Green Forests Work

2019 Annual Report

Contents

A Letter From The President

Sequestration of carbon by forests has been identified as a tangible method for limiting the rise of CO_2 in the atmosphere and mitigating climate change. The Intergovernmental Panel on Climate Change (IPCC) recently reported that an increase of 1 billion hectares of forest on Earth could limit global warming to 1.5°C by 2050. Where these 1 billion hectares, or approximately 1 trillion trees, will go is a tricky question. With concern about global food shortages and increased wildfires in a changing climate, forest establishment on productive agricultural lands and areas near urban centers would be discouraged. However, disturbed lands that were previously forested and marginal agricultural lands would be suitable if soils can facilitate forest growth. In a recent study published in Science, Bastin et al. (2019) performed an analysis to map potential global reforestation areas in locations that excluded existing forests, agriculture lands, and urban areas and found 0.9 billion hectares that could potentially support forests. More than 50% of the area they identified was located in six countries: Russia, US, Canada, Australia, Brazil and China. Temperate forest regions of the eastern US were identified as having the highest potential for reforestation. Interestingly, this is the focal area of GFW's work to reverse the effects of recent forest loss due to surface mining.

Successful rehabilitation and revegetation of mine-impacted land is vital for the current and future prosperity of mining regions across the globe. A commitment to improving conditions on reclaimed mined land for the future seems like a worthwhile investment. By improving our ability to rehabilitate mined land we create new opportunities for lands that are often considered marginal and we stand a chance of contributing significantly to the development of a sustainable future.

We appreciate the support of all our funders, partners and volunteers. Without this support, we couldn't begin to make an impactful contribution to local and global communities. Now, more than ever before, has reforestation been linked to our future prosperity.

- Dr. Chris Barton

Bastin, J-F., Y. Finegold, C. Garcia, D. Mollicone, M. Rezende, D. Routh, C. M. Zohner and T. W. Crowther. 2019. The global tree restoration potential. Science 365 (76-79).

Who We Are

Green Forests Work (GFW) is a non-profit organization whose mission is to reforest surface mined lands in Appalachia that were previously reclaimed using practices that prevent effective reforestation. GFW's vision is to create a renewable and sustainable multi-use resource that will provide economic opportunities while enhancing the local and global environment. By converting reclaimed, non-native grasslands and scrublands into healthy, productive forestland, GFW is effectively addressing two needs of the region. Our reforestation projects improve the environment by eradicating exotic species and restoring the ecosystem services that forests provide to society, and we create employment opportunities for equipment operators, nurserymen and women, and tree planters. With the help of our partners and volunteers, our vision is quickly becoming a reality—since 2009, we have planted 2.8 million trees across approximately 4,500 acres.

Year	Acres Planted	Number of Trees Planted
2009	37	35,155
2010	204	145,285
2011	670	352,516
2012	321	228,249
2013	381	256,182
2014	362	200,181
2015	629	374,038
2016	386	239,720
2017	349	259,305
2018	665	401,728
2019	466	318,938
TOTALS	**4,470**	**2,811,297**

Table 1. Summary of GFW's reforestation efforts from 2009 - 2019.

