | 1.81E-02 | 6.20E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Food | 2.12E-01 | 1.67E-02 | 1.81E-02 | 9.23E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.54E+00 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E+00 | 5.24E-02 | 1.14E+00 | 4.60E-02 | |
| Water | 2.30E-03 | 2.24E-04 | 1.14E+00 | 1.96E-04 | |
| Food | 3.25E-02 | 2.34E-03 | 1.14E+00 | 2.05E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.82E-02 |

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.18E+01 | | | | | | | 2.23E-01 | | 1.00E+00 | 1.00E+00 | 2.23E-01 |
| Water | 5.82E-02 | | | | | 5.67E-03 | | | | 1.00E+00 | 1.00E+00 | 5.67E-03 |
| Food-an. | 8.78E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.76E+01 | | | | 2.99E+00 | | | | | 1.00E+00 | 1.00E+00 | 2.99E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.17E-02 | | | | | | | 1.16E-04 | | 1.00E+00 | 1.00E+00 | 1.16E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.00E-08 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.14E-03 | | | | 1.70E-04 | | | | | 1.00E+00 | 1.00E+00 | 1.70E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.18E+01 | 2.23E-01 | 1.60E+01 | 1.40E-02 | |
| Water | 5.82E-02 | 5.67E-03 | 1.60E+01 | 3.54E-04 | |
| Food | 4.64E+01 | 2.99E+00 | 1.60E+01 | 1.87E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.01E-01 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.17E-02 | 1.16E-04 | 2.60E+01 | 4.46E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Food | 2.14E-03 | 1.70E-04 | 2.60E+01 | 6.55E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.10E-05 |

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.70E-03 | | | | | | | 1.98E-05 | | 1.00E+00 | 1.00E+00 | 1.98E-05 |
| Water | 2.00E-03 | | | | | 1.95E-04 | | | | 1.00E+00 | 1.00E+00 | 1.95E-04 |
| Food-an. | 1.85E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.63E-03 | | | | 1.30E-04 | | | | | 1.00E+00 | 1.00E+00 | 1.30E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 1.28E-03 | | 1.00E+00 | 1.00E+00 | 1.28E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.72E-03 | | | | 2.96E-04 | | | | | 1.00E+00 | 1.00E+00 | 2.96E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E-03 | 1.98E-05 | 2.06E-01 | 9.60E-05 | |
| Water | 2.00E-03 | 1.95E-04 | 2.06E-01 | 9.45E-04 | |
| Food | 1.63E-03 | 1.30E-04 | 2.06E-01 | 6.29E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.67E-03 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 1.28E-03 | 1.00E-01 | 1.28E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Food | 4.74E-03 | 2.96E-04 | 1.00E-01 | 2.96E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.58E-02 |

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 3.58E-04 | | 1.00E+00 | 1.00E+00 | 3.58E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.21E+01 | | | | 4.94E+00 | | | | | 1.00E+00 | 1.00E+00 | 4.94E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 1.44E-03 | | 1.00E+00 | 1.00E+00 | 1.44E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.27E-03 | | | | 4.99E-04 | | | | | 1.00E+00 | 1.00E+00 | 4.99E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 3.58E-04 | 5.50E+01 | 6.51E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Food | 6.23E+01 | 4.94E+00 | 5.50E+01 | 8.98E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.98E-02 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 1.44E-03 | 1.25E+01 | 1.15E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Food | 6.47E-03 | 4.99E-04 | 1.25E+01 | 3.99E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.55E-04 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 1.92E-03 | | 1.00E+00 | 1.00E+00 | 1.92E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.04E-03 | | | | 3.21E-04 | | | | | 1.00E+00 | 1.00E+00 | 3.21E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 1.92E-03 | 7.50E-02 | 2.57E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Food | 1.06E-02 | 3.21E-04 | 7.50E-02 | 4.28E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.99E-02 |

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.34E-02 | | | | | | | 1.25E-04 | | 1.00E+00 | 1.00E+00 | 1.25E-04 |
| Water | 2.80E-05 | | | | | 2.73E-06 | | | | 1.00E+00 | 1.00E+00 | 2.73E-06 |
| Food-an. | 8.90E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.72E-04 | | | | 2.96E-05 | | | | | 1.00E+00 | 1.00E+00 | 2.96E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.29E-02 | | | | | | | 1.22E-04 | | 1.00E+00 | 1.00E+00 | 1.22E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.39E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.06E-04 | | | | 3.23E-05 | | | | | 1.00E+00 | 1.00E+00 | 3.23E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.34E-02 | 1.25E-04 | 8.00E-02 | 1.56E-03 | |
| Water | 2.80E-05 | 2.73E-06 | 8.00E-02 | 3.41E-05 | |
| Food | 4.61E-04 | 2.96E-05 | 8.00E-02 | 3.70E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.97E-03 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.29E-02 | 1.22E-04 | 8.00E-02 | 1.53E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Food | 4.59E-04 | 3.23E-05 | 8.00E-02 | 4.03E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.93E-03 |

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.61E-02 | | | | | | | 8.61E-05 | | 1.00E+00 | 1.00E+00 | 8.61E-05 |
| Water | 2.90E-04 | | | | | 2.82E-05 | | | | 1.00E+00 | 1.00E+00 | 2.82E-05 |
| Food-an. | 5.99E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.57E-04 | | | | 2.05E-05 | | | | | 1.00E+00 | 1.00E+00 | 2.05E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 8.90E-03 | | | | | | | 4.76E-05 | | 1.00E+00 | 1.00E+00 | 4.76E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.42E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.76E-05 | | | | 2.99E-06 | | | | | 1.00E+00 | 1.00E+00 | 2.99E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.61E-02 | 8.61E-05 | 8.00E-02 | 1.08E-03 | |
| Water | 2.90E-04 | 2.82E-05 | 8.00E-02 | 3.53E-04 | |
| Food | 3.17E-04 | 2.05E-05 | 8.00E-02 | 2.56E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.68E-03 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 8.90E-03 | 4.76E-05 | 4.58E-01 | 1.04E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 1.42E-02 | 2.99E-06 | 4.58E-01 | 6.53E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.10E-04 |

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 1.50E-04 | | 1.00E+00 | 1.00E+00 | 1.50E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.37E-05 | | | | 1.09E-06 | | | | | 1.00E+00 | 1.00E+00 | 1.09E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 3.37E-03 | | 1.00E+00 | 1.00E+00 | 3.37E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.37E-03 | | | | 5.07E-04 | | | | | 1.00E+00 | 1.00E+00 | 5.07E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 1.50E-04 | 1.35E-02 | 1.11E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 1.09E-06 | 1.35E-02 | 8.07E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.12E-02 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 3.37E-03 | 1.35E-02 | 2.50E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 5.07E-04 | 1.35E-02 | 3.75E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.87E-01 |

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.30E-02 | | | | | | | 6.95E-05 | | 1.00E+00 | 1.00E+00 | 6.95E-05 |
| Water | 2.60E-04 | | | | | 2.53E-05 | | | | 1.00E+00 | 1.00E+00 | 2.53E-05 |
| Food-an. | 8.15E-06 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.11E-04 | | | | 2.47E-05 | | | | | 1.00E+00 | 1.00E+00 | 2.47E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.70E-03 | | | | | | | 2.51E-05 | | 1.00E+00 | 1.00E+00 | 2.51E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.17E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.49E-04 | | | | 1.98E-05 | | | | | 1.00E+00 | 1.00E+00 | 1.98E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E-02 | 6.95E-05 | 2.00E-03 | 3.48E-02 | |
| Water | 2.60E-04 | 2.53E-05 | 2.00E-03 | 1.27E-02 | |
| Food | 3.19E-04 | 2.47E-05 | 2.00E-03 | 1.24E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.98E-02 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.70E-03 | 2.51E-05 | 1.50E-02 | 1.68E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Food | 2.49E-04 | 1.98E-05 | 1.50E-02 | 1.32E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.00E-03 |

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.07E-02 | | | | | | | 5.72E-05 | | 1.00E+00 | 1.00E+00 | 5.72E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.71E-06 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.56E-04 | | | | 2.04E-05 | | | | | 1.00E+00 | 1.00E+00 | 2.04E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 1.07E-05 | | 1.00E+00 | 1.00E+00 | 1.07E-05 |
| Water | 1.30E-04 | | | | | 1.27E-05 | | | | 1.00E+00 | 1.00E+00 | 1.27E-05 |
| Food-an. | 1.89E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.47E-05 | | | | 5.94E-06 | | | | | 1.00E+00 | 1.00E+00 | 5.94E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.07E-02 | 5.72E-05 | 9.00E-03 | 6.36E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Food | 2.63E-04 | 2.04E-05 | 9.00E-03 | 2.26E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.62E-03 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 1.07E-05 | 8.00E-02 | 1.34E-04 | |
| Water | 1.30E-04 | 1.27E-05 | 8.00E-02 | 1.58E-04 | |
| Food | 7.49E-05 | 5.94E-06 | 8.00E-02 | 7.42E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.66E-04 |

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.00E-02 | | | | | | | 1.07E-04 | | 1.00E+00 | 1.00E+00 | 1.07E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.67E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.27E-04 | | | | 2.60E-05 | | | | | 1.00E+00 | 1.00E+00 | 2.60E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-02 | 1.07E-04 | 4.58E-01 | 2.33E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 3.94E-04 | 2.60E-05 | 4.58E-01 | 5.68E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.90E-04 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 2.63E+00 | 3.70E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.70E-05 |

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 5.84E-04 | | | | 1.00E+00 | 1.00E+00 | 5.84E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 9.73E-04 | | | | 1.00E+00 | 1.00E+00 | 9.73E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Water | 6.00E-03 | 5.84E-04 | 1.83E+00 | 3.19E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.19E-04 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Water | 1.00E-02 | 9.73E-04 | 2.73E-02 | 3.57E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.57E-02 |

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 4.52E-01 | 2.15E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.15E-04 |

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 1.70E-02 | 5.73E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.73E-03 |

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 9.73E-06 | | | | 1.00E+00 | 1.00E+00 | 9.73E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 9.73E-06 | | | | 1.00E+00 | 1.00E+00 | 9.73E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 9.73E-06 | 2.00E-02 | 4.87E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.87E-04 |

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Water | 1.00E-04 | 9.73E-06 | 9.20E-03 | 1.06E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.06E-03 |

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 1.17E-05 | | | | 1.00E+00 | 1.00E+00 | 1.17E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.85E-07 | | | | 1.00E+00 | 1.00E+00 | 1.85E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Water | 1.20E-04 | 1.17E-05 | 8.00E-01 | 1.46E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.46E-05 |

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Water | 1.90E-06 | 1.85E-07 | 2.00E-04 | 9.25E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.25E-04 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 6.42E-05 | | 1.00E+00 | 1.00E+00 | 6.42E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.76E-03 | | | | 6.17E-04 | | | | | 1.00E+00 | 1.00E+00 | 6.17E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 1.92E-02 | | 1.00E+00 | 1.00E+00 | 1.92E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.44E-03 | | | | 1.15E-04 | | | | | 1.00E+00 | 1.00E+00 | 1.15E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 6.42E-05 | 5.85E-02 | 1.10E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Food | 7.76E-03 | 6.17E-04 | 5.85E-02 | 1.05E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.16E-02 |

| Thallium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 1.92E-02 | 7.40E-04 | 2.60E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Food | 1.88E-02 | 1.15E-04 | 7.40E-04 | 1.55E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.62E+01 |

# DOSE CALCULATIONS FOR EASTERN COTTONTAIL

# MAXIMUM CONCENTRATION

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 1.39E+01 |
| Antimony | | | 1.54E+01 |
| Arsenic | | | 7.26E+00 |
| Barium | | | 1.09E+01 |
| Beryllium | | | 2.27E-02 |
| Cadmium | | | 1.36E+00 |
| Chromium | | | 5.95E+00 |
| Cobalt | | | 5.45E-02 |
| Copper | | | 4.12E-02 |
| Lead | | | 5.11E-01 |
| Manganese | | | 1.28E-01 |
| Mercury | | | 4.05E-03 |
| Nickel | | | 7.22E-03 |
| Selenium | | | 2.28E-01 |
| Silver | | | 1.09E+00 |
| Vanadium | | | 1.13E-01 |
| Zinc | | | 6.98E-02 |
| Toluene | | | 8.64E-06 |
| Xylene | | | 2.86E-04 |
| Benzo(a)pyrene | | | 1.28E-02 |
| Di-N-octylphthalate | | | 6.51E-06 |
| Flouranthene | | | 1.15E-04 |
| Pyrene | | | 2.57E-02 |
| 4,4'-DDD | | | 2.87E-03 |
| 4,4'-DDE | | | 4.61E-03 |
| 4,4'-DDT | | | 2.34E-03 |
| Alpha-Chlordane | | | 3.15E-04 |
| Aroclor 1254 | | | 1.11E-02 |
| Aroclor 1260 | | | 2.50E-01 |
| Dieldrin | | | 6.15E-02 |
| Endosulfan 1 | | | 2.71E-03 |
| Endrin aldehyde | | | 1.60E-02 |
| Heptachlor | | | 1.34E-04 |
| Gamma-Chlordane | | | 3.39E-04 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.10E-03 |
| Thallium | | | 4.84E+01 |
| | | | |
| TOTAL | | | 1.06E+02 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 9.64E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 2.78E-02 |
| Barium | | | 1.08E-01 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.20E-02 |
| Chromium | | | 1.06E-02 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.37E-04 |
| Lead | | | 6.45E-04 |
| Manganese | | | 5.07E-03 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 2.92E-05 |
| Selenium | | | 4.67E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.96E-04 |
| Zinc | | | 3.54E-04 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 9.45E-04 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 3.41E-05 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 3.53E-04 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 1.27E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 1.58E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 3.70E-05 |
| Bis(2-ethylhexyl)phthalate | | | 3.19E-04 |
| Chlorobenzene | | | 3.57E-02 |
| Cis-1,2-Dichloroethane | | | 2.15E-04 |
| Vinyl Chloride | | | 5.73E-03 |
| Aldrin | | | 4.87E-04 |
| Endrin | | | 1.06E-03 |
| Lindane | | | 1.46E-05 |
| Heptachlor Epoxide | | | 9.25E-04 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 2.37E-01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: EASTERN COTTONTAIL

| CHEMICAL | | | HAZARD QUOTIE |
|---|---|---|---|
| Aluminum | | | 1.34E-01 |
| Antimony | | | 6.87E+00 |
| Arsenic | | | 6.48E-01 |
| Barium | | | 2.43E+00 |
| Beryllium | | | 3.37E-03 |
| Cadmium | | | 3.03E+00 |
| Chromium | | | 3.98E-01 |
| Cobalt | | | 5.67E-03 |
| Copper | | | 1.53E-01 |
| Lead | | | 6.84E-02 |
| Manganese | | | 9.53E-02 |
| Mercury | | | 1.20E-02 |
| Nickel | | | 6.44E-03 |
| Selenium | | | 8.48E-02 |
| Silver | | | 1.63E+00 |
| Vanadium | | | 5.06E-03 |
| Zinc | | | 9.35E-01 |
| Toluene | | | 1.27E-05 |
| Xylene | | | 1.87E-03 |
| Benzo(a)pyrene | | | 2.96E-03 |
| Di-N-octylphthalate | | | 8.98E-02 |
| Flouranthene | | | 3.99E-05 |
| Pyrene | | | 4.28E-03 |
| 4,4'-DDD | | | 6.79E-04 |
| 4,4'-DDE | | | 1.21E-03 |
| 4,4'-DDT | | | 5.56E-04 |
| Alpha-Chlordane | | | 1.98E-05 |
| Aroclor 1254 | | | 8.07E-05 |
| Aroclor 1260 | | | 3.75E-02 |
| Dieldrin | | | 2.19E-02 |
| Endosulfan I | | | 2.14E-03 |
| Endrin aldehyde | | | 5.71E-03 |
| Heptachlor | | | 7.42E-05 |
| Gamma-Chlordane | | | 8.24E-05 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.05E-02 |
| Thallium | | | 2.88E-01 |
| | | | |
| TOTAL | | | 1.70E+01 |

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.30E+04 | | | | | | | 6.95E+01 | | 1.00E+00 | 1.00E+00 | 6.95E+01 |
| Water | 4.95E-01 | | | | | 4.82E-02 | | | | 1.00E+00 | 1.00E+00 | 4.82E-02 |
| Food-an. | 2.37E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 8.45E+00 | | | | 6.72E-01 | | | | | 1.00E+00 | 1.00E+00 | 6.72E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 1.92E-02 | | 1.00E+00 | 1.00E+00 | 1.92E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.70E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.08E-01 | | | | 8.59E-03 | | | | | 1.00E+00 | 1.00E+00 | 8.59E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E+04 | 6.95E+01 | 5.00E+00 | 1.39E+01 | |
| Water | 4.95E-01 | 4.82E-02 | 5.00E+00 | 9.64E-03 | |
| Food | 1.08E+01 | 6.72E-01 | 5.00E+00 | 1.34E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.40E+01 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 1.92E-02 | 1.25E-03 | 1.54E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Food | 1.09E-01 | 8.59E-03 | 1.25E-03 | 6.87E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.23E+01 |

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.71E+01 | | | | | | | 9.14E-02 | | 1.00E+00 | 1.00E+00 | 9.14E-02 |
| Water | 3.60E-03 | | | | | 3.50E-04 | | | | 1.00E+00 | 1.00E+00 | 3.50E-04 |
| Food-an. | 4.56E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.03E-01 | | | | 8.16E-03 | | | | | 1.00E+00 | 1.00E+00 | 8.16E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.03E+02 | | | | | | | 5.51E-01 | | 1.00E+00 | 1.00E+00 | 5.51E-01 |
| Water | 5.60E-02 | | | | | 5.45E-03 | | | | 1.00E+00 | 1.00E+00 | 5.45E-03 |
| Food-an. | 2.36E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.55E+00 | | | | 1.23E-01 | | | | | 1.00E+00 | 1.00E+00 | 1.23E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.71E+01 | 9.14E-02 | 1.26E-02 | 7.26E+00 | |
| Water | 3.60E-03 | 3.50E-04 | 1.26E-02 | 2.78E-02 | |
| Food | 1.07E-01 | 8.16E-03 | 1.26E-02 | 6.48E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.93E+00 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.03E+02 | 5.51E-01 | 5.06E-02 | 1.09E+01 | |
| Water | 5.60E-02 | 5.45E-03 | 5.06E-02 | 1.08E-01 | |
| Food | 1.55E+00 | 1.23E-01 | 5.06E-02 | 2.43E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.34E+01 |

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 1.50E-03 | | 1.00E+00 | 1.00E+00 | 1.50E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.80E-03 | | | | 2.23E-04 | | | | | 1.00E+00 | 1.00E+00 | 2.23E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.40E+00 | | | | | | | 3.42E-02 | | 1.00E+00 | 1.00E+00 | 3.42E-02 |
| Water | 3.10E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 1.01E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 9.60E-01 | | | | 7.63E-02 | | | | | 1.00E+00 | 1.00E+00 | 7.63E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 1.50E-03 | 6.60E-02 | 2.27E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Food | 2.84E-03 | 2.23E-04 | 6.60E-02 | 3.37E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.61E-02 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.40E+00 | 3.42E-02 | 2.52E-02 | 1.36E+00 | |
| Water | 3.10E-03 | 3.02E-04 | 2.52E-02 | 1.20E-02 | |
| Food | 9.61E-01 | 7.63E-02 | 2.52E-02 | 3.03E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.40E+00 |

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 5.12E+01 | | | | | | | 2.74E-01 | | 1.00E+00 | 1.00E+00 | 2.74E-01 |
| Water | 5.00E-03 | | | | | 4.87E-04 | | | | 1.00E+00 | 1.00E+00 | 4.87E-04 |
| Food-an. | 2.33E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.30E-01 | | | | 1.83E-02 | | | | | 1.00E+00 | 1.00E+00 | 1.83E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.60E+00 | | | | | | | 8.55E-03 | | 1.00E+00 | 1.00E+00 | 8.55E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 7.58E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.12E-02 | | | | 8.91E-04 | | | | | 1.00E+00 | 1.00E+00 | 8.91E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| *Chromium* | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.12E+01 | 2.74E-01 | 4.60E-02 | 5.95E+00 | |
| Water | 5.00E-03 | 4.87E-04 | 4.60E-02 | 1.06E-02 | |
| Food | 2.33E-01 | 1.83E-02 | 4.60E-02 | 3.98E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.36E+00 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.60E+00 | 8.55E-03 | 1.57E-01 | 5.45E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Food | 1.20E-02 | 8.91E-04 | 1.57E-01 | 5.67E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.02E-02 |

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 5.08E+01 | | | | | | | 2.72E-01 | | 1.00E+00 | 1.00E+00 | 2.72E-01 |
| Water | 9.30E-03 | | | | | 9.05E-04 | | | | 1.00E+00 | 1.00E+00 | 9.05E-04 |
| Food-an. | 3.40E-01 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.27E+01 | | | | 1.01E+00 | | | | | 1.00E+00 | 1.00E+00 | 1.01E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 7.65E+01 | | | | | | | 4.09E-01 | | 1.00E+00 | 1.00E+00 | 4.09E-01 |
| Water | 5.30E-03 | | | | | 5.16E-04 | | | | 1.00E+00 | 1.00E+00 | 5.16E-04 |
| Food-an. | 4.28E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.89E-01 | | | | 5.47E-02 | | | | | 1.00E+00 | 1.00E+00 | 5.47E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.08E+01 | 2.72E-01 | 6.60E+00 | 4.12E-02 | |
| Water | 9.30E-03 | 9.05E-04 | 6.60E+00 | 1.37E-04 | |
| Food | 1.30E+01 | 1.01E+00 | 6.60E+00 | 1.53E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.94E-01 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.65E+01 | 4.09E-01 | 8.00E-01 | 5.11E-01 | |
| Water | 5.30E-03 | 5.16E-04 | 8.00E-01 | 6.45E-04 | |
| Food | 6.93E-01 | 5.47E-02 | 8.00E-01 | 6.84E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.80E-01 |

| Manganese | Predicted Concent | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.11E+02 | | | | | | | 1.13E+00 | | 1.00E+00 | 1.00E+00 | 1.13E+00 |
| Water | 4.58E-01 | | | | | 4.46E-02 | | | | 1.00E+00 | 1.00E+00 | 4.46E-02 |
| Food-an. | 1.94E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.06E+01 | | | | 8.39E-01 | | | | | 1.00E+00 | 1.00E+00 | 8.39E-01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.00E+00 | | | | | | | 5.35E-03 | | 1.00E+00 | 1.00E+00 | 5.35E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.51E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.00E-01 | | | | 1.59E-02 | | | | | 1.00E+00 | 1.00E+00 | 1.59E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.11E+02 | 1.13E+00 | 8.80E+00 | 1.28E-01 | |
| Water | 4.58E-01 | 4.46E-02 | 8.80E+00 | 5.07E-03 | |
| Food | 1.06E+01 | 8.39E-01 | 8.80E+00 | 9.53E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.29E-01 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.00E+00 | 5.35E-03 | 1.32E+00 | 4.05E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Food | 2.15E-01 | 1.59E-02 | 1.32E+00 | 1.20E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.61E-02 |

