

ECOLOGICAL RESTORATION ON THE MONONGAHELA NATIONAL FOREST 2023 REPORT





GREEN FORESTS WORK'S MISSION

Green Forests Work's (GFW) mission is to re-establish healthy and productive forests on formerly mined lands in Appalachia.

VISION

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 scrub lands into healthy, productive forestland.

Our reforestation projects provide jobs for equipment operators, nursery workers, and tree planters, and improve the environment by eradicating exotic species and restoring ecosystem services. With the help of our partners and volunteers, this vision is quickly becoming a reality.

Since 2009, we have planted over six million trees on more than 11,500 acres.

BACKGROUND

GFW is a 501(c)(3) nonprofit organization housed at the University of Kentucky. GFW's mission is to restore healthy, productive, native forests on lands that have been impacted by coal surface mining in the Appalachian region and beyond. For over a decade, GFW has been working with the US Forest Service to restore red-spruce ecosystems on the Monongahela National Forest. This work has been performed at the Mower Tract in the Greenbrier Ranger District and at Sharp Knob in the Marlinton Ranger District. The following provides an overview of restoration activities that have occurred between 2011 and 2023.



A seedling is planted in early May at the Mower Tract.



Professional tree planters begin to plant on Sharp 23.

RESTORATION BENEFITS

RED SPRUCE

Red spruce (*Picea rubens*) influenced forests have severely declined in West Virginia: The Red Spruce – Yellow Birch Forest (G2S2) and the Red Spruce – Southern Mountain Cranberry Forest (G2S1), which surrounds the Mower Tract, are imperiled¹ and critically imperiled² communities within the state, respectively. Protecting and re-establishing these communities is of conservation concern because they support 240 rare species in West Virginia alone (see page 4). Red spruce have a limited range due to their specific site requirements. They grow best in cool, moist climates, which is why the high elevations of the Appalachian Mountains are one of the few places that can support their growth. Cheat Mountain, where the Mower Tract is located, has been identified by the Central Appalachian Spruce Restoration Initiative and The Nature Conservancy as a key red spruce corridor and top priority for conservation. Corridors connect large communities together, acting as roadways for all the living things within them. Having these connections between large communities allows species to move further north as the southern extent of their range becomes inhospitable due to



A red spruce settles into its new home on Cheat Mountain.

¹ Imperiled (S2) is a conservation status designated by NatureServe meaning that the species has a high risk of extinction due to restricted range, relatively few populations (80 or fewer), recent or widespread declines, or other factors.

² Critically imperiled (S1) is a conservation status designated by NatureServe meaning that the species has a very high risk of extinction due to extreme rarity (five or fewer populations), very steep declines, or other factors.



An excavator begins work on the decommissioning of sediment ponds at Cheat Mountain.

RESTORATION TECHNIQUES

REPURPOSING NON-NATIVE SPECIES

Grasslands and plantations of non-native trees, such as Norway spruce and red pine, were created on the mined areas during the reclamation process. The non-native species that were seeded and planted did not provide the same ecosystem services as native red spruce and needed to be cleared before soil decompaction activities could be performed. Although the non-native pines and Norway spruce could tolerate the compacted soil better than many native tree species, they still did not develop healthy roots or grow vigorously.

Since the stunted, non-native trees had little value for lumber or furniture, they were knocked down by a bulldozer or excavator, pushed into piles, and then scattered across the site after ripping. As they decompose, they will provide valuable functions on the site. The dead wood provides a suitable growth medium for mosses, lichens, and fungi, which support a variety of wildlife. The woody debris also provides habitat for a variety of insects, birds, and mammals. As the wood decays, nutrients and organic matter are provided to the soil, increasing the soil's fertility and water-holding capacity. The downed trees also increase the rate of natural regeneration by acting as perches for songbirds such as Dark-eyed Juncos (*Junco hyemalis*), which spread native seed in their droppings. Fire cherry (*Prunus pensylvanica*) is not planted but can be seen growing prolifically amid the piles of downed trees. Colonization of fire cherry and other native species has been attributed to the "perch effect," which increases species richness and the abundance of locally adapted plants.

SOIL DECOMPACTION

Mitigating soil compaction is the most critical step in putting mined lands on a trajectory toward becoming native forests. Loosening the soil allows native plants to naturally regenerate by providing a suitable medium for root growth, while planting trees facilitates the process. Ripping is typically done in the fall when the soil is dry to maximize soil fracturing. Komatsu America Corp. has been providing equipment and funding to assist with site preparation since 2019. After the non-native trees are cleared by a Komatsu D61 bulldozer and PC210 excavator, local contractors rip the land using a Komatsu D155 bulldozer equipped with dual, rear-mounted ripping shanks. The shanks are spaced eight feet apart.

WETLAND CREATION

After the ripping and scattering of downed trees, a contractor is hired to create wetlands and vernal pools of varying depths and sizes. One goal for creating wetlands is to increase water and sediment holding capacity on the restoration area. More than 1,700 wetlands have been created by an excavator based on observed drainage patterns, evaluation of soils and sub-surface conditions, and previous work. Some of the drainages and sediment ponds that were created by the mining company have also been improved and planted with wetland plants. The wetlands are created to intercept and retain precipitation and groundwater and trap sediment. They also provide habitat for amphibians and other wildlife species, and they provide suitable conditions for 145 state rare plant species known to be associated with wetlands in the High Alleghenies, including 60 critically imperiled (S1) species, 56 imperiled (S2) species, and 29 vulnerable (S3) species.