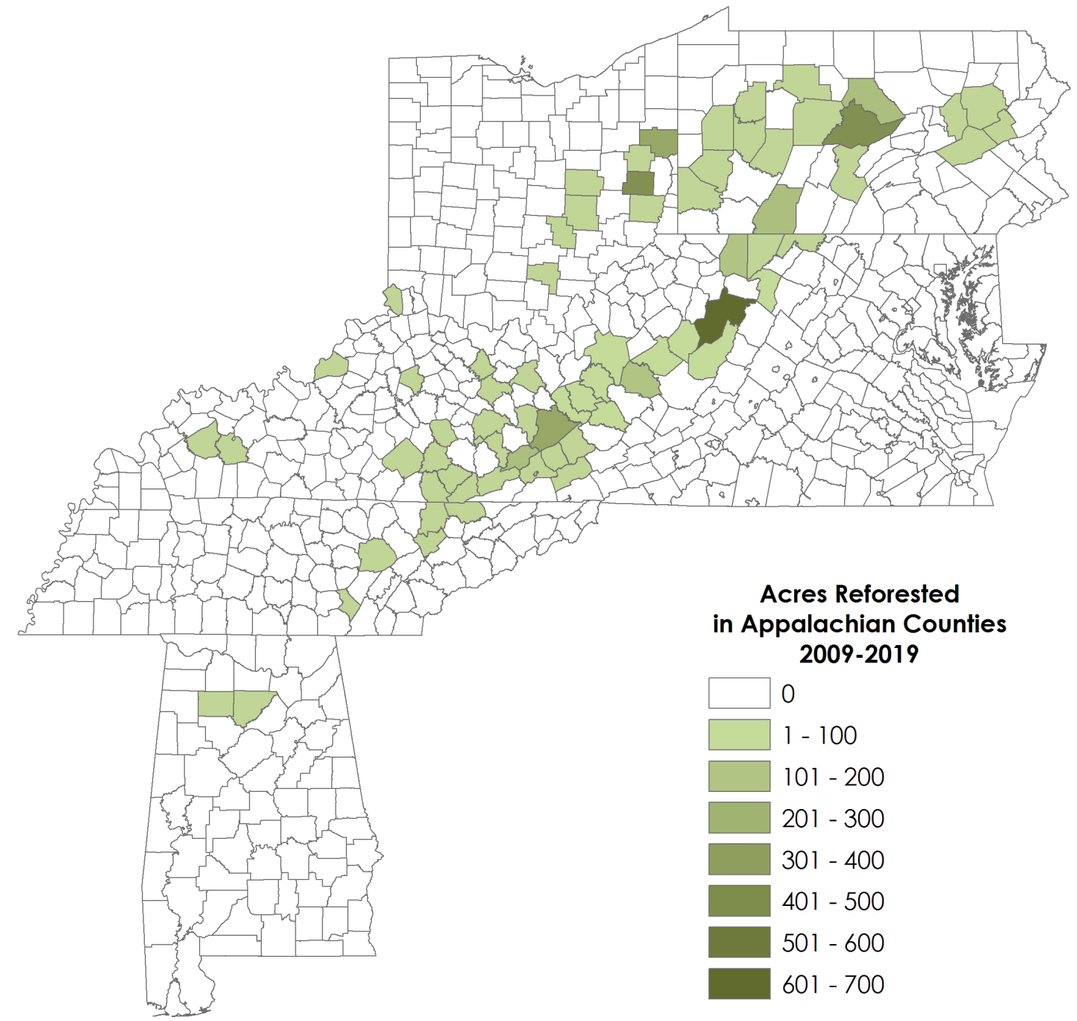

Figure 1. Map of locations of reforestation projects supported by GFW in Appalachian states.

Volunteerism Spotlight

GFW began as an initiative, relying on donated seedlings and donated services, such as ripping and volunteer tree planting to implement projects. Cash donations transformed GFW into an organization that purchases hundreds of thousands of seedlings and supports local contractors to perform site preparation and tree planting, but we have maintained our "roots", by continuing to host volunteer tree planting events every spring. At these events, we teach our volunteers about threats to our forests, the importance of native species, the benefits of individual species, and the benefits of forests to society. Each year, our volunteers help GFW and the Appalachian Regional Reforestation Initiative (ARRI) to reforest additional acreage by planting tens of thousands of seedlings, helping to reforest dozens of acres. It is hoped that our volunteers will apply the lessons learned from these events throughout their lives, fostering a greater conservation ethic in society.

2009-2019 Participants	Volunteers <25 Years Old	Volunteer Hours
21,075	10,799	120,486

Table 2. Summary of volunteer participation.

Thank you to **all** of the volunteers who have helped us over the years...

You have made the world a better place for future generations!

