

Limitations of Classification Systems and Rationale for Flexible Design

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Why classify ecosystem services?

Example - NAICS is used for:

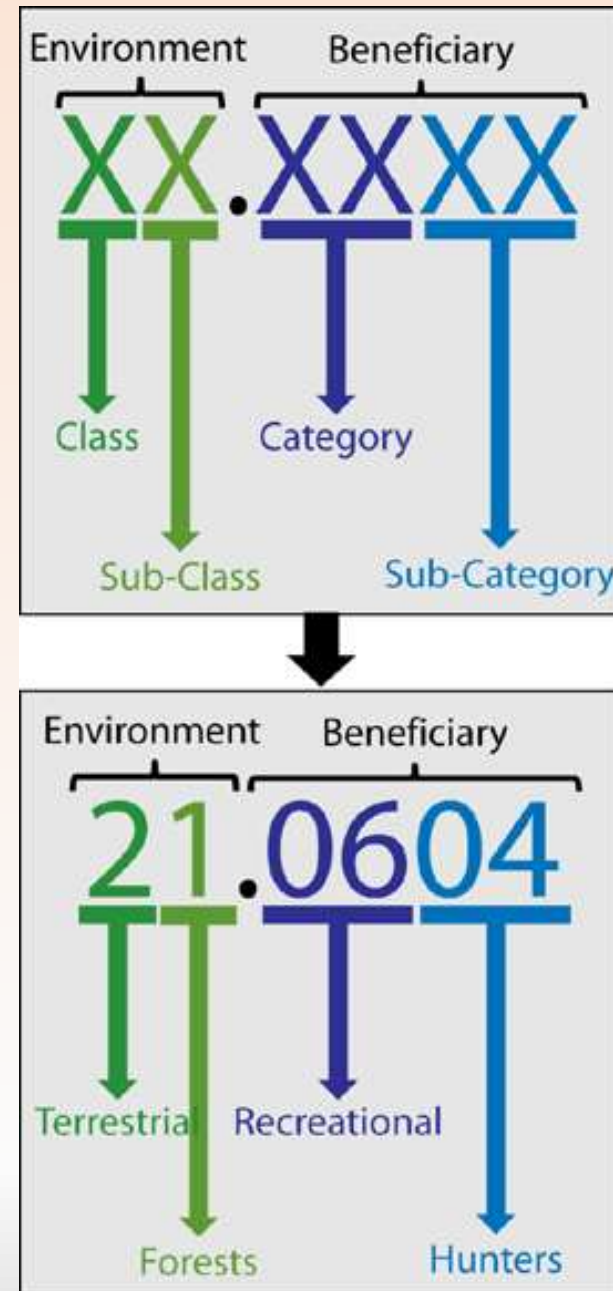
“classifying business establishments for the collection, tabulation, presentation, and analysis of statistical data describing the U.S. economy”

Consistent ES classification might provide:

1. Condition and trends of natural capital
 - *Cumulative multi-scale impacts*
2. Performance metrics reflecting social concerns/benefits
 - *Comparisons among projects / programs*
3. Reference list of services
 - *Guide thinking for inexperienced analysts*

The potential for elegant
simplicity is appealing
FEGS Example
2 categories of ecosystems
4 categories of
beneficiaries

Landers and Nahlik, 2013. Final Ecosystem Goods and Services Classification System (FEGS-CS). EPA/600/R-13/ORD-004914. U.S. EPA



Some systems prioritize ecological details

Beneficiaries are not necessarily specified

Division	Group	Class	Class type
Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination and seed dispersal	<i>By amount and source</i>
		Maintaining nursery populations and habitats	<i>By amount and source</i>
	Pest and disease control	Pest control	<i>By reduction in incidence, risk, area protected</i>
		Disease control	
	Soil formation and composition	Weathering processes	<i>By amount/concentration and source</i>
		Decomposition and fixing processes	
Water conditions	Chemical condition of freshwaters	<i>By amount/concentration and source</i>	
	Chemical condition of salt waters		

