Stream Corridor Restoration

nvrc
Northern Virginia Regional Commission

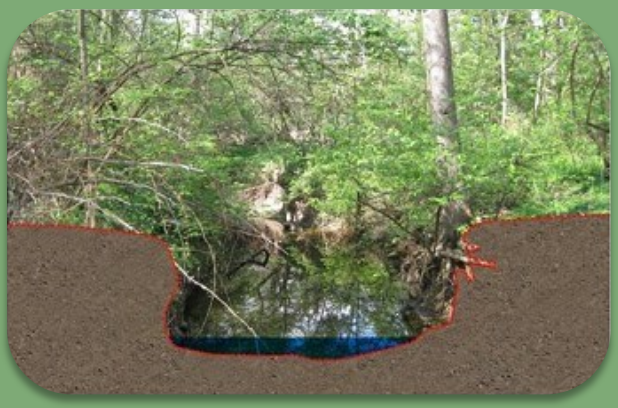
June 2020

Stream Corridor Restoration

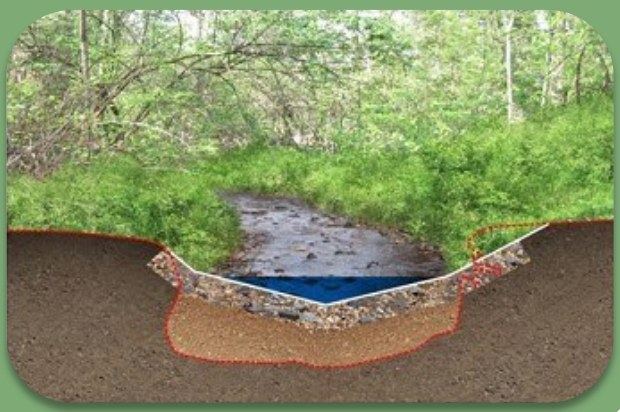
What is stream corridor restoration?

Stream corridor restoration is one of many ways to restore and manage streams to lower the effects that stormwater has on natural resources in our urban watersheds. Stream corridor restoration works with other stormwater management practices to reduce erosion of streams and flooding. It improves water quality and provides healthy habitats that support wildlife. Local governments design stream corridor restoration projects to support human infrastructure like buildings, roads, and power systems. They also design projects with a focus on public health and safety. The goals of stream corridor restoration projects vary based on a study of current conditions. The study finds limits and opportunities based on how we use the land now and expect to use it in the future. Stream corridor restoration rebuilds the shape and structure of the stream. The designs restore habitat and native, aquatic species that help the stream return to its natural function and work in a sustainable way. It is important to remember that natural streams in the urban environment of Northern Virginia may look very different than natural streams in other areas. As water flows, it wears down the stream bottom which makes the stream grow deeper and the sides of the stream grow taller. When the stream becomes very deep and the sides become very tall, the deeply incised stream channel is unable to do its job correctly. Local governments rebuild deeply incised stream channels to carry water and sediment in a sustainable way that supports stream function. They give the stream a gentle slope to connect the stream to the neighboring low-lying ground called the floodplain. This creates stable stream banks that provide habitat for native plants. There are several different approaches to accomplish stream corridor restoration projects. The Natural Channel Design approach models construction from the natural shape of the stream, the nearby floodplain, and the trees and plants along the stream. The Regenerative Stream Channel approach uses barriers in the stream to create more connectivity with the floodplain during smaller rain events. The Legacy Sediment Removal approach removes sediment that has built up in the stream over many years, which restores the natural state of the stream and its resources.

