

### Compiled 2015 High Priority Science Needs of the North Atlantic LCC

This document is a compilation of the summaries of seven most highly ranked priority science needs developed by the North Atlantic LCC Technical Committee during the March 10-11 Technical Committee meeting. The following table lists the needs described in the subsequent written narratives. The identifiers reference the subgroups of the Technical Committee from which the topics originated: “A” for (freshwater) aquatic, “CM” for coastal and marine, and “TW” for terrestrial and (freshwater) wetlands.

Each group considered a number of other science needs that were considered important. Although not all needs can be acted upon each year, needs that did not make the final priority list will be retained for consideration at a future time. Science delivery needs were also discussed at the meeting and will be addressed separately.

<b>Identifier</b>	<b>Title of Need</b>
CM-1	Assessment of connectivity and resiliency of tidally influenced road crossings
A-1	Aquatic classification for eastern Canada
CM-2	Planning for marsh migration with sea level rise and increased storm surge
TW-1	Vulnerability of cultural resources to flooding; consistent floodplain assessment*
A-2	Evaluation of stream networks for climate resilience
TW-2	Rare plant prioritization
CM-3	Impact of sea level rise and storms on Atlantic Flyway migratory shorebird stopover habitats

\* Two separate narratives were consolidated into a single topic for voting by the full committee

## CM-1. Assessment of Connectivity and Resiliency of Tidally Influenced Road Crossings

### Summary of science need:

Understanding the types and distribution of tidal creek road crossings (culverts and bridges) is a critical need for efforts to prioritize locations for upgrades to improve passage for aquatic organisms and reduce damage from coastal flooding.

### Key outcomes:

Consistent data across region on tidally influenced road crossings that will allow for assessment of aquatic organism passage efficiency as well as condition assessment for resiliency to sea-level rise, storm surge and floods. Information can be used to prioritize upgrade, restoration and repair in the face of sea-level rise and floods and predict the impact of undersized or perched crossings on bidirectional movement of water, organisms and sediment.

### Justification (selection criteria, state of current science):

A project to address this need could leverage existing partnership, protocols, database, training and survey efforts to target tidally influenced crossings in coastal zone where upland drainage can be inhibited by undersized or compromised structures. Additionally, condition of the structure relative to withstanding increased water levels on a regular (tidal) and infrequent (storm) basis is a key public safety concern.

- **Foundational needs** for organizing landscape conservation - **consistent protocols and database**
- Needs that **address major threats and uncertainties** to sustaining natural or cultural resources in the North Atlantic LCC - **sea-level rise and future floods**
- Needs that address threats and uncertainties to **multiple species or habitats** at landscape scales – **multiple species using tidal creeks and rivers upstream**
- Needs that will **inform applied conservation decisions** and actions (in the face of change and uncertainty) – **prioritize upgrade repair or culverts**
- Needs that are **priorities for existing partnerships** in the North Atlantic LCC (NEAFWA, JVs, FHPs, NEPARC, DOTs, coastal managers and fisheries managers)

### Connections to existing science projects:

Protocols, database and training for crossing assessment is underway with Hurricane Sandy funds under the North Atlantic Aquatic Connectivity Collaborative (NAACC). Building in the tidal component onto that existing effort would be leveraging the expertise and foundation of the NAACC to more thoroughly assess an important aquatic connectivity consideration. A proposed partnership with Gulf of Maine Council to use the information to provide trainings and outreach to help municipal staff and engineers prioritize replacements of tidally influenced crossings with both structural and organism passage considerations would increase the dissemination and therefore, utility, of the results.

### Partners / partnerships who benefit from addressing the need:

Natural resource managers, North Atlantic Aquatic Connectivity Collaborative, fisheries biologists, restoration ecologists, Atlantic Coastal Fish Habitat Partnership, transportation and emergency management sector, municipal and regional planners and public works departments.

### Anticipated cost / length of time:

Two field seasons of training and surveys for tidally influenced road stream crossings integrated with the NAACC's existing project. Should be able to add to protocol development for tidally influenced crossings, database, and training for field survey crews and surveys for \$100,000.

### Needed expertise:

Aquatic organism passage, database design, surveys, and impacts of floods on infrastructure already exists within NAACC. Level of training for tidally influenced structures is higher so dedicated survey technicians would be hired and trained.

