United States Department of Agriculture
USDA Climate Hubs
1400 Independence Avenue, SW
Washington, D.C. 20250

INFORMATIONAL MEMORANDUM
SUBJECT: **USDA Climate Hubs Annual Report for FY 2023**

ASTRID MARTINEZ FLORES Digitally signed by ASTRID MARTINEZ FLORES Date: 2024.04.30 14:14:58 -04'00'

THROUGH: **Astrid Martinez** Executive Committee Chair, USDA Climate Hubs
Acting Deputy Chief, NRCS Soil Survey and Resource Assessment
William Hohenstein, Executive Committee Vice-Chair, USDA Climate Hubs
Director, Office of Energy and Environmental Policy

WILLIAM HOHENSTEIN Digitally signed by WILLIAM HOHENSTEIN Date: 2024.04.30 14:07:08 -04'00'

FROM: **Lynn G. Knight**, National Lead, USDA Climate Hubs
Natural Resources Conservation Service

LYNN KNIGHT Digitally signed by LYNN KNIGHT Date: 2024.04.29 16:56:32 -04'00'

Chris Miller, National Coordinator (Acting), USDA Climate Hubs
Office of Energy and Environmental Policy

CHRISTOPHER MILLER Digitally signed by CHRISTOPHER MILLER Date: 2024.04.30 08:21:19 -04'00'

Summary. This report summarizes FY2023 accomplishments of the USDA Climate Hubs. Regional staff addressed important national priorities supporting implementation of best practices for responding climate adaptation and resilience, climate literacy, climate-smart agriculture and forestry, environmental justice, and climate-smart wildland fire and forest restoration. Climate Hub staff recognize that collaboration and coordination with partners in USDA agencies, other Federal and State government agencies, universities, Cooperative Extension, Tribal nations, Soil and Water Conservation Districts, non-profits and others is essential for achieving the volume and quality of informational materials, technology support and outreach to end-users. The content of this report demonstrates how Climate Hubs lead the way in cross-functional collaboration, both within the USDA and with external partners. Climate Hubs are also uniquely placed to represent the perspective of USDA end-users and agencies when working with other Federal agencies and external partners.

FY2023 Metrics

	Hub staff hosted or participated in 288 workshops and webinars with an estimated 28,721 participants, they gave 234 presentations at meetings and had 32 engagements with Tribes.
	The Hubs published 259 products in FY23, including 46 peer reviewed publications, and 212 white papers, grey literature and other informational products.
	In FY23, the Climate Hubs website received 291,360 visits with 78% engagement (meaning that users spent measurable time on the site or engaged with webpage elements).
	The Hubs developed 21 curricula in FY23 reaching 32,274 students and had 16 activities specifically for youth that reached 2,390 participants.

Appendices A and B include FY23 peer-reviewed publications and grey literature, respectively. Appendix C includes FY23 budget information. Appendix D provides contact information.

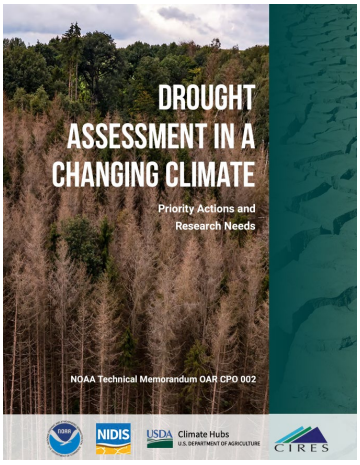
The USDA International Climate Hub | Foreign Agricultural Service

The International Climate Hub (ICH) officially launched in May 2023 and began operations in earnest in July. The ICH has made significant strides in expanding its reach and impact, reaching 4,000 users in just 5 months. Through outreach at events like Africa Climate Week and the African Food Systems Forum, ICH staff directly engaged over 500 participants and initiated exploratory discussions with potential collaborators. The ICH also discussed its tools with high-level officials from Argentina, Paraguay, and Uruguay, and with more than 40 foreign agricultural attaches working in Washington, DC. Participants expressed enthusiasm for the ICH's resources, particularly predictive tools for disasters and growing season challenges. During this time, the International Climate Hub launched its first significant tool, COMET-Planner Global, which exemplifies USDA's commitment to measuring, monitoring, reporting and verifying greenhouse gas emissions in agriculture. It does this by giving farmers worldwide the ability to predict the impact of certain conservation practices on their land's ability to sequester carbon in soil, helping them understand their contributions to fighting climate change.

