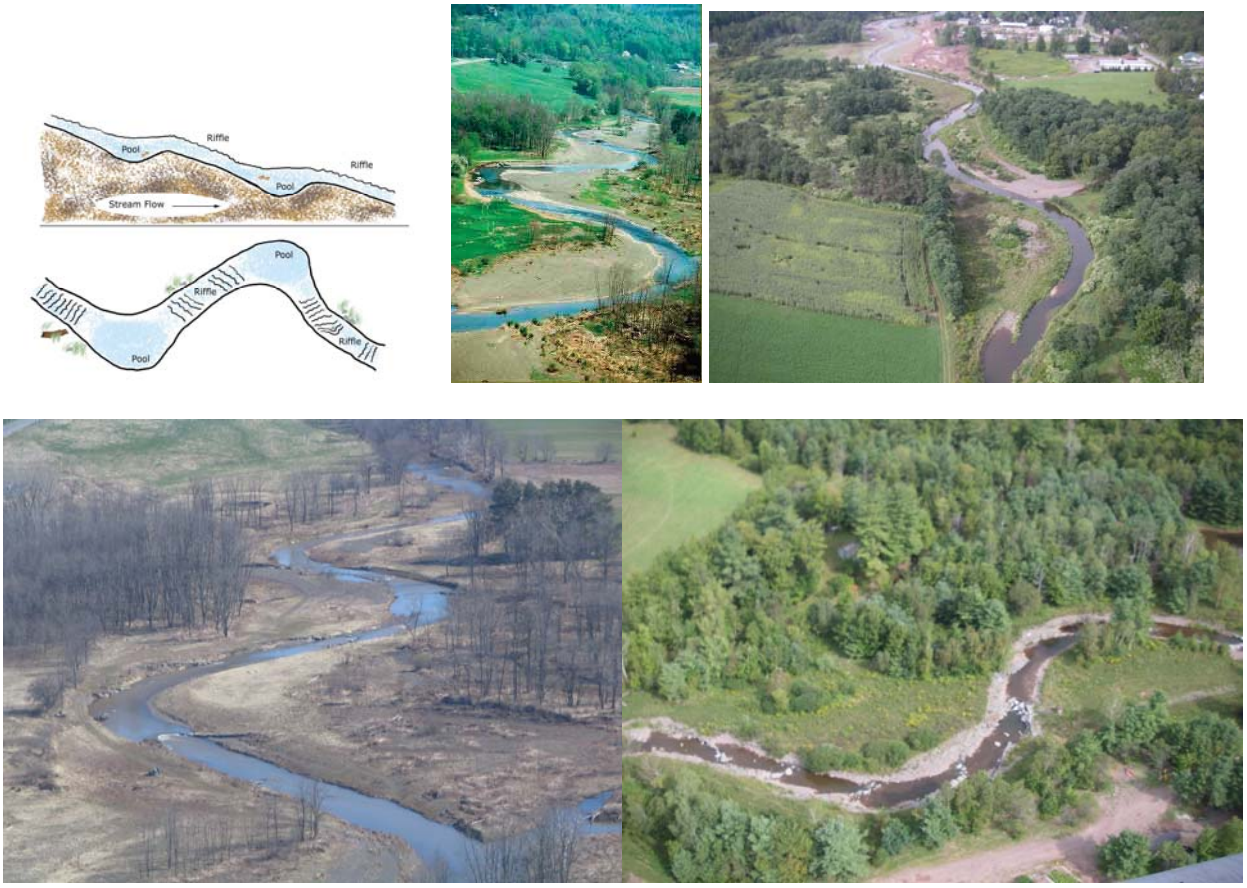
Practice Title

Re-creating meander geometry

Photo(s)



Greene County streams after their meander geometry was restored to the extent necessary to move sediment and flow without excess erosion or deposition (bottom photos). The proper meander geometry is determined through detailed stream assessment. Also, a diagram showing the typical position of pools and riffles within a meandering stream, and a few other stream meander geometry patterns (top).

