Climate Resilience

For Your Community, Woods and Wildlife

Mass Land Conservation Conference
March 23, 2019 - Worcester, MA

Today's Presenters:

Ariel Maiorano
Assistant Coordinator, Shaping the Future of Your Community
Mass Audubon

- Community Resilience in Massachusetts

Lisa Hayden
Outreach Coordinator
New England Forestry Foundation

- Parcel-level Climate-Informed Forestry

Jeff Ritterson
Ornithologist
Mass Audubon

- Resilient Habitat for Birds and Wildlife

Resilience at many scales…

Our Region – New England

Our Commonwealth – Massachusetts

Our Towns – municipal planning (growth, open space)

Our Properties – private woodland stewardship

Our backyard species – Forestry for Birds, wildlife

Community Resilience in MA: Every Decision Counts

Ariel Maiorano

Shaping the Future of Your Community Program,
Mass Audubon
amaiorano@massaudubon.org

Mass Audubon

Shaping the Future of Your Community

Resilience:

The ability to bounce back after stressors

Adaptation:

A change that allows a person or place to survive in its environment

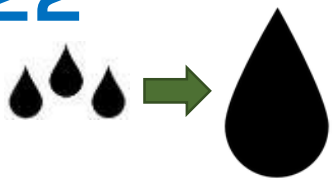
Climate Impacts Observed in MA

Temperature: 2.8°F Since 1895

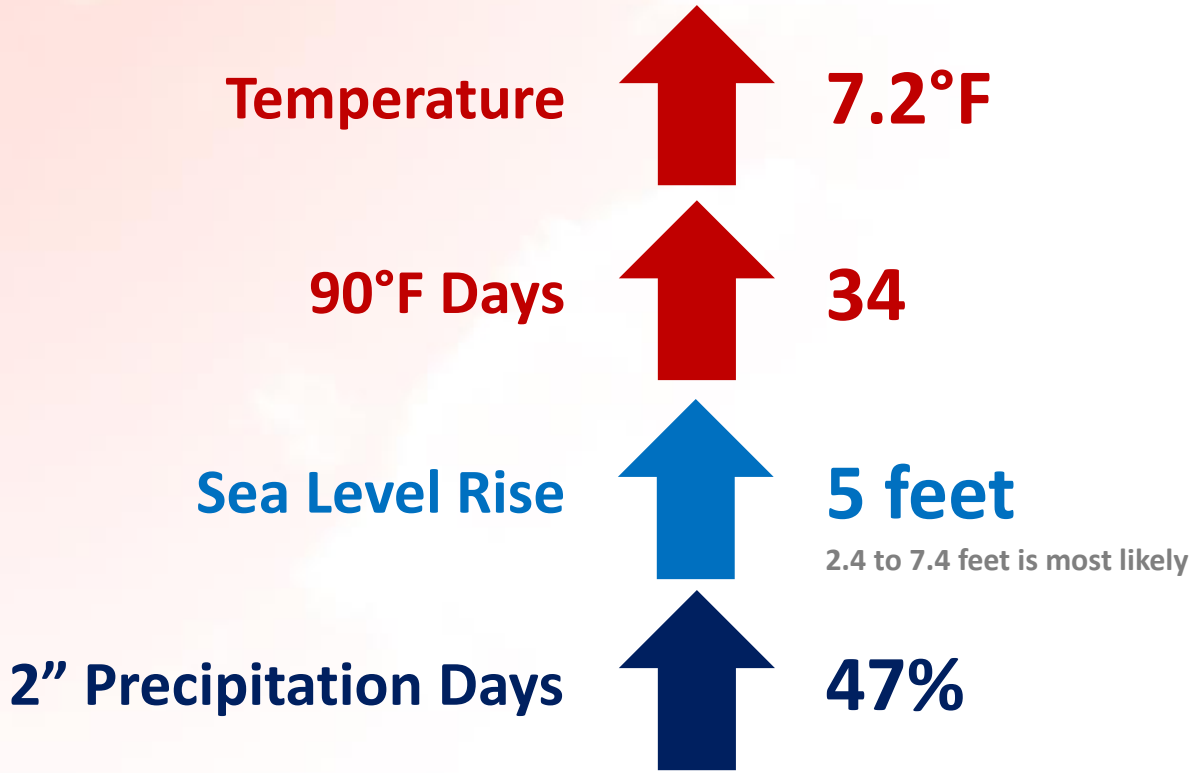
Growing Season: 11 Days Since 1950

Sea Level Rise: 11 inches Since 1922

Strong Storms: 55% Since 1958



Projected Climate Changes by the 2090s

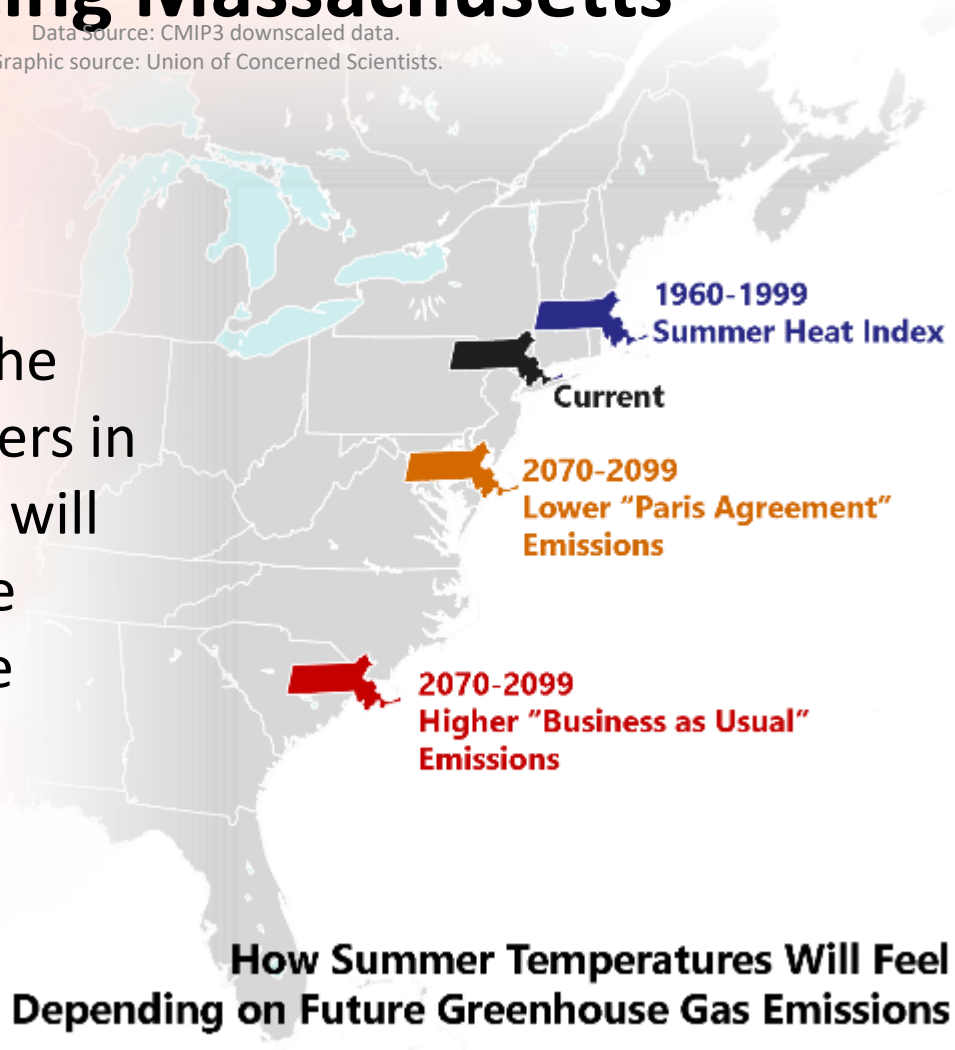


Source: Northeast Climate Science Center,

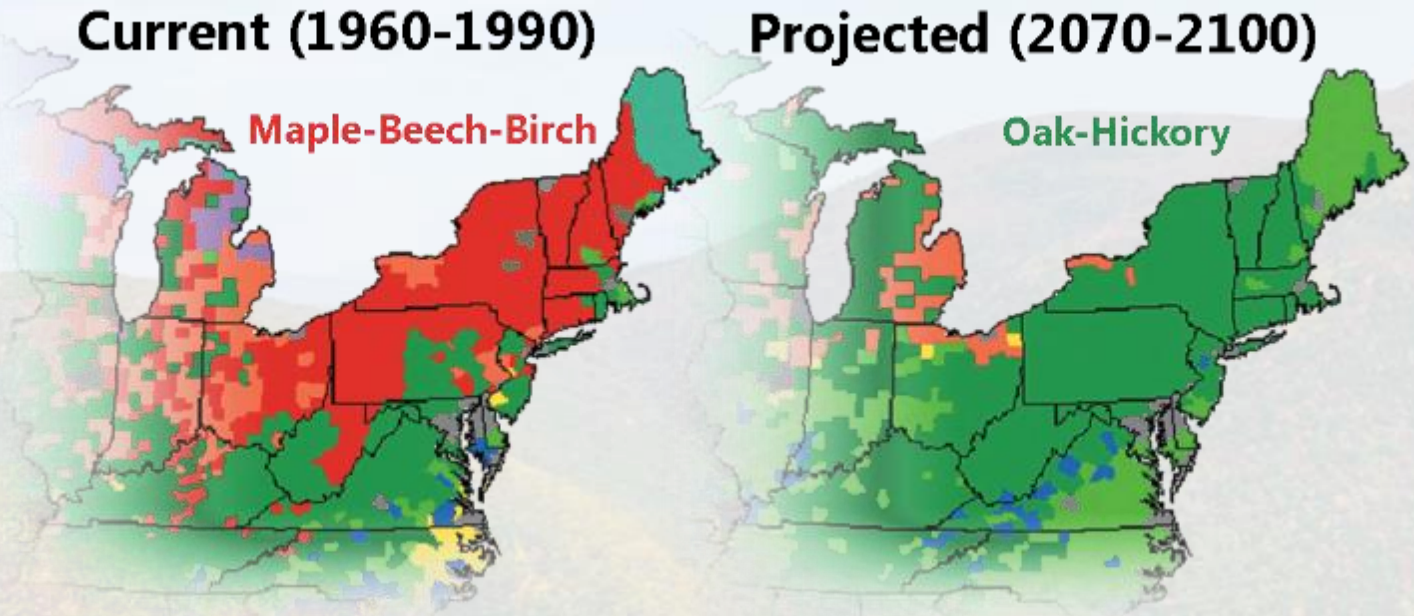
Migrating Massachusetts

Data source: CMIP3 downscaled data.
Graphic source: Union of Concerned Scientists.