### A-1. Aquatic classification for eastern Canada

#### Summary of science need:

A freshwater classification in the U.S. portion of the NALCC has allowed states to understand their freshwater resources in light of the full distribution of stream types in the U.S. However, the Atlantic Canada portion of the NA LCC remains unassessed. A group of over 40 Canadian and U.S. partners met last year and noted the need for a consistent aquatic classification across this region. Previously, the base data required were not available in Canada but due to recent efforts by various partners, much of the needed information is now available.

#### Key outcomes:

A consistent mapped aquatic classification from Atlantic Canada to Virginia. Hydrography coded with key attributes used in the U.S. classification such as stream size, gradient, geology, stream temperature, hydrologic class, and valley confinement. This effort also could include an update to the northeast U.S. classification to match the newly released Appalachian LCC stream classification, which included new attributes of hydrologic regime, valley confinement, and continuous temperature mapping.

#### Justification (selection criteria, state of current science):

Conserving the Northeast's freshwater resources requires a consistent classification of stream and lake features into recognizable entities or categories. The NALCC habitat datasets form the foundation of regional conservation in the Maritimes, Quebec, and the U.S. This will facilitate a new understanding of aquatic biota and populations on a regional scale and create a new opportunity to assess the condition and prioritize habitats at a scale broader than the individual state or province.

#### Connections to existing science projects

With the completion of the NALCC and RCN funded NE aquatic habitat classification and NE Terrestrial Habitat Map, the classification methods and many of the necessary input datasets (hydrology, geology, DEM, etc.) have been created. With the completion of the Appalachian LCC stream classification, methods have been developed to map hydrologic regime, valley floodplain confinement types, and a continuous temperature model.

#### Partners / partnerships who benefit from addressing the need:

State fish and wildlife agencies, NEAFWA, provincial fish and wildlife/environment departments, Department of Fisheries and Oceans, aboriginal groups and other provincial/state and regional environmental agencies including water planning agencies, NGOs (at the national, provincial and regional level), and municipalities.

#### Anticipated cost / length of time:

2 years and approximately \$110,000 (assumes leveraging of an additional \$40,000 from Canadian partners, of which \$15,000 has already been secured). Updating the Northeast U.S. portion (matching App. LCC and Canada refinements) expected to be approx.. \$60,000.

#### Needed expertise:

Expertise in aquatic classification; GIS skills, skills in coordination of regional team of experts/review committee, project management; maintain strong working relations with key data owners; abilities in management of spatial information and data sharing.

## CM-2. Planning for Marsh Migration

### Summary of science need:

To better adapt for increasing sea levels and storm surge, there is a need to identify upslope areas with potential for establishment of marsh vegetation as existing tidal marsh locations become increasingly vulnerable to loss of integrity and areal extent.

### Key outcomes:

Extend elevation data collection transects from salt marshes into adjacent upland marsh migration zones to evaluate the marsh migration potential of these sites. Produce maps that show suitable habitat for salt marsh transgression. Prioritize survey sites adjacent to National Wildlife Refuge (NWR), National Park Service (NPS) or State conservation lands.

### Justification (selection criteria, state of current science):

Throughout the NA LCC region and beyond, the areal extent of salt marsh vegetation, especially high marsh, is rapidly declining due to increased storm surge and inundation stress (and potentially other anthropogenic stresses such as excessive nutrients and invasive species). Assessing where salt marsh vegetation will be able to move upslope unassisted, and where facilitated migration may need to occur, may allow managers to mitigate some of the losses of habitat and rare bird habitat.

### Connections to existing science projects

Maine's marsh migration demonstration project, Hurricane Sandy Tidal Marsh Resiliency project (SHARP subcomponents), Dynamic Inundation SLR model (Lentz et al.), Designing Sustainable Landscapes Phase III.

### Partners / partnerships who benefit from addressing the need:

Planners, conservation and natural resource management agencies at all levels, NGO's, modelers.

### Anticipated cost / length of time:

One season, field based elevation surveys and maps ~\$115,000. Overall budget depends on the acreage to be covered, and level of penetration into the upland.

### Needed expertise:

Ground based survey skills (RTK or total station), some plant identification skills, expertise in mapping.

### Remaining questions or other comments:

Assess retreat at seaward edge of vegetation? Include data dictionary for field survey crews to record vegetation types, barriers to migration? Prioritize sites based on availability of high resolution LiDAR to compare with ground based methods but this type of analysis is not in current scope.