Figure 1



The top graphic shows a cross section of an incised stream with steep, unstable banks and exposed roots. The bottom graphic shows a stream after stream corridor restoration with gently sloping, stable banks that allow the stream to interact with groundwater and the nearby floodplain.



nvrc
Northern Virginia Regional Commission

Division of Planning and Environmental Services
A. Wagner

Photo credit: Will Parson, Chesapeake Bay Program and Fairfax County

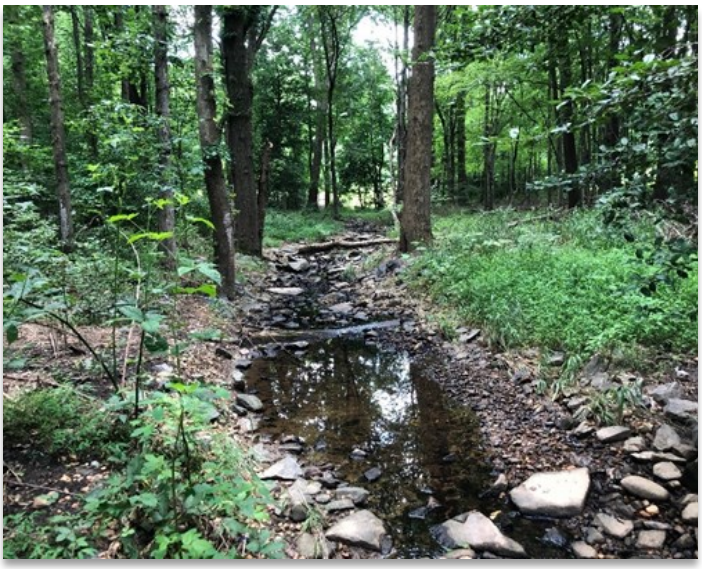
Stream Corridor Restoration

Why do local governments do stream corridor restoration?

Population growth in the past several decades led to a fast change in the way we use our land. The impacts to our local streams in Northern Virginia are the result of changes in land use from forest, to agriculture, to the current urban communities. This makes our waters and natural resources a part of the surrounding developed lands. Changes in the way we use land and the way we manage it effects the overall health of our streams over time. When we build roads, buildings, and parking lots, we create more hard surfaces that water cannot soak into. This causes more water to runoff into streams in a short period of time instead of gradually soaking into the land. Large amounts of polluted stormwater overwhelm our streams during rain events which can wear down stream banks. This can also cause streams to disconnect from groundwater and adjacent floodplains. This forces streams to grow deeper and wider, exposing tree roots and systems such as sanitary sewer and stormwater pipes. The Virginia Department of Environmental Quality (DEQ) and localities monitor the biological, chemical, and physical health of our local streams. Virginia DEQ listed approximately 250 miles of streams in Northern Virginia that are impaired in 2018. This means they are too polluted or degraded to meet the water quality standards set in the Clean Water Act. Many of these streams are unable to support healthy fish, aquatic insects, swimming, boating, edible fish or shellfish, or safe drinking water. Local governments do stream corridor restoration along with stormwater management to help spread out the stream's energy to slow it down. This reduces flooding further down the stream and returns the stream to a long-term healthy state while protecting property and infrastructure from damage.

Figure 2

The photo on the left shows a stream before stream corridor restoration in Fairfax County. It shows exposed roots and unstable trees along the incised stream. The photo on the right shows the same stream six years after stream corridor restoration. It shows gently sloping banks that interact with groundwater and the floodplain. Stable trees and lush plants line the stream which filter water and create habitat for wildlife.



nvrc
Northern Virginia Regional Commission

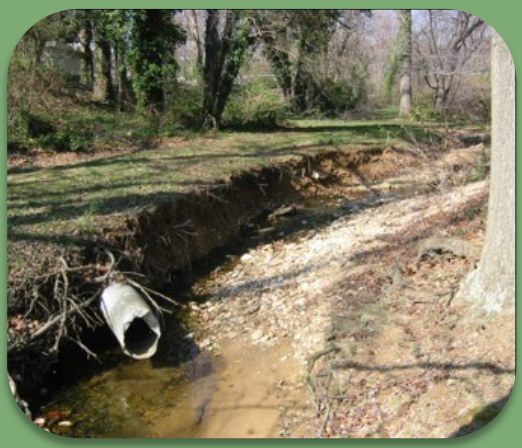
Photo credit: Fairfax County

Stream Corridor Restoration

What are the benefits of stream corridor restoration?

