Keep Forests Healthy

A Tool to Assess Resilience, Health & Productivity

Whether you spend time outside in your woods, or just enjoy the beauty of your trees and wildlife from your window, you likely love your woods and want to keep them healthy.

Forests are always changing and adapting to new conditions. Some changes, like the progression of green summer leaves to bright red and gold fall foliage, or the annual return of migratory songbirds are expected.

Other shifts, such as the first signs of spring leaf-out or an increase in fast-growing nuisance plants such as poison ivy, are visible when comparing differences in woodlands across many years or decades.

Our climate is changing in ways that humans have never experienced before, resulting in changing weather patterns, rising temperatures and shifts in seasonal precipitation patterns. Actions you take today can help your forest to be resilient, healthy, and productive in the face of future climate changes.

The tool provides a rapid and simple process to assess forest resiliency. This publication contains background information on important characteristics of resilient and healthy forests and examples of potential adaptation strategies. It is accompanied by a scorecard to be used in the field to evaluate the resiliency of a forest.

Forest Resilience: The capacity of a forest to respond to a disturbance by resisting damage or stress and recovering quickly.

Forest Health and Resilience Principles

Climate change will alter the frequency and intensity of threats such as pest outbreaks, the occurrence of invasive species, wildfires and storms that forests are facing. New York's forests already face threats from invasive bugs like the emerald ash borer. A changing climate, combined with increased existing pressures, can put your woods at even greater risk of recovering from extreme weather events and other forest stressors. There are several forest management actions that can help you prepare your woods to cope with the unpredictable conditions that lie ahead. Working with a forester or other natural resource professional can help you determine the appropriate actions or the unique conditions on your land.

PRINCIPLES OF RESILIENT FOREST MANAGEMENT

1. Keep Forests as Forests.

Larger and more connected forest blocks tend to be more resilient and less impacted from stressors such as invasive plants. Aim for the long-term protection of your forest, soils and water resources on your land by considering long-term protection tools like conservation easements and legacy planning. Consider updating your forest management plan to include resilient characteristics. Ensure that rare or unique species and communities are managed and protected.

2. Reduce Stressors.

The changing climate is expected to create more attractive conditions for invasive species and forest pests and pathogens that often outcompete native tree species or even render them functionally extinct like Chestnut Blight. A diverse forest with strong healthy trees may be able to withstand threats from pests and disease and provide a future seed source. Young tree seedlings are the future of the forest — and often the tastiest morsels for your local deer population. By promoting a healthy community of younger trees, your woodland will be more adaptable to changing conditions in the future.

3. Address Vulnerabilities.

As the climate changes, conditions for current tree species will change, too. Hedge your bets and have a variety of native tree species present in your woods, so eventual "winners" will be ready to thrive. If your focus is on maintaining a single tree species, you run the risk of that species being unable to handle future conditions — and your whole forest loses out. A diverse forest structure is just as important as the individual species. A woodland with all the same size trees can also be at risk. Keeping a good population of young trees, middle-aged trees and old trees will not only provide diverse places for wildlife to live today, but it will also enable your woods to handle a variety of situations in the future.

Assess the Condition of Your Forest

The Keep Forests Healthy scorecard can help you assess how resilient your forest may be to changing climate conditions. Consider the condition of your woods and check the appropriate boxes during a woods walk in your forest. The evaluation can help you identify potential risks and highlight management options that may increase the forest's ability to cope with the pressure of changing conditions. Discuss these topics with a professional as you plan for the future of your forest.

FOREST DIVERSITY AND COMPOSITION

Every woodlot is different and will contain a different mix of tree and plant species due to the conditions unique to that place and to the history of the land. In general, a forest that contains a variety of tree species that are well-suited to current local conditions and future climate conditions without many interfering plant species will be better able to tolerate changes in climate and other stressors.

SPECIES DIVERSITY

Higher Risk	☐ ☐ ☐	Lower Risk
The forest has low species diversity, either in the canopy or throughout the forest. One or a few tree species are dominant.		Many tree species are present,without a single species being overly dominant.

