

CARING  
FOR YOUR  
WOODS

## Adapting to Changing Conditions

dcr

Massachusetts



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NIACS  
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Woodlands



## Forests Change

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 are as anticipated as the progression of green summer leaves to the red and gold of fall foliage or the annual return of brightly-colored migratory songbirds. Other changes in our woodlands are only visible when comparing differences across many years or decades.

### Responding to Climate Change

Do you wonder about the changing conditions in your woods? Many people are asking more questions about how a changing climate could affect forests and what actions can ensure forests stay healthy no matter what the future holds.

There are two ways that you can help respond to climate change in your woods. First, you can consider how climate change may affect your woods and work with a professional forester to ensure that the trees, wildlife, and other forest species can cope with changing conditions – these adaptation actions are outlined in this booklet.

In addition to ensuring forests are healthy and productive over the long term, you can also consider additional actions that increase the ability of forests to absorb and store carbon from the atmosphere as a means to reduce the amount of heat-trapping carbon dioxide in the atmosphere. The *Caring for Your Woods – Managing for Forest Carbon* booklet contains additional information on this topic, which is called carbon *mitigation*.

# Climate Change

Our climate is changing in ways that humans have never experienced before, resulting in rising temperatures and shifts in seasonal precipitation patterns. You may be noticing some of these changes in your woods – such as earlier dates for the first signs of spring leaf-out, unusual weather patterns and powerful storms, longer dry periods in summer, or new insect pests and nuisance plants.



Streambank erosion can be exacerbated by extreme precipitation and weather events.

## NOT JUST GLOBAL WARMING

The climate is changing in many different ways.

**Average temperatures have risen**

**3.3<sup>o</sup>F**

since record-keeping began in

1895. Winter temperatures have risen even more.



**Precipitation has increased more**

**than 6 inches** statewide, and warmer temperatures mean that more precipitation is coming as rain than snow.



**Plants and animals are responding to climate change.**

For example, plants found at Walden Pond are **leafing out 18 days**

**earlier** than what Henry David Thoreau recorded in the 1850s.



This century, temperatures are expected to continue warming with a potential increase of **5-10<sup>o</sup>F**



Precipitation patterns are changing, and some areas are experiencing **more frequent heavy rain** events and **longer dry periods** between events.

# How Climate Change Affects Forests

Some forests are already facing threats from a variety of stressors, such as invasive plant species and introduced pests like the gypsy moth, emerald ash borer, and hemlock woolly adelgid. A changing climate can increase the effects of existing stressors or introduce new threats.

There are solutions available to help you and your woods prepare for and cope with the unpredictable conditions that lie ahead. A first step is exploring the ways that your forest may be vulnerable to climate change, as well as what factors may help protect it.



An invasive vine chokes trees (left); an undersized culvert (top right); and hemlock woolly adelgid (bottom right).

## Are your woods at risk?

Climate change will not affect all forest species, communities, and parts of the landscape in the same way. Your woods have unique conditions – factors such as soil type, elevation, slope, and past land use history – that may make it more or less vulnerable to changing conditions. A forester can help you understand how climate change and other stressors may affect your woods – and what you can do about it.

### Increases in extreme

**precipitation events:** Extreme precipitation events are becoming more common and can lead to flooding, soil erosion, and sedimentation.

**Increases in storm frequency and intensity:** Climate change may increase the intensity, scope, or frequency of weather events such as windstorms and ice storms.

**Elevated drought risk:** Warmer temperatures and altered precipitation patterns can increase risk of drought and associated tree mortality.

**Increasing occurrence of wildfire:** More frequent days with weather conditions suitable for fire, plus increasing fuel loads due to other disturbances, may increase the risk of wildfire.

### Increases in insect pests and forest pathogens:

Insect pests like hemlock woolly adelgid and southern pine beetle can expand their range northward under a warmer climate.

**Increases in invasive plants:** Invasive species will benefit from warmer temperatures and longer growing seasons, affecting forest growth and composition.

**Reduction in tree species habitat:** Some tree species in Massachusetts are projected to have reduced habitat suitability, including red spruce, eastern hemlock, and eastern white pine.

