



CASRI

The Central Appalachian
Spruce Restoration Initiative

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2012 YEAR-END REPORT FOR THE CENTRAL APPALACHIAN SPRUCE RESTORATION INITIATIVE

SUMMARY

The Central Appalachian Spruce Restoration Initiative (CASRI) is a partnership of diverse interests who share the common goal of restoring the red spruce-northern hardwood ecosystem across the high elevation landscapes of Central Appalachia. This ecosystem, which supports many species that are rare in the region, was decimated by exploitative logging a century ago and is now making a slow recovery. CASRI is comprised of private, state, federal, and non-governmental organizations that recognize restoration of this ecosystem as imperative for maintaining the ecological integrity of the Central Appalachians.

CASRI includes the following partners:

Appalachian Mountain Joint Venture (AMJV), Appalachian Regional Reforestation Initiative (ARRI), Canaan Valley National Wildlife Refuge (CVNWR), Natural Resources Conservation Service (NRCS), The Mountain Institute (TMI), The Nature Conservancy (TNC), Trout Unlimited (TU), U.S. Forest Service Northern Research Station (NRS), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service Monongahela National Forest (USFS-MOF), West Virginia Division of Natural Resources (WVDNR), West Virginia Division of Forestry (WVD OF), West Virginia Highlands Conservancy (WVHC), West Virginia State Parks, and West Virginia University (WVU).

The CASRI partnership began as a small working group that was formed to conserve the endangered West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), which depends on the red spruce-northern hardwood ecosystem. As the partnership grew, it broadened into a multi-faceted ecosystem restoration effort that seeks to address such issues as plant diversity, wildlife diversity, climate change, spruce regeneration, recreation, aesthetics, pollinator recovery, public education and interpretation, soils, private land timber restoration, and connectivity between public and privately owned habitats. The thread that connects all members of CASRI is the determination to restore the red spruce ecosystem and the diversity of plants and wildlife it supports. CASRI partners developed this mission statement to sum up the purpose of the group:

CASRI envisions a functioning red spruce-northern hardwood forest ecosystem restored across portions of its former range on both public and private lands, with the scale, connectivity, maturity and other features that provide habitat to sustain and enhance the viability of the many species and natural communities dependent on this ecosystem.

In 2010, the CASRI partners developed a strategic action plan to guide restoration efforts over the next decade ([CASRI Action Plan](#)). This action plan lays out a series of goals, objectives, and key actions that are designed to work toward the CASRI vision. To complement the action plan, CASRI partners developed a technical document that outlines restoration objectives and methods in various spruce-northern hardwood habitats ([Restoration Approach](#)).

2012 proved to be another successful year for the growing restoration initiative. CASRI partners helped raise an additional \$725,800.00 for on-the-ground projects in 2012, adding to the \$162,341.00 raised since 2006. This represents the best fundraising year yet. CASRI partners planted 34,275 seedlings and recruited over 2,175 volunteer hours. Acres planted totaled roughly 206 for 2012, adding to the over 715 acres planted since 2006. Over 160 acres of red spruce were released from the understory by commercial and non-commercial cuttings.

This report summarizes the restoration activities in which CASRI partners have engaged during the 2012 calendar year. The activities are cross-referenced to the applicable goals, objectives, and key actions from the action plan. The second year of the CASRI Action Plan implementation has been marked by securing a remarkable amount of funding that will support larger projects in the upcoming years. However, much more work remains to make the CASRI vision a reality.

CASRI partners would like to thank all of the hardworking volunteers that support our projects. This restoration effort would not exist without the countless hours volunteers dedicate! CASRI would also like to thank all of the generous organizations that have contributed funding to support on-the-ground efforts.

2012 HIGHLIGHTED PROJECTS

CONNECTING FORESTS IN CANAAN VALLEY

Much has happened in the Canaan Valley Landscape during 2012. In addition to being designated one of the America's Great Outdoors landscapes, a number of spruce planting projects continued the work of connecting remnant patches of red spruce across property boundaries. On 911 Remembrance Day, Blackwater Falls State Park worked with AmeriCorps members to transplant 1,800 red spruce to Pendleton Lake Recreation area. Volunteers saved the spruce from power line rights-of-way and planted approximately 10 acres. In addition, Canaan Valley National Wildlife Refuge (CVNWR) planted over 6,000 spruce trees. During the spring of 2012, CVNWR partnered with Timberline Homeowners Association and the North Fork Watershed Project to plant both sides of the Blackwater River on private and public lands. The Partners for Fish and Wildlife Program (USFWS) worked with a private land owner nearby to plant 1,200 spruce trees and contribute to



Figure 1: Students enjoy a day of planting red spruce on newly acquired Refuge property.

the efforts in Canaan Valley. Both of these plantings were supported by the West Virginia Highlands Conservancy (WVHC).

The Nature Conservancy worked diligently with the Monongahela National Forest to finish the acquisition of 593 acres to connect large forest blocks in the Canaan Valley landscape. The Thunderstruck acquisition is expected to be completed by next year. In addition, CVNWR and the USFS ramped up their support for local educational outreach by supporting efforts at Tucker County High School to launch school programs in conjunction with a high elevation classroom green house. All of these efforts demonstrate how the CASRI partnership is working from multiple directions to restore ecosystems on a large scale.

