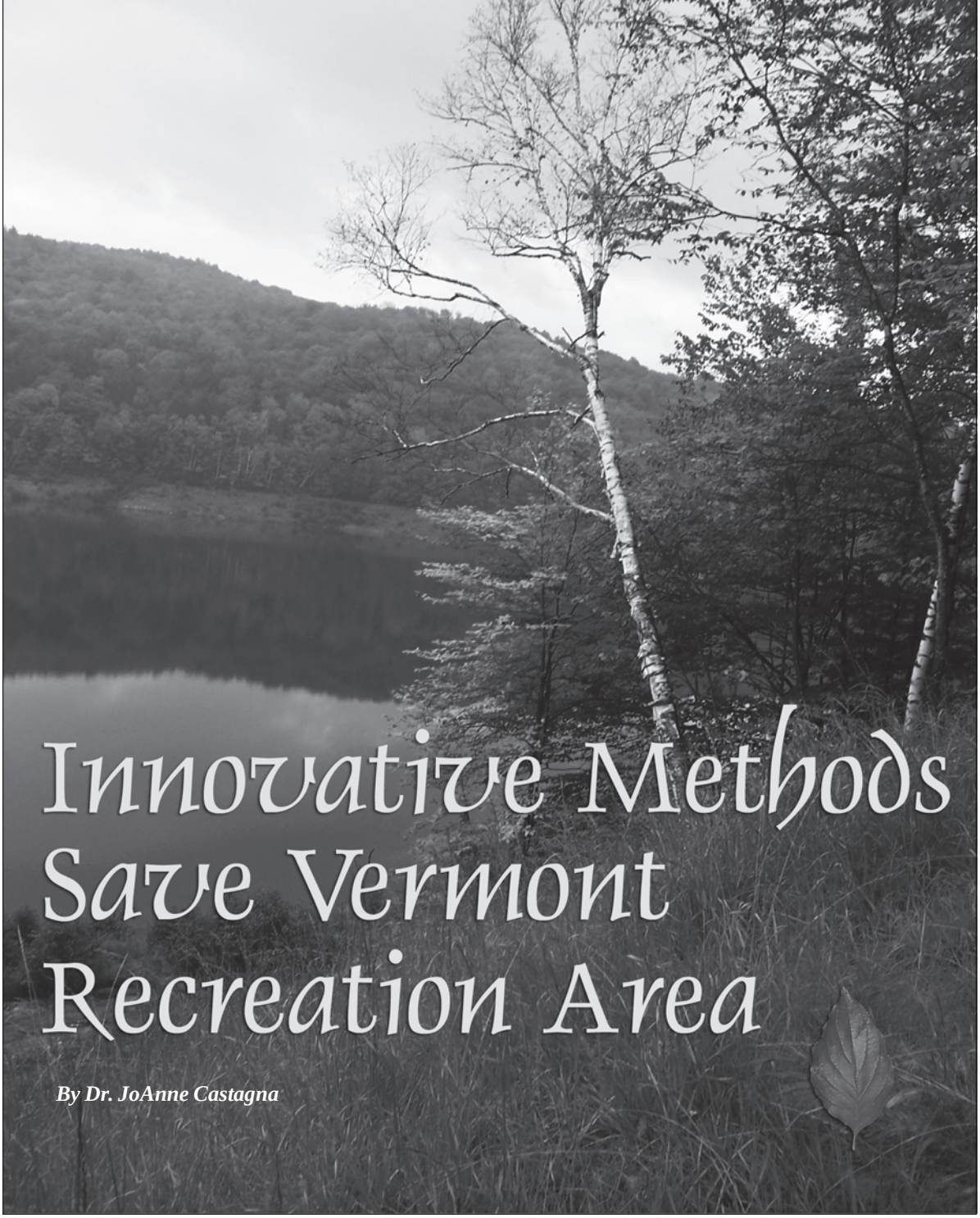


Photo by Jenifer Thalhauser, Planning Division, United States Army Corps of Engineers, New York District

