Damage Determination and Restoration Scaling

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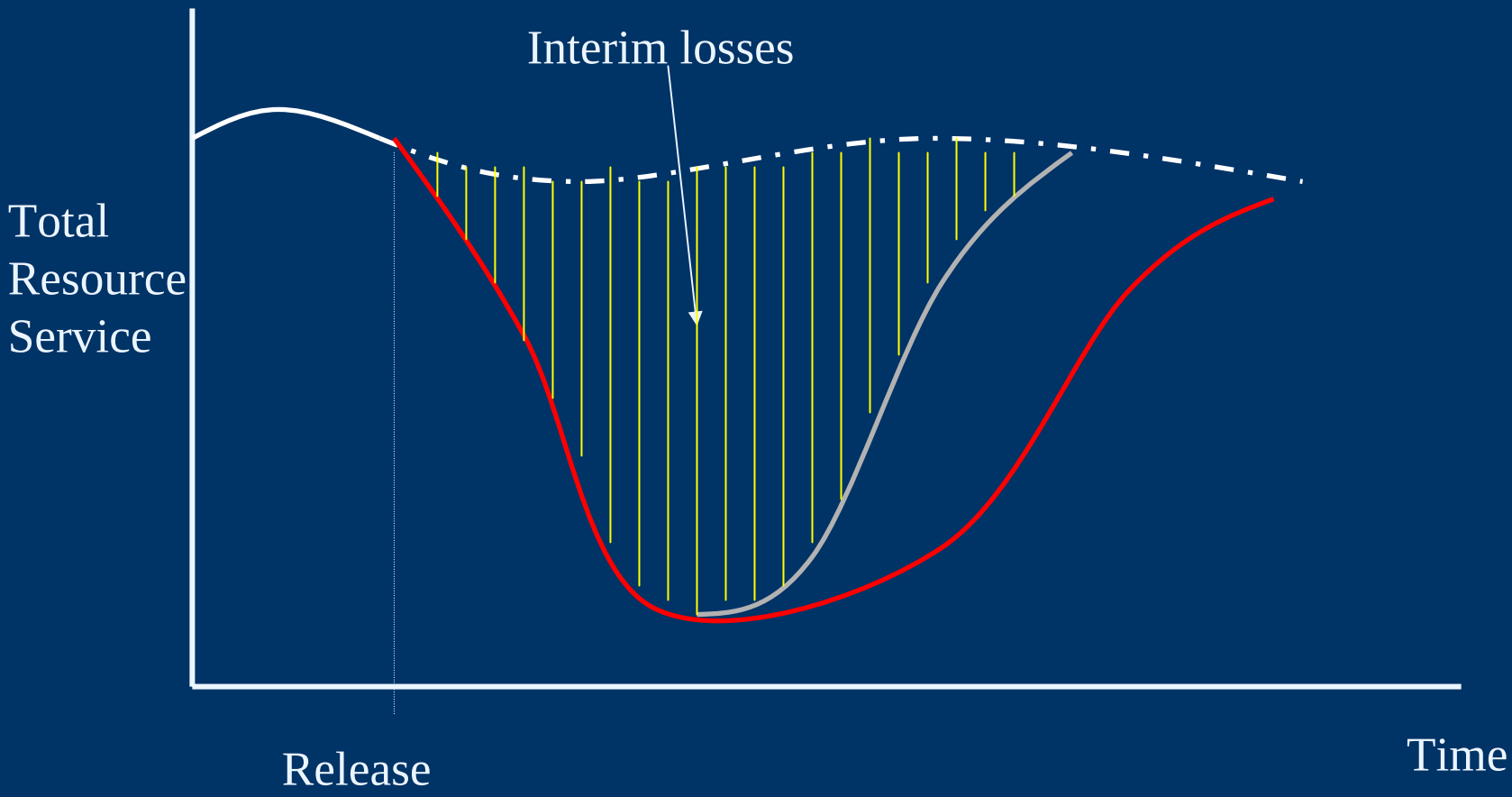
Overview

- Measure of damages

"*Damages* means the amount of money sought by the natural resource trustee as compensation for injury, destruction, or loss of natural resources"

- Use of economics to "scale" damages approaches under CERCLA, OPA, and State Laws
- Applications and Case examples

Measuring Interim Losses
What Economic Tools are Appropriate?



