Appalachian
Landscape Conservation Cooperative

2015
ANNUAL REPORT

5-YEAR REVIEW:

A Reflection on the Evolution and Growth of our LCC

Landscape Conservation Cooperatives (LCCs) were established – and all of us became involved – to proactively work beyond state and jurisdictional boundaries to address the scale and scope of stressors like urbanization, energy development, and climate change. We needed to collaborate at a more comprehensive scale to protect species, habitats, and ecosystems that are so valuable to the natural world and society. It was imperative to plan and manage regionally in order to protect valued natural and cultural resources today while working towards a resilient landscape for the future.

DAVID WHITEHURST
Virginia Department of Game and Inland Fisheries , Appalachian LCC Steering Committee Chair

PAUL JOHANSEN
West Virginia Division of Fish and Wildlife Resources , Appalachian LCC Steering Committee Vice Chair

In the five years we have had the great pleasure of being the Chair and Vice Chair of the Appalachian LCC, our Steering Committee, staff, and larger conservation community has made tremendous strides on many fronts. Our Cooperative established its governing structure for proactively addressing landscape-level stressors and emerging issues. The development of a 5-Year Work Plan directed our focus and energy towards shared conservation priorities and key opportunities for collaborative efforts. Through consultations with managers and researchers representing diverse expertise and affiliations from throughout the region, we identified the most pressing scientific needs that had to be addressed in order to work towards landscape-scale conservation.

Identifying these needs were essential in funding the best research projects that assembled foundational data and developed tools and products to support on-the-ground conservation and natural resource management. The information and resources from these projects also had the net effect of informing our LCCs Landscape Conservation Design (LCD) Framework. This dynamic and living plan – which will continue to be revised through consultations with partners and integration of new science - is identifying and prioritizing critical lands and waters important for sustaining functional ecosystems throughout the Appalachians and will provide the ability for incorporating landscape data into local land-use decisions.

Of course, all of this success reflects our network of dedicated and passionate individuals collaborating together to communicate, engage, and demonstrate the importance of this work for natural resource management, conservation, and society. It has been our pleasure to be a part of such a committed group of people in this partnership that has led to the rapid evolution and growth of this LCC. We look forward to continuing to support this work in creating an ecologically resilient and enduring Appalachian landscape for the future.

Integrating LCC Science into Planning and Land-use Decisions

As the new Chair and Vice Chair of the Appalachian LCC, we would like to first state how grateful the LCC community is for the tremendous leadership David Whitehurst and Paul Johansen have shown in building this partnership and establishing a solid foundation for which to grow. We hope to continue the landscape conservation momentum they have built in the Appalachians in the coming years.

GWEN BREWER
Maryland Department of Natural Resources
Appalachian LCC
Incoming Chair

CLYDE THOMPSON
U.S. Forest Service
Appalachian LCC
Incoming Vice Chair

Looking back, our LCC has invested in and supported the creation of vital research products, tools, and a landscape conservation design framework to address the most pressing science needs in the region. It is now our duty to ensure this science becomes integrated into planning and decision making at regional, state, and local levels to ensure key habitats and ecosystems are conserved in large, interconnected areas.

With our solid background and experience in the science side of landscape-scale conservation, we can now seek out new and perhaps unconventional partners and engage in dialogue with key audiences – such as industry – that are influencing the landscape. Looking at the needs and common interests of others and finding ways to mesh our mission with theirs gives us additional opportunities to expand upon our successes.

With the outstanding leadership of the LCC Coordinator, excellent support from LCC staff, and commitment from diverse and talented partners, the Appalachian LCC has accomplished a lot in a short amount of time. As there is still much to do, we look forward to working with the partnership to meet the challenge of conserving the unique biological and cultural treasures of the Appalachian region.

OUR PARTNERS

STATES/DISTRICTS

Georgia Department of Natural Resources

Maryland Department of Natural Resources

North Carolina Wildlife Resources Commission

Pennsylvania Fish and Boat Commission

Pennsylvania Game Commission

Tennessee Wildlife Resources Agency

Virginia Department of Game and Inland Fisheries

West Virginia Division of Natural Resources

NATIVE AMERICAN TRIBES

Eastern Band of Cherokee Indians

FEDERAL AGENCIES

Environmental Protection Agency (R3 & R4)

National Oceanic and Atmospheric Administration (Eastern)

National Park Service (National Capital Region, SE & HQ)

Natural Resource Conservation Service (Eastern)

Office of Surface Mining Reclamation and Enforcement (R1)

Tennessee Valley Authority

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service (R4 & R5)

U.S. Forest Service (R8 & 9)

U.S. Geological Survey (NE Area)

NON-GOVERNMENTAL ORGANIZATIONS

National Wildlife Federation (Climate Program)

The Nature Conservancy (Central Appalachian)

