Evolution of Ecosystem Services through NRDA

An Historical Perspective

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In the case of the SS Zoe Colocotroni a district court damage award for destruction of marine invertebrates was overturned because the appellate court held that the trustees had not reliably valued the resource.

**Commonwealth of Puerto Rico, et al. v. The SS Zoe Colocotroni, 628 F.2d 652, 1980.**

- Department of Interior NRD Regulations
  - Quantification of dollar damages
  - Rebuttable Presumption
The Day the Environmental World Changed

- The birth of Natural Resource Damage
- The birth of Eco-Risk Assessment
- Ecosystem Services
The Day the Environmental World Changed

- The birth of Natural Resource Damage
- The birth of Eco-Risk Assessment
- Ecosystem Services

EXXON VALDEZ
“…evidently we’re leaking some oil and we are going to be here for a while.”

Captain Hazelwood
Injuries from Exposure to the Spill

- Estimated that from 100,000 to 300,000 birds were killed
  - some common murre colonies in the affected area were reduced by half
- Estimated a loss of 2,650 sea otters in Prince William Sound
- Impaired south-central Alaska's fisheries
The Exxon Valdez Damage Assessment

- Exxon contributed $20 million to conduct the NRD for the spill
  - a seat at the table
    - The federal government reneged
- “Assessment War” ensued
  - Federal and State governments spent $120m
  - Exxon spent a reputed $70m
- Unexpected Benefit - Understanding
  - Government and Private Sector
  - Scientists – Policy Makers – Academics
  - Catalyst for Service Analysis methodologies
The Exxon Valdez Damage Assessment

- Funds appropriated by Congress for Valdez Settlement were placed into a revolving fund and used to fund other Assessments
- EPA attempted to become the Federal trustee
  - John Sununu turned them down
- EPA began to conduct true Ecological Risk Assessments
How Do You Value Something that is Not Traded in any Marketplace?
Natural Resource Damages

- Cost of Restoration, Replacement or Acquisition of Equivalent
- Loss of Use
  - Actual
  - Passive
- Trustees’ Assessment Costs
Contingent Valuation Methodology

- Passive Use Loss
  - Option Value
  - Bequest Value
  - Existence Value
- Nobel Panel on CVM
- Unique Resources

WHAT’S IT WORTH?
The Settlement

- Billion Dollar Settlement
  - $900 million over a ten-year period
  - $100 million re-opener
  - Bill Reilly (EPA Administrator) concluded that any settlement for less than $1 billion was not politically viable

- Money would be used for restoration
  - Administered by Trustee Council
The Legacy of the Valdez

- NRD Assessment Methods
  - Monetary Approach
  - Contingent Valuation Methodology
- EPA Focus on Ecological Injury
  - CERCLA/RCRA Eco-Risk
- Oil Pollution Act
- Net Environmental Benefits Analysis
The Steam/Hot Water Clean-Up
Net Environmental Benefits Analysis (NEBA)
Net Environmental Benefits Analysis (NEBA)

NEBA balances the ecological benefits of planned clean-up against the ecological costs in an attempt to:

- *discourage alternatives that would do more harm than good*
- *encourage the selection of alternatives that offer the greatest potential benefit to the environment*
- *Simple diversity and density of species analysis*
- What was really being measured were relative Ecological Service Losses
Legacy of John Knauss
1990 Marine Restoration Conference

- First marine restoration sciences conferences.
  - Demonstrated that our capability to restore injured ecosystems

- “The ability to actually restore and reclaim damaged portions of our environment is now a very exciting possibility.”[1]

- “The burden rests upon the scientific community to come up with viable, meaningful, useful ways of actually doing damage assessment and restoration that work.”[2]


[2] Ibid, 695
A New Paradigm: Service Based Assessment and Restoration

- Exxon Bayway, $12 million, United States v. Exxon Corp., No. 91-1003, (E.D. NY);
- NOAA economist, Brian Julius
- DOI economist, Bruce Peacock
- habitat based /ecological barter
- quantify the injury to an ecological system and the resources who use it
- translation of ecological service loss into in-kind restoration
- focus on the benefit created and not the cost to create the benefit
Services Provided by Eel Grass

Eelgrass Services

- Habitat Benefits
  - Feeding
  - Migration
  - Invertebrates
  - Giant Food Web
  - Refuge
  - Nursery
  - Spawning

Other Benefits

- Nutrient Cycling
- Stabilizes Sediments
- Commercial Fisheries
- Recreational Fisheries
- Moderate Inputs

Export Resources

- Fish
- Birds
- Man
- Mammals
- Detrital
- Living Biomass

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Interim Lost Services Following Resource Injury
Ecological Restoration

When Ecosystem Function(s) and Service(s) are Impaired in a Particular Ecosystem Patch, it is Possible to Restore and Compensate for a Damaged Ecosystem(s) Elsewhere so that the Aggregate Performance of the Ecological Landscape Remains the Same or is Improved
Natural Resources and Services

- Natural resources are valuable assets in that they yield flows of services to people.
- Actions by individuals and firms can lead to changes in the flows of these services - causing favorable effects (benefits) and unfavorable effects (costs and damages).
- The value of natural resources as an asset can be defined as the sum of discounted present values of the flows of all of the services.
- The value of a restoration project as an asset can be defined as the sum of discounted present values of the flows of all of the services.
Natural Resources and Services

- Injury to natural resources can be defined as the sum of discounted present values of the service flows lost.
The value of a restoration project can be defined as the sum of discounted present values of the services flows created or enhanced.

- **Natural Recovery**
  - **[Loss of 800 SAY]**

- **Off-Site Restoration**
  - **[Gain of 5,000 SAY]**

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**Years**

- **Start**
- **Full Recovery**

**% of Services**

- 100
- 80
- 60
- 40
- 20
The value of a restoration project can be defined as the sum of discounted present values of the services flows created or enhanced.
Habitat Equivalency Analysis

- Off-Site Restoration
  - Gain of 5,000 SAY
- Natural Recovery
  - Loss of 800 SAY
- Invasive Remediation
  - Loss of 2,500 SAY

% of Services

Start

Full Recovery

Years
Liability for damage to natural resources has been established under CERCLA, CWA as amended by OPA and the National Marine Sanctuaries Act.

The natural resource damage assessment area was one of the first areas to concerently consider:
- how we were going to measure the cost of ecological injury?
- how we were going to restore injured ecosystems?

The government’s most sophisticated application of ecosystem service valuation methods occurs in the determination of these damages.

Use in Risk Assessment and Remedial Evaluation

Ability to proffer restoration in lieu of remediation – Texas & Louisiana