

Principles for the Ecological Restoration of Aquatic Resources

Source: Watershed Ecology Team of EPA's Office of Wetlands, Oceans and Watersheds

www.epa.gov/owow/wetlands/restore/

Restoration Principles

As the number of restoration projects have grown, the understanding of which issues need to be addressed during the planning and implementation of a project have also grown. In an effort to assist organizations and individuals who are planning restoration projects, the Watershed Ecology Team of EPA's Office of Wetlands, Oceans and Watersheds, have developed a set of principles which provide valuable lessons learned in order to better complete a restoration project.

The following is a summary of the Watershed Ecology Team's guidance for the issues critical to the success of a wide range of aquatic resource restoration projects. The full discussion on "Restoration Principles: Principles for the Ecological Restoration of Aquatic Resources" can be found at www.epa.gov/owow/wetlands/restore/.

Build community support

As in all environmental management activities, the importance of community perspectives and values should not be overlooked. Coordination with the people and organizations that may be affected by the project can help build the support needed to get the project moving and ensure long-term protection of the restored area.

Preserve and protect aquatic resources

Restoration does not replace the need to protect aquatic resources in the first place, the first objective should be to prevent further degradation.

Restore natural structure

Many aquatic resources in need of restoration have problems that originated with harmful changes to the physical characteristics of a stream channel. It is difficult to return the functions of the stream without returning altered streams to a more natural structure.

Restore natural function

In order to maximize the benefits of the restoration project, it is essential to identify what functions should be present in an undisturbed stream. When developing the design for the restoration, missing or impaired functions can become the priorities.

Work within the watershed and broader landscape context

Restoration requires a design based on the entire watershed. Activities throughout the watershed can impact the aquatic resource that is being restored. Beyond the watershed, the broader landscape includes how the community interacts with the stream as well as adjacent wildlife habitats.

Address ongoing causes of degradation

Restoration efforts are likely to fail if the sources of degradation persist. It is essential to identify the causes of degradation and eliminate or remediate the stresses wherever possible.

Use of a reference site

Reference sites are areas that are comparable in structure and function to the proposed restoration site before it was degraded. As such, reference sites may be used as models for restoration projects.



While numerous groups, such as watershed associations, undertake riparian plantings and light construction work, any design and geomorphology assessment should be conducted by a licensed professional.

Develop clear, achievable, and measurable goals

Goals direct implementation and provide the standards for measuring success. Good goals provide focus and increase project efficiency.

Focus on feasibility

Particularly in the planning stage, it is critical to focus on whether the proposed restoration activity is feasible, taking into account scientific, financial, social and other considerations.

Restore native species and avoid non-native species

The temporary disturbance during restoration projects invites colonization by invasive species which can undermine restoration efforts and lead to further spread of these harmful species.

Use passive restoration, when appropriate

Before actively altering a restoration site, determine whether passive restoration (i.e., simply reducing or eliminating the sources of degradation and allowing recovery time) will be enough to allow the site to naturally regenerate.

Involve the skills and insights of a multi-disciplinary team

Restoration can be a complex under-taking that integrates a wide range of disciplines including ecology, geomorphology, engineering, planning, communications and social science. It is important that the planning and implementation involve people with experience in the disciplines needed for the particular project.

Anticipate future changes

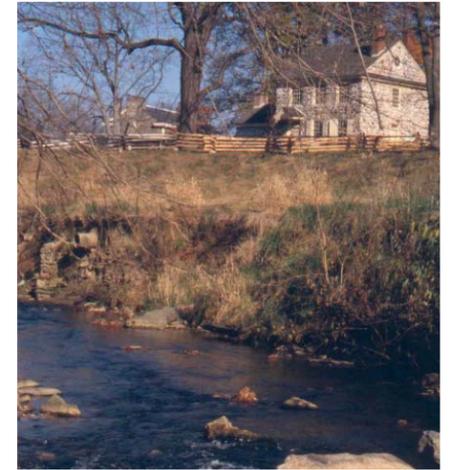
Since the environment and our communities are both dynamic, foreseeable ecological and societal changes should be factored into the design.

Monitor and adapt where changes are necessary

Every combination of watershed characteristics and restoration techniques is unique and, therefore, restoration efforts may not proceed exactly as planned. Adapting a project to at least some change or new information should be considered normal.