*CICES –
Classification
system;
Regulating
services excerpt*

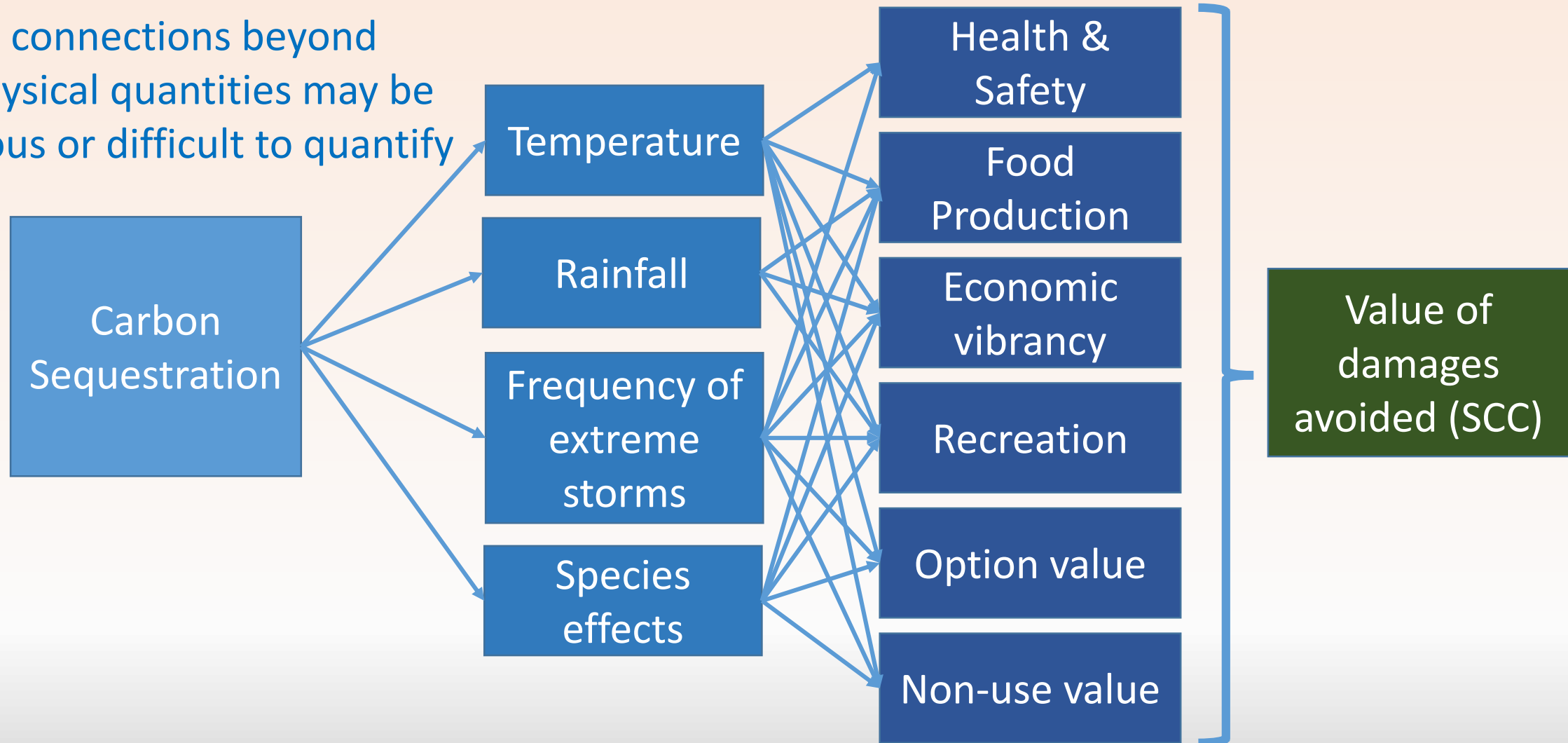
Why preserve flexibility?

