

Green Forest Works for Appalachia



*Prepared by the Science Team of the Appalachian
Regional Reforestation Initiative*





KEY CONTRIBUTORS

With additional contributions from Science and Core Team members of the Appalachian Regional Reforestation Initiative.

Dr. Mary Beth Adams
United States Forest Service
Timber and Watershed Laboratory
Parson, West Virginia 26287
Telephone: 304.478.2000, ext. 130
E-mail: mbadams@fs.fed.us

Dr. Patrick Angel
Office of Surface Mining, USDI
421 West Highway 80
London, Kentucky 40741
Telephone: 606.309.4159
E-mail: pangel@osmre.gov

Dr. Christopher Barton
University of Kentucky
106 Cooper Building
Lexington, Kentucky 40506
Telephone: 859.257.2099
E-mail: barton@uky.edu

Dr. James Burger
Virginia Polytechnic Inst & State University
228 Cheatham Hall
Blacksburg, Virginia
Telephone: 540.231.7680
E-mail: jaburger@vt.edu

Dr. Keith Eshleman
University of Maryland
301 Braddock Road
Frostburg, Maryland 21532
Telephone: 301.689.7170
E-mail: Eshleman@al.umces.edu

Dr. Jennifer Franklin
University of Tennessee
274 Ellington Plant Sciences Building
Knoxville, Tennessee 37996
Telephone: 865.974.2724
E-mail: jafranklin@utk.edu

Dr. Michael Jacobson
Pennsylvania State University
7 Ferguson Building
University Park, Pennsylvania 16802
Telephone: 814.863.0401
E-mail: mgj2@psu.edu

Dr. Brian McCarthy
Ohio University
317 Porter Hall
Athens, Ohio 45701
Telephone: 740.593.1615
E-mail: mccarthy@ohio.edu

Dr. Jeffrey Skousen
West Virginia University
Agricultural Sciences Building 1106
Morgantown, West Virginia 26506
Telephone: 304.293.6256
E-mail: jskousen@wvu.edu

Dr. Petra Wood
United States Geological Survey
WV Cooperative Fish & Wildlife Res Unit
PO Box 6125, West Virginia University
Morgantown, WV 26506
Telephone: 304.293.3794
E-mail: pbwood@wvu.edu

Dr. Carl Zipper
Virginia Polytechnic Inst & State University
Smyth Hall
Blacksburg, Virginia 24061
Telephone: 540-231-9782
E-mail: czip@vt.edu

Dr. Brian Smith
Appalachian Mountains Joint Venture
American Bird Conservancy
3761 Georgetown Road
Frankfort, KY 40601
Telephone: 502-573-0330, ext. 227
E-mail: bsmith@abcbirds.org



TABLE OF CONTENTS

Executive Summary.....	4
Overview.....	5
Background.....	7
Structure	9
Summary.....	11
Appendix 1: Detailed Green Forest Works Proposal	Separate Bound Document
Appendix 2: Letters of Endorsement and Editorials of Support	Separate Bound Document
Appendix 3: ARRI’s Statement of Mutual Intent	Separate Bound Document
Appendix 4: ARRI’s Forestry Reclamation Advisory No. 4	Separate Bound Document
Appendix 5: Pilot Projects by Community Volunteers.....	Separate Bound Document
Appendix 6: Green Forest Works for Appalachia: Second Year Pilot Project Proposal	Separate Bound Document
Appendix 7: Cost Analysis of Green Workers	Separate Bound Document



Preparing to begin planting at a site in Boone County, West Virginia, March 2009. Photo: Jessica Vierling.



Cerulean Warbler: Frode Jacobson.



Green Forest Works for Appalachia

EXECUTIVE SUMMARY

The Appalachian Regional Reforestation Initiative (ARRI) is a cooperative effort between the states of the Appalachian region and US Department of Interior's Office of Surface Mining (OSM), leading the way to reforest mined lands—old and new—through the use of cutting-edge research and diverse partnerships. We propose the creation of a Green Forest Works for Appalachia program to help achieve our partnership's goals. This program will **employ over 2,000 Appalachian citizens** to reforest old mined lands, similar to reforestation efforts performed by the Civilian Conservation Corps in the 1930's. Successful reestablishment of diverse hardwood forests that once dominated these lands will provide a significant carbon sink and a renewable, sustainable multi-use resource that will create economic opportunities while enhancing the local and global environment. ARRI scientists estimate that between **750,000 and 1 million acres of old surface-mined land is available for reforestation** in the eastern coal fields. The existence of these neglected mined lands presents significant environmental challenges for Appalachia, but also provides many opportunities through the creation of green jobs, environmental enhancement, and climate change mitigation.

