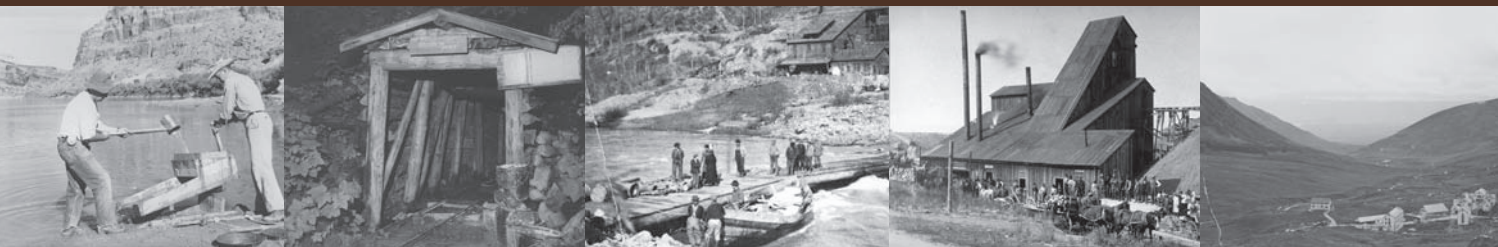


Abandoned Mine Lands: *A New Legacy*




DISCOVER

RESTORE

SUSTAIN





Dear Friends,

For the past 19 years, the Bureau of Land Management (BLM) has worked diligently to change the legacy of hardrock mining on federally-managed lands. The BLM has changed this legacy by protecting the public and the environment by restoring lands and waters impaired by mining over the past two centuries, while preserving the historical significance of mining on the landscape. The BLM's Abandoned Mine Lands (AML) program is highlighting our work at AMLs as the "*New Legacy*." This program is guided by a phased approach that moves impacted mine lands and water to a restored, safe, and sustained state.

While the BLM has already achieved significant success in restoring abandoned mine sites through this approach, we cannot do this alone—we rely heavily on valuable partnerships that enable us to leverage expertise and resources, apply best management practices, and utilize lessons learned. Collaboration and coordination with other Federal agencies, state cleanup programs, local governments, industry, non-profit organizations, and—most importantly—communities help to ensure that our actions are lasting and sustainable while preserving the historical significance of abandoned mine lands.

Outreach is an essential part of this approach, and the BLM is committed to open communication and transparent public involvement throughout the decision-making process—starting early in the regulatory and planning process, well before action is taken. While leveraging past successes provides a strong foundation for moving forward, utilizing innovative approaches and new ideas can lead to even larger strides toward future success. Because it is often local leaders and experts that understand and bring acceptance of such innovative thinking to their communities, the BLM understands the value of listening and working closely with our local partners.

While a great deal of work remains to transition from the old mining legacy to a New Legacy of restored ecological, cultural, and safe landscapes our commitment endures. Through our approach to restore abandoned mine lands, the BLM works to protect public health, public safety, and the environment; increase stewardship through sustainability of our national landscapes; and continue our progress toward moving all mining sites along the path to the New Legacy.

Edwin Roberson
*Bureau of Land Management,
Assistant Director,
Renewable Resources and Planning*

Acidic mine drainage passive wetland treatment near Eureka on the upper Animas river.



BLM Mission

The BLM's mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

The AML program supports the BLM mission by restoring public lands and water impacted by historic hardrock mining in the West, while preserving the historic, cultural, natural, and wildlife habitat resources that they provide.

“The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased; and not impaired in value”

— Theodore Roosevelt

“The accounts of abundance of gold are of such an extraordinary character as would scarcely command belief were they not corroborated by the authentic reports of officers in the public service.”

—President James K. Polk,
1848 State of the Union Address



A gold dredge in Alaska.



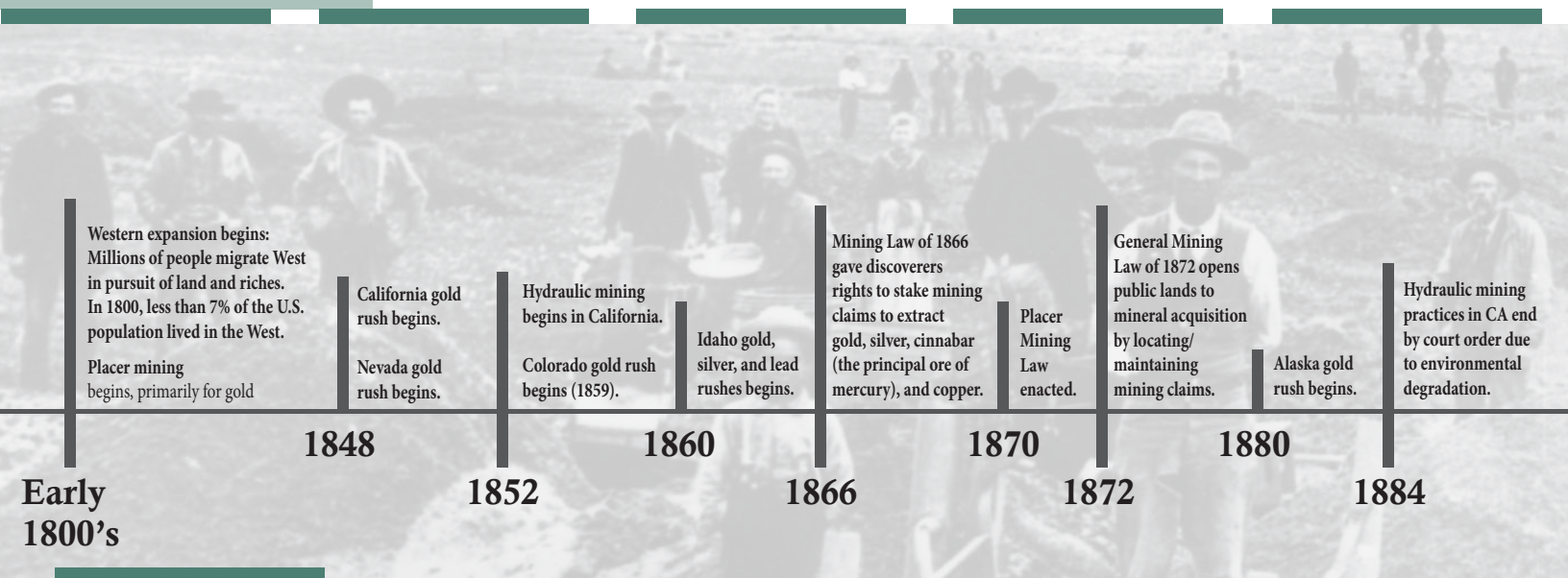
The Ester Creek
Placer Mine in Alaska.

A Long Legacy Of Hardrock Mining

Mining in our nation’s western lands and waters for precious metals was a powerful force behind the exploration and settlement of the American West. The lure of fortune-making and legislative incentives fostered by the 1872 Mining Law provided the economic base on which many remote communities were established and on which our country prospered. Often driven by economic expansions or wartime needs, these communities

and the mines that supported them went through many “booms” and “busts.”

The large-scale gold rushes in Alaska, California, Colorado, Idaho, and Nevada ushered in a redistribution of our nation’s population. But, even at the height of the gold rush, much of the West was not settled. Today, 11 of the 20 states with the fastest population growth are in the West, where BLM-administered public lands abound. As a result,



the number of visitors to BLM public lands has doubled in the past 2 decades—to nearly 60 million visitors in 2011. The West has become America’s Backyard.

Until the latter half of the 20th century, few environmental regulations existed to encourage mining companies to minimize or prevent the environmental impacts caused by their facilities. Historic mines produced precious or profitable metals such as gold, silver, copper, lead, and platinum. However, the aftermath of such mining left behind unrecovered or subordinate minerals and other processing byproducts such as arsenic, mercury, cyanide, lead, and acids. Such wastes made their way into the soil and water. Many of these mines involved extensive underground workings. Mines also needed processing facilities such as mills to crush the ore and smelters to produce the metals. Gold discoveries in streams led to destructive “placer” mining in Alaska and California. Hydraulic mining in California and dredge mining in Montana resulted in stream siltation and extensive erosion, scarring landscapes in the process.

Hydraulic mining required millions of gallons of water. Entrepreneurs dammed streams and built complex systems of ditches and wooden flumes to direct water to the mining operations. By 1859, 5,726 miles of aqueducts ran through the California mining region.

As easily accessible ore deposits were exhausted, individuals and companies developed new technologies to locate, extract, and process minerals and ores from more challenging locations. Mining and mineral processing equipment became more complex, and profitable mines began to require larger footprints. Technologies such as heap leach and vat processing significantly

enhanced recoveries from lower-grade ores. Unfortunately, the necessary chemicals for these new technologies, such as mercury and cyanide, at times escaped into the environment due to inadequate controls and practices. When economic “busts” eventually arrived due to metal price drops, hardrock mining operations ended and the companies folded or moved elsewhere. The mines were shut down or abandoned and usually never restored and/or remediated. Environmental and/or physical risks remained leaving behind conditions that are hazardous to people and our public lands and resources. As a result, it has left thousands of potentially dangerous abandoned mine features were left behind on the public lands. This is the Old Legacy of mining on public lands that the BLM works to address.

The old legacy of these abandoned mines, safety hazards, and contaminated land and water forecast the need for environmental cleanup and safety measures. The transition from the Old Mining Legacy to the new AML program legacy was sparked by the passage of environmental legislation in the mid- to late-20th century. Laws such as the National Environmental Policy Act (NEPA), Federal Land Policy and Management Act (FLPMA), Clean Water Act, Surface Mining Control and Reclamation Act (SMCRA), and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) were enacted to address environmental and public health concerns. These laws help prevent environmental contamination and safety issues from developing in the future. The BLM’s programs and funding have responded to the needs of AMLs on public lands and work in support of these laws.



A mining dredge.



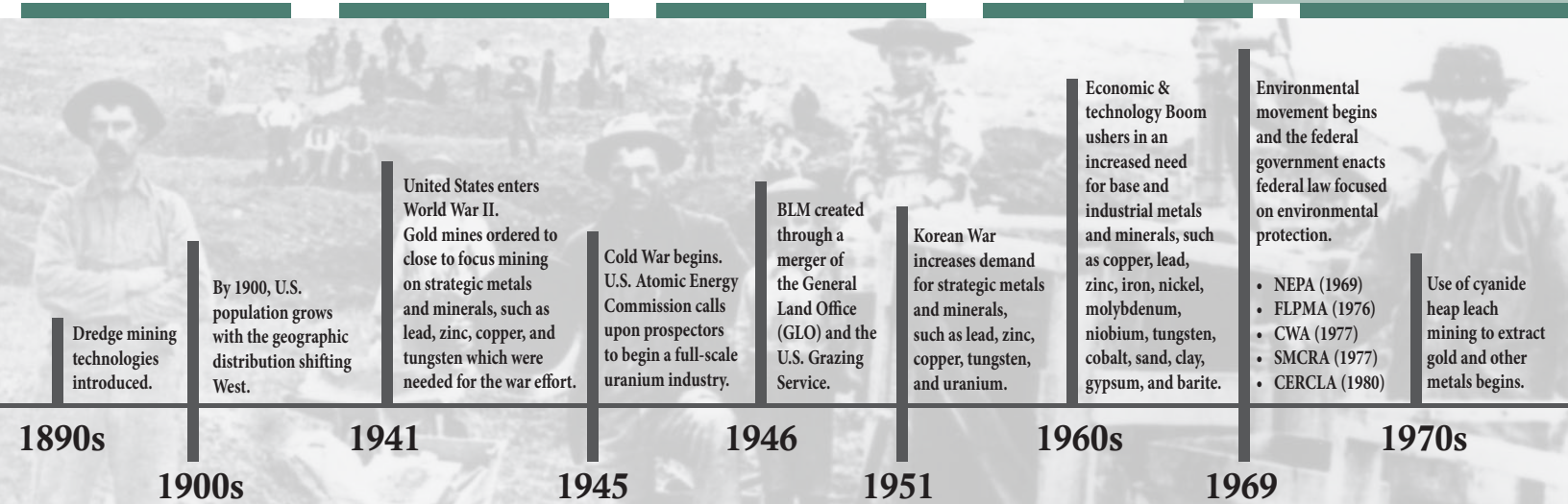
A mining operation in Fairbanks, Alaska.