PLANTING OF NATIVE SPECIES

In the spring following ripping, the reforestation sites and wetlands are planted with a variety of native plants by volunteers and professionals. Depending on the species, plants are established through direct seeding, or by the planting of bareroot seedlings, containerized/potted plants, and seedling plugs. To increase survival, the seeds and plants are purchased or grown from a locally adapted seed source. Each planting year from 2010 to 2019, the Natural Resources Conservation Service- Appalachian Plant Materials Center provided seed and plants grown from seed collected in high elevation areas across the Monongahela National Forest.

Red spruce is the largest component of every planting, overall comprising 41% of the total seedlings planted. Other native species are selected based on their benefit to wildlife, their association with red spruce forests and wetlands in the High Alleghenies, and how they compete with red spruce. For example, aspen is the second largest component of the plantings overall, because it is a fast-growing species and provides food and cover for wildlife, helping to quickly establish an early successional habitat. Aspen are also short-lived compared to red spruce and northern hardwoods, so they will not compete with these trees and will eventually be overshadowed by them. The average planting density of upland plants is 536 plants/acre, which leaves sufficient open spaces for natural regeneration. Wetlands are planted at a higher density of approximately 1,000 plants per acre.



Wildflowers and other native plants naturally colonize ripped areas. This bench was ripped in 2021 at Sharp Knob.



Aerial view of the ponds before work begins on their removal.

POND DECOMMISSIONING

On the Mower Tract are a series of over fifty abandoned sediment ponds that border the downgradient side of our restoration area. Under current SMCRA regulations, these would have to be removed as part of the reclamation process. However, these predated SMCRA and were allowed to remain and today serve little ecological benefit and are a source of thermal pollution to downstream coldwater fish habitat. In an effort to address this problem, we initiated a project in 2023 to decommission the ponds and turn them into a complex of small wetlands with greatly reduced ponded area that can be planted with a mixture of wetland trees and shrubs that will grow and eventually shade the area. An area of approximately 60 acres will be converted at the site. Extensive earth moving and restructuring is required, and the project will likely be implemented in phases. Phase 1, which is ongoing, will eliminate 15 ponds and that area will be planted in spring 2024.



Post removal landscape in an area where one of the ponds was decommissioned.

COMMUNITY SERVICES

In addition to providing a multitude of environmental benefits, forest restoration provides immediate and future economic benefits. Contract services and supplies for soil decompaction, tree planting, wetland creation, and cultivation of seedlings have put millions of dollars back into a region that has experienced a severe economic downturn due to the decline in the coal industry. Re-establishing red spruce will also help generate future revenue for the Forest through sustainable timber harvesting. Red spruce is a high-value species because of its use in paper manufacturing and construction. It has added economic and cultural value in the region because it is a preferred material for many stringed instruments that are popular in bluegrass music.

One of the things we learned from the COVID-19 pandemic was that more opportunities for outdoor nature-based experiences are needed. During the pandemic, parks and public land saw a substantial increase in visitors. The need for fresh air, exercise, companionship, and an escape from remote working led to this increased usage. As we consider new opportunities for expanding recreation infrastructure on public land, areas that are underutilized, such as abandoned and legacy mines, should be improved for these uses.

At the Mower Tract, development of recreation infrastructure went hand in hand with the ecological

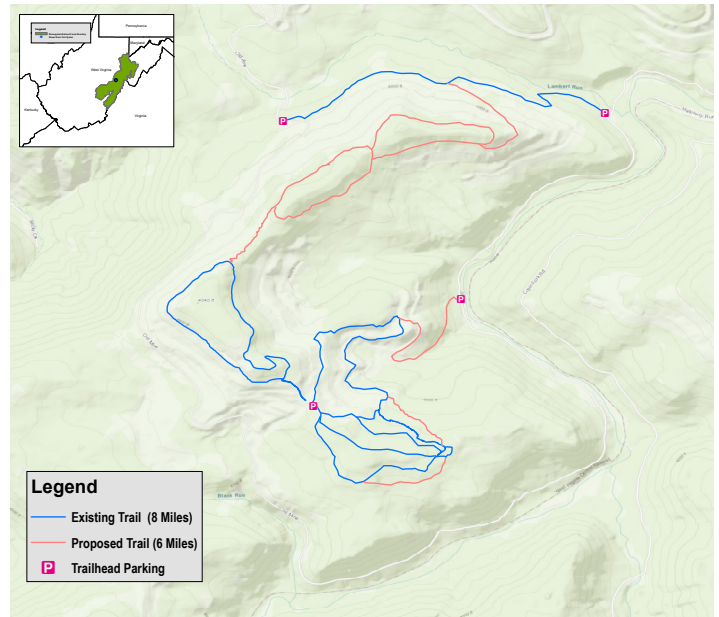


Figure 1. Map of created trails within restoration area at the Mower Tract.

restoration work. Dozer trails developed to traverse the restoration areas were improved and converted to hiking and biking trails (Figure 1). Cleared areas were leveled to provide campsites. The clearing of the non-native trees opens the view shed of the restoration areas to visitors, and in the near future, a more visually interesting landscape will be established. Habitat improvement will promote hunting and wildlife viewing opportunities. To date, 8 miles of hiking/biking trails have been developed (6 more proposed) and over 30 campsites have been created in the restoration area.



Camping sites established at the Mower Basin get frequent use due to stunning views and proximity to newly created hiking and biking trails.

