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For further information on market-based mine land reclamation, visit www.mcrcc.osmre.gov/tree

Market-Based Mine Land Reclamation

Although the U.S. Office of Surface Mining has helped reclaim tens of thousands of acres of mine lands, significant challenges remain

In many parts of the U.S., surface mining operations provide jobs, tax revenues, and cost-effective fuel for local electric power and manufacturing companies. At the same time, surface mining can also significantly change natural landscapes if mine sites are not returned to the original pre-mining land use. For over two decades, the Office of Surface Mining (OSM) has helped mine operators improve the environmental quality of mine sites by helping them develop post-mining reclamation plans and by funding the clean up of abandoned mines.

When was OSM founded, and what is its charter?

The Surface Mining Control and Reclamation Act (SMCRA) of 1977 established OSM in the Department of the Interior. SMCRA identified two critical mine land reclamation areas—abandoned mine lands (Title IV) and active mine lands (Title V). Title IV funds the restoration of mine sites abandoned before 1977, and Title V requires mine operators to minimize surface-mining impacts by restoring mine lands to a condition equal to or better than that which existed prior to mining. OSM works with the states and tribes to develop and implement their mining regulatory and reclamation programs to meet the purposes of SMCRA.

What has OSM done to assure that mine operators properly restore mine lands?

Since its inception, OSM has conducted extensive outreach efforts throughout the coal-producing states, supporting state and tribal reclamation programs and working closely with mine operators to develop sound

Prior to reclamation this abandoned coal mine contained dangerous highwalls, hazardous water bodies, and spoil material. The mining ended in 1952. Photo: Chuck Meyers, Office of Surface Mining.

After reclamation the highwalls have been covered and hazardous water bodies removed. With the land regraded to gentle slopes the grass cover has eliminated excessive erosion and provides a rich upland wildlife habitat. Photo: Chuck Meyers, Office of Surface Mining.

reclamation practices. Title IV funding has allowed landowners and state agencies to successfully reclaim approximately 250,000 acres of abandoned mine lands, and Title V provisions have dramatically reduced the impact of surface mining projects.

As a result, mine operators have improved much of the affected land identified in 1977, through either reforestation or other reclamation techniques.

Have all environmental issues associated with mine lands been addressed?

Unfortunately, no. According to OSM's records, there are currently approximately 400,000 acres of unreclaimed abandoned mine lands—and hundreds of thousands of additional unidentified acres may remain. At the same time, many Title V sites have the potential to yield multiple environmental benefits through post-mining reforestation.

What is OSM doing now to address these challenges?

Today, OSM is aggressively promoting reforestation on active and abandoned mine lands. The objective is to raise awareness of reforestation as a reclamation option, promote state and federal regulatory approaches that encourage reforestation, and help reforestation projects succeed.

Why should landowners and mine operators want to reforest?

Reforestation is a winning proposition for landowners' and mine operators' bottom lines, as well as for the environment. Reclaimed forests provide value in two ways. First, they provide wood, which can be sold in the form of timber or other wood products. Second, forests perform a wide range of environmental "services." They can sequester significant amounts of carbon dioxide, minimize soil erosion (thereby preventing soil and nutrients from entering bodies of water), conserve water resources, and provide habitats for diverse species.

Mature tree growth on reclaimed mine land. Photo: Chuck Meyers, Office of Surface Mining.

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May 2002

Mine land reforestation can bring multiple environmental, economic, and social benefits

Today, more landowners and mine operators are reforesting their property instead of turning it into grasslands. They recognize that reforestation delivers substantial economic value as well as environmental and social benefits. This economic value includes the concurrent development of valuable ecological assets and renewable timber resources. Environmental benefits include reduced carbon dioxide in the atmosphere, improved water quality, and habitat preservation. Social or "community" benefits consist of job creation, increased tax revenue, and greater opportunities for recreation and tourism.

The result for landowners and mine operators who choose reforestation is a "win-win" scenario, which often yields improved community relations and greater economic value than can be achieved by traditional alternatives, such as selling land in traditional real-estate markets or leasing it as pasture.

This reclaimed area in Tennessee has received final bond release. Species include those that have been planted (e.g., white pine, black alder, green ash), and those that have established themselves through natural succession (e.g., yellow poplar, maple). Photo: Vic Davis, Office of Surface Mining.

