










Improving the Transfer of Ecological Estimates in Ecosystem Services Research & Policy

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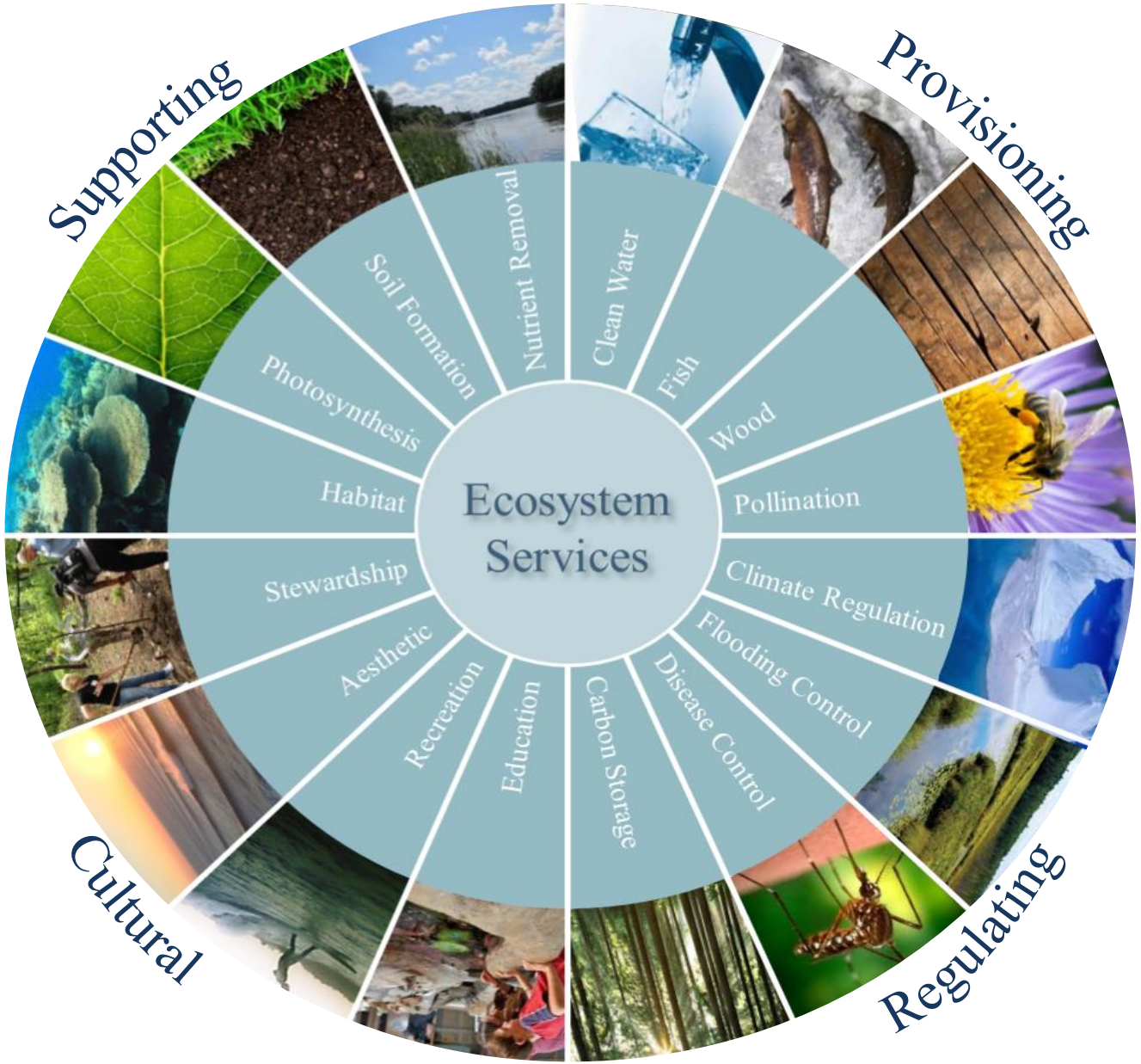
Ecosystem services are the components of nature humans use and enjoy



Ecosystem service assessments are often data, budget and time limited

WATER RESOURCES RESEARCH, VOL. 28, NO. 3, PAGES 675–683, MARCH 1992

Benefit Transfer: Conceptual Problems in Estimating Water Quality Benefits Using Existing Studies

WILLIAM H. DESVOUSGES

Status of Benefits Transfer in the United States

ECOLOGICAL ECONOMICS 60 (2006) 429–434

available at www.sciencedirect.com

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Benefit transfer focuses on the issues and methods related to economic value transfer

There is no analogous method for the transfer of ecological estimates and models

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journal homepage: www.elsevier.com/locate/ecolecon

Analysis

Enhancing the reliability of benefit transfer over heterogeneous sites: A meta-analysis of international coral reef values

