SAFEGUARDING

RECLAIMING

RESTORING

NATIONAL ASSOCIATION OF ABANDONED MINE LAND PROGRAMS

Burning Coal Refuse, Indiana



Abandoned Mine Landslide, Kentucky



ATV Accident in Mine Opening, Pennsylvania



INTRODUCTION

The National Association of Abandoned Mine Land Programs (NAAMLP) produced this report with support from the federal Office of Surface Mining Reclamation and Enforcement. The NAAMLP represents 31 State and Tribal AML Programs that reclaim abandoned mine sites to protect the public's health and safety.

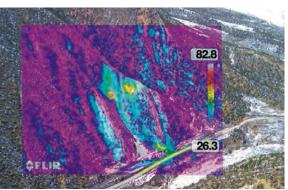
The Surface Mining Control and Reclamation Act (SMCRA) of 1977 established national standards for coal mining and requirements for reclamation of active mine sites. Additionally, Title IV created the Abandoned Mine Land (AML) Program to reclaim mined areas that meet a legal definition of "abandonment" (no party with continuing reclamation responsibility for mine sites left inactive or abandoned prior to 1977) and that pose significant health, safety, and environmental problems to the public. SMCRA requires all active coal mine operators to pay a reclamation fee on each ton of coal mined which is used to fund the AML program.

Since the enactment of the SMCRA in 1977, the AML program has reclaimed thousands of dangerous sites left by abandoned coal mines, resulting in increased safety for millions of Americans. Specifically, more than 350,000 acres of high priority abandoned coal mine sites have been reclaimed through \$6.2 billion in grants to State and Tribal AML programs under SMCRA. This means hazards associated with more than 19,500 open mine portals, over 725 miles of dangerous highwalls, and 26,000 acres of dangerous piles and embankments have been eliminated and the land reclaimed. Despite these impressive accomplishments, \$4 billion of high priority problems still threaten the public health and safety and remain unreclaimed. These hazardous sites require safeguarding by the State and Tribal AML programs.

The AML program has built an impressive coalition of partners dedicated to abandoned mine reclamation and restoration. Through the cooperation of private land owners, industry representatives, federal agencies, local officials and watershed groups, thousands of additional acres of abandoned mined land have been transformed into productive uses such as: farmland, pasture, open space, wildlife habitat and recreational areas. This report looks at abandoned mine reclamation accomplishments nationwide.

The landmark SMCRA legislation afforded most states and tribes their first opportunities to begin addressing the most severe problems left from the days of poorly regulated mining. AML program benefits also include the creation of thousands of jobs, often in economically depressed areas. Every \$1 million in grant funding expended translates into an estimated 40 jobs in areas such as construction, labor, equipment and other services.

SAFEGUARDING





GRASS VALLEY MINE FIRE ABATEMENT PROJECT, COLORADO

In 2009, the Colorado Division of Reclamation received citizen complaints about smoke and fumes from the Sunny Ridge coal mine located near the town of Silt. Following a temporary emergency surface-sealing project, the mine fire was controlled by drilling and grouting. The two collapsed mine entries were grouted, then additional borings were drilled and cased into the mine workings between the two entries. Thirty thousand gallons of fire-fighting foam and 895 cubic yards of cement were injected into the mine voids. The fire was quenched and cooled and no combustion is occurring. Construction began in May 2010 and was completed by August, 2010 with a total cost of \$560,945.00.

INTERSTATE 72 BRIDGE SUBSIDENCE STABILIZATION, ILLINOIS

This project prevented the collapse of the Interstate 72 Sangamon River Bridge just east of Springfield, Illinois. The Department of Transportation (IDOT) discovered the bridge was beginning to settle due to coal mine subsidence and determined that it would likely collapse if ground movements were allowed to continue. In March 2011, the Department of Natural Resources' Abandoned Mined Lands Division implemented an emergency mine stabilization program that stopped ground settlement by drilling and pumping concrete grout into the mine voids. Concurrently, IDOT strengthened critical bridge elements and conducted frequent inspections. By pooling expertise and resources, this project demonstrated that grouting can be used to stop active coal mine subsidence.