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 5.40E+00 | | | | | | | 2.89E-02 | | 1.00E+00 | 1.00E+00 | 2.89E-02 |
| Water | 1.20E-03 | | | | | 1.17E-04 | | | | 1.00E+00 | 1.00E+00 | 1.17E-04 |
| Food-an. | 8.16E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.24E-01 | | | | 2.58E-02 | | | | | 1.00E+00 | 1.00E+00 | 2.58E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.20E+00 | | | | | | | 1.71E-02 | | 1.00E+00 | 1.00E+00 | 1.71E-02 |
| Water | 3.60E-03 | | | | | 3.50E-04 | | | | 1.00E+00 | 1.00E+00 | 3.50E-04 |
| Food-an. | 8.40E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 8.00E-02 | | | | 6.36E-03 | | | | | 1.00E+00 | 1.00E+00 | 6.36E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.40E+00 | 2.89E-02 | 4.00E+00 | 7.22E-03 | |
| Water | 1.20E-03 | 1.17E-04 | 4.00E+00 | 2.92E-05 | |
| Food | 3.32E-01 | 2.58E-02 | 4.00E+00 | 6.44E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.37E-02 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.20E+00 | 1.71E-02 | 7.50E-02 | 2.28E-01 | |
| Water | 3.60E-03 | 3.50E-04 | 7.50E-02 | 4.67E-03 | |
| Food | 8.84E-02 | 6.36E-03 | 7.50E-02 | 8.48E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.18E-01 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.70E+00 | | | | | | | 1.98E-02 | | 1.00E+00 | 1.00E+00 | 1.98E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.77E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.70E-01 | | | | 2.94E-02 | | | | | 1.00E+00 | 1.00E+00 | 2.94E-02 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.42E+01 | | | | | | | 1.29E-01 | | 1.00E+00 | 1.00E+00 | 1.29E-01 |
| Water | 2.30E-03 | | | | | 2.24E-04 | | | | 1.00E+00 | 1.00E+00 | 2.24E-04 |
| Food-an. | 7.66E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.26E-02 | | | | 5.77E-03 | | | | | 1.00E+00 | 1.00E+00 | 5.77E-03 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E+00 | 1.98E-02 | 1.81E-02 | 1.09E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Food | 3.74E-01 | 2.94E-02 | 1.81E-02 | 1.63E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.72E+00 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.42E+01 | 1.29E-01 | 1.14E+00 | 1.13E-01 | |
| Water | 2.30E-03 | 2.24E-04 | 1.14E+00 | 1.96E-04 | |
| Food | 8.03E-02 | 5.77E-03 | 1.14E+00 | 5.06E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.19E-01 |

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.09E+02 | | | | | | | 1.12E+00 | | 1.00E+00 | 1.00E+00 | 1.12E+00 |
| Water | 5.82E-02 | | | | | 5.67E-03 | | | | 1.00E+00 | 1.00E+00 | 5.67E-03 |
| Food-an. | 4.39E+01 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.88E+02 | | | | 1.50E+01 | | | | | 1.00E+00 | 1.00E+00 | 1.50E+01 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.20E-02 | | | | | | | 2.25E-04 | | 1.00E+00 | 1.00E+00 | 2.25E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.15E-03 | | | | 3.30E-04 | | | | | 1.00E+00 | 1.00E+00 | 3.30E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.09E+02 | 1.12E+00 | 1.60E+01 | 6.98E-02 | |
| Water | 5.82E-02 | 5.67E-03 | 1.60E+01 | 3.54E-04 | |
| Food | 2.32E+02 | 1.50E+01 | 1.60E+01 | 9.35E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.01E+00 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.20E-02 | 2.25E-04 | 2.60E+01 | 8.64E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Food | 4.15E-03 | 3.30E-04 | 2.60E+01 | 1.27E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.13E-05 |

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.10E-02 | | | | | | | 5.88E-05 | | 1.00E+00 | 1.00E+00 | 5.88E-05 |
| Water | 2.00E-03 | | | | | 1.95E-04 | | | | 1.00E+00 | 1.00E+00 | 1.95E-04 |
| Food-an. | 5.51E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.85E-03 | | | | 3.85E-04 | | | | | 1.00E+00 | 1.00E+00 | 3.85E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 1.28E-03 | | 1.00E+00 | 1.00E+00 | 1.28E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 3.72E-03 | | | | 2.96E-04 | | | | | 1.00E+00 | 1.00E+00 | 2.96E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.10E-02 | 5.88E-05 | 2.06E-01 | 2.86E-04 | |
| Water | 2.00E-03 | 1.95E-04 | 2.06E-01 | 9.45E-04 | |
| Food | 4.85E-03 | 3.85E-04 | 2.06E-01 | 1.87E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.10E-03 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 1.28E-03 | 1.00E-01 | 1.28E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Food | 4.74E-03 | 2.96E-04 | 1.00E-01 | 2.96E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.58E-02 |

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 3.58E-04 | | 1.00E+00 | 1.00E+00 | 3.58E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.21E+01 | | | | 4.94E+00 | | | | | 1.00E+00 | 1.00E+00 | 4.94E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 1.44E-03 | | 1.00E+00 | 1.00E+00 | 1.44E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.27E-03 | | | | 4.99E-04 | | | | | 1.00E+00 | 1.00E+00 | 4.99E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 3.58E-04 | 5.50E+01 | 6.51E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Food | 6.23E+01 | 4.94E+00 | 5.50E+01 | 8.98E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.98E-02 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 1.44E-03 | 1.25E+01 | 1.15E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Food | 6.47E-03 | 4.99E-04 | 1.25E+01 | 3.99E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.55E-04 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Pyrene | Predicted Concent | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 1.92E-03 | | 1.00E+00 | 1.00E+00 | 1.92E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.04E-03 | | | | 3.21E-04 | | | | | 1.00E+00 | 1.00E+00 | 3.21E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.70E-02 | | | | | | | 1.44E-04 | | 1.00E+00 | 1.00E+00 | 1.44E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.12E-06 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.46E-04 | | | | 5.14E-05 | | | | | 1.00E+00 | 1.00E+00 | 5.14E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 1.07E-05 | | 1.00E+00 | 1.00E+00 | 1.07E-05 |
| Water | 1.30E-04 | | | | | 1.27E-05 | | | | 1.00E+00 | 1.00E+00 | 1.27E-05 |
| Food-an. | 1.89E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.47E-05 | | | | 5.94E-06 | | | | | 1.00E+00 | 1.00E+00 | 5.94E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E-02 | 1.23E-04 | 2.00E-03 | 6.15E-02 | |
| Water | 2.60E-04 | 2.53E-05 | 2.00E-03 | 1.27E-02 | |
| Food | 5.65E-04 | 4.38E-05 | 2.00E-03 | 2.19E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.60E-02 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.60E-03 | 4.06E-05 | 1.50E-02 | 2.71E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Food | 4.03E-04 | 3.21E-05 | 1.50E-02 | 2.14E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.85E-03 |

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.30E-02 | | | | | | | 1.23E-04 | | 1.00E+00 | 1.00E+00 | 1.23E-04 |
| Water | 2.60E-04 | | | | | 2.53E-05 | | | | 1.00E+00 | 1.00E+00 | 2.53E-05 |
| Food-an. | 1.44E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 5.50E-04 | | | | 4.38E-05 | | | | | 1.00E+00 | 1.00E+00 | 4.38E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 7.60E-03 | | | | | | | 4.06E-05 | | 1.00E+00 | 1.00E+00 | 4.06E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.88E-07 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.03E-04 | | | | 3.21E-05 | | | | | 1.00E+00 | 1.00E+00 | 3.21E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 1.50E-04 | 1.35E-02 | 1.11E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 1.09E-06 | 1.35E-02 | 8.07E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.12E-02 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 3.37E-03 | 1.35E-02 | 2.50E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 5.07E-04 | 1.35E-02 | 3.75E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.87E-01 |

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 1.50E-04 | | 1.00E+00 | 1.00E+00 | 1.50E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.37E-05 | | | | 1.09E-06 | | | | | 1.00E+00 | 1.00E+00 | 1.09E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 3.37E-03 | | 1.00E+00 | 1.00E+00 | 3.37E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.37E-03 | | | | 5.07E-04 | | | | | 1.00E+00 | 1.00E+00 | 5.07E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.50E-02 | 1.87E-04 | 8.00E-02 | 2.34E-03 | |
| Water | 2.90E-04 | 2.82E-05 | 8.00E-02 | 3.53E-04 | |
| Food | 6.89E-04 | 4.45E-05 | 8.00E-02 | 5.56E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.25E-03 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-02 | 1.44E-04 | 4.58E-01 | 3.15E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 4.31E-02 | 9.07E-06 | 4.58E-01 | 1.98E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.35E-04 |

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 3.50E-02 | | | | | | | 1.87E-04 | | 1.00E+00 | 1.00E+00 | 1.87E-04 |
| Water | 2.90E-04 | | | | | 2.82E-05 | | | | 1.00E+00 | 1.00E+00 | 2.82E-05 |
| Food-an. | 1.30E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 5.59E-04 | | | | 4.45E-05 | | | | | 1.00E+00 | 1.00E+00 | 4.45E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.70E-02 | | | | | | | 1.44E-04 | | 1.00E+00 | 1.00E+00 | 1.44E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.30E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.14E-04 | | | | 9.07E-06 | | | | | 1.00E+00 | 1.00E+00 | 9.07E-06 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.30E-02 | 2.30E-04 | 8.00E-02 | 2.87E-03 | |
| Water | 2.80E-05 | 2.73E-06 | 8.00E-02 | 3.41E-05 | |
| Food | 8.47E-04 | 5.44E-05 | 8.00E-02 | 6.79E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.59E-03 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.90E-02 | 3.69E-04 | 8.00E-02 | 4.61E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Food | 1.38E-03 | 9.72E-05 | 8.00E-02 | 1.21E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.83E-03 |

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 4.30E-02 | | | | | | | 2.30E-04 | | 1.00E+00 | 1.00E+00 | 2.30E-04 |
| Water | 2.80E-05 | | | | | 2.73E-06 | | | | 1.00E+00 | 1.00E+00 | 2.73E-06 |
| Food-an. | 1.64E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 6.83E-04 | | | | 5.44E-05 | | | | | 1.00E+00 | 1.00E+00 | 5.44E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.90E-02 | | | | | | | 3.69E-04 | | 1.00E+00 | 1.00E+00 | 3.69E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.62E-04 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 1.22E-03 | | | | 9.72E-05 | | | | | 1.00E+00 | 1.00E+00 | 9.72E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 1.92E-03 | 7.50E-02 | 2.57E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Food | 1.06E-02 | 3.21E-04 | 7.50E-02 | 4.28E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.99E-02 |

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-02 | 1.44E-04 | 9.00E-03 | 1.60E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Food | 6.48E-04 | 5.14E-05 | 9.00E-03 | 5.71E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.17E-02 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 1.07E-05 | 8.00E-02 | 1.34E-04 | |
| Water | 1.30E-04 | 1.27E-05 | 8.00E-02 | 1.58E-04 | |
| Food | 7.49E-05 | 5.94E-06 | 8.00E-02 | 7.42E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.66E-04 |

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 2.90E-02 | | | | | | | 1.55E-04 | | 1.00E+00 | 1.00E+00 | 1.55E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.67E-05 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 4.75E-04 | | | | 3.78E-05 | | | | | 1.00E+00 | 1.00E+00 | 3.78E-05 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.90E-02 | 1.55E-04 | 4.58E-01 | 3.39E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 5.72E-04 | 3.78E-05 | 4.58E-01 | 8.24E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.21E-04 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 2.63E+00 | 3.70E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.70E-05 |

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 5.84E-04 | | | | 1.00E+00 | 1.00E+00 | 5.84E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 9.73E-04 | | | | 1.00E+00 | 1.00E+00 | 9.73E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Water | 6.00E-03 | 5.84E-04 | 1.83E+00 | 3.19E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.19E-04 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Water | 1.00E-02 | 9.73E-04 | 2.73E-02 | 3.57E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.57E-02 |

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 9.73E-05 | | | | 1.00E+00 | 1.00E+00 | 9.73E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 4.52E-01 | 2.15E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.15E-04 |

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 9.73E-05 | 1.70E-02 | 5.73E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.73E-03 |

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 9.73E-06 | | | | 1.00E+00 | 1.00E+00 | 9.73E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 9.73E-06 | | | | 1.00E+00 | 1.00E+00 | 9.73E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 9.73E-06 | 2.00E-02 | 4.87E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.87E-04 |

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Water | 1.00E-04 | 9.73E-06 | 9.20E-03 | 1.06E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.06E-03 |

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 1.17E-05 | | | | 1.00E+00 | 1.00E+00 | 1.17E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.85E-07 | | | | 1.00E+00 | 1.00E+00 | 1.85E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Water | 1.20E-04 | 1.17E-05 | 8.00E-01 | 1.46E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.46E-05 |

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Water | 1.90E-06 | 1.85E-07 | 2.00E-04 | 9.25E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.25E-04 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 6.42E-05 | | 1.00E+00 | 1.00E+00 | 6.42E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 7.76E-03 | | | | 6.17E-04 | | | | | 1.00E+00 | 1.00E+00 | 6.17E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.13E+00 | 9.59E+04 | | | | | | | | | |
| Soil | 6.70E+00 | | | | | | | 3.58E-02 | | 1.00E+00 | 1.00E+00 | 3.58E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.24E-02 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 2.68E-03 | | | | 2.13E-04 | | | | | 1.00E+00 | 1.00E+00 | 2.13E-04 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 6.42E-05 | 5.85E-02 | 1.10E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Food | 7.76E-03 | 6.17E-04 | 5.85E-02 | 1.05E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.16E-02 |

| Thallium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E+00 | 3.58E-02 | 7.40E-04 | 4.84E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Food | 3.51E-02 | 2.13E-04 | 7.40E-04 | 2.88E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.87E+01 |

