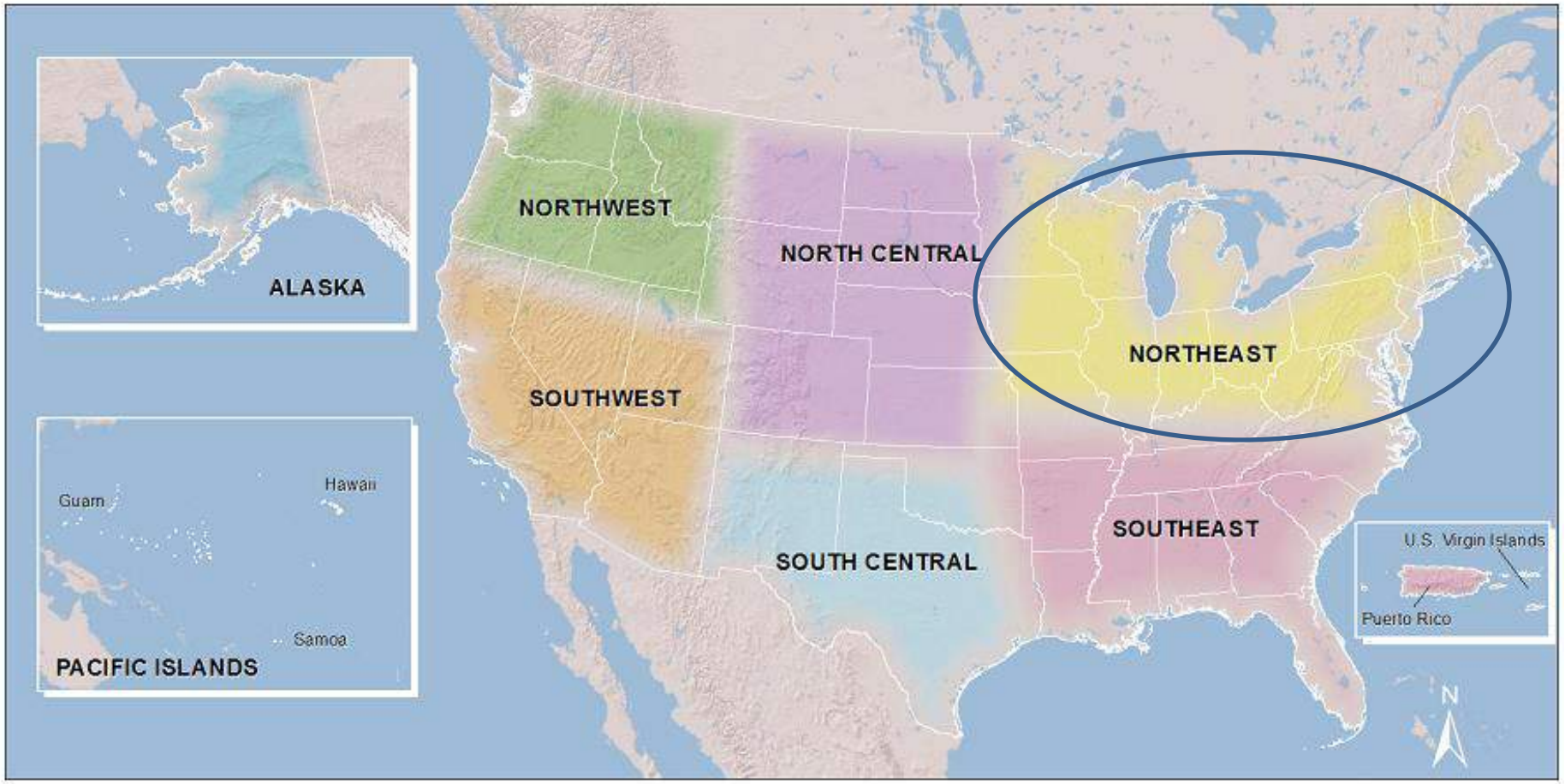
NE CSC
Northeast Climate Science Center

ACCNRS
April 19, 2016

http://necsc.umass.edu/

DOI Regional Climate Science Centers



- 8 science-based Climate Science Centers with joint research interests
- Multiple LCCs per CSC with overlap
- Coordination across boundaries is critical - research, education, and outreach
- Host institutions (PIs) are key to coordination

NE CSC
Northeast Climate Science Center

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Federal Director, USGS

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NE CSC Consortium Members

University of Massachusetts Amherst

Richard Palmer (Lead PI)
Ray Bradley (PI)
Curt Griffin (PI)
Keith Nislow (PI)

College of Menominee Nation

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Columbia University

Radley Horton (Lead PI)

