# 2026 MOWER TRACT MINED LAND RESTORATION IN THE MONONGAHELA NATIONAL FOREST, WV



# MISSION

Green Forests Work's (GFW) mission is to reestablish 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 8 million trees on over 16,000 acres.

# OVERVIEW

GFW, USDA Forest Service – Monongahela National Forest, Arbor Day Foundation, Komatsu, Mennen Environmental Foundation, Scheidel Foundation, Proteus Foundation, The Nature Conservancy and other partners initiated a project to restore native forests on lands disturbed by surface coal mining in the Central Appalachian Region. This collaborative, science-based restoration project aims to address priority goals associated with the Central Appalachian Spruce Restoration Initiative. The project includes reclaimed mine tracts in West Virginia in the Monongahela National Forest (MNF). A holistic suite of restoration activities including invasive plant control, soil decompaction, and planting of native trees and shrubs were implemented. In the project areas, vernal wetlands were created and native pollinator seed was sown. The work has restored habitat for neotropical migratory songbirds, Northern flying squirrel, native brook trout, ruffed grouse and numerous species that inhabit wetlands. In addition, restoration activities will ultimately improve watershed conditions by providing thermal protection for headwater streams and preventing erosion and subsequent stream sedimentation. From 2011-2026, over 960,000 seedlings were planted on 1,500 restored acres and more than 625 pounds of native seed were spread across the project areas. In addition, over 1,600 vernal pools and wetlands were created and miles of headwater streams were protected through the underplanting of conifers that provide wildlife habitat and shade.




Buckets filled with red spruce (*Picea rubens*) await Komatsu volunteers at a tree planting event in April 2026 at the Mower Tract.

# MONONGAHELA NATIONAL FOREST

## Mower Tract

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 1). 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 GFW and a host of other partners 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. To date, over 960,000 seedlings have been planted on over 1,500 acres at the Mower Tract (Table 1).

