Northeast Climate Science Center Regional Science Science Meeting
University of Massachusetts, Amherst

2015 Northeast State Wildlife Action Plans

Climate Change—Impacts and Adaptation in the Northeast
Exploring Regional Priorities for Action

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How did the Northeast SWAPs incorporate climate change into their threat analysis and conservation action development, specifically:

- How did states assess vulnerability of Species of Greatest Conservation Need (SGCN) or SGCN habitats?
- What major climate change impacts are expected?
- What are the most pressing non-climate stressors?
- Which taxa/species and habitats are considered most vulnerable to climate change?
- What conservation actions were prioritized in light of climate change?
- How did the states incorporate AFWA Best Practices and Guidelines for climate change?
Why a Climate Change Lens for Regional Action?

The SWAPs identified **Climate Change and Severe Weather** as one of the **top five threats**. Additional consensus based on **September 2016 Survey of NEFWDTC members and SWAP Coordinators** in framing a regional response to joint threats and priorities.

Climate change is **novel in terms of threats** because State Fish and Wildlife Agencies:

- Cannot prevent it.
- Cannot reverse it.
- Need to consider another layer of uncertainty.

Successful action means **adaptation**, a suite of actions at local to multistate or regional scale.
Climate Change Impacts: Reported
Climate Change and Severe Weather Impacts of High Concern as Reported in the 2015 SWAPs

Temperature
- Temperature extremes (air); more heat waves
- Temperature increase (water)

Precipitation
- Increased periodic droughts; short-term and late summer droughts
- Increased precipitation; more rain, less snow in winter

Extreme Events
- More intense storms
- More frequent flooding

Hydrologic Change
- Increased streamflow (freshwater)
- Increased saltwater intrusion (estuaries)

Sea Level Rise

Habitat Shifting and Alteration

Phenology Change
Non-Climate Stressors and Synergistic Effects with Climate Change

**Terrestrial, Aquatic, and Coastal Impacts**

- **Habitat loss and fragmentation**
  Example: Affects movement/migration of many taxa

- **Increased invasive species**
  Example: Hemlock wooly adelgid

- **Increased diseases**
  Example: Moose with tick-related diseases

- **Pollution**
  Example: Increased algal blooms from nitrogen pollution

**Example Synergistic Effects**

- Reduces species and habitat migration corridors

- Changing thermal conditions support invasive species spread

- Less winter die-off of disease organisms

- Warmer water exacerbates pollution impacts on multiple aquatic species
Representative Northeast Taxa and Species Most Vulnerable to Climate Change (as Reported in the 2015 SWAPS) and Related Vulnerability Characteristics

Amphibians
- Terrestrial salamanders and others
- Example: Jefferson salamander

Mammals
- Examples: Canada lynx, moose, long-tailed weasel, ermine, snowshoe hare, northern short-tailed shew, meadow vole

At Edge of Range or Environmental Threshold

Life History Traits
- (Lifespan, diet flexibility, mobility, cryptic coat color)

At Risk from Multiple Other Threats

Restriction to Vulnerable Habitats or Specific Geologic Features

Some Dragonflies and Butterflies
- Example: Monarch butterfly

Freshwater invertebrates:
- mussels, crayfish
- Example: Eastern pearlshell mussel

Migratory and Cold-Water Fish:
- Examples: Arctic char, Brook trout

Some Coastal and Woodland Bird Species
- Example: Roseate tern
Representative Northeast Taxa and Species Most Vulnerable to Climate Change with Related Adaptation Actions
as Reported in the 2015 SWAPS

- Amphibians
- Mammals
- Migratory and Cold-Water Fish
- Dragonflies and Butterflies
- Freshwater invertebrates: mussels, crayfish
- Coastal and Woodland Bird Species

Build or Restore Habitat
Connectivity and Migration/Travel Corridors

Identify, Protect, and Monitor Climate Refugia

Restore Habitat Quality

Allow Habitat Migration
Major Threats for Most Vulnerable Habitats

Coastal/Marine
(Beaches, Dunes, Mudflats, Offshore Islands, Other)