Wildlife Management Institute

REGIONAL PARTNERSHIPS

Appalachian Mountains Joint Venture

Central Hardwoods Joint Venture

Eastern Brook Trout Joint Venture

Ohio River Basin Fish Habitat Partnership

Southeast Aquatic Resources Partnership

OUR STAFF

Jean Brennan, PhD
Coordinator & Director of Science

Matthew Cimitile
Communications Coordinator

Jessica Rhodes
GIS Analyst and Data Manager

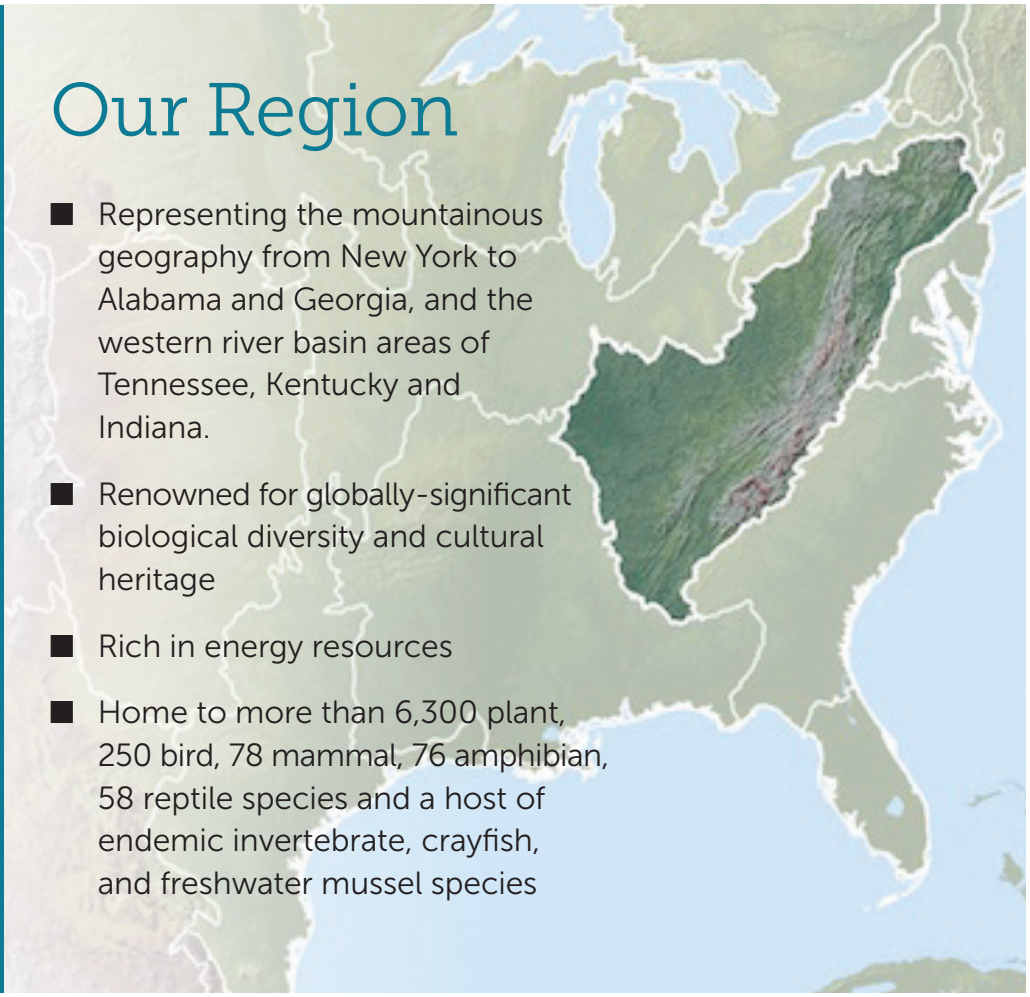
Ginny Kreitler
Outreach Coordinator

Mary Davis, PhD
Aquatic Ecologist

Rosanne Hessmiller
IT and Web Applications

Tracy Clark
Graphics Design

Our Region



- Representing the mountainous geography from New York to Alabama and Georgia, and the western river basin areas of Tennessee, Kentucky and Indiana.
- Renowned for globally-significant biological diversity and cultural heritage
- Rich in energy resources
- Home to more than 6,300 plant, 250 bird, 78 mammal, 76 amphibian, 58 reptile species and a host of endemic invertebrate, crayfish, and freshwater mussel species

Our Vision

Ecological Integrity. Environmental Benefits. Sustainable Wildlife Populations.

Our Mission

Achieve sustainable landscape-level conservation in Appalachia through partnerships, shared resources, and enhanced science-based management capacity to deliver landscape-level planning and conservation actions as part of a national network.

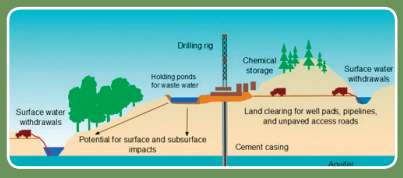
Our Strategy

The Appalachian LCC is helping to deliver vital science information and conservation tools to the conservation community. We do so by working on major conservation priorities, coordinated efforts, and collaborative landscape planning identified and articulated by our Steering Committee members and partners. To make our vision a reality, the Cooperative is focusing on:

- Creating and delivering a landscape-level data sharing strategy and scalable toolset
- Delivering landscape-level conservation design for regional use
- Creating an ongoing facilitated process to promote engagement and dialogue across the Appalachian LCC region
- Assessing and aligning conservation goals and actions that reflect our Cooperative members' common and shared vision

2015 Highlights

Developing a Landscape Conservation Design for Regional and Local Planning



Supporting and Integrating Proactive Research to Address Vital Science Needs

Showcasing Innovative LCC Products, Tools, and Resources

Developing a Landscape Conservation Design for Regional and Local Planning

Connected landscapes are necessary to sustain the many natural areas, unique biodiversity, and cultural resources that make the Appalachians a special place.

Conservation Planning is a process that identifies and prioritizes lands that encompass important natural and cultural resources across the landscape and develops protection and management strategies to link these lands together. It is collaborative and coordinated, involving many organizations and reaching across jurisdictional and political boundaries. The effort to identify critical areas vital to sustain fish and wildlife populations, enhance ecosystem services for society, and protect cultural resources is informed by technical experts from among the Cooperative's membership using their on-the-ground knowledge and expertise.