Enhancing Climate Adaptation and Resilience to Extreme Weather Events and Chronic Change

Responding to and planning for drought

- Current methods for assessing drought conditions do not account for how climate change is affecting the character of drought, most notably in regions that may be experiencing long term aridification or humidification. To address this issue, the USDA Climate Hubs partnered with NOAA's National Integrated Drought Information System (NIDIS) to co-host a technical working meeting. The outcomes of the meeting informed the development of the report, Drought Assessment in a Changing Climate: Priority Actions and Research Needs, which synthesizes ideas and feedback from over 100 subject-matter experts representing more than 44 institutions. The report highlights priority actions and research questions to improve drought assessment across fifteen focus areas.



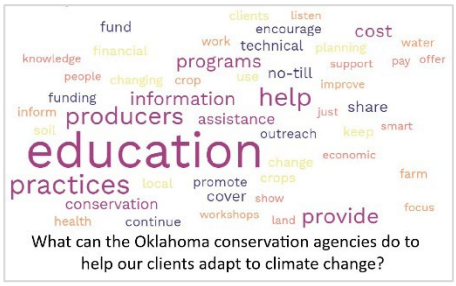
- Agriculture is growing in Alaska even though it is a land of extremes. In 2022, a large snowpack melted late, delaying planting and grazing. This was followed by minimal precipitation for half of the growing season and record-breaking rains the other half. To increase resilience to weather extremes including drought, the Northwest Climate Hub partnered with the University of Alaska-Fairbanks Cooperative Extension Service and the National Drought Mitigation Center (NDMC), to lead two workshops for peer-to-peer learning and to share information on drought and climate adaptation options. These workshops were attended by producers and staff from the NRCS, FSA, and Cooperative Extension who learned about the US Drought Monitor, drought scenario planning, and climate adaptation practices for more sustainable operations in the face of climate change.

- Lying distant from the lower 48 and with a climate that has no analogy in the mainland U.S., Hawai'i has unique drought reporting and response needs that require local expertise. The Southwest Climate Hub collaborated with the NDMC and the Pacific Drought Knowledge Exchange to share drought response and drought reporting information with agency personnel and agricultural stakeholders in four workshops. Participants increased their understanding of weather and climate, and actions to improve agricultural resilience to drought.

- In southern portions of the Northern Plains region, aridification threatens the viability of rangeland livestock grazing and irrigated agriculture. In western areas, flash drought depletes soil moisture and surface water more quickly during the growing season. During 2023, the Northern Plains Hub continued to coordinate the Wyoming Conditions Monitoring Team (WCMT)—a collaborative team of 16 state, tribal, and federal partners in its third year of service. WCMT provides weekly input to the U.S. Drought Monitor and hosts monthly public webinars about current conditions and outlooks. In FY 2023, the team organized 11 webinars, reaching 374 attendees and 598 viewers of the recordings, which helped raise awareness across the state. Webinar attendees were affiliated with Federal agencies, State/City/Local government, and Conservation Districts/Non-Government Organizations/General Public. The Northern Plains Hub also joined a multi-institute team, led by NOAA NIDIS, to author a report "2020–2021 Drought in the U.S. Northern Plains and Canadian Prairies: Initial Assessment of Impacts and Response to Build Resilience During an Ongoing Drought." This report enhances understanding of drought response and preparedness, along with detailing outstanding needs.

- Montana recently experienced three consecutive years of drought, as well as severe flooding in the Greater Yellowstone Area. Impacts to working lands have included loss of property and infrastructure, wildfire damage, depleted stock water, and grasshopper infestation. In response, the Northern Plains Climate Hub organized a 2-day AgroClimate Workshop in partnership with NRCS, Montana State University Extension, Intertribal Agriculture Council, and Montana Association of Conservation Districts. The event convened 90 agricultural and forestry professionals, who increased their knowledge of weather and climate resources, as well as climate-smart practices. Their confidence also grew in using and effectively communicating these concepts.

