



Economic Issues in Ecosystem Management : An Introduction and Overview

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Ecosystem Management is a vague term

- Refers to natural resource management that influences human decisions in using ecological resources especially land, while striving to recognize “all” implications of human decisions on the functioning and condition of an ecosystem.



Why does vagueness arise?

- Operational in different ways to different researchers/groups
- Majority of writers from field such as ecology are more distant from public decision making
- Weaknesses in literature:
 - Natural scientists not encompassing public choice
 - Economists not writing based on sound scientific understanding



Purpose of this Paper

- Broad overview of what ecosystem management means to different proponents
- Identify some approaches economists might consider
- Suggest some concerns economists could elucidate to policy analysts



Perspectives on the meaning of ecosystem management

- Economists : extension of multiple use management. By extending traditional list of market and non market goods and services to include ecological health and quality
- This meaning thus raises complex questions for economists, if accepted.



Ecosystem Management as a Constraint

- May overlook scientific rationale for management i.e. emphasize on protection, maintenance or restoration of healthy productive systems rather than emphasizing human uses by determining constraints on decisions intended to enhance human welfare



Ecosystem management as a Constraint (continued)

- Production functions may be highly uncertain
- Use of a constrained optimization approach
 - identify ecosystem attributes in form of constraints
 - evaluate shadow cost of meeting constraints
 - Idea is to define ecosystem constraints in terms measurable by current knowledge and are cautious w.r.t. uncertainties inherent in ecosystem
 - Management decisions made at “Safe Minimum Standard”



Other views

- Randall-Farmer approach
- Views SMS in hierarchical sense i.e. constraints operational at individual ecosystem level are disaggregated components at global level
- One problem: How to define an “intolerably high cost”.
- Or how much constraint is enough to be “safe” as well as “tolerable”



Constrained Optimization Approach

- Well suited to the view of ecosystem management as placing human desires secondary to ecological health by setting constraints on management actions that provide goods and services of human interest.



Swallow's suggestions

- More work is needed to assess benefits of ecological conditions in a holistic manner
- Should we address the issue of choosing ecological constraints that achieve tolerable costs or actually estimating values?
- The valuation question should be recast in a manner that more explicitly considers the SMS requirement to define tolerable costs.



Producing “ecosystem conditions” and the relevance of Economics

- Noss and Cooperrider(1994) study
- Ecological science and conservation oriented value judgment used
- Recognition of human/economic values only as means to facilitate ethical goals.
- Economists may find this unreasonable.




Producing “ecosystem conditions” and the relevance of Economics

- Economists recognize a willingness to reduce consumption as a resource trade off made in return for whatever goods received from a healthier ecosystem or for whatever good feelings we have about sacrifice for the sake of the land.



Managing for diverse and resilient ecosystems

- Grumbine (1994) on ecosystem management
 - to maintain viable populations of all species in situ
 - to represent all native ecosystems
 - to maintain all ecological and evolutionary processes
 - to plan for evolutionary time
 - to accommodate human use within these constraints
- Usual focus on a keystone or umbrella species is a practical but imperfect approach to simplify safely the complexity of ecological attributes



Multiple Use Modules: building blocks for reserve networks

- Recommended especially for developed temperate countries
- Builds on land allocated as core reserves
- Surrounded with buffer zones with gradually increasing human use
- Reserve network consists of two or more multiple use modules that are connected either by designated corridors or by surrounding landscape in which existing land uses do not present insurmountable barriers to dispersal of individual flora and fauna between core reserves



Multiple Use Modules

- Geometry of MUMs raises resource tradeoff issues for managers
- Radius and acreage are inputs to “production functions” for constraints on biodiversity or ecosystem resilience within the module
- Opportunity cost depends on land acreage



Multiple Use Modules

- Cost depends on degree of restrictions imposed on consumptive uses, with the core reserve prohibiting nearly all consumptive uses and probably restricting recreation access while the buffers prohibit progressively fewer uses.