AML ENVIRONMENTAL STABILIZATION PROJECT, NAVAJO NATION

For years, environmental concerns focused on ground water contamination due to buried mine waste at reclaimed AML project areas since the material has low level radiation of 25 to 100 picocuries per gram. Radiation comes from Uranium, Thorium, Radium or other heavy metals. Theoretically these metals are mobile in the presence of water and air. The Navajo AML program designed a containment cell similar to RCRA Part C landfill with an evaporation cap. This landfill has a leachate collection system to monitor migration of fluids. In partnership with Lawrence Livermore National Laboratories from San Francisco, a weather monitoring device was installed in March 2013 to monitor moisture characterizations taken at various depths.









SILVER CITY HARD ROCK MINE RECLAMATION PROJECT, UTAH

The Silver City Project is near the town of Eureka. Nearly 20 million tons of silver, gold, copper, zinc and lead ore worth over \$3 billion in 2006 dollars were mined from 1877 until the last mine closed in 2002. In 1910, Eureka was a center of mining activity and the ninth largest city in Utah. The many abandoned mines addressed by this project were a destination for history buffs, rock hounds and thrill seekers who raced off-road-vehicles through the hillsides pocked with 1,000 foot deep mine shafts, steep unstable mine dumps and open mine portals. Completed in 2011, 39 portals and 158 shafts were safeguarded at a cost of \$439,566.

SAFEGUARDING

HORSETHIEF ROAD SUBSIDENCE, MONTANA

The abandoned Republic #3 Mine is located on the edge of Roundup, Montana. Since 1982 Montana's AML program has responded to surface collapse and other AML issues related to this mine. In 2012, Montana's AML program was alerted to sinkholes and subsidence issues developing where Horsethief Road, a local school bus route with a traffic volume of 1,700 vehicles a day, passes over the mined area. With the road closed, drilling confirmed caving had advanced to within 6 feet of the road surface leaving voids of up to 25 feet deep under the road. A pressurized grouting program was developed and bid to stabilize 1,000 feet of road surface.









UNDERGROUND MINE SUBSIDENCE, NORTH DAKOTA

Collapsing underground coal mines are a public hazard in many areas across western North Dakota. The first photo shows a mine collapse which suddenly occurred in 2001 beneath a tractor parked in a farm building north of Beulah. An AML emergency project was conducted at that time to remove the tractor and fill the sinkhole.

The second photo shows pumping of cementitious grout into underground mine workings in 2012 along a public highway that is near to the location of the first photo. The grout is pumped through cased drill holes and into underground mine voids to stabilize the area and protect the public from catastrophic mine collapse.





LOGE ELEMENTARY GROUTING, INDIANA

Loge Elementary School in Boonville, Indiana was built on an area of undocumented underground mining. The Indiana AML Program completed five separate Emergency Reclamation Projects on school property from 1995 to 2009. Due to the safety hazards posed by recurring mine subsidence, the AML program conducted a grouting and stabilization project at the school. In the summer of 2011, over 11,000 cubic yards of a concrete grout mixture was pumped into the underground mine void via 850 drill holes. Filling the void should prevent collapse of the mine roof, protecting school facilities, staff, and the 450 children enrolled annually.

JORDAN STREET LANDSLIDE, KENTUCKY

The steep hillside located above Jordan Street in the community of Hazard, Kentucky had been gradually sliding for several years. Residents living in the area were concerned for their families' safety and frustrated with property damage, including mine drainage flowing down the hillside causing the earth to slide and property to become unstable. Large cracks also formed in the foundation of the primary residence from ground movement caused by the mine drainage.

AML reclamation to abate these mine-related problems included construction of reinforced concrete and gabion retaining walls and associated drainage controls behind and around the primary residence and the adjacent properties.