## **TW-1A. Consistent Floodplain Assessment across the Northeast**

### Summary of science need:

Floodplains are one of the most diverse ecosystems in the Northeast, providing critical habitat for a large variety of wildlife and plants, but also one of the most degraded ecosystems in the region. Further, the catastrophic effects of recent floods in the Northeast have increased the need for understanding floodplains in order to enhance public safety and reduce flood losses. Specifically, there is a need to better map and assess floodplain habitats to prioritize conservation sites, identify areas of high flood risk, and develop strategies to conserve these challenging systems while providing benefits to local communities.

### Key outcomes:

A mapped assessment and prioritization of floodplain habitats, and a map of flood risk and benefits. Applications of climate change projections of peak streamflows and how that affects conservation prioritization.

### Justification (selection criteria, state of current science):

The goal is to build on the following studies and models to create a comprehensive assessment: 1) identify and map the “Active River Area” using a fine scale (10 m) mapping method for identifying river buffers based on the topographic components (e.g. floodplain, meander belt, material contribution), 2) evaluate flood processes using seasonal overlays of satellite images to identify and quantify where floodplains are still receiving seasonal flooding and where they are severed from the river, and 3) map flood risk and resilience using a Vermont wide GIS-based flood resilience screening tool that allows users to assess river corridors for their erosion and deposition risk, and conservation assets related to flood resilience.

Additionally, FEMA has released updated floodplain maps and EPA has developed flood risk and resilience tools. The Nature Conservancy and Natural Capital project are developing approaches to better map flood mitigation services and address questions such as: what is the biophysical and economic value of existing natural features in providing excess water storage during flood events, and where should interventions be targeted to achieve the greatest reduction in downstream flood impacts?

Projections of peak flows have been developed for floodplain assessments using available watershed modeling. Potential existing work includes that of Richard Palmer (NECSC) for CT River watershed. Additional watershed modeling that could be used for climate projections include the Susquehanna and Coastal New England (Merrimack River) projects.

### Connections to existing science projects:

This project would build on the terrestrial and aquatic habitat mapping efforts and utilize some of the same data. The prioritization would feed into the conservation design efforts such as identifying regional conservation opportunity areas.

### Partners / partnerships who benefit from addressing the need:

State Fish and Wildlife Agencies, Conservation NGOs, State Historic Preservation Offices, State Natural Heritage programs, National Park Service and others.

### Anticipated cost / length of time:

Moderate, the data and methods exist already but need to be mapped and tested regionally. ~\$100,000.

### Needed expertise:

GIS, remote sensing, modeling, conservation prioritization.

**TW-1B. Cultural Resources Vulnerable to Inundation**  
(for voting purposes, combined w/ floodplain assessment TW-1A)

Summary of science need:

Floodplains are fertile locations for cultural resources, specifically archaeological sites, prehistoric features, industrial sites/buildings, etc. Their physical location makes them vulnerable to flooding events, however, which could increase in the future with a changing climate. Consequently, a need exists to identify cultural resources that may be vulnerable to flooding under projections of future peak flood events.

Key outcomes:

Cultural resource managers can identify where to prioritize asset vulnerability and make decisions regarding what can be lost or documented when they know how many sites may be vulnerable and where they are. Partnerships on cultural resource use of NALCC products would also be developed. Working with the National Park Service, vulnerable resources on the National Register of Historic Places, as well as additional cultural resources in State and Tribal inventories, would be evaluated.

Justification (selection criteria, state of current science):

The assessments would assist in landscape scale strategic planning (and climate change planning at any scale) for historic districts. The data would support emergency planning operations prior to and immediately following a storm event. It could be used to prioritize documentation of resources at risk. The fact that floodplains are historically used for long periods of time for habitation as well as the production of materials/vegetation used by various cultures also makes them frequently traditional cultural properties and highly sensitive areas. Archaeological data would not be included in this effort; rather the methods could be developed using non-sensitive and publicly available National Register data, but the methods and partnerships developed could lead to future collaborations. Depending on available projections for peak flows as determined in TW3-A, methods for using flood projections to assess flood exposure of historic structures and associated resources would be developed either only at the watershed scale or region-wide. Testing at a watershed scale could justify support for future climate change streamflow modeling and develop protocols for the long term protection and stewardship of cultural resources vulnerable to climate change.