Investing in People

A large part of GFW's mission is to provide employment and economic opportunities in a region that has historically experienced high income inequality, and unemployment and poverty rates higher than the national average. By investing in environmental restoration projects, we're also investing in people in the Appalachian region. Over the past decade, GFW has invested millions of dollars in the region, providing employment to seed collectors, nursery workers, herbicide applicators, equipment operators, and tree planters (Figures 2-5). Some of the equipment operators and tree planters that we've hired formerly worked in coal mines. Through this investment, other supportive industries such as hospitality, retail, and transportation also benefit, as our projects require contractors to travel to project locations across the region.

Figure 2. A nursery worker lifts bare root oak seedlings at a tree nursery.

Figure 3. Site preparation contractors make plans to begin removing non-native trees.

Figure 4. An equipment operator uses a Komatsu bulldozer to loosen compacted ground prior to tree planting.

By restoring native forests, we're also investing in the future. Future economic returns may be realized through forest managment, harvesting of timber and non-timber forest products, increased property values, tourism and recreational opportunities, and potentially through trading in ecological asset credits (Figures 6 & 7). The restored forests also provide residents with healthier and safer places to live by improving air and water quality and buffering storm events. Studies have shown that living near green spaces or natural areas improves the mental well being of residents by lowering anxiety and feelings of depression and improving quality of sleep and cognitive functioning. These and other health benefits may increase the quality of life in the region by decreasing health care expenses.

Figure 5. Professional tree planters reforest a hillside after the ground had been ripped.

Figures 6 & 7. Many of the trees that we plant are important timber species, such as this white oak (above) and yellow poplar (right).

2019 Highlights

In 2019, Green Forests Work and our partners reforested 461 acres, planting 318,938 trees with the help of 2,377 volunteers (Table 1). While GFW helped support many other projects in 2019 (Figure 8), this annual report only highlights the following projects:

Daniel Boone National Forest (KY)

This project expanded upon a project that was implemented in 2017 and aims to restore oak-pine forests in the region, especially shortleaf pine, which has been declining for decades due to fire suppression, southern pine beetle outbreaks, disease, and other factors.

Regional Conservation Partnership Program (OH)

This program aims to create future Cerulean Warbler habitat by reforesting privately owned land in Kentucky and Ohio.

Monongahela National Forest (WV)

This ongoing effort aims to create young forest habitat and improve water quality in the near future. As the forests mature, the goal is to create larger blocks of red spruce dominated forest and improve connectivity between existing tracts of red spruce.

Year Planted	Acres Reforested	Trees Planted	Number of Volunteers
2019	461	318,938	2,377

Table 3. Summary of 2019 reforestation effort.