Through the Green Forest Works for Appalachia program, many economic, social, and environmental improvements will be realized for the citizens of Appalachia. Forested watersheds help control flooding and improve stream water quality. Thriving forests sequester carbon, clean the air, and help offset global climate change. Diverse forests provide habitat for wildlife and support a variety of recreation activities important to local human communities. Healthy forests are renewable and sustainable, thereby providing local jobs for an existing and growing wood industry for decades to come.

▲ **What We Propose:** The Green Forest Works for Appalachia program would employ over **2,000 Appalachian citizens** by planting trees on **175,000 acres** of old mined land. This program is based on smaller-scale projects we have accomplished to date through our existing network of community, industry, and agency partners. If implemented, the program will

provide multi-use, sustainable forests, but also education and guidance to help revitalize local economies centered around the wood products industry.

▲ **Why We Propose This:** Economic, social, and environmental benefits can be achieved simultaneously. In economically-depressed Appalachia, there are up to 1 million acres of mined land in a state of “arrested natural forest succession” that can be reforested. Local citizens will be provided good-paying jobs to restore native hardwood forests that will sequester carbon, improve water quality, and benefit state and federal species of conservation concern.

▲ **What Is Possible:** Using ARRI's proven methods and our existing network of Appalachian partners, this program will restore healthy, productive forests now rather than these areas remaining as stagnant, non-productive “scrublands” for possibly centuries. Ancillary benefits that could develop include certified “green” wood products, ecotourism, biodiversity enhancement, woody biofuels, and other green opportunities.

▲ **The Projected Outcome:** By 2014, planting trees on old mined land can create over **2,000 green jobs**, can restore approximately **175,000 acres** of barren lands with diverse hardwood forests, and plant **125 million trees** that will sequester carbon, improve water quality and flows, and benefit species of conservation concern that depend on forests.

▲ **What Is Needed:** To ensure success in creating good-paying green jobs and implementing this properly, we need a minimum of 5 years of secure funding, starting at approximately \$15 million and increasing annually up to \$220 million. The number of jobs created, trees planted, and acres reforested increases substantially each year.

The following proposal and appendices provides details outlining the Green Forest Works for Appalachia program. We firmly believe that this initiative will generate substantial (1) economic benefits, (2) green jobs, and (3) environmental improvements.



Green Forest Works for Appalachia

PROPOSAL

OVERVIEW

Who we are: The Appalachian Regional Reforestation Initiative (ARRI) is a proven coalition of Appalachian residents – scientists, foresters, conservationists, and volunteer groups. Through this proposal, we plan to improve our region’s economy, watersheds, and environment. ARRI was formed from the bottom-up by dedicated field workers in federal and state agencies and scientists from universities across Appalachia. This well-established, cooperative effort in the Appalachian region uses cutting-edge research to encourage restoration of high quality forests on active coal mines and formerly mined sites in the eastern U.S. Similarly, the Appalachian Coal Country Watershed Team (ACCWT) is formed of community watershed groups in over 30 locations across the 8 coal-producing states of the Appalachians (figure 1), committed to improving environmental conditions and serving communities impoverished by ecological degradation due to surface mining. Together, ARRI and ACCWT have the proven science,

effective on-the-ground partnerships, and experience to develop and manage this proposed green jobs initiative, known as the Green Forest Works for Appalachia.



Figure 2: Locust and non-native grasses were planted on this severely compacted coal surface mine in Garrett County, Maryland, in 1990. As a result of the compacted soils and competing vegetation, the development of natural forest community has been delayed, a condition known as “arrested succession.” (Photo by Mike Hiscar, 2006).



