



U.S. Department of the Interior Climate Science Centers and U.S. Geological Survey National Climate Change and Wildlife Science Center—Annual Report for **2017**

By Elda Varela Minder

2017 was a year of review and renewal for the Department of the Interior (DOI) Climate Science Centers (CSCs) and the U.S. Geological Survey (USGS) National Climate Change and Wildlife Science Center (NCCWSC). The Southeast, Northwest, Alaska, Southwest, and North Central CSCs' 5-year summary review reports (<https://nccwsc.usgs.gov/csc-reviews>) were released in 2017 and contain the findings of the external review teams led by the Cornell University Human Dimensions Research Unit in conjunction with the American Fisheries Society. The reports for the Pacific Islands, South Central, and Northeast CSCs are planned for release in 2018. The reviews provide an opportunity to evaluate aspects of the cooperative agreement, such as the effectiveness of the CSC in meeting project goals and assessment of the level of scientific contribution and achievement. These reviews serve as a way for the CSCs and NCCWSC to look for ways to recognize and enhance our network's strengths and identify areas for improvement. The reviews were followed by the CSC recompetition (<https://nccwsc.usgs.gov/csc-competition>), which led to new hosting agreements at the Northwest, Alaska, and Southeast CSCs. Read on to learn more about the excellent science and activities conducted by the network centers in 2017.

Science Publications

In fiscal year 2017, NCCWSC and the CSCs funded 40 new projects that can work to address management decisions and questions important to the regions associated with these projects. The following are several science activities and findings to which our network of researchers contributed in 2017.

Exploring the Impact of Precipitation Variability on Desert Bighorn Sheep Diets in the Arid Southwest

Researchers supported by the NCCWSC looked at how seasonal changes affect nitrogen and moisture availability in the diet of desert bighorn sheep in the Southwestern United States. These researchers are working to identify specific habitat conditions and vegetation that can be used by the species during future droughts, thus contributing to management plans to effectively protect the long-term survival of the species. The researchers found that, overall, food selection was more strongly associated with high nitrogen and moisture content than energy content. This finding is in contrast to more northern species who are more limited by the energy content available in their food. Research findings are described in the journal *Oikos*.

Learn more at <https://doi.org/10.1111/oik.04282>

2017 Snapshot



More than **165** new publications

More than **115** new datasets



40 new projects

More than **\$10** million toward new and continued research projects



Desert bighorn sheep ewe. Credit: Jimmy Cain, USGS.

Predicting Wildfire Under a Changing Climate in the Western United States

Although a complex process, wildfire modeling can have huge benefits for resource managers and communities that are looking to predict, prepare for, and reduce the damage caused by wildfires. A publication in *Ecological Applications*, co-authored by an Alaska CSC researcher, examines the relations between climate, hydrology, and wildfire—offering insight for improving the predictive power of wildfire models.

Learn more at <https://nccwsc.usgs.gov/content/predicting-wildfire-western-us-under-changing-climate>



Wildfire in Yellowstone National Park, Wyoming. Credit: Mike Lewelling, National Park Service.



Handies Peak Wilderness, Colorado. Credit: Bob Wick, Bureau of Land Management.

Forest Effects on Snow Across the Pacific Northwest

Across the Pacific Northwest, melt off from mountain snowpack is an important source of summer water, supporting irrigation, native fish, and hydropower. A paper in *Hydrological Processes* describes Northwest CSC-funded research to examine how alpine forest cover influences snowpack, providing insights that can help managers protect regional sources of summer water.

Learn more at <https://doi.org/10.1002/hyp.11144>



Mt. Rainier National Park, Washington. Credit: Alan M. Cressler, USGS.

High Temperatures in Cities Spell Bad News for Bees

Southeast CSC-supported researchers are studying the response of bees to increases in temperature in urban environments. Moving their laboratory observations into the field, the researchers found that almost all of the observed species were negatively affected by warming temperatures. In *Biology Letters*, the researchers propose that if species have a higher sensitivity to urban warming, they may also be more sensitive to warming in other environments.

