



SEPTEMBER 2014

Increasing the Resiliency of Forests in New England: A Weather-Wise Worksheet for Homeowners

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Introduction

Manomet Center for Conservation Sciences developed this worksheet to help urban and suburban residents in New England communities identify ways to make the areas around their home more resilient to changing weather and climate. The notion of taking action on climate change may seem overwhelming; however, **you can pick and apply practices that are relevant to your property.**

Over the last two decades, New England has experienced changing weather patterns and these changes are expected to continue over the next fifty years. New England is predicted to become warmer and wetter, storms are projected to become more frequent and intense, periods of extreme heat are expected to increase, as will the frequency and severity of short- and long-term drought. These changes may cause stress to trees and wooded areas around our homes making them unhealthy and more prone to damage and mortality. Although homeowners cannot control these changes in climate, we can take steps in our own yards to make our property and neighborhoods more resilient to climate change. Your actions today can keep your trees healthy and help future generations in your community be better prepared to face climate change.

This workbook lays out three steps to help homeowners prepare their property for climate change:

- › **Step 1 – Prepare for Change.** Learn about predicted changes in weather and climate
- › **Step 2 – Plan for Change.** Identifies key elements of landscape planning which can be enhanced to help you prepare for changes in weather and climate.
- › **Step 3 – Apply Key Strategies.** Provides a menu of practices for reducing the risk posed by changes in weather and climate around your yard.

Step 1: Prepare for Change

Changing weather and climate are expected to raise water and air temperatures and alter rainfall and snowfall patterns which has the potential to result in wide-ranging impacts to home and yard trees.

Strategy #1: Increase your knowledge about climate change

- Being aware about changes in weather and climate is an important first step to preparing for climate change.
- Follow climate change in the newspaper, on-line news, TV news, and popular press.
- Attend workshops about climate change and understand how your property may be impacted.
- Learn what other urban and suburban residents are doing to respond to climate change and how to apply that knowledge to your house lot.

Step 2: Plan for Change

An important step for getting ready for climate change is to maintain and take good care of trees on your lot. Addressing risks and opportunities into your existing landscaping can help ensure that your yard trees remain healthy over the short and long term.

Strategy #1: Identify how your property might be affected by climate change

Identifying areas that are particularly vulnerable or resilient to climate change can help you identify and prioritize maintenance activities.

- Areas vulnerable to climate change include:

- ❑ Trees that are targets for pests Eastern hemlock, ashes, and maples.
- ❑ Trees that might be stressed by warming weather including American beech, Eastern hemlock, balsam fir, red and black spruce.
- ❑ Shallow soils with many rocky outcrops and well-drained sandy soils that are at high risk for stress during a drought or damage during a storm.
- ❑ Low-lying areas that may be at risk to flooding, storm surges, and sea level rise.
- ❑ Some species that may thrive under changing conditions, creating opportunities to establish healthy, native habitat. Resilient areas include:
 - ❑ Trees likely favored by warming weather including white pine, oaks, and hickory.
 - ❑ Deep, moderately well-drained soils, which are drought and flood resistant.
 - ❑ Forested northern slopes or forest areas within five miles of the ocean.

Step 3: Apply Key Strategies and Relevant Best Management Practices

There are practical ways to minimize impacts of climate change changes so that yard trees continue to provide benefits for you and future generations.

Strategy #1 Keep trees healthy

Healthy and well-maintained trees are better equipped to survive and adapt to changing weather and climate.

- ❑ Routinely maintain trees on your property. Prune and care for trees for to keep them healthy and reduce risk to damage from storms or pests. Municipal and private arborists can provide practical advice and help identify and prioritize maintenance tasks.
- ❑ Remove invasive plant species on your property such as burning bush, buckthorn, multiflora rose, Eurasian honeysuckle species, Japanese knotweed, and Norway maple.
- ❑ Mulch (using an organic product) under yard trees to retain soil moisture.
- ❑ Leave branches and leaves under heavily wooded patches of forest. These materials provide nutrients for healthy growth and resiliency against extreme weather such as winter cold, drought, and heat.