MOWER TRACT:

SITE HISTORY AND PROJECT GOALS

The Mower Tract (40,000 acres) of the Monongahela National Forest was purchased from the Mower Land and Lumber Company in the early 1980s. It is located on Cheat Mountain (4,848 ft elevation) in Randolph and Pocahontas Counties, West Virginia (Figure 2). The Mower Tract and the surrounding high elevation areas were historically dominated by old-growth red spruce and red spruce-northern hardwood forests; but after the industrial logging era of the late 19th and early 20th centuries, the red spruce ecosystem in the West Virginia highlands was reduced by an estimated 90%. Clear-cut slash ignited unnaturally hot wildfires, which eliminated the red spruce seed source and caused former red spruce forests to be replaced by even-aged, hardwood dominated forests. Extensive logging was linked to regional flooding and was key to the establishment of the Monongahela National Forest.

In addition to logging, coal mining further reduced and prevented the re-establishment of red spruce communities in West Virginia. In the Mower Tract, approximately 2,000 acres were surface mined for coal. Reclamation laws required mining companies to return the site to approximate original contour and to control erosion, which was accomplished by compacting soils and planting non-native trees or seeding aggressive grasses and legumes. The Mower Tract was reclaimed to non-native conifer plantations and pasture and remained this way for over 30 years. Native species could not recolonize the reclaimed sites because of the compacted soils and thick grass cover.

Starting in 2010, the U.S. Forest Service began a partnership with Green Forests Work (GFW) and the Appalachian Regional Reforestation Initiative (ARRI) to conduct a suite of restoration activities, including non-native species removal, organic matter loading, soil decompaction, mined land reforestation, and wetland creation. In the short term, the goal is to create an early successional habitat, with the ultimate goal being to establish a forest that is at least 30% red spruce. Ancillary benefits include improved water quality, enhanced wildlife habitat, and improved ecosystem services, such as carbon sequestration.

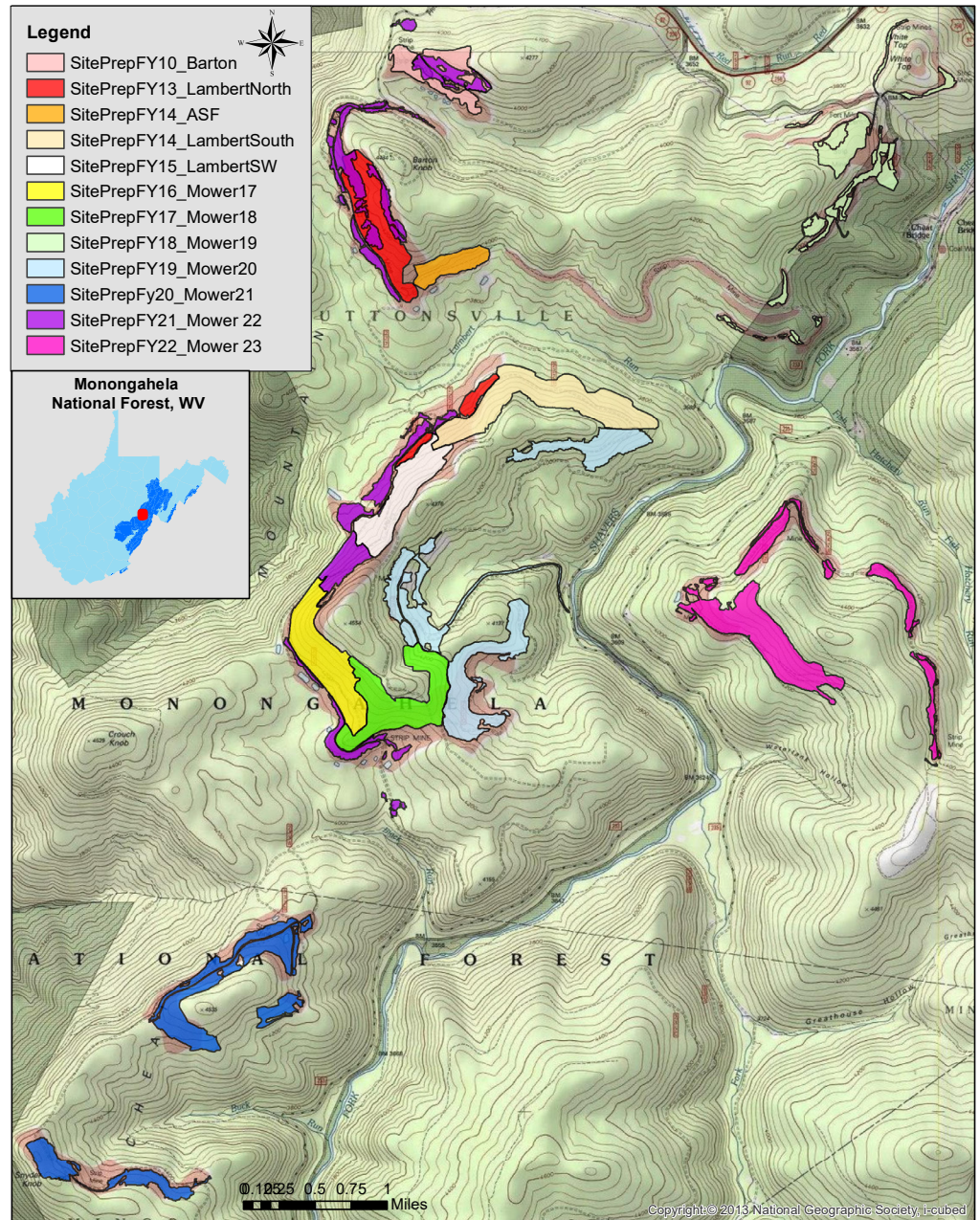


Figure 2: Map of restoration areas by year at the Mower Tract.



Contractors plant large aspen at pond area at the Mower Tract in 2023.