Learn more at <https://globalchange.ncsu.edu/hot-cities-spell-bad-news-bees/>

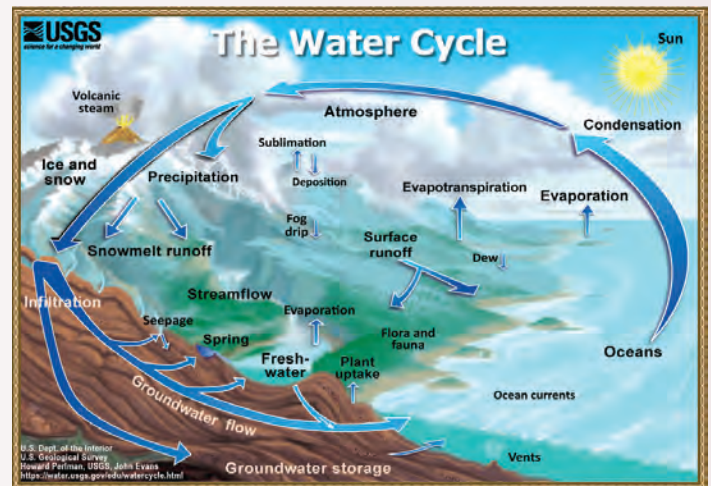


Bumble bees, like this one, are among the bee species most vulnerable to increases in temperature. Credit: Elsa Youngsteadt, North Carolina State University.

Linking Atmospheric Rivers to Wildfire Patterns in the Southwest

A dataset developed by researchers working with the Southwest CSC and published in *Journal of Geophysical Research: Biogeosciences* helps identify the ecological impacts of atmospheric rivers in the interior Southwest. Atmospheric rivers are a meteorological phenomenon that carries high concentrations of water vapor in narrow bands from the warm tropics up to western North America (similar to rivers in the sky). Researchers examined how atmospheric rivers affect dryland vegetation productivity and thus fuel loads available for wildfires.

Learn more at <http://www.swcsc.arizona.edu/news/2017/03/data-announcement-linking-atmospheric-rivers-wildfire-patterns-southwest>



The water cycle. Credit: USGS.

Climate Impacts on Amphibian and Reptile Species in the South-Central United States

South Central CSC researchers authored a paper in *Herpetological Conservation & Biology* that highlights model results of four amphibian and reptilian species (two salamanders, one frog, and one turtle) in the South-Central United States. The authors projected future distributions of the species by using data from four climate models run according to two greenhouse gas concentration pathways. The model results projected losses and gains for the species in the years 2050 and 2070.

Learn more at http://www.herpconbio.org/Volume_12/Issue_2/Salas_et_al_2017.pdf

Jemez Mountains, New Mexico. Credit: Mark Watson, New Mexico Department of Game and Fish.

Education and Training

The NCCWSC and CSCs are incredibly proud of the training programs they have developed over the years. In the fall of 2016, students, postdoctoral researchers, and professionals from the national and all eight regional CSCs gathered at the University of Massachusetts Amherst where the Northeast CSC hosted the **very first** National CSC Student and Early Career Training. The event was attended by 70 participants as well as 30 facilitators, trainers, and guest speakers. This cooperative training event provided an opportunity for attendees to share their research and brush up on their science communication skills. The training included inspiring keynote speakers, various student presentations, and workshop sessions focused on developing professional skills and building a network of peers. For an inside look, check out this short video on the Early Career Climate Forum blog, which showcases the training, with insight from some of the participants and organizers as well as a student's take on the event.



Nearly 250 students/fellows were affiliated with the CSCs in 2017.

Icons designed by Freepik from www.flaticon.com



Lindsey Parkinson, a graduate student from the University of Alaska Fairbanks, presenting at the National CSC Student and Early Career Training. Credit: Toni Klemm, University of Oklahoma.

Video: <https://www.eccforum.org/inside-story-highlights-and-perspectives-first-ever-national-csc-early-career-training>

Blog: <http://eccforum.org/case-you-blinked-here%e2%80%99s-review-2-day-action-packed-breakneck-paced-1st-ever-national-csc-student-and>

CSCs Debut New Climate Projection Training at the 2017 National Adaptation Forum

To address the challenges of understanding the scope of available climate projections, a group of early career researchers from the CSCs developed a training session designed to introduce stakeholders to the opportunities and challenges of using future climate projections in adaptation planning. The training session debuted at the 2017 National Adaptation Forum (NAF) conference in Minneapolis, Minnesota, and was attended by 22 participants from a wide variety of sectors. Participants worked in small groups, with the assistance of CSC facilitators, to address a sample management challenge.

