



# CASRI

The Central Appalachian  
Spruce Restoration Initiative

# ACTION PLAN OF THE CENTRAL APPALACHIAN SPRUCE RESTORATION INITIATIVE

## HISTORY OF RED SPRUCE IN CENTRAL APPALACHIA

For centuries the highest elevations in Central Appalachia have been dominated by red spruce (*Picea rubens*) and red spruce-northern hardwood forests. Logging 'booms' significantly reduced the extent of this forest, and its availability as habitat for associated wildlife. In West Virginia, spruce was reduced from over 500,000 acres to only about 50,000 by the end of the 20<sup>th</sup> century. In the 1800s our rapidly expanding nation had a growing need for resources. The heavy demand for timber in eastern population centers and the growing newspaper industry increased the scale and scope of logging until much of this Central Appalachian timber resource was exploited. Red spruce was particularly valued for constructing fine instruments like fiddles, guitars and pianos but mostly used to make paper. Due to its wood's light weight and strength, red spruce was also sought for ship building.

The impacts of these extractive logging operations went beyond the relatively short-lived logging impacts such as loss of forest cover, lack of mature forest habitat for wildlife, and exposed soil susceptible to erosion. Steam trains were used to access and move the timber, and cinders from these trains ignited the dried slash of the harvested spruce forests causing large and intense fires that burned the thick humus layer of the red spruce forest soils. Some fires burned the ground to the bedrock eliminating soil as well as the seed bank of spruce forest vegetation, leaving these sites available for the 'pioneering' northern hardwood species to dominate. The combined effects of cutting and fire resulted in areas that once had a large red spruce component becoming hardwood-dominated forests with little or no spruce. Along with the contraction of the red spruce forest itself, rare species including the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), Cheat Mountain salamander (*Plethodon nettingi*), and saw-whet owl (*Aegolius acadicus*) experienced a severe habitat loss due to these changes.

Fortunately, some fragmented patches of spruce and spruce-hardwood forest did persist in areas that were hard to access for logging or that were missed by the fires. In the time that has passed since the last extensive spruce forest harvests and the associated devastating fires, red spruce has been returning to more and more acres within its historic range in West Virginia, seeding into the northern hardwood forests from the remnant patches of forest and moving into a place of dominance as canopy gaps allow.

## WHY CENTRAL APPALACHIANS? WHY NOW?

The Central Appalachian Mountains provide multiple natural resources for our society, making them assets of inestimable value. Ecological restoration of the forests of the Central Appalachians will not only help sustain these essential ecosystem functions, but ensure future generations continue to enjoy the beauty and recreational opportunities of this landscape. Some of these irreplaceable resources include the following:

- Forested watersheds that supply water for millions of people living downstream in the Potomac and Ohio River drainages, on both sides of the Eastern Continental Divide.

- Forests serving as the “lungs” of the East Coast, filtering pollutants to produce clean air and storing carbon to reduce levels in the atmosphere.
- Timber and non-timber forest products for local and regional industries.
- Streams and wetlands that serve as natural flood control, maintain water supplies, trap excess sediment, improve water quality, supply food for downstream ecosystems, and maintain and enhance biodiversity.
- Terrestrial and freshwater habitats supporting significant plant and animal populations, making it one of the biodiversity ‘hot-spots’ of North America.
- Largest intact blocks of forest in the mid-Atlantic that provide habitat for breeding populations of neotropical migrants and other birds requiring large forest patches, as well as wide-ranging mammals such as black bear and bobcat.
- A wide range of outdoor recreation opportunities for major population centers on the East Coast.

In addition, the current diversity and relatively intact condition of the Central Appalachian forests make them of high conservation value for creating a resiliency needed when considering the stressors of a changing climate. This region’s extensive natural landscape provides forested south to north habitat corridors with significantly variability in elevation. For plants and animals moving in an attempt to adapt, the opportunity to head upward in elevation and from south to north, without running into habitat obstructions, means a better chance of survival in the face of climate change. This greater possibility for migration and adaptation ultimately will help to maintain the region’s high level of biodiversity, which keeps ecosystems strong and more resilient to any challenges climate change may bring.

