Ecosystem Services, Environmental Stressors and Decision Making

Results of a Global SETAC and ESA Pellston Workshop

September 28 – October 3, 2014, Shepherdstown, WV, USA

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Workshop Objectives

1. Develop broad consensus about, and practical guidance for, the application of the ecosystem services (ES) concept to environmental decision making as part of a movement towards environmental sustainability.

2. Develop work products in the form of scientific manuscripts, booklets, and presentation materials needed to promote environmental stewardship within SETAC's and ESA's membership globally, and society more generally.

Key Topics Explored

1. Ecosystem services, protection goals & environmental decision making

   Focus: Use of ES in environmental decision making, including as protection goals
   Goal: Summarize the multiple uses of the ES concept in environmental policy & management approaches

2. From impact to ecosystem service: ecological production functions (EPFs)

   Focus: Emphasize development & use of EPFs to translate environmental impacts into changes in ES for enhanced environmental management
   Goal: Identify the uses of & development needs for EPFs as effective translators of environmental impacts

3. Application of ecosystem services considerations in risk assessment & management

   Focus: Emphasize practical approaches to integrate ES as endpoints throughout the ecological risk assessment process to achieve improved & effective environmental management
   Goal: Identify practical approaches for including ES in ecological risk assessments

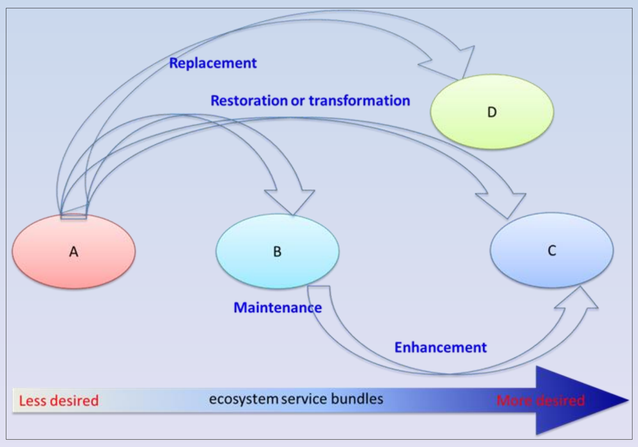
4. Application of ecosystem services in natural resource management & restoration decision-making

   Focus: ES tools for evaluating resource management & restoration alternatives & consequences
   Goal: Summarize practical approaches for the application of ES in natural resource & ecological restoration management decision making

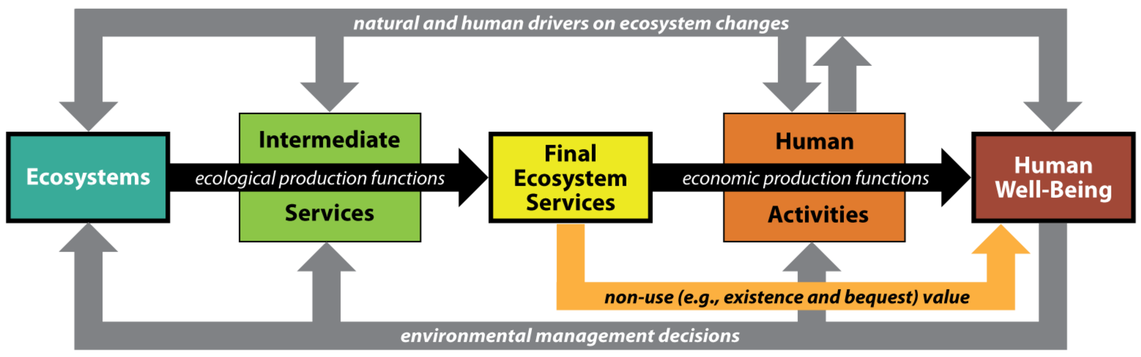
5. Practical guidance for applying the ecosystem services concept in environmental decision making

   Focus: Synthesize and summarize input from other work groups & from other sources on guidance for application of ES to decision making
   Goal: Review existing approaches for & examples of ES applications

Categories of ES-NRM (Replacement, Restoration/Transformation, Maintenance, Enhancement) Based upon Current and Desired Levels of ES Provision



Relationships among Ecosystems, Ecosystem Services, and Human Well-being



Summary of Key Findings (Workshop "Nuggets")

1. ES can be used to make interactions between people & ecosystems more visible in decision making & the assessments informing decisions.

