

Technology Development and Transfer

**Improvement through
technical assistance,
transfer of technology,
and training**



Coal mining at this Ohio site was a temporary use of the land. In the first step of the mining operation one foot of topsoil and two feet of subsoil were removed and stored separately. During reclamation the soil was restored, seeded with alfalfa, red clover, timothy, and orchard grass and today is used for hay production. This mine reclamation resulted in above average crop yields and very rapid return to the long-term agricultural land use.

The Office of Surface Mining provides states, Indian Tribes, federal agencies, the coal industry, and citizens with the technical information and tools they need to carry out their responsibilities under the Surface Mining Law. These activities include providing direct technical assistance to address specific mining and reclamation problems; transferring technical capability to others through training, consultations, forums, and conferences so they are better equipped to solve problems on their own; developing and testing new methods of mining and reclamation; and maintaining automated systems and databases used by others in making decisions under the Law.

Helping our State and Tribal Partners

A key premise of the Surface Mining Law is that primary responsibility for day-to-day permitting, inspection and enforcement rests with the states because of regional differences in types of mining, geology, climate, and other physical conditions. Through technical assistance the Office of Surface Mining is providing state and tribal partners with the tools they need to meet those obligations as effectively and efficiently as possible.

Because the technical capability of each state and tribe varies dramatically, the Office of Surface Mining must be prepared to fill technical gaps by providing otherwise unavailable expertise as the need arises. For example, an Office of Surface Mining hydrologist can provide much-needed professional help to a state dealing with a problem that it rarely encounters but that the Office of Surface Mining has encountered and addressed in other parts of the country. Even in those states sufficiently staffed to address most technical issues, the Office of Surface Mining is often asked to help verify technical information

and decisions based on the broader national and regional perspectives that Office of Surface Mining technical staff typically have. This assistance ranges from frequent, informal, day-to-day consultations to extensive analyses of technical mining and reclamation issues involving research, documentation, and site visits. This assistance has resulted in an expanded relationship with states and tribes where the Office of Surface Mining's traditional oversight presence has increasingly been supplemented by an active technical assistance and support role. This has led to an atmosphere of cooperation and partnership that is helping everyone do a better job in implementing the Surface Mining Law.

Providing Services to Citizens and the Coal Industry

While the focus of the Office of Surface Mining's work is directed at helping state and tribal partners do their jobs, the ultimate goal is to improve the health, safety, and the environment for our primary customers -- the people who live and work in coalfield communities. The Office of Surface Mining provides information to citizens to help them better understand their rights and responsibilities for implementing the Surface Mining Law.

Working with other Agencies

While states and tribes are the focus of partnership for the Office of Surface Mining, working relationships with other agencies result in more effectively and comprehensively addressing environmental issues under surface mining and related laws. For example, under the Acid Drainage Technology Initiative, the Office of Surface Mining is working with many other government agencies to find better ways to prevent and eliminate acid mine drainage. The Environmental Protection Agency (EPA) is helping the Office of Surface Mining by trying to remove impediments to re-mining of abandoned sites in its enforcement of the Clean Water Act. At the same time, the Office of Surface Mining is contributing to the Environ-



In areas of high rainfall conditions water can easily erode soils. To prevent erosion of the hillside at this Pennsylvania mine site, a rock check dam was constructed across the slope. This small structure slows the flow and prevents water from eroding gullies in the smoothly graded slopes.

mental Protection Agency's clean water goals by loading Clean Water Act violations into the Applicant Violator System so that these violations are considered in mine permitting decisions under the Surface Mining Law. Using the Applicant Violator System, the Tennessee Valley Authority checks potential coal suppliers to make sure they don't do business with those who owe the government money.

Bringing People Together to Pursue Common Goals

To keep pace with constantly changing mining and reclamation technologies, the Office of Surface Mining has sponsored several events that have brought together people with common goals and problems to learn from each other, to develop new approaches to resolving problems, and to find ways to combine our efforts for better results. Through the Office of Surface Mining's widely attended National Coal

Symposium and a series of regional symposia that followed, the Office of Surface Mining took steps to develop more effective working relationships with other government agencies that have coal-related missions and a need to share technical information, including the Mine Safety and Health Administration, the Department of Energy, Environmental Protection Agency, Department of Agriculture, and other bureaus within Interior.