SPRUCE RELEASE ON CHEAT MOUNTAIN

On top of Cheat Mountain in the Greenbrier Ranger District of the Monongahela National Forest, the USFS continued to implement spruce release treatments that began in 2011. This work involves releasing understory spruce to accelerate its growth to the overstory. To achieve the goal of expanding red spruce coverage through forest composition improvement, red spruce were released by cutting down selected overstory hardwoods that were suppressing the spruce.

The primary objective for this project was to improve habitat for the federally-listed endangered West Virginia northern flying squirrel, whose abundance is directly correlated to the amount of red spruce in the overstory. Additional benefits from the project include: accelerated tree growth; progress toward a mixed spruce-hardwood overstory in the future; increased stand structure; and short-term improvements in habitat for early successional

species, in particular high interest game species such as the ruffed grouse and snowshoe hare. The secondary objective was to favor the growth of black cherry, an important wildlife food species, through crop tree release. Because the amount of red spruce and black cherry was limited in the treatment areas, crop tree release occurred on as many red spruce and black cherry as practical. Where inclusions of dense red spruce occurred, up to 1/3 of the red spruce was thinned to improve habitat structure and increase growth of the remaining trees. To increase stand structure in areas where no red spruce was present (particularly areas of dense beech brush), small openings were created. These openings will provide early successional habitat, and create space for red spruce or other trees to regenerate.



Figure 2: Understory spruce gets day lighted after sawyers create canopy opening.

Release treatments were conducted on approximately 100 acres in 2012. The majority of the treatment areas were young (20-25 year old) stands with a red spruce and/or black cherry component. Two stands were older (60-80 years old), but lacked an overstory component of red spruce. The treated stands now have more complex vertical and horizontal structure due to the small openings that were created, and the scattered understory spruce trees now have room to grow (Figure 2).

WILDLIFE CONSERVATION SOCIETY ENHANCES RESILIENCY IN CENTRAL APPALACHIA

With support from the CASRI partnership, The Nature Conservancy was awarded \$250,000 from the Wildlife Conservation Society (WCS) to maintain and enhance the resilient high elevation forests of the Central Appalachians. Funds from WCS will be leveraged to conduct restoration work in areas that are critical to enhancing connectivity between existing red spruce-northern hardwood forest blocks. Three major restoration projects will be supported by this grant:

Pharis Knob – Restoration work will expand existing high-quality forest blocks at the edges of a private land easement area and will create a connecting corridor across open land within the easement area. The corridor will reconnect an estimated 50,000 acres of red spruce-northern hardwood landscape. The work will also include restoration of 1.25 miles of headwater stream. Restoration activities will include red spruce and northern hardwood tree plantings, fencing, and invasive species treatments.

Thunderstruck – Grant funds will help initiate the restoration of red spruce-northern hardwood forest on a 290-acre portion of the Thunderstruck tract. The restored areas will connect to the 24,000-plus acres of spruce and northern hardwood communities in the adjacent Roaring Plains and Dolly Sods wilderness areas. Restoration will be accomplished through tree planting and release of existing understory spruce.

Upper Greenbrier North – The WCS grant will facilitate a portion of the spruce restoration work that is associated with the Upper Greenbrier North project on the Monongahela National Forest. This work is the initial phase of a project that will enhance connectivity between existing blocks of red spruce-northern hardwoods that cover over 100,000 acres. The work will involve non-commercial silvicultural manipulation to accelerate the growth of red spruce seedlings and saplings into the overstory.

As a direct result of working collaboratively through the CASRI partnership, an incredible \$725,800 was raised in 2012, not including in-kind contributions and match! These funds will help partners achieve meaningful on-the-ground restoration at a large scale.

This project will also demonstrate building partnerships to implement adaptation actions across public-private ownerships, engage private landowners in conservation actions for adaptation, and balance adaptation actions with historical and cultural uses of the lands.

NATIVE, "LOCAL," PLANTS: THE BEST CHOICE FOR RESTORATION, RECLAMATION OR LANDSCAPING

CASRI partners continued support for local native plant production in 2012. In addition to the ongoing native propagation work at NRCS Alderson Plant Material Center and the new Tucker County High School Greenhouse, the West Virginia Highlands Conservancy (WVHC) initiated a new partnership with the West Virginia Division of Forestry Clements Tree Nursery.

With the help of WVHC members, the West Virginia Division of Forestry Clements Tree Nursery will begin to propagate a selection of locally sourced native species. For the past two years, Highlands Conservancy members and partners have been collecting fruits of native species such as cones, berries, pods, etc., and processing them for the seed. They have developed a significant inventory of seed for over 30 species. This has been just one part of a program supported in part by the USF&WS WV Northern Flying Squirrel Conservation Fund. They have also helped recruit hundreds of volunteers who have planted tens of thousands of spruce and fir trees as part of the larger CASRI reforestation effort.