Learn more at <http://eccforum.org/using-climate-projections-almost-real-world>



South Central CSC climate scientist Adrienne Wootten leading a small group training at the 2017 NAF. Credit: South Central CSC.



Participants at the Leadership Workshop for Early Career Women in Science. Credit: Lindsey Heaney, University of Alaska Fairbanks.

Alaska CSC Leadership Workshop Brings Together Women Scientists and Supporters

In the summer of 2017, 45 women in science and related fields gathered to hone their leadership skills at a 2-day Leadership Workshop for Early Career Women in Science sponsored by the Alaska CSC. The workshop was organized by Alaska CSC graduate fellow Joanna Young, following a 3-week Homeward Bound leadership training expedition to Antarctica. The overarching mission of the workshop was to increase the capacity of women in science to have a voice at the leadership table in any field about which they are passionate.

Learn more at <https://casc.alaska.edu/news/ak-csc-leadership-workshop-brings-together-women-scientists-and-supporters>

Student Research Symposium Gathers Island Students in Guam

In the spring of 2017, the Pacific Islands CSC Student Research Symposium in Guam assembled 14 students from the University of Hawai'i at Mānoa, the University of Hawai'i at Hilo, and the University of Guam. Students presented their work on diverse topics, from groundwater resource evaluation to wastewater issues and local effects of rising sea levels to climate-smart agricultural practices. The symposium represented multidisciplinary perspectives on tackling climate issues, and students received advice from a panel of climate professionals for transitioning to the “real world.”

Learn more at http://pi-csc.soest.hawaii.edu/news/2017_05_StudentSymposium_Guam_final.pdf

Participants at the Student Research Symposium in Guam.
Credit: Rachel Lentz, University of Hawai'i, Honolulu.



Tribes and Indigenous Communities

The CSCs work with Tribes and indigenous communities to better understand their specific vulnerabilities to climate change and build their capacity for adapting to these impacts. In order to strengthen NCCWSC and CSC work with Tribes and indigenous communities, the Department of the Interior's Bureau of Indian Affairs (BIA) has placed Tribal Climate Scientist/Technical Support Coordinators (Tribal Resilience Liaisons) at several of the CSCs (Alaska, Northeast [Midwest region], Northeast/Southeast [share a liaison], Northwest, South Central, and Southwest). The work is conducted through research projects, outreach events (such as cultural festivals and tribal schools), training workshops, stakeholder meetings, youth internships, and other coordination activities.

Learn more at <https://nccwsc.usgs.gov/tribal-indigenous>

Permafrost Loss Dramatically Changes Yukon River Chemistry and Hydrology With Potential Global Implications

USGS-led and Alaska CSC-supported research shows that permafrost loss due to a rapidly warming Alaska is leading to significant changes in the freshwater chemistry and hydrology of Alaska's Yukon River Basin with potentially global climate implications. The study was the result of a unique collaboration between the USGS, the Yukon River Inter-Tribal Watershed Council, the Pilot Station Traditional Council, and the Indigenous Observation Network (ION), with additional support from the Administration for Native Americans and the National Science Foundation. ION is a citizen-science network funded by the organizations listed above, the Administration for Native Americans, and the National Science Foundation.

Learn more at <https://nccwsc.usgs.gov/content/permafrost-loss-dramatically-changes-yukon-river-chemistry-and-hydrology-potential-global>

Researcher Carol Hasburgh taking winter water chemistry samples on the Yukon River, Alaska, for a permafrost loss study. Credit: Ryan Toohey, USGS.



Drought Risk and Adaptation in the Wind River Indian Reservation

This North Central CSC-supported report describes the progress of in-depth, semi-structured interviews with water and resource managers at the Wind River Indian Reservation (WRIR). The purpose of the interviews is to document and understand local knowledge and observations of drought risk and responses and demonstrate how these can help inform drought preparedness and planning. This report is informed by a social-ecological systems (SES) framework and an integrated vulnerability assessment to determine the social and ecological vulnerabilities to drought and climate variability at WRIR.

