

2003 National Abandoned Mine Land Reclamation Award Nomination

Freedom Coal 1 & 3 Reclamation Project

Village of Macksburg
Jefferson Twp., Noble County, Ohio

Submitted on: February 15, 2003

Submitted by: Ohio Department of Natural Resources
Division of Mineral Resources Management
Abandoned Mine Land Program
1855 Fountain Square Court
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Construction dates: Begun July 2000 and completed October 2001.

Project construction cost: \$470,470.00

Reclamation/Oversight by: Ohio Department of Natural Resources
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Mike Sponsler, Chief
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Construction Contractors:
B & N Coal Inc.
Roger Osborn, PE

Natural Stream Channel Consultant:
Kleski Environmental Consulting
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Freedom Coal 1 & 3 Reclamation Project

Background

The Freedom Coal 1 & 3 Reclamation Project is located within the Goose Hollow watershed in Noble County, Jefferson Township, OH. Goose Hollow begins approximately 2.5 miles north of Macksburg, flows through the eastern edge of Macksburg, and empties into West Fork Duck Creek. Prior to mining, the land within the watershed was used for agricultural and timber (woodland and wildlife management) purposes.

From 1953 to 1968, the Meigs Creek #9 coal was underground mined, contour strip-mined and auger mined (*Attachment A*). Approximately 185 acres of the unreclaimed strip mine was responsible for contributing 85% of the sediment and chemical contaminants in Goose Hollow. Freedom Coal 1 & 3 Reclamation Project reclaimed 67.15 acres (*Figure 1*). The remaining acreage was reclaimed under a former project, Freedom Coal 2 completed in 1996, and a reforestation project completed in 1989.

The strip mine addressed by this reclamation project was contour mined. The bench and steep out-slopes of the mine had undergone severe erosion due to the exposed shale, weathered sandstone and coal refuse/mixed spoil composition (*Figure 2*). USDA Natural Resources Conservation Service has estimated approximately 800-900 tons of soil (spoil) loss occurred each year. Bench impoundments or on-site pits (8 total) contained acid mine drainage from unsealed auger holes and other possible underground mines. Acid mine drainage from the unmapped mine complex had damaged road culverts downstream and reduced receiving stream pH levels to 3.5-4.0 eliminating aquatic life.

As a result, the state regulatory agency fielded many complaints from county, township, and village officials regarding sediment-clogged streams, clogged road culverts, road flooding, storm drain problems and acid mine drainage within the Goose Hollow watershed. Three road culverts on Noble CR 27 and culverts on Jefferson TR 505 were completely replaced around 1985 and one was replaced again in 1990. The county had also been forced to clean out roadside ditches along these same roads.

Continued erosion of sediment from the area again filled stream channels and road culverts to cause extensive road flooding along Jefferson TR 505 and CR 27, threatening the health, safety, and general welfare of Macksburg (pop. 295) occupants on the northeast and southeast side the village. The project received a Priority 2 rating and is registered in the national Abandoned Mined Lands Inventory (OH-338).

Reclamation Techniques

The original reclamation project design for Freedom Coal 1 & 3 was completed in late 1997, with a scope of work to include establishing positive drainage by grading slopes from the highwall to the stream or drainage ways and establishing vegetation. However, a major 500-year storm event occurred in the Goose Hollow sub-watershed causing nearly 15 inches of rain to fall in 36 hours over the Noble County area, resulting in the worst flooding conditions in the watershed's history. At least two fatalities and numerous injuries occurred. As a result, the reclamation design was reviewed and changes were made to reduce the flooding frequency, improve water quality and attempt to restore the watershed to a biologically diverse watershed.

To reduce the effects of flooding on the Village of Macksburg, a sand filter dry pond was constructed in a tributary that enters Goose Hollow from the east. This area of the watershed was identified as a source of significant sediment and a peak flow problem from an unreclaimed site not currently funded for reclamation. Working similarly to a wetland but without the plant communities, the sand filter dry pond was constructed to capture sediment and reduce peak discharge until reclamation of the area can be completed.

