

# Indiana Department of Natural Resources

## Division of Reclamation, Abandoned Mine Land Program

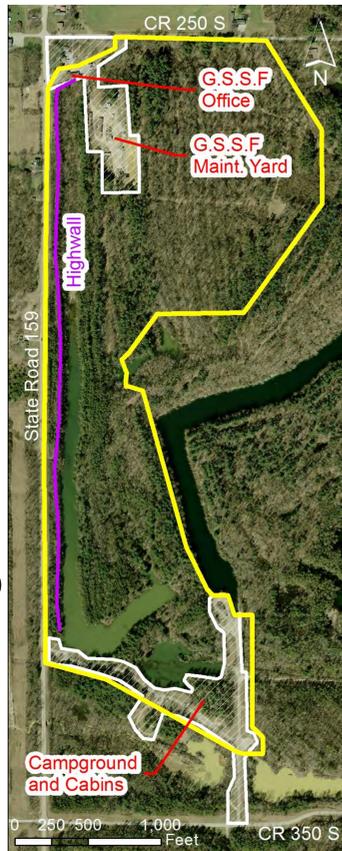


# AML Site 1805, Narrow Lake



### A Significant Safety Hazard To Visitors

A 3,850 linear-foot dangerous highwall was formed during operation of the Sullivan #27 surface mine, which operated between 1944 and 1977 and was located within the current confines of Greene-Sullivan State Forest (GSSF), where it posed a danger to visitors to the site. Furthermore, the northern section of the highwall was immediately adjacent to the GSSF main office where the highwall, which ranged between 10 and 50 feet high, created hazardous working conditions for GSSF employees.

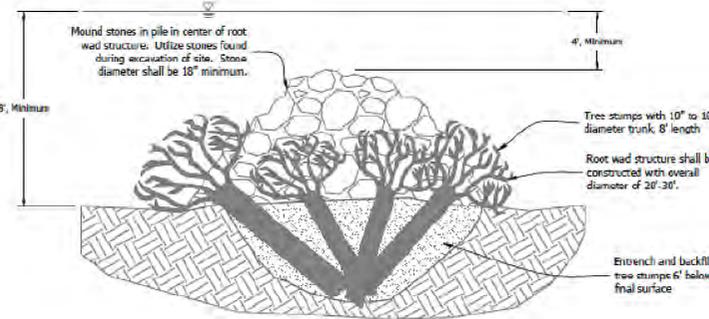


The northern end of the highwall was twenty-five feet away from the headquarters of Greene-Sullivan State Forest.

The Indiana Abandoned Mine Lands Program (Indiana AML) used geomorphic design and standard construction procedures were employed to eliminate the highwall and regrade the area to a safe 4:1 slope that is resistant to excessive erosion. Additionally, the project improved visitor access to Narrow Lake, which was reconfigured and combined with Beaver Dam Lake, another pit lake on the property, and installed fish habitat structures in the lake, thus providing an improved experience for visitors at the site.

### Innovation Through Collaboration

Indiana AML worked closely with the Division of Fish and Wildlife (F&W) in the design and construction of fish habitat structures in the reconfigured Narrow Lake. As a result of the F&W's suggestions, Indiana AML settled on a rosette-style configuration for the fish habitat structures, with root balls of trees arranged in a circle and rip-rap placed in the center to prevent flotation of the root balls. This collaboration continued through the construction



The fish habitat structure design called for several root balls to be arranged in a rosette and held in place with rock placed in the middle of the root balls.

phase, during which F&W staff provided additional recommendations that were implemented by Indiana AML and its contractor, Kerns Excavating. Fish habitat structures were repositioned so that they would be submerged to a depth of four to seven feet as Narrow Lake reached its design pool elevation. Indiana AML also installed additional fish structures, such as rock piles and whole trees, at the suggestion of F&W staff.

### Construction: Unique Considerations and Challenges

Indiana AML's main challenge during construction was to execute a large earth-moving project near existing cabins and other recreational infrastructure, which, with the exception of cabins immediately next to Narrow Lake, remained open to paying visitors throughout the duration of the project. Indiana AML took measures to limit noise and other disturbances to area visitors. For example, water pumps were placed where the noise generated by the pumps was directed away from the cabins.



Part of the construction area was located nearby recreation cabins on the property, which were open to visitors during construction.

Two large rain events during construction posed an additional challenge. The site received six inches of rain on June 12, 2018 and seven inches of rain on September 10, 2018, leading to heavy stormwater discharges from the site on both days. Despite these rain events, all major erosion control structures survived intact with the exception of rill formation at several locations on the site.

Indiana AML realized cost savings during construction by using a stockpile of native sandstone left over from a previous reclamation project nearby. The sandstone was used to line ditches at the site in place of riprap as a cheaper and more aesthetically pleasing alternative.

### Long-Term Improvement

As a result of the project, 3,850 linear feet of dangerous highwall on a heavily accessed parcel of Indiana state property was backfilled, thus eliminating a significant safety hazard for area visitors and GSSF employees. The grading conformed to geomorphic landscape design, which incorporates undulations that mimic natural topography and better withstand erosion over time. In addition, a 6-foot-wide safety ledge, constructed approximately 1.5 feet below Narrow Lake's design pool elevation, was added to the perimeter of the lake to allow visitors a safe means of exit from the water.



A new boat launch was installed at the southeastern end of Narrow Lake as a part of the project.

Furthermore, the project incorporated a number of features that enhanced the recreational amenities located at the site. Indiana AML created level areas at the site where new cabins may be built. A second gravel boat ramp was added to the southeast shore

of the lake to provide improved boat access. Over a mile of walking trails were added to the site, including a 5,000-foot perimeter trail around Narrow Lake and a new 1,650-foot trail spur connecting an existing trail to the GSSF main office. Finally, ten fish habitat structures were added to Narrow Lake, thus improving the lake's fishing opportunities.



Nearly completed lake with installed fish habitat structures.

The project was completed significantly under budget. The original design cost estimate of the project was \$2,208,470.05, the winning bid price from the contractor for this project, Kerns Excavating, was \$1,645,900.00, and the final construction cost was \$1,589,461.60. Therefore, the total cost of the project was \$619,008.45 less than the design cost estimate and \$56,438.40 less than the bid price.



Greene-Sullivan State Forest office after reclamation of the highwall. The sandstone riprap in foreground was salvaged and reused.



Finished Narrow Lake highwall project looking at cabins at the southern end of the site.