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Increasing the Resiliency of Forests in New England: A Weather-Wise Resource Guide for Urban Forests and Community Planning

Introduction

The Weather-Wise Worksheet for urban forest and community planning outlines four steps (prepare for change, plan for change, apply key strategies, and monitor and adjust) to help make your lands and community 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

FACT SHEET: What Climate Change Means for Maine and the Northeast (2014)

http://www.whitehouse.gov/sites/default/files/docs/state-reports/MAINE_NCA_2014.pdf

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.nyserdera.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

Strategy #2: Identify potential threats and vulnerabilities specific to your municipality

Urban Forests and Climate Change (2013)

Safford, H.; Larry, E.; McPherson, E.G.; Nowak, D.J.; Westphal, L.M. U.S. Forest Service, Climate Change Resource Center.

<http://www.fs.usda.gov/ccrc/topics/urban-forests>

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>

Climate Change Impacts in the United States: Forests (2014)

Joyce, L. A., S. W. Running, D. D. Breshears, V. H. Dale, R. W. Malmshiemer, R. N. Sampson, B. Sohngen, and C. W. Wood—all, 2014: Ch. 7: Forests. 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, 175-194.

http://nca2014.globalchange.gov/system/files_force/downloads/low/NCA3_Full_Report_07_Forestry_LowRes.pdf?download=1

Forest Threat Facts: Climate Variability, Climate Change, and Severe Weather (2014)

USDA, Forest Service, The Eastern Forest Environmental Threat Assessment Center • Asheville, Raleigh, and Research Triangle, NC

http://www.forestthreats.org/products/fact-sheets/EFETAC_climate_factsheet_2013.pdf

Changing Climate, Changing Forests: The Impacts of Climate Change on Forests of the Northeastern United States and Eastern Canada (2012)

Rustad, L., J. Campbell, J. Dukes, T. Huntington, K. Fallon Lambert, J. Mohan, N. Rodenhouse. 2012. Changing Climate, Changing Forests: The Impacts of Climate Change on Forests of the Northeastern United States and Eastern Canada. USDA Forest Service, Northern Research Station General Technical Report NRS-99: 56pp.

http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs99.pdf

Quick Guide to Climate-Smart Conservation (2013)

Stein, B.A., P. Glick, N. Edelson, and A. Staudt (eds) National Wildlife Federation, Washington, D.C.

http://www.nwf.org/pdf/Climate-Smart-Conservation/Climate-Smart_Conservation_Quick_Guide.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

Strategy #3: Build community awareness and share experiences with others

Climate Change Communications: Strategies and Steps (2013)

Appendix A of Climate Change in the Parks (2013), Institute at the Golden Gate, Sausalito, CA

<http://www.parksconservancy.org/assets/conservation/environmental-sustainability/pdfs/climate-change-education.pdf>

Parks: The New Climate Classroom: Insights for Climate Change Communication and Education (2014)

Institute at the Golden Gate, Sausalito, CA.

http://api.ning.com/files/QsQ1m7RyND3nUWGsqXYWRjzbwUbWsVtdgqxQBK6D94X4tILZYcYk5uvu4qj*bQcuCzLiHcAhfbdU-eJr8YpKCZksL3hDghz/IGG_ClimateConferenceReport.pdf

A Recipe for Reaching Out (2003)

Maureen McDonough, Lisa Burban, Kasey Russell

From: Dialogue on Diversity: Broadening the voices in urban and community forestry., NA-IN-03-03, USDA Forest Service, Northeastern Area, State and Private Forestry and Michigan State University, Saint Paul, MN.

<http://na.fs.fed.us/pubs/uf/recipe/recipe.pdf>

Having the Climate Conversation: Strategies for Local Governments (2012)

Barry, L. and N. Weigeldt. ICLEI- Local Governments for Sustainability (Management) Inc.

http://www.icleicanada.org/images/icleicanada/pdfs/having_the_climate_conversation.pdf

Step 2. Plan for Change

Strategy #1: Establish goals and objectives for each major planning area

Planning the Urban Forest: Ecology, Economy, and Community Development (2009)

Schwab, J. (General Editor). American Planning Association, Planning Advisory Service, Report Number 555, Chicago, IL.

<https://www.planning.org/research/forestry/>

Green Works for Climate Resilience: A Guide to Community Planning for Climate Change (2014)

Reeve, K. and R. Kingston. 2014. National Wildlife Federation, Washington, DC.