Strategy #2: Plant species that are resilient to climate change

When selecting new species for your yard consider:

- ❑ Native drought tolerant species from New England.
- ❑ Trees that are least affected by ice storms and other extreme weather events.
- ❑ Plants that are well suited for conditions on your property (e.g. wet areas, well drained areas, etc.).
- ❑ Consider planting trees native to areas south of your property. The USDA's plant hardiness zones have shifted over time in response to changes in climate. Trees recommended for zones south of your property may be better suited to warmer weather.

Strategy #3: Conserve water and reduce runoff

Trees and plants can keep water clean and can help reduce stormwater runoff that can degrade streams and rivers.

- ❑ Minimize pavement or use permeable paving or gravel in parking areas, driveways, or sidewalks to allow water to be absorbed into the ground to reduce runoff and provide moisture to yard trees.
- ❑ Create buffers along streams and wetlands to slow down storm water, prevent sediment and other chemicals from entering water bodies, and provide shade to keep water cool.
- ❑ Install a rain garden or bio-swales to manage stormwater runoff.
- ❑ Use a rain barrel to capture and re-use rain water from roof.
- ❑ Disconnect rain spouts from municipal sewer systems to reduce flooding and water quality problems.
- ❑ Reduce the size of lawn/turf areas.

Strategy #4: Provide wildlife habitat

Healthy and native landscaping around your home can provide habitat for a variety of wildlife.

- ❑ Leave forested buffers around vernal pools, streams, lakes, and rivers to provide shade and protect habitat and travel corridors. Follow local regulations and guidelines.
- ❑ In larger yards, create dense patches of trees with natural forest ground cover to provide habitat for a wide-range of plant and animal species.

- ❑ In areas with high deer populations consider using plants not favored by deer. Use tree tubes and/or deer repellent to protect seedlings and sapling and regenerate the forest.
- ❑ Support local conservation of wildlife habitat by land trusts.

Strategy #5: Reduce safety risks on your property

Trees and landscaping near your home may increase risks property damage during storms or wildfires.

- ❑ Routinely maintain trees on your property. Prune and care for trees for to keep them healthy and reduce risk of falling limbs during storms. Arborists can readily identify trees at risk and have strategies to shore up trees from storm damage.
- ❑ Consider applying the FireWise guidelines to landscaping around you home if you are in an high fire risk area.

Strategy #6: Reduce the effects of extreme weather on your house

- ❑ Healthy and native landscaping around your home can help reduce the risks of downed trees and limbs and basement flooding along with reducing heating and cooling costs.
- ❑ Consult with a licensed arborist, your municipal arborist, or other town tree staff about pruning for tree health and human safety in light of possible ice storms or wind storms.
- ❑ Plant deciduous shade trees and shrubs to the east, south, and/or west of your house to help keep your home cool in the summer.
- ❑ Plant evergreen trees and shrubs to the northwest, north, and northeast areas of your house to reduce cooling from winter weather and winds.
- ❑ Use rain gardens and bio-swales to help manage runoff on your property. Directing excess runoff into the ground and away from your basement can help maintain soil moisture for trees and help avoid basement flooding.

Strategy #7: Fight climate change by sequestering carbon dioxide, a greenhouse gas

Trees are multi-generational means of capturing carbon dioxide from the atmosphere and reducing greenhouse gasses. Organic matter such as leaves and compost can be used to increase carbon and organic matter in the soil which also increase soil nutrients and the ability of soil to hold moisture during droughts.

- ❑ Plant trees to remove and store carbon dioxide from the atmosphere.
- ❑ Replace areas of your lawn with perennials to allow more organic matter and carbon to be stored in the soil
- ❑ Mulch your garden, perennials, and trees. You can compost your leaves and use them as mulch and/or a soil amendment to improve soils quality.
- ❑ Use trees and shrubs to reduce home energy use (see Strategy 6) and greenhouse gas emissions associated with energy use.