In 1998 work continued with other agencies to find economical and environmentally safe ways to dispose of coal combustion by-products. The 1998 Prime Farmland Forum and Workshop provided an opportunity for agencies concerned with the state of America's agricultural lands to assess the impacts of their programs and those of other agencies on prime farmland and to discuss how to develop policies and programs that will enhance and protect valuable cropland for our nation's future.



One of the most widespread and dramatically visual problems prior to the Surface Mining Law was highwalls that were left exposed when a mining operation was complete. At this Kentucky mine the highwall is being reclaimed as the mine progresses around the hillside. When overburden is removed from the active pit it is used to cover the highwall of the mined-out area.

Under a cooperative agreement with the Interstate Mining Compact Commission (IMCC), the Office of Surface Mining and state regulatory authorities are pooling their capabilities to access, summarize, and analyze publicly available electronic information related to the Surface Mining Law. The initial phase of this agreement focuses on more cost-efficient and effective ways of using currently available information and search capabilities (i.e., COALEX and LEXIS databases).

Technical Information Processing System (TIPS)

The Technical Information Processing System is a computer system designed by the Office of Surface Mining in partnership with primacy states. The system is maintained by the Office of Surface Mining for use by state and Tribal regulators and the Office of Surface Mining staff. The system consists of a centrally-located fileserver networked through the Office of Surface Mining wide-area network to engineering/scientific work stations which are interconnected to local area networks in state, Tribal, and selected federal offices. The Technical Information Processing System suite of scientific, data base, and mapping core software aids the technical decision-making associated with conducting reviews of permits, performing cumulative hydrologic impact assessments using a watershed approach, quantifying potential effects of coal mining, preventing acid mine drainage, quantifying subsidence impacts, measuring revegetation success, assisting in the design of abandoned mine lands projects, and providing the scientific basis for environmental assessments and environmental impact statements.

Before reclamation this rich wetland was the site of a 96 acre abandoned mine near Pella, Iowa. Using money from the Abandoned Mine Land Fund, the project eliminated unvegetated spoil and flooded mine pits that were causing acid mine drainage. With reclamation complete the wetland aids in eliminating the acidic runoff and is a viable habitat that is actively used by migratory waterfowl.



Technical Information Processing System activities in 1998 included a large work effort related to system testing associated with conversion from UNIX to NT. This conversion will allow the system to be used on the desktops of state, Tribal and federal regulators across the country and will significantly increase the use while enhancing the Office of Surface Mining Electronic Permitting Initiative nation wide. The Technical Information Processing System staff continued to actively work with state and Tribal regulatory authorities in the implementation of the Electronic Permitting Initiative and Geographic Information System (GIS) initiative while continuing to provide daily user support for other system applications. Work also continued in the development of Geographic Information System capabilities for Indian Lands Mines. These activities included assistance to the Hopi in the full implementation of the Hopi Land Information System.

Training of state, Tribal, and Office of Surface Mining personnel in the practical application of the system is done on a continuing basis and is an integral part of the system operation. When space is available, the general public also attends Technical Information Processing Systems courses. This year 40 classes were taught at the training facilities in the three regional service centers and at state and Tribal training facilities. In 1998, 463 students attended the classes compared to the 270 students in 1997 (an increase of 71 percent). Course offerings included surface-water modeling, ground-water modeling, three-dimensional spatial geologic and toxic-material modeling, environmental statistical analysis, environmental data base management, analysis of water quality data using Piper and Stiff analysis, geographic information system use, slope stability, automated drafting and site design, statistical analysis, and global positioning system use.



In 1999 the majority of TIPS resources will be committed to the conversion from the 7-year old UNIX workstations to NT workstations/fileservers.

Acid Drainage Technology Initiative

The Acid Drainage Technology Initiative is a partnership which the Office of Surface Mining has joined with industry, states, academia, other governmental agencies, and groups to identify, evaluate and develop "best science" practices to prevent acid mine drainage, and to describe the best methods for preventing new acid mine drainage and eliminating existing sources. The National Mine Land Reclamation Center of the University of West Virginia serves as the Secretary for the Initiative. The Eastern Mine Drainage Federal Consortium, a group of federal agencies working in the Appalachian region, helps coordinate the Federal participation. The Interstate Mining Compact

The Technical Information Processing System is a linch-pin for the new electronic permitting now being used at many active mines. Maps, such as the one shown here, are only one benefit of electronic permitting. The potential improved efficiency and decreased permit review costs make this one of the most exciting innovations since the mine permit process began in 1977.