Species Clements will propagate include:
Flowering Dogwood, *Cornus florida*
Silky Dogwood, *Cornus amomum*
Northern Arrowwood, *Viburnum recognitum*
Winterberry Holly, *Ilex verticillata*
Serviceberry, *Amelanchier arborea*
Mountain Holly, *Ilex montana*
American Elderberry, *Sambucus canadensis*
Mountain Ash, *Sorbus americana*
Black Chokeberry, *Aronia melanocarpa*
Balsam Fir, *Abies balsamea*

Clements Nursery Manager, Jason Huffman, expressed an interest in growing more natives, but there had been no source for the seeds. To initiate this native plant propagation the nursery will begin growing 10 species collected mostly in Tucker, Preston and Randolph Counties (WV). Each species is common, an important wildlife food species, and could serve a diverse utility.

Depending on seed viability, germination and propagation success, these native species may appear in the Clements Nursery's catalog in future years. If there is a demonstrated demand for the plants, the partnership hopes to expand the effort in coming years.

CASRI ACCOMPLISHMENTS, 2012

The projects highlighted above show some of CASRI's biggest accomplishments for 2012, but those projects comprise only a part of the systematic, landscape-scale restoration effort that CASRI partners have been pursuing over the last seven years. The following presents a complete summary of accomplishments for 2012 related to key actions, objectives, and goals outlined in the 10 year CASRI Action Plan. See the 2011 CASRI report for a comprehensive summary of accomplishments for 2011 and prior years. Highlighting specific achievements by partners engaged in spruce restoration not only helps the initiative see where it has been, but provides direction on the next steps in implementing the plan. Restoration of this size and scope is a long-term commitment to working collaboratively towards common goals and objectives.

GOAL I. MAINTAIN AND INCREASE OVERALL AREA OF ECOLOGICALLY FUNCTIONING RED SPRUCE COMMUNITIES WITHIN THEIR HISTORIC RANGE.

Objective A. Maintain existing acres of red spruce northern-hardwood communities that reflect natural conditions.

Key Actions

I.A.1. Ensure regional land planning efforts by federal and state agencies support conservation of existing red spruce communities.

Accomplishments

- **In 2011 TNC provided input to the George Washington National Forest Plan Revision for red spruce habitat restoration. The George Washington NF draft Forest Plan revision of 2012 recognized red spruce as one of their 20 ecological systems. The draft plan created an objective stating the following: “The current acreage of approximately 600 acres of red spruce forest ecological system is maintained and additional spruce sites are reestablished to a total of 1,300 acres. Areas in Laurel Fork where Norway spruce and red pine were planted should be restored to red spruce.” Furthermore, the plan also has a management strategy that states: “The Spruce Forest system is limited to the Laurel Fork area. Strategies for restoring and maintaining the Spruce Forest system should emphasize restoring spruce to those sites where Norway spruce and red pine have been planted and maintaining conditions favorable to continued growth of existing stands. The Laurel Fork area should continue to be managed to restore and maintain the Spruce Forest including active planting of red spruce seedlings and releasing red spruce seedlings that are suppressed by hardwoods.” But until the plan is finalized, no projects will be proposed on the ground. Additionally, this does not apply to the Jefferson National Forest, where ecological zone mapping is still being completed.**

I.A.2. Provide support for private landowners to maintain and restore existing spruce communities.

Accomplishments

- **CVNWR along with USFS-MOF, WV TNC, WVHC, North Fork Watershed Project and many volunteers helped Timberline Homeowners Association plant 25 acres of red spruce along the Blackwater River on the Timberline Conservancy property in April.**
- **USFWS Partners Program completed a project to restore nearly 12 acres of red spruce on protected private property near Canaan Valley National Wildlife Refuge.**

Objective B. Restore identified priority areas to red spruce northern-hardwood communities.

Key Actions

I.B.1. Identify, using latest science and tools, high priority areas for spruce community restoration and conservation. Analysis should include selecting sites by their expected resiliency to changing temperature and precipitation patterns.

Accomplishments

- **A CASRI team led by TNC met to develop an updated set of maps to spatially describe the spruce forest and other high elevation resources and provide a tool for**

identifying priority areas for restoration. The update is expected to be completed in 2013.

- The soils community made progress in determining where red spruce forests historically grew on the landscape by determining key geomorphic and chemical indicators in the soil. Field work will continue on this front.
- WVDNR worked with the Northeast Association of Fish and Wildlife Agencies to model climate change impacts to Central Appalachian red spruce forests.
- WVDNR developed a map of high priority target areas for spruce community restoration for Canaan Valley State Park.
- WVDNR's habitat suitability model and vegetation plot data for red spruce forests and wetlands were used by NRCS in developing ecological site descriptions (ESDs) for the red spruce ecosystem.

I.B.2. Identify spruce forest reference conditions for restoration purposes.

Accomplishments

- CASRI partners met and decided updates and clarifications to the Restoration Approach document are needed and will occur in 2013.

I.B.3. Release understory spruce through timber stand improvement techniques such as girdling for gap openings, thinning using commercial timber sales, and herbicide applications to undesirable understory hardwoods.