Multiple Use Modules

- Increasing radius increases land allocation to the core. Pushes the outer boundary further, increasing use restrictions on additional acres
- The boundaries within the MUMs are chosen so that marginal cost of improvement in appropriate ecological goals through change in the width of one portion of the module would be set equal across all portions of the module



Multiple Use Modules

- Do MUMs require an implicit set of tradeoffs?
- YES
- Tradeoffs must balance views of conservation biologists and those of public preferences.



Modules to Reserve Networks

- Adds more dimensions to cost analysis of ecosystem management
- Contribution of corridor to meeting ecosystem constraints while balancing the marginal cost of increasing ecosystem quality by widening the main corridor boundary and its buffer zones
- Scale considerations – local, regional, global
- Addition of MUMs creates a number of substitution possibilities within a cost minimization framework
- Economists must consider cost minimization configurations



But Cost minimization alone is not enough

- Sometimes targeted biodiversity or ecosystem resilience constraint is invariant to the number of modules in the network
- Here cost minimization might allow reduction in size of individual MUMs as reserve network grows to represent more ecosystem types



Economists' role

- Economists must elucidate role of public preference in developing public support for ecosystem management and how that support may depend upon the chosen constraint.
- Identify what ecosystem management contributes to human welfare
- Identify whether and how ecosystem management might influence the composition of those contributions to increase the public support for conservation goals.



Economists' role (continued)

- Would the weight that ecosystem managers give to biodiversity and ecosystem health be validly judged by the broader public?
- Example: Cost of adding 1 acre to core for each is the same and science provides no means to judge unambiguously concerning which should have more acreage.



Example

- If individual has stronger preference for ecotype 2 then WTP curve represented by downward sloping “demand” curve
- Place Q acres in each ecosystem
- Total WTP = $OACQ + OABQ$
- Contrast: take economists’ advice: Add land to each reserve so that the individuals marginal WTP for each additional acre is equal w.r.t. each reserve
- Total WTP = $OAEQ1 + OADQ2$ (exceeds original total)



Incentives and marketing ecosystem management

- Most ecosystem management focuses on public lands for political or administrative convenience
- Need landowner cooperation to encompass all ecotypes
- Therefore public preferences for ecosystem attributes also relates directly to creating incentives for private individual actions that enhance ecosystem health and for raising funds
- Marketing focused on public willingness to support certain species




Incentives and marketing for ecosystem management (continued)

- Creation of mechanisms for private individuals and groups to gain/ generate incentives to manage biodiversity
- Non market values of biodiversity largely unexamined
- Economist's traditional focus on quantities may be misrepresentative
- Issue is one of identifying the public value of desirable land management actions, from ecosystem management point of view and then creating mechanisms for bringing these values into the incentive structure for landowners



Landowners within the Multiple Use Model

- Policy and economic research nearly absent concerning development of regulations or incentives designed specifically to gain landowner cooperation in ecosystem management
- 40% of U.S. ecosystem types remain unrepresented in public reserves



Landowners within the Multiple Use Model (continued)

- MUM with publicly owned center and multiple owner inner and outer buffers.
- Managers bargain for cooperation with other landowners and may set the boundary of the core reserve so that the margin of public land becomes part of the inner buffer.
- MUST offer incentives to private landowners



Brief Summary (continued)

- Economists view of ecosystem management as extension of traditional MU management may not be consistent with biologists views of setting constraints.
- Ecosystem complexity and uncertainty lead to safe minimum standard management style.
- Must encompass economic benefits with economists shifting emphasis from benefits to how tight a constraint will society consider tolerable.



Brief Summary

- Biologists need to acknowledge trade offs with public preferences
- Cost minimization identifies tradeoffs implicit in establishing reserves, buffers and corridors
- Must manage to enhance public financial and political acceptance
- Economist contribute by analyzing opportunity costs
- Identify landowner cooperatives (public/private land interaction) incentives and bargaining.