2023 MOWER RESTORATION

In 2023, GFW and partners planted 105,215 trees and shrubs and created 60 wetlands. Prior to planting, non-native species were removed and the soil was decompacted. In total, 1,462 acres have been restored in the Mower Tract. This has included the creation of more than 1,700 wetlands and the planting of nearly 790,000 trees and shrubs (Table 1). Although the majority of the planting has been accomplished by professionals, more than 500 volunteers have assisted us in these efforts, as well as Appalachian Conservation Corps, AmeriCorps members annually since 2020. Table 2 lists the 60 native tree and shrub species and 4 herbaceous species that have been planted on the Mower Tract restoration areas over the years.

Table 1. Yearly summary of restoration activities.

¹ In addition to the 192 ripped acres, 8 acres of non ripped slopes were planted.

² In addition to the 171 ripped acres, 18 acres of land ripped in the past project years were planted.

³ There is an overlap in the species planted each year. Across all years, more than 60 species of trees and shrubs have been planted, as well as many more species of herbaceous transplants and seeds.

Year Planted	Restoration Area (ac)	Wetlands Created	# Trees and Shrubs Planted	# Species Planted	Volunteers Engaged
2011	90	135	22,550	12	60
2013-2014	105	75	28,485	8	117
2015	116	279	46,937	11	49
2016	65	100	35,436	22	90
2017	95	318	76,782	32	90
2018	200	175	93,308	35	14
2019	58	192	51,108	23	85
2020	200 ¹	84	92,318	21	0
2021	184	108	119,718	32	20
2022	189 ²	180	117,452	31	0
2023	160	60	105,215	20	0
TOTAL	1,462	1,706	789,309	60 total³	525

Table 2. Summary of the native tree and shrub species and herbaceous species that have been planted on the Mower Tract restoration areas over the years, along with their percentages of the total.

Species	Total Planted	% of Total	Species	Total Planted	% of Total
Red Spruce	344,952	43.73%	Maple Leaf Viburnum	1,500	0.19%
Bigtooth/Quaking Aspen	76,609	10.09%	Beech	1,415	0.18%
Speckled Alder	57,698	7.31%	Yellow Birch	1,413	0.18%
Black Cherry	47,201	5.98%	Bush Honeysuckle (Native)	1,384	0.18%
Silky Dogwood	20,643	2.62%	Red Oak	700	0.09%
Mountain Ash	18,807	2.38%	Blackhaw	652	0.08%
Winterberry Holly	17,837	2.26%	Other	432	0.05%
Red Osier Dogwood	18,850	2.39%	Fraser Magnolia	339	0.04%
Arrowood Viburnum	15,607	1.98%	Catberry	312	0.04%
Chokecherry	12,456	1.58%	Pin Cherry	250	0.03%
Serviceberry	14,178	1.80%	Bear Oak	240	0.03%
Sugar Maple	12,471	1.58%	Silky Willow	400	0.05%
Red Maple	13,292	1.69%	Red Raspberry	101	0.01%
Black Chokeberry	18,793	2.38%	Late Figwort	100	0.01%
Balsam Fir	13,780	1.75%	Red Chokeberry	100	0.01%
Hazelnut	10,115	1.28%	Steeplebush, Pipestem	100	0.01%
Black Elderberry	9,515	1.21%	Highbush Cranberry	75	0.01%
Witch hazel	8,150	1.03%	Red Mulberry	75	0.01%
Wild Raisin	4,953	0.63%	Swamp Rose	34	0.00%
Cucumber Magnolia	4,754	0.60%	Black Birch	33	0.00%
Ninebark	4,215	0.53%	Mountain Holly	32	0.00%
American Chestnut	3,558	0.45%	Hemlock	23	0.00%
Willow	3,324	0.42%	Black Raspberry	6	0.00%
Ironwood	2,900	0.37%	Skunk Current	6	0.00%
Red Elderberry	4,846	0.61%	Wild Grape	3	0.00%
Hawthorn	2,313	0.29%	Devil's Walkingstick	1	0.00%
Lowbush Blueberry	2,243	0.28%	TOTAL Trees	788,771	
Staghorn Sumac	2,102	0.27%	Herbaceous Plants		
Alternate Leaf Dogwood	2,475	0.31%	Penstemon	280	0.04%
Mountain Maple	2,675	0.34%	Smooth Oxeye	150	0.02%
Basswood	1,597	0.20%	Sweet Fern	100	0.01%
Nannyberry	1,586	0.20%	Milkweed	8	0.00%
American Plum	1,550	0.20%			



Equipped with trees, professional tree planters set out on Sharp Knob site on a foggy morning.



A red spruce is planted at Sharp Knob in the early spring of 2023.

SHARP KNOB: *SITE HISTORY AND PROJECT*

Sharp Knob, also located on Cheat Mountain in Pocahontas County, West Virginia, shares much of the local history of the Mower Tract in that it was also formerly dominated by red spruce forests before being replaced by northern hardwoods after logging and slash fires. In addition to logging, coal mining throughout Appalachia further reduced and prevented the re-establishment of red spruce communities. On Sharp Knob, approximately 700 acres were surface mined for coal. In contrast to the nearby Mower Tract, which was mined after the 1977 mining reclamation law (requiring mining companies to return the site to approximate original contour, compact to control erosion, and revegetate with grasses or plantations), Sharp Knob was mined in the 1960's and early 70's. Before 1977, once mining was completed, the mining companies revegetated the site by seeding non-native grasses and legumes and/or planting exotic tree plantations, and then had no further obligations; the sites were abandoned, leaving mine benches and highwalls. Abandoned mines often had problems such as land instability, erosion, and water issues. Sharp Knob has flat mine benches of exotic Norway spruce and red pine plantations, grasslands, and steep highwalls with large mine ponds at the base. On the most compacted areas of Sharp Knob, due to soil compaction and thick exotic grass cover,

native trees and shrubs are not able to colonize and exotic plantation trees grow stunted with shallow root systems. Roughly 60 years have passed since mining was completed at Sharp Knob, and very few native trees have successfully established on the most compacted areas.