By the end of the century, summers in Massachusetts will "feel" more like summers in the South.



Future Forests



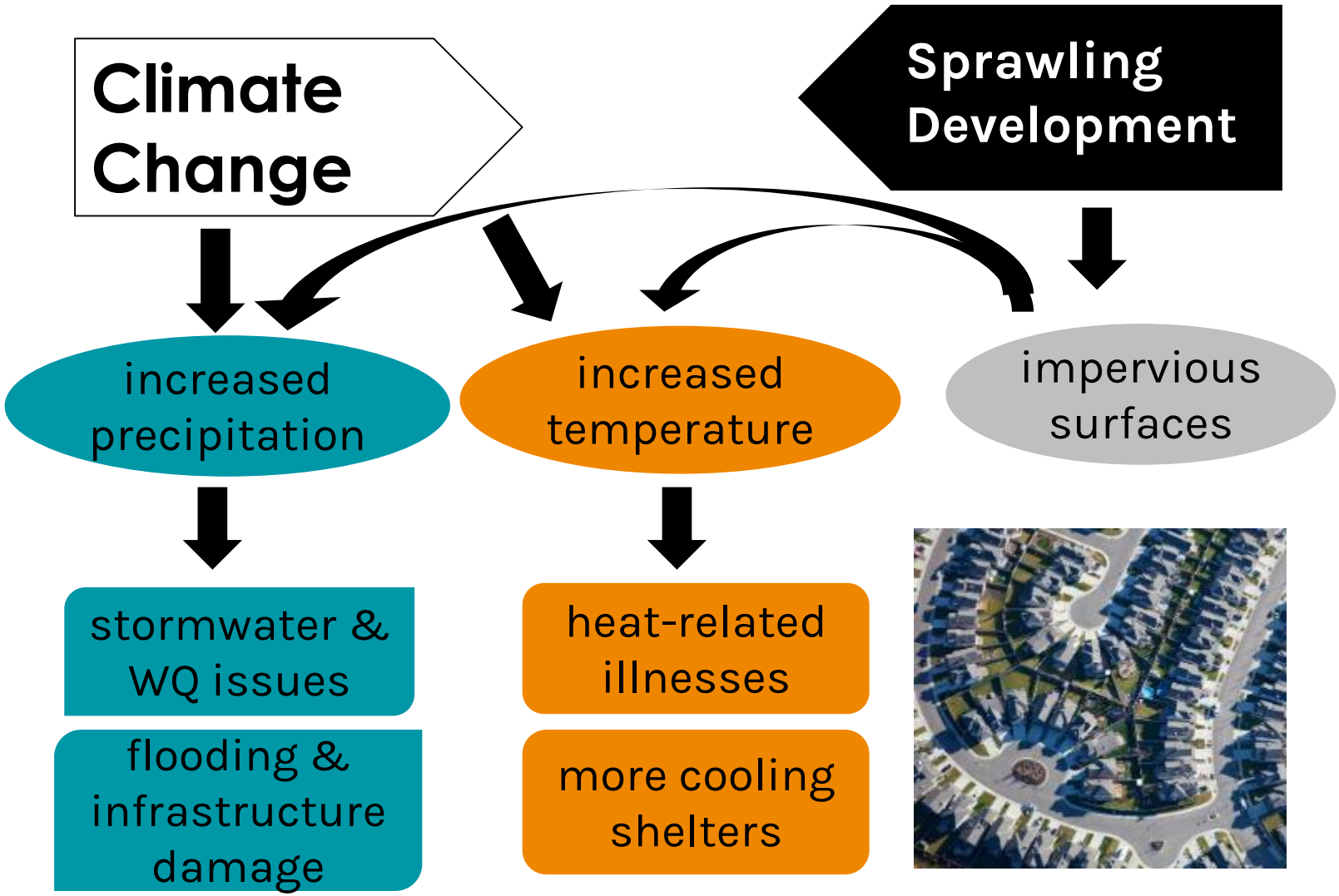
Maple, Beech, Birch → **Oak, Hickory**

Graphic source: USGCRP, 2009

Change in 24-hour, 100-year Design Storms (inches)

	NOAA TP-40	NOAA Atlas 14	Change
Taunton	6.9”	7.7”	**12%**
Boston	6.6”	7.8”	**18%**
Worcester	6.5”	7.6”	**17%**

NOAA Atlas 14: http://hdsc.nws.noaa.gov/hdsc/pfds/


Climate Change
Sprawling Development
increased precipitation
increased temperature
impervious surfaces
stormwater & WQ issues
flooding & infrastructure damage
heat-related illnesses
more cooling shelters

Conserving natural landscapes is our first line of defense

We can also integrate and restore nature in our existing infrastructure to adapt to the impacts of climate change, and remain resilient to natural hazards

Nature-based Solutions (NBS)

Nature-Based Solutions *use* natural systems, *mimic* natural processes, or *work in tandem with* traditional approaches to address natural hazards like flooding, erosion, drought, and heat islands.

Green Infrastructure

Low Impact Development (LID)

Nature based solutions at every scale

Rural, suburban, or urban

Conserve available open space providing ecosystem services

Integrate concepts into new development at neighborhood scales

Restore resilience in urban areas at site specific scale

Every Decision Counts: Tools for Shaping Your Community

- Funding for adaptation
- Institutionalize strategies for resilience

- Municipal Vulnerability Preparedness **(MVP)**
- **Bylaw Review**

Municipal Vulnerability Preparedness (MVP)

Bylaw Review Tool

Factors	Conventional	Better	Best
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE			
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards
Require native vegetation and trees	Require or recommend invasive species	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings

Planning Document	What does it do?	What should I look for?	How do I change it?
Master Plan (MP)	Comprehensive guiding document that sets **community goals**	• **Current**, reflects changing priorities? • Prioritizes **sustainable development?** • Defines specific measures to retain local **community character** & values?	Planning Board often with assistance of a special Master Planning Committee
Open Space and Recreation Plan (OSRP)	Identifies local **natural** resource and recreation priorities and plans for protection and management	• **Current**, reflects current parcel status, priorities? • Allows variety of OS uses: recreation, conservation? • Considers **land and water** resources? • Consider **local context** of existing OS?	Conservation Commission, often with assistance of a special OS Committee. Must meet state guidelines
Zoning Bylaw/ Ordinance	Determines how parcels may be used and sets **dimensional requirements**	• Focuses development near **existing infrastructure**, away from natural resources? • Allows **flexible dimensional requirements?** • Prioritizes protection of **natural features?** • **Limits clearing/grading,** impervious areas? • Requires **LID** features?	Adoption and revision requires approval through Town Meeting (TM) or City Council
Open Space Residential Design (OSRD)	Type of conservation development that maximizes **protection of natural resources**	• Allowed **by right** (not by special permit)? • Requires ≥ **50% of open space** protection on a parcel? • References **priority areas** from local MP/OSRP? • **Connects OS** within and on adjoining parcels? • Allow **flexible dimensional** requirements? • Requires **LID** features?	Adoption/revision requires approval through TM/City Council
Site Plan Review	Reviews **development design** for consistency with local standards	• **Limits clearing/grading,** impervious areas? • Requires **LID** features? • Allows easy **siting of LID** features, including near roadways and in parking islands?	Adoption requires approval through TM/City Council
Stormwater or LID Bylaw	**Reduces stormwater pollution** and/or specifically encourages LID	• Requires **LID** features? • **Discourages curbing** and limits impervious areas? • Prohibits **topsoil removal?** • **Limits clearing/grading?**	Adoption requires approval through TM/City Council

Municipal Vulnerability Preparedness (MVP)