This healthy 6-year old white pine is growing very well on reforested mine land. Photo: Vic Davis, Office of Surface Mining.

What is reforestation?

Reforestation is the re-establishment of a natural forest system on formerly mined lands or other deforested sites.

How does reforestation benefit landowners, the community, and the environment?

Reforestation offers significant economic, social, and environmental benefits. These include:

- **Environmental benefits**—Forests can minimize soil erosion (thereby preventing soil and nutrients from entering bodies of water), remove large amounts of carbon dioxide from the atmosphere, conserve water resources, and provide habitats for diverse plant and animal species.

- **Ecological asset value**—By providing environmental improvements, reforestation also produces ecological assets. Ecological assets are tradable credits based on the economic value of ecological "services"—such as removing carbon from the atmosphere—to key stakeholders. Through reforestation, landowners and mine operators may generate carbon sequestration credits, stream and wetland restoration credits, watershed pollution reduction credits, endangered species habitat preservation credits, and potentially other types. These credits can be sold to other companies or "banked" to enhance property value.
- **Timber value**—Forests provide marketable timber and pulp products. In addition, managed commercial timber harvesting can be compatible with the maintenance of ecological assets. Timber harvesting offers additional revenue for landowners and mine operators as well as job opportunities for local residents.
- **Recreational areas**—Forests provide an aesthetic venue for hiking, mountain biking, skiing, seasonal hunting, and other outdoor activities. The development of recreation opportunities supports regional tourism, and benefits area residents.

Christmas tree farms are found on reclamined mine land in many areas of the country. Photo: Chuck Meyers, Office of Surface Mining.

- **Job creation**—Reforestation and forest maintenance activities (including timber harvesting) bring jobs to local communities. As noted above, reforestation also indirectly contributes to the creation of tourism industry jobs.
- **Local tax revenue**—By creating jobs and attracting tourists, reforestation can make a substantial contribution to an area's tax base.
- **Landowner tax reduction** – Many states offer tax incentives for landowners to choose a forestry land use. These incentives can result in significant property tax reductions.

When is reforestation the right option?

Because many coal mine sites (particularly in the Appalachian region) were originally forests, reforestation is often the most suitable option for reclamation. However, to determine the feasibility of a reforestation project, landowners and mine operators need to carefully consider a site's productivity potential, reforestation costs, future timber value, and potential for ecological asset development. For many mine sites, reforestation offers optimal economical and environmental value over the long term.

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Reforestation helps SMCRA Title IV and V reclamation projects succeed

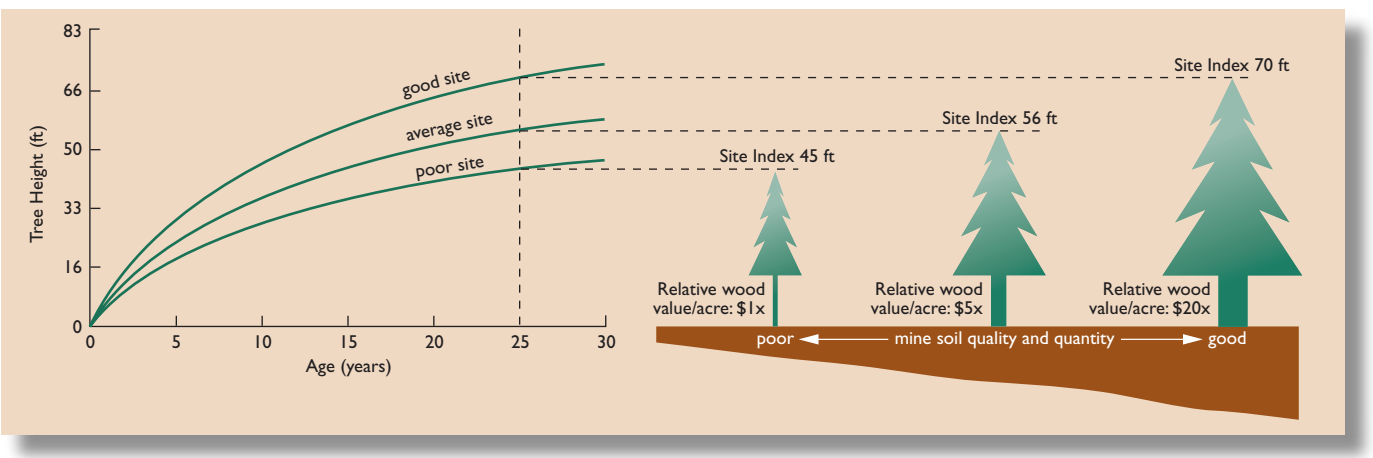
Through the Surface Mining Control and Reclamation Act (SMCRA) of 1977, the Office of Surface Mining (OSM) became responsible for managing two critical mine land reclamation challenges—abandoned mine lands (Title IV) and active mine lands (Title V). Title IV funds the restoration of mine sites abandoned before 1977, and Title V requires mine operators to minimize surface-mining impacts by restoring mine lands to their original contours.

