



LANDSCAPE
CONSERVATION
COOPERATIVES



2013 | Network Annual Report



Dr. Elsa Haubold, National Coordinator.
COURTESY FWC

It has been a pleasure spending the last part of 2013 as the National LCC Coordinator. I have enjoyed meeting LCC staff who are some of the most talented, dedicated, bright people I have ever had the opportunity to work with—and I have worked with some amazing people in the past so that says a lot about the quality of our team.

As I spent the past 12 years working for the Florida Fish and Wildlife Conservation

Commission, I understand that States and their partners are key to the success of current and future conservation. In addition to States, Tribes and First Nations, and international partners, LCCs are working closely with the DOI Climate Science Centers and many existing partnerships such as Fish Habitat Partnerships and Migratory Bird Joint Ventures and a wide variety of non-governmental organizations to develop shared objectives and ensure conservation success for the future. Much progress has been made in developing individual LCCs and integrating across LCCs to develop a seamless network that transcends the continent and U.S. islands. This annual report contains highlights from each of the 22 LCCs reporting on their progress in leveraging partners; meeting science priorities; planning and conservation design; information, data and tools; and assessing, inventory, and monitoring. I think you will be impressed with synergies gained through the efforts of LCCs.

Looking to the future in 2014, I am excited about building on the LCC Network vision to develop a LCC Network Strategic plan. I look forward to working with the newly formed LCC Council which will provide another means to strengthen and build LCC Network partnerships to achieve landscape conservation. The LCC Network is evolving into an impressive force for changing and improving our approach to natural and cultural resource conservation. Here's to an even better 2014!

Elsa Haubold

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ON THE COVER

Brown bear at Kodiak National Wildlife Refuge. STEVE HILLEBRAND/USFWS

Spring Beauty at Sunflower Flats, Elko District BLM Nevada. SHANELL OWEN

Paddling the canals of Alligator River National Wildlife Refuge.
STEVE HILLEBRAND, USFWS

LCC Network

Our landscapes and the fish, wildlife, plants and cultural heritage they support are increasingly impacted by land use pressures and widespread threats amplified by a rapidly changing climate. These threats are not just impacting isolated places or a single species, but are affecting entire landscapes and multiple resources. The ability to effectively plan for and address these threats across landscapes is beyond the ability of any one agency or organization.

The 22 LCCs collectively form a network of resource managers and scientists who share a common need for scientific information and interest in conservation. Each LCC brings together federal, state, and local governments along with Tribes and First Nations, non-governmental organizations, universities, and interested public and private organizations. Our partners work collaboratively to identify best practices, connect efforts, identify science gaps, and avoid duplication through conservation planning and design.

VISION

Landscapes capable of sustaining natural and cultural resources for current and future generations.

MISSION

A network of cooperatives depends on LCCs to:

- » Develop and provide integrated science-based information about the implications of climate change and other stressors for the sustainability of natural and cultural resources;
- » Develop shared, landscape-level, conservation objectives and inform conservation strategies that are based on a shared scientific understanding about the landscape, including the implications of current and future environmental stressors;
- » Facilitate the exchange of applied science in the implementation of conservation strategies and products developed by the Cooperative or their partners;
- » Monitor and evaluate the effectiveness of LCC conservation strategies in meeting shared objectives;
- » Develop appropriate linkages that connect LCCs to ensure an effective network.



Canada Geese
at Montezuma
National
Wildlife Refuge.
DOUG RACINE

LCC NETWORK LEADERSHIP

In August 2013, the U.S. Fish and Wildlife Service selected the new national LCC coordinator for the Landscape Conservation Cooperative network. DR. ELSA HAUBOLD replaces DR. DOUG AUSTEN, who served as national coordinator for three years. Elsa comes to the network with 12 years' experience working on wildlife diversity and endangered species issues at the state, regional, and national level with the Florida Fish and Wildlife Conservation Commission. Elsa also brings a wealth of non-governmental organizational experience, having previously coordinated the Texas Marine Mammal Stranding Network.

DR. BEN THATCHER, assistant national LCC coordinator, continued to provide excellent support to the LCC network. In addition, the Service has identified network level communications and facilitation and coordination support for LCCs.

ANN FROSCHAUER was selected to help coordinate network communications, including leading development of a strategic communications plan, annual reporting, and other outreach materials including the network website.

MEGAN COOK joined the LCC network team to provide support for network activities including meeting planning, workgroup facilitation and coordination, and assisting with accomplishing network identified priorities.

Leadership with the LCC Network also includes Laurie McGilvray, National Oceanic and Atmospheric Administration, Avra Morgan, Bureau of Reclamation, Cat Hawkins Hoffman, National Park Service, Karen Blakney, Bureau of Land Management, and Monica Tomosy, U.S. Forest Service.



Antelope and
greater sage
grouse. JEANNIE
STAFFORD/USFWS

LCC COUNCIL

A Council of interagency, tribal and non-governmental representatives was named to provide network-level coordination and support to the LCCs. The LCC Council consists of up to twenty-seven participants, including six federal agency directors, three U.S. federally recognized Tribal participants, one Indigenous participant, four State agency directors, four NGO participants, one LCC participant, two “Major partnership” participants, four International participants, and two “At-Large” participants.

The LCC Council will serve the LCC network by learning from them and helping to identify the ecological and institutional challenges faced by the LCCs that should be addressed at the network scale. Serving as the voice for the LCC network, the Council will seek to support changes that can be made at the network level to facilitate the work of the LCCs. The Council will provide a platform for highlighting LCC successes and challenges. Sustained funding is needed for the LCC network, and the Council will work to ensure that local and regional partnership efforts are supported at the highest levels.

Looking inward, the LCC Council will provide network-level coordination to identify opportunities to reduce duplication, leverage resources and capacities, and improve efficiencies and conservation outcomes across the LCCs.

NETWORK COMMUNICATIONS

The LCC Network website, <www.LCCNetwork.org> came online this year. The website was regularly updated with information related to LCC projects and success stories. In addition to the website, network level social media accounts (Twitter and Facebook) have come online and continue to build an audience to share LCC stories and information.



Catch of the day
at the Upper
Mississippi River
National Wildlife
Refuge. BOB
DRIESLEIN/USFWS

NATIONALLY FUNDED PROJECTS

A portion of the FY2013 Service appropriations for Cooperative Landscape Conservation and Adaptive Science was retained as a national funding source for the strategic development, support, and expansion of scientific information and decision support tools for the LCC network. A collaborative multi-step process was initiated to identify highest-priority LCC needs and to solicit, evaluate, and prioritize project proposals.

Two thematic areas were selected, and a national review panel of subject matter experts was identified. Those two thematic areas were: “Integrating Assessment and Planning for Aquatic Resource Conservation at Landscape Scales” and “Developing a Network of Ecologically Functional and Connected Landscapes by Facilitating Landscape Conservation Design”. The review panel recommended four projects among 46 qualifying proposals, and those projects were subsequently selected for funding. These projects advance the mission of the LCC network and will greatly enhance the capabilities of the LCC network to meet its conservation goals.

For more information about these projects,
visit <www.LCCNetwork.org>.

LCC Activities

In 2013, the 22 LCCs made significant progress toward ensuring the sustainability of our economy, land, water, wildlife and cultural resources through diverse collaborative, science-based projects and partnerships. It is important to note that it would be impossible to capture all of the successes and progress made by individual LCCs or LCCs working together on shared priorities. This report is intended to give a brief overview of some of the most outstanding projects and successes for the past year. Please visit the network website or individual LCC websites for additional information about how LCCs are working to leverage partnerships, meet science priorities, enhance planning and conservation design, develop and share information, data and tools, and support assessment, inventory and monitoring.

Aleutian & Bering Sea Islands

The Aleutian and Bering Sea Islands LCC includes the islands of the Aleutian archipelago, the Pribilof Islands of St. Paul and St. George, St. Matthew and Hall Islands, and St. Lawrence Island, and includes the surrounding marine waters seaward to the U.S. Exclusive Economic Zone.



MISSION: The Aleutian and Bering Sea Islands Landscape Conservation Cooperative (ABSILCC) promotes coordination, dissemination, and development of applied science to inform conservation of natural and cultural resources in the face of climate change and other landscape-scale stressors.

LEVERAGING PARTNERSHIPS: In 2013, the ABSILCC joined an extensive list of partners who came together to collect ShoreZone imagery of St. Lawrence Island and map the results. Our LCC provided \$10K that was matched by \$117K in partner contributions to address a broadly-shared data need that was identified by our Partnership Community at our January 2013 Workshop. Overall, we paired \$145K of FWS funds with \$20K from USGS to leverage just over \$600K for seven applied science projects.

MEETING SCIENCE PRIORITIES: In 2013 we completed development of our five-year Strategic Science Plan. Based on a synthesis of over 50 research and management plans relevant to the Aleutian and Bering Sea region, we identified six landscape-scale stressors of interest. The synthesis also identified seven key resource categories and four ecosystem services that are at risk from one or more of these stressors. We supported seven projects in 2013 that address applied science needs of one or more stressors.

As an example, our LCC is partnered with the Wildlife Conservation Society to develop a comprehensive geospatial analysis of marine vessel traffic within the ABSI region. The resulting products will be used by partners including Audubon Alaska and Oceana to conduct vulnerability assessments of priority resources including seabirds and marine mammals.

Little Kiska
Island
COURTESY
ABSI LCC

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Visit <absilcc.org>

PLANNING AND CONSERVATION DESIGN: The products from the marine vessel traffic study will also be used by the Aleutian Islands Risk Assessment for the development of recommended vessel routes that transit the Aleutian archipelago along the North Pacific Great Circle Route. This important element of a landscape conservation design will be integrated with oil spill response capabilities and equipment to enhance the ability to respond to derelict vessels for the prevention of vessel groundings and catastrophic oil spills.

INFORMATION, DATA AND TOOLS: The ABSILCC has brought together two teams of downscaled climate modelers to work together and make their products available through web-based data portals. Partnering with the USGS Alaska Climate Science Center and the Alaska Ocean Observing System (AOOS), we have convened several expert teams to use these downscaled climate model projections to conduct vulnerability assessments of marine mammals, seabirds, and other priority resources. This effort also considers implications of climate for ecosystem services such as subsistence harvest, commercial fishing and cultural integrity.

