![North Atlantic Landscape Conservation Cooperative logo]

NORTH ATLANTIC
LANDSCAPE CONSERVATION COOPERATIVE

2016
ANNUAL REPORT

North Atlantic Landscape Conservation Cooperative

INTRODUCTION

The North Atlantic Landscape Conservation Cooperative (LCC) reached a major milestone in 2016. This year, the concept that inspired the establishment of our partnership in 2010 transformed from an idea to a reality -- twice.

First, in the spring, partners from New Hampshire, Vermont, Connecticut, and Massachusetts completed *Connect the Connecticut*, a landscape conservation design for the Connecticut River watershed. Then in the fall, collaborators from 13 states released the first set of products from a landscape conservation design for the entire Northeast region.

These accomplishments embody all that we stand for: fostering collaboration among diverse partners to achieve shared goals, supporting science that addresses some of the most urgent conservation issues of our time, and developing information and tools that help organizations and individuals make decisions with regional context.

Landscape conservation design is about more than conserving lands and waters. Our success is measured not only in acres, but in clean water, safe roadways, pathways for migration, open spaces, working lands, and communities of fish, wildlife, and people that are more resilient to change.

More exciting than the completion of landscape conservation design projects is that people are using the resulting products to guide work on various scales across the region, from the Eightmile River watershed in Connecticut, to the five-state Chesapeake Bay watershed. As a whole, this work is greater than the sum of its parts because it reflects a vision shaped by partners across the region.

It also allows us to make progress on priorities we identified in the fall of 2016 focusing on Landscape Conservation, Aquatic Connectivity, Coastal Resilience, and At-Risk Species -- all areas where the North Atlantic LCC is advancing work across the region through the development and distribution of scientific information.

This year's Annual Report shows how our partnership is leading the way to a sustainable future by empowering stakeholders to make decisions at scales that matter for people and wildlife today and tomorrow.

Ken Elowe
U.S. Fish and Wildlife Service
Assistant Regional Director of Science Applications
Steering Committee Chair

Bill Hyatt
Connecticut Department of Energy
and Environmental Protection
Chief of Natural Resources
Steering Committee Vice Chair

Who We Are

Our Partners

STATES/DISTRICTS

Connecticut Department of Energy and Environmental Protection

Delaware Division of Fish and Wildlife

District of Columbia Department of Environment

Maine Department of Inland Fisheries and Wildlife

Maryland Department of Natural Resources

Massachusetts Division of Fisheries and Wildlife

New Hampshire Fish and Game Department

New Jersey Division of Fish and Wildlife

New York Department of Environmental Conservation

Pennsylvania Game Commission

Pennsylvania Fish and Boat Commission

Rhode Island Department of Environmental Management

Vermont Department of Fish and Wildlife

Virginia Department of Game and Inland Fisheries

NATIVE AMERICAN TRIBES

United South and Eastern Tribes

Houlton Band of Maliseets

FEDERAL AGENCIES

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service

U.S. Geological Survey

Department of the Interior Northeast Climate Science Center

National Park Service

Bureau of Ocean Energy Management, Regulation and Enforcement

Bureau of Indian Affairs

Bureau of Land Management

National Oceanic and Atmospheric Administration

U.S. Environmental Protection Agency

U.S. Forest Service

CANADIAN PARTNERS

Environment Canada, Canadian Wildlife Service

The Nature Conservancy of Canada

NON-GOVERNMENTAL ORGANIZATIONS

Ducks Unlimited

Manomet Center for Conservation Sciences

National Wildlife Federation

The Nature Conservancy

National Fish and Wildlife Foundation

New England Wild Flower Society

Trust for Public Land

Wildlife Management Institute

Wildlife Conservation Society
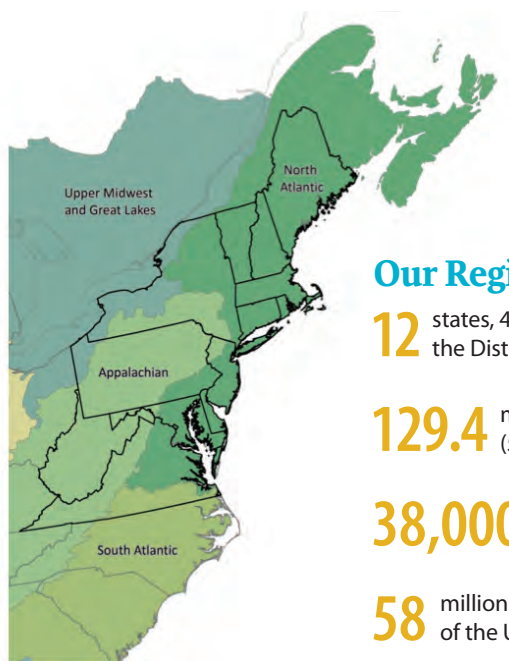
Our Region

12 states, 4 provinces, and the District of Columbia

129.4 million acres of land (52.2 million hectares)

38,000 miles of shoreline (61,000 kilometers)

58 million people, 17.8 percent of the U.S. population

Our Staff

Andrew Milliken
Coordinator through September 2016

Mike Slattery
Acting Coordinator beginning October 2016

Scott Schwenk
Science Coordinator

Steve Fuller
Science Delivery Coordinator

BJ Richardson
Regional GIS Coordinator

David Eisenhauer
Science Applications Communications Coordinator

Renee Farnsworth
GIS Analyst

Bartholomew Wilson
Coastal Resiliency Coordinator

Bridget Macdonald
Communications Coordinator

Emily Powell
Coastal Resilience Research Associate

Our Purpose

Vision:

Landscapes that sustain our natural resources and cultural heritage maintained in a healthy state through active collaboration by conservation partners and partnerships in the North Atlantic region.

Mission:

The North Atlantic Landscape Conservation Cooperative (LCC) is an applied science and management partnership that builds upon a long history of conservation in the region by uniting private, state, tribal, and federal stakeholders around common goals for sustaining natural and cultural resources, and fostering the development of tools and strategies to achieve those goals in the face of threats and uncertainty.

Strategy:

Research, coordination, and science delivery - each aspect of the conservation work supported by the North Atlantic LCC contributes to a regional vision for adaptive management.

This vision is captured in the Northeast Regional Conservation Framework, developed in collaboration with states and other partners during a formative workshop held in Albany, N.Y., in 2011. Although this framework shares a number of elements with other adaptive management approaches, it is unique in its emphasis on the delivery of science for practical applications by:

- **Managing information** to ensure access in necessary scales and formats

- **Translating science** into relevant and usable products

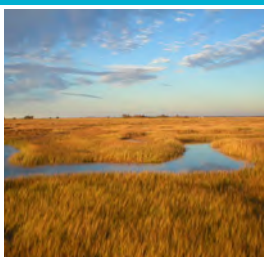- **Helping networks of partners** adopt and use these products for specific applications

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The North Atlantic LCC 2016 Annual Report highlights examples of how our work in five priority areas is advancing regional conservation by empowering practitioners on the ground.