Since the advent of SMCRA, many Title V reclamation projects have involved planting fast-growing dominant grasses to create pastures and other grasslands. Although aesthetically pleasing, these rolling, grassy hills do not offer the same economic and environmental benefits as the original forests they replace, especially with respect to preserving wildlife habitats and the ability to capture carbon from the atmosphere. Moreover, once pastureland is established, it is often difficult and costly to develop productive forests if soil has been excessively compacted and there is competition from aggressive ground covers.

By incorporating sound reforestation techniques into Title IV and Title V reclamation plans, landowners and mine operators can maximize long-term economic and environmental value.

Can reforested mine sites receive final bond release?

According to Title V, mine operators must post reclamation bonds for areas they expect to impact at the time they obtain their surface mining permit. This process includes the designation of a post-mining land-use plan and the development and approval of a complementary reclamation plan. As mining is completed and the reclama-



Following the forestry reclamation approach will lead to significant improvement in Site Index. As mine soil quality increases, tree growth increases linearly, but wood value increases exponentially. Figure based on research conducted by Dr. James Burger, Virginia Polytechnic Institute

tion process begins, the mining operator becomes eligible to apply for bond release. Many reforested mine sites have received final bond release, and OSM is currently working with the states and tribes to remove impediments to reforestation.

What are sound practices in reforesting mine lands?

More than two decades of research in the Appalachian region suggest that the following five-step forestry reclamation approach leads to productive reforestation:

- Create a new soil medium by replacing the original soil with four feet of surface soil, weathered sandstone, or the best available material
- Loosely grade the topsoil or topsoil substitutes established in step one to create a noncompacted soil growth medium
- Use native and noncompetitive ground covers that are compatible with growing trees
- Plant two types of trees—early succession species for wildlife habitat and soil stability, and commercially valuable crop trees
- Use proper tree planting techniques

How does the cost of reforestation compare with the cost of establishing pastureland?

In the past, many landowners and mine operators may have assumed that transforming mine sites to hay and pastureland is less costly than reforestation. However, reforestation is often less expensive than establishing pastureland.

First, low compaction final grading requires less bulldozer time than highly compacted pastureland projects. Moreover, because reforestation does not require dense, aggressive ground cover, the costs of fertilizer, lime, and seeding may be less than those associated with pastureland projects. Finally, in most cases, pastureland requires maintenance throughout the bond liability period to maintain site productivity and to eliminate rills and gullies, whereas forestland requires very little maintenance, in part because stable rills and gullies are compatible with forestry land uses.

Does the forestry reclamation approach increase forest timber value?

Research has shown that mine land reclaimed using the five-step forestry reclamation approach can create forests that offer greater productivity and resulting timber value than "natural" forests on unmined lands. For example, timber-size logs can often be grown on sites reclaimed in Appalachia and the Midwest through the forestry reclamation approach in the same amount of time it takes to grow pulp-size logs on other types of forest sites. In addition, the forestry reclamation approach has been shown to optimize the growth of commercially valuable hardwood species, such as northern red oak, which can further increase timber value.

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Emerging environmental markets can make mine land reforestation an even more economically attractive reclamation option

Ecological assets are tradable credits that reflect the economic value that public or private sector stakeholders have assigned to an environmental "service." For example, a power company concerned about future carbon dioxide (CO_2) regulations may be willing to "lease" a forest's ability to remove carbon from the atmosphere, or a manufacturing company required to protect an endangered species may wish to purchase the forest's value as a habitat.

