Crucial Elements of a Reporting System for Ecosystem Service Values

Results of CFARE Project –
Valuing the Ecosystem Services from Farms and Forests

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Background

- Project initiated by USDA Office of Ecosystem Markets (OEM) and Council on Food, Agriculture, and Resource Economics (C-FARE)
- Collaboration among many governmental and academic researchers
- Address question: How well can the benefits of USDA programs be measured with existing data, tools and information?
  - Proof of concept
  - No primary valuation studies
- Chose three policy-relevant ecosystem service areas: *carbon, pollination, water quality*
- Intended audience - USDA analyst or manager

Elements of a systematic approach

1. Define terms but retain some flexibility
2. Interdisciplinary teams
   a. Identify credible data and methods
   b. Develop cause-and-effect conceptual models and
3. Monetize benefits where appropriate
4. Use decision-relevant benefit indicators to complement or serve as alternatives to monetary values
5. Demonstrate sensitivities to assumptions and sources of error
6. Identify opportunities to broaden set of services and improve estimates

1. Define terms but retain flexibility

- Specificity promotes clarity about value
  - When we measure ecosystem services…
    - Are beneficiaries specified? quantified?
    - Is strength of concern represented?

1. Define terms but retain flexibility
Example - flexible definitions of value promote custom fit

- Most robust to value *final* ecosystem services but may diverge from program goals
  - Residential property values easier to measure than human health benefits
- Retaining *intermediate* services as benefit measures may provide a better match when data or information is limiting
  - Water quality outcomes might be used as leading indicators of health risks from harmful algae in place of monetary values

2a. Interdisciplinary teams identify credible data & methods

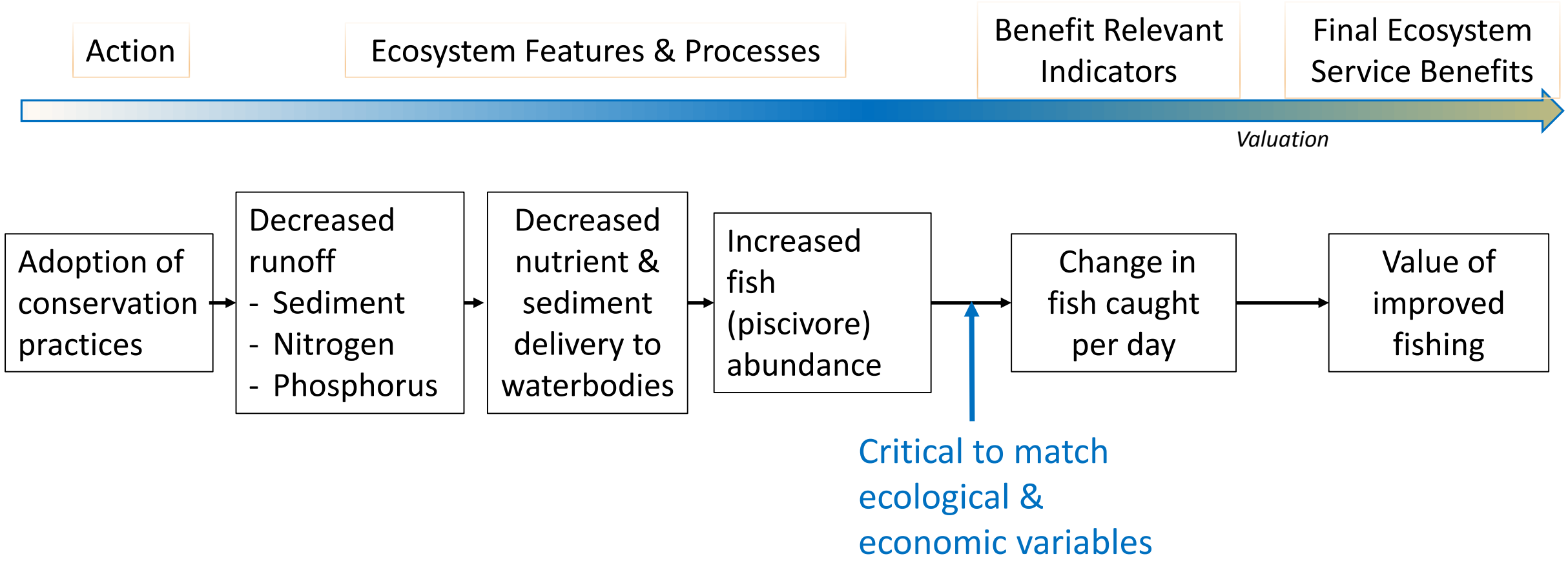
- Credibility varies
  - By ecosystem service (due to availability of models, valuation techniques that can be used)
  - By data type (length of the cause and effect chain)
  - By geographic area
  - By eye of the beholder
- Need for credibility varies by decision context
  - Rough monetary estimates or non-monetary indicators might be sufficient for demonstrating types of program benefits
  - Precise values might be needed to inform cost-effectiveness of alternatives

2a. Interdisciplinary teams identify credible data & methods
Credibility issues that arose in project

- Source data credibility
  - Can ecosystem changes be reasonably attributed to actions being evaluated?
  - Are data and model results from studies outside the peer-reviewed literature acceptable?
- Method credibility
  - Unit value benefit transfer - What is sufficiently similar context for transfer?
  - Are detailed cause and effect models required?

