The Federal Resource Management and Ecosystem Services **Project**

Building the Data Infrastructure to Support Nation-Wide Ecosystem Services Assessments ACES 2014



How Was the Guidebook Created?



General Assessment Steps



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Ecological Analysis: Means-Ends Diagrams

Assessment and Analysis



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Social Impact Analysis

Assessment and Analysis

Ecological changes

Human interaction with and preferences for changes

- # of beneficiaries
- Access to service
- Substitutes to service
- Reliability of service

3 focal approaches:

- 1. Monetary valuation
- 2. Non-monetary valuation (MCDA)
- 3. Benefit relevant indicators

Goal of the Assessment Process

Assessment and Analysis

To create an alternatives matrix that feeds into the decision process

Ecosystem Service	Status Quo	Downstream Dam	Upstream Release	
Protection of at-risk species	Predi	cted chanae in us	es and	
Wildlife watching	where p	where possible, a weight		
Flood risk reduction	marcat	ing importance to		
COST	Со	st of each alterna	tive	

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Data and Modeling Needs

- Ecological Production Functions
 - Models to estimate production of services
 - Data to parameterize the models
- Social Impact/Preferences
 - Data on social qualifiers
 - Access by stakeholders, substitutability/rarity, ...
 - Data on stakeholder populations
 - Who is benefiting and where are they?
 - What is their socio-economic status, cultural identity, ...?
 - Data and models on stakeholder preferences for alternatives

Agenda

Dean Urban:

Data and Infrastructure Needs for Ecosystem Services Assessment (overview)

Annie Neale:

EPA's EnviroAtlas as a Resource for Nationwide Ecosystem Services Assessments

Jimmy Kagan:

Building Midscale Datasets to Support Ecosystem Services Assessments

Rob Johnston:

Enhancing the Geospatial Validity of Meta-Analysis to Support Ecosystem Service Benefit Transfer

 Lynn Maguire: Scale and Context Dependence in Multicriteria Analyses of Ecosystem Services

The Federal Resource Management and Ecosystem Services **Project**

Data and Infrastructure Needs for Ecosystem Services Assessment Dean Urban

Nicholas School of the Environment Duke University



Aim: Distributed Implementation

The FRMES project aims to scale up nationally:

- Across geographies
- Across agencies (and agency mandates)
- Across decision contexts
- This implies:
 - Robust, flexible, transferable models
 - National-scale data of consistent quality





NATIONAL SOCIO-ENVIRONMENTAL SYNTHESIS CENTER



National Science Foundation WHERE DISCOVERIES BEGIN

Chain-of-Custody of Information



For each service:

- How good are the models?
- Do we have data available?

Example: Western Forests and Fire



Mechanical thinning

NPS (Bryce Canyon)



Prescribed fire

Northern Rockies Fire Science Network

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Forests and Fire

reduce ladder fuels, reduce fuel connectivity

thin understory

reduce fire risk

reduced exposure reduced hazard

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Forests and Fire

Forests (fuels)	Manage- ment	Fire potential	Fire behavior	Fire effects	Property risk, cost	Human health impacts	Human well- being
FVS-FFE	x	x	x	x			
FM 97.5	x	x					
FIRE-BGC	x	x	x	x			
FARSITE		x	x	x			
SIAM					x		
WIRHD					x		
RAVAR					x		
AERMOD						x	

Thanks to Keith Stockman (USFS)

Forests and Fire

Data:

- Local (highresolution)
- National (moderate resolution)



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Forests and Biodiversity



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Chain-of-Custody of Information

Lots of pieces, not well connected:

- to other pieces
- to management actions

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Using Benefit Relevant Indicators

What is measured:

 Social factors that affect how a service is used or valued

Assessment and Analysis

Techniques:

• # of beneficiaries, access, etc.

Yields:

 Socially relevant ecological indicators modified by social information

Requires:

 Information on beneficiaries and how they interact with services

Caveats:

- No stakeholder preference information
- Biases are less transparent

Biophysical Indicator:

• Fish habitat

+

Reaction

Social Information:

- # of fishing permits
- # of access points for fishing
- # of other fishing sites

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Monetary Valuation

What is measured:

• Willingness to pay (WTP)

Techniques:

- Revealed preference (Travel cost, property values)
- Stated preference (Surveys asking WTP)
- Production/profit function

Yields:

- Dollar value of ES provided (or change in ES)
- Allows BCA

Requires:

Quantified ecological outcome to value

Caveats:

- Some services difficult or deemed unsuitable to monetize
- Difficult but possible to transfer values

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Travel Costs

Survey for WTP

Non-Monetary Methods: Multi-Criteria Evaluation

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What is expressed:

 Relative value for each service and overall value for each alternative

Techniques:

- In-person elicitation
- Surveys

Requires:

 Quantified ecological outcome and capacity to elicit stakeholder preferences

Caveats:

- Elicitation can be timeconsuming
- Results not transferable to different decision contexts

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State-of-the-Art?

Service	Ecology		Qualifiers		Social Impacts	
Fire risk reduction	Data	Models	Data	Models	Data	Models
Biodiversity support	Data	Models	Data	Models	Data	Models
Recreation (non use)	Data	Models	Data	Models	Data	Models
Watershed protection	Data	Models	Data	Models	Data	Models

poor -> moderate -> good

Conclusions and Prospectus

- We have a lot of data and quite a few models (not very well connected)
- We need more of each
- The chain-of-custody of info has lots of weak links, but this is a solvable problem (via collaboration)
- The data and models need to be built and curated over time if we want to do this well

National-Scale Data

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Regional Data and Models?

- Gradient nearestneighbor imputation using NLCD x FIA data
- Produces maps of
 - Vegetation structure
 - Size distributions
 - Species composition (species of concern, invasives)

Scaling Social Analyses?

 Scaling up valuation: benefit transfer models with geospatial conditioners

 Transportability of nonmonetary valuation (MCDA)

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