Restoration Scaling of Cultural Service Injuries Using Structured Decision Support: NRDA Methods for Native American Claims

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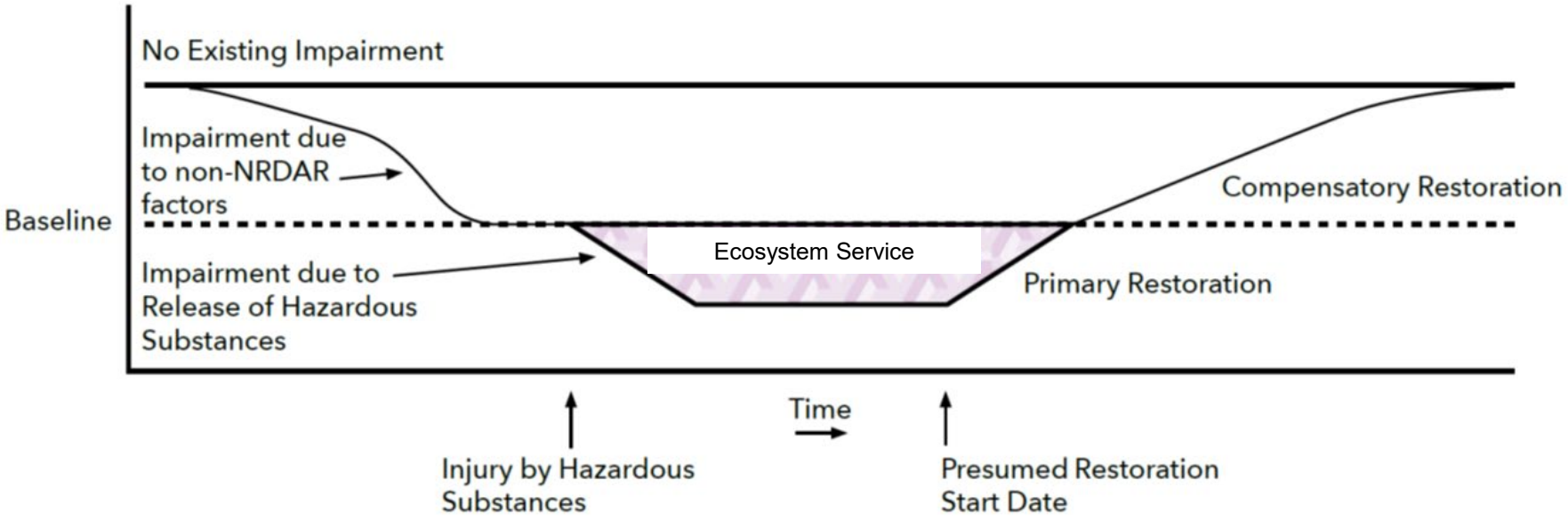
- Environmental regs (e.g., NEPA, CERCLA, CWA, and OPA) govern loss of ecosystem services associated natural resource injuries
- The science and economic frameworks for regs provide limited tools to address cultural service impacts (especially nonuse services)
- Differing cultural perspectives can result in significant and unique cultural service losses for Native Americans

Western Society Cultural Perspectives
- Humans dominant over nature
- Resource equivalency and substitution acceptable
- Present value of resources (discounting ok)
- Cultural & environmental values measured with economic & science-based frameworks
- Manage allowable risks
- ……

Native American Cultural Perspectives
- Holistic view - humans part of (not dominant over) nature
- Pass healthy resources for future generations; discounting of future services not appropriate
- Resource substitution less accepted
- Treaty rights, tribal sovereignty, & TEK
- ……

- Today's Focus: Structured Decision Support (SDS) as a method for restoration scaling of cultural services under Natural Resource Damage Assessment (NRDA) under CERCLA and OPA
  - Applicable for NEPA as well