An open pit copper mine that originated with mining claims on federal land near Ajo, Arizona.



An abandoned copper mine in Dillon, Montana.



“BLM’s New Legacy is the result of the hard work of our committed AML staff who are dedicated to not only the restoration of our lands and waters but to the preservation of our western heritage.”

— Nancy Dean,
Division Chief, BLM

Abandoned Mine Lands Program: A New Legacy

A New Legacy is unfolding as the BLM works to restore public lands impacted by two centuries of historic hardrock mining. Consistent with its mission to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations, the BLM is fostering a New Legacy to bring unsafe and contaminated abandoned mines to a restored, safe and sustained state. Building an enduring New Legacy requires commitment of resources, actions, and expertise. The BLM implements a phased approach, singularly focused on restoring and reclaiming lands and waters. This approach consists of:

- *Discover:* Locate and assess hazards at abandoned mines. During this phase, potential risks are evaluated and the measures for addressing hazards are determined. The abandoned mines that pose the greatest threat

to the public and the environment are prioritized for funding. All of this is done within the context of the BLM’s available funding and the agency’s many programs and priorities.

- *Restore:* Address the hazards at abandoned mines with the goal of protecting the public and environment. During this phase, the BLM and its partners implement intermediate and permanent measures to restore abandoned mines, and determine long-term monitoring and maintenance requirements.
- *Sustain:* Protect the public and the environment into the future. During this phase, the BLM and its partners monitor and maintain restoration measures to support safer public lands and water for today as well as tomorrow.



Restored mine buildings at the Duncan abandoned mine located in the South Pass Historical Mining District and State Park in Wyoming.



Agencies develop regulations and programs to implement new environmental laws.

BLM issues Surface Management Program regulations. (1981)

BLM Hazardous Materials Program established. (1985)

BLM AML Task Force formed.
BLM conducts initial AML inventory activity.

AML Task Force reports that in an area of 7.4 million acres, approximately 7,000 AML sites were verified containing over 6,600 safety hazards.

BLM establishes AML program.

BLM AML pilot watershed projects launched in the Upper Animas River (Colorado) and Boulder River (Montana).

AML inventory grows to 8,000 sites.

Clean Water Action Plan released; provides blueprint for restoring and protecting the nation’s precious water resource.

Third AML pilot watershed project launched in Cottonwood Wash, Utah.

Mine Safety Health Administration (MSHA) launches first national outreach campaign, the “Stay Out-Stay Alive” initiative, to educate the public about AML hazards.

First 10 AML watershed sites restored.

Restoration projects underway on 120 AML sites in 31 watersheds in 12 states.

50,000 AML safety brochures distributed to educate public land visitors and users about AML hazards.

1980s

1989-1996

1997

1998

1999

The BLM defines an **Abandoned Mine** as an abandoned hard rock mine on or affecting public lands administered by the BLM, at which exploration, development, mining, reclamation, maintenance, and inspection of facilities and equipment, and other operations ceased as of January 1, 1981 (the effective date of BLM's Surface Management regulations codified at 43 CFR Subpart 3809) with no evidence demonstrating that the miner intends to resume mining. This includes, but is not limited to: acid and caustic rock drainages, waste rock, mill tailings, and retort waste. Physical safety hazards may include steep slopes, adits, winzes, raises, buildings, high walls, settling ponds, other water retaining features, as well as other related dangerous structures. For many abandoned mines, no current claimant of record or viable potentially responsible party exists. Abandoned mines generally include a range of mining impacts or features that may pose a threat to water quality, public safety, and/or the environment.

The BLM implements our approach in partnership with other federal agencies, state agencies, local governments, and private and not-for-profit organizations. These partnerships provide the best way to collaborate on actions, leverage vital resources, and ensure success.

Since the inception of the AML program, the BLM and its partners have been committed to addressing high-risk and high-priority abandoned mine sites to protect public health and safety.

Our shared commitment and approach for addressing hazards at these abandoned mine sites is demonstrated in our on-the-ground accomplishments from Fiscal Years (FY) 2009 to 2011 relative to the previous three-year time frame (2006 to 2008). This report highlights those accomplishments and our overall progress towards fostering a New Legacy for abandoned hardrock mines.



Restored stream along the South Fork of the Coeur d'Alene River, in Shoshone County, near Osburn, Idaho.



Fisherman at the Big Hole River in Montana.



Restored Zortman and Landusky abandoned gold mines located in the Little Rocky Mountains of north-central Montana.



Bat-friendly gate constructed to cover a large open shaft at the Old Swansea abandoned mine in Arizona.

AML inventory grows to over 8,500 sites.
Over 650 AML physical safety sites remediated.
Over 65 water quality sites restored.
Over 120 restored abandoned mine sites monitored and maintained.
AML program performance measures established for accountability and reporting accomplishments.

2000

AML inventory grows to over 9,500 sites.
Over 500 AML physical safety sites remediated.
Over 45 water quality sites restored.
Over 240 restored abandoned mine sites monitored and maintained.

2001

AML inventory grows to over 9,800 sites.
Over 530 AML physical safety sites remediated.
Over 90 AML water quality sites restored.
Over 150 restored abandoned mine sites monitored and maintained.

2002

AML inventory grows to over 11,000 sites.
Over 510 AML physical safety sites remediated.
Over 70 AML water quality sites restored.
Over 140 restored abandoned mine sites monitored and maintained.
BLM begins using chemical tracers to determine pollution sources, time of travel of contaminants, and track pollution flow.

2003

AML inventory grows to over 12,000 sites.
Over 280 AML physical safety sites remediated.
Over 330 AML water quality sites restored.
Over 115 restored abandoned mine sites monitored and maintained.

2004

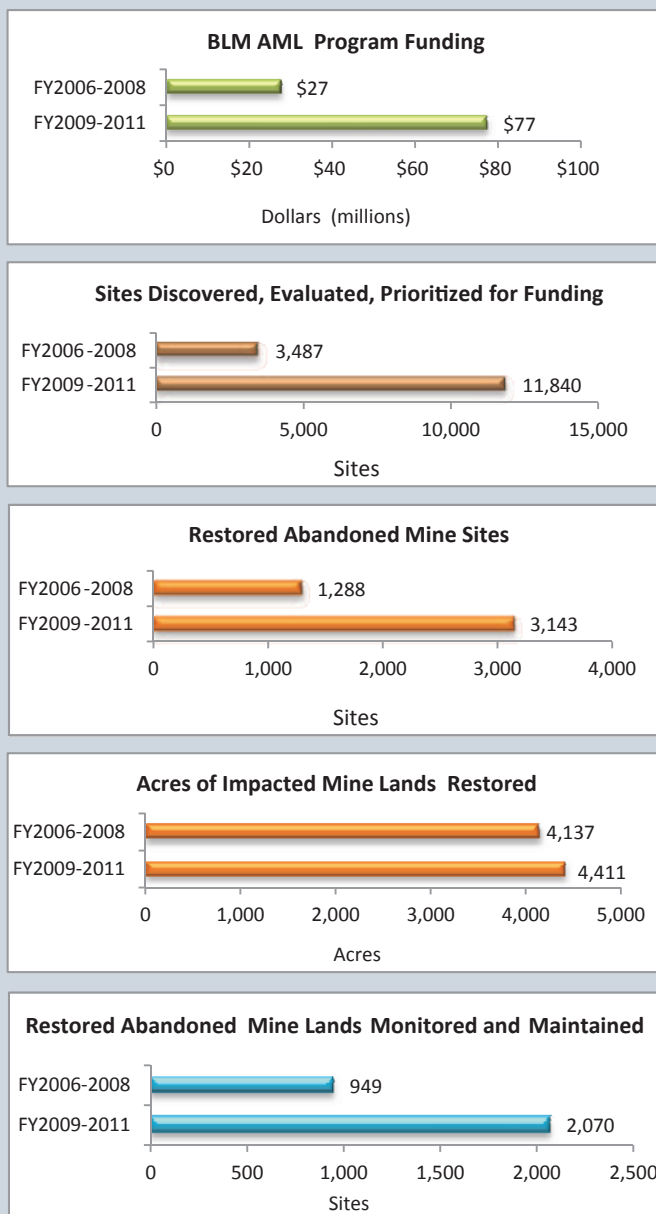


Figure 1-1: AML Program Accomplishments At-A-Glance.

As illustrated in Figure 1-1, during the time period between FY 2009 to 2011 (as compared to 2006 to 2008), the BLM AML program:

- Inventoried 250 percent more abandoned mine sites.
- Addressed high-risk safety hazards at 144 percent more abandoned mine sites.
- Restored 7 percent more acres of impacted land.
- Monitored and maintained 112 percent more restored mine sites, ensuring lasting protections for both the public and environment.

Moreover, when compared to the previous eight years (2000 to 2008), there is a dramatic advancement of program goals during the accomplishment period of FY 2009 to 2011. These 2009 to 2011 accomplishments significantly advanced program mission and objectives by increasing:

- The identified inventory of abandoned mine sites from 19,000 (in 2000 to 2008) to over 28,000 (in 2011);
- The number of abandoned mine sites with safety hazards addressed from 3,962 (in 2000 to 2008) to over 7,100 (in 2011);
- The acres of impacted mine lands restored from 5,688 (in 2000 to 2008) to close to 10,000 acres (in 2011); and
- The number of restored abandoned mine sites monitored and maintained from over 1,870 (in 2000 to 2008) to close to 4,000 (in 2011).

AML inventory grows to over 13,000 sites.
175 AML physical safety sites remediated.
Water quality measured in sites from FYs 2000-2004, changed to acres in FY 2005.
Over 930 acres of abandoned mine lands addressed to restore water quality.
Over 130 restored abandoned mine sites monitored and maintained.

AML inventory grows to over 14,000 sites.

Over 300 AML physical safety sites remediated.

Over 1,110 acres of abandoned mine lands addressed to restore water quality.

Over 250 restored abandoned mine sites monitored and maintained.

AML Program National Strategic Plan released to communicate program initiatives and planned projects to the public.

AML inventory grows to over 15,000 sites.

Over 500 AML physical safety sites remediated.

Over 1,540 acres of AMLs addressed to restore water quality.

Over 345 restored abandoned mine sites monitored and maintained.

BLM and the U.S. Forest Service report on a decade of progress restoring hardrock mines with a combined 5,000 physical safety sites remediated; hazardous substances cleaned up at over 400 sites; and water quality restored at 281 sites and over 3,000 acres.

BLM partners with Tread Lightly! And the National Off-Highway Vehicle Conservation Council to provide AML safety information to the increasing number of OHV enthusiasts on public lands.