2016 ACCOMPLISHMENTS IN PRIORITY AREAS
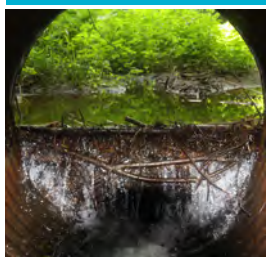
Aquatic Connectivity and Condition	Coastal and Community Resilience	Landscape Conservation Initiatives	At-Risk Species	Science Delivery
4	6	9	12	15

Aquatic Connectivity

OVERVIEW

Why it matters: Tens of thousands of outdated, damaged, and poorly designed road-stream crossings fragment rivers and streams across the North Atlantic region, preventing aquatic species from moving up and downstream and increasing flooding risks for communities. The North Atlantic LCC is working with partners to restore and protect river systems to ensure they are healthy, safe, and connected for the benefit of people and wildlife.

The LCC supports efforts to identify and upgrade road-stream crossings that represent flooding risks to communities and barriers to movement for wildlife. *Credit: Scott Jackson/UMass Amherst*

WHAT'S NEW:

Major barriers for aquatic organisms and the people who care about them have been coming down across the region since the establishment of the North Atlantic Aquatic Connectivity Collaborative (NAACC) - a network of partners across 13 states collaborating on aquatic connectivity and road-stream crossing resilience.

With a central database of regional road-stream crossing infrastructure, standard protocols and trainings for assessments, and web-based tools for prioritizing upgrades, the NAACC provides a collaborative framework for partners to take on the enormous task of upgrading culverts and bridges that represent barriers to aquatic connectivity and threats to

infrastructure and safety. It also provides a replicable approach. Partners from the Southeast Conservation Adaptation Strategy (SECAS) are exploring adopting the NAACC framework, and the Upper Midwest and Great Lakes LCC is interested in contributing to the database.

In 2016, the NAACC held 17 trainings and shadowing opportunities to demonstrate the standard assessment protocols to professionals in the fields of both conservation and transportation. More than 13,000 new records were added the NAACC database in 2016, bringing the total up to 21,000 since its establishment. Last fall, partners at The Nature Conservancy added another valuable resource to this collaborative with the completion of the Aquatic

Barrier Prioritization web application, which provides a comprehensive view of aquatic barriers across the Northeast region, and an ecological basis for prioritizing which ones to target first for the greatest long-term conservation benefit.

WHAT'S NEXT:

Partners at the Nature Conservancy of Canada are making headway on a project that will open the door for cross-border aquatic conservation. By developing an aquatic habitat classification map for Canada that builds upon an existing aquatic map for the Northeastern U.S. created by the Eastern Division of The Nature Conservancy, the project will complete the aquatic habitat picture for the entire North Atlantic LCC region.

Efforts are also underway to facilitate linkages between the NAACC and tools developed for assessing stream temperature and brook trout habitat across the region such as the Spatial Hydro-Ecological Decision System (SHEDS). For example, the Stream Crossings Explorer combines aquatic connectivity and other aquatic information with information on risk-of-failure of crossings. This pilot project is a collaboration between the NAACC and SHEDS teams.

Credit: Bridget Macdonald/NALCC

Who is the NAACC?

- **414 observers** who collect field data

- **87 coordinators** who organize regional or state efforts

- **19 Advisory Committee members** who provide technical advice as needed

- **15 Steering Committee members** who serve as the decision-making body and represent organizations such as the U.S. Forest Service, Vt. Agency of Natural Resources, N.H. Dept of Fish and Game, U.S. Fish & Wildlife Service, and Mass Dept of Fish and Game.

Stream temperature tools streamline work to protect aquatic habitat in Connecticut

Product: The Spatial Hydro-Ecological Decision System (SHEDS)

Seamlessly linking datasets, models, and decision-support systems, SHEDS offers a set of tools designed to help resource managers make strategic decisions to protect freshwater habitats. These include:

• Stream temperature database with data from more than 60 organizations and state agencies across the Northeastern U.S.

• Interactive Catchment Explorer (ICE) to help identify priority catchments

• Interactive mapping tool to view and explore Eastern brook trout data

DEVELOPED BY:
Ben Letcher, U.S. Geological Survey, and colleagues

WHO IS USING SHEDS?
Neal Hagstrom, Fisheries Biologist, Connecticut Department of Energy and Environmental Protection (DEEP)

HOW IS IT ADVANCING HIS WORK?
As soon as the winter thaw begins, Neal Hagstrom's days (and some nights) are filled with trout stocking, stream-population monitoring, angler surveys, and "boat shocking" -- electrofishing by boat at night. When he's not in the field, he is often fielding requests.

"I probably spend 25 percent of my time handling data requests from graduate students, consultants, and others," Hagstrom said.

That's one way SHEDS can help. The stream temperature database offers a public data viewer with which students and professionals alike can review records submitted by more than 60 agencies and organizations across the Northeast, including the Connecticut DEEP.

The database is used to calibrate a regional stream temperature model, which predicts daily mean water temperature at the catchment scale and identifies priority areas for protecting habitat for coldwater-dependent species like Eastern brook trout.
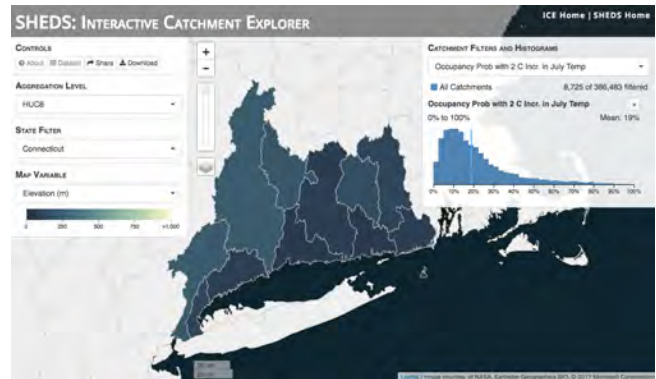
The Interactive Catchment Explorer (ICE) web mapping tool visualizes predicted persistence of local brook trout populations in different climate change scenarios.

The tool's ability to set priorities can help Hagstrom respond to additional requests he often gets from the public.

"Towns are always asking me, 'What are the best places to conserve?'" he said. "Now I can give them a map with Ben's data on it that tells them, 'This is the best habitat. This is where you should spend your money.'"

That's because unlike many models that start big and scale down, the stream temperature tool was built with municipal users in mind.

"It is applicable at a very localized level," Hagstrom said. Just as important, it is accessible to a non-technical user. "The platform is extremely flexible, and with just a little instruction, easy to navigate."

As such, he sees potential to engage a range of audiences, from chapters of Trout Unlimited looking for sites for riparian buffer planting projects, to educators seeking to teach quantitative skills through real conservation scenarios. It's also a way to foster collaboration.

"The tool could help leverage towns and user groups in the same watershed to develop uniform regulations because it provides perspective on how communities are interconnected along drainage lines," he said. That's not only good for aquatic systems, it's easier to enforce.