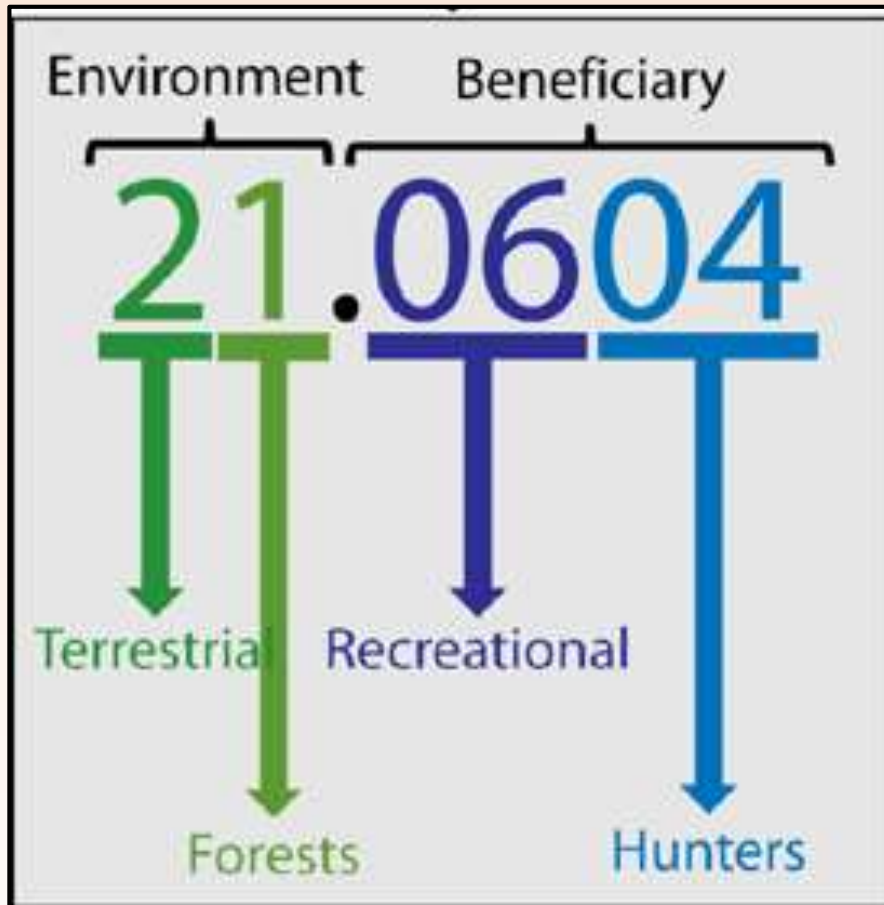
1. Match classification system structure and data/knowledge/preferences
2. Transparency
 - Reveal project goals or agency missions
 - Reveal embedded assumptions and uncertainties (esp. potential vs realized benefits)
3. Cost-efficiency
 - Standardized systems may create unnecessary costs (e.g., when intermediate outcomes work best)
 - Flexibility allows systems to conform to multiple directives (e.g., when alternative metric/method is legally required)

Biophysical metrics vs beneficiaries

When do final services add value to intermediate metrics?

Many connections beyond biophysical quantities may be tenuous or difficult to quantify