We also worked with the AOOS to develop the Alaska Platform of Opportunity Portal (APOP). This online data portal presents research vessel ship schedules in an interactive, map-based tool and provides information to enhance collaboration in an area that is remote and largely inaccessible. We will continue to expand participation of partners including the USFWS, U.S. Coast Guard, and NOAA.

ASSESSING, INVENTORY AND MONITORING: In 2013 we partnered with the USGS and Alaska Maritime National Wildlife Refuge to support a second year of field data collection that looks at diets of Tufted Puffins as indicators of size and species composition of forage fish. The project is part of a three-decade time series across a geographic scale of several thousand miles—truly a “landscape perspective” of the nearshore marine ecosystem in Alaska.

Other projects supported by the ABSILCC include an inventory of cultural resources in the Aleutian archipelago, analysis of historic seabird diet samples, and modeling marine bird distribution using at-sea survey data.

Appalachian

The Appalachian LCC spans across 15 states, from New York to Alabama. The Central Appalachian Region supports a broad range of habitats and is characterized by its mountainous geography with long broad ridges, steep slopes, deep gorges, and wide intermountain valleys. It is also the largest continuous biodiversity “hotspot” area in the continental United States.

Fall color in the Appalachian Mountains.
COURTESY
APPALACHIAN
LCC



VISION: Ecological Integrity. Environmental Benefits. Sustainable Wildlife Populations.

MISSION: Achieve sustainable landscape-level conservation in Appalachia through partnerships, shared resources, enhanced science-based management capacity, landscape-level planning, and support for conservation actions and research as part of a national network. The 5-Year Work Plan goals are: (1) Create and deliver a landscape level data sharing strategy and scalable toolsets; (2) Deliver landscape-level conservation plans for regional use; (3) Create an on-going facilitated process to promote engagement and dialogue across the Appalachian LCC region; and (4) Assess and align conservation goals and actions that reflect the Cooperative Members’ common and shared vision.

LEVERAGING PARTNERSHIPS: The Southeast Aquatic Resources Partnership (SARP) has dedicated their funds to build a new website within the Appalachian LCC Web Portal and Content Management System, which facilitates the integration of resources and sharing of valuable datasets and products among a multitude of partners. This Portal effectively links and shares content, functionality, and tools between the three web partners: <AppLCC.Org>, <EasternBrookTrout.org>, and <Southeastaquatics.net>. All three partners have gained a vast array of web tools as well as outreach and management support including time sensitive funding announcements, online application submissions, access to private workgroup spaces to share preliminary products, and storage and dissemination of developed products.

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Visit <applcc.org>

MEETING SCIENCE PRIORITIES: The Appalachian LCC has supported research that provides foundational data such as ‘A (unifying) Stream Classification System’ and conducting a ‘Data Needs Assessment’. Funded research is also leading to the creation of decision-support tools, “Web-Based Tool for Riparian Restoration Prioritization to Promote Climate Change Resilience”, and formation of management guidance, ‘Development of a Hydrologic Foundation and Flow-ecology Relationships for Monitoring Riverine Resources in the Marcellus Shale Region.’

Finally, the Cooperative’s research is examining current threats and stressors, and modeling future expansion of these in its studies ‘Assessing Future Impacts of Energy Extraction in the Appalachian Mountains’ and “Understanding Land Use and Climate Change in the Appalachian Landscape.”

PLANNING AND CONSERVATION DESIGN: Conservation planning identifies and prioritizes lands that encompass important natural and cultural resources across the landscape and develops protection and management strategies. Funded research led by Clemson University is reviewing conservation planning tools, data needs, and integrative processes for the Appalachian LCC.

INFORMATION, DATA AND TOOLS: The web-based Content Management System of the <AppLCC.org> web portal allows for robust data storage and access to our partnership. In addition, research conducted by NatureServe is laying the critical groundwork for climate change associated impacts on natural resources by compiling vulnerability assessments on species and habitats.

ASSESSING, INVENTORY AND MONITORING: It has been recognized by the Appalachian LCC partnership that in order to develop and deliver landscape-level planning tools it is essential to establish a standard classification system. Funded research will assemble and identify key location and classification data while developing products that depict and map cave and karst habitats and biological resources across the Appalachian LCC.

Arctic

Stretching 3000 miles east to west, the Arctic LCC contains 1.8 Billion-acres and nearly 78,000 miles of the most inaccessible shoreline and terrain in the northern hemisphere, taking in parts of Alaska and five Canadian provinces and territories. The North American Arctic is undergoing the most rapid climate-driven change on the planet.

An ancient
cache in Arctic
Alaska. KEN
TAPE



MISSION: Identify and provide information needed to conserve natural and cultural resources in the face of landscape scale stressors, focusing on climate change, through a multidisciplinary program that supports coordinated actions among management agencies, conservation organizations, communities, and other stakeholders.

LEVERAGING PARTNERSHIPS: The Arctic LCC works collaboratively with partners from eight U.S. Federal agencies, two Canadian Federal agencies, two State agencies, one provincial government, one Tribe, one Alaskan Borough government, five universities, and eight non-profit organizations addressing how climate-driven changes are affecting arctic hydrology, coastal processes, permafrost, and arctic ecosystems. Project dollars have been leveraged at a rate of 2.4:1 (\$12.2 million in partner contributions leveraged by \$5.0 million in LCC funds).

MEETING SCIENCE PRIORITIES: We have a portfolio of nearly 60 projects addressing our highest priority science and information gaps. Our Science Plan emphasizes providing resource managers and other stakeholders with reliable forecasts of future natural resource conditions through an adaptive cycle of monitoring, modeling, and collaborative interdisciplinary research. The Science Plan also emphasizes the need to deliver information in forms that are readily understandable and usable by multiple audiences—that process begins with conscientious data management and value-added synthesis products.

LEARN MORE

Visit <www.arcticlcc.org>

PLANNING AND CONSERVATION DESIGN: In a rapidly-changing Arctic, conservation planning and design is predicated on accurate projections of future conditions. The Arctic LCC has created several dozen spatially explicit projections of future conditions relative to temperature, precipitation and other parameters for multiple time slices. Completion of the multi-LCC and Alaska Climate Science Center-funded Integrated Ecosystem Model will provide even better informed projections of future conditions for most of Alaska and Northwestern Canada.

INFORMATION, DATA AND TOOLS: The paucity of information on pristine Arctic systems' response to rapid climate-driven changes precludes managers from making informed decisions that consider future conditions. This LCC partnership is providing spatially-explicit projections of future conditions, ecosystem response models, avian vulnerability assessments, and management tools for candidate and listed species (polar bears, eiders and yellow-billed loons) and culturally-important subsistence resources. We are creating important synthesized databases of hydroclimatological and wildlife distribution data. We are developing monitoring protocols and maps for fundamental landscape drivers like thermokarst and permafrost. We helped develop a high resolution landcover map for northern Alaska, are contributing to important digital elevation models crucial to coastal planning, and have created an inventory of vulnerable intertidal resources along the Alaska coastline.

ASSESSING, INVENTORY AND MONITORING: In the Arctic, the weak link of downscaled environmental models is the sparse or non-existent input data. To address this, we are implementing a landscape-wide monitoring network for wildlife habitat parameters that have been called for by many, but provided by none. Our Terrestrial Environmental Monitoring Network (TEON) will collect, distribute, and synthesize long-term observational data needed to detect and forecast effects of a changing climate, hydrology, and permafrost regime on wildlife, habitat, and infrastructure in northern Alaska, measuring variation in processes sensitive to climate change.

California

The California LCC encompasses eight Ecoregions (Sierra Nevada, Central Valley, Bay Delta, North Coast, Central Coast, South Coast, Baja California and adjacent marine area) in California.



California
coastline.
COURTESY
CA-LCC

VISION: California supports diverse and thriving ecosystems through lasting cooperative conservation partnerships.

FIVE-YEAR GOAL: A growing community of resource managers, scientists, conservation practitioners and others that are successfully collaborating to advance and implement actions that promote resilient and adaptable ecosystems across the landscape in the face of environmental change.

LEVERAGING PARTNERSHIPS: Since 2010, 27 CALCC projects have been leveraged with partner funds over two and a half times equaling \$8.8 million for collaborative research occurring within the CA LCC. Leveraged staff includes Dr. Karen Thorne as a USGS Science Advisor and the housing of two CALCC Data Managers at Point Blue Conservation Science. For example, the CALCC, in collaboration with North Pacific LCC, two Climate Science Centers, U.S. Fish and Wildlife Service National Wildlife Refuges and three Universities, is investigating the sea-level rise effects on coastal ecosystems and wildlife populations along the Pacific coast. Results are being translated in a format relevant to refuge managers and other partners for on-the-ground decision making.

MEETING SCIENCE PRIORITIES: The nine 2013 CALCC projects emphasized science delivery and translation to resource managers to ensure regional science priorities and needs were met through direct interactions between scientists and managers. For example, U.S. Forest Service Plan Revisions, California State Wildlife Action Plan

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and other adaptation plans are being guided by large scale climate-smart adaptation strategies developed for the Sierra Nevada. Focal resources were identified and adaptation strategies were developed through collaborative multi-partner workshops and meetings.

PLANNING AND CONSERVATION DESIGN: Landscape Conservation Design (LCD) was identified as a key objective in the CALCC 5-Year Science-Management Framework. In 2013, the Central Valley was identified as the location for a pilot LCD project in FY14. In partnership with UC Davis and Point Blue Conservation Science, the CALCC organized two workshops to demonstrate decision support tools to inform climate-smart conservation. Over 50 natural resource managers and scientists attended. A 326 document reading list, 10 presentations and 5 learning exercises from the workshops are accessible on the Climate Commons website.