LEARN MORE:

• **Spatial Hydro-Ecological Decision System (SHEDS) Product page:** http://www.northatlanticlcc.org/products/sheds

• **Connecticut Department of Energy and Environmental Protection:** www.ct.gov/deep

Coastal and Community Resilience

OVERVIEW

Why it matters: The rate of sea-level rise for the North Atlantic region is greater than the global average, and the consequences are already manifesting along the coast. Hurricanes Irene and Sandy demonstrated how vulnerable tidal marshes, beaches, and communities are to flooding and erosion from extreme weather events that are expected to increase. The North Atlantic LCC has been supporting efforts to strengthen coastal resilience in the wake of these storms.

The LCC has been supporting efforts to increase coastal and community resilience since Hurricane Sandy demonstrated how vulnerable our shorelines are to extreme weather events. *Credit: FWS*

WHAT'S NEW:

In 2016, many of the three-year research studies coordinated by the LCC to investigate threats to coastal systems and species with Department of Interior Hurricane Sandy funding were completed, including three of the four projects focused on beach-nesting birds. The final reports for these projects are now available on the LCC's Coastal Resiliency website, and deliverables from several other efforts are expected this spring.

All of the tidal marsh resiliency projects are on track to be completed in 2017. Data from The Nature Conservancy's "Identifying Resilient Coastal Sites for Conservation" project and the Salt Marsh Avian Research Program's tidal wetlands assessment are expected to be released this spring. In addition to highlighting the most productive salt marshes for marsh-nesting birds, these layers will help partners identify locations where marshes may migrate due to sea-level rise.

Partners from the Northeast Regional Ocean Council and the Mid-Atlantic Regional Ocean Council are also wrapping up efforts to synthesize information and disseminate resources to stakeholders working in coastal areas, and will be leading a science-delivery workshop this spring to provide training to target users.

In 2016, the Atlantic and Gulf Coast Resiliency project team compiled and synthesized quantitative tolerance thresholds related to sea-level rise and storms for 45 fish, wildlife, and plant species of conservation concern and four coastal habitats, as well as adaptation strategies that benefit both ecological and human coastal communities. As the year came to an end, the LCC embarked on a new effort with the Northeast Climate Science Center to improve online access to this information for local decision-makers through the Massachusetts Wildlife Climate Action Tool.

WHAT'S NEXT:

The LCC has funded the new "Beach Nesting Bird Habitat Model Synthesis" to integrate modeling work conducted by Rutgers University, Virginia Tech, and the U.S. Geological Survey. The project is expected to be completed in December 2017.

Cooperators at the University of Massachusetts Amherst have conducted research, literature review, and expert interviews for an effort to improve connectivity of tidally influenced culverts. Partners are developing a protocol for assessing the passability of these structures that will be tested in early summer 2017.

REPORTS NOW AVAILABLE ON THE COASTAL RESILIENCE SITE:

TITLE	PRINCIPAL INVESTIGATOR
"Protection of Critical Beach-nesting Bird Habitats in the Wake of Severe Coastal Storms"	Brooke Maslo, Rutgers University
"Analysis of Piping Plovers and other Beach Dependent Species"	Jim Fraser, Virginia Tech
"Multiple Factor Analysis of Piping Plovers and other Beach-Dependent Species Habitat Use and Population Dynamics Following Storm and Human Created Changes to Barrier Island Habitats within the Fire Island National Seashore"	Jim Fraser and Sarah Karpanty, Virginia Tech
"Designing Sustaining Coastal Landscapes in the Face of Sea-level Rise and Storms"	Kevin McGarigal, UMass Amherst

Science directs partners toward a sustainable future for the Great Marsh

Product: Hydro-MEM Model for
Plum Island Estuary

Combining the Marsh Equilibrium Modeling approach with a hydrodynamic modeling approach, the Hydro-MEM model forecasts the evolution of marsh landscapes under different sea-level rise scenarios, with or without marsh restoration and storm surge factored in, to inform future management decisions with regard to system dynamics.

DEVELOPED BY:

Scott Hagen, Louisiana State University, and
Jim Morris, University of South Carolina

WHO IS USING HYDRO-MEM?

Wayne Castonguay, Executive Director of the
Ipswich River Watershed Association
Member of the Great Marsh Resiliency Partnership

HOW IS IT ADVANCING HIS WORK?

When Wayne Castonguay talks about the driving force behind the collaborative coastal resiliency work aligning 29 communities that surround the 20,000-acre Plum Island Estuary, or Great Marsh, in northeastern Massachusetts, he doesn't call it Hurricane Sandy. He calls it Sandy 1.

The Hydro-MEM model forecasts the evolution of the 20,000-acre Plum Island Estuary, also known as the Great Marsh, under different sea-level rise scenarios. *Credit: Matthew Kirwan/USGS*

"We started using that term as a way to remember that we need to keep doing more," explained Castonguay, executive director of the Ipswich River Watershed Association. "This work doesn't end with Sandy."

The work didn't start with Sandy, either. Two informal initiatives -- the Great Marsh Coalition (GMC) and the Parker-Ipswich-Essex Rivers Restoration Partnership (PIE Rivers) -- had been working to protect the marsh and the coastal watersheds that drain into it for years. The infamous 2012 hurricane that wreaked havoc on coastal communities along the eastern seaboard gave the work a new sense of urgency, however.

"When Sandy came along, we realized we had to up our game," said Castonguay. "We needed to do things more holistically in order to take our work to the next level to really move the needle for the Great Marsh."

Under the leadership of the National Wildlife Federation, GMC and PIE Rivers joined forces to form a new initiative called the Great Marsh Resiliency Partnership, involving 29 cities and towns, plus federal and state agencies, universities, and nongovernmental organizations.

As a founding organization of GMC and PIE Rivers, the Ipswich River Watershed Association has a lead role in two major aspects of the project: conducting an assessment of barriers to natural flow in the Great Marsh watershed and partnering with the National Wildlife Federation on a community-planning process to develop town-specific recommendations for increasing collective resiliency.

With scientific guidance from a dynamic salt marsh model, municipal task forces in each of the 29 towns in the Great Marsh region are determining the best actions to make their communities more resilient to sea-level rise. *Credit: PIE Rivers*

Although the project is built upon the bedrock of engaged citizens from the surrounding communities who have rallied around protecting this resource, research supported by the North Atlantic LCC has provided the scientific scaffolding to craft a solid plan.

With a Hurricane Sandy resiliency grant coordinated by the LCC, collaborators from Louisiana State University and the University of South Carolina coupled different modeling approaches to develop a biological-hydrodynamic model (Hydro-MEM) parameterized for Plum Island Estuary to forecast marsh responses to sea-level rise and storm surge connected to sea-level rise and altered marsh landscapes.

By simulating how sea-level rise will affect natural dynamics from hydrology to marsh growth rates, the model provides a scientific basis for actions that will sustain the entire system in the face of change.