2. A decision-making instrument (e.g., regulation, assessment method) is using an ES approach if it considers: how ecosystem changes affect human well-being; all relevant ES; and compares changes in the well-being of different stakeholders.

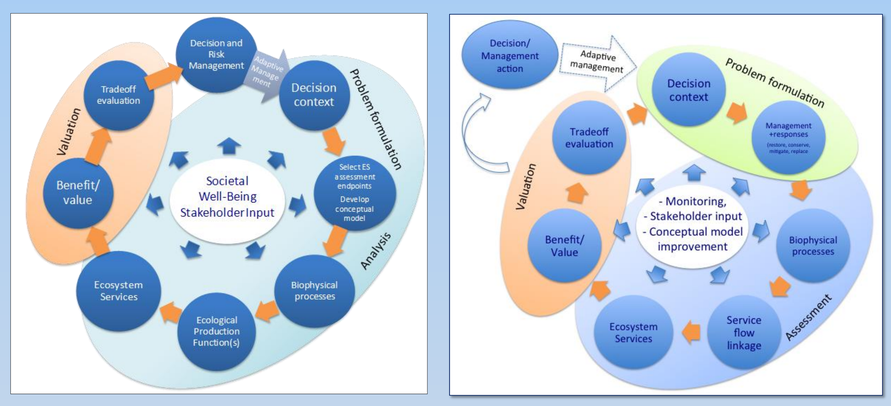
3. Research is needed to assess if benefits claimed of the ES approach have been realized & if perceived challenges have formed barriers to implementation.

4. To date, most EPFs are based on broad assumptions (e.g., simplistic scoring & summing of land cover types). Ecological complexity is cited as a barrier impeding use of more sophisticated process models in EPFs. Developing detailed project-specific conceptual models is key to handling ecological complexity.

5. Implementation of ES more broadly in environmental decision making will require greater use of mechanistic ecological process models. Attributes of EPFs to advance development & use of process models include that they:
   - Incorporate controlling feedback loops & different rate functions for multiple services & their interactions
   - Respond to variable stressor levels & different potential management actions
   - Respond to ecosystem condition
   - Are dynamic & scalable
   - Are easily used, running on conventional desktop/laptop computers w/modest data needs
   - Rely on data that are widely available (spatially) & of adequate quality
   - Have well-characterized performance
   - Are transparent with publicly available code

6. The ES concept can be implemented now in risk assessment & risk management. Research can help to remedy weaknesses & limitations perceived in the underlying ES science, although much of that science is sufficiently developed to move forward. ES assessment endpoints should be viewed as complementary to conventional endpoints.

Ecosystem Services in Risk Assessment (left) and Natural Resources Management (right)



7. In the context of sustainable decision making, the current reductionist, piecemeal approach to risk assessment & risk management is no longer sufficient.

8. Seemingly disparate points of view & contrasting decision-making processes could be reconciled through use of ES. Reconciliation would be facilitated by effective engagement of stakeholders & the public in setting environmental protection goals & specifying the nature of information that best reflects their values relative to those goals.

9. Landscapes are managed to protect, restore, or enhance one or more ES. Natural resource management (NRM) decisions are often driven by narrow regulatory or policy schemes that can fail to account for interactions among ES, or fail to broadly incorporate stakeholder preferences regarding ES. ES-based NRM (ES-NRM) provides a transparent approach for prioritizing, assessing & valuing bundles of ES & identifying the consequences & tradeoffs which result from landscape & resource management decisions.

10. Characteristics of a practical framework suitable for application to ES-NRM include:
    - Systematic & transparent assessment process that operates through multiple scales & considers cross-scale interactions
    - Context-relevant engagement/involvement of stakeholders throughout the process
    - A phased & iterative process to allow assessment complexity to be appropriately scaled to the consequences of the decision
    - Explicit requirements for review, iteration & adaptive management
    - A process for developing long-term monitoring of key variables & indicators to evaluate success & support adaptive management

Workshop Participants

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Results from the workshop are expected to be published as a series of peer-reviewed papers in IEAM and Frontiers in Ecology in 2015.

Main workshop Sponsors

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