

The Role of Economics in the Natural Resource Damage Assessment and Restoration (NRDAR) Process

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Summary

- Current focus of natural resource and environmental economists
- Relationship between ecosystem services, human uses and economic values
- Overview of economic tools
- Overview of habitat equivalency analysis
- Questions



King Eider female, oiled



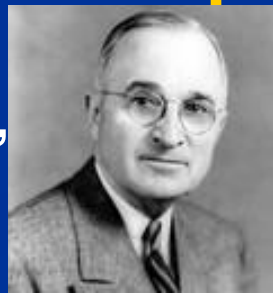
Economists' View of the World

Economics is about how to manage scarce resources, including time, money, services, and natural resources.

Traditional Stereotypes

- As a social science, economics is anthropocentric.
- Economics is only about money (or profit, or things).
- Economics is unethical.

Factoid: Plain-speaking President Harry Truman said he longed for one-armed economists because when asked for advice, their response usually was along the line of "on the one hand, Mr. President, but on the other hand..."



Positive Economics

- As a social science, economics concerns itself with interconnectedness between humans and the natural environment.
- Helps think about tradeoffs among scarce resources.
- Values for natural resources increase with information.
- Can coordinate well with normative positions from science, law & policy.

Relationship Between Ecosystem Services, Uses and Values

While there may not be a universally accepted definition of ecosystem services across disciplines, ecologists' general classification aligns with the economic concepts of use and non-use values:

- Provisioning services, e.g., goods produced like food, timber, fuel, water (i.e., commodities)
- Regulating services, e.g., flood and disease control
- Cultural services, e.g., spiritual, recreational, cultural benefits
- Supporting services, e.g., nutrient cycling, soil formation

- Direct use involves human physical involvement with natural resources (e.g., logging, fishing, cultural, and tourism)
- Indirect use values resources that support humans or what humans directly use, e.g., climate regulation, flood control, animal/fish, pollination, waste assimilation
- Non-use does not involve physical interaction (i.e., bequest and option values)

Why does economics fit into the damage assessment process?

Pollution events



Changes in good and services provided



Changes in human well-being*



Changes in economic value



Natural resource injuries



Assessment



Claim for damages

*Interconnectedness between humans and environment

Where does economics fit into the damage assessment process?

- **NRDAR claim elements include:**

- **Costs of emergency restoration**
- **Trustees' assessment costs**
- **Damages**

- **Trustees have two options for damages claim development:**

1. Measure the **costs** of restoration, rehabilitation, replacement, and/or acquisition of equivalent resources (intended to re-establish baseline conditions); and/or
2. Measure the **compensable value**, i.e., the amount of money or in-kind projects required to compensate the public and/or Tribes for the interim loss in services over time.

DEPARTMENT OF THE INTERIOR

43 CFR Part 11

RIN 1090-AA97

Natural Resource Damages for
Hazardous Substances

AGENCY: Department of the Interior.

ACTION: Final rule.

What kind of economic tools are used in the damage assessment process?

Market Methods

- Market Price Method (e.g., cost of dredging contaminated sediments)
- Productivity Method (e.g., relationship between clean water and agriculture)



Revealed Preference

- Hedonic Pricing Method (e.g., local housing values reflect environmental quality conditions)
- Travel Cost Method (e.g., value of fishing area reflected in spending to get there). Random utility model (RUM) has become the preferred way to value quality at recreation sites. People trade off travel costs and quality when making trip decisions.

Economic Tools (cont'd)

Stated Preference

- Contingent Valuation (e.g., survey in Montrose)
- Conjoint Analysis or Contingent Choice (e.g., TVE in Fox River)

Benefits Transfer (don't be fooled, reliable transfers can be complex)

After usually about 30 minutes of questions and descriptions, the CV interview depends on a yes/no question that is used to determine damages:

"Is your household willing to pay \$X in higher income taxes (or some other method) to have this program to eliminate (or avoid) the injuries that I have described to you?"