Figure 1: Eight states within the Appalachian Mountains region—PA, MD, OH, WV, VA, KY, TN, and AL—comprise the majority of the eastern coal-fields (map by Matt Shumar).

What we propose: We propose the creation of an innovative, region-wide program that would establish permanent, diversified green jobs in the economically-depressed region of Appalachia. In the first 5 years of the Green Forest Works for Appalachia program, we will employ **over 2,000 Appalachian citizens** to return diverse hardwood forests to approximately **175,000 acres** of coal surface mines reclaimed using practices that were not conducive to effective reforestation (figure 2). Smaller-scale projects have been highly successful, implementing the techniques contained herein and utilizing volunteers through our existing network of community, industry, and agency partners. Success stories are described briefly in Appendix 1, all indicating the level of knowledge, investment, and interest that partners have generated from our efforts to date. If implemented, this program will revitalize local economies and provide multi-use forests that are a vital and sustainable resource into the future.



Figure 3: The American chestnut once dominated the canopy of Appalachia's hardwood forests, but the chestnut blight eliminated this species, and its extremely important food source, from the forest in the mid-20th century. Minelands offer great opportunities to reintroduce blight-resistant chestnut trees to Appalachian forests (Map by The American Chestnut Foundation).

This effort can:

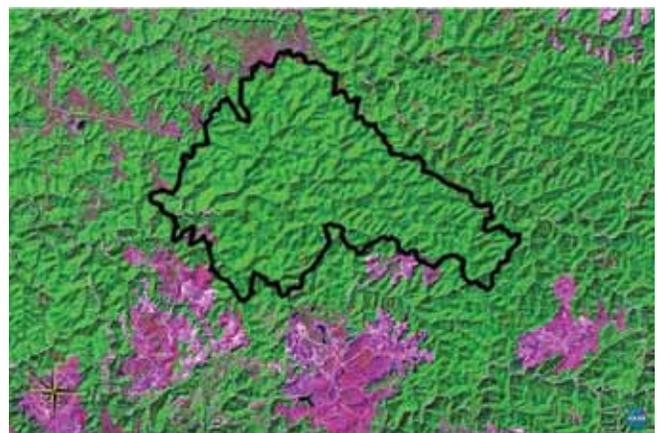
- ▲ Restore native forests to 175,000 acres of mine-altered lands of Appalachia (figure 3);
- ▲ Through education and technology training, help revive the traditional Appalachian economy and culture that revolved around high-quality craftsmanship, thereby strengthening and diversifying communities;
- ▲ Prioritize watersheds in which intense reforestation will significantly reduce flood damage and improve water quality, saving the nation millions in disaster relief and providing cleaner water for Appalachian citizens;
- ▲ Use reforestation to reconnect forest patches and restore watersheds, enhancing critical habitat for terrestrial and aquatic species of conservation concern;
- ▲ Use old minelands to return American Chestnuts to Appalachian forests, reintroducing a keystone species back to the culture and wildlife of the region;

- ▲ Construct wetlands to enhance habitat and biodiversity, and also serve as buffers to help reduce the potential of catastrophic floods;
- ▲ Identify suitable solar and wind energy sites on lands currently underutilized, and work with our local contacts for permission to build such projects; and,
- ▲ Establish voluntary and lasting conservation agreements (such as conservation easements) with participating landowners.

Where this will happen: Eastern U.S. lands that have been mined for coal and reclaimed under Federal and State laws constitute a significant land resource and the potential for a diversified, sustained green job economy. Estimates of the quantity of post-bond released mined lands (i.e., lands where mining companies have met all reclamation requirements by law and are under no obligation for additional work on these lands) in Appalachia that could be available for reforestation and carbon sequestration range between three-quarter to one million



Using heavy machinery, deep seams can be ripped into compacted soils so tree roots can establish and water can infiltrate the surface (Photo by James Burger).



The research area within the black boundary is almost entirely forested; the pink areas have been surface mined and reclaimed to mostly non-native grasses. Water infiltration is much greater within the forested area, greatly reducing flood risk (Image from NASA).