**Rising sea levels:** Sea levels will continue rising, and intensifying coastal storms may increase coastal forest dieback and replacement with salt marshes.

# Call to Action

## Taking Action in Your Woods

Taking an active role as a steward of your land can help your woods adapt to warmer, drier summer conditions and more frequent disturbances from events such as wind, storms or disease that can damage trees. A woodland of healthy, diverse trees can better withstand stress and support the community of plants and animals that live in your woods.

The following pages provide some ideas for actions that you might implement on your woodland and why they are so important. Work with a professional forester to create a customized plan for your woods that meets the needs of your unique situation and goals.



## TAKING ACTION CHECKLIST

As you read the actions on the following pages, use this checklist to identify those to discuss with your forester.

### Actions to Protect Ecosystem Functions

- Keep forest land in forest use.
- Protect rare or sensitive plant and animal communities.
- Protect water and soils on your land.

### Actions to Reduce Stressors

- Improve ability of your trees to resist insect pests and disease.
- Prevent and control invasive plants.
- Manage damage to young trees from excessive deer browsing.

### Actions to Build Resilience

- Promote a diversity of tree species.
- Promote a diversity of tree ages and sizes.

### Actions to Promote Change

- Prepare for big weather events by promoting strong, healthy trees in your woodlot.
- Respond quickly after big disturbance events to help your woods bounce back.
- Proactively manage your forest for future conditions.

### Monitoring Over Time

- Monitor your woods and the effect of different management tactics.

# Actions to Protect Ecosystem Functions

The renowned conservationist Aldo Leopold advised, “To keep every cog and wheel is the first precaution of intelligent tinkering.” This wise guidance remains true in an era of unprecedented and sometimes unpredictable change. When working on your land, look for opportunities to protect sensitive ecosystems and species – they need your assistance now more than ever.

## **Keep forest land in forest use.**

Many forests in Massachusetts are being lost to other land uses, which fragments the remaining forests into smaller and smaller patches. Protecting forests and maintaining connected habitats helps reduce the impacts that climate change and other stressors have on plants and animals. If you are worried about what will happen to your land when you can no longer care for it, refer to the *Caring for Your Woods: Setting Goals* booklet in this series for estate planning resources, such as *Protecting Your Legacy: A Massachusetts Landowner’s Guide to Conservation-based Estate Planning*.

If you are interested in keeping your woods as they are, not cleared for housing or commercial development, you can learn more about your options for conservation and how you can begin planning for that outcome now. When landowners keep their forests growing and manage them for the long term, they are helping to fight climate change and supporting a more resilient landscape for all.

## **Protect rare or sensitive plant and animal communities.**

Uncommon or fragile plants and animals will have the most difficult time adapting to changing conditions. While we can’t provide absolute certainty that our attention to these natural wonders will protect them into the future, we can try and give them the best possible chance. Perhaps there are management activities you can implement, like removing invasive plants, ensuring that the right amount of light or shade protects the community, or

better managing wetland areas. Consult with a professional and monitor these situations closely. A forester or wildlife biologist can help you establish a plan to protect these natural communities on your land.

## **Protect water and soils on your land.**

Massachusetts forests are experiencing more frequent and much larger precipitation events. These events could cause wash-outs like you’ve never experienced before, so it’s important to understand the capacity of the soils in your woods to handle extreme events and ensure your culverts and crossings can handle a much larger stream flow than you might expect. Maintaining plants in areas adjacent to wetlands and streams will help ensure that less of your soil is washed away and avoid filling and choking your healthy streams. A professional can help you anticipate and design appropriate improvements you may need to protect your water sources.





## Actions to Reduce Stressors

Often our forests are already being threatened by a variety of stressors, including invasive plant species, insect pests, and pesky wildlife. Reducing the impact of these stressors on forests is a critical first step for ensuring that the woods are healthy for whatever may come. You may already be taking many of these actions – if so, keep up the good work! Even if you are just getting started on these actions, every little bit will help provide big benefits to your woods and the wildlife that depend on them.