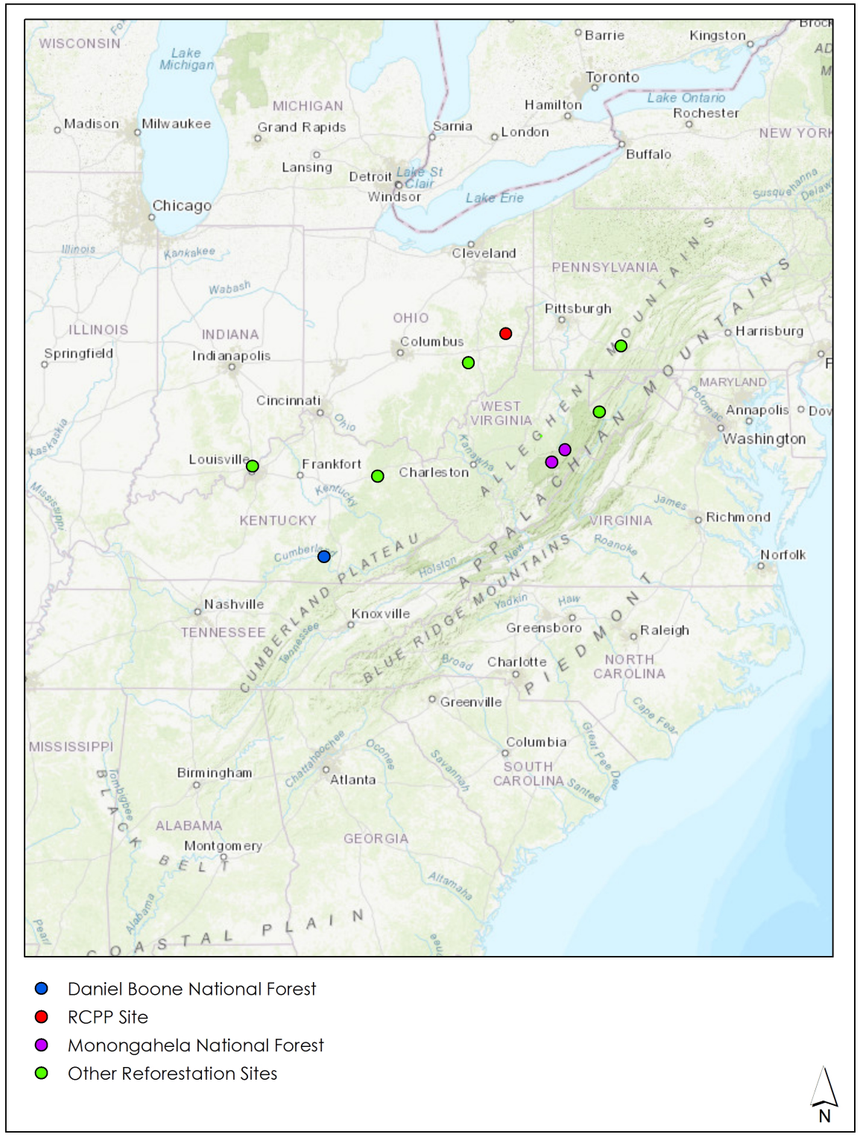

Figure 8. 2019 reforestation sites.

Daniel Boone National Forest

Since 2016, Green Forests Work has partnered with the United States Forest Service—Daniel Boone National Forest (USFS-DBNF), Arbor Day Foundation, and other partners to reforest nearly 100 acres of surface mined land within the DBNF (Figure 9). The 2019 project area expanded upon previous efforts in 2017, adding an additional 31 acres of restored area (Figure 9). The site was forested prior to mining but was reclaimed to hay/pastureland. Since the site was not managed for its intended use, it quickly transformed to an early successional habitat dominated by exotic plant species and remained as such for approximately 30 years due to the excessive soil compaction that was required by reclamation regulations at that time. Without intervention, the site was likely to stay in this state of arrested natural successional for decades. The goal of this project was to improve ecosystem services by restoring native forest cover to benefit wildlife and improve soil health and water quality.

METHODS

To avoid the use of herbicides, a small dozer scraped off the top 2-3 inches soil, along with the vegetation, and pushed it to the project perimeter in the fall of 2018 (Figure 10). Removing the top 2-3 inches of soil removes the seedbank of the unwanted vegetation. The piles of soil and vegetation along the project perimeter quickly decompose and provide suitable medium for natural regeneration. In the meantime, the "soil"/brush piles also provide food and shelter for wildlife and act as weep berms that collect runoff from the project area.

In the fall of 2018, the ground was cross-ripped using a large bulldozer equipped with two 4-foot long ripping shanks mounted behind each track to mitigate soil compaction. The rips were spaced approximately eight feet apart, creating an 8-foot by 8-foot grid after cross-ripping.

RESULTS

This site served as GFW's primary volunteer tree planting location for groups such as Angel's Envy and Philadelphia Insurance, as well as numerous colleges, universities, and other groups. Through the work of approximately 320 volunteers and local contractors, 18,740 trees were planted at the site in the spring of 2019 (Table 4; Figures 11-13).