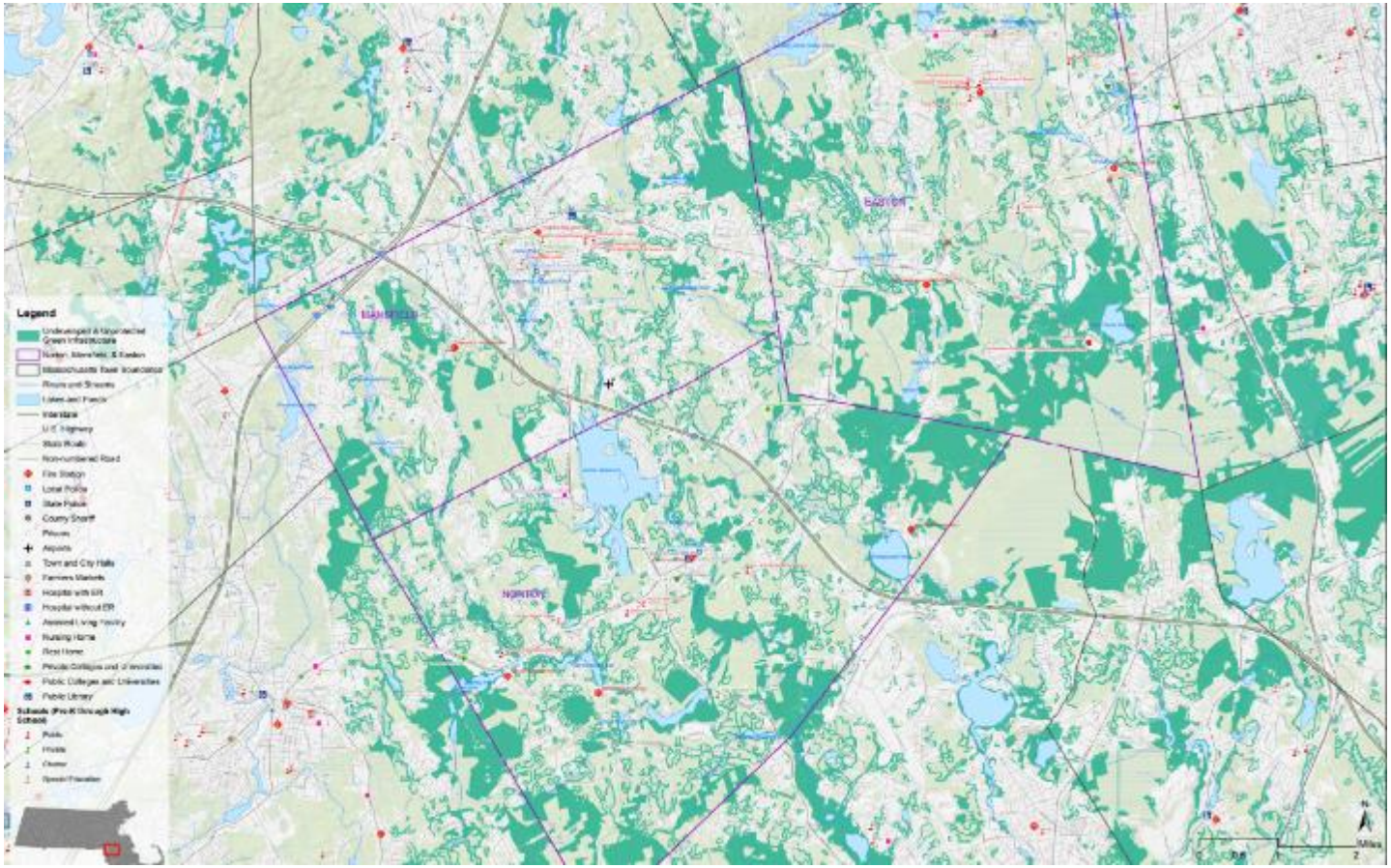
State and local partnership to build resiliency to climate change

1. Engage Community
2. Identify CC impacts and hazards
3. Complete assessment of vulnerabilities & strengths
4. Develop and prioritize actions
5. Take Action

www.ResilientMA.org State Climate Change Clearinghouse

Regional Planning for Shared Resources

- Example: Sole source aquifer serves 5 towns
- Comprehensive identification of assets and vulnerabilities
- Your actions impact your neighbors – so team up!



Resilient Taunton Watershed Network (RTWN)

Two MVP Grant Opportunities

Planning Grant

Open now, rolling applications through May 3, 2019

$15,000 - $100,000

Completed by June 30, 2020

Pool of $1M

Action Grant

Open now, rolling applications through April 19, 2019

$25,000 - $2,000,000

Completed by June 30, 2020

Pool of $10M

Your Participation Is What The Process Is Made Of!

- Plans get their emphasis from whoever shows up to the planning sessions
- ***You*** are the local land experts
- Leverage existing work and promote climate resilience in your community!

EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS

Matthew A. Beaton, Secretary

Grant Announcement

Commbuys Bid # BD-18-1042-ENV-ENV01-25921

Request for Responses (RFR) ENV 18 POL 03

Dated: April 13, 2018

MUNICIPAL VULNERABILITY PREPAREDNESS GRANT PROGRAM (MVP)
IMMEDIATE NEEDS ROUND FY 18

MVP ACTION GRANT

1. Grant Opportunity Summary

A. PROPOSALS SOUGHT FOR: Financial and technical assistance for municipalities who have received designation from the Executive Office of Energy and Environmental Affairs (EEA) as a Climate Change Municipal Vulnerability Preparedness (MVP) Community ("MVP Community") to implement priority adaptation actions identified through the MVP planning process, or similar climate change vulnerability assessment and action planning that has led to MVP designation.

B. OVERVIEW AND GOALS: The Municipal Vulnerability Preparedness Grant Program supports Executive Order 569, "Establishing an Integrated Climate Change Strategy for the Commonwealth," by providing direct funding and technical support to cities and towns to complete and implement community-driven climate change vulnerability assessments and

l climate-related

Grants, which
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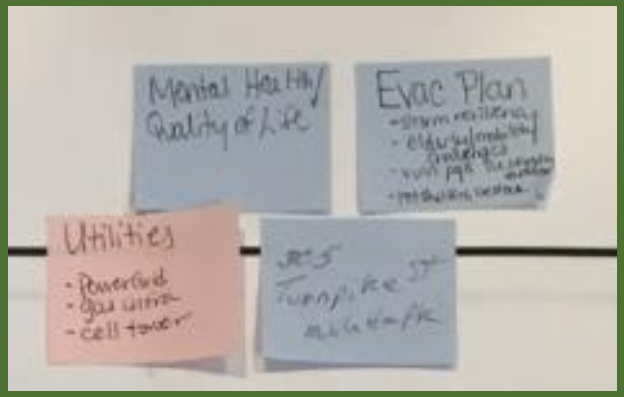
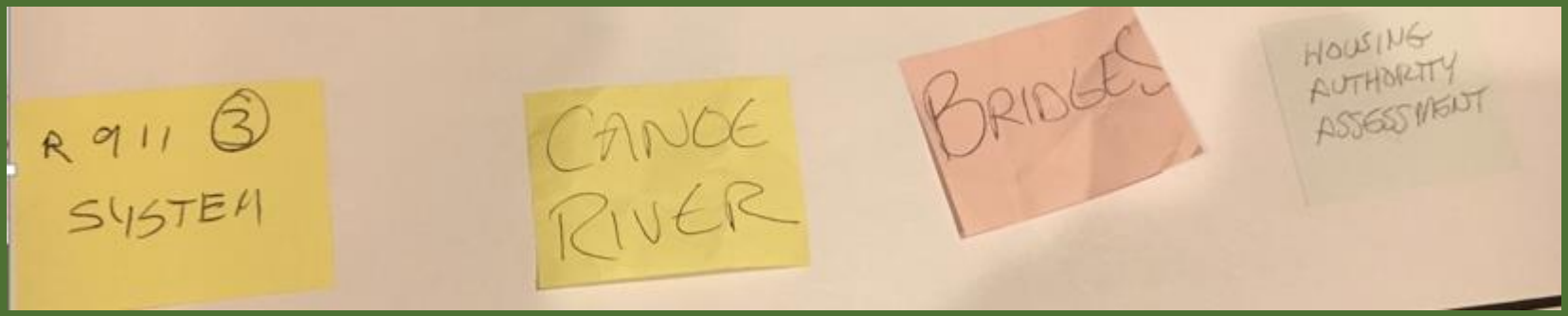
ns identified by
ne weather, sea
See further detail
ons or strategies
ystems to improve

"Projects that propose **nature-based solutions** or strategies that rely on green infrastructure or conservation and enhancement of natural systems to improve community resilience will **receive higher scores**."

Everyone adapts differently

Resilience planning can include…





Thank You!

Ariel Maiorano

Shaping the Future of Your
Community Program,
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Engaging Woodland Owners

in Climate-Informed Forestry

Massachusetts Land Conservation Conference

March 23, 2017 - Worcester, MA

The Urgent Climate Challenge

IPCC report:

12 years to reduce carbon emissions – Need for ecosystem adaptation

40 scientists, Climate & Land Use Alliance: Focus on forests and forestry for solutions

National Research Council: forestry can help meet the challenge

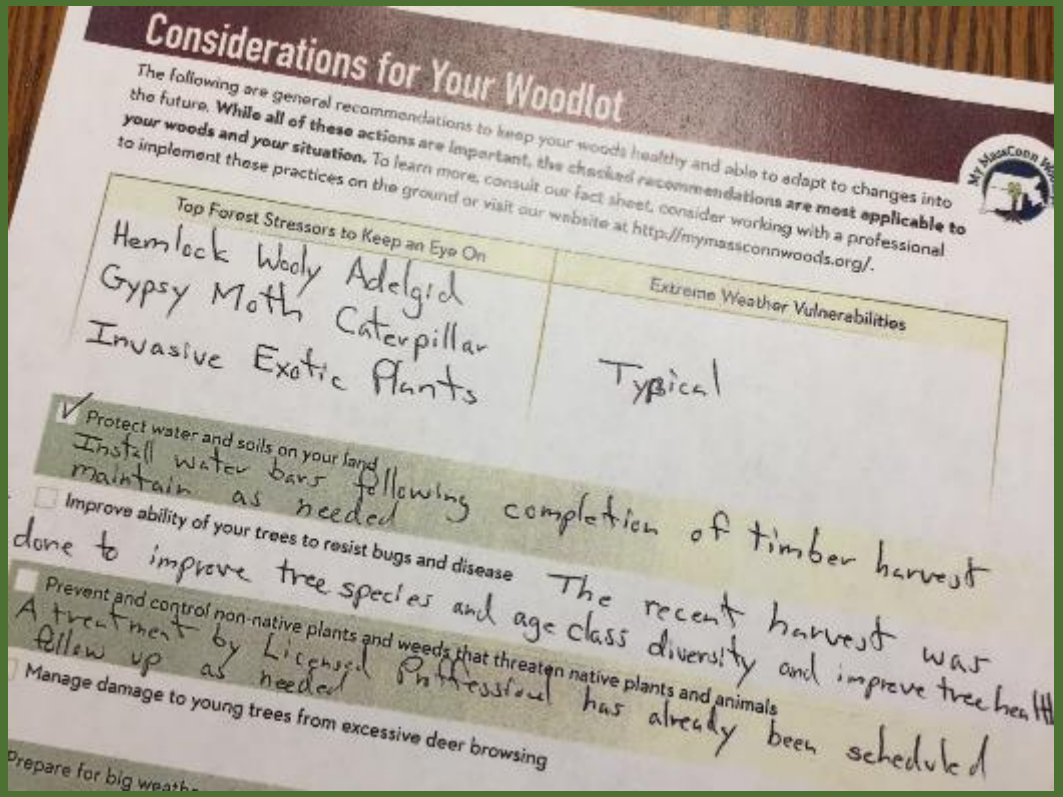
TWC: Aftermath Hurricane Michael, Marianna, Fla., 10/11/18. (Charlotte Kesl for The Washington Post via Getty Images)

