2013 High Priority Science Needs of the North Atlantic LCC

Summary List:

A1. Compilation of aquatic biological data	Aquatic
A2. Stream connectivity and barriers	Aquatic
A3. Stream flow and temperature	Aquatic
TW1. Vernal pool mapping and monitoring	Terrestrial & freshwater wetlands
TW2. Migratory stopover habitat	Terrestrial & freshwater wetlands
TW3. Forest structure and condition	Terrestrial & freshwater wetlands
TW4. Compilation of terrestrial species data	Terrestrial & freshwater wetlands
CM1. Tidal wetland habitat suitability	Coastal and marine
CM2. Wetland restoration projects for resilience	Coastal and marine
CM3. Natural systems response to Hurricane Sandy	Coastal and marine

A1. Compilation of Aquatic Biological Data

Summary of science need:
Compile, document, and make available data on high priority biological endpoints of aquatic ecosystems, such as fish, mussels, benthic macroinvertebrates and other species of conservation concern.

Key outcomes:
One or multiple databases or portals with spatial locations (e.g., stream segment) of occurrence, abundance, or other measures of aquatic species in a form that can be used for purposes such as modeling habitat relationships and threat analysis. Geographic scope would be North Atlantic LCC or Northeast states.

Justification (selection criteria, state of current science):
Regional compilation and integration of existing spatial data on the occurrence and abundance of fish and other aquatic species could have many uses in conservation design and is necessary for the new NALCC project led by Downstream Strategies. Biological data have been collected by many partners but have not been assembled on a regional basis. This work would complement other efforts to promote integration of data for physical and chemical properties of rivers and streams.

Connections to existing science projects
Project would directly contribute to the decision support tool project of Downstream Strategies and would need to be closely coordinated with that project. It could also add value to projects such as those of North Atlantic LCC and NE Climate Science Center that are assembling data and models for stream temperature and flow. Several existing databases exist, such as "MARIS" for fish data, and EPA's "NARS," that may serve the needed purposes if linked or expanded to encompass additional data. Any effort should to be tied closely with other efforts to collect data, e.g., for regional synthesis of State Wildlife Action Plans.

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.
Strategic plan component(s) and action(s) addressed: Ecological Planning: Action 1, Develop and maintain lists of priority species and natural communities Conservation Design: Action 2, Develop regional, consistent, spatial databases
Anticipated cost / length of time: Costs are estimated at $25,000 for one year but will depend on the scope (e.g., number of species), the availability of partners to share data, and partner needs in compiling and documenting data.
Needed expertise: Skills in coordination and project management; maintain strong working relations with key data owners (e.g., state agencies); abilities in management of spatial information and data sharing.

A2. Stream Connectivity and Barriers

Summary of science need: Enhance understanding of stream connectivity and barriers.
Key outcomes: Improved mapping of anthropogenic barriers (such as culverts) and natural barriers incorporated into tools to aid in prioritizing restoration efforts to benefit fish and other aquatic life. Addressing this need could involve multiple phases, with a first phase being to identify and assemble existing data and develop a prioritized plan for addressing data gaps.
Justification (selection criteria, state of current science): Considerable effort has been invested in mapping the locations of dams, but other barriers to stream connectivity, including culverts and also natural barriers (such as waterfalls), are not comprehensively mapped. As a result, efforts to identify and prioritize restoration efforts to restore natural aquatic connectivity are hampered.
Connections to existing science projects Information on this need could be used directly by the Designing Sustainable Landscapes project and the aquatic forecasting and brook trout project. There is potential for work to address this need to leverage possible projects on coastal barriers/connectivity from Hurricane Sandy response efforts.
Partners / partnerships who benefit from addressing the need: U.S. Fish and Wildlife Service, state agencies, partnerships including the Eastern Brook Trout Joint Venture and Atlantic Coastal Fish Habitat Partnership, TNC, and other organizations involved in restoring stream connectivity and protecting aquatic life.
Strategic plan component(s) and action(s) addressed: Ecological Planning: Action 4, Compile and develop information on threats and limiting factors.

Conservation Design: Action 2, Develop regional, consistent, spatial databases
Anticipated cost / length of time: An estimated $150,000 could be used to assemble existing data (e.g., by states), identify existing data gaps, and begin field work to fill data gaps. Alternatively, if Hurricane Sandy funding in this area is provided to the Dept. of Interior, then an estimated $100,000 could be sufficient complete the work (including field identification of barriers) for areas of the North Atlantic outside of the hurricane impact area.
Needed expertise: Experience in mapping, database management, project coordination, and field work for barrier descriptions.