Key NRDA Concepts



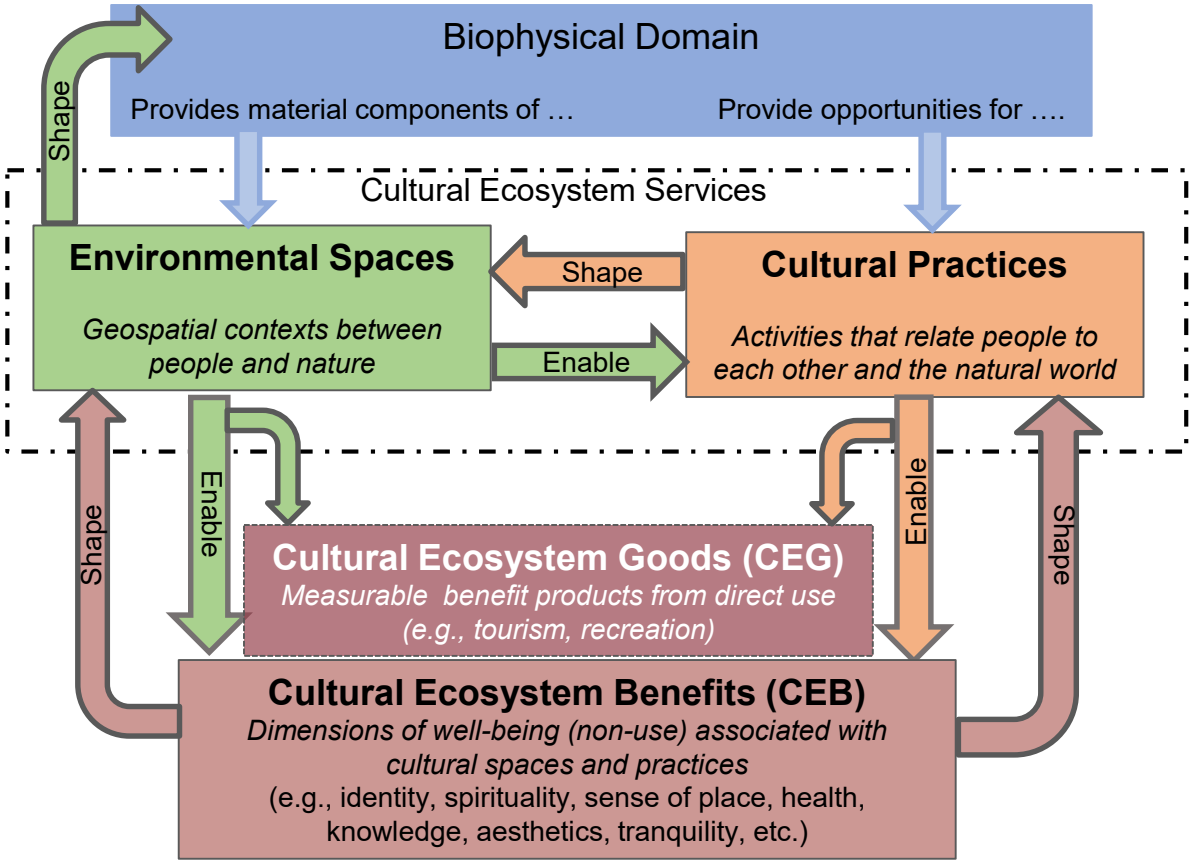
- Compensatory Restoration
  1. To extent practicable, trustees must consider compensatory restoration actions providing same type & quality of services with comparable value
  2. If (1) not possible, trustees should identify actions that provide natural resources and services of comparable type and quality
  3. Where (2) not of comparable value, the scaling process will involve valuation of lost and replacement services 15 CFR 990.53 (C)(2)

NRDA Regulatory Considerations

- Public (direct) and nonuse cultural services are compensable values
- Direct Use: measured with traditional economics
    - recreation, tourism
- Nonuse values *generally considered nonmaterial, non-consumptive, non-measurable using traditional economic methods*
    - identity, spirituality, sense of place, health, knowledge, aesthetics, tranquility, etc.

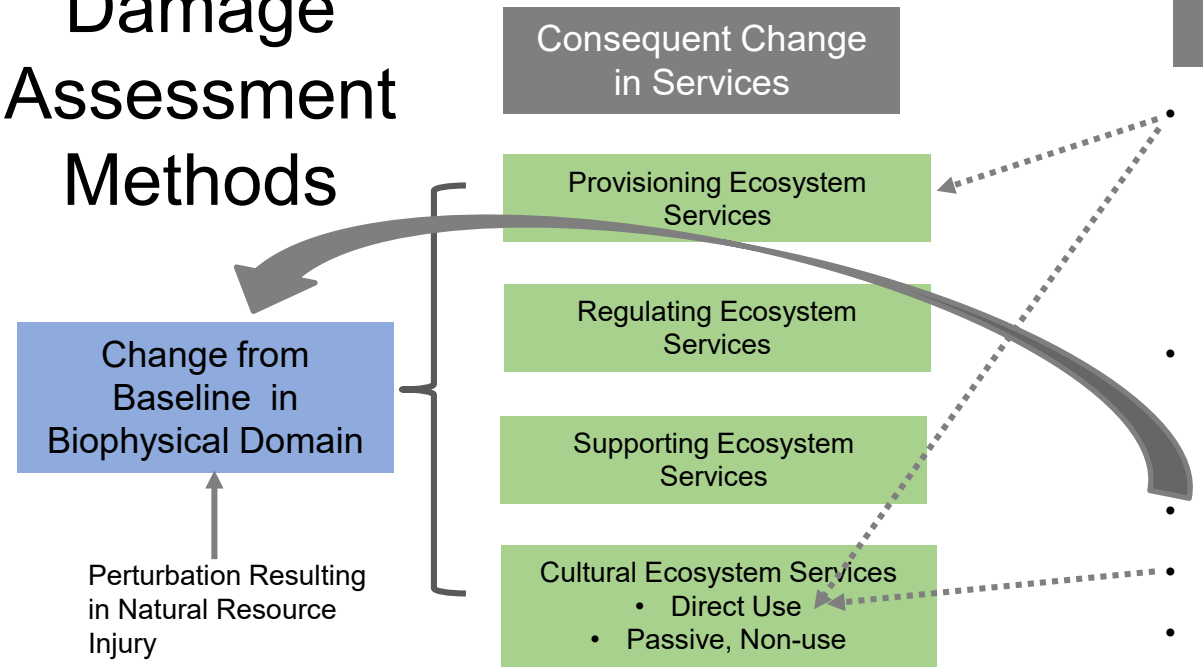
Understanding Cultural Ecosystem Services (CES): Conceptual Model