SPECIES SUITABILITY

Higher Risk	☐ ☐ ☐	Lower Risk
The dominant tree species are near the southern extent of their species range or are adapted to cold conditions.		The dominant tree species can tolerate warmer, drier, or more variable conditions and are generally found farther south.

GENERAL TREE HEALTH

Higher Risk	☐ ☐ ☐	Lower Risk
Trees have poor growth form or have been damaged by insect pests or forest diseases.		Trees are healthy and free of disease and generally have good growth and form.

INSECTS AND DISEASES

Higher Risk	☐ ☐ ☐	Lower Risk
The forest is currently affected by insects or diseases. There are looming threats such as nearby outbreaks.		There are no current or looming forest insect or disease issues and there is a diversity of non-host species.

FOREST STRUCTURE

When it comes to forest structure, more complexity is often better. Forest structure includes having a diversity of tree sizes and species, varying the number of trees per acre, and ensuring the presence of dead wood –both standing and down. These conditions make your woods more likely to attract wildlife and recover quickly from disturbance.

STRUCTURAL DIVERSITY

Higher Risk ☐ ☐ ☐ **Lower Risk**

The forest contains trees that are primarily a single age or size, creating a simple canopy.

The forest includes trees of different sizes as well as multiple vertical layers (overstory, understory, etc.).

STANDING DEAD TREES

Higher Risk ☐ ☐ ☐ **Lower Risk**

No or few large standing dead trees are present.

There are noticeable numbers of standing dead trees (several per acre) and some are large.

DOWN DEAD WOOD

Higher Risk ☐ ☐ ☐ **Lower Risk**

Woody material, especially large pieces, are rare or absent.

There are noticeable amounts of dead wood, especially large pieces, on the forest floor.

TREE CROWNS AND SPACING

Higher Risk ☐ ☐ ☐ **Lower Risk**

Trees are too crowded and competing for growing space, or (less common) trees are inadequately stocked and too widely spaced.

Trees have adequate growing space that leads to them having large, healthy crowns.

REGENERATION

Regeneration refers to the young trees that will grow into the future forest, and these small trees are crucially important because they will influence how the forest changes over time. The species and health of these trees matter, and it is important to protect them from challenges like deer browse and competition from less desirable or interfering species.

DESIRABLE REGENERATION

Higher Risk ☐ ☐ ☐ **Lower Risk**

Tree seedlings and saplings are absent in the understory or are dominated by undesirable species.

Tree seedlings or saplings are present in the understory; the species mix is desirable for achieving management goals.

SPECIES SUITABILITY

Higher Risk ☐ ☐ ☐ **Lower Risk**

Regeneration includes species that are near the southern extent of their species range or are adapted to cold conditions.

Regeneration includes tree species that can tolerate warmer, drier, or more variable conditions, and they are generally present farther south.

INTERFERING PLANTS

Higher Risk ☐ ☐ ☐ **Lower Risk**

Plants such as buckthorn, multiflora rose, autumn olive, beech, ferns, and garlic mustard are common in the forest and may impede natural regeneration.

Interfering plants are absent on the property or are deliberately confined to small areas.

DEER BROWSE

Higher Risk ☐ ☐ ☐ **Lower Risk**

The occurrence of moderate to severe deer browse may create substantial challenges for tree regeneration and recruitment.

Deer browse does not pose a substantial challenge to tree regeneration that needs to be addressed.

SITE LEVEL RISKS

Every location will be affected by climate change in unique ways. For example, a riparian forest may be more vulnerable to extreme rain events or flooding, while an exposed ridgetop may be more susceptible to extreme storms that can cause windthrow. Consider the unique ways that a site may be affected to develop actions tailored to that place.

MOISTURE STRESS OR DROUGHT

Higher Risk ☐ ☐ ☐ **Lower Risk**

The forest is susceptible to drought because the trees are not tolerant or because the soils are sandy or drought-prone.

Moisture stress or drought would not cause problems at this location.

EXTREME RAINFALL

Higher Risk ☐ ☐ ☐ **Lower Risk**

Forest is in an area that would be heavily affected by extreme rainfall, such as a floodplain or steep, highly-erodible slope.

Extreme rainfall would not cause problems at this location.