Where "Planning" is the process to identify shared actions that lead to mutual goals, a Conservation Design is the product that is continuously refined by integrating new information on habitat, threats, and other on-the-ground conditions. The product can be a series of maps and supporting data layers or decision support tools that illustrate the location of key focal landscapes and priority resources. The application of these tools can inform management decisions and conservation actions to ensure the quality, quantity, and location of habitat needed to protect biodiversity. The successful product – commonly referred to as a "Conservation Blueprint" or "Landscape Conservation Design (LCD)" – will be a dynamic, living plan that is updated with the best science and through ongoing consultations with the conservation community and provides public land managers, non-profit organizations, private landowners, and industries the ability to incorporate landscape data into their own local land-use decisions.

This past year saw the Cooperative take great strides in identifying and prioritizing discrete lands and waters important for sustaining functional ecosystems throughout the Appalachians. **The comprehensive and detailed Appalachian LCC conservation design is unique among the LCC Network in the power of the modeling efforts that generated the initial products.** Using super-computing technology, researchers at Clemson University identified focal landscapes and critical corridors as key areas that most likely offer resiliency and represent ecologically significant habitats for species and natural resources of concern. Combined, these identified lands and waters provide a conservation framework to safeguard key ecological systems and achieve resilient systems across our geography.

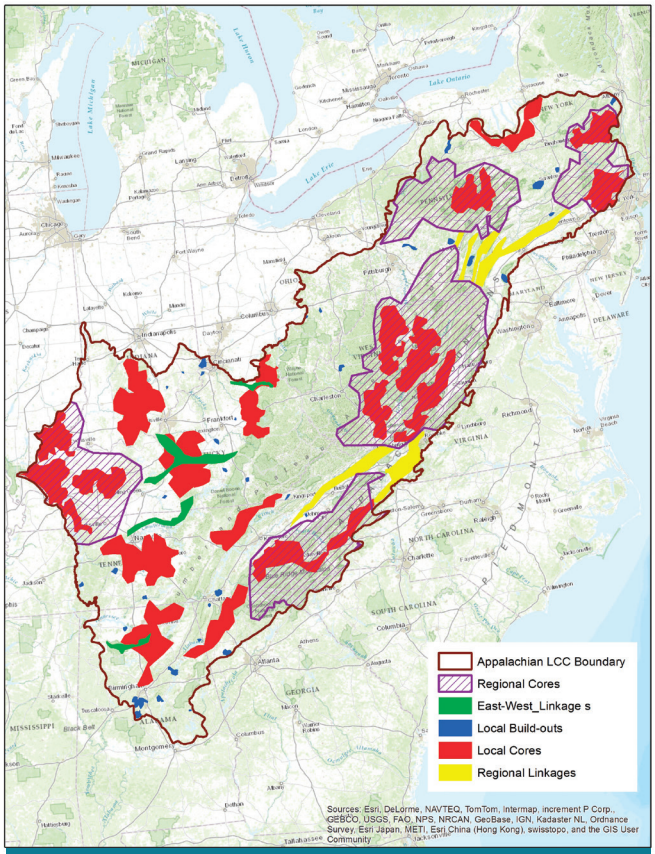
ELEMENTS OF THE DESIGN:

Funded Research Products

To develop the Phase 1 Design, Clemson researchers Drs Paul Leonard and Rob Baldwin incorporated findings and data from previous LCC-funded research. These research projects addressed the most pressing needs identified during the Cooperative's consultations with the conservation community and were chosen by our Steering Committee as key for building the foundational science for landscape conservation in the Appalachians.

The Cooperative's suite of research projects provided essential regional information on biodiversity, connectivity, and future threats that fed into the modeling of the initial design and included:

- **Foundational Information** – Stream Classification System, Data Needs Assessment, and Cave and Karst Classification and Mapping
- **Future Trends** – Assessing Future Energy Development and Vulnerability of Species and Habitats to Climate Change
- **Potential Stressors** – Ecosystem Benefits and Risks and Stream Impacts from Water Withdrawals in the Marcellus Shale Region



Initial conservation design map for the Appalachian LCC with all five design elements - regional cores, local cores, regional linkages, valley and ridge linkages, and local build outs.

Clemson researchers and LCC staff are now refining the Design through a series of consultations with technical experts from among the Cooperative network, while also further incorporating aquatic integrity and ecosystem services information into the modeling effort.

Appalachian LCC Workshop on new LCC science and tools for partners in Pennsylvania.

THE NEXT PHASE:

Supporting Focal-Landscape Communities

Building on initial results from our Landscape Conservation Design effort, the Cooperative is strategically targeting coordination efforts in a handful of identified focal areas – the Tennessee, Ohio and Susquehanna River Basins, and large forested landscapes in the northern regions of the LCC. These landscapes hold immense biodiversity of native and endangered species and are thus the initial focus of the LCC's regional conservation effort.

The LCC will engage multiple agencies and stakeholders in these areas to ensure the protection of these valued landscape for generations to come. To engage local partners and highlight opportunities for collaborative conservation actions and science needs, these initiatives will identify shared opportunities to work together for greater conservation effectiveness while initiating long-term planning and coordination of conservation delivery for the protection of some of the most diverse areas in North America.

In 2015, the LCC worked with state and federal partners to organize a first-of-its-kind meeting hosted by the Tennessee Valley Authority and Tennessee Aquarium to celebrate conservation successes in the Tennessee River Basin and to facilitate discussions for greater cooperation and strategic effectiveness. More than 85 stakeholders participated in the workshop, representing federal and state government agencies, conservation groups, industry, and academia. The participating organizations represented a long-standing community that has worked together on conservation actions to protect one of the most diverse areas for aquatic species in North America. The workshop offered the first formal assembly of this broad community working in the Basin.

At the meeting, participants identified the Appalachian LCC as a regional forum to help continue and expand this regional planning dialogue by bringing these conservation partners together along with nontraditional partners such as private landowners, Chambers of Commerce, and industry. It was also recognized that through the LCC, these partners can share data across the entire basin, utilize the many decision support tools and resources available through the Appalachian LCC Web Portal, and form a more strategic conservation workforce guided by landscape-level conservation design.

