Nine Mile Creek Streambank Restoration

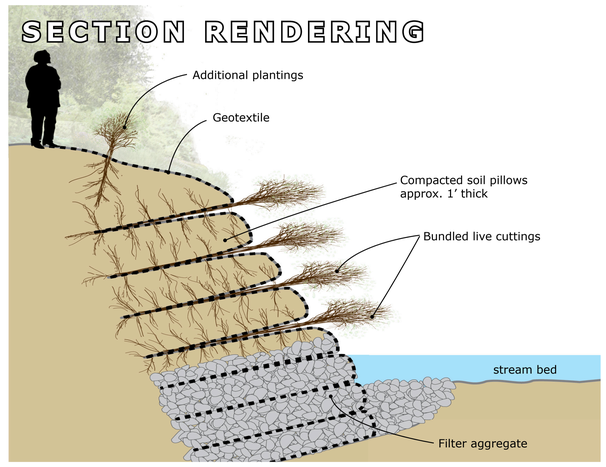
Soil Pillows

Soil Pillows are utilized in a bioengineering method known as Vegetated Reinforced Slope Stabilization (VRSS). The method combines rock, specialized fabric, soil, and plants to stabilize steep, eroding slopes in a structurally sound manner. VRSS typically involves protecting layers of soils with a specialized fabric (e.g. erosion control blanket) and vegetating the slope with either water tolerant shrubs (often willow or dogwood species) between the soil layers or by seeding the soil with desired species before it is covered by the protective material. In either case, with adequate light and moisture, the vegetation grows quickly and provides significant root structure to strengthen the bank. In places where the channel is confined and where the streambanks are steep, soil pillows are a feasible solution.

LOCATION 3
EXISTING CONDITIONS

Some of the severe erosion areas on Nine Mile Creek are directly adjacent to parking lots, streets, or buildings where space is limited. In these areas, soil pillows will be used to reconstruct and stabilize the banks with a much steeper slope than would otherwise be possible. Using soil pillows will allow the stream to stay in its current alignment (where space is limited) while protecting the banks against further erosion.

SECTION RENDERING



SIMILAR PROJECT

A nearly continuous stretch of Minnehaha Creek was stabilized from Portland Avenue to Bloomington Avenue during the winter of 2007/08. The stream reach, located within the Minnehaha Creek Regional Park was degraded from streambank erosion and failing infrastructure, which posed an immediate threat to the stability and structural integrity of property, banks and infrastructure in and along the creek. Among the methods employed for bank stabilization, Soil Pillows were used at several locations having very steep banks in order to minimize the amount of soil excavation that would be needed. The site shown is located a short distance downstream of Interstate I-35W.

MATERIALS

Materials consist of graded rock for the lower layers of the structure and for internal drainage, if necessary. Geotextile fabric is used to wrap the soil. Plants, such as willow or dogwood, or seed mixture is used for planting in and between the soil pillows.

Constructed Riffle

Grade control measures are used where channel downcutting has occurred. Various types of weirs are commonly used to provide grade control on streams, particularly in steeper systems. Weirs can be constructed of sheetpile, concrete, or natural materials such as rock. For Nine Mile Creek, natural rock will be used to mimic natural riffles. Large boulders will comprise the core of the structure, with smaller rock material placed on the upstream and downstream sides of the boulders to provide a gradual transition to the channel. The riffles will raise the surface of the water profile, and will reconnect the stream to its floodplain areas. Following the installation of the riffles, pools will be created upstream of the riffles. These pools will fill with sediment over time, which will in effect raise the channel bottom to the desired elevation.

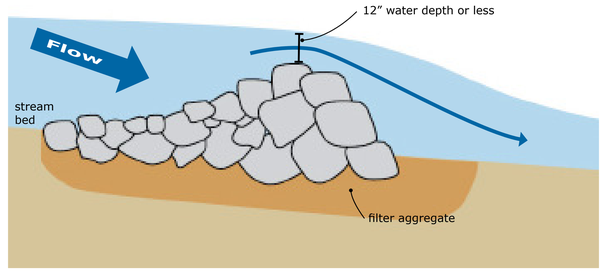
MATERIALS

Constructed riffle materials consist of various gradations of rock, ranging from large, 3-foot boulders to coarse gravel.

LOCATION 4
EXISTING CONDITIONS

Constructed riffles will be used to help stabilize a relatively steep portion of Nine Mile Creek as it transitions from the community gardens area to the large, flat wetland located west of Highway 169. They will also be used further upstream to provide channel stability. The riffles will stabilize the channel profile and will help the creek to dissipate excess energy in a controlled manner, thereby reducing bank erosion. The riffles will also provide diversity to the creek, which is beneficial to aquatic life.