Non-Climate Change Threats
- Habitat conversion and alteration; development, shoreline hardening
- Invasive species

Climate Change Threats
- Sea level rise
- More intense, more frequent storm events
- Increased coastal flooding, exacerbated by land subsidence
- Increased erosion
- Increased saltwater intrusion
- Increased salt spray
- Increased coastal acidification
### Major Threats for Most Vulnerable Habitats

**Wetlands (Tidal and Nontidal)**

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<thead>
<tr>
<th>Non-Climate Change Threats</th>
<th>Climate Change Threats</th>
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<tr>
<td>Impaired water quality</td>
<td>Sea level rise</td>
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<tr>
<td>Land use changes</td>
<td>More intense storm events</td>
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<td>Water supply</td>
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<td>Increased saltwater intrusion</td>
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Major Threats for Most Vulnerable Habitats

Aquatic and Riparian Habitat
(Freshwater and Tidal)

**Non-Climate Change** Threats

- Water quality degradation
- Invasive species
- Habitat conversion and alteration; lack of aquatic connectivity
- Channel dredging

**Climate Change** Threats

- Droughts
- Changes in air temperature and precipitation
- Water temperature extremes
- Sea level rise
Major Threats for Most Vulnerable Habitats

Upland Habitats

**Non-Climate Change Threats**

- Land use changes and conversion (development, energy, and road infrastructure)
- Increased impervious surfaces
- Invasive species
- Forest habitat condition

**Climate Change Threats**

- More intense, more frequent storm events
- Changes in air temperature and precipitation
Incorporating Broader Landscape Considerations into Proposed Actions for Climate Resilience of Conservation Targets—Examples from the SWAPs

1. **Build Landscape and Vulnerable Habitat Resilience**
   - Conduct Landscape Assessment and Conservation
   - Refine COAs in a Landscape Context
   - Consider Ecosystem Service Value in Conservation Prioritization
   - Build High-Elevation Resilience

2. **Increase Habitat and Refugia Connectivity**
   - Maintain and Protect Biological Corridors between Habitat Blocks and Habitat Refugia
   - Increase Riverine, Floodplain, and Riparian Habitat Connectivity
   - Protect Connectivity between Coastal and Upland Habitats

3. **Begin Assessing Phenological/Environmental Change**
   - Assess potential phenological decoupling that may cause species to become endangered.
The Next Ten Years—Increasing Capacity to Adapt

Rapidly evolving climate, species, and adaptation science.

- Establish meaningful climate impact baselines for monitoring,
- Coordinate research/leverage knowledge of emerging science.
- Share learning.

Practice conservation decisionmaking involving multiple threats and threshold-based decisionmaking.

Opportunities to collaborate regionally, across sectors, and beyond traditional partners to intersect ecological and human community resilience planning.

- Build on work with: NEAFWA, RCN grants program, academic institutions, the Landscape Conservation Cooperatives, Regional Conservation Partnerships, NatureServe Network, NOAA, Coastal Zone Management Agencies, the Northeast Coastal Acidification Network, and others.
Identify Regional and Multistate Action Collaboration Opportunities that Build on Prioritized SWAP Adaptation Actions

- Marine and Coastal Habitats
- Aquatic Habitats and Wetlands
- Uplands (including climate refugia and other rare habitats)

2015 Prioritized SWAP Actions

- Climate Change
- Land Use and Development
- Pollution
- Invasive Species
- Diseases

Get a Spatial View
Seek Multi-state and Regional Opportunities to Scale Up Adaptation Actions Based on Goals for Three Landscape Theme Areas and Interactions of Primary Threats
The Northeast RCN Program supports critical work to address emerging threats.

From 2007 to 2015, RCN has provided $2.5 million in funds for more than 50 projects to address conservation of Species of Greatest Conservation Need and their habitats.
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