Streams in Appalachia are home to many rare, threatened, and endangered mussels, as well as a diverse assemblage of rare fish, aquatic insects, and salamanders. Reforesting minelands will help improve water quality and watershed health (Photo by The Nature Conservancy).

acres. From Pennsylvania in the north to Alabama in the south, citizens of the coal fields of Appalachia can come together to restore both the economy and the ecology of their home watersheds and homelands (figure 4).

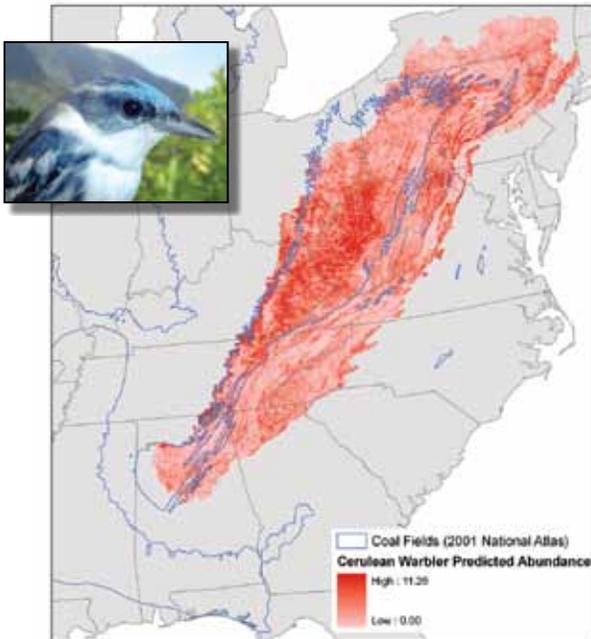
Equally important, we can bridge the gap between new green jobs and Appalachian culture. The Appalachian region is where we live and work; we know from experience that the combination of ARRI, ACCWT, and our diverse network of partners will:

- ▲ Increase civic engagement;
- ▲ Enhance community capacity;
- ▲ Foster economic redevelopment; and
- ▲ Create an enduring, sustainable system.

These are not the hollow claims – these are the proven results of multiple years of research and development, partnerships with community groups, and numerous tree-planting projects that have actively engaged Appalachian communities.



Figure 4: Small reforestation projects are a great outreach and education tool—citizens, politicians, and schools from local communities regularly volunteer on small projects, where they learn about the scale of reforestation needs, our regional partnership, how they can become involved, and how to properly plant tree seedlings (Photo by Brian Smith).



Cerulean Warblers have declined by over 70% since 1966, and the Appalachians are the core of their breeding range. This “hot spot” map predicts where Cerulean Warblers are densest, indicating where we can target reforestation projects to benefit this species that prefers large blocks of diverse hardwood forests. Map by Matt Shumar; Cerulean Warbler photo courtesy of Fundación ProAves.

BACKGROUND

Why we propose this: Old mind lands present numerous problems; many lost opportunities for proper reforestation of surface mines have occurred since the Surface Mining Control and Reclamation Act (SMCRA) was implemented in 1978. In the early years of SMCRA, regulators focused on eliminating often disastrous erosion, sedimentation, and landslide events that were commonplace pre-SMCRA. As a result, excessive compaction of surface mines to create low-erosion grasslands quickly became the rule of thumb. In addition, surface mine operators believed that reclaiming lands to hay and pasture were easier and cheaper to achieve than returning them to forests (recent data proves otherwise). These factors have led to significant forest fragmentation and loss of forest productivity across the coalfields of Appalachia. The Green Forest Works for Appalachia program will focus reforestation efforts specifically on severely compacted mined land that is covered with unproductive, and mostly non-native,



Figure 5: The Green Forest Works for Appalachia program will reforest severely compacted mined lands currently covered with unproductive grasses, “scrub” trees, and non-native invasives (Photo by Patrick Angel). Without intervention, these areas will remain in arrested succession for decades, if not centuries.

grasses and scrub that will likely remain for decades, if not centuries (figure 5).

The changing face of reclamation: Focused efforts by ARRI are beginning to change the way surface mines are being reclaimed by the coal industry and regulatory authorities currently operating in Appalachia. Since the start of ARRI in 2004, approximately 60 million trees have

been planted and approximately 88,235 acres restored to forests on newly mined land. ARRI is ‘forward looking,’ diligently working to educate and train the active mining industry about reclamation methods that work for tree plantings in order to reclaim new ground to forests from this point forward. Unfortunately, the legacy of old mined lands—once forested but now in grasslands—must now be addressed or many forest ecosystem services will be lost.



