

Ecological Risk Assessment Workshop

August 24, 2010

Vieques, Puerto Rico

Workshop Agenda

5:00 – 5:15

Welcome

5:15 – 5:30

Introductions and Workshop Goals

5:30 – 6:30

**Overview of Ecological Risk Assessment
Protocol Steps and Examples**

6:30 – 6:45

Break

6:45 – 8:00

Continued Eco-Risk Assessment Discussion and Wrap-up

Ecological Risk Assessment Participants/Roles

USEPA – Federal regulatory agency providing oversight of cleanup activities

PREQB – Commonwealth regulatory agency providing oversight of cleanup activities

USFWS – Federal agency managing lands owned by the Federal government and providing scientific support to USEPA on cleanup activities

NOAA – Federal agency providing scientific support to USEPA on cleanup activities, primarily for coastal and marine areas

Navy – Federal agency that conducted historical military and support activities and is responsible for clean up activities under CERCLA

Workshop Contributors

- Danny Rodriguez – United States Environmental Protection Agency (USEPA)
- Wilmarie Rivera – Puerto Rico Environmental Quality Board (PREQB)
- Kevin Cloe - Navy
- Mindy Pensak - USEPA
- Diane Wehner – National Oceanic and Atmospheric Administration (NOAA)
- Scott Heim – TRC- Environmental Quality Board Technical Support Contractor
- John Martin – CH2M HILL – Navy Technical Support Contractor
- Rich Henry – United States Fish and Wildlife Service (USFWS)

Goals of Workshop

- To provide a broad overview of the ecological risk assessment process (eco-risk) as it applies to Vieques sites.
- Describe basic parts of eco-risk
- Answer your questions

CERCLA Process

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA)
- CERCLA requires EPA to cleanup hazardous waste sites in ways that will protect both human health and the environment.
- Risk assessments characterize the potential risks to human health and the environment

Vieques Master Plans – Overview

“Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program, Vieques, Puerto Rico” April 2010

- **Provides a blueprint for consistent data collection and risk assessments for all Vieques sites**
- **This document includes methodologies for conducting**
 - **eco-risk**
 - **human health risk assessments**
 - **sampling methodologies for soil, water, sediment, and groundwater**

What is Eco-Risk Assessment?

- An eco-risk assessment evaluates potential risks to animals and plants
- The eco-risk data, along with the human health risk data, are used, if necessary, to develop cleanup levels to protect human health and the environment

Why Do We Need an Eco-Risk Protocol Specific to Vieques?

- Eco-risk is a standard process applied to CERCLA sites across the country
- For Vieques, it is tailored to the animals and plants specific to the island.



Eco-Risk Process – CERCLA Eight Steps

Screening Level Steps

1. Problem formulation and toxicity evaluation
2. Exposure estimate, risk calculation

Baseline Level Steps (if needed)

3. Problem formulation
4. Study design
5. Verify field sampling design
6. Site investigation and data analysis
7. Risk characterization
8. Risk management