NEFF's Exemplary Forestry

- Measurable metrics defined for the Acadian Forest in Maine
- Working on developing standards for Southern New England forests

- Enhancing environmental values from water quality to carbon sequestration
- Improving wildlife habitat and protecting biodiversity
- Producing more and better quality wood locally

Exemplary Forestry… Addresses Climate



Considerations for Your Woodlot

The following are general recommendations to keep your woods healthy and able to adapt to changes into the future. **While all of these actions are important, the checked recommendations are most applicable to your woods and your situation.** To learn more, consult our fact sheet, consider working with a professional to implement these practices on the ground or visit our website at http://mymassconnwoods.org/.

Top Forest Stressors to Keep an Eye On	Extreme Weather Vulnerabilities
Hemlock Wooly Adelgid Gypsy Moth Caterpillar Invasive Exotic Plants	Typical

- [x] Protect water and soils on your land — Install water bars following completion of timber harvest maintain as needed
- [ ] Improve ability of your trees to resist bugs and disease — The recent harvest was done to improve tree species and age class diversity and improve tree health
- [ ] Prevent and control non-native plants and weeds that threaten native plants and animals — A treatment by Licensed Professional has already been scheduled follow up as needed
- [ ] Manage damage to young trees from excessive deer browsing

Prepare for big weath…

Addressing climate change as the knowledge base becomes available, **increasing the resilience to, adaptation for, and mitigation of, climate change.**

Opacum Land Trust's property – climate-informed forestry Checklist

My MassConn Woods

MassConn Goal:
80,000 acres of new conservation land –
or 33% of region.

Wildlands & Woodlands Goal:
30 million acres by 2060 –
or 70% of New England.

Why Engage Landowners?

We're working in larger regions

and wider partnerships with bigger goals in mind:

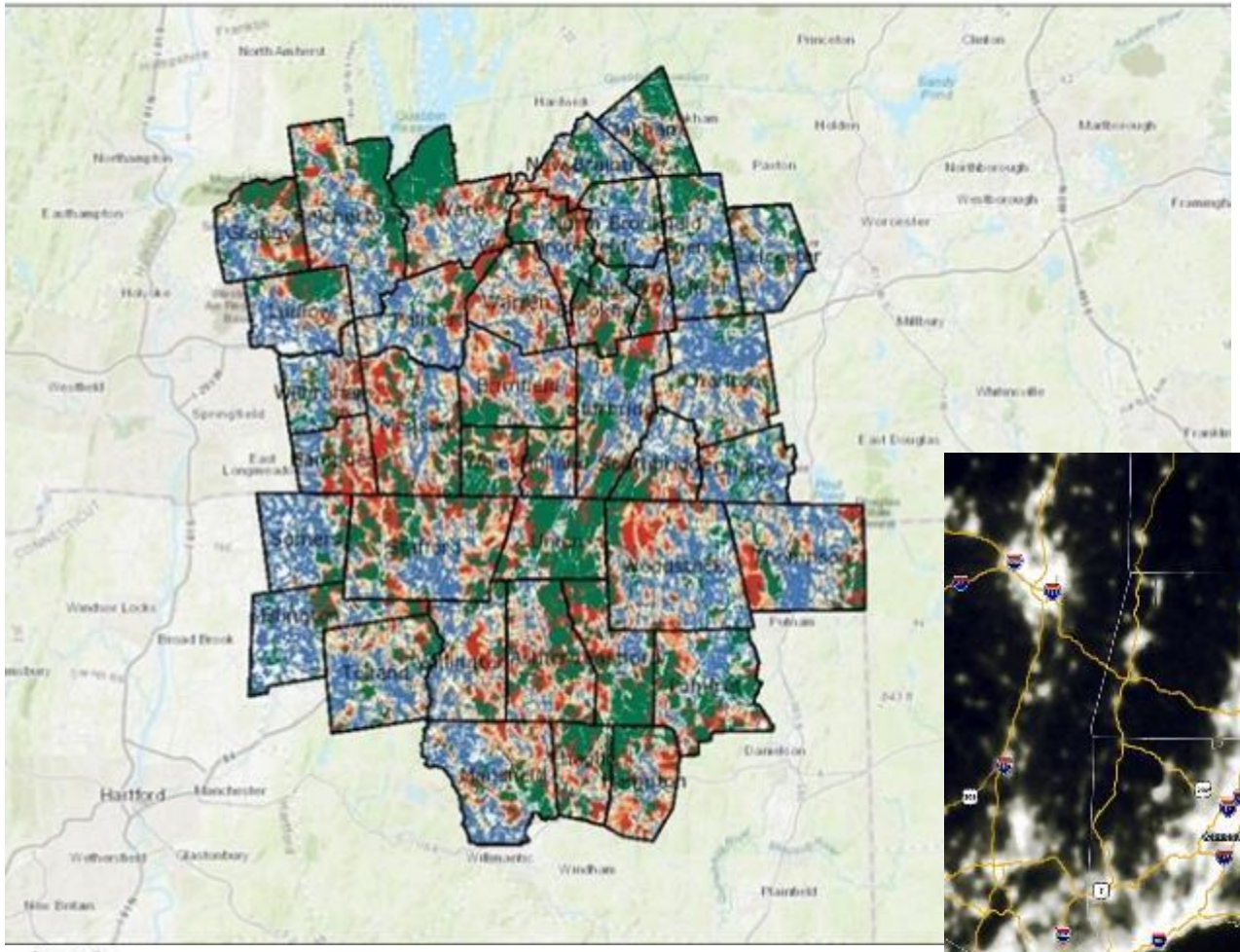
Increasing the pace - and scale - of conservation

Improving forest health & resilience

There is a Disconnect:

Even with all of our historic efforts, private landowners remain largely unaware of resources available to help them make key decisions

MassConn Sustainable Forest Partnership Conservation Priority Map



My MassConn Woods

Forest Service Grant to NEFF

Parcel-level Climate Adaptation in the MassConn Woods: Tools for Foresters, Actions by Landowners

OUTCOMES:

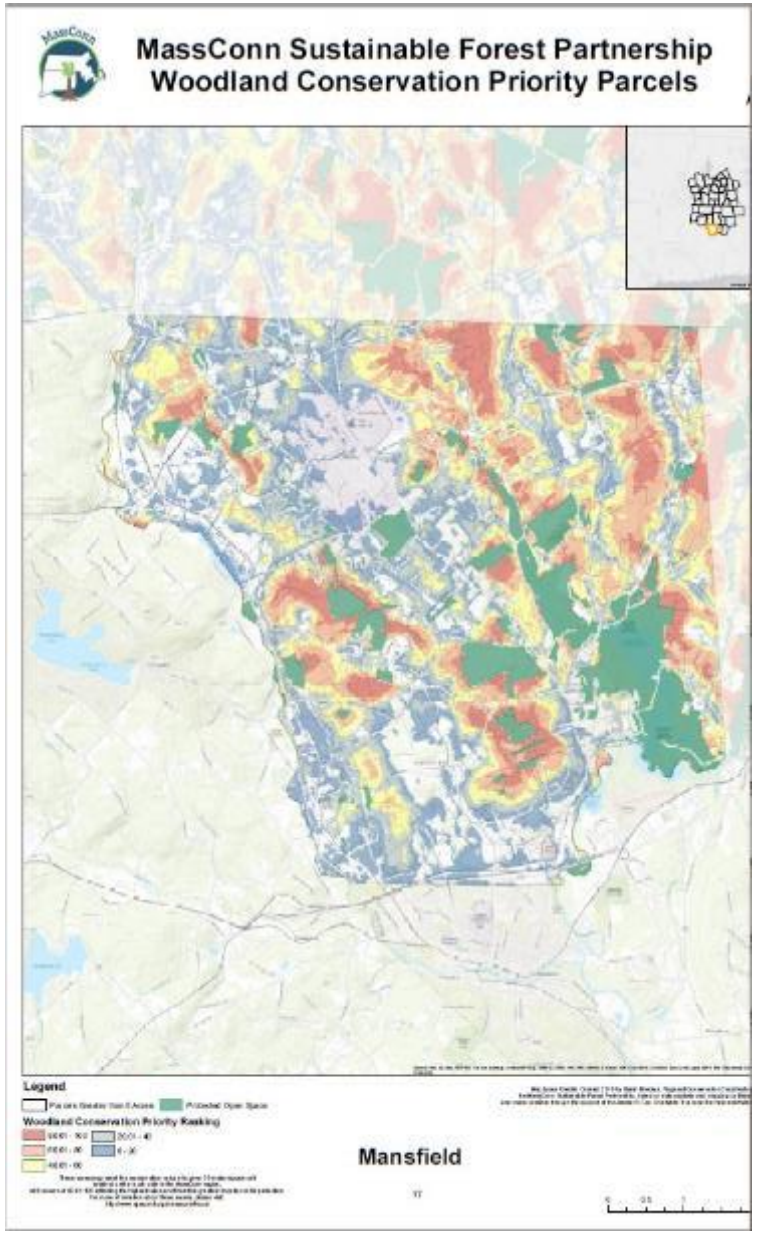
- Complete MassConn outreach for forest resilience assessments – Prioritizing parcels that rank high for TNC Climate Resilience data (75 Checklist visits)
- Train 25 more CT & MA foresters
- Adaptation assessments on 2500 acres; 50 owners with management plan or added climate component, land trust demo sites