# DOSE CALCULATIONS FOR RED FOX

## MEAN CONCENTRATION

| Contaminant and Form | Test Species | Lab Test Results (mg/kg/day) | Endpoint Species | Scaling Factor (Prod. of 1/UFs) | Estimated Wild-life NOAEL (mg/kg/day) |
|---|---|---|---|---|---|
| Aluminum | Rat | 5.00E+01 | Red Fox | 1.00E-01 | 5.00E+00 |
| Antimony | Mouse | 1.25E+00 | Red Fox | 1.00E-03 | 1.25E-03 |
| Arsenic | Mouse | 1.26E+00 | Red Fox | 1.00E-02 | 1.26E-02 |
| Barium | Rat | 5.06E+00 | Red Fox | 1.00E-02 | 5.06E-02 |
| Beryllium | Rat | 6.60E-01 | Red Fox | 1.00E-01 | 6.60E-02 |
| Cadmium | Mouse | 2.52E+00 | Red Fox | 1.00E-02 | 2.52E-02 |
| Chromium | Mouse | 4.60E+00 | Red Fox | 1.00E-02 | 4.60E-02 |
| Cobalt | Rat | 1.57E+02 | Red Fox | 1.00E-03 | 1.57E-01 |
| Copper | Rat | 6.60E+01 | Red Fox | 1.00E-01 | 6.60E+00 |
| Lead | Rat | 8.00E+00 | Red Fox | 1.00E-01 | 8.00E-01 |
| Manganese | Rat | 8.80E+01 | Red Fox | 1.00E-01 | 8.80E+00 |
| Mercury | Mouse | 1.32E+01 | Red Fox | 1.00E-01 | 1.32E+00 |
| Nickel | Rat | 4.00E+01 | Red Fox | 1.00E-01 | 4.00E+00 |
| Selenium | Mouse | 7.50E-01 | Red Fox | 1.00E-01 | 7.50E-02 |
| Silver | Rat | 1.81E+02 | Red Fox | 1.00E-04 | 1.81E-02 |
| Vanadium | Rat | 1.14E+01 | Red Fox | 1.00E-01 | 1.14E+00 |
| Zinc | Rat | 1.60E+02 | Red Fox | 1.00E-01 | 1.60E+01 |
| Toluene | Mouse | 2.60E+02 | Red Fox | 1.00E-01 | 2.60E+01 |
| Xylene | Mouse | 2.06E+00 | Red Fox | 1.00E-01 | 2.06E-01 |
| Benzo(a)pyrene | Mouse | 1.00E+01 | Red Fox | 1.00E-02 | 1.00E-01 |
| Di-N-octylphthalate | Mouse | 5.50E+02 | Red Fox | 1.00E-01 | 5.50E+01 |
| Flouranthene | Mouse | 1.25E+02 | Red Fox | 1.00E-01 | 1.25E+01 |
| Pyrene | Mouse | 7.50E+01 | Red Fox | 1.00E-03 | 7.50E-02 |
| 4,4'-DDD | Rat | 8.00E-01 | Red Fox | 1.00E-01 | 8.00E-02 |
| 4,4'-DDE | Rat | 8.00E-01 | Red Fox | 1.00E-01 | 8.00E-02 |
| 4,4'-DDT | Rat | 8.00E-01 | Red Fox | 1.00E-01 | 8.00E-02 |
| Alpha-Chlordane | Mouse | 4.58E+00 | Red Fox | 1.00E-01 | 4.58E-01 |
| Aroclor 1254 | Mouse | 1.35E+00 | Red Fox | 1.00E-02 | 1.35E-02 |
| Aroclor 1260 | Mouse | 1.35E+00 | Red Fox | 1.00E-02 | 1.35E-02 |
| Dieldrin | Rat | 2.00E-01 | Red Fox | 1.00E-02 | 2.00E-03 |
| Endosulfan I | Rat | 1.50E+00 | Red Fox | 1.00E-02 | 1.50E-02 |
| Endrin aldehyde | Mouse | 9.00E-01 | Red Fox | 1.00E-02 | 9.00E-03 |
| Heptachlor | Rat | 8.00E-01 | Red Fox | 1.00E-01 | 8.00E-02 |
| Gamma-Chlordane | Mouse | 4.58E+00 | Red Fox | 1.00E-01 | 4.58E-01 |
| Benzene | Mouse | 2.63E+02 | Red Fox | 1.00E-02 | 2.63E+00 |
| Bis(2-ethylhexyl)phthalate | Mouse | 1.83E+01 | Red Fox | 1.00E-01 | 1.83E+00 |
| Chlorobenzene | Beagle | 2.73E+01 | Red Fox | 1.00E-03 | 2.73E-02 |
| Cis-1,2-Dichloroethane | Mouse | 4.52E+02 | Red Fox | 1.00E-03 | 4.52E-01 |
| Vinyl Chloride | Rat | 1.70E+00 | Red Fox | 1.00E-02 | 1.70E-02 |
| Aldrin | Rat | 2.00E-01 | Red Fox | 1.00E-01 | 2.00E-02 |
| Endrin | Mouse | 9.20E-01 | Red Fox | 1.00E-02 | 9.20E-03 |
| Lindane | Rat | 8.00E+00 | Red Fox | 1.00E-01 | 8.00E-01 |
| Heptachlor Epoxide | Beagle | 2.00E-02 | Red Fox | 1.00E-02 | 2.00E-04 |
| Methylene chloride | Rat | 5.85E+00 | Red Fox | 1.00E-02 | 5.85E-02 |
| Thallium | Rat | 7.40E-01 | Red Fox | 1.00E-03 | 7.40E-04 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 1.93E+00 |
| Antimony | | | 3.87E+00 |
| Arsenic | | | 4.34E-01 |
| Barium | | | 1.06E+00 |
| Beryllium | | | 8.92E-03 |
| Cadmium | | | 1.67E-01 |
| Chromium | | | 6.86E-01 |
| Cobalt | | | 9.78E-03 |
| Copper | | | 3.79E-03 |
| Lead | | | 7.70E-02 |
| Manganese | | | 9.68E-03 |
| Mercury | | | 5.74E-04 |
| Nickel | | | 1.16E-03 |
| Selenium | | | 2.75E-02 |
| Silver | | | 2.44E-01 |
| Vanadium | | | 1.81E-02 |
| Zinc | | | 5.49E-03 |
| Toluene | | | 1.76E-06 |
| Xylene | | | 3.78E-05 |
| Benzo(a)pyrene | | | 5.05E-03 |
| Di-N-octylphthalate | | | 2.56E-06 |
| Flouranthene | | | 4.54E-05 |
| Pyrene | | | 1.01E-02 |
| 4,4'-DDD | | | 6.15E-04 |
| 4,4'-DDE | | | 6.02E-04 |
| 4,4'-DDT | | | 4.23E-04 |
| Alpha-Chlordane | | | 4.09E-05 |
| Aroclor 1254 | | | 4.36E-03 |
| Aroclor 1260 | | | 9.81E-02 |
| Dieldrin | | | 1.37E-02 |
| Endosulfan I | | | 6.59E-04 |
| Endrin aldehyde | | | 2.50E-03 |
| Heptachlor | | | 5.26E-05 |
| Gamma-Chlordane | | | 9.18E-05 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 4.31E-04 |
| Thallium | | | 1.02E+01 |
| | | | |
| TOTAL | | | 1.89E+01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 8.32E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 2.40E-02 |
| Barium | | | 9.30E-02 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.03E-02 |
| Chromium | | | 9.13E-03 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.18E-04 |
| Lead | | | 5.57E-04 |
| Manganese | | | 4.37E-03 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 2.52E-05 |
| Selenium | | | 4.03E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.70E-04 |
| Zinc | | | 3.06E-04 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 8.16E-04 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 2.94E-05 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 3.05E-04 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 1.09E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 1.37E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 3.19E-05 |
| Bis(2-ethylhexyl)phthalate | | | 2.75E-04 |
| Chlorobenzene | | | 3.08E-02 |
| Cis-1,2-Dichloroethane | | | 1.86E-04 |
| Vinyl Chloride | | | 4.94E-03 |
| Aldrin | | | 4.20E-04 |
| Endrin | | | 9.13E-04 |
| Lindane | | | 1.26E-05 |
| Heptachlor Epoxide | | | 7.98E-04 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 2.05E-01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 1.22E-02 |
| Antimony | | | 2.50E-02 |
| Arsenic | | | 4.01E-03 |
| Barium | | | 8.41E-04 |
| Beryllium | | | 4.40E-05 |
| Cadmium | | | 9.13E-04 |
| Chromium | | | 1.08E-03 |
| Cobalt | | | 1.61E-04 |
| Copper | | | 8.82E-04 |
| Lead | | | 1.50E-04 |
| Manganese | | | 3.09E-05 |
| Mercury | | | 3.01E-04 |
| Nickel | | | 6.07E-05 |
| Selenium | | | 2.50E-03 |
| Silver | | | 8.64E-03 |
| Vanadium | | | 1.99E-04 |
| Zinc | | | 4.01E-02 |
| Toluene | | | 2.53E-10 |
| Xylene | | | 6.57E-08 |
| Benzo(a)pyrene | | | 7.44E-04 |
| Di-N-octylphthalate | | | 2.39E-04 |
| Flouranthene | | | 1.12E-06 |
| Pyrene | | | 6.38E-03 |
| 4,4'-DDD | | | 8.12E-05 |
| 4,4'-DDE | | | 4.91E-05 |
| 4,4'-DDT | | | 5.47E-05 |
| Alpha-Chlordane | | | 2.26E-03 |
| Aroclor 1254 | | | 7.30E-05 |
| Aroclor 1260 | | | 9.90E-02 |
| Dieldrin | | | 2.98E-04 |
| Endosulfan I | | | 5.67E-07 |
| Endrin aldehyde | | | 5.44E-05 |
| Heptachlor | | | 1.73E-07 |
| Gamma-Chlordane | | | 1.06E-05 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.03E-08 |
| Thallium | | | 1.72E+00 |
| | | | |
| TOTAL | | | 1.92E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.59E+03 | | | | | | | 9.64E+00 | | 1.00E+00 | 1.00E+00 | 9.64E+00 |
| Water | 4.95E-01 | | | | | 4.16E-02 | | | | 1.00E+00 | 1.00E+00 | 4.16E-02 |
| Food-an. | 8.35E-01 | | | 6.10E-02 | | | | | | 1.00E+00 | 1.00E+00 | 6.10E-02 |
| Food-veg. | 2.98E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.30E+00 | | | | | | | 4.84E-03 | | 1.00E+00 | 1.00E+00 | 4.84E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.28E-04 | | | 3.12E-05 | | | | | | 1.00E+00 | 1.00E+00 | 3.12E-05 |
| Food-veg. | 6.90E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.59E+03 | 9.64E+00 | 5.00E+00 | 1.93E+00 | |
| Water | 4.95E-01 | 4.16E-02 | 5.00E+00 | 8.32E-03 | |
| Food | 3.82E+00 | 6.10E-02 | 5.00E+00 | 1.22E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.95E+00 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E+00 | 4.84E-03 | 1.25E-03 | 3.87E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Food | 6.94E-02 | 3.12E-05 | 1.25E-03 | 2.50E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.89E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.60E+00 | | | | | | | 5.47E-03 | | 1.00E+00 | 1.00E+00 | 5.47E-03 |
| Water | 3.60E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 6.93E-04 | | | 5.06E-05 | | | | | | 1.00E+00 | 1.00E+00 | 5.06E-05 |
| Food-veg. | 1.56E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.54E+01 | | | | | | | 5.34E-02 | | 1.00E+00 | 1.00E+00 | 5.34E-02 |
| Water | 5.60E-02 | | | | | 4.71E-03 | | | | 1.00E+00 | 1.00E+00 | 4.71E-03 |
| Food-an. | 5.83E-04 | | | 4.26E-05 | | | | | | 1.00E+00 | 1.00E+00 | 4.26E-05 |
| Food-veg. | 3.81E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.60E+00 | 5.47E-03 | 1.26E-02 | 4.34E-01 | |
| Water | 3.60E-03 | 3.02E-04 | 1.26E-02 | 2.40E-02 | |
| Food | 1.63E-02 | 5.06E-05 | 1.26E-02 | 4.01E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.62E-01 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.54E+01 | 5.34E-02 | 5.06E-02 | 1.06E+00 | |
| Water | 5.60E-02 | 4.71E-03 | 5.06E-02 | 9.30E-02 | |
| Food | 3.82E-01 | 4.26E-05 | 5.06E-02 | 8.41E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.15E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 5.89E-04 | | 1.00E+00 | 1.00E+00 | 5.89E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 2.90E-06 | | | | | | 1.00E+00 | 1.00E+00 | 2.90E-06 |
| Food-veg. | 2.80E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.00E+00 | | | | | | | 4.21E-03 | | 1.00E+00 | 1.00E+00 | 4.21E-03 |
| Water | 3.10E-03 | | | | | 2.60E-04 | | | | 1.00E+00 | 1.00E+00 | 2.60E-04 |
| Food-an. | 3.15E-04 | | | 2.30E-05 | | | | | | 1.00E+00 | 1.00E+00 | 2.30E-05 |
| Food-veg. | 3.00E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 5.89E-04 | 6.60E-02 | 8.92E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Food | 2.84E-03 | 2.90E-06 | 6.60E-02 | 4.40E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.97E-03 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E+00 | 4.21E-03 | 2.52E-02 | 1.67E-01 | |
| Water | 3.10E-03 | 2.60E-04 | 2.52E-02 | 1.03E-02 | |
| Food | 3.00E-01 | 2.30E-05 | 2.52E-02 | 9.13E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.78E-01 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.50E+01 | | | | | | | 3.15E-02 | | 1.00E+00 | 1.00E+00 | 3.15E-02 |
| Water | 5.00E-03 | | | | | 4.20E-04 | | | | 1.00E+00 | 1.00E+00 | 4.20E-04 |
| Food-an. | 6.82E-04 | | | 4.98E-05 | | | | | | 1.00E+00 | 1.00E+00 | 4.98E-05 |
| Food-veg. | 6.75E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 7.30E-01 | | | | | | | 1.54E-03 | | 1.00E+00 | 1.00E+00 | 1.54E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.46E-04 | | | 2.53E-05 | | | | | | 1.00E+00 | 1.00E+00 | 2.53E-05 |
| Food-veg. | 5.11E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Chromium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.50E+01 | 3.15E-02 | 4.60E-02 | 6.86E-01 | |
| Water | 5.00E-03 | 4.20E-04 | 4.60E-02 | 9.13E-03 | |
| Food | 6.82E-02 | 4.98E-05 | 4.60E-02 | 1.08E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.96E-01 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.30E-01 | 1.54E-03 | 1.57E-01 | 9.78E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Food | 5.46E-03 | 2.53E-05 | 1.57E-01 | 1.61E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.94E-03 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.19E+01 | | | | | | | 2.50E-02 | | 1.00E+00 | 1.00E+00 | 2.50E-02 |
| Water | 9.30E-03 | | | | | 7.81E-04 | | | | 1.00E+00 | 1.00E+00 | 7.81E-04 |
| Food-an. | 7.97E-02 | | | 5.82E-03 | | | | | | 1.00E+00 | 1.00E+00 | 5.82E-03 |
| Food-veg. | 2.98E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.93E+01 | | | | | | | 6.16E-02 | | 1.00E+00 | 1.00E+00 | 6.16E-02 |
| Water | 5.30E-03 | | | | | 4.45E-04 | | | | 1.00E+00 | 1.00E+00 | 4.45E-04 |
| Food-an. | 1.64E-03 | | | 1.20E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.20E-04 |
| Food-veg. | 2.64E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.19E+01 | 2.50E-02 | 6.60E+00 | 3.79E-03 | |
| Water | 9.30E-03 | 7.81E-04 | 6.60E+00 | 1.18E-04 | |
| Food | 3.05E+00 | 5.82E-03 | 6.60E+00 | 8.82E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.79E-03 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.93E+01 | 6.16E-02 | 8.00E-01 | 7.70E-02 | |
| Water | 5.30E-03 | 4.45E-04 | 8.00E-01 | 5.57E-04 | |
| Food | 2.65E-01 | 1.20E-04 | 8.00E-01 | 1.50E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.77E-02 |

| Manganese | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.05E+01 | | | | | | | 8.52E-02 | | 1.00E+00 | 1.00E+00 | 8.52E-02 |
| Water | 4.58E-01 | | | | | 3.85E-02 | | | | 1.00E+00 | 1.00E+00 | 3.85E-02 |
| Food-an. | 3.73E-03 | | | 2.72E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.72E-04 |
| Food-veg. | 2.03E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.57E-04 | | 1.00E+00 | 1.00E+00 | 7.57E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.44E-03 | | | 3.97E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.97E-04 |
| Food-veg. | 7.20E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.05E+01 | 8.52E-02 | 8.80E+00 | 9.68E-03 | |
| Water | 4.58E-01 | 3.85E-02 | 8.80E+00 | 4.37E-03 | |
| Food | 2.03E+00 | 2.72E-04 | 8.80E+00 | 3.09E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.41E-02 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.57E-04 | 1.32E+00 | 5.74E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Food | 7.74E-02 | 3.97E-04 | 1.32E+00 | 3.01E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.75E-04 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.20E+00 | | | | | | | 4.63E-03 | | 1.00E+00 | 1.00E+00 | 4.63E-03 |
| Water | 1.20E-03 | | | | | 1.01E-04 | | | | 1.00E+00 | 1.00E+00 | 1.01E-04 |
| Food-an. | 3.33E-03 | | | 2.43E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.43E-04 |
| Food-veg. | 1.32E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 9.80E-01 | | | | | | | 2.06E-03 | | 1.00E+00 | 1.00E+00 | 2.06E-03 |
| Water | 3.60E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 2.57E-03 | | | 1.88E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.88E-04 |
| Food-veg. | 2.45E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.20E+00 | 4.63E-03 | 4.00E+00 | 1.16E-03 | |
| Water | 1.20E-03 | 1.01E-04 | 4.00E+00 | 2.52E-05 | |
| Food | 1.35E-01 | 2.43E-04 | 4.00E+00 | 6.07E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.24E-03 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E-01 | 2.06E-03 | 7.50E-02 | 2.75E-02 | |
| Water | 3.60E-03 | 3.02E-04 | 7.50E-02 | 4.03E-03 | |
| Food | 2.71E-02 | 1.88E-04 | 7.50E-02 | 2.50E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.40E-02 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.10E+00 | | | | | | | 4.42E-03 | | 1.00E+00 | 1.00E+00 | 4.42E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.14E-03 | | | 1.56E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.56E-04 |
| Food-veg. | 2.10E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 9.80E+00 | | | | | | | 2.06E-02 | | 1.00E+00 | 1.00E+00 | 2.06E-02 |
| Water | 2.30E-03 | | | | | 1.93E-04 | | | | 1.00E+00 | 1.00E+00 | 1.93E-04 |
| Food-an. | 3.10E-03 | | | 2.26E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.26E-04 |
| Food-veg. | 2.94E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.10E+00 | 4.42E-03 | 1.81E-02 | 2.44E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Food | 2.12E-01 | 1.56E-04 | 1.81E-02 | 8.64E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.53E-01 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E+00 | 2.06E-02 | 1.14E+00 | 1.81E-02 | |
| Water | 2.30E-03 | 1.93E-04 | 1.14E+00 | 1.70E-04 | |
| Food | 3.25E-02 | 2.26E-04 | 1.14E+00 | 1.99E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.84E-02 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.18E+01 | | | | | | | 8.79E-02 | | 1.00E+00 | 1.00E+00 | 8.79E-02 |
| Water | 5.82E-02 | | | | | 4.89E-03 | | | | 1.00E+00 | 1.00E+00 | 4.89E-03 |
| Food-an. | 8.78E+00 | | | 6.41E-01 | | | | | | 1.00E+00 | 1.00E+00 | 6.41E-01 |
| Food-veg. | 3.76E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.17E-02 | | | | | | | 4.56E-05 | | 1.00E+00 | 1.00E+00 | 4.56E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.00E-08 | | | 6.57E-09 | | | | | | 1.00E+00 | 1.00E+00 | 6.57E-09 |
| Food-veg. | 2.14E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.18E+01 | 8.79E-02 | 1.60E+01 | 5.49E-03 | |
| Water | 5.82E-02 | 4.89E-03 | 1.60E+01 | 3.06E-04 | |
| Food | 4.64E+01 | 6.41E-01 | 1.60E+01 | 4.01E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.58E-02 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.17E-02 | 4.56E-05 | 2.60E+01 | 1.76E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Food | 2.14E-03 | 6.57E-09 | 2.60E+01 | 2.53E-10 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.76E-06 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.70E-03 | | | | | | | 7.78E-06 | | 1.00E+00 | 1.00E+00 | 7.78E-06 |
| Water | 2.00E-03 | | | | | 1.68E-04 | | | | 1.00E+00 | 1.00E+00 | 1.68E-04 |
| Food-an. | 1.85E-07 | | | 1.35E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.35E-08 |
| Food-veg. | 1.63E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 5.05E-04 | | 1.00E+00 | 1.00E+00 | 5.05E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 7.44E-05 | | | | | | 1.00E+00 | 1.00E+00 | 7.44E-05 |
| Food-veg. | 3.72E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E-03 | 7.78E-06 | 2.06E-01 | 3.78E-05 | |
| Water | 2.00E-03 | 1.68E-04 | 2.06E-01 | 8.16E-04 | |
| Food | 1.63E-03 | 1.35E-08 | 2.06E-01 | 6.57E-08 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.54E-04 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 5.05E-04 | 1.00E-01 | 5.05E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Food | 4.74E-03 | 7.44E-05 | 1.00E-01 | 7.44E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.79E-03 |

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 1.41E-04 | | 1.00E+00 | 1.00E+00 | 1.41E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 1.32E-02 | | | | | | 1.00E+00 | 1.00E+00 | 1.32E-02 |
| Food-veg. | 6.21E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 5.68E-04 | | 1.00E+00 | 1.00E+00 | 5.68E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 1.41E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.41E-05 |
| Food-veg. | 6.27E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 1.41E-04 | 5.50E+01 | 2.56E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Food | 6.23E+01 | 1.32E-02 | 5.50E+01 | 2.39E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.42E-04 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 5.68E-04 | 1.25E+01 | 4.54E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Food | 6.47E-03 | 1.41E-05 | 1.25E+01 | 1.12E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.65E-05 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.57E-04 | | 1.00E+00 | 1.00E+00 | 7.57E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 4.79E-04 | | | | | | 1.00E+00 | 1.00E+00 | 4.79E-04 |
| Food-veg. | 4.04E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| 0.00E+00 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.57E-04 | 7.50E-02 | 1.01E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Food | 1.06E-02 | 4.79E-04 | 7.50E-02 | 6.38E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.65E-02 |

| 0.00E+00 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | N/A | |
| Water | 0.00E+00 | 0.00E+00 | 0.00E+00 | N/A | |
| Food | 0.00E+00 | 0.00E+00 | 0.00E+00 | N/A | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 0.00E+00 | N/A | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 0.00E+00 | N/A | |
| | | | | | |
| Total | | | | | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.34E-02 | | | | | | | 4.92E-05 | | 1.00E+00 | 1.00E+00 | 4.92E-05 |
| Water | 2.80E-05 | | | | | 2.35E-06 | | | | 1.00E+00 | 1.00E+00 | 2.35E-06 |
| Food-an. | 8.90E-05 | | | 6.50E-06 | | | | | | 1.00E+00 | 1.00E+00 | 6.50E-06 |
| Food-veg. | 3.72E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.29E-02 | | | | | | | 4.82E-05 | | 1.00E+00 | 1.00E+00 | 4.82E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.39E-05 | | | 3.93E-06 | | | | | | 1.00E+00 | 1.00E+00 | 3.93E-06 |
| Food-veg. | 4.06E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.34E-02 | 4.92E-05 | 8.00E-02 | 6.15E-04 | |
| Water | 2.80E-05 | 2.35E-06 | 8.00E-02 | 2.94E-05 | |
| Food | 4.61E-04 | 6.50E-06 | 8.00E-02 | 8.12E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.26E-04 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.29E-02 | 4.82E-05 | 8.00E-02 | 6.02E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Food | 4.59E-04 | 3.93E-06 | 8.00E-02 | 4.91E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.51E-04 |

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.61E-02 | | | | | | | 3.39E-05 | | 1.00E+00 | 1.00E+00 | 3.39E-05 |
| Water | 2.90E-04 | | | | | 2.44E-05 | | | | 1.00E+00 | 1.00E+00 | 2.44E-05 |
| Food-an. | 5.99E-05 | | | 4.38E-06 | | | | | | 1.00E+00 | 1.00E+00 | 4.38E-06 |
| Food-veg. | 2.57E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 8.90E-03 | | | | | | | 1.87E-05 | | 1.00E+00 | 1.00E+00 | 1.87E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.42E-02 | | | 1.03E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.03E-03 |
| Food-veg. | 3.76E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.61E-02 | 3.39E-05 | 8.00E-02 | 4.23E-04 | |
| Water | 2.90E-04 | 2.44E-05 | 8.00E-02 | 3.05E-04 | |
| Food | 3.17E-04 | 4.38E-06 | 8.00E-02 | 5.47E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.82E-04 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 8.90E-03 | 1.87E-05 | 4.58E-01 | 4.09E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 1.42E-02 | 1.03E-03 | 4.58E-01 | 2.26E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.30E-03 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 5.89E-05 | | 1.00E+00 | 1.00E+00 | 5.89E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 9.85E-07 | | | | | | 1.00E+00 | 1.00E+00 | 9.85E-07 |
| Food-veg. | 1.37E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 1.32E-03 | | 1.00E+00 | 1.00E+00 | 1.32E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 1.34E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.34E-03 |
| Food-veg. | 6.37E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 5.89E-05 | 1.35E-02 | 4.36E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 9.85E-07 | 1.35E-02 | 7.30E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.43E-03 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 1.32E-03 | 1.35E-02 | 9.81E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 1.34E-03 | 1.35E-02 | 9.90E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.97E-01 |

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.30E-02 | | | | | | | 2.73E-05 | | 1.00E+00 | 1.00E+00 | 2.73E-05 |
| Water | 2.60E-04 | | | | | 2.18E-05 | | | | 1.00E+00 | 1.00E+00 | 2.18E-05 |
| Food-an. | 8.15E-06 | | | 5.95E-07 | | | | | | 1.00E+00 | 1.00E+00 | 5.95E-07 |
| Food-veg. | 3.11E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.70E-03 | | | | | | | 9.88E-06 | | 1.00E+00 | 1.00E+00 | 9.88E-06 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.17E-07 | | | 8.51E-09 | | | | | | 1.00E+00 | 1.00E+00 | 8.51E-09 |
| Food-veg. | 2.49E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E-02 | 2.73E-05 | 2.00E-03 | 1.37E-02 | |
| Water | 2.60E-04 | 2.18E-05 | 2.00E-03 | 1.09E-02 | |
| Food | 3.19E-04 | 5.95E-07 | 2.00E-03 | 2.98E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.49E-02 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.70E-03 | 9.88E-06 | 1.50E-02 | 6.59E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Food | 2.49E-04 | 8.51E-09 | 1.50E-02 | 5.67E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.59E-04 |

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.07E-02 | | | | | | | 2.25E-05 | | 1.00E+00 | 1.00E+00 | 2.25E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.71E-06 | | | 4.90E-07 | | | | | | 1.00E+00 | 1.00E+00 | 4.90E-07 |
| Food-veg. | 2.56E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 4.21E-06 | | 1.00E+00 | 1.00E+00 | 4.21E-06 |
| Water | 1.30E-04 | | | | | 1.09E-05 | | | | 1.00E+00 | 1.00E+00 | 1.09E-05 |
| Food-an. | 1.89E-07 | | | 1.38E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.38E-08 |
| Food-veg. | 7.47E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.07E-02 | 2.25E-05 | 9.00E-03 | 2.50E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Food | 2.63E-04 | 4.90E-07 | 9.00E-03 | 5.44E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.55E-03 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 4.21E-06 | 8.00E-02 | 5.26E-05 | |
| Water | 1.30E-04 | 1.09E-05 | 8.00E-02 | 1.37E-04 | |
| Food | 7.49E-05 | 1.38E-08 | 8.00E-02 | 1.73E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.89E-04 |

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.00E-02 | | | | | | | 4.21E-05 | | 1.00E+00 | 1.00E+00 | 4.21E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.67E-05 | | | 4.87E-06 | | | | | | 1.00E+00 | 1.00E+00 | 4.87E-06 |
| Food-veg. | 3.27E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-02 | 4.21E-05 | 4.58E-01 | 9.18E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 3.94E-04 | 4.87E-06 | 4.58E-01 | 1.06E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.02E-04 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 2.63E+00 | 3.19E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.19E-05 |

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 5.04E-04 | | | | 1.00E+00 | 1.00E+00 | 5.04E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 8.40E-04 | | | | 1.00E+00 | 1.00E+00 | 8.40E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Water | 6.00E-03 | 5.04E-04 | 1.83E+00 | 2.75E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.75E-04 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Water | 1.00E-02 | 8.40E-04 | 2.73E-02 | 3.08E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.08E-02 |