"Can the marsh accrete? Can beaches migrate? Where does it make sense to use living shoreline approaches? In order to figure out how to enhance the resilience of the Great Marsh, we had to really understand the system," said Castonguay. "There has been a long history of trying things that ultimately did not work. This model provided the basis on which to develop interventions that would."

Another LCC-supported effort to inventory all beach armoring structures and inlet modifications from Maine to Virginia (featured in the case study on page 13) has also been essential to the task of assessing barriers to Great Marsh hydrology.

> **By simulating how sea-level rise will affect natural dynamics from hydrology to marsh growth rates, the model provides a scientific basis for actions that will sustain the entire system in the face of change.**

LEARN MORE:

- **Hydro-MEM Model Project:**
  http://www.northatlanticlcc.org/
  coastal-resiliency/projects/hydro-mem

- **Great Marsh Coalition:**
  http://greatmarsh.org

- **Parker-Ipswich-Essex Rivers Restoration Partnership:** http://pie-rivers.org

- **National Wildlife Federation:**
  http://www.nwf.org/

- **Ipswich River Watershed Association:**
  http://www.ipswichriver.org/

- **Great Marsh Resiliency Partnership:**
  http://greatmarshresiliency.org

"We analyzed the entire geography for intersections between municipal infrastructure and critical habitat and evaluated them for vulnerability to coastal change," explained Castonguay. "Based on all of that work, we pulled stakeholders from every single community into municipal task forces to figure out what they could do to make each town more resilient."

And that, said Castonguay, is the best evidence of the success of the partnership so far. After all, their work doesn't end with this storm.

"With the Sandy projects winding down, we are starting to think about how to implement recommendations, and that will come down to community buy-in," he said. "Making this about the towns has been central to the whole process and project from the beginning."

View up the Connecticut River from the French King Bridge in Gill, Mass. *Credit: Keith Carver*

Landscape Conservation Initiatives

OVERVIEW

Why it matters: To provide for future generations of fish and wildlife, we need to consider the big picture: How much habitat do different species need to thrive? How might their populations be impacted by future change? The North Atlantic LCC is supporting a collaborative approach to addressing these questions through "landscape conservation design." This process helps partners identify networks of intact, resilient areas capable of supporting long-term needs of people and wildlife across a broad geography and empowers them to make the best decisions to protect these priority landscapes into the future.

WHAT'S NEW:

After reaching a milestone with the public launch of *Connect the Connecticut*, a landscape conservation design for the Connecticut River watershed, the LCC forged ahead with an even bigger challenge -- bigger by more than 250,000 square miles. A network of priority lands and waters across the entire 13-state Northeast region. Initially known as the Regional Conservation Opportunity Areas (RCOAs) project, this collaborative effort now has the working title *Nature's Network*.

Building on pioneering work by the Northeast conservation community -- from the development of habitat maps for the Northeast States' Regional Conservation Needs Program to the U.S. Fish and Wildlife Service (FWS) cross-programmatic work to support Strategic Habitat Conservation -- *Nature's Network* offers scientific consensus on the highest conservation priorities in the region and creates new opportunities to work together. It represents a shared vision and a practical set of tools that can empower people working in different places at different scales to contribute to the greater conservation good, while meeting the goals of their individual organizations.

After more than a year of development involving technical experts from agencies and organizations in all 13 states, the team behind *Nature's Network* released Version 1.0 products for review in August with a month-long webinar series designed to introduce the various products to target audiences. In addition to feedback from technical users, LCC staff collected input from the Steering Committee during the fall meeting on the potential for regional tools to inform work and foster greater collaboration in the region.

WHAT'S NEXT:

Partners are using the data and approaches developed through *Nature's Network* and *Connect the Connecticut* to lay the groundwork for landscape conservation design in other priority landscapes, including the Patuxent River area of Maryland, the Delmarva Peninsula, and the Delaware River Basin.

Regional perspective advances habitat goals for Chesapeake Bay watershed

Product: *Nature's Network* (working title)

The first version of a landscape conservation design for the Northeast region lays the groundwork for unified conservation action across 13 states, based on scientific consensus. More than a map, it offers a suite of decision-support tools representing the following conservation approaches:

- **Terrestrial and Wetland Core Networks** - Connected networks of intact and diverse terrestrial, wetland, and coastal systems that provide habitat for wildlife and benefits for people, such as access to intact forests and sources of clean water.

- **Aquatic Core Networks** - Connected network of intact and diverse aquatic systems that provide habitat for resident and anadromous fish, as well as other organisms, and benefits such as recreation and clean water for people.

- **Habitat for Imperiled and Regional Species of Greatest Conservation Need (RSGCN)** - Important habitat for hundreds of vulnerable species not fully captured in core habitat networks that provide additional perspective on opportunities to support biodiversity.

- **Restoration Opportunities** - Degraded or fragmented places where restoration will make the most difference.

- **Regional Connectivity and Marsh Migration** - Best opportunities to maintain regional connections and connect tidal marshes to adjacent uplands.
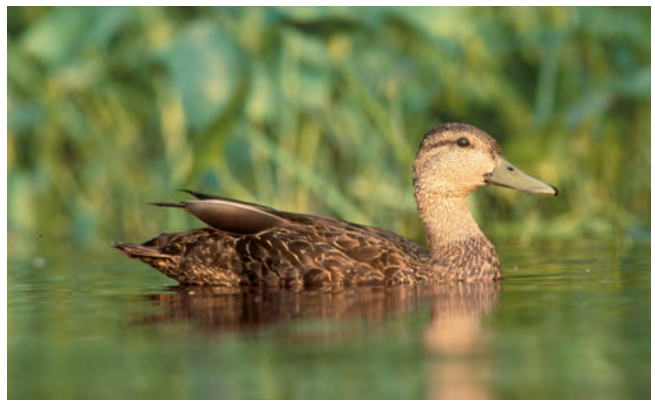
The Habitat Goal Implementation team is charged with identifying the best actions to support a set of priority resources in the watershed, including American black duck. *Credit: Scott Nielson/FWS*

DEVELOPED BY:

A team of experts from 13 states, the North Atlantic LCC, the U.S. Fish and Wildlife Service, nongovernmental organizations, and academic institutions

WHO IS USING *NATURE'S NETWORK*?

Christine Conn, Landscape Conservation Planner for the Maryland Department of Natural Resources, Co-Chair of the Chesapeake Bay Program's Habitat Goal Implementation Team (HGIT)

HOW IS IT ADVANCING HER WORK?

In 2015, Christine Conn had a chance to see how Maryland fits into the big conservation picture when she was invited to co-chair the Habitat Goal Implementation Team (HGIT) for the Chesapeake Bay Program, a regional partnership that has led and directed the restoration of the Bay since 1983. In less than a year, she says, "My conservation universe expanded from Maryland to the entire Chesapeake Bay watershed."

The Chesapeake Bay Program has a high-level habitat goal to restore, enhance, and protect a network of lands, waters, and associated benefits resulting from higher water quality. It's the job of the HGIT to drill down to the nitty-gritty: What needs to happen on the ground across the five watershed states to achieve this goal?