- CES: interactions between people and environmental spaces
  - nonexistent in biophysical domain absent of people
- NR injuries may impact
  - stock, supply, or condition of environ. spaces
  - level and quality of cultural practices and subsequent values
- Existing NRDA methods measure changes in biophysical domain, EG and CEG



Modified from Fish et al. Ecosystem Services 21 (2016) 208-217 and Bryce et al. Ecosystem Services (2016) 258-269.

Typical Damage Assessment Methods



Available Methods and Typical Approaches

- Revealed Preference (RP)
  - Market Price, Appraisal, Factor Income
  - Travel Cost
  - Hedonic Pricing
- Stated Preferences
  - Contingent Valuation
  - Conjoint Analysis
- Equivalency Analysis (HEA/REA)
- Random Utility Model (RUM)
- Value = Cost Assumption
  - Cost Avoided
  - Replacement or Substitute Cost
- Benefits Transfer

- Cultural non-use services:
  (1) sometimes acceptably addressed using above with above approach;
  (2) sometimes settlement by fatigue; or
  (3) often have not been addressed

Ignoring Non-material Cultural Services: doesn't have to be so

OPA NRDA

Trustees may quantify injuries in terms of:

- … extent of the injury to a natural resource
- … extent of injury to a natural resource, with subsequent translation of that change to a reduction in (cultural) services, or
- amount of services lost as a result of the incident

CERCLA NRDA

The effects of a discharge/release on a resource may be quantified by directly measuring changes in services provided … instead of quantifying the changes in the resource itself, when …:

- Change in services from baseline … can be demonstrated
- Change in services can be measured without measuring extent of change of resource; and
- Services to be measured … provide better indication of damages than direct quantification of injury

Structured Decision Support (SDS) for Restoration Scaling of Cultural Services

- Direct measurement of cultural ecosystem benefits without using traditional economic theory
- Service-to-service scaling of lost and at risk services with primary and compensatory restoration
- Methods incorporate widely accepted and published elements
  - decision science
  - stated preference value elicitation
  - multi-attribute utility theory
  - negotiation theory
- Above elements widely used in society (including environmental management)
- SDS process meets NRDA regulatory requirements

Structured Decision Support (SDS) for Evaluating Cultural Services in Canada

- Developed supporting First Nations and Indigenous Peoples address environmental injuries in Western Canada (BC and AB)
  - Methods Development
    - Evaluating Losses of Traditional Native Values With Community-Based Multi-attribute Value Analysis
    - Compensating Aboriginal Cultural Losses: An Alternative Approach to Assessing Environmental Damages
- Applicable for planning and assessment of variety of conditions
  - Petroleum extraction, utilities, waste disposal, reservoir, and other facilities; fishing restrictions, climate change, and more
  - Often applied in support of litigation where results aren't publicly available after the trial
- SDS elements used in Pacific Northwest to evaluation tribal community well-being (e.g., indigenous health indicators, sense of place, climate change)

Key Steps in SDS Process

1. Problem formulation and planning
2. Defining cultural services and baseline
3. Quantifying severity of lost cultural services
4. Relative importance of individual cultural end values (CEV_x)
5. Identify primary and compensatory restoration alternatives and effects of each alternative on individual CEV_x
6. Normalize restoration alternatives
7. Evaluate least cost restoration program to make injured parties whole

Used for structured decision support; not dictating decision outcomes

What Makes a Cultural Effect Matter?

1. *It has to change something that the potentially affected population cares about*
2. *It has to be significant*
3. *It has to align with the specific injuries of incident*
4. *It can't be double counted with other service losses*
5. *It has to be possible*
6. *It has to be objectively measurable and scalable*

Who Determines Using SDS?