Innovative Methods Save Vermont Recreation Area

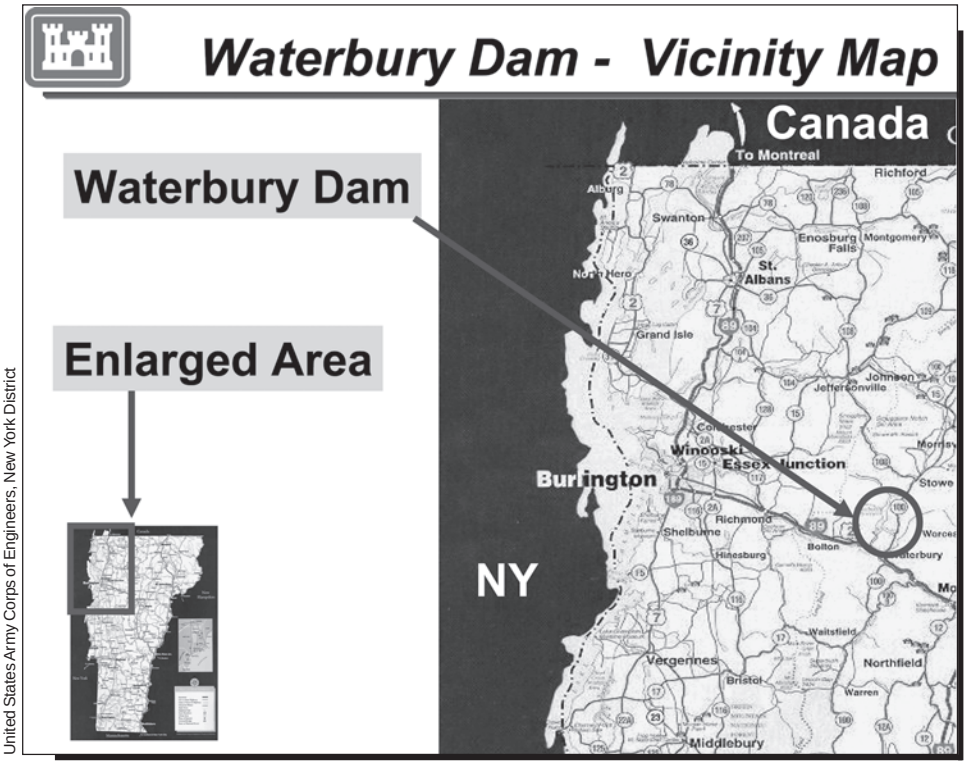
By Dr. JoAnne Castagna

Each year, primarily during the summer months, hundreds of visitors, nature enthusiasts, recreation seekers, and local residents travel to Vermont's 850-acre Waterbury Reservoir campground to enjoy the outdoor activities available along the 19 miles of pristine shoreline. The area is perfect for camping, fishing, hiking, and water sports.

In 1935, the United States Army Corps of Engineers® designed and managed the construction of the dam in response to a flooding disaster and since then has periodically modified it. In recent years, the dam has experienced seepage problems, and the sloped banks along the shoreline became unstable due to erosion.

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 Corps began construction work on the dam. The reservoir was lowered to 520 feet, but the water is currently at 550 feet and will return to summer pool level (590 feet) when the work is completed. Also, the reservoir's water level was lowered each winter when the campground closed.

Lowering the reservoir takes pressure off the dam, reduces seepage, and allows safer conditions for construction work. However, this drawdown and the wave action from recreational boats against the exposed shoreline were contributing factors



Site map for the Waterbury Dam

to the shore's erosion and resulted in its instability. In response to this safety hazard, the Corps's New York District, with the assistance of other Corps districts, used traditional and innovative engineering techniques to make the banks of the reservoir safer.

The sloped banks of the reservoir were vegetated, but when the reservoir was lowered, the lower portions without vegetation were exposed. This caused the soil on the upper part of the bank to erode and uproot vegetation, especially during rainfall. When the vegetation was lost, the upper portions of the bank were also exposed and subject to erosion.

With the ground exposed, groundwater percolated out of the soil—contributing to the slope's erosion—and added additional soil to the reservoir. Allowing this runoff to continue would cause the campground to lose large portions of land and would adversely affect the water quality of the reservoir and downstream river. In addition, the flow of sediment into the reservoir creates turbid, muddy water; reduces the water's oxygen level; and increases the water's temperature, which can harm water habitats.

Photo by Construction Division, United States Army Corps of Engineers, New York District

The slope was regraded prior to placing riprap for stabilization.

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

Traditional techniques, using stone or riprap, stabilized the bottom of the slope. The weight of the stone prevents wave action from moving or removing the stone and prevents scoring or erosion. This part of the slope must remain stable for the upper areas (stabilized using bioengineering techniques) to remain in place and function properly.

