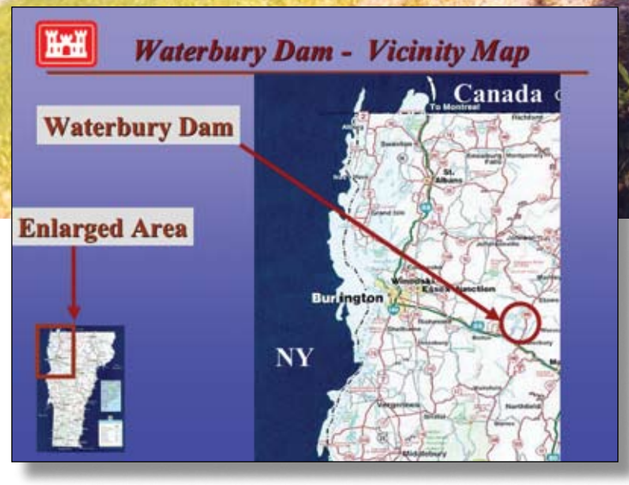
Saving the Shoreline

By JoAnne Castagna, Ed.D.

Corps of Engineers uses innovative methods to help save a popular Vermont recreation area



ABOVE: The nearly finished work to stabilize the shoreline at the Waterbury Recreation Area in Vermont. FACING PAGE: Early work in progress along the shoreline. Various species of vegetation helped stabilize the soil, after serious erosion had taken place due to cycles of lowering the water level behind the dam. See graphic at the right for location. (Photos and graphic by author)

Each year primarily during the summer months, hundreds of visitors, nature enthusiasts, recreation seekers, and local residents make a trek to Vermont's 850-acre Waterbury Reservoir campsite. They make the journey to enjoy the outdoor activities available along the 19-miles of pristine shoreline. They find the popular area to be perfect for camping, fishing, hiking, and water sports. However, during recent years, the sloped banks along the shoreline had become unstable due to erosion and posed a safety hazard. In response to this, the Corps used traditional and innovative engineering techniques to make the banks of the reservoir safer.

The erosion is believed to be due to a number of factors including the drawdown of the reservoir that is performed every winter when the campground closes and wave action from recreational boats impacting the previously exposed shoreline. In 2000 the State of Vermont lowered the reservoir due to safety concerns at the nearby Waterbury Dam and lowered it again in 2002 when the U.S. Army Corps of Engineers began construction work on the dam.

The Corps designed and managed the construction of the 70-year-old dam in 1935 in response to a flooding disaster and since then has periodically modified it. In recent years, the dam has experienced seepage problems and the Corps' New York District, with the assistance of other Corps districts, has been making repairs that are expected to be completed this fall.

To perform these repairs, the reservoir was lowered in 2002 to 520 ft., which is normally at 590 ft., summer pool level. Presently, the water is at 550 ft and will be back to summer pool level when the work is completed. Lowering the reservoir takes pressure off of the dam, reduces dam

seepage and allows for safer construction work to take place. The reservoir's annual lowering and additional lowerings in 2000 and 2002 are believed to be the main contributing factors to the shore's erosion and resulting in the shore's instability.

The sloped banks of the reservoir are vegetated. When the reservoir was lowered it exposed the lower portions of the bank that are not vegetated. This exposed bank causes the soil on the upper part of the bank to erode and uproot vegetation, especially during rainfall. When the vegetation is lost, this leaves upper portions of the bank exposed and subject to erosion.

When the ground is exposed it makes it easy for groundwater to percolate out of the soil and contribute further to the slope's erosion and adding additional soil to the reservoir.

If this runoff continues the campground can loose large portions of land and the water quality of the reservoir and downstream river will be adversely impacted. In addition, the flow of sediment into the reservoir creates turbidity, muddy water, reduces the water's oxygen level and increases the water's temperature, which can harm water habitats.

This summer, the Corps in collaboration with the State of Vermont constructed a shoreline stabilization project for 1,100 feet of reservoir shoreline using both traditional and bioengineering methods.

"Traditional techniques are being used to stabilize the bottom of the slope," said Marty Goff, project engineer, US Army Corps of Engineers, New York District. "This includes using stone, or riprap, on the toe, or the bottom, of the slope. The weight of the stone prevents wave action from moving or removing the stone and prevents scoring or erosion of the toe of the slope." He added, "This part of the slope must remain stable in order for the upper reaches, which were stabilized using bioengineering techniques, to remain in place and function properly."

Bioengineering techniques are a variety of methods that use dormant plant cuttings from woody plants to alleviate soil erosion. The plants are planted in specific arrangements in the soil depending upon the technique. The cuttings come from plants that root easily. The root system of the plants helps to hold the soil together preventing sediment loss.

Only native plants are being used. The toe, or bottom, of the slope will be planted with willow, dogwood and alder species to provide quick rooting. The remaining slope will be planted with a mix of low growing to medium sized shrub species such as bearberry, snowberry, sweet fern and lowbush blueberry. Along the top of the slope the white pine and eastern hemlock are being planted to maintain the aesthetic consistency of the camping area.

"The State of Vermont has been a strong proponent of bioengineering and they encouraged us to use it in this project," said Goff. "The Corps has used bioengineering in the past, but just using grass. This is the first time we used native plants. This is a departure from the more traditional approach, which typically involves steel sheet pile and back-filling," said Goff. "The result is a more natural and sustainable slope."

Combining traditional and bioengineering techniques is beneficial because a stable slope is being achieved without diminishing the natural appearance of the area. The project will not have the "engineered" look of many slope stabilization projects. The environment benefits from combining techniques as well. Planting vegetation along the shoreline provides nesting and foraging habitats for native bird species and for campground visitors it maintains the look and feel of the region.

Presently, the toe stabilization at the bottom of the slopes is completed. Grass seed is now being layed down on the tops of the slopes for immediate slope stabililization. This fall a mix of live cuttings and containers of woody vegetation, such as shrubs and trees, are going to be planted on the slopes for longer term stabilization. Planting in the fall is more conductive to plant survival than planting during the summer. The campground will be closed for the winter and when it reopens in spring 2007 the restored portions of the shoreline will be open to the public.

Goff provides the following suggestions for other engineers performing similar shore stabilization projects:

- Coordinate constantly with your various state agencies to make sure everyone is in agreement with the schedule and project goals so you do not become unnecessarily postponed.
- Consider the "green" approach when trying to stabilize slopes. This bioengineered slope should be as stable as a typically constructed "hard" design.

"A significant thing we've learned from this project is that it is important to always be open to new and innovative ideas even if they deviate from the traditional."

Dr. JoAnne Castagna is a technical writer-editor for the U.S. Army Corps of Engineers, New York District. She can be reached at joanne.castagna@usace.army.mil