Accomplishments

- Greenbrier Ranger District (USFS-MOF) conducted 100 acres of spruce release on Cheat Mountain. *See II.A.2.*

I.B.4. Conduct plantings of spruce and other native species associated with spruce communities (as indicated in the National Vegetation Class descriptions).

Accomplishments

- More than 90 volunteers planted 6,000 red spruce seedlings on 50 acres along the Blackwater River in Canaan Valley, WV. It was a cooperative red spruce planting event between CVNWR, Timberline Homeowners Association and the North Fork Watershed Project.
- Over 25 volunteers including members of the National Wild Turkey Federation, the Ruffed Grouse Society, and local homeowners and birders worked with refuge staff to plant over 2,000 speckled alder seedlings as a part of the refuge's habitat restoration program.
- Students from Tucker County High School attended a field trip to the refuge to learn about using native plants in habitat restoration. About 35 students planted 500 red spruce and 700 speckled alder seedlings.
- Over 100 volunteers planted almost 2,500 red spruce seedlings on a newly acquired section of CVNWR. Volunteers included local landowners, members of the Sierra Club and the Ruffed Grouse Society, visiting Student Conservation Association (SCA) members, students from the Adventure West Virginia program from West Virginia University, environmental science students and the "Greenworks Sustainability Club" from Davis & Elkins College, and first year students and the "WE LEAD" Appalachian

Experience team from West Virginia Wesleyan College.

- **With help from AmeriCorps members, USFS-MOF planted 5,000 spruce seedlings across 21 acres of decommissioned roads in the Upper Williams River watershed.**
- **Canaan Valley and Blackwater Falls State Parks planted over 2,000 red spruce trees with the help of AmeriCorps members.**
- **WVDNR planted 1,100 red spruce along the Upper Shavers Fork River.**
- **WVDNR, USFS-MOF and NRCS planted 1,000 red spruce and 500 balsam fir at Blister Swamp.**
- **Greenbrier Ranger District (USFS-MOF) planted approximately 3,700 native plants across 5-plus acres on the reclaimed Lambert Strip mine.**

I.B.5. Support native seed collection and plant/seedling propagation programs to maintain local seed sources and planting stock for projects.

Accomplishments

- **CVNWR issued a special use permit to WVHC to collect native plant seeds.**
- **USFS-MOF and NRCS Alderson Plant Material Center collected native plant material on 5 different occasions, including aspen roots and native grass/herbaceous species seeds, for a dry mix to sow directly after ground disturbance associated with restoration work (e.g. deep ripping).**
- **WVHC continued seed collection of over 30 species; 10 of which will be grown at WVDOF State Nursery.**

I.B.6. Monitor representative restoration areas to assess whether restored community goals are developing along expected trajectories.

Accomplishments

- **CVNWR, USFS-MOF, and WV State Parks monitored approximately 40 acres of restoration plantings using the CASRI “Rapid Assessment” monitoring plan.**
- **USFS-MOF began development of a monitoring protocol for spruce release areas.**
- **WVDNR monitored beaver impacts and growth of planted balsam fir at Blister Swamp. Baseline monitoring data for 35 newly planted deer exclosures at Blister Swamp was collected.**

Objective C. Protect land suitable for red spruce northern-hardwood communities, or identified as wildlife habitat corridors or forest connectors.

Key Actions

I.C.1. Purchase acreage of red spruce communities through fee acquisition from willing sellers.

Accomplishments

- **The remaining 593 acres of the Thunderstruck property were purchased by The Nature Conservancy. Transfer of the acreage to the Monongahela National Forest is planned. Pending transfers include the purchase of 300 acres through a federal appropriation and the donation of 115 acres by TNC. Funds to acquire the remaining 176.4 acres have been requested by the USFS.**
- **CVNWR purchased an 8.59 acre balsam fir stand near the Cooper Tract along Rt. 32.**

I.C.2. Pursue management agreements and conservation easements with private landowners.

Accomplishments

- **As part of the American Rivers-EPA grant awarded in 2012 to secure an easement on Pharis Knob, TNC is preparing to purchase conservation easements on two parcels: 357 acres on the main Gandy Ranch tract east of Pharis Knob, and 38 acres on a separate tract west of the Knob in the Laurel Fork headwaters. In addition, another 60 acres of conservation easement area was donated by the landowner in the riparian area along Gandy Creek where riparian and in-stream habitat improvements will be performed. When completed, this project will connect critical areas of WV northern flying squirrel habitat and will restore a high elevation wildlife corridor from Spruce Mountain to Laurel Fork Wilderness.**
- **USFWS Partners Program entered an agreement with a private land owner to restore and protect red spruce on roughly 12 acres near Red Creek. *See also I.A.2.***

I.C.3. Encourage use of programs established by the Clean Water Act, Clean Air Act, Farm Bill and other legislation to support private landowners interested in red spruce restoration.

Accomplishments

- **A private landowner in the Sinks of Gandy area continued planting spruce on his property with support from WHIP.**

Objective D. Map and quantify the size and configuration of spruce and spruce-northern hardwood forests at regular intervals to assess temporal changes in the overall extent of these habitats across the landscape.