Marine Biological Laboratory

Linda Deegan (Lead PI)

University of Minnesota

Anthony D'Amato (Lead PI)

University of Missouri Columbia

Frank Thompson III (Lead PI)

University of Wisconsin-Madison

Pete McIntyre (Lead PI)

Improving the way climate science informs resource management

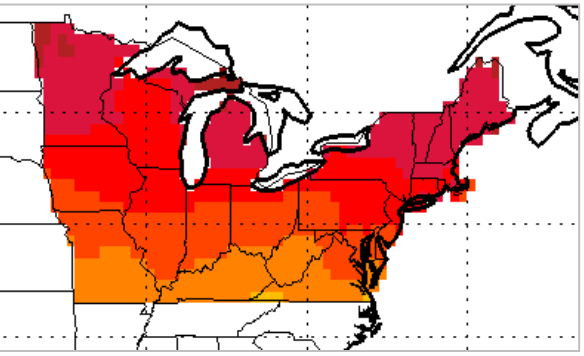
The Northeast Climate Science Center provides scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife and cultural resources can use to anticipate, monitor, and adapt to climate change in the Northeast region

NE CSC Science Themes

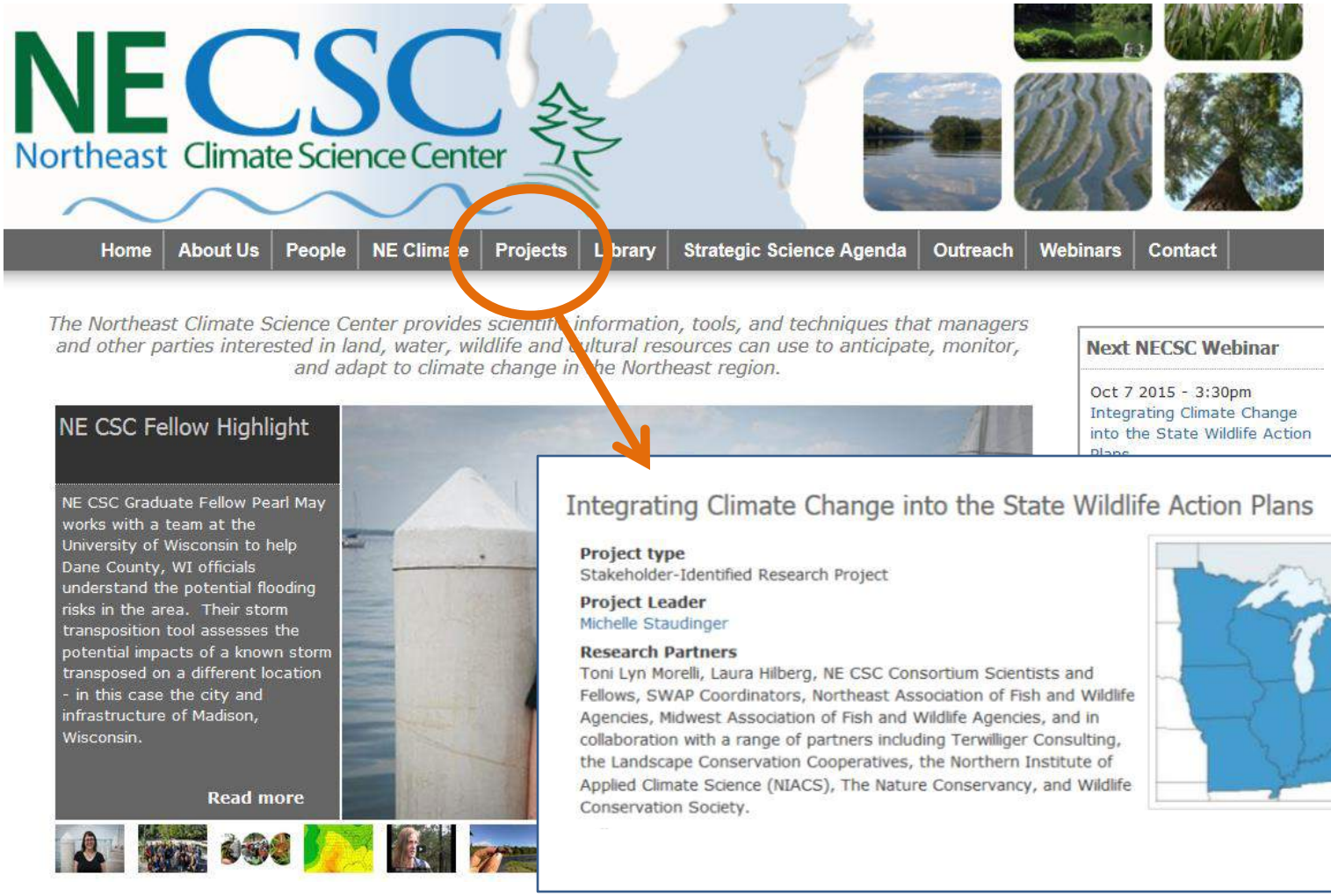
1. Climate change **projections** and **assessments**
2. Climate impacts on **land-use** and **land-cover**
3. Climate impacts on **freshwater** resources and ecosystems
4. Climate impacts on Atlantic and Great Lakes **coastal** and **nearshore** environments
5. **Ecosystem vulnerability** and **species response** to climate variability and change
6. Impacts of climate variability and change on **cultural** resources
7. **Decision frameworks** for evaluating **risk** and managing natural resources under climate change