For those faced with the challenge of reclaiming abandoned mine lands (Title IV) or active mine lands (Title V), the emerging ecological asset markets may provide new economic incentives to reforest or pursue other environmentally sound reclamation techniques, such as stream and wetland restoration.

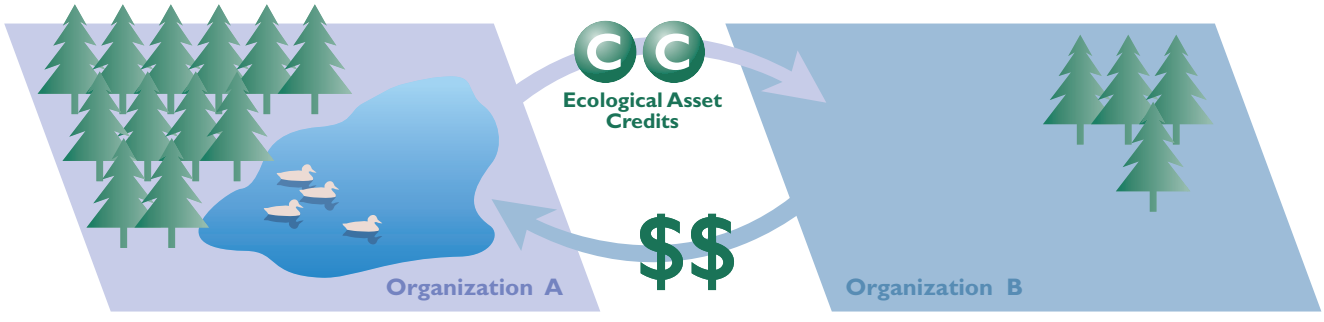
Ecological assets that can be created through the reclamation of mined lands include carbon sequestration credits, wetlands and stream restoration credits, watershed pollution reduction credits, endangered species habitat conservation credits, and potentially other types.

What are environmental markets?

The concept of applying markets to environmental protection emerged as an alterative to traditional "command and control" regulations. Over the past 30-40 years, command and control regulations have significantly improved environmental protection and clean up. However, many public and private sector experts believe that augmenting command and control rules with market-based approaches can improve the efficiency of environmental controls and accelerate environmental gains.

Environmental markets refer to the markets in which participating organizations and individuals buy and sell ecological assets. Typically, these ecological assets have been certified by one or more regulatory agencies, and they may be applied toward compliance with one or more environmental regulations.

Establishing multiple ecological assets (e.g., stored carbon in vegetation, water bodies, and rare or endangered species habitat) on reclaimed mine land can bring aesthetic value along with many other environmental, economic, and social benefits.



Environmental markets allow organizations to protect the environment in the most cost-effective manner. Graphic provided by EPRI.

How do environmental markets work?

One of the most effective market-based approaches to environmental control is the "cap and trade" concept. In this approach, regulators set a maximum limit (i.e., a "cap") for emissions of a particular pollutant in a given geographical area. This area can be local, regional, national, or even global—depending on the scope of the environmental challenge. Within the cap and trade zone, organizations with especially clean operations or those that establish mitigation projects designed to offset environmental impacts can register pollution or mitigation credits. Organizations holding these credits can then sell them to other organizations requiring extra help to achieve regulatory compliance.

What is the status of environmental markets today?

The cap and trade concept was incorporated into federal environmental policy through the passage of The Clean Air Amendments of 1990. Since then, successful trading systems have been established for sulfur dioxide and other air pollutants. These programs have enabled industry to achieve overall environmental goals at a lower cost than would have been possible under a traditional regulatory framework.

Today, a wide variety of organizations—including regulatory agencies, environmental organizations, industry groups, and brokerage firms—are investigating ways to apply the cap and trade concept to other environmental issues, creating a wide range of tradable environmental credits.

How can landowners and mine operators participate in ecological asset markets?

Many surface coal mines (particularly in the Appalachian region) were originally forests. By restoring mine lands to their original state or, in some cases, creating new ecological features—such as a wetland or species habitat that never existed before—landowners and mine operators can develop tradable ecological assets.

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Reforestation creates economic value through the carbon-storing capabilities of trees

Reclaimed forests naturally capture and store a great deal of carbon, which in its gaseous form (carbon dioxide or CO_2) acts as a "greenhouse gas" that can contribute to climate change. Some local government agencies are evaluating proposals that would require companies under their jurisdictions to reduce their carbon emissions. Additional emissions reduction requirements may be implemented over the long-term, although substantial near- and medium-term uncertainty remains.

