

ARRI's First Five Years



September 2009

APPALACHIAN REGIONAL REFORESTATION INITIATIVE

ARRI's Beginnings

The Appalachian Region is made up of seven States: Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Surface coal mining in these States is taking place on lands that were largely forested with mixed species of hardwood trees prior to mining. However, reclamation of these surface coal mines has, for the most part, resulted in abandoned grass and shrub lands that are not conducive to tree survival and growth. These mine sites are usually highly compacted and are covered with thick stands of grasses and shrubs that compete with trees for water, nutrients, and sunlight and provide a habitat for animals that feed on trees. While these sites meet regulatory requirements for reclaiming coal mines, they do not provide the environmental, economic, and recreational, advantages of restoring the mine sites to forest land. The Appalachian Regional Reforestation Initiative (ARRI) was created to promote methods of reclaiming mine sites in a way that will reestablish the forests that existed prior to mining.

ARRI was started in 2004 in a meeting with representatives of the state regulatory authorities of each of the seven States in the Appalachian Region. During the meeting, team leaders were chosen, the science behind the initiative (the Forestry Reclamation Approach or FRA) was discussed and the general direction of the initiative was mapped out. The importance of ARRI being a joint State and Federal initiative was emphasized and continues to be a cornerstone of the initiative. Since that first meeting, ARRI has forged valuable partnerships with industry, environmental groups, other government agencies, academia, and local citizens—all who are interested in restoring forests on mined lands. We will discuss these partnerships later in this document.

In ARRI's first five years we have made significant progress in promoting the initiative which is described throughout this document. While there is still much to be done, we believe the basis for success has been well established.

ARRI's Goals

ARRI's goals are to communicate and encourage mine reforestation practices that: 1) plant more high-value hardwood trees on reclaimed coal mine lands in Appalachia; 2) increase the survival rates and growth rates of planted trees; and 3) expedite the establishment of forest habitat through natural succession. Research has provided the means to attain these goals by using the Forestry Reclamation Approach (FRA) discussed later in this publication.

ARRI's mission is to enlist the help of all interested parties in using the FRA to reclaim active and abandoned coal mine sites to eventually restore Appalachia's forests on those lands.



Nine year old white oak trees in Kentucky

Accomplishments

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The Forestry Reclamation Approach (FRA)

The basis for achieving ARRI's goals is a series of techniques for reclaiming mine sites collectively known as the Forestry Reclamation Approach (FRA). The FRA was developed from research conducted over the past half century by university and government reforestation researchers and experts. Research has shown that the FRA, which will provide for diverse, effective forest lands, has five basic steps: 1) Create a suitable rooting medium for good tree growth that is no less than 4 feet deep and

comprised of topsoil, weathered sandstone, and/or the best available material; 2) Loosely grade the topsoil or topsoil substitutes established in step one to create a non-compacted growth medium; 3) Use ground covers that are compatible with growing trees; 4) Plant two types of trees - early succession species for wildlife and soil stability, and commercially valuable crop trees; and, 5) Use proper tree planting techniques.

The FRA is based on knowledge gained from both scientific research and prac-

tical experience. The FRA can achieve cost effective regulatory compliance for coal operators while creating productive forests that generate value for their owners and provide watershed protection, wildlife habitat, and other environmental services.

More information about the FRA can be found in the Forest Reclamation Advisories. These publications, authored by the ARRI Science team, can be found on the web site at <http://arri.osmre.gov>. See the Outreach section of this document for more information on the Advisories.

The ARRI Core Team

To begin ARRI a Core Team was established in December 2003. The Core Team was charged with establishing methods of promoting ARRI and developing ways to provide on-the-ground success. The Core Team, currently comprised of 26 people, is made up of representatives from OSM, the State Regulatory Authorities of the six primacy States in the Appalachian Region, the Tennessee Federal program, and OSM's Appalachian Region Office.

The current Core Team Leaders are Paul

Rothman, KYDNR and Mike Bower, OSM - AR.

The Core Team has created numerous promotional items including brochures, newsletters, a website, and posters to help spread the word about ARRI.

The Core Team conducts monthly conference calls with call leadership alternating between the State representatives and OSM. These calls update the Core Team on progress towards implementing FRA in each state as well as

special events promoting ARRI and the status of projects that team members are working on.

The Core Team has selected two members to act as liaisons to work with the Science Team (see below for information on the Science Team). These liaisons work with the Science Team to funnel information to and from the Core Team.

The ARRI Science Team

The ARRI Core Team established the Science Team in March 2005. The Science Team is comprised of 30 team members representing 10 universities, including Ohio State University, Ohio University, Pennsylvania State University, Purdue University, Southern Illinois University, University of Kentucky, University of Maryland, University of Tennessee, Virginia Tech, and West Virginia University; the U.S. Forest Service; the U.S. Geological Survey; and The American Chestnut Foundation.