Because of the existence of the Monongahela National Forest and large tracts of rural private lands at high elevations, there is the potential to recreate large, historically coniferous forest areas in West Virginia. Restoration at this scale means that forest conditions can be developed that will benefit wildlife habitat for some of the rarest species in the region, water quality, recreational opportunities and forest health and function overall. Such improvements increase the forest’s ability to buffer the effects of climate change.

## A LANDSCAPE RESTORATION APPROACH: THE CENTRAL APPALACHIAN SPRUCE RESTORATION INITIATIVE

Despite the great values and climate change resiliency potential of the Central Appalachian mountain forests, the region’s forests face landscape level threats such as surface mining, natural gas extraction, acid deposition, invasive pests and pathogens, habitat conversion, and wind resource development. Protecting the integrity and diversity of ecosystem functions the Central Appalachians provide has never been more important.

Addressing the integrity and diversity of the red spruce ecosystems grew in importance over the past several decades, prompting a group of private, state, federal, and non-governmental organizations to develop the Central Appalachian Spruce Restoration Initiative (CASRI). In the early 2000s, concerned cooperators met to discuss how to increase actions in scale and scope to protect red spruce forest resources and ensure long term persistence of associated species like the WV northern flying squirrel. As meetings continued, the participants began to recognize that

developing a shared vision and integrated work plan would enhance the overall impact of each organization's ability to carry out red spruce conservation and restoration actions.

The Monongahela National Forest Resource Management Plan contains a red spruce restoration management prescription for 150,000 acres of high elevation habitat. The U.S. Fish and Wildlife Service 15 year management plan includes a significant spruce component, and the West Virginia Division of Natural Resources Wildlife Conservation Action Plan calls for the conservation of spruce forests. From this multi-organization commitment, CASRI partners recognized the need to formalize efforts to carry out restoration actions. The diverse group of partners came together and developed a Memorandum of Understanding (MOU) for coordinating actions and laying out a vision of the landscape-scale restoration of the red spruce-northern hardwood ecosystem. The working group born of this MOU called itself the High Elevation Conservation Working Group.

The working group continued to grow in numbers of partners and to refine its common approach. It is now known as the Central Appalachian Spruce Restoration Initiative (CASRI). The common interest in this restoration effort has many facets such as plant diversity, wildlife diversity, climate change, spruce regeneration, recreation, aesthetics, pollinator recovery, public education and interpretation, 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'S VISION

*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.*

To fulfill this vision, CASRI will work cooperatively across boundaries to perpetuate the ecological integrity of the red spruce-northern hardwood forest and the native wildlife and plant communities tied to these forest ecosystems through active management and land conservation. Restoration of this forest ecosystem will enhance the long-term resiliency of the forest and wildlife populations to outside threats and pressures such as those from climate change, pollution, invasive species, and development. It will also expand existing habitat for priority wildlife and plant species and create new areas for future range expansion. Ultimately the restoration will help perpetuate the biological diversity and integrity of this forest ecosystem.

### CASRI'S GOALS AND OBJECTIVES: 2010-2020

CASRI has developed a set of goals and objectives to guide the work of the group and its partners for the next ten years. Through execution of these goals, the vision of a functioning spruce-hardwood ecosystem can begin to be realized on a landscape scale.

***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**

1. Ensure regional land planning efforts by federal and state agencies support conservation of existing red spruce communities.
2. Provide support for private landowners to maintain and restore existing spruce communities.

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

**Key Actions**

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.
2. Identify spruce forest reference conditions for restoration purposes.
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.
4. Conduct plantings of spruce and other native species associated with spruce communities (as indicated in the National Vegetation Class descriptions).
5. Support native seed collection and plant/seedling propagation programs to maintain local seed sources and planting stock for projects.
6. Monitor representative restoration areas to assess whether restored community goals are developing along expected trajectories.

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

**Key Actions**

1. Purchase acreage of red spruce communities through fee acquisition from willing sellers.
2. Pursue management agreements and conservation easements with private landowners.
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.