In her role as co-chair with David Whitehurst from the Virginia Department of Game and Inland Fisheries, Conn coordinates and supports six sub-teams that are working to answer that question as it relates to six priority resources that span the watershed's ecological gradient: American black duck, Eastern brook trout, fish passage, wetlands, stream health, and submerged aquatic vegetation (SAV).

Regional perspective will help partners protect enough of the right kinds of habitat, in the right places, to support Chesapeake Bay watershed fish and wildlife, now and into the future. *Credit: Chesapeake Bay Program*

Each priority resource is linked to specific management objectives that incorporate a combination of spatial, temporal, and numeric attributes. For example, the goal for American black duck is to "restore, enhance, and preserve habitat that can support a population of 100,000 by 2025".

With those targets in mind, each workgroup focuses on setting and advancing incremental goals that reflect both the expertise and limitations within each of the five watershed states.

"What we are really trying to do is make sure individual actions to address these management outcomes at the state level will enable us to collectively leverage our money, time, and resources in a way that optimizes fish and wildlife diversity on a regional scale," explained Conn. "That's where I see the *Nature's Network* products being so important."

Conn explained that each of the HGIT workgroups is developing two-year milestones detailing what can be accomplished in the short term to advance their long-term goals. Returning to the black duck example, the first management approach is to restore degraded wetlands in historic breeding grounds.

"In order to make that happen, we need to develop a decision-support tool to evaluate current and future habitats, looking at the long-term resilience of areas that are already considered important. Since the *Nature's Network* models already include that kind of forecasting, we can fine-tune the information based on other data products from our partners," she said. "So the data works its way down to help us identify exactly where we need to work to meet our goals."

By complementing the maps and data with local knowledge, the team can determine the most appropriate actions to take in those places.

"More than just where to prioritize, it can help us figure out where we need to develop funding, or where to conduct outreach to communities," she explained. "The specific objectives for these resources are all very different, but when you start to look at addressing common management challenges in order to make the most of limited funding, and figuring out how partners can work together in the most important areas, you can see that *Nature's Network* will be really important for helping us align our efforts."

In the big picture, Conn said, "It will also be the recipe for conserving enough of the right kinds of habitat, in the right places, to support Chesapeake fish and wildlife, now and into the future."

LEARN MORE:

- *Nature's Network:* http://www.naturesnetwork.org
- **Chesapeake Bay Program:** http://www.chesapeakebay.net
- **Habitat Goal Implementation Team:** http://www.chesapeakebay.net/ groups/group/habitat_goal_implementation_team
- **Maryland Department of Natural Resources:** http://www.dnr.state.md.us

At-Risk Species

OVERVIEW

Why it matters: From New England cottontail to the communities of freshwater mussels found in the Tennessee River Basin in Virginia, thousands of species have found their niche in the Northeastern United States, and many of them are threatened by habitat loss and degradation. The North Atlantic LCC supports the development of information, tools, and partnerships to help practitioners identify the best conservation opportunities and strategies to keep at-risk species from going extinct, and to make sure common species stay common.

WHAT'S NEW:

The LCC and partners have incorporated specific habitat needs for a range of different species into scientific products designed to help managers make decisions to support biodiversity. The team behind the *Connect the Connecticut* landscape conservation design used a set of 14 species Landscape Capability models developed by the Designing Sustainable Landscapes project at UMass Amherst as one component in prioritizing sites that have the potential to support biodiversity into the future. By the end of 2016, UMass had completed Landscape Capability models for 30 species - including American woodcock, black bear, and wood turtle — selected to serve as representatives for other species with similar needs because they are sensitive to disturbance and feasible to monitor.

These models were also incorporated into the *Nature's Network* project, along with data on important habitat needs for hundreds of animals identified as Species of Greatest Conservation Need (SGCN) in Wildlife Action Plans revised by states in 2015. Both the representative species models and the important habitat data can be used alone or as part of the landscape conservation designs.

The LCC also supported efforts to focus more narrowly on specific species that are vulnerable to climate change. Partners from Downstream Strategies released the new Fish Habitat Decision Support Tool in February, which enables users to establish and rank conservation priorities, predict how cold-water species like brook trout will fare under various management scenarios, and evaluate long-term
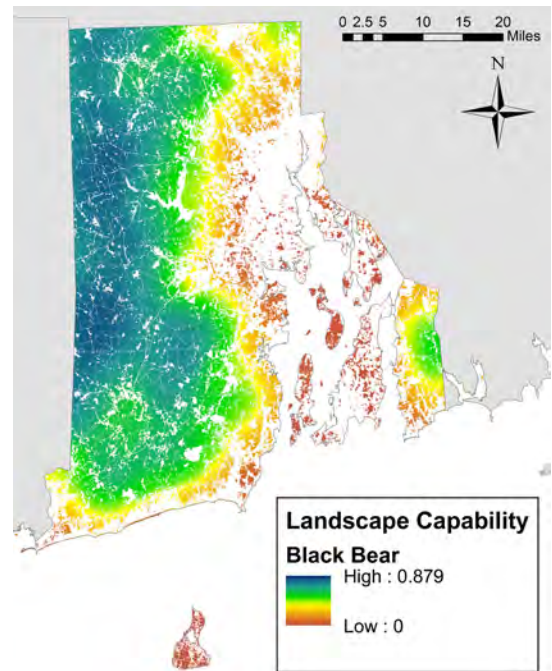
The LCC supports the development of models to help identify areas of high habitat value for a suite of representative species, including black bear.

conservation benefits in the face of climate change.

Several Hurricane Sandy-funded projects focusing on species threatened by sea-level rise, such as saltmarsh sparrow and piping plover, wrapped up in the fall and are now beginning to release products designed to inform the work of professionals on the frontlines of species conservation in beaches, marshes, and river systems.

Increasingly, the LCC has been engaging with the FWS Endangered Species program to apply landscape science to support work on dozens of species that have been court-mandated for status assessments under Endangered Species Act listing petitions. Science supported by the LCC will be used to evaluate threats, species status, and habitat condition.

WHAT'S NEXT:

In the new year, staff from the LCC and FWS met with a group of private forest landowners, and began to map out a process for science-based collaboration. By fostering an exchange of information between landowners and managers on habitat for key species, partners will establish a mechanism for identifying mutually beneficial opportunities for landowners to contribute to conservation. The effort represents a proactive collaboration between private industry and the wildlife agencies, with the hope that common interests will expedite conservation and minimize the regulatory burden for the emerging partnership.