Co-Team Leaders of the Science Team

are: Dr. James Burger, from Virginia Tech and Dr. Chris Barton, from the University of Kentucky

The Science Team's purpose is to provide the credentials and technical guidance for ARRI and to improve the science behind the FRA.

The Science Team has written a series of serial bulletins describing ARRI and the Forestry Reclamation Approach. The first five Forest Reclamation Advisories have been distributed and several more are being drafted. The Science team will continue to provide bulletins

The Science Team's purpose is to provide the credentials and technical guidance for ARRI and to improve the science behind the FRA.

which will describe the practical field applications of reforestation research.

Outreach

Communication with stakeholders is the key to successfully implementing this initiative. ARRI's Core Team has been promoting use of the FRA to stakeholders through a variety of means including:

The ARRI website at

<http://arri.osmre.gov>

The ARRI website contains information about the members of the Core and Science Teams, ARRI's publications, news clips and videos about ARRI events, addresses of the State regulatory authorities, scientific information about the FRA and forestry research, and information about upcoming events. The website is updated constantly to provide the most up-to-date information about the initiative and newcomers to ARRI are encouraged to examine the website to see what the initiative is all about.

ARRI's Newsletter

ARRI periodically publishes a newsletter to inform stakeholders of our activities. Core Team members from throughout the region contribute articles on how they are promoting ARRI and about implementing the FRA in the field. The newsletters can be found on the ARRI website.

Communication with stakeholders is the key to successfully implementing an initiative.

Brochures

ARRI created a brochure with information about the initiative to introduce people to the FRA and the reasons why ARRI is necessary. The brochure is distributed at mining and reclamation conferences across the country and through requests received from the ARRI website.

Forest Reclamation Advisories

The Science Team has written a series of informative articles regarding various aspects of reclamation using the Forestry Reclamation Approach. The articles are called Forestry Reclamation Advisories and are written for field practitioners of reclamation to better understand the science behind the Forestry Reclamation Approach and to give tips on implement-

ing the FRA in the field. Seven Advisories have been published so far and all can be found on the ARRI website at <http://arri.osmre.gov>.

Videos

ARRI was a featured segment in a video produced by the Department of the Interior called "Together We Can, The Importance of Partnerships." The video addresses the importance of partnerships to all DOI employees in accomplishing the Department's missions.

ARRI and the FRA were also featured in a video produced by the University of Kentucky called, "Reclaiming the Future: Reforestation in Appalachia." This video discusses the science behind the FRA and how it is implemented in the field to reclaim coal mined lands.

Television, newspapers, and radio

ARRI has been the subject of numerous articles in the media. The most popular stories are about ARRI sponsored Arbor Day events in which volunteers are enlisted from communities throughout Appalachia to plant trees on reclaimed coal mines in celebration of Arbor Day. Articles and videos about ARRI can be found on the website at the ARRI in the News tab.

Partnerships

ARRI was established to promote the use of the FRA in reclaiming active and abandoned mine sites. The Core Team realized at ARRI's inception that to effectively promote the initiative, partnerships with all stakeholders would be vital. Through ARRI's Statement of Mutual Intent, partnerships have been established with government agencies, industry organizations, watershed/citizen groups, environmental groups, academic institutions, conservation groups, faith-based groups, international groups and schools. In addition, 182 individuals have signed ARRI's Statement of Mutual Intent.

ARRI's success in establishing working

partnerships was recognized in May 2007 when it was awarded the prestigious Cooperative Conservation Award by the Secretary of the Department of the Interior. This award recognizes conservation achievements that involve collaborative activity among a diverse range of entities.

A brief description of the partnerships ARRI has fostered is found below.

Industry

ARRI has made significant gains in recruiting coal operators to consider forestry as the post-mining land use of choice and by encouraging the use of the FRA whenever trees are planted. To date, a total of 59 industry organizations have become active ARRI partners. Many coal companies

have invited ARRI Science Team researchers to conduct FRA experiments on their mine sites for the purpose of advancing the science of surface mine reforestation. Many mining companies are also engaging OSM/VISTA and community volunteers in the reclamation of post-bond released mines sites that were not reclaimed with the benefit of proper reforestation techniques. These companies are providing heavy equipment and operators to mitigate mine soil compaction by ripping so volunteers from the local communities can plant trees in an effort to reestablish forests on degraded sites.