Bioengineering techniques use dormant plant cuttings from woody plants that root easily to alleviate soil erosion. Planted in specific arrangements depending on the

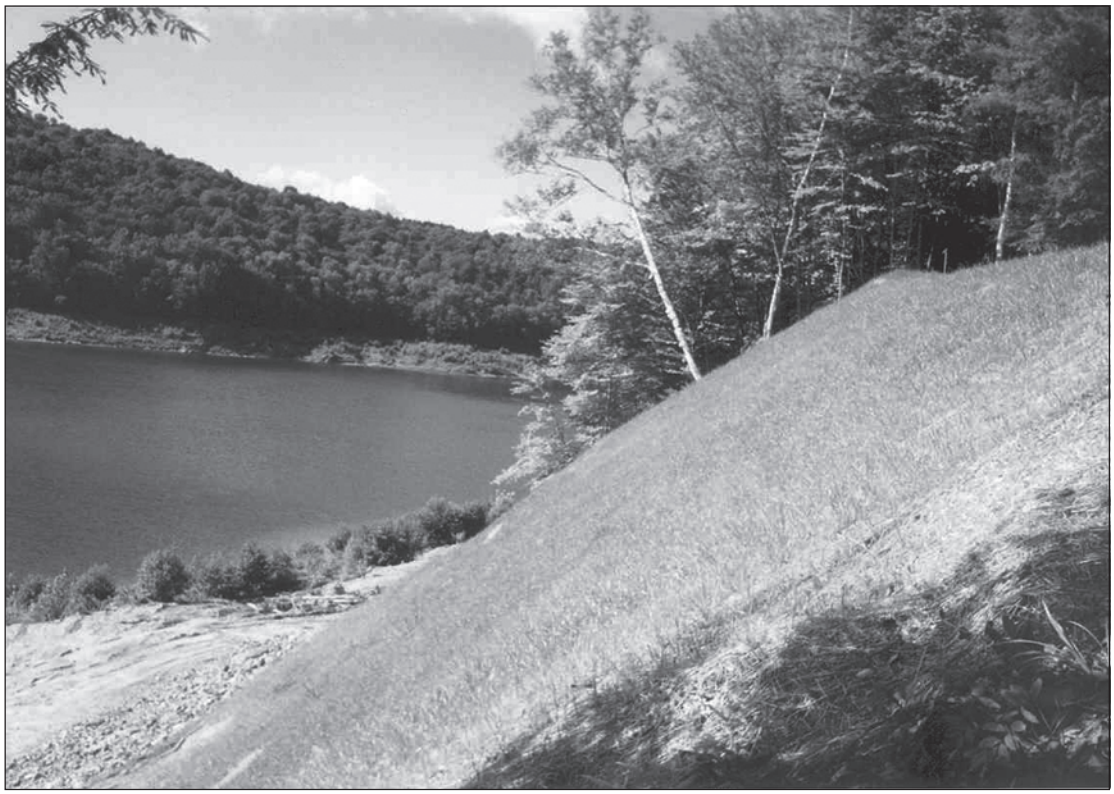


Photo by Marty Goff, United States Corps of Engineers, New York District

Riprap was placed at the bottom of the slope for stabilization, and the regraded slope was covered with grass seeding prior to fall plantings.

technique, the root systems hold the soil together and prevent sediment loss. Only native plants were used for this project. Willow, dogwood, and alder species were planted at the bottom of the slope to provide quick rooting. A mix of low-growing to medium-size shrubs were planted on the rest of the slope.

The State of Vermont is a strong proponent of the bio-engineering technique and encouraged its use. The Corps has used bioengineering in the past, but this was the first time native plants were used. A departure from the more traditional approach—which typically involves steel sheet pile and backfilling—resulted in a more natural and sustainable slope.

Combining traditional and bioengineering techniques is beneficial because a stable slope was achieved without diminishing the area's natural appearance, and it won't have the "engineered" look of many slope stabilization projects. The environment also benefits from combining the two techniques. Planting vegetation along the shoreline provides nesting and foraging habitats for native bird species and maintains the look and feel of the region for campground visitors.

With the stabilization at the bottom of the slopes completed, grass seed was sown at the top of the slopes for immediate slope stabililization. In the fall, a mix of live cuttings and containers of woody vegetation, such as shrubs and trees, were planted on the slopes for long-term stabilization. Planting in the fall is more conducive to plant survival than planting during the summer.

The project manager provided the following suggestions for other engineers performing similar shore stabilization projects:

- Coordinate constantly with various state agencies to make sure everyone agrees with the schedule and project goals to avoid unnecessary delays.
- Consider the "green" approach when trying to stabilize slopes. A bioengineered slope should be as stable as a typically constructed "hard" design.
- Be open to new and innovative ideas, even if they deviate from the traditional.

Although the Waterbury Reservoir campground is closed for the winter, when it reopens in the spring, the restored portions of the shoreline will be open to the public.

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