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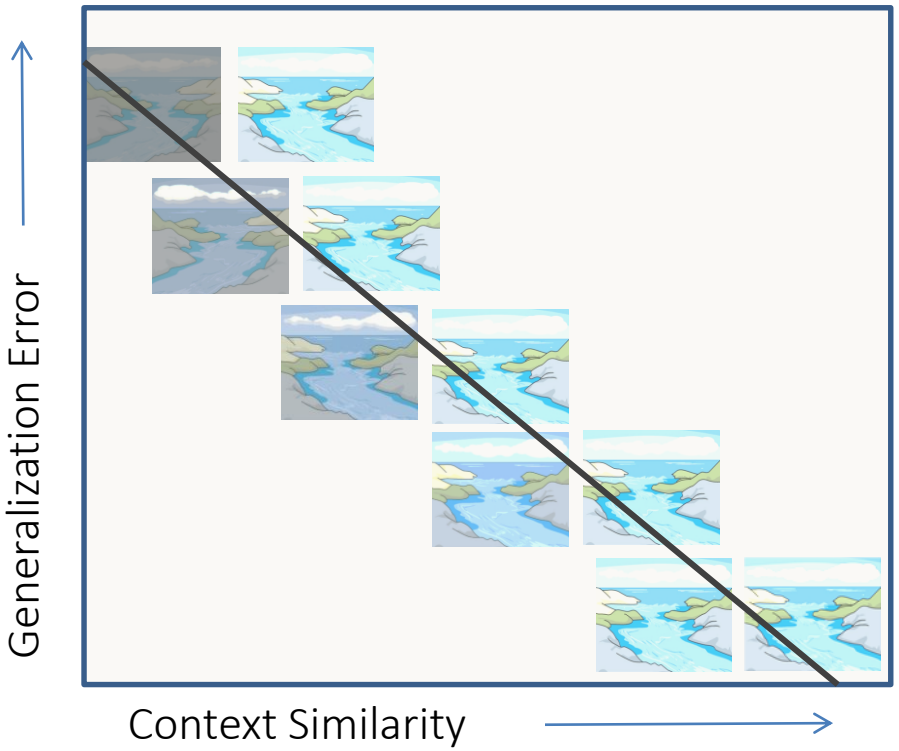
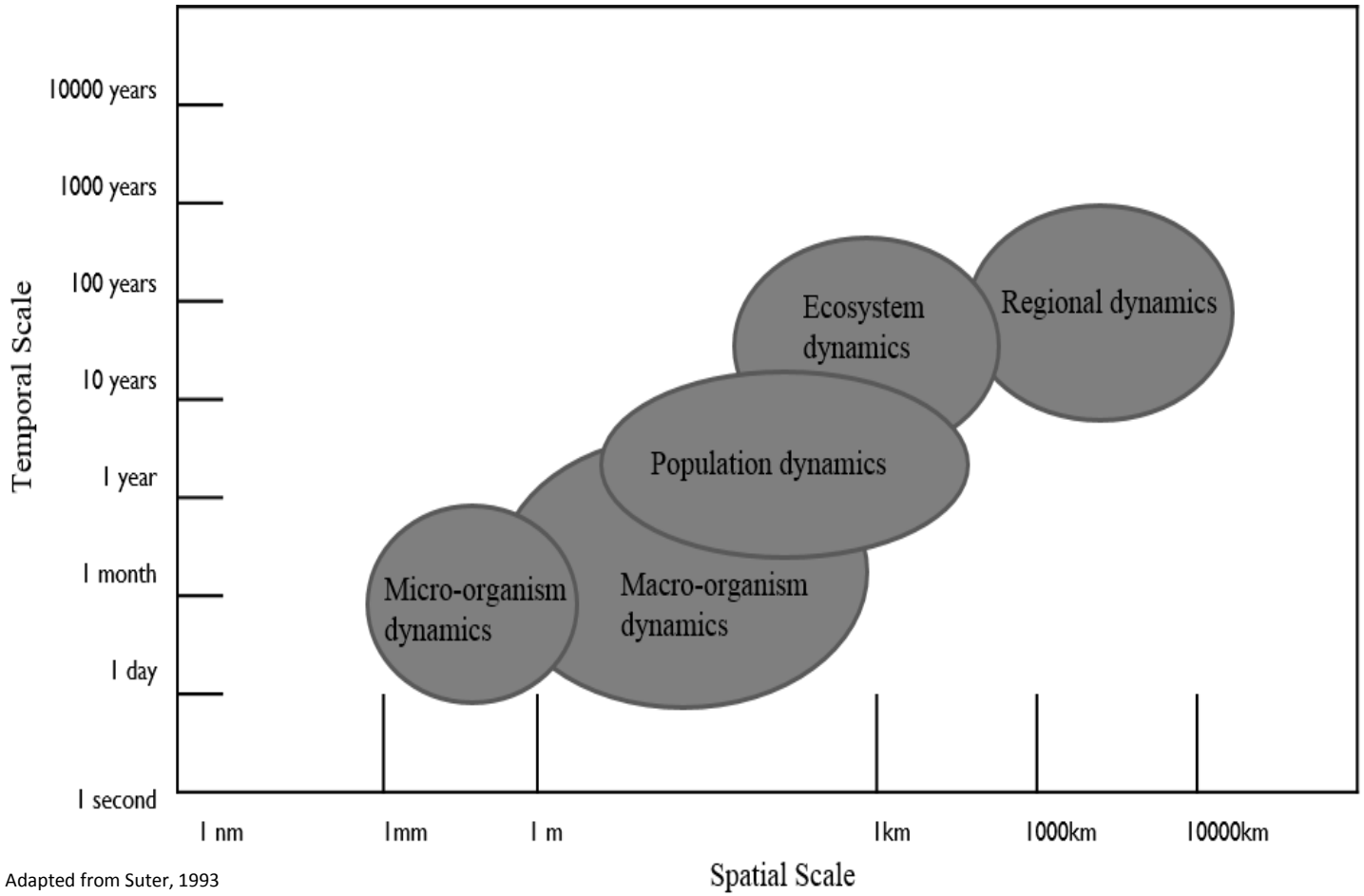
Question 1:
How can a benefit transfer approach be applied to **ecological production estimates** in ecosystem services research?