Measure of Natural Resource Damages:

- CERCLA, OPA Most State Laws
  - Cost of restoring the resource to baseline (primary restoration actions)
  - Loss in value of injured resources pending recovery to baseline

    OR

    Cost of restoration actions to compensate injured resources pending recovery
  - Assessment costs

Different Concepts of Compensation for Interim Losses

- Monetary compensation
  - How much money do the affected individuals require to be "made whole" for the loss?
- Resource compensation
  - How much additional public resources does the public require to be "made whole" for the loss?

Scaling Approaches

Scaling determines:

"How Much Compensation is the Public Owed?"

- Valuation approaches
  - Value-to-value methods
  - Value-to-cost methods
- Resource compensation
  - Service-to-service/resource-to-resource

Types of Economic Value

- Market
  - Profit and wages
  - Revenues
  - Jobs
  - Value of coastal real estate
- Non-market
  - Use values – recreation, environmental services
  - Non-use values/passive uses

Different Types of Economic Values for a Resource

- Active use values
  - Recreational fishing, boating, hunting, bird watching, commercial
- Option values
  - You may not use resource now, but you want to keep your options open to use it later
- Passive use values
  - Value of resources independent of any direct active use
    - Bequest, existence
    - Often ecological services (e.g., carbon sequestration) are placed under this category

Non-Market Valuation

- Most of the valuation in NRDA is of non-market values
  - Recreational services - beach Use, fishing etc.
  - Environmental goods – protecting species, open spaces
  - Natural resource quality – water quality, air quality
- Valuation is for both “use” and “non-use”
- Some resources are traded in markets where market valuation methods are possible – e.g., water, trees

Potential Valuation Tools

- Travel cost model:
  - Model demand for recreation based on individuals' observed behavior (e.g., site choice and trip cost)
- Market Valuation:
  - Use of market data to determine market value or price or goods/services traded in markets e.g., water
- Hedonic analysis
  - Measure of environmental value through market prices (often housing prices)
- Conjoint analysis:
  - Survey procedure used to determine the values for attributes of goods or services based on stated and revealed preference data
- Contingent valuation:
  - Estimates total value using a questionnaire to collect information about respondents' willingness to pay for a good or service

Methods to Scale Damages

- Travel cost
- Hedonic price models
- Contingent valuation
- Market Valuation
- Factor income
- Benefits transfer
- Conjoint
- Habitat/resource equivalency

Value-to-value
Value-to-cost

Service-to-service
Resource-to-resource

Valuation Approach (Value-to-Cost)

- Value of service losses due to injury (in $ terms) = cost of restoration projects
- Traditional “valuation” approach under CERCLA regulations
- Under OPA, is basically a “method of last resort”
  - Used when neither service-to-service nor value-to-value methods can be performed at a reasonable cost and/or within a reasonable timeframe
  - Will generally be used for smaller spills with limited damages

Valuation Approach (Value-to-Value)

- Framework:
  - Value ($) of service losses due to injury = value ($) of service gains from compensatory restoration project (with discounting)
- Conditions for use:
  - Applied when service-to-service is not appropriate
- Directly analogous to HEA scaling process, but using value, rather than measured resources or service flows, as the basis of equivalency calculation