- Oklahoma has seen an increased incidence of extreme climate-related events (drought, flooding events, extreme cold, and severe storms) over the last twenty years, yet this remains a state where talking about climate change remains a hard sell. The Southern Plains Climate Hub partnered with the NRCS, Oklahoma State University, Langston University and the Oklahoma Association of Conservation Districts (OACD) to conduct conversations about the local impacts of drought and other extreme weather events across Oklahoma. The program focused on the needs and concerns of those on the front lines of conservation in the state and consisted of a short presentation, brief surveys and, at some



venues, a moderated discussion among participants. Approximately 300 producers and conservation professionals from different regions of Oklahoma engaged in the dialogue about local climate patterns. Feedback from participants emphasized the needs for "*useable conservation planning*", for continuing to share information on conservation innovations and best practices and for additional education for K-12 audiences.

- Drought punctuated by extreme precipitation from atmospheric rivers is common in Washington and Oregon. To understand how these events affect communities and resources, the Northwest Climate Hub helped to plan and facilitate a virtual workshop (300 people attended). Participants heard a review of the 2022 water year and outlook for the 2023 water year from a climatology perspective and learned of climate impacts to forestry, irrigation systems, and communities, as well as actions taken to reduce impacts. In addition, the Northwest Climate Hub co-hosts the Pacific Northwest Drought Early Warning webinar series with NOAA NIDIS.

- The Southwest Hub is a founding partner in the Southwest Drought Learning Network (SWDLN) which aims to foster regional knowledge sharing for improved drought resilience. Working with DLN partners, the Southwest Hub convened a two-day annual meeting hosted at a tribal college, bringing together 70 climate practitioners, resource managers, and stakeholders to exchange information and work together on collaborative goals for the upcoming year. The SWDLN also partners with NIDIS and the NDMC to host monthly drought briefings, and during 2023, published nine drought adaptation case studies on the Conservation and Adaptation Resources Toolbox (CART) platform.

Wildfire preparation, response, and recovery

- In their role supporting the Science Advisory Panel of the California Wildfire and Forest Resilience Task Force, California Climate Hub staff developed and wrote the Central Coast Regional Profile to summarize the socio-ecological context of the Central Coast region of California related to community and ecosystem resilience to wildfire and climate change. California Climate Hub staff conducted expert interviews (32 interviewees) and a stakeholder survey (784 respondents) to inform the profile. The profile was also informed by reviewing the best available science and incorporating current condition assessments developed by another research team. The profile is publicly available online and was released at a public meeting in the region in May 2023.

- The range of impacts from recent large fires in Oregon have spurred extensive research and monitoring across multiple agencies, ownerships, and non-governmental organizations. As wildfires increase in frequency and extent across the state, we need to understand the impacts that large-scale fires will have on all aspects of the landscape. To help address this need, the Northwest Climate Hub contributed to a Post-Fire Research and Monitoring Symposium for 600 participants in February 2023. The symposium provided the opportunity for scientists to share their findings from recent westside Oregon fires and for practitioners and policy makers to begin discussions on how new discoveries can inform

future decision-making. The symposium also promoted collaboration between institutions involved in post-fire research and monitoring. Attendees included individuals from federal and state agencies, Tribes, universities, non-governmental organizations, and private companies.

Learning from and preparing for hurricanes

- Though each climate disaster brings setbacks and loss to agricultural producers and forest landowners, each extreme event also offers important lessons about climate resilience. After hurricanes Irma and Maria devastated Puerto Rico and the US Virgin Islands in 2017, the USDA Caribbean Climate Hub launched a post-hurricane assessment to understand the factors that help explain the capacities of farmers, forest landowners and communities to adapt to hurricanes. The findings from their focus group discussions and in-depth interviews with 152 farmers, forest owners, and agriculture and forest experts in Puerto Rico and the U.S Virgin Islands are available here.

- In 2017, Hurricane Maria left millions of downed trees in Puerto Rico. Though many of the trees were high-value tropical hardwood species, a lack of processing capacity and ready local market for salvage logs resulted in the logs being chipped and lost to landfills. Since then, the USDA Caribbean Climate Hub has worked to help increase the sustainable use of forest resources. In January 2023, the Caribbean Hub hosted a meeting led by business and nonprofit leaders who aim to form a collective of people and organizations working with forest products and timber harvested in Puerto Rico.