Targeting Outreach

- Heat map: MassConn Ecological Priorities – Red = top 20%

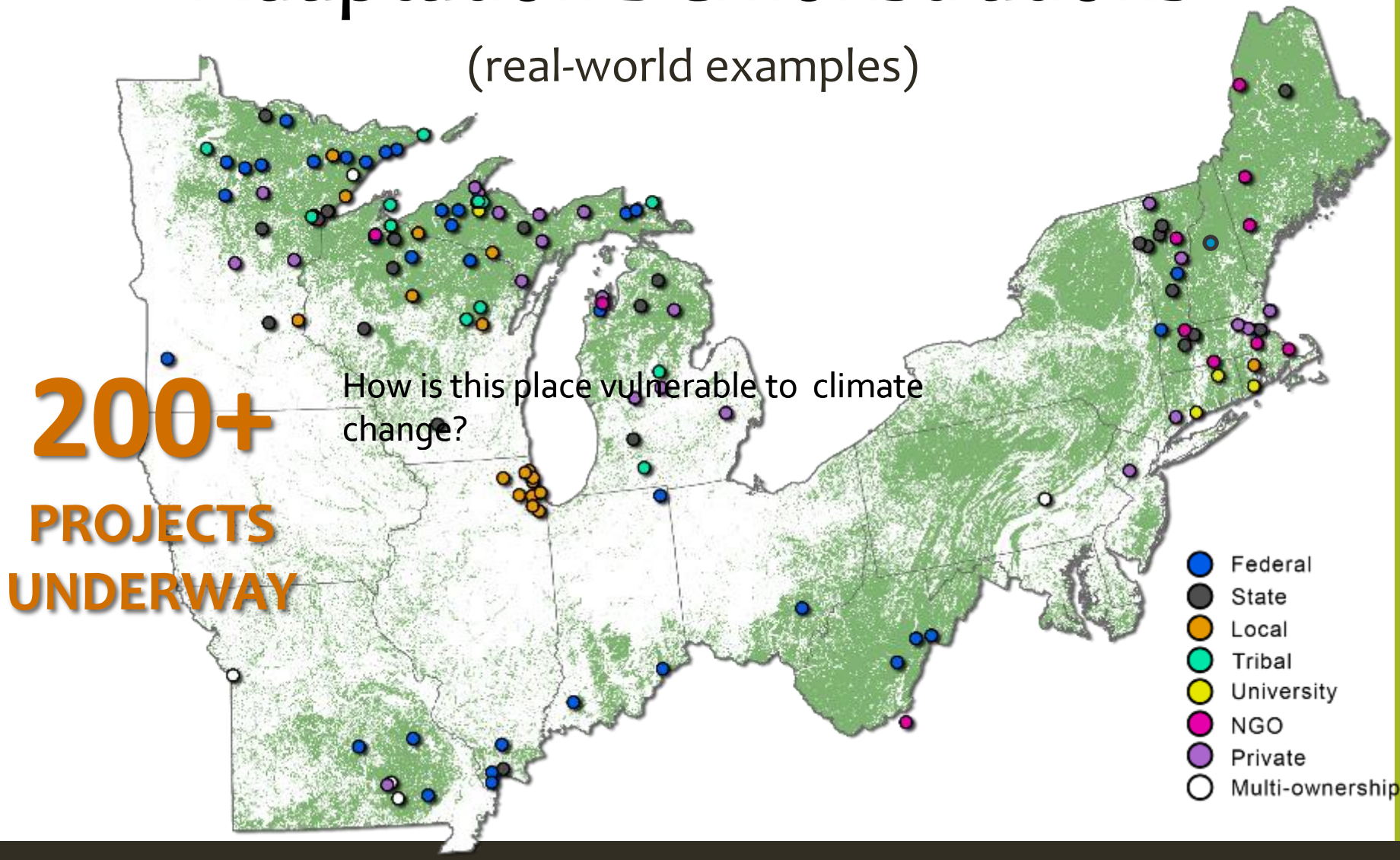
- Tool for strategic landowner outreach:

  Using GIS data to pull mailing list for outreach from highly resilient parcel ownerships –
  25+ acres



Adaptation Demonstrations

(real-world examples)

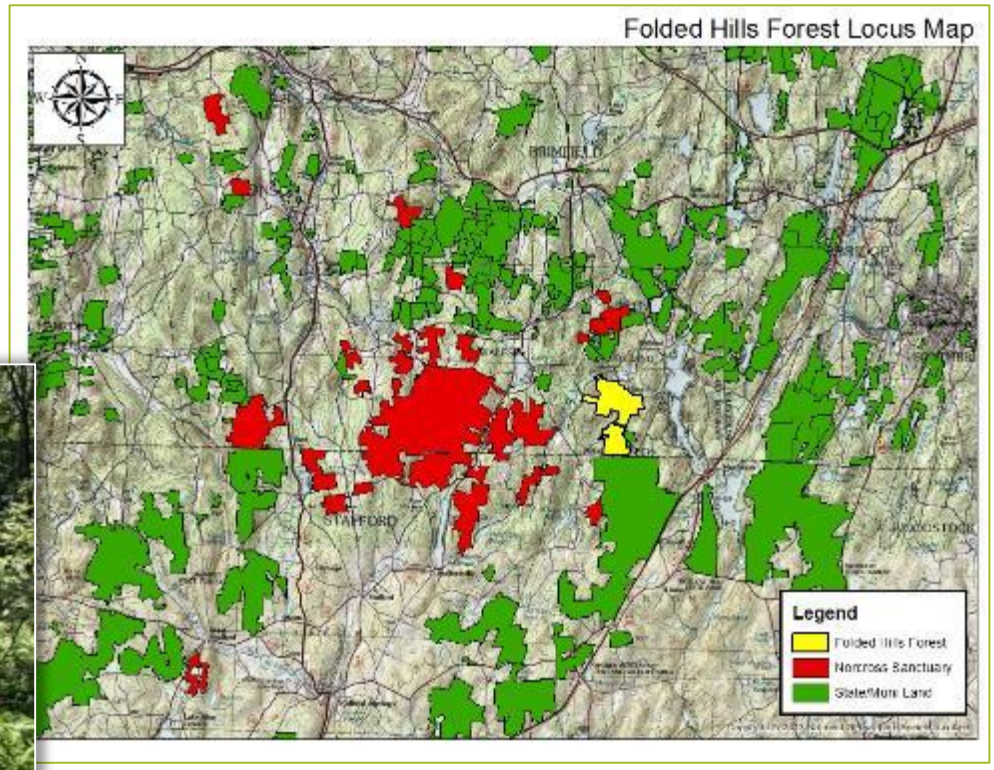


www.forestadaptation.org/demos

How is this place vulnerable to climate change?

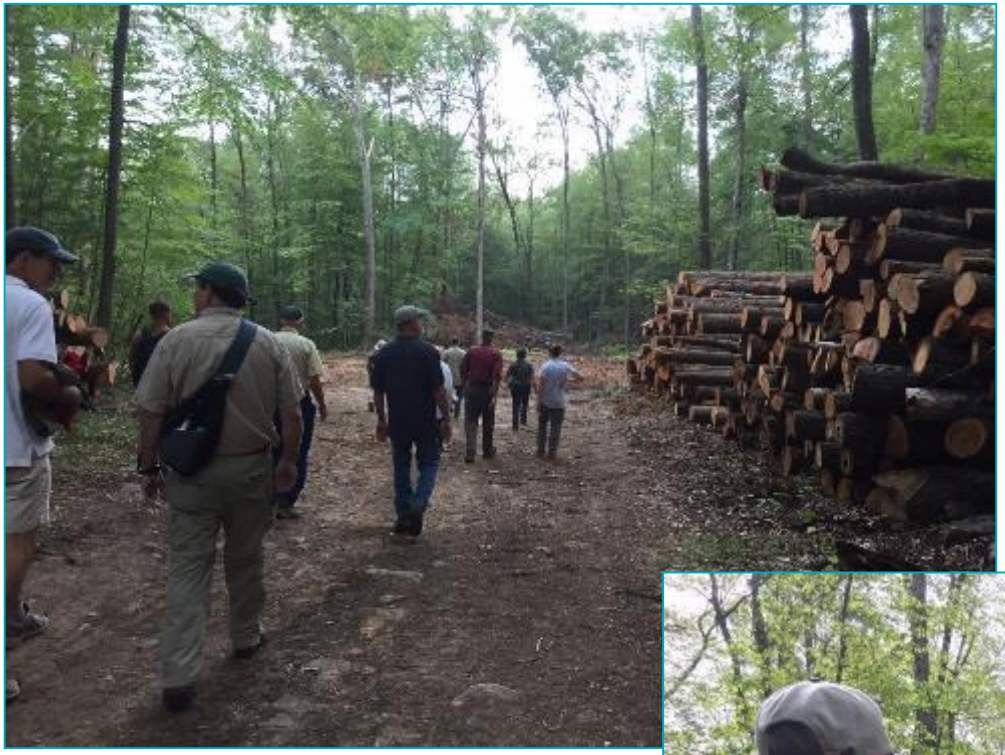
Norcross Wildlife Sanctuary – Demonstration site

- Privately-managed refuge with >8,000 acres in MA and CT
- Heart of Emerald Forest within MassConn region
- Forest management on portions of Sanctuary
- Upland & aquatic habitats



What opportunities or challenges does climate change present?