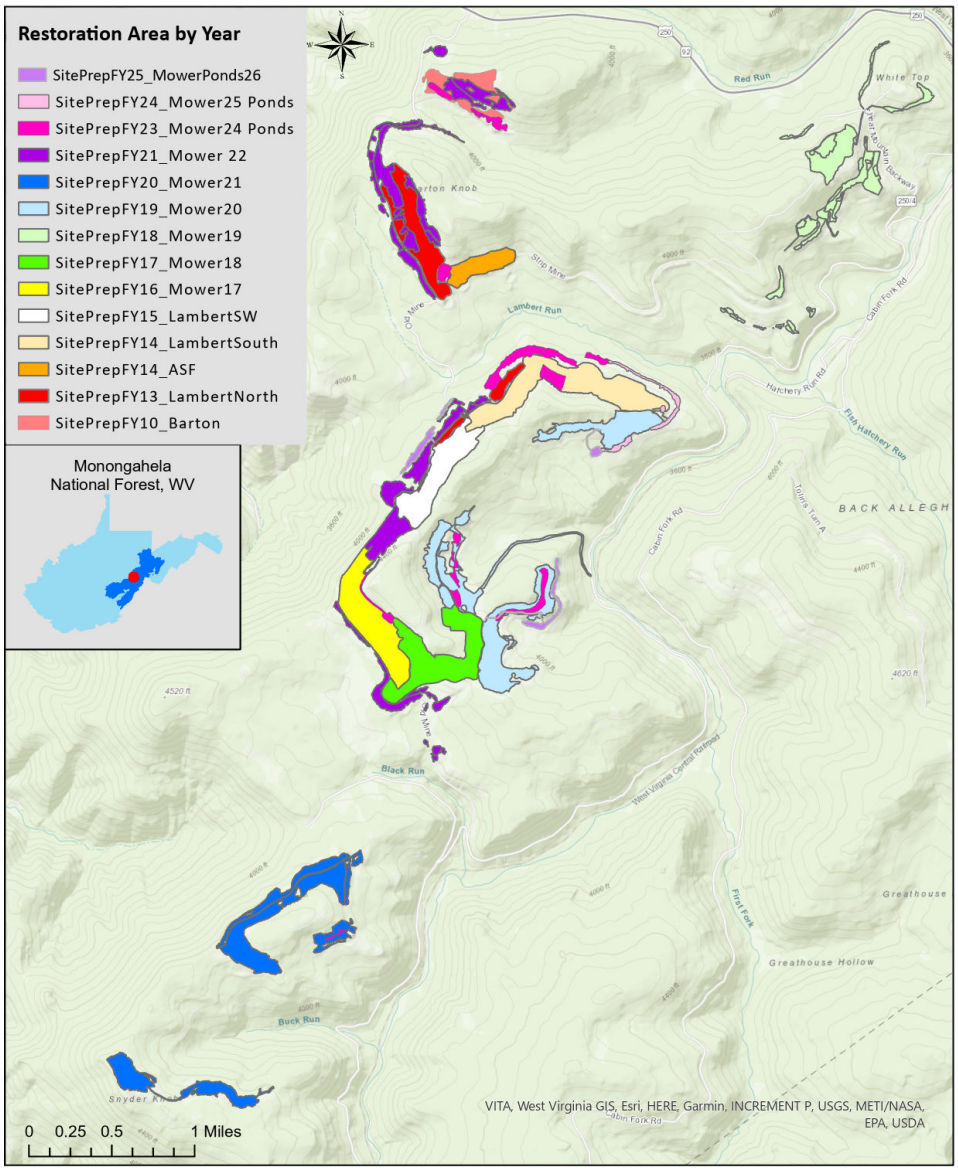


Figure 1. Mower Tract Restoration through 2026.



Planters make their way to the planting site at the Mower Tract in the spring of 2026.

# 2026 MOWER RESTORATION

## MINE POND DECOMMISSIONING

On the Mower Tract are a series of over one hundred 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. Pre-mining, rain water was slowed by trees and vegetation, filtered into the soil, and slowly made its way underground to streams that reach the Shavers Fork of the Greenbrier River below the Mower Tract. After the mining, water was unable to infiltrate the soil due to heavy compaction by mining equipment, flowed quickly over the surface of the land and collected in the sediment ponds, where it was exposed to air temperatures and sunlight and warmed significantly before overflowing to streams and forest below the mined areas, contributing thermal pollution to the Shavers Fork. The warm water runoff is increasing the temperature of this high elevation river habitat, which supports aquatic life that depend on cold waters, such as the native brook trout.

In an effort to address this problem, we initiated a project in 2023 to decommission the ponds and turn them into complexes 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 to wetland complexes on the Mower Tract. Extensive earth moving and restructuring is required, so the project is being implemented in phases. Phase 1 eliminated 18 ponds on an area covering 28 acres and was planted in spring 2024. Phase 2 eliminated 22 ponds on an area covering 13 acres and was planted in spring 2025.



One of the 2026 restoration area wetland complexes.



Professional tree planters hike to the 2026 restoration area to plant trees.



An excavator operator from Ridgewater LLC decompacts the edges of a mine sediment pond and the surrounding ground before pushing soil into the pond's footprint while creating wetland complexes. Credit: Ridgewater

# PHASE 3: 2025 SITE PREP AND 2026 PLANTING

In the fall of 2025, an excavator moved earth, decompacted edges of ponds, built porous "weep berms" that release water slowly to downgradient forests, and extended soil area for planting with wetland shrubs and trees. During that time, Forest Service partners led 15 Appalachian Conservation Corps (ACC, Conservation Legacy) crew in planting 1,682 trees and wetland shrubs and 1,725 herbaceous plants on about 1.3 acres of freshly decompacted ground adjacent to the future Mower Ponds 26 area. Other participants included 2 family member volunteers and 2 Arbor Day Foundation staff members that happened to be touring the Mower Tract that day. The seed was collected locally and grown by the USFS Region 9 nursery, and included 14 species, including 2 mountain mints, beebalm, raspberry, swamp rose, and elderberry. In late March, Forest Service partners planted 60 silky dogwood, swamp rose, and willow stakes in Mower Ponds areas while doing maintenance on some of the aforementioned fall planted seedlings that had frost-heaved.

**Continues on page 6**

## MOWER TRACT
### 2026

**TREES PLANTED**
32,604

**ACRES PLANTED**
16.5 plus 19 replanted

**MINE PONDS REMOVED**
27

**NATIVE WILDFLOWER AND GRASS SEED**
95 lbs spread

**From page 5**

In spring 2026, Forest Service and GFW oversaw the professional planting of 31,332 trees and wetland shrubs of 24 different species, as well as 5,438 herbaceous plants of 3 different species. The trees and wetland shrubs were planted on 16.5 acres of decommissioned mine ponds converted to wetland complexes. The herbaceous plants were planted on 19 acres of the 2024 restoration area as a supplemental planting to add herbaceous species diversity. During the planting, 95 lbs of native wildflower, legume, and grass seed was spread over the 16.5 acres of wetland complexes.