Key Actions

I.D.1. Delineate the extent of existing red spruce stands at a scale of 1:24,000 through current, high resolution air photo interpretation, plot data and modeling. Validate this map via ground truth control points.

Accomplishments

- **WVDNR incorporated vegetation data for 18,000 stands on the Monongahela National forest, 1,200 WV northern flying squirrel habitat points, and 100 stands in Kumbrabow State Forest into the spruce mapping validation dataset.**
- **An AmeriCorps member shared with USFWS was trained and mentored at WVDNR to work on the mapping effort in 2012. High-priority areas needing validation were identified, and an additional 700 ground truth validations points in these areas were collected by AmeriCorps, WVDNR, and USFS-MOF staff.**

I.D.2. Update mapping developed in Key Action 1, using the latest imagery available, on a regular basis to assess changes in the quantity, size and configuration of spruce communities across the landscape.

GOAL II. INCREASE THE BIOLOGICAL INTEGRITY OF EXISTING RED SPRUCE NORTHERN-HARDWOOD COMMUNITIES.

Objective A. Improve red spruce northern-hardwood community structure and species composition across the Central Appalachian landscape.

Key Actions

II.A.1. Support research to understand significant ecological relationships within spruce communities.

Accomplishments

- **In cooperation with WVDNR and TNC, USFS researchers studied spruce budworm and its relationship to balsam fir within the Central Appalachian red spruce ecosystem.**

II.A.2. Implement restoration projects that include native plantings, overstory thinning, gap creation, snag creation, coarse woody debris creation, and spruce release.

Accomplishments

- *See I.B.4 and I.B.3.*
- **USFS-MOF completed wetland enhancement at Barton Bench at two sites that included coarse woody debris placement.**

II.A.3. Monitor development of ecosystem species composition and structure including snags and coarse woody debris.

Objective B. Reduce and prevent forest fragmentation.

Key Actions

II.B.1. Identify threatened areas of highest priority for red spruce community restoration.

Accomplishments

- **WVDNR prepared a statewide map of forest fragmentation, including forests in the red spruce ecosystem.**
- *See I.B.1*

II.B.2. Prioritize these threatened areas for conservation action.

II.B.3. Engage industry partners when possible to limit impacts on core forest habitat.

II.B.4. Increase road decommissioning projects.

Accomplishments

- *See I.B.4 (USFS-MOF Upper Williams Project)*
- **USFS-MOF completed 5.75 miles of road decommissioning and woody debris loading at Lambert Strip in partnership with the Canaan Valley Institute. *See also II.E.1***
- **The first contracts for road decommissioning in the Upper Greenbrier North were completed in fall 2012 totaling 0.5 miles.**
- **USFS-MOF signed an EA decision for the Upper Greenbrier North project which allows for 118 miles of road and trail decommissioning to be completed over several years.**

II.B.5. Develop cross-partnership Best Management Practices for limiting fragmentation.

Accomplishments

- **USFS-MOF eliminated artificial aquatic passage barriers at three sites accessing a total of 3 miles of aquatic habitat in the Upper Greenbrier North.**
- **USFS-MOF signed an EA decision for the Upper Greenbrier North project which plans for aquatic passage improvements at 42 sites.**

Objective C. Restore connectivity between existing red spruce northern-hardwood communities.

Key Actions

II.C.1. Increase patch sizes of red spruce communities across the landscape to enhance ecological function.

Accomplishments

- *See Key Action I.B.3 and I.B.4*

II.C.2. Identify key areas for connectivity between spruce forests across the Central Appalachians. Strive to preserve and increase connected north-south and elevational gradients.

Accomplishments

- **USFS-MOF (Greenbrier Ranger District), NRCS, and TNC identified Cunningham Knob as a potential habitat connector in the Sinks of Gandy area with good potential for spruce release. Additional site evaluations will be conducted in 2013 to confirm this.**

II.C.3. Implement restoration activities on lands identified as key connectors.

Accomplishments

- *See Key Action I.B.3 and I.B.4*

II.C.4. Increase easements and acquisition of lands identified as key connectors.

Accomplishments

- *See Key Action I.C.1 and I.C.2*

Objective D. Manage non-native invasive species infestations in red spruce northern-hardwood communities.

Key Actions

II.D.1. Develop and implement effective, safe, and environmentally sound restoration for weed-infested areas.

Accomplishments

- **The Barton Bench Ecological Restoration project was supported a second year by the Potomac Highlands Cooperative Weed and Pest Management Area’s seasonal “Ecosystem Support Team” invasive species treatment crew, under TNC supervision. The team worked for a week treating 134 acres at the restoration sites on Cheat**

Mountain to manage existing populations of invasive plants in spruce planting areas.

- **Invasive yellow iris was treated by the PHCWPMMA crew for a third year at the Blister Swamp restoration area.**
- **USFS-MOF (Greenbrier Ranger District) treated 35 acres at Cunningham Knob for meadow knapweed to prevent spreading into valuable spruce habitats.**

II.D.2. Apply Best Management Practices for preventing the spread of non-native invasive species in all project areas.