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Partnerships (continued)

Watershed groups

Watershed and citizen groups are becoming increasingly interested in the benefits of partnering with ARRI, their goals being watershed improvement through the establishment of healthy and productive forests on degraded mined lands. A total of 17 watershed/citizen groups have become formal ARRI partners. These partnerships were facilitated by the Appalachian Coal Country Watershed Team (ACCWT). ACCWT is formed of community improvement/watershed groups in 30+ locations across the 8 states of the Appalachians, serving communities impoverished by environmental degradation. Each ACCWT group hosts one, or more, full-time OSM/VISTAs. Together, ARRI and ACCWT have the proven science, the “on-the-ground” connections, and the local experience to engage communities and recruit watershed and citizen groups to consider reforestation projects.

Environmental, Conservation, and Faith-Based Groups

Over the past 5 years, ARRI has worked to earn the trust of the environmental community while encouraging the mining industry to adopt forestry as the post-mining land use of choice. Surface mining evokes strong emotions in people, but individuals and groups on both sides of the debate have been able to find common ground in ARRI's goals. To date, 10 major environmental groups have signed the ARRI's Statement of Mutual Intent. Prominent groups such as the Bluegrass Chapter of the Sierra Club have not only pledged support, but also encouraged their members to participate in ARRI tree planting events. Numerous environmental leaders have also pledged support for ARRI as individuals. Since 2005, 17 conservation groups have signed ARRI's statement of mutual intent and most have become very active partners in promoting reforestation on surface mines.

There has been a huge response from church groups to ARRI's efforts. There

is a growing movement within faith-based communities across the nation to become better stewards of the earth, to become involved, and to do something positive for the environment. To date, 8 faith-based groups have



pledged support for ARRI.

The American Chestnut Foundation

One of ARRI's most active partners is The American Chestnut Foundation (TACF). TACF's main objective is to re-establish the chestnut within its original range. Once known as the “Redwood of the East,” 4 billion chestnut trees, covering 200 million acres, were wiped out by blight by the 1950s. The Appalachian coal fields coincide with a large central portion of this chestnut range, and use of the FRA on mine sites provides an ideal growth medium for the blight-resistant chestnut seeds. The TACF/ARRI partnership will allow TACF to use ARRI's reclamation sites for establishing experimental plots and demonstration sites. Through a program called “Operation Springboard”, ARRI and TACF scientists have teamed up with mine operators to evaluate planting protocols and techniques needed for when TACF's disease-resistant chestnuts will be available in mass quantities. Started in 2008, Operation Springboard is providing researchers opportunities to evaluate the potential for using reclaimed surface mines as vectors of dispersal, or “springboards”, for establishing TACF's chestnuts back into the Appalachian

forest.

Coal-Coffee-Cerulean Warbler

Coal industry representatives from Appalachia and Colombian coffee officials met with Cerulean Warbler conservationists on April 14, 2009 in Charleston, West Virginia to discuss proactive conservation opportunities to reverse habitat loss for the Cerulean Warblers across their range in North and South America.

The Cerulean Warbler is a small migratory songbird that breeds in mature deciduous forests of eastern North America, migrates across the Gulf of Mexico and through Central America, and winters in evergreen forests of the northern Andes Mountains in South America. A remarkable overlap occurs between Cerulean Warbler habitat and existing areas of Appalachian coal and Andean coffee production.

Conference attendees discussed strategies to increase, maintain, and protect shade-grown agriculture and primary forest in South America, reclaim surface mined lands back to functional native hardwood forests by using the FRA in North America, and educate children, communities, and industry professionals about the international connection of coal, coffee, and Cerulean Warblers. Working with environmental committees of state and national mining associations to further develop and implement these strategies will be key to their success.

As part of the Cerulean Warbler partnership, a pen pal program was established linking high school students from the coal fields of the Appalachian Mountains with students of the coffee region in the Andean Mountains of Colombia, South America. Students who participated in this program learned important lessons in conservation of wildlife, reforestation of coal surface mines, shade-grown versus sun-grown coffee plantations, foreign language, world geography, and cultural diversity.

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Partnerships (continued)

Other Government Agencies

A total of 52 State and Federal government agencies have become active ARRI partners. Numerous government agencies work to regulate, facilitate, and provide tech transfer for the processes of coal surface mining and reclamation. Therefore, these partnerships are critical in the effort to disseminate information about the benefits of restoring healthy and productive forests on surface mines. An active partnership between the US Fish and Wildlife Service (USFWS) and ARRI culminated with the signing of the Statement of Mutual Intent by the Directors of the USFWS and OSM in Kentucky in November 2007. ARRI representatives have provided numerous presentations about mined land reforestation to the USFWS. Other noted partnerships exist between ARRI and the US Forest Service and the US Geological Service, both of which provide a member on ARRI's Science Team. Furthermore, all of forestry and wildlife agencies in the seven coal states of Appalachia are avid ARRI partners.