INTRODUCTION ▶ 1-9

Figure 1-2

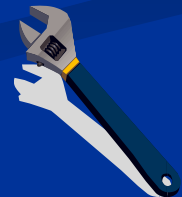
Example Choice Question

If you were going to fish the waters of Green Bay, would you prefer to fish the waters of Green Bay under Alternative A or Alternative B? *Check one box in the last row*

	Alternative A ▼	Alternative B ▼
Yellow Perch		
Average catch rate for a typical angler.....	40 minutes per perch	30 minutes per perch
Fish consumption advisory.....	No more than one meal per week	No more than one meal per week
Trout and Salmon		
Average catch rate for a typical angler.....	2 hours per trout/salmon	2 hours per trout/salmon
Fish consumption advisory.....	Do not eat	No more than one meal per month
Walleye		
Average catch rate for a typical angler.....	8 hours per walleye	4 hours per walleye
Fish consumption advisory.....	Do not eat	No more than one meal per month

Restoration-Based Economic Tools

- Economists extended theory from valuation studies to develop restoration-based tools, including:
 - Habitat Equivalency Analysis (HEA)—balances service gains from restoration actions against service losses on habitat, e.g., 10 acres of salt marsh are burned after a diesel spill.
 - Resource Equivalency Analysis (REA)—like HEA, but for a particular resource rather than a habitat e.g., 60 migratory birds die after landing in mine waste ponds.
- Commonly used in NRDAR cases, hydro licensing, pipeline permitting, endangered species, non-commercial timber losses, etc.
 - Method supported in US court decisions
 - Been gaining wide acceptance by industry