Context similarity is a key requirement of sound benefit transfers



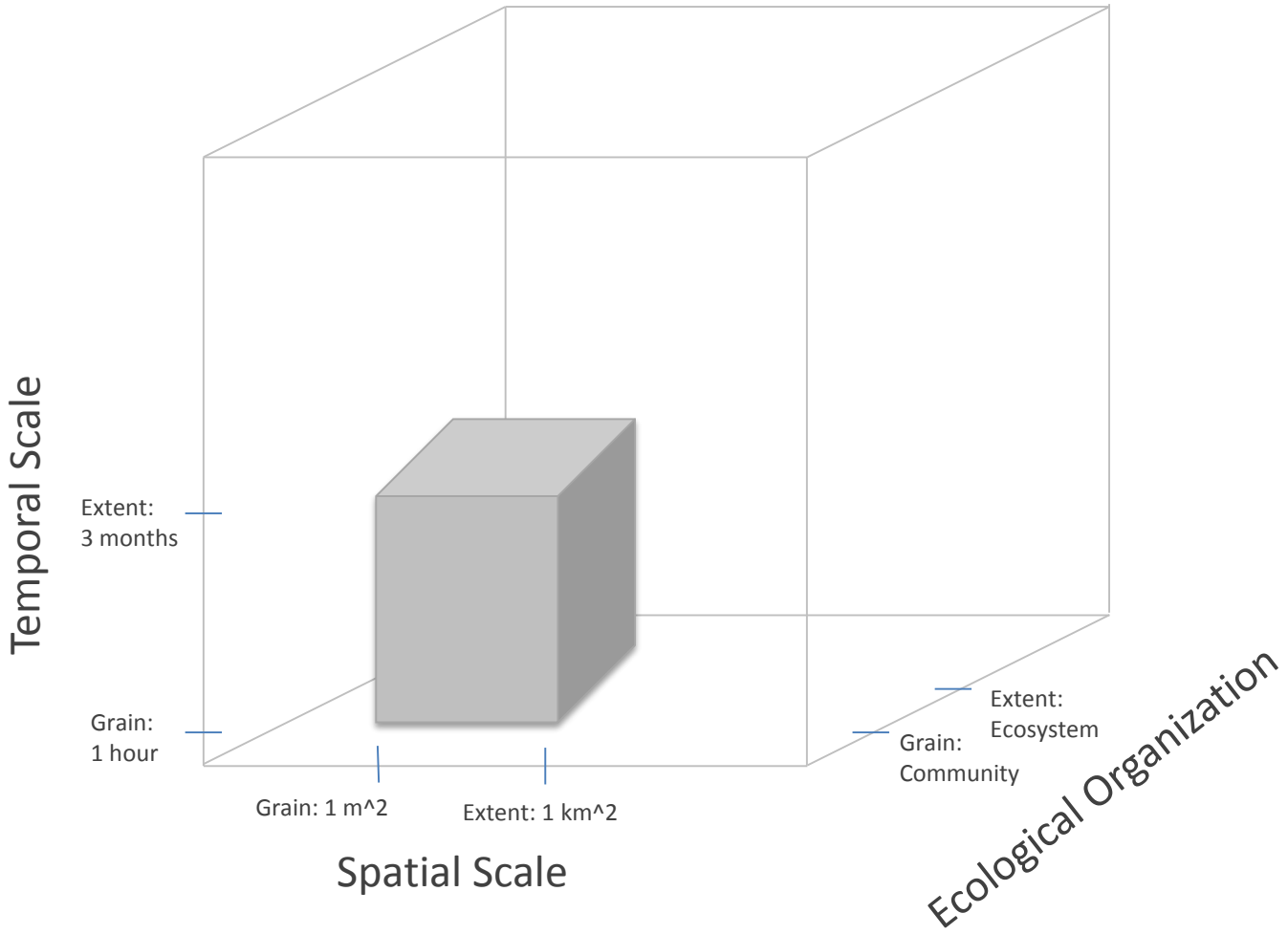
Question 2:
How to broadly define ecological **contexts** across services, ecosystems, and ecological processes?