<http://www.nwf.org/~media/PDFs/Global-Warming/Climate-Smart-Conservation/2014/green-works-final-for-web.pdf>

Toronto Green Standard For New Low-Rise Non-Residential Development (2010)

City of Toronto, Ontario

www.toronto.ca/planning/environment/pdf/lr_nonres_tech.pdf

Community Benefits, Costs, and Strategic Planting (2007)

McPherson, E.J., J.R. Simpson, P.J. Peper, S.L. Gardner, K.E. Vargas, and Q. Xiao, General Technical Report, PSW-GTR-202, US Forest Service Pacific Southwest Research Station

http://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf

Developing a Street and Park Tree Management Plan: An introduction to the preparation of a strategic approach to the care and maintenance of your community forest.

Northeast Center for Urban & Community Forestry Amherst, MA

<http://na.fs.fed.us/urban/inforesources/mgmtplanguide/mgmtplanguide.pdf>

Strategy #2: Gather and catalogue basic forest information

A Guide to Assessing Urban Forests (2013)

United States Department of Agriculture, Northern Research Station, NRS-INF-24-13, Syracuse, NY

http://www.urbanforestrysouth.org/resources/library/ttresources/a-guide-to-assessing-urban-forests/fss_get/file

i-Tree Vue

A free mapping tool, developed by the US Forest Service, uses the National Land Cover Database (NLCD) to determine the amount of forest, wetlands, and other land use within your community.

<http://www.itreetools.org/vue/>

i-Tree Canopy

A free tool, developed by the US Forest Service that determines tree cover and land use types within a community using Google Maps. It can also estimate ecosystem service values provided by forests including carbon storage and air pollution removal as well as monitor changes in forest canopy over time.

<http://www.itreetools.org/canopy/>

i-Tree Streets

A free tool, developed by the US Forest Service that helps communities complete a street tree inventory. The program also quantifies environmental and aesthetic benefits of trees including energy conservation, air quality improvement, CO2 storage.

<http://www.itreetools.org/streets/>

Strategy #3: Identify planning areas where climate change may impact your municipality

Climate Change Adaptation Options for Toronto's Urban Forests (2007)

Clean Air Partnership, Toronto, ON

http://www.cleanairpartnership.org/pdf/climate_change_adaptation.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>

Web Soil Survey

A free online tool that provides soil data and information produced by the National Cooperative Soil Survey. The site is updated and maintained online as the single authoritative source of soil survey information. Soil surveys can be used to identify areas at risk to drought or flooding.

<http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Strategy #4: Identify potential responses to unpredictable climate change impacts

Tree Emergency Manual for Public Officials (2000)

Community Forestry Education Project, Cornell Cooperative Extension of Monroe County, Rochester, NY

<http://www.umass.edu/urbantree/TEM.pdf>

Storms Over the Urban Forest: Planning, Responding, and Regreening-- A Community Guide to Natural Disaster Relief (1994)

Burban, L.L., J.W. Andreson. U.S. Dept. of Agriculture, Forest Service, Northern Area State & Private Forestry, Broomall, PA

<http://www.na.fs.fed.us/spfo/pubs/uf/sotuf/sotuf.htm>

Urban Tree Risk Management: A Community Guide to Program Design and Implementation (2003)

Pokorny, J.D. USDA Forest Service, NA-TP-03-03, Northeastern Area State and Private Forestry, St. Paul, MN

http://www.na.fs.fed.us/spfo/pubs/uf/utrm/urban_tree_risk_mgmt.pdf

Cost-Effective Tree Removal and Utilization Strategies to Address Invasive Species Attacks (2007)

Bratkovich, S., Al.Steele, J. Simons, A. Weatherspoon, U.S. Forest Service, Northeastern Area, St. Paul, MN

<http://semircd.org/ash/news/Cost%20Effective%20Tree%20Removal.pdf>

Step 3. Apply Key Strategies

FOREST HEALTH

Strategy #1: Maintain a healthy and diverse community of trees

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

Developing a Street and Park Tree Management Plan: An introduction to the preparation of a strategic approach to the care and maintenance of your community forest.