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 4.52E-01 | 1.86E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.86E-04 |

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 1.70E-02 | 4.94E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.94E-03 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 8.40E-06 | | | | 1.00E+00 | 1.00E+00 | 8.40E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 8.40E-06 | | | | 1.00E+00 | 1.00E+00 | 8.40E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 8.40E-06 | 2.00E-02 | 4.20E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.20E-04 |

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Water | 1.00E-04 | 8.40E-06 | 9.20E-03 | 9.13E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.13E-04 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 1.01E-05 | | | | 1.00E+00 | 1.00E+00 | 1.01E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.60E-07 | | | | 1.00E+00 | 1.00E+00 | 1.60E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Water | 1.20E-04 | 1.01E-05 | 8.00E-01 | 1.26E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.26E-05 |

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Water | 1.90E-06 | 1.60E-07 | 2.00E-04 | 7.98E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.98E-04 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 2.52E-05 | | 1.00E+00 | 1.00E+00 | 2.52E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 6.03E-10 | | | | | | 1.00E+00 | 1.00E+00 | 6.03E-10 |
| Food-veg. | 7.76E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 7.57E-03 | | 1.00E+00 | 1.00E+00 | 7.57E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-02 | | | 1.27E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.27E-03 |
| Food-veg. | 1.44E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 2.52E-05 | 5.85E-02 | 4.31E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Food | 7.76E-03 | 6.03E-10 | 5.85E-02 | 1.03E-08 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.31E-04 |

| Thallium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 7.57E-03 | 7.40E-04 | 1.02E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Food | 1.88E-02 | 1.27E-03 | 7.40E-04 | 1.72E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.19E+01 |

# DOSE CALCULATIONS FOR RED FOX

# MAXIMUM CONCENTRATION

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 5.47E+00 |
| Antimony | | | 6.06E+00 |
| Arsenic | | | 2.85E+00 |
| Barium | | | 4.28E+00 |
| Beryllium | | | 8.92E-03 |
| Cadmium | | | 5.34E-01 |
| Chromium | | | 2.34E+00 |
| Cobalt | | | 2.14E-02 |
| Copper | | | 1.62E-02 |
| Lead | | | 2.01E-01 |
| Manganese | | | 5.04E-02 |
| Mercury | | | 1.59E-03 |
| Nickel | | | 2.84E-03 |
| Selenium | | | 8.97E-02 |
| Silver | | | 4.30E-01 |
| Vanadium | | | 4.46E-02 |
| Zinc | | | 2.75E-02 |
| Toluene | | | 3.40E-06 |
| Xylene | | | 1.12E-04 |
| Benzo(a)pyrene | | | 5.05E-03 |
| Di-N-octylphthalate | | | 2.56E-06 |
| Flouranthene | | | 4.54E-05 |
| Pyrene | | | 1.01E-02 |
| 4,4'-DDD | | | 1.13E-03 |
| 4,4'-DDE | | | 1.81E-03 |
| 4,4'-DDT | | | 9.20E-04 |
| Alpha-Chlordane | | | 1.24E-04 |
| Aroclor 1254 | | | 4.36E-03 |
| Aroclor 1260 | | | 9.81E-02 |
| Dieldrin | | | 2.42E-02 |
| Endosulfan I | | | 1.07E-03 |
| Endrin aldehyde | | | 6.31E-04 |
| Heptachlor | | | 5.26E-05 |
| Gamma-Chlordane | | | 1.33E-04 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 4.31E-04 |
| Thallium | | | 1.90E+01 |
| | | | |
| TOTAL | | | 4.16E+01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 8.32E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 2.40E-02 |
| Barium | | | 9.30E-02 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.03E-02 |
| Chromium | | | 9.13E-03 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.18E-04 |
| Lead | | | 5.57E-04 |
| Manganese | | | 4.37E-03 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 2.52E-05 |
| Selenium | | | 4.03E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.70E-04 |
| Zinc | | | 3.06E-04 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 8.16E-04 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 2.94E-05 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 3.05E-04 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 1.09E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 1.37E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 3.19E-05 |
| Bis(2-ethylhexyl)phthalate | | | 2.75E-04 |
| Chlorobenzene | | | 3.08E-02 |
| Cis-1,2-Dichloroethane | | | 1.86E-04 |
| Vinyl Chloride | | | 4.94E-03 |
| Aldrin | | | 4.20E-04 |
| Endrin | | | 9.13E-04 |
| Lindane | | | 1.26E-05 |
| Heptachlor Epoxide | | | 7.98E-04 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 2.05E-01 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED FOX

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 3.46E-02 |
| Antimony | | | 3.91E-02 |
| Arsenic | | | 2.64E-02 |
| Barium | | | 3.41E-03 |
| Beryllium | | | 4.40E-05 |
| Cadmium | | | 2.92E-03 |
| Chromium | | | 3.69E-03 |
| Cobalt | | | 3.53E-04 |
| Copper | | | 3.76E-03 |
| Lead | | | 3.90E-04 |
| Manganese | | | 1.61E-04 |
| Mercury | | | 8.36E-04 |
| Nickel | | | 1.49E-04 |
| Selenium | | | 8.18E-03 |
| Silver | | | 1.52E-02 |
| Vanadium | | | 4.90E-04 |
| Zinc | | | 2.00E-01 |
| Toluene | | | 4.89E-10 |
| Xylene | | | 1.95E-07 |
| Benzo(a)pyrene | | | 7.44E-04 |
| Di-N-octylphthalate | | | 2.39E-04 |
| Flouranthene | | | 1.12E-06 |
| Pyrene | | | 6.38E-03 |
| 4,4'-DDD | | | 1.49E-04 |
| 4,4'-DDE | | | 1.48E-04 |
| 4,4'-DDT | | | 1.19E-04 |
| Alpha-Chlordane | | | 6.85E-03 |
| Aroclor 1254 | | | 7.30E-05 |
| Aroclor 1260 | | | 9.90E-02 |
| Dieldrin | | | 5.26E-04 |
| Endosulfan I | | | 9.17E-07 |
| Endrin aldehyde | | | 1.72E-05 |
| Heptachlor | | | 1.73E-07 |
| Gamma-Chlordane | | | 1.54E-05 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.03E-08 |
| Thallium | | | 3.20E+00 |
| | | | |
| TOTAL | | | 3.65E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.30E+04 | | | | | | | 2.73E+01 | | 1.00E+00 | 1.00E+00 | 2.73E+01 |
| Water | 4.95E-01 | | | | | 4.16E-02 | | | | 1.00E+00 | 1.00E+00 | 4.16E-02 |
| Food-an. | 2.37E+00 | | | 1.73E-01 | | | | | | 1.00E+00 | 1.00E+00 | 1.73E-01 |
| Food-veg. | 8.45E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 7.57E-03 | | 1.00E+00 | 1.00E+00 | 7.57E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.70E-04 | | | 4.89E-05 | | | | | | 1.00E+00 | 1.00E+00 | 4.89E-05 |
| Food-veg. | 1.08E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E+04 | 2.73E+01 | 5.00E+00 | 5.47E+00 | |
| Water | 4.95E-01 | 4.16E-02 | 5.00E+00 | 8.32E-03 | |
| Food | 1.08E+01 | 1.73E-01 | 5.00E+00 | 3.46E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.51E+00 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 7.57E-03 | 1.25E-03 | 6.06E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Food | 1.09E-01 | 4.89E-05 | 1.25E-03 | 3.91E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.10E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.71E+01 | | | | | | | 3.60E-02 | | 1.00E+00 | 1.00E+00 | 3.60E-02 |
| Water | 3.60E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 4.56E-03 | | | 3.33E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.33E-04 |
| Food-veg. | 1.03E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.03E+02 | | | | | | | 2.17E-01 | | 1.00E+00 | 1.00E+00 | 2.17E-01 |
| Water | 5.60E-02 | | | | | 4.71E-03 | | | | 1.00E+00 | 1.00E+00 | 4.71E-03 |
| Food-an. | 2.36E-03 | | | 1.73E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.73E-04 |
| Food-veg. | 1.55E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.71E+01 | 3.60E-02 | 1.26E-02 | 2.85E+00 | |
| Water | 3.60E-03 | 3.02E-04 | 1.26E-02 | 2.40E-02 | |
| Food | 1.07E-01 | 3.33E-04 | 1.26E-02 | 2.64E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.26E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.90E+00 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.03E+02 | 2.17E-01 | 5.06E-02 | 4.28E+00 | |
| Water | 5.60E-02 | 4.71E-03 | 5.06E-02 | 9.30E-02 | |
| Food | 1.55E+00 | 1.73E-04 | 5.06E-02 | 3.41E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.38E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 5.89E-04 | | 1.00E+00 | 1.00E+00 | 5.89E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 2.90E-06 | | | | | | 1.00E+00 | 1.00E+00 | 2.90E-06 |
| Food-veg. | 2.80E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.40E+00 | | | | | | | 1.35E-02 | | 1.00E+00 | 1.00E+00 | 1.35E-02 |
| Water | 3.10E-03 | | | | | 2.60E-04 | | | | 1.00E+00 | 1.00E+00 | 2.60E-04 |
| Food-an. | 1.01E-03 | | | 7.36E-05 | | | | | | 1.00E+00 | 1.00E+00 | 7.36E-05 |
| Food-veg. | 9.60E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 5.89E-04 | 6.60E-02 | 8.92E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Food | 2.84E-03 | 2.90E-06 | 6.60E-02 | 4.40E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.97E-03 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.40E+00 | 1.35E-02 | 2.52E-02 | 5.34E-01 | |
| Water | 3.10E-03 | 2.60E-04 | 2.52E-02 | 1.03E-02 | |
| Food | 9.61E-01 | 7.36E-05 | 2.52E-02 | 2.92E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.47E-01 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 5.12E+01 | | | | | | | 1.08E-01 | | 1.00E+00 | 1.00E+00 | 1.08E-01 |
| Water | 5.00E-03 | | | | | 4.20E-04 | | | | 1.00E+00 | 1.00E+00 | 4.20E-04 |
| Food-an. | 2.33E-03 | | | 1.70E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.70E-04 |
| Food-veg. | 2.30E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.60E+00 | | | | | | | 3.36E-03 | | 1.00E+00 | 1.00E+00 | 3.36E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 7.58E-04 | | | 5.54E-05 | | | | | | 1.00E+00 | 1.00E+00 | 5.54E-05 |
| Food-veg. | 1.12E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Chromium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.12E+01 | 1.08E-01 | 4.60E-02 | 2.34E+00 | |
| Water | 5.00E-03 | 4.20E-04 | 4.60E-02 | 9.13E-03 | |
| Food | 2.33E-01 | 1.70E-04 | 4.60E-02 | 3.69E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.35E+00 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.60E+00 | 3.36E-03 | 1.57E-01 | 2.14E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Food | 1.20E-02 | 5.54E-05 | 1.57E-01 | 3.53E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.18E-02 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 5.08E+01 | | | | | | | 1.07E-01 | | 1.00E+00 | 1.00E+00 | 1.07E-01 |
| Water | 9.30E-03 | | | | | 7.81E-04 | | | | 1.00E+00 | 1.00E+00 | 7.81E-04 |
| Food-an. | 3.40E-01 | | | 2.48E-02 | | | | | | 1.00E+00 | 1.00E+00 | 2.48E-02 |
| Food-veg. | 1.27E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 7.65E+01 | | | | | | | 1.61E-01 | | 1.00E+00 | 1.00E+00 | 1.61E-01 |
| Water | 5.30E-03 | | | | | 4.45E-04 | | | | 1.00E+00 | 1.00E+00 | 4.45E-04 |
| Food-an. | 4.28E-03 | | | 3.12E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.12E-04 |
| Food-veg. | 6.89E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.08E+01 | 1.07E-01 | 6.60E+00 | 1.62E-02 | |
| Water | 9.30E-03 | 7.81E-04 | 6.60E+00 | 1.18E-04 | |
| Food | 1.30E+01 | 2.48E-02 | 6.60E+00 | 3.76E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.01E-02 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.65E+01 | 1.61E-01 | 8.00E-01 | 2.01E-01 | |
| Water | 5.30E-03 | 4.45E-04 | 8.00E-01 | 5.57E-04 | |
| Food | 6.93E-01 | 3.12E-04 | 8.00E-01 | 3.90E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.02E-01 |

| Manganese | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.11E+02 | | | | | | | 4.44E-01 | | 1.00E+00 | 1.00E+00 | 4.44E-01 |
| Water | 4.58E-01 | | | | | 3.85E-02 | | | | 1.00E+00 | 1.00E+00 | 3.85E-02 |
| Food-an. | 1.94E-02 | | | 1.42E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.42E-03 |
| Food-veg. | 1.06E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.00E+00 | | | | | | | 2.10E-03 | | 1.00E+00 | 1.00E+00 | 2.10E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.51E-02 | | | 1.10E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.10E-03 |
| Food-veg. | 2.00E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.11E+02 | 4.44E-01 | 8.80E+00 | 5.04E-02 | |
| Water | 4.58E-01 | 3.85E-02 | 8.80E+00 | 4.37E-03 | |
| Food | 1.06E+01 | 1.42E-03 | 8.80E+00 | 1.61E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.50E-02 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.00E+00 | 2.10E-03 | 1.32E+00 | 1.59E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Food | 2.15E-01 | 1.10E-03 | 1.32E+00 | 8.36E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.43E-03 |

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 5.40E+00 | | | | | | | 1.14E-02 | | 1.00E+00 | 1.00E+00 | 1.14E-02 |
| Water | 1.20E-03 | | | | | 1.01E-04 | | | | 1.00E+00 | 1.00E+00 | 1.01E-04 |
| Food-an. | 8.16E-03 | | | 5.96E-04 | | | | | | 1.00E+00 | 1.00E+00 | 5.96E-04 |
| Food-veg. | 3.24E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.20E+00 | | | | | | | 6.73E-03 | | 1.00E+00 | 1.00E+00 | 6.73E-03 |
| Water | 3.60E-03 | | | | | 3.02E-04 | | | | 1.00E+00 | 1.00E+00 | 3.02E-04 |
| Food-an. | 8.40E-03 | | | 6.13E-04 | | | | | | 1.00E+00 | 1.00E+00 | 6.13E-04 |
| Food-veg. | 8.00E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.30E-02 | | | | | | | 9.04E-05 | | 1.00E+00 | 1.00E+00 | 9.04E-05 |
| Water | 2.80E-05 | | | | | 2.35E-06 | | | | 1.00E+00 | 1.00E+00 | 2.35E-06 |
| Food-an. | 1.64E-04 | | | 1.19E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.19E-05 |
| Food-veg. | 6.83E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.90E-02 | | | | | | | 1.45E-04 | | 1.00E+00 | 1.00E+00 | 1.45E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.62E-04 | | | 1.18E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.18E-05 |
| Food-veg. | 1.22E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.57E-04 | 7.50E-02 | 1.01E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Food | 1.06E-02 | 4.79E-04 | 7.50E-02 | 6.38E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.65E-02 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.57E-04 | | 1.00E+00 | 1.00E+00 | 7.57E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 4.79E-04 | | | | | | 1.00E+00 | 1.00E+00 | 4.79E-04 |
| Food-veg. | 4.04E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 1.41E-04 | 5.50E+01 | 2.56E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Food | 6.23E+01 | 1.32E-02 | 5.50E+01 | 2.39E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.50E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.42E-04 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 5.68E-04 | 1.25E+01 | 4.54E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Food | 6.47E-03 | 1.41E-05 | 1.25E+01 | 1.12E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.65E-05 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 1.41E-04 | | 1.00E+00 | 1.00E+00 | 1.41E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 1.32E-02 | | | | | | 1.00E+00 | 1.00E+00 | 1.32E-02 |
| Food-veg. | 6.21E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 5.68E-04 | | 1.00E+00 | 1.00E+00 | 5.68E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 1.41E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.41E-05 |
| Food-veg. | 6.27E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.10E-02 | 2.31E-05 | 2.06E-01 | 1.12E-04 | |
| Water | 2.00E-03 | 1.68E-04 | 2.06E-01 | 8.16E-04 | |
| Food | 4.85E-03 | 4.02E-08 | 2.06E-01 | 1.95E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.28E-04 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 5.05E-04 | 1.00E-01 | 5.05E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Food | 4.74E-03 | 7.44E-05 | 1.00E-01 | 7.44E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.79E-03 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.10E-02 | | | | | | | 2.31E-05 | | 1.00E+00 | 1.00E+00 | 2.31E-05 |
| Water | 2.00E-03 | | | | | 1.68E-04 | | | | 1.00E+00 | 1.00E+00 | 1.68E-04 |
| Food-an. | 5.51E-07 | | | 4.02E-08 | | | | | | 1.00E+00 | 1.00E+00 | 4.02E-08 |
| Food-veg. | 4.85E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 5.05E-04 | | 1.00E+00 | 1.00E+00 | 5.05E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 7.44E-05 | | | | | | 1.00E+00 | 1.00E+00 | 7.44E-05 |
| Food-veg. | 3.72E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.09E+02 | 4.40E-01 | 1.60E+01 | 2.75E-02 | |
| Water | 5.82E-02 | 4.89E-03 | 1.60E+01 | 3.06E-04 | |
| Food | 2.32E+02 | 3.20E+00 | 1.60E+01 | 2.00E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.28E-01 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.20E-02 | 8.83E-05 | 2.60E+01 | 3.40E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Food | 4.15E-03 | 1.27E-08 | 2.60E+01 | 4.89E-10 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.40E-06 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.09E+02 | | | | | | | 4.40E-01 | | 1.00E+00 | 1.00E+00 | 4.40E-01 |
| Water | 5.82E-02 | | | | | 4.89E-03 | | | | 1.00E+00 | 1.00E+00 | 4.89E-03 |
| Food-an. | 4.39E+01 | | | 3.20E+00 | | | | | | 1.00E+00 | 1.00E+00 | 3.20E+00 |
| Food-veg. | 1.88E+02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 4.20E-02 | | | | | | | 8.83E-05 | | 1.00E+00 | 1.00E+00 | 8.83E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-07 | | | 1.27E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.27E-08 |
| Food-veg. | 4.15E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E+00 | 7.78E-03 | 1.81E-02 | 4.30E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Food | 3.74E-01 | 2.76E-04 | 1.81E-02 | 1.52E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.45E-01 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.42E+01 | 5.09E-02 | 1.14E+00 | 4.46E-02 | |
| Water | 2.30E-03 | 1.93E-04 | 1.14E+00 | 1.70E-04 | |
| Food | 8.03E-02 | 5.59E-04 | 1.14E+00 | 4.90E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.53E-02 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.70E+00 | | | | | | | 7.78E-03 | | 1.00E+00 | 1.00E+00 | 7.78E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.77E-03 | | | 2.76E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.76E-04 |
| Food-veg. | 3.70E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.42E+01 | | | | | | | 5.09E-02 | | 1.00E+00 | 1.00E+00 | 5.09E-02 |
| Water | 2.30E-03 | | | | | 1.93E-04 | | | | 1.00E+00 | 1.00E+00 | 1.93E-04 |
| Food-an. | 7.66E-03 | | | 5.59E-04 | | | | | | 1.00E+00 | 1.00E+00 | 5.59E-04 |
| Food-veg. | 7.26E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.40E+00 | 1.14E-02 | 4.00E+00 | 2.84E-03 | |
| Water | 1.20E-03 | 1.01E-04 | 4.00E+00 | 2.52E-05 | |
| Food | 3.32E-01 | 5.96E-04 | 4.00E+00 | 1.49E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.01E-03 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.20E+00 | 6.73E-03 | 7.50E-02 | 8.97E-02 | |
| Water | 3.60E-03 | 3.02E-04 | 7.50E-02 | 4.03E-03 | |
| Food | 8.84E-02 | 6.13E-04 | 7.50E-02 | 8.18E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.02E-01 |

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.30E-02 | 9.04E-05 | 8.00E-02 | 1.13E-03 | |
| Water | 2.80E-05 | 2.35E-06 | 8.00E-02 | 2.94E-05 | |
| Food | 8.47E-04 | 1.19E-05 | 8.00E-02 | 1.49E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.31E-03 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.90E-02 | 1.45E-04 | 8.00E-02 | 1.81E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Food | 1.38E-03 | 1.18E-05 | 8.00E-02 | 1.48E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.96E-03 |

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 3.50E-02 | | | | | | | 7.36E-05 | | 1.00E+00 | 1.00E+00 | 7.36E-05 |
| Water | 2.90E-04 | | | | | 2.44E-05 | | | | 1.00E+00 | 1.00E+00 | 2.44E-05 |
| Food-an. | 1.30E-04 | | | 9.51E-06 | | | | | | 1.00E+00 | 1.00E+00 | 9.51E-06 |
| Food-veg. | 5.59E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.70E-02 | | | | | | | 5.68E-05 | | 1.00E+00 | 1.00E+00 | 5.68E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.30E-02 | | | 3.14E-03 | | | | | | 1.00E+00 | 1.00E+00 | 3.14E-03 |
| Food-veg. | 1.14E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.50E-02 | 7.36E-05 | 8.00E-02 | 9.20E-04 | |
| Water | 2.90E-04 | 2.44E-05 | 8.00E-02 | 3.05E-04 | |
| Food | 6.89E-04 | 9.51E-06 | 8.00E-02 | 1.19E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.34E-03 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-02 | 5.68E-05 | 4.58E-01 | 1.24E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 4.31E-02 | 3.14E-03 | 4.58E-01 | 6.85E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.97E-03 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 5.89E-05 | | 1.00E+00 | 1.00E+00 | 5.89E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 9.85E-07 | | | | | | 1.00E+00 | 1.00E+00 | 9.85E-07 |
| Food-veg. | 1.37E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 1.32E-03 | | 1.00E+00 | 1.00E+00 | 1.32E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 1.34E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.34E-03 |
| Food-veg. | 6.37E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 5.89E-05 | 1.35E-02 | 4.36E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 9.85E-07 | 1.35E-02 | 7.30E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.43E-03 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 1.32E-03 | 1.35E-02 | 9.81E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 1.34E-03 | 1.35E-02 | 9.90E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.35E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.97E-01 |