AML inventory grows to over 16,000 sites.

Over 470 AML physical safety sites remediated.

Over 1,470 acres of AMLs addressed to restore water quality.

Over 340 restored abandoned mine sites monitored and maintained.

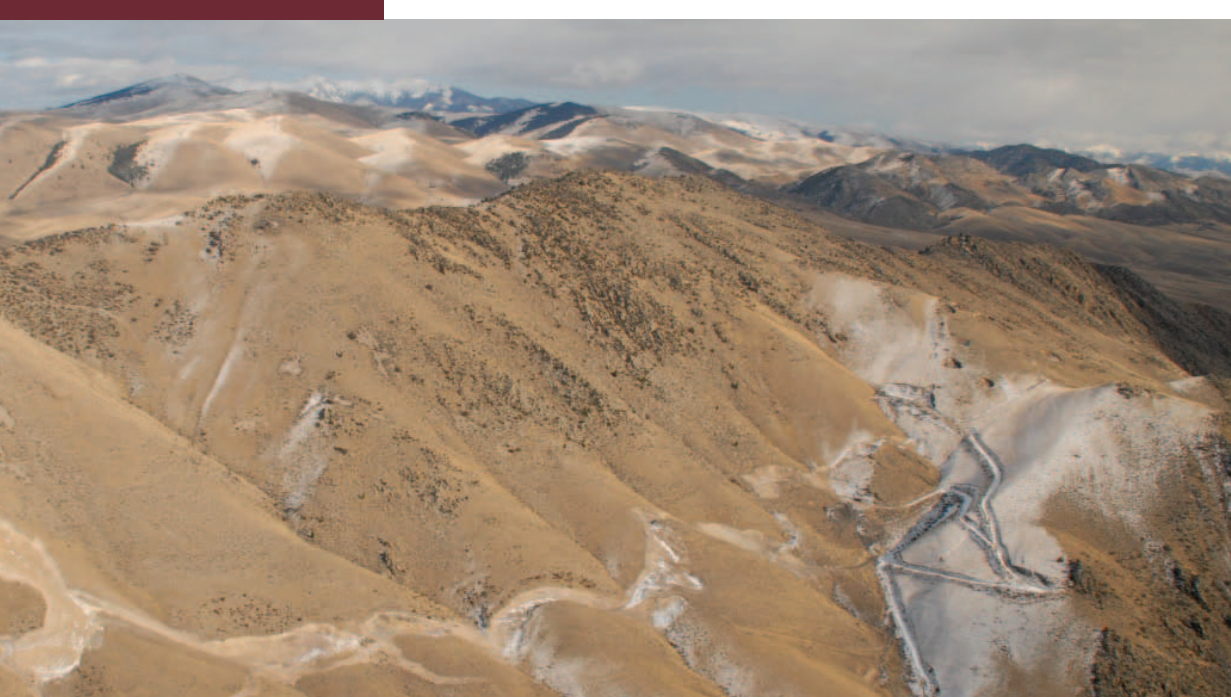
BLM launches the Fix A Shaft Today! FAST! campaign with multiple partners for purposes of eradicating AML sites on lands on or affecting public lands.

2005

2007

2006

2008



Restored abandoned Maiden Rock mine.

Guided by our phased approach for addressing abandoned mine sites, the remainder of this report provides a closer look at our recent accomplishments. The examples provided throughout the report offer insight into many of the environmental, health, and safety impacts associated with abandoned mine sites, and the lasting positive impacts of restoring them. The BLM's goal is that these invaluable public lands and water resources become safer now and long into the future.



Opening ceremony for the new ATV and mountain bike-friendly trail system at the Bayhorse Unit of the Land of the Yankee Fork State Park and Historic Area (BUYLF).

“To me, the “New Legacy” of the AML program provides for responsible mining concurrent with successful reclamation. In Montana, BLM has cooperated with many partners like states, non-profits, mining companies, and private landowners to reclaim hundreds of old legacy mines to protect public safety and restore the environment for clean water and wildlife.”

—Peter Bierbach,
Montana BLM State Office
AML Program Lead

AML inventory grows to over 18,000 sites.

Over 470 AML physical safety sites remediated.

Over 1,300 acres of AMLs addressed to restore water quality.

Over 420 restored abandoned mine sites monitored and maintained.

AML program receives approximately \$30 million in one time funding and an additional increase in program funding. There are 76 projects launched that focus on public safety. Work included major inventory efforts and eliminating hazards at abandoned mines located in close proximity to populated places, and high-use areas such as trails, designated off-highway vehicle areas, and picnic areas.

AML inventory grows to over 23,000 sites.

Over 1,200 AML physical safety sites remediated.

Over 1,500 acres of AMLs addressed to restore water quality.

Over 880 restored abandoned mine sites monitored and maintained.

BLM releases an interim strategy on combating spread of white-nose syndrome in abandoned mine openings that provide bat habitat.

AML inventory grows to over 28,000 sites.

Over 1,450 AML physical safety sites remediated.

Close to 1,600 acres of AMLs addressed to restore water quality.

BLM develops 760 restored abandoned mine sites monitored and maintained.

BLM develops Feasibility Study estimating costs for AML site validation and physical safety closures.

Since FY 2000:

- Over 7,100 AML physical safety sites remediated.
- Impacted land restored at over 600 sites (FY 2000-2004) and close to 1,000 acres (FY 2005-2011).
- Close to 4,000 restored abandoned mine sites monitored and maintained.
- Over 25,000 known abandoned mine sites remain to be assessed and restored.

2009

2010

2011

The Art of Discovery and Evaluation: The Agent for Change

"A sense of history should be the most precious gift of science and of the arts."
— Aldo Leopold



Inventory work in the Cuprite Hills of Esmeralda County, NV identifies open adit.

The West contains thousands of abandoned mines that operated mainly in the 1800s and early 1900s, many of which are located on public lands. In some cases, data or historical records—such as those from the former Bureau of Mines—were available to support quick validation of the location and status of past mines (see sidebar “Discovery Phase At-A-Glance”). Unfortunately, in other cases the locations of these historic mines were not well documented so accurately determining their locations and status involves additional effort. The BLM is continuing to work with its partners to locate and evaluate these remaining historic mines and to prioritize their restoration and protection. The information collected during the inventory or discovery phase forms the basis for determining whether additional site characterization is needed. Such information supports priority setting for future action. Without a baseline inventory, determining which abandoned mine sites to restore first would be a difficult, random, and highly ineffective

Discovery Phase At-A-Glance

- *Observing* and surveying an area to identify and record new AML sites.
- *Validating* preliminary information about AML sites and features. For example, there may be a record in the database, or a map symbol, that needs to be checked to confirm the site exists and that it is located on BLM-managed lands.
- *Recording* GIS data for the footprint of the site by measuring its overall perimeter and individual feature perimeters. Taking digital images of features and general site conditions.
- *Posting* warning signs, constructing temporary fencing, and implementing other access controls to keep people safe.
- *Documenting* any surrounding cultural resources, historic properties, evidence of visitation, and wildlife habitat for further evaluation. In some cases, concurrent cultural surveys are conducted.
- *Entering* the data collected from the field in the Abandoned Mines and Site Cleanup Module (AMSCM).
- *Evaluating* potential risks posed by the hazards and determining the measures for addressing them.
- *Checking* the status of any mining claims that may overlap the site in order to coordinate cleanup actions with the mining claimants.
- *Prioritizing* funding to the abandoned mines that pose the greatest threat to the public and the environment.



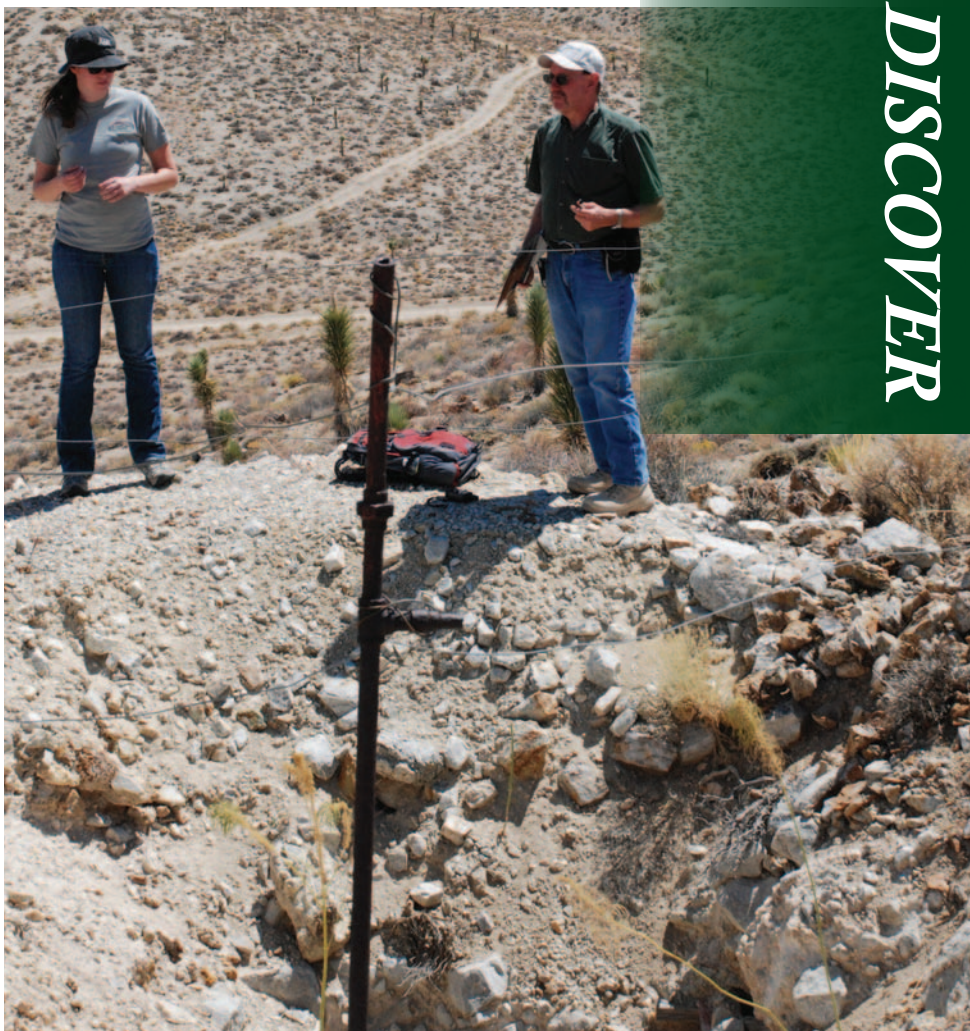
Documenting mine shaft at Sylvania Mill in Esmeralda County, NV.

process. With the goal of addressing sites that pose the greatest threats to public safety and the environment first, BLM management works closely with state offices and partners to render effective decisions on potential risks and set project funding priorities that are balanced with other partner programs and priorities. The BLM's AML inventory provides the basis for informed decision making and advances the New Legacy of restored public lands and water for today and tomorrow.

During FY 2009 to 2011, the BLM, together with its partners, inventoried 11,840 sites—increasing the BLM's inventory from 19,000 (in 2008) to over 28,000 abandoned mine sites. New abandoned mine sites were discovered in all 12 western states including Alaska, with the greatest increases concentrated in four states where population growth is increasing contact between people and abandoned mine sites, including: Arizona (1,912 sites), California (1,660 sites), Nevada (3,524 sites), and New Mexico (2,773 sites). The BLM's ability to identify these additional sites was supported by additional funding made available to the BLM's AML program. The funding increase supported efficiency improvements and innovative management initiatives. Such improvements included establishing inventory teams and field validation studies to improve the completeness of our inventory and enhance data quality.