Seed species included: partridge pea, swamp milkweed, butterfly milkweed, marsh blazing star, common sneezeweed, wild bergamot, narrowleaf mountain mint, hoary mountain mint, blackeyed Susan, giant ironweed, blue vervain, heath aster, calico aster, showy ticktrefoil, wild senna, oxeye sunflower, eastern gamagrass, evening primrose, biennial beeblossom, bottlebrush grass, and beggartick, as well and 2 'West Virginia wetland seed' mixes and a 'native habitat for strip mines' mix."



Decommissioned pond ready for planting.

Table 1. Yearly summary of restoration activities.
[1] In addition to the 192 ripped acres, 8 acres of nonripped slopes were planted.
[2] Each eliminated pond retained a wetland feature.

| Year | Restoration Area (ac) | Replanted Acres | Wetlands Created | Acres of wetlands | Trees\Shrubs Planted | Herbaceous Plants | Species | Volunteers |
|---|---|---|---|---|---|---|---|---|
| 2011 | 90 | | 135 | | 22,550 | | 12 | 60 |
| 2013-14 | 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 | 8 | 32 | 20 |
| 2022 | 171 | 18 | 180 | 5.6 | 117,452 | | 31 | 0 |
| 2023 | 160 | | 60 | 7.1 | 105,215 | 192 | 20 | 0 |
| 2024 | 28 | 36 | 18[2] | 23 | 102,343 | | 19 | 30 |
| 2025 | 13 | | 22[2] | 13 | 35,769 | | 19 | 7 |
| 2026 | 16.5 | 19 | | 16.5 | 32,604 | 5,438 | 27 | 40 |
| **TOTAL** | **1,502** | | **1,646** | | **960,025** | **8 species** | **60 total** | **555** |





Left and right: Big Run riparian area during tree and shrub planting spring 2026.

# RIPARIAN UNDERPLANTINGS 2026

The U.S. Forest Service has a very active Watershed program and countless riparian areas that could benefit from tree planting. From 2023 to 2026, GFW planted nearly 126,000 trees on over 440 acres of riparian areas in Pocahontas and Randolph counties, WV. Each unique project had its own goals, but many of the benefits to the resiliency of the streams are shared. Most of the project areas were heavily impacted by past land use such as industrial logging and have continued to remain in an open canopy condition with relatively low plant diversity. Despite many of the streams occurring in high elevation landscapes where they should be strongholds for brook trout, the open canopy conditions result in temperature stress for coldwater species and brook trout occurrence is often limited.

The majority of planted trees have been red spruce. According to the MNF fisheries biologist, Chad Landress, "The restoration of red spruce in these riparian areas will increase stream shade and directly improve conditions for coldwater dependent species like the brook trout. Further, red spruce prevalence in these areas will increase plant diversity indirectly by shading out some of the goldenrod and creating microclimates conducive to other species. The cooling effects of red spruce along these streams as well as the ability of spruce to increase riparian soil moisture holding capacity by deepening organic soils will provide improved aquatic ecosystem function downstream...The effects of red spruce in riparian areas builds resiliency for climate change extremes such as drought and flood stress."

Table 2: Summary of GFW watershed plantings in the Monongahela National Forest, WV. Other partners include the U.S. Forest Service, The Nature Conservancy, and AmeriCorps Appalachian Forest National Heritage Area.

| Year | Site | Acreage | Trees Planted |
|---|---|---|---|
| 2023 | Gandy Creek | 60 | 18,085 |
| 2023 | Pharis Knob | 42 | 11,610 |
| 2023 | First Fork | 22 | 6,935 |
| 2023 | Beaver Creek | 6 | 2,000 |
| 2024 | Elklick Run & Fox Run | 45 | 12,544 |
| 2025 | Tributaries of Glady Creek | 168 | 44,500 |
| 2025 | East Fork Greenbrier | 62 | 16,330 |
| 2026 | Big Run at Buffalo Lake | 36 | 13,875 |
| **Total** | | **441** | **125,879** |

Table 3: Watershed species planted in 2026.

| Common Name | Scientific Name | # Planted |
|---|---|---|
| Black Chokeberry | *Aronia melanocarpa* | 1,600 |
| Native Honeysuckle | *Diervilla lonicera* | 925 |
| Mountain Ash | *Sorbus americana* | 1,260 |
| Red Spruce | *Picea rubra* | 6,000 |
| Smooth Alder | *Alnus serrulata* | 1,840 |
| Speckled Alder | *Alnus rugosa* | 2,000 |
| Steeplebush | *Spirea tomentosa* | 250 |
| **Total** | | **13,875** |

The dominant canopy trees shading streams in several of the underplanted riparian areas are eastern hemlocks, which are being lost due to hemlock woolly adelgid. In these areas, GFW and the MNF planted hardwoods and red spruce to build resiliency and to increase ecosystem connectivity and improve health. Riparian canopy cover provides shade to cool water temperatures and prevent thermal pollution. Referring to a planting in riparian areas surrounding the East Fork of the Greenbrier River Landress said, "This area is critical habitat for the federally-listed candy darter and a stronghold for eastern hellbender. Hemlocks in this area are in decline and planting spruce now will help ensure a conifer component to this ecosystem."