Summary of Practice

The winding pattern of a river or stream is called its meander pattern. These meanders result in a longer channel with a lower slope. These curves slow down the water and absorb energy, which helps to reduce the potential for erosion. The velocity of a stream is typically greatest on the outside of a meander bend. The increased force of this water often results in erosion along this bank, extending a short distance downstream. On the inside of the bend, the stream velocity typically decreases, which often results in the deposition of sediment, usually sand and gravel. If you could look at the long-term history of a valley over hundreds or thousands of years, you would see that the stream has moved back and forth across the valley

bottom. In fact, this lateral migration of the channel, accompanied by down cutting, is what has formed the valley.

Success in stream management is based on working with the stream, not against it. If a reach of channel is suffering unusual bank erosion, down cutting of the bed, aggradation, change of channel pattern, or other evidence of instability, a realistic approach to addressing these problems should be based on restoring the system's equilibrium. This is done by replicating the characteristics found in a local, relatively stable, balanced stream of a similar type, known as a "reference reach." In addition to considering the volume and velocity of water that must pass through a channel or under a bridge, the natural stream design approach also takes into account the sediment load, channel shape (pattern and profile), and velocity distribution in the channel. The stream channel features that are typically retained or restored to reference conditions include: channel slope (or gradient), bankfull channel width, bankfull channel depth, pool riffle sequence, meander pattern, and hydraulic roughness.

Impact on Stream and Floodplain Processes and Functions

Once a stream is returned to a "functioning" condition, it should adequately transport sediment through the system. The re-creation of meander patterns focuses on the geometry and physics of the stream in order to establish a channel shape that will not be subject to rapid adjustments. The resulting stream channel should cause fewer problems from dramatic channel adjustments, while also providing better habitats for fish and other wildlife.

Impact on Your Property

The objective of a natural stream design project is to establish a stream channel that is in dynamic equilibrium. This does not mean that the stream will be free from erosion, since erosion is a natural process. Erosion and sediment deposition are natural physical processes that occur in all streams. In designing a stream restoration project, special consideration is given to managing the causes of stream instabilities as opposed to treating symptoms. A stream in dynamic equilibrium will often move out of equilibrium in response to natural or man-made changes in the watershed or in the stream channel. When such movements are incompatible with development, then the project should incorporate additional techniques to ensure that the stream continues to properly function without destroying infrastructure.

Impact on Neighbor's Property

Re-creating meander geometry focuses on managing causes of problems rather than treating symptoms. Focusing on an immediate symptom on your property with other more temporary methods can result in simply moving the problem up or downstream. The re-creation of meander geometry focuses on the stream system as a whole and can therefore result in long-term solutions to property loss or damage at a reach scale.

Recommended Use

Re-creating meander geometry can help lead a stream system in a direction in which it will sustain itself in a way that benefits both man-made structures and wildlife. It is therefore highly recommended to be used in situations where other methods, such as gravel removal or rip-rap, simply moves the problem to another location or only provides temporary relief. Re-creating meander pattern is more costly than some other stabilization methods but can provide longer-term solutions without the need for annual successive projects. Bioengineering and cross vanes are often used in conjunction with re-creating meander geometry.

Permits Needed

In-stream work will require a DEC Article 15 Stream Disturbance Permit. An ACOE permit is required when more than 25 cubic yards of fill material will be used below the "ordinary high water mark" (the approximate yearly flood level); the DEC can advise you about determining these limits. Please contact info@catskillstreams.org to schedule a site visit from a local resource professional that can advise on the best options for your streamside.

Resources (Links, Articles, etc.)

Keystone Stream Team. 2002. Guidelines for Natural Stream Channel Design for Pennsylvania Waterways. Developed by the Keystone Stream Team. Prepared by the Alliance for the Chesapeake Bay. *http://www.canaanvi.org/canaanvi_web/community. aspx?id=389.*

Rosgen, David L. 1998. The Reference Reach – A Blueprint for Natural Channel Design. In Proceedings of ASCE Specialty Conference on Restoration, Denver, Colorado. *http://www.wildlandhydrology.com/html/references_.html*

Text Sources

Thigpen, Janet. 2006. Stream Processes: A Guide to Living In Harmony with Streams. Chemung County Soil & Water Conservation District. Available of web: http://www.chemungcountyswcd.com/homepage.html.

Photo Sources

Amy Reges, Upper Susquehanna Coalition
Greene County Soil and Water Conservation District
New York City Department of Environmental Protection