While inventory activities are resource intensive and often complex, they are critical to the decisionmaking process and essential to effective program and project management necessary to restore abandoned mine lands. For example, Cadastral surveys conducted in Elko County, Nevada, Boulder City, Nevada, and southern Nevada clarified land ownership and management responsibilities in areas of historic mining activity. Wildlife, historic, and cultural surveys resulted in recommendations for closure methods aimed at preserving resources for the thousands of sites and acres of impacted mine lands restored during 2009 to 2011. For example, the BLM's partner Bat Conservation International, Inc. (BCI), conducted over 850 bat surveys in abandoned mines in Arizona, Colorado, Utah, California, Nevada, Oregon, and Washington. The BCI developed performance criteria and engineered designs for mine closure structures that prevented human intrusion into AMLs containing bat populations. Further, the BLM took prompt action at AML sites to protect the public by posting warning signs, constructing temporary fencing, and implementing other access controls as necessary while inventorying close to 12,000 abandoned mines sites.

The following highlights from the innovative inventory team approach in Idaho, New Mexico, and in Alaska, further demonstrate the BLM's success during the site discovery and evaluation phase.



Open adit discovered in Nevada.



BCI's Subterranean Program Coordinator avoids a pool of acid water while surveying an abandoned gold mine near Medford, Oregon.

The BLM Completes Estimate of Field Validation and Remediation of AML Sites

In September 2011, the BLM completed the *AML Program Feasibility Study for Site Validation and Physical Safety Closures* to estimate the costs and timeframe to validate and address un-remediated AML sites posing physical safety hazards. The study identified high, medium, and low risk

sites; and estimated that the total cost for field validation and physical safety hazard remediation at all 22,104-identified AML physical safety sites would be approximately \$401.7 million.



Idaho inventory team discovers open shaft near the abandoned Klondike gold mine easily accessible by recreationists on Idaho's Salmon River, famous for whitewater boating and fishing.



New Mexico inventory team member documenting open adit.

AML Inventory Teams in Idaho and New Mexico Advance the Discovery of AML Sites and Mitigation of Safety Hazards



Idaho inventory team documents historic mine buildings.



New Mexico inventory team identifies open shaft.

The Idaho and New Mexico State Offices have taken an innovative approach to leverage resources and boost inventory activities in both states to ensure potential AML sites are identified and added to the BLM's AML inventory to help expedite the closures of high risk AML sites that threaten public health and safety. Idaho and New Mexico have created state-wide AML inventory teams that cross BLM district and field office boundaries. Accomplishments of these state teams include:

- Surveying 15 mining districts and conducting on-the-ground inventory activities in six other

districts, collecting data for 5,200 mining sites and associated features, and constructing 15 temporary safety closures (fence and signs) around the most dangerous sites and features encountered in New Mexico.

- Surveying and collecting data and associated features for mining sites across Idaho, including 96 high-risk hazardous mine openings in the Salmon, Idaho region along the Lewis and Clark National Historic Trail, Nez Perce National Historic Trail, and Continental Divide National Scenic Trail all of which were closed during 2009 to 2011.



Open adit and shaft located in the Salmon, Idaho region near several national trails identified by the Idaho inventory team.



Alaska Upper Koyukuk Mine Hazard Inventory— 2,000 Acres of Historic Mine Lands Inventoried

The BLM is undertaking a large-scale inventory of federally-managed lands within the Fairbanks District. The BLM-managed lands around Fairbanks witnessed intensive industrial-scale, historic hardrock mining and those lands are, therefore, likely to possess a high density of physical and environmental hazards. These facts, coupled with a relatively large local human population active in outdoor recreation, led to the decision to begin intensive inventory and survey efforts. Additionally, efforts were made to communicate the resulting information from the surveys to the public. The inventory project team is composed of BLM archeologists and faculty and students from Michigan Technological University and the University of Alaska-Anchorage under the direction of an archeologist. The project team uses archaeological field methods to systematically identify and inventory environmental and physical hazards resulting from past mining activity. Additionally, the team collects a thorough record of mining-related cultural resources within the survey blocks.

Over 2,000 acres of BLM lands were inventoried during 2011. Several hundred mining related features including pits, shafts, adits, tailings, piles, high-walls, hazmat occurrences, machinery, ore piles, trenches, buildings, and structures, were recorded with over 1,000 photographs and GPS latitude and longitude coordinates. In addition to documenting the abandoned mine features, 46 previously unrecorded historic archeological sites were identified, recorded, and entered into BLM and State of Alaska databases. By collecting a detailed record of cultural resources associated with abandoned mine land hazards, the need for additional archeological fieldwork prior to moving forward with remediation is minimized. The team is also inventorying and surveying several thousand additional acres in the Fairbanks area and in the vicinity of the Upper Koyukuk River and western Alaska in Kobuk and Squirrel River drainages. This work is expected to be completed by 2013.



Documented cribbed shaft entrance in the Fairbanks Creek drainage in Alaska.



Recording early 20th century mine workings on Gold Creek, Upper Koyukuk in Alaska.

Alaska Upper Koyukuk Mine Hazard Inventory project included a variety of communication, outreach, and educational materials including a poster prepared for the fall 2009 Alaska Miners Association convention, a paper at the 2011 Alaska Anthropological Association annual meeting, and an article in an industrial heritage publication.

Restoring Public Lands and Water for Today and Tomorrow

"Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity. Conservation, viewed in its entirety, is the slow and laborious unfolding of a new relationship between people and the land."

—Aldo Leopold

The West has become America's backyard. The increased presence of people living in the West, along with greater pressures on wildlife and sensitive ecosystems, has increased the likelihood of human and environmental exposure to the myriad of potential hazards posed by the thousands of abandoned mines located on public lands. The BLM is committed to working towards protecting the millions of public land users and the health, diversity, and productivity of the public lands we manage. The AML program plays a key role in doing just that. During the Restore phase, the BLM implements the measures identified during the Discovery phase to restore mine-impacted land and water to protect the public and environment, while safeguarding the cultural and ecological resources that they provide.



Before photo of a hazardous opening in Yavapai County near a popular hunting and recreation area in Yavapai County was closed.

Restoring Impacted Mine Lands Phase At-A-Glance

- *Implementing* intermediate and permanent restoration measures determined during the discovery phase to address public safety and human health and environmental hazards. Measures include closing open adits and mine shafts, removing impacted soil or waste piles, capping and covering waste, and installing water treatment systems.
- *Implementing* measures determined during the discovery phase to protect wildlife habitat and natural resources while addressing hazards at abandoned mine sites. Examples include installing mine closure structures (e.g., iron gates or covered by bat-friendly cupolas) that prevent visitor exploration, but allow for free movement of bats.
- *Ensuring* measures determined during the discovery phase protect historic and cultural resources while addressing hazards at abandoned mine sites. Resources include historic mine features, prehistoric fossils, and Tribal artifacts.
- *Determining* final long-term monitoring and maintenance requirements, such as groundwater monitoring systems to ensure the restored public lands and water are protected into the future.

The BLM's AML inventory contains over 28,000 abandoned mine sites and over 70,000 features. Approximately 25 percent of the sites have either been remediated, have restorative measures planned or underway, or do not require further action. The remaining 75 percent require further investigation and/or remediation.



After photo of a hazardous opening in Yavapai County near a popular hunting and recreation area in Yavapai County was closed.

Together with the collaborative efforts of the BLM's AML partners, we were able to make significant progress over the last 3 years towards advancing a New Legacy of safe and hazard free public lands and water for today and tomorrow. During FY 2009 to 2011, the BLM and its partners addressed 3,143 physical safety hazard sites. This accomplishment nearly doubles the total number of safety hazard sites remediated since year 2000 to over 7,100 sites. While gains were realized in each of the 12 states, including Alaska, the surge in addressing safety hazards sites was led by the same four states that led the inventory surge: Nevada (949 sites), California (747 sites), Arizona (559 sites), and New Mexico (268 sites). These accomplishments were driven by both the initial inventory improvements and the sizable funding increases for the important work of addressing physical safety hazards at sites in proximity to communities, public places, and high-use areas (such as trails, designated off-highway vehicle areas, and camping areas). For example, the BLM and Idaho Department of Parks and Recreation worked as partners to close 48 mine openings and construct 11,000 feet of protective fence near a new all-terrain vehicle (ATV) and mountain bike-friendly trail system at the Bayhorse Unit of the Land of the Yankee Fork State Park and Historic Area in central Idaho.

The BLM restored over 4,400 acres of mine-impacted lands during FY 2009 to 2011— an increase of 7 percent over the previous 3 year period (2006 to 2008). Four states were responsible for over 90 percent of the total acres restored through environmental cleanups. In fact,

Montana restored 3,207 acres of land—nearly 75 percent of all restored acres during this period. Nevada restored 453 acres, while Arizona and Colorado restored 304 and 203 acres, respectively. While this represents a modest increase, the impacts were significant as demonstrated in the project summaries found at the end of this section. Also, a larger number of site restorations were initiated in this 3-year period, which is likely to result in a more significant increase in acres restored in the years to come. For example, Idaho and Utah directed substantial funding and on-the-ground work towards large, complex site cleanups. Restoration of these impacted lands will continue until they are safely and fully restored.

During this period, the BLM also implemented multiple interim measures to reduce environmental risk until permanent measures are put in place. For example, a temporary drainage system was constructed at the Kelly Mine in Red Mountain California to prevent storm flows from re-depositing arsenic-contaminated tailing material onto private properties. This measure helps to immediately protect the residents of Red Mountain from arsenic contamination until the removal of 65,000 cubic yards of mill tailings at the Kelly Mine and surrounding vacant properties is completed.

The BLM implemented innovative restoration measures, such as constructed wetland bioreactors and the use of mushroom compost, to achieve greater results with fewer resources. In line with the Department of the Interior's New Energy Frontier Initiative, the BLM, where possible,

Environmental cleanups are guided by important public laws such as:

- CERCLA
- FLPMA
- NEPA



Removed 50 tons of contaminated mercury mine waste from the abandoned Archer mine and mill site in Fresno County, CA protecting the White Creek watershed and the wildlife and local residents downstream.

“This initiative continues the bureau’s commitment to reducing abandoned mine hazards,”
“We’re taking a pro-active approach to warning active mining claimants whose mining claims include hazardous sites.”

-BLM Director Bob Abbey

integrates renewable energy and renewable fuels, such as wind, solar, and biofuels into site restoration measures to promote the use of renewable resources on our nation’s public lands, offset cost, and increase sustainability. The AML program worked with the BLM’s Renewable Energy office to identify abandoned mine sites eligible for solar development, as described in the “Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States.”

In addition, the BLM and its partners conducted community and stakeholder outreach to make sure our accomplishments are in-line with public desires and that our actions have lasting on-the-ground results. To meet long-term community needs, the BLM coordinates remediation efforts with the local community in designing and implementing remedial projects at abandoned mine lands. For example, in 2011, the BLM launched an initiative to reach out to mining claim holders to help mitigate abandoned mine hazards. The effort responded to growing concerns about the number of accidents and hazards related to abandoned mines. Through this initiative, the BLM contacted nearly 4,000 holders of active mining claims, located mostly in the western United States and Alaska, to advise them if hazards have been reported within or near the boundaries of their claims. Along with this information, claim holders were advised of their potential responsibilities if certain mining activities are occurring so they could take appropriate action to reduce risk. This initiative

helps to reinforce the BLM’s key message that abandoned mines are potentially hazardous and recommends that mine claimants and members of the public “Stay Out and Stay Alive.”