New Staff Expertise to Aid Regional Planning Efforts

The Cooperative has added two new members to the team to further coordinate and support the Cooperative's regional conservation planning efforts. They will focus on landscape projects in the focal areas mentioned above.

MARY DAVIS

Aquatic Ecologist Dr. Davis is an ecosystem ecologist with technical expertise in aquatic habitats of the southeastern U.S. Her professional services include scientific and outreach resources for project management, coalition development, and strategic planning. Mary's areas of scientific interest focus on natural hydrologic regimes of freshwater aquatic habitats and include instream flow requirements and riverine ecosystem functions. She recently served as the Coordinator of the Southern Instream Flow Network for the Southeastern Aquatic Resources Partnership (SARP). As an aquatic ecologist with SARP, Mary has worked extensively with the South Atlantic, Gulf Coast Prairie, and Gulf Coastal Plains and Ozarks LCCs on development of regional geospatial resources and models to support instream flow standards and development of aquatic conservation plans. Mary directed the Southern Freshwater Program for eight years for the Southern US Conservation Region of The Nature Conservancy. Mary earned her Masters of Science in fire ecology from Florida State University and doctorate in wetland ecology from the University of Florida.

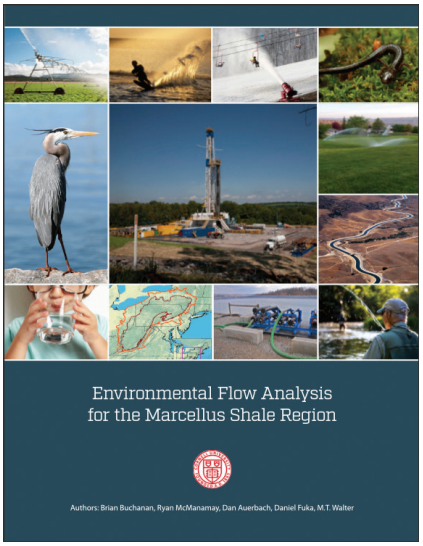
GINNY KREITLER

Outreach Coordinator Ginny Kreitler comes to the LCC after serving on the LCC's Steering Committee for two years. Her prior involvement with the Steering Committee and LCC working groups (one advising on the energy impacts project and one considering the use of indicator species) has enabled her to quickly move in to her new role, in which she is helping foster collaboration with conservation practitioners in the northern extent of the LCC, specifically in the states of New York, New Jersey, Pennsylvania, Ohio, West Virginia, Maryland, and Virginia. Previously, Ginny worked for National Audubon, serving on an internal climate change working group, contributing to strategy development on forest priorities, and working with Argonne National Lab to bring habitat data in to new planning tools for the electric and gas sectors. In Pennsylvania, she is a long-time partner in the state land trust community, and partner with watershed protection groups for the last seven years. She now operates a consulting practice from which she continues to provide services to this community.


CREDIT: NATURESERVE

Supporting and Integrating Proactive Research to Address Vital Science Needs

This past year saw the Appalachian LCC release cutting edge research that provided essential information, maps, and tools to the natural resource and conservation community on a number of different fronts, including energy development - the leading driver of large-scale change in the Appalachians, the benefits and risks of ecosystems, and climate change vulnerability of species and habitats.



Modeling Stream Impacts from Water Withdrawals in the Marcellus Shale Region

The rivers and streams of the Central Appalachians are home to more than 200 species of fish and other aquatic life. They also provide a reliable source of drinking water, recreational opportunities and associated economic benefits to people living in large cities and surrounding communities. With so many benefits and uses, it is vital to answer the question: how will the region's freshwater supply – and the health of natural systems delivering this resource –fare in the coming years under increasing water withdrawals from human activities? New data and recommendations generated from this question could help resource managers, industry and others make informed decisions in achieving sustainable river and stream flows that balance the needs of society and healthy ecosystems.

Key findings and recommendations from the research include:

- Flow-ecology relationships indicate fish are sensitive not only to changes in low flows, but also to changes in a variety of flow components (season, median, and high flows). This has important implications for setting sustainable flow standards and designing monitoring campaigns.
- A considerable number of streams are at high risk of flow alteration due to withdrawals during the summer and fall seasons – especially smaller streams in the southwestern (western portions of Ohio River Basin) and northern (headwaters of the Upper Susquehanna and Hudson River Basins) sections of the region;
- Though these high-risk streams are individually small, combined they drain the majority of the study region;
- Fixed minimum aquatic flow standards that do not consider seasonal changes in flows and throughout the year may not be adequate to sustain fish populations and aquatic biodiversity.
- If flow standards due to water withdrawal regulations vary with stream size and season, it can provide the necessary balance between human needs and flows needed to sustain fish and aquatic ecosystems.

The Cooperative funded a team of Environmental Engineers at Cornell University to develop models based on cumulative and observed impacts of water withdrawal and predict aquatic communities' response to changes in stream flow across the entire Marcellus Shale Region. The study focused on one such water withdrawal demand; hydraulic fracturing – a process of drilling and injecting large quantities of water (often obtained from nearby streams) underground to break apart shale rocks and release natural gas. By looking at hydraulic fracturing in the context of the cumulative impacts of water withdrawals from human activities and factors such as season, stream size, and projected expansion of natural gas development, the research aimed to answer:

- What are the observed impacts of water withdrawals on freshwater fish communities and ecosystems associated with current levels of water withdrawals?
- What might those impacts look like under a range of potential water withdrawal scenarios associated with expanding energy development?
- Is it possible, using computer modeling, to identify different flow regimes that deliver a more balanced approach for regulating water withdrawals to meet human demands and sustain healthy ecosystems?