Summary

Experts agree that climate change will change our forests as well as our own backyards. The steps outlined in this workbook (prepare for change, plan for change, and apply key strategies) are intended to help you understand the impacts of climate change on your property and apply tangible actions, both small and large, to make your yard, house, and neighborhood more resilient to changes in weather and climate. The notion of taking action on climate change can be overwhelming. However, we believe you will find there are simple ways, perhaps some you are already doing, to keep your yard resilient to climate change.

Acknowledgements

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Increasing the Resiliency of Forests in New England: Resource Guide for Homeowners

Introduction

The Weather-Wise Worksheet for Homeowners outlines three steps (prepare for change, plan for change, and apply key strategies) to help make your home and yard more resilient to changes in weather and climate. This resource guide provides background information to help you implement the strategies identified in the worksheet. Although we worked to make this guide complete, you also may find other useful resources for taking action on climate change.

Step 1: Prepare for Change

Strategy #1: Increase your knowledge about climate change

National Information

Climate Change Impacts in the United States: Frequently Asked Questions about Climate Change (2014)

Walsh, J., D. Wuebbles, K. Hayhoe, J. Kossin, K. Kunkel, G. Stephens, P. Thorne, R. Vose, M. Wehner, J. Willis, D. Anderson, V. Kharin, T. Knutson, F. Landerer, T. Lenton, J. Kennedy, and R. Somerville. 2014. Appendix 4: Frequently Asked Questions. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, T.C. Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 790-820.

<http://nca2014.globalchange.gov/report/appendices/faqs>

Climate Change Impacts in the United States: Climate Science Supplement (2014)

Walsh, J., D. Wuebbles, K. Hayhoe, J. Kossin, K. Kunkel, G. Stephens, P. Thorne, R. Vose, M. Wehner, J. Willis, D. Anderson, V. Kharin, T. Knutson, F. Landerer, T. Lenton, J. Kennedy, and R. Somerville. 2014. Appendix 3: Climate Science Supplement. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 735-789.

<http://nca2014.globalchange.gov/report/appendices/climate-science-supplement>

Regional Information

Climate Change in the Northeast (2014)

Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz. 2014. Ch. 16: Northeast. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 371-395.

<http://nca2014.globalchange.gov/report/regions/northeast>

State-Level Information

Maine's Climate Future: An Initial Assessment (2009)

Jacobson, G.L., I.J. Fernandez, P.A. Mayewski, and C.V. Schmitt (editors). 2009. *Maine's Climate Future: An Initial Assessment*. Orono, ME: University of Maine.

http://climatechange.umaine.edu/files/Maines_Climate_Future.pdf

Climate Change in Northern New Hampshire: Past, Present, and Future (2014)

Wake, C., E. Burakowski, P. Wilkinson, K. Hayhoe, A. Stoner, C. Keeley, J. LaBranche Climate Solutions New England, Sustainability institute, University of New Hampshire, Durham, NH

http://climatesolutionsne.org/sites/climatesolutionsne.org/files/unhsi-csne-northernnh_climateassessment_june_4_2014.pdf

Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State. (2011)

Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, and P. Grabhorn (Eds.) 2001. Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State. Synthesis Report. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

<http://www.nysesda.ny.gov/climaid>

Considering Vermont's Future in a Changing Climate: The First Vermont Climate Assessment (2014)

Galford, Gillian L., Ann Hoogenboom, Sam Carlson, Sarah Ford, Julie Nash, Elizabeth Palchak, Sarah Pears, Kristin Underwood, and Daniel V. Baker, Eds, 2014: Considering Vermont's Future in a Changing Climate: The First Vermont Climate Assessment. Gund Institute for Ecological Economics, 219 pp.

http://dev.vtclimate.org/wp-content/uploads/2014/04/VCA2014_FullReport_LowRes2.pdf

Step 2: Plan for change

Strategy #1: Identify how your property might be affected by climate change

Climate Change and New England's Urban Forests (March 2014)

The Citizen Forester, MA Urban and Community Forestry Program, MA Department of Conservation and Recreation, Boston, MA

<http://www.mass.gov/eea/docs/dcr/stewardship/forestry/urban/citizen-forester/cf2014-march-.pdf>

National Climate Change Viewer

An online climate projections viewer shows temperature and precipitation trends at the county level.

http://www.usgs.gov/climate_landuse/clu_rd/apps/nccv_viewer.asp

Coastal Change Analysis Program Regional Land Cover

The Coastal Change Analysis Program contains a database of land cover and land change information for the coastal regions of the U.S.