In addition, the measures identified during Discovery phase to help protect or recover wildlife habitat and sensitive ecosystems as part of the New Legacy were carefully integrated during the restoration of the 3,143 abandoned mine sites and 4,400 acres of impacted mine lands. For example, the BLM and its long-time partner BCI, closed 10 abandoned mines posing significant safety hazards in northwestern Arizona by installing iron gates or covering with bat-friendly cupolas, which allow for use of the mine openings by bats and other species while preventing human intrusion. The BLM also helped to develop decontamination protocols to help reduce the potential human transmission of a fungus (*Geomyces destructans*), believed to be the cause of the devastating white-nose syndrome (WNS) in bats. The protocols are to be implemented when persons enter bat habitat during surveying or restoration of abandoned mine sites.

Finally, we took steps to protect the treasure trove of history and cultural resources revered by local communities and visitors alike. For instance, we closed 10 potentially deadly mine shafts near the Lost Arch Inn located southwest of Needles, California while ensuring the remains of mining implements and other historic artifacts were



The BLM continues its long time support for the “Stay Out-Stay Alive” Initiative launched by the U.S. Department of Labor’s Mine Safety and Health Administration (MSHA) to educate the public about the existing hazards the importance of steering clear of active and abandoned mines. In 2010, the Utah State Office released a “Stay Out Stay Alive” CD available in both English and Spanish, and the Nevada State Office promoted safe and sustainable uses of Off Highway Vehicles (OHVs) on public lands through public service announcements and collaboration with OHV user groups.



MSHA mine inspectors spoke to hundreds of students and teachers at elementary schools across the West in 2011 about the dangers posed by abandoned mine during 2011.

Stakeholder engagement among the BLM, Idaho, and the Coeur d’Alene Tribe, resulted in agreement to an environmental damage settlement with ASARCO LLC, a North American mining conglomerate, for the recovery of wildlife, habitat, and other natural resources managed by the Department of Interior and state and tribal governments at the Bunker Hill Superfund Facility in the Coeur d’Alene Basin of Northern Idaho. This payment is part of the largest environmental damage bankruptcy case in U.S. history, with parent corporation Grupo México providing a total of \$1.79 billion to resolve ASARCO’s environmental liabilities from operations that contaminated land, water, and wildlife resources on federal, state, tribal, and private lands in the United States. Because of the cooperation of federal, state, and tribal governments those responsible for polluting the nation’s landscapes and waterways will be paying for the restoration and protection of significant national landscapes and wildlife resources that have been injured in the Coeur d’Alene basin watershed.

protected. This likewise assured that the thousands of visitors each year will continue to enjoy and benefit from the unique cultural and historical artifacts of our nation’s important mining legacy. At the Davis Mine, we implemented stability and longevity measures to protect the Davis Mill building—an historic mining structure that is one of the last mills of its type. This building was recently added to the National Register of Historic Places. Additional information about these projects is shared in the project summaries below.

The following project summaries further highlight the BLM’s on-the-ground success restoring mine-impacted public lands and water, while protecting the cultural and ecological resources that they provide.



After restoration.



Before restoration.

Rip Van Winkle Mine, Nevada



Federally-listed threatened Lahontan cutthroat trout.



Before restoration shows acidic seepage from the Rip Van Winkle tailings in Coon Creek, a tributary of Maggie Creek and the Humboldt River in northeastern Nevada.

Remnants of the Rip Van Winkle Mine are located on Lone Mountain, northwest of Elko, Nevada. This lead and zinc mining operation was active from the late nineteenth century until 1944. Six small tailings dams were identified in a nearby creek, and cyanide barrels were found at the mill and on the uppermost tailings impoundment. Vegetation on the site was sparse and in the vicinity of the tailings some plants showed signs of stress. Acid mine drainage from leftover mine tailings piles threatened to contaminate a tributary of Maggie Creek—critical habitat for the federally-listed,

threatened Lahontan cutthroat trout—as well as the Humboldt River in northeastern Nevada. In response, the BLM initiated the removal of contaminated mine tailings across nine acres of the site. Acid-forming rocks were removed from the creek and replaced with native soil. Local contractors and subcontractors performed this work under the direction of the BLM and the U.S. Army Corps of Engineers, benefitting the local economy, even as the project ensured the long-term protection of native fish and wildlife.



Rip Creek diversion and reclaimed ponds:
In the middle foreground the extensive armored creek channel diversion is visible, moving flowing water around the tailings to avoid contact with them.



Bayhorse Abandoned Mine, Idaho

During the 1860s, the Bayhorse Mine was a bustling center of activity for those seeking riches in silver. Today the mine is abandoned, resting on the outskirts of the Salmon-Challis National Forest in central Idaho, adjacent to the Bayhorse Unit of the Land of the Yankee Fork State Park and Historic Area. The Yankee Fork State Park is a 20.9-acre site with historical interpretations and numerous recreational opportunities. Land of the Yankee Fork State Park comprises several units scattered through the whole of the Land of the Yankee Fork Historic Area, including the Bayhorse Unit. The units are surrounded by public land, which offer hundreds of miles of OHV/ATV trails and fishing, camping, hunting, backpacking, and hiking opportunities galore. While wandering around in these woods you will most likely come across old abandoned mining sites. These abandoned mines can be hard to see by OHV users. Also, they can act as an attractive danger for outdoor enthusiasts.

When the Idaho Department of Parks and Recreation announced plans to develop an ATV and mountain bike-friendly trail system at the Bayhorse Unit, it recognized that several hazardous conditions at the abandoned Bayhorse Mine needed to be addressed before the project moved forward. In response, the Idaho Department of Parks and Recreation partnered with the BLM to close 48 mine openings and construct 11,000 feet of protective fence. The opening of the new trail was marked with a ribbon cutting ceremony where guests were treated to an extended ATV tour of ghost towns and old mines of the West. This collaborative effort earned a “Cooperative Conservation Award” for the IDPR from the BLM for their collaborative effort in addressing abandoned mine land safety hazards.



Restored historic mine buildings along the new trail system at the BULYF.



During restoration of the open adit.



Before restoration of adit near Bayhorse abandoned mine.



Backfilling collapsed mine features at the Maiden Rock with the Big Hole River in the background.

Maiden Rock Phosphate Mine, Montana



Helicopter installation of a grate over a mine shaft at Maiden Rock abandoned mine.

The Maiden Rock Phosphate mine is located in Silver Bow and Beaverhead Counties, approximately 20 miles south of Butte, Montana. The abandoned mines, located near the popular Maiden Rock fishing site on the Big Hole River, posed extreme danger to the public through a number of physical safety hazards, including air vents up to 1,200 feet deep. In

response, the BLM implemented a remediation plan based on safety and rock stability. By the project's end, 76 individual dangers had been addressed: 42 were backfilled and 33 were either fenced or had grates installed via helicopter. These efforts greatly improved public safety in this popular, well-used fishing area.



Maiden Rock mine trend before restoration.



Aerial photo of the restored Maiden Rock abandoned mine.



Abandoned mine opening before sealing to protect the La Sal Creek Watershed.

La Sal Creek Watershed, Utah

The La Sal Creek Watershed Project covers the final 3 to 4-mile stretch of La Sal Creek as it leaves Utah and enters Colorado. Mining in the area dates back to the 1950s, when drilling programs conducted by the USGS discovered uranium and vanadium in a zone that became known as the “La Sal Creek Mineral Belt.” To reach these deposits, horizontal passageways were bored through the rock, creating piles of waste materials that remain on each of the area’s five mines (now abandoned). These abandoned mine sites are located along the northern rim of the canyon formed by La Sal Creek, a perennial stream that drains the southern flank of the La Sal Mountains. Three permanent residences are located within the project area beneath the Firefly/Pygmy Mine (approximately 1 percent of the dump area) lies on National Forest System lands. The other three mines that were part of this project were: Black Hat, Blue Cap, and St. Patrick mines. They are located immediately below the sandstone rim of Lion Canyon. Water quality samples confirmed that mining contaminants—including arsenic and radioactive materials—were leaching from waste rock piles, polluting area surface and

groundwater, and potentially impacting water supplies downstream. These contaminants presented a risk to campers as well as area residents and threatened aquatic life within both La Sal and nearby Lion Canyon Creek.

Starting with detailed water, pasture, and sediment sampling in 2000 and 2001, the BLM began a series of steps to address and correct the problems caused by the region’s mining legacy. The BLM finalized a safety and health plan in December 2002, a conceptual site model in June 2003, a field sampling plan in January 2004, and an engineering evaluation/cost analysis in October 2005. Resulting actions, started in the summer of 2010, included constructing a sulfate-reducing bioreactor to remove metals and restore the proper pH of ground and surface water; sealing mine adits; demolishing and disposing of unsafe structures; removing lower-level radiation debris; stabilizing slopes; and planting vegetation to absorb further contamination. Ongoing monitoring and maintenance will ensure that these remedies are functioning as designed and protecting human health and the environment.



Stabilizing slopes and planting vegetation prevents runoff from the abandoned mines sites from impacting the Sal Creek Watershed.



Sealing of horizontal mine adits to stop arsenic and radioactive materials from impacting the Sal Creek Watershed in Utah.



Multiple shaft and adit closures near the Swansea historic mining site.



Open mine shaft prior to closure at the abandoned Swansea Mine.

Swansea Mine, Arizona



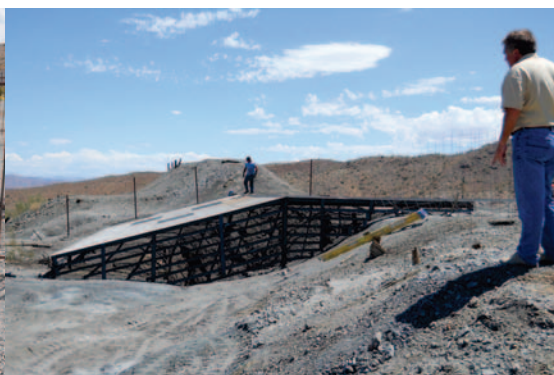
Historic structures from the former Swansea mining town.

Arizona's Swansea Mine, located in Swansea Townsite, a historic ghost town southwest of Prescott, is a popular camp site for hundreds of visitors and locals every year. Mining in the area began in 1862 with the discovery of copper ore and continued up until 1937, when the mine closed for good. During the town's heyday, Swansea housed 25,000 workers and featured a general store, a lumber company, a saloon, theaters, restaurants, and barbershops, in addition to its mining and smelting facilities. But in the years following the mine's closure, while fencing kept most of the public safe, multiple open shafts and other threats posed a continued risk to humans and animals.

The BLM provided the necessary funding and expertise to correct these issues and ensure public safety. In May 2010, nearly 50 people gathered at the Townsite to help BLM kick off a "ground-filling" celebration. By August 2010, 8 deep, abandoned open mine shafts had been filled in or had bat-friendly closures installed. The work was performed by local contractors and with American-made products purchased from local vendors. Today, this historic land is safe for both the public and area wildlife.



Ground filling ceremony at the abandoned Swansea mine.