A3. Stream Flow and Temperature

Summary of science need: Address data gaps in stream flow and temperature that will increase the accuracy and usefulness of aquatic decision support tools such as the project for aquatic flows and brook trout sponsored by the North Atlantic LCC.
Key outcomes: Improved regional mapping and analysis of stream temperatures, including the influence of groundwater; improved information on identifying, protecting, and restoring cold water refugia for salmonids and other aquatic species.
Justification (selection criteria, state of current science): Mapping the impacts of groundwater flows and other factors on stream temperature is challenging at regional scales but is important for defining habitat for aquatic species and in developing conservation and restoration strategies to protect them. Progress in these areas in the Western U.S. can serve as models for the Northeast, including the landscape network approach of Dan Isaak and colleagues and the primer for cold water refuges developed by Christian Torgersen and colleagues.
Connections to existing science projects Information on this need could be used directly by the Designing Sustainable Landscapes project and the aquatic forecasting and brook trout project. The work would need to be closely coordinated with NE Climate Science Center projects in this area.
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.
Strategic plan component(s) and action(s) addressed: Ecological Planning: Action 4, Compile and develop information on threats and limiting factors.

Anticipated cost / length of time: A funding level of $100,000 would allow partial completion of temperature work in the North Atlantic and fully fund work to develop materials on identifying cold water refugia. Opportunities to leverage the work with the Climate Science Center and other organizations would be explored.
Needed expertise: Hydrologic, geologic, and engineering expertise, including experience with spatial statistical models for stream networks.

TW1. Vernal Pool Mapping and Monitoring

Summary of science need: Better identify and monitor vernal pools, which are important ecosystem components and have particular value as habitat for amphibians and reptiles.
Key outcomes: Better identifying the location of vernal pools across the region and encouraging coordinated monitoring of vernal pool-dependent species.
Justification (selection criteria, state of current science): Vernal pools are important ecosystem components and have particular value as habitat for amphibians and reptiles, many of which are of high conservation concern. They are also sensitive to degradation and could be particularly vulnerable to the impacts of climate change. However, because of their isolated nature they are difficult to map on a regional basis and not particularly amenable to mapping using remote sensing techniques. NatureServe has some data and various states and other entities have monitoring programs for vernal pool-dependent species but they are not well-coordinated across the region.
Connections to existing science projects Location of amphibian and reptile habitat related to vernal pools has been compiled for some parts of the North Atlantic but is very limited elsewhere and impacts the ability of NALCC partners to model and predict animals and plants dependent on this habitat. Projects that could benefit from this work include the effort to identify Priority Amphibian and Reptile Conservation Areas (PARCAs) and *Designing Sustainable Landscapes.*
Partners / partnerships who benefit from addressing the need: Northeast Partners in Amphibian and Reptile Conservation (NEPARC), state wildlife and natural resource agencies, U.S. FWS and other federal agencies, NGOs.
Strategic plan component(s) and action(s) addressed: Conservation Design: Action 2, Develop regional, consistent, spatial databases; Action 3, Assess existing habitat capacity.
Anticipated cost / length of time: An estimated $75,000-$100,000 would be needed for a one year project to gather existing data,

identify data gaps, coordinate regional monitoring protocols or efforts, prioritize efforts to gather new data or develop models of vernal pool occurrence, and begin data collection or modeling efforts.

Needed expertise:
Experience in compiling and organizing spatial information, experience in coordinating regional conservation efforts.

TW2. Migratory Stopover Habitat

Summary of science need:
Better identify regional use of habitat by migratory landbirds, which is needed to complement focus on habitat for breeding or resident wildlife species.

Key outcomes:
- Maps indicating predictive models of relative habitat use (and by inference, relative habitat value) by migrating birds (primarily landbirds) across the entire Northeast region based on weather radar data and other supplemental data such as mobile radar, acoustic data, or nanotag telemetry data
- Validation of radar-based assessment of migratory habitat use/value with on-the-ground bird data collected during the migration period

Justification (selection criteria, state of current science):
NALCC efforts to characterize habitat have focused on wildlife needs during the breeding season or for year round residents, but have neglected migratory stopover habitat, which could represent the most significant resources that the NALCC can provide for some species. Recent approaches to characterizing habitat use by birds during the migratory period, using weather radar and other techniques, are expanding our ability to assess relative habitat use by migrating species at large scales. Incorporating a measure of migratory habitat value into conservation design and planning would allow for more fully accommodating the life history needs of migratory species during their entire annual life cycle.