Commission, representing eastern coal-producing states, and the National Mining Association, representing the U.S. coal industry, also participate.

While the initial focus is on the coal fields of Appalachia, the prediction effort will be expanding to include the Western United States, including non-coal mining. In 1998, the members of the Initiative completed a draft *AMD Remediation Handbook — a user manual on AMD remediation methods*. The Handbook is a compilation of all known remediation methods and experiments, including examples where the work was unsuccessful. The Handbook should help those eliminating existing acid mine drainage problems and improvement in the cost-effectiveness of stream cleanup projects.

This year work also began on a handbook titled *Review of Mine Drainage Prediction Methods*. This handbook, will be issued in 1999, and cover overburden testing, sampling, and field validation.

International Activities

In many countries, mining has been practiced for centuries with little regulation or noticeable concern for the environment. The successful implementation of the Surface Mining Law in the United States is a model for nations facing the challenge of protecting the environment and still promoting coal production. In recent years, several governments have requested assistance from the Office of Surface Mining in improving their capability to administer mining and reclamation programs. In 1998, the Office of Surface Mining and state staff made presentations and assisted mining professionals from several foreign countries including South Africa, Hungary, and China.

Technical Assistance for Indonesia

In 1998, the Office of Surface Mining completed a 3-year technical assistance project with the government of Indonesia. This project provided assistance to improve the country's capacity to regulate the surface coal mining industry and reclaim mined lands in an economical and environmentally sound manner. The World Bank funded the project and fully reimbursed the Office of Surface Mining for all costs.

Under the project, technical professionals from Indonesia attended Office of Surface Mining training courses on various topics, including reclamation bond calculation, erosion and sediment control, and operation of the Technical Information Processing System. Office of Surface Mining and state personnel traveled to Indonesia to provide on-site assistance in the areas of inspection practices, permit processing, and program management. As a result of recommendations by Office of Surface Mining personnel, Indonesia issued new guidelines for spoil handling and implemented bonding requirements.

Coal and Peat Fire Suppression in Indonesia and Malaysia

In early 1998, Indonesia again approached the Office of Surface Mining for help -- this time to combat wildfires that had been ravaging dense forests for months. The difficulty of suppressing these fires has

A coal seam close to the land surface has caused the waterfalls as this small stream flows over it. The coal outcrop along the stream has been ignited and the seam is now an active fire.



The interrelated danger of forest and peat fires can be seen here at this active fire close to the surface of the land.

been exacerbated by dozens of outcrops of exposed coal and peat that dot the mountainous regions of Indonesia. Because the coal and peat burn easily and often much longer than the forests, they pose a constant threat of re-igniting the forests long after the wildfires have been brought under control.

Fighting coal and peat fires requires specialized fire suppression technology. Over the years, the Office of Surface Mining and state regulatory authorities have gained considerable experience and expertise in this area dealing with the many and varied coal fires in the U.S. Under an existing Memorandum of Understanding with Indonesia, and with funding from the State Department's Southeast Asia Environmental Initiative, the Office of Surface Mining began providing much-needed technical fire-fighting assistance in the summer of 1998.

The fire suppression assistance program, to be completed by mid-1999, includes developing a mechanism for priority setting, training in the identification of hazards and the characterization of fire sites, selection of abatement alternatives, and on-the-ground management of fire suppression activities.

The Office of Surface Mining was also asked by Indonesia's neighbor, Malaysia, for peat fire suppression assistance. Again, working under the Southeast Asia Environmental Initiative, the Office of Surface Mining provided some short-term training and assistance to Malaysians in the reconnaissance and identification of peat fires, and then arranged for the Malaysians to participate in the Indonesia fire suppression assistance project's training activities.