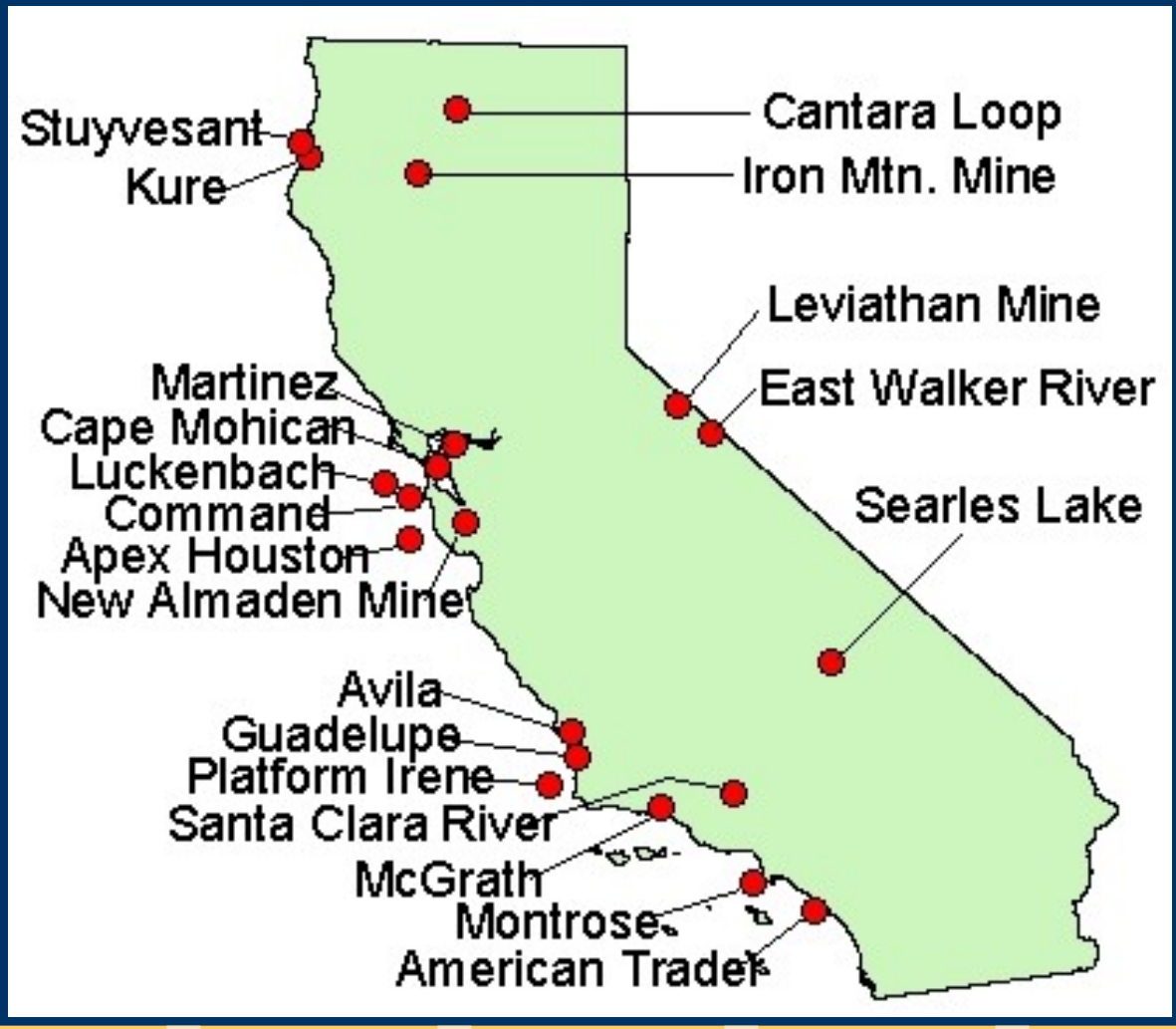
Resource Equivalency Approach

- Framework:
  - Resources/service losses due to injury = resource/service gains from compensatory restoration project (with discounting)
- Conditions for use:
  - Injured and restored resources and services are the same type, quality, and comparable value
- Encompasses:
  - Habitat/resource equivalency analysis (HEA/REA)
  - Methods predicting direct human use services (recreational participation) – subject to specific constraints

Case Examples

- American Trader
  - Projects and Travel Cost Benefits Transfer
- Iron Mountain Mine
  - Resource Equivalency and Travel Cost Benefits Transfer
- Lavaca Bay
  - Value to Value for Recreational Fishing
- Montrose
  - Value to Cost – Contingent Valuation
- Green Bay
  - Value to Value - Conjoint