Scales: A Structure for Ecological Contexts

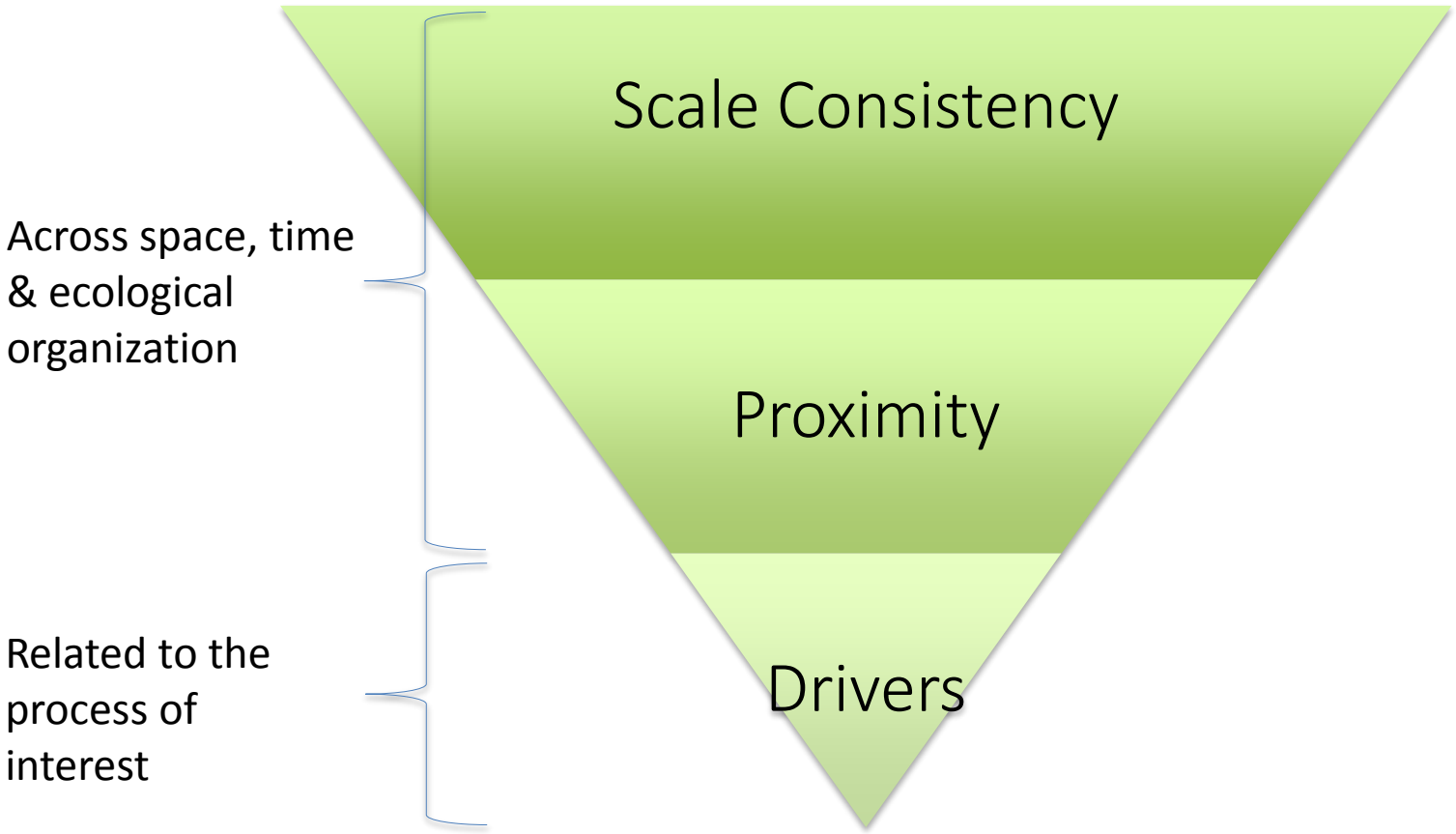


Adapted from Suter, 1993

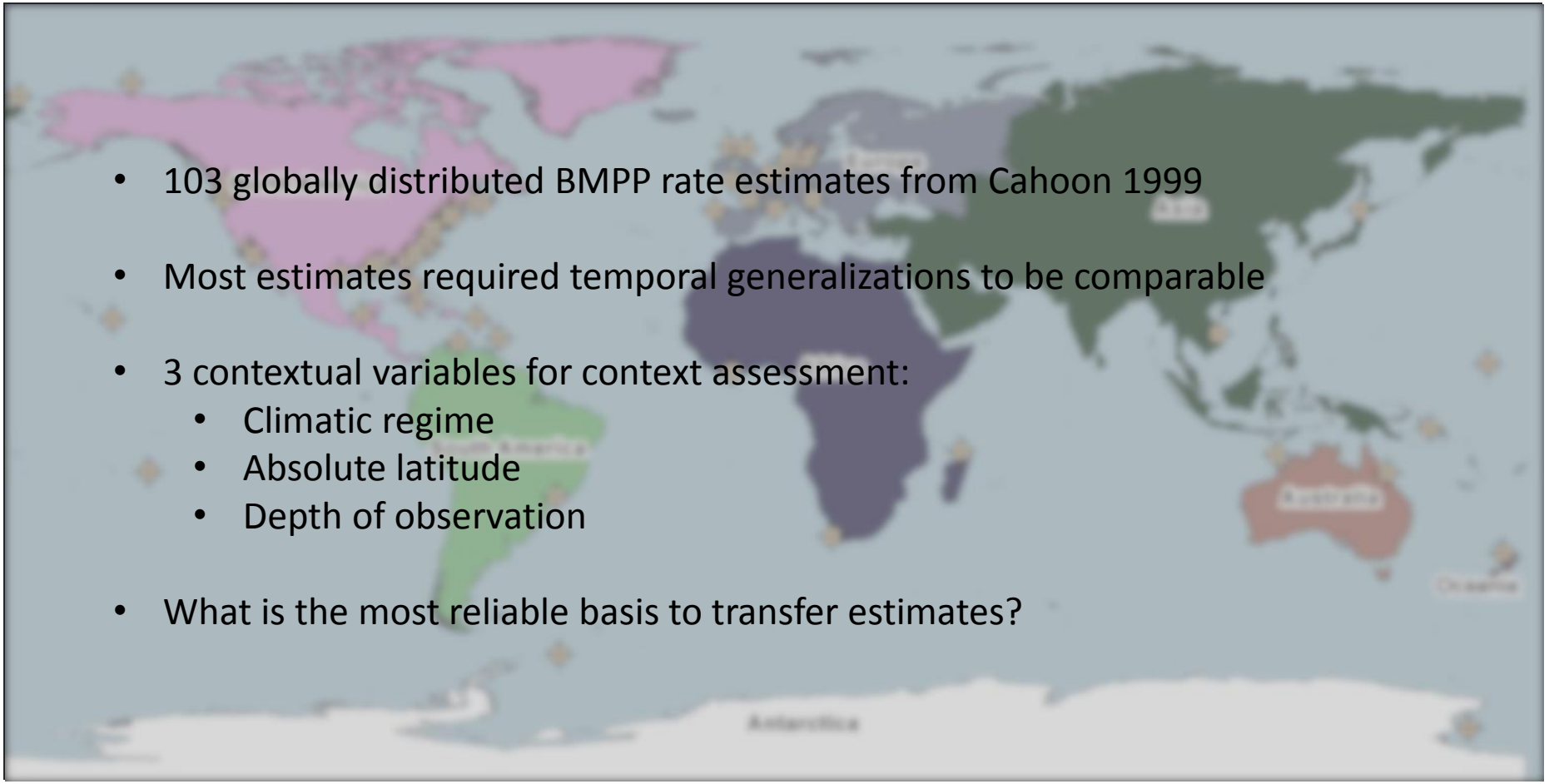
Contextual Reference Frames: Scale and Level of Organization



Hypothesized Indicators of Transferability based on Contextual Similarity



Case Study: Benthic Microalgal Primary Production (BMPP) Rates