<http://coast.noaa.gov/digitalcoast/tools/lca>

LANDFIRE

A free mapping tool that provides over 20 geo-spatial layers (e.g. vegetation, fuel, fire risk, disturbance, etc.), to create vegetation maps to identify areas that are vulnerable to wildfire or declines in productivity.

<http://www.landfire.gov/index.php>

Step 3: Apply Key Strategies

Strategy #1: Keep trees healthy

How to Prune Trees (2012)

USFS, NA-FR-01-95, Northeastern Area, State and Private Forestry, Newtown Square, Pennsylvania

http://na.fs.fed.us/spfo/pubs/howtos/ht_prune/htprune-rev-2012-screen.pdf

Tree Owner's Manual for the Northeastern Midwestern United States (2008)

Johnson, J., G. Johnson, M. McDonough, L. Burban, J. Monear. United States Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry, NA-FR-04-07, Newton Square, PA

http://na.fs.fed.us/pubs/uf/tom/090202_tom_lr.pdf

Planting and After Care of Community Trees Planting and After Care of Community Trees (2008)

Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension, University Park, PA

<http://pubs.cas.psu.edu/freepubs/pdfs/uh143.pdf>

Urban Trees and Shrubs: A Guide to the Selection of Trees and Shrubs in Urban Areas

US Forest Service, State and Private Forestry

<http://na.fs.fed.us/spfo/pubs/uf/uts/index.htm>

Strategy #2: Plant species that are resilient to climate change

Ice Resistant Tree Populations (2009)

University of New Hampshire Cooperative Extension, Durham, NH

http://extension.unh.edu/resources/files/Resource000987_Rep1123.pdf

Ice Storm Response: helping Landscape Tree Recover from Ice Storms (2008)

USDA Forest Service, Northeastern Area State and Private Forestry, Durham, NH

<http://www.vtfpr.org/protection/documents/HelpTreesRecover.pdf>

Selecting Tree Species for Planting in Areas Where Asian Longhorn Beetle and Emerald Ash Borer Are a Concern (2014)

US Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA

<http://na.fs.fed.us/pubs/2014/WhyAReplacementTreeTable140806.pdf>

A Homeowner's Guide to Preventing the Introduction and Spread of Invasive Species: How You Can Make a Difference (2013)

Rawlins, K.A., D.J. Moorhead and C.T. Barger. The University of Georgia, BW-2013-01, Center for Invasive Species and Ecosystem Health, Tifton GA.

<http://www.gainvasives.org/HomeownersGuide-InvasiveSpecies.pdf>

Invasives: Know Them-Don't Grow Them

New England Wildflower Society, Framingham, MA

<http://www.newfs.org/images/protect/Invasive%20Brochure%20Reduced%20File%20Size.pdf>

Strategy #3: Conserve water and reduce runoff

YardScaping: Five steps to make your piece of the planet a healthier place to live.

Maine Yardscaping Program, Augusta, ME

http://www.maine.gov/dacf/php/pesticides/yardscaping/documents/New_YardScaping_Booklet.pdf

The Homeowners Lawn Care and Water Quality Almanac (2000)

Gussack, E. and F.S. Rossi, Cornell Cooperative Extension, Ithaca, NY

www.gardening.cornell.edu/lawn/almanac/index.html

Good to the Last Drop (2003)

Marinelli, J. Audubon Magazine, National Audubon Society, New York, NY.