ARRI's International Engagement

ARRI has attracted significant international attention and the development

and execution of the reforestation initiative in Appalachia is serving as an organizational model for groups in other countries whose goal is to restore disturbed landscapes on a regional scale. ARRI's Statement of Mutual Intent has been signed by 7 international conservation groups and numerous individuals from foreign countries to include: Canada, Colombia, Ecuador, Mexico, Panama, Peru, Romania, and Venezuela. ARRI Scientists have carried the ARRI's message about the universality of the Forestry Reclamation Approach to international conferences in South Korea, China, and Romania. ARRI was recently used as an example of a world class post-mining regional reforestation initiative in the key-note presentation at a post-mining regeneration conference in eastern Germany's brown coal area. A recent editorial on the reforestation initiative in Appalachia was published in the Canadian based, "International Journal of Mining, Reclamation, and Environment", and the international coal industry magazine "World Coal" featured a story about ARRI.

An ARRI representative traveled to South America to participate in the 3rd

Cerulean Warbler Summit in Bogotá and San Vicente de Chucuri, Colombia in October 2008. During the visit, representatives of the USFWS, US Forest Service, the American Bird Conservancy, and ARRI met with Juan Orduz, President of the Colombian Coffee Federation and Gabriel Gomez, Director of Cenicafe in Bogotá to discuss forestry activities that benefit the Cerulean Warbler. They agreed to engage in a "Cerulean Warbler Friendly" certification program with the coal industry.

United Nations Environmental Programme Pledge

ARRI signed a memorandum of understanding (MOU) in 2008 with the United Nations Environmental Program (UNEP) establishing a goal to plant 38 million trees on reclaimed coal mines in 3 years. This is a part of a larger UNEP goal to plant 300 million trees in North America and 7 billion trees worldwide. The MOU was signed during a tree planting ceremony on Governors Island, New York on Thursday, December 11, in which ARRI participated in planting five American chestnut trees.

The Statement of Mutual Intent

The Core Team developed a Statement of Mutual Intent to give individuals and groups an idea of what we need in the way of support to fulfill our goals. Signatories to the Statement pledge to promote ARRI and apply the site preparation and planting techniques of the FRA to reestablish forests on mined land.

The Core Team held an initial signing ceremony on December 15, 2004 at Stonewall Jackson Lake State Park, West Virginia during which 36 people signed the Statement.

Five years later we have 357 signatories to the Statement of Mutual In-



tent representing 172 diverse groups including the American Chestnut Foundation, the Rocky Mountain Elk Foundation, the National Mining Association, major coal producing companies, researchers from universities across the country, environmentalists, and representatives from State, local, and Federal government including the Governor of Kentucky.

You can view the Statement of Mutual Intent and sign up to be a part of this important initiative by stopping by the ARRI website at <http://arri.osmre.gov>.

ARRI at Work

According to figures supplied by the States in the Appalachian Region, approximately 38 million trees have been planted on about 63,000 acres in the Appalachian Region during the period from 2005 through 2008. While not all of these trees were planted using the FRA, the number is significant in demonstrating that reforestation is part of the reclamation plans of many mine sites in the Appalachian Region. To showcase reforestation efforts in the region ARRI participates in numerous events including:

Arbor Day Tree Plantings

ARRI has organized and or participated in over 50 Arbor Day Events in the first five years of ARRI. Initially, the ARRI core team organized such events and encouraged coal operators to host these outreach programs. Most of the operators hosting these events were practicing some type of reforestation in their reclamation efforts. The success of these events was overwhelming. To date over 5,000 people, ranging from grade school, middle school, high school, technical and vocational school, and college students; teachers; boy scouts; 4-H Club members; conservation groups; coal miners; other associated industry personal such as the wood products industry; mining consultants; other government natural resource conservation agencies; mining regulators; local community leaders; media; and family members of all the previously mentioned groups, participated in these events. Almost all agreed, it was a lot of fun. The Arbor Day events became so successful that many of the operators who hosted the earlier events have hosted an Arbor Day event every year since. On many of these events the ARRI Core Team no longer organizes, we simply attend. The ARRI Core Team continues to encourage other coal operators to become involved in this invaluable outreach program.

Over 20,000 native hardwoods, including American chestnuts have been planted during the Arbor Day events. Not only did all of the participants gain valuable knowledge about mined land reforestation, but all of the coal operators who hosted the earlier events, are now practicing better reforestation. We were all inspired to do a better job by the enthusiasm expressed by the young participants of the Arbor Day Program.