At the headwaters of Goose Hollow watershed, an existing water impoundment with a significant fish and aquatic wildlife population was weakened after a major storm event in 1998. The idea of draining the pond met with opposition so an alternative plan was implemented. Stabilizing the embankment consisted of placing large rock (type A and B size) on the downstream slope and across the top to maintain access to an existing oil well. The impoundment is not currently a threat to Macksburg or residents along Goose Hollow.

Reclamation included typical reclamation techniques, grading for positive drainage, installing drainage control structures (rock dams for trapping sediment and silt fence), resoiling and establishing vegetation; it also went beyond. Excavation was performed along the highwalls to locate all known auger holes and mine portals, which were then sealed with non-coal pit slurry available on site. Six underground mine openings were also located and sealed using on-site clay material. This construction procedure is particularly noteworthy. Once sealed, the auger holes and mine complex fill with groundwater without oxidation taking place. As a result, acid mine drainage associated with the auger holes and known underground mine openings has been significantly reduced.

To further reduce flooding potential, stream restoration work was completed in Goose Hollow. Clogged road culverts, replaced by the county as recently as 1985, were cleaned out and three to five feet of sediment removed from 1465 lineal feet of stream channel (*Figure 3*). The dredged material was hauled to an area on the project site for burial, as required and approved by the US Army Corp of Engineers Nationwide 27 permit. Extra care was given to protect the riparian vegetation during sediment removal. As a result, most of the trees remained. Success of the operation was published in the local newspaper *The Daily Jeffersonian*, 2001 stating "Silt Removal Brings Road Relief."

Rock-lined channels were used to take the drainage off the bench on all final graded areas. However on Freedom Project Area 1, a change in the drainage patterns after a 1998 storm event and a steep sandstone outcropping created a drainage challenge for the outlet of a rock-lined channel. A natural channel design was incorporated, in lieu of rock channel protection, to carry the concentrated drainage from the reclaimed bench to the receiving stream (*Figure 4*).

B & N Coal contractor employed Kleski Environmental Consulting to find a solution to the steep slope problem. The step pool design included a series of rock-lined steps. These reduce drainage velocities and allowed sediments coming from the reclaimed area to slowly and naturally travel down the steep slope without creating significant erosion and sediment damage to the receiving stream. Following the construction of the step pool system, the surrounding construction area was vegetated using grasses, legumes and tree seedlings to restore it to the pre-construction condition. To date, the step pool system has successfully carried drainage from the project area to the receiving stream without any significant sediment damage.

In Freedom Project Area 3, approximately 1725 feet of the sub-tributary was so severely choked with sediment that no real defined channel existed. The original project plans called for 1200 lineal feet (1800 tons) of straight rock-lined channel to be constructed to direct the drainage

to the receiving stream from the upper reach of the watershed. An additional 525 lineal feet (700 tons) of rock channel was included with the natural channel design, however, the proposed rock drain was expensive and did nothing to improve the eco-system of the sub-tributary.

Kleski Environmental Consulting (subcontractor) proposed to construct a natural stream channel system in place of the typical rock-lined channel. The design was submitted and reviewed by both the contractor and regulatory agency.

For the first time on a reclamation project, the design included the feasibility of constructing a natural stream channel and all of the different channel types required to enhance its function. The design proposed to construct a Rosgen E channel with meanders, a series of Rosgen A & Aa step pool channels, and Rosgen B channel for the sub-tributary drainage channel before it flowed to the receiving stream (*Figure 5a, 5b*).

The step pool system was used on both sides of the hollow to intercept the drainage from steeper portions of the watershed above the project area, and carried the drainage through the mid-reaches of the project area and into the main drainage system in the lower-reaches.

Construction of the natural channel system resulted in a \$10,000 cost savings in materials. Only about 50% of the planned rock was used, which required less limestone to be hauled to the site. The channel lengths remained the same (1725 lineal feet), as did the use of native materials as footer rock in the step pools.

Restoration of the watershed to its pre-mining land use required reforestation of the project area. The reforestation plan was the first of its kind, timed in conjunction with reclamation construction. With construction complete in Fall 2001, tree planting began in Spring 2002.

More than sixty thousand hardwood seedlings were planted on the reclaimed area and consisted of red oak, bald cypress, sweet gum, black oak, butternut, red cedar, green ash, silver maple and many other species. The riparian corridor along the natural stream channel system was planted with 1500 box elder, paw paw, river birch, bald cypress, indigo, silky dogwood and other species of tree seedlings (*Figure 6*).