California Larger NRDA Cases



American Trader

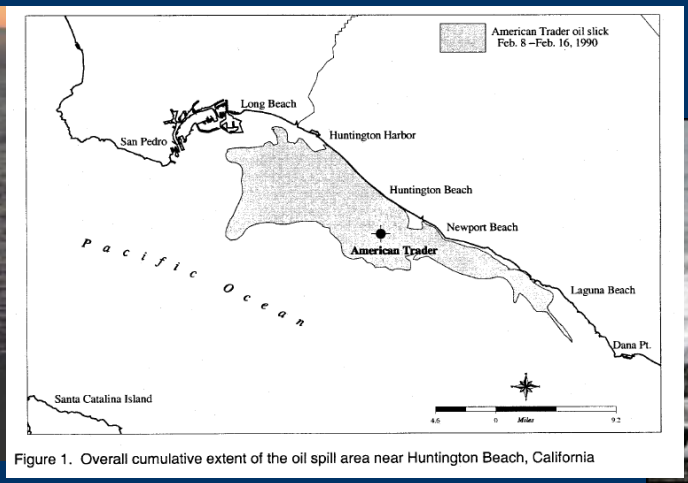
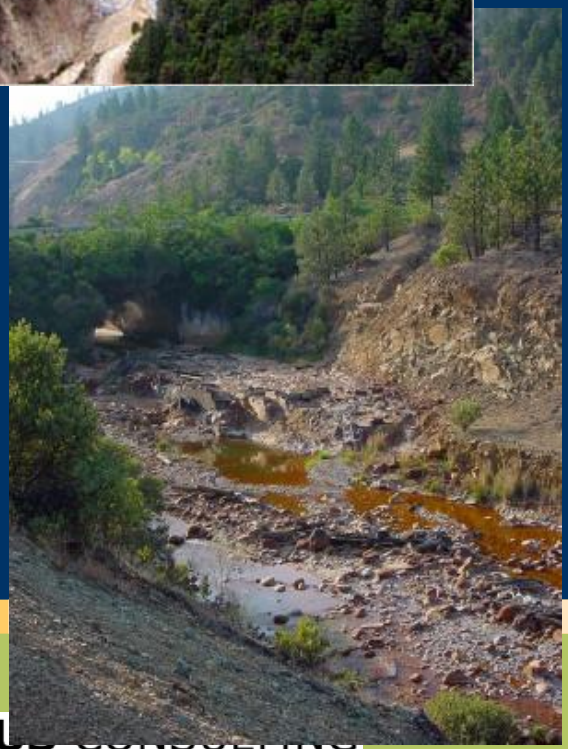


Figure 1. Overall cumulative extent of the oil spill area near Huntington Beach, California

- 60 square miles of ocean were oiled
- Oil washed ashore along roughly 14 miles of beaches
- Closed Southern California Beaches for up to 5 weeks
- Killed approximately 3,400 birds, including brown pelicans, and their off-spring were lost.
- Oiled coastal wetlands

Iron Mountain Mine



Aquatic Resource

- 2.3 miles Boulder Creek
- 2.6 miles Slickrock Creek
- Flat Creek
- Groundwater

Riparian Habitats

- At least 50 acres

Terrestrial Habitats

Human Use

- Loss of use of over 2000 acres of recreation area
- Benefits Transfer/Travel Cost Method

Lavaca Bay, Texas

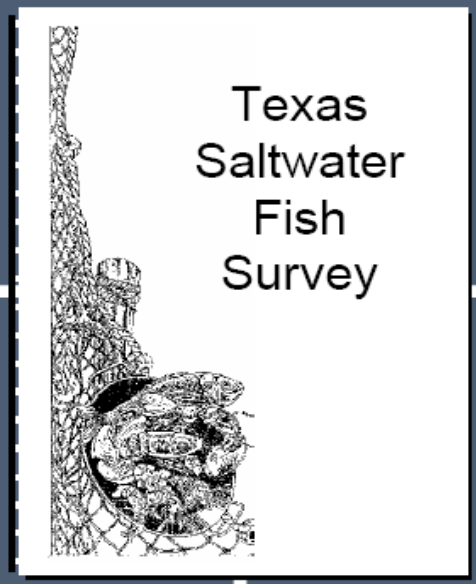
Mercury and PAHs

- Rec. Fishing Closure
- Rec. Fishing consumption
- Advisories
- Fish
- Benthic critters
- Groundwater
- Soils
- Wetlands