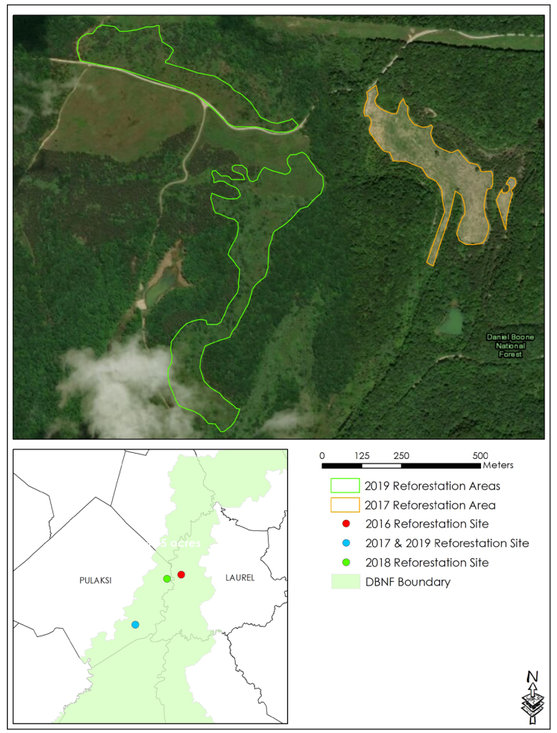

Figure 9. Locations of 2016-2019 sites and reforestation boundaries of 2017 & 2019 sites.

Figure 10. A bulldozer scrapes the unwanted vegetation and seed bank to the project perimeter.

Figure 11. Volunteers with Angel's Envy plant some of the 6,400 white oaks they raised funds for in support of this project.

Figure 12. Students participating in an alternative spring break program that teaches about mountaintop removal and provides service opportunities through planting trees.

Figure 13. Volunteers with Philadelphia Insurance joined GFW for two days of tree planting.

Acres Reforested	Trees Planted	Number of Volunteers
31	18,740	320

Table 4. Summary of the 2019 reforestation effort in the Daniel Boone National Forest.

Regional Conservation Partnership Program

This project is part of a multi-year, multi-state, Regional Conservation Partnership Program (RCPP) grant that was awarded to the American Bird Conservancy, the Appalachian Mountains Joint Venture, Green Forests Work, and other partners by the USDA – Natural Resources Conservation Service in 2015. This grant is intended to improve and create forest habitat for Cerulean warbler (*Setophaga cerulea*) and other songbirds in Kentucky, Maryland, Ohio, Pennsylvania, and West Virginia. The 2019 RCPP project expands upon reforestation efforts in 2018 in Harrison county, Ohio (Figure 14). The 181-acre project site was previously being leased for pasture, but the landowner wanted to restore the forest that existed prior to mining.

METHODS

In the summer of 2018, the site was sprayed with herbicide to kill the aggressive grasses that blanketed the site (Figure 15). To mitigate soil compaction, the site was cross-ripped with a large bulldozer equipped with two 4-foot long ripping shanks mounted behind each track on an 8-foot by 8-foot spacing in the winter of 2019 (Figure 16). Care was taken to leave a buffer strip along waterways to prevent erosion and sedimentation of downstream waters.

RESULTS

The 181-acre site was planted with 123,100 trees by contractors in the spring of 2019 (Figures 17-18; Table 5). The following species were planted at the site: white oak, chinkapin oak, black oak, shumard oak, northern red oak, bur oak, black cherry, yellow poplar, persimmon, sugar maple, red maple, big tooth aspen, black locust, sycamore, sweet gum, rough leaf dogwood, redbud, silky dogwood, hazelnut, and American chestnut (provided by The American Chestnut Foundation).

"I want to make a place for wildlife. I want birds to have a place to nest, and I want deer and turkeys to have acorns to feed on. I want my grandkids to grow up and remember that I did this. I want to help improve the water and air. I can't think of a reason not to plant trees. I just think it's all good, period. Everybody wins—nobody loses."

