



Accomplishments Report

2022



Table of Contents

Introduction	3
2022 CASRI Admin Team	4
2022 Accomplishments Summary	5
Project and People Spotlights	
Riparian Buffer at Glady Creek.....	8
Partner Profiles	9
2022 CASRI Partner Accomplishments	
Tree Plantings	12
Spruce Release	13
Habitat Restoration	13
Research, Surveying, and Monitoring	15



*Amid fall colors, heavy machinery push stunted, non-native conifers out of the way before decompacting the soil at Mower 23/Fish Hatchery in preparation from spring tree planting.
Courtesy of Green Forest Works*

Introduction

The Central Appalachian Spruce Restoration Initiative (CASRI) is a robust partnership between 15+ federal and state agencies, and global to local non-profits dedicated to restoring red spruce (*Picea rubens*) ecosystems in the Central Appalachians. See page four for a full list of CASRI partners. Since its inception in the early 2000s, CASRI partners have restored thousands of acres of red spruce and worked with dozens of local communities to make progress on CASRI's ambitious mission to restore historic red spruce-northern hardwood ecosystems across the high elevation landscapes of Central Appalachia.

Red spruce was once abundant across the high-elevation habitats of Central Appalachia. After large-scale clear-cutting as a result of extensive logging in the early 1900s, these forests are now scattered patches at the very highest elevations. CASRI partners use multiple tactics such as tree plantings, red spruce release, habitat restoration of wetlands, and non-native invasive species removal to help reconnect and extend these isolated forest patches of red spruce. CASRI works on both public and private lands with a multitude of partners to coordinate restoration across the Central Appalachians.



*A professional tree planter plants dormant wetland seedlings around created wetlands and vernal pools on Mower 22.
Courtesy of Green Forest Works*

2022 CASRI Administrative Team



Kathryn (Katy) Barlow, kathryn.barlow@tnc.org

Katy Barlow received her PhD in Ecology at Penn State where she conducted research on the restoration challenges and opportunities resulting from unconventional gas development, and the rhetoric of environmental decision-making tied to reclamation regulations. Katy currently works for The Nature Conservancy's Central Appalachians Program as the Restoration Manager. *"Red spruce forests are magical. CASRI partners are dedicated and passionate. As I see it, there's no more inspiring forest and partnership to work with than CASRI."*

Ellen White

Hello, my name is Ellen White. In May of 2021 I graduated from the University of Cincinnati with a bachelor's in environmental science. From 2021-2023 I worked in partnership with Forest Service and Appalachian Forest National Heritage Area as an AmeriCorps service member. During my time as an AmeriCorps, I helped various Forest Service employees improve Red Spruce ecosystems and stream corridors, including helping to manage the conclusion of the Sharps Knob planting projects. One of my favorite moments with CASRI was during the 2021 CASRI conference, when we gathered at Canaan Valley BBQ and listened to a soils lecture by Adrienne Nottingham. During my spare time you can find me kayaking, snowboarding, or playing guitar.





Rachel Pitsenberger

My name is Rachel, I'm this year's Chesapeake Conservation Corp member for the Maryland-DC TNC chapter. I recently graduated from Georgetown University with my degree in biology and minors in environmental studies and Spanish. Before joining the TNC team, I worked as a research intern with Habitat for Humanity, a program intern with the Chesapeake Bay Trust, and served as an Internship Coordinator with the Center for the Advancement of the Steady State Economy. I am looking forward to meeting all of you and to learning more about conservation planning in action while working with the CASRI team this year.

Accomplishments Summary

In total, CASRI partners planted approximately **218,337 trees**, including red spruce and native hardwoods, conifers, and shrubs, on over approximately **474 acres** in Central Appalachia. **19 species** of native seed were spread on **64.5 acres** of land at restoration sites. There were **58.1 acres** and **11 miles** of non-native and invasive species treatment, **7.1 acres** of wetland creation and **8.1 acres** of stream restoration. Finally, partners completed over **543.9 acres** of spruce release and deep-ripped **186 acres** and **13.2 miles** of land for habitat restoration. In addition to the above, CASRI partners engaged in extensive research, monitoring, and outreach, including salamander surveys, journal publications, and newspaper articles. The stories and accomplishments below give a small glimpse of all that CASRI partners accomplished in 2022.