National Technical Training Program

In support of the greater emphasis that the Office of Surface Mining has placed on providing technical assistance to those who have the day-to-day responsibility to carry out the Surface Mining Law, the national technical training program was stepped up in 1998. This training program is a cooperative effort with states and tribes and addresses the needs of federal, state, tribal, and private organizations with regulatory and reclamation responsibilities. To meet the demand for training by industry and the public, the Office of Surface Mining conducted a workshop on acid forming materials at the national meeting of the American Society for Surface Mining Reclamation and is exploring similar opportunities for 1999.

All technical training courses were taught by teams of state and Office of Surface Mining staff. In 1998, there were 157 instructors -- 50 percent from the Office of Surface Mining, nine percent from the Interior Department's Solicitor's Office, 37 percent from states, and the remaining four percent from other sources. The 27 courses, which reached 819 students, were presented in 29 locations in 12 states. State and tribal students accounted for 79 percent of students, while Office of Surface Mining accounted for 18 percent and three percent were non-government participants. A new course in abatement techniques for extinguishing mine fires was added to the course schedule, an introductory course in acid materials for program staff was piloted, and new courses in alternative enforcement techniques are achieving results under the Law and under development. Training courses offered in 1998 included:



At this site subsidence, resulting from a coal seam fire has required people to abandon their house and relocate. As the coal burns it leaves a void under the shallow soil causing subsidence, additional exposure to the fire, and widespread damage to land.

While developing the permit to mine, company employees at this Montana operation identified a large sandstone outcrop known as "Eagle Rock." The unique feature, located in the middle of the coal reserve, had special aesthetic value, contained unique wildlife habitats, and was a camp site of ancient native peoples. A plan was developed to mine around the outcrop instead of mining through the area and destroying it. Today Eagle Rock remains a local landmark and this unique ecological and historical niche continues to be part of the Montana landscape.

Course Name	Number of Sessions	Number of Students
Acid-Forming Materials: Fundamentals	3	52
Acid-Forming Materials: Planning & Prevention	2	42
Acid-Forming Materials for Program Staff	1	7
Administration of Reclamation Projects	1	16
Abandoned Mine Design Workshop: Dangerous Openings	1	9
Abandoned Mine Design Workshop: Fires Underground/Refuse Burning	1	10
Abandoned Mine Design Workshop: Landslides	1	9
Abandoned Mine Design Workshop: Subsidence	1	12
Applied Engineering Principles	2	35
Blasting and Inspection Procedures	2	31
Bonding Workshop: Administrative & Legal Aspects	1	23
Bonding Workshop: Cost Estimation	2	44
Effective Writing	3	40
Enforcement Procedures	1	21
Erosion and Sediment Control	3	51
Evidence Preparation and Testimony	2	33
Expert Witness	2	19
Historic and Archeological Resources	1	25
Instructor Training	1	18
NEPA Procedures	1	23
Permitting Hydrology	1	10
Principles of Inspection	2	21
Soils and Revegetation	2	41
Spoil Handling and Disposal	1	28
Surface & Groundwater Hydrology	2	45
Underground Mining Technology	4	92
Wetlands Awareness	4	62
Total	48	819

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Two years ago the Office of Surface Mining identified a need to provide training to staff members on agency trust responsibility to American Indian Tribes. The Office of Surface Mining wanted to cooperate with other Interior Department bureaus to accomplish the following objectives: 1. present the Department's trust responsibilities and each agency's policies and procedures for fulfilling those responsibilities, 2. ensure that the cooperating agencies know their responsibilities and are operating from a common understanding, and 3. develop a resource handbook to be used as a desk reference manual. An integrated course was developed with the Bureau of Land Management, Bureau of Indian Affairs, Minerals Management Service, Solicitor's Office, and the Office of American Indian Trust. The Office of Surface Mining provided the lead for development and instruction for solid mineral



Before mining at this Washington site, the steep sloped mountain terrain supported mixed conifer and hardwood forests that produced timber on a 60-year rotation. After mining and reclamation trees are replanted and the land is returned to its original long-term forestry land use.

sessions, provided instruction on inspection and enforcement, prepared a video on sacred site issues, and developed training modules for cultural issues. The first course was held in Phoenix, Arizona during 1997 for 60 Interior Department personnel. A second course was held last year in Denver, Colorado, for over 100 participants. A third course is planned for Washington D.C. in the near future.

