Urban Stream Naturalization: A Tale of Three Wisconsin Cities

True stream restoration in an urban setting is next to impossible because the city has usually been built up around the stream and the hydrology of the area is drastically different than before settlement. The best outcome most cities can hope for is stream rehabilitation or naturalization. Many times the creation of a stone-lined low-flow channel and rehabilitating the floodplain are the first steps in naturalizing the stream and restoring channel and floodplain dynamics.

Newton Creek Remediation and Restoration–Superior, Wis.

Newton Creek began at a surface water impoundment from an oil refinery wastewater treatment plant, flows 1.5 miles north through a city park and residential areas; emptying into Hog Island Inlet and ultimately into Superior Bay of Lake Superior.

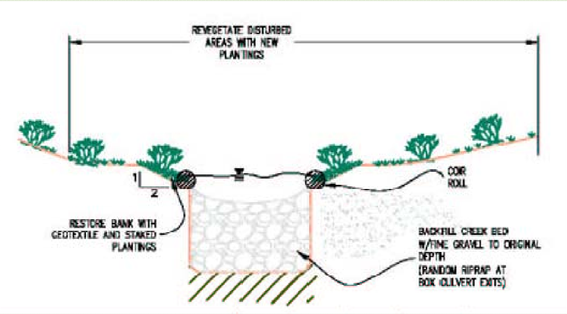
The stream was heavily polluted and contained limited aquatic life. Sediments in various areas of the Newton Creek System were significantly contaminated with a variety of pollutants toxic to aquatic organisms, and supported only an impaired benthic macroinvertebrate community. Pollutants of concern included hydrocarbons, metals, and ammonia. Lead, chromium, and mercury levels were also elevated in the Newton Creek System.

The channel showed little geomorphic complexity, and bed sediments were rarely mobilized, which diminished diversity of aquatic and riparian organisms.

The associated Hog Island Inlet remediation project was the first sediment remediation/restoration project completed under the Great Lakes Legacy Act on Lake Superior .

Site Investigation, Remediation Design and

- Environmental and ecological risk assessment
- Sampling and chemical analysis of sediment, soil, water, suspended sediments, and groundwater
- Biological testing, including macroinvertebrate taxonomy, whole sediment and elutriate toxicity testing
- Hydraulic modeling
- Landscape design
- Public involvement
- Permit coordination; NPDES, wetlands
- Post-remediation report



Project Features

- Cleanup and restoration of 1.5-miles creek and 17-acre embayment of Lake Superior
- Removal of approximately 100,000 tons of contaminated sediments
- Re-vegetation of streambank, water course, and near shore areas with native species
- Pre-dredging rescue of fish, invertebrates, and turtles from Hog Island Inlet
- Ongoing monitoring of contamination removal success

Project Time Frame

- 1999 - 2006

Results

- Dramatic improvements to ecosystem within two years
- Post-project biological assessments have found a net increase in plant and benthic organism diversity
- Sensitive species returned within one year

Underwood Creek Rehabilitation and Flood Management For Milwaukee Metropolitan Sewerage District–Milwaukee, Wis.

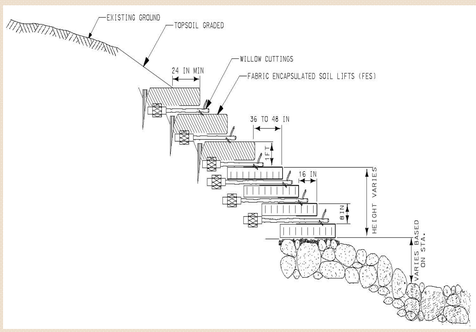
Historical channel alterations to Underwood Creek resulted in increased peak discharges that contributed to significant downstream flooding in the late 1990's. As a result, the MMSD initiated the *Milwaukee County Grounds (MCG) Floodwater Management Facility Project*, which includes an overflow diversion structure on Underwood Creek and an approximately 900 acre-feet floodwater detention facility.
The MCG Project provided an opportunity to rehabilitate approximately 6,600 feet of Underwood Creek watercourse through the removal of concrete channel lining; the development of a replacement bioengineered channel, with riffle and pool sequences; and the reactivation (lowering) and re-vegetation of the adjoining floodplain.