Northeast Center for Urban & Community Forestry Amherst, MA

<http://na.fs.fed.us/urban/inforesources/mgmtplanguide/mgmtplanguide.pdf>

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

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

Strategy #2: Control non-native pests and plants

Cumberland Town Forest Invasive Species Management Plan (2013)

Anderson, J. prepared for Town of Cumberland, Maine

http://cumberlandmaine.com/wp-content/uploads/2014/01/CumberlandTownForest_IPMPlan_2013.pdf

Websites for Invasive Plant and Pests Species:

US Forest Service Northeastern Area website maintains current information about invasive plants and pests threatening forests in New England.

Invasive plants

http://www.na.fs.fed.us/fhp/invasive_plants/

Invasive insects

<http://www.na.fs.fed.us/fhp/id/index.shtm>

US Forest Service Top Ten Invasive Plants in New England

http://www.na.fs.fed.us/fhp/invasive_plants/top_ten_invasives/index.shtm

Invasive Plant Atlas of New England (IPANE)

http://www.eddmaps.org/ipane/volunteers/training_materials/2006_basic_10_species.pdf

Emerald Ash Borer

A clearinghouse of information of the Emerald Ash Borer is available at <http://www.emeraldashborer.info>.

Emerald Ash Borer Pest Alert (2008)

McCullough, D. and Katovich, S. USDA Forest Service, Northeastern Area, State & Private Forestry, Newtown Square, PA

http://na.fs.fed.us/spfo/pubs/pest_al/eab/eab.pdf

Emerald Ash Borer: A guide to identification and comparison to similar species. (2008)

Parsons, G.L. Michigan State University, East Lansing, MI

http://www.emeraldashborer.info/files/eab_id_guide.pdf

Asian Longhorned Beetle

Asian Longhorned Beetle - A New Introduction (2008)

USDA Forest Service, State and Private Forestry, Northeastern Area; Animal and Plant Health Inspection Service, Pest Alert NA-PR-01-99. Newtown Square, PA

http://www.na.fs.fed.us/pubs/palerts/alb/alb_pa.pdf

Asian Longhorned Beetle and its Host Trees (2012)

Parker, B., Skinner, M., Dodds, K., Bohne, M. United States, Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry, Newtown Square; NA-PR-05-12

<http://na.fs.fed.us/pubs/alb/alb-and-host-trees-09-12-2012-screen.pdf>

Selecting Tree Species for Planting in Areas Where ALB/EAB 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>

Hemlock Woolly Adelgid

The USFS Northeastern area maintains a clearinghouse of information about the Hemlock Woolly Adelgid:

<http://www.na.fs.fed.us/fhp/hwa/>

Hemlock Woolly Adelgid (Pest Alert) (2005)

US Forest Service, Northeastern Area, State and Private Forestry, 11 Campus Blvd, Quite 200, Newtown Square, PA 19073, NA-PR-09-05

http://na.fs.fed.us/spfo/pubs/pest_al/hemlock/hwa05.htm

Eastern Hemlock Forests: Guidelines to Minimize the Impacts of Hemlock Woolly Adelgid (2004)

Ward, J.S.; Montgomery, M.E.; Cheah, C.A.S.-J.; Onken, B.P.; Cowles, R.S. NA-TP-03-04. U.S. Department of Agriculture, Forest Service, Northeastern Area State & Private Forestry, Morgantown, WV. 27 p.

http://na.fs.fed.us/pubs/tps/eastern_hemlock/eastern_hemlock.pdf (PDF)

Strategy #3: Minimize negative impacts of storm events

An Initial Storm Damage Assessment Protocol for Urban and Community Forests (2001)

USDA Forest Service Northeast Center for Urban and Community Forestry, University of Massachusetts, Amherst and Davey Resource Group

http://www.urbanforestrysouth.org/resources/library/ttresources/TTResource.2004-12-02.0911/fss_get/file

Ice Resistant Tree Populations (2009)

University of New Hampshire Cooperative Extension, Durham, NH

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

Trees and Ice Storms: the Development of Ice Storm-Resistant Urban Tree Populations (2006)

Hauer, R.J., J.O. Dawson, and L.P. Werner. 2006. Joint Publication 06-1, College of Natural Resources, University of Wisconsin-Stevens Point, and the Department of Natural Resources and Environmental Sciences and the Office of Continuing Education, University of Illinois at Urbana-Champaign. 20pp.

