

**Indiana Department of Natural Resources
Division of Reclamation**

Submits

**AML Site 380
Lowland Western
Pike County, Indiana**

for the

2005 Abandoned Mine Land Reclamation Award

Submitted By

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Project Information

Construction Start Date: May 17, 2004
Majority of Construction Completed by: November 8, 2004
Expended on FY2002 AML Grant
Construction Costs of \$344,024.82

Organizations Responsible for the Reclamation

Indiana Department of Natural Resources
Division of Reclamation - Design/Project Management
Division of Fish and Wildlife - Landowner
Jerry Aigner Construction Inc. - Contractor

Date Submitted

March 17, 2005

Introduction

Today, the Indiana Sugar Ridge Fish and Wildlife Area, which is made up of six separate areas, consists of over 8000 acres of mostly old strip mined land and provides tremendous recreational opportunities for Hoosiers and other visitors to our State. Much of this area was leased from Amax Coal Company from 1964 to 1980 when most of the land was donated to the Division of Fish and Wildlife. Sugar Ridge now offers nearly 100 pits and lakes, some with trout, and thousands of acres of forested spoils that provide prime opportunities for hunting, fishing, trapping, and wildlife watching. Both the State endangered Bobcat and River Otter make their home in the woods and waters of this property. Unfortunately, as was often the case, parts of this property contained the scars of past coal mining activities including barren coal refuse and acid mine drainage. It is the reclamation activities at AML Site 380, within Sugar Ridge Area 1, that are being nominated for this award.

The intent of this project was to address the exposed, acid producing refuse that was not only very unsightly on this public property, but was also adversely affecting off-site drainage, and to create wildlife habitat where it had been extremely degraded. The work generally consisted of consolidating and burying the coal refuse in a designated area, the development of wetlands and revegetation.

Background

This site is located near Winslow, Indiana in Pike County, Patoka Township at T1S, R8W, Sections 25, 26, 35 and 36 on the Petersburg, IN Quadrangle. The problems at this site were the result of the operations of an old tipple site, rail load out and coal refuse area that occurred in 1939 and 1940 by an unknown operator. The negative aspects of these operations resulted in approximately 19 acres of mostly barren coal refuse and two acres of pit bottoms that produced off-site drainage with an average pH of around 3 and elevated heavy metal concentrations.

As the landowner and sister agency, the Indiana Division of Fish and Wildlife was very supportive of the proposed reclamation activities at this site. This project will actually be the third reclamation project undertaken on the Sugar Ridge Fish and Wildlife Area, two other projects being completed in 1994 and 2002. The property managers at Sugar Ridge were very cooperative and appreciative of the work accomplished by the AML

Program, as we are able to take these highly degraded and unsightly areas and transform them into highly productive wildlife habitat in a very short order. This allows them to provide a much higher quality experience to visitors of this popular property. With the completion of this project, there is only one more major reclamation project within Sugar Ridge, and that is slated for construction in 2006.

As an example of the cooperation we enjoyed from the Sugar Ridge property managers, we were able to produce a better reclamation project while creating additional highly valuable wildlife habitat. During the early design phase, it was discovered that there was only limited available borrow material to cover the exposed coal refuse at this site. This would force us to directly revegetate much of the area, compromising the acid mine drainage remediation process. However, when approached, Sugar Ridge was more than willing to offer an adjacent undisturbed, fallow field to be used as a source of high quality borrow material. In return we would not dig a typical, deep, straight-sided, borrow pit that offers limited wildlife value, but instead, create a highly variable, shallow water wetland complete with adjustable water control structure and native vegetation. This collaborative effort resulted in a much higher quality reclamation project.

Reclamation Objectives and Activity

The objectives of this reclamation project included reducing the adverse off-site contamination caused by the barren coal refuse and acidic pit bottoms, improving the aesthetic value of the area and creating valuable wildlife habitat.

Reclamation consisted primarily of consolidating and burying the coal refuse in a designated area, redirecting drainage through constructed channels, covering barren pit bottoms, cleaning up trash and concrete foundations, building both a passive treatment wetland and a wildlife wetland and revegetating all disturbed areas.

All the coal refuse that was scattered throughout this site was gathered up and consolidated into the refuse disposal area. The refuse was heavily limed and then covered with two feet of high quality clay in an effort to encapsulate the acid forming material and reduce, if not eliminate, the production of acid mine drainage. This part of the site was shaped so that drainage will flow off of this area and into designated channels, reducing sedimentation as well as recharge of the acid forming materials down below.