One Survey: Multiple Objectives

Fish consumption data for baseline risk assessment

Recreation choice data to estimate fishing losses

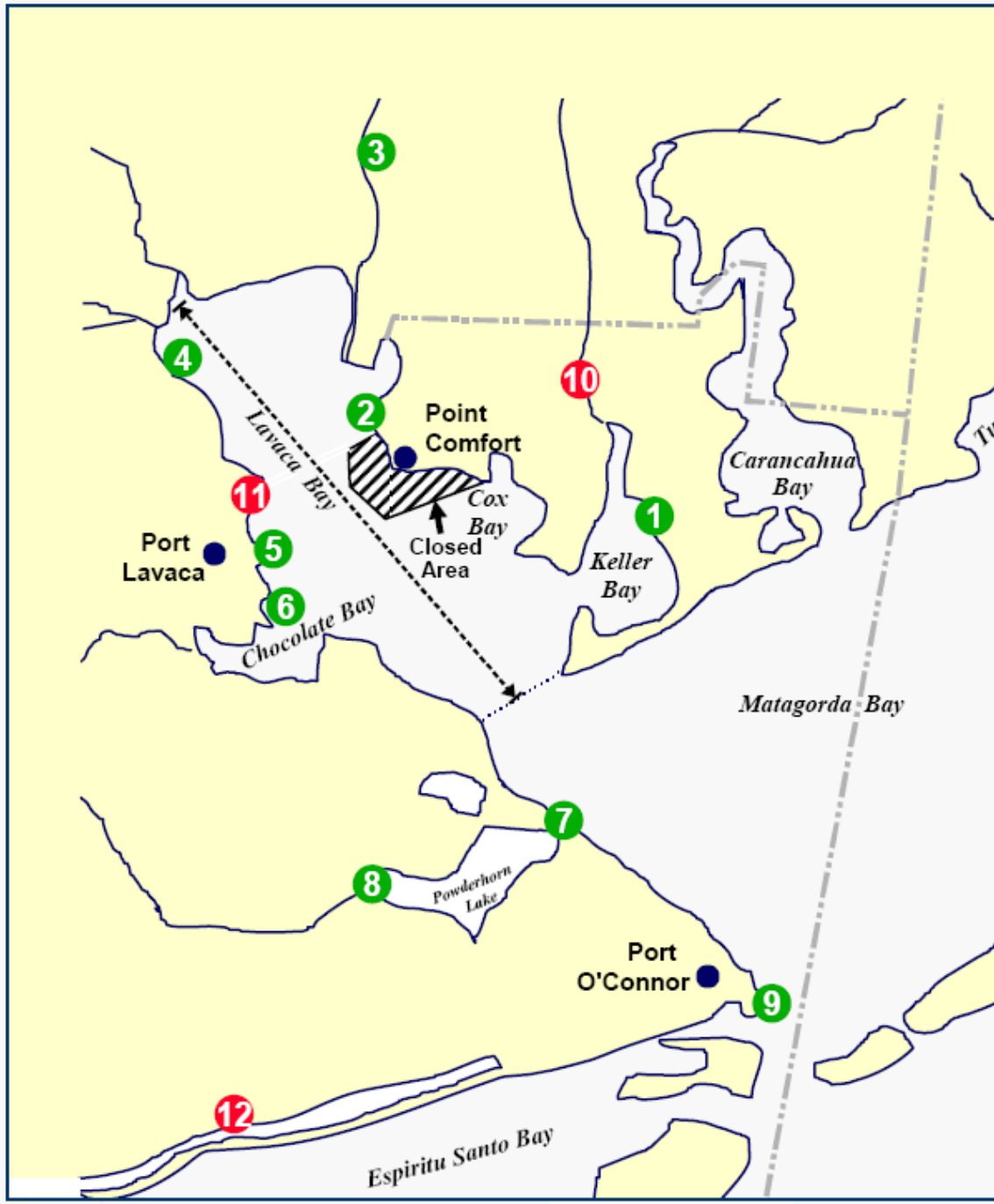


Recreation choice data to evaluate restoration alternatives

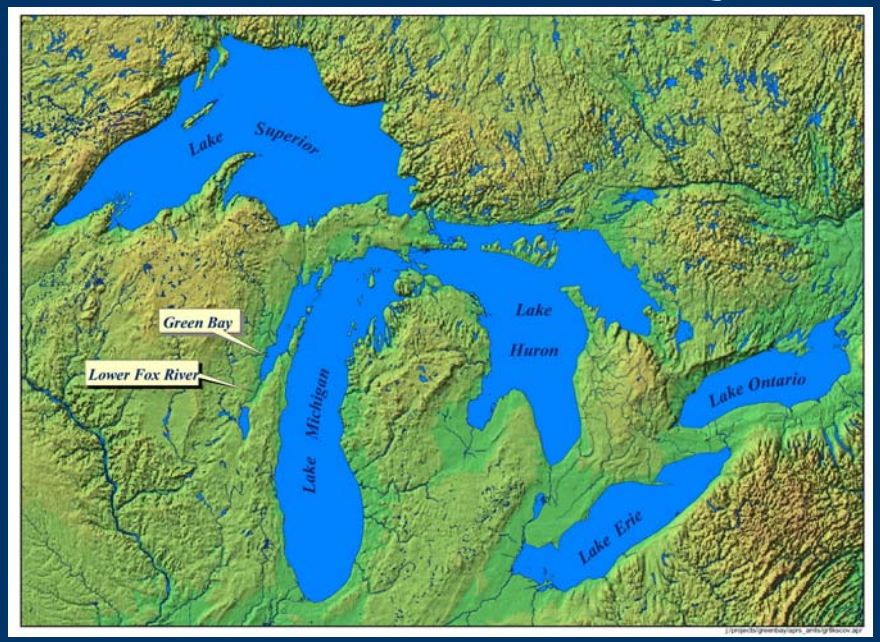
	Site A	Site B	N
Type of Fishing	Boat	Pier	
Additional distance to fishing or launch site	5 miles from your closest saltwater fishing site	15 miles from your closest saltwater fishing site	
Catch rate	3 red drum	2 spotted sea trout	Neith nor Si
Surroundings	No view of industrial plants	View of industrial plants	I will go sa fishin
Congestion	Many people or boats in sight	Some people or boats in sight	
Facilities at site	Good parking and restrooms	Limited parking	
Fish consumption advisory	No advisory (fish can be eaten)	Fish should not be eaten	
Check only ONE box	☐ Prefer Site A	☐ Prefer Site B	☐ Prefe Site A

Potential Locations for Recreational Fishing Projects

1. Olivia
2. Bean Property (new site)
3. Lolita
4. Six-Mile Boat Ramp
5. Port Lavaca Pavilion (new site)
6. Harbor of Refuge
7. Indianola
8. Powderhorn Lake/ Colomo Creek
9. Port O'Connor
10. Keller Creek
11. Lighthouse Beach
12. Fulghum Launch



Green Bay, Michigan/Wisconsin



PCB / Dioxin Contamination

Aquatic Resources/Sediments
Fish
Birds – bald eagles
Recreational Fishing
Fish Consumption Advisories

Green Bay NRDA – Restoration Scaling

- How much is enough?
- How should the different restoration project types be combined into an overall approach?
- What are the public's preferences and attitudes?

Green Bay NRDA – Restoration Alternatives

- Wetland preservation