Inventory of tidal inlets shows Forsythe's Little Egg is a big natural asset

Product: Beach and Tidal Habitat Inventories

This set of resources provides a comprehensive look at the location, status, and condition of potential piping plover breeding grounds from Maine to Virginia in three periods: before Hurricane Sandy, immediately after Hurricane Sandy, and three years after post-storm recovery efforts. The inventory was developed using imagery from Google Earth, Google Maps, state agencies, municipalities, and private organizations. It includes:

Little Egg Inlet on the coast of New Jersey provides important habitat for three endangered species found at Forsythe National Wildlife Refuge.
Credit: Google Earth

- Google Earth files and metadata of Pre-Sandy Tidal Inlets, Beach Fill, and Beach Armoring (Me. to Va.); Excel spreadsheet of Pre-Sandy Beach Development, Armoring, and Fill by Community

- Report providing Inventory of Habitat Modifications to Sandy Beaches, Me. to Va.

- Report providing Inventory of Habitat Modifications to Tidal Inlets, Me. to Va.

- Inventory of Habitat Modifications to Sandy Beaches for Coastal Migration and Wintering Range in Continental U.S.

DEVELOPED BY:
Tracy Monegan Rice, Terwilliger Consulting, Inc.

WHO IS USING THE BEACH AND TIDAL INLET HABITAT INVENTORIES?
Wendy Walsh, Endangered Species Biologist, U.S. Fish and Wildlife Service New Jersey Field Office

HOW IS IT ADVANCING HER WORK?
As the lead biologist for the recovery of the threatened red knot and the New Jersey state lead for the threatened piping plover, Wendy Walsh spends a lot of time thinking about managing human influences that will affect habitat these species depend upon: sandy beaches and tidal inlets.

> **Little Egg Inlet is not just of high value, it is unique. It may be the only baseline for comparing managed and natural inlets.**

During Hurricane Sandy, barrier beaches overwashed around Little Egg Inlet, an opening into Great Bay in the wilderness portion of Forsythe National Wildlife Refuge. And that turned out to be a good thing for plovers.

"It created great habitat," Walsh said. "Plover numbers really increased." Did they ever. Today, Walsh said, "Beaches around Little Egg Inlet provide habitat for about a third of the plover population in New Jersey, as well as habitat for migratory concentrations of red knot and the listed plant seabeach amaranth."

Now proposed activities in the inlet threaten to interfere with natural processes necessary to maintain this habitat complex.

"There has been drift of sand from nearby beach fill, and a plan to dredge the inlet," Walsh explained. It's not yet clear how these activities may affect the habitat.

In the face of these threats, Tracy Rice's inventory has provided valuable perspective to make the case for careful management around this inlet. Although Little Egg Inlet was previously considered important plover habitat in New Jersey, the Tidal Inlet Inventory revealed something new.

"Little Egg Inlet is the only unmodified inlet between Montauk, New York, and Gargathy Inlet in Virginia, a shoreline distance of nearly 350 miles," said Walsh. "That means that every other inlet along that entire stretch of coastline has been stabilized, dredged, sand

mined, or altered in some way. This is the only one that is more or less in its natural condition."

It seems Little Egg Inlet is an even rarer natural asset than anybody realized, and that's important to know in the context of the Service's new policy for mitigating impacts to habitats that are considered to be of high value to at-risk species. Little Egg Inlet is not just of high value, it is unique. It may be the only baseline for comparing managed and natural inlets.

All three of Forsythe's listed beach-dependent species thrive in the shifting habitats that surround the natural inlet.

"We knew these species favor these kinds of sites, and we knew most of them were altered, but we didn't know it was all but one," said Walsh. "The data provided a landscape perspective that enabled us to say Little Egg Inlet is unique, at least in the Mid Atlantic. It just took someone adding it all up."

That someone was Rice, and the new report dovetails with her previous

The federally listed piping plover depends upon sandy beaches and tidal inlets for nesting habitat. *Credit: FWS*

work to inventory coastal habitat in the Southeastern portion of the United States. Together, the reports provide a complete inventory of the red knot's coastal habitat, and Walsh is already anticipating using the information in an upcoming project to develop a recovery plan for red knot.

"The recovery outline will give us good perspective to think about future habitat availability for red knot: how much habitat is available, how much of that is managed, and how much is undisturbed," she said.

FOR MORE INFORMATION:

- **Beach and Tidal Habitat Inventories Product page:** http://northatlanticlcc.org/products/habitat-inventories

- **U.S. Fish and Wildlife Service New Jersey Field Office:** https://njfieldoffice.fws.gov/

- **Edwin B. Forsythe National Wildlife Refuge:** https://www.fws.gov/refuge/edwin_b_forsythe/

Science Delivery

Why it matters: Scientific information is only as valuable as it is applicable. One of the key functions of the North Atlantic LCC is to make sure partners working at different scales have access to the best datasets and decision-support tools in the region, and guidance on how to use these products effectively to advance their work in conservation.

WHAT'S NEW:

The LCC redoubled efforts to deliver scientific resources to partners who can use them to address a range of conservation priorities across the region, both online and in person. The completion of a new product database created a central clearinghouse for practitioners to explore and access all of the foundational information, assessments, research results, and tools supported by the LCC.

Staff and partners also shared information with conservation professionals across the region face-to-face in trainings, workshops, meetings, and through a cohort of **Demonstration and Delivery Projects** *(See page 16).*

"It was eye-opening for me to learn about all of the different efforts taking place around the Great Marsh to model and understand the effects of sea-level rise and climate change. I learned a lot, and I hope the momentum continues, and the work is packaged and shared so communities can benefit from all of this research."

- Great Marsh Resiliency Modeling Workshop attendee Lisa O'Donnell, a member of the Board of Selectmen in Essex, Mass.

Here are some highlights:

Applying Information & Tools from LCCs in the Northeast Region

LOCATION:
Northeast Association of Fish and Wildlife Agencies Conference, Annapolis, Md.

DESCRIPTION:
A hands-on introduction to a range of information and tools developed by the North Atlantic and Appalachian LCCs.

AUDIENCE:
Approximately 20 biological and GIS staff from state fish and wildlife agencies and nongovernmental organizations.

Chesapeake Bay Program Habitat Goal Implementation Team (HGIT) Meeting

LOCATION:
National Conservation Training Center, Shepherdstown, W.V.

DESCRIPTION:
Demonstration of using products from *Nature's Network* to address specific conservation scenarios in the Chesapeake Bay watershed.

AUDIENCE:
Approximately 30 HGIT team members from state agencies, federal programs, and nongovernmental organizations.

Great Marsh Resiliency Modeling Workshop

LOCATION:
Parker River National Wildlife Refuge, Newburyport, Mass.

DESCRIPTION:
Presentations and discussion led by Principal Investigators of Hurricane Sandy resiliency projects on how their research can inform decisions that will affect a 20,000-acre tidal marsh threatened by climate change.

AUDIENCE:
Approximately 50 representatives from local communities, nongovernmental organizations, and state agencies.

Demonstration and Delivery Projects

The North Atlantic LCC provides grants to partners that have the vision and knowledge to deliver science at relevant scales for practitioners, landowners, and communities.