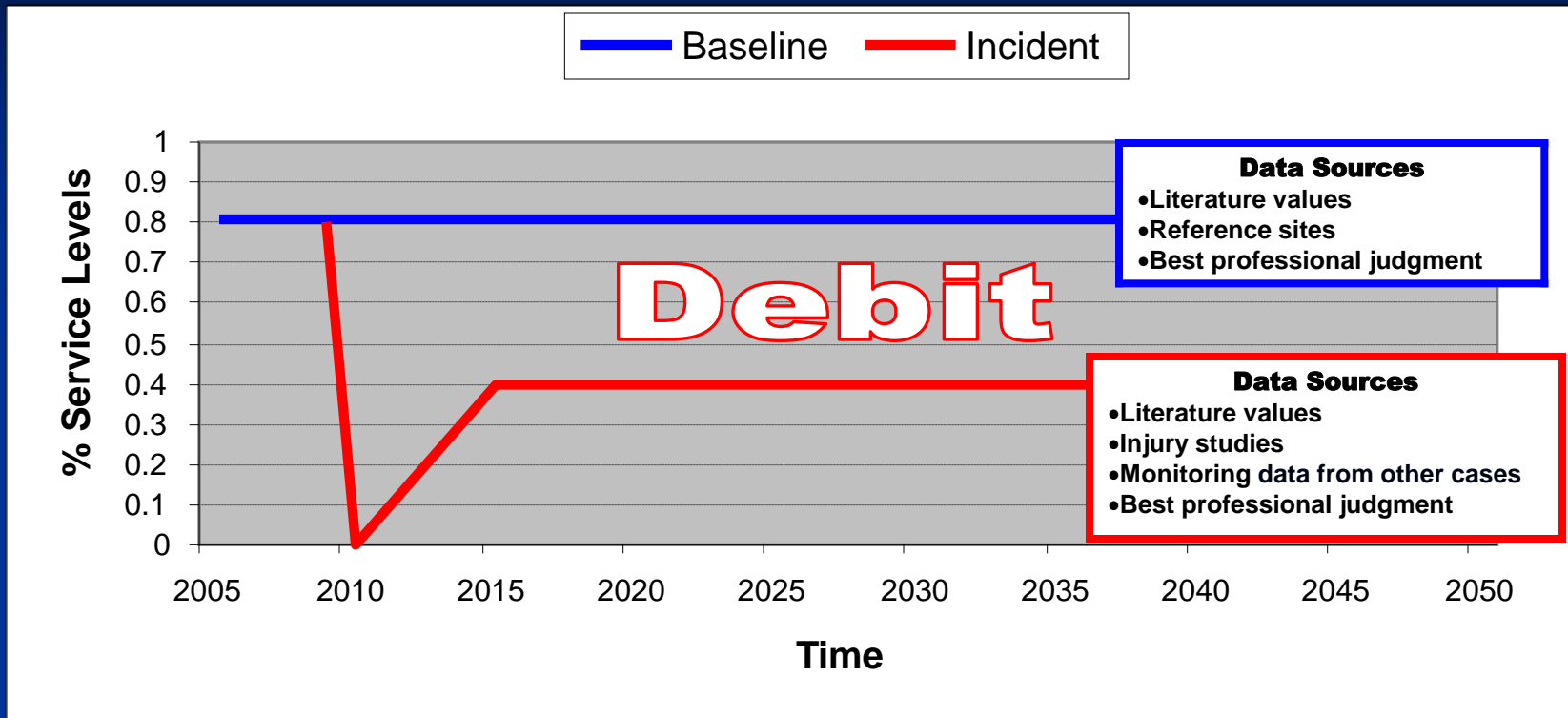


How are economic tools selected in the damage assessment process?

The criteria for selection of economic methods include:

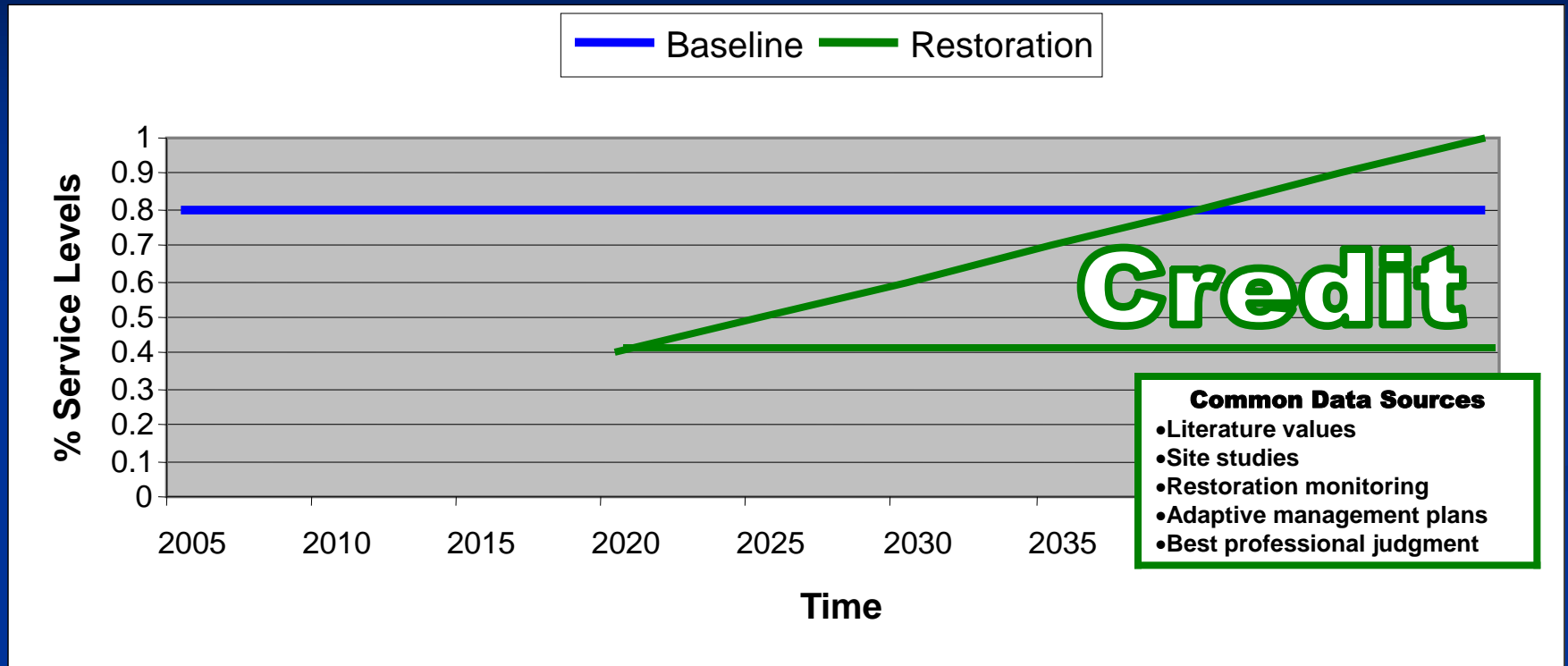
- Feasible and reliable for the incident and type of natural resource injury, e.g.,
 - Addresses the nature, degree, spatial and temporal extent of injury
 - Peer-reviewed
 - General acceptance by experts in the field
 - Subject to standards governing application
 - Inputs and assumptions supported by a clear rationale
- Reasonable cost (less than expected damages)
- Avoid double counting
- Cost-effective (minimum cost for a given restoration goal)