During closure of a shaft near the Swansea historic mining site.



Closed shaft near the Swansea abandoned mine in Arizona.



Closed shaft near the abandoned Carbonate Hill Mine.

Carbonate Hill Abandoned Mine, NM

Discovered in 1984, the Carbonate Hill Mine is located on public land in New Mexico's San Simon Mining District. Lead, silver, and zinc were mined and milled at the Carbonate Hill site up until 1952, when operations ceased and the site was abandoned. For years, the mine's open shafts posed a significant danger to the hundreds of recreational users—rock hounds, amateur prospectors, hikers, hunters, and ORV enthusiasts—visiting the site every year.

In 2009, the BLM, in collaboration with the New Mexico Minerals and Mining Division's Abandoned Mine Land Program, funded a \$400,000 project to address these dangers. The Minerals and Mining Division also provided staff time for project

development, environmental assessment, and construction monitoring, with additional funding from the Office of Surface Mining. Activities began in March 2010 and were completed the following month. In all, 21 abandoned mine openings were addressed through methods such as backfilling, constructing plugs using polyurethane foam, and building safety fences. The project also utilized specialized gates and grate structures offering access for bats and owls to their underground mine habitats while protecting them from human disturbance.



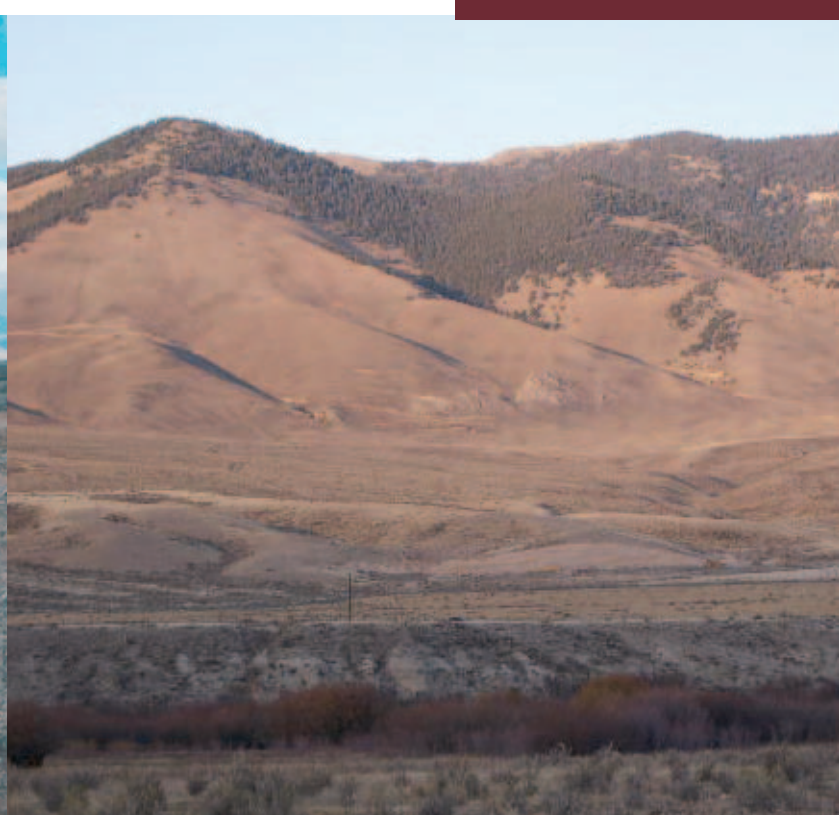
One of multiple open adits prior to closure.



Closure of open adit identified by the New Mexico inventory team.



Acid mine tailings deposited on the Lemhi landscape prior to restoration.

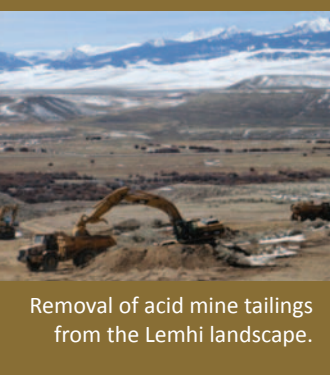


16 acres of range and wildlife habitat restored.

Buckhorn Mill Abandoned Lead and Silver Processing Mill, Idaho



Mine tailings dam removal underway.



Removal of acid mine tailings from the Lemhi landscape.

Located 35 miles southeast of Salmon, Idaho on the Lemhi River, the former Buckhorn Mill processed lead and silver ore during its operation decades ago. Mining activity left approximately 5.5 acres of cumulative tailings in six different tailing ponds across the 16-acre site. In August 2003, heavy rains breached a dam on one of the tailings ponds and sent lead-contaminated sediment into the Lemhi River, disturbing the ecosystems of the bull trout and already-threatened Chinook salmon. The safety of homeowners downhill from the site was also of concern, with at least one house flooded by the breach.

In response, BLM developed a cleanup strategy that went into action in 2007. In all, more than 39,000 cubic yards of toxic tailings, ores, and soils

were placed in an on-site repository that was then graded to blend into the surrounding terrain. A 3-foot cap of clean cover soils was constructed atop the repository to protect and prevent access to the contaminated materials. In order to speed recovery of the disturbed areas, topsoil was imported and laid down, and the areas were reseeded and mulched. Protective fences were installed to protect the area as it re-vegetated. Cleanup was completed in 2009. The site is now on a monitoring and maintenance schedule that includes the annual eradication of noxious weeds. Contaminants from the former Buckhorn Mill no longer pose a threat to residents or local wildlife, including fish in the Lemhi River. The site's 16 acres now serve as natural open space and wildlife habitat.



Remaining mill structure prior to removal during restoration.



Fixing adit near the Lost Arch mining camp and trails.

Lost Arch Mine, California

On the edge of the scenic Turtle Mountains Wilderness some 30 miles southwest of Needles, California, the intrepid desert traveler can discover the remains of long-ago prospectors at the Lost Arch Inn. Charley Brown and his mining partner Jesse Craik built a mining cabin in the 1800s. The cabin, which remains mostly intact, was constructed in the center of a desert wonderland for lost mine hunters and those who like to follow forgotten trails through scenic canyons.

Among the relics, until recently, an unsuspecting hiker could have stumbled onto or into any of 10 potentially deadly mine shafts. These hazards were

among those in the California desert made safer by increased funding for the BLM's AML Program in 2009. Some of the shafts and adits date back to the 1800s and could have easily resulted in serious injury or death to unsuspecting motorists or hikers. Several 20-foot by 20-foot steel structures were used to close the shafts and adits, which allows owls and bats to come and go at will, while preventing human intrusion. Additionally, the funding made possible the establishment of primitive camping sites in the Lost Arch Historic Mining Camp, as well as the renovation of the Mexican Hat Trail.



Lost Arch historic mining camp near newly renovated the Mexican Hat Trail.



Historical landmark sign near Lost Arch mine.



Cribbed shaft closed with polyurethane foam (PUF) plug and backfill at Duncan abandoned mine site.

Duncan Mine, Wyoming



Adit closure at the Duncan abandoned mine site.



Closure of open shaft at the Duncan abandoned mine site.

With an elevation of nearly 8,200 feet, the abandoned Duncan Mine is located in the South Pass area of Wyoming near historic emigrant trails, and the historic mining communities of South Pass City and Atlantic City. Known physical hazards, including open shafts and exposed mining pits, posed serious threats to curious visitors, hikers, and campers routinely using the surrounding trails.

In collaboration with the Wyoming State Abandoned Mine Lands Program, the BLM helped address

the concerns. Three mine openings were either backfilled or closed with barricades or bat gates, while nearly an acre of mining waste was removed and exposed pits filled in. Existing structures, valued for their historic significance, were stabilized for eventual inclusion in the South Pass Historic Mining District and State Park. These efforts have made this abandoned mining area safe once again for tourists and recreational users of the land and will allow for future education on the site.



Acid mine tailings before restoration.



Open adit near the abandoned mine prior to closure.



Stabilized Davis Mill building in Nevada County, California.

Davis Mill, California

Located in Nevada County, California, approximately 3 miles north of Nevada City, the Davis Mill was founded in 1915 and operated intermittently until the 1940s. At the mill, raw ore was fed through a rock crusher and then to a series of stamps where the ore was pulverized and mixed with water to form a pulp. This pulp was then mixed with mercury, salt and copper sulfate and fed into settling tanks. Mercury was vaporized and recovered for reuse from this mix, and the remaining silver and gold residue was melted in a furnace and poured into molds to form bars of silver-gold bullion. The waste products (i.e., mill tailings) from this process flowed away from the mill across an unnamed tributary of nearby Rock Creek and into a floodplain area, roughly 600 to 800 feet northwest of the Davis Mill.

In February 2003, samples of these tailings were taken for analysis by BLM technical specialists and

the U.S. Geological Survey. Elevated levels of arsenic, lead and mercury were identified. In response, the BLM worked with a contractor to remove approximately 6,400 cubic yards of tailings and dispose of them at a permitted treatment, storage, and disposal facility. Subsequent sampling in the affected area confirmed that cleanup goals were met.

The BLM also developed recommendations to stabilize the original Davis Mill building, which is one of the last mills of its type and had been added to the National Register of Historic Places. In 2011, drainage areas were constructed around the Davis Mill building, along with other measures to ensure the stability and longevity of this historic structure.



Side view of the stabilized Davis Mill building.



Inside view shows mill equipment including the stamp battery where the ore was pulverized and mixed with water to form a pulp still intact.

Sustaining A New Legacy: Protecting the Public and the Environment into the Future

“We have fallen heirs to the most glorious heritage a people ever received, and each one must do his part if we wish to show that the nation is worthy of its good fortune.”

—Theodore Roosevelt

Long-term protection of restored sites is the final and longest phase of the AML program. Once restoration measures are implemented at an abandoned mine site, we must monitor and maintain those measures to ensure lasting protection for today as well as tomorrow.

As sites move along the Discover-Restore-Sustain continuum, more sites enter and remain in the “sustain” phase. By the end of 2011, 2,070 restored abandoned mine sites are in the monitoring and maintenance phase—an increase of 118 percent over the previous 3-year period (2006 to 2008). Collectively, four states accounted for 86 percent of the sites that completed the restoration phase and entered the monitoring and maintenance phase, including Montana (791 sites), Idaho (489),

Colorado (340 sites), and Washington/Oregon (150 sites). These accomplishments were driven by both the initial inventory improvements and the sizable funding increases for the important work of addressing physical safety hazards at sites, as well as large, complex site cleanups being completed. As noted earlier in the report, a much larger number of site restorations was initiated in this three-year period. This is likely to result in a significant increase in acres restored in the years to come, thus an increase in restored sites moving to the “sustain” phase.

Monitoring is necessary to assess the effectiveness of restoration actions over time. For example, we discovered earlier efforts had only limited success to control acid mine drainage from entering

Sustain Phase At-A-Glance

- *Monitoring* and maintaining restoration measures ensures that the measures are in place as long as necessary and continue to achieve the desired result. Activities conducted during this phase may include monitoring at water quality sites, checking adits and shaft closures as they can fail over time, checking fences and signs which can be vandalized or otherwise damaged, and ensuring measures are not adversely impacting wildlife (e.g., bat gates may have been placed incorrectly and may cause death or stress to the bat population).
- *Seeking* opportunities to cultivate stewardship by supporting or creating programs and initiatives that touch the lives of the public and the next generation of public land stewards.



A portion of the abandoned Zortman-Landusky gold mine before restoration.