GFW and the USFS intend to continue fundraising for additional Red Spruce Ecological Restoration projects, as well as expand to restoration projects on mined lands in other Forest Service districts, until we've reforested as much mining-degraded land in the Monongahela National Forest as possible. The process has begun for restoring mined lands on other districts of the Monongahela National Forest. Conversations between partners have been extensive, preliminary maps have been created, and a portion of the funding has been secured, and we expect to begin work in 2024.

Red Spruce Ecological Restoration on Sharp Knob has been a collaborative effort between GFW, USFS-Monongahela National Forest, Komatsu, Appalachian Headwaters, Argosy Foundation, Snowshoe Mountain Ski Resort, Appalachian Stewardship Foundation, Mennen Environmental Foundation, National Forest Foundation, Appalachian Regional Reforestation Initiative, Office of Surface Mining Reclamation and Enforcement, The Nature Conservancy, AmeriCorps-Appalachian Forest National Heritage Area, Natural Resources Conservation Service-Appalachian Plant Materials Center, Central Appalachian Spruce Restoration Initiative (CASRI), Arbor Day Foundation, West Virginia Highlands Conservancy, University of Kentucky, and many others.



Professional planters load red spruce trees into their bags before planting at Sharp Knob 23.

Table 3. List of native species planted at Sharp Knob each year. A total of 143,290 trees, shrubs, and herbaceous plants of 39 species have been planted from 2018 to 2023.

Trees and Shrubs	Total Planted	% of Total
Red Spruce	54,552	38.07%
Yellow Birch	17,761	12.40%
Black Cherry	15,250	10.64%
Sugar Maple	8,150	5.69%
Red Maple	9,780	6.83%
Quaking Aspen	7,180	5.01%
Allegheny Serviceberry	4,295	3.00%
Red Osier Dogwood	2,670	1.86%
Black Elderberry	1,600	1.12%
Red Elderberry	1,100	0.775
Silky Dogwood	1,525	1.06%
<i>Diervilla lonicera</i>	400	0.28%
Speckled Alder	5,608	3.91%
Alternate-leaf Dogwood	1,070	0.75%
Winterberry Holly	1,539	1.07%
Choke Cherry	701	0.49%
Hornbeam	38	0.03%
Cucumber Magnolia	27	0.02%
Arrowwood Viburnum	1,173	0.82%
American Chestnut ¹	750	0.52%
American Hazelnut	1,183	0.83%
American Plum	200	0.14%
Black Chokeberry	572	0.40%
Butternut	100	0.07%
Fraser Magnolia	11	0.01%
Lowbush Blueberry	25	0.02%
Mountain Ash	3,373	2.35%
White Oak	100	0.07%
Wild Raisin	32	0.02%
Willow	2	0.00%
Witch Hazel	150	0.10%
Hawthorn	318	0.22%
Herbaceous Plants		
Tall Sunflower	325	0.23%
Gray-headed coneflower	300	0.21%
Common Milkweed	30	0.02%
Blue Vervain	350	0.24%
Boneset	350	0.24%
Joe Pye Weed	350	0.24%
Swamp Milkweed	350	0.24%
TOTAL	143,290	100%