ACCWT, OSM/VISTA, and Watershed Groups

The Spring of 2009 was the first year that the Appalachian Coal Country Watershed Team (ACCWT) partnered with ARRI. Together, the ACCWT and ARRI hosted eight volunteer tree planting events throughout the ACCWT's eight state region. This joint effort strives to improve watersheds through the reforestation of former mine sites previously reclaimed without benefit of using the FRA. The partnership successfully enhanced reclaimed mine sites through the supplemental planting of native hardwood species to promote healthy forest habitats, an effort that is helping to influence the way reclamation progresses in the future.

The ACCWT is a coalition of change-minded grassroots-level watershed improvement groups determined to repair the environmental degradation

left from historic coal mining while creating economic stability needed in our rural communities. With its Support Office located in Beckley, West Virginia, the ACCWT's goals are to: build local capacity, monitor water quality, enhance outreach and education, engage redevelopment, and require professional development. The Team is supported by an innovative partnership between AmeriCorps VISTA and the Office of Surface Mining. The ACCWT began in 2002 as an OSM/VISTA initiative, placing determined college-trained OSM/VISTA Volunteers in a year of service in rural mining communities. Reflecting the needs and the determination of the communities they serve, the ACCWT currently has 36 OSM/VISTAs in the field with another 24 positions funded under the Recovery Act and 20 Summer Associates starting this spring/summer.

In the partnership, ARRI brings the science that creates successful tree growth on reclaimed mine sites and the ACCWT brings volunteers and public engagement necessary to get the job done. With the ACCWT's large local watershed volunteers and civic engagement practices, tree plantings were never short on community volunteers to plant trees. ARRI members ensured the seedlings were planted correctly with instructional lessons prior to planting and one-on-one help to any volunteer who requested it.

Through this first year of working together, the Appalachian Coal Country Watershed Team and the Appalachian Regional Reforestation Initiative planted 27,500 tree seedlings on 36 acres of previously mined grasslands with the participation of 520 community volunteers.

The ACCWT and ARRI are already planning tree planting projects for the spring of 2010 intending to greatly

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ARRI at Work (continued)

increase the number of sites, volunteers and trees planted.

FRA Provisions in State and Federal Permits

ARRI has worked closely with numerous State and federal regulatory agencies to incorporate the FRA (Forestry Reclamation Approach) into policies and regulations. The regulatory authority in six of the seven states, within the Appalachian Region, is the state mining and reclamation agency. In TN the OSM is the regulatory authority. Most of these agencies have developed policies and/or regulations dealing directly with mined land reforestation.

Early efforts in the State of KY resulted in RAM 124. This Reclamation Advisory Memorandum mandated reforestation techniques in 1997. Technical Reclamation Memorandum, TRM #21, approved in 1995, also incorporated many early reforestation techniques in the State of KY.

Ohio formalized their “Mined Land Technical Reforestation Guidance & Recommendations” in 2001 and their Inspection & Enforcement Guidelines 94-1 in 1994.

Pennsylvania Code; Title 25; Chapter 87.147 - 156 establishes details for site preparation, revegetation requirements, and reclaiming to forest-

land or wildlife habitat.

Maryland developed “Guidelines for Using FRA on Maryland Coal Mines” in 2006 that fully incorporated the FRA when reclaiming to forestland.

Tennessee’s guidance document is the Biology/Revegetation Procedure 10.4: “Reforestation and Wildlife Enhancement Initiative” approved in 1999.

Virginia Developed “Guidelines for Husbandry & Reclamation Practices” (Memorandum #3-96) in 1996, and Guidance Memorandum #2-01 “Reforestation Reclamation Practices” in 2001 that incorporate the FRA.

Both the Tennessee Federal Program and the Virginia State Program reduced or eliminated the ground cover standard for forestry post mining land uses to a level that controls erosion and promotes good tree growth and natural invasion. By choosing a ground cover vegetation level that is appropriate for achieving the post-mining land use of an individual site, these States have taken an important step in removing regulatory barriers to implementing the FRA.

WV promulgated regulations governing post mine land uses for both forestland (38CSR2-7.6) and wildlife habitat (38CSR2-7.7) in 2005 that fully incorporate the FRA. Commercial forestry regulations (38CSR2-7.4) were incorporated into the State program for AOC variant sites in 2000.

Other Federal, State and even county agencies have incorporated the FRA into their efforts. The US Fish and Wildlife Service and the Army Corps of Engineers encourage reclamation to forestland using the FRA to reestablish forest habitat for threatened and endangered species and for expedited forest habitat establishment along waters of the U.S. Many stream restoration projects, mandated by both State and Federal wetland mitigation requirements, incorporate the FRA in their efforts. State and Federal AML (Abandoned Mines Lands) sections in the Appalachian Region are working with ARRI to implement the FRA in their efforts. County planning agencies have expressed interest in the FRA when developing county-wide land use plans.