Restored Landusky abandoned gold mine.

directly into the Rogue River from an adit at the base of the abandoned Almeda gold and copper mine in Josephine County, Oregon. The Almeda mine is located within a steep canyon stretch of the Rogue River and downstream from Galice, Oregon. Recreationists—including sightseers, rafters, and fishermen—are all drawn to the site by its colorful mineral deposit. The increased funding received in 2009 enabled the BLM to determine and implement corrective measures that sealed the mine's entrance and prevented any further impact from acid mine drainage on the river and the Galice community. Maintenance of restorative measures is necessary as well. In Nevada, we reapplied a surface sealant to dry-holding ponds at the abandoned Caselton mine continuing to prevent lead, manganese, silver, and other metal-processing tailings from becoming airborne. Prior to the draining—holding ponds at the abandoned Caselton mine, the water was so acidic from tailings contamination that it literally dissolved shoes.

By continually seeking to improve the agency's AML reclamation and remediation efforts, the BLM looks for innovative methods for potential on-the-ground remedial efforts and for cost savings. One example is the installation of a wind turbine at the Zortman and Landusky abandoned mine site. This effort should help to offset the long-term water treatment and monitoring energy costs by \$300,000 per year.

We know that the long-term restoration of America's public lands depends on citizens who are informed and willing to assist us in protecting these lands and water. We continue to seek opportunities to cultivate stewardship by supporting or creating programs and initiatives that touch the lives of American youth, the next generation of public land stewards. The next generation of future abandoned mine site experts are now receiving valuable on-the-ground experience through BLM programs like America's Great Outdoors; this program helps to match Eagle Scouts who need to perform community service projects with work needed at abandoned mine sites.



Eagle Scouts fence off an open shaft in Clark County, Nevada.

Projects have ranged from individual and troop endeavors to complex Eagle Scout advancement projects. The abandoned mine securing work performed by Eagle Scout candidates has helped the Nevada Division of Minerals' AML program in ways that no one could have imagined a few years ago. A steady stream of eager and capable Eagle Scouts come forward each year to help the Nevada Division fence, barricade, and sign hazardous mine openings. For their part, the Eagle Scouts not only provide one-time assistance, they also gain experience and education that can benefit them in the future. Any work performed by the Eagle Scouts is closely monitored for safety by the Nevada Division staff. Between 2009 to 2011, the Eagle Scouts helped fence, barricade, and sign 143 hazardous mine openings in Carson City, Churchill, Clark, Douglas, Lyon, Mineral, Nye, and Washoe Counties. The BLM salutes Eagle Scouts for their hard work, dedication, and genuine concern for the safety of all people using public lands.

We seek opportunities to recognize and thank the current generation of public land stewards whenever possible. Public land stewards are our partners who enhance the BLM's work toward restoring our nation's landscapes and fostering the new legacy of abandoned mine lands. Recently, we recognized a BLM volunteer from Arizona who has donated more than 12,000 hours of volunteer time under the BLM Volunteer Program. In another instance, the BLM presented an archeological "Trowel" award to a volunteer for supporting numerous interpretative and stabilization projects at the historic Swansea mine site. The BLM thanks all of our public land stewards across the nation dedicated to promoting sustainability of public lands for future generations.

The following project summaries further highlight the BLM's success in sustaining measures put in place at abandoned mine sites to support the protection of the public and the environment into the future.



Corrective measures include access controls.



View inside the reopened adit at Almeda abandoned mine.



Acid mine waste flowing from the remediated adit near abandoned Almeda gold and copper mine before implementing corrective measure.



Installation of a 225kW wind turbine at the Zortman-Landusky abandoned mine to offset the long-term water treatment and monitoring energy costs.



Long-term groundwater monitoring and treatment system at Zortman-Landusky abandoned mine.

Zortman and Landusky Abandoned Gold Mines, Montana



New water treatment plant for Swift Gulch completed in 2011.

Spanning some 1,200 cumulative acres, the Zortman and Landusky Mines are located 2 miles apart in the Little Rocky Mountains of north-central Montana. Both mines are near the southern boundary of the Fort Belknap Indian Reservation in the southwest corner of Phillips County. The area's gold mining activity stretches as far back as the late 1860s and continued up until 1998, when the mines' most recent owner declared bankruptcy.

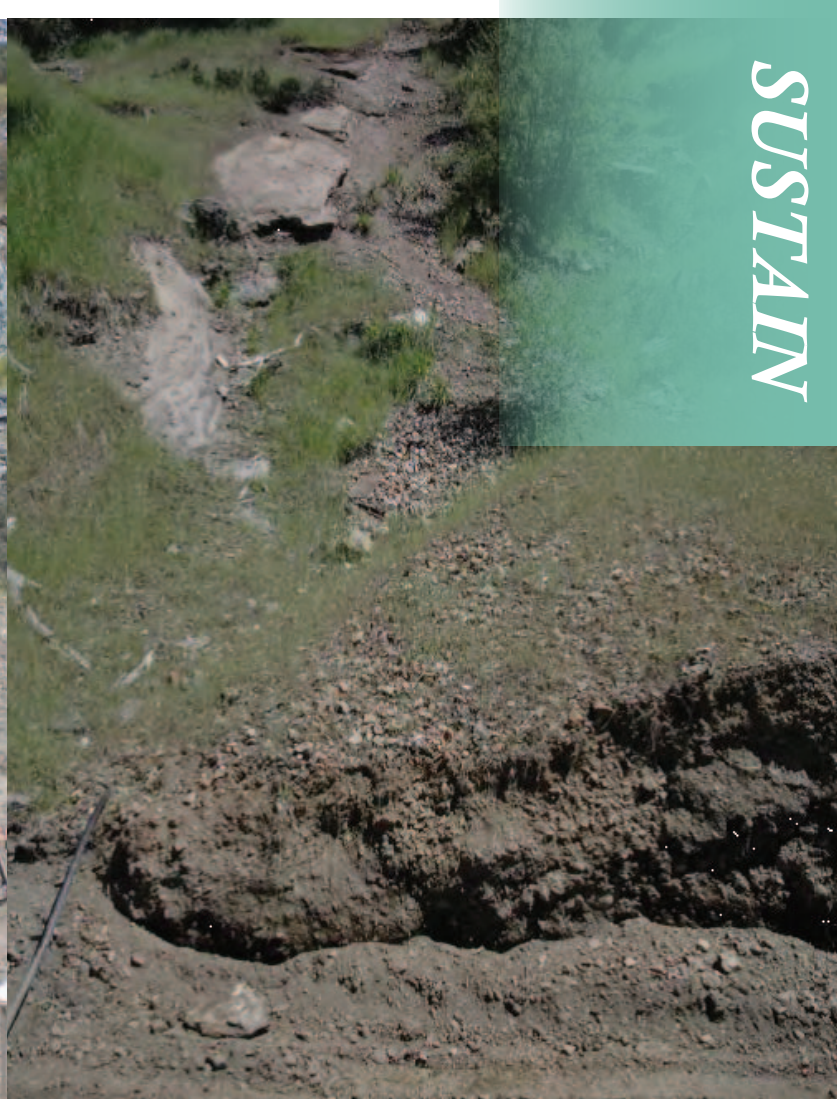
While restoration activities at these two sites were completed in the mid-2000s, precipitation runoff from both mines still flows into tributaries of the Milk and Missouri Rivers. Ongoing monitoring and maintenance activities include the maintenance of water capture and treatment systems that prevent excessive heavy metals, nitrates, selenium, and cyanide from being discharged into the surrounding streams. A \$13.8 million water treatment trust fund was set up by the Montana Department of Environmental Quality to construct and operate

three of these water capture and treatment systems. But in recent years, due to excessive precipitation in the area, water treatment costs have exceeded available funds by more than \$1 million annually. This excessive precipitation also necessitated an additional water treatment system to treat waters flowing into the Swift Gulch, which flows onto the Fort Belknap Tribal Reservation.

With assistance from the BLM in the spring of 2011, a water treatment plant for Swift Gulch was completed, along with a 225 kW wind turbine to help offset the approximately \$300,000 in annual power costs such treatment plants require. While remediation efforts continue, the four treatment plants established by the Montana Department of Environmental Quality and the BLM have successfully prevented contaminants from being discharged into nearby streams and tributaries, keeping the water safe for local populations and wildlife.



Soil sampling at the abandoned Contact Mine in California.



Mine tailings migrating down the hill from the abandoned Contact Mine.

Contact Mine, California

Located in the hills of Sonoma County, California, the Contact Mine is situated in the West Mayacmas Mining District near the headwaters of Anna Belcher Creek. The mine began operations in approximately 1870 and remained active up until 1956. In the decades following, remaining waste products from the Contact Mine and the Sonoma Mine (located downstream) leached mercury into Anna Belcher Creek, Big Sulphur Creek, and the Russian River watershed—critical spawning habitat for salmon and steelhead trout. This contamination—and its source waste piles on the Contact and Sonoma mines—was confirmed by USGS sampling assessments conducted in April 2001.

With assistance from federal funding provided in 2009, the BLM began a cleanup effort in 2010 and consolidated waste piles, capped them with clean soil, and re-seeded with native plants. Cleanup is now complete and the area's water resources are no longer affected by mining wastes. Monitoring will continue until 2014 to ensure that the streams and watershed remain free from migrated mercury contamination.



Water flowing from a drainage adit near Contact Mine.

Thank you, Partners!

Communication and collaboration among project partners are essential to overcoming the complexities of restoring abandoned mine lands. Not only can formerly mined lands be large enough to stretch over multiple jurisdictions, but their contaminant runoff can also affect streams, watersheds, individual landowners, and communities far beyond a site's actual borders. For a single agency or organization with limited resources, it is often impossible to carry out effective restoration activities without partners. The BLM Abandoned Mine Lands Program would like to sincerely thank all of the partners providing support to identify and restore abandoned hardrock mine sites for safer public lands and water.

Alaska Department of Natural Resources, Division of Mining, Land and Water – Abandoned Mine Lands Program

Arizona Department of Environmental Quality

Arizona Department of Land

Arizona Department of Water Resources

Arizona Game and Fish

Arizona State Mine Inspector

Arizona State Mine Inspector's Office

Barrick Gold Corporation

Bat Conservation International, Inc.

Batworks, Inc., Rapid City, SD

Bristol Companies

Bureau of Alcohol, Tobacco, Firearms, and Explosives

Butte County, ID

California Abandoned Mine Lands Unit

California Department of Environmental Conservation

California Water Resources Board

City of Coeur d'Alene, ID

City of Silver City, NM

Clark County, NV Metro Police

Coeur d'Alene Basin Commission

Colorado Division of Reclamation Mining and Safety

Eureka, Pershing, and Washoe County (Nevada) Sheriffs

Fort Belknap Tribes, Fort Belknap, MT

Freeport McMoRan Copper and Gold, Inc.