Affected population (tribal members as experts using constructed stated preference)

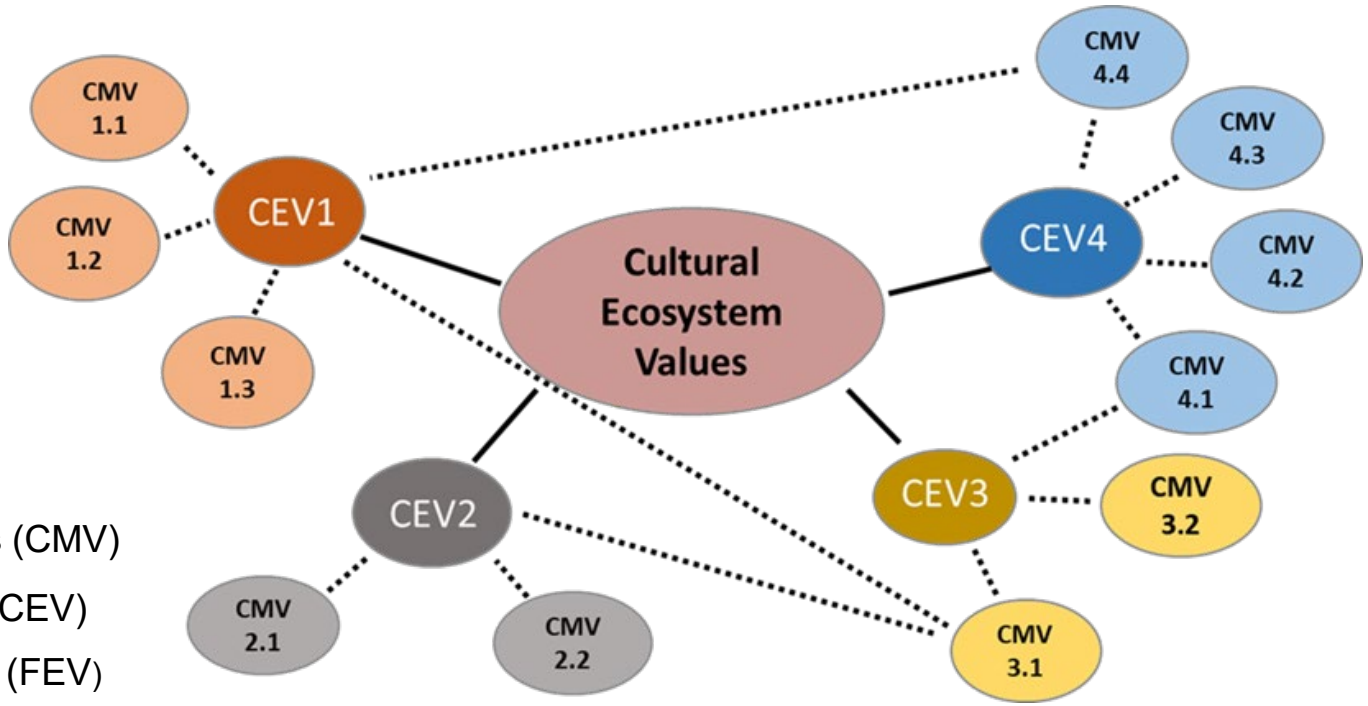
Technical Experts

Step 1: Problem formulation & planning

a. Listen and understand injuries from the science, engineering, legal, and tribal perspectives
b. Understand requirements and constraints (regulatory, legal, and cultural context; time frame, tribal capacity, budget limits, etc.)
c. Align assessment methods with issues & focus of incident
d. Identify cultural experts and involvement of community & elders
e. Ways to verify/validate information; whom to include when
f. Formalize agreements regarding how sensitive information gathered, handled, and utilized
g. Outcome: approach appropriate from tribal perspective yet rigorous, defensible, transparent, and understandable for both impacted and responsible parties
h. Build respect and trust between stakeholders

Step 2: Define cultural injuries and baseline

1. Collaborative, iterative effort between technical experts and tribal community identifying cultural values that have been, or may be impacted
2. Define hierarchies and mean-ends relationships
3. Establish baseline cultural values (“all but for the release”)
4. Identify if an impacted service may be appropriate to quantify economically



Cultural Means Values (CMV)

Cultural Ends Values (CEV)