Partners

Bolded partners contributed information to the 2022 Accomplishments Report (Thank you!)

**Appalachian Forest National Heritage Area
(AFNHA)**

Appalachian Mountain Joint Venture (AMJV)

Appalachian Regional Reforestation Initiative
(ARRI)

Appalachian Landscape Conservation Cooperative
(APPLCC)

Canaan Valley Institute (CVI)

**Canaan Valley National Wildlife Refuge
(CVNWR)**

Environmental Protection Agency (EPA)

Green Forests Work (GFW)

U.S. Forest Service Northern Research Station
(NRS)

**U.S. Forest Service Monongahela National Forest
(USFS-MOF)**

Natural Resources Conservation Service (NRCS)

National Wildlife Refuge System

The Mountain Institute (TMI)

Marshall University

The Nature Conservancy (TNC)

Trout Unlimited (TU)

U.S. Fish and Wildlife Service (USFWS)

U.S. Forest Service George Washington-Jefferson

National Forest (USFS-GWF)

**West Virginia Division of Natural Resources
(WVDNR)**

West Virginia Division of Forestry (WVDOF)

West Virginia Highlands Conservancy (WVHC)

West Virginia Land Trust (WVLT)

West Virginia University (WVU)



Project and
People
Spotlights in
2022

West Virginia Land Trust

Project Highlight

Riparian Buffer at Glady Creek

By Rachel Pitsenberger

When it comes to reflecting on CASRI's 2022 accomplishments, TNC West Virginia's Headwater Reforestation project quickly comes to mind. This Monongahela National Forest project spans over 180 acres across the West Fork of Glady Creek, Gandy Creek, and the Crooked Fork of the Elk River. With a \$50,000 award from the Appalachian Stewardship Foundation Grant, CASRI partners were able to successfully plant 49,000 trees including red spruce, balsam fir, and other native associate trees in riparian zones on the Monongahela National Forest. This successful project was led by Todd Miller (TNC) and Chad Landress (US Forest Service) and would not have been possible without the support from partners, including Green Forests Work, Ruffed Grouse Society, and Trout Unlimited. The year-long project involved serious site preparations in the Fall of 2021 using heavy equipment to restore flood plain hydrology and create streamside terraces. Following the site preparation, TNC contractors completed the planting of a whopping 49,000 trees in the Spring of 2022.

The restored riparian buffers will offer valuable protection to rivers and streams by filtering harmful pollutants, stabilizing stream banks, maintaining cooler and more consistent water temperatures for cold-water dependent species, and restoring many other essential ecosystem functions. Likewise, the impressive reforestation project will enhance the integrity and climate resilience of the Monongahela National Forest red spruce ecosystem. The red spruce restoration was strategically planned so as to increase the network of connected lands in the Central Appalachians which is essential to CASRI's goals of developing resilient and sustainable habitat for red-spruce dependent species such as the Northern Flying Squirrel.

Keep an eye out for field trip opportunities to visit the project site and see the restoration success for yourself!

Partner Profiles 2022

This section is dedicated to showcasing some of our dedicated CASRI partners. Thank you for your hard work!

NRCS - Jim Leonard



In 2013 I moved from Middletown, MD - located at the eastern edge of Central Appalachia - to re-embark on my undergraduate degree at WVU, studying Agroecology with an emphasis on soil science. During this time, I served as vice-president and later as president for the Plant and Soil Science Club, as well as was a four-year member of the school's Soil Judging team, winning the 2016 National Collegiate Soil Judging Competition in Kansas. Ultimately, it was soil judging that got me completely hooked on soil science. As an undergraduate I was first introduced to the red spruce ecosystems in 2014 by Travis Nauman while he was conducting his PhD research. This experience led to my own undergraduate research, where our efforts later identified and described trace fossils of "rock-eating" fungi in high-elevation red spruce soils for the first time (manuscript to be published).