**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**

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.
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**

1. Support research to understand significant ecological relationships within spruce communities.
2. Implement restoration projects that include native plantings, overstory thinning, gap creation, snag creation, coarse woody debris creation, and spruce release.
3. Monitor development of ecosystem species composition and structure including snags and coarse woody debris.

**Objective B.** Reduce and prevent forest fragmentation.

**Key Actions**

1. Identify threatened areas of highest priority for red spruce community restoration.
2. Prioritize these threatened areas for conservation action.
3. Engage industry partners when possible to limit impacts on core forest habitat.
4. Increase road decommissioning projects.
5. Develop cross-partnership Best Management Practices for limiting fragmentation.

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

**Key Actions**

1. Increase patch sizes of red spruce communities across the landscape to enhance ecological function.
2. Identify key areas for connectivity between spruce forests across the Central Appalachians. Strive to preserve and increase connected north-south and elevational gradients.
3. Implement restoration activities on lands identified as key connectors.
4. Increase easements and acquisition of lands identified as key connectors.

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

**Key Actions**

1. Develop and implement effective, safe, and environmentally sound restoration for weed-infested areas.
2. Apply Best Management Practices for preventing the spread of non-native invasive species in all project areas.
3. Encourage and promote local nurseries to grow native plant species for planting.
4. Provide information about potential non-native invasive threats.
5. Monitor restored sites for new infestations of invasive species.

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

**Key Actions**

1. Protect and restore wetlands within the spruce zone to enhance ecological services and biodiversity
2. Protect streams and wetlands by insuring buffers are in place during silvicultural restoration work.
3. Maintain buffers along headwater and other streams by planting unforested riparian areas and protecting existing ones.
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.

5. Support projects that remediate acid mine drainage.

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

**Key Actions**

1. Support research to address acid deposition and soil/stream acidification on poorly buffered geologies typical under high elevation spruce communities.
2. Support research that addresses deposition of other atmospheric pollutants (e.g. mercury) on high elevation mountains in Central Appalachians.
3. Support research for understanding soil carbon relationships with conifer forests.
4. Support monitoring of biological soil quality in existing red spruce communities.

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

**Key Actions**

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

1. Identify and prioritize focal species associated with red spruce communities and their key habitat requirements.
2. Support research to determine minimum patch sizes necessary to supply habitat to maintain viable populations of rare species.
3. Support implementation of recovery action plans and conservation strategies for threatened, endangered, and sensitive species associated with red spruce ecosystems.
4. Identify and prioritize targeted acquisitions and specific management actions for priority habitat areas.

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

**Key Actions**

1. Identify populations of key species in existing habitat and areas undergoing restoration treatments.
2. Identify specific habitat conditions for species of concern associated with spruce-northern hardwood communities.
3. Evaluate existing species monitoring protocols and implement new approaches when necessary.
4. Support agencies that are conducting monitoring actions, and integrate monitoring data into future restoration strategies.
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**

1. Create targeted audience outreach plan that will include producing brochures and maps.
2. Launch website containing information about restoration initiative, financial support needed and progress towards accomplishing key actions.
3. Increase educational outreach through volunteer recruitment and programs.
4. Provide landowners with informational materials about Farm Bill programs and conservation opportunities for improving spruce habitat.

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

**Key Actions**

1. Develop a red spruce learning network and information forums.
2. Identify key research needs for the restoration of red spruce communities and develop a collaborative approach to obtaining the answers.

***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**

1. Engage multi-state partners to develop a network of restoration sites across the Central Appalachian landscape.
2. Work with partners to implement state wildlife action plans and other land management plans which focus on spruce/northern hardwood species management.
3. Integrate multi-state partners into the Appalachian Landscape Conservation Cooperative and other regional ecological planning teams.
4. Support an increase in adequate funding levels for restoration projects by all land managing partners.
5. Support allocation of resources for CASRI coordinator position, key staff and partner organizations.

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

**Key Actions**

1. Support resource allocation for monitoring and evaluation of all restoration areas.
2. Develop plan for sharing best evaluation methodologies and data locally and across the Central Appalachians.