- Extreme weather events could create challenges to forest management operations (-), but could also enhance structural diversity (+)
- Many insect pests and invasive plants may become more problematic in the future, especially if forests are stressed from changes in the climate (-)
- Loss of hemlock and other important species reduce cover and food available for many important wildlife species (-)
- Extreme rain events could damage culverts and forest roads, negatively impacting water quality (-)



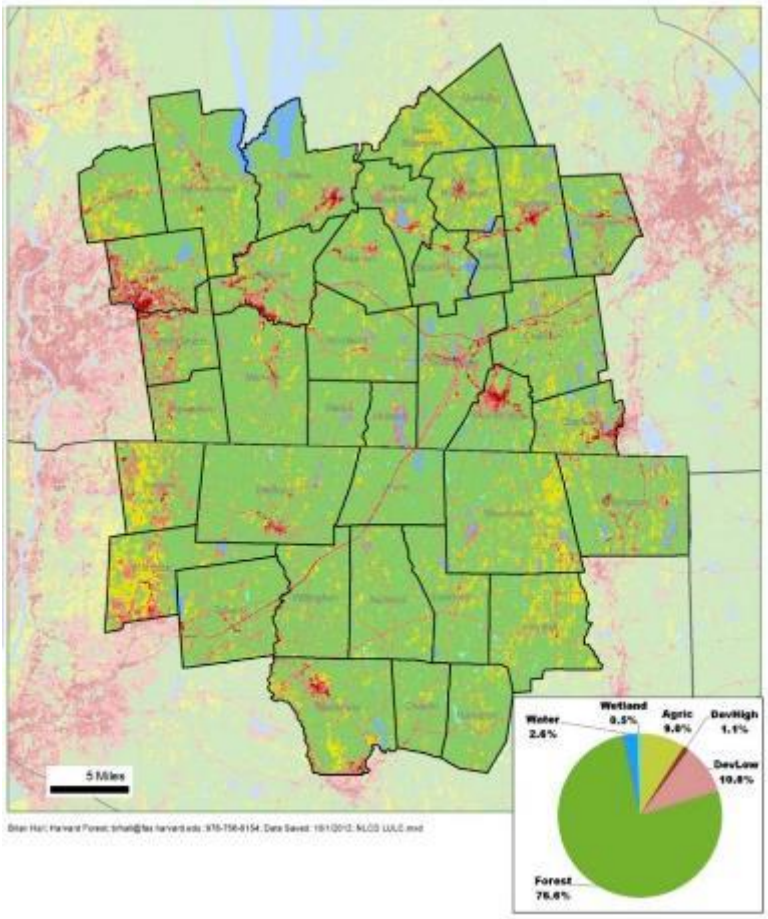
Harvest & Habitat Walks at

Norcross Sanctuary

Folded Hills Forest
40-acre management site
August 2016

Whaleback Ridge Forest
20-acre harvest site
May 2016

How do we incorporate climate change into stewardship?



Help foresters

talk to landowners.

Equip Foresters to Work one-on-one

Climate Change & Our Forests

Guidance for Foresters and Land Managers

Forests are a defining feature of the landscape in "the MassConn Woods" of northeastern Connecticut and south central Massachusetts. These natural systems, so crucial to our history and current quality of life, provide many environmental, economic, and social benefits to the region.

These forests, primarily in private family or individual ownership, will increasingly be affected by a changing climate. Understanding these potential impacts is an important first step to sustaining healthy forests in the face of changing conditions.

THE CLIMATE HAS CHANGED

The Earth's climate is changing. Many trends have been tracked across the globe, some reaching back hundreds of thousands of years. Although the climate has always changed, the changes that have occurred over the past century are more profound than anything that has happened since the start of human civilization and have important effects on our current environment.

The average annual temperature in the area has risen more than 2°F since the late 1800s.[1,2] Temperatures warmed in all seasons, with winter warming by more than 3°F. Temperature records show that warming has accelerated in recent decades.

Winter temperatures increased by more than 3°F since the turn of the last century, and heavy rainfall events have become more common.

Precipitation also increased during this period, ranging from increases of approximately 3 inches across most of Connecticut to more than 5.5 inches in central Massachusetts.[1] The greatest increase in precipitation has been in the fall, with smaller increases during spring and summer. Extreme precipitation events have increased substantially, particularly over the past several decades[2].

CHANGES WILL CONTINUE

It's impossible to predict exactly what will happen in the future, so global climate models can help us understand how the climate may react under various scenarios. There are many different models available and they provide an opportunity to understand the range of potential changes that may occur depending on the carbon-intensity of future energy sources.

Temperatures will increase

Climate models agree that temperatures will increase across all seasons in the region over the next century. The projected increase in annual temperature ranges from 3 to 10°F by the end of the century, depending upon future scenarios.[3,4] Growing seasons will continue to get longer as a result of warmer temperatures.

1

Considerations for Your Woodlot

The following are general recommendations to keep your woods healthy and able to adapt to changes into the future. While all of these actions are important, the checked recommendations are most applicable to your woods and your situation. To learn more, consult our fact sheet, consider working with a professional to implement these practices on the ground or visit our website at http://mymassconnwoods.org/.

Top Forest Stressors to Keep an Eye On	Extreme Weather Vulnerabilities

- ☐ Protect water and soils on your land
- ☐ Improve ability of your trees to resist bugs and disease
- ☐ Prevent and control non-native plants and weeds that threaten native plants and animals
- ☐ Manage damage to young trees from excessive deer browsing
- ☐ 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
- ☐ Promote a diversity of tree species
- ☐ Promote a diversity of tree sizes
- ☐ Protect rare or sensitive plant & animal communities
- ☐ Consider how your current trees will react to future conditions and which tree species you might want to promote
- ☐ Monitor your woods and the effect of different management tactics

What actions can help systems adapt to change – on *your* lands?

MassConn's ***Considerations for Your Woodlot*** *"Checklist"*

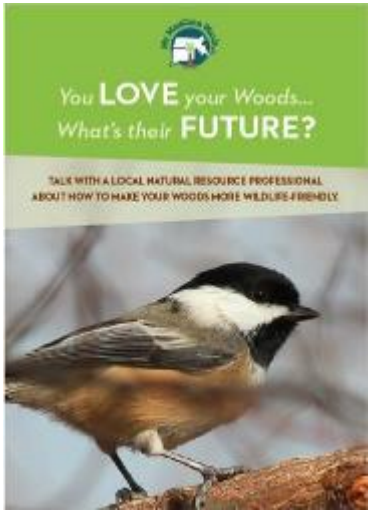
- Protect water and soils on your land.
- Protect rare or sensitive plant and animal communities.

- Improve ability of your trees to resist bugs and disease.
- Prevent and control non-native plants and weeds that already threaten native plants and animals.

- 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.

- Promote a diversity of tree species and tree sizes.
- Consider how your current trees and new trees that you may want to plant will react to future conditions.

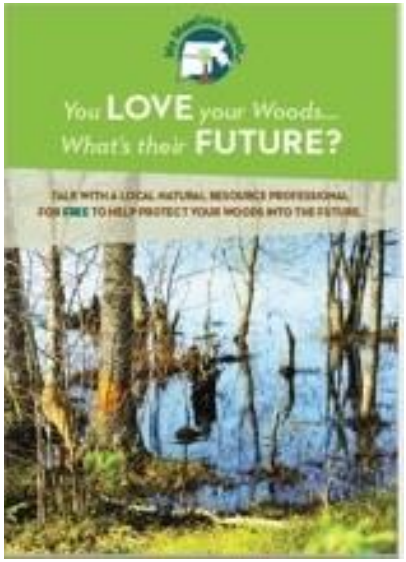
Talking Climate Change…
What messages resonate?



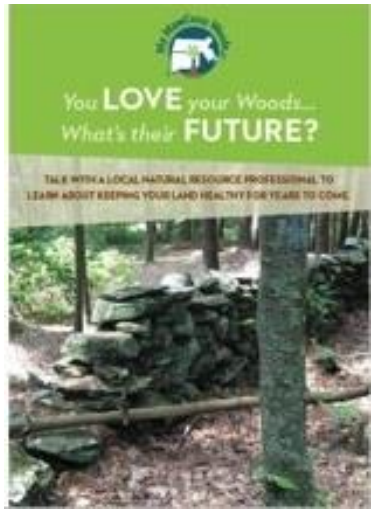
Wildlife

Direct mail to 613 MA, 424 CT owners of 30+ acres across 38 towns

Also offered “free” forester visits at MassConn events and Woodland Ambassador workshops

