Stream Restoration

A DOI Nature-Based Solutions Roadmap Fact Sheet

Streams are small surface waterways originating from groundwater, runoff, or a wetland.[1] Within the US, stream health is declining due to increased impervious surfaces, polluted stormwater runoff, nutrient pollution, drought, deforestation, and physical obstructions.[2] Stream restoration can be achieved through form-based methods, which physically manipulate the stream to restore its natural morphology, and process-based methods, which focus on restoring ecological interactions that occur within the stream.[3]

TECHNICAL APPROACH

There are many specific techniques used for form-based stream restoration, including:

- Regrading stream banks to shallower slopes in order to reduce erosion and promote groundwater recharge.[4]
- Placing woody debris in the stream to redirect water flows into more complex channels, slow water movement, and provide fish habitat.[5]
- Building cross vanes made of stones to direct the water toward the center of the stream and reduce erosion along stream banks.[6]

Process-based stream restoration often extends beyond the stream itself to restore ecological processes. For example, restoring riparian buffer vegetation reduces pollutants entering the stream, and preserving land around the stream provides space for natural channel migration over time.[7-8]

BENEFITS

Climate Threat Reduction

- Reduced flooding
- Drought mitigation
- Reduced wildfire risk
- Carbon storage and sequestration
- Heat mitigation

Social and Economic

- Recreational opportunities
- Reduced erosion
- Clean drinking water
- Jobs
- Mental health and well-being
- Resilient fisheries
- Cultural values

Ecological

- Improved water quality
- Enhanced biodiversity
- Reduced runoff
- Supports wildlife

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SITE SUITABILITY FACTORS

- ✓ Low gradient
- ✓ Cohesive banks
- ✓ Bank erosion
- ✓ Near sources of nutrient pollution
- ✓ Large amounts of impervious surfaces
- ✗ Downstream of large sediment supply
- ✗ High stream power
- ✗ Stream barriers that will not be removed
- ✗ Streams running through wetlands
- ✗ Poor access

EXAMPLE PROJECT

The National Park Service restored Chilogatee Stream in Great Smoky Mountains National Park, which had been degraded by riparian clearing, channel relocations, and livestock access before the area was part of the park.[9] Restoration included establishing a new stream channel, placing rocks and logs to protect streambanks, and planting native seeds in the riparian zone.

Chilogatee Stream after restoration. Photo credit: National Park Service.

KEY RESOURCES

Title and Link	Site Suitability	Design and Construction	Monitoring Guidance	Example Projects
Stream Restoration: A Natural Channel Design Guidebook (NC State, NC A&T, NC Sea Grant)	✓	✓	✓	–
Restoring Western Headwater Streams with Low-Tech Process-Based Methods (American Rivers)	–	✓	✓	✓

LEARN MORE

Visit the DOI Nature-Based Solutions Roadmap for more information on stream restoration, other nature-based solutions, and principles and considerations broadly relevant for nature-based solutions projects. The stream restoration summary includes additional details on each section included in this fact sheet, plus information on operations and maintenance, common barriers, and more resources and example projects.

Explore the Roadmap

Full Roadmap Document

Stream Restoration Section

www.nicholasinstitute.duke.edu/roadmap

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