In anticipation of future potential CO_2 emissions requirements, many industrial companies are planning to buy "credits" for the carbon captured and stored (i.e., "sequestered") by reclaimed forests. These credits could help carbon-emitting firms more cost-effectively comply with future requirements. For landowners and mine operators, the sale of carbon sequestration credits is a promising new economic opportunity associated with reforestation. For landowners, the leasing or sale of reforested mine land to companies seeking environmental credits can also bring new economic opportunity.

Extensive vegetation growth is storing significant amounts of carbon on this 200-acre Eastern Kentucky reclaimed coal mine. Photo: Chuck Meyers, Office of Surface Mining.

What is carbon sequestration, and how does it work?

Carbon sequestration refers to the transformation of atmospheric carbon dioxide into solid carbonaceous components, such as those comprising trees, shrubs, other vegetation, and soil organic matter. Once the carbon dioxide has been transferred into these materials, it is effectively stored (i.e., sequestered) until decomposition occurs. Even after trees are harvested, some of the carbon remains trapped in solid form if the trees are converted into wood products such as lumber, plywood, and other building materials.

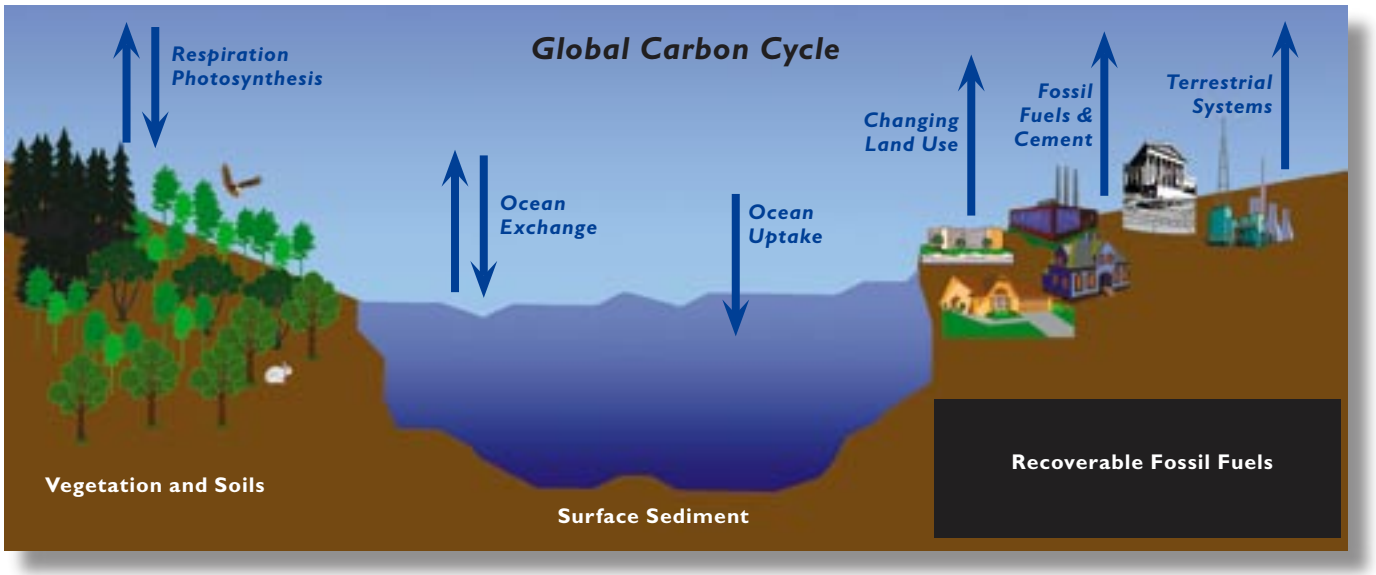
What are carbon credits?

Carbon credits provide ownership or "rental" rights to a certain amount of gaseous carbon that has been sequestered in a forest, which a company may then buy, sell, or apply toward a reduction. (Ownership rights pertain to the carbon sequestered in a forest—not the trees themselves.) Carbon credits are measured in terms of tons of carbon sequestered per acre of forest; generally a third party verifies the sequestration activity in the forest.