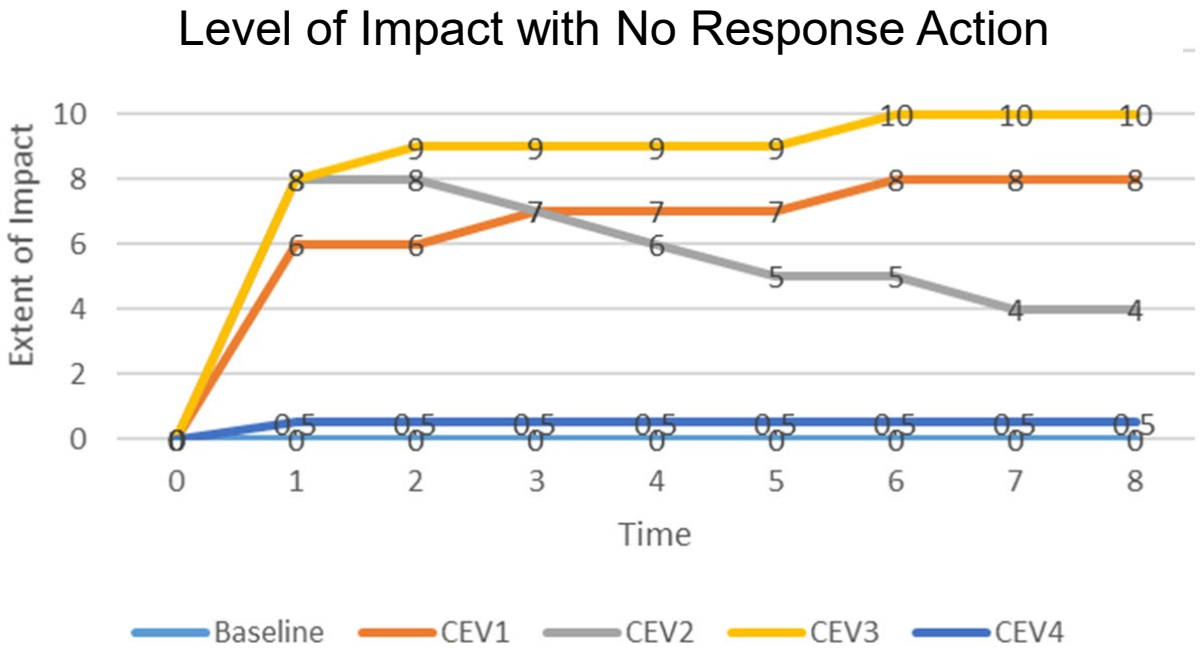
Financial Ends Values (FEV)

Step 3: Quantifying Severity of Lost Services (CEVn)

Level of Impact	Quantitative or Qualitative Indicators
0	Baseline
1	↓
2	
3	
4	
5	
6	
7	
8	
9	
10	Most Severe Imaginable

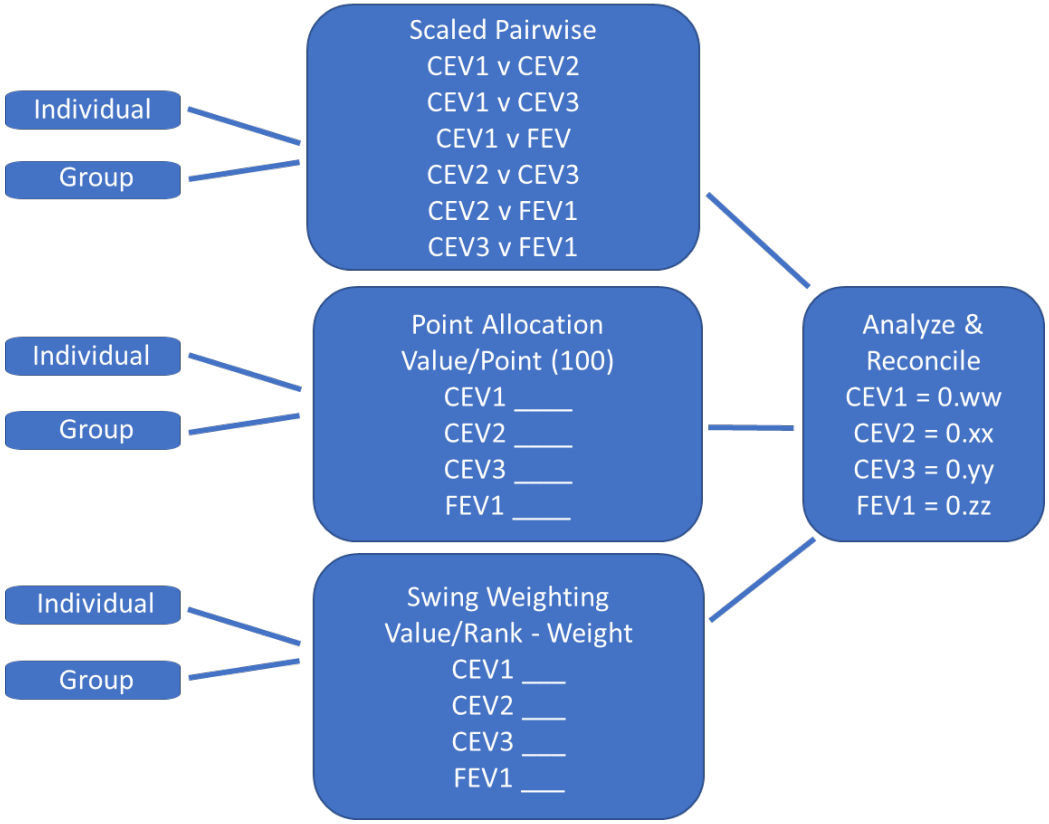
Evaluate level of impact for each cultural end value (CEV_x) using constructed Likert Scales