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.30E-02 | | | | | | | 4.84E-05 | | 1.00E+00 | 1.00E+00 | 4.84E-05 |
| Water | 2.60E-04 | | | | | 2.18E-05 | | | | 1.00E+00 | 1.00E+00 | 2.18E-05 |
| Food-an. | 1.44E-05 | | | 1.05E-06 | | | | | | 1.00E+00 | 1.00E+00 | 1.05E-06 |
| Food-veg. | 5.50E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 7.60E-03 | | | | | | | 1.60E-05 | | 1.00E+00 | 1.00E+00 | 1.60E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.88E-07 | | | 1.38E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.38E-08 |
| Food-veg. | 4.03E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E-02 | 4.84E-05 | 2.00E-03 | 2.42E-02 | |
| Water | 2.60E-04 | 2.18E-05 | 2.00E-03 | 1.09E-02 | |
| Food | 5.65E-04 | 1.05E-06 | 2.00E-03 | 5.26E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.56E-02 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.60E-03 | 1.60E-05 | 1.50E-02 | 1.07E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Food | 4.03E-04 | 1.38E-08 | 1.50E-02 | 9.17E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.50E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.07E-03 |

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.70E-03 | | | | | | | 5.68E-06 | | 1.00E+00 | 1.00E+00 | 5.68E-06 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.12E-06 | | | 1.55E-07 | | | | | | 1.00E+00 | 1.00E+00 | 1.55E-07 |
| Food-veg. | 6.46E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 4.21E-06 | | 1.00E+00 | 1.00E+00 | 4.21E-06 |
| Water | 1.30E-04 | | | | | 1.09E-05 | | | | 1.00E+00 | 1.00E+00 | 1.09E-05 |
| Food-an. | 1.89E-07 | | | 1.38E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.38E-08 |
| Food-veg. | 7.47E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-03 | 5.68E-06 | 9.00E-03 | 6.31E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Food | 6.48E-04 | 1.55E-07 | 9.00E-03 | 1.72E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.48E-04 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 4.21E-06 | 8.00E-02 | 5.26E-05 | |
| Water | 1.30E-04 | 1.09E-05 | 8.00E-02 | 1.37E-04 | |
| Food | 7.49E-05 | 1.38E-08 | 8.00E-02 | 1.73E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.89E-04 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 2.90E-02 | | | | | | | 6.10E-05 | | 1.00E+00 | 1.00E+00 | 6.10E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.67E-05 | | | 7.06E-06 | | | | | | 1.00E+00 | 1.00E+00 | 7.06E-06 |
| Food-veg. | 4.75E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.90E-02 | 6.10E-05 | 4.58E-01 | 1.33E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Food | 5.72E-04 | 7.06E-06 | 4.58E-01 | 1.54E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.58E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.49E-04 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 2.63E+00 | 3.19E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.19E-05 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 5.04E-04 | | | | 1.00E+00 | 1.00E+00 | 5.04E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 8.40E-04 | | | | 1.00E+00 | 1.00E+00 | 8.40E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Water | 6.00E-03 | 5.04E-04 | 1.83E+00 | 2.75E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.83E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.75E-04 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Water | 1.00E-02 | 8.40E-04 | 2.73E-02 | 3.08E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.08E-02 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 8.40E-05 | | | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 4.52E-01 | 1.86E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.86E-04 |

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 8.40E-05 | 1.70E-02 | 4.94E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.94E-03 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 8.40E-06 | | | | 1.00E+00 | 1.00E+00 | 8.40E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 8.40E-06 | | | | 1.00E+00 | 1.00E+00 | 8.40E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 8.40E-06 | 2.00E-02 | 4.20E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.20E-04 |

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Water | 1.00E-04 | 8.40E-06 | 9.20E-03 | 9.13E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.13E-04 |

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 1.01E-05 | | | | 1.00E+00 | 1.00E+00 | 1.01E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.60E-07 | | | | 1.00E+00 | 1.00E+00 | 1.60E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Water | 1.20E-04 | 1.01E-05 | 8.00E-01 | 1.26E-05 | |
| Food | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.26E-05 |

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Water | 1.90E-06 | 1.60E-07 | 2.00E-04 | 7.98E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.98E-04 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 2.52E-05 | | 1.00E+00 | 1.00E+00 | 2.52E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 6.03E-10 | | | | | | 1.00E+00 | 1.00E+00 | 6.03E-10 |
| Food-veg. | 7.76E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 4.82E+00 | 3.62E+05 | | | | | | | | | |
| Soil | 6.70E+00 | | | | | | | 1.41E-02 | | 1.00E+00 | 1.00E+00 | 1.41E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.24E-02 | | | 2.36E-03 | | | | | | 1.00E+00 | 1.00E+00 | 2.36E-03 |
| Food-veg. | 2.68E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 2.52E-05 | 5.85E-02 | 4.31E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Food | 7.76E-03 | 6.03E-10 | 5.85E-02 | 1.03E-08 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.31E-04 |

| Thallium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E+00 | 1.41E-02 | 7.40E-04 | 1.90E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Food | 3.51E-02 | 2.36E-03 | 7.40E-04 | 3.20E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.22E+01 |

# DOSE CALCULATIONS FOR RED-TAILED HAWK

# MEAN CONCENTRATION

| Contaminant and Form | Test Species | Lab Test Results (mg/kg/day) | Endpoint Species | Scaling Factor (Prod. of 1/UFs) | Estimated Wild-life NOAEL (mg/kg/day) |
|---|---|---|---|---|---|
| Aluminum | Ringed Dove | 1.11E+02 | Red-Tailed Hawk | 1.00E-01 | 1.11E+01 |
| Antimony | Mouse | 1.25E+00 | Red-Tailed Hawk | 1.00E-04 | 1.25E-04 |
| Arsenic | Mallard Duck | 5.14E+00 | Red-Tailed Hawk | 1.00E-02 | 5.14E-02 |
| Barium | Chick | 2.09E+01 | Red-Tailed Hawk | 1.00E-02 | 2.09E-01 |
| Beryllium | Rat | 6.60E-01 | Red-Tailed Hawk | 1.00E-02 | 6.60E-03 |
| Cadmium | Mallard Duck | 1.45E+00 | Red-Tailed Hawk | 1.00E-01 | 1.45E-01 |
| Chromium | Black Duck | 4.60E+00 | Red-Tailed Hawk | 1.00E-01 | 4.60E-01 |
| Cobalt | Rat | 1.57E+02 | Red-Tailed Hawk | 1.00E-04 | 1.57E-02 |
| Copper | Chicken | 3.32E+01 | Red-Tailed Hawk | 1.00E-01 | 3.32E+00 |
| Lead | Kestrel | 3.85E+00 | Red-Tailed Hawk | 1.00E-01 | 3.85E-01 |
| Manganese | Rat | 8.80E+01 | Red-Tailed Hawk | 1.00E-02 | 8.80E-01 |
| Mercury | Mallard Duck | 6.40E-02 | Red-Tailed Hawk | 1.00E-02 | 6.40E-04 |
| Nickel | Mallard Duckling | 7.74E+01 | Red-Tailed Hawk | 1.00E-02 | 7.74E-01 |
| Selenium | Mallard Duck | 4.00E-01 | Red-Tailed Hawk | 1.00E-01 | 4.00E-02 |
| Silver | Rat | 1.81E+02 | Red-Tailed Hawk | 1.00E-05 | 1.81E-03 |
| Vanadium | Mallard Duck | 1.14E+01 | Red-Tailed Hawk | 1.00E-02 | 1.14E-01 |
| Zinc | Mallard Duck | 3.00E+02 | Red-Tailed Hawk | 1.00E-03 | 3.00E-01 |
| Toluene | Mouse | 2.60E+02 | Red-Tailed Hawk | 1.00E-02 | 2.60E+00 |
| Xylene | Mouse | 2.06E+00 | Red-Tailed Hawk | 1.00E-02 | 2.06E-02 |
| Benzo(a)pyrene | Mouse | 1.00E+01 | Red-Tailed Hawk | 1.00E-03 | 1.00E-02 |
| Di-N-octylphthalate | Ring Dove | 1.11E+00 | Red-Tailed Hawk | 1.00E-02 | 1.11E-02 |
| Flouranthene | Mouse | 1.25E+02 | Red-Tailed Hawk | 1.00E-02 | 1.25E+00 |
| Pyrene | Mouse | 7.50E+01 | Red-Tailed Hawk | 1.00E-04 | 7.50E-03 |
| 4,4'-DDD | Brown Pelican | 2.80E-03 | Red-Tailed Hawk | 1.00E-02 | 2.80E-05 |
| 4,4'-DDE | Brown Pelican | 2.80E-03 | Red-Tailed Hawk | 1.00E-02 | 2.80E-05 |
| 4,4'-DDT | Brown Pelican | 2.80E-03 | Red-Tailed Hawk | 1.00E-02 | 2.80E-05 |
| Alpha-Chlordane | Red-winged b-bir | 2.14E+00 | Red-Tailed Hawk | 1.00E-02 | 2.14E-02 |
| Aroclor 1254 | Screech Owl | 4.10E-01 | Red-Tailed Hawk | 1.00E-01 | 4.10E-02 |
| Aroclor 1260 | Screech Owl | 4.10E-01 | Red-Tailed Hawk | 1.00E-01 | 4.10E-02 |
| Dieldrin | Rat | 2.00E-01 | Red-Tailed Hawk | 1.00E-03 | 2.00E-04 |
| Endosulfan I | Gray Partridge | 1.00E+01 | Red-Tailed Hawk | 1.00E-01 | 1.00E+00 |
| Endrin aldehyde | Mouse | 9.20E-01 | Red-Tailed Hawk | 1.00E-03 | 9.20E-04 |
| Heptachlor | Rat | 8.00E-01 | Red-Tailed Hawk | 1.00E-02 | 8.00E-03 |
| Gamma-Chlordane | Red-winged b-bir | 2.14E+00 | Red-Tailed Hawk | 1.00E-02 | 2.14E-02 |
| Benzene | Mouse | 2.63E+02 | Red-Tailed Hawk | 1.00E-03 | 2.63E-01 |
| Bis(2-ethylhexyl)phthalate | Ring Dove | 1.11E+00 | Red-Tailed Hawk | 1.00E-01 | 1.11E-01 |
| Chlorobenzene | Beagle | 2.73E+01 | Red-Tailed Hawk | 1.00E-04 | 2.73E-03 |
| Cis-1,2-Dichloroethane | Mouse | 4.52E+02 | Red-Tailed Hawk | 1.00E-04 | 4.52E-02 |
| Vinyl Chloride | Rat | 1.70E+00 | Red-Tailed Hawk | 1.00E-03 | 1.70E-03 |
| Aldrin | Red-winged b-bir | 2.00E-01 | Red-Tailed Hawk | 1.00E-01 | 2.00E-02 |
| Endrin | Mallard Duck | 3.00E-01 | Red-Tailed Hawk | 1.00E-01 | 3.00E-02 |
| Lindane | Mallard Duck | 2.00E+01 | Red-Tailed Hawk | 1.00E-01 | 2.00E+00 |
| Heptachlor Epoxide | Beagle | 2.00E-02 | Red-Tailed Hawk | 1.00E-03 | 2.00E-05 |
| Methylene Chloride | Rat | 5.85E+00 | Red-Tailed Hawk | 1.00E-03 | 5.85E-03 |
| Thallium | Rat | 7.40E-01 | Red-Tailed Hawk | 1.00E-04 | 7.40E-05 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 8.23E-01 |
| Antimony | | | 3.68E+01 |
| Arsenic | | | 1.01E-01 |
| Barium | | | 2.44E-01 |
| Beryllium | | | 8.48E-02 |
| Cadmium | | | 2.76E-02 |
| Chromium | | | 6.52E-02 |
| Cobalt | | | 9.30E-02 |
| Copper | | | 7.17E-03 |
| Lead | | | 1.52E-01 |
| Manganese | | | 9.20E-02 |
| Mercury | | | 1.13E+00 |
| Nickel | | | 5.68E-03 |
| Selenium | | | 4.90E-02 |
| Silver | | | 2.32E+00 |
| Vanadium | | | 1.72E-01 |
| Zinc | | | 2.79E-01 |
| Toluene | | | 1.67E-05 |
| Xylene | | | 3.59E-04 |
| Benzo(a)pyrene | | | 4.80E-02 |
| Di-N-octylphthalate | | | 1.21E-02 |
| Flouranthene | | | 4.32E-04 |
| Pyrene | | | 9.60E-02 |
| 4,4'-DDD | | | 1.67E+00 |
| 4,4'-DDE | | | 1.64E+00 |
| 4,4'-DDT | | | 1.15E+00 |
| Alpha-Chlordane | | | 8.32E-04 |
| Aroclor 1254 | | | 1.37E-03 |
| Aroclor 1260 | | | 3.07E-02 |
| Dieldrin | | | 1.30E-01 |
| Endosulfan I | | | 9.40E-06 |
| Endrin aldehyde | | | 2.33E-02 |
| Heptachlor | | | 5.00E-04 |
| Gamma-Chlordane | | | 1.87E-03 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 4.10E-03 |
| Thallium | | | 9.73E+01 |
| | | | |
| TOTAL | | | 1.45E+02 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 2.50E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 3.94E-03 |
| Barium | | | 1.51E-02 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.20E-03 |
| Chromium | | | 6.11E-04 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.58E-04 |
| Lead | | | 7.74E-04 |
| Manganese | | | 2.93E-02 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 8.72E-05 |
| Selenium | | | 5.06E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.13E-03 |
| Zinc | | | 1.09E-02 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 5.46E-03 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 5.62E-02 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 5.82E-01 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 7.31E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 9.14E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 2.14E-04 |
| Bis(2-ethylhexyl)phthalate | | | 3.04E-03 |
| Chlorobenzene | | | 2.06E-01 |
| Cis-1,2-Dichloroethane | | | 1.24E-03 |
| Vinyl Chloride | | | 3.31E-02 |
| Aldrin | | | 2.81E-04 |
| Endrin | | | 1.87E-04 |
| Lindane | | | 3.37E-06 |
| Heptachlor Epoxide | | | 5.34E-03 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 1.04E+00 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MEAN CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 7.35E-03 |
| Antimony | | | 3.35E-01 |
| Arsenic | | | 1.32E-03 |
| Barium | | | 2.74E-04 |
| Beryllium | | | 5.90E-04 |
| Cadmium | | | 2.13E-04 |
| Chromium | | | 1.45E-04 |
| Cobalt | | | 2.16E-03 |
| Copper | | | 2.35E-03 |
| Lead | | | 4.17E-04 |
| Manganese | | | 4.15E-04 |
| Mercury | | | 8.33E-01 |
| Nickel | | | 4.21E-04 |
| Selenium | | | 6.30E-03 |
| Silver | | | 1.16E-01 |
| Vanadium | | | 2.67E-03 |
| Zinc | | | 2.87E+00 |
| Toluene | | | 3.39E-09 |
| Xylene | | | 8.82E-07 |
| Benzo(a)pyrene | | | 9.98E-03 |
| Di-N-octylphthalate | | | 1.59E+00 |
| Flouranthene | | | 1.51E-05 |
| Pyrene | | | 8.57E-02 |
| 4,4'-DDD | | | 3.12E-01 |
| 4,4'-DDE | | | 1.88E-01 |
| 4,4'-DDT | | | 2.10E-01 |
| Alpha-Chlordane | | | 6.49E-02 |
| Aroclor 1254 | | | 3.23E-05 |
| Aroclor 1260 | | | 4.37E-02 |
| Dieldrin | | | 3.99E-03 |
| Endosulfan I | | | 1.14E-08 |
| Endrin aldehyde | | | 7.15E-04 |
| Heptachlor | | | 2.32E-06 |
| Gamma-Chlordane | | | 3.06E-04 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.38E-07 |
| Thallium | | | 2.31E+01 |
| | | | |
| TOTAL | | | 2.97E+01 |

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.59E+03 | | | | | | | 9.17E+00 | | 1.00E+00 | 1.00E+00 | 9.17E+00 |
| Water | 4.95E-01 | | | | | 2.78E-02 | | | | 1.00E+00 | 1.00E+00 | 2.78E-02 |
| Food-an. | 8.35E-01 | | | 8.18E-02 | | | | | | 1.00E+00 | 1.00E+00 | 8.18E-02 |
| Food-veg. | 2.98E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.30E+00 | | | | | | | 4.60E-03 | | 1.00E+00 | 1.00E+00 | 4.60E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.28E-04 | | | 4.19E-05 | | | | | | 1.00E+00 | 1.00E+00 | 4.19E-05 |
| Food-veg. | 6.90E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.59E+03 | 9.17E+00 | 1.11E+01 | 8.23E-01 | |
| Water | 4.95E-01 | 2.78E-02 | 1.11E+01 | 2.50E-03 | |
| Food | 3.82E+00 | 8.18E-02 | 1.11E+01 | 7.35E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.33E-01 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E+00 | 4.60E-03 | 1.25E-04 | 3.68E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| Food | 6.94E-02 | 4.19E-05 | 1.25E-04 | 3.35E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.71E+01 |

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.60E+00 | | | | | | | 5.20E-03 | | 1.00E+00 | 1.00E+00 | 5.20E-03 |
| Water | 3.60E-03 | | | | | 2.02E-04 | | | | 1.00E+00 | 1.00E+00 | 2.02E-04 |
| Food-an. | 6.93E-04 | | | 6.79E-05 | | | | | | 1.00E+00 | 1.00E+00 | 6.79E-05 |
| Food-veg. | 1.56E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.54E+01 | | | | | | | 5.08E-02 | | 1.00E+00 | 1.00E+00 | 5.08E-02 |
| Water | 5.60E-02 | | | | | 3.15E-03 | | | | 1.00E+00 | 1.00E+00 | 3.15E-03 |
| Food-an. | 5.83E-04 | | | 5.71E-05 | | | | | | 1.00E+00 | 1.00E+00 | 5.71E-05 |
| Food-veg. | 3.81E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.60E+00 | 5.20E-03 | 5.14E-02 | 1.01E-01 | |
| Water | 3.60E-03 | 2.02E-04 | 5.14E-02 | 3.94E-03 | |
| Food | 1.63E-02 | 6.79E-05 | 5.14E-02 | 1.32E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.06E-01 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.54E+01 | 5.08E-02 | 2.09E-01 | 2.44E-01 | |
| Water | 5.60E-02 | 3.15E-03 | 2.09E-01 | 1.51E-02 | |
| Food | 3.82E-01 | 5.71E-05 | 2.09E-01 | 2.74E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.09E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.09E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.59E-01 |

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 5.60E-04 | | 1.00E+00 | 1.00E+00 | 5.60E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 3.90E-06 | | | | | | 1.00E+00 | 1.00E+00 | 3.90E-06 |
| Food-veg. | 2.80E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.00E+00 | | | | | | | 4.00E-03 | | 1.00E+00 | 1.00E+00 | 4.00E-03 |
| Water | 3.10E-03 | | | | | 1.74E-04 | | | | 1.00E+00 | 1.00E+00 | 1.74E-04 |
| Food-an. | 3.15E-04 | | | 3.09E-05 | | | | | | 1.00E+00 | 1.00E+00 | 3.09E-05 |
| Food-veg. | 3.00E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 5.60E-04 | 6.60E-03 | 8.48E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| Food | 2.84E-03 | 3.90E-06 | 6.60E-03 | 5.90E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.54E-02 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E+00 | 4.00E-03 | 1.45E-01 | 2.76E-02 | |
| Water | 3.10E-03 | 1.74E-04 | 1.45E-01 | 1.20E-03 | |
| Food | 3.00E-01 | 3.09E-05 | 1.45E-01 | 2.13E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.45E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.45E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.90E-02 |

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.50E+01 | | | | | | | 3.00E-02 | | 1.00E+00 | 1.00E+00 | 3.00E-02 |
| Water | 5.00E-03 | | | | | 2.81E-04 | | | | 1.00E+00 | 1.00E+00 | 2.81E-04 |
| Food-an. | 6.82E-04 | | | 6.68E-05 | | | | | | 1.00E+00 | 1.00E+00 | 6.68E-05 |
| Food-veg. | 6.75E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 7.30E-01 | | | | | | | 1.46E-03 | | 1.00E+00 | 1.00E+00 | 1.46E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.46E-04 | | | 3.39E-05 | | | | | | 1.00E+00 | 1.00E+00 | 3.39E-05 |
| Food-veg. | 5.11E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chromium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.50E+01 | 3.00E-02 | 4.60E-01 | 6.52E-02 | |
| Water | 5.00E-03 | 2.81E-04 | 4.60E-01 | 6.11E-04 | |
| Food | 6.82E-02 | 6.68E-05 | 4.60E-01 | 1.45E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.60E-02 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.30E-01 | 1.46E-03 | 1.57E-02 | 9.30E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| Food | 5.46E-03 | 3.39E-05 | 1.57E-02 | 2.16E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.52E-02 |