Examples of Ongoing NE CSC Projects

1. *Future climate scenarios at a high resolution*
   - Ray Bradley, UMass Amherst
2. *Quantifying climate change impacts on forest ecosystems and evaluating associated adaptation strategies*
   - Tony D'Amato, University of Minnesota
3. *Making decisions in complex landscapes: headwater stream management across multiple agencies*
   - Evan Grant, USGS Conte Anadromous Fish Laboratory



Learn more at http://necsc.umass.edu/



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USGS science for a changing world

Climate Science Support for State Wildlife Action Plans

Partners: SWAP Coordinators, NEAFWA, MAFWA, Terwilliger Consulting, LCCs, NIACS, TNC, and WCS

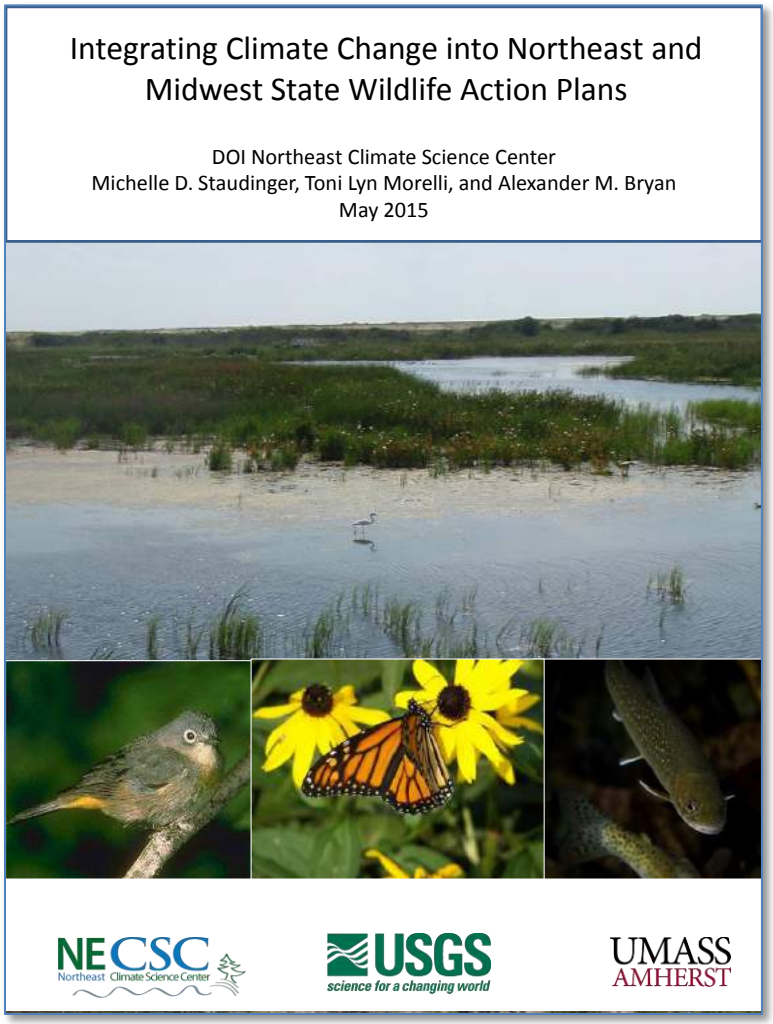
TEAMING WITH WILDLIFE
a natural investment

- Revised every 10 years
- Deadline October 1, 2015
- Challenged to incorporate climate change into current revisions
- Proactive, comprehensive wildlife conservation strategies that asses the health, challenges, and potential actions each State would like to accomplish
- Mandate by Congress to receive funding through Wildlife Conservation and Restoration and State Wildlife Grants Programs