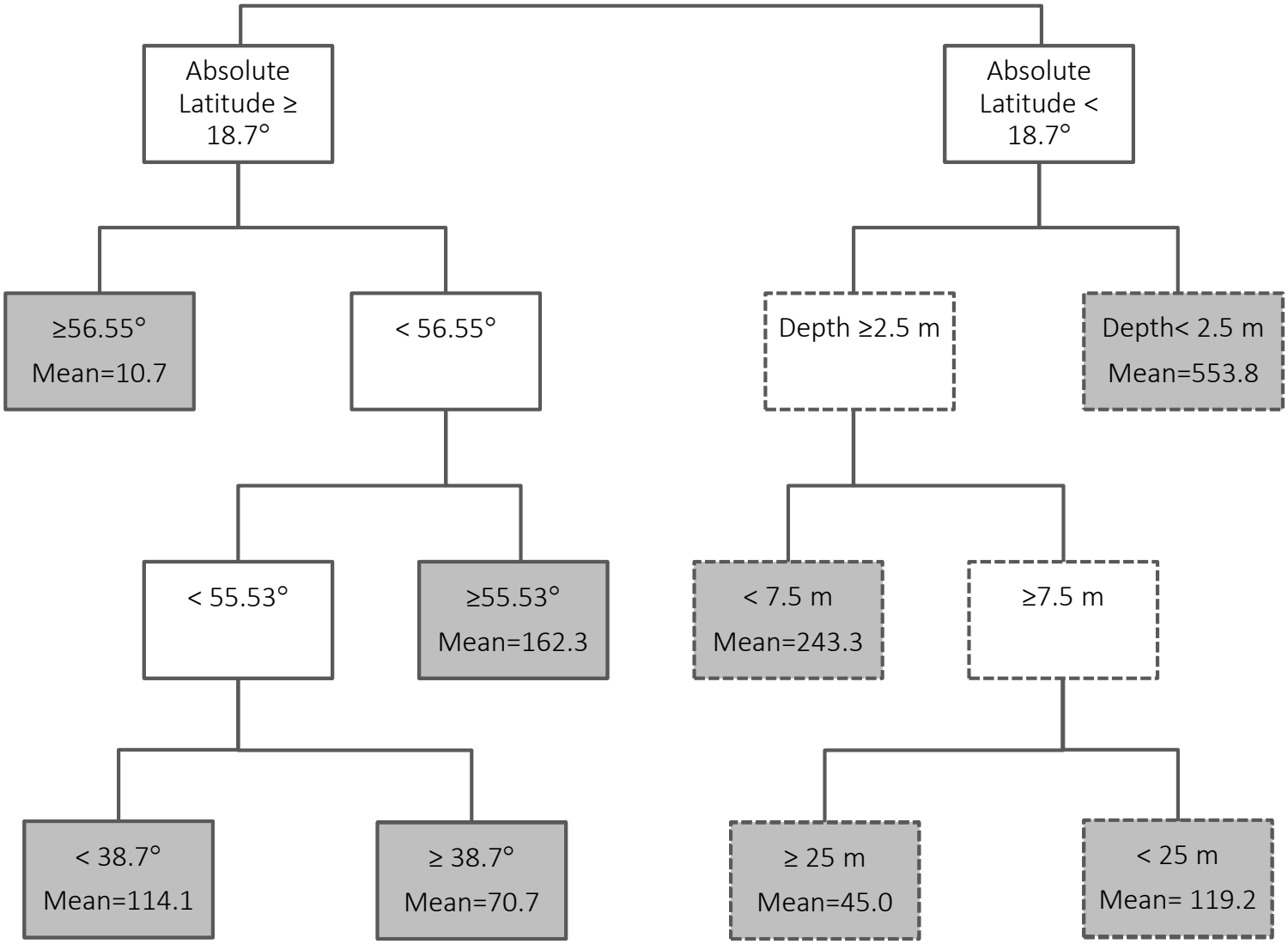
- 103 globally distributed BMPP rate estimates from Cahoon 1999
- Most estimates required temporal generalizations to be comparable
- 3 contextual variables for context assessment:
  - Climatic regime
  - Absolute latitude
  - Depth of observation
- What is the most reliable basis to transfer estimates?

