Gaps: What we measure vs. what we want to know about streams to link to human values

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Why link to human values?

1. Communicate
   - Describe Status and Trends
     • Include in monitoring programs

2. Provide Information for Benefits Analysis
   - Project Futures
     • Model output

3. National Account Quantities
   
   Track and Manage Nature’s Wealth
Definition

• **Final ecosystem goods and services are biophysical features, quantities or qualities that require little further translation to make clear their relevance to human well-being.**

See --


Two Workshops Three Ecosystems

• Identify beneficiaries of ecosystems
  – e.g. irrigators, trappers, drinking water, barge operators, recreational anglers, non-use
  – Streams, Estuaries, Wetlands

• Identify metrics of final services for each

• Results are a working hypothesis
  – If we want to know what matters to people we have to ask them.
Attributes relevant to Stream Beneficiaries: Simple Example

<table>
<thead>
<tr>
<th></th>
<th>Amount of Water</th>
<th>Biology</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigator</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>Angler</td>
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<td>X</td>
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<td>Non-Use</td>
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<tr>
<td>WWTP</td>
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Attributes relevant to Stream Users: Simple Example

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See Table 1 in the Stream Workshop Report
http://www.epa.gov/nheerl/arm/streameco/index.html

PDF Page 22
The “Checkmark matrix”
Attributes Relevant to Stream Users: An Example

Recreational Angler
Specific Measures: Angler

Biology

Presence, abundance, condition, size and gender of recreationally relevant native or naturalized fish taxa at each point at all times
Specific Measures: Angler

Biology

Presence, abundance, condition, size and gender of recreationally relevant native or naturalized fish taxa at each point at all times

Excluding stocked fish
Can existing systems provide this information?

Compare the information required to support these indicators for:

– 1) status and trends reporting
– 2) benefits analysis

To existing capacity

e.g. EPA’s EMAP or NARS

• [www.epa.gov/aquaticsurveys](http://www.epa.gov/aquaticsurveys)
Site Level Measure vs Regional Indicator—Recreational Angler

Measure

Presence, abundance, condition, size and gender of recreationally relevant native or naturalized fish

Indicators

1. Percent of stream miles with recreational fish, or
2. Percent of stream miles with sufficient recreational fish, or
3. Percent of stream miles by recreational fishing quality class
Fishing Quality Indicator

(Illustrative Example)
Information Needs for Status and Trends -- Fish

1. **Requiring changes in data collection**
   - Abundance by size
   - Stocked fish
   - Suitability for beneficiary use
   - Time

2. **Not requiring changes in data collection**
   - Definition of recreational fish
   - Threshold levels
     - “sufficient”, “fishing quality class”, “suitability”
More information needed to support benefits analysis
More information needed to support benefits analysis

We need these models!
Multiple Linked Models Needed

Models to address the following questions

A. What change in riparian vegetation arises from a change in BMP policy?
B. What change in water temperature arises from a change in riparian vegetation?
C. What change in recreational fishing quality arises from a change in water temperature?
Summary

1. Definitions and examples --
   http://www.epa.gov/nheerl/arm/streameco/index.html
   Article in press in Frontiers

2. Gap analysis –
   – field information
   – translational information
   – time and space – models?
   – production function models
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Spatial Density – Requirements Differ

Status and Trends
- Population estimation for a region from observations
  - Half-width of confidence interval = $Z_{1-\frac{\alpha}{2}} \times 100 \times \text{Sqrt}[p(1-p)/n]$
  - National stream survey has a sample of ~1,000
    - One site every 1,000 km of stream

Benefits analysis
- Predictions of change in resources from models
  - Local scarcity for a recreational angler?
    $<< 1,000 \text{ km}$