Many of the mining permits now being issued by the regulatory authorities are proposing forestland as the post mine land use. Most of these permits include FRA language. Many of the permits being reclaimed to wildlife habitat and other uses that require tree planting, also contain FRA language. ARRI will continue to work with the regulatory authorities, landowners, coal operators, mining consultants, and other interested parties to promote mined land reforestation using the FRA.

ARRI’s Excellence in Reforestation Awards Program

In 2005, the ARRI Core Team created an awards program to recognize those individuals, operators, or mine sites that exemplify the use of the FRA in reclamation.

Each state in the Region may present two of the Excellence in Reforestation Awards each year. Both active mines and abandoned mine lands are eligible for awards. From these State awards, one Regional Award is



selected that showcases the best use of the FRA in the Region.

Each State decides where and when to present its awards and the Regional Awards are presented during the ARRI Mined Land Reforestation Conference the following year. Since 2005, over 40 awards have been presented by the States. See the ARRI website at <http://arri.osmre.gov> for information on award winners and award presentation criteria.

OSM Applied Science Grants

In the last five years over 1.1 million dollars have been awarded to reforestation research by OSM's Applied Science Grants Program. The Applied Science Grants are part of OSM's Technology Development and Transfer and made possible by the National Technology Transfer Team (NTTT).

OSM established the NTTT in 2003 to provide a forum to guide, coordinate, and communicate OSM's national and regional technology transfer activities. The NTTT is composed of members from OSM and from States that administer coal mining activities. OSM is represented by members from Headquarters, the National Technical Training Program (NTTP), Technical Innovation and Professional Services (TIPS), and three OSM Regions (Appalachian, Mid-Continent, and Western). The States are represented by the Interstate Mining Compact Commission and the Western Interstate Energy Board. Each OSM region has a

regional technology transfer team comprised of a technical representative from each of the States, Tribes, OSM Divisions and Field Offices in that region to identify, advance, and develop technical solutions. The solutions can then be advanced to the NTTT for dissemination and implementation in other regions.

As the importance of ARRI's goals have become apparent to the public, the mining industry, the environmental community and the academic community, and as the Science Team of ARRI has evolved, so has the need for mined land reforestation research. In 2004, the first year of ARRI, and prior to the formation of the Science Team of ARRI, there were no Applied Science Grants awarded for mined land reforestation. By 2008, 10 grants have been awarded by the Applied Science Grants Program, applying over one million dollars to mine land reforestation research.

Grant recipients include: Ohio University, University of Kentucky, West Virginia University, Virginia Tech, University of Tennessee and The American Chestnut Foundation. Research categories range from evaluation of reforestation potential of mined lands, to carbon sequestration, to American chestnut restoration, to soil hydrologic group classification, to grading practices and ground covers, to steep slope FRA (a very timely issue as FRA advances to new areas of mine land reclamation). All of this research to date has been conducted by Science Team members of ARRI, however, there is no exclusion to research organizations outside of ARRI. To view details and published reports of these research efforts please visit OSM's Applied Science Grant Program's website at: <http://www.techtransfer.osmre.gov/NTTMainSite/appliedscience.htm>.

ARRI's FRA Training

ARRI's main objective is to get coal operators to reclaim to forestland using the FRA (Forestry Reclamation Approach). This evolving method of reclamation techniques will result in a forest habitat which mimics the pre-mining native forest much faster than traditional methods. ARRI's primary tools include outreach and training.

Most of the FRA training conducted thus far has been by state and federal employees working on the ARRI Core Team within their assigned areas (states) of responsibility. Most of the seven Appalachian States conduct, at least one FRA training session annually for their staff. Some states conduct annual

training sessions for permitting staff and for inspection and enforcement staff (reclamation inspectors) separately. Most of these sessions include State Core Team members, OSM Core Team members and Science Team members from within that state. ARRI Core Team members and Science Team members also provide training to industry groups, community groups, conservation groups and environmental groups.

Reforestation workshops, which tend to be more detailed and often include field activities, have been conducted for state and federal regulatory agencies, industry organizations, landowner organizations

and associations, large land companies, coal operators, watershed associations and organizations that provide training and guidance to those watershed organizations, youth environmental organizations, conservation groups and environmental groups.

ARRI has been working closely with OSM's National Technical Training Program (NTTP), to develop a Reforestation Workshop. Reforestation workshop objectives and outlines have been developed and individual lesson plans are being prepared. Until the NTTP Reforestation Workshop is finalized, reforestation modules emphasizing the FRA will be incorporated into other NTTP classes.