- Crop losses due to hurricanes can have significant economic repercussions for farmers and the broader agricultural industry in the Southeast U.S. and recovery from the hurricane damage often takes years and extensive rehabilitation. Climate change is expected to increase the intensity and frequency of hurricanes, in turn increasing the exposure of southeastern farming operations to hurricane damage. The Southeast Climate Hub presented on Hurricane preparation and recovery to 40 Florida producers and commodity group leaders at Solutions from the Land's Climate Smart Agriculture Meeting, in Gainesville, Florida, sharing the

Increasing resilience, addressing vulnerabilities in agriculture

- Farmers in the Northeast are increasingly interested in using climate smart and soil health practices as part of their farm management and NRCS is interested in providing support for farmers using these practices. However, there is a lack of information regarding economic effects of long-term use of these practices. The Northeast Climate Hub is assessing these economic outcomes. During FY23, the team working on this project published the paper "Long-term economic impacts of no-till adoption" in the journal Soil Security, and presented on the topic of

economics of no-till adoption at the Agricultural and Applied Economics Association meeting. The information synthesized by this team will assist farmers and land managers in making decisions about use of soil health practices on their operations. The results demonstrate that no-tillage increases net returns relative to chisel tillage by reducing operational costs, and show that the relative profitability of no-tillage increases over time the longer the practice is implemented.

- Communicating scientific research findings to the public and natural resource managers is a key mission of the USDA Climate Hubs. This year, the USDA Northeast Climate Hub has published four factsheets that synthesize scientific information and results on "Soil moisture monitoring systems: components and costs," "Soil water availability monitoring for diversified vegetable farms," "Effects of climate change on aquaculture in the Gulf of Maine," and "Coastal Forests: Vulnerability to Sea Level Rise."

- Soil health practices are gaining traction in the Southeast US, but there is variability in adoption rates across the region and across different farming systems. During FY2023, the Southeast Climate Hub presented to a variety of audiences to support the wider adoption of soil health practices. Contributing to five meetings across five southeastern states, they reached over 300 participants including farmers, agricultural advisors and USDA agency personnel. Topics covered included practices for incorporating cover crops to improve soil health and build resilience to climate-related threats and how conservation practices can improve soil functioning through grassland management.

- The Midwest Climate Hub, the Great Lakes Integrated Sciences and Assessments, the Northern Forests Climate Hub, and the Northern Institute of Applied Climate Science (NIACS) have partnered with an array of Midwest organizations to develop agricultural vulnerability assessments for each state in the region. These assessments, alongside additional state resources, are available online. Each state assessment presents historical climate change that occurred from 1979 to 2021; projected changes under future greenhouse gas emissions scenarios; the impacts of these changes (both historical and projected) on agricultural operations; and considerations for adapting agricultural operations to these impacts.

- The Midwest Hub is working with The Ohio State University and additional Midwest university/Extension partners to establish Climate Ready Midwest, a project funded by USDA-NIFA to bolster Extension-Hub connections and develop a Climate Hub-Extension framework. Following interviews of Extension specialists, the project team has conducted a "Sense-Making" workshop with the interviewed participants. This workshop succeeded in engaging Extension specialists in discussion surrounding their organizations' capacity to deliver climate programming. These data collection efforts will contribute to an Extension needs assessment and co-development of a series of climate-smart practices for agriculture across the Midwest.

- To help stakeholders in the US Caribbean learn about the technical and financial assistance available from the USDA for resource conservation, climate mitigation and adaptation in agriculture and forestry, the USDA Caribbean Climate Hub and collaborators launched a series of five OneUSDA workshops in 2023. These workshops were organized as part of the Climate-smart Caribbean program (a NIFA funded project) and provided a platform for USDA agencies, Extension and Conservation Districts to promote climate-related management practices and assistances to farmers and landowners. The workshops reached a diversity of landowners, agency personnel and other stakeholders and preliminary results show that over 90% of workshop attendees are likely to apply the climate-smart knowledge they gained and practices discussed. To ensure the information delivered at the workshops reaches a much wider audience, the Caribbean Climate Hub have also produced short videos to showcase the work of two farmers who attended the workshops and who are finding success with climate-smart agriculture. The videos showcase La Microfinca Farm in Camuy, PR and Finca Atebey in Santa Isabel, PR and the climate-smart and NRCS conservation practices the owners have implemented to cope with the impacts of climate change such as: contour farming, crop diversity, rain water harvesting, windbreaks, drip irrigation, and more. Collectively, the videos have been viewed over 650 times.