HEA Inputs from Scientists



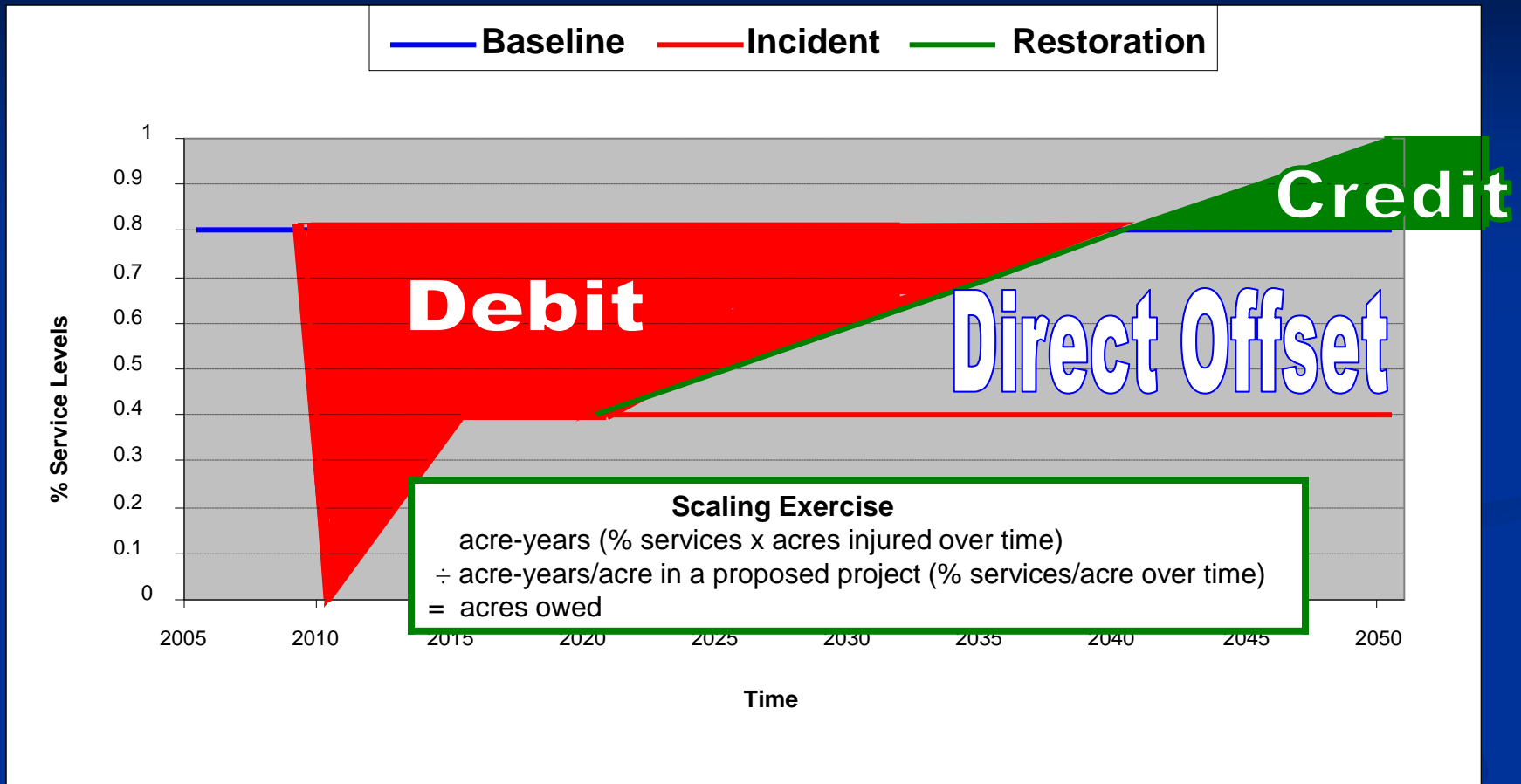
1. Identify baseline “but for” the release. % services are related to a physical unit of habitat like acres/sq km, stream/river-miles, kg of biomass (including trophic transfer).
2. Identify % ↓ in services relative to baseline (debit), e.g., FQI, woody cover index, % loss related to contaminant levels.