### **Improve the ability of your trees to resist pests and disease.**

Promoting the growth of the healthiest, strongest trees in your woodland will help your property withstand increased threats from pests and disease and provide a future seed source. Additionally, make sure your forest has a diversity of tree species, so your woods won't be overly at risk if a pest attacks one particular tree species. Further, actions to increase the diversity of your trees (discussed on the next pages) can reduce the risk of pests and diseases affecting your woods and provide opportunities for a faster recovery when forests are affected.

### **Suppress or eradicate invasive plants.**

The changing climate is projected to create even more attractive conditions for undesirable plants that are not native to our area. Unfortunately, non-native plants – and even some aggressive native species – often outcompete our native tree species and contribute very little to the values we appreciate most from our woods: deep, strong root systems for clean water, native nuts and berries for wildlife to eat, complex leafy structure for wildlife shelter, and even valuable wood for you to harvest for income to reinvest back into keeping your woods healthy. By staying on top of eliminating these invasive plant threats, you will ensure your woods are better prepared for the future.

### **Manage damage to young trees from excessive deer browsing.**

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, you can have more confidence that your woodland will be more adaptable to changing conditions in the future. To prevent deer browsing, consider managing your deer population or using protective tubes or fencing to reduce their impact. Concentrating tree tops following a timber harvest can also create areas for seedlings to grow away from deer. A professional forester can help you think through the best solution for your situation.

# Actions to Build Resilience

When thinking about the future, one of the most important things we can do is to support the natural capacity of ecosystems to cope with change. By ensuring that forests are healthy and resilient, we put them in the best position to withstand many kinds of stressors and bounce back from severe weather and other disturbances. There are a variety of actions you can do to help improve the ability of your forests to adapt to changing conditions, and a forester can help determine what actions are most suitable for the unique conditions on your land.



## **Promote a diversity of tree species.**

As the climate changes, the conditions for tree species will also change and not all species will react in the same way. You can hedge your bets and make sure your woods have a variety of native tree species present, so eventual “winners” will adapt and thrive, and your woods won’t miss a beat. On the other hand, if you focus on maintaining a single tree species on your property, you run the risk of that particular species being unable to handle future conditions – and your whole forest loses out. By considering the unique ways that climate change may affect your woods, you will be better able to identify a variety of different tree species that are suited to your site.

## **Promote a diversity of tree ages and sizes.**

A diverse forest structure is just as important as having a variety of tree species. A woodland that has trees of all the same size can be affected by changes in the same way, which may mean a forest is less able to adapt and respond accordingly. Landscapes that contain a mixture of young trees, middle-aged trees, and old trees can provide diverse places for wildlife to live today. Many forests in Massachusetts contain trees that are all of a similar age, and your forester may suggest actions to regenerate areas with a new age class to improve the ability of the woods to handle a variety of situations in the future.

## **Promote strong, healthy trees to prepare for big weather events.**

The healthiest and most vigorous trees are better able to withstand damaging events and can provide a viable seed source and good genetics for the next generation of trees, too. You can work with a professional to favor the most healthy and vigorous trees and also manage your woods to promote others to grow strong and sturdy. For example, thinning the trees in a crowded forest can enable the remaining trees to grow larger, wider, and more complex root systems and increase their ability to withstand drought and other stressors. Also consider leaving groups of desirable trees in concentrated “islands” as these areas can be less susceptible to extreme wind.





## Actions to Promote Change

Another sage piece of advice is to “prepare for the unexpected.” No matter how much we wish it wasn’t so, it has always been impossible to predict the future. Our changing climate means that our future forests may look very different than what we have today. In some situations, we may be able to anticipate and prepare for these coming changes, helping forests make a more graceful transition to their future state.

### **Respond quickly after big disturbance events to help your woods bounce back.**

A quick response after a damaging event is very important. If your woodland experiences a sudden pest outbreak, you should work with a forester to evaluate and control the issue, preventing the threat from spreading further. Similarly, a big storm event might damage a portion of your woodland. Play an active role to make sure it’s ready to recover as quickly as possible by encouraging the growth of native tree seedlings in these areas. This may include controlling invasive plants, which thrive after disturbances, and protecting seedlings from deer browse.