The Appalachian LCC-funded study is the first region-wide assessment to document "flow-ecology" relationships – showing connections between observed impacts under current water withdrawal standards (based on daily water gauge data collected over the last 15 years and fish surveys) and the decline in freshwater fish communities. Using these results, Cornell researchers then applied a model to vary water withdrawal scenarios – for example from current standards to a more seasonally variable scenario – that provided critical information on what level of flow regime alteration achieves the best balance in meeting both human/energy water needs and those required to maintain healthy ecosystems and diversity.

For more information about the findings and recommendations from the research including access to the final report and data, visit: www.applcc.org/research/aquatic-ecological-flows

ECOSYSTEM BENEFITS AND RISKS:

Online Resources for Natural Resource Management

From clean drinking water and air to exceptional hiking, fishing, and hunting opportunities, the Appalachians provide a reprieve from the city and essential ecosystem benefits that enter households. Understanding the complete and diverse benefits society receives from nature as well as risks to their sustainability will allow managers, industry, and the public to adopt policies that protect and invest in these resources. To meet this need, the Appalachian LCC is collaborating with the U.S. Forest Service and North Carolina State University on cutting-edge research that integrates society's value of ecosystems with future threats to better inform natural resource planning and management across the Appalachian landscape.

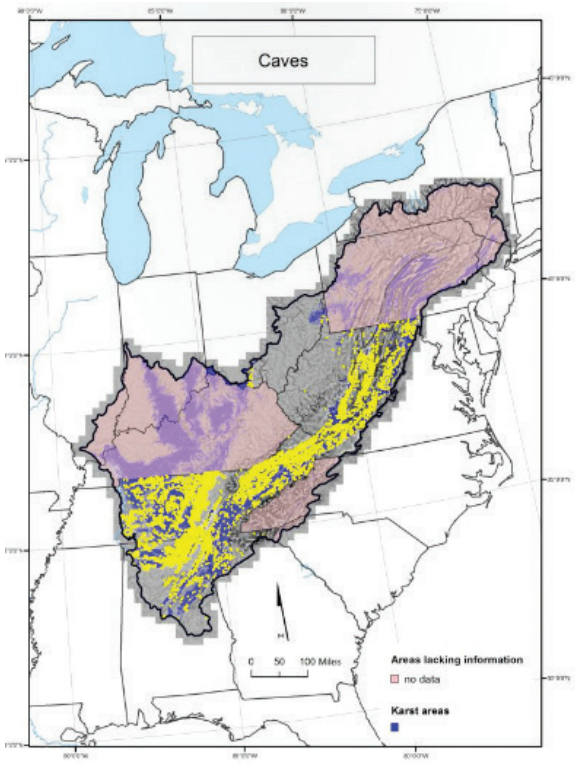
The "Ecosystem Benefits and Risks" section of the Appalachian LCC Web Portal serves as a clearing-house for Appalachian ecosystem services knowledge and data. It provides users with key information they need to make resource management decisions that improve and sustain nature's benefits to people. This online resource provides a synthesis of existing regional knowledge about ecosystem services and threats to their sustainability in the Appalachians. The synthesis focuses on the benefits and risks to water, soils, harvested forest species, landscape values, outdoor recreation, and forest carbon storage. Deliverables include linkages to data resources, online decision support tools, and published scientific literature.

Building upon this online synthesis of existing knowledge and data, researchers are now generating new assessments to better understand how Appalachian ecosystem services have, and are likely to change, as a result of urbanization, energy development, climate change, and other major drivers of rapid landscape change. This new work will produce maps, reports, and other products intended to assist partners in enhancing the capacity of Appalachian landscapes to provide important natural benefits to people. This unique work provides a comprehensive resource to partners at a regional level, serving as a model for the LCC Network to deliver ecosystem services conservation science more broadly.

ACCESS ALL THE ONLINE RESOURCES:
http://applcc.org/ecosystem-risks-benefits

WHAT LIES BENEATH:

Mapping Cave and Karst Resources



"What Lies Beneath?" is not just a great name for a horror movie, but can describe the scientific and biodiversity challenges in protecting the richness of natural resources within karst landscapes. This fragile landform in the Appalachian region is the result of hydrologic impacts that "dissolve" porous bedrock such as limestone and create a terrain characterized by springs, caves, and sinkholes. Since many of these locations are in hard to access areas and some caves tunneling miles underground, there is a lack of detailed classification and mapping information that creates a significant barrier for understanding these ecosystems contributions in providing vital water quality and housing unique biodiversity.

Researchers from an array of organizations and institutions used intricate modeling techniques to classify the diversity from known cave and karst formations associated with factors like geology and hydrologic flow regimes.

The project first summarized pre-existing efforts to collect and present karst resource information and developed an appropriate classification system for karst habitats within Appalachia. From this foundational work, researchers predicted what level of biodiversity might be expected throughout cave and karst systems in the region. Products generated include a series of maps, geospatial information layers, and other deliverables that provide a comprehensive overview for examining relationships between environmental factors, biodiversity, and distribution within karst areas of the Appalachians. Finally, a visual survey compiles all this information and guides users to what this project has accomplished, as well as new questions and results that would interest end-users.

By delivering these products, it can inform managers decisions above ground in order to protect 'what lies beneath'. Appalachian LCC staff are currently working with research and management communities to integrate spatial information on the physical and biological resources of cave and karst ecosystem science into an interactive map and scenario-based decision support tool to assist landscape conservation planning for the region.

The research team comprised of scientists from American University, U.S. Geological Survey, University of the South, University of Illinois, and University of Florida.