RECLAIMING





HIGHWAY 400 DANGEROUS HIGHWALL, KANSAS

The Highway 400 Project addressed approximately 2,800 linear feet of Priority 2 dangerous highwall situated along U.S. Highway 400 on the Cherokee and Crawford County line in southeast Kansas just east of the town of Cherokee. This section of Highway 400 has a traffic count of over 5,000 vehicles per day. The backfilling and grading of the dangerous highwall was completed in 2010 with mitigation for wetland disturbances being done on adjacent property owned and managed by the Kansas Department of Wildlife, Parks and Tourism. Much of the water resource was able to be replaced as shown in the before and after photos.

SICKENIUS URANIUM MINE RECLAMATION PROJECT, TEXAS

The Sickenius Abandoned Mine Land (AML) Project is 50 miles southeast of San Antonio, Texas. The abandoned mine consisted of a hazardous water body (35 feet deep), 3,830 linear feet of highwall, (60 feet high) and 21 acres of radioactive spoil (0 to 350 µR/hr above radiation background levels). Grading was completed in 3 phases from February 2008 to August 2011, moving 807,117 cubic yards of spoil and highwall. The site is stabilized as of March 2013. The reclaimed 34-acre site contains slopes of 14% and radiation readings below 30 µR/hr. Total reclamation contract cost was \$2,049,210.29.





SHOOTERS HILL SHAFTS, VIRGINIA

Unfamiliarity with abandoned mines greatly increases dangers posed to citizens. In the Richmond, Virginia coalfield, citizens are largely unaware of mining from the 1800s. The Shooters Hill Shafts in Goochland County were extremely hazardous vertical openings. The project consisted of filling two vertical openings, one of which measured approximately 125 feet deep. During construction, Department of Mines, Minerals and Energy personnel rescued a box turtle and leopard frog that had fallen into one of the shafts. It will never be known what went unrescued over the past 150 years.

Reclamation was completed in December 2011 at a cost of \$67,327.28. This project serves as a model for other mine hazards in the Richmond coalfield.









DEANS FERRY ROAD DANGEROUS HIGHWALL, ALABAMA

This Blount County project site is located south of Hayden, Alabama, in a rapid population growth area of the Birmingham-Hoover MSA. The project included a dangerous highwall which was 30 feet in height and parallel to Deans Ferry Road and was dangerously close for 2,100 linear feet. Reclamation of the Priority 2 highwall included 20 acres of previously unreclaimed spoil which was well visited by locals for recreation and hunting. Drainage from this eroding spoil entered an unnamed tributary of the Warrior River. The contractor completed the project on November 12, 2010, at a cost of \$163,945.00, 2% under budget.

RECLAIMING

WESTERCAMP RECLAMATION PROJECT, IOWA

The Westercamp Reclamation Project addressed 88 acres of priority features including dangerous highwalls, acid mine drainage and clogged stream channels requiring the mitigation of thirteen separate water bodies. Located in the Muchakinock Creek Watershed, the Westercamp Project required two separate earthwork contracts with funding also provided by the Watershed Cooperative Agreement Program, in-kind services from the local watershed group and ten other conservation partners. Working around a high voltage transmission line that bisected the work zone helped bring community resources together, ensuring project completion success. This partnership approach to reclamation has been the template used to take on over twenty-five other projects in the State of Iowa.







NORTH JONES SHAFT, ALASKA

This Priority I shaft was discovered in a historic mining district located 15 miles northwest of Palmer, Alaska. The surrounding area is visited by approximately 50,000 recreational users per year. Popular activities include hunting, fishing, mountain biking, hiking, and ATV riding. The shaft was closed with a combination of large boulder backfill, concrete and rebar. The site was completed in June, 2010 and continues to be stable today.