- Sum △ CEV_x over time



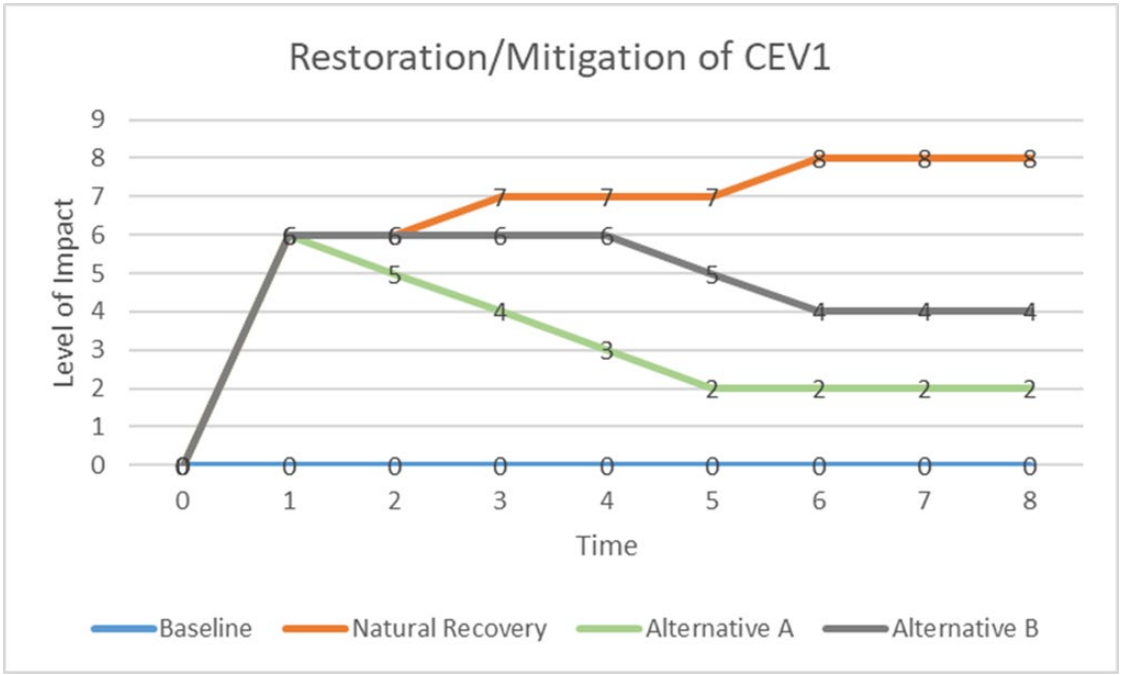
Step 4: Relative Importance of Individual Cultural Services

- Not all CEVs of equal importance (Tribal perspective)
  - Small impacts to important values more significant than moderate impacts to less important values
- Use multiple methods and multiple groups to evaluate relative importance of individual CEVs
  - Forced prioritization not required
- Can be supported by community survey methods



Step 5: Identify Primary & Compensatory Restoration Alternatives

- Primary & compensatory restoration alternatives
- Evaluate △ CEV_x for restoration alternatives using same constructed Likert scales as Step 3



Step 6: Normalize Restoration Alternatives

Rebalance level of impact and restoration response based on relative importance results from Step 4

Value	Normalized Weight	Unweighted Response in Year 8			Value Weighted Response in Year 8		
		No Action	Alt. A	Alt. B	No Action	Alt. A	Alt. B
CEV 1	0.78	-8	-2	-4	-6.2	-1.6	-3.1
CEV 2	0.09	-6	-5	-2	-0.5	-0.5	-0.2
CEV 3	0.13	-10	-9	-6	-1.3	-1.2	-0.8
Total	1.00	-24	-16	-12	-8.08	-3.12	-4.08