Connections to existing science projects
The project "Radar Analysis of Fall Bird Migration Stopover Sites in the Northeastern U.S." (funded in part with FWS/USGS SSP funds) provides a starting point for further work on this topic. It analyzed weather radar data for all NEXRAD stations in the Northeast during 2 fall migration seasons and provided an assessment of relative habitat use by migrating birds within the areas covered by those NEXRAD stations. It also provided an initial attempt at developing a predictive model of migratory habitat use for the entire region. However, the model had a variety of limitations, and no validations of the radar analyses with on-the-ground bird survey data have been completed.

Partners / partnerships who benefit from addressing the need:
FWS and State agencies with responsibilities for managing bird population, Joint Ventures, NGOs working on wildlife conservation and ecological integrity.

Strategic plan component(s) and action(s) addressed:
Ecological Planning Strategy - Action 6: Develop and apply models that relate populations to habitat,

ecological processes and other limiting factors
Anticipated cost / length of time: $100,000 to conduct a two year study assuming other contributions by U.S. FWS Refuge program and state agencies.
Needed expertise: - Knowledge of analysis of radar data for determining migrating bird habitat use - Expertise in habitat modeling - Expertise in studying and surveying birds during the migratory period

TW3. Forest Structure and Condition – Compilation of Disturbance History

Summary of science need: Improve the mapping of forest disturbance and structure for use in defining the capability of the region's forests to support wildlife populations.
Key outcomes: Seamless mapping of forest disturbance and biomass across the North Atlantic region at a higher resolution than is currently available.
Justification (selection criteria, state of current science): Deficiencies in spatially-explicit, regional-scale characterization of forests, especially their structure, are recognized as one of the major limiting factors in defining current habitat for wildlife. They also limit predicting future wildlife habitat because current conditions serve as a starting point for projecting what forests will be like in the future. This approach would take advantage of recent advances in using time series of satellite (Landsat) imagery ("stacks") to characterize disturbance history, which can be used in understanding current forest structure. This is likely a first step since available satellite imagery goes back about 30 years, and so is not relevant for characterizing forests that have not been substantially disturbed during that timeframe. This method also does not explicitly characterize current structure, as it requires assumptions and projections about what has happened to the forests since they were disturbed. LiDAR could provide more direct measures of forest structure and would be the "gold standard" if available, but it would be far too costly at this time to fill the large gaps in regional LiDAR coverage.
Connections to existing science projects Forest structure, condition and history would provide significant metrics to inform Habitat Suitability for representative and priority species, including through the *Designing Sustainable Landscapes* project.
Partners / partnerships who benefit from addressing the need: USFS Forest Inventory and Analysis, UMass DSL Team, USGS Regional Data Liaisons, State Forest and Wildlife Agencies, Nature Serve, state wildlife and natural resource agencies.
Strategic plan component(s) and action(s) addressed: Ecological Planning: Action 4, Compile and develop information on threats and limiting factors.

Conservation Design: Action 2, Develop regional, consistent, spatial databases
Anticipated cost / length of time: It appears that the multi-year, multi-organization project *U.S. forest disturbance history from Landsat: North American Forest Dynamics* will go a long way in meeting this science needs. Up to $25,000 is recommended to work with the investigators of this project to evaluate the quality of data in the Northeast and to refine the effort for this region, and to adapt the data products for use in wildlife habitat modeling.
Needed expertise: Expertise in remote sensing and Land Use Land Cover Analysis and experience in defining forest disturbance.

TW4. Compilation of Terrestrial Species Data

Summary of science need: Compile and synthesize presence/absence data for terrestrial and wetland representative species and Regional SGCN, and plants, prioritized based on ongoing assessments of data gaps.
Key outcomes: A cohesive presence/absence database for representative species, Regional SGCN, and plants. Compiled data will include metadata, species designations, and where possible, metrics describing data quality analogous to NatureServe standards. Project will address data management, including database development, data sharing issues, data sensitivities, and integration with existing data that have been compiled for representative species and Regional SGCN.
Justification (selection criteria, state of current science): Representative species and Regional SGCN are a focus for the NALCC, including both state and federal partners. Presence/absence or presence only data have many applications critical to landscape conservation planning and design, including SWAPs, DSL, T&E, refuge expansion planning, Migratory Birds, and Young Forest conservation initiatives. However, data are currently held in many disparate locations, in some cases by individual investigators, hampering regional assessment efforts.
Connections to existing science projects Compilation will be informed by ongoing assessments of data gaps for SWAP Synthesis. Data would be directly used by *Designing Sustainable Landscapes* project and potentially for PARCA project.
Partners / partnerships who benefit from addressing the need: State wildlife and natural resource agencies, U.S. FWS and other federal agencies, NGOs.
Strategic plan component(s) and action(s) addressed: Ecological Planning: Action 1, Develop and maintain lists and associated information on priority species. Conservation Design: Action 2, Develop regional, consistent, spatial databases