PROJECT	GRANTEE	UPDATES AND MILESTONES
Envision the Susquehanna: Incorporating Landscape Science into Large Landscape Conservation	Chesapeake Conservancy	Workshops are ongoing to engage community members in the project and share resources with partners
Enhanced Stewardship of Priority Habitats and Species on Private Lands	Wildlife Conservation Society Adirondack Program	The "New York State Tools for Land Use Planning" gallery went live on DataBasin in December
Science to Practice: A Science Delivery Program for Regional Conservation Partnerships in New England	Highstead Foundation	The 6th annual RCP Gathering was held in November, focusing on "The Power of Teamwork to Advance Regional Conservation"
Catalyzing Land Trust Capacity for Data and Science Integration	Open Space Institute	The "Conservation in a Changing Climate" guide for land trusts was released in October in partnership with the Land Trust Alliance
Local Adaptation for Marsh Migration	Maine Department of Inland Fisheries and Wildlife	Outreach is ongoing in coastal towns in Maine that served as case studies in the project, and are incorporating sea-level rise data into planning
White Mountains to Moosehead Lake Initiative	Trust for Public Land	Stakeholders continue to use a customized online portal to view data and access data and develop maps for the 2.7 million-acre landscape

The North Atlantic LCC's Conservation Planning Atlas provides access to 279 datasets -- and counting -- and serves as a hub for conservation resources from relevant efforts and geographies.

RESOURCE CATEGORY	NUMBER OF DATASETS
CLIMATE CHANGE	65
TERRESTRIAL	53 (33 SPECIES)
AQUATIC	22
COASTAL AND MARINE	60 (24 SPECIES)
CONNECT THE CONNECTICUT	59
NATURE'S NETWORK	20
TOTAL	279

▶ *Explore the data at: https://nalcc.databasin.org*

Climate data expands conservation horizons for Maine partnership

Project: Catalyzing Land Trust Capacity for Data and Science Integration

LED BY:
Open Space Institute (OSI)

WHERE THE WORK IS MAKING A DIFFERENCE:
With support from the Open Space Institute, a partnership of eight land trusts in midcoast Maine -- the 12 Rivers Initiative -- is planning for the future by building stronger relationships with its neighbors upon a foundation of climate data.

After learning about the wealth of datasets available in the Land Protection in a Changing Climate gallery on the North Atlantic LCC's Conservation Planning Atlas, Anna Fiedler of the 12 Rivers Initiative decided to give the partnership's priorities a second look.

"We already had a good plan in place, but we saw potential to reexamine it through the lens of climate data," said Fiedler, who is the Director for Conservation for Midcoast Conservancy, one of the eight land trusts that comprise 12 Rivers.

In addition to reevaluating priorities within their 825,000-acre service area, the partners realized regional datasets could help them make more meaningful decisions by looking beyond their borders.

"We saw this as an opportunity to approach land trusts at the edges of our landscape to talk about where conservation corridors should go once they leave our map," said Fiedler.

HOW THEY DID IT:
12 Rivers applied for a grant from the OSI to incorporate climate data into their long-term planning with guidance from a "circuit rider" -- Gillian Davies of the BSC group -- who was trained to provide technical support.

Fiedler and her colleague Ruth Indrick, Project Coordinator for the Kennebec Estuary Land Trust, created a map highlighting overlapping priority areas identified by combining the Terrestrial Resilience and Regional Flow datasets developed by The Nature Conservancy and the Index of Ecological Integrity

Anna Fiedler from the Midcoast Conservancy shares a new map developed using climate data with members of neighboring land trusts to identify opportunities to connect. *Credit: 12 Rivers Initiative*

developed by the Designing Sustainable Landscapes Project at UMass Amherst. Together these datasets help practitioners identify sites in the Northeast with characteristics necessary to support biodiversity and wildlife movement into the future.

Idrick and Fiedler then presented this co-occurrence model along with individual maps depicting each dataset at a workshop for staff from all eight land trusts of 12 Rivers, as well as others along the boundaries.

"We talked about what we envisioned for planning, shared maps with the lands committee at each land trust so they could ground truth what the models showed, and agreed to reexamine the edges and corridors with new information provided by our neighbors," said Fiedler. "Mapping is a great tool, but it's important to use local knowledge to put it to the test."

It's also good diplomacy. "The conversation really strengthened our relationships with the land trusts at our borders," she said.

HOW IT IS ADVANCING THEIR WORK:
Thanks to support from OSI, 12 Rivers has been able to prioritize conservation planning in a way they wouldn't have otherwise. "As a land trust, we are balancing land stewardship, reactive land conservation, and volunteer engagement, so there often just isn't the bandwidth for long-range planning," said Fiedler. "Giving this process a timeline made it something we had to prioritize. We got the technical support that we needed to do the mapping, and now we are the experts."

The map has also provided positive scientific reinforcement for the direction the partnership is heading. "The data showed

us that we already had a solid conservation plan in place, but by making sure it is aligned with new knowledge, it shows that we are looking ahead," said Fiedler. "That's really valuable when going to donors and funders."

WHERE IT WILL TAKE THEM NEXT:
While 12 Rivers is still in the process of realigning its conservation plan based on input from partners and neighbors, the mapping exercise has started important conversations.

"We are seeing now that the bulk of the effort moving forward will be communicating about it. We are incorporating more climate change context into our work, and we are looking for ways to talk about it that keep a range of different people engaged, without using the kinds of buzzwords that can close the conversation."

Fiedler explained that at a workshop for 12 Rivers' staff and board of directors, attendees learned about the co-occurrence mapping process and results and took part in an activity in which people paired up and played the role of either a skeptical landowner or a member of a land trust who was trying to convince the landowner that their property was key to conserve.

"Participants said that finding common ground with the other person was extremely important. Most people didn't even use the phrase 'climate change' in their conversations," she said.
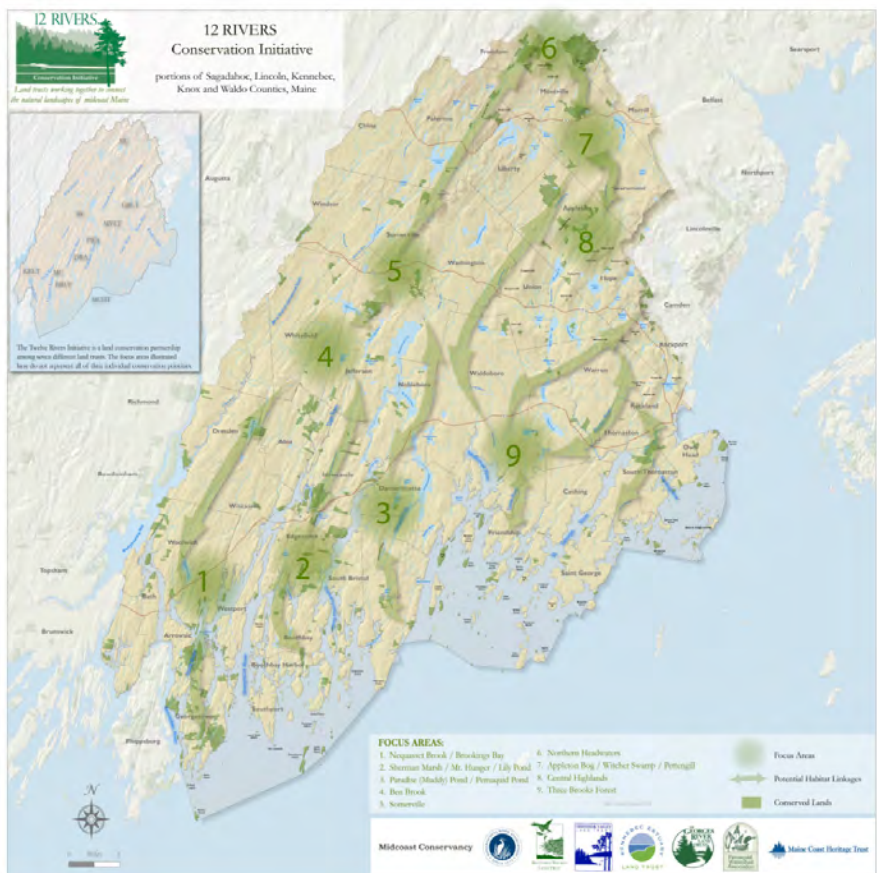
The Maine-based partnership developed a conservation plan designed to support habitat for wildlife and community needs, like working lands and recreation, across an 825,000-acre landscape with guidance from the Open Space Institute. *Credit: 12 Rivers Initiative*