Step 7 Evaluate Least Cost Restoration Program

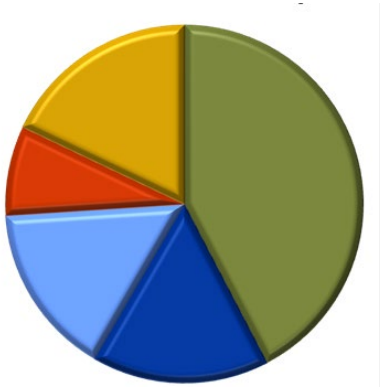
- What's cost effective?
  - NRDA regulations require most cost-effective alternative
- What about risk?
  - RPs look for alternatives with high EV(benefit/unit cost)
- Existing Canadian approach (more applicable to NEPA)
  - If one CEVx can be expressed in dollars (FEVx) in Step 2, each CEVx can be expressed in dollars using the relative weights from Step 5
  - Calculate priced out monetary equivalents for each value
  - Use additive function to calculate total monetary equivalent
  - Monetizing loss later in process helps keep focus on impacts to cultural values, healing, and restoration
  - Discount cash flows, not cultural values or habitat
- Under NRDA, use replacement (implementation) unit costs for each alternative

Example Means/Ends Relationships and Relative Importance for Risks to Sustainable Mobile Bay

Perceived Threats to Sustainable System:

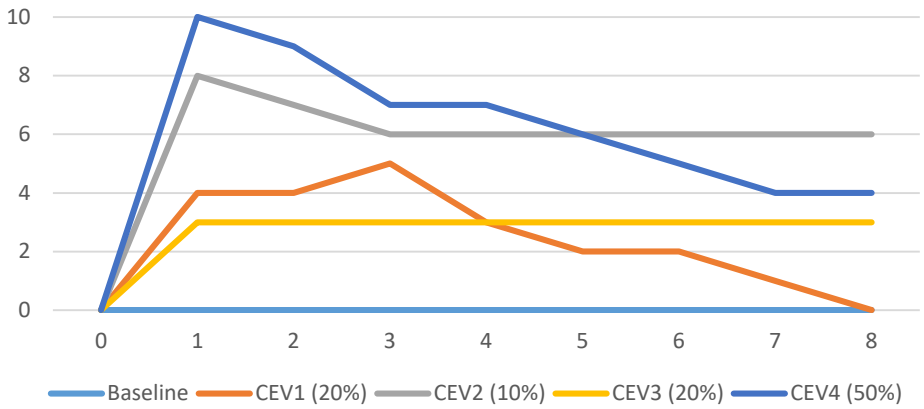
- **Economic** - Unfettered development and population growth
- **Infrastructure** - Aging infrastructure, climate resiliency, and displacement
- **Environmental** - Non-point source water quality and sediment issues
- **Social** - Lack of understanding or apathy
- **Governance** - Lack of understanding and ability to balance of trade-offs in environmental, economic, and social goals*;* stove-piped agencies, regulations and programs;