Connections to existing science projects:

[National Register of Historic Places Public Dataset spatial data](https://irma.nps.gov/App/Reference/Profile/2210280/) available at:  
<https://irma.nps.gov/App/Reference/Profile/2210280/>

North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk *Environmental and Cultural Resources Condition* Report, Ch. 10 Cultural and Tribal Resources

Partners / partnerships who benefit from addressing the need:

National Park Service, State Historic Preservation Offices, Tribal Historic Preservation Offices

Anticipated cost / length of time:

\$10-15,000 over 6 months. Scope depends on the availability of peak streamflow projections if they are available over entire region or if we can only test methods for select watersheds. If conducted in isolation from floodplain assessment project (A), budget would be \$25,000.

Needed expertise:

Relies on availability and methods for floodplain inundation projections as determined in TW3-A. GIS, National Register of Historic Places, traditional cultural properties.

## A-2. Evaluation of stream networks for climate resilience

### Summary of science need:

Climate change is altering freshwater systems and conservationists need a way to identify stream networks that will sustain aquatic diversity and key processes under a changing climate. One promising approach is to evaluate and score stream networks for their climate resilience based on an evaluation of geophysical properties that endure under climate change and create options for species. In freshwater systems these properties include the length and complexity of a functionally connected stream network as well as the number of gradient and temperature classes, the intactness of the floodplain, and the degree of hydrologic alteration within the networks.

### Key outcomes:

1) A comprehensive map of all stream networks in the Northeast with an estimate of their climate resilience and data on their underlying resilience characteristics. 2) A prioritization of stream networks by geographic region (HUC, fish ecoregions). 3) A resultant tool for users to view the results including recommendations regarding how to maintain or improve stream resilience score for given networks.

### Justification (selection criteria, state of current science):

Climate change is altering freshwater systems and conservationists need a way to identify stream networks that will sustain aquatic diversity and key processes under a changing climate. Methods have been developed by the US Forest Service (Ryman and Isaak 2010), academics (Palmer et al.), and The Nature Conservancy (draft Anderson and Olivero et al 2014). As growing human populations increase the pace of climate and land use changes, estimating the resilience of freshwater systems will be increasingly important for delivering effective long-term conservation. Climate change assessment efforts to date have tended to focus on localized changes in stream temperature (especially for implications to coldwater fish), but not aquatic network-wide resilience to changes. This science need therefore complements existing climate change assessments.

### Connections to existing science projects

With the completion of the NALCC and RCN funded NE aquatic habitat classification, NE Geospatial Condition Assessment, and the Stream Connectivity Assessments it is now possible to spatially evaluate these climate resilience characteristics and identify the most resilient freshwater networks in the region. This project would also complement the NE Terrestrial Resilience, NE Riparian Climate Corridors and NE Coastal Resilience.

### Partners / partnerships who benefit from addressing the need:

State fish and wildlife agencies, NEAFWA, and other state and regional environmental agencies including water planning agencies, NGO's, municipalities, federal agencies, and New England Interstate Water Pollution Control Commission. Partnerships include Eastern Brook Trout Joint Venture (EBTJV), Atlantic Coastal Fish Habitat Fish Habitat Partnership (ACFHP), and the National Fish Habitat Partnership.

### Anticipated cost / length of time:

1- 2 years, <\$100 K for US only. 2-3 yrs <\$200 to include Atlantic Canada.

### Needed expertise:

GIS skills, skills in coordination of regional team of experts/review committee, project management; maintain strong working relations with key data owners (e.g.NorEaST); abilities in management of spatial information and data sharing.

## TW-2. Regional rare plant prioritization

### Summary of science need:

Rare plants are a critical component of biological diversity but are typically under-represented in regional conservation designs due to limited federal funding for rare plants. Existing state and global rarity ranks are not at the appropriate resolution for conservation/prioritization decisions at a regional scale. A more refined assessment of which species need specific conservation action at the regional scale is needed.

### Key outcomes:

- identify a team of botanists from the 13 state Natural Heritage Programs, NatureServe regional botanists, New England Wildflower Society, and other experts
- use NatureServe/Natural Heritage plant data and the team to assess questions such as: What is the regional or global distribution of the species? How rare is the species across its range? Is the species declining across its range? Is the species associated with a rare habitat or natural community? Does the species require specific management in order to maintain its populations? Is the species at the edge of its climatic range? Is the species especially vulnerable to climate change? Is the species likely to expand or contract its distribution in the region?
- Prioritize species for conservation action and for incorporation into conservation design efforts.