Forestry Reclamation Approach Research and Demonstration Projects

Although the FRA is based on decades of scientific research and experience, the ARRI Science Team is continually engaged in reforestation research and experiments in an effort to further refine the science of reestablishing forests on mined lands. To showcase this research, the Science Team has established FRA demonstration projects in strategic locations across the Appalachian coal field to provide outreach to the regulatory community, industry, landowners, and others.

Kentucky - Starfire and Bent Mountain

The University of Kentucky (UK) established the Star Fire research and demonstration complex in Perry County, Kentucky in the mid-1990s for the purpose of demonstrating loose-grading techniques. Over the years, thousands of visitors have been taken on ARRI field trips to Star Fire to see the healthy and productive forest



Nine year old trees planted on plots reclaimed using the FRA at Starfire.

that has developed under the FRA. UK has followed up their research at Star Fire with the installation of similar research and demonstration complexes at Bent Mountain and Guy Cove. The research at Bent Mountain in Pike County, Kentucky is focused on



Plots of various soil types under study at Bent Mountain

on mine soils, and the mitigation of compacted mine soils by ripping. The focus of the Guy Cove research complex in Perry County, Kentucky is on how the FRA effects water quality, the hydrology of hollowfills, and stream restoration efforts.

Ohio - Oxford Mining Company

Jockey Hollow near Cadiz, Ohio is a mine site where the FRA was implemented over an extensive area and disease-resistant American chestnuts were planted in experimental plots by Ohio University. This mine site has been the destination of numer-

ous field trips to demonstrate how the FRA can be implemented where large amounts of topsoil resources are available to construct the growth medium for trees.



Tennessee - White Oak Reforestation Project

18 month old American chestnuts at Jockey Hollow

The White Oak Reforestation Project is located in Campbell County, Tennessee, on an active Gatliff Coal Company remaining permit. The Knoxville Field Office worked with Gatliff Coal Company to develop the White Oak Reforestation Project, with a focus on implementing current reforestation technology.

The permanent reforestation demonstration plots include 130 acres of reclaimed mine land. Each plot is established using different



A red oak tree on the WORP

growth mediums, different grading and compaction treatments, and various native and noncompetitive ground covers. The tree species include commercially valuable hardwoods

such as Northern Red Oak, White Oak, and Yellow Poplar, as well as other native trees and wildlife shrub species. To date over 65,000 trees have been planted on the project area. The long range plans are to establish a permanent demonstration area to show the application of the Forestry Reclamation Approach technology.

Virginia - Powell River

The Powell River Project near Norton, Virginia is a reforestation research and demonstration complex operated by Virginia Tech. Powell River Project, a unique public-private partnership, has produced many positive impacts since its 1980 beginning; research has developed effective cost-efficient mine reclamation and environmental protection

practices that are helping the Appalachian coal industry remain competitive



Tree growth at Powell River

while protecting the environment, and

over 20,000 students and teachers from local schools have participated in environmental education programs at the Education Center.

West Virginia - Samples Mine

Researchers at West Virginia University, regulators from the West Virginia Department of Environmental Resources and Catenary Coal Company personnel developed an experimental practice covering over 800 acres at the Samples mine complex in Kanawha County. Three large plots were constructed using different soils and plant materials. Comparisons of growth mediums, compaction rates and ground covers are being conducted. Satellite points were also established throughout the mine area. Sur-



Tree seedlings planted at Catenary Coal

vival and growth rates of trees, ground cover characteristics and the evolving soils are being closely monitored. Catenary Coal has committed to long term monitoring of this experimental practice.

ARRI Meetings and Workshops

To spread the word about the FRA, ARRI representatives have made numerous presentations to diverse groups. These presentations help introduce ARRI, the FRA and ARRI's goals and help keep management on all levels, abreast of ARRI's activities. ARRI Science Team members have even

provided presentations about FRA research in other countries such as Korea and China. ARRI has also manned exhibits at technical forums, conferences and even county fairs and community events. ARRI representatives also provide training to industry on the FRA and conduct meetings to promote and inform agencies,

organizations and individuals about mine land reforestation. ARRI will continue to respond to requests for presentations and or meetings, and will actively seek out stakeholders with common goals for both active mining reforestation and legacy mine site conversion to forestland.

ARRI Mined Land Reforestation Conferences

ARRI has sponsored three successful conferences during which over 650 people have learned about the FRA and experienced first hand how the FRA is used to reclaim mine sites.

The 2007 Mined Land Reforestation Conference was held August 7-8 at the Southwest Virginia Higher Education Center in Abingdon, Virginia. The conference featured presentations and panel discussions on reforestation on mined lands by industry, regulatory and academic people. The conference also featured a tour of Virginia coal mining operations that use the FRA in their reclamation and a tour of reforestation plantings on mine sites at the Powell River Project Research Center.