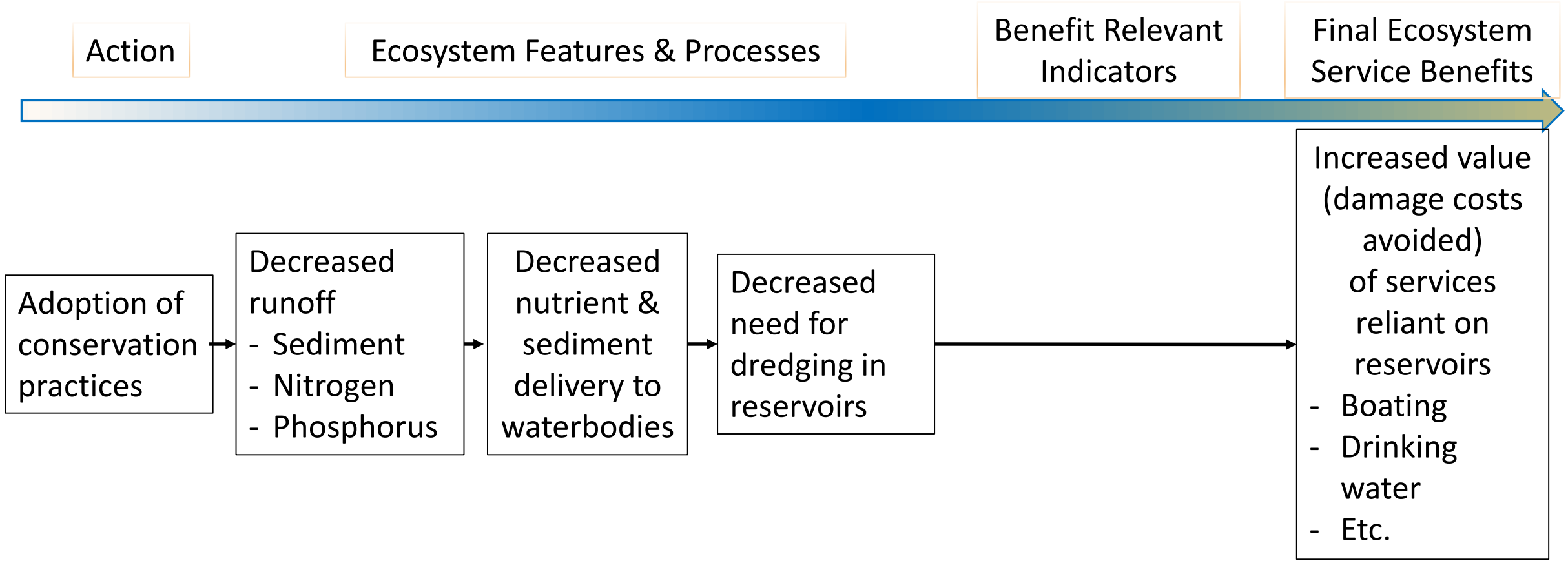
2b+3. Conceptual models used to choose what to monetize