INFORMATION, DATA AND TOOLS: In 2013, CALCC projects produced over 120 products including workshops, publications, data and reports. The weekly CALCC electronic newsletter has reached over 725 subscribers. All information, data and tools are available on the CALCC Climate Commons—a one stop shop for climate change data and information, decision support tools and CALCC project information. For example, easy to understand synthesis articles were developed on topics such as climate downscaling and scenario planning to explain concepts, link to data and tools, and provide resources for further reading.

ASSESSING, INVENTORY AND MONITORING: CALCC presented ongoing assessment, inventorying and monitoring efforts to partners (e.g. climate, fog, sea level rise and birds) through 17 webinars and eight workshops in 2013. The U.S. Fish and Wildlife Service use data housed by the CALCC on the Climate Commons to assess hydrological regimes of refuges to assess water needs and availability. For example, working with all three Joint Ventures in California, a monitoring protocol was developed for assessing shorebird population response to climate change across the Pacific Coast. This project maximizes the value of monitoring data to inform adaptive conservation and management.

Caribbean

The Caribbean LCC includes the terrestrial and marine components of Puerto Rico, the U.S. Virgin Islands, and the island of Navassa (the U.S. Caribbean). We recognize the connectivity with the greater Caribbean and with continental regions through shared species, habitats, and conservation opportunities and goals. Therefore, we work Caribbean-wide with partners as opportunities arise.

View from a high point in Puerto Rico's Northeast Ecological Corridor with the city of Luquillo in the distance. OLIVER BENCOSME/SEAGRANTPR.ORG



VISION: To be a catalyst for collaboration and a primary source for science-based information to sustain natural and cultural resources in Caribbean land and seascapes.

MISSION: Develop and provide the best available conservation science and strategies to agencies, decision makers, organizations, researchers, and the general public in order to conserve, restore and sustain natural and cultural resources in the Caribbean.

LEVERAGING PARTNERSHIPS: The U.S. Forest Service (USFS) International Institute of Tropical Forestry leads the cooperative from their Headquarters in Río Piedras, Puerto Rico. U.S. Fish and Wildlife Service (USFWS) personnel and priorities have teamed with USFS research capacity and climate expertise from the Southeast Climate Science Center to develop downscaled climate data, hydrologic modeling, urban growth modeling, and landcover dynamics addressing science priorities. The CLCC operates with shared support from the U.S. Geological Survey Southeast Climate Science Center, USFWS and the The U.S. Forest Service International Institute of Tropical Forestry.

MEETING SCIENCE PRIORITIES: An initial science priority has been to develop downscaled climate data appropriate for looking at future scenarios in the Caribbean. Climate gradients are steep, with annual rainfall varying from less than 1 m to over 5 m over short distances. Cloud forests on mountain peaks harbor a high number of endemic species and high biodiversity. The Southeast Climate Science Center has helped increase the resolution of climate projections from a few relatively large grid cells, to a fine scale grid of projections that take into account the land surface and terrain—and yield much better

available and work to integrate this estuarine monitoring system with others in the region.

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information for assessing future scenarios of water availability, wildlife habitat, and ecosystem services.

PLANNING AND CONSERVATION DESIGN: A major resource for the region is El Yunque National Forest in Puerto Rico. El Yunque is both a natural and cultural resource with more tree species than all the other National Forests combined. It is an “early adopter” in establishing the new Forest Planning rule. As a planning tool, the CLCC has been cooperating in the development of an El Yunque Atlas that communicates to the public, in English and Spanish, the natural and social systems and services within and surrounding the forest.

INFORMATION, DATA AND TOOLS: The CLCC disseminates information through stakeholder meetings, workshops, open house activities, conference calls, and social media. We are actively developing knowledge through our programs and platforms to deliver information through the CLCC data center on our web site. As an example three projects have looked at ecosystem governance: within the leadership of the CLCC (steering committee members and organizations), within the U.S. Caribbean, and throughout the international Caribbean. Information on who is doing what in conservation has been compiled in compendiums and the spatial distribution of governance entities is available on our site.

ASSESSING, INVENTORY AND MONITORING: Estuarine systems in the region are highly studied, monitored by citizen and science organizations, and managed by multi partner organizations. These systems are not studied, monitored or managed in an integrated fashion. The CLCC has begun to collaborate with organizations monitoring sea level rise in the complex estuarine system in the San Juan Metropolitan area. We will help make the data more readily

Desert

The Desert LCC is a bi-national, self-directed, collaborative, public-private partnership that is collectively impacting landscape conservation in 15 states across the major desert regions of the Southwestern United States and Northern Mexico. The Desert LCC area includes the Mojave, Sonoran, and Chihuahuan deserts, grasslands and valley bottoms, isolated mountain ranges, and large river systems, ranging in elevation from near sea level to more than 10,000 feet.



MISSION: To use collaborative partnerships to provide scientific and technical support, coordination, and communication to resource managers and the broader Desert LCC community to address climate change and other landscape-scale ecosystem stressors.

LEVERAGING PARTNERSHIPS: The Desert LCC has developed interdisciplinary, multi-organizational teams of managers and experts from various sectors of the conservation community to address six priority Critical Management Questions that are yielding information and decision support tools needed by managers to address large-scale ecosystem stressors. The Desert LCC is leveraging work completed by the University of Arizona's Water Resources and Research Center, The Nature Conservancy, Bureau of Reclamation, and others to better understand and apply successful strategies and methodologies for developing, implementing, and evaluating environmental flow recommendations and viable management options that can increase ecosystem and species resiliency to climate change (CMQ 1: Water Management and Climate Change).

MEETING SCIENCE PRIORITIES: The Desert LCC is also developing science and decision support tools to address five other Critical Management Questions, with a focus on aquatic, grassland, and riparian ecosystems; and species that are sensitive to climate change. Science products developed by the Desert LCC inform conservation delivery, including climate adaptation activities to ensure ecosystem function and resiliency, as well as services that people depend on and which have significant social and economic impacts. The Desert LCC funded the Southern Nevada Water Authority to address gaps in current scientific knowledge regarding climate change impacts on lake and reservoir water quality and how water uses are likely to be impacted. This research is enabling managers to evaluate the quality of raw water and plan for future infrastructure or treatment changes.

The Rio Grande runs through the heart of the northern Chihuahuan Desert in the Big Bend-Río Bravo region, forming the border between the U.S. and Mexico. JEFF BENNETT, NATIONAL PARK SERVICE

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<www.usbr.gov/dlcc>

PLANNING AND CONSERVATION DESIGN: Science products developed by the Desert LCC inform landscape conservation planning and design. The Desert LCC funded “An Ecosystem Conservation Assessment for the lower San Pedro Watershed in Arizona” to help provide a science-based, strategic design for prioritizing where conservation efforts are most needed and to offer insights on conservation actions practical for implementation. The study will suggest approaches for developing a new conservation framework for watershed conservation planning that includes an evaluation of high-value biodiversity, hydro-ecological processes, protected areas, landscape connectivity, and climate change adaptation strategies.

INFORMATION, DATA AND TOOLS: The Desert LCC has developed various forums and online platforms for collaboration, dialogue, and problem-solving, including sharing existing information, data, and tools related to priority resources. In 2014, the Desert LCC will host several roundtable forums to deliver and discuss LCC products and tools with resource managers, as well as to identify critical gaps in information that the LCC can help fill. With funding from the Desert LCC, the Sky Island Alliance and Springs Stewardship Institute are inventorying and assessing spring resources and developing an online regional Spring Inventory Database. This project will allow partners to easily access and share information; engage volunteers in locating unmapped springs and assisting with monitoring efforts; and help managers understand and rehabilitate these crucial resources for people, wildlife, and plants, including a variety of sensitive, threatened and endangered species.

ASSESSING, INVENTORY AND MONITORING: Climate change is one of the most difficult challenges land managers face in meeting their charge of sustaining ecosystems and biodiversity. To help reduce uncertainty of climate change impacts on biodiversity in the California desert, the Desert LCC funded the University of California Riverside’s Center for Conservation Biology to identify gaps in focal species coverages, to define and test monitoring methods and protocols for efficiency and effectiveness, and to pilot a citizen-science monitoring program. The University successfully leveraged another \$165,000, for this important project.

The Eastern Tallgrass Prairie & Big Rivers

The Eastern Tallgrass Prairie and Big Rivers LCC sits in the heart of the Midwest. Stretching from central Ohio across parts of Indiana, Illinois, Iowa, Missouri, and Minnesota to eastern Nebraska, Kansas, and Oklahoma, this working landscape supports more than 400,000 farms and large urban populations from Chicago to Des Moines.



Tiger swallowtail butterfly on a thistle. JEFF BENNETT, NPS

VISION: Functional tallgrass prairie and big river natural communities embedded in a healthy and productive agricultural and urban landscape—ecologically connected lands and waters, managed cooperatively for current and future generations.

MISSION: Restore and connect wildlife with people on the rich soils of a functional working landscape.

LEVERAGING PARTNERSHIPS: The Eastern Tallgrass Prairie and Big Rivers LCC leverages federal, state and non-governmental resources to reduce nutrient and sediment run-off from farming communities in the Mississippi basin. This addresses the hypoxic or “dead” zone in the Gulf of Mexico while benefiting wildlife habitat and improving water quality. It is facilitating selection and siting of innovative conservation and management practices for agricultural communities.

MEETING SCIENCE PRIORITIES: Understanding the attitudes, perceptions and motivations of private landowners is key to conservation success in this working landscape. LCC partners including U.S. Geological Survey, Purdue University and Oregon State University, are leveraging financial and technical support from the Northeast Climate Science Center to develop a system to identify watersheds within the basin where application of conservation practices can reduce nutrient runoff and enhance conservation for grassland and riparian birds. It will also identify willing landowners who are capable of implementing these practices.

Additionally, nearly 300 experts across disciplines have formed technical advisory groups to identify science needs and goals for the LCCs four focal areas: urban watershed restoration, agroecology practices, prairie restoration, and river restoration.

