Ecosystem Response and Regional Assessment (EcoResA and EcoRegA) as Supporting Frameworks for More Sustainable Sediment Management

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Introduction: The concept of ecological risk assessment (ERA) has traditionally been applied to sediment management to evaluate whether specific actions (such as permitting of chemicals or disposal of dredged material) have the potential to pose risk to ecological or human endpoints, or whether in situ contaminated sediments pose risks requiring management actions. With advances in our understanding of ecosystem services, recognition of the interconnectedness between ecology, environment, and human uses has prompted new considerations for evaluating and protecting ecosystems. Thus, sediment must be managed not only to maintain good ecological status at the field or river reach scale but also to sustain the viability and sustainability of landscape and aquatic ecosystem services (EsS) at the watershed scale [1,2]. Although ERA is a powerful tool for sectoral, single-issue regulation and management, EsS assessment may provide more meaningful insights on environmental impacts and social costs, as well as the net benefits and trade-offs likely derived from different management options.

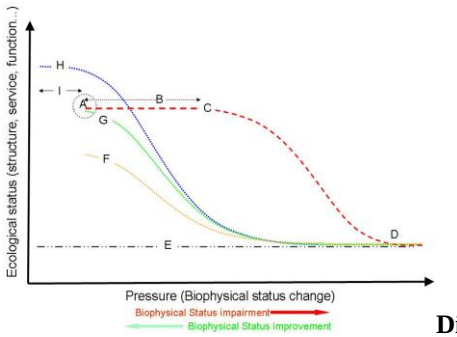

Fig. 1: Individual SPUs respond uniquely to changes in biophysical conditions. Adapted from [4].

Discussion:

Advocates of EsS-based evaluations are promoting expansion of the current risk-focused thinking behind ERA to consider a range of desirable and undesirable responses by different ecosystem endpoints (service-providing units or SPUs); in this context, an EsS assessment may be better described as an Ecosystem Response Assessment (EcoResA) [3]. An understanding of the responses of a range of relevant SPUs to past or proposed changes to biophysical conditions (e.g., a change in landscape use, a remedial action, etc.) over time, if applied in a spatially explicit manner, can inform Ecosystem Regional Assessment (EcoRegA) [3].

		Evidence of Exposure/Pressure[a]						
		Stong decrease	Moderate decrease	Slight decrease	none	Slight increase	moderate increase	Strong increase
Evidence of Effect[a]	Strong positive	very high benefit	high benefit	moderate benefit	no link			
	Moderate positive	moderate benefit	moderate benefit	slight benefit	no link			
	Slight positive	slight benefit	negligible	negligible	no link			
	none	negligible	negligible	negligible	none	negligible	negligible	negligible
	Slight negative				no link	negligible	negligible	slight risk
	Moderate negative				no link	slight risk	moderate risk	moderate risk
	Strong negative				no link	moderate risk	high risk	very high risk

Fig. 2: Example EcoResA decision table; responses of SPUs to biophysical pressures. Adapted from [4].

Understanding trade-offs is essential to inform decisions about sustainable sediment management and should underlie concepts such as "green remediation", "working with nature", "green clean-up" and similar "eco-friendly" approaches. These concepts are implicit in evolving cost-benefit approaches such as Net Ecosystem Benefits Assessment (NEBA). However, a more explicit shift of focus from economics and risk to trade-off-focused frameworks will generate better informed landscape and aquatic management decisions. A range of emerging tools, case studies and approaches to EcoResA and EcoRegA for sediment management will be presented in this paper.

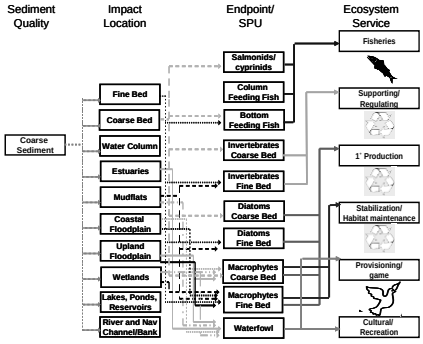

Fig. 2: The pathways of impact and trade-offs between services, times and scales are evaluated in EcoRegA. Adapted from [1].

References: [1] Apitz (2011) *IEAM* ***7(4)***:691-693; [2] Apitz (2012) *STOTEN* **415**:9-30; [3] Apitz (2013) *IEAM* **9(2)**:214-230; [4] Apitz and Nasci (in prep).