In 2018 I began a master's degree under the guidance of Dr. Jim Thompson with the goal of continuing to work in red spruce ecosystems, while simultaneously beginning a soil science Pathways internship with the

NRCS. Our research focused on how soil organic carbon (SOC) stocks differ between various red spruce ecosystems, and measured SOC stocks to better understand SOC dynamics in terms of restoration and disturbance through the lens of ecological site descriptions. I also worked under agreement with the Forest service at the time to develop a new provisional ecological site description for red spruce ecosystems occurring on the Pottsville sandstone formation, spanning from Cheat Mountain into Canaan Valley and Dolly Sods. Across both projects we described and sampled around 115 new soil profiles throughout the Monongahela National Forest.

After graduating in 2022 I converted to a permanent federal position with the NRCS as a soil scientist stationed in the Frederick, MD, soil survey office where I now reside. Put short, my role in the agency as a soil scientist is to aid in the collection of soil-landscape data, map soils and soil properties across MLRA 148, and to provide guidance and insight to soil management and soil formation.

I first came to CASRI as an undergraduate when I was researching "rock-eating" fungi in red spruce soils around 2016 and have felt at home ever since. Except for a year or so amidst the field research during my thesis, I have tried to play a role in CASRI as much as possible. I see my role in CASRI as a forest soil scientist, with around ~8 years of experience working with red spruce forest soils of the MNF spanning numerous research projects not including my own. I bring direct knowledge of the red spruce soil-ecosystem relationship to offer aid in guiding restoration and conservation efforts taken up by CASRI as it relates to the soil resource. During my time with CASRI I have been a member of the Research Committee, working most recently on the development of a spodic intensity raster map and helping with the spatial decision tools. I was also tasked as coauthor for the soil chapter in the upcoming CASRI restoration book of which I feel lucky to contribute. My time with CASRI and experiences with its participants have been some of the best of my working career - the dedication of its members and breadth of conservation experience is unmatched. I truly believe we have an incredible force working for the restoration and conservation of red spruce in Central Appalachia.

Into the future I see CASRI continuing to play a critical role in Central Appalachian conservation efforts. It is my goal to continue developing soil property maps for the MNF and hope to spatialize the SOC stock data we have collected and map these carbon stocks based on differences in red spruce communities. It is my opinion that the future is bright for both CASRI and for red spruce within Central Appalachia. I am only but one small part of that effort, and in my mind everyone who has contributed to telling the story has played an important role. CASRI is the sum of its parts and the dedication given by its participants.

Research Highlights

During my 3.5 years researching red spruce SOC stocks I saw and experienced many things. While most people were locked down during the height of the pandemic, I spent my days alone in the MNF slugging shovels, digging bars, and gear up the mountain hillslopes and hollows, describing and sampling many soils and corresponding ecosystems. I visited over 400 unique locations during this time, and as a result, experienced and learned many things. I can think of many wonderful experiences related to my time doing field research, but there are a few that stick out most in my mind:

- Experiencing the forest waking-up daily to a rising sun peaking over the mountain ridges
- Organizing a multi-agency field week in Canaan Valley (2019) to aid in ecological site development, which some of you contributed your time to (Thank You!)
- Countless black bear encounters, some of which were much more unnerving than others
- Fisher sightings on two different occasions; one of these occasions I observed the fisher dragging a young fawn by the neck across the hillslope I was digging, and snuck up to within 15 feet of the fisher before it noticed me - it displayed a face and teeth that only a mother could love
- Digging deep folistic epipedons and feeling the soil smear of spodic properties between my fingers
- The countless fly-fishing opportunities to end a hard day's work
- The many helping hands on various occasion to assist me with my work - it is nice to have some company sometimes!
- Overall, contributing to the database of red spruce soil descriptions for use into the future by others

In terms of specific research highlights related to our findings, a few also come to mind.

