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Ecosystem Services Valuation and its Application to Estuarine Habitat Restoration

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Prepared By
Peter Edwards, PhD., Resource Economist,
IMSG - Office of Habitat Conservation

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Outline

- Introduction
- Ecosystem Services and NOAA
- ARRA Restoration Projects
- ESV Pilot Project
- Study Expectations
- Conclusions

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- What is the role of social sciences and economics?
- Social Sciences can support NOAA's mandate/mission
 - Stewardship through **science-based** conservation and management
 - Demonstration of the **economic value** of the “products and services” of NOAA to society
- How best can NOAA demonstrate the value of habitat restoration?
 - NOAA's “products” are seldom observed in the marketplace
 - Often requires welfare estimation (ie valuation).



Ecosystem Services

ECOSYSTEM SERVICES

Supporting

- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION
- —

Provisioning

- FOOD
- FRESH WATER
- WOOD AND FIBER
- FUEL
- ... **FISH BIOMASS**

Regulating

- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION
- ... **CARBON CAPTURE**

Cultural

- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL
- ... **RECREATIONAL FISHING /WILDLIFE VIEWING**

- Millennium Ecosystem Assessment (2005)
- Ecosystem services are *end-products*, that is, “components of nature, directly enjoyed, consumed, or used to yield human well-being.”
 - Boyd and Banzhaf (2006)



Ecosystem Service Valuation

- Ecosystem processes and functions contribute to services
- Eliciting the public's preferences for ecosystem services
- Typical Valuation Sequence
 1. Identify the ecosystem service (end product)
 2. Quantify the service flows (monitoring)
 3. Value these flows (monetary or other qualitative measures of value)





ARRA Projects

- \$167M, for 50 habitat restoration projects nationwide
- Includes estuarine and wetland restoration projects
- Provides an opportunity for research and data collection on socio-economic impacts and benefits
- To demonstrate the benefits/impacts that habitat restoration can provide to society
- http://www.nmfs.noaa.gov/habitat/restoration/restorationatlas/recovery_map.html



Ecosystem Services – ARRA

- 50 projects, 29 ecosystem services identified
- Primary production, water regulation, habitat formation, and recreation – most common
- Other service - Food provision (fish and shellfish)
- ESV pilot project selection
 - Scale
 - Relevant end points (services)
 - Feasibility



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ESV – all about valuing changes in habitat quality



Before



After



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Pilot Project





Pilot Project – cont'd

- Elwha Floodplain Restoration, Washington
 - NPS Dam removal, lower floodplain restoration
 - Re-vegetation , long term fish monitoring (salmon)
- ES Valuation Survey
 - Recreational and passive use
 - Selection of appropriate attributes
 - Cultural Services (Tribal values – non monetary)



Methodology

- Stated preference, choice experiment
- Valuation Survey
- Sample frame – General population, Washington State
 - Sub sample - Lower Elwha-Klallam Tribe
- RUM (Random Utility Model) analytical framework
- Willingness to Pay (WTP) for changes in ecosystem services.



Examples of Attributes

Attributes	Description
Recovery Fish Species/other	Recovery of threatened/endangered species
Abundance of target Species	Number of catchable-size fish in restored floodplain
Public Access/Passive Recreation	Improved access: hiking birding, wildlife viewing
Active (consumptive) Recreation	White water rafting, recreational fishing, other?
Tribal–Cultural Activities	Resumption of tribal ceremonies post dam removal
Cost to your household	Cost to a given household, mandatory taxes



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YOU WILL BE ASKED TO VOTE

An example of a typical choice scenario that might be presented to respondents

Johnston et al 2009

You will be given choices and asked to vote for the choice you prefer by checking the appropriate box. Questions will look similar to the sample below. Scores of 0-100% show river conditions. 0% is the lowest possible score. 100% is the highest possible score in the Pawtuxet.

SAMPLE QUESTION

Effect of Restoration	Current Situation (no restoration)	Restoration Project A	Restoration Project B
Fish Habitat	0% 0 of 4347 river acres accessible to fish	5% 225 of 4347 river acres accessible to fish	5% 225 of 4347 river acres accessible to fish
Population Survival Score	0% Chance of 50-year survival	50% Chance of 50-year survival	30% Chance of 50-year survival
Catchable Fish Abundance	80% 116 fish/hour found out of 145 possible	80% 116 fish/hour found out of 145 possible	70% 102 fish/hour found out of 145 possible
Fish-Dependent Wildlife	55% 20 of 36 species native to RI are common	60% 22 of 36 species native to RI are common	60% 22 of 36 species native to RI are common
Aquatic Ecological Condition Score	65% Natural condition out of 100% maximum	70% Natural condition out of 100% maximum	70% Natural condition out of 100% maximum
Public Access	Public CANNOT walk and fish in area	Public CAN walk and fish in area	Public CAN walk and fish in area
Cost to your Household per Year	\$0 Increase in Annual Taxes and Fees	\$10 Increase in Annual Taxes and Fees	\$2 Increase in Annual Taxes and Fees
HOW WOULD YOU VOTE? (CHOOSE ONE ONLY)	<input checked="" type="checkbox"/> I vote for NO RESTORATION	<input checked="" type="checkbox"/> I vote for PROJECT A	<input checked="" type="checkbox"/> I vote for PROJECT B

If you prefer No Restoration, check here

If you prefer Project A, check here

If you prefer Project B, check here



Project Peculiarities

- Dam Removal already scheduled
 - WTP for dam removal – not the payment vehicle
- Instead ...Value (WTP) for ecosystem changes associated with restored floodplain
- Policy scenarios could be varied by scale and time
 - WTP for accelerated restoration?
 - Climate change impacts?



Study Expectations

- Welfare estimates and public preferences
- Measure outcomes that resonate with public
- Assist with prioritization
 - What attributes matter most? Where, when?
- Demonstrate value of NOAA products and services (dam removal & flood plain restoration)
 - Improved Messaging (public, congress)
 - Funding (justifies restoration expenditures)



- Bio economic modeling and ESV
 - Ecological, Physico-Chemical & Economic models
 - Predictive: simulations, policy scenarios,
 - Ecosystem service values and climate change
- Ecosystem Services Valuation – an emerging issue
 - Federal agencies being asked to incorporate into planning (eg P&G WRDA).
 - Other projects? (San Francisco Bay, Chesapeake Bay)



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Thank You

Questions & Comments

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