Integrating Climate Change into Northeast and Midwest State Wildlife Action Plans

Report Outline

1) Regional climate changes
2) Regional species and habitats at greatest risk and most vulnerable to climate impacts
3) Biological responses to climate impacts with a focus on Regional Species of Greatest Conservation Need (RSGCN)
4) Scale-appropriate adaptation strategies and actions



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Affecting Plans

"The report is exactly what states needed for our Plans"

–PA Game Commission; Bureau of Wildlife Management

"(The report) has really helped us think more clearly in this - AND definitely helped us in making the decision to separate climate change from the threats chapter into its own Chapter"

– MD Department of Natural Resources

"I'm sure this report will have great utility even beyond the SWAP revision process…we may put together a similar report in (our region) and this will serve as a useful template"

– USGS reviewer

"We will be producing a regional threat assessment…based on the 2015 SWAPs…(the) report will be an important reference as we move into regional planning and state-level implementation."

– Terwilliger Consulting, Inc.

The SWAPs and Beyond

How did we envision the report being used?

- Guide for SWAP writing and revisions on climate change
- Direct use of text and figures
- Demonstration of the applicability of existing climate and adaptation tools

- A regional guide and resource on:
  - What has already been done
  - Ongoing adaptation work
  - What is known / not known


MASSACHUSETTS WILDLIFE
CLIMATE ACTION TOOL
climateactiontool.org

Massachusetts Wildlife Climate Action Tool

Inspiring local action to protect the Commonwealth's natural resources in a changing climate

A Cooperative Project Involving:

- MA Division of Fisheries and Wildlife
- UMass Amherst Center for Agriculture, Food and the Environment
- MA Cooperative Fish and Wildlife Research Unit
- DOI Northeast Climate Science Center

Massachussetts Wildlife
CLIMATE ACTION TOOL

Select your topic of interest to learn how climate change is affecting your community's fish, wildlife, and other natural resources. Use the tool to explore and plan climate change adaptation actions.

I'm interested in...

- LEARNING ABOUT CLIMATE CHANGE
- FISH & WILDLIFE
- FOREST RESOURCES
- WETLAND & AQUATIC RESOURCES
- PROTECTING LAND
- MANAGING MY LAND
- ROADS & OTHER INFRASTRUCTURE
- IMPROVING POLICY, LAWS & REGULATIONS
- LAND USE PLANNING
- STARTING WITH TOWN OR WATERSHED

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NECSC Northeast Climate Science Center
The Center for Agriculture, Food and the Environment
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Massachussetts Wildlife
CLIMATE ACTION TOOL

QUICK START | ABOUT US | USER GUIDE | CONTACT & FEEDBACK

Climate Pages:

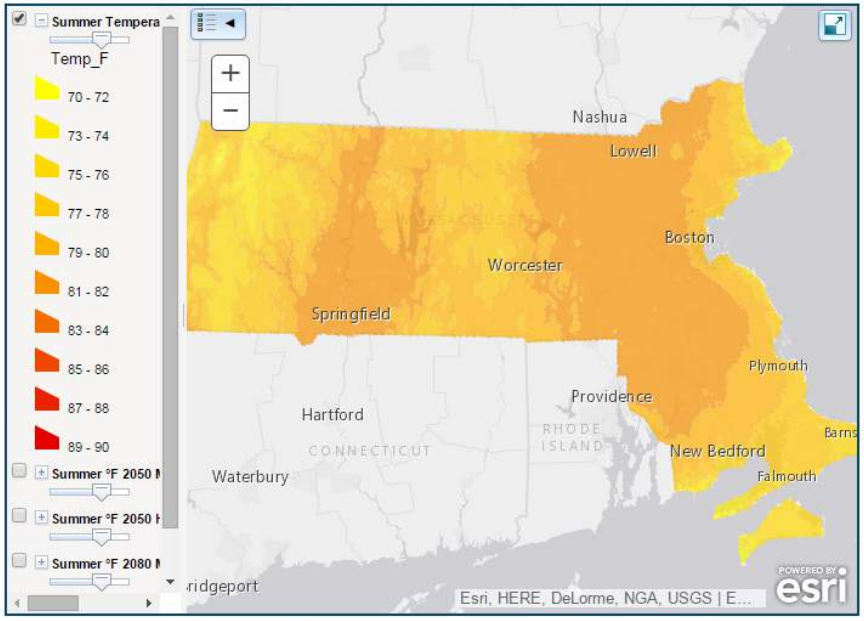
- Summary of historical and future trends
- Seasonal trends
- Extreme events
- Interactive maps
- Additional graphics and resources

Stressors

Temperature changes

Annual and Seasonal Temperature Changes

The Earth's climate is warming. Global average annual temperatures have increased by 1.5° F since 1895, and the vast majority of this increase has occurred since 1980. The Northeast United States has experienced an increase in annual temperatures of 1.6°F over the last century. Warming has been occurring during all seasons, but has been greatest during winter (0.24°F/decade). Warming is also greatest at higher latitudes, elevations, and inland from the Atlantic coast.