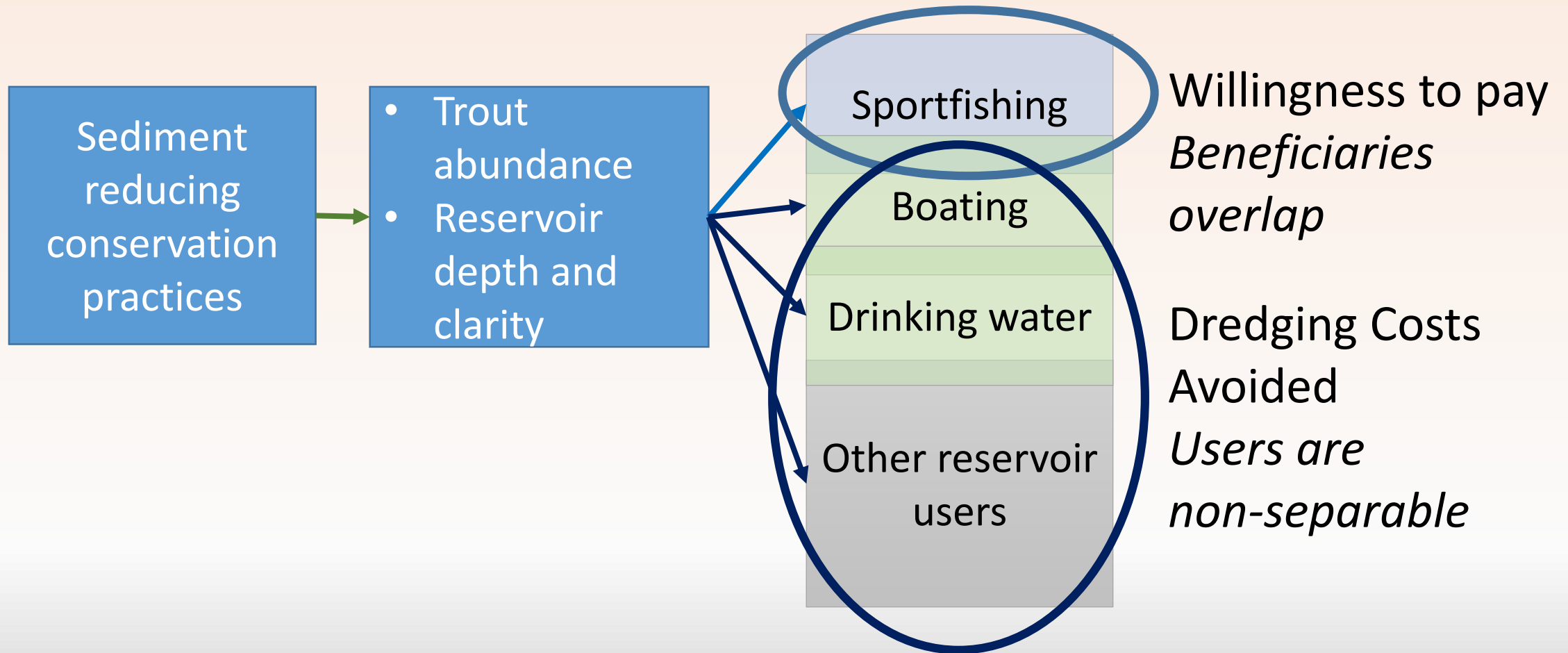
Systems will constrain thinking to achieve simplicity

For example

- Some systems require identifying a major ecosystem as the source of benefits
- Does this prevent us from capturing emergent or complementary effects of spatial arrangements?
 - E.g., amphibian life cycle requirements

Landers and Nahlik, 2013. Final Ecosystem Goods and Services Classification System (FEGS-CS). EPA/600/R-13/ORD-004914. U.S. EPA

Specifying beneficiaries often does not avoid double-counting benefits



Classifications may need to be tailored to decisions

Example - Proposed typology for US Army Corps of Engineers

Ecosystem Service Category
Ecosystem Sustainability (Non-uses)
Water Supply & Regulation
Hazard Mitigation (Reduced risks to Property & Infrastructure, Human Safety)
Navigation Maintenance
Recreation Supply
Cultural, Spiritual & Educational Support
Aesthetics
Food Provisioning
Raw Goods & Materials Provisioning
Water Purification & Waste Treatment to Protect Human Health
Climate Regulation via Carbon Sequestration
Human Health Support (other than water purification)

- Services separated to distinguish core mission areas
- Specific metrics would be determined by local context:
 - Data & model availability
 - Decision relevance
- Metrics meet Corps' requirements
 - Methods transparent
 - Appropriate for cost-benefit OR cost-effectiveness analysis

From Wainger et al. in press. USACE ERDC Technical Report.

Cost benefit assessment to apply to a classification system

- Do benefits outweigh costs?
- Is the quality of information gained worth the cost?

Costs

Low Benefit:Cost

- Fidelity to site-specific context - most important
- Comparing similar sites

Answers for a detailed & standardized system will depend on context

High Benefit:Cost

- Cumulative impacts across programs or projects - most important
- Comparing disparate sites

Benefits

Conclusions

- Flexibility needed to retain cost-effective approaches
 - Intermediate metric can be a leading indicator of many benefits
 - Negatives of double counting (or unrealized benefits) need to be balanced against logistical and scientific limits
- Requiring use of beneficiaries can exclude benefits that
 - The public has difficulty perceiving and understanding
 - Match institutional and legal missions
- Forcing square pegs into round holes will create information biases – multiple systems can reveal them
 - Boxes limit your thinking – what is lost?