<http://www.vtfpr.org/protection/documents/TreesandIceStorm.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>

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>

How to Evaluate and Manage Storm-Damage Forest Areas (2001)

Barry, P.J., C. Doggett, R.L. Anderson, K.M. Swain. 2001. US Forest Service, Southern Region, Asheville, NC

http://www.fs.fed.us/r8/foresthealth/pubs/storm_damage/contents.html

Flooding and its Effect on Trees (1993)

S. Katovich, C. Locey, J. Pokorny, R. Wiest, US Forest Service, Northeastern Area State and Private Forestry, St. Paul, MN.

http://na.fs.fed.us/spfo/pubs/n_resource/flood/table.htm

Understanding the Effects of Flooding on Trees (2008)

Iles, J. and M. Gleason Iowa State University Extension

<https://store.extension.iastate.edu/Product/sul1-pdf>

Strategy #4: Increase urban tree cover

Planting Trees in Designed and Built Community Landscapes: Checklists for Success

Reynolds, M.K. and H.S. Ossenbruggen, US Forest Service, State and Private Forestry, Northeastern Area, Durham, NH

http://www.na.fs.fed.us/spfo/pubs/uf/plant_trees/planting_trees.htm

Protecting and Developing the Urban Tree Canopy

The United States Conference of Mayors, Washington, D.C.

<http://www.usmayors.org/trees/treefinalreport2008.pdf>

Strategy #5: Conduct sustainable timber harvests

Massachusetts Forestry Best Management Practices Manual (2013)

Catanzaro, P., J. Fish, D. Kittredge., MA Department of Conservation and Recreation Service, Forestry Program,

<https://masswoods.net/sites/masswoods.net/files/pdf-doc-ppt/MA-Forestry-BMP-Manual.pdf>

Best Management Practices for Forestry: Protecting Maine's Water Quality (2004)

Maine Department of Conservation, Maine Forest Service, Augusta, ME

http://www.maine.gov/dacf/mfs/publications/handbooks_guides/bmp_manual/bmp_manual.pdf

Best Management Practices for Forestry: Protecting New Hampshire's Water Quality (2005)

University of New Hampshire Cooperative Extension,

https://extension.unh.edu/resources/files/Resource000248_Rep267.pdf

Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont (2009)

Vermont Department of Forests, Parks, and Recreation, Waterbury, VT

<http://www.vtfpr.org/watershed/documents/Amp2009pdf.pdf>

New York State Forestry Best Management Plans for Water Quality (2007)

New York State Forestry, Albany, NY

<http://www2.dnr.cornell.edu/ext/info/pubs/Harvesting/BMP%20Field%20Guide.pdf>

Silvicultural Activities and Wetlands (2014)

Department of Environmental Conservation, Watershed Management Division, Vermont Wetlands Program, Montpelier, VT

http://www.watershedmanagement.vt.gov/wetlands/docs/2014_Silviculture_Guidance.pdf

WILDLIFE HABITAT

Strategy #1: Maintain and restore native forest habitats

Chapter 1: Restoring the Urban Forest Ecosystem: An Introduction (2012)

Duryea, M.L. University of Florida, School of Forest Resources and Conservation Department,

<https://edis.ifas.ufl.edu/pdffiles/FR/FR06500.pdf>

Sustaining America's Urban Trees and Forests: a Forest on the Edge Report (2010)

Nowak, D. J. S.M. Stein, P.B. Randler, E.J. Greenfield, S.J. Comas, M.A. Carr, R.J. Alig.

Gen. Tech. Rep. NRS-62. U.S. Forest Service, Northern Research Station, Newtown Square, PA

http://www.itreetools.org/news/articles/GTR_NRS62_Sustaining_Americas_Urban_Trees_and_Forests.pdf

Enriching and Managing Urban Forests for Wildlife (2012)

Joseph M. Schaefer, University of Florida School of Forest Resources and Conservation Department

<http://edis.ifas.ufl.edu/pdffiles/FR/FR07200.pdf>

Urban Nature: How to Foster Biodiversity in World's Cities (2014)

Conniff, R. Yale Environment 360, January 6, 2014, New Haven, CT

http://e360.yale.edu/feature/urban_nature_how_to_foster_biodiversity_in_worlds_cities/2725/

Good Forestry in the Granite State: Chapter 6 Wildlife Habitat (2010)

Bennett, K.P. editor. 2010. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition). University of New Hampshire Cooperative Extension, Durham, N.H.