Currently, organizations and individuals buy and sell carbon credits in private markets, which are in their early stages. However, there are signs that companies are becoming more interested in carbon credit trading. For example, a new organization called the Chicago Climate Exchange has enlisted dozens of domestic and international corporations to buy and sell carbon credits on a voluntary basis.

What does all this mean for landowners and mine operators?

Although there is some regulatory uncertainty, the long-term (i.e., 20-50 years) future of carbon credit markets looks very promising. This long-term promise is yet another benefit associated with reforestation—and a good short-term reason for mine operators and landowners to consider reforestation.



Carbon stored in forests is part of the global carbon cycle, depicted above. Arrows represent carbon fluxes between the atmosphere and global carbon pools. A significant amount of carbon is stored in these pools, including vegetation and soils, ocean water and sediments, and unharvested fossil fuels. Reforesting mined land can increase carbon storage in soils and vegetation.

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Enhancing or creating wetlands, streams, wildlife habitats, and other ecological features on former mine lands can create large economic and environmental value

By developing environmentally productive ecosystems —through either reforestation or other reclamation options—landowners and mine operators can create a portfolio of ecological assets that may include "credits" for carbon sequestration, wetland and stream restoration, watershed pollution reduction, and endangered species habitat preservation.

Wetland and stream restoration projects are often compatible with reforestation. By controlling soil erosion, intact forest ecosystems prevent silt from entering fragile stream and wetland areas. In addition, tree root structures trap pollutants, keeping them from contaminating watershed areas. Forests also provide habitats for rare or endangered species.

At this reclaimed Ohio mine site, the operator has created a permanent impoundment from a sedimentation pond. This provides rich wildlife habitat. Photo: Chuck Meyers, Office of Surface Mining.

What are wetland mitigation credits, and how do they work?

Wetlands are vital ecosystems that are important to protecting and enhancing water quality, maintaining species biodiversity, mitigating floodwaters, providing bird and fish nursery grounds, and offering recreation opportunities.

In 1972, Congress passed the Clean Water Act, "to restore and maintain the chemical, physical, and biological integrity" of the nation's waters. Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) was authorized to issue permits for the discharge of dredged or fill material into navigable waters and wetlands. To compensate for impacts to these waters, permitees must mitigate these impacts through the creation, restoration, enhancement, or preservation of wetlands.

State and federal agencies may issue wetlands mitigation credits for projects that meet USACE guidelines. Any organization can obtain wetland credits, either to sell or to "bank" for use in future development projects, that could adversely affect wetlands. Because wetlands can be created in the process of mine land reclamation, it is possible to develop these areas in such a way that wetland mitigation credits can be obtained.

What are stream mitigation credits, and how do they work?

Over the years, human activities contributed to changes in the equilibrium of stream systems in the United States, often adversely affecting water quality, water storage potential, species habitats, and recreational and aesthetic values. Like wetlands, stream corridors are protected under Section 404 of the Clean Water Act.

As with wetlands, by restoring stream corridors to a "healthy" state, mine owners and operators may obtain stream mitigation credits, which they can sell or "bank" to mitigate future projects that affect streams.

What are Total Maximum Daily Load credits, and how do they work?

American industry has made significant progress in improving surface water quality through the National Pollutant Discharge Elimination System (NPDES) program for point-source discharges. However, many water bodies, such as watersheds, still fail to meet water quality goals because of pollution from nonpoint sources, including agriculture, golf courses, and the "natural settling" of industrial pollutants from the atmosphere.

Total Maximum Daily Load (TMDL) refers to the maximum amount of a pollutant that is allowed by law to enter a waterbody. The federal TMDL program sets maximum allowable pollutant levels that can enter the waterbody from both point and nonpoint sources. Typically, a state agency following EPA guidelines will issue allowances or "credits" for pollutant discharge to the various sources located within the watershed. Companies within a watershed can then trade these TMDL credits, either to mitigate excessive pollutant discharge or to obtain additional revenue for eliminating pollutants.

What are endangered species habitat credits, and how do they work?

Conservation efforts to save plants and animals from extinction began in the early 1900s. Extinction is a naturally occurring event, but recent evidence shows that the rate of extinction worldwide has increased dramatically in the last century. In response, Congress passed the Endangered Species Act (ESA) in 1973 to conserve ecosystems upon which endangered and threatened (known as "listed") species depend and to conserve and recover listed species In 1982, Congress initiated the development of habitat conservation plans (HCPs) through Section 10 of the ESA to promote wildlife habitat conservation.