### Justification (selection criteria, state of current science):

Many rare plants have a stochastic distribution and are therefore not captured by typical coarse filters of conservation designs (forest blocks, forest cores, connectivity). NatureServe and all 13 Northeastern states (Heritage Programs) have detailed mapping and rarity ranking of the region's rare plants. However, neither the state rarity ranks (S1-S5) nor the global ranks (G1-G5) are the appropriate resolution for making conservation prioritization/decisions at the NALCC regional scale. A collaborative effort to provide a regional context for plant rarity and vulnerability would be of great value in rare plant conservation. A model of this type of regional prioritization is provided by New England Wildflower Society's "Flora Conservanda" (<http://www.newfs.org/conserve/flora-conservanda>).

### Connections to existing science projects

The North Atlantic LCC has actively supported and participated in successful efforts to identify regional Species of Greatest Conservation Need for species of fish and wildlife. A comparable effort for plants would complement efforts for animals and could inform regional conservation planning and design efforts (e.g., Regional Conservation Opportunity Areas).

### Partners / partnerships who benefit from addressing the need:

State, federal, and nongovernmental organizations working to conserve rare plants

### Anticipated cost / length of time:

\$75,000 for 18 months

### Needed expertise:

Botanists with expertise in the distribution of rare plant species, the threats they face, and management steps beneficial to their persistence.

### Remaining questions or other comments:

Availability and interest of some of the key participants needs to be confirmed; cost estimates need to be further refined.



### CM-3. Climate Change Impacts on Atlantic Flyway Populations of Migratory Shorebirds

Summary of science need:

Given the importance of coastal stopover sites for shorebirds migrating along the Atlantic Flyway, there is an important need to better understand how sea level rise and increased storms could affect shorebird habitats and populations of shorebirds that depend on these habitats.

Key outcomes:

Develop a practical methodology to evaluate how climate change will affect the extents of specific shorebird habitats and carrying capacities at selected NWRs. This will provide a proof of concept and methodology, which can subsequently be applied to a much larger set of important northeastern coastal shorebird sites to evaluate the impact of climate change on the viability of the entire flyway. Based on these findings, evaluate how management activities could safeguard shorebird populations by mitigating current and projected climate-driven coastal impacts.

Justification (selection criteria, state of current science):

The Atlantic Flyway provides critical migration stopover habitat for a number of migratory shorebird species, however little is known about the impacts of climate change (sea level rise and increased storms) on these locations and on shorebird populations. This is an identified priority for Atlantic Coast Joint Venture partners and the Atlantic Flyway Shorebird Initiative, an effort supported by the National Fish and Wildlife Foundation. Priorities consistent with the following criteria:

- *Needs that address threats and uncertainties to multiple species or habitats at landscape scales* – Multiple species of shorebirds at flyway scale: several Atlantic Flyway shorebird species have suffered between a 50-90% decline over the last 30 years.
- *Needs that will inform applied conservation decisions and actions (in the face of change and uncertainty)* – Identify expected changes in habitat availability resulting from climate change and apply that information towards actively managing shorebird habitats, to best support these vulnerable populations.

Connections to existing science projects:

Piping Plover and Sea-level Rise modeling (NALCC); Updating of National Wetland Inventory maps (NALCC); Risk Reduction and Resiliency Enhancement for Great Marsh (NFWF); Assessing Coastal Impoundment Vulnerability and Resilience in the Northeast (NFWF), Integrated Waterbird Management and Monitoring Approach (USFWS); USGS development of dynamic SLR model affecting coastal habitats (NECSC).

Partners / partnerships who benefit from addressing the need:

A broad array of federal, state and NGO landholders who manage migratory shorebird habitats, particularly. Atlantic Coast Joint Venture partners and the Atlantic Flyway Shorebird Initiative .

Anticipated cost / length of time:

This is a multi-year project with a total anticipated cost of approximately \$200,000. NALCC contribution would be \$60-80,000 to 1) develop methodology; 2) relate existing shorebird data to habitat availability at four NWRs; 3) project future habitat conditions in the face of SLR and storms; 4) project changes in site carrying capacities due to habitat changes; and 5) evaluate management activities that are guided by the findings of this project. This money would leverage existing post Sandy funding and may lead to additional partners providing funding and support.

Needed expertise:

Shorebird population ecology and behavior, sea level rise response models for beaches and flats, and coastal habitat ecology.