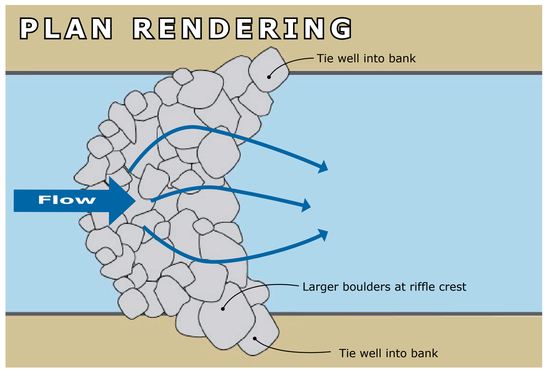
SECTION RENDERING



SIMILAR PROJECT

Following the 1987 "super storm," a rapids was constructed on Nine Mile Creek downstream of the 106th Street Bridge. The rapids was one of several grade-control structures that were installed on a three-mile stretch of creek in the lower valley. The project allowed the stream to continue its course while taking measures to protect areas where water flow was eroding valley walls. Other protection measures included applying porous deflector dikes, burying sheetpile walls parallel to the creek to prevent undercutting of slopes, installing weirs (rock or capped sheetpile) to limit stream-bed degradation, and improving storm-sewer outlets.

PLAN RENDERING



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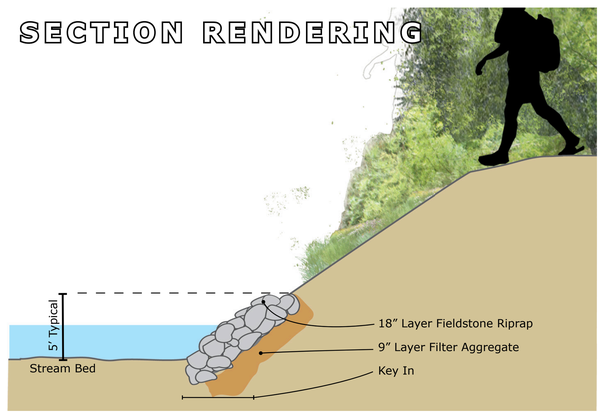
Stone Toe Protection

Stone Toe Protection is constructed from cobble-sized rock on the creek edges. It extends to approximately the bankfull level, which will protect the channel banks for flow events that occur every 1 to 2 years or less. The material will extend below the channel bed to resist scour. Coarse gravel is used to separate the larger rock material from underlying soil. Stone toe protection is typically used in conjunction with revegetation of the upper banks.

LOCATION 1 EXISTING CONDITIONS

Severe bank erosion is evident along much of Nine Mile Creek between Excelsior Boulevard and 9th Street South. The stream channel is deep and confined between parking lots and buildings, with very little floodplain to provide relief during high flows. As a result, flow velocities can be very high during large flood events. In these areas, lining the lower banks with cobble-sized rock will protect the banks from being undercut by frequent flood events. Native vegetation will be planted to protect the upper banks from less-frequent flood events.

SECTION RENDERING



SIMILAR PROJECT

Stone toe protection has been used extensively in Nine Mile Creek's Lower Valley, in conjunction with deflector dikes, grade control measures and stabilization of large bank failures. Following the 1987 "super storm," the proposed design allowed the stream to continue its course while taking measures to protect areas where water flow was eroding valley walls. The resulting measures have stabilized the stream channel and valley walls while blending seamlessly with the natural environment.

MATERIALS

Stone toe protection materials consist of cobble-sized material with coarse gravel filter layer to provide separation from the underlying soil. Natural fieldstone is used.

Rock Vanes

Rock vanes are constructed using boulders on the creek bottom. They function by diverting flow toward the center of the channel and away from the eroding bank. They point upstream and disappear into the channel bottom, making them largely inconspicuous. Rock vanes are often constructed in series to protect a greater length of channel.

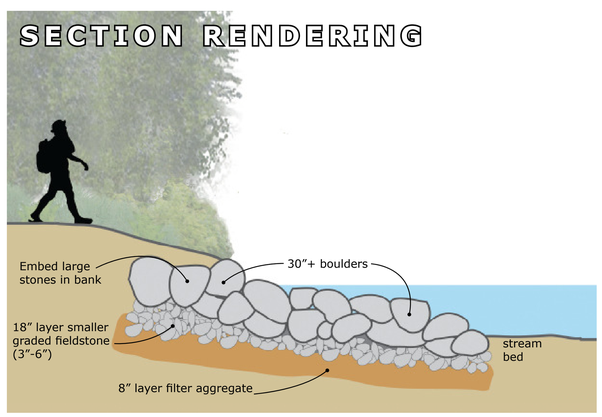
MATERIALS

Materials consist of various gradations of rock, ranging from large, 3-foot boulders to coarse gravel.

LOCATION 2 EXISTING CONDITIONS

Some portions of Nine Mile Creek have severe erosion on only one of the banks. This is generally due to one bank being higher than the other, and may be worsened by a bend in the channel. In these situations, rock vanes can be used to direct flow away from the higher eroding bank and toward the lower, more stable bank.

SECTION RENDERING



SIMILAR PROJECT

Rock vanes were used to stabilize an eroding bend on Valley Creek in Afton, Minnesota. The vanes were carefully designed to maintain surrounding trout habitat, including a deep scour hole a short distance downstream. The upper banks were vegetated with native grasses and shrubs. Construction was completed in fall 2008.

PLAN RENDERING