Applicant Violator System (AVS)

One of the underlying principles in the Surface Mining Law is that those who benefit from mining are responsible for returning the land and water to productive use as mining is completed. Section 510(c) of the Law prohibits the issuance of new permits to applicants who are responsible for outstanding violations until those violations are corrected. Often, determining whether an applicant owns or controls operations with violations is very difficult, largely due to the complexities of corporate relationships and inconsistencies from state-to-state

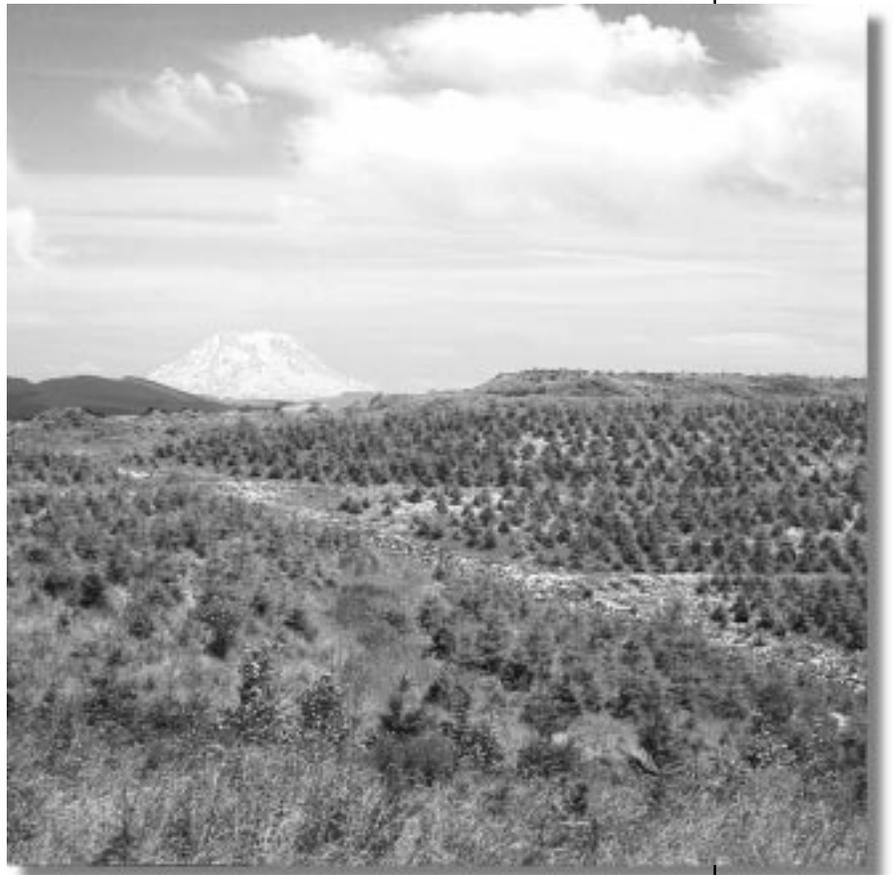
in how ownership and control is recorded and tracked.

The primary purpose of the Applicant Violator System is to provide state regulatory authorities with a centrally-maintained database of information to evaluate an applicant's mining history, including the applicant's relationship to past operations. The Applicant Violator System contains violation records as well as information on ownership and control of mining operations. By checking the system during the review of permit applications, a determination whether an applicant is entitled to a permit can be made. The system is also checked prior to awarding Abandoned Mine Land reclamation contracts. During 1998, the Office of Surface Mining responded to 4,568 requests for Applicant Violator System information from (state and federal) regulatory authorities, state Abandoned Mine Land programs, and others who use the system to check violation histories.

In late 1997 and throughout 1998, a team of Interior Department staff conducted a thorough review of Office of Surface Mining's ownership and control regulations and policies to identify ways to make them as effective and fair as possible. This process included numerous discussions with states, coal industry representatives, citizens' groups and others affected by these regulations. The Office of Surface Mining expects to propose for public comment redesigned ownership and control rules in early 1999. Following consideration of all comments received on the proposal, the Office of Surface Mining will develop and publish final regulations.