Figure 5: Green Forest Works for Appalachia aims to remove non-native invasive species such as the autumn olive, Royal Paulownia, and knotweed (Photo by Carl Zipper).

Figure 6: ARRI’s Science Team “Forestry Reclamation Approach” for compacted soils



Step 1: Site evaluation to check soil compactness and properties, and state of vegetation (i.e., grassland, scrub, invasives). Photo by James Burger.



Step 2: Machinery is used for mechanical control/removal of vegetation if necessary. Photo by James Burger.



Step 3: Deep tillage of compacted soils (‘ripping’) to allow tree roots to establish and water to infiltrate the surface. Photo by Richard Davis.



Step 4: Fertilizer is applied if necessary. Photo by James Burger.



Step 5: Trained crews plant hardwood seedlings at specific spacings and locations to enhance survival and growth. Photo by James Burger.



Step 6: Follow-up weed control around seedlings to further enhance their survival. Photo by James Burger.

This program will increase demand for seedlings from nurseries in the eastern U.S. Substantially more tree seeds will need to be gathered, and nurseries will need to increase their production of seedlings. This will generate additional need for green workers.



Figure 7: ARRI's process to reforest old minelands works—these yellow poplar seedlings were planted in uncompacted mine spoil, showing average growth at year three (left), and year 11 (right). All photos by Chris Barton.

What can be done for old mined lands: By working with state and federal partners and the current mining industry, many new mines are being reforested during reclamation. Now, however, ARRI and its ACCWT partners also are 'looking backward' at the approximately one million acres mined and reclaimed to grassland in Appalachia since the implementation of SMCRA in 1978. ARRI's Science Team has developed scientifically proven methods to meet the challenges of reforesting compacted grasslands (figure 6). Using ARRI's proven methods and existing Appalachian partnerships of ARRI and ACCWT, this program will restore healthy, productive forests *now* (figure 7) rather than these areas remaining as stagnant, non-productive "scrublands" for possibly *centuries*. We not only know the science, but we have the know-how to form community-based partnerships that are critical to gaining access to these old mined lands.

Job Creation and Education: The main focus of the Green Forest Works for Appalachia program is to strengthen the economy of Appalachia by creating gainful employment for local residents by restoring a sustainable resource to the landscape. However, we also must provide the training and guidance needed to establish economically sustainable industries that are based on these resources. By restoring forests where no forests currently exist, the economic opportunities provided by this program will not only meet the needs of the Appalachian people today but

will put those young forests on a trajectory to preserve the right of future Appalachians to meet their economic needs. The Appalachian forest is one of the most beautiful in the world, is one of the region's most valuable assets, and has played an integral part in the rich cultural heritage of the mountain people. By providing forestry and conservation training, educational opportunities, guidance and career development for its workers, and by facilitating low-interest small business start up loans, the Green Forest Works for Appalachia program will grow a skilled green workforce to restore, protect, and manage this natural resource that is so vital to the region's current and future prosperity.

STRUCTURE

The Green Forest Works for Appalachia program, as proposed, would have a three-tiered structure. It would be composed of an upper level Managing Entity, anywhere from 3–8 mid-level Implementing Entities, and numerous bottom-level Contracting Entities.

- ▲ **Managing Entity (ME):** If government funding is secured, ARRI will provide guidance to an "umbrella" ME. The ME responsibilities, working jointly with ARRI, will include distributing funds to the lower tiers, overseeing the program's implementation, and evaluating performance.

- ▲ **Implementing Entities (IE):** This role will be fulfilled by well-established and respected non-profit organizations with the capacity and experience necessary to manage the project. We envision 3–8 organizations fulfilling IE responsibilities. The budget for each IE will be based upon the land area within its jurisdiction and immediate opportunities for reforestation.
- ▲ **Contracting Entities (CE):** This level consists of the contractors (e.g., companies, businesses, and professionals) who actually will perform the on-the-ground work. The vast majority of the program’s funding will be injected into this level (via contracts with IEs), and compensation will be lucrative enough to attract qualified field workers. Examples of CEs include heavy equipment operators, natural resource management professionals, and professional tree planting companies.