OTHER EXTREME WEATHER

Higher Risk ☐ ☐ ☐ **Lower Risk**

Parts of the forest may be susceptible to extreme weather events, such as a ridgetop that has a higher risk of damage from high winds.

This location is not at an elevated risk of damage from extreme weather events.

SHORTER AND MILDER WINTERS

Higher Risk ☐ ☐ ☐ **Lower Risk**

Warmer winter conditions could negatively affect the forest or create challenges to forest management or timber harvest. For example, more variable snowpack could reduce windows for forest harvesting during the winter season.

Warmer winter conditions may be beneficial to forests or may increase opportunities for forest management or timber harvest.

Take Action to Improve Forest Resilience

Once you complete the Keep Forests Healthy scorecard, organize the outcomes by risk and address the high-risk performance areas first. This section presents concerns and strategies to address areas that need improvement. A forester can help fit goals and objectives, and associated practices that improve resilience, into a landowner's long-term plan. A forester can also help prioritize activities over time. It's important to remember that any activity to address at-risk areas moves a woodlot forward toward improved resilience.

FOREST DIVERSITY AND COMPOSITION

CONCERNS	STRATEGIES
Species Diversity Forest has low species diversity. One or a few tree species are dominant.	• Use forest management to promote a greater diversity of tree species. Multi-species stands are generally more resilient than single species stands. • Promote regeneration through harvesting or plant a variety of native species expected to do well under future conditions.
Species Suitability The current tree species are near the southern extent of their species range or are adapted to cold conditions.	• Promote species with a wide range of moisture and temperature tolerances if they are present or plant if needed. • Promote a variety of native species expected to do well under future conditions if they are present, or plant if needed.
General Tree Health Trees have poor form reflecting more challenging site conditions or have damage from insect pests or forest diseases.	• Thin forest stands to remove crowded, damaged or stressed trees to reduce competition for light, nutrients, and water.

FOREST DIVERSITY AND COMPOSITION (CONT.)

CONCERNS	STRATEGIES
Insects & Disease The forest is currently affected by insects or diseases or there are looming threats (such as problematic pests nearby).	• Retain survivors of pest or disease outbreaks, droughts, windthrow events, or other disturbances during salvage or sanitation operations. • Create a diverse mix of forest or community types, age classes, and stand structures to reduce the availability of host species for pests and pathogens. • Thin to reduce the density of a pest's host species to discourage infestation, knowing that species are especially susceptible to pests and pathogens at stocking levels.

FOREST STRUCTURE

CONCERNS	STRATEGIES
Structural Diversity The forest contains trees that are primarily a single age or size, creating a simple canopy.	• Use forest management to emulate aspects of natural disturbance to support the establishment of different age classes. Stands containing trees of different ages and sizes may be more resilient than even-aged stands.
Standing Dead Trees No or few standing dead trees are present.	• Leave or create standing dead trees during forest management activities where they do not create a hazard. • Leave standing dead trees during salvage operations where they do not create a hazard. • Allow some trees to grow to larger sizes so that they can provide value to wildlife and serve as future dead wood.
Down Dead Wood Woody material, especially large pieces, are rare or absent.	• Leave large pieces of woody material on the ground after disturbances and forest management activities.
Tree Crowns & Spacing Trees are inadequately stocked and too widely spaced, or trees are too crowded and competing for growing space.	• Thin stands by identifying crop trees, creating room to grow for desirable species of good form.

REGENERATION

CONCERNS	STRATEGIES
Desirable Regeneration Tree seedlings and saplings are absent in the understory or are dominated by undesirable species.	• Retain trees of desirable or less common species in the overstory so that these legacies may provide a future seed source. • Control competition from undesirable tree species, including beech suckers and sprouts, and interfering species to enhance regeneration of desired tree species. • Restrict recreation or management activities that may have the potential to damage desirable regeneration. For example, prevent off-trail ATV use or minimize damage from harvesting operations to protect residual regeneration.
Species Suitability Regeneration includes species that are near the southern extent of their species range or are adapted to cold conditions.	• Favor species that are currently present that have wide ecological amplitude and can persist under a wide variety of climate and site conditions. • Identify and promote species that currently occupy a variety of site conditions and landscape positions.
Interfering Plants Plants such as buckthorn, multiflora rose, autumn olive, and garlic mustard are common in the forest.	• Thin stands by identifying crop trees, creating room to grow for desirable species of good form.
Deer Browse The occurrence of moderate to severe deer browse may create substantial challenges for tree regeneration and recruitment.	• Install fences, bud caps, and other physical barriers to prevent herbivory. • Promote abundant regeneration of multiple species to supply more browse than herbivores are expected to consume. • Use tree tops from forest harvest or plantings of non-palatable tree species as locations for “hiding” desirable species from herbivores to reduce browse pressure.