HIGHLAND HIGHWALL, MISSOURI

This project is located one mile southwest of Calhoun in Henry County. The 84-acre site was mined prior to 1974 and reclaimed to existing Missouri coal law standards, leaving a highwall along the county road. This project reclaimed mine spoils, dangerous piles and embankments, 3,600 feet of dangerous highwall and a hazardous water body. Reclamation eliminated the dangerous highwall and the hazardous water body by filling with spoil material. The spoils were graded and shaped to match the surrounding terrain, lime and fertilizer was incorporated, and the site was seeded with cool season grass and legumes. Project was completed on May 2, 2012.

61ST STREET NORTH SW RECLAMATION PROJECT, OKLAHOMA

This Priority 2 project is located in the city limits of Broken Arrow, Oklahoma. Work began on May 21, 2008, and the final inspection was on June 16, 2009. A total of 395,240 cubic yards of mine spoil was used to reclaim 50 acres. Approximately 2,000 feet of dangerous highwall and one hazardous water body were eliminated at a total cost of \$599,911.70. Over 4 acres of new wetlands were added with several different wetland species. A permanent vegetative cover was planted and students from Oklahoma State University Chapter of the Society of American Foresters, working with the State Forestry Department, planted 2,000 bare-root trees at the site.





RESTORING





The Brilliant No. 2 Mine on Vermejo Park Ranch produced coking coal for steel production between 1918 and 1953. Using geomorphic designs that mimic the shapes of natural hills and channels, this project restored meandering stream segments to 2,600 feet of previously straightened creek, mitigated 140 foot high steep and eroding dangerous piles and embankments, removed mine wastes from the creek, and closed the mine portal with a steel bat gate. These measures, completed in September 2012, have made the site safe for visitors and hunters and improved water quality and other environmental conditions, while avoiding high-voltage power lines and numerous historic ruins.



COLE CREEK RECLAMATION PROJECT, ARKANSAS

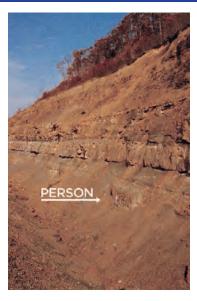
The 67-acre Cole Creek Project, located near Hunt, Arkansas was mined during the 1960s. The project cost \$1,202,404 and consisted of utilizing natural stream design methods to reconstruct 0.8 miles of the clogged channel of Cole Creek, eliminating 1,700 feet of dangerous highwall, ten acres of dangerous piles and embankments and three hazardous water bodies. According to AMLIS (Abandoned Mine Land Inventory System), 186 people are no longer at risk; however, this figure would not reflect the number of visitors that passed by the project area while traveling to a public lake 1.5 miles northwest. The project was completed in April of 2012.





HOOVERHURST SOUTHEAST DANGEROUS HIGHWALL, PENNSYLVANIA

This 57-acre abandoned mine reclamation project is located in Montgomery Township, Indiana County, Pennsylvania. Completed in June 2012, the reclamation included backfilling 4,500 linear feet of Priority 2 dangerous highwall with over 1.2 million cubic yards of spoil material. The highwall was as high as 160 feet in some areas, and the mine site was extensively used by ATV riders. The reclamation project eliminated highwalls, pits, and steep spoil slopes by regrading the site to pre-mining conditions creating gently sloping topography. The reclaimed site was stabilized with a grass/legume seed mix suitable for abandoned mine sites.







BELLVIEW RECLAMATION PROJECT, TENNESSEE

This site near Spencer included over 3,500 feet of highwall and 11 water-filled pits. Pre-law mining destroyed 650 feet of stream that ran through the property and led to flooding of a neighboring farm. Of greatest concern was 2,000 feet of dangerous highwall which bordered residences, farms and Bellview Methodist Church.



Reclamation included treating and eliminating 15 million gallons of acidic water and grading 225,000 cubic yards of spoil material to backfill the pits and highwalls. Stream reconstruction included the placement of various in-stream structures and the floodplain was planted with riparian trees and shrubs. Construction was completed on June 3, 2011 with a total of 47 acres reclaimed.

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