<http://extension.unh.edu/goodforestry/assets/docs/GoodForestry2010FINALreducedsizeSECURE.pdf>

Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine (2007)

Bryan, R. Published by Maine Audubon, in cooperation with Maine Department of Conservation, Professional Logging Contractors of Maine, Master Logger Program, Small Woodland Owners Association of Maine, Falmouth, ME

<http://maineaudubon.org/wp-content/uploads/2012/08/MEAud-FocusSpeciesForestry.pdf>

Landowner's Guide to Wildlife Habitat: Forest Management for the New England Region (2005)

DeGraaf, R.M., M. Yamasaki, W.B. Leak, and A.M. Lester. University Press of New England

<http://www.upne.com/1584654678.html>

Forester's Guide to Managing Wildlife Habitats in Maine (1999)

Elliott, C.A. University of Maine Cooperative Extension, Orono, Maine

<http://www.upperstjohnriver.com/BFM.pdf>

Strategy #2: Maintain forest habitat connectivity and woodland block size

Promoting and Preserving Biodiversity in the Urban Forest (2006)

Alvey, A.A. Urban Forestry and Urban Greening 5:195-201

<http://ccesuffolk.org/assets/Promoting-and-Preserving-Biodiversity-UFUG-06.pdf>

Biodiversity and the Restoration of the Urban Forest Ecosystem (2012)

Binelli, E. K., University of Florida, Florida Cooperative Extension Service

<http://edis.ifas.ufl.edu/pdffiles/FR/FR06700.pdf>

Resilient Sites for Species Conservation in the Northeast and Mid-Atlantic Region (2011)

Anderson, M.G., M. Clark, and A. Olivero Sheldon. The Nature Conservancy, Eastern Conservation Science. 122pp.

http://rcngrants.org/sites/default/files/final_reports/Resilient-Sites-for-Species-Conservation%281%29.pdf

Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine (2007)

Bryan, R. Published by Maine Audubon, in cooperation with Maine Department of Conservation, Professional Logging Contractors of Maine, Master Logger Program, Small Woodland Owners Association of Maine, Falmouth, ME

<http://maineaudubon.org/wp-content/uploads/2012/08/MEAud-FocusSpeciesForestry.pdf>

Strategy #3: Maintain forest refugia

Good Forestry in the Granite State: Chapter 7 Sensitive Areas (2010)

Bennett, K.P. editor. 2010. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition). University of New Hampshire Cooperative Extension, Durham, N.H.

<http://extension.unh.edu/goodforestry/assets/docs/GoodForestry2010FINALreducedsizeSECURE.pdf>

Forestry Habitat Management Guidelines for Vernal Pool Wildlife (2004)

Calhoun, A. J. K. and P. deMaynadier. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

<http://www.umaine.edu/vernalpools/MunicipalGuideResources/Forestry%20Habitat%20Management%20Guidelines%20for%20Vernal%20Pool%20Wildl.pdf>

WATER QUALITY

Strategy #1: Use trees and other vegetation to help manage storm water runoff and aquatic habitat

Urban Watershed Forestry Manual: Part 1 Using Trees to Protect and Restore Urban Watersheds (2005)

Cappiella, K., T. Schueler, and T. Wright, Center for Watershed Protection, Ellicott City, MD

<http://nemonet.uconn.edu/images/resources/FREMO/completepart1forestrymanual.pdf>

Urban Watershed Forestry Manual Part 2: Conserving and Planting Trees at Development Sites (2006)

NA-TP-01-06, U.S. Forest Service, Northeastern Area, State and Private Forestry

<http://www.forestsforwatersheds.org/storage/part2forestrymanual.pdf>

Restoring the Hydrological Cycle in the Urban Forest Ecosystem (2012)

Korhnak, L.V. University of Florida, School of Forest Resources and Conservation Department, Florida Cooperative Extension Service.