The 2008 conference was held August 5-7 at Chief Logan State Park in Logan, West Virginia. The conference began with a field trip to view tree plantings on mine sites in various locations in

southern West Virginia. During the tour a 10 and a 13 year old site reclaimed using FRA provisions were viewed along with an active site where mine soil was being constructed and placed in accordance with the FRA. The second day was devoted to presentations by industry, regulatory and academic people examining each of the five steps of the FRA in detail. On the third day the conference participants visited another mine site that incorporated many of the techniques discussed the previous day, such as loose grading, end-dumping, ripping, reduced ground covers, and native tree plantings.

The 2009 conference was held on August 4-6, at the Jenny Wiley State Park in Prestonsburg, Kentucky. Field tours were held on August 4th and 6th to view a stream reconstruction project that used the FRA to reforest the banks of a reconstructed stream, an active mining operation demonstrating FRA techniques, and reforestation research demonstration projects undertaken by the University of Kentucky that showed the effec-

tiveness of the FRA in enhancing tree survivability and growth.

During presentations on August 5th, speakers provided information on successful permitting and reclamation strategies for reforesting coal mine permits. Panels of regulatory and industry personnel discuss the challenges and successes of reclaiming mines using the FRA, and the academic community presented progress and results of reforestation research.

Presentations made during each of the three conferences are available on the ARRI web site.

Planning is underway for the 2010 conference to be held in June in Pittsburgh, Pennsylvania in conjunction with the American Society of Mining and Reclamation and the Western Pennsylvania Coalition for Abandoned Mine Reclamation.

Green Forest Works for Appalachia

In the spring of 2009, ARRI successfully conducted tree planting projects on coal mine sites reclaimed without the benefits of the FRA as prototypes for a much larger regional effort. In order to plan and conduct these pilot projects, ARRI partnered with The Appalachian Coal County Watershed Team (ACCWT) which trains and coordinates OSM/VISTA Volunteers. ARRI provided the scientific and technical support for the events and ACCWT provided the volunteers and public involvement for planting the trees in eight coal field communities.

A representative with the Baum Foundation in San Francisco who serves with the United Nations Environmental Program (UNEP) participated in one of the ARRI/ACCWT pilot tree planting projects in eastern Kentucky.

Based on her experience at the pilot tree planting event and subsequent conversations with ARRI, the representative started generating interest within the conservation community and administration of President Barack Obama for the development of a green jobs program to reforest previously reclaimed mined lands as an economic stimulus for Appalachia. The Baum Foundation asked for technical information and data from the ARRI Science Team for the purpose of developing a formal proposal to submit to potential government, patron, and corporate sponsors.

Under the guidance of the Baum Foundation, the ARRI Science Team created a formal proposal to create a program called Green Forest Works for Appalachia. If funded, the program will create jobs for the people of Appalachia

through the reforestation of mined land, similar to efforts that were performed by the Civilian Conservation Corps in the 1930's. The program would involve ARRI partners, guided by experts using the FRA, to reforest mine sites reclaimed as grasslands for the creation of green jobs and the resultant environmental benefits.

By 2014, planting trees on old mined land can create over 2,000 jobs. This will result in the reforestation of approximately 175,000 acres with 125 million trees planted by Green Jobs workers.

ARRI representatives are engaged in an on-going dialogue with the Baum Foundation to develop the program.

Next Steps

ARRI will continue to advocate improved reclamation of active and abandoned coal mines through reforestation using the FRA. The benefits of reforestation provide one of the few areas of common ground for industry and the environmental community. Forests play a critical role in moderating temperatures, controlling runoff, improving water quality, sequestering carbon, and providing biological diversity and wildlife habitat.

To advance the use of the FRA in reclaiming active and abandoned mine sites, ARRI will:

- recruit mined land reforestation partners with the Statement of Mutual Intent and foster existing partnerships;
- advance the science of surface mine reforestation through research and field experiments;
- work to help landowners, mine operators and permit consultants recognize the value of reforestation in reclaiming mined lands and to get FRA provisions inserted into mine permits.
- provide tech transfer with the Forest Reclamation Advisories;
- promote reforestation on active surface mines with its awards program;
- organize annual Arbor Day events on active mine sites;
- conduct tree planting events with volunteers on mined land reclaimed with a grassland approach (including OSM VISTAs, industry representatives, community groups, school children, etc.);
- conduct FRA workshops and an annual reforestation conference;
- continue to advise outside groups working to create green jobs in Appalachia by planting trees on legacy mines; and,
- provide presentations and field trips to promote the FRA;
- distribute brochures, newsletters and other materials promoting the initiative.

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ARRI at Work . . .