Design for self-sustainability

Perhaps the best way to ensure the long-term viability of a restored area is to minimize the need for continuous maintenance of the site, such as vegetation management, or frequent repair of damage done by high water events. In addition to limiting the need for maintenance, designing for self-sustainability also involves favoring ecological integrity, as an ecosystem in good condition is more likely to have the ability to adapt to watershed changes over time.



Restoration is not just a scientific effort, community perspectives and values should be a cornerstone of any restoration effort.



Sources and additional resources:

"Principles for the Ecological Restoration of Aquatic Resources": www.epa.gov/owow/wetlands/restore/

"Stream Corridor Restoration: Principles, Processes, and Practices": www.usda.gov/stream_restoration/newtofc.htm

Society for Ecological Restoration International: www.ser.org/



Local efforts are underway

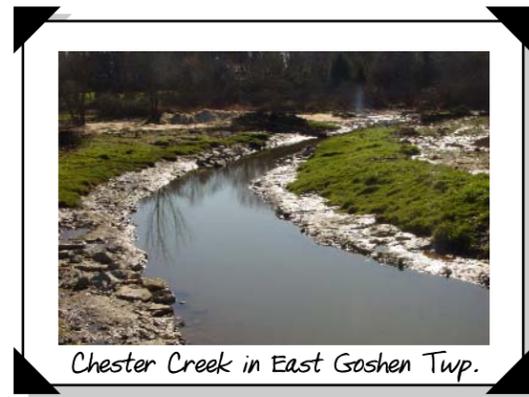
Here are some "snapshots" of projects in Chester County.

Several stream restoration projects have been completed or are underway in Chester County. Learning from the local experience of these projects and incorporating these principles into your stream restoration plans will help ensure long-term success.



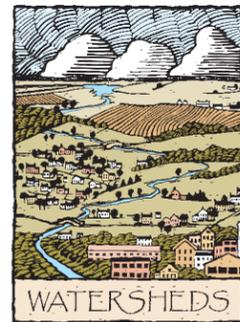
Brandywine Creek in Birmingham Twp.

The USDA Natural Resources Conservation Service installed rock barbs to protect the stream bank next to Creek Road by creating a still water pool along the bank. Improved fish habitat is an additional benefit.



Chester Creek in East Goshen Twp.

East Goshen Twp completed a stream restoration project to provide ecological and habitat improvements, erosion control and channel stabilization.



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Stream Restoration What It Is and What It Isn't

As we go about our lives in Chester County, it can be easy to overlook the streams and rivers that flow throughout our neighborhoods, urban centers, and countryside. However, the streams and rivers, and the corridors through which they flow, play a significant role in our quality of life and in our economy.

Streams, and their corridors, are complex ecosystems that provide benefits such as drinking water supplies, flood control and mitigation, recreational opportunities, food and habitat for aquatic species and other wildlife, and commercial benefits for industries. Changes in land use and land cover often cause changes in runoff to occur much more quickly than the receiving streams can adjust. This often causes the streams to experience rapid—and destructive—erosion and sedimentation that sets off a sequence of undesired consequences. These consequences include flooding, property damage (from erosion and flooding), destruction of aquatic habitats, and water quality impacts.

Recognition of the many values of healthy streams and their corridors has led to an expanding interest in stream restoration. There is no one definition for stream restoration; a restoration project should be a holistic process that returns the stream and its surrounding ecosystem to a close approximation of its condition prior to disturbance. Activities such as planting riparian buffers or placing protective barriers along the stream banks are not considered to be "stream restoration." While these provide important benefits, a restoration project should be based on matching the characteristics of a stream to those of its watershed.

The objective of stream restoration is to create a more natural stream system that is integrated within the watershed and the community in which it occurs. Stream restorations are not intended to merely recreate form without the functions of a natural stream, or the functions in an artificial configuration bearing little resemblance to a natural form. The upstream factors which are affecting the stream, as well as the downstream resources that would be impacted by any changes at the restoration site, need to be fully considered during the planning, restoration design and project implementation.



When streams are disconnected from their floodplain, stormwater runoff will often erode the stream banks.