Learn more at http://nccsc.colostate.edu/sites/default/files/projects/McNeeley_&_Beeton_2017.pdf

Wind River, Wyoming. Credit: Shannon McNeeley, Colorado State University.



Screenshot from the Northeast Indigenous Climate Resilience Network website.

Online Launch of the Northeast Indigenous Climate Resilience Network

The Sustainable Development Institute (SDI) at the College of Menominee Nation, a member of the Northeast CSC's consortium, launched an online resource for Tribal members, scientists, and supporting partners to engage on similar interests, find research and adaptation opportunities together, and connect across the region. This website was developed with funding from the Northeast CSC and provides the latest tools and resources for indigenous peoples and scientists to work together toward meeting the current challenges of climate change.

Learn more at <https://necsc.umass.edu/news/announcing-northeast-indigenous-climate-resilience-network>

Water is Life for the Swinomish Indian Tribal Community

For the Swinomish people of northwestern Washington, water is life. However, this symbiotic relation between man and nature is increasingly threatened by sea-level rise and changes in northwestern storm and rainfall patterns. The USGS is working to forecast sea-level changes and coastal impacts in real time to help coastal communities be prepared. The Northwest CSC provided support for the development of this work through a project focused on understanding the interactions between human health, environment, and climate in Salish Sea communities.

Learn more at <https://www.usgs.gov/news/water-life-swinomish-indian-tribal-community>

Large wood debris deposited on March 10, 2016, above Martha's Beach and Park, La Conner, Washington, blocking the access road on the Swinomish Reservation. Credit: Eric Grossman, USGS.



Communicating Climate Change for Tribes Workshop

This South Central CSC-supported workshop, held in the spring of 2017 in Norman, Oklahoma, provided Tribal members with tools and tactics they can use to discuss climate change with various audiences in their communities, including Tribal councils. Activities included hands-on demonstrations, practicing outreach methods, and presentations about climate.

Learn more at http://www.southcentralclimate.org/content/documents/Communicating_Climate_Change_for_Tribes1.pdf

Wichita Mountains Wildlife Refuge, Oklahoma.
Credit: Elise Smith, U.S. Fish and Wildlife Service.



First Tribal Climate Change Action Camp

Students, teachers, and concerned members of Tribal communities participated in the first Tribal Climate Change Action Camp, hosted at the Navajo Technical University in Crownpoint, New Mexico, in the summer of 2017. Workshop topics included an introduction to climate science, adaptation strategies, community engagement and organizing strategies, planning and implementing a community project, and more. The American Indian Higher Education Consortium, Southwest CSC, South Central CSC, Institute for Tribal Environmental Professionals, and Native Nations Climate Adaptation Program partnered to host the event.

Learn more at <http://www.swcsc.arizona.edu/news/2017/06/tribal-climate-action-camp>

New Mexico. Credit: Abigail Lynch, USGS.

Partnerships

Effective response to the challenges of climate change requires collaboration between managers and scientists. Ongoing partnerships with Federal agencies, Tribes, State and local governments, nongovernmental organizations, and the public guide our research priorities and activities.

Ecological Drought—How Drought Effects Ecosystems

With the goal of addressing ecological drought across the Nation, NCCWSC, The Nature Conservancy, and The Wildlife Conservation Society partnered to create an Ecological Drought Working Group as a part of the Science for Nature and People Partnership (SNAPP, <https://snappartnership.net/teams/ecological-drought/>). The group is focused on understanding the natural and human dimensions of ecological drought impacts and promoting the application of solutions that provide mutual benefits to people and nature. This effort involved supporting research focused on identifying drought impacts through a series of regional drought workshops held across the eight CSCs and highlighting some of the work in this area through the NCCWSC and U.S. Fish and Wildlife Service's National Conservation Training Center webinar series.

Learn more at <https://nccwsc.usgs.gov/content/ecological-drought-across-country>



Little Grand Wash, Utah.
Credit: Alan M. Cressler, USGS.

Partnering to Better Understand Biodiversity

The NCCWSC and the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP WCMC), the Southwest CSC, and North Central CSC/Earth Resources Observation and Science (EROS) led a workshop series funded by the National Aeronautics and Space Administration (NASA) Biodiversity Program. The program advances global biodiversity modeling by identifying lessons learned from the development and execution of climate models (for example, Global Circulation Models). The workshop series brought together ecosystem, biodiversity, and climate modelers via in-person workshops and virtual discussions in the summer of 2017.