- Reference state O horizons contain up to 75% of the total SOC stock
- Red spruce ecological sites and ecological states differ in SOC stocks
- ESD can be used to increase C sequestration during forest restoration activities
- The greatest soil C stock measured from these ecosystems contained 1061 Mg C ha⁻¹
- Soil C stocks in O horizons seem to have a positive relationship with increasing red spruce cover where fire was a significant part of historic disturbance
- Central Appalachian red spruce forest soils seem to have the capacity to sequester more carbon than other similar ecosystems on the east coast

Future Research Efforts

- Horizon thickness/folistic probability map
- Revised spodic intensity map for the MNF
- Spatialize red spruce SOC stocks across the MNF
- Complete red spruce soil research publications (3-4 in total)
- Horizon/SOC stock/spodic property development and loss in relation to year since logging

The Nature Conservancy, West Virginia – Will Evans



Where are you from, where did you go to school?

I'm from Chesterfield Virginia, just outside of Richmond. I earned my undergraduate degree from the College of William & Mary and am currently working on my masters in natural resource stewardship focused on restoration ecology at Colorado State University.

What agency you work for and what do you do there?

I work for the Nature Conservancy in West Virginia as an Ecological Restoration Coordinator. My work centers on large-scale restoration projects in West Virginia and Central Appalachia. My main focus is red spruce restoration on the Monongahela National Forest, but I'm also working on prescribed fire and late successional forest management projects.

How did you get into CASRI and red spruce work?

I had wanted to work for TNC in Appalachia for a while, so when a job came open doing spruce restoration in West Virginia, it seemed like a perfect fit. My role in CASRI started taking off after my first field season doing spruce release.

What are you passionate about when it comes to the environment?

Lots of things! I've found great personal fulfillment from spending time in nature. Most of my hobbies revolve around spending time outside, which is what ultimately brought me to the field of conservation. From an intellectual viewpoint, I like how ecology and conservation are complex puzzles, extremely interconnected, with lots of moving parts. Most of all, I find fulfillment of working for something much bigger than myself, something that has potential to positively impact our little corner of the world long-term.

What are you excited for CASRI to do in the future?

I'm looking forward to seeing more projects implemented on the ground, more organizations and agencies thinking about spruce restoration, and I'm excited to see CASRI work as a vehicle to make real, lasting, progress in the restoration of spruce.

2022 CASRI Accomplishments

Tree Plantings

Canaan Valley National Wildlife Refuge

- ***Red Spruce and Canaan Fir Planting*** - Canaan Valley National Wildlife Refuge, with monetary help from TNC and volunteers, planted 3,000 red spruce and 2,000 Canaan fir seedlings on 25 acres in and around Cheat Mountain salamander habitat and 5 acres along the drainage that empties into the North Branch of the Blackwater creating a riparian buffer.

Green Forests Work and USFS Greenbrier Ranger District of the Monongahela National Forest

- ***Mower Tract, Mower 22 Planting*** - The U. S. Forest Service, in partnership with Green Forests Work (GFW) and many other partners, planted 117,252 seedlings of red spruce, native hardwoods, and wetland shrubs of 31 species on 189 acres of reclaimed mine land that was deep ripped in fall 2021. Additionally, Appalachian Conservation Corps (Conservation Legacy) planted 200 willow stakes in created wetlands.
- ***Beulah, Wildell, Upper Greenbrier North Tree Planting*** - The U. S. Forest Service, in partnership with Green Forests Work (GFW), planted 55,625 red spruce, hardwood, and wetland shrub seedlings of 30 species were planted across 196.5 acres of stream riparian habitat. An added 12.5 acres were planted in this landscape with TNC providing plants and contract planning, while GFW oversaw the contract.
- ***Mower Tract, Appalachian Conservation Corps (ACC)*** - An 8-person Appalachian Conservation Corps (AmeriCorps, Conservation Legacy) saw crew, in partnership with Green Forests Work (GFW) and the U. S. Forest Service, seeded 34.5 acres on the Mower 22 restoration area with 19 species of native flowering species for pollinators, including 1 native grass and 2 fruit-bearing shrubs.

