

The logo for Adaptive Silviculture for Climate Change (ASCC) is a green rectangle with the letters 'ASCC' in white, bold, sans-serif font.

# ADAPTIVE SILVICULTURE FOR CLIMATE CHANGE

## Cutfoot Experimental Forest, Minnesota

ASCC is creating robust, science-based examples of integrating climate change adaptation into silvicultural planning and on-the-ground actions.

### **Project Purpose**

Adaptive Silviculture for Climate Change (ASCC) is a collaborative effort to establish a series of experimental silvicultural trials across a network of different forest ecosystem types throughout the United States. Scientists, USDA Forest Service land managers, and a variety of partners have developed trial sites as part of a multi-regional study researching long-term ecosystem responses to a range of climate change adaptation actions.

### **Project Area**

The installation on the Chippewa National Forest Cutfoot Experimental Forest was the first ASCC

project site to be planned and implemented. The Cutfoot Experimental Forest covers approximately 3,000 acres, the majority of which consists of natural-origin red pine stands. The area that were selected for the ASCC project is dominated by red pine regenerated from a fire in 1918.



### **Projected Climate Change Impacts**

Key climate change impacts that the project team considered for the Cutfoot Experimental Forest include:

- Increasing drought stress, resulting in reduced forest growth and leading to more susceptibility to pests and diseases
- Increased risk of wildfire

Climate change will present challenges and opportunities for accomplishing the management objectives for red pine ecosystems, like those on the Cutfoot Experimental Forest, including:

#### **Challenges**

- Red pine, a dominant tree species in north-central Minnesota, is projected to have reduced habitat suitability under future climate scenarios.
- Other northern species on the Cutfoot site are expected to see reduced habitat suitability under climate change, including quaking aspen, balsam fir, paper birch, jack pine, and white spruce.

#### **Opportunities**

- Some tree species are expected to have increased habitat suitability under climate change, including bur oak, red maple (both native to the red pine ecosystem), bitternut hickory, black cherry, and white oak (currently found in the next southern climate zone in Minnesota).
- Habitat suitability for eastern white pine and northern red oak is not expected to change substantially in north-central Minnesota.

**To learn more about the Cutfoot Experimental Forest ASCC project, contact the Site Lead:**

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## Adaptation Options

What approach best prepares forest ecosystems for climate change?

Adaptation options occupy a continuum of management goals related to their levels of desired change. A team of natural resource specialists and researchers developed a set of desired future conditions, objectives, and tactics for the Cutfoot Experimental Forest based on three climate adaptation approaches:

### RESISTANCE

*Maintain relatively unchanged conditions over time*

Strategies & Approaches:

- uniform (free) thin (100-120 ft<sup>2</sup>/acre) removing red pine and jack pine to maintain species diversity
- maintain red pine dominance

### RESILIENCE

*Allow some change in current conditions, but encourage an eventual return to reference conditions*

Strategies & Approaches:

- variable density thin (20% in gaps, 20% in reserves, 100-120 ft<sup>2</sup>/acre)
- maintain red pine dominance
- increase future-adapted native species (eastern white pine, jack pine, red oak, bur oak, and red maple)

### TRANSITION

*Actively facilitate change to encourage adaptive responses to changing and new conditions*

Strategies & Approaches:

- irregular shelterwood (20% in gaps, 60-80 ft<sup>2</sup>/acre)
- increase heterogeneity
- increase future-adapted, native and new species (eastern white pine, red oak, bur oak, white oak, red maple, bitternut hickory, black cherry, and ponderosa pine)



Reduce Climate Change Impacts

Over 275,000 future-adapted seedlings have been planted!

Facilitate Adaptive Responses

### Monitoring

Monitoring is an essential component of the ASCC study. Research partners from many institutions are working together to investigate the effectiveness of different silvicultural treatments aimed at creating adaptive ecosystems. Some of the monitoring items include:

- Residual tree survival and growth
- Songbird and other wildlife community responses
- Natural regeneration and planted seedling survival and growth

### Progress & Next Steps

Project participants will continue tending and monitoring the Cutfoot Experimental Forest ASCC project site for many years. This includes vegetation control around planted seedlings and deer browse protection on pine seedlings. A second entry into the *resistance* treatment is planned to reduce basal area to 90-100 ft<sup>2</sup>/acre. Team members are using the Forest Vegetation Simulator (FVS) to model forest growth and tree survival for treatments and climate change scenarios.

### Project Impacts

Treatments and findings from this study are part of an active network of long-term silviculture research, and create a model experimental design for research on forest adaptation to climate change.

For more information on the ASCC approach and the ASCC project sites, go to: [www.forestadaptation.org/ascc](http://www.forestadaptation.org/ascc)



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