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Visit <www.tallgrassprairielcc.org>

PLANNING AND CONSERVATION DESIGN: The lower Missouri River encompasses nearly 1.5 million acres of bottomland habitat for fish, wildlife and plants, while providing commercial transportation and recreation opportunities across our nation's heartland. Over time, societal interests have led to dramatic changes there, creating a highly altered system influenced by upstream reservoirs. More than 70 representatives from federal, state and non-governmental agencies and organizations are contributing to the LCC-led hydro-geomorphic evaluation of the lower 670 miles of the river from Little Sioux, Iowa to St. Louis, Missouri. It looks at historical, current and predicted future attributes of the river based on ecological processes and physical features. The resulting maps and models will serve as tools to maximize ecological functionality while considering flood control, restoration potential, recreation, navigation, and other interests along the river.

INFORMATION, DATA AND TOOLS: Alongside partner LCCs, the Eastern Tallgrass Prairie and Big Rivers is leading the development of a Midwest Landscape Conservation Communications Network. This is made up of more than 40 communications experts representing federal, state, and non-governmental organizations across the Midwest and central U.S./Canada. By building collaborative and strategic communications campaigns for broad-scale natural resources issues we can achieve our goal of maximizing our reach with key stakeholders.

ASSESSING, INVENTORY AND MONITORING: Water quality is directly linked human and economic health, as well as, ecological health and biodiversity of a landscape. Supported by the LCC, the U.S. Geological Survey Water Science Centers are working to evaluate and monitor stream sediment and nutrients during critical times for wildlife and people within the North Fork Maquoketa River Basin in Iowa. This critical time includes when crops most need nutrients during growing periods, as well as during key life stages where stream health is critical for fish and other wildlife.

Great Basin

The Great Basin LCC sits between the Rocky and Sierra Nevada Ranges and covers nearly all of Nevada, and parts of Oregon, California, Utah and Idaho. The Basin's 145,000 square miles includes the largest desert in North America and the largest national forest in the lower 48 states.



Spring Beauty at
Sunflower Flats,
Elko District BLM
Nevada. SHANELL
OWEN

MISSION: The Great Basin LCC (GBLCC) enhances understanding of the effects of changing climate and other natural and human impacts across the region and promotes the coordination of science-based actions to enable human and natural communities to respond and adapt to those conditions.

LEVERAGING PARTNERSHIPS: The GBLCC funded six studies this year to address our priorities: wildfire, invasive species, and sagebrush habitats, which leveraged \$4 in match for every \$1 we funded. We also convinced several partners to provide support for hosting a three-day Tribal Climate Change Adaptation Training for 24 members of Great Basin tribes.

MEETING SCIENCE PRIORITIES: Cheatgrass is widespread invasive weed, and large die-offs of it increase the wildfire risk and threaten biotic integrity of our sagebrush ecosystem. We funded Dr. Elizabeth Leger, of the University of Nevada, Reno, to study the causes and consequences of cheatgrass die-offs. This project will use satellite imagery to provide information on the size and extent of die-offs and determine if these events are restoration opportunities for restoring native forbs and grasses.

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PLANNING AND CONSERVATION DESIGN: BLM recently completed an Ecoregional Assessment covering two-thirds of the GBLCC. Using this assessment, we are leading the effort to identify landscape-scale conservation opportunities and challenges, and strategic cross-jurisdictional solutions which include climate change. This report will be a foundational piece for BLMs ecoregional direction, part of a comprehensive landscape design.

INFORMATION, DATA AND TOOL: We co-sponsor the Great Basin Climate Forums, where we discuss how resource management decisions are made in relation to weather and climate. Forum attendees are diverse: federal (32%), tribal (12%), NGO (12%), state (10%) local government (9%), university (6%). GBLCC and partners developed the Great Basin Weather & Climate Dashboard an online resource for information about climate conditions, drought predications, and snow forecasts for the Basin.

ASSESSING INVENTORY AND MONITORING: We are currently gathering and synthesizing the many existing scientific priorities in the Great Basin. Our Science and Traditional Ecological Knowledge (S-TEK) working group will identify guiding principles and high-level science and support needs. Our S-TEK strategy will provide strategic guidance for activities related to landscape-scale conservation, design, and resource management for the GBLCC and out partners.

Great Northern

The Great Northern LCC encompasses a bi-national North American landscape covering nearly 300 million acres. This landscape spans interior British Columbia and portions of Alberta in Canada, and extends from eastern Washington and northeastern Oregon across north and central Idaho into western Montana and Wyoming.

Middle Fork
Flathead River,
DAVID RESTIVO,
NPS



VISION: A landscape that sustains its diverse natural systems to support healthy and connected populations of fish, wildlife, and plants; sustains traditional land uses and cultural history; and supports robust communities.

MISSION: Coordinate, facilitate, promote, and add value to large landscape conservation to build resource resilience and inform sustainable resource management in the face of climate change and other landscape stressors.

LEVERAGING PARTNERSHIPS: Our collaborative efforts are numerous and as diverse as the landscapes in which we work. Two long-term partner projects that exemplify GNLCCs leveraging are: 1) a climate change and land use vulnerability assessment and adaptation strategy that crosses the international border in the Flathead Basin within the Crown of the Continent ecosystem, and 2) support for landscape design, landscape integrity and connectivity science to support landscape conservation in the interior Columbia Basin and Columbia Plateau.

MEETING SCIENCE PRIORITIES: Multi-year funding support for the NorWeST stream temperature project has led to valuable science tools and climate modeling products. The project recently added models for three large western watersheds. Stream temperature models help planners and managers advance our connectivity and aquatic integrity goals by delivering data targeting priority conservation targets (salmon, trout, riverine, riparian, and aquatic connectivity) while understanding climate change vulnerability and adaptation options.

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PLANNING AND CONSERVATION DESIGN: To aid regional conservation planning efforts, we provided funding to the National Wildlife Refuge System (NWRS) to lead a collaborative effort with the Arid Lands Initiative in the Columbia Plateau region. The collaboration has developed spatial prioritizations that can be used by the NWRS and multiple partners and stakeholders. We also provided funding for development of regional climate and connectivity work for the Western Governors' Association Critical Habitat Assessment Tools (CHAT), which use state wildlife data to develop regional summary maps and prioritizations.

INFORMATION, DATA AND TOOLS: To support our funded projects and partners, we provide technical expertise for the Landscape Conservation Management and Assessment Portal (LC MAP). This web-based system has analysis tools for landscape design and mapping, can be used to integrate information with other systems (e.g. Data.gov, Data Basin, ArcGIS.com) and securely stores data. GNLCC has taken a leading role in using LCMAP as a LCC National Network tool as well as a tool to be used with Climate Science Centers and other complimentary efforts.

ASSESSING, INVENTORY AND MONITORING: We are beginning to link our conservation targets with regional Inventory and Monitoring Programs of the U.S. Fish and Wildlife Service and the National Park Service. We have also worked with the Pacific Northwest Aquatic Monitoring Partnership to identify ways to develop protocols and data delivery mechanisms that meet the needs of our partners. GNLCC recognizes monitoring as a necessary step of adaptive management and Strategic Habitat Conservation. We are in the early stages of discussion on the role of GNLCC in regional monitoring. One particular role may be to track landscape integrity (conservation potential) as described in the draft GNLCC Science Plan.

Great Plains

The Great Plains LCC is located in parts of eight states in the central United States, and covers more than 200 million acres from South Dakota to Texas.

Flint Hills of
Kansas. EDWIN
OLSON, WIKI
COMMONS



MISSION: To lead the development, facilitation and integration of science and management to ensure strategic natural resource conservation on the Great Plains.

VISION: To maximize stakeholder effort across the landscape and optimize data collection, use, and management to conserve habitat and priority species through the development and application of scientific data.

LEVERAGING PARTNERSHIPS: The Great Plains LCC (GPLCC) is working with partners to conserve identified priority habitats throughout the Great Plains, with an emphasis on playas, grasslands, and prairie rivers and streams. Research has also been applied to priority species, including Arkansas River shiner, black-tailed prairie dog and lesser prairie-chicken. Partners have contributed science and technology capacity through the GPLCC Science Committee and the GPLCC Data Steward.

MEETING SCIENCE PRIORITIES: The GPLCC has invested considerable time, energy and funds into lesser prairie-chicken research and management. With support from GPLCC funds, State partners from Colorado, New Mexico, Kansas, Oklahoma and Texas have developed a Range-wide Management Plan for the bird, while Texas Tech University and the U.S. Geological Survey have conducted research on the impacts of climate change on nesting success and habitat requirements. In addition, the GPLCC has done some conclusive work identifying river and stream geomorphological, flow, and species requirements that has been used by the partners to prioritize conservation actions for Great Plains fishes.

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PLANNING AND CONSERVATION DESIGN: The GPLCC has endorsed the concept of Landscape Conservation Design (LCD) and is embarking on a pilot LCD centered on grassland systems of the Southern High Plains. This approach will ensure that limited GPLCC resources for science and research will be directed to those projects that address key uncertainties and are directly linked to supporting priority species at desired levels while enabling conservation actions at a landscape scale.

Information, data and tools: The GPLCC has developed a Data Portal with the USGS and its Science Base–LC Map platform. All data, tools, and research reports from GPLCC-funded science are available through this Data Portal. The GPLCC has also increased its capacity with a Data Steward who acts as the point of contact for partners, researchers and other users working with LC Map.

ASSESSING, INVENTORY AND MONITORING: Improved landcover data is essential for relevant analysis of species and habitat distribution. The GPLCC, with partners in TX and OK, produced a new classification map based on the NatureServe Ecological System Classification with a spatial resolution of one acre. The system has already been used to target conservation areas in TX and OK. Full LCC-wide coverage of this landcover classification system is being considered by other GPLCC partners.

Gulf Coast Prairie

The 100-million-acre Gulf Coast Prairie LCC encompasses portions of five States (Texas, Oklahoma, Louisiana, Mississippi, and Kansas), four terrestrial ecoregions (Edwards Plateau, Gulf Coast Prairie, Oaks and Prairies, and Tamaulipan Brushlands) and portions of three Mexican States (Tamaulipas, Nuevo Leon, and Coahuila).