### **Proactively manage your forest for future conditions.**

Be thoughtful about what tree species are growing where. For example, a warmer climate may put some species like quaking aspen and eastern hemlock at greater risk, while many oak and hickory species may be better adapted to future conditions. A forester can help you consider how well your tree species are matched to your site conditions, both now and into the future. In some situations – such as when a forest has been heavily affected by an insect pest, drought, or other disturbance – there may be benefits to promoting a different mix of species that will be better able to thrive in our changing landscape. Actions may include allowing for natural regeneration of different plant communities, management activities that slowly change the forest over time, or planting trees or seeds that will hopefully become the future forest.

# Resources

The following resources can help you learn more about issues related to caring for your forest.

## **NORTHERN INSTITUTE OF APPLIED CLIMATE SCIENCE (NIACS)**

Woodland owners and forest managers can increase the resilience of their forests and help adapt to changing conditions. The Climate Change Response Framework provides tools and resources for climate-informed land management.

An ecosystem vulnerability assessment and related resources summarize information about climate change impacts on tree species and forests in New England.

[www.forestadaptation.org/new-england](http://www.forestadaptation.org/new-england)

Adaptation strategies describe options for responding to climate change and outline a variety of actions for climate-informed management.

[www.forestadaptation.org/strategies](http://www.forestadaptation.org/strategies)

The Adaptation Workbook can be used by you and your forester to consider the effects of climate change and to design land management and conservation actions to help prepare for changing conditions.

[www.adaptationworkbook.org](http://www.adaptationworkbook.org)

The Climate Change Tree Atlas is a U.S. Forest Service resource that provides the current ranges and potential changes in habitat suitability for 125 tree species in the Eastern United States under future climate change. The website includes video tutorials on how to use the Atlas.

[www.fs.fed.us/nrs/atlas/tree](http://www.fs.fed.us/nrs/atlas/tree)

## **USDA NORTHERN FOREST CLIMATE HUB**

The USDA Northern Forests Climate Hub, part of a national network of Hubs, develops and delivers science-based information and resources to help natural resource managers and woodland owners integrate climate change information into planning, decision making, and management activities.

[www.climatehubs.usda.gov/hubs/northern-forests](http://www.climatehubs.usda.gov/hubs/northern-forests)

## **MASSACHUSETTS DEPARTMENT OF CONSERVATION AND RECREATION**

The Department of Conservation and Recreation's Bureau of Forestry manages state lands for future generations, and is focused on creating resilient forests for the benefit of all Commonwealth residents. Access programs and services for private forest landowners, including forestry technical assistance.

[www.mass.gov/topics/forestry](http://www.mass.gov/topics/forestry)

Learn about forest stewardship planning with climate change in mind.

[www.mass.gov/dcr/climateforestry](http://www.mass.gov/dcr/climateforestry)

Learn about planning for bird habitat through the Foresters for the Birds program.

[www.mass.gov/dcr/birds](http://www.mass.gov/dcr/birds)

## **MASSWOODS**

UMass Extension maintains this web site as an information hub for forest landowners. Those who help to steward forests can respond to climate change impacts and promote forest resiliency through their land-use decisions. *Increasing Forest Resiliency for an Uncertain Future*, a joint publication of UMass Amherst and The University of Vermont, describes the characteristics of resilient forests and actions to increase resiliency.

[www.masswoods.org/caring-your-land/forest-resiliency](http://www.masswoods.org/caring-your-land/forest-resiliency)

## **MASS AUDUBON**

*Managing Forests for Trees and Birds in Massachusetts* provides guidance on specific habitat assessments and silvicultural practices that create and maintain habitat for birds throughout a variety of forest types in the state.

[www.massaudubon.org/our-conservation-work/wildlife-research-conservation/bird-conservation-protection/forest-birds](http://www.massaudubon.org/our-conservation-work/wildlife-research-conservation/bird-conservation-protection/forest-birds)

### **Monitor your woods and the effect of different management tactics.**

No matter what actions you may decide to take, you can monitor the changes in your woods. Regularly keeping an eye on your woods will help you better understand how the changing climate will affect your property in particular. Think about recording annual leaf-out dates. Check for signs of pest infestation or disease on certain trees. Take note of the number and success rate of tree seedlings, as these little trees will ultimately determine the future of your forest.

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