Step 1 Problem Formulation



Step 1 Problem Formulation



Step 1 Problem Formulation

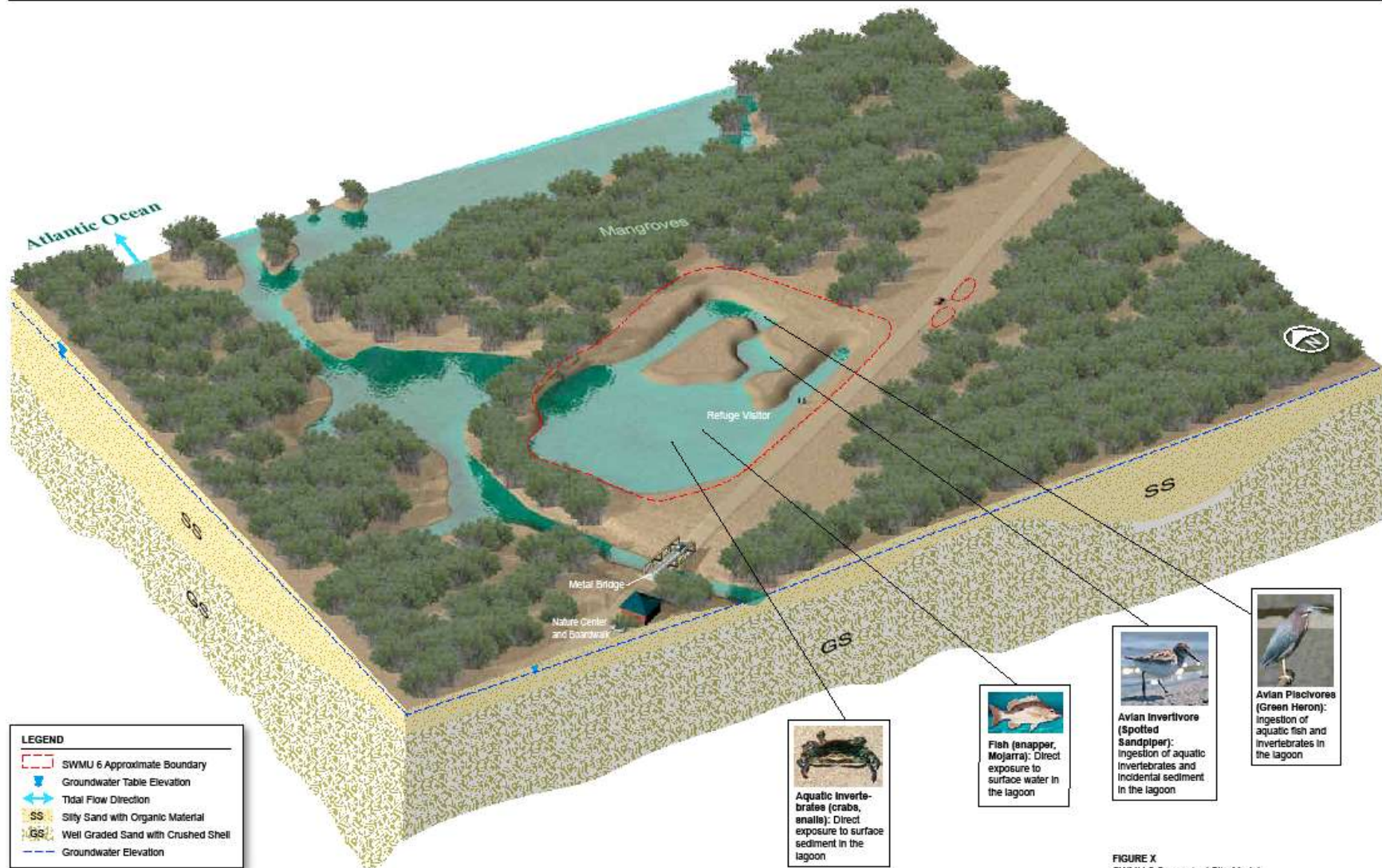


FIGURE X
SWMU 6 Conceptual Site Model
Former NASD, West Vieques, Puerto Rico

Step 1 Problem Formulation



Step 1 - Eco-Risk Screening Guidelines – Surface Water

- Surface water screening guidelines include:
 - **Puerto Rico Water Quality Standards**
 - **USEPA National Recommended Water Quality Criteria**
 - **NOAA Screening Quick Reference Tables**
- Screening values different for freshwater and saltwater

Step 1 - Eco-Risk Screening Guidelines - Sediment

- Sediment screening guidelines include:
 - **Freshwater**
 - Threshold Effect Concentrations (MacDonald et.al. 2000)
 - Ecotox Thresholds – USEPA (1996)
 - Sediment Guidelines – Florida inland waters (MacDonald et.al. 2003)
 - **Marine/Estuarine**
 - ER-L (Effects Range – Low) (Long et.al. 1995)
 - Sediment Guidelines – Florida coastal waters (MacDonald et.al. 1994)
 - NOAA Screening Quick Reference Tables (2008)

Step 1 - Eco-Risk Screening Guidelines– Surface Soil

- Surface soil screening guidelines include:
 - **USEPA Ecological Soil Screening Levels (USEPA 2003 – 2008)**
 - **Toxicological benchmarks for terrestrial plants and soil/litter invertebrates (Efroymson et. al. 1997)**
 - **USFWS soil screening values (Beyer, 1990)**

Step 2 - Hazard Quotients

- Risk is calculated using hazard quotients (HQs)

HQ = Maximum Concentration / Screening Guideline

$HQ \geq 1$ Further Evaluation

$HQ < 1$ No Further Evaluation



Step 2 - Example Risk Calculations – Direct Media Exposure

Surface Water Media

- Copper in lagoon surface water = **5.0 µg/L (max)**
- Eco-Risk surface water screening guideline = **3.1 µg/L**