¹ Backcrosses provided by The American Chestnut Foundation

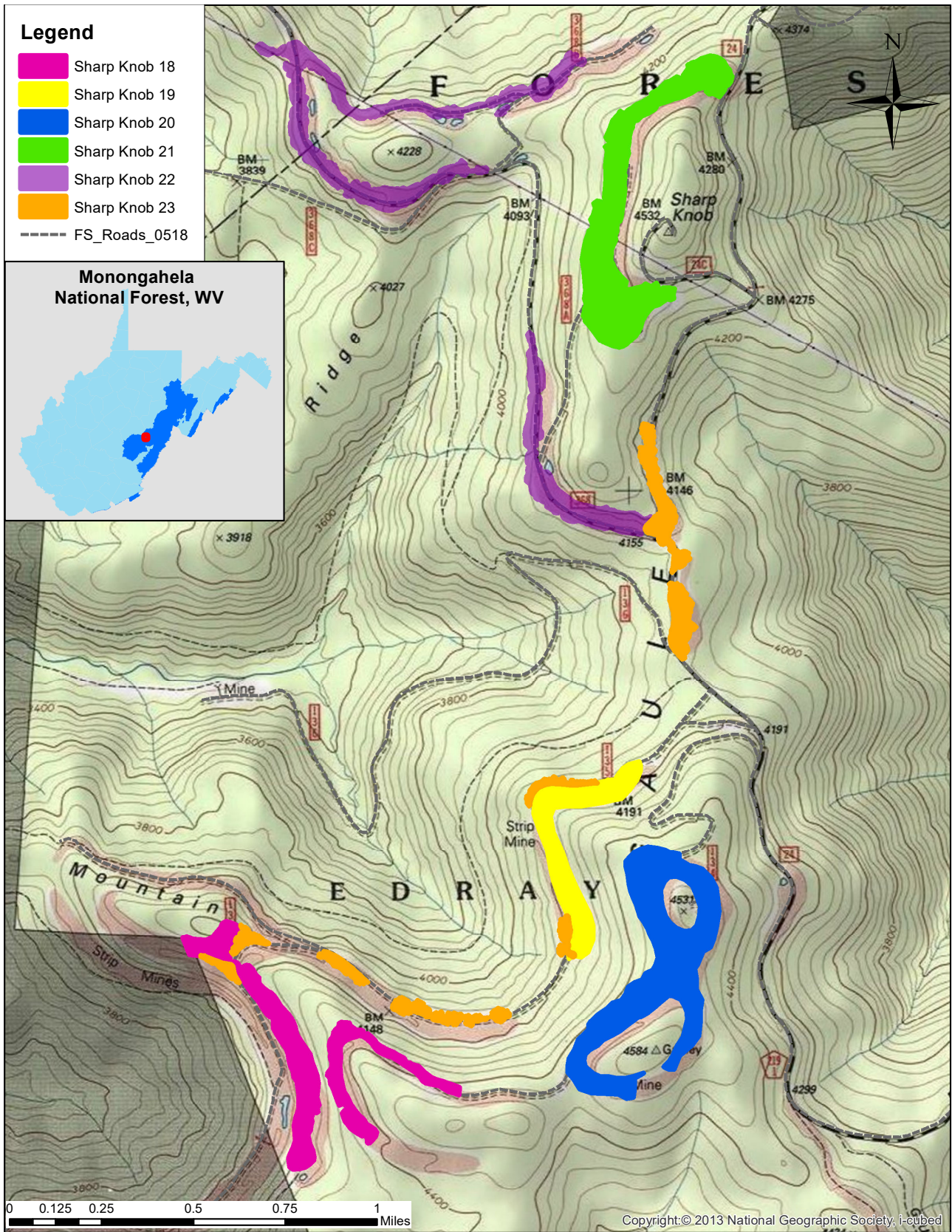


Figure 3. Map of restoration areas by year at Sharp Knob.

SHARP KNOB RESTORATION ACTIVITIES

Since Green Forests Work began working with the U.S. Forest Service-Monongahela National Forest and other partners on Sharp Knob, restoration projects have taken place annually since 2018. Prior to planting, non-native species were removed and the soil was decompacted. So far, 241 acres have been restored. This has included the creation of 93 wetlands and the planting of over 141,000 trees and shrubs (species are listed in Table 3), as well as over 2,000 native herbaceous plants (Table 3). Seeds of flowering species for pollinators have been spread throughout the restoration area. Although the majority of the planting has been accomplished by professionals, 57 volunteers have assisted us in these efforts. This past fall 2022, 26 acres were decompacted, and 17,500 trees were planted in the spring of 2023 (Table 4). This completes the mined land restoration on Sharp Knob.

Table 4. Yearly summary of restoration activities.

Year Restored	Acres Reforested	Wetlands Created	# of Trees & Shrubs Planted	# Species	Event Type	Volunteers
2018	35	8	14,800	12	Professional	
2018			3,175		Volunteer	57
2019	22	2	11,299	17	Professional	
2020	65	5	37,082	10	Professional	
2021	47		25,799	17	Professional	
2022	46	78	34,230	19	Professional	
2023	26		14,850	16	Professional	
Total	241	93	141,235	48*		57

* In addition, over 2,000 herbaceous transplants of 7 species planted, and dozens of pollinator species seeded.



RESEARCH HIGHLIGHTS

The Forestry Reclamation Approach (FRA) is a practical guide to reforesting surface-mined lands. Bats, a group of mammals with declining populations, could benefit from mine reforestation. To determine if the FRA can provide a suitable bat foraging habitat, we surveyed bat activity at created depressional wetlands on 1-year-old and 8-year-old FRA reforested lands (FRA1; FRA8), wetlands in naturally regenerating forest on traditionally reclaimed mined land (~40 years old; REGEN), and wetlands in mature forest not previously mined (MAT). I passively recorded echolocation calls for 12 nights across 16 sites between June and August 2021. I analyzed bat activity using the number of recordings,

Breezey Snyder examined bat foraging at the Mower Tract for her MS degree from the University of Kentucky.



Breezey Snyder and an undergraduate lab technician sort insects that were captured using black light traps.

pulses, and feeding buzzes in conjunction with nocturnal insect abundance and biomass, microhabitat characteristics, and landscape characteristics via generalized linear mixed-effects modeling. Both FRA1 and FRA8 had activity levels similar to MAT. REGEN had significantly greater foraging activity than the other three land classes possibly due to its distance from roads and proximity to forest edges. Insect abundance and biomass were comparable across sites, indicating FRA practices do not hinder the establishment of a prey base for bats. Overall, bats are utilizing the restored mined land for foraging (Table 5). Reforestation of mined lands, complemented with wetland creation, provides habitat that could benefit bat species conservation in Appalachia.

Table 5: Bat species identified by echolocation calls at Cheat Mountain

Species	FRA1	FRA8	REGEN	MAT	Total
Big brown bat	1,388	37	153	91	1,669
Eastern red bat	820	318	1,184	522	2,844
Hoary bat	311	232	600	187	1,330
Silver-haired bat	0	66	0	73	139
Myotis spp.	5	5	34	0	44
Tricolored bat	0	65	146	45	256
Total	2,524	723	2,117	918	6,282