<https://edis.ifas.ufl.edu/pdf/files/FR/FR07000.pdf>

Using Vegetative Systems to Manage Stormwater Runoff: 10 Case Studies

Developed by the Center for Watershed Protection, Ellicott City, MD

<http://www.forestsforwatersheds.org/storage/sw%20case%20study.pdf>

Water, Climate Change and Forests (2010)

Furniss, M.J.; B.P. Staab, S. Hazelhurst, C. Clifton, F. Cathrine, K.B. Roby, B.L. Ilhadrt, E.B. Larry,

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http://www.fs.fed.us/pnw/pubs/pnw_gtr812.pdf

i-tree Hydro

A free program, developed by the US Forest Service, that models water flow and changes in water quality based on the amount of tree cover and impervious service within a watershed.

<http://www.itreetools.org/hydro/>

Strategy #2: Design infrastructure to withstand storm events

Urban Systems, Infrastructure, and Vulnerability (2014)

Cutter, S. L., W. Solecki, N. Bragado, J. Carmin, M. Fragkias, M. Ruth, and T. J. Wilbanks, Ch. 11: 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, 282-296.

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An Economic Analysis of Improved Road/Stream Crossings (2013)

Levine, J. The Nature Conservancy, Adirondack Chapter, Keene Valley, NY

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Strategy #3: Minimize storm impacts to water bodies and wetlands

Restoring the Hydrological Cycle in the Urban Forest Ecosystem (2012)

Korhnak, L.V. University of Florida, School of Forest Resources and Conservation Department, Florida Cooperative Extension Service.

<https://edis.ifas.ufl.edu/pdf/files/FR/FR07000.pdf>

Using Vegetative Systems to Manage Stormwater Runoff: 10 Case Studies

Developed by the Center for Watershed Protection, Ellicott City, MD

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Massachusetts Forestry Best Management Practices Manual (2013)

Catanzaro, P., J. Fish, D. Kittredge., MA Department of Conservation and Recreation Service, Forestry Program,

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Maine Department of Conservation, Maine Forest Service, Augusta, ME

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Vermont Department of Forests, Parks, and Recreation, Waterbury, VT

<http://www.vtfrp.org/watershed/documents/Amp2009pdf.pdf>

New York State Forestry Best Management Plans for Water Quality (2007)

New York State Forestry, Albany, NY

<http://www2.dnr.cornell.edu/ext/info/pubs/Harvesting/BMP%20Field%20Guide.pdf>

Silvicultural Activities and Wetlands (2014)

Department of Environmental Conservation, Watershed Management Division, Vermont Wetlands Program, Montpelier, VT

http://www.watershedmanagement.vt.gov/wetlands/docs/2014_Silviculture_Guidance.pdf

Strategy #4: Maintain watershed health

Water, Climate Change and Forests (2010)

Furniss, M.J.; B.P. Staab, S. Hazelhurst, C. Clifton, F. Cathrine, K.B. Roby, B.L. Ilhadrt, E.B. Larry,

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i-tree Hydro

A free program, developed by the US Forest Service, that models water flow and changes in water quality based on the amount of tree cover and impervious service within a watershed.

<http://www.itreetools.org/hydro/>

AMENITY VALUE AND RECREATION

Strategy #1: Maintain scenic and other amenity values associated with trees

Community Benefits, Costs, and Strategic Planting (2007)

McPherson, E.J., J.R. Simpson, P.J. Peper, S.L. Gardner, K.E. Vargas, and Q. Xiao, General Technical Report, PSW-GTR-202, US Forest Service Pacific Southwest Research Station

http://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf

Developing a Street and Park Tree Management Plan: An introduction to the preparation of a strategic approach to the care and maintenance of your community forest.

Northeast Center for Urban & Community Forestry Amherst, MA

<http://na.fs.fed.us/urban/inforesources/mgmtplanguide/mgtplanguide.pdf>

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>

How Cities Use Parks for Climate Change Management

American Planning Association, Washington, D.C.

<https://www.planning.org/cityparks/briefingpapers/climatechange.htm>

Reducing Urban Heat Islands: Compendium of Strategies, Trees and Vegetation (2008)

Climate Protection Partnership Division in the U.S. Environmental Protection Agency's Office of Atmospheric Programs, Washington, D.C.

<http://www.epa.gov/heatlands/resources/pdf/TreesandVegCompendium.pdf>

Strategy #2: Create a low-impact recreational trail system

Lightly on the Land: The SCA Trail Building and Maintenance Manual (2006)

Birkby, B. and The Student Conservation Association, 2nd Edition, Mountaineers Books, 304 pp.