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.19E+01 | | | | | | | 2.38E-02 | | 1.00E+00 | 1.00E+00 | 2.38E-02 |
| Water | 9.30E-03 | | | | | 5.23E-04 | | | | 1.00E+00 | 1.00E+00 | 5.23E-04 |
| Food-an. | 7.97E-02 | | | 7.81E-03 | | | | | | 1.00E+00 | 1.00E+00 | 7.81E-03 |
| Food-veg. | 2.98E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.93E+01 | | | | | | | 5.86E-02 | | 1.00E+00 | 1.00E+00 | 5.86E-02 |
| Water | 5.30E-03 | | | | | 2.98E-04 | | | | 1.00E+00 | 1.00E+00 | 2.98E-04 |
| Food-an. | 1.64E-03 | | | 1.61E-04 | | | | | | 1.00E+00 | 1.00E+00 | 1.61E-04 |
| Food-veg. | 2.64E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.19E+01 | 2.38E-02 | 3.32E+00 | 7.17E-03 | |
| Water | 9.30E-03 | 5.23E-04 | 3.32E+00 | 1.58E-04 | |
| Food | 3.05E+00 | 7.81E-03 | 3.32E+00 | 2.35E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.68E-03 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.93E+01 | 5.86E-02 | 3.85E-01 | 1.52E-01 | |
| Water | 5.30E-03 | 2.98E-04 | 3.85E-01 | 7.74E-04 | |
| Food | 2.65E-01 | 1.61E-04 | 3.85E-01 | 4.17E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.85E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.85E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.53E-01 |

| Manganese | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.05E+01 | | | | | | | 8.10E-02 | | 1.00E+00 | 1.00E+00 | 8.10E-02 |
| Water | 4.58E-01 | | | | | 2.58E-02 | | | | 1.00E+00 | 1.00E+00 | 2.58E-02 |
| Food-an. | 3.73E-03 | | | 3.65E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.65E-04 |
| Food-veg. | 2.03E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.20E-04 | | 1.00E+00 | 1.00E+00 | 7.20E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.44E-03 | | | 5.33E-04 | | | | | | 1.00E+00 | 1.00E+00 | 5.33E-04 |
| Food-veg. | 7.20E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.05E+01 | 8.10E-02 | 8.80E-01 | 9.20E-02 | |
| Water | 4.58E-01 | 2.58E-02 | 8.80E-01 | 2.93E-02 | |
| Food | 2.03E+00 | 3.65E-04 | 8.80E-01 | 4.15E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.22E-01 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.20E-04 | 6.40E-04 | 1.13E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| Food | 7.74E-02 | 5.33E-04 | 6.40E-04 | 8.33E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.96E+00 |

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.20E+00 | | | | | | | 4.40E-03 | | 1.00E+00 | 1.00E+00 | 4.40E-03 |
| Water | 1.20E-03 | | | | | 6.75E-05 | | | | 1.00E+00 | 1.00E+00 | 6.75E-05 |
| Food-an. | 3.33E-03 | | | 3.26E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.26E-04 |
| Food-veg. | 1.32E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 9.80E-01 | | | | | | | 1.96E-03 | | 1.00E+00 | 1.00E+00 | 1.96E-03 |
| Water | 3.60E-03 | | | | | 2.02E-04 | | | | 1.00E+00 | 1.00E+00 | 2.02E-04 |
| Food-an. | 2.57E-03 | | | 2.52E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.52E-04 |
| Food-veg. | 2.45E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.20E+00 | 4.40E-03 | 7.74E-01 | 5.68E-03 | |
| Water | 1.20E-03 | 6.75E-05 | 7.74E-01 | 8.72E-05 | |
| Food | 1.35E-01 | 3.26E-04 | 7.74E-01 | 4.21E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.74E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.74E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.19E-03 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E-01 | 1.96E-03 | 4.00E-02 | 4.90E-02 | |
| Water | 3.60E-03 | 2.02E-04 | 4.00E-02 | 5.06E-03 | |
| Food | 2.71E-02 | 2.52E-04 | 4.00E-02 | 6.30E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.04E-02 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.10E+00 | | | | | | | 4.20E-03 | | 1.00E+00 | 1.00E+00 | 4.20E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.14E-03 | | | 2.10E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.10E-04 |
| Food-veg. | 2.10E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 9.80E+00 | | | | | | | 1.96E-02 | | 1.00E+00 | 1.00E+00 | 1.96E-02 |
| Water | 2.30E-03 | | | | | 1.29E-04 | | | | 1.00E+00 | 1.00E+00 | 1.29E-04 |
| Food-an. | 3.10E-03 | | | 3.04E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.04E-04 |
| Food-veg. | 2.94E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.10E+00 | 4.20E-03 | 1.81E-03 | 2.32E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| Food | 2.12E-01 | 2.10E-04 | 1.81E-03 | 1.16E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.44E+00 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 9.80E+00 | 1.96E-02 | 1.14E-01 | 1.72E-01 | |
| Water | 2.30E-03 | 1.29E-04 | 1.14E-01 | 1.13E-03 | |
| Food | 3.25E-02 | 3.04E-04 | 1.14E-01 | 2.67E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.76E-01 |

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.18E+01 | | | | | | | 8.36E-02 | | 1.00E+00 | 1.00E+00 | 8.36E-02 |
| Water | 5.82E-02 | | | | | 3.27E-03 | | | | 1.00E+00 | 1.00E+00 | 3.27E-03 |
| Food-an. | 8.78E+00 | | | 8.60E-01 | | | | | | 1.00E+00 | 1.00E+00 | 8.60E-01 |
| Food-veg. | 3.76E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.17E-02 | | | | | | | 4.34E-05 | | 1.00E+00 | 1.00E+00 | 4.34E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.00E-08 | | | 8.82E-09 | | | | | | 1.00E+00 | 1.00E+00 | 8.82E-09 |
| Food-veg. | 2.14E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.18E+01 | 8.36E-02 | 3.00E-01 | 2.79E-01 | |
| Water | 5.82E-02 | 3.27E-03 | 3.00E-01 | 1.09E-02 | |
| Food | 4.64E+01 | 8.60E-01 | 3.00E-01 | 2.87E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.16E+00 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.17E-02 | 4.34E-05 | 2.60E+00 | 1.67E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| Food | 2.14E-03 | 8.82E-09 | 2.60E+00 | 3.39E-09 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.67E-05 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.70E-03 | | | | | | | 7.40E-06 | | 1.00E+00 | 1.00E+00 | 7.40E-06 |
| Water | 2.00E-03 | | | | | 1.12E-04 | | | | 1.00E+00 | 1.00E+00 | 1.12E-04 |
| Food-an. | 1.85E-07 | | | 1.82E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.82E-08 |
| Food-veg. | 1.63E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E-03 | 7.40E-06 | 2.06E-02 | 3.59E-04 | |
| Water | 2.00E-03 | 1.12E-04 | 2.06E-02 | 5.46E-03 | |
| Food | 1.63E-03 | 1.82E-08 | 2.06E-02 | 8.82E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.82E-03 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 4.80E-04 | | 1.00E+00 | 1.00E+00 | 4.80E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 9.98E-05 | | | | | | 1.00E+00 | 1.00E+00 | 9.98E-05 |
| Food-veg. | 3.72E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 1.34E-04 | | 1.00E+00 | 1.00E+00 | 1.34E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 1.77E-02 | | | | | | 1.00E+00 | 1.00E+00 | 1.77E-02 |
| Food-veg. | 6.21E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 4.80E-04 | 1.00E-02 | 4.80E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| Food | 4.74E-03 | 9.98E-05 | 1.00E-02 | 9.98E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.80E-02 |

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 1.34E-04 | 1.11E-02 | 1.21E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| Food | 6.23E+01 | 1.77E-02 | 1.11E-02 | 1.59E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.60E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 5.40E-04 | | 1.00E+00 | 1.00E+00 | 5.40E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 1.89E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.89E-05 |
| Food-veg. | 6.27E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.20E-04 | | 1.00E+00 | 1.00E+00 | 7.20E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 6.43E-04 | | | | | | 1.00E+00 | 1.00E+00 | 6.43E-04 |
| Food-veg. | 4.04E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 5.40E-04 | 1.25E+00 | 4.32E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| Food | 6.47E-03 | 1.89E-05 | 1.25E+00 | 1.51E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.47E-04 |

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.20E-04 | 7.50E-03 | 9.60E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| Food | 1.06E-02 | 6.43E-04 | 7.50E-03 | 8.57E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.82E-01 |

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.34E-02 | | | | | | | 4.68E-05 | | 1.00E+00 | 1.00E+00 | 4.68E-05 |
| Water | 2.80E-05 | | | | | 1.57E-06 | | | | 1.00E+00 | 1.00E+00 | 1.57E-06 |
| Food-an. | 8.90E-05 | | | 8.73E-06 | | | | | | 1.00E+00 | 1.00E+00 | 8.73E-06 |
| Food-veg. | 3.72E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.29E-02 | | | | | | | 4.58E-05 | | 1.00E+00 | 1.00E+00 | 4.58E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 5.39E-05 | | | 5.28E-06 | | | | | | 1.00E+00 | 1.00E+00 | 5.28E-06 |
| Food-veg. | 4.06E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal* | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.34E-02 | 4.68E-05 | 2.80E-05 | 1.67E+00 | |
| Water | 2.80E-05 | 1.57E-06 | 2.80E-05 | 5.62E-02 | |
| Food | 4.61E-04 | 8.73E-06 | 2.80E-05 | 3.12E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.04E+00 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.29E-02 | 4.58E-05 | 2.80E-05 | 1.64E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Food | 4.59E-04 | 5.28E-06 | 2.80E-05 | 1.88E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.82E+00 |

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.61E-02 | | | | | | | 3.22E-05 | | 1.00E+00 | 1.00E+00 | 3.22E-05 |
| Water | 2.90E-04 | | | | | 1.63E-05 | | | | 1.00E+00 | 1.00E+00 | 1.63E-05 |
| Food-an. | 5.99E-05 | | | 5.87E-06 | | | | | | 1.00E+00 | 1.00E+00 | 5.87E-06 |
| Food-veg. | 2.57E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 8.90E-03 | | | | | | | 1.78E-05 | | 1.00E+00 | 1.00E+00 | 1.78E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.42E-02 | | | 1.39E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.39E-03 |
| Food-veg. | 3.76E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.61E-02 | 3.22E-05 | 2.80E-05 | 1.15E+00 | |
| Water | 2.90E-04 | 1.63E-05 | 2.80E-05 | 5.82E-01 | |
| Food | 3.17E-04 | 5.87E-06 | 2.80E-05 | 2.10E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.94E+00 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 8.90E-03 | 1.78E-05 | 2.14E-02 | 8.32E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Food | 1.42E-02 | 1.39E-03 | 2.14E-02 | 6.49E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.57E-02 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 5.60E-05 | | 1.00E+00 | 1.00E+00 | 5.60E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 1.32E-06 | | | | | | 1.00E+00 | 1.00E+00 | 1.32E-06 |
| Food-veg. | 1.37E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 1.26E-03 | | 1.00E+00 | 1.00E+00 | 1.26E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 1.79E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.79E-03 |
| Food-veg. | 6.37E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 5.60E-05 | 4.10E-02 | 1.37E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 1.32E-06 | 4.10E-02 | 3.23E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.40E-03 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 1.26E-03 | 4.10E-02 | 3.07E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 1.79E-03 | 4.10E-02 | 4.37E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.45E-02 |

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.30E-02 | | | | | | | 2.60E-05 | | 1.00E+00 | 1.00E+00 | 2.60E-05 |
| Water | 2.60E-04 | | | | | 1.46E-05 | | | | 1.00E+00 | 1.00E+00 | 1.46E-05 |
| Food-an. | 8.15E-06 | | | 7.99E-07 | | | | | | 1.00E+00 | 1.00E+00 | 7.99E-07 |
| Food-veg. | 3.11E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.70E-03 | | | | | | | 9.40E-06 | | 1.00E+00 | 1.00E+00 | 9.40E-06 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.17E-07 | | | 1.14E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.14E-08 |
| Food-veg. | 2.49E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E-02 | 2.60E-05 | 2.00E-04 | 1.30E-01 | |
| Water | 2.60E-04 | 1.46E-05 | 2.00E-04 | 7.31E-02 | |
| Food | 3.19E-04 | 7.99E-07 | 2.00E-04 | 3.99E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.07E-01 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.70E-03 | 9.40E-06 | 1.00E+00 | 9.40E-06 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| Food | 2.49E-04 | 1.14E-08 | 1.00E+00 | 1.14E-08 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.41E-06 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.07E-02 | | | | | | | 2.14E-05 | | 1.00E+00 | 1.00E+00 | 2.14E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.71E-06 | | | 6.58E-07 | | | | | | 1.00E+00 | 1.00E+00 | 6.58E-07 |
| Food-veg. | 2.56E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 4.00E-06 | | 1.00E+00 | 1.00E+00 | 4.00E-06 |
| Water | 1.30E-04 | | | | | 7.31E-06 | | | | 1.00E+00 | 1.00E+00 | 7.31E-06 |
| Food-an. | 1.89E-07 | | | 1.85E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.85E-08 |
| Food-veg. | 7.47E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.07E-02 | 2.14E-05 | 9.20E-04 | 2.33E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| Food | 2.63E-04 | 6.58E-07 | 9.20E-04 | 7.15E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.40E-02 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 4.00E-06 | 8.00E-03 | 5.00E-04 | |
| Water | 1.30E-04 | 7.31E-06 | 8.00E-03 | 9.14E-04 | |
| Food | 7.49E-05 | 1.85E-08 | 8.00E-03 | 2.32E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.42E-03 |

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.00E-02 | | | | | | | 4.00E-05 | | 1.00E+00 | 1.00E+00 | 4.00E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.67E-05 | | | 6.54E-06 | | | | | | 1.00E+00 | 1.00E+00 | 6.54E-06 |
| Food-veg. | 3.27E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-02 | 4.00E-05 | 2.14E-02 | 1.87E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Food | 3.94E-04 | 6.54E-06 | 2.14E-02 | 3.06E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.17E-03 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 2.63E-01 | 2.14E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.14E-04 |

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 3.37E-04 | | | | 1.00E+00 | 1.00E+00 | 3.37E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 5.62E-04 | | | | 1.00E+00 | 1.00E+00 | 5.62E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Water | 6.00E-03 | 3.37E-04 | 1.11E-01 | 3.04E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.04E-03 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Water | 1.00E-02 | 5.62E-04 | 2.73E-03 | 2.06E-01 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.06E-01 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 4.52E-02 | 1.24E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.24E-03 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 5.62E-06 | | | | 1.00E+00 | 1.00E+00 | 5.62E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 1.70E-03 | 3.31E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.31E-02 |

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 5.62E-06 | 2.00E-02 | 2.81E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.81E-04 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 5.62E-06 | | | | 1.00E+00 | 1.00E+00 | 5.62E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 6.75E-06 | | | | 1.00E+00 | 1.00E+00 | 6.75E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 5.62E-06 | 3.00E-02 | 1.87E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.87E-04 |

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Water | 1.20E-04 | 6.75E-06 | 2.00E+00 | 3.37E-06 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.37E-06 |

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.07E-07 | | | | 1.00E+00 | 1.00E+00 | 1.07E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 2.40E-05 | | 1.00E+00 | 1.00E+00 | 2.40E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 8.10E-10 | | | | | | 1.00E+00 | 1.00E+00 | 8.10E-10 |
| Food-veg. | 7.76E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Water | 1.90E-06 | 1.07E-07 | 2.00E-05 | 5.34E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.34E-03 |

| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 2.40E-05 | 5.85E-03 | 4.10E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| Food | 7.76E-03 | 8.10E-10 | 5.85E-03 | 1.38E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.10E-03 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 7.20E-03 | | 1.00E+00 | 1.00E+00 | 7.20E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-02 | | | 1.71E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.71E-03 |
| Food-veg. | 1.44E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Mean Concentration

| Thallium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 7.20E-03 | 7.40E-05 | 9.73E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 7.40E-05 | 0.00E+00 | |
| Food | 1.88E-02 | 1.71E-03 | 7.40E-05 | 2.31E+01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.40E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.40E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.20E+02 |

# DOSE CALCULATIONS FOR RED-TAILED HAWK

# MAXIMUM CONCENTRATION

RISK ASSESSMENT SPREADSHEET - INGESTION OF SOIL

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 2.33E+00 |
| Antimony | | | 5.76E+01 |
| Arsenic | | | 6.65E-01 |
| Barium | | | 9.88E-01 |
| Beryllium | | | 8.48E-02 |
| Cadmium | | | 8.83E-02 |
| Chromium | | | 2.23E-01 |
| Cobalt | | | 2.04E-01 |
| Copper | | | 3.06E-02 |
| Lead | | | 3.97E-01 |
| Manganese | | | 4.80E-01 |
| Mercury | | | 3.13E+00 |
| Nickel | | | 1.40E-02 |
| Selenium | | | 1.60E-01 |
| Silver | | | 4.09E+00 |
| Vanadium | | | 4.25E-01 |
| Zinc | | | 1.39E+00 |
| Toluene | | | 3.23E-05 |
| Xylene | | | 1.07E-03 |
| Benzo(a)pyrene | | | 4.80E-02 |
| Di-N-octylphthalate | | | 1.21E-02 |
| Flouranthene | | | 4.32E-04 |
| Pyrene | | | 9.60E-02 |
| 4,4'-DDD | | | 3.07E+00 |
| 4,4'-DDE | | | 4.93E+00 |
| 4,4'-DDT | | | 2.50E+00 |
| Alpha-Chlordane | | | 2.52E-03 |
| Aroclor 1254 | | | 1.37E-03 |
| Aroclor 1260 | | | 3.07E-02 |
| Dieldrin | | | 2.30E-01 |
| Endosulfan I | | | 1.52E-05 |
| Endrin aldehyde | | | 5.87E-03 |
| Heptachlor | | | 5.00E-04 |
| Gamma-Chlordane | | | 2.71E-03 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 4.10E-03 |
| Thallium | | | 1.81E+02 |
| | | | |
| TOTAL | | | 2.64E+02 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF WATER

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 2.50E-03 |
| Antimony | | | 0.00E+00 |
| Arsenic | | | 3.94E-03 |
| Barium | | | 1.51E-02 |
| Beryllium | | | 0.00E+00 |
| Cadmium | | | 1.20E-03 |
| Chromium | | | 6.11E-04 |
| Cobalt | | | 0.00E+00 |
| Copper | | | 1.58E-04 |
| Lead | | | 7.74E-04 |
| Manganese | | | 2.93E-02 |
| Mercury | | | 0.00E+00 |
| Nickel | | | 8.72E-05 |
| Selenium | | | 5.06E-03 |
| Silver | | | 0.00E+00 |
| Vanadium | | | 1.13E-03 |
| Zinc | | | 1.09E-02 |
| Toluene | | | 0.00E+00 |
| Xylene | | | 5.46E-03 |
| Benzo(a)pyrene | | | 0.00E+00 |
| Di-N-octylphthalate | | | 0.00E+00 |
| Flouranthene | | | 0.00E+00 |
| Pyrene | | | 0.00E+00 |
| 4,4'-DDD | | | 5.62E-02 |
| 4,4'-DDE | | | 0.00E+00 |
| 4,4'-DDT | | | 5.82E-01 |
| Alpha-Chlordane | | | 0.00E+00 |
| Aroclor 1254 | | | 0.00E+00 |
| Aroclor 1260 | | | 0.00E+00 |
| Dieldrin | | | 7.31E-02 |
| Endosulfan I | | | 0.00E+00 |
| Endrin aldehyde | | | 0.00E+00 |
| Heptachlor | | | 9.14E-04 |
| Gamma-Chlordane | | | 0.00E+00 |
| Benzene | | | 2.14E-04 |
| Bis(2-ethylhexyl)phthalate | | | 3.04E-03 |
| Chlorobenzene | | | 2.06E-01 |
| Cis-1,2-Dichloroethane | | | 1.24E-03 |
| Vinyl Chloride | | | 3.31E-02 |
| Aldrin | | | 2.81E-04 |
| Endrin | | | 1.87E-04 |
| Lindane | | | 3.37E-06 |
| Heptachlor Epoxide | | | 5.34E-03 |
| Methylene chloride | | | 0.00E+00 |
| Thallium | | | 0.00E+00 |
| | | | |
| TOTAL | | | 1.04E+00 |