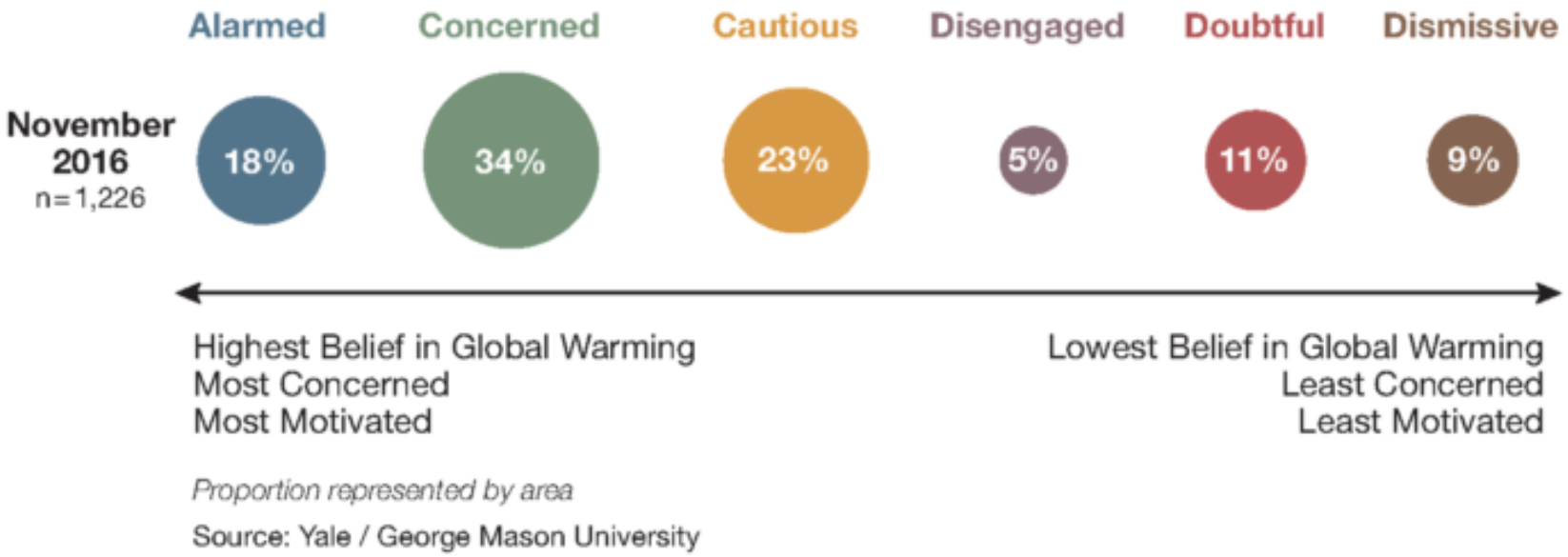


Extreme Weather

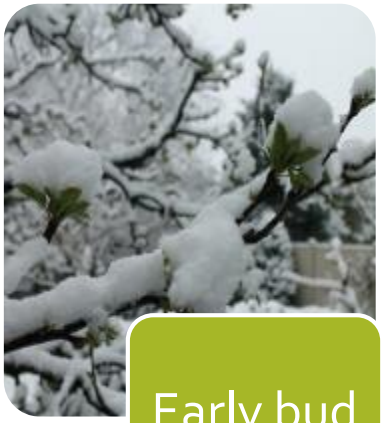


Healthy Woods

Know your audience.
What do they really believe?



Find common ground.



Early bud break

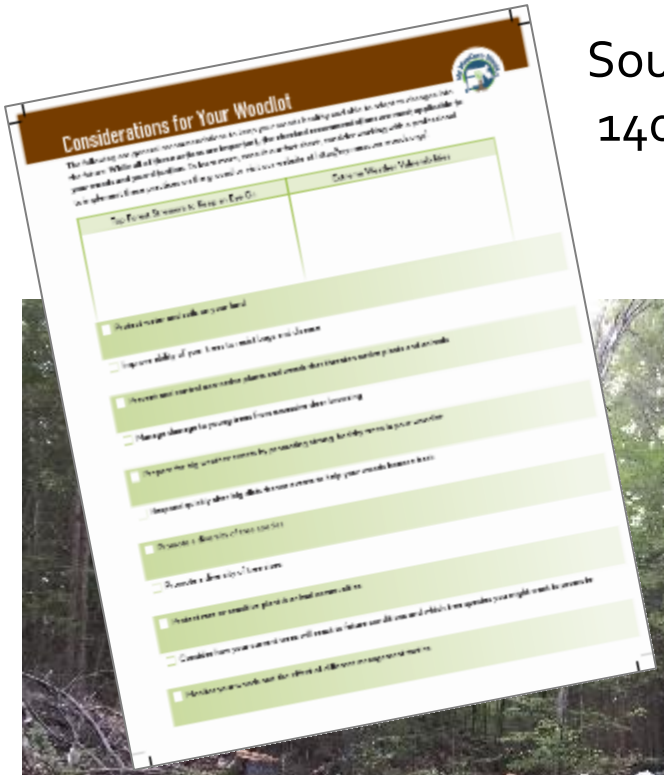
Wash-outs

Extreme weather

Moisture stress

A “Four’easter” March 2018

Considerations for Your Woodlot

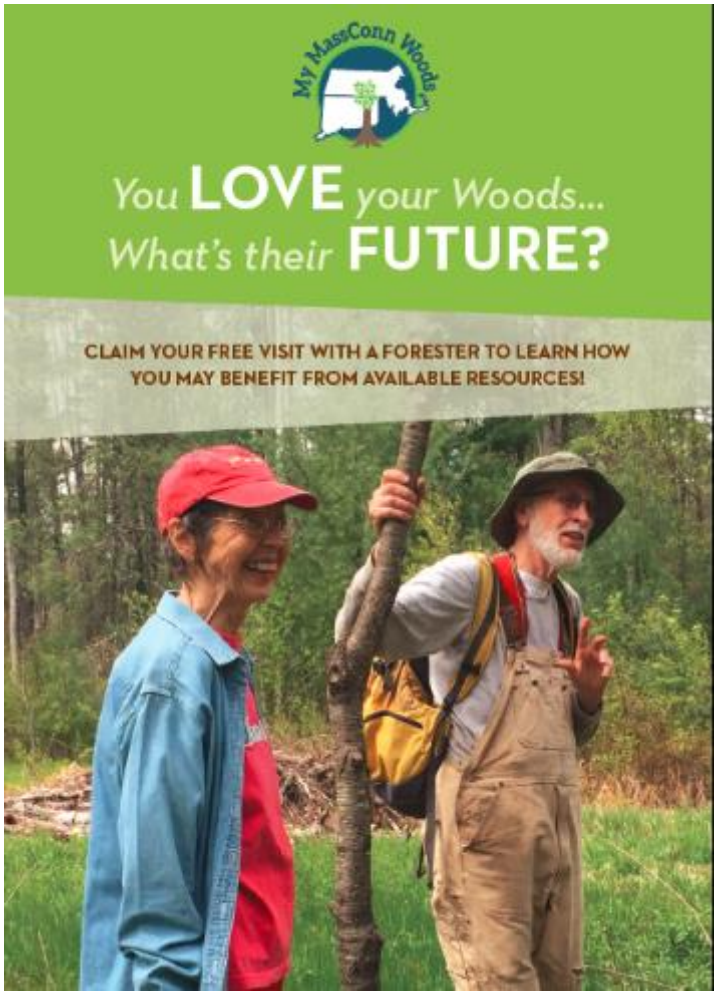


Southbridge/Dudley, MA
140 acres

Climate-Informed Practices:

- ✓Treated/removed invasives (12 acres - barberry, knotweed, multiflora rose)
- ✓Timber harvested to diversify age classes & species (40 acres)
- ✓Clear-cut with reserves for wildlife habitat (4.5 acres)

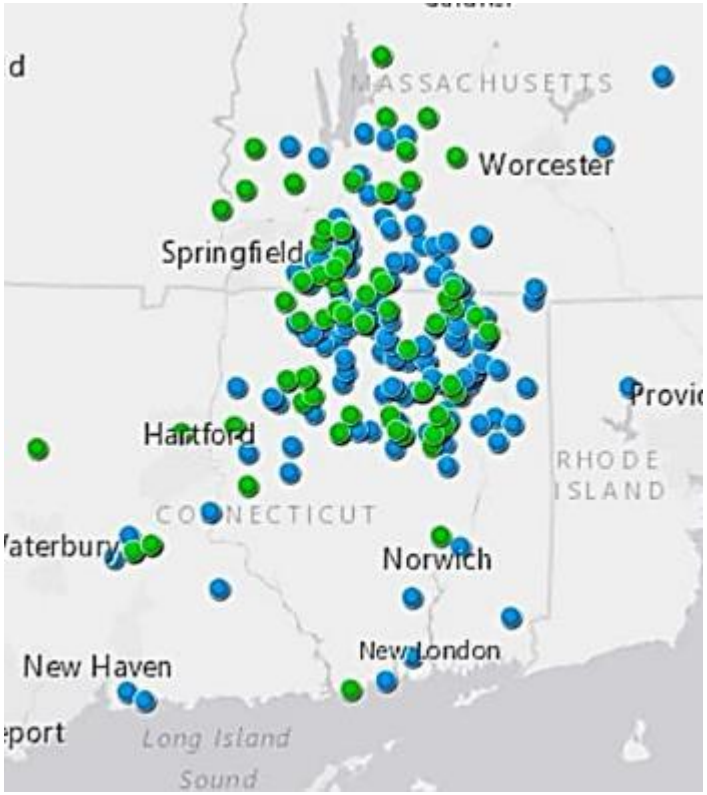
Forester Visits Continuing 2019



- 53 (of 75) climate-informed visits complete (to owners of 30+ acres)
- More than 3400 acres so far – surpassing grant goal (2500)

Integrating with RCPP

(Learning to love alphabet soup!)