Anticipated cost / length of time: 1 year, approximately $25,000 for a subset of high priority species.
Needed expertise: Skills in coordination and project management; maintain strong working relations with key data owners (e.g., state agencies); abilities in management of spatial information and data sharing.

CM1. Tidal Wetland Habitat Suitability

Summary of science need: Assessing tidal wetland habitat suitability related to 1) tidal regime and flooding from sea level rise and storms and 2) changing elevation and habitat patterns
Key outcomes: Habitat capability models for species using tidal wetlands that incorporates changing tidal levels and patterns due to sea level rise and storms as the initial drivers but also incorporates changing habitat types and patterns over the longer term.
Justification (selection criteria, state of current science): Need to understand the impact of changing tidal levels and patterns due to sea level rise and storms on habitat suitability and persistence of saltmarsh species including but not limited to saltmarsh sparrow, black duck, rail, and marsh-dependent fish to make decisions on habitat restoration and management.
Connections to existing science projects Would be incorporated into the *Research and Decision Support Framework to Evaluate Sea-level Rise Impacts for the U.S. Atlantic Coast* and feed into the Designing Sustainable Landscapes habitat capability projects. Would also relate to the *Saltmarsh Habitat and Avian Research Project (SHARP)*. Consistent with Structured Decision Making on Sea Level Rise\ developed by the LCC.
Partners / partnerships who benefit from addressing the need: SHARP partnership, Black Duck Joint Venture, Atlantic Coast Joint Venture, FWS, NPS, States, TNC
Strategic plan component(s) and action(s) addressed: Ecological Planning, Conservation Design, understanding of climate impacts on habitats and species
Anticipated cost / length of time: Low cost, 1 year for first component for pilot sites (e.g., Barnegat Bay and Chincoteague), higher cost, 3 years for second component
Needed expertise: Habitat modeling, wetland estuarine dynamic modeling.

CM2. Wetland Restoration Projects for Resilience

Summary of science need: Assessment of and lessons learned from Hurricane Sandy tidal wetland restoration projects for increasing resilience.
Key outcomes: Develop standard monitoring and assessment protocols, assess effectiveness of Hurricane Sandy tidal wetland restoration projects including shoreline restoration alternatives in increasing resilience and summarize lessons learned for future restoration projects.
Justification (selection criteria, state of current science): Need to ensure that future restoration projects are informed by the results of current and ongoing efforts. Should take advantage of numerous wetland restoration projects that will be conducted as part of Hurricane Sandy resiliency work (Department of the Interior).
Connections to existing science projects Connects to existing saltmarsh monitoring and integrity work on NWRs, NPS and state lands. Would meet the intent of LCC high priority RFP from last year.
Partners / partnerships who benefit from addressing the need: FWS, NPS, USGS, NOAA refuges, parks and restoration programs.
Strategic plan component(s) and action(s) addressed: Monitoring and Evaluation, Research.
Anticipated cost / length of time: Low cost with Hurricane funding/3 years
Needed expertise: Saltmarsh monitoring and modeling.

CM3. Natural Systems Response to Hurricane Sandy

Summary of science need: Analyze the response of natural systems in reducing impact from Hurricane Sandy to inform future decisions and reduce future risk.
Key outcomes: Understand the importance of natural systems and associated management actions in reducing risk from storm flooding; understand where the risks will be in the future and provide guidance on managing natural systems to reduce future risk. Quantifying the future cost from management actions.
Justification (selection criteria, state of current science): Need to learn from Hurricane Sandy how natural features reduce the vulnerability of habitats,

communities and infrastructure.
Connections to existing science projects Hurricane Sandy Assessment projects.
Partners / partnerships who benefit from addressing the need: NPS, USGS, FWS, NOAA, FEMA, ACOE
Strategic plan component(s) and action(s) addressed: Conservation Design
Anticipated cost / length of time: Moderate with Hurricane funding/3 years
Needed expertise: Impact assessment and modeling, ecological economist