Edwards Plateau
region of Texas.
TEXAS PARKS
AND WILDLIFE
DEPARTMENT



VISION: The Gulf Coast Prairie LCC (GCPLCC) is a collaborative partnership of agencies, tribes, and organizations working together, realizing common goals, and having a cooperative determination to enhance cultural and natural resource conservation and sustainability across the landscape.

MISSION: The GCPLCC mission is to sustain, protect, and conserve natural and cultural resources in the Gulf Coast Prairie landscape/geography in the face of such threats and stressors as climate change, population growth, and urbanization.

LEVERAGING PARTNERSHIPS: The GCPLCC partners have leveraged more than \$3 million in time and technical expertise to develop common science priorities and to identify and carry out science activities, including development of a Mottled Duck Decision Support Tool and a Conservation Planning Atlas to house information. Leveraging resources and skill sets enables development of sound science priorities, and landscape-scale research to implement Strategic Habitat Conservation (SHC).

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[<gulfcoastprairielcc.org>](http://gulfcoastprairielcc.org)

MEETING SCIENCE PRIORITIES: Complex landscape-level issues are more effectively addressed by partners focusing on a common conservation goal. With partial funding from the National Oceanic and Atmospheric Administration, the GCPLCC is collaborating with three other LCCs to develop the Gulf Coast Vulnerability Assessment (GCVA). The GCVA will identify climate adaptation strategies for implementation across the Gulf Coast. Private lands compose over 90% of the LCC area and this partnership is working with landowner organizations to address surface water resources, habitat fragmentation and fish and wildlife needs.

PLANNING AND CONSERVATION DESIGN: The GCPLCC Science Strategy is under development to bring together the focal species effort, ongoing projects, and science gaps that need to be addressed within the SHC framework, including the identification of desired ecological conditions. The Science Strategy will guide and inform science investment decisions including research pertaining to human dimensions to inform future actions.

INFORMATION, DATA AND TOOLS: The Southeast Aquatic Resources Partnership (SARP) is inventorying in-stream flow to assess the flow-ecology relationships in all ecoregions of the Gulf Coast Prairie LCC. The Conservation Planning Atlas (CPA) houses and shares information, data, and tools used for GCP LCC-funded priority science activities.

ASSESSING, INVENTORY AND MONITORING: The GCPLCC partnership has compiled State Wildlife Action Plans and input from the Stakeholder Advisory Committee at the U.S. Geological Survey South Central Climate Science Center to help serve as a reference point when assessing conservation needs across this multi-jurisdictional landscape. Measures of success will be identified through the implementation of Strategic Habitat Conservation to address partner priorities.

Gulf Coastal Plains & Ozarks

The Gulf Coastal Plains and Ozarks LCC covers all of Mississippi, Arkansas and parts of 10 states in the southeastern U.S. It encompasses the entire lower Mississippi River from just north of Cairo, Illinois, to its mouth at the Gulf of Mexico and approximately 200 miles of coastline along the Gulf.

Bottomland forest, Big Lake National Wildlife Refuge. JEREMY BENNETT, USFWS



VISION: Natural and cultural landscapes capable of sustaining healthy ecosystems, clean water, fish, wildlife, and human communities in the 180-million-acre Gulf Coastal Plains and Ozarks region through the 21st century.

MISSION: Define a shared vision for sustainable natural and cultural resources in the face of a changing climate and other threats; design strategies to achieve that vision; and deliver results on the ground through leadership, partnerships, contributed resources, evaluation and refinement over time.

LEVERAGING PARTNERSHIPS: The Gulf Coastal Plains and Ozarks LCC (GCPOLCC) is working with 65 partners representing 28 individual agencies and organizations in the Gulf of Mexico to identify key vulnerabilities to climate change in the Gulf Region. To incorporate future change into current conservation planning, a tool is being developed to identify where future coastal wetland migration is likely and unlikely to occur under various scenarios of sea level rise and future urbanization.

MEETING SCIENCE PRIORITIES: Conserving large connected areas that encompass whole river systems and forests begins with both a shared vision of conservation and an understanding of natural resource conditions and is based on shared knowledge. GCPOLCC addressed inconsistent, insufficient and out-of-date land classification data for the region by creating a complete, seamless and consistent Land Cover Database. It uses nationally accepted land cover classification systems, is available online and provides a foundation for large-scale conservation science and planning.

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PLANNING AND CONSERVATION DESIGN: The Conservation Planning Atlas (CPA) is a spatial data visualization tool for land managers, planners and other conservation practitioners serving multiple regions. CPA and LCC staff help conservation practitioners by searching out, assessing and synthesizing data most compatible and relevant to conservation. In addition to searchable datasets, the CPA provides a map function and online work spaces available even to those working in remote rural locations with slow internet speeds.

INFORMATION, DATA AND TOOLS: River floodplain ecosystems are extremely valuable in supporting water quality, wetlands, and fisheries—yet large scale aquatic systems are more difficult to assess than terrestrial systems. Working in collaboration with St. Catherine's Creek National Wildlife Refuge, Private John Allen National Fish Hatchery, the Southeast Aquatic Resources Partnership, and the U.S. Fish & Wildlife Service Inventory & Monitoring Program, the GCPOLCC developed a Habitat Suitability Index (HSI) for alligator gar, a popular gamefish and apex predator species of the lower Mississippi River and tributaries. This project combined new remote sensing techniques with ground-truthing from water quality data loggers and telemetry data collected on 60 gar over three years. The HSI can characterize the availability, suitability, and spatial distribution of aquatic habitat for gar—and eventually other aquatic species—throughout the Lower Mississippi River floodplain.

ASSESSING, INVENTORY AND MONITORING: The U.S. Fish & Wildlife Service Region 4 National Wildlife Refuge System Inventory & Monitoring Network (I&M) and the GCPOLCC continued to coordinate acoustical bat monitoring for the second year. The Southeast's 20 species of insectivorous bats rely on pine or hardwood forest habitats and provide valuable agricultural pest control benefits. Under a shared protocol across 45 USFWS field stations, 64 unique routes were sampled repeatedly across 10 states, obtaining the identification of ~7680 bat calls and thirteen bat species. These species baselines will be shared with partner organizations for use in landscape population assessments. This program may ultimately yield insights on landscape level population changes or shifts in species distributions due to climate change, expanding urbanization, wind development and White-nose Syndrome.

North Atlantic

The North Atlantic LCC covers 13 states and four provinces in the northeastern U.S. and southeastern Canada. The LCC encompasses more than 38,000 miles of shoreline, a diversity of terrestrial, aquatic, coastal and marine systems and a full spectrum of land use from urban to agricultural to wilderness. The diverse jurisdictions, partners and partnerships in the North Atlantic LCC area have a history of working together towards common goals.

Cape Cod
National
Seashore



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

MISSION: Providing a partnership in which the private, state, tribal and federal conservation community works together to address increasing land use pressures and widespread resource threats and uncertainties amplified by a rapidly changing climate. The partners and partnerships in the cooperative address these regional threats and uncertainties by agreeing on common goals for land, water, fish, wildlife, plant and cultural resources and jointly developing the scientific information and tools needed to prioritize and guide more effective conservation actions by partners toward those goals.

LEVERAGING PARTNERSHIPS: Working with the Department of the Interior (DOI), its bureaus, and the broader conservation community to coordinate Hurricane Sandy resiliency science projects, identify science needs and help guide future restoration investments. This includes a portion of Interior's recently announced \$162 million investment in 45 projects throughout the region impacted by Sandy.

MEETING SCIENCE PRIORITIES: The LCC received \$1.27 million in Hurricane Sandy mitigation funds from DOI to coordinate and support a collaborative, region-wide effort to restore fish passage while reducing the likelihood of damage to road stream crossings from future floods.

PLANNING AND CONSERVATION DESIGN: Designing Sustainable Landscapes (Phase 2)—This ongoing LCC project is assessing current and potential future landscapes in the Northeast to provide integral ecosystems and suitable habitat for representative species, and provide strategic habitat guidance in the face of urban growth, changing

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climate, and more. The second phase of the project has the following goals: Assess current habitats capabilities for supporting sustainable populations of wildlife; Predict the impacts of landscape-level changes on the future habitats to support wildlife populations; Target conservation programs to achieve and evaluate progress objectives in State Wildlife Action Plans (SWAP) and other conservation plans; and Enhance coordination among partners through conservation design.

INFORMATION, DATA AND TOOLS: The NPLCC launched its Conservation Planning Atlas (CPA). It serves as a natural resource data discovery, visualization, and analytical platform for stakeholders throughout the area. Through it users can discover and access spatial datasets and conduct spatial analyses of landscape scale conservation science and design in the region. It is coupled with U.S. Geological Survey Science Base, which houses all NPLCC-funded science and an array of additional non-spatial data on landscape-scale conservation and climate change. The CPA was created to address three major problems plaguing those who wish to use spatial analysis tools: 1) the inconsistency and incompatibility of available datasets; 2) the overwhelming volume of data available; and 3) the expert staff time required to properly disseminate available data. Go to [<nplcc.databasin.org>](http://nplcc.databasin.org) to use this powerful conservation-planning tool.

ASSESSING, INVENTORY AND MONITORING: The LCC made two early investments in overall regional vulnerability assessments for species and habitats that are now complete. NatureServe and Heritage Program collaborators have developed a Climate Change Vulnerability Index to provide a rapid, scientifically defensible assessment of species' vulnerability to climate change. Also supported was the second phase of a regional project to study Vulnerabilities to Climate Change of Northeast Fish and Wildlife Habitats. This project built off a first phase of work funded by Northeast states through the Regional Conservation Needs program on the vulnerability to climate change of additional Northeastern habitat types resulting in three reports on regional vulnerabilities to terrestrial habitats, cold water fish habitat and coastal habitats. Also created was a database of ongoing coastal climate change projects and tools, the Northeast Climate U.S. site [<www.neclimateus.org>](http://www.neclimateus.org). Both the species and habitat vulnerability assessment reports are undergoing peer review and the reports will be released in final form in 2014.