<http://www.mountaineersbooks.org/Lightly-on-the-Land-P286.aspx>

Best Maintenance Practices: Maine Motorized Trail Construction and Maintenance Manual (2011)

Maine Department of Conservation, Bureau of Parks & Lands, Off-Road Vehicle Division, Augusta, ME

http://www.maine.gov/dacf/parks/trail_activities/atv/docs/motorized-trailBMP-handbook.pdf

Trail Solutions: IMBA's Guide to building Sweet Single Track (2004)

International Mountain Bicycling Association, Boulder, CO, 272 pp.

<https://www.imba.com/catalog/book-trail-solutions>

Strategy #3: Have a plan to monitor and repair trails after large storms

A Recreation Trail Scorecard for evaluating trails in northern New England (2009)

Wilkerson, E. and A. Whitman, Natural Capital Science Note, Manomet Center for Conservation Sciences, Brunswick, ME

Protocol

https://www.manomet.org/sites/default/files/publications_and_tools/trailassessment_ncnote12.2009.pdf

User guide

https://www.manomet.org/sites/default/files/publications_and_tools/trailassessmentprotocol_userguide12.2009.pdf

Strategy #4: Encourage deer management

Impacts of white-tailed deer overabundance in forest ecosystems: An overview. (2008)

Rawinski, T.J. Northeastern Area State and Private Forestry, Forest Service, U.S. Department of Agriculture

http://www.na.fs.fed.us/fhp/special_interests/white_tailed_deer.pdf

White-trailed Deer in Northeastern Forests: Understanding and Assessing Impacts (2014)

Rawinski, T.J. 2014. US Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA.

<http://www.town.east-hampton.ny.us/DocumentsPDF/DeerManagement/UnderstandingDeerImpacts.pdf>

LOCAL CLIMATE REGULATION

Strategy #1: Grow and retain trees on site

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>

Reducing Urban Heat Islands: Compendium of Strategies, Trees and Vegetation (2008)

Climate Protection Partnership Division in the U.S. Environmental Protection Agency's Office of Atmospheric Programs, Washington, D.C.

<http://www.epa.gov/heatislands/resources/pdf/TreesandVegCompendium.pdf>

How Cities Use Parks for Climate Change Management

American Planning Association, Washington, D.C.

<https://www.planning.org/cityparks/briefingpapers/climatechange.htm>

AIR QUALITY AND GREENHOUSE GAS SEQUESTRATION

Strategy #1: Minimize air pollution impacts

Reducing Air Pollution through Urban Forestry (1999)

E. Gregory McPherson, E.G. and J.R. Simpson, From the Proceedings of the 48th Annual Meeting of the California Forest Pest Council, Sacramento, CA.

http://www.fs.fed.us/psw/programs/uesd/uep/products/11/cufr_73.pdf

Air pollution removal by urban trees and shrubs in the United States (2006)

Nowak, D. J., D.E. Crane, J.C. Stevens

Urban Forestry & Urban Greening 4:115-123

http://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ue_2006_nowak001.pdf

Tree species selection, design, and management to improve air quality (2000)

Nowak, D.J. Annual Meeting Proceeding of the American Society of Landscape Architects, Washington, D.C.

http://sites.udel.edu/sld/files/2012/09/Nowak_Trees-for-air-quality1.pdf

Strategy #2: Protect sites with planted trees

A Guide to Preserving Trees in Development Projects (2005)

Elmendorf, W., H. Gerhold, L. Kuhns, Pennsylvania Urban and Community Forestry Program, School of Forest Resources, The Pennsylvania State University, University Park, PA

<http://pubs.cas.psu.edu/freepubs/pdfs/uh122.pdf>

Understanding Tree Planting in Construction-Damaged Soils (2008)

Elmendorf, W. The Pennsylvania State University, College of Agricultural Sciences, Cooperative Extension, University Park, PA

<http://pubs.cas.psu.edu/FreePubs/pdfs/uh187.pdf>

Protecting trees from construction damage: a homeowner's guide (1999)

Johnson, G.R. WW-06135, University of Minnesota Extension, St. Paul, MN.