The benefits of stream corridor restoration go far beyond stable stream banks, reducing erosion, and reducing sediment pollution. Reducing erosion improves the water quality of local streams making them a better habitat for fish and aquatic bugs. Stream corridor restoration projects can improve the connectivity of streams with groundwater. This creates conditions that allow the stream to function more naturally, moving sediment in a way that does not erode the stream during small storm events. Widening streams may cause property damage to nearby homes and infrastructure and pose a risk to public safety if left untouched. Fixing these streams with stream corridor restoration projects reduces that threat. Additionally, there are opportunities for the repair of exposed and damaged systems such as sanitary sewer and stormwater pipes during construction of stream corridor restoration projects.

Figure 3



The photo above is an example of exposed infrastructure in a stream in Alexandria, Virginia. This could be repaired during a stream corridor restoration project.

Are there rules we must follow to protect our streams and rivers?

Stream corridor restoration projects need both federal and state level permits to assess all potential effects of a project before it begins. The nationwide permit for Aquatic Habitat Restoration, Establishment, and Enhancement Activities is a requirement to work within streams, the area along streams, and wetlands. This permit focuses on fixing water habitat to improve water quality and wildlife communities. This includes monitoring the stream before and after construction to measure the success of a project. Also, local governments must follow the Municipal Separate Storm Sewer System (MS4) permit to manage stormwater flowing into our local streams. The MS4 permit requires localities to protect and restore streams and their surroundings through policies and regulations. These include land use policy, stormwater regulations, and stormwater improvement projects. Total Maximum Daily Loads (TMDLs) are specific requirements under the MS4 permits for the release of stormwater to our local streams. A TMDL is the maximum amount of sediment and pollution that can occur in a body of water to meet water quality standards set by the Clean Water Act. Both the Chesapeake Bay and local rivers and streams require TMDLs if the waters are impaired, meaning they are not fishable and swimmable. Localities create action plans to address TMDLs that consider cost efficiency, addressing major pollution sources, and the chance of success for actions carried out. Local governments fund projects including stream corridor restoration and upstream stormwater management practices because they must meet these requirements. Stream corridor restoration projects help jurisdictions reduce nutrient and sediment pollution to an acceptable level. These projects are often the most cost-effective choice to reduce as much pollution as possible per dollar spent.

nvrc
Northern Virginia Regional Commission

Division of Planning and Environmental Services
A. Wagner

Photo credit: Wood Environment & Infrastructure Solutions

Frequently Asked Questions

Why are expensive stream corridor restoration projects done instead of focusing our efforts on cheaper projects?

Figure 4

The photo on the top shows a stream before stream corridor restoration in Fairfax County. The deeply incised stream banks reached high above a person's head. The photo on the bottom shows the same stream two years after stream corridor restoration.

Local governments do both large-scale stream corridor restoration projects and stormwater management projects like rain garden or tree plantings in our region. Some stormwater management projects are likely less noticeable given their small scale of construction and placement spread throughout the community. Planting rain gardens and trees along streams are vital to improve local water quality, but these practices are not enough on their own to meet federal and local water quality regulations. Localities use watershed planning and monitoring to identify both upland stormwater projects to reduce runoff and in-stream improvement projects. Based on the unique features of an area, different types of projects are best to reduce sediment and pollution in our streams in a cost-effective way. Often in urban areas, stream corridor restoration projects offer a more cost-effective solution based on dollars spent per pound of pollution reduced. This means it would take many more small-scale restoration projects to reduce the same amount of pollution that several large-scale stream corridor restoration projects could. These projects have a big effect in a small area without overtaking valuable property, like many small-scale restorations. In urban areas like Northern Virginia, developed infrastructure such as roads and buildings cover most of the land. This limits the amount of space that is available for stormwater management practices and makes it difficult to find locations for many impactful small-scale restoration projects. Maintenance needs and costs vary for different types of restoration projects. Typically, stream corridor restoration projects that used natural materials during construction have a low cost of maintenance. In comparison, rain gardens need more effort and higher maintenance costs to ensure they work properly. With projects spread throughout communities, high maintenance projects can quickly become overwhelming and fall into disrepair.

nvrc Northern Virginia Regional Commission

Frequently Asked Questions

Why are stream corridor restoration projects expensive?