Tree survival rates have ranged from 60-65 percent. Severe summer drought conditions from late June through late August of 2002 stressed the trees. Review of this first winter season survival rate will be conducted in the spring and throughout the summer and fall seasons.

Conclusion

Flooding of Jefferson Township Road 505 in Macksburg occurred almost as frequently as it rained. Goose Hollow was choked with sediments from the eroding mine spoil and road culverts could barely handle low seasonal flows, even after replacement in 1985. State and federal officials agreed that this mining related problem area was a significant threat to public health and safety of local residents. Main project objectives were reclamation of the sediment sources and the reduction in flooding frequency.

The successful combination of flood control methods used included stream restoration to remove sediments, with minimal disturbance to existing riparian vegetation; un-clogging the road culverts in sequence with the reclamation; and construction of a flow and sediment retention structure (sand filter dry pond) in a tributary known to contribute sediment from an unreclaimed site. The site has been monitored for a full year via the Mayor's Office; no flooding complaints have been received.

The Ohio Environmental Protection Agency determined that certain portions of Duck Creek have not yet obtained Warm Water Habitat (WWH) status due to significant impacts to the stream from the past mining practices in Goose Hollow watershed, a tributary of Duck Creek (West Fork).

Freedom Coal 1 and 3 Reclamation Project will significantly and positively impact Duck Creek in obtaining WWH status in the future. The innovative construction and restoration methods used include the restoration of the upper reaches of the watershed by reclaiming the acid producing spoils, plugging of auger holes and underground mine openings, construction of a natural stream system including step pools to help aid aquatic habitat development, and re-establishing a forest canopy along the riparian corridor in the upper reaches and on the out-slopes and borrow areas of the project area.

Similar objectives to those of Freedom Coal 1 & 3 Reclamation Project continue to be a priority throughout the Goose Hollow watershed. Progress to restore the watershed to pre-mining conditions will be monitored as additional reclamation efforts continue on un-reclaimed sites identified as detrimental to the progress of meeting WWH status.

Photo Captions to Accompany Map and Photos

Attachment A. Mining History for Freedom Coal 1 & 3 Reclamation Project

<i>Surface-Mining License #</i>	<i>Mining Company</i>	<i>Date Issued</i>	<i>Date Released</i>
1943	Electro-Metallurgy Company	12/15/53	07/13/56
2906	Ohio Auger Company	03/29/57	07/08/60
3154	Ohio Auger Company	03/29/58	07/17/61
3392	Peaker Run Company	03/15/59	07/08/64
3658	Peaker Run Company	03/15/60	08/06/62
3919	Peaker Run Company	03/15/61	07/08/64
3939	C & C Coal Company	04/13/61	09/02/69
4183	C & C Coal Company	04/13/62	05/28/71
4788	Marietta Coal Company	11/09/64	04/18/66
5027	Marietta Coal Company	01/09/67	10/02/68

Figure 1. Map showing project area of Freedom Coal 1 & 3 Reclamation Project, Macksburg Quad.

Blue squares = Natural stream channel system
Black squares = Known auger holes & drift mine openings
Red line = Project work limits

Figure 2 ‘Cover Shot’. Prior to reclamation, steep slopes and eroding sandy soils typical throughout the project site produced severe sediment and acid mine drainage problems. After reclamation the sediment sources, flooding frequency and acid drainage were significantly reduced.

Figure 3. Road culverts, replaced in 1985 by the county on Jefferson TR 505, as seen before and after the implementation of successful flood control methods.

Figure 4. Construction of a natural channel step pool drainage system successfully carries drainage down a steep transition from the end of a rock drain to the receiving stream from the Freedom Coal 1 project area.

Figure 5a & 5b. (Figure 5a) View of natural channel design (Rosgen E type channel) on Freedom Coal 3 main channel looking east; (Figure 5b) Natural channel design (Rosgen E type channel and step pool) on Freedom Coal 3 project area created pooled areas of drainage to help aid aquatic habitat development.

Figure 6. Black locust (*Robinia pseudoacacia*) seedling planted in spring 2002, one of more than 60,000 hardwood seedlings.