- Wetland restoration
- Reducing agricultural runoff into Green Bay
  - Stream buffer strips
  - Conservation tillage on cropland
- Improved recreational opportunities

Scaling Restoration

- Co-trustees used an economic survey of public values and attitudes ("total value equivalency")
- The value to the public of the increase in environmental quality that will be achieved through restoration is balanced against the value that will be lost because of continuing PCB injuries
- This determines "how much is enough," with the flexibility to consider different project mixes

Results – Restoration Scaling

PCB Cleanup Scenario	Wetlands		Increase in bay water clarity from runoff control	Improvement in existing parks
	Acres preserved	Acres restored		
Intensive (injuries gone in 20 years)	8,700	2,900	+2”	10%
	6,900	2,300	+6”	5%
Intermediate (injuries gone in 40 years)	9,900	3,300	+4”	10%
	8,700	2,900	+8”	10%

Groundwater

- Often co-occurs with surface water injures at CERCLA sites
- For the most part this is only a state issue
- Quantification is often a challenge
  - Quantity v. quality issues
- Multiple approaches to estimate damages
  - Market Valuation
  - Value –to- Value
  - Resource Equivalency

Conclusions

- NRDA focuses on compensatory not punitive damages
- NRDA designed to make the public whole for injuries to natural resources through restoration
  - How much is enough?
- Economic methods are critical to determining how much compensation is approprate to make the public whole
- Multiple methods often used
  - Each case is unique
  - Different types of stressors
  - Alternative restoration approaches
  - Public preferences