RISK ASSESSMENT SPREADSHEET - INGESTION OF FOOD

EXPOSURE SCENARIO: MAXIMUM CONCENTRATION FOR EACH CHEMICAL
RECEPTOR: RED-TAILED HAWK

| CHEMICAL | | | HAZARD QUOTIENT |
|---|---|---|---|
| Aluminum | | | 2.08E-02 |
| Antimony | | | 5.25E-01 |
| Arsenic | | | 8.69E-03 |
| Barium | | | 1.11E-03 |
| Beryllium | | | 5.90E-04 |
| Cadmium | | | 6.81E-04 |
| Chromium | | | 4.96E-04 |
| Cobalt | | | 4.73E-03 |
| Copper | | | 1.00E-02 |
| Lead | | | 1.09E-03 |
| Manganese | | | 2.16E-03 |
| Mercury | | | 2.32E+00 |
| Nickel | | | 1.03E-03 |
| Selenium | | | 2.06E-02 |
| Silver | | | 2.04E-01 |
| Vanadium | | | 6.58E-03 |
| Zinc | | | 1.43E+01 |
| Toluene | | | 6.57E-09 |
| Xylene | | | 2.62E-06 |
| Benzo(a)pyrene | | | 9.98E-03 |
| Di-N-octylphthalate | | | 1.59E+00 |
| Flouranthene | | | 1.51E-05 |
| Pyrene | | | 8.57E-02 |
| 4,4'-DDD | | | 5.73E-01 |
| 4,4'-DDE | | | 5.68E-01 |
| 4,4'-DDT | | | 4.56E-01 |
| Alpha-Chlordane | | | 1.97E-01 |
| Aroclor 1254 | | | 3.23E-05 |
| Aroclor 1260 | | | 4.37E-02 |
| Dieldrin | | | 7.07E-03 |
| Endosulfan I | | | 1.85E-08 |
| Endrin aldehyde | | | 2.26E-04 |
| Heptachlor | | | 2.32E-06 |
| Gamma-Chlordane | | | 4.43E-04 |
| Benzene | | | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | | | 0.00E+00 |
| Chlorobenzene | | | 0.00E+00 |
| Cis-1,2-Dichloroethane | | | 0.00E+00 |
| Vinyl Chloride | | | 0.00E+00 |
| Aldrin | | | 0.00E+00 |
| Endrin | | | 0.00E+00 |
| Lindane | | | 0.00E+00 |
| Heptachlor Epoxide | | | 0.00E+00 |
| Methylene chloride | | | 1.38E-07 |
| Thallium | | | 4.29E+01 |
| | | | |
| TOTAL | | | 6.39E+01 |

| Aluminum | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.30E+04 | | | | | | | 2.60E+01 | | 1.00E+00 | 1.00E+00 | 2.60E+01 |
| Water | 4.95E-01 | | | | | 2.78E-02 | | | | 1.00E+00 | 1.00E+00 | 2.78E-02 |
| Food-an. | 2.37E+00 | | | 2.32E-01 | | | | | | 1.00E+00 | 1.00E+00 | 2.32E-01 |
| Food-veg. | 8.45E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Antimony | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.60E+00 | | | | | | | 7.20E-03 | | 1.00E+00 | 1.00E+00 | 7.20E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.70E-04 | | | 6.56E-05 | | | | | | 1.00E+00 | 1.00E+00 | 6.56E-05 |
| Food-veg. | 1.08E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aluminum | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.30E+04 | 2.60E+01 | 1.11E+01 | 2.33E+00 | |
| Water | 4.95E-01 | 2.78E-02 | 1.11E+01 | 2.50E-03 | |
| Food | 1.08E+01 | 2.32E-01 | 1.11E+01 | 2.08E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E+01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E+01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.36E+00 |

| Antimony | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E+00 | 7.20E-03 | 1.25E-04 | 5.76E+01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| Food | 1.09E-01 | 6.56E-05 | 1.25E-04 | 5.25E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.81E+01 |

| Arsenic | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.71E+01 | | | | | | | 3.42E-02 | | 1.00E+00 | 1.00E+00 | 3.42E-02 |
| Water | 3.60E-03 | | | | | 2.02E-04 | | | | 1.00E+00 | 1.00E+00 | 2.02E-04 |
| Food-an. | 4.56E-03 | | | 4.46E-04 | | | | | | 1.00E+00 | 1.00E+00 | 4.46E-04 |
| Food-veg. | 1.03E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Barium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.03E+02 | | | | | | | 2.06E-01 | | 1.00E+00 | 1.00E+00 | 2.06E-01 |
| Water | 5.60E-02 | | | | | 3.15E-03 | | | | 1.00E+00 | 1.00E+00 | 3.15E-03 |
| Food-an. | 2.36E-03 | | | 2.32E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.32E-04 |
| Food-veg. | 1.55E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Arsenic | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.71E+01 | 3.42E-02 | 5.14E-02 | 6.65E-01 | |
| Water | 3.60E-03 | 2.02E-04 | 5.14E-02 | 3.94E-03 | |
| Food | 1.07E-01 | 4.46E-04 | 5.14E-02 | 8.69E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.78E-01 |

| Barium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.03E+02 | 2.06E-01 | 2.09E-01 | 9.88E-01 | |
| Water | 5.60E-02 | 3.15E-03 | 2.09E-01 | 1.51E-02 | |
| Food | 1.55E+00 | 2.32E-04 | 2.09E-01 | 1.11E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.09E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.09E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.00E+00 |

| Beryllium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.80E-01 | | | | | | | 5.60E-04 | | 1.00E+00 | 1.00E+00 | 5.60E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.98E-05 | | | 3.90E-06 | | | | | | 1.00E+00 | 1.00E+00 | 3.90E-06 |
| Food-veg. | 2.80E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cadmium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.40E+00 | | | | | | | 1.28E-02 | | 1.00E+00 | 1.00E+00 | 1.28E-02 |
| Water | 3.10E-03 | | | | | 1.74E-04 | | | | 1.00E+00 | 1.00E+00 | 1.74E-04 |
| Food-an. | 1.01E-03 | | | 9.88E-05 | | | | | | 1.00E+00 | 1.00E+00 | 9.88E-05 |
| Food-veg. | 9.60E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Beryllium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-01 | 5.60E-04 | 6.60E-03 | 8.48E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| Food | 2.84E-03 | 3.90E-06 | 6.60E-03 | 5.90E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.60E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 8.54E-02 |

| Cadmium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.40E+00 | 1.28E-02 | 1.45E-01 | 8.83E-02 | |
| Water | 3.10E-03 | 1.74E-04 | 1.45E-01 | 1.20E-03 | |
| Food | 9.61E-01 | 9.88E-05 | 1.45E-01 | 6.81E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.45E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.45E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 9.02E-02 |

| Chromium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 5.12E+01 | | | | | | | 1.02E-01 | | 1.00E+00 | 1.00E+00 | 1.02E-01 |
| Water | 5.00E-03 | | | | | 2.81E-04 | | | | 1.00E+00 | 1.00E+00 | 2.81E-04 |
| Food-an. | 2.33E-03 | | | 2.28E-04 | | | | | | 1.00E+00 | 1.00E+00 | 2.28E-04 |
| Food-veg. | 2.30E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Cobalt | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.60E+00 | | | | | | | 3.20E-03 | | 1.00E+00 | 1.00E+00 | 3.20E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 7.58E-04 | | | 7.43E-05 | | | | | | 1.00E+00 | 1.00E+00 | 7.43E-05 |
| Food-veg. | 1.12E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chromium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.12E+01 | 1.02E-01 | 4.60E-01 | 2.23E-01 | |
| Water | 5.00E-03 | 2.81E-04 | 4.60E-01 | 6.11E-04 | |
| Food | 2.33E-01 | 2.28E-04 | 4.60E-01 | 4.96E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.60E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.60E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.24E-01 |

| Cobalt | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.60E+00 | 3.20E-03 | 1.57E-02 | 2.04E-01 | |
| Water | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| Food | 1.20E-02 | 7.43E-05 | 1.57E-02 | 4.73E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.57E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.09E-01 |

| Copper | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 5.08E+01 | | | | | | | 1.02E-01 | | 1.00E+00 | 1.00E+00 | 1.02E-01 |
| Water | 9.30E-03 | | | | | 5.23E-04 | | | | 1.00E+00 | 1.00E+00 | 5.23E-04 |
| Food-an. | 3.40E-01 | | | 3.34E-02 | | | | | | 1.00E+00 | 1.00E+00 | 3.34E-02 |
| Food-veg. | 1.27E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Lead | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 7.65E+01 | | | | | | | 1.53E-01 | | 1.00E+00 | 1.00E+00 | 1.53E-01 |
| Water | 5.30E-03 | | | | | 2.98E-04 | | | | 1.00E+00 | 1.00E+00 | 2.98E-04 |
| Food-an. | 4.28E-03 | | | 4.19E-04 | | | | | | 1.00E+00 | 1.00E+00 | 4.19E-04 |
| Food-veg. | 6.89E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Copper | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.08E+01 | 1.02E-01 | 3.32E+00 | 3.06E-02 | |
| Water | 9.30E-03 | 5.23E-04 | 3.32E+00 | 1.58E-04 | |
| Food | 1.30E+01 | 3.34E-02 | 3.32E+00 | 1.00E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.32E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.32E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.08E-02 |

| Lead | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.65E+01 | 1.53E-01 | 3.85E-01 | 3.97E-01 | |
| Water | 5.30E-03 | 2.98E-04 | 3.85E-01 | 7.74E-04 | |
| Food | 6.93E-01 | 4.19E-04 | 3.85E-01 | 1.09E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.85E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.85E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.99E-01 |

| Manganese | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.11E+02 | | | | | | | 4.22E-01 | | 1.00E+00 | 1.00E+00 | 4.22E-01 |
| Water | 4.58E-01 | | | | | 2.58E-02 | | | | 1.00E+00 | 1.00E+00 | 2.58E-02 |
| Food-an. | 1.94E-02 | | | 1.90E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.90E-03 |
| Food-veg. | 1.06E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Mercury | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.00E+00 | | | | | | | 2.00E-03 | | 1.00E+00 | 1.00E+00 | 2.00E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.51E-02 | | | 1.48E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.48E-03 |
| Food-veg. | 2.00E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Manganese | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.11E+02 | 4.22E-01 | 8.80E-01 | 4.80E-01 | |
| Water | 4.58E-01 | 2.58E-02 | 8.80E-01 | 2.93E-02 | |
| Food | 1.06E+01 | 1.90E-03 | 8.80E-01 | 2.16E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.80E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.80E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.11E-01 |

| Mercury | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.00E+00 | 2.00E-03 | 6.40E-04 | 3.13E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| Food | 2.15E-01 | 1.48E-03 | 6.40E-04 | 2.32E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 6.40E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.44E+00 |

| Nickel | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 5.40E+00 | | | | | | | 1.08E-02 | | 1.00E+00 | 1.00E+00 | 1.08E-02 |
| Water | 1.20E-03 | | | | | 6.75E-05 | | | | 1.00E+00 | 1.00E+00 | 6.75E-05 |
| Food-an. | 8.16E-03 | | | 8.00E-04 | | | | | | 1.00E+00 | 1.00E+00 | 8.00E-04 |
| Food-veg. | 3.24E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Selenium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.20E+00 | | | | | | | 6.40E-03 | | 1.00E+00 | 1.00E+00 | 6.40E-03 |
| Water | 3.60E-03 | | | | | 2.02E-04 | | | | 1.00E+00 | 1.00E+00 | 2.02E-04 |
| Food-an. | 8.40E-03 | | | 8.23E-04 | | | | | | 1.00E+00 | 1.00E+00 | 8.23E-04 |
| Food-veg. | 8.00E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Nickel | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 5.40E+00 | 1.08E-02 | 7.74E-01 | 1.40E-02 | |
| Water | 1.20E-03 | 6.75E-05 | 7.74E-01 | 8.72E-05 | |
| Food | 3.32E-01 | 8.00E-04 | 7.74E-01 | 1.03E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.74E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.74E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.51E-02 |

| Selenium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.20E+00 | 6.40E-03 | 4.00E-02 | 1.60E-01 | |
| Water | 3.60E-03 | 2.02E-04 | 4.00E-02 | 5.06E-03 | |
| Food | 8.84E-02 | 8.23E-04 | 4.00E-02 | 2.06E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.86E-01 |

| Silver | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.70E+00 | | | | | | | 7.40E-03 | | 1.00E+00 | 1.00E+00 | 7.40E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.77E-03 | | | 3.70E-04 | | | | | | 1.00E+00 | 1.00E+00 | 3.70E-04 |
| Food-veg. | 3.70E-01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Vanadium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.42E+01 | | | | | | | 4.84E-02 | | 1.00E+00 | 1.00E+00 | 4.84E-02 |
| Water | 2.30E-03 | | | | | 1.29E-04 | | | | 1.00E+00 | 1.00E+00 | 1.29E-04 |
| Food-an. | 7.66E-03 | | | 7.51E-04 | | | | | | 1.00E+00 | 1.00E+00 | 7.51E-04 |
| Food-veg. | 7.26E-02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Silver | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.70E+00 | 7.40E-03 | 1.81E-03 | 4.09E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| Food | 3.74E-01 | 3.70E-04 | 1.81E-03 | 2.04E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.81E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.29E+00 |

| Vanadium | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.42E+01 | 4.84E-02 | 1.14E-01 | 4.25E-01 | |
| Water | 2.30E-03 | 1.29E-04 | 1.14E-01 | 1.13E-03 | |
| Food | 8.03E-02 | 7.51E-04 | 1.14E-01 | 6.58E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.14E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.14E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.32E-01 |

| Zinc | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.09E+02 | | | | | | | 4.18E-01 | | 1.00E+00 | 1.00E+00 | 4.18E-01 |
| Water | 5.82E-02 | | | | | 3.27E-03 | | | | 1.00E+00 | 1.00E+00 | 3.27E-03 |
| Food-an. | 4.39E+01 | | | 4.30E+00 | | | | | | 1.00E+00 | 1.00E+00 | 4.30E+00 |
| Food-veg. | 1.88E+02 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Toluene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.20E-02 | | | | | | | 8.40E-05 | | 1.00E+00 | 1.00E+00 | 8.40E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.74E-07 | | | 1.71E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.71E-08 |
| Food-veg. | 4.15E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Zinc | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.09E+02 | 4.18E-01 | 3.00E-01 | 1.39E+00 | |
| Water | 5.82E-02 | 3.27E-03 | 3.00E-01 | 1.09E-02 | |
| Food | 2.32E+02 | 4.30E+00 | 3.00E-01 | 1.43E+01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.00E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.57E+01 |

| Toluene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.20E-02 | 8.40E-05 | 2.60E+00 | 3.23E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| Food | 4.15E-03 | 1.71E-08 | 2.60E+00 | 6.57E-09 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.60E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.23E-05 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Xylene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.10E-02 | | | | | | | 2.20E-05 | | 1.00E+00 | 1.00E+00 | 2.20E-05 |
| Water | 2.00E-03 | | | | | 1.12E-04 | | | | 1.00E+00 | 1.00E+00 | 1.12E-04 |
| Food-an. | 5.51E-07 | | | 5.40E-08 | | | | | | 1.00E+00 | 1.00E+00 | 5.40E-08 |
| Food-veg. | 4.85E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Xylene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.10E-02 | 2.20E-05 | 2.06E-02 | 1.07E-03 | |
| Water | 2.00E-03 | 1.12E-04 | 2.06E-02 | 5.46E-03 | |
| Food | 4.85E-03 | 5.40E-08 | 2.06E-02 | 2.62E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.06E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.06E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.53E-03 |

| Benzo(a)pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.40E-01 | | | | | | | 4.80E-04 | | 1.00E+00 | 1.00E+00 | 4.80E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.02E-03 | | | 9.98E-05 | | | | | | 1.00E+00 | 1.00E+00 | 9.98E-05 |
| Food-veg. | 3.72E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Di-N-octylphthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.70E-02 | | | | | | | 1.34E-04 | | 1.00E+00 | 1.00E+00 | 1.34E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.80E-01 | | | 1.77E-02 | | | | | | 1.00E+00 | 1.00E+00 | 1.77E-02 |
| Food-veg. | 6.21E+01 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Benzo(a)pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.40E-01 | 4.80E-04 | 1.00E-02 | 4.80E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| Food | 4.74E-03 | 9.98E-05 | 1.00E-02 | 9.98E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.80E-02 |

| Di-N-octylphthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.70E-02 | 1.34E-04 | 1.11E-02 | 1.21E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| Food | 6.23E+01 | 1.77E-02 | 1.11E-02 | 1.59E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.60E+00 |

| Flouranthene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.70E-01 | | | | | | | 5.40E-04 | | 1.00E+00 | 1.00E+00 | 5.40E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.93E-04 | | | 1.89E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.89E-05 |
| Food-veg. | 6.27E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Pyrene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.60E-01 | | | | | | | 7.20E-04 | | 1.00E+00 | 1.00E+00 | 7.20E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 6.56E-03 | | | 6.43E-04 | | | | | | 1.00E+00 | 1.00E+00 | 6.43E-04 |
| Food-veg. | 4.04E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Flouranthene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-01 | 5.40E-04 | 1.25E+00 | 4.32E-04 | |
| Water | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| Food | 6.47E-03 | 1.89E-05 | 1.25E+00 | 1.51E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.25E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.47E-04 |

| Pyrene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.60E-01 | 7.20E-04 | 7.50E-03 | 9.60E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| Food | 1.06E-02 | 6.43E-04 | 7.50E-03 | 8.57E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 7.50E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.82E-01 |

| 4,4'-DDD | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 4.30E-02 | | | | | | | 8.60E-05 | | 1.00E+00 | 1.00E+00 | 8.60E-05 |
| Water | 2.80E-05 | | | | | 1.57E-06 | | | | 1.00E+00 | 1.00E+00 | 1.57E-06 |
| Food-an. | 1.64E-04 | | | 1.60E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.60E-05 |
| Food-veg. | 6.83E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDE | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.90E-02 | | | | | | | 1.38E-04 | | 1.00E+00 | 1.00E+00 | 1.38E-04 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.62E-04 | | | 1.59E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.59E-05 |
| Food-veg. | 1.22E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| 4,4'-DDD | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 4.30E-02 | 8.60E-05 | 2.80E-05 | 3.07E+00 | |
| Water | 2.80E-05 | 1.57E-06 | 2.80E-05 | 5.62E-02 | |
| Food | 8.47E-04 | 1.60E-05 | 2.80E-05 | 5.73E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.70E+00 |

| 4,4'-DDE | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.90E-02 | 1.38E-04 | 2.80E-05 | 4.93E+00 | |
| Water | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Food | 1.38E-03 | 1.59E-05 | 2.80E-05 | 5.68E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.50E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| 4,4'-DDT | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 3.50E-02 | | | | | | | 7.00E-05 | | 1.00E+00 | 1.00E+00 | 7.00E-05 |
| Water | 2.90E-04 | | | | | 1.63E-05 | | | | 1.00E+00 | 1.00E+00 | 1.63E-05 |
| Food-an. | 1.30E-04 | | | 1.28E-05 | | | | | | 1.00E+00 | 1.00E+00 | 1.28E-05 |
| Food-veg. | 5.59E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Alpha-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.70E-02 | | | | | | | 5.40E-05 | | 1.00E+00 | 1.00E+00 | 5.40E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 4.30E-02 | | | 4.21E-03 | | | | | | 1.00E+00 | 1.00E+00 | 4.21E-03 |
| Food-veg. | 1.14E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| 4,4'-DDT | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 3.50E-02 | 7.00E-05 | 2.80E-05 | 2.50E+00 | |
| Water | 2.90E-04 | 1.63E-05 | 2.80E-05 | 5.82E-01 | |
| Food | 6.89E-04 | 1.28E-05 | 2.80E-05 | 4.56E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.80E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.54E+00 |

| Alpha-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-02 | 5.40E-05 | 2.14E-02 | 2.52E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Food | 4.31E-02 | 4.21E-03 | 2.14E-02 | 1.97E-01 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.99E-01 |

| Aroclor 1254 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.80E-02 | | | | | | | 5.60E-05 | | 1.00E+00 | 1.00E+00 | 5.60E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.35E-05 | | | 1.32E-06 | | | | | | 1.00E+00 | 1.00E+00 | 1.32E-06 |
| Food-veg. | 1.37E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aroclor 1260 | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.30E-01 | | | | | | | 1.26E-03 | | 1.00E+00 | 1.00E+00 | 1.26E-03 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.83E-02 | | | 1.79E-03 | | | | | | 1.00E+00 | 1.00E+00 | 1.79E-03 |
| Food-veg. | 6.37E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Aroclor 1254 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.80E-02 | 5.60E-05 | 4.10E-02 | 1.37E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Food | 2.72E-05 | 1.32E-06 | 4.10E-02 | 3.23E-05 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.40E-03 |

| Aroclor 1260 | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 6.30E-01 | 1.26E-03 | 4.10E-02 | 3.07E-02 | |
| Water | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Food | 2.47E-02 | 1.79E-03 | 4.10E-02 | 4.37E-02 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.10E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 7.45E-02 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Dieldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.30E-02 | | | | | | | 4.60E-05 | | 1.00E+00 | 1.00E+00 | 4.60E-05 |
| Water | 2.60E-04 | | | | | 1.46E-05 | | | | 1.00E+00 | 1.00E+00 | 1.46E-05 |
| Food-an. | 1.44E-05 | | | 1.41E-06 | | | | | | 1.00E+00 | 1.00E+00 | 1.41E-06 |
| Food-veg. | 5.50E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Endosulfan I | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 7.60E-03 | | | | | | | 1.52E-05 | | 1.00E+00 | 1.00E+00 | 1.52E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 1.88E-07 | | | 1.85E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.85E-08 |
| Food-veg. | 4.03E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Dieldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.30E-02 | 4.60E-05 | 2.00E-04 | 2.30E-01 | |
| Water | 2.60E-04 | 1.46E-05 | 2.00E-04 | 7.31E-02 | |
| Food | 5.65E-04 | 1.41E-06 | 2.00E-04 | 7.07E-03 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.10E-01 |

| Endosulfan I | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 7.60E-03 | 1.52E-05 | 1.00E+00 | 1.52E-05 | |
| Water | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| Food | 4.03E-04 | 1.85E-08 | 1.00E+00 | 1.85E-08 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.52E-05 |

| Endrin aldehyde | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.70E-03 | | | | | | | 5.40E-06 | | 1.00E+00 | 1.00E+00 | 5.40E-06 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 2.12E-06 | | | 2.08E-07 | | | | | | 1.00E+00 | 1.00E+00 | 2.08E-07 |
| Food-veg. | 6.46E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Heptachlor | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.00E-03 | | | | | | | 4.00E-06 | | 1.00E+00 | 1.00E+00 | 4.00E-06 |
| Water | 1.30E-04 | | | | | 7.31E-06 | | | | 1.00E+00 | 1.00E+00 | 7.31E-06 |
| Food-an. | 1.89E-07 | | | 1.85E-08 | | | | | | 1.00E+00 | 1.00E+00 | 1.85E-08 |
| Food-veg. | 7.47E-05 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Endrin aldehyde | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.70E-03 | 5.40E-06 | 9.20E-04 | 5.87E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| Food | 6.48E-04 | 2.08E-07 | 9.20E-04 | 2.26E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 9.20E-04 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 6.10E-03 |

| Heptachlor | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.00E-03 | 4.00E-06 | 8.00E-03 | 5.00E-04 | |
| Water | 1.30E-04 | 7.31E-06 | 8.00E-03 | 9.14E-04 | |
| Food | 7.49E-05 | 1.85E-08 | 8.00E-03 | 2.32E-06 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 8.00E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 8.00E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.42E-03 |

| Gamma-Chlordane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 2.90E-02 | | | | | | | 5.80E-05 | | 1.00E+00 | 1.00E+00 | 5.80E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 9.67E-05 | | | 9.48E-06 | | | | | | 1.00E+00 | 1.00E+00 | 9.48E-06 |
| Food-veg. | 4.75E-04 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 3.00E-02 | 0.00E+00 |

| Benzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Gamma-Chlordane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 2.90E-02 | 5.80E-05 | 2.14E-02 | 2.71E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Food | 5.72E-04 | 9.48E-06 | 2.14E-02 | 4.43E-04 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.14E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.15E-03 |

| Benzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 2.63E-01 | 2.14E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.63E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.14E-04 |

| Bis(2-ethylhexyl)phthalate | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 6.00E-03 | | | | | 3.37E-04 | | | | 1.00E+00 | 1.00E+00 | 3.37E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Chlorobenzene | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Uptake from Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-02 | | | | | 5.62E-04 | | | | 1.00E+00 | 1.00E+00 | 5.62E-04 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

| Bis(2-ethylhexyl)phthalate | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Water | 6.00E-03 | 3.37E-04 | 1.11E-01 | 3.04E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.04E-03 |

| Chlorobenzene | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Water | 1.00E-02 | 5.62E-04 | 2.73E-03 | 2.06E-01 | |
| Food | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.73E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.06E-01 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Cis-1,2-Dichloroethane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Cis-1,2-Dichloroethane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 4.52E-02 | 1.24E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 4.52E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.24E-03 |

| Vinyl Chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-03 | | | | | 5.62E-05 | | | | 1.00E+00 | 1.00E+00 | 5.62E-05 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Aldrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 5.62E-06 | | | | 1.00E+00 | 1.00E+00 | 5.62E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-03 | 0.00E+00 |

| Vinyl Chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Water | 1.00E-03 | 5.62E-05 | 1.70E-03 | 3.31E-02 | |
| Food | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 1.70E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.31E-02 |

| Aldrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 5.62E-06 | 2.00E-02 | 2.81E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 2.81E-04 |

| Endrin | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.00E-04 | | | | | 5.62E-06 | | | | 1.00E+00 | 1.00E+00 | 5.62E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 0.00E+00 | 0.00E+00 |

| Lindane | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.20E-04 | | | | | 6.75E-06 | | | | 1.00E+00 | 1.00E+00 | 6.75E-06 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-02 | 0.00E+00 |

| Endrin | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Water | 1.00E-04 | 5.62E-06 | 3.00E-02 | 1.87E-04 | |
| Food | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 3.00E-02 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 1.87E-04 |

| Lindane | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Water | 1.20E-04 | 6.75E-06 | 2.00E+00 | 3.37E-06 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E+00 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 3.37E-06 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Heptachlor Epoxide | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | | 0.00E+00 | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Water | 1.90E-06 | | | | | 1.07E-07 | | | | 1.00E+00 | 1.00E+00 | 1.07E-07 |
| Food-an. | 0.00E+00 | | | 0.00E+00 | | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-veg. | 0.00E+00 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

| Methylene chloride | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 1.20E-02 | | | | | | | 2.40E-05 | | 1.00E+00 | 1.00E+00 | 2.40E-05 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 8.27E-09 | | | 8.10E-10 | | | | | | 1.00E+00 | 1.00E+00 | 8.10E-10 |
| Food-veg. | 7.76E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.00E-01 | 0.00E+00 |