Accomplishments

- **The Greenbrier District (MOF) issued a decision for the Upper Greenbrier North project that included requirements for clean equipment and mulch, use of native seed for stabilization, pre-treatment of existing infestations, and follow-up monitoring and control of infestations.**

II.D.3. Encourage and promote local nurseries to grow native plant species for planting.

Accomplishments

- **The NRCS (Alderson Plant Materials Center) and the WV State nursery continued to work with the USFS-MOF, USFWS-CVNWR and other partners to provide native plant material for ecosystem restoration efforts. Over 4,000 native shrubs from Alderson PMC were planted on the Mower Tract through this partnership.**
- **Tucker County High School Greenhouse has been working with CVNWR biologists to begin growing native plants including red spruce.**

II.D.4. Provide information about potential non-native invasive threats.

II.D.5. Monitor restored sites for new infestations of invasive species.

Accomplishments

- **Invasive yellow iris treatments at Blister Swamp were monitored by WVDNR**
- **Transects, trails, and roads were monitored for invasive species infestations at CVNWR through a volunteer monitoring program.**

Objective E. Restore or improve forest hydrology, wetlands and streams associated with red spruce communities in the Central Appalachians.

Key Actions

II.E.1. Protect and restore wetlands within the spruce zone to enhance ecological services and biodiversity.

Accomplishments

- **See Key Action II.A.2**
- **See Key Action II.B.4**
- **WVDNR, USFS-MOF, AmeriCorps, USFWS, WVHC, and NRCS constructed 35 exclosures to protect balsam fir and globally rare species from herbivory at Blister Swamp.**
- **USFS-MOF created ephemeral wetlands at six sites as part of the Lambert Strip ecological restoration project.**

II.E.2. Protect streams and wetlands by insuring buffers are in place during silvicultural restoration work.

II.E.3. Maintain buffers along headwater and other streams by planting unforested riparian areas and protecting existing ones.

Accomplishments

- **As described in I.C.2, 60 acres and 1.25 miles of Gandy Creek riparian area and floodplain habitat was protected by conservation easement as part of the Gandy Ranch project. WV in-lieu fee mitigation funds will support in-stream habitat improvement work.**
- *See riparian area plantings in I.B.4.*
- **USFS-MOF signed an EA decision for the Upper Greenbrier North that plans for 660 acres of riparian reforestation and 197 miles of in-stream habitat enhancement.**

II.E.4. Reduce overland flow by supporting watershed restoration efforts designed to restore more natural hillslope drainage patterns and processes, reduce soil loss/erosion (including hillslope and stream bank stabilization), and increase soil productivity.

Accomplishments

- **USFS-MOF (Greenbrier Ranger District) in partnership with Appalachian Regional Reforestation Initiative (ARRI), University of Kentucky, Green Forests Work, Alderson PMC, and many others received a \$150,000 grant from American Rivers to continue deep ripping and restoration at the Mower Tract in 2013. Funds will be used to implement the first phase of deep ripping at Lambert Strip.**

II.E.5. Support projects that remediate acid mine drainage.

Objective F. Support an understanding of biological and chemical soil processes.

Key Actions

II.F.1. Support research to address acid deposition and soil/stream acidification on poorly buffered geologies typical under high elevation spruce communities.

Accomplishments

- **USFS-MOF through a cooperative agreement worked with the NRCS to update the soil resource inventory in association with Ecological Site Inventory efforts in the Red Spruce ecosystem on USFS-MOF lands. Additional work has also been done by NRCS on private lands. Soils data has been collected for multiple areas and is currently being analyzed and interpreted. Lab analyses and data entry are currently being done by NRCS and USFS-MOF. This data set was collected for multiple analyses – one being to assess nutrient levels. The data set will be correlated and available to the public in November 2013.**

II.F.2. Support research that addresses deposition of other atmospheric pollutants (e.g. mercury) on high elevation mountains in Central Appalachians.

Accomplishments

- **See II.F.1. USFS-MOF, WVU and NRCS developed a proposal that looks at conducting a risk assessment for watersheds and their potential to deliver methyl mercury in to the ecosystem. This proposal has been circulated to various funding sources in 2012.**

II.F.3. Support research for understanding soil carbon relationships with conifer forests.

Accomplishments

- **See II.F.1. Archived soil samples were taken from the 2012 field season and stored at the USFS-MOF. In 2012, the USFS-MOF and Colorado State University started collaborating on a project to characterize carbon in a more detailed manner for the red spruce ecosystem. This project will begin in the summer of 2013 with the delivery of the soil samples to the lab in Fort Collins, CO. Results are anticipated in 2014.**

II.F.4. Support monitoring of biological soil quality in existing red spruce communities.