Learn more at <https://nccwsc.usgs.gov/projects/#/project/5050cb0ee4b0be20bb30eac0/587e8e94e4b0a765aab5eeca>



Northern spotted owl.
Credit: U.S. Fish and Wildlife Service.



Whitebark pine beetle damage. Credit: Don Becker, USGS.

Northeast CSC Co-Hosts First Annual Regional Invasive Species and Climate Change (RISCC) Management Symposium

The Northeast CSC and partners convened a meeting of natural resource managers and scientists to discuss how climate change is affecting the risk of invasive species in the Northeast region and identify ways to translate research into management action. The meeting was co-convened by the Northeast CSC, the University of Massachusetts Amherst, and the New York Invasive Species Research Institute and in dialogue with State and Federal partners. More than 100 natural resource managers and researchers came together to learn, teach, discuss, and plan for improving on-the-ground as well as policy responses to invasive species in the face of climate change.

Learn more at <http://people.umass.edu/riscc/symposium.html>

Development of New High-Resolution Elevation Model for Majuro Atoll, Republic of the Marshall Islands

A collaboration of partners developed a digital elevation model (DEM) for the Majuro Atoll in the Republic of the Marshall Islands (RMI) by combining topological (geographic features) and bathymetric (measurements of the ocean's depth) data. Due to the low, flat contours of Pacific atolls, accurate high-resolution elevation data are vital for inundation modeling that supports vulnerability and adaptation planning. The DEMs provide a seamless elevation product for analyzing the impact of various climate change scenarios on coastal regions. The USGS Coastal National Elevation Database (CoNED) Applications Project, Pacific Islands CSC, USGS Coastal and Marine Geology Program (CMGP), University of Guam, University of Hawai'i at Mānoa, National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey, Republic of the Marshall Islands Office of Lands & Survey, College of the Marshall Islands, Directorate of Civil Aviation RMI, and the Marshall Islands Conservation Society came together to create this map.

Learn more at <https://doi.org/10.5066/F7416VXX>



High-resolution topobathymetric maps are vital to predicting how sea-level rise will affect Majuro Atoll. Credit: WorldView-3 mosaic from the U.S. Department of Agriculture/Natural Resource Conservation Service.

Building Resilience Through Actionable Science Workshops

Research funded by the Southeast CSC, South Central CSC, and Gulf Coastal Plains & Ozarks Landscape Conservation Cooperative was used in workshops organized by the USGS's Wetland and Aquatic Research Center (WARC) and The Nature Conservancy's (TNC) Gulf of Mexico Whole Systems Conservation Program. The workshops were designed to share with stakeholders the findings from WARC's work on tidal saline wetland migration and from TNC's work on open space protection in the Gulf area; to engage discussion of potential applications of these findings in land use, conservation, and flood mitigation planning; and to solicit input on the customization and use of these products for decision making.

Learn more at <https://globalchange.ncsu.edu/building-resilience-actionable-science-workshops/>



Snow geese in a wetland. Credit: U.S. Fish and Wildlife Service.

Researcher and Center Achievements and Awards

The CSCs and NCCWSC have a talented, dedicated group of personnel and researchers. In recognition of this excellence, numerous individuals and Centers are periodically acknowledged for their contributions. Congratulations to all of our recognized scientists, and thank you to all of the NCCWSC and CSC personnel that continue to make our work possible!

DOI Climate Science Centers Receive Climate Adaptation Awards at the National Adaptation Forum

The Northeast and North Central CSCs were among a group of organizations and individuals honored at the 2017 National Adaptation Forum for their outstanding work in determining how the Nation's natural resources can become more resilient to the impacts of a rapidly changing world.



Wind River Indian Reservation, Wyoming. Credit: public domain.