Green Forests Work and USFS Marlinton - White Sulphur Ranger District of the Monongahela National Forest

- ***Sharp's Knob, Appalachian Conservation Corps (ACC)*** - An 8-person Appalachian Conservation Corps (AmeriCorps, Conservation Legacy) saw crew, in partnership with Green Forests Work (GFW) and the U. S. Forest Service, seeded 30 acres on the Sharp 22 restoration area with 19 species of native flowering species for pollinators, including 1 native grass and 2 fruit-bearing shrubs.
- ***Sharp's Knob, Sharp 22 Planting*** - The U. S. Forest Service, in partnership with Green Forests Work (GFW) and many other partners, planted 34,230 seedlings of red spruce, native hardwoods, and wetland shrubs of 19 species on 46 acres of reclaimed mine land that was deep ripped in 2021.

The Nature Conservancy

- **Tree Planting** - 4,000 trees planted on TNC's preserves in western Maryland.
- **Red Spruce Planting** - TNC provided 2,000 red spruces that were planted by volunteers.

Spruce Release

Green Forests Work and USFS Greenbrier Ranger District of the Monongahela National Forest

- **Cheat Mountain, Appalachian Conservation Corps (ACC)** - A 7-person Appalachian Conservation Corps (AmeriCorps, Conservation Legacy) saw crew, in partnership with Green Forests Work (GFW) and the U. S. Forest Service, felled trees into streams for riparian restoration while doing spruce release in a 10.8 acre section between the First Fork of Shavers Fork and Old House Run on Cheat Mountain.
- **Mower Tract** - The US Forest Service contracted out 180 acres of spruce release work to occur within the Mower area with bulk of implementation to take place in 2023.

Canaan Valley National Wildlife Refuge

- **Spruce Release** - Canaan Valley National Wildlife Refuge continued non-commercial spruce release on 3.8 acres along the Blackwater River by girdling only hardwoods. This is an area that was planted approximately 20 years ago and the spruce are ready to be released.
- **Beech Brush Removal** - Canaan Valley National Wildlife Refuge manually cut 3.3 acres of beech brush on Cabin Knob in sensitive Cheat Mountain salamander habitat where understory spruce is working its way into the mid story. It is our hope that cutting this beech brush occasionally will get the red spruce saplings into the mid-story and ultimately the over-story faster.

The Nature Conservancy

- **Spruce Release** - Ecological Restoration Team completed 486 acres of non-commercial spruce release.
- **Spruce Release** - Appalachian Conservation Corps crew completed 40 acres of non-commercial spruce release under the supervision of Ecological Restoration Team leadership.

Habitat Restoration

Canaan Valley Institute and USFS Greenbrier Ranger District of the Monongahela National Forest

- **Greenbrier Ranger District** - 6.2 miles of road-to-trail conversion using decompaction methods paired with new trail construction in red spruce ecosystems to minimize impacts from legacy road features and new

trail construction (i.e., skinny trails that drain better are better for users, water and the spruce ecosystem!) (In partnership with Canaan Valley Institute).

Canaan Valley Institute, Trout Unlimited, and USFS Greenbrier Ranger District of the Monongahela National Forest

- **Greenbrier Ranger District - 7 miles** of road decommissioning in red spruce ecosystems (In partnership with Canaan Valley Institute and Trout Unlimited)

Canaan Valley Institute, Trout Unlimited, WV Department of Natural Resources, West Virginia University, and USFS Greenbrier Ranger District of the Monongahela National Forest

- **Greenbrier Ranger District - 8.1 miles** of stream restoration in red spruce ecosystems; selectively using hardwoods in favor of retaining red spruce (In partnership with Canaan Valley Institute and Trout Unlimited, WV Department of Natural Resources, and West Virginia University).