North Pacific

The North Pacific LCC encompasses Pacific coastal temperate rainforest and adjacent marine waters—from the Kenai Peninsula in South-central Alaska to Bodega Bay in Northern California. It engages two countries (U.S., Canada), four states (Alaska, Washington, Oregon, California), one province (British Columbia) and many Tribes/First Nations.



A snowy
Mt. Rainier in
Washington.
JOHN
MANKOWSKI,
NPLCC

MISSION: Promoting development, coordination, and dissemination of science to inform landscape-level conservation and sustainable resource management in the face of a changing climate and related stressors.

LEVERAGING PARTNERSHIPS: Working closely with indigenous peoples, federal and state agencies, the Northwest and Alaska Climate Science Centers, and non-governmental organizations to explore how Traditional Ecological Knowledge (TEK) promotes understanding of our changing environment, plan/adapt for climate- change, and focus attention on cultural and natural resources important to area Tribes and First Nations. Seven TEK pilot projects, four projects on tribal subsistence resources, and climate adaptation classes focused on issues of tribal interest have been funded.

MEETING SCIENCE PRIORITIES: Five science priorities guide where the NPLCC develops, coordinates, and disseminates science to inform landscape-level conservation and sustainable resource management in the face of a changing climate and related stressors: 1) Hydrologic regime shifts on rivers, streams, and riparian corridors; 2) Change in air temperature and precipitation on forests; 3) Changes in sea levels and storms on marine shorelines, the nearshore and estuaries; 4) Changes in the hydrologic regime on anadromous fish; and 5) Invasive species, diseases, pests and their effects on biological communities. Access details and results of this at <northpacific.org/resources>.

PLANNING AND CONSERVATION DESIGN: Facilitating collaborative landscape design in the NPLCC is supporting spatially-explicit landscape conservation design in the Cascadia Partner Forum. The aim is to increase the climate-related adaptive capacity

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of natural resources in this transboundary region. Funding is used to engage scientist-practitioner partnerships to apply the best available science to the information needs of managers tasked with conserving connectivity in the face of climate change. Products will include maps, data, and strategic and tactical plans to promote climate-informed connectivity management.

Further north and along the coast, the NPLCC is offering support for supporting Heiltsuk First Nation's participation in strategic landscape reserve design process. This work identifies landscape conservation features to sustainably manager cultural sites and resources over short and long- term time frames.

INFORMATION, DATA AND TOOLS: The NPLCC launched its Conservation Planning Atlas (CPA) to serve as a natural resource data discovery, visualization, and analytical platform for stakeholders throughout the area. Through it users can discover and access spatial datasets and conduct spatial analyses of landscape scale conservation science and design in the region. It is coupled with USGS Science Base, which houses all NPLCC-funded science and an array of additional non-spatial data on landscape-scale conservation and climate change. The CPA was created to address three major problems plaguing those who wish to use spatial analysis tools: 1) the inconsistency and incompatibility of available datasets; 2) the overwhelming volume of data available; and 3) the expert staff time required to properly disseminate available data. Go to [<nplcc.databasin.org>](http://nplcc.databasin.org) to use this powerful conservation-planning tool.

ASSESSING, INVENTORY AND MONITORING: The NPLCC is supporting an effort to assess, inventory, and track stream temperature data from all tribal, federal, state, and private sources to develop a comprehensive database. Spatial statistical models for river networks will be applied to these data predict stream temperature for all fish-bearing streams in the U.S. portion of the NPLCC. Differences between model outputs for historic and future climate scenarios will be used to assess spatial variation in the vulnerability of sensitive fish species across the NPLCC. The temperature database and climate scenarios will be distributed as geospatial products to facilitate planning and vulnerability assessments for all aquatic species.

Northwest Boreal

The Northwest Boreal LCC consists of more than 330 million acres of boreal forests, alpine habitat, wetlands and rivers, spanning 1,500 miles east to west, with an altitudinal range from sea level to the highest point in North America. If the NWB LCC was a country, it would be the 20th largest in the world.

A frozen, meandering river in interior Alaska.
AMANDA ROBERTSON



VISION: A landscape that sustains functioning, resilient boreal ecosystems and associated cultural resources in perpetuity.

MISSION: To promote coordination, development, and dissemination of applied science to inform landscape level conservation in the face of a changing climate and other stressors.

LEVERAGING PARTNERSHIPS: The Northwest Boreal LCC is committed to working across the international border to coordinate applied science to inform shared land and resource management needs. Nearly half of the land area (47.5%) in the NWBLCC is in Canada and membership composition and participation on the Steering Committee reflects this. There is a pressing need for more resources dedicated to preparation and synthesis of compatible trans-boundary environmental inventories and monitoring data.

MEETING SCIENCE PRIORITIES: The NWBLCC has identified nineteen priority natural resource information needs that are necessary to understand, monitor, and manage for landscape change and sustainable resource management in the region. Within these priorities, the LCC is focusing its efforts on a consistent approach to environmental monitoring and assessment and the sharing of environmental and natural resource data across the international border.

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PLANNING AND CONSERVATION DESIGN: The NWBLCC hosted a landscape conservation planning in November of 2013. The workshop focused on approaches to landscape conservation planning, design, and science in support of the development of a landscape conservation foundation. The results of the workshop provide a blueprint for integrating our priority information needs into a comprehensive plan for landscape conservation and facilitate strategic prioritization of our activities over time.

INFORMATION, DATA AND TOOLS: Through the coordinated efforts of all five Alaska LCCs, federal, state and academic partners are developing an updated and more accurate Alaska National Hydrography Dataset for the state. The product will improve our ability to monitor the status of our surface waters and will allow us to more effectively model future aquatic habitat conditions in a changing climate. Salmon management, pollutant transport studies, and the investigation of the spread of water-dispersed invasive species are just a few of the important management uses of such a dataset.

Assessing, inventory and monitoring: The NWBLCC is partnering with the Conservation of Arctic Flora and Fauna's Circumboreal Vegetation Mapping (CBVM) group to develop a vegetation map of the boreal biome of North America and Eurasia. The development of such a map (with an initial focus on the NWB region) will enable us to consistently monitor changes in land cover and species distributions across the Northern Hemisphere.

Pacific Islands

The Pacific Islands Climate Change Cooperative encompasses more than 2,000 islands, atolls, and seascapes spanning millions of square miles in the Central North, Western North, and Central South Pacific Basin, including Hawai'i, American Sāmoa, Republic of the Marshall Islands, Federated States of Micronesia, Commonwealth of the Northern Mariana Islands, Guam, the Republic of Palau, and the U.S. Marine National Monuments.



Coral at Palmyra National Wildlife Refuge. USFWS

VISION: Assist those who manage native species, island ecosystems and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands.

MISSION: Improve the ability of native island species and ecosystems to accommodate future climate change and related perturbations, and support the long-term protection of key cultural resources, by providing useful projections of climate and natural resource change in the Pacific Islands, innovative management options, and a membership that supports coordinated action among institutional and community stakeholders.

LEVERAGING PARTNERSHIPS: As resource managers begin to grapple with climate change impacts on natural and cultural resources, a formidable challenge is communicating complex scientific concepts into language that makes sense for those planning and implementing conservation programs. The PICCC conducted communications trainings in the Commonwealth of the Northern Mariana Islands and the Territory of Guam. It provided an opportunity for agency, NGO, and community managers to explore communications best practices and principles of behavior change within a culturally and geographically relevant context.

MEETING SCIENCE PRIORITIES: Seeing an urgent need to develop climate change vulnerability assessments for suites of species across island landscapes; and realizing that, existing vulnerability assessment methodologies did not meet the needs of our island systems; a technical team of eleven experts, led by PICCC staff and populated by scientists from Steering Committee Member organizations, began

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developing a new methodology and conducting two simultaneous assessments: one for all native plants (1,000+) and another for native forest birds in Hawai'i. The team completed the plant vulnerability assessment and published a technical report late in 2013. PICCC staff immediately began working with resource managers to identify ways to use the data sets, GIS layers, and Google Earth visualizations in their conservation planning and implementation activities.

PLANNING AND CONSERVATION DESIGN: The best way to preserve productive agricultural acreage and rare wilderness land is to balance development with conservation through a scientific planning process that considers the land's biocultural values. To do help with that, two PICCC Steering Committee Member organizations, the Trust for Public Land and the Office of Hawaiian Affairs, are now working on a plan called Greenprint. After launching on the island of O'ahu in 2013, Greenprint will expand to cover the entire state. PICCC Staff and other Steering Committee Member organizations are serving on the Greenprint Steering Committee and technical advisory team to ensure that the most current climate change projections, data sets, and GIS layers are utilized in identifying priorities for land conservation.

INFORMATION, DATA AND TOOLS: Effective data management is critical and PICCC is working at both regional and national levels to ensure that the LCC is linked into data management options that make sense, including an online Conservation Planning Atlas. Throughout 2013 PICCC Staff collaborated with data management and visualization experts in Hawai'i on the development of our web-based data portal that will go live in 2014. The PICCC also worked with the USGS Pacific Islands Climate Science Center to test-drive a new online data management tool for project grantees.

ASSESSING, INVENTORY AND MONITORING: The PICCC is working with the National Park Service to assess the vulnerability of 44 National Historic Landmarks in Hawai'i and the Pacific to better understand the impacts of climate change. The findings of this assessment will help the National Park Service prioritize investment of the limited resources available for providing technical advice, conducting condition assessments, and completing preventative infrastructure upgrades and repairs.

Peninsular Florida

The Peninsular Florida LCC covers the peninsula of Florida from Cedar Key on the Gulf of Mexico coast to a point near Saint Augustine on the Atlantic coast and then south to the Florida Keys.

Wacissa River,
Florida. FWC



VISION: Our conservation cooperative is a valued resource for conservation design and delivery that supports a Florida landscape comprised of functional and interconnected ecosystems, valued by citizens, that contribute to regional and national conservation landscape connectivity.

MISSION: The mission of the PFLCC is to foster landscape scale conservation to sustain natural and cultural resources for future generations.