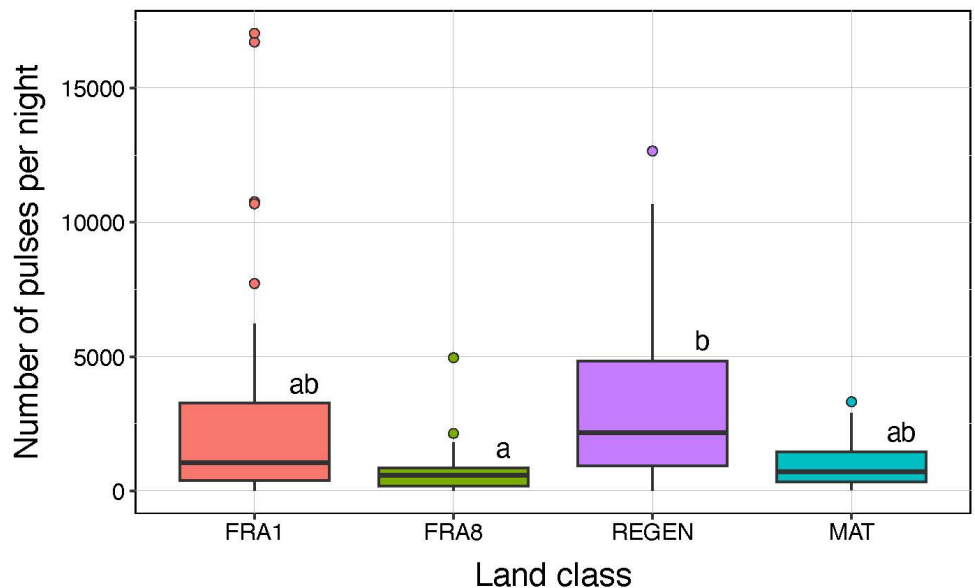


Figure 4. Number of bat detections per sampling night by treatment.

REBECCA'S BIRDS

The Forestry Reclamation Approach (FRA) emphasizes best practices for the reforestation of mined landscapes, such as the planting of native trees and shrubs. Although the FRA is expected to benefit wildlife, no studies have empirically examined the effects of the FRA on avian species. My study aimed to identify which reclamation approaches and/or landscape features promote breeding songbirds, particularly mature forest avian guilds and species of conservation need (Table 6). I conducted point count surveys at the Mower Tract and Sharps Knob. I assessed differences in avian occupancy, species richness, and species abundance between four treatment types: 1) younger (2-5 years) FRA sites, 2) older (8-11 years) FRA sites, 3) non-FRA regenerated minelands, and 4) unmined, mature forests. Younger FRA sites were positively associated with the occupancy and species richness of the disturbed (shrubland/forest edge) and generalist breeding habitat guilds, but negatively associated with the occupancy and species richness of mature forest species. Treatment type had similar effects on species-specific abundance estimates, with mature forest species maintaining higher abundance in non-FRA and mature forest sites, and disturbed habitat species having higher abundance in younger and older FRA treatments.



Rebecca Davenport examined bird use within the Monongahela National Forest while a graduate student at the University of Kentucky.

Table 6. Presence/absence of all species (n = 60) from point count surveys across four treatment types (YFRA, OFRA, REGEN, MAT). Species are categorized into one of three habitat guilds: 1) mature forest, 2) disturbed (shrubland/forest edge), and 3) generalist.

Guild	Species	YFRA	OFRA	REGEN	MAT
Mature Forest	Blackburnian Warbler (<i>Dendroica fusca</i>)	✓	✓	✓	✓
	Black-capped Chickadee (<i>Poecile atricapillus</i>)	✓	✓	✓	✓
	Black-throated Blue Warbler (<i>Dendroica caerulescens</i>)		✓	✓	✓
	Black-throated Green Warbler (<i>Setophaga virens</i>)	✓	✓	✓	✓
	Blue-headed Vireo (<i>Vireo solitarius</i>)	✓	✓	✓	✓
	Brown Creeper (<i>Certhia americana</i>)			✓	✓
	Canada Warbler (<i>Wilsonia canadensis</i>)	✓		✓	✓
	Eastern Wood Pewee (<i>Contopus virens</i>)		✓		
	Golden-crowned Kinglet (<i>Regulus satrapa</i>)	✓	✓	✓	✓
	Hairy Woodpecker (<i>Leuconotopicus villosus</i>)	✓		✓	✓
	Hermit Thrush (<i>Catharus guttatus</i>)	✓	✓	✓	✓
	Hooded Warbler (<i>Wilsonia citrina</i>)				✓
	Magnolia Warbler (<i>Setophaga magnolia</i>)	✓	✓	✓	✓
	Northern Waterthrush (<i>Seiurus noveboracensis</i>)	✓	✓		✓
	Ovenbird (<i>Seiurus aurocapilla</i>)			✓	
	Pileated Woodpecker (<i>Dryocopus pileatus</i>)			✓	
	Pine Siskin (<i>Carduelis pinus</i>)		✓		
	Red Crossbill (<i>Loxia curvirostra</i>)	✓	✓		✓
	Red-bellied Woodpecker (<i>Melanerpes carolinus</i>)			✓	✓
	Red-breasted Nuthatch (<i>Sitta canadensis</i>)	✓	✓	✓	✓
Red-eyed Vireo (<i>Vireo olivaceus</i>)	✓	✓	✓	✓	