<http://archive.audubonmagazine.org/backyard/backyard0309.html>

Strategy #4: Provide wildlife habitat

Monthly Tips and Reminders for Your Healthy Yard (2004)

National Audubon Society, Audubon at Home, New York, NY

<http://athome.audubon.org/sites/default/files/documents/calendar.pdf>

Ten Ways to Make a Difference for Migrating Birds

National Audubon Society, Audubon at Home, New York, NY

<http://athome.audubon.org/ten-ways-make-difference-migrating-birds>

Getting Started Workbook: Helping Birds in Your Neighborhood and Community (2010)

National Audubon Society, New York, NY

http://athome.audubon.org/sites/default/files/documents/neighborhood_birds-blacklogos-final.pdf

Protecting Your Vernal Pool Habitat

Manomet Center for Conservation Sciences, Manomet, MA

[ftp://ftp.manomet.org/Water/Vernal_Pool_BMPs.pdf](http://ftp.manomet.org/Water/Vernal_Pool_BMPs.pdf)

Plants for Pollinators: A Regional Guide for Farmers, Land Managers, and Gardeners In the Ecological Region of the Adirondack - New England Mixed Forest - Coniferous Forest - Alpine Meadow Province

The Pollinator Partnership, San Francisco, CA

<http://www.pollinator.org/PDFs/Guides/Adirondackrx3FINAL.pdf>

Strategy #5: Reduce safety risks on your property

How to Recognize Hazardous Defects in Trees (2012)

Albers, J., Bedker, P., MacKenzie, M., O'Brien, J., Pokorny, J., USDA, United States Forest Service, Northeastern Area, State and Private Forestry, NA-FR-01-96

http://www.na.fs.fed.us/spfo/pubs/howtos/ht_haz/ht_haz_low_res.pdf

There's Life in Hazard trees

Prepared by: Mary Torsello, Pathologist and Toni McLellan, Wildlife Biologist, USDA Forest Service, Northeastern Area, State & Private Forestry, Durham, NH

http://na.fs.fed.us/spfo/pubs/uf/wl_haztrees/haztrees.htm

Recovery of Stands Damaged by Ice Storms: Advice for Landowners and Foresters (2014)

Vermont Forest Health Newsletter, January 2014, Vermont Department of Forests, Parks, and Recreation.

<http://www.vtfpr.org/protection/documents/IceDamage2014.pdf>

Managing Storm Damaged Woods

Klase, W. University of Wisconsin Cooperative Extension, Rhinelander, WI

<http://dnr.wi.gov/topic/ForestLandowners/documents/ManagingStormDamagedWoods.pdf>

Firewise Communities

NFPA's Wildland Fire Operations Division and Firewise Communities Program, Quincy, MA

www.firewise.org

Strategy #6: Reduce the effects of extreme weather on your house

Energy conservation planting strategies - Tree care

Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/treecare/energy/strategies.html>

Landscaping for Energy Efficiency (1995)

Department of Energy, Energy Efficiency and Renewable Energy Clearinghouse, DOE/GO-10095-046

<http://www1.eere.energy.gov/library/pdfs/16632.pdf>

i-Tree Design

i-Tree Design a free program developed by the US Forest Service that allows users to evaluate tree effects on energy efficiency. The program uses Google Earth imagery to show most effective placement of trees for energy savings.

<http://www.itreetools.org/design.php>

Strategy #7: Fight climate change by sequestering carbon dioxide, a greenhouse gas

Carbon Storage and Sequestration by Trees in Urban and Community Areas of the United States (2013)

Nowak, D.J., E.J. Greenfield, R.E. Hoehn, E. Lapoint, Environmental Pollution 178:229-236

http://www.itreetools.org/eco/resources/nrs_2013_nowak_001.pdf

The Role of Forests in Carbon Cycles, Sequestration, and Storage (2003)

Percy, K.E., R. Jandl, J.P. Hall, and M. Lavigne. The Global Network for Forest Science Cooperation, Newsletter No.1

<http://iufro.boku.ac.at/iufro/taskforce/hptfcs.htm>

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