One-way Analysis of Variance (ANOVA) models Climatic Regime, Absolute Latitude and Depth

Variable for Model (1-way ANOVA)	Adj R^2	RMSE	F-ratio	P-Value
Climatic Regime	0.117	138.84	7.63	0.0008**
Absolute Latitude	0.153	136.02	4.00	0.013**
Depth	0.058	143.40	3.06	0.032*

Stronger evidence was observed across climatic regimes and absolute latitudes than depths.

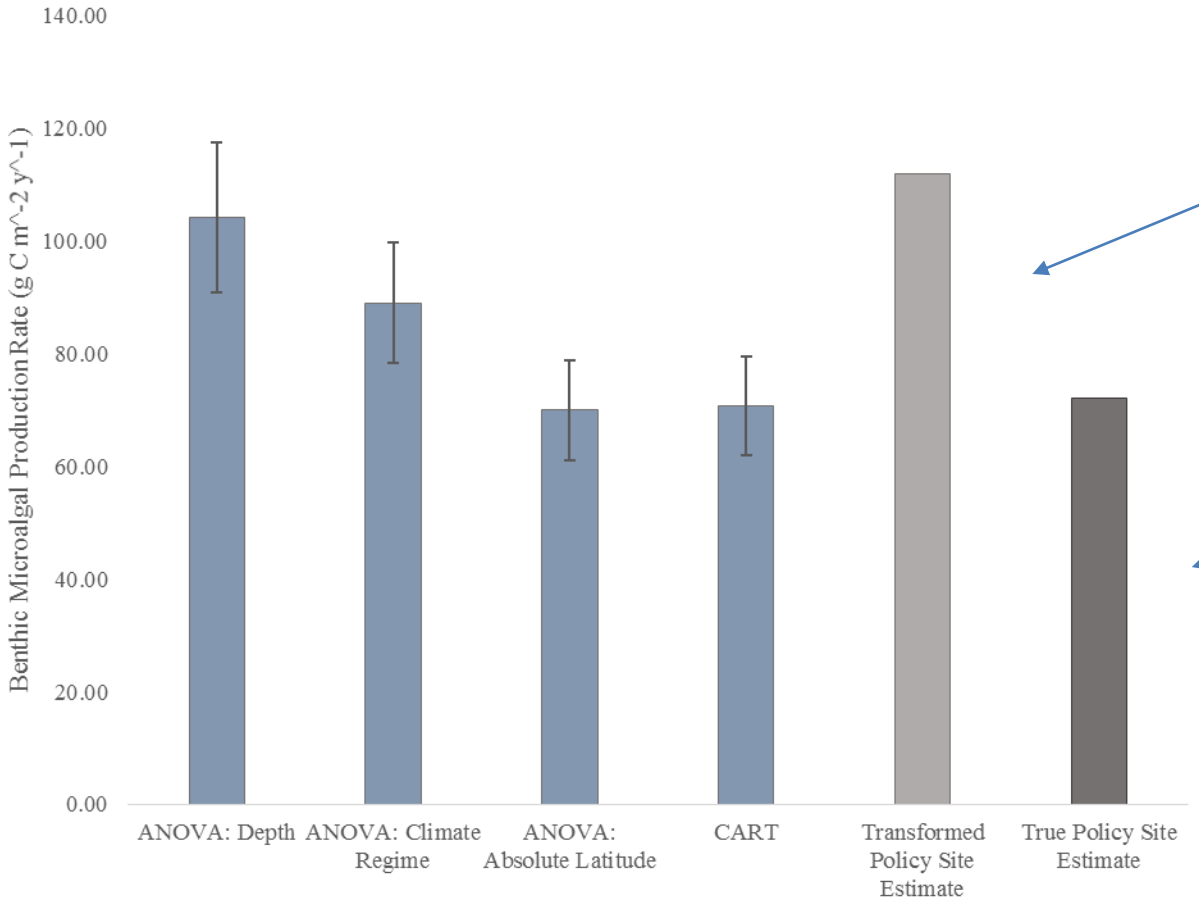
Classification and Regression Tree (CART) model