Learn more at <https://nccwsc.usgs.gov/announcement-keywords/awards>

- **Broad Partnership Category:** Massachusetts Wildlife Climate Action Tool Partnership—Together, the Northeast CSC, University of Massachusetts Amherst, Massachusetts Division of Fisheries and Wildlife, and Massachusetts Office of Energy and Environmental Affairs developed the Massachusetts Wildlife Climate Action Tool. The tool helps resource managers access information on climate change impacts and vulnerabilities of fish, wildlife, and habitats, and explore adaptation actions to promote resilient natural communities.
- **Honorable Mention:** Wind River Reservation Tribal Water Engineer and Partners—The North Central CSC and others worked closely with the Wind River Office of the Tribal Water Engineer and Water Resource Control Board to co-produce science for drought preparedness. This work includes a Tribal-driven social-ecological vulnerability assessment; co-production of drought and climate change-related information and decision-support tools; and community engagement in drought and climate science education that integrates local knowledge and multigenerational learning approaches to resource management.
- **Honorable Mention:** Dr. Olivia LeDee—Olivia LeDee, Deputy Director for the Northeast CSC, was honored for providing consistent and innovative leadership on climate adaptation for Minnesota during her former position with the Minnesota Department of Natural Resources.

North Central CSC Researchers Awarded NASA Grants

North Central CSC and USGS Fort Collins Science Center scientists are co-investigating a NASA proposal selected for funding on an Advanced Pheno-Climatic Information System. Their research is planned to focus on how climate change may influence the spatial distribution and temporal behavior of key populations of organisms, communities, and species. They plan to develop a system to incorporate tools, workflows, and software for bringing phenological (the study of cyclic and seasonal natural phenomena) and climate data together.

Learn more at https://esto.nasa.gov/files/solicitations/AIST_16/ROSES2016_AIST_A41_awards.html



Emerging monarch at Caribou-Targhee National Forest, Idaho. Credit: U.S. Forest Service.

South Central CSC Researchers Part of Team Awarded National Science Foundation Grant to Improve Prediction of Extreme Weather Events

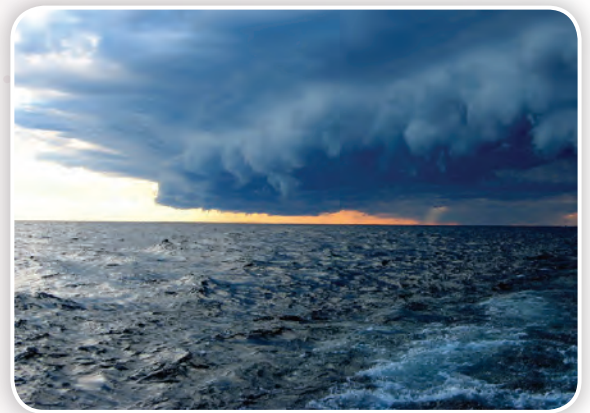
The South Central CSC at the University of Oklahoma partnered with the National Weather Service to create the Severe Weather and Climate Change Working Group and developed a proposal that awarded a 5-year, \$1.8 million National Science Foundation Prediction of and Resilience against Extreme Events grant for improving the prediction of heavy rainfall events. The SC CSC plans to further support the project by hosting three regional stakeholder meetings to ensure that new rainfall prediction tools are available to aid the decision making needs of local communities. This research may improve forecasting and increase communication between researchers, forecasters, and all related stakeholders.

Learn more at <http://ou.edu/content/publicaffairs/archives/2017/OUResearchTeamReceives18MillionNSFGranttoBetterPredictHeavyRainfallEvents.html>

Southwest CSC USGS Director Recognized as a Highly Cited Researcher in Environment and Ecology by the Web of Science

For the second year in a row, Southwest CSC USGS Director Steve Jackson was recognized as a 2017 Highly Cited Researcher in Environment and Ecology by the Web of Science (WoS). His research employs tree rings, fossil rodent remains, and sediments from lakes and bogs to investigate how past climatic changes and human activities have affected species distributions, biodiversity, and ecosystem properties. The designation is given to scientists who rank in the top 1 percent of WoS citations in their respective fields.

Learn more at <https://clarivate.com/hcr/>



Storm at Muskegon, Michigan. Credit: Andrea Miehls, USGS.

Tools

NCCWSC and CSC researchers work closely with managers to produce tools that aid decision makers with their management tasks. These tools range from data portals and maps to scenario planning techniques and more!