Accomplishments

- **NRCS soil scientists, DNR, USFS, and USFWS ecologists and biologists worked with TNC staff to characterize the soils and assess other evidence of the historic forest at the Gandy Ranch spruce corridor restoration project. Species suitability by the soil map units was described based on evidence of conifer forest discovered in soils pits, the historic boundary survey tree records from Melissa Thomas-Van Gundy's work, current residual 'wolf trees' across the planting area, and the team's knowledge of forest on similar environmental conditions. The aim is to increase understanding and strengthen the justification of the forest types to restore the corridor's pasture lands.**

Objective G. Support development of spruce communities more resilient to average and seasonal temperature and precipitation changes over the next 50 years.

Key Actions

II.G.1. Preserve and increase connected north-south and elevational gradients through acquisition, easements, and implementation of restoration actions.

Accomplishments

- **See Key Action I.C.2.; also highlighted projects "Connecting Forests in Canaan Valley" (p. 4) and "Wildlife Conservation Society Enhances Resiliency in Central Appalachia" (p. 6).**

II.G.2. Identify and prioritize restoration sites by their resiliency to changing temperature and precipitation patterns.

GOAL III. PROTECT HABITAT FOR KEY WILDLIFE SPECIES AND COMMUNITIES TO PROMOTE BIODIVERSITY.

Objective A. Provide functional habitat for species dependent on red spruce ecological systems.

Key Actions

III.A.1. Identify and prioritize focal species associated with red spruce communities and their key habitat requirements.

III.A.2. Support research to determine minimum patch sizes necessary to supply habitat to maintain viable populations of rare species.

III.A.3. Support implementation of recovery action plans and conservation strategies for threatened, endangered, and sensitive species associated with red spruce ecosystems.

Accomplishments

- **CVNWR is continuing recovery actions (monitoring) for both WV northern flying squirrel and Cheat Mountain salamander.**
- **The USFS-MOF continued forest-wide inventory and monitoring for the WV northern flying squirrel, Cheat Mountain salamander, and northern goshawk.**
- **USFS-MOF (Greenbrier Ranger District) installed 55 WV northern flying squirrel nest boxes throughout the Upper Greenbrier North project area at 4 different locations for a total monitoring coverage of 550 acres.**
- **WVDNR conducted annual monitoring of nest boxes.**

III.A.4. Identify and prioritize targeted acquisitions and specific management actions for priority habitat areas.

Accomplishments

- **USFS-MOF and TNC completed acquisition of another portion of the Thunderstruck property, which will conserve and restore habitat for the WV northern flying squirrel and Cheat Mountain salamander.**
- **TNC was awarded \$300,000 from American Rivers to protect and restore a key habitat corridor for WV northern flying squirrel in the Sinks of Gandy area. Total project value is over 1 million dollars.**

Objective B. Establish adequate inventory and monitoring for key wildlife species.

Key Actions

III.B.1. Identify populations of key species in existing habitat and areas undergoing restoration treatments.

Accomplishments

- **WVDNR funded a genetic study of northern flying squirrels which documented that the West Virginia population forms a single population, distinct from populations in North Carolina and Virginia.**
- **WVDNR funded Marshall University to survey occupied Cheat Mountain Salamander (CMS) sites to determine connectivity between sites and delineate priority conservation areas. Twenty-eight occupied sites were surveyed in 2012. In cooperation with Marshall University and CVNWR, genetic samples were collected from CMS individuals to support a population genetics study in 2013.**

III.B.2. Identify specific habitat conditions for species of concern associated with spruce-northern hardwood communities.

Accomplishments

- **USFS-MOF and Marshall University collected microhabitat data and soil samples at 20 cover boards to better understand the potential impacts of roads and trails on CMS populations and assist in the development of management recommendations aimed at reducing fragmentation of CMS populations and habitat across the Forest**

III.B.3. Evaluate existing species monitoring protocols and implement new approaches when necessary.

III.B.4. Support agencies that are conducting monitoring actions, and integrate monitoring data into future restoration strategies.

III.B.5. Develop agreements with landowners to permit monitoring actions on private land.

GOAL IV. INCREASE COMMUNICATIONS, OUTREACH AND EDUCATION ON THE IMPORTANCE OF THE RED SPRUCE ECOSYSTEMS.

Objective A. Develop and distribute communication tools for targeted audiences.

Key Actions

IV.A.1. Create targeted audience outreach plan that will include producing brochures and maps.

Accomplishments

- **WVHC paid for the screen printing of CASRI bandanas with website and CASRI logo for distribution to volunteers during tree planting events.**
- **WVDNR shared a PowerPoint presentation and report on the red spruce ecosystem with USFS-MOF and the District staff.**
- **TMI, with photos and editorial assistance from WVDNR, wrote and published an article on conservation success at Blister Swamp in the popular “Wonderful West Virginia” magazine.**

IV.A.2. Launch website containing information about restoration initiative, financial support needed and progress towards accomplishing key actions.

Accomplishments

- **WVHC continued support and maintenance of www.restoreredspruce.org to increase visibility of CASRI efforts.**

IV.A.3. Increase educational outreach through volunteer recruitment and programs.

Accomplishments

- **A Connecting People with Nature Grant for \$9,900 was awarded to Canaan Valley NWR by the US Fish and Wildlife Service for the proposal--Cultivating Conservation Connections at Canaan Valley NWR. The application emphasized the key tenets of the**

funding, which includes engaging, educating and employing youth.