LEVERAGING PARTNERSHIPS: The Peninsular Florida LCC is leveraging funding to provide for cost shared capacity building including an Adaptive Science Coordinator, a LCC Science/State Wildlife Action Plan Coordinator and a Communications/Outreach Coordinator. Additionally, office space for the Coordinator is being provided by the Florida Fish and Wildlife Conservation Commission.

MEETING SCIENCE PRIORITIES: The science focus of the Peninsular Florida LCC has been to enhance conservation planning in Florida by investigating a number of possible trajectories of future landscape transformation through development of scenarios. The scenarios will include four main drivers of change: climate change, shifts in planning approaches and regulations, population change, and variations in financial resources, while incorporating the latest updates to statewide conservation priorities via the Critical Lands and Water Identification Project (CLIP) dataset. Through a systematic exploration at the landscape-scale, this research will identify some of the major challenges to future conservation efforts. Scenarios are conceived not as blueprints for the future, but rather as learning tools for management of uncertainty. The scenarios are internally-consistent bundles of assumptions with a number of dimensions. Three future time horizons were simulated for each scenario: 2020,

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2040 and 2060. Each alternative future visualizes land use patterns and landscape transformations such as coastal inundation, urbanization, and infrastructure changes. Future changes in conservation lands are modeled and/or designed based on the input from local experts and managers and using the best available ecological information and data.

PLANNING AND CONSERVATION DESIGN: The Peninsular Florida LCC has been updating and expanding the CLIP databases to develop a conservation blueprint or design. CLIP is comprised of five resource categories that include multiple databases. The core elements include: biodiversity (four databases), landscapes (two databases), surface water (three databases), groundwater (one database) and marine (10 databases). The databases are peer-reviewed by technical review committees for scientific rigor. The CLIP also contains a prioritization feature with 6 priority levels. CLIP priorities 1 and 2 are being used in the development of the scenarios.

INFORMATION, DATA AND TOOLS: The Peninsular Florida LCC is working with the USGS National Wetlands Center to develop a visualization tool that will be a desk top application that will not require GIS training to use. The tool will support the scenarios and allow end users to create their own polygons and to import compatible local data sets to assess impacts of alternative future conditions. This tool is being developed by leveraging the use of an existing software platform called EverVIEW. This platform allows users to drill down into the data using embedded tools.

ASSESSING, INVENTORY AND MONITORING: The Peninsular Florida LCC is planning to integrate its efforts with the Florida Wildlife Action Plan which has recently been updated to include climate change impacts. The goals and objectives for the LCC and SWAP demonstrate a high degree of synchronicity. The eight required elements for SWAPs include: information on distribution and relative abundance of wildlife; location and condition of key habitats and community types; problems that may adversely impact wildlife or habitats; description of needed conservation actions; proposed plans for monitoring; revisions due at least every 10 years; coordination with conservation partners and involve the public in SWAP development, revision and implementation.

Plains & Prairie Potholes

The Plains and Prairie Potholes LCC encompasses the northern Great Plains, prairie pothole region, known as North America's "duck factory," as well as several major river systems including the Missouri, Yellowstone and the Red River of the North. Our efforts span portions of Minnesota and Iowa, North Dakota, South Dakota, eastern Montana, eastern Wyoming, and into the Canadian provinces of Alberta, and Saskatchewan and Manitoba.



MISSION: Increase conservation delivery by reducing scientific uncertainty associated with landscape-level stressors that are important to our partnership. We promote coordination, dissemination, and development of applied science to support landscape level conservation in the face of complex landscape-scale stressors.

LEVERAGING PARTNERSHIPS: All new projects funded in 2013 received financial, in-kind and/or technical support from multiple LCC partners, emphasizing the deepening commitment of our partners to contribute to landscape-scale conservation. The Natural Resource Conservation Service provided more than \$1 million to implement conservation practices identified by carbon sequestration research to benefit grasslands in the northern Great Plains. The U.S. Geological Survey joined state, federal and non-governmental partners in Montana and North Dakota to examine the relationship between oil production and the spread of invasive plant species in the Williston Basin. Ducks Unlimited, Inc. and Ducks Unlimited, Canada are estimating the effects of wetland distribution and loss on water quality and quantity to better understand ways to incentivize wetland conservation in the Souris River watershed in the U.S. and Canada.

MEETING SCIENCE PRIORITIES: Examining emerging threats to our natural resources along with current challenges will allow us to make informed projections for the future. Studying grassland conversion risk, a collaborative research project between the University of Wyoming, Ducks Unlimited and the World Wildlife Fund exemplifies this forward-thinking mentality. Examining Farm Bill programs, soil types and climate change scenarios, scientists can

Prairie potholes.
USFWS

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project those grasslands most vulnerable to conversion. States like Montana, Wyoming, North and South Dakota now have the science necessary to design conservation programs that proactively and effectively address these ongoing and future threats.

PLANNING AND LANDSCAPE CONSERVATION DESIGN: The lower Missouri River encompasses nearly 1.5 million acres of bottom land habitat for fish, wildlife and plants, while providing commercial transportation and recreation opportunities for communities across our nation's heartland. Over time, societal interests have led to dramatic changes there, creating a highly altered system influenced by upstream reservoirs. More than 70 representatives from federal, state and non-governmental agencies and organizations are contributing to the LCC-led hydro-geomorphic evaluation of the lower 670 miles of the river from Little Sioux, Iowa to St. Louis, Missouri. It looks at historical, current and predicted future attributes of the river based on ecological processes and physical features. The resulting maps and models will serve as tools to maximize ecological functionality while considering flood control, restoration potential, recreation, navigation, and other interests along the river.

INFORMATION, DATA AND TOOLS: Alongside partner LCCs, the Plains and Prairie Potholes LCC is leading the development of a Midwest Landscape Conservation Communications Network. This is made up of more than 40 communications experts representing federal, state, and non-governmental agencies and organizations across the Midwest and central U.S./Canada. By building collaborative and strategic communications campaigns for broad-scale natural resources issues we can achieve our goal of maximizing our reach with key stakeholders.

ASSESSING, INVENTORY AND MONITORING: The development of a native prairie adaptive management database has allowed scientists to directly link on-the-ground monitoring efforts with real-time prairie management options to treat invasive plants such as smooth brome and Kentucky blue grass. The database stores valuable monitoring data and keeps track of management actions taken on specific refuge and wetland management district units over time; data used to create predictive models that generate management recommendations for refuge managers for the upcoming year.

South Atlantic

The South Atlantic LCC encompasses an ecologically diverse 89 million acres across portions of six states, from southern Virginia to northern Florida. The geography also includes the marine environment within the federal Exclusive Economic Zone. It is a place where major urban mega-regions and extensive private lands intersect with extraordinary hotspots of biodiversity and cultural heritage.

Paddling the canals of Alligator River National Wildlife Refuge. STEVE HILLEBRAND, USFWS



VISION: A landscape that sustains the nation's natural and cultural resources for current and future generations.

MISSION: To create a shared blueprint for landscape conservation actions that sustains natural and cultural resources.

LEVERAGING PARTNERSHIPS: As part of its effort to develop a Conservation Blueprint for the future of the region, the South Atlantic LCC has been working closely with local and regional partnerships (including the Atlantic Coast Joint Venture, Southeast Aquatic Resources Partnership, Atlantic Coast Fish Habitat Partnership, Albemarle National Estuary Partnership, Governor's South Atlantic Alliance, and Southeast Partners in Amphibian and Reptile Conservation) to integrate regional priorities into a shared and spatially explicit plan for the future of the South Atlantic region

MEETING SCIENCE PRIORITIES: The South Atlantic LCC has been integrating existing science and filling science gaps needed to create a Conservation Blueprint for the region. For example, a project assessing how beach nesting species (birds, sea turtles, and beach mice) will be vulnerable to sea level rise has just been completed. The results are being used to ensure the LCC's Conservation Blueprint will adequately cover those species into the future

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PLANNING AND CONSERVATION DESIGN: In March the Cooperative adopted its natural and cultural resource objectives (indicators). With our objectives in hand, the steering committee established the goal of completing version 1.0 of a conservation design for the entire LCC (the South Atlantic Conservation Blueprint) by March 2014. LCC staff has been modeling the past, present, and future condition of the Cooperative's shared conservation objectives (indicators) in relation to established levels. This work will inform the State of the South Atlantic report and will provide the data needed to test the effectiveness of the Blueprint. About 200 people from 58 different organizations attended four Blueprint development workshops held in October and November. The purpose of the workshops was to ensure local knowledge of places and ecosystems informed the development of the Blueprint. The results of the workshops will be combined and compared with existing conservation plans and reviewed for how well the places and actions support the Cooperatives natural and cultural resource indicators. The steering committee is slated to adopt this version of the Blueprint for specific use cases in March 2014.

INFORMATION, DATA AND TOOLS: In a coordinated effort with other eastern and southeastern LCCs, the Cooperative launched the South Atlantic Conservation Planning Atlas (CPA). The CPA is a searchable, science-based mapping platform that provides LCC products to conservation decision-makers. The CPA is currently providing projected landscape change information and will ultimately host the Cooperative's Conservation Blueprint and associated decision support tools.

ASSESSING, INVENTORY AND MONITORING: The South Atlantic LCC's Natural and Cultural Resource Indicators provide shared measures of success for the Cooperative and are all being monitored by partners throughout the region. As part of a State of the South Atlantic effort, the Cooperative is now working to integrate that monitoring information to determine the past and present condition of those indicators throughout the South Atlantic region.

Southern Rockies

The Southern Rockies LCC encompasses over 127 million acres distributed across four states: Utah, Colorado, Arizona and New Mexico, and Wyoming. The area is geographically and ecologically complex; from 14,000 foot peaks to the Grand Canyon and cold desert basins. It spans primarily the Wasatch and Uinta Mountains, Colorado Plateau, Southern Rockies and Arizona/New Mexico Plateau ecoregions of Omernik (1987).



VISION: A productive partnership among federal, state, and tribal management agencies, and non-governmental conservation organizations, communities and other stakeholders to acquire and share information to support on-the-ground strategic conservation efforts addressing climate change and other landscape-scale stressors.