Decision Support Tool for Trout Management in Michigan

A user-friendly, map-based decision support tool combines stream-specific information on resource availability (such as money, time, personnel), temperature, and biological conditions (such as trout species abundance, thermal habitat parameters) to assist fisheries professionals in planning for the future. The tool, developed with support from the NCCWSC, can also act as a model for the development of similar tools for freshwater and marine fisheries throughout the world.

Learn more at <https://databasin.org/datasets/56dc4c3c63614e6fb58d1c1c7b696444>



Trout. Credit: USGS.

Hydrology Futures Portal Shows Historic and Future Water Conditions in the United States

Water users throughout the contiguous United States can now view the past and potential future of hydrologic processes through USGS's recently released Hydrology Futures Portal. This tool, created with the help of the North Central and South Central CSCs, provides a user-friendly interface summarizing simulated monthly historic and future conditions for variables including runoff and streamflow.

Learn more at <https://www.usgs.gov/news/new-tool-shows-historic-and-simulated-future-water-conditions-us>



Streambank, New Mexico. Credit: Shawn Carter, USGS.



Brook trout. Credit: Tyler Wagner, USGS.



Shoreline at Palmyra Atoll, Hawai'i. Credit: USGS.

Decision Support Tools for Lake and Stream Fish Management

Northeast CSC-funded work resulted in two tools that provide decision support for lake and stream fish management. The FishTail tool was developed to provide resource managers and agencies with scientific information on how streams are currently affected by land use and assess if those habitats may change in future climate conditions. A separate interactive website, "Shifts in fish habitat under climate change," visually demonstrates new data on lake temperature changes and consequential effects on walleye and largemouth bass populations in Wisconsin. These online tools have been developed to help managers protect lake and stream fish populations into the future.

Visit the FishTail tool at <https://nccwsc.usgs.gov/projects/#/project/4f8c648de4b0546c0c397b43/52138cf2e4b0b08f44619be8>

Learn more about Wisconsin lakes at <https://owi.usgs.gov/vizlab/climate-change-walleye-bass/>

Seasonal Forecasting Tool Helps Pacific Island Communities Anticipate Sea-Level Extremes

A researcher at the University of Hawai'i (UH) Sea Level Center has led an international effort, partly funded by the Pacific Island CSC at UH Mānoa, to quantify sea-level variations in the Pacific Islands. The group compiled monthly sea-level predictions in the tropical Pacific from several models to produce seasonal (up to 6-month) forecasts of mean sea-level anomalies. The results were recently published in the *Journal of the American Meteorological Society*, and a website has been launched to present the ongoing forecasts. The interactive website enables Pacific Island communities to access real-time seasonal forecasts for 12 island stations across the Pacific Basin.

Learn more at http://pi-csc.soest.hawaii.edu/news/2017_01_24_Widlansky_SLForecasting.pdf

New Scenario Planning for Climate Adaptation Website

Making decisions under uncertainty is difficult, but scenario planning can help bring options to light. The Southwest CSC and partners have developed a website aimed at helping managers learn more about scenario planning in relation to facing climate challenges. The website contains guides, case studies, tools, a directory of experts, and more.

Learn more at <http://www.swcsc.arizona.edu/announcements/new-scenario-planning-climate-adaptation-website>

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Forest fire in Arizona. Credit: U.S. Forest Service.

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Riparian birds. Credit: Joseph Fontaine, USGS.

Website Communicates Progress of Avian Conservation Planning in the Gulf of Mexico

The Gulf of Mexico Avian Monitoring Network (GoMAMN) is composed of avian scientists and land managers working to develop a coordinated and comprehensive approach to avian monitoring. The approach aims to provide solutions to contemporary and long-term conservation needs within the Gulf of Mexico. The GoMAMN forum launched a website to communicate its progress on avian monitoring planning in the Gulf of Mexico. The Southeast CSC played a key role in facilitating engagement of a large number of stakeholders in a structured decision framework to develop the avian monitoring plan.

Learn more at <https://globalchange.ncsu.edu/secsc/projects-fiscal-year/measuring-effects-of-restoration-and-ecological-change-on-bird-populations-in-the-gom/>

Outreach and Community Engagement

Our Centers strive to maintain strong engagement and communication with the communities they serve. Our scientists participate in and support several local, regional, and national events in order to share our research with a wide range of audiences and stay informed about management needs.