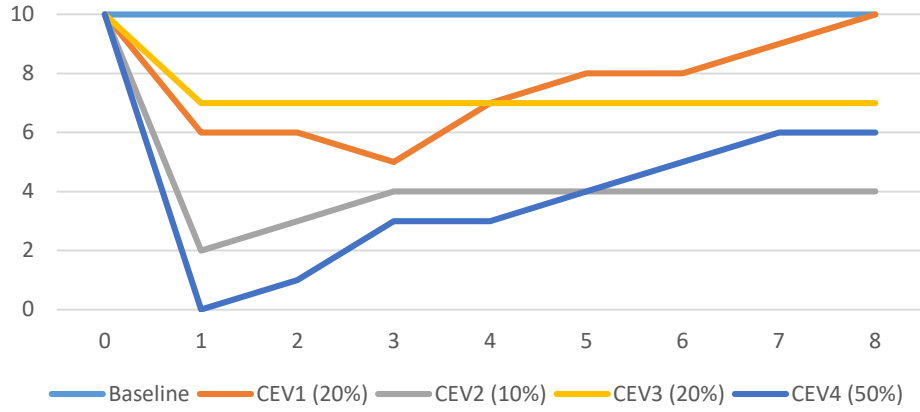
Coastal Workshop



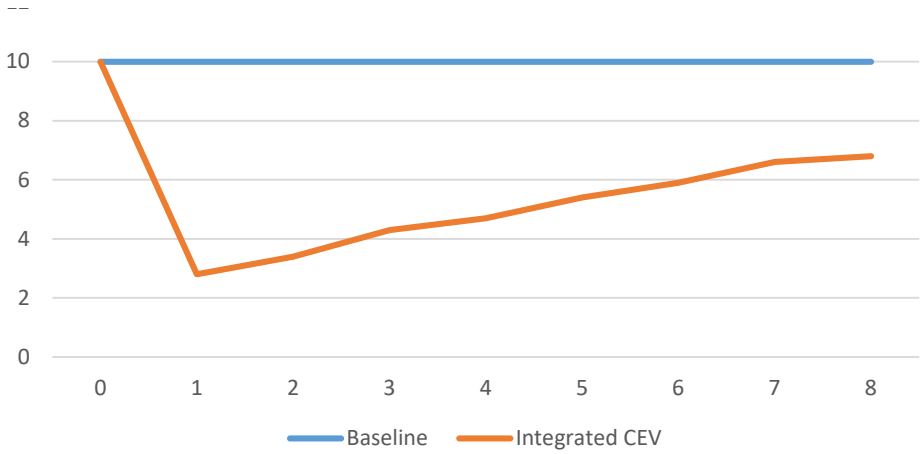
Watershed Workshop

Flipping Baseline looks like multiple ecosystem service (ES) values using HEA





Calculating weighted average of CEVx resembles restoration scaling with HEA



Conclusions and Recommendations

- SDS is a decision support (not decision dictating) useable for avoiding, mitigating, and/or compensating impacts to cultural ecosystem services from wide variety of applications, including for NRDA
- Common framework with flexible application to address unique tribal priorities and site-specific issues
- Both NEPA and NRDA applications would benefit from the Tribes developing technical documents and publications
  - It takes two (or more) to settle; increased understanding by all parties increases likelihood of cooperative settlements
  - Technical approaches from past settlements often not available outside of litigation
  - Some unique issues easier addressed in the absence of a contested case

Questions and Comments

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Dr. Benjamin Simon and Dr. Kristin Skrabis – DOI Office of Policy

Full Citations for Selected SDS Cultural Service Publications

- **Evaluating Losses of Traditional Native Values With Community-Based Multi-attribute Value Analysis.** McDaniels, Timothy L. and William Trousdale. Ecological Economics. Vol. 55/2 pp 173-186. 2005.
- **Compensating Aboriginal Cultural Losses: An Alternative Approach to Assessing Environmental Damages.** Gregory, Robin, and William Trousdale. Journal of Environmental Management. Volume 90, Issue 8, June 2009, Pages 2469-2479.
- **Indigenous Climate Change Adaptation Planning Using a Values-Focused Approach: A Case Study with the Gitga'at Nation.** Reid, Michael G., Colleen Hamilton, Sarah K. Reid, William Trousdale, Cam Hill, Nancy Turner, Chris R. Picard, Cassandra Lamontagne, and H. Damon Matthews. 2014. Journal of Ethnobiology 34 (3): 401–24.
- **Values-Based Measures of Impacts to Indigenous Health.** Gregory, R., D. Easterling, N. Kaechele**,** W. Trousdale. 2016. Risk Analysis, 36(8):1581-1588. DOI: 10.1111/risa.12533
- **Developing Responsive Indicators of Indigenous Community Health**. Donatuto, J.; Campbell, L.; Gregory, R. Int. J. Environ. Res. Public Health 2016, 13, 899.
- **Indigenous community health and climate change: Integrating biophysical and social science indicators**. 2014. Donatuto, J., Grossman, E., Konovsky, J., Grossman, S., and Campbell, L. 2014. Coastal Management, 42(4), 355-373.
- **"Sense of Place": Human Wellbeing Considerations for Ecological Restoration in Puget Sound**. 2016. Donatuto, J. and T. Satterfield. Coastal Management, DOI: 10.1080/08920753.2016.1208037.
- **Community-based research as a mechanism to reduce environmental health disparities in American Indian and Alaska native communities**. 2015. McOliver, C., A. Camper, J. Doyle, M. Eggers, T. Ford, M. Lila, J. Berner, L. Campbell, and J. Donatuto. International Journal of Environmental Research and Public Health, 12(4), 4076-4100.

Assessment Methodologies – CERCLA 43 CFR 11.83

- **Use Value Methodologies (**43 CFR 11.83(4)): ***Factors that may be considered by trustees to evaluate the feasibility and reliability of methodologies can include***:

  (i) Is the methodology capable of providing information of use in determining the restoration cost or compensable value appropriate for a particular natural resource injury?

  (ii) Does the methodology address the particular natural resource injury and associated service loss in light of the nature, degree, and spatial and temporal extent of the injury?

  (iii) Has the methodology been subject to peer review, either through publication or otherwise?

  (iv) Does the methodology enjoy general or widespread acceptance by experts in the field?

  (v) Is the methodology subject to standards governing its application?

  (vi) Are methodological inputs and assumptions supported by a clearly articulated rationale?

  (vii) Are cutting edge methodologies tested or analyzed sufficiently so as to be reasonably reliable under the circumstances?

- **Use Value Methodologies (**43 CFR 11.83(5)): ***All of the above factors may not be applicable to every case, and other factors may be considered to evaluate feasibility and reliability***. The authorized official shall document any consideration of factors deemed applicable in the Report of Assessment.