- John Anderson, property owner

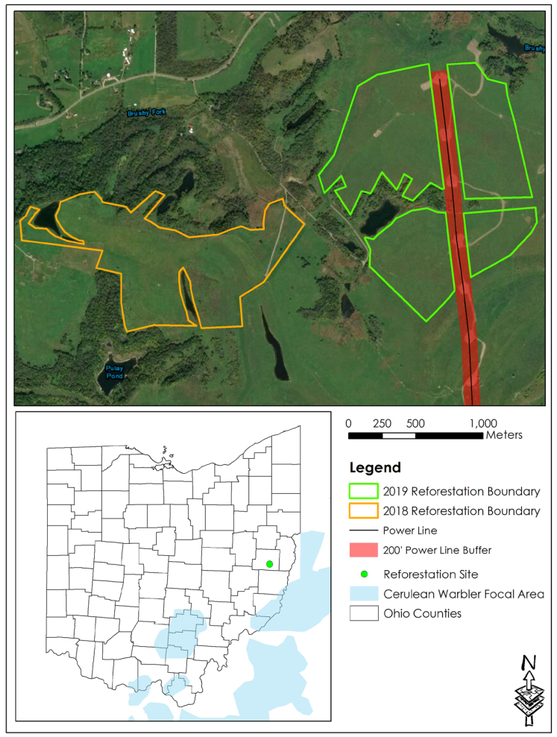

Figure 14. Harrison County reforestation areas and

Figure 15. This picture highlights the effectiveness of the herbicide application.

Figure 16. The snow helps accentuate the rips after ripping in a single direction across the site.

Figure 17. A professional planter plants along the rips.

Figure 18. A freshly planted oak seedling along one of the rips.

Acres Reforested	Trees Planted	Number of Volunteers
181	123,100	-

Table 5. Summary of reforestation effort.

Monongahela National Forest

Since 2010, Green Forests Work has partnered with the Monongahela National Forest and many other partners to restore 788 acres of mined land in the Mower Tract of the Greenbrier Ranger District (Table 6 & Figure 19). In 2018, efforts also expanded into the Marlinton Ranger District. Projects continued in both Districts in 2019, with an additional 93 acres in the Greenbrier Ranger District and an additional 22 acres on the Marlinton Ranger District. Numerous wetlands were created on both projects and were planted with native wildflowers, shrubs, and trees. These projects aim to create young forest habitat for Golden-winged Warblers and other migratory songbirds, restore red spruce-northern hardwood forests, and improve water quality in the Monongahela National Forest, where previous reclamation practices have prevented the re-establishment of red spruce and native trees.

METHODS

A part of this project requires the removal of non-native Norway spruce and red pines that were planted during mining reclamation. Non-native trees were knocked down prior to ripping. To mitigate soil compaction in the Greenbrier Ranger District, 93 acres were ripped by a large bulldozer equipped with two, 4-foot long ripping shanks mounted behind each track on an 8-foot by 8-foot spacing in fall 2018. After ripping was completed, felled trees were scattered across the site.

RESULTS

Of the 93 acres that were ripped on the Greenbrier Ranger District, 60 acres were planted with more than 51,000 trees by a contractor, although 85 volunteers planted approximately 4,000 seedlings. The felled trees were extremely thick across a 33 acre section that was prepared, so that area will be planted in 2020 or 2021, after the trees have decomposed. Volunteers from the Arbor Day Foundation and Grove Collaborative enjoyed a beautiful day of planting, as did a group of volunteers from Komatsu (Figs. 20 & 21). Komatsu America Corporation is providing funding to help restore up to 1,000 additional acres in the coming years and has generously loaned heavy equipment to conduct restoration activities.

In the Marlinton Ranger District, 22 acres were cross-ripped and planted with nearly 11,300 trees and shrubs. Additionally, the eight wetlands that were created in 2018 were planted with a mix of 2,297 plants including the following species: black chokeberry, arrowwood, wild raisin, willow, swamp milkweed, joe pye weed, boneset, and blue vervain (Fig. 22).

Year Restored	Ranger District	Acres Reforested	Wetlands Created	Plants Planted	Number of Volunteers
2010-2018	Greenbrier	671	1,082	303,498	420
2018	Marlinton	35	8	14,800	87
2019	Greenbrier	60	192	51,108	85
2019	Marlinton	-	-	2,297[1]	-
2019	Marlinton	22	-	11,299	-
TOTAL		**788**	**1,282**	**383,002**	**592**

Table 6. Summary of restoration efforts in the Monongahela National Forest. [1]Wetland plants