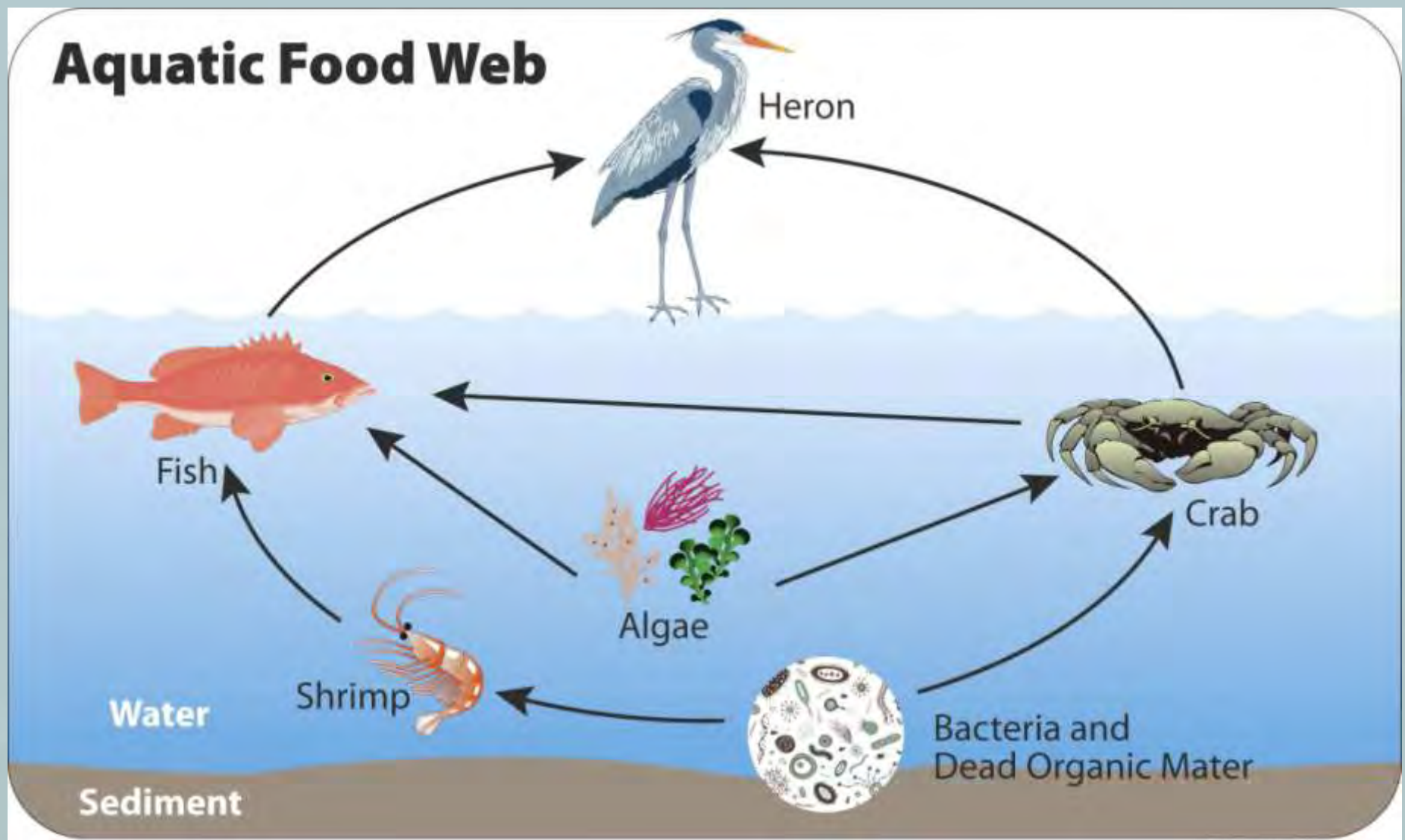
HQ = 5.0 / 3.1 = 1.6 Further Evaluation, go to Step 3

Surface Soil Media

- Manganese in surface soil = **150 mg/kg (max)**
 - Eco-Risk surface soil screening guideline = **220 mg/kg**

HQ = 150 / 220 = 0.7 No Further Evaluation

Step 2 Screening Level Exposure Estimate, Risk Calculation



Eco-Risk Process – CERCLA Eight Steps

Screening Level Steps

1. Problem formulation and toxicity evaluation
2. Exposure estimate, risk calculation

Baseline Level Steps (if needed)

3. Problem formulation
4. Study design
5. Verify field sampling design
6. Site investigation and data analysis
7. Risk characterization
8. Risk management

Step 3 – Refinement

- Chemicals of potential concern ($HQ > 1$) from Step 2 are refined using more realistic assumptions
- Examples:
 - Use average concentration across the whole site
 - More realistic wildlife characteristics
 - Consider background chemical concentrations
 - Chemicals rarely detected ($< 5\%$) may be removed from further evaluation
 - Consider other relevant screening guidelines
- Chemicals that still require further evaluation are carried forward

Step 3 – Problem Formulation



Step 1 Problem Formulation



FIGURE X
SWMU 6 Conceptual Site Model
Former NASD, West Vieques, Puerto Rico

Step 4 – Study Design



Step 5 – Verification of Field Sampling Design



Step 6 – Site Investigation and Data Analysis



Step 7 – Risk Characterization



Step 8 – Risk Management

