Taking

Concordia University stabilizes bluff with native grasses

By Clay Frazer

In 2005, Concordia University in Mequon, Wis., undertook one of the most ambitious Lake Michigan bluff stabilization projects ever attempted. The three-year, $12 million project was overseen by a multi-national engineering and design firm and entailed the complete excavation and re-grading of a 20-acre, ½-mile-long section of Lake Michigan shoreline and the associated bluff. The bluff was re-graded from a 3:1 slope to a 2:1 slope. Incorporated into the restoration design were a pedestrian switchback sidewalk and stairway system, a complex storm water drainage system that drains to a perched wetland system at the toe of the slope, coastal wetlands, 2,700 ft of large rip-rap stone, and a submerged rock revetment to help dissipate wave energy at the shoreline. The project won several national and international engineering design awards.

Deep-rooted native grasses and wildflowers were utilized in the vegetation plan to stabilize soils on the slope, increase storm water infiltration rates, reduce overland storm water flow rates, and add visual interest, ecological value and aesthetic appeal to the campus. Following construction, native vegetation did not fully establish in all locations, leading to the establishment (and dominance in some locations) of invasive species. As shallow-rooted clonal invasive species gained a foothold, surface erosion conditions worsened in several locations.

Devising a Plan

In 2012, Concordia University commissioned Eco-Resource Consulting (ERC) to evaluate vegetation and erosion conditions on the bluff, and draft a vegetation management plan (VMP). The primary goal of the VMP was to eradicate shallow-rooted invasive species where they dominated, and replace them with deep-rooted sustainable native plant communities in order to stabilize surface soils and mitigate erosional conditions.

By 2015, invasive species were contained to the point that native grasses and forbs could be supplementally seeded into a 2-acre treatment area within the centrally located switchback sidewalk area. ERC utilized a multi-faceted and adaptive management approach to prepare the treatment area for supplemental seeding with native vegetation. Site preparation methods involved well-timed cutting (to reduce invasive plant propagation and surface plant biomass), custom herbicide regimes, and the use of prescribed fire to reduce remaining plant biomass and re-invigorate remnant native plants from the original restoration.

Application & Results

Due to proximal topsoil loss as a result of dominance by shallow-rooted invasive species, ERC specified the use of Verdyol's Biotic Earth Black as a hydraulic growth medium (HGM). The bluff site's soil organics, mycorrhizae and macro-nutrients were heavily depleted due to the clay sub-soil conditions that existed on the project area after several years of invasive species dominance on steep grades.

The product was applied with a conventional hydroseeder in July 2015. It was combined with a customized native seed mix (along with annual and perennial cool season nurse crops), Verdyol's Scientific soil stabilizer and tackifier, and Milorganite fertilizer. Due to the

The hydraulic growth medium, native seed mix, tackifier and fertilizer were applied hydraulically.

Root

vertical drop distance (nearly 140 ft) the product slurry was applied through several sections of 3-in. hose and a specialized nozzle. A second application of Verdyol's Virgin bonded fiber matrix (BFM) was applied for enhanced erosion control, thermal and moisture containment, and vegetation growth enhancement. The BFM application reduced the watering frequency requirement, thus reducing costs.

Results of the July application were rapidly apparent. Annual nurse crop germination occurred within six days, and 20 days after the application, cool-season native nurse crops (*Elymus* sp.) had bolted to approximately ¾ in. in average height. By September, every native species (approximately 14 species) was visually evident at the seedling stage and had attained an average height of 6 in.

As the 2015 treatment area saw rapid native seedling establishment, the second stage of the restoration involved installation of approximately 20,000 native plants (plugs). Plugs were installed in September, which normally is near the end of the growing season in southern Wisconsin. The Verdyol products extended the growing season by thermally and hydrologically stabilizing soils and maximizing plant growth through increased nutrient and mycorrhizal soil activity. Phase II is planned for 2016 and will entail a similar specification on an adjacent 4-acre treatment area. SWS

Clay Frazer is senior ecologist for Eco-Resource Consulting Inc. Frazer can be reached at cfrazer@eco-resource.net or 608.316.5071.