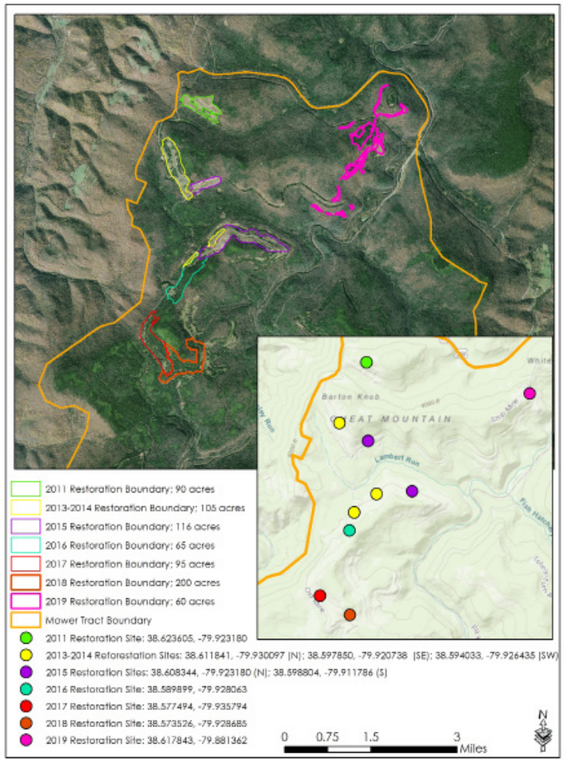

Figure 19. Greenbrier Ranger District restoration areas 2011-2019.

Figure 20. GFW president Dr. Barton, Abbie Eisenhart of the Arbor Day Foundation, and Doug Manning of the USFS talking to Grove Collaborative employees and customers about the importance of red spruce restoration and mined land reforestation at the planting event.

Figure 21. Volunteers from Komatsu interplant red spruce at the Greenbrier Ranger District planting site.

Figure 22. The wetlands created in 2018 in the Marlinton Ranger District were planted with a variety of wetland plants in 2019.

GFW STAFF & PARTNERS

Staff

Michael French—Director of Operations
Kylie Schmidt—Reforestation Coordinator

Board of Directors

Christopher Barton—President
Professor, University of Kentucky
Director, UK Appalachian Center
Paul Rothman—Vice President
Consultant, Kentucky Department for Natural Resources
Carmen Agouridis—Treasurer
Professor, University of Kentucky
Steve Felch—Secretary
Retired from USDI, Office of Surface Mining Reclamation & Enforcement
Tammy Horn-Potter— State Apiarist for the Kentucky Department of Agriculture and founder of Coal Country Beeworks
Mary Miller—Private Citizen
Doug Blom—Consultant/Strategic Advisor, Komatsu Mining Corp

Operational Collaborators

Patrick Angel—USDI, Office of Surface Mining Reclamation & Enforcement
Scott Eggerud—USDI, Office of Surface Mining Reclamation & Enforcement

Partners

Corporate Groups

Angel's Envy
ArborGen
Benevity
Dropseed Nursery
Electric Power Research Institute
Faberson's Creekview Woodshop
Grove Collaborative
Komatsu America Corp
Komatsu Mining Corp
Kroger
Luburgh, Inc.
Mountain Ridge, LLC
Napieralski Forestry Enterprise
New Forest Services
Philadelphia Insurance
RidgeWater
Snowshoe Mountain, Inc.
Telenations, Inc. - TreeMedia
Treecycler
Union Concrete, Division of RBS, Inc.
Williams Forestry and Associates

Educational Groups

Appalachian State University
Bridgewater College
Danville High School
Drew University
Franklin University
Green Bank Middle School
Indiana University of Pennsylvania
Indiana University of Pennsylvania-Research Institute
Marian University
Marshall University
Morehead State University, Sustainability Council
Pennsylvania State University-Altoona
Pennsylvania State University-Dubois
Pocahontas County High School
Radford University
Richwood High School
University of Delaware
University of Kentucky
University of Kentucky, Appalachian Center
University of Kentucky, College of Agriculture, Food and Environment
University of Kentucky, Department of Forestry
University of Kentucky, Department of Mining Engineering
University of Kentucky, Lewis Honor College
University of Kentucky, Robinson Center for Appalachian Resource Sustainability
University of Maryland
University of North Carolina-Chapel Hill
West Virginia University
Xavier University

