Pooled Monitoring Initiative's Restoration Research Award Program

Project Title

Literature review: Non-monetary valuation of ecosystem service change due to stream restoration

Lead Entity

Tess Thompson
Ally Delaney
Biological Systems Engineering
Virginia Tech

The Pooled Monitoring Initiative pools resources to support scientists who answer key restoration questions posed by the regulatory and practitioner communities. The research teams then provide the answers back to those who asked the questions for direct application. The goal of the program is to answer these key restoration questions that serve as a barrier to watershed restoration project implementation.

Questions? See cbtrust.org/grants/restoration-research/

Research question(s)

D.8 Resource trade-offs in different types of restoration projects

Issue addressed

Stream restoration is a term that is broadly used to indicate changes to stream channels with the goal of reducing channel erosion, protecting infrastructure, and improving aquatic habitat and ecosystem health. Historically, stream restoration was conducted to mitigate impacts to stream ecosystems from activities such as urban development. Increasingly, stream restoration is used in the Chesapeake Bay watershed to reduce nutrient and sediment loading from streambank erosion as part of the watershed implementation plans (WIPs) for the Chesapeake Bay total maximum daily load federal program (TMDL). As a result, emphasis is placed on stabilizing stream channels. While limiting channel migration is an important design goal to protect infrastructure, immobilizing naturally dynamic ecosystems can reduce ecological uplift. Trade-offs between design goals are common in stream restoration design; however, a robust assessment of trade-offs between different potential stream restoration designs has not been conducted.

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Project findings

A systematic literature was conducted to identify and summarize the ES of small streams and respective quantification methods that are relevant to stream restoration. Based on a systematic review of 59 studies, these ES are summarized below:

Provisioning

- Plant production
- Wild animals and fish
- Genetic resources
- Water quantity

Regulating and maintenance

- Carbon retention
- Sediment retention (including bed/bank sediment)
- Nutrient retention
- Microclimate regulation
- Habitat provisioning and maintenance
- Lateral connectivity
- Longitudinal connectivity

Cultural

- Aesthetic experience
- Education and research
- Nature-based tourism and recreation
- Sense of place

Multiple non-monetary valuation techniques are available to quantify ES, allowing the comparison of different management and stream restoration design alternatives.

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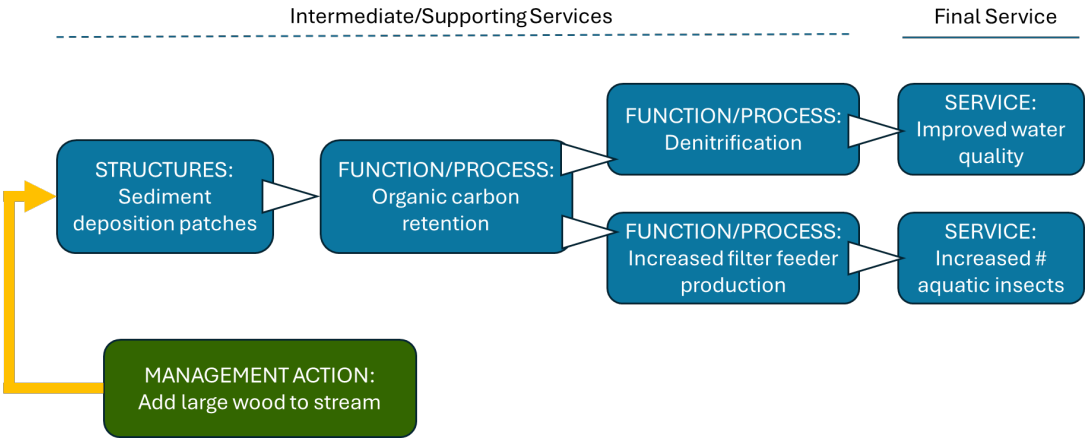

Figure 1. Linking stream restoration actions to ecosystem services

Recommendations

Develop an objective, science-based framework for the systematic assessment of the effect of different stream restoration activities on the provision of ES by small streams to clarify the trade-offs in different stream restoration projects.

Why does this study matter?

This literature review summaries the ES of small streams that can be altered by stream restoration activities and provides examples of the use of ES in evaluating different stream restoration activities. By quantifying changes in ES resulting from different design options, project designers, regulators and resource managers can compare different restoration activities in a manner that is balanced, understandable, credible, and transparent.

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What should we do with this information?

It is important to recognize that streams are complex, dynamic ecosystems that provide multiple services. Activities affecting streams should be evaluated using metrics that reflect changes in the many ecosystem services provided by stream systems.

What will the end-user (regulator/manager and practitioner) do with this information?

- Stream restoration designers should consider the impact of different stream restoration activities on the multiple different ES provided by small streams and select design options that provide the greatest overall improvement in ES.
- Regulators and managers should assess streams and restoration projects using metrics that quantify the provision of ES.

For more information:

Visit the Chesapeake Bay Trust's Pooled Monitoring Restoration Research page for the Final Report https://cbtrust.org/grants/restoration-research/

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