- **Students from Tucker County High School attended a field trip to the refuge to learn about using native plants in habitat restoration. About 35 students were able to participate in the restoration efforts by planting 500 red spruce and 700 speckled alder seedlings.**
- **Tucker County High School student, John Messer, developed and presented what he learned to other students and teachers, the local community and the school board – kicking off Canaan Valley’s “Restoration Leaders” program.**
- **37 students and 4 teachers from Tucker County High School traveled to the Hampshire County High School in Romney, WV. This trip enabled the students and teachers to see how another high school was running a productive and sustainable greenhouse and garden. The Tucker County High School will be a place where not only trees and other plants will be grown for restoration on surrounding lands, but a place where students will learn about how they can be a part of all the important restoration work that is being done all around them.**

IV.A.4. Provide landowners with informational materials about Farm Bill programs and conservation opportunities for improving spruce habitat.

Accomplishments

- **USFWS Partners for Fish & Wildlife Program provided landowners in multiple locations with information to support spruce restoration activities on private land.**

Objective B. Foster information and resource sharing culture with conservation professionals.

Key Actions

IV.B.1. Develop a red spruce learning network and information forums.

IV.B.2. Identify key research needs for the restoration of red spruce communities and develop a collaborative approach to obtaining the answers.

Accomplishments

- **USFS-MOF (Soil Science Program) and NRCS hosted a CASRI soils tour to share information with multiple conservation professionals on spodosols in the red spruce forest.**

GOAL V. INCREASE CAPACITY AND INSTITUTIONALIZE COORDINATION OF RED SPRUCE RESTORATION EFFORTS TO EXPAND IMPLEMENTATION OF KEY ACTIONS.

Objective A. Integrate action plan for the restoration of red spruce communities into local, state, and regional plans.

Key Actions

V.A.1. Engage multi-state partners to develop a network of restoration sites across the Central Appalachian landscape.

Accomplishments

- **CASRI Coordinator attended the first collaborative spruce restoration meeting for the Southern Appalachian states. Representatives from multiple states including North Carolina, Tennessee, Virginia and Georgia developed a plan to increase landscape scale restoration coordination.**

V.A.2. Work with partners to implement state wildlife action plans and other land management plans which focus on spruce/northern hardwood species management.

Accomplishments

- **TNC and the CVNWR, in cooperation with other CASRI partners submitted a proposal to the America's Great Outdoors initiative (AGO). The Canaan Valley landscape was selected as one of only two AGO priorities in West Virginia. This program has the potential to bring capacity and funding to the state in support of the Canaan Valley landscape land protection and CASRI restoration projects.**

V.A.3. Integrate multi-state partners into the Appalachian Landscape Conservation Cooperative and other regional ecological planning teams.

V.A.4. Support an increase in adequate funding levels for restoration projects by all land managing partners.

Accomplishments

- **TNC, with support from many CASRI partners, was awarded a Wildlife Conservation Society grant for \$250,000 to support a network of spruce restoration projects that will increase resiliency in the face of climate change. Including match and in-kind contributions this project shows an incredible \$2 million commitment to landscape scale restoration. *See highlighted project on page 6.***
- **WVDNR and National Wild Turkey Federation (NWTf) were awarded \$12,300 from USFS Resource Advisory Committee (RAC) to implement a restoration project at Blister Swamp (*See I.B.4 & II.E.1*). In-kind services for this project totaled approximately \$39,900.**
- **The West Virginia Highlands Conservancy (WVHC) was awarded a \$3,500 grant from American Forests to purchase spruce trees for planting. Including match and in-kind this grant leveraged \$26,450 to support multiple planting projects.**
- **The USFS-MOF received \$18,222 in in-kind contributions from various partners to implement native plant restoration on the Mower Tract.**
- ***See III.A.4, American Rivers Grant for \$300,000.***
- ***See II.E.4, American Rivers Grant for \$150,000.***
- ***See V.A.5, CVNWR grant for \$10,000***

V.A.5. Support allocation of resources for CASRI coordinator position, key staff and partner organizations.

Accomplishments

- **Refuge staff selected a high school student John Messer to work on red spruce habitat restoration and other biological projects with refuge biologists during the summer of 2012.**

- **Supplies for the Tucker Co. High School greenhouse were purchased by CVNWR with grant funds. These supplies will help the students begin growing red spruce, balsam fir and other native plants which will aid in restoration efforts both on the Refuge and throughout the AGO project area. Supplies include planting trays, growing media, greenhouse benches, a ventilation system and a chemicalizer.**
- **USFS-MOF, TNC, and USFWS continued to provide financial support for the CASRI coordinator position.**

Objective B. Evaluate outcomes for all key actions outlined in this plan.

Key Actions

V.B.1. Support resource allocation for monitoring and evaluation of all restoration areas.

Accomplishments

- **USFS-MOF, CVNWR, TNC, WVDNR and TMI allocated personnel time toward monitoring CASRI restoration plantings.**

V.B.2. Develop plan for sharing best evaluation methodologies and data locally and across the Central Appalachians.