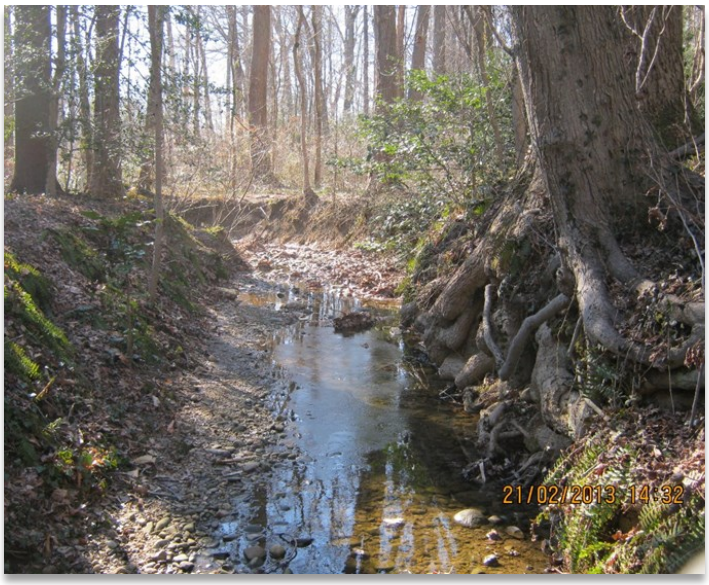
They are high cost because they include the cost of all planning, design, construction, and maintenance. These projects often range from $1,200 to $2,000 per linear foot of stream restored. They are still more cost effective in terms of pollution removed per dollar spent than many alternatives. It is important to remember that money spent on these large-scale projects are not taking away the millions of dollars available to fund small-scale low-cost restoration projects.

Why don't we let the stream heal itself naturally?

It is true that streams heal naturally, however this occurs over long periods of time at a geologic scale. The time needed for a stream to heal itself gets longer as the stream becomes more degraded. Also, the time needed grows longer as watershed and land conditions change. Even with regulations and efforts to develop in a way that has less impact on streams, our local stream conditions continue to worsen. Stream corridor restoration is one way to manage our streams long-term. If left untouched, widening streams would allow more property damage to occur. It would also not allow for exposed system fixes to occur during restoration projects.

Figure 5

The photo on the left shows a stream before stream corridor restoration in Fairfax County. The stream is widening, which creates unstable trees along the stream. The photo on the right shows the same stream three years after stream corridor restoration. Streams are unable to heal themselves at this quick rate without stream corridor restoration practices.



nvrc Northern Virginia Regional Commission

Photo credit: Fairfax County

Frequently Asked Questions

Why are trees removed during stream corridor restoration?

Stream corridor restoration calls for tree removal for several reasons. However, project design plans minimize the number of trees removed while still achieving project goals. Before tree removal, an ecologist or biologist takes stock of trees and plants on the site and studies their health. They decide which trees and plants are the best to preserve and enhance within the area surrounding the stream. Also, they map plants and wetlands with a focus on keeping plants connected to nearby forests and natural areas. Trees near urban streams capture stormwater and help it soak into the ground. This helps reduce runoff to streams during storms. Tree roots, organisms in soil, leaves, and wood lying beneath trees act like sponges which slow down and hold stormwater. Trees protect our local streams from erosion and pollution by reducing sediment and taking up nutrients. They improve water quality throughout our waterways and improve soils to help with drainage. Using the information gathered from studying the site, existing trees help determine the path of the stream. They also help decide the level of construction needed and the ability to connect the stream to the neighboring floodplain. The trees removed from a stream corridor restoration project are based on an inventory and assessment of trees by an urban forester. The goal is to remove as few trees as possible. Construction teams remove trees if they are unhealthy or dead, falling into the stream, threaten infrastructure or property, or become damaged from construction. Project design plans include native tree and vegetation plantings to replace removed trees with monitoring in place to ensure they survive after construction. Some projects also include invasive plant management as part of the site study both before and after construction.

Figure 6

This series of photos shows Big Rocky Run in Fairfax County, Virginia. From top to bottom, the photos show before, after, and four years after stream corridor restoration.

nvrc
Northern Virginia Regional Commission

Frequently Asked Questions

Why do local governments use many different approaches to improve local water quality?