As part of this legislation, companies—including mining operations—doing business on lands occupied by threatened or endangered wildlife must develop plans to mitigate the effects of their activities on resident plants and animals. While these programs are not yet widespread, it may be possible in some circumstances to create HCPs using a "habitat bank" approach, wherein habitats are banked (through conservation easement or other means) before land is disturbed. A related variation is the "mitigation credit" system, in which "banked" habitats are established as "credits," and the habitat banker may either use the credits as needed or sell them to another party requiring mitigation lands.

TXU Energy, a pioneer in mine land reforestation, explores potential ecological asset value on two mine sites

Since 1973, TXU Energy (formerly Texas Utilities)—a leading supplier of electricity and natural gas—has been a pioneer in the reforestation of reclaimed mine lands. Because the company has achieved such positive results from its reforestation projects, TXU managers are now engaged in research to develop new ecological asset value on mine sites.

In particular, TXU, in partnership with the Electric Power Research Institute's (EPRI) Eco-Solutions program, applied EPRI's Strategic Eco-Asset Manager (STREAM) model to identify opportunities for the development of multiple ecological assets on two TXU mine sites.

The first TXU site is 1,294 acres of reclaimed pastureland. Local farmers lease this land for livestock grazing. The second site is a 70-acre parcel where mining only recently ceased. This site was graded and planted with wheat to provide site stability and sediment control, but it has yet to be fully reclaimed.

Do the sites have the potential to support multiple ecological assets?

According to TXU's initial ecological assessment, potential ecological asset management options for the two sites include: *(continued on reverse)*

Reforested site on TXU mine lands. The successful development of ecological assets requires careful planning and evaluation of results. Photo: Scott Frederick, GreenVest.

The STREAM Model—An Ecological Asset Planning Tool

The STREAM Model was developed specifically for use in ecological asset (i.e., "eco-asset") assessment, management, and valuation. Landowners and mine operators can use the model to prioritize ecological asset investment choices, forecast ecological asset investment outcomes, and understand ecological asset risks and rewards.

The STREAM model brings option value theory and other advanced financial concepts into the environmental marketplace. The model incorporates uncertainty about future market prices, as well as institutional uncertainties such as the future of ecological asset markets (e.g., carbon sequestration credits). As a result, it can provide sensitivity (i.e., "what if") analyses to help decision makers consider a full range of future scenarios.

TXU—A Reforestation Pioneer

To support its electricity generating operations, TXU operates three surface coal mines in east Texas, disturbing approximately 1,500 acres each year. To restore its mine lands to sound ecological condition, TXU established a pioneering reforestation program. Since the program began in 1973, the company has planted over 18 million trees on 25,000 acres. Since 1995, TXU has planted approximately 1.7 million trees annually on reclaimed mine land. About one-half of TXU's reforested area has been developed as wildlife habitat, which involved establishing an appropriate mix of over 40 native hardwood and coniferous tree species. The new forest provides high-quality food and cover areas for wildlife.

The other half of the reforested area is commercial forest planted with loblolly pine. Currently, these areas are being evaluated for carbon sequestration certification under the Voluntary Greenhouse Gas Reporting Program sponsored by the U.S. Department of Energy.

- Converting the 1,294 -acre pasture to tree plantations, or establishing tree plantations on the stabilized 70-acre site, to generate carbon sequestration credits and/or provide revenue from forest products
- Expanding and/or creating wetlands to generate wetland mitigation credits
- Enhancing and/or creating streams to generate stream mitigation credits

What were the overall findings of the analysis?

Once the potential ecological assets of the reclaimed lands (and acreage to be dedicated to each) were identified, the STREAM model was used to evaluate the potential value of different ecological asset development options and to compare that with the option of keeping the lands as pasture.

According to the analysis, on the lowland portions of the two properties, development of streams and wetlands would produce significantly better value than keeping the land as pasture. This is due to the potential to obtain wetland and/or stream mitigation credits. On the upland portions of the properties, reforestation would produce much better value than keeping the land as pasture. This is due to the expected timber value and potential to obtain carbon sequestration credits. These findings demonstrate how the development of ecological assets can be the best reclamation option, both economically and environmentally.