As a final attempt to improve water quality, a small passive treatment wetland was developed in the main drainage channel just prior to where it leaves the site.

A major part of this project was the excavation of cover material from the borrow area and the subsequent development of the wildlife wetland. The fallow field where the borrow area was developed consisted of a very heavy, very deep clay soil. This heavy clay was an ideal cover material, as it would form a barrier to water infiltration into the coal refuse. However, excavation of this material proved to be extremely difficult. Not only was this a naturally low lying field, but an unusually wet spring and summer season only exacerbated the situation.

The contractor originally attempted to excavate the borrow using scrapers, but this was mostly unsuccessful because the wet clay soil would “plow” out in front of the machinery, making excavation nearly impossible. The method that proved most successful was using large excavators and trucks, however, this required a major revision of the contractor’s equipment. With a little ingenuity and a lot of persistence, he was finally able to excavate the required yardage and shape the final contours.

In addition to the two wetland areas, where practical, several drainage channels were developed using an alternative design to promote wildlife habitat while still providing drainage. Typically, a flat-bottom, riprap lined channel is used to convey water through the channel as quickly as possible, with minimal sedimentation. In areas of shallower slopes and/or less flow, a parabolic, grass-lined channel is often used, but is still designed not to impound any standing water. The alternative channels used at this site were typically shaped but left rough graded to purposely create small puddles of water within the channel. These areas were then seeded with a “wet meadow” seed mix specifically designed for these occasionally wet areas. These small “vernal pools”, sometimes only a few square feet in size, provide vital habitat for numerous wildlife species including reptiles, amphibians and even birds such as the American Woodcock. This is just another prime example of a creative reclamation technique that accomplishes the goals of the AML Program while taking environmental restoration to the next level.

And finally, the entire site was finish graded, fertilized, seeded and mulched to establish a permanent vegetative cover crop as quickly as possible. Special attention was paid to the wetland edges, as these were hand seeded with native wetland species. A true, self-sustaining wetland ecosystem is

not possible without the appropriate vegetation. The wetlands at this site will not only provide wildlife habitat that will be enjoyed by the visiting public, but will also provide passive treatment for any persistent acid mine drainage that may occur.

Post Reclamation Land Use

This site once consisted of scattered areas of barren and unsightly coal refuse that produced acid mine drainage (pH 3) that flowed off-site. And this site existed right in the middle of a public fish and wildlife area being visited by thousands of people every year. Today, these areas have been graded, covered with soil and revegetated. Two wetland areas have been developed as well as several areas of vernal pools. All of this fits in quite nicely with the current land use of the public fish and wildlife area. The former barren areas, now well vegetated, will be used by many species including rabbits, deer, turkey and bobwhite quail. The wetland areas have already attracted large numbers of waterfowl, and will also be utilized by many other mammals, reptiles, birds and amphibians. And the public will enjoy all of this while fishing, hunting or wildlife watching. Not only has an abandoned mine land area been restored to a productive land use with improved water quality, but a public area has been greatly enhanced by this project.

Summary and Conclusions

Prior to reclamation, the barren refuse and acid mine drainage at this site were not only extremely unsightly to users of this public property, but were also terribly detrimental to the fish and wildlife resources that were trying to be managed there. Today, an environmentally damaged area has been restored and the public has benefited. The cooperative efforts of the Indiana Department of Natural Resources, Divisions of Reclamation and Fish and Wildlife have proven to be very successful.

Photo Captions

Attached is a graph and five photos showing portions of the site before and after reclamation depicting the dramatic differences and overall success of this reclamation project.

Photo 1: This graph shows the immediate water quality improvement in pH following reclamation. The sample point is located at the outfall of the passive treatment wetland, just prior to where it enters the receiving stream.

Photo 2: This shot shows one portion of the main refuse area, obviously before reclamation, showing the barren coal refuse surrounded by well vegetated spoils.