During the life of this mine over 14 thousand acres of land will be disturbed and restored. Most of this acreage was upland forest containing Douglas-fir and Red alder. Following mining and reclamation of the land, forests are being replanted using native species of trees. With the land reclaimed, this site quickly resembles the surrounding Cascade mountain landscape.

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During reclamation the land is regraded to establish the natural drainage patterns. At this North Dakota mine site, wood fiber netting is used to line the regraded drainage channels at the bottom of the reseeded slope. The netting prevents erosion until grass has been established and stabilizes the shallow channel. The netting material breaks down after the vegetation is established and adds organic material to the soil.

Other activities completed this year by the Applicant Violator System Office in Lexington, Kentucky, include: refining and improving the current system by providing assistance to state and federal permitting authorities, helping users on the interpretation of system data and its results, proposing modifications and enhancements to the system based on user feedback, updating and maintaining all data related to companies with interstate relationships, conducting ownership and control investigations; and pursuing comprehensive settlement agreements to accomplish reclamation and collect outstanding debts.

During 1998 the system was converted to a new mini-computer that has enabled it to operate more efficiently and at faster speeds. Also in 1998, through a cooperative agreement with the State of Kentucky, the Office of Surface Mining and the state began working to develop full compatibility between state and federal ownership and control automated data that can easily be shared and to eliminate duplicative data entries.

Prime Farmland

Successful reclamation of prime farmland has been a major concern to operators and citizens in the Midwest since before passage of the Surface Mining Law. In 1998, the Office of Surface Mining, jointly with other agencies, sponsored a Prime Farmland Forum. The latest research findings and successful reclamation techniques were presented to about 120

Access to the Applicant Violator System is available to the general public, coalfield citizens, individual coal companies, and industry representatives through public domain software, the Internet, or by direct dial-in. The Office of Surface Mining has received and processed over 318 requests for access software. General information about the Applicant Violator System is also provided through the Office of Surface Mining's "fax-on-demand" service.

During the last eight years, the Office of Surface Mining has provided general system training to 844 federal and state users and provided training to 362 people on how to access the system. Much of this instruction has been tailored to meet the needs of the target audience, such as the inspectors, auditors, and investigators. This training is provided on an as-needed basis, designed to address specific issues such as ownership and control relationships, the system database, and Applicant Violator System/Office of Surface Mining policy.

On reclaimed surface mines, topsoil is essential for reestablishing crop, forage, and timber production. At this Southern Indiana mine site the topsoil was handled with special care by using spreading techniques that minimize compaction that would hinder root penetration and water absorption by new seedlings. The reclaimed land at this site provides farmland that is productive for all crops grown in this area.



citizens, mine operators, and state and federal officials. Proceedings from the Forum have been published and are available. A follow-up Prime Farmland Workshop where reclamation techniques were reviewed was attended by about 80 reclamationists and citizens. The Office of Surface Mining also entered into a cooperative agreement with the University of Illinois and Southern Illinois University to fund continued research into identifying soil characteristics that may be used to demonstrate reclamation success.

Government Performance and Results Act Report

Goal 3. Better Service: *Strengthen the capabilities of states, Tribes, and the Office of Surface Mining staff to enforce the Surface Mining Law effectively by improving service to customers, partners, and stakeholders, through open communications, technical training opportunities, technical assistance, and the transfer of technology - in order to have better information and skills to make decisions.*

Performance Measure	1997 Actual	1998 Plan	1998 Actual
Customer satisfaction rate in the quality of technical training.....	85 percent	85 percent	90 percent
Number of students trained.....	1,010 students	900 students	819 students

Measuring performance within the technical training program continues to focus on customer surveys. Student satisfaction with the training is assessed at the conclusion of the course. Several months later, students and their supervisors are re-surveyed to identify whether they have applied what they learned in the course and how the training proved useful in the context of their day-to-day work. During 1998 results of the class surveys averaged 90 percent satisfaction and follow-up evaluations indicated that the training does improve job performance in many areas. During 1998, 814 students were trained and at the customers' requests, three additional classes planned for 1998 were re-scheduled for the Fall. This is very close to the goal of training 900 students per year and is the first phase of a larger effort to train 4,500 students over the next five years.

The success of topsoil handling is measured by the land's crop productivity after reclamation. Crops grown at this reclaimed Indiana mine have consistently been above required yields.