Climate projections displayed in this map represent the average of the maximum air temperature (degrees F) for June, July, and August for the years 2010-2080...
Read More

Future climate projections consistently show continued warming over the 21st century across Massachusetts and the entire New England region. All climate models agree that the warming trend will continue over the coming decades with high emission scenarios giving the greatest warming. However, for a given emissions scenario, the exact magnitude of warming varies slightly depending on the models used and their structure. Massachusetts is projected to see average temperature increases that exceed the global average, with potential warming of around 5°F annually by mid-century under a high emissions scenario. Model projections of future seasonal changes generally suggest winter will continue to show the greatest amounts of warming with increases up to 5°F by mid-century.

Extreme Temperature Events

Extreme temperatures in the form of heatwaves may become more frequent, more intense, and last longer. Extreme high temperature events are on the rise globally. Warmer night-time temperatures are driving this overall trend with fewer cold nights and more warm nights. However,

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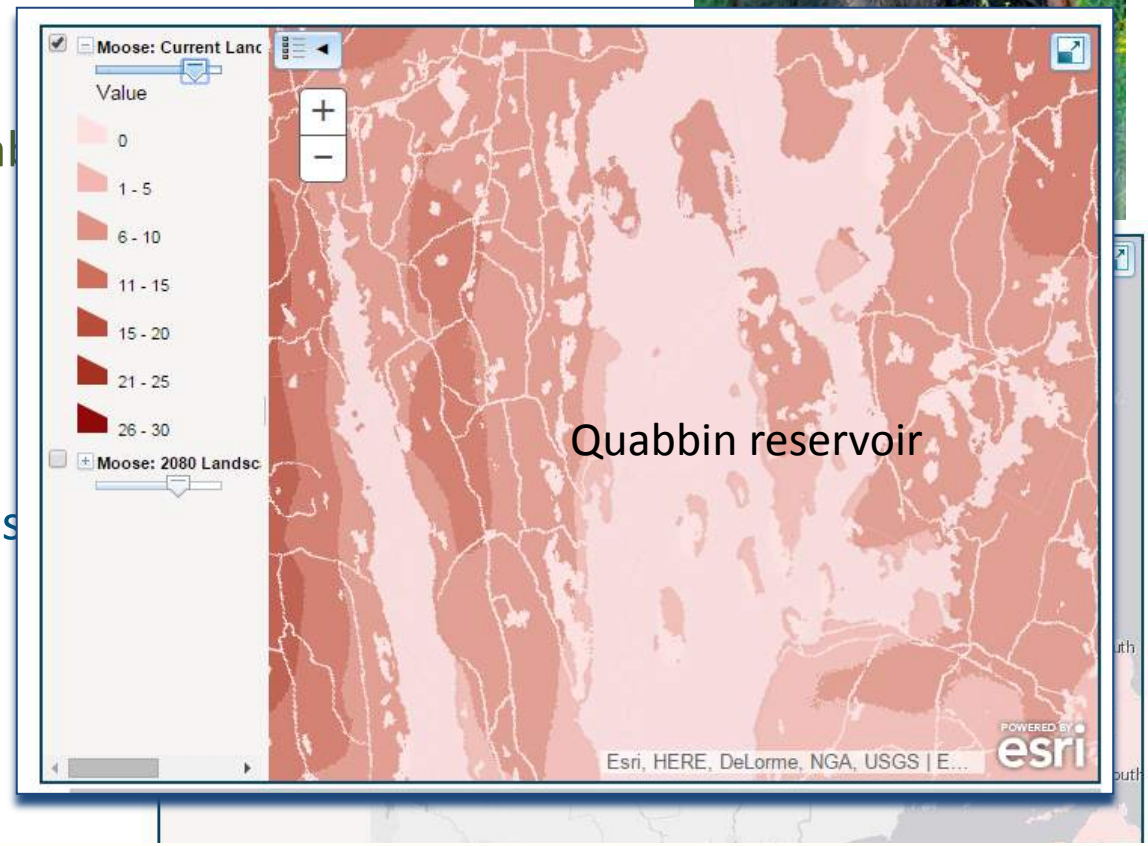
Species Ecology and Vulnerability:

- Species-specific stressors
- Background
- Climate impacts
- Climate Change Vulnerabil
  Assessment results
- Adaptation Strategies
- Related habitats
- Related species groups
  - Large mammals

Moose



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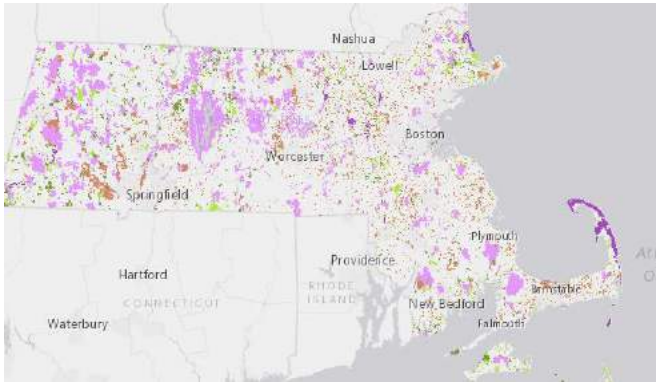
Synthesis of Adaptation Strategies and Actions

- National
- Regional
- State
- Local

} Goals, strategies, approaches, tactics

→ **Actions**

NATIONAL *fish, wildlife & plants* CLIMATE ADAPTATION STRATEGY



Land protection: Strategic land protection

Choices for Taking Action

- Adaptation type
  - Land protection
  - Education and outreach
  - Monitoring and field assessments
- Related species, habitats
- Examples
- Additional resources for taking action

→ Decision support tool
→ Guidebooks, trainings
→ Contact info for an expert

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Diverse team of expert partners

Acknowledgments

This tool was developed by the Climate Action Tool Development Team:

- Scott Jackson, University of Massachusetts - Amherst
- John O'Leary, Massachusetts Division of Fisheries and Wildlife
- Michelle Staudinger, DOI Northeast Climate Science Center
- Stephen DeStefano, USGS Massachusetts Cooperative Fish and Wildlife Research Unit
- Melissa Ocana, University of Massachusetts – Amherst
- Ana Rosner, US Geological Survey
- Katie Theoharides, Theoharides Consulting
- Jonathan Brooks, Massachusetts Division of Fisheries and Wildlife
- Tom Cairns, University of Massachusetts - Amherst
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- Paul Catanzaro, University of Massachusetts - Amherst
- Tony D'Amato, University of Vermont
- Nicole DeAngelis, Massachusetts Division of Fisheries and Wildlife
- Laura Hilberg, EcoAdapt
- Stephen Jane, University of Massachusetts - Amherst
- Toni Lyn Morelli, DOI Northeast Climate Science Center
- Emily Silver, University of Massachusetts - Amherst

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- Dan Koch and Kevin Robicheau, Massachusetts Division of Fisheries and Wildlife
- Alex Bryan, DOI Northeast Climate Science Center
- Hector Galbraith, EcoSolutions
- Ambarish Karmalkar, DOI Northeast Climate Science Center, University of Massachusetts - Amherst
- Mikaela Heming, University of Massachusetts - Amherst
- David Paulson, Massachusetts Division of Fisheries and Wildlife

Climate Synthesis:

- Extensive literature reviews
- Expert input and review
- NE CSC and partner products
  - Integrating Climate Change into SWAPs
  - UMass Amherst
    - ❖ Designing Sustainable Landscapes (DSL); Conservation Assessment and Prioritization System (CAPS); Critical Linkages
  - USGS Woods Hole Science Center
  - USGS Conte Center
  - MA Department of Fish &Wildlife
    - ❖ Natural Heritage BIOMAP2

Summarized, distilled, written, rewritten, rewritten…. reviewed, rewritten….

climateactiontool.org

Designed to Inform and Inspire Local Action as the Climate Changes

The climate is changing rapidly in Massachusetts, but the Massachusetts Climate Action Tool highlights actions we can take now to increase the ability of fish and wildlife, natural resources, and human communities to adapt to these changes.

The Tool makes the best available science accessible to local decision-makers, conservation practitioners, large landowners, and community leaders who want to take action to protect the Commonwealth's natural resources and help them adapt to a changing climate.

With the Massachusetts Wildlife Climate Action Tool, users can explore:

- information on climate change impacts, including over 30 climate variables
- vulnerabilities of various fish and wildlife and their habitats
- information about non-climate stressors such as development and loss of landscape connectivity
- on-the-ground adaptation strategies and actions to help maintain healthy, resilient natural communities in the face of climate change, including forestry practices, land protection, and restoring landscape connectivity.