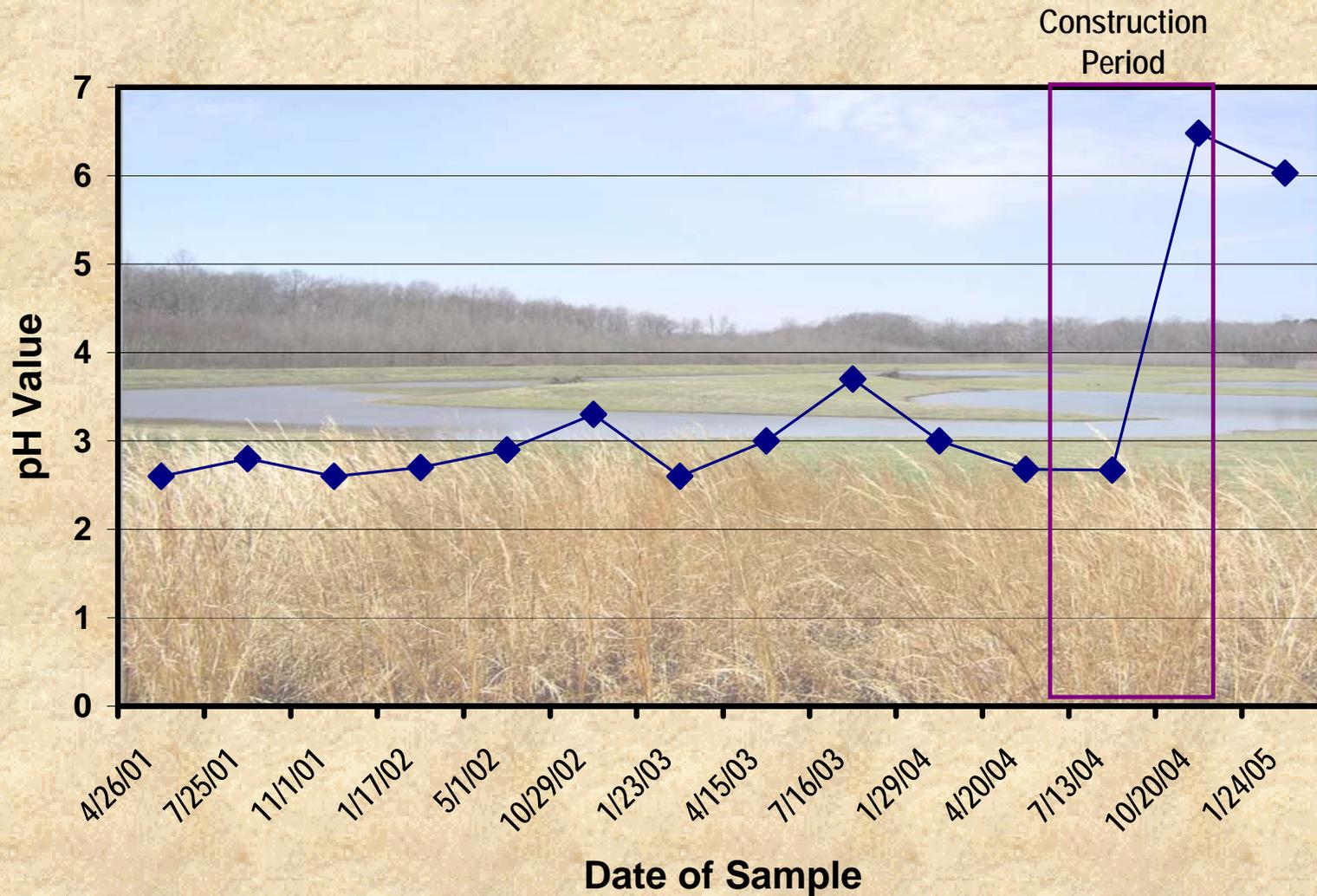
Photo 3: Here the contractor is removing the coal refuse with the long-reach excavator while the bulldozer is spreading cover material on an adjacent area. Cover Photo.

Photo 4: Here is an example of one of the alternative design drainage channels with standing water in “vernal pools” within the shallow channel itself.

Photo 5: This is a view of the first two cells of the passive treatment wetland clearly showing, even at the very initial stages of development, water quality improvement from the first cell on the left to the second on the right. Two additional cells are just to the right of this photo.

Photo 6: This final shot shows a portion of the wildlife wetland shortly after revegetation and depicts the sinuous design of the wetland cells.

Site 380 pH





Site 380 Photo No. 2



Site 380 Photo No. 3



Site 380 Photo No. 4



Site 380 Photo No. 5



Site 380 Photo No. 6