HEA Inputs from Scientists (cont'd)



3. Select appropriate restoration projects and identify %↑ in services.

HEA Inputs from Scientists (cont'd)



4. “Scale” selected projects so the replacement is in physical units (credit owed). Goal is to have:

Debit = Credit

Discounting

- Discount rate is applied to services lost and restored.
- CERCLA/OPA are compensatory laws, and discounting puts compensatory restoration in present value.
- Measures how much we prefer current use or condition of resources vs. the future; our “impatience”
 - 3% discounting means: Prefer 1 acre of habitat today vs. 18 acres in 25 years
 - 5% discounting means: Prefer 1 acre of habitat today vs. approximately 15 acres in 25 years
- 3% discount rate is commonly used for valuing lost natural resource services (Freeman, 1993; Lind, 1982; NOAA, 1999; and court decisions on NRDAR cases)

When to Use HEA

- Types of lost & replacement services are similar.
- Quality of lost & replacement functions/services are similar.
- Know enough about quality, quantity, timing of lost & replacement services to quantify.



Advantages of Using HEA

- When applied correctly, HEA/REA can quickly and reliably use the metric of ecosystem services to measure indirect use (not human use) values and identify appropriate quantity of restoration.
- Resource-to-resource approach avoids costly valuation studies; lost and replacement services are measured with the same metric.
- Restoration can be scaled without estimating \$\$ values, but could finish the analysis by calculating:
 1. **Restoration cost** (e.g., cost to restore habitat)
 2. **Substitute cost** (e.g., cost of acquiring new habitat)
 3. **Replacement cost** (e.g., cost of purchasing tree seedlings)
- Greater potential for cost-effective settlement of claims.

Disadvantages of Using HEA

- Can be difficult to identify which services lost and to be replaced.
- HEA is sensitive to the input decisions, particularly:
 - Service loss level (baseline and injury)
 - Years to recovery (recovery curve)
 - Level of recovery (residual injury)
- May incorrectly assume that the public has similar values for what was lost and restored.
- Does not help to decide whether a resource *should* be restored compared to the cost of restoration actions.

Questions?



Broad overview of ecosystem valuation:
<http://www.ecosystemvaluation.org>