Local governments protect and improve our local streams with a combination of different approaches working together. Local governments use policy that guides decision making on the management of land use, the environment, and flooding. They use stormwater management to reduce runoff from rain, control flooding, and reduce erosion. This includes putting in new stormwater practices and requiring controls for redevelopment projects that previously had none. They use stormwater improvement projects like stream corridor restoration, improving existing stormwater systems, and constructing new stormwater facilities. Planting trees and rain gardens capture and filter stormwater, which addresses the source problem of polluted waters entering our streams. Stream corridor restoration projects improve the functionality of our streams and floodplains to allow them to handle stormwater during storms. The best approach is using both in-stream and up-stream approaches whenever possible. Local governments should add more stormwater facilities, trees, and rain gardens to reduce runoff over time. They should also create stable stream channels that will protect infrastructure and trees along the stream. By using both methods, there will be healthier water flowing at a manageable rate into stable streams. This will hold up through heavy rain events and the test of time.

What makes a stream corridor restoration project successful?

Stream corridor restoration design, permitting, and construction is a multi-year and complex process. It requires experienced consultants in engineering, biology, forestry, landscape architecture, project management, and construction. Contractors can differ greatly in their level of experience and their preferred methods and materials. It is important to use contractors with recognized long-term success in previous stream corridor restoration projects. It is important to consult professional biologists to consider the potential gains or losses to the stream and nearby area that may occur from the project. Communication with the public is a key component to a successful project. Local governments work with communities during the design phase to ensure the project goals address concerns. Stream corridor restoration projects must follow all permitting requirements to be successful.

For a virtual tour of stream corridor restoration projects in Northern Virginia, visit us at: www.novaregion.org/1468/Stream-Corridor-Restoration

nvrc
Northern Virginia Regional Commission

Division of Planning and Environmental Services
A. Wagner

Photo credit: Will Parson, Chesapeake Bay Program

Resources

Source	Title	URL
Arlington County	Stream and Infrastructure Improvement Projects	https://environment.arlingtonva.us/stormwater-watersheds/management/stream-and-infrastructure-improvement-projects/
	Myths and Misconceptions about Stream Restoration	https://newsroom.arlingtonva.us/release/myths-and-misconceptions-about-stream-restoration/
Chesapeake Stormwater Network	Urban Stream Restoration	http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2015/06/U4.-Urban-Stream-Restoration-Fact-Sheet-in-Chesapeake-Bay-Watershed.pdf
City of Alexandria	Total Maximum Daily Loads	https://www.alexandriava.gov/tes/oeq/info/default.aspx?id=52652
	MS4 Permit	https://www.alexandriava.gov/tes/stormwater/info/default.aspx?id=93364
City of Falls Church	Stream Restoration Projects	http://www.fallschurchva.gov/353/Stream-Restoration-Projects
EPA	Summary of the Clean Water Act	https://www.epa.gov/laws-regulations/summary-clean-water-act
	Overview of Impaired Waters	https://www.epa.gov/tmdl/overview-identifying-and-restoring-impaired-waters-under-section-303d-cwa
Fairfax County	Understanding Stream Restoration	https://www.fairfaxcounty.gov/soil-water-conservation/enjoy-restore-streams/
	Stream Restoration and Stabilization	https://www.fairfaxcounty.gov/soil-water-conservation/stream-restoration
	Tree Action Plan 2018	https://www.fairfaxcounty.gov/boardofsupervisors/sites/boardofsupervisors/files/assets/meeting-materials/2018/oct02-environmental-item4-tree-action-plan.pdf
	Comprehensive Plan	https://www.fairfaxcounty.gov/planning-development/comprehensive-plan/policy-plan
Prince William County	From Ravaged Waterway to Thriving Ecosystem	https://occoquandistrict.net/from-ravaged-waterway-to-thriving-ecosystem-vdot-stream-restoration-tour/
VA DEQ	Water Quality Assessment Integrated Report	https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2018305(b)303(d)IntegratedReport.aspx
U.S Army Corps of Engineers	2017 Nationwide Permit Information	https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Nationwide-Permits/
USDA NRCS	Stream Corridor Restoration	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/ndcsmc/?cid=nrcs143_009158