Costs:

- ▲ The amount of funding requested for the Green Forest Works for Appalachia program is estimated at \$15,000,000 for the first year.

- ▲ Over a period of five years the program will grow in size until its annual budget reaches nearly \$220,000,000. At that point the program will have reached its operational capacity and will be fully functional.

Benefits as proposed:

- ▲ **Year 1**—Green Forest Works for Appalachia will create an estimated 162 new green jobs:
 - This team will consist of 92 forest technicians, 10 foresters/crew foremen, 15 bulldozer operators, and 45 professional service contractors.
 - During this time, over 4 million trees will be planted on 6,000 acres of abandoned mine land.
- ▲ **Year 5**—If the Green Forest Works for Appalachia program grows exponentially until year 5:
 - **2,000 new, permanent jobs** created in Appalachia;
 - **125 million trees** are planted; and
 - **175,000 acres** will be reforested.

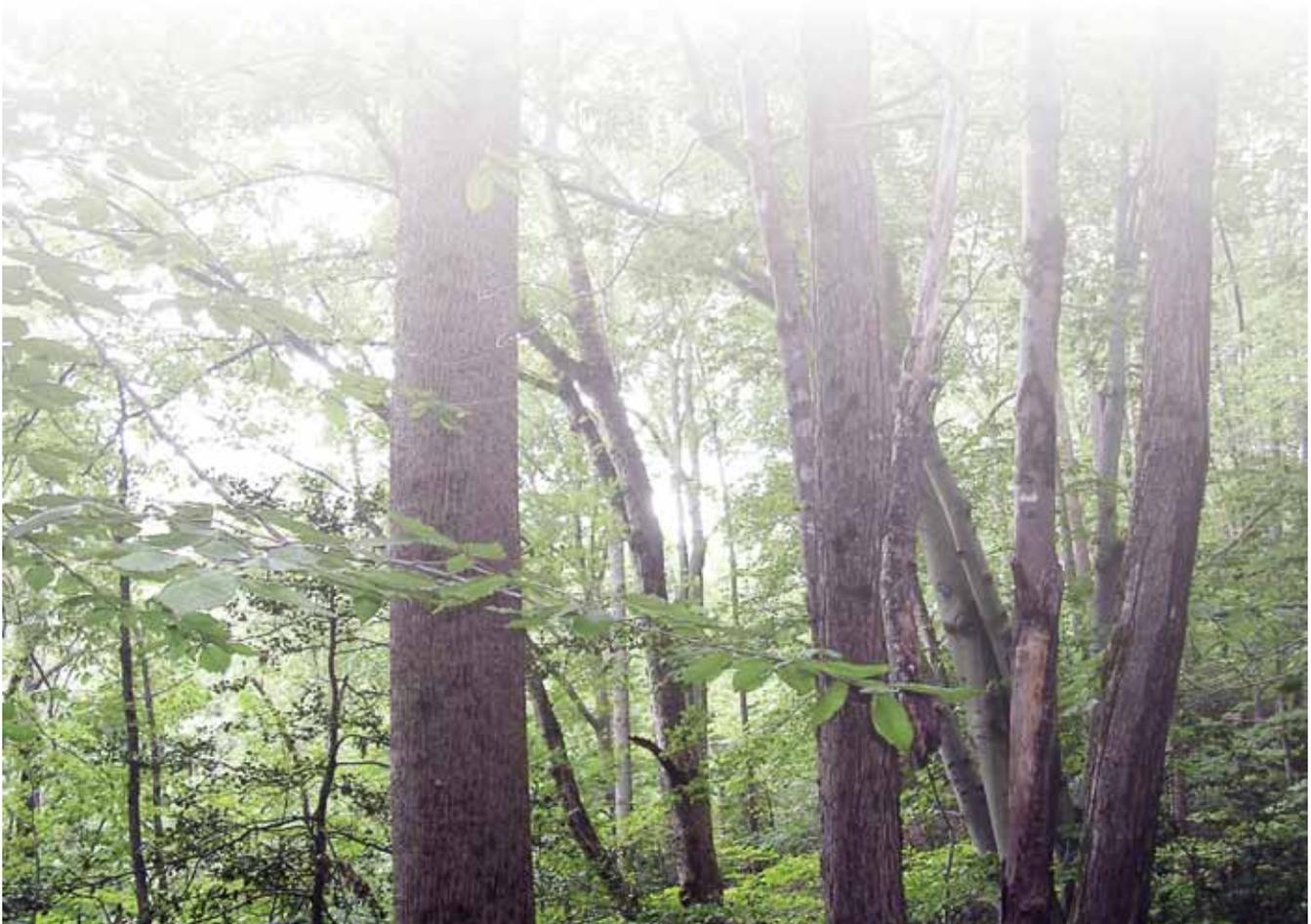


Photo by Mike Parr

- ▲ Linkages with other sectors of the economy will create additional jobs and add vitality to a region plagued with excessive unemployment (9.4% average for the 8 eastern coal states).
- ▲ Reforestation will produce a carbon sink to help mitigate effects of climate change
 - Forests growing on good quality mine sites can sequester 3–5 times more carbon than grassland.
- ▲ Additional environmental benefits include conservation of biodiversity, fewer invasive species, soil and water conservation, and reducing forest fragmentation.
- ▲ Landowner benefits include increased timber value, tax incentives, leasing for recreational areas, and carbon sequestration credits.
- ▲ Appalachian communities will have better flood control, restoration of native forests for cultural and recreational benefits, and additional tax revenue.

Long-Term Sustainability: Since funding, regardless of the source, will inevitably cease, it is imperative that this initiative will be able to sustain itself after the allotted five years have expired. Green jobs will be able to persist in three key areas that can be used as a source of continued funding:

1. **Tourism:** Appalachian forests are among the most beautiful in the world, are valuable regional, national and global assets, and have played an integral part in the rich cultural heritage of Appalachian communities. Thus, this newly reforested region will serve as an excellent tourist destination and capture an expanding sector of the United States economy. A portion of tourism taxes could be diverted back to the Green Forest Works for Appalachia program to continually expand efforts.