Conceptual model with process detail - Sportfishing example



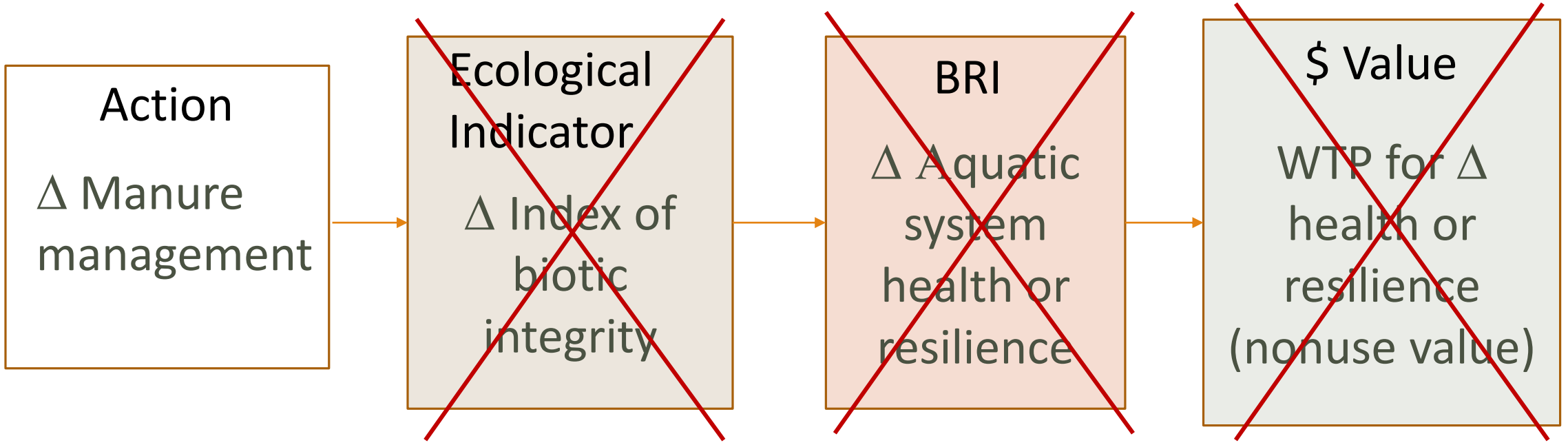
3. Monetize where appropriate

Conceptual model with simplified relationships - Reservoir example



4. Use BRIs to complement or provide alternative to monetary values

Ecosystem Service: Non-use values of enhanced ecosystem health



4. Use BRIs to complement or provide alternative to monetary values

Action

Δ Manure management

~~**Ecological Indicator**~~

~~Δ Index of biotic integrity~~

BRI

Δ Nutrient delivery - weighted by potential for ameliorating harm

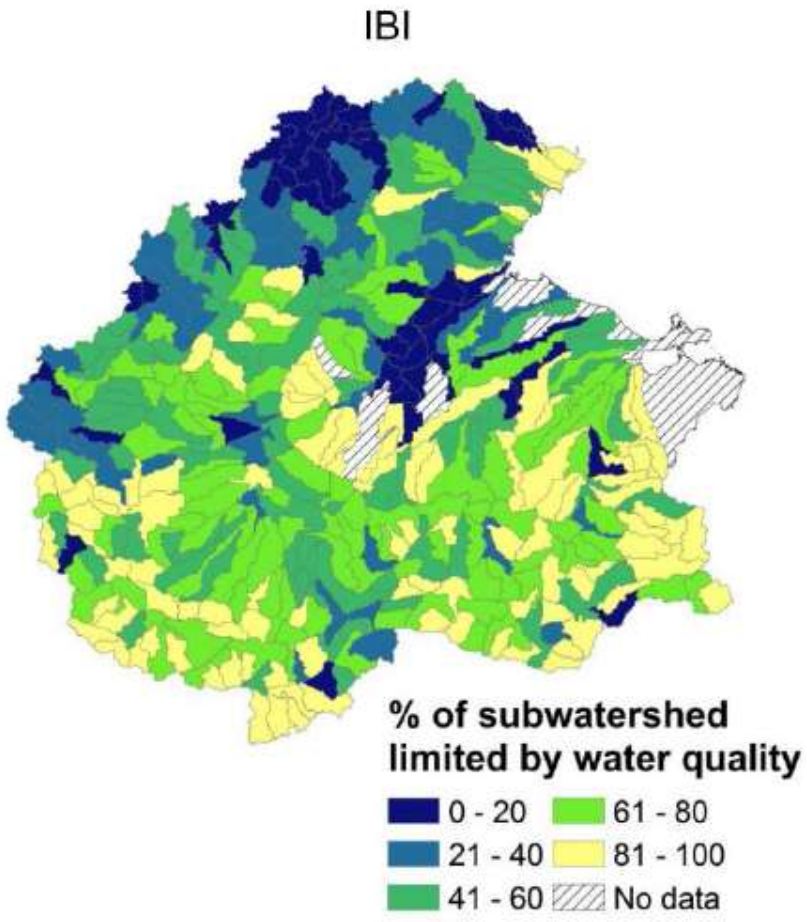


Figure 6 in Keitzer et al. 2016

Quantifying the Potential Water Quality Benefits of Agricultural Conservation Practices for Stream Fish Conservation in the Western Lake Erie Basin

5. Demonstrate sensitivities to assumptions

Example - Sportfishing values highly sensitive to uncertain inputs

	Total fishing days (millions)	Baseline walleye catch (fish/day)	Baseline white bass catch (fish/day)	% Increase in fish	% Increase in fish caught	Total benefits (M 2015$)
Baseline	2.84	1.24	6.16	42%	42%	**$22**
50% fewer fishing days	**1.42**	1.24	6.16	42%	42%	**$11**
50% of piscivore increase caught	2.84	1.24	6.16	42%	**21%**	**$12**
catch rate + 2	2.84	**3.24**	**8.16**	42%	42%	**$21**

6. Identify opportunities to improve

- Broaden set of services that can be quantified
  - Strategic investments in data collection and models to isolate effects of conservation practices from background trends
  - Improve data on how practices affect outcomes that can be valued (requires collaboration among disciplines)
- Improve accuracy in benefit transfer
  - More gap-filling valuation studies
  - Develop tools that improve ability to transfer values based on data (e.g., meta-regression models)
  - Models of changes in demand useful for benefit transfer

Conclusions
Applying an ecosystem service valuation framework

1. Interdisciplinary collaboration enhances credibility of all methods
2. Many services can be monetized, but
   - All that were evaluated in case study required bold assumptions
   - Values may not align well with agency goals
3. Non-monetary benefit indicators are needed to provide a more complete picture of benefits
4. Monetization promotes consistency but all dollar values are not necessarily readily aggregated
   - Easy to generate overlapping benefits by choosing expedient methods
   - Values can be non-comparable due to divergent definitions of value