As with productive conservation, productive communication starts by identifying common ground, and OSI will be supporting 12 Rivers in this aspect of their work as well by providing guidance on messaging based on research from the Yale Program on Climate Communication.

"It's wonderful to have that support," said Fiedler. "I'm glad they understand that communication is something that is critical to long-term planning."

LEARN MORE:

- **Open Space Institute:** www.osiny.org
- **Midcoast Conservancy:** http://www.midcoastconservancy.org
- **12 Rivers Initiative:** http://www.12rivers.org
- **Conservation in a Changing Climate:** http://climatechange.lta.org

Credit: Emily Francis/FWS

2016 YEAR IN REVIEW:
A selection of North Atlantic LCC and partner milestones in 2016

JANUARY

LCC leads a training on using the Conservation Planning Atlas to view and share datasets for a group of partners collaborating to restore the Hudson River watershed.

FEBRUARY

Downstream Strategies releases the Fish Habitat Decision Support Tool for prioritizing the conservation of habitat for aquatic species, including brook trout, river herring, and shad.

The Town Council in Palmer, Mass., requests special enabling legislation from the state senate to direct the transfer of a 92-acre parcel of land from MassDOT to the Palmer Conservation Commission based on data from *Connect the Connecticut*.

MARCH

Staff from the LCC and FWS introduce refuge biologists to scientific tools that offer regional perspective on habitat management and planning at the National Wildlife Refuge biological workshop in Shepherdstown, W.V.

APRIL

LCC staff and partners lead a hands-on introduction to information and tools developed by the North Atlantic and Appalachian LCCs during a workshop at the Northeast Association of Fish and Wildlife Agencies Conference in Annapolis, Md.

Scientists and stakeholders meet at the Parker River National Wildlife Refuge in Newburyport, Mass., for an LCC-supported symposium on using science to help protect a 20,000-acre tidal wetland known as the Great Marsh.

MAY

Partners publically launch *Connect the Connecticut*, a collaborative effort to conserve a network of resilient lands and waters to sustain wildlife and people in the 11,250 square-mile Connecticut River watershed.
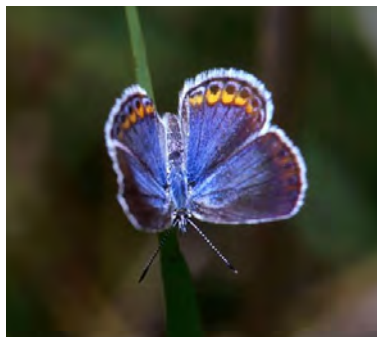
JUNE

FWS Director Dan Ashe presents the John S. Gottschalk Partnership Award to the group of Service staff who helped lead the *Connect the Connecticut* landscape conservation design project, including North Atlantic LCC Coordinator Andrew Milliken.

North Atlantic LCC Science Coordinator Scott Schwenk, Science Delivery Coordinator Steve Fuller, and Steering Committee Chair Ken Elowe join staff and partners from across the LCC Network for a meeting to address recommendations from the National Academy of Sciences.

JULY

Partners from across the region meet at the Albany Pine Bush Preserve in New York to review the first versions of products from *Nature's Network*, an effort to identify conservation priorities across the 13 Northeast states.

AUGUST

The LCC initiates a month-long review process for the Version 1.0 products from the *Nature's Network* project, including weekly review webinars led by staff and partners.

The Nature Conservancy releases "Resilient and Connected Landscapes" report, featuring guidance from the LCC on landscape permeability.

SEPTEMBER

The Nature Conservancy releases the Aquatic Barrier Prioritization, offering a comprehensive view of aquatic barriers across the Northeast region and an approach for prioritizing which ones to target first for the greatest long-term conservation benefits.

After serving as North Atlantic LCC Coordinator since its establishment in 2010, Andrew Milliken departs for a new position as a Project Manager at the Lake Champlain Fish and Wildlife Conservation Office in Vermont. FWS Chesapeake Coordinator Mike Slattery steps in as Acting Coordinator.

The White House recognizes LCC Steering Committee member Rick Bennett, FWS Northeast Regional Scientist, as a GreenGov Presidential Awards Climate Champion for his leadership of the DOI Hurricane Sandy Response Team.

OCTOBER

North Atlantic LCC Coastal Resilience Coordinator Megan Tyrrell departs for a new position with Waquoit Bay National Estuarine Research Reserve. FWS Coastal Geologist Bart Wilson takes over coordinating three cohorts of Hurricane Sandy projects focusing on tidal marsh, beaches and barrier islands, and aquatic connectivity.

The Open Space Institute releases the "Conserving Nature in a Changing Climate" guide designed to put climate science in the hands of small groups who can make a big conservation impact.

NOVEMBER

Highstead Foundation hosts the 6th annual Regional Conservation Partnership (RCP) Gathering, featuring sessions on the LCC-supported landscape conservation design projects *Connect the Connecticut* and *Nature's Network*.

The National Park Service releases the Coastal Adaptation Strategies Handbook to summarize the current state of climate adaptation in national parks and identify resources to help plan for and adapt to climate change in coastal areas, including LCCs.

The U.S. Geological Survey publishes a paper describing the testing, application, and efficacy of the iPlover smartphone application, the first of many anticipated publications on Hurricane Sandy-funded research supported by the North Atlantic LCC.

DECEMBER

The Wildlife Conservation Society Adirondack Program releases the New York State Tools for Land Use Planning gallery on the LCC's Conservation Planning Atlas to provide access to regional data showing locally occurring natural resources in the Empire State.

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To learn more about the North Atlantic LCC, please visit: http://northatlanticlcc.org
To learn more about the LCC Network, please visit: https://lccnetwork.org