2. **Solar and Wind Farms:** Solar panels and wind turbines will not only need to be constructed but also maintained indefinitely. These jobs will demand skilled labor and provide Appalachia the opportunity to strengthen its human capital as well as place the region at the forefront of technological innovation. Lease payments should include a payment to the Green Forest Works for Appalachia initiative to enable continued funding.
3. **Carbon Sequestration Credits:** Reforestation will create opportunities for carbon credits, particularly on lands that are not currently planted in trees. Agreements with landowners could include an allowance

for the Green Forest Works for Appalachia initiative to receive a portion of the carbon credits from tree-plantings under the program, again creating an opportunity to sell those credits to fund continued work.

Additional Projects: Since tree planting is a seasonal activity, continued green employment will be available through:

- ▲ Tree nursery work and tree seed gathering
- ▲ Solar/Wind farm site preparation/maintenance
- ▲ Measurement of carbon sequestered by registered projects
- ▲ Outreach and technical transfer to landowners
- ▲ Invasive species eradication
- ▲ Wildlife habitat technicians (e.g., prescribed fire teams)
- ▲ Timber stand improvement
- ▲ Public land maintenance crews (e.g., hiking/horseback trails, park grounds)
- ▲ Highway beautification (e.g., roadside cleanup, tree plantings)
- ▲ Wildland fire technicians
- ▲ Tourism guides

SUMMARY

This proposal is *“Shovel Ready”*—the Green Forest Works for Appalachia program is designed to build, secure, and sustain the true prosperity for the people and communities of Appalachia. The Appalachian region is a land of contrast—people have suffered from poverty for decades, but the region abounds with natural resources; Appalachian forests support some of the highest biological diversity in the world’s temperate region, but extraction of the region’s abundant coal reserves have impacted the landscape. With one program, we can address economical, environmental, and ecological challenges simultaneously. Over a period of five years, the Green Forest Works for Appalachia program will create permanent employment for approximately **2,000 local residents** from rural coal-field communities planting more than **125 million trees on over 175,000 acres**.