NCCWSC Goes to Science Camp

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Each year, the USGS headquarters in Reston, Virginia, hosts a Science Camp in partnership with the Reston Association. USGS participation in this camp provides an opportunity for NCCWSC scientists to engage with the community and help educate a younger generation of scientists through hands-on activities. In 2017, the NCCWSC participated in the camp by presenting activities educating campers about how fish and wildlife respond to warmer temperatures, droughts, and other climate-driven changes. Activities focused on fish, migratory birds, and habitat availability and included a fishing activity, a board game, and a team activity.



NCCWSC researchers engage with campers at the USGS Science Camp. Credit: Bonnie Myers, USGS.



“Expert Is In” Public Outreach Event at the Natural History Museum

In the spring of 2017, NCCWSC researchers participated in the “Expert Is In” public outreach event at the Smithsonian Museum of Natural History to demonstrate how climate change is affecting fish communities. Scientists used an interactive activity to show what types of fish might still be available as climate changes and displayed a geographic information system storymap highlighting where climate change is already affecting freshwater fish. The goals of the activity were to increase public awareness of the impacts of climate change on freshwater fish and engage visitors in discussion on what managers and individuals can do to help mitigate the effects of climate change on fish.

North Central CSC Hosts Congressmen

The North Central CSC and representatives from the National Park Service hosted Congressmen Mike Quigley (D-IL 5th District) and Jared Polis (D-CO) in the summer of 2017. The North Central CSC USGS and University Directors briefed the congressmen on examples of climate change impacts and CSC projects that focus on addressing management challenges in their respective regions. The North Central CSC also had a visit from a staffer for Senator Cory Gardner (R-CO) and a visit from Aaron Ray from the Office of Management and Budget who was on detail at the USGS Southwest Regional Center in Denver. The visitors were briefed on North Central CSC work in the region.

Learn more at <http://nccsc.colostate.edu/event/6-01-2017/science-briefing>

The Northwest CSC Co-Hosted a Community Discussion on Sea-Level Rise

The Northwest CSC and the North Pacific Landscape Conservation Cooperative co-hosted an event to bring groups facing the challenges of sea-level rise together to discuss what is known, what is being done to address the issue, and how future efforts might be better coordinated. This event began with an introduction to the latest science on sea-level rise, followed by a series of short presentations from representatives of research groups, government agencies, Tribes, municipalities, and non-governmental organizations about how their groups are tackling the sea-level-rise-related challenges. Invitees included members of the local media, members of the Northwest Science Writers Association, agency communicators, city planners and policymakers, community advocates, and local elected officials.



Northern Oregon coast from Cape Lookout State Park. Credit: Ruth Jacobs, USGS.

Collaborating Across Worldviews to Build Adaptive Capacity in the Face of Change

The Manager Climate Corps (MCC) was created by the University of Hawai‘i at Hilo, a member of the Pacific Islands CSC university consortium, to support and connect local natural resource managers, researchers, cultural practitioners, policy professionals, community leaders, and graduate students in Hawai‘i through in-person networking and collaborative research. Using the themes in the Pacific Islands CSC's Science Agenda, the MCC builds adaptive capacity locally by identifying existing professional networks and expanding them through manager-based research projects and collaborative forums.

Learn more at <https://hilo.hawaii.edu/pi-csc/>



Hawai'i. Credit: Shawn Carter, USGS.

Series of Listening Sessions with State Fish and Wildlife Agencies in the Southeast

The Southeast CSC held "listening sessions" with regional southeastern State fish and wildlife agencies at their home offices. The agencies offered guidance on the ways that the Southeast CSC could be of most use to these organizations in the next 5 years. Feedback received from these sessions may be used to help shape the Center's strategic plan for 2018–23. As part of each visit, Southeast CSC provided a seminar on climate change science and impacts in respective States. The sessions were in response to a request from the State fish and wildlife agencies for this kind of capacity building and continuing education.

Learn more at <https://globalchange.ncsu.edu/partners-inform-new-science-plan-se-csc-embarks-listening-tour/>



Gulf Islands National Seashore, Florida. Credit: Alan M. Cressler, USGS.



Learn more about the NCCWSC and the CSCs at <https://nccwsc.usgs.gov/>