MISSION: Integrate science and management expertise to support sustainable outcome-based conservation delivery; facilitate landscape-scale conservation and adaptive management; identify priority science issues and needs; develop spatially-explicit resource management goals; provide scientific decision support for measurable outcomes; participate as part of a seamless national network of LCCs focused on meeting the shared needs of partner organizations; and coordinate with Climate Science Centers on science needs and information transfer.

LEVERAGING PARTNERSHIPS: Through a collaborative effort by the LCC's co-hosting agencies (FWS & BOR) we are leveraging capacity and funds from the Valles Caldera National Preserve, The Nature Conservancy, and University of New Mexico to quantify the influence of forest treatments on water yields and reduced risks of catastrophic wildfires. Results will be incorporated into conservation management plans for fisheries (e.g., Rio Grande chub and sucker, and cutthroat trout), riparian restoration actions (replanting of riparian woody shrubs and trees, stream geomorphology reconstructions), and terrestrial wildlife species threatened by long-term changes in habitat and climate (e.g., the Jemez Mountains Salamander, New Mexico Meadow Jumping Mouse).

Bull elk at Big Spring Creek, Great Sand Dunes National Park & Preserve, Colorado. NPS

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MEETING SCIENCE PRIORITIES: The SRLCC sponsored a vulnerability assessment (VA) completed by The Nature Conservancy and the Gunnison Climate Working Group in the Gunnison Basin of CO. The VA was conducted on 24 ecosystems and 73 species. As a result of the VA, adaptation strategies were developed for the Gunnison Sage Grouse, and partners completed construction of over 100 projects on private lands in the Basin to improve or restore wetlands for grouse brood rearing habitat.

PLANNING AND CONSERVATION DESIGN: The SRLCC supported the National Wildlife Refuge Association in development of the Environmental Assessment and Land Protection Plan for the Bear River Watershed Conservation Area (BRWCA). The Plan creates conservation strategies and a framework for conservation implementation. Focal species and habitats have been identified within the BRWCA as well as a draft conservation easement document. On May 1, 2013, Dan Ashe, Director of the U.S. Fish and Wildlife Service, approved and signed the BRWCA Environmental Assessment and Land Protection Plan.

INFORMATION, DATA AND TOOLS: The SRLCC is leveraging existing capacity and agreements with the Bureau of Land Management (BLM), Utah State University, and the USGS Utah Cooperative Fish and Wildlife Research Unit to assist land management agencies (e.g., Utah Division of Wildlife, BLM, Forest Service) with analysis and application of large data-sets, such as BLM's Colorado Plateau Rapid Ecoregional Assessment to their specific resources, landscapes and management strategies.

ASSESSING, INVENTORY AND MONITORING: Two years' worth of monitoring of the impacts of forest restoration treatments across 32,000 acres of ponderosa pine ecosystems has been completed in the Front Range, Colorado, as part of a Collaborative Forest Landscape Restoration (CFLRP) project. This SRLCC funded project is contributing to the adaptive management decision-making processes in the Front Range CFLRP, and informs CFLRPs implementing and evaluating similar restoration treatments in nearby states with pine-dominated forests (e.g. New Mexico, Arizona and Montana).

Upper Midwest & Great Lakes

The Upper Midwest and Great Lakes LCC is home to a diverse range of fish, wildlife plants and habitats including the Great Lakes—North America's largest freshwater resource—coastal wetlands, boreal forests, major river systems and prairie-hardwood ecosystems. Many of these ecosystems surround heavily populated urban centers.

Sunrise at
Siskiwit Bay.
USFWS



VISION: Envisioning a conservation community that, while governed by their unique purposes and missions, collaborates on sustaining lands and waters that support natural and cultural resources and the services they provide.

MISSION: To support and sustain a conservation community through information development and dissemination designed to inform coordinated conservation action.

LEVERAGING PARTNERSHIPS: Collaborative projects funded through the LCC exemplifies our collective success and benefits the day-to-day work of federal, state, non-profit and private agencies and organizations engaged in natural resources management. Leadership shown by the Great Lakes Fishery Commission and The Nature Conservancy has paved the way to effectively address fragmentation of our aquatic resources. This is shown in the LCCs efforts to coordinate aquatic connectivity efforts across the upper Midwest and Great Lakes landscape. The deepening commitment of our individual partners exemplifies the LCCs goal of a coordinated, collaborative approach to our most pressing natural resources issues.

MEETING SCIENCE PRIORITIES: Our technical experts are working to address five areas of focus, including, augmenting and coordinating aquatic habitat connectivity efforts, contributing to the evolution of State Wildlife Action Plans, and conservation and management for our northern forests, coastal and urban areas. We have supported ongoing and recently completed scientific investigations that relate to aquatic habitat fragmentation and are already contributing valuable science to the field of aquatic conservation and management of the Great Lakes tributaries. Over 275,900 potential barriers to fish movement were mapped and predictive models assigned a pass-ability rating to every road crossing in the basin. Researchers then developed

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an initial optimization model identifying which barriers when removed would provide connectivity to the most tributary distance given a certain budget.

PLANNING AND CONSERVATION DESIGN: We are connecting research milestones from 2013 with conservation and management practitioners in the field. For example, our efforts to assess the impacts of climate change on riverine fish and fish habitat is influencing the planning and on the ground conservation actions in the Driftless region of Wisconsin. Similarly, our investigation on management scenarios for forest resiliency to projected climate change impacts is guiding planning efforts and demonstration projects for adaptive forest management in locations across the northern forests.

INFORMATION, DATA AND TOOLS: Alongside partner LCCs within the Midwest and Central U.S./Canada, we are leading development of a Midwest Landscape Conservation Communications Network. It is made up of more than 40 communications experts representing federal, state, and non-governmental agencies and organizations across the Midwest and central U.S./Canada. These representatives are working together to build collaborative and strategic communications campaigns for broad-scale natural resources issues to maximize our reach with key stakeholders.

Technologically, we are supporting cutting-edge efforts to manage large data sets while optimizing solutions to complex natural resource issues. We continue to support development of an online system known as the Information Management and Delivery System for conservation professionals to facilitate the flow of information and to track progress in addressing major conservation challenges.

ASSESSING, INVENTORY AND MONITORING: Researchers with U.S. Geological Survey are assisting fisheries managers monitor for and assess potential impacts of climate change on fisheries resources in the Great Lakes. Cool water fish guilds in Lake Erie's central basin are seasonally squeezed vertically in the water column and horizontally towards the eastern basin, and into shallower waters by hypoxia. This seasonal change forces cool and cold water fish guilds to overlap with consequences to food web dynamics.

Western Alaska

Covering one of the most geographically remote landscapes on the continent, the Western Alaska LCC includes over 90 million acres, ~7200 miles of coastline, 116 Tribes and communities and only 901 miles of disconnected roads. Although the human footprint is small, climate change impacts are already causing significant changes in the region. Understanding these changes is critical for future management of some of the continent's most productive breeding habitat.



MISSION: Promotes coordination, dissemination, and development of applied science to inform landscape level conservation, including terrestrial-marine linkages, in the face of landscape scale stressors, focusing on climate change.

LEVERAGING PARTNERSHIPS: The LCC has stimulated action amongst its partners to meet shared goals outside of LCC funded activities. For instance, given the LCC priority need for improved tidal benchmarks and wave and storm surge models, our coastal science partners are leveraging resources to address these needs, independent of the LCC's projects. Partners contribute at least \$1.60 per \$1.00 of LCC funds for projects.

MEETING SCIENCE PRIORITIES: Climate change is altering the characteristics of sea ice formation in the Bering and Chukchi Seas resulting in more severe winter storm impacts when sea ice is not present to dampen waves and storm surges. Convening a Coastal Hazards workshop led to key recommendations for understanding and responding to these changes. Additionally, by identifying water temperature as a key uncertainty, we have developed projects to clarify how climate-related water temperature changes are influenced by the geomorphological characteristics of watersheds and how that affects habitat for salmon and other priority species.

Brown bear
at Kodiak
National Wildlife
Refuge. STEVE
HILLEBRAND/
USFWS

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PLANNING AND CONSERVATION DESIGN: LCC products are used in planning activities such as the NPS Climate Change Scenarios Planning, BLM's Rapid Ecoregional Assessments, workgroups such as the Coastal Hazards, Western Arctic Caribou Herd, and the Steller's Eider Recovery Team and DOI's "Managing for the Future in a Rapidly Changing Arctic." The LCC is heavily invested in resolving uncertainties and providing decision support tools for climate change related landscape conservation design efforts in western Alaska.

INFORMATION, DATA AND TOOLS: We work to ensure that the science, data and tools created meet decision maker needs. Analysis of the timing and extent of thaw-refreeze events across Alaska resulted in spatially explicit summary products tailored to individual land and game management units. The LCC joined other LCCs and numerous partners to simplify updates to the National Hydrography Dataset for Alaska. This will bring surface water map data up to national standards and greatly improve its utility for monitoring, modeling, and other resource management uses. The LCC has also funded expansion of ShoreZone data collection in western Alaska, which provides important information for use in coastal management, community and conservation planning, facilities siting, emergency planning and more.

ASSESSING, INVENTORY AND MONITORING: Although western Alaska is expected to be significantly impacted by climate change, assessing the potential impact of change is often precluded by sparse baseline datasets. The LCC is actively engaged in identifying and addressing these data needs. There is a state-wide strategy to design a 'voluntary participation water temperature monitoring network' and we are leading the effort standardize monitoring protocols, determine where and what type of data are currently being collected, and work with the Alaska Climate Science Center to analyze existing activities to identify data gaps and opportunities. Within western Alaska we are working with partners to develop implementation strategies for two of the five subregions of the LCC for this network. The end goal is to build upon what partners are already doing to design a sustainable network where partner data can be shared in regional analyses.



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Joe-pye Weed in Canaan Valley. GERRI WILSON/
USFWS VOLUNTEER

River Otter in California.
RICK KIMBLE/USFWS

Silvio O. Conte National Fish and Wildlife Refuge.
COURTESY NORTH ATLANTIC
LCC