Guild	Species	YFRA	OFRA	REGEN	MAT	
Mature Forest	Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>)			✓		
	Ruffed Grouse (<i>Bonasa umbellus</i>)			✓		
	Scarlet Tanager (<i>Piranga olivacea</i>)	✓		✓		
	Sharp-shinned Hawk (<i>Accipiter striatus</i>)	✓				
	Swainson's Thrush (<i>Catharus ustulatus</i>)	✓	✓	✓	✓	
	Veery (<i>Catharus fuscescens</i>)	✓	✓	✓	✓	
	White-breasted Nuthatch (<i>Sitta carolinensis</i>)	✓				
	Winter Wren (<i>Troglodytes hiemalis</i>)	✓	✓	✓	✓	
	Yellow-rumped Warbler (<i>Setophaga coronata</i>)	✓	✓	✓	✓	
	Yellow-throated Vireo (<i>Vireo flavifrons</i>)		✓	✓		
Disturbed	Alder Flycatcher (<i>Empidonax alnorum</i>)	✓	✓			
	Brown Thrasher (<i>Toxostoma rufum</i>)	✓				
	Chestnut-sided Warbler (<i>Setophaga pensylvanica</i>)	✓	✓		✓	
	Chipping Sparrow (<i>Spizella passerina</i>)	✓	✓		✓	
	Common Yellowthroat (<i>Geothlypis trichas</i>)	✓	✓	✓	✓	
	Dark-eyed Junco (<i>Junco hyemalis</i>)	✓	✓	✓	✓	
	Eastern Towhee (<i>Pipilo erythrophthalmus</i>)	✓	✓	✓	✓	
	Field Sparrow (<i>Spizella pusilla</i>)	✓	✓		✓	
	Indigo Bunting (<i>Passerina cyanea</i>)	✓	✓	✓	✓	
	Mourning Warbler (<i>Geothlypis philadelphia</i>)		✓			
	Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	✓	✓			
	Ruby-throated Hummingbird (<i>Archilochus colubris</i>)	✓			✓	
	Song Sparrow (<i>Melospiza melodia</i>)	✓	✓	✓		
	Swamp Sparrow (<i>Melospiza georgiana</i>)	✓	✓	✓	✓	
	White-throated Sparrow (<i>Zonotrichia albicollis</i>)				✓	
	Wild Turkey (<i>Meleagris gallopavo</i>)	✓				
	Yellow Warbler (<i>Setophaga petechia</i>)	✓			✓	
	Generalist	American Crow (<i>Corvus brachyrhynchos</i>)	✓	✓	✓	✓
		American Goldfinch (<i>Spinus tristis</i>)	✓	✓		✓
		American Robin (<i>Turdus migratorius</i>)	✓	✓	✓	✓
Blue Jay (<i>Cyanocitta cristata</i>)		✓	✓	✓	✓	
Carolina Wren (<i>Thryothorus ludovicianus</i>)		✓				
Cedar Waxwing (<i>Bombycilla cedrorum</i>)		✓	✓	✓	✓	
Chimney Swift (<i>Chaetura pelagica</i>)				✓	✓	
Common Raven (<i>Corvus corax</i>)			✓			
House Wren (<i>Troglodytes aedoni</i>)			✓		✓	
Mourning Dove (<i>Zenaida macroura</i>)		✓				
Northern Flicker (<i>Colaptes auratus</i>)		✓	✓	✓		
Turkey Vulture (<i>Cathartes aura</i>)			✓			



Figure 5. Four treatment types: A) Younger (2-5 yr) FRA, B) older (8-11 yr) FRA, C) non-FRA, naturally regenerated minelands (> 40 yr), and D) unmined, mature forest.at Sharp Knob 23.



Attendees listen to Breezey Snyder as she talks about her bat study at the annual ARRI conference in August 2023.

ARRI REFORESTATION WORKSHOP



One of the many wetlands visited during the ARRI workshop.

On August 29th and 30th, Green Forests Work, the Office of Surface Mining Reclamation and Enforcement, the University of Kentucky, West Virginia University, and the USDA Forest Service hosted the 2023 Appalachian

Regional Reforestation Initiative's Annual Workshop in Elkins, WV. Day 2 of the workshop included a tour of the Mower Tract restoration area. Attendees were provided an overview of the project and several unique aspects of the project were visited and discussed including native plant establishment, wetland creation, recreation opportunities, soils, red spruce propagation, and wildlife research. Attendees from six states representing federal and state agencies, NGOs, and private companies were represented.





CONTACT US

CHRIS BARTON

President

859.619.1532

barton@greenforestswork.org

MICHAEL FRENCH

Director of Operations

812.447.3285

michael.french@greenforestswork.org

MAY MAY BARTON

Director of Marketing & Communications

859.806.8753

maymaybarton@greenforestswork.org

ANNA MARIA BRANDUZZI

Reforestation Coordinator

412.996.0517

branduzzi@greenforestswork.org

BREEZEY SNYDER

Reforestation Coordinator

484.639.7883

briana.snyder@greenforestswork.org

PROJECT PARTNERS AND SPONSORS

Arbor Day Foundation
American Forests
AmeriCorps, Appalachian Conservation Corp - Conservation Legacy
AmeriCorps, Appalachian Forest National Heritage Area
Appalachian Headwaters
Appalachian Mountains Joint Venture
Appalachian Regional Commission
Appalachian Regional Reforestation Initiative
Appalachian Stewardship Foundation
Argosy Foundation
Brad Stanback and Shelli Lodge-Stanback
Central Appalachian Spruce Restoration Initiative
Coal Country Beeworks
Canaan Valley Institute
Chicago Botanical Society
Claude Worthington Benedum Foundation
Environmental Protection Agency - American Rivers
Komatsu
Mennen Environmental Foundation
Mountain Ridge
National Fish and Wildlife Foundation
National Forest Foundation
Natural Resources Conservation Service - Appalachian Plant Materials Center
The American Chestnut Foundation
Treecycler
The Mountain Institute
The Nature Conservancy
Pisgah Banjo Company
Proteus Foundation
Ridgewater LLC
Snowshoe Mountain Resort
University of Kentucky
U.S. Forest Service - Monongahela National Forest
U.S. Fish and Wildlife Service
Northern West Virginia Brownfields Assistance Center
West Virginia Department of Environmental Protection
West Virginia Division of Natural Resources
West Virginia Division of Forestry
West Virginia Highlands Conservancy
West Virginia University