Government Groups

AmeriCorps
Appalachian Regional Commission
Appalachian Regional Reforestation Initiative
Kentucky Department for Natural Resources
Kentucky Department of Fish and Wildlife Resources
Kentucky Division of Abandoned Mine Lands
Kentucky Division of Conservation
Kentucky Division of Forestry
Kentucky Division of Mine Permits
Kentucky Division of Mine Reclamation and Enforcement
Kentucky Division of Mine Safety
Kentucky Division of Oil and Gas
Ohio Department of Natural Resources
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry
Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Pinchot State Forest
Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Weiser State Forest
Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation
Pennsylvania Department of Environmental Protection, Bureau of District Mining Operations

Government Groups Cont.

Pennsylvania Game Commission
Tennessee Department of Environment and Conservation
United States Department of Agriculture, Forest Service-Allegany National Forest
United States Department of Agriculture, Forest Service-Daniel Boone National Forest
United States Department of Agriculture, Forest Service-Monongahela National Forest
United States Department of Agriculture, Natural Resources Conservation Service
United States Department of Agriculture, Natural Resources Conservation Service, Appalachian Plant Materials Center
United States Department of Interior, Fish and Wildlife Service
United States Department of Interior, National Park Service, Flight 93 National Memorial
United States Department of Interior, National Park Service, National Parks of Western Pennsylvania
United States Department of Interior, Office of Surface Mining Reclamation and Enforcement
United States Environmental Protection Agency
Virginia Department of Forestry
Virginia Department of Mines, Minerals, and Energy
West Virginia Department of Environmental Protection
West Virginia Department of Natural Resources
West Virginia Division of Forestry

Non-governmental Organizations

A Living Tribute
American Association of Zookeepers
American Bird Conservancy
American Forests
American Rivers
Anonymous
Arbor Doy Foundation
Appalachian Headwaters
Appalachian Mountains Joint Venture
Appalachian Stewardship Foundation
Art For Trees
Boy Scouts of America, Troops 60, 75, 170, & 227
Canaan Valley Institute
Catholic Diocese of Lexington, Catholic Committee of Appalachia-Kentucky
Central Appalachian Spruce Restoration Initiative
Christian Theological Seminary
Coal Country Beeworks
Flight 93 National Memorial Volunteers-In-Parks
Foundation for the Carolinas
Friends of Flight 93 National Memorial
Kentucky Writers and Artists for Reforestation
Mennen Environmental Foundation
National Fish and Wildlife Foundation
National Forest Foundation
National Park Foundation
Network for Good
Norfolk Southern Foundation
Pennsylvania Environmental Council
Renaissance Charitable Foundation
Sheldon and Audrey Katz Foundation
Sierra Club – Bluegrass Chapter
Snowy Owl Foundation
The American Chestnut Foundation
The Baum Foundation
The Mountain Institute
The Nature Conservancy
The Wilds
West Virginia Highlands Conservancy

Individuals/Independent

Alice Tor
Anonymous
Brad Stanback and Shelli Lodge-Stanback
Carmen Agouridis
Chet Edwards
Christopher Barton
Connie Marrett
David Sylvia
Dick Whitaker
Elisabeth Vincent
Elizabeth Cook
Eugene Russo
Frederick Williamson
Garald and Joan P. Lawrence
Geoffrey Hill
Geoffrey Trowbridge
Ian White
James Whitney
Jim Philliips
Jim Richardson
John Anderson
Justin Huber
Kathryn O'neill
Kay Hazelett
Kenneth Schmidt
Kevin Henry
Lynn Justice
Mary Miller
Melissa Barron
Nana Lampton
Nathan Blan
Otto Luburgh
Paul and Elizabeth Bork
Preston Gibson
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Stephen Lipovsky
Tanya and Lori Faberson
Thomas Lawrence
Timothy Gilboe
Tom and Kathryn Brannon
Virginia Leake
William O'Laughlin

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