Uncertainty and Error: Model Validation

- Models perform better for **"well-represented"** temperate sites
- More sophisticated method does not always perform better

Uncertainty and Error: Temporal Generalization Error



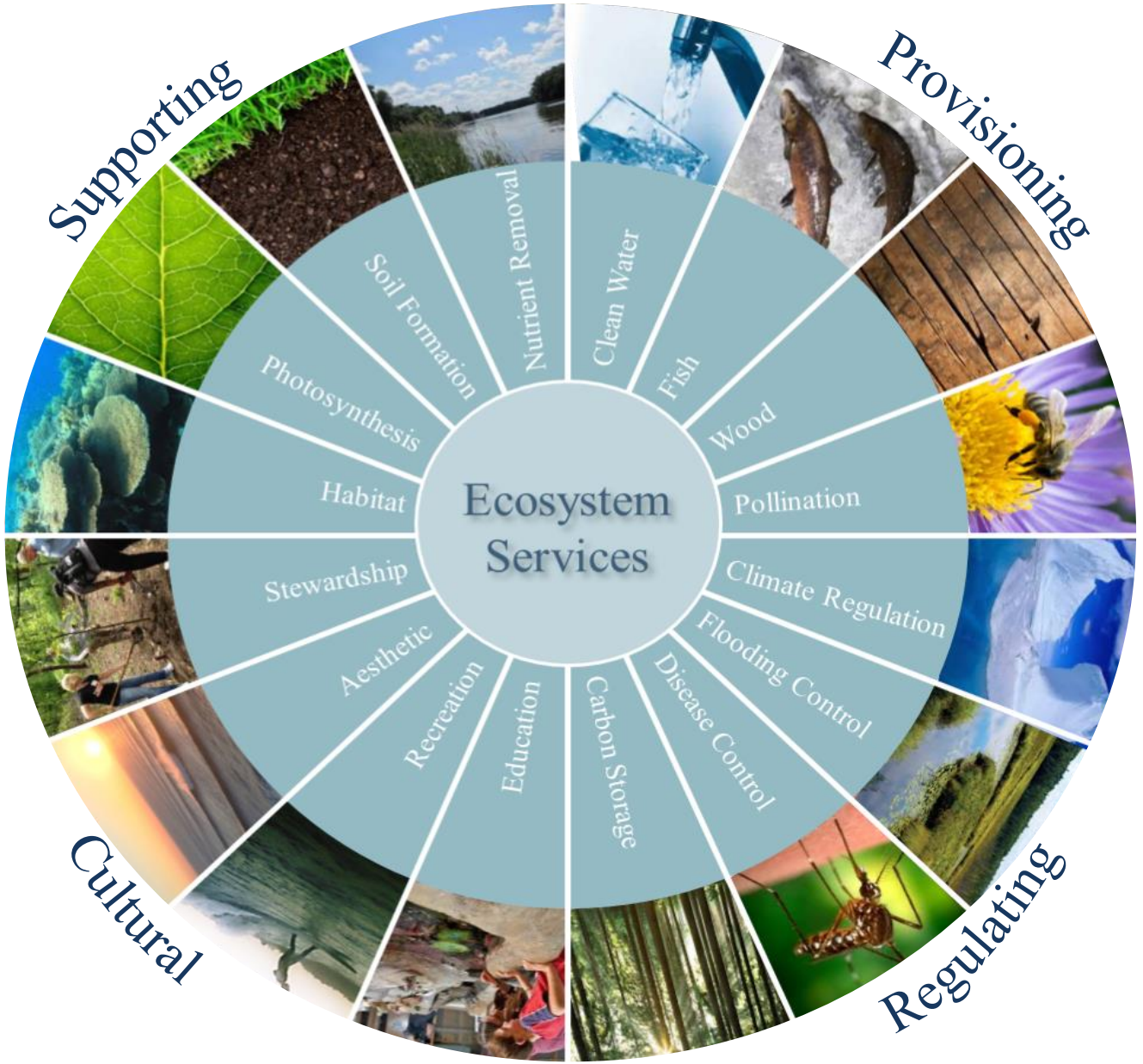
Hypothetical transformed estimate from average hourly rate to average annual

Original reported estimate: average annual rate

Conclusions

- Findings support the hypothesis that transfer errors are largest for reference frame inconsistencies or generalizations
- Identification of broad contextual features permits the exploration of necessary assumptions and uncertainties
- Comparison of approaches indicates that for some data simple methods may be just as effective as complex approaches
- More case studies and assessment is needed to validate approach and indicator hierarchy

Questions?