Green Forests Work and USFS Greenbrier Ranger District of the Monongahela National Forest

- **Mower Tract, Appalachian Conservation Corps (ACC)** - A 7-person Appalachian Conservation Corps (AmeriCorps, Conservation Legacy) saw crew, in partnership with Green Forests Work (GFW) and the U. S. Forest Service, cleared NNIS and stump sprayed herbicide over **32 acres** of the Greenbrier Ranger District.
- **Mower Tract, Mower 23/Fish Hatchery Site Preparation - 160 acres** of mined land were decompacted on Mower 23/Fish Hatchery of the U. S. Forest Service, Greenbrier Ranger District, in partnership with Green Forests Work (GFW), in preparation for planting of red spruce, native hardwoods, and wetland shrubs in spring 2023. **7.1 acres** of wetlands of various sizes were created.

Green Forests Work and USFS Marlinton - White Sulphur Ranger District of the Monongahela National Forest

- **Sharp's Knob, Appalachian Conservation Corps (ACC)** - An 8-person Appalachian Conservation Corps (AmeriCorps, Conservation Legacy) hand crew, in partnership with Green Forests Work (GFW) and the U. S. Forest Service, removed NNIS, including autumn olive, bush honeysuckle, multiflora rose, and Japanese barberry, from **11 miles** of mined land restoration area roadsides.
- **Sharp's Knob, Sharp 23 Site Preparation - 26 acres** of mined land were decompacted on Sharp 23 of the U. S. Forest Service, Marlinton Ranger District, in partnership with Green Forests Work (GFW) and Appalachian Headwaters, in preparation for planting of red spruce, native hardwoods, and wetland shrubs in spring 2023.

The Nature Conservancy - WV, MD, VA Chapters

- **Habitat Restoration** - Treated **26.1 acres** of non-native invasive species, 15 acres of which were found in or around previously released commercial spruce release units.

Research, Surveying, and Monitoring

Canaan Valley National Wildlife Refuge

- ***Cheat Mountain Salamander Monitoring***– Canaan Valley National Wildlife Refuge conducted Cheat Mountain Salamander surveys with the new long-term monitoring protocol developed by WV DNR, based on out detection probability protocol. All 46 survey pointes were visited three times in the spring and twice in the fall. In addition, habitat data was collected at all survey points and we continued our mark and recapture study for the 3-mile trail under pass where we are trying to determine if CMS are crossing the trail via the underpass.

CASRI Research Committee

Research is a slow and deliberate process, red spruce is a slow growing species, and soils form on geologic time.

- ***Red Spruce Soil Carbon research*** – James Leonard
 - Reference state O horizons contain up to 75% of the total SOC stock.
 - Red spruce ecological sites and ecological states differ in SOC stocks.
 - ESD can be used to increase C sequestration during forest restoration activities.
 - The greatest soil C stock measured from these ecosystems contained 1061 Mg C ha⁻¹.
 - Soil C stocks in O horizons seem to have a positive relationship with increasing red spruce cover where fire was a significant part of historic disturbance.
 - Central Appalachian red spruce forest soils seem to have the capacity to sequester more carbon than other similar ecosystems on the east coast.

Green Forests Work and USFS Monongahela National Forest

- ***Journal Publication*** - Branduzzi, Anna M., Barton, Chris. D., Baskin, C. Carol, & Davis, Allison G. (2022). "Evaluating the use of woody debris to enhance native plant establishment from seeds on legacy coal mines in West Virginia (USA). *Native Plants Journal*, 23(3), 272-287.
<https://muse.jhu.edu/pub/19/article/875864/summary>
- ***Master's Thesis*** - Snyder, Briana C. "Bat Activity on West Virginia Mined Lands Restored via the Forestry Reclamation Approach." (2022). Theses and Dissertations--Forestry and Natural Resources.
https://uknowledge.uky.edu/forestry_etds/67/
- ***Master's Thesis*** - Rhodes, Benjamin. "Evaluating Restoration Outcomes: Red Spruce Reforestation in the West Virginia Highlands." (2022). Theses and Dissertations--Forestry and Natural Resources.
https://uknowledge.uky.edu/forestry_etds/63/

The Nature Conservancy

- *Partnership with Dr. Jay Raymond* - assisted in monitoring three long term spruce release sites.
- *Monitoring* - Gathered 420 snapshot monitoring points to assess spruce response to commercial timber harvest release.