<http://www.extension.umn.edu/garden/yard-garden/trees-shrubs/protecting-trees-from-construction-damage/>

Strategy #3: Grow and retain trees on site

Climate Change, Carbon, and the Forests of the Northeast (2007)

Perschel, R.T., A.M. Evans and M.J. Summers. Forest Guild, Santa Fe, NM

http://www.forestguild.org/publications/research/2007/ForestGuild_climate_carbon_forests.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>

Strategy #4: Minimize stand damage when harvesting timber

Forest Biomass Retention and Harvesting Guidelines for the Northeast (2010)

Forest Guild Biomass Working Group, Forest Guild, Santa Fe, NM.

http://www.forestguild.org/publications/research/2010/FG_Biomass_Guidelines_NE.pdf

Strategy #5: Grow trees that can be utilized as products that reduce greenhouse gas (GHG) emissions

Managing Forests because Carbon Matters: Integrating Energy, Products, and Land Management Policy (2011).

Malmsheimer, R.W., J.L. Bowyer, J.S. Fried, E. Gee, R.L. Izlar, R.A. Miner, I.A. Munn, E. Oneil, and W.C. Stewart. Journal of Forestry: 109(7S):S7–S50.

<http://www.safnet.org/documents/JOFSupplement.pdf>

Carbon Dioxide Reduction Through Urban Forestry: Guidelines for Professional and Volunteer Tree Planters (1999)

McPherson, E.G., J.R. Simpson, PSW-GTR-171, US Forest Service, Pacific Southwest Research Station, Berkeley, CA

http://www.fs.fed.us/psw/programs/uesd/uep/products/cufr_43.pdf

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

Climate Change, Carbon, and the Forests of the Northeast (2007)

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

HEALTH AND HUMAN SAFETY

Strategy #1: Maintain safe roads and trails

I-tree-Storm

A free program, developed by the US Forest Service, that establishes a standard method to assess storm damage as well as estimates time and funds for damage mitigation.

<http://www.itreetools.org/storm/index.php>

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

How to Recognize and Reduce Tree Hazards in Recreation Sites (1986)

Robbins, K. United States Department of Agriculture, Forest Service, Northeastern Area, NA-FR-31

<http://na.fs.fed.us/spfo/pubs/hazardtrees/recreation/index.htm>

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

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Birkby, B. and The Student Conservation Association, 2nd Edition, Mountaineers Books, 304 pp.

<http://www.mountaineersbooks.org/Lightly-on-the-Land-P286.aspx>

Best Maintenance Practices: Maine Motorized Trail Construction and Maintenance Manual (2011)

Maine Department of Conservation, Bureau of Parks & Lands, Off-Road Vehicle Division, Augusta, ME

http://www.maine.gov/dacf/parks/trail_activities/atv/docs/motorized-trailBMP-handbook.pdf

Trail Solutions: IMBA's Guide to building Sweet Single Track (2004)

International Mountain Bicycling Association, Boulder, CO, 272 pp.

<https://www.imba.com/catalog/book-trail-solutions>

Strategy #2: Manage wildfire risk appropriately

Firewise Communities

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

www.firewise.org

Step 4: Monitor and Adjust

Strategy 1: Have an efficient monitoring system for monitoring key forest habitats, natural communities, and species affected by climate change

I-Tree Tools

I-tree is a suite of free tools developed by the US Forest Service to help map forest resources and monitor changes over time. There are a variety of tools that can measure canopy cover, track changes over time, and model potential future scenerios.

<https://www.itreetools.org/>

Strategy 2: Have an efficient monitoring system for infrastructure

Managing Municipal Infrastructure in a Changing Climate

Municipalities Newfoundland and Labrador, St. John's, NL

<http://www.municipalnl.ca/userfiles/files/DEC-00306-Infrastructure%20Workbook%20%28Web-Email%20Quality%29.pdf>

Strategy #3: Periodically incorporate the results of your monitoring and adjust management strategies to respond to existing and emerging threats

Urban and Community Forestry Programs at the state and federal level can help track existing and emerging threats to urban forests.

Project Canopy Maine

<http://www.projectcanopy.me/>

Vermont Division of Forestry, Urban and Community Forestry

http://www.vtfrp.org/urban/for_urbcomm.cfm

New Hampshire Community Forestry Program

<http://www.nhdf.org/about-forests-and-lands/bureaus/community-forestry-program.aspx>

New York State urban and Community Forestry

<http://www.dec.ny.gov/lands/4957.html>

US Forest Service Urban and Community Forestry

<http://na.fs.fed.us/urban/index.shtm>

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