The Tool provides local information specific to Massachusetts that organizations or communities can integrate into comprehensive climate adaptation plans or ongoing projects. The Tool has been developed as a dynamic platform that will continue to evolve as information becomes available and new partners come to the table. We welcome your feedback and participation.

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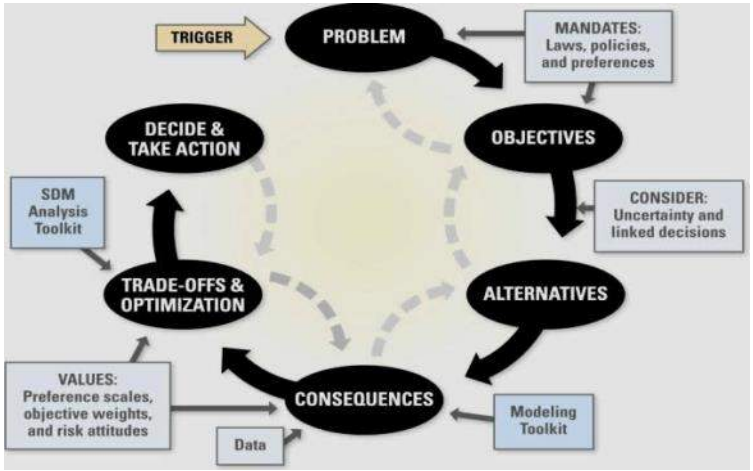
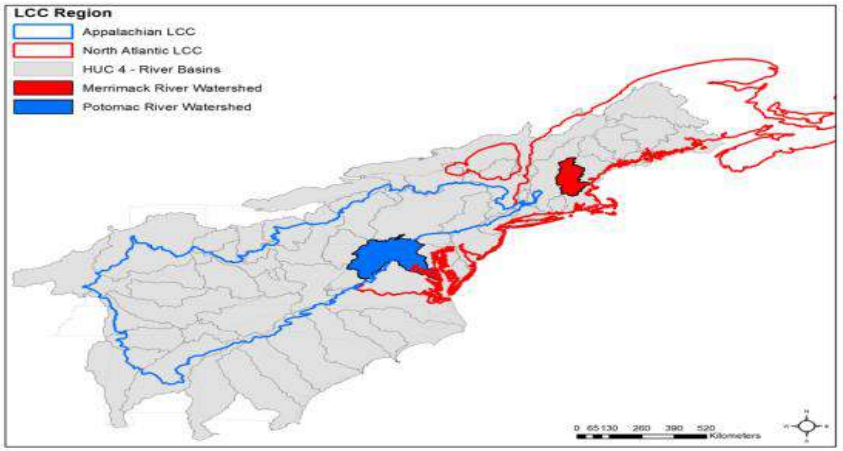
Local Case Studies in Regional Adaptation

Landscape Scale Decision Making for Headwater Stream Ecosystem Conservation

PIs: E. Grant, R. Katz, M. Runge, A. Roy, B. Letcher

- Project is using decision theory and tools to help stakeholders collaboratively create adaptive strategies that protect headwater ecosystems from climate and other stressors





Potomac and Merrimack Watersheds

Headwater stream species of special conservation concern include brook trout & stream salamanders

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Adapting Acadia National Park to Climate Change through Scenario Planning

How do we protect our fragile historic carriage roads from heavier rains, storms, and flooding?

As the warm season gets longer, should we open earlier and close later?