VIEW ALL THE CAVE AND KARST ECOSYSTEM PRODUCTS:
http://applcc.org/classification-mapping-cave-karst-resources

ON THE HORIZON:

Assessing Vulnerability of Species and Habitats to Climate Change

2015 was the warmest year on record, continuing a long-term warming trend that is expected to accelerate as the century moves forward. Along with the current deck of environmental, economic, and social changes that are influencing the landscape, climate change will augment these developments, affecting habitats and species in different ways. Understanding the vulnerability of specific species and habitats within the Appalachian LCC to climate change is of critical importance and a major research priority of the Cooperative.

New climate change vulnerability assessments are now available for 41 species and 3 habitats in the Appalachians. The conservation community can view and search each of these assessments by relative ranking or vulnerability scores, conservation status ranks, state and subregion of assessment, and higher taxonomy. In addition, principle investigators NatureServe compiled the results of 700 species assessments previously completed by other researchers as well as assessments on several habitats.

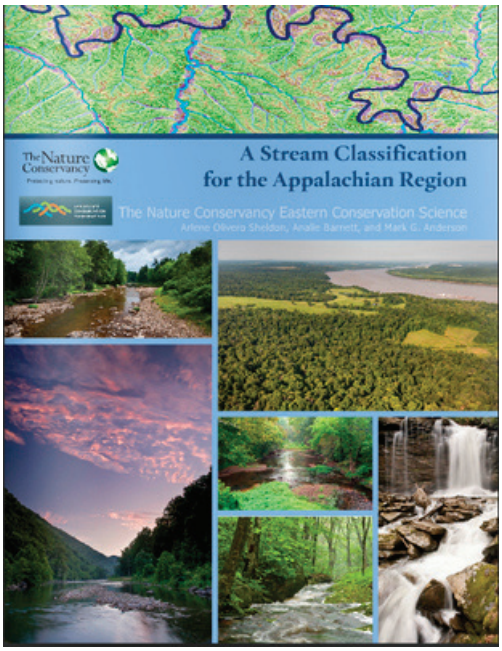
Photo credit: NatureServe

In conducting these assessments, NatureServe's research team first convened a panel of climate experts to explore the understanding of climate change in the Appalachian landscape. The team compiled and reviewed existing vulnerability assessments, compared strengths and weaknesses of methodologies used, and recommended a vulnerability assessment method for adoption.

The recommended method was deployed to generate vulnerability assessments for a suite of key species and habitats selected in consultation with partners of the Cooperative. The detailed dataset assembled as part of this analysis is also available on-line and can be filtered by state, region, taxa, and ecological system.

ACCESS THE ASSESSMENTS:
http://applcc.org/research/climate-change-vulnerability

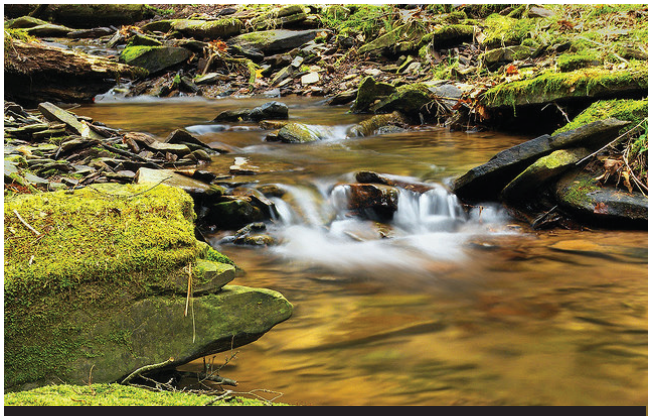
Classifying the Appalachian's Freshwater Resources



Flowing freshwater is the lifeblood of the Appalachian region. The 400,000 miles of streams and rivers that cross the region provide food, energy and recreation for people as well as supports some of the most unique and endangered aquatic biodiversity found on the planet. To sustain this biological treasure and aid conservation planning across the region, standardized stream classification information for the entire Appalachians is needed. With such information, managers and decision makers can develop and implement sustainable flow standards and water management recommendations that are key for balancing the needs of society and healthy ecosystems.

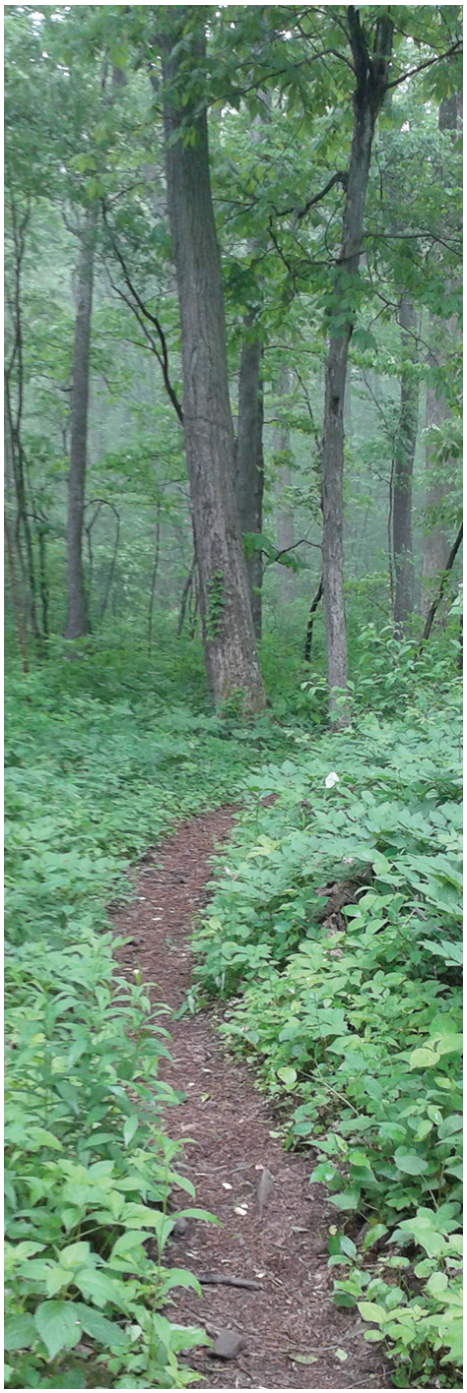
The Cooperative funded researchers from The Nature Conservancy's Northeast Region to unify the various state-based stream classifications found in the region into a single consistent system. This project developed a classification and map for stream and river systems that represents the region's natural flowing-water aquatic habitats. The study includes a "Story Map" illustrating the mapped classification system for streams and rivers, a report describing methods used to evaluate and develop the classification system, a literature review of existing stream classifications, and a GIS stream data set.