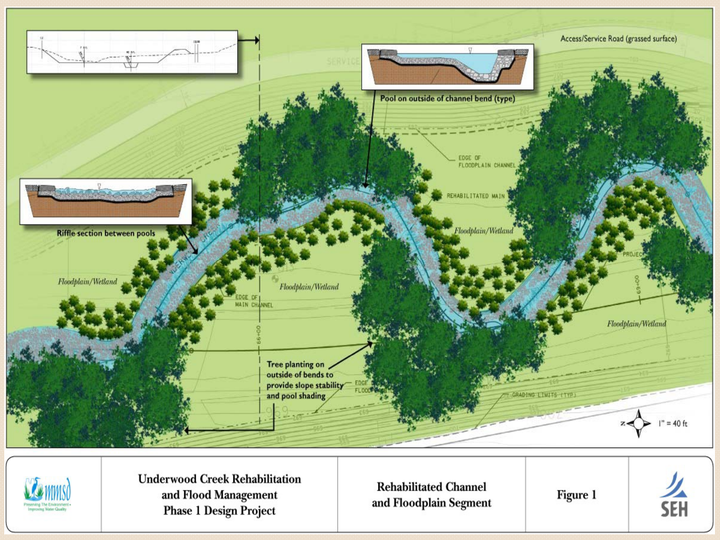
August 2009 Construction Photos

Riffles

Geomorphic and Vegetation Design Features Focused on Flood Management and Riparian Habitat

- Rock lined main channel
- Riffle and pool sequence
- Meandering main channel
- Lowered floodplain
- Bordered by Fabric Encapsulated Soil (FES) lifts
- Vegetated floodplain
- Geocell/FES embankments on steep slopes
- Native vegetation (trees, shrubs, root stock)
- Wetland areas and associated plantings
- Protect Butler's Garter Snake Habitat (threatened species in Wis.)



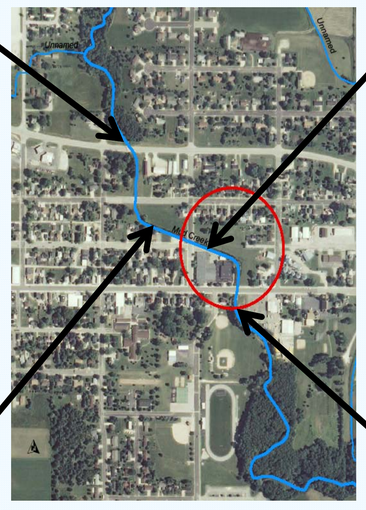


Pre-project Conditions
Underwood Creek is a major tributary of the Menomonee River that underwent considerable alteration in the past, including floodplain filling, channel widening and realignment, and the installation of concrete lining along a significant portion of its length.

Mud Creek Realignment for Reedsville High School–Reedsville, Wis.

Mud Creek is a small creek flowing through Reedsville, Wis. The creek originates in wetlands upstream of the city. At the upstream end of the city, the streambanks of Mud Creek are thick with trees encroaching into the creek, tall grasses and weeds. In contrast to this, the middle of the city near Reedsville High School has been channelized, with a vertical stone wall on the right bank, mowed grass on the left bank and many grasses across the bottom of the channel. The creek makes a right turn around the high school. The stream bottom varies between mud and gravel, boulders and mud with tall grasses across the entire stream bottom. At the downstream end of the city, the streambanks are brush covered.

Project Area

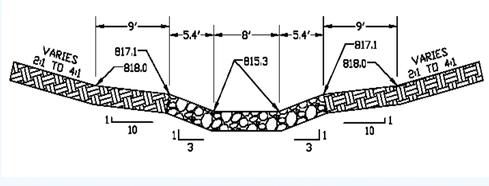


Reedsville High School is planning a building expansion and would like to realign the channel for the expansion, creating meanders for a more natural channel.

Proposed Alignments

Final Alignment

As part of the "naturalization", a floodplain is created and a low flow channel is created inside of a main channel. See the proposed typical channel cross section at right.



Challenges with the project included the limited usable physical space due to the urban setting; short project reach; agency input; public perceptions of the effects of realigning the channel; and client perceptions of what a "natural" stream channel should look like. Construction will take place in Summer 2010.