MassConn Hand-Raisers 2014-17
(mailing address)

"DON'T MISS THIS OPPORTUNITY TO LEARN ABOUT NEW FUNDING IN YOUR AREA"

- **Referring visit responders to grant applications for forest management plans, Forester for the Birds habitat assessments**

Or

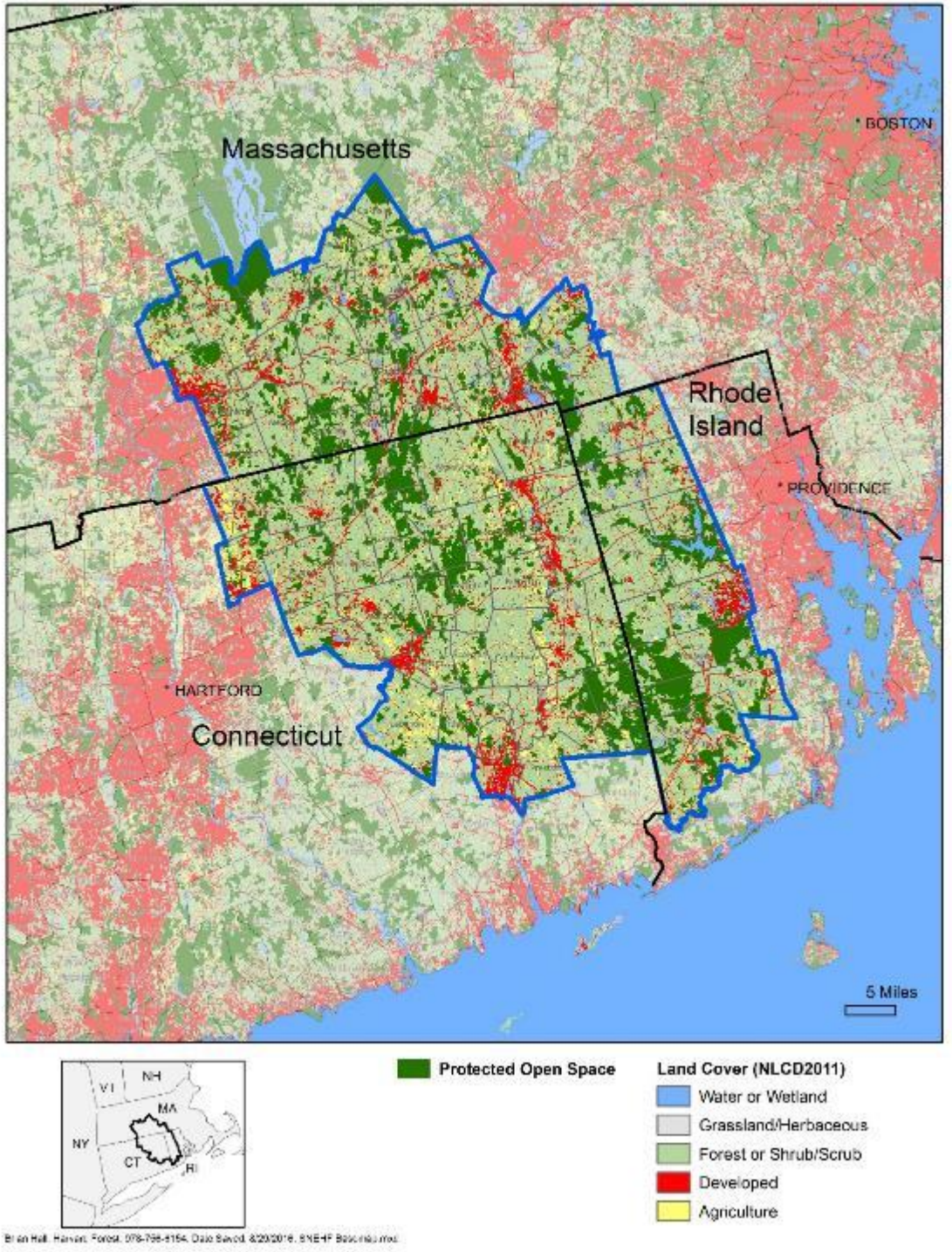
- **Traditional NRCS cost share for wildlife habitat, or invasives treatment or plans**

RCPP Funding

- Phase 2: $1.5 million for EQUIP
- Bird habitat assessments with each state Audubon; forest management plans & practices on about 6,000 acres

- To learn more: Visit The Last Green Valley web site

http://thelastgreenvalley.org/learn-protect/agriculture-forestry/southern-new-england-heritage-forest/



WOODLAND RESILIENCE WALKS
Landowners Leading…

Owners who got a Checklist visit,
taking action on their land…
And sharing their experience with other owners

Forestry with Birds – and Climate in Mind!

An Integrated Training Workshop for Foresters
May 1, 2019 - Brookfield, MA
CEUs offered

Mass Audubon

NIACS
Northern Institute of Applied Climate Science

How can *you* address climate resilience?

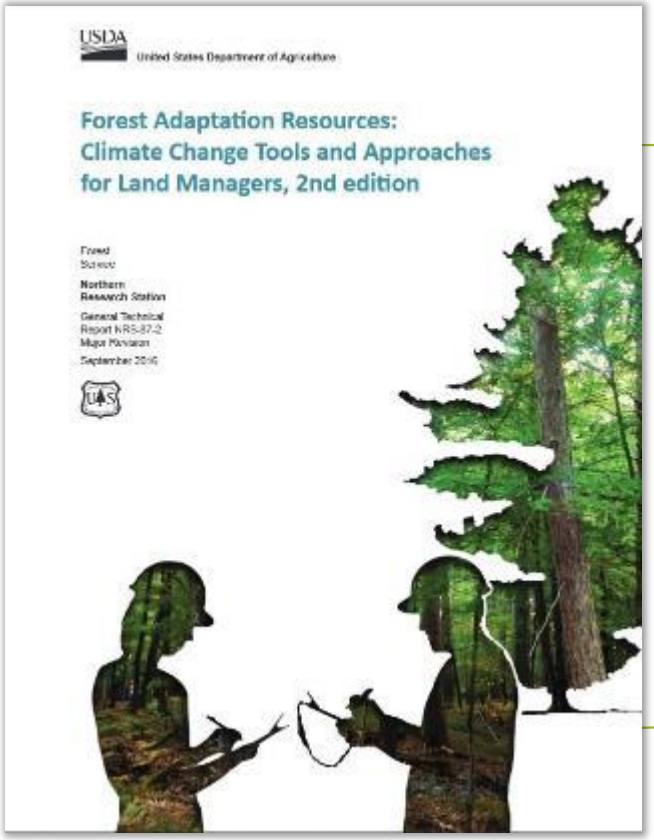
- Interested in planning for climate change on your conserved lands?

Tools are Available

-Parcel-level forest adaptation
-Climate messaging for owners

To access resources developed for the MassConn Woods RCP, visit:
http://www.forestadaptation.org/massconn

Forest Adaptation Resources



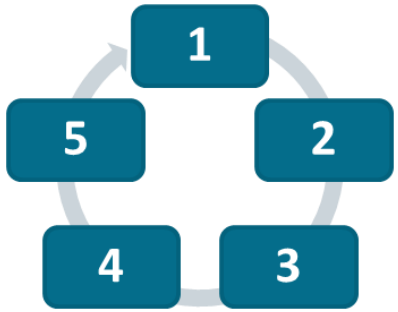
Swanston et al. 2016;
www.forestadaptation.org/far

Strategies & Approaches

Menu of adaptation actions

Adaptation Workbook

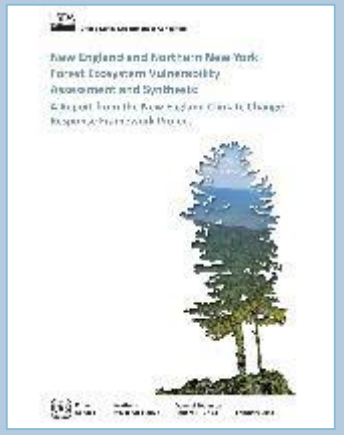
- Structured process to integrate climate change considerations into management
- Workbook approach



How is this place vulnerable to climate change?

- Review resources to understand regional impacts from climate change
- Consider your local site conditions to understand unique vulnerabilities and risks.

New report!



www.forestadaptation.org/ne-assessment

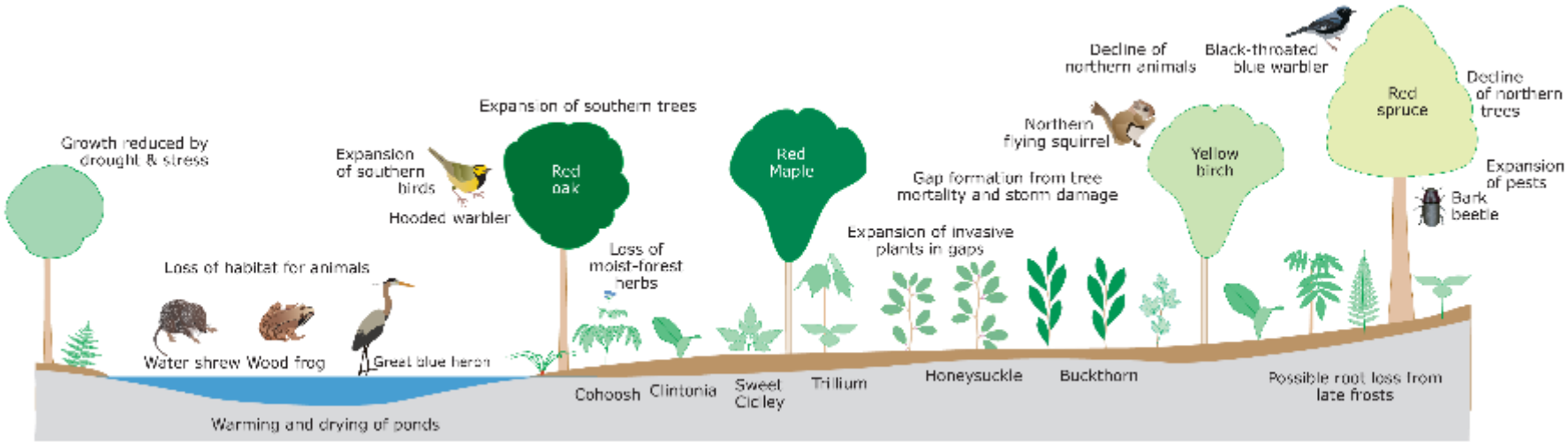


Illustration by Jerry Jenkins, from Rustad et al. 2012

What actions can be taken to

enhance the ability of a system to cope with change

and

meet land management goals and objectives?

What actions can help systems adapt to change?

Thinning:

Favor mast-producing species, increase diversity

Improve growth & health of remaining trees

What actions can help systems adapt to change?

Retain: Den trees, snags, coarse woody debris for habitat

Protect: Establish riparian wetland reserve

What actions can help systems adapt to change?

Infrastructure

Replace undersized culverts and bridges

Some populations of species of concern are declining

Wood Thrush