The final products represent aquatic habitat types across this region in a manner that is appropriate and useful for building ecological flow ecology relationships and inform conservation planning for sustaining aquatic biodiversity in the region.



Small stream in Pennsylvania;Nicholas A. Tonelli

LEARN MORE:
http://applcc.org/research/stream-classification



Showcasing Innovative LCC Products, Tools, and Resources

From training workshops to webinars to online courses, the Appalachian LCC is working to put landscape science in the hands of those delivering conservation and making decisions impacting natural resources locally and regionally. These trainings represent years of work laying the groundwork for a new way of doing conservation business in the Appalachians. By funding research that addresses the collective conservation community's top science needs, the Cooperative has collected foundational information, conducted assessments of resource conditions, developed decision-support tools, and fostered collaborative networks to unite partners across boundaries. Now with more of these resources available, LCCs are doing the legwork to transfer that science to partners and making participants at these events early adopters of innovative conservation science.

Multiple LCCs Engage Virginia State Agency on Landscape Science and Products

Virginia DGIF and LCC staff from the North Atlantic, South Atlantic, and Appalachian

For the first time outside of Alaska, staff from multiple LCCs overlapping the same state met with a state agency to solicit feedback and share updates on their Cooperatives' products and tools. The Virginia Department of Game and Inland Fisheries (VA DGIF) hosted the meeting with all three LCCs in the state - the Appalachian, the North Atlantic, and the South Atlantic. Staff from each LCC reported on progress toward creating a landscape conservation design for their region, while the state agency shared many of their conservation activities and priorities.

The Appalachian LCC presented its Phase I Conservation Design based on its full-regional modeling to capture priority resources. The South Atlantic LCC presented its Conservation Blueprint (version 2.0 – again, reflecting the iterative nature of these designs) based initially on expert opinion and is being further refined with increasing data inputs. The North Atlantic LCC presented the results of its sub-regional pilot project to demonstrate how to implement a regional design across a focal landscape. Earlier research products informed the geospatial design based in part on species-habitat modeling.

The meeting would not have taken place without the tireless effort of the VDGIF staff who also represent their agency on LCC Steering Committees. Becky Gwynn, the agency's Steering Committee representative for the North Atlantic LCC, organized the event, while the Appalachian LCC Steering Committee chair David Whitehurst and the South Atlantic Steering Committee representative Cale Godfrey served as facilitators during the meeting. Each of these partners have also provided invaluable expertise and guidance during the evolution and growth of the LCCs.

Location: Richmond, Virginia

Audience: 30-35 representatives from programs throughout the state agency

Appalachian LCC Featured tools:

- **Appalachian LCC Conservation Design** - A phased, multi-year effort by Clemson researchers and technical teams is analyzing terrestrial and aquatic resources within the Appalachian LCC geography to help identify places where conservation efforts will be most strategic and effective in achieving conservation goals.
- **Riparian Prioritization for Climate Change Resilience** - Identifies vulnerable stream and riverbanks that lack tree cover and shade in cold-water stream habitats so managers can provide shade that limits the amount of heat and reduces impacts from climate change.

Moving Forward: Virginia staff expressed support for multi-scale planning efforts, and the LCCs plan on knitting together their Design and Blueprint spatial plans through the Southeast Conservation Adaptation Strategy to create a cohesive picture of the entire landscape.

A First of its Kind Gathering in the Tennessee River Basin

The Tennessee Valley Authority and the Tennessee Aquarium sponsored a first-of-its-kind meeting to gather regional conservation partners, celebrate successes conserving and improving aquatic biodiversity in the Tennessee River watershed, and to consider how greater cooperation could lead to more strategic prioritization and effectiveness.

Yellowfin madtoms prior to their release in the Upper Tennessee River Basin; *Credit: USFWS*

Endangered mussels bound for the Powell River; *Credit: USFWS*

Location: Chattanooga, Tennessee

Audience: More than 85 stakeholders representing federal and state government agencies, local, regional, and national conservation organizations, and academia.

Featured Tools:

- **Energy Forecast Model and Map Visualization Tool** - Using data on trends in energy development, the tool predicts where potential coal, natural gas, and wind developments will intersect with areas of high natural value, such as intact forests and vital watersheds.
- **Riparian Prioritization for Climate Change Resilience**

Moving Forward: Partners are creating a collaborative network within the Basin in order to utilize and share tools, data, and lessons learned that can help inform strategic prioritization and achieve successes in conserving and improving aquatic biodiversity in the Tennessee River Basin.

Applying LCC Tools to Issues Impacting the Keystone State

Pennsylvania is a landscape filled with abundant forests and wildlife, thousands of miles of rivers and streams, and home to a productive energy industry that includes the emergence of natural gas and alternative energy sources. Natural resource agencies and conservation organizations increasingly see the value for proactive science and tools that help inform decisions to protect and conserve the lands, waters, and wildlife of the state while harnessing resources that benefit society and the economy. The goal of this workshop was to provide a thorough summary of available LCC-funded tools and research products, begin coordinating with a variety of resource managers and scientists on future planning and management efforts, and start a dialogue on how products could be used to address issues in the state as well as what additional science needs remain.