NATIONAL PARK SERVICE
Department of the Interior

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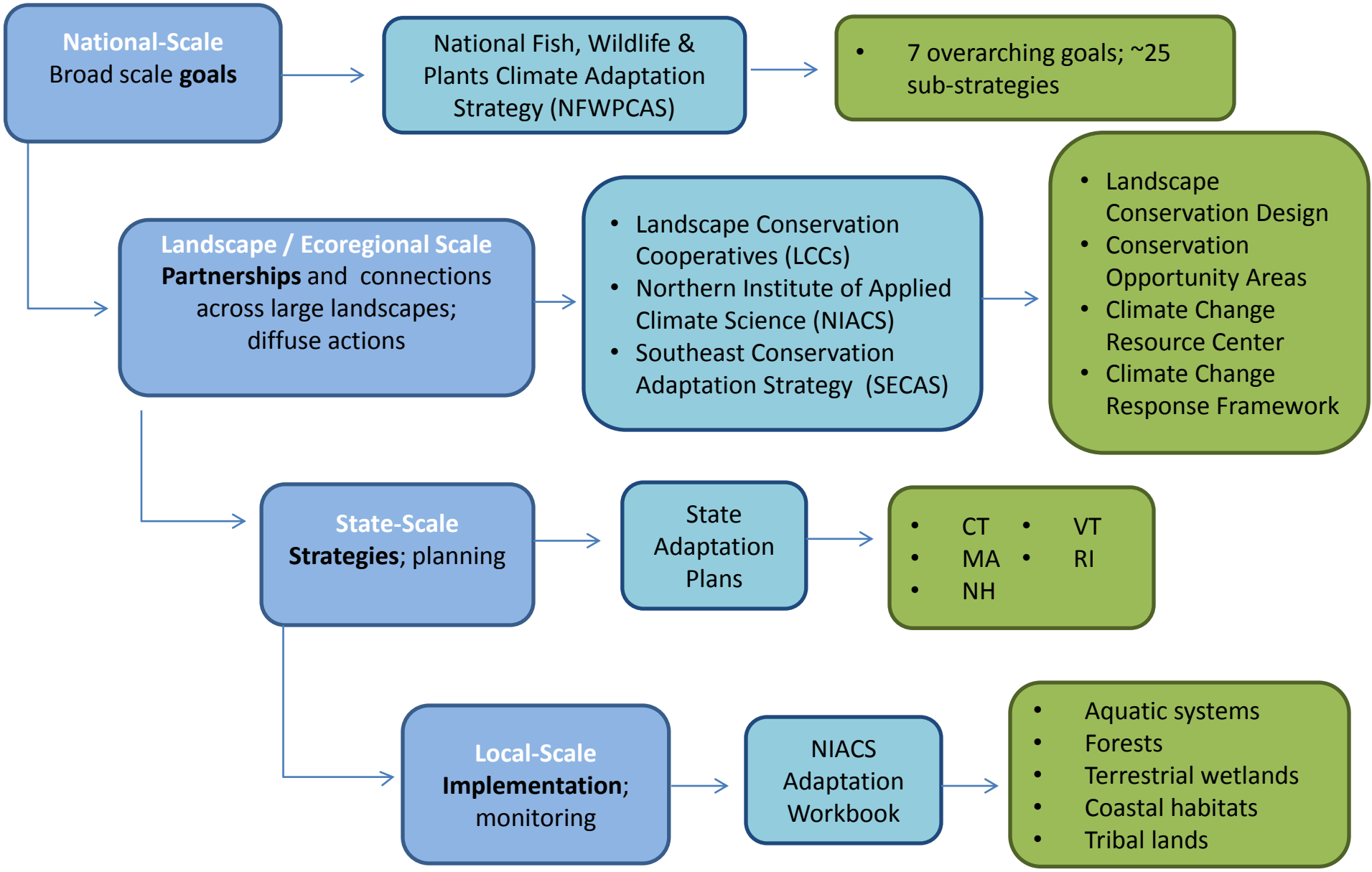
Driver	Calm Before the Warm	Middle of the Roller Coaster	Sizzlin' Summer, Floodin' Fall	Bigger Boat
Number of 'hot' summer days (>90 °F); length of frost-free season	Early:Late ↓ ↑	↑	↑	↑
Number of 'cold' winter days (<32 °F)	↑ ↓	↓	↓	↓
Summer precipitation	↓ ↓	↓	↓	↑
Inland and coastal storms	↓ ↑	<->	↑	↑
Sea level rise	↑ ↑	↑	↑	↑
Climate Variability Emphasis	Inter-decadal (AMO*) − +	Inter-annual	Intra-annual (seasonal)	Episodic events

Adaptation Strategies: From Conception to Implementation



Where we're headed...

Project Awards in FY'15:

Supporting Collaborative Relationships between Tribes and Climate Science in the Northeast Region to Address Climate Impacts
Lead PI: Chris Caldwell, College of Menominee Nation Sustainable Development Institute

Characterizing Local and Rangewide Variation in Demography and Adaptive Capacity of a Forest Indicator Species
Lead PI: Evan H Campbell Grant, USGS Patuxent Wildlife Research Center

Pilot Study to Evaluate Coastal Change Using Unmanned Aerial Systems (UAS)
Lead PI: Erika E. Lentz, USGS Woods Hole

An Integrated Assessment of Lake and Stream Thermal Habitat Under Climate Change
Lead PI: Jordan S. Read, USGS

Climate Effects on the Culture and Ecology of Sugar Maple
Lead PI: Kristina Stinson, UMass Amherst

Does Variation in Life History and Evolutionary Response Affect Species Vulnerability to Climate Change? Implications for Management
Lead PI: Benjamin Letcher, USGS

Reconnecting Floodplains and Restoring Green Space as a Management Strategy to Minimize Risk and Increase Resilience in the Context of Climate and Landscape Change
Lead PI: Richard Palmer

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