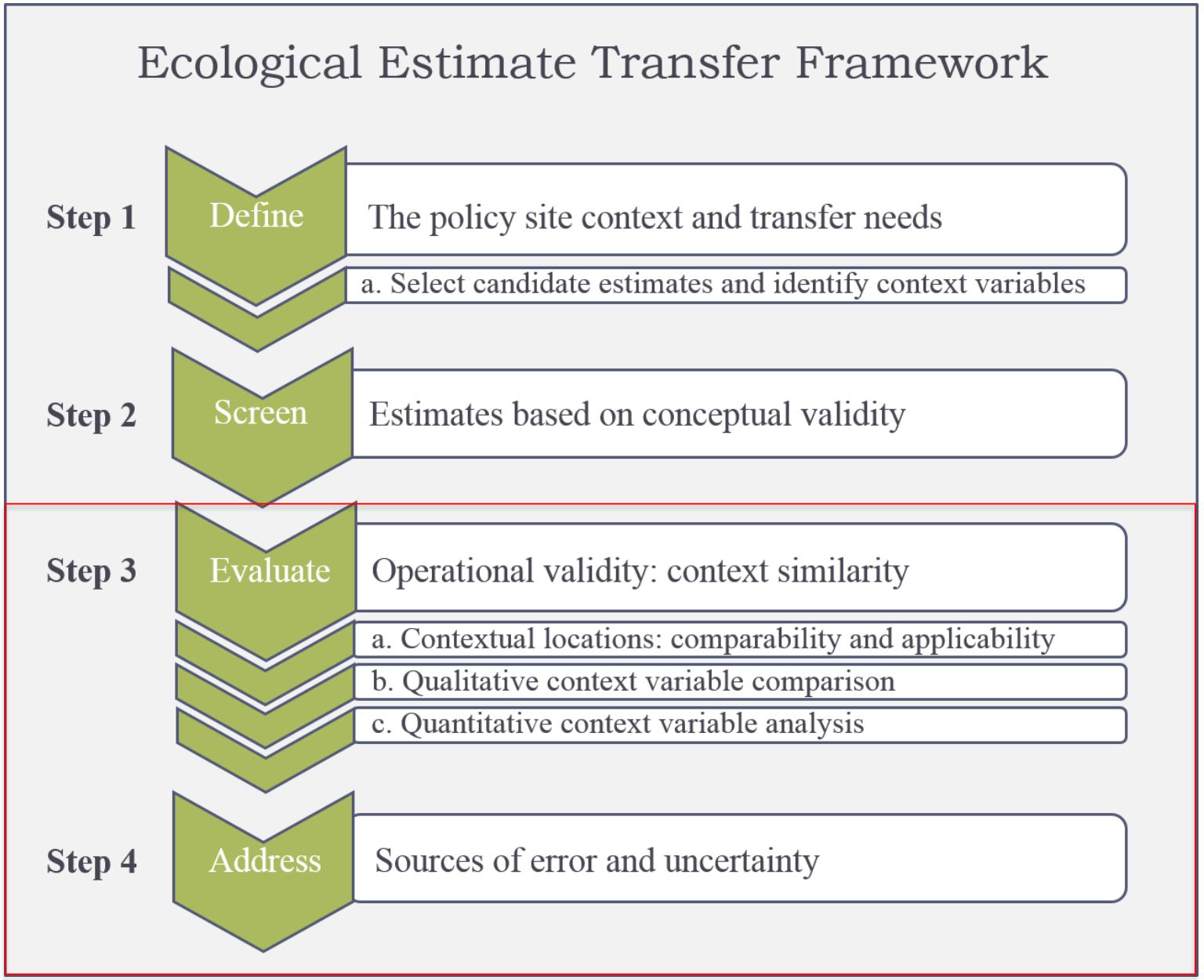

Supporting
Provisioning
Cultural
Regulating
Ecosystem Services
Nutrient Removal
Soil Formation
Photosynthesis
Habitat
Clean Water
Fish
Wood
Pollination
Stewardship
Aesthetic
Recreation
Education
Carbon Storage
Disease Control
Flooding Control
Climate Regulation

Next Steps

- Relative importance of reference frame components
- Investigation into model sensitivity
- More case studies!

Steps for Conducting a Benefit Transfer
1. Describe the policy case
2. Identify existing, relevant studies
3. Review available studies for quality and applicability
a. The basic commodities must be essentially the equivalent
b. The baseline and extent of change should be similar
c. The affected populations should be similar
4. Transfer the benefit estimates
5. Address uncertainty

EPA Guidelines for Preparing Economic Analyses (2000)


Ecological Estimate Transfer Framework
Step 1
Define
The policy site context and transfer needs
a. Select candidate estimates and identify context variables
Step 2
Screen
Estimates based on conceptual validity
Step 3
Evaluate
Operational validity: context similarity
a. Contextual locations: comparability and applicability
b. Qualitative context variable comparison
c. Quantitative context variable analysis
Step 4
Address
Sources of error and uncertainty

How to fill knowledge gaps in ecosystem service models and assessments?