Location:
State College, Pennsylvania

Audience: Staff from the Academy of Natural Sciences, Army Corps of Engineers, Environmental Protection Agency, the National Fish and Wildlife Foundation, Pennsylvania Department of Conservation & Natural Resources, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, Susquehanna River Basin Commission, The Nature Conservancy, U.S. Fish and Wildlife Service, and the Western Pennsylvania Conservancy.

Featured Tools:

- **Energy Forecast Model and Map Visualization Tool**
- **Riparian Prioritization for Climate Change Resilience**
- **Appalachian LCC Conservation Design**
- **Ecosystem Benefits and Risk Research and Website** - The Appalachian LCC has collaborated with the US Forest Service to provide information and tools that fully integrate society's value of ecosystems with future threats to better inform natural resource planning and management. Users can access information, maps, data, and additional resources brought together through this collaboration to incorporate ecosystem benefits and risks information into planning and management decisions.

Moving forward: Many of the participants saw the value of these tools and products for their current activities. They planned to work with LCC staff to learn how best to use tools and incorporate them in their planning and management decisions. Others requested future meetings to provide presentations to additional staff and other organizations who are dealing with issues such as mitigation, restoring streams and riverbanks, developing shared conservation priorities, and addressing energy development.

Northeast Association of Fish and Wildlife Agencies Workshop: Incorporating LCC Science in the Northeast Region

The Appalachian and the North Atlantic LCC partnered to deliver a hands-on workshop for applying information and tools developed by LCCs in the northeast region. The workshop was intended for biological and GIS staff from state agencies and non-governmental organizations who are interested in using LCC information to guide conservation decisions.

Photo: Matthew Cimitile

Hands on-training taking place at NEAFWA Workshop; *Photo: Jessica Rhodes*

Location: Annapolis, Maryland

Audience: 25 stakeholders representing state fish and wildlife agencies, federal agencies, and non-governmental organizations.

Featured Tools:

- **Conservation Planning Atlas on Data Basin** - The Atlas is a science-based mapping platform where members can view, retrieve, and perform analyses on spatial information with specific conservation goals in mind.
- **Appalachian LCC web portals**
- **Ecosystem Benefits and Risk Research and Website**
- **Energy Forecast Model and Map Visualization Tool**
- **Riparian Prioritization for Climate Change Resilience**

Moving Forward:
Workshop attendees expressed interest in the tools presented after having an opportunity to utilize them in a hands-on session following each presentation. Appalachian LCC staff offered future assistance to those in attendance who had additional questions and mentioned the option of presenting to smaller groups via a webinar for interested organizations. A follow-up survey was emailed to compile feedback and help improve future training sessions.

LOOKING AHEAD:

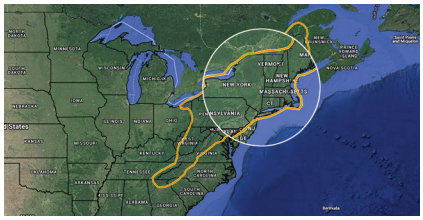
Online Learning

For the first five years of the Appalachian LCC Partnership, we have focused time and energy on building a collaborative conservation network, on funding research and developing data and tools that address the community's top science needs, and on integrating those products into the initial phase of our landscape conservation design.

The previous section of this report detailed some of the delivery activities already taking place that are putting LCC science into the hands of resource managers and on-the-ground biologists. To achieve the broadest possible outreach in getting our tools and resources in the hands of those making decisions and managing the resources, the Appalachian LCC will continue to create the necessary on-line training courses needed to effectively support the ability of managers to use and deploy the tools and funded research products and resources.

This online learning platform currently being built, hosts self-paced tutorials and classes for available LCC tools and resources, similar to what a University offers. Participants will learn the tool's intended use and be given a step-by-step demonstration of its function and how to apply it to natural resource issues. Once completing the course, users can work with LCC staff directly to discuss how to use the tools in their own work. Case study examples are also available on how these tools can help conservation managers make informed and strategic decisions.

The Appalachian LCC is preparing these online learning platform hosts self-paced tutorials and classes for available LCC tools and resources.



Riparian Restoration to Promote Climate Change Resilience
This user-friendly tool allows managers and decision-makers to rapidly identify and prioritize areas along the banks of rivers, streams, and lakes for restoration, making these ecosystems more resilient to disturbance and future changes in climate.

Energy Forecast Modeling
Models of wind, shale gas, and coal development for the entire study area have been created to predict potential future energy development and impacts to natural resources within the Appalachians. Models and data from all development projections populate a web- based mapping tool to help inform regional landscape planning decisions.

Ecosystem Benefits and Risks
The Ecosystem Benefits and Risks site within the Appalachian LCC Web Portal serves as a clearinghouse for Appalachian ecosystem services knowledge and data, providing users with the tools they need to make informed resource management decisions that improve and sustain nature's benefits to people.

Front Cover:

Stream in the Tennessee River Basin; photo by Mary Davis, AppLCC
Hydrofracking well pad - photo by Maryland Department of Natural Resources
Freshwater fish fieldwork; photo by Gary Peeples, USWS
Diana Fritillary Butterfly; photo by Greg Gilbert
Chantrelle; photo by the National Environmental Modeling and Analysis Center
Fern Cave National Wildlife Refuge; photo by Digital Alabama

Waterfall in Dupoint State Forest, North Carolina
Photo by Matthew Cimitile, AppLCC

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The Appalachian LCC is a self-directed regional partnership.
The Department of the Interior through the U.S. Fish and Wildlife Service
is providing project support and staff to facilitate this partnership.

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Visit our website at www.applcc.org