Granite County Commissioner, MT

Great Divide Ski Corporation, Marysville, MT

Hinsdale County, CO

Hydro Solutions, Inc, MT

Idaho Department of Environmental Quality

Idaho Department of Fish and Game

Idaho Department of Lands – Abandoned Mine Lands Program

Idaho Historic Preservation Office

KC Harvey Environmental, LLC (formerly Reclamation Research Group, Bozeman, MT)

Lemhi County, Idaho

Montana Bureau of Mines and Geology

Montana Department of Environmental Quality – Abandoned Mine Lands Program

Montana Department of Fish, Wildlife & Parks

National Association of Abandoned Mine Lands Programs

National Park Service

Nevada Abandoned Mine Lands Program

Nevada County Resource Conservation District

Nevada Department of Wildlife

Nevada Division of Environmental Protection

Nevada Division of Minerals

Nevada Mining Association

New Mexico Abandoned Mine Land Program, Mining and Minerals Division

New Mexico Department of Minerals, Energy and Natural Resources – Abandoned Mine Land Program

New Mexico State University

Noble Excavating, Libby, MT

North West Services Inc, Butte, MT

Northern Arizona University

OHV Ambassadors

Oregon Department of Environmental Quality, Land Quality Division – Environmental Cleanup and Emergency Response Section

Oregon Department of Geology and Mineral Industries

Pioneer Technical Services, Helena, MT

Placer County Resource Conservation District

Pyramid Lake Paiute Tribe

Salmon/Challis National Forest

San Juan Resource Conservation District

Sawtooth National Forest

Shoshone County, ID

South Dakota Department of Environment and Natural Resources – Minerals and Mining Program

South Dakota School of Mines and Technology

Spectrum Engineering, Billings, MT

Target Minerals

The Great Basin Institute

The University of Arizona

U.S. Army Corps of Engineers

U.S. Army Corps of Engineers, Omaha District

U.S. Bureau of Reclamation

U.S. Environmental Protection Agency

U.S. Forest Service

U.S. Geological Survey

Union Pacific Railroad

List of Partners, continued

Utah Abandoned Mine Reclamation Program
Utah Department of Environmental Quality
Utah Department of Natural Resources
Utah Division of Environmental Response and Remediation
Utah Division of Radiation Control
Utah Water Science Center

Washington Department of Ecology
Washington Department of Natural Resources
Wyoming Acid Drainage Technology Initiative – Metal Mining Sector
Wyoming Association of American State Geologists
Wyoming Department of Environmental Quality – Abandoned Mine Land Program

The BLM and the National Mining Association have recognized the exceptional contribution of the following partners through the Reclamation and Sustainable Mineral Development Award program. We are proud to highlight their achievements and the remarkable impact they have had on-the-ground to protect public health and safety.

California Department of Conservation's Abandoned Mine Lands Unit

The California Department of Conservation's Abandoned Mine Lands Unit is a recognized leader in the effort to eradicate physical hazards associated with California's 47,000 abandoned mines, approximately two-thirds of which lie on federal lands. The unit has taken a lead role in inventorying and remediating unsafe abandoned mine features on lands in California by coordinating with more than two dozen partners, and by providing funds and staff time. The unit has compiled data on nearly 24,000 abandoned mine land features. Since 2002, the unit has provided more than \$650,000 to its partners to remediate more than 500 hazardous mine features.

Nevada Operating Engineers Union Joint Apprenticeship Committee for Northern Nevada

In Nevada, the BLM has focused on working to reduce hazards to public land users in areas like Painted Rock, located east of Reno and Sparks. While evaluating the impacts of the area, the BLM encountered a large fenced-in facility containing bulldozers and other heavy equipment. This turned out to be the training center for the Nevada Operating Engineers Union, which quickly volunteered its apprentices to fill in abandoned mine openings as part of their bulldozer training. The BLM was impressed by the Union's focus on safety; the patience of the trainers; the pace at which the apprentices learned to operate the machinery; and the positive spirit of the participants in this effort. The Union's donation of equipment, fuel, and operators allowed the BLM to address these hazards at no expense to the taxpayer.

Nevada Division of Minerals, Nevada Department of Wildlife, Nevada, Nevada Natural Heritage Foundation Program, US Forest Service, and Private Volunteers

A post-World War I boom in lead, copper, and silver mining around Spruce Mountain, Nevada, left the area dotted with shafts and adits such as the

notorious "Hummer Hole." This extremely deep hole was large enough to swallow up three Hummers side by side. These and other hazards around the mountain represented a huge threat to the OHV community. The BLM partnered with federal, state, and local organizations and volunteers to tackle the problem. The Nevada Division of Minerals located and inventoried the hazards, posting warning signs at the entrances of particularly dangerous shafts. Girl Scout volunteers helped to fence in selected openings. Bat surveys were conducted by the Nevada Department of Wildlife. The Forest Service constructed bat gates, while the BLM conducted backfills. A heavy steel grate closure secured the Hummer Hole's gaping entrance. The work was conducted at elevations of up to 9,000 feet, in remote terrain, hours from any commercial or emergency services. Despite these obstacles, these diverse partners cooperated to close the hazards rapidly and efficiently. In all, the partners addressed 47 mine hazards.

Teck American, Incorporated

For over a century, silver, lead, zinc, and tungsten were extracted at the McCracken mine in Mohave County, Arizona. Teck American acquired patent claims for the site in 1983 and leased the site for mining silver from 1983 to 1985. The site has been dormant ever since. However, Mohave County is a popular area for hikers and ORV riders, and in 2005, an ORV enthusiast approached Teck American about acquiring the McCracken site. In a subsequent evaluation of the site, Teck American determined that the McCracken mine would require an extensive closure plan due to potential safety risks posed by the mine's deep shafts and rotting timbers. This plan was developed in 2007, in collaboration with local ORV clubs and regulators. Ultimately, Teck American secured 47 hazardous mine openings using polyurethane foam and backfill.

Thank you!

"The overall working relationship between BCI and the BLM could not be better. We are achieving a lot of good things in the strong and productive partnership!"

**-James Corbett,
Subterranean Program
Coordinator, Bat
Conservation International**

“The vast possibilities of our great future will become realities only if we make ourselves responsible for that future.”

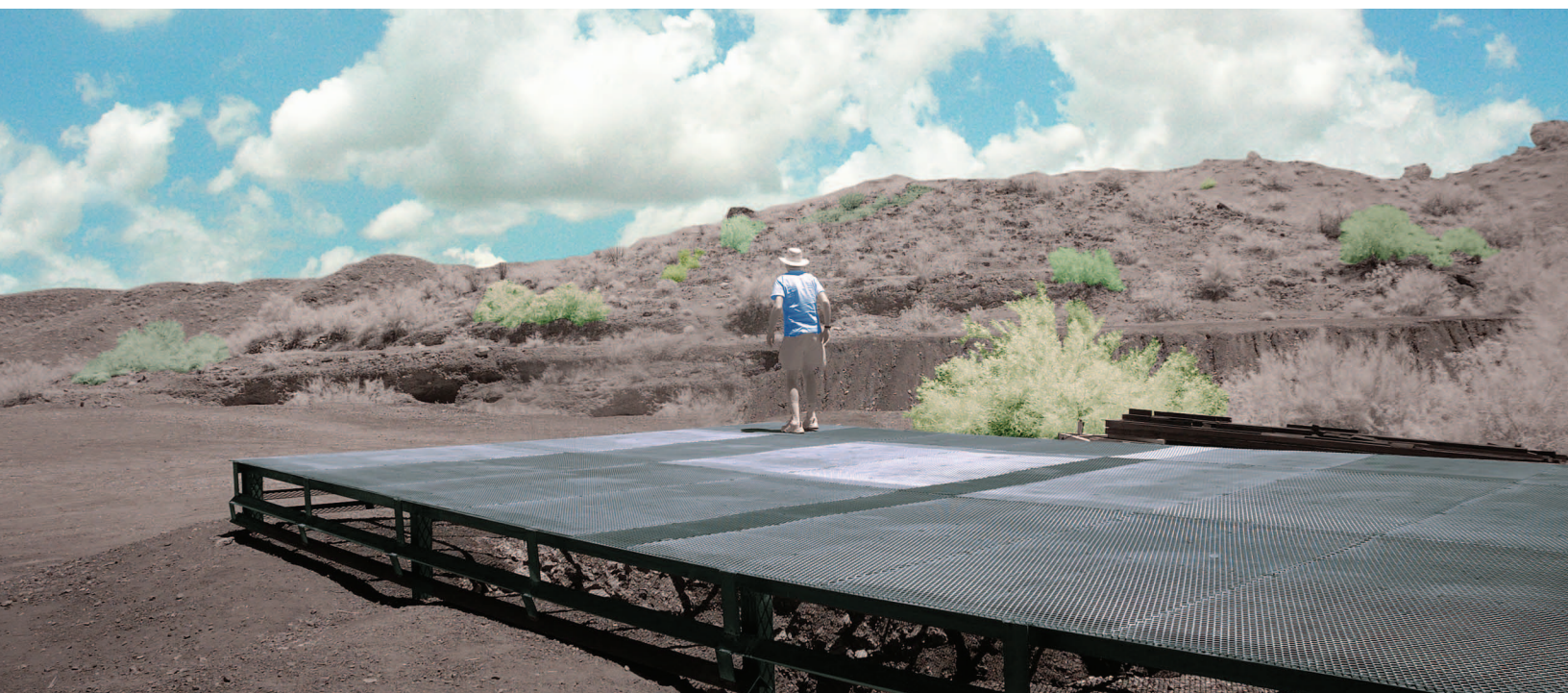
—Gifford Pinchot

A New Legacy: Our Past, Present, and Future

The BLM AML program has achieved much success in restoring impacted abandoned mine lands as demonstrated by our on-the-ground accomplishments from FY 2009 to 2011. The project highlights provided throughout this report offer insight into many of the environmental, health, and safety impacts associated with abandoned mine sites, as well as the lasting positive impacts of restoring them. Our success can be attributed to three key factors: 1) implementation of a phased approach that moves impacted mine lands and water to a restored, safe, and sustainable state; 2) funding increases; and 3) leveraged resources through coordination and collaboration with our partnership. These factors have afforded us the opportunity to demonstrate innovative approaches to restore land and water, such as inventory teams to enhance site inventory and expedite closures of high-risk AML sites, and the use of renewable energy to help offset long-term maintenance and monitoring costs associated with restoring abandoned mine lands.

With our achievement is the realization that there is more work to do. With 25,400 known abandoned mine sites remaining in the AML inventory, the BLM will continue to forge a New Legacy for America’s western lands. We will continue to leverage funding and resources, implement innovative approaches, and work in collaboration with state, local, and tribal government partners, other federal agencies, and local communities to transform the old mining legacy to a sustainable, protective, and informative land use inheritance for current and future generations.

Ultimately, protection of human health and the environment is the overarching goal of the BLM’s Discover-Restore-Sustain process. Integrating other priorities into this process—such as cultural heritage awareness and recreational improvements—further enhances the BLM’s efforts. The lasting measure of our accomplishments will be how safely and seamlessly the AML program’s New Legacy is reflected in the national landscape.



A bat-friendly closure installed over a deep abandoned mine shaft near the Swansea ghost town protecting the public and wildlife now and into the future.

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BLM AML staff and partners.

Cover Photos (Top to Bottom and Left to Right):

Gold miners sampling a remote placer mining claim using a prospector's rocker box, Old mine entrance, Almeda gold and copper mine in 1910, White Swan gold mine, A historic mining town, Upper Animas River Basin, Opening of an abandoned uranium mine discovered in San Rafael Swell area of Utah, Fixing adit near the Lost Arch mining camp and trails, and 225kW wind turbine installed at the Zortman and Landusky abandoned mine

ABANDONED MINE LANDS: A NEW LEGACY

Publication date: May 2013

BLM Publication Number: BLM/WO/GI-13/007-3720

Bureau of Land Management: www.blm.gov/wo/st/en/prog/more/Abandoned_Mine_Lands.html

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