In spring 2026 GFW again partnered with the U.S. Forest Service to plant Big Run adjacent to the popular Buffalo Lake. We planted red spruce to add conifers to shade the stream, mountain ash and native honeysuckle to add some diversity, and we planted wetland loving species near the stream and in the floodplain, including black chokeberry, steeplebush, smooth alder, and speckled alder.



Above: The group gathers before site work. Below: UK students (pics 1 &2) and Oxford technicians (pic 3) in the MNF in the summer of 2026.

# LOCAL, REGIONAL AND GLOBAL PARTNERSHIPS

This summer, GFW partnered with the Arbor Day Foundation, Sony, Oxford University and the University of Kentucky to analyze carbon storage in a chronosequence of young reforested red spruce (*Picea rubens*) at the Mower Tract. This project will explore research questions: how does time influence (1) red spruce growth rates, (2) soil quality and soil development, and (3) carbon sequestration in restored red spruce forests on former coal mined land? Our project partners plan to develop a digital twin, a virtual representation of a real object or system, altered with real-time data to optimize performance or decision making of a growing forest. In the movie Apollo 13, NASA was depicted using training simulators on Earth as physical counterparts (or prototype digital twins) fed with live telemetry data from the crippled spacecraft to test and figure out safe maneuvering and reentry procedures for the damaged capsule in space. A digital twin for a forest would allow for the examination of differing growth parameters that may lead to enhanced carbon sequestration, tree survival or productivity.

The chronosequence approach is a scientific method that uses space-for-time substitution to study long-term ecological changes without having to wait decades for data. Restored plantations spanning 0 to 15 years since restoration were compared with mature reference forest controls. Within each of five 3-year age classes, we selected 3 independent 40 × 40 m plots, chosen to be comparable across slope, aspect, elevation, restoration unit, planting context and accessibility. All planted trees in each plot were counted to determine survival rates and each tree was measured for height and diameter. Soil samples and whole tree harvesting were employed to determine carbon content. Each plot was also measured using terrestrial LiDAR laser scanning, and 1 hectare drone survey using RGB (red, green, blue) and multispectral imagery. Terrestrial laser scanning-derived aboveground biomass will provide ground truth for estimating drone-based above-ground biomass and carbon.

Given that red spruce forests were once found on an estimated 300,000 ha (740,000 ac) in West Virginia in 1865 and subsequently reduced to 24,000 ha (60,000 ac) by the 1990s, research that can aid in the recovery and resilience of this forest type is greatly needed. Better tools for analyzing forest productivity and carbon sequestration rates in red spruce forests may reveal important insights for forest management and climate change. As this partnership grows, we hope to provide much information that will help reforestation projects in Appalachia and worldwide.









Komatsu staff volunteers plant trees at Mower 2026.

# KOMATSU VOLUNTEER EVENT 2026

Our Komatsu partners, who are major supporters of this restoration work, returned to the Mower Tract on April 29, 2026 to plant trees. One and a half acres of decompacted or "fluffed" ground was set aside for this volunteer tree planting event. GFW, USFS staff, and Komatsu executive staff planted 1,204 red spruce, Canaan fir, and speckled alder.







# PARTNERS

National Fish and Wildlife Foundation
Arbor Day Foundation
Komatsu
Mennen Environmental Foundation
Proteus Foundation
Suntory Global Spirits
Scheidel Foundation
Pisgah Banjo Company
The Nature Conservancy
The American Chestnut Foundation
University of Kentucky
US Forest Service

www.greenforestswork.org

**Click the link above or scan QR code for more information about Green Forests Work**

# CONTACT US


CHRIS BARTON | President
barton@greenforestswork.org | 859.619.1532

MICHAEL FRENCH Director of Operations
michael.french@greenforestswork.org | 812.447.3285

MAY MAY BARTON
Director of Marketing & Communications
maymaybarton@greenforestswork.org

ANNA MARIA BRANDUZZI
Reforestation Coordinator
branduzzi@greenforestswork.org

BRIANA SNYDER
Reforestation Coordinator
briana.snyder@greenforestswork.org

ERIC OLIVER
Reforestation Coordinator
eric.oliver@greenforestswork.org

MADDIE VARIAS
Wildlife and Conservation Specialist
maddie.varias@greenforestswork.org