Dose Calculations for Individual Contaminants - Maximum Concentration

| Heptachlor Epoxide | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Water | 1.90E-06 | 1.07E-07 | 2.00E-05 | 5.34E-03 | |
| Food | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 2.00E-05 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 5.34E-03 |

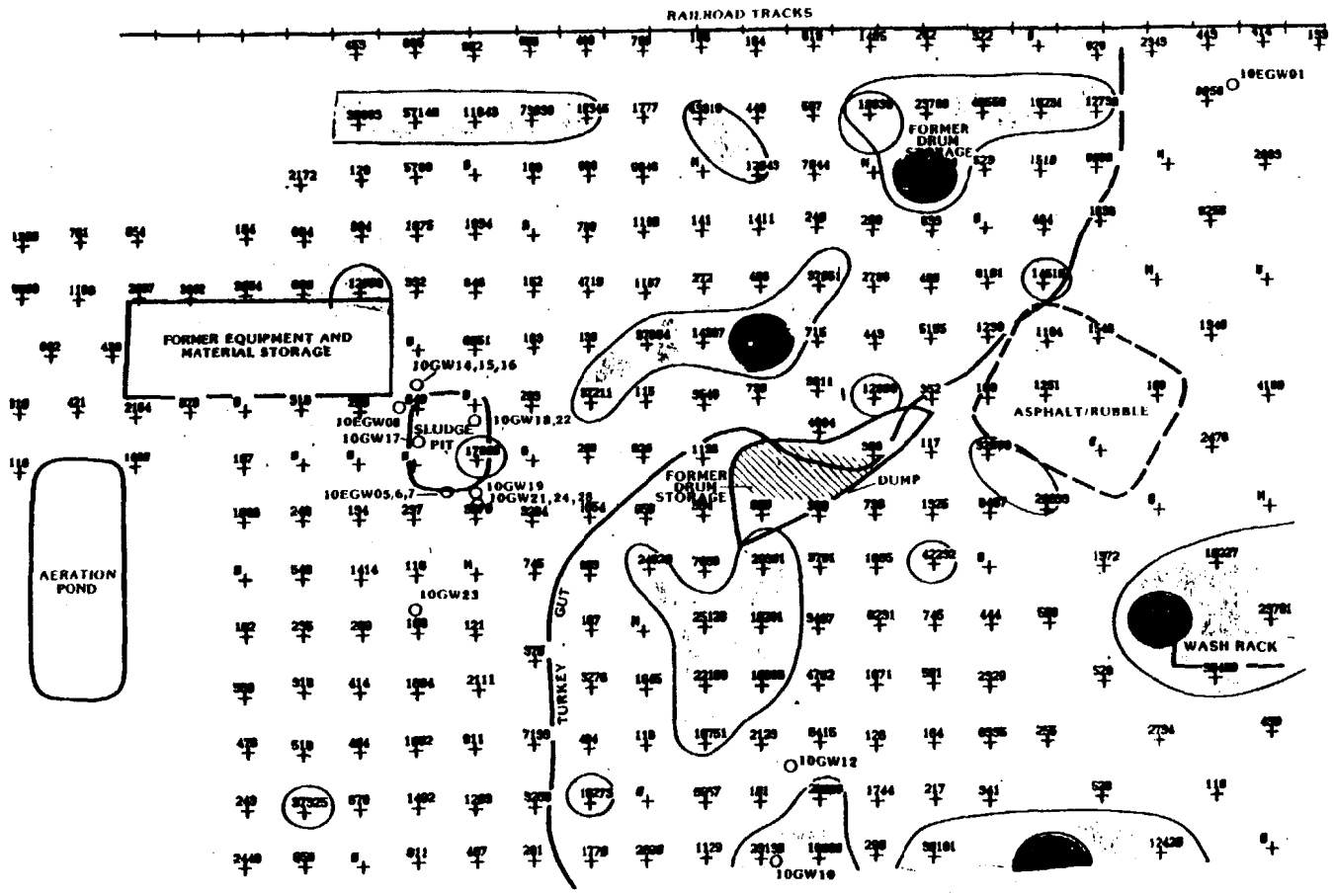
| Methylene chloride | Concentration mg/kg | Dose mg/kg-day | NOAEL | Hazard Quotient | Hazard Index |
|---|---|---|---|---|---|
| Ingestion | | | | | |
| Soil | 1.20E-02 | 2.40E-05 | 5.85E-03 | 4.10E-03 | |
| Water | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| Food | 7.76E-03 | 8.10E-10 | 5.85E-03 | 1.38E-07 | |
| Inhalation | | | | | |
| Air | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| Dermal | | | | | |
| Soil | 0.00E+00 | 0.00E+00 | 5.85E-03 | 0.00E+00 | |
| | | | | | |
| Total | | | | | 4.10E-03 |

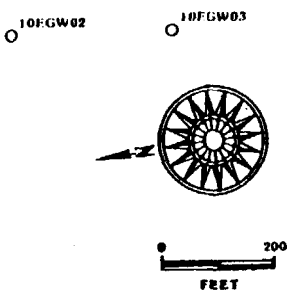
Dose Calculations for Individual Contaminants - Maximum Concentration

| Thallium | Predicted Concent. | Weight kg | From Food mg/day | Intake from Meat mg/kg/day | Intake from Vegetation mg/kg/day | Intake from Water mg/kg/day | Dermal Uptake from Soil mg/kg/day | Dietary Intake Soil mg/kg/day | Air mg/kg/day | Fractional Intake | Absorption Fraction | Predicted Dose mg/kg-day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | | 1.15E+00 | 1.15E+05 | | | | | | | | | |
| Soil | 6.70E+00 | | | | | | | 1.34E-02 | | 1.00E+00 | 1.00E+00 | 1.34E-02 |
| Water | 0.00E+00 | | | | | 0.00E+00 | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Food-an. | 3.24E-02 | | | 3.17E-03 | | | | | | 1.00E+00 | 1.00E+00 | 3.17E-03 |
| Food-veg. | 2.68E-03 | | | | 0.00E+00 | | | | | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Inhalation | | | | | | | | | | | | |
| Air | 0.00E+00 | | | | | | | | 0.00E+00 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| Dermal | | | | | | | | | | | | |
| Soil | 0.00E+00 | | | | | | 0.00E+00 | | | 1.00E+00 | 1.50E-01 | 0.00E+00 |

# APPENDIX L

# SOIL GAS SURVEY MAP




**Legend:**

Ion Counts:

- ≥ 100,000
- 10,000-99,999

O = Monitoring Wells

+ = Petrex Collector

M = Missing Sample

[redacted]

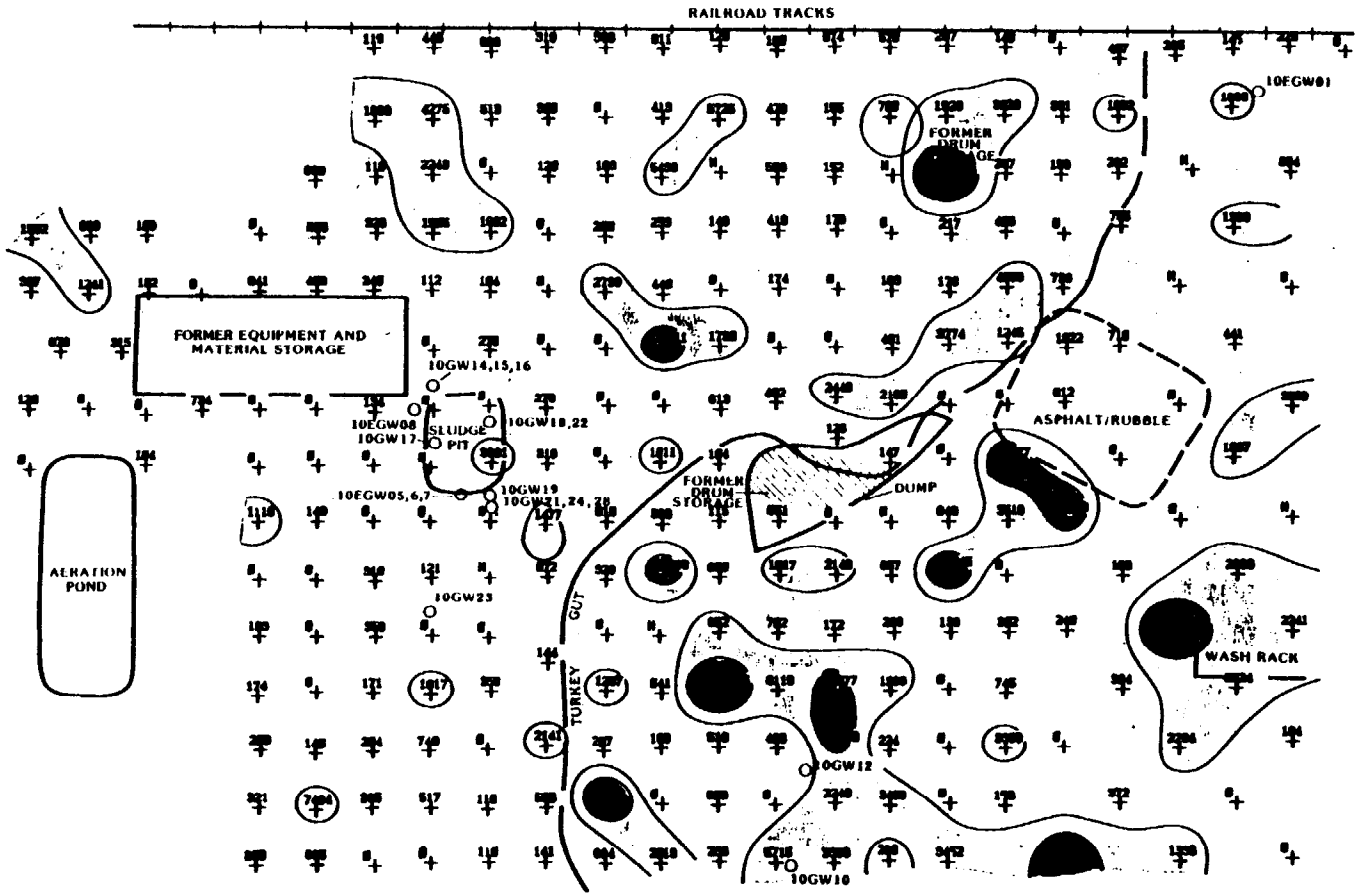
**SITE 10**

CHERRY POINT, NORTH CAROLINA

**Relative Flux**

**Trichloroethane and Freon II & 113**

April 9, 1990 | Figure: 8 | Scale: 1in.=200ft.




**Legend:**

Ion Counts:

- ≥ 100,000
- 10,000-99,999
- 1,000-9,999

O = Monitoring Wells

+ = Petrex Collector

M = Missing Sample

10EGW02

10EGW03

N

0 200

FEET

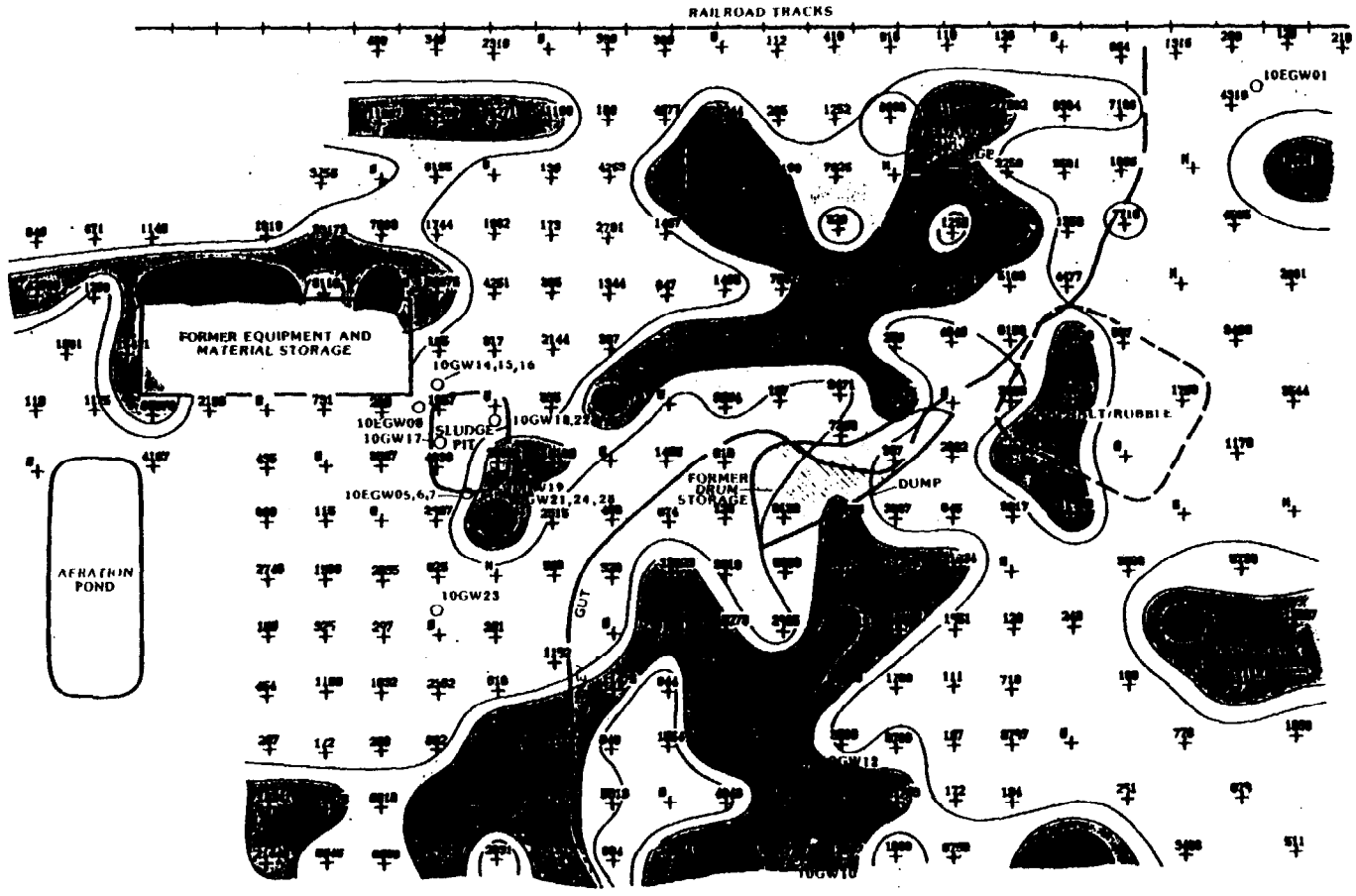
# SITE 10

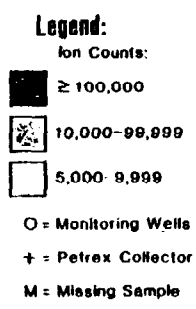
CHERRY POINT, NORTH CAROLINA

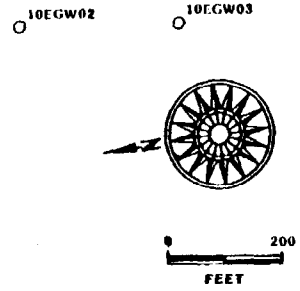
## Relative Flux

## Dichlorobenzene and Trichlorobenzene

April 9, 1990 Figure: 7 Scale: 1in. = 200ft.



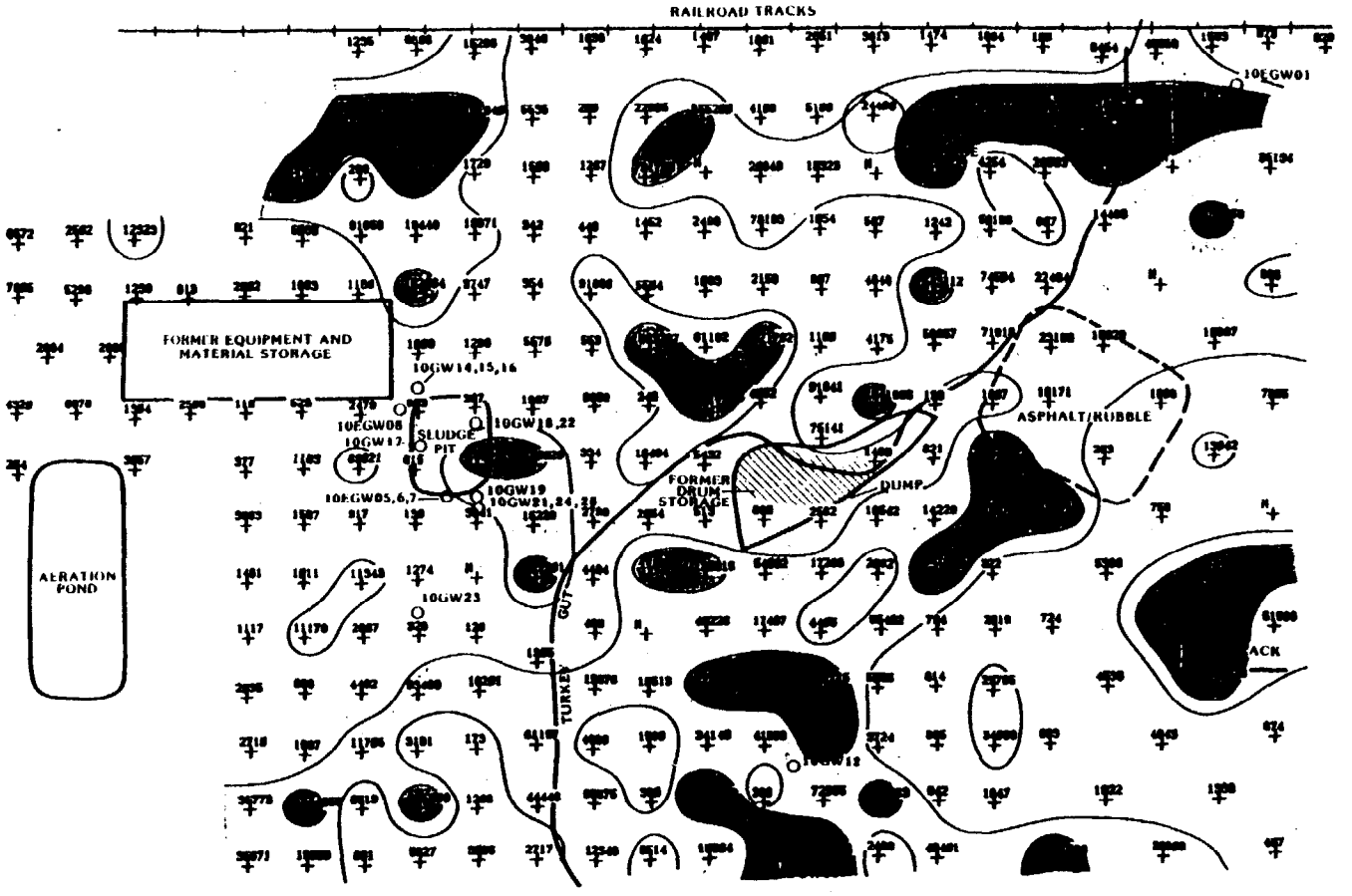

**SITE 10**

CHERRY POINT, NORTH CAROLINA

**Relative Flux**

**Trichloroethylene and Tetrachloroethylene**

April 9, 1990 | Figure: 6 | Scale: 1in.=200ft




**Legend:**

Ion Counts:

- ≥ 100,000
- 10,000-99,999

O = Monitoring Wells

+ = Petrex Collector

M = Missing Sample

N

0 200

FEET

# SITE 10

CHERRY POINT, NORTH CAROLINA

## Relative Flux

## Combined Hydrocarbons/Naphthalenes

April 9, 1990 | Figure: 5 | Scale: 1in. = 200ft.