What can landowners and mine operators learn from the STREAM analysis at TXU?

The ecological asset assessment process, which may include financial analyses using STREAM or similar models, appears to be a promising new methodology for estimating and comparing different ecological asset management scenarios on mine lands and other land types. Another important lesson is that it is beneficial to consider doing an analysis of potential ecological asset value of post-mining lands before reclamation begins or even before mining operations begin.

Companies from many industries have implemented ecological asset development programs—and landowners and mine operators can learn from their experiences

Many companies from a wide variety of industries—including power companies and timber-product companies—have implemented programs to develop and enhance ecological assets that provide economic benefits while improving the environment. Landowners and mine operators can benefit from their experiences. Two companies with valuable stories to share are Allegheny Power and Champion International.

Example #1—Developing ecological assets can increase property value and produce tax benefits if lands are conserved

Allegheny Power owns more than 20,000 acres of land in West Virginia's Canaan Valley, which was timbered about 100 years ago. Instead of simply selling surplus land to a private developer, the power company worked with the U.S. Fish and Wildlife Service (FWS) to place the land into conservation. By appraising the complete ecological asset value of its Canaan Valley holdings, Allegheny Power was able sell the land to the FWS and obtain tax benefits based on the difference between the sale price and the land's appraised value.

Why did FWS want to conserve the Canaan Valley Land?

The Canaan Valley is extremely ecologically diverse. It is home to 40 different wetland and upland plant communities, with more than 580 plant species and 290 species of mammals, birds, reptiles, amphibians, and fishes. The area also contains habitat for the threatened Cheat Mountain salamander and potential habitat for the endangered West Virginia northern flying squirrel and the Indiana bat. As a result, FWS wanted to conserve this land—but Allegheny did not want to the sell the property outright.

What did Allegheny Power do instead of just selling the land?

Allegheny hired a certified independent appraiser to determine the ecological asset value of the land. Unlike a traditional real estate land appraisal, this appraisal considered the worth of the land's ecosystems, taking into account the worth of the property in terms of its development potential (e.g., resort, residential, etc.) and ecological assets value (wetland, species habitat, and carbon sequestration potential).

This appraisal valued Allegheny's Canaan Valley holdings at $33.3 million. The company sold the land to FWS for $16 million and claimed a $17.3 million charitable contribution based on the land's ecological asset value.

Example #2—Environmental markets can resolve conflicts between the needs of business and the needs of the environment

When Champion sold a tract of land to Misstex Properties, an evaluation of the site revealed a cluster of red-cockaded woodpeckers. As a result, FWS required that Misstex not harvest timber from a large area of its newly acquired land. To solve this problem, Misstex proposed relocating the woodpeckers living in the logging zone to woodpecker habitat on Champion's property. The FWS approved, and all three involved parties—Champion, Misstex, and the woodpeckers—benefited.

How were the woodpeckers discovered?

In 1997, Misstex purchased a 753-acre tract of forestland in Montgomery County, Texas, from Champion, for the specific purpose of harvesting timber. During the timber purchase, one occupied and one abandoned red-cockaded woodpecker cluster were discovered on the land.

As a result, FWS required Misstex to leave 80 acres of timber surrounding the clusters uncut to provide foraging habitat for the birds. However, Misstex had planned to harvest all of the timber on the tract, so the company considered obtaining an incidental-take permit that would allow it to legally harvest the entire site, which would eliminate the cavity trees and result in the eventual loss of two adult woodpeckers.

How did the two companies resolve the conflict between timber harvesting and maintaining the woodpeckers' habitat?

Misstex developed a Habitat Conservation Plan (HCP) that proposed mitigating the impact of tree cutting by gradually relocating the red-cockaded woodpeckers from the Misstex land to Champion's Brushy Creek site, a parcel of two-thousand acres in east Texas managed by the U.S. Forest Service as a red-cockaded woodpecker habitat.

Champion agreed to Misstex's proposal and enrolled its Brushy Creek site in the FWS's East Texas Regional Safe Harbor program for red-cockaded woodpeckers. Misstex paid Champion $50,000. The result was a "win-win" situation between the companies, which also helped the survival of an endangered species.

Red-Cockaded Woodpeckers. U.S. Fish and Wildlife Line Art by Robert Savannah.