SITE LEVEL RISKS

CONCERNS	STRATEGIES
Moisture Stress or Drought The forest can be negatively affected by drought because the trees are susceptible or because the soils are drought-prone.	• Seed or plant drought-resistant genotypes of commercial species. • Plant oaks, pines, and other drought-tolerant native species in locations that are expected to become drier.
Extreme Rainfall Forest is in an area that will be heavily affected by extreme rainfall, such as a floodplain or steep, highly-erodible slope.	• Plant species that can cope with periodic inundation and flooding, such as swamp white oak and silver maple, on sites that are in low landscape positions or prone to flooding. • Ensure the forest soils are covered by leaf litter, vegetation, and downed wood to reduce the potential for soil erosion and sedimentation into nearby streams.
Other Extreme Weather The forest is at risk from other extreme weather events, such as windstorms or hurricanes.	• Thin stands to increase tree growing space and increase the wind firmness of the residual stand, favoring the healthiest trees. • Design canopy gaps and harvest edges with an orientation and shape informed by the prevailing winds to reduce the risk of windthrow.
Shorter and Milder Winters Warmer winter conditions will negatively affect the forest or create challenges to forest management or timber harvest.	• Promote long-lived conifers with wide ecological tolerances, such as eastern white pine. • Time the season of harvest operations to match site conditions and minimize risk to stands. • Limit harvest or management-related disturbance in areas that may be buffered from climate change (e.g., spring-fed stands sheltered in swales or valleys).

Authors

Kristina Ferrare
Cornell Cooperative Extension

Gregg Sargis
The Nature Conservancy

Maria Janowiak
USDA Forest Service, Northern Research Station,
Northern Institute of Applied Climate Science

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Related Resources

Cornell Master Forest Owner Program
http://blogs.cornell.edu/ccemfo

Climate Change Response Framework
www.forestadaptation.org

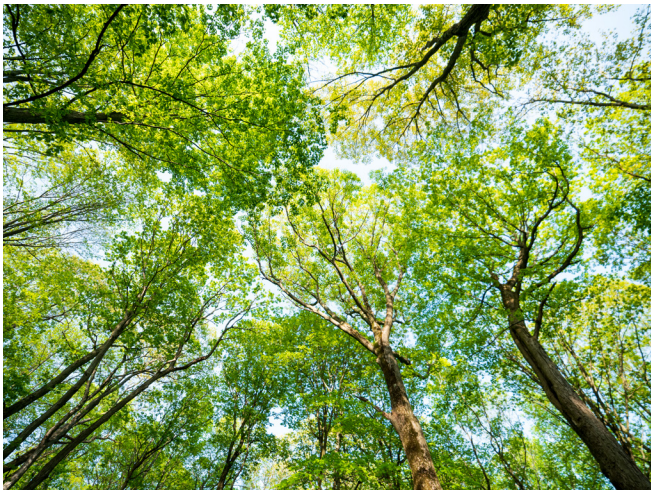
Increasing Forest Resiliency for an Uncertain Future
www.masswoods.net/caring-your-land/forest-resiliency

NYSDEC Forest Management Assistance
www.dec.ny.gov/lands/5238.html

NYSDEC Terrestrial Invasive Species
www.dec.ny.gov/animals/95383.html

U.S. Forest Service Climate Change Atlas
www.nrs.fs.fed.us/atlas

Natural Resource Navigator
www.naturalresourcenavigator.org



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NIACS Northern Institute of Applied Climate Science

Cornell Cooperative Extension
Onondaga County