- Following a formal request from several Caribbean Community (CARICOM) leaders to President Biden, the Southeast Climate Hub NRCS co-lead, Allen Casey, led a team of subject-matter-experts that traveled to Saint Vincent and the Grenadines, Guyana, and Jamaica to deliver three 5-day workshops to agriculture extension agents. The goal of the workshops was to improve skills and assessment abilities in the efficient use of organic and inorganic nutrients, better understand the role of soil health as a function of a sustainable nutrient management system, and understand how better nutrient management and soil health practices can reduce the impacts of climate change.

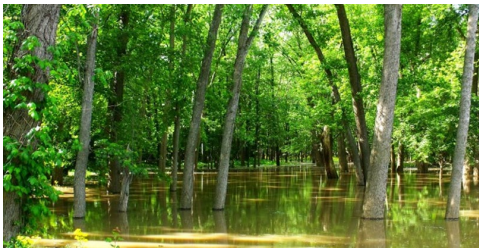
- Four Climate Hubs collaborated for the 78th International Annual Conference of the Soil and Water Conservation Society in Des Moines Iowa. The Midwest, Northern Plains, Southern Plains, and Caribbean Climate Hubs hosted an interactive exhibitor booth, two panels, and two oral presentations to discuss Climate Hub interactions with Certifed Crop Advisors, discuss Climate Smart Practice adoption and share information about the range of information, tools and services from the Climate Hubs.

Increasing resilience, addressing climate vulnerabilities in forestry

- The Updated Silvics of North American Project (USNAP) was launched as an international collaborative effort between the Canadian Forest Service, National Forestry Commission of Mexico, and USDA Forest Service to revitalize the Silvics of North America (SNA). Initiated by the USDA Southeast Climate Hub, USNAP will bring silviculture into the 21st century by publishing the SNA on a dynamic digital platform where it will receive regular

updates, be available in English, Spanish, and French, contain 300+ species, and include new content such as updated range maps, range projections, climate change impacts, invasive species, and urban forestry. Currently there are 65 chapters in development along with many opportunities to become involved in the authorship process.

- Forest land owners and managers in the southeast US need guidance based on sound, peer-reviewed science to remain resilient and productive in the face of climate change and variability. However, as risks increase and emerging threats arise, guidance must be developed and shared to help producers make climate-informed decisions. Therefore, the USDA SE Climate Hub worked with State forest health managers in Florida and Louisiana to produce state-specific emerging forest threats facts sheets.



- Starting in FY2023 and continuing into FY2024, the Yale Forest Forum is presenting a fall speaker series on the topic of climate smart forestry hosted by the Yale School of the Environment, the USDA Northeast Climate Hub and the USDA Southeast Climate Hub. This webinar series Understanding Climate-Smart Forestry in Practice explores topics including climate impacts, adaptation and mitigation management strategies, the impact of climate smart forestry on community safety and resilience, economic opportunities, and the influences of policies and markets on climate smart forestry. Eleven weeks of webinars on climate smart forestry topics will be available online. Around 750 participants view each webinar and 17 students participate in discussion sessions each week.

- Forest management decision-makers are navigating the current climate situation and changing market processes. There is no place where news related to forestry and climate change in the Northeast is consolidated for forestry professionals to readily access. Therefore, in January 2023, the Northeast Climate Hub launched a new weekly forest and climate focused newsletter, "*The Pulse*." The newsletter shares forest, climate, and carbon related news clips from a wide variety of sources and is aimed at forestry professionals.

- The ability of the US Forest Service to successfully implement proposed management on its lands is often dependent on the support or resistance of local stakeholders and partners. California Climate Hub staff collaborated with USFS to design and facilitate a workshop to engage stakeholders on a restoration strategy for the Mendocino National Forest (MNF). The workshop leveraged multiple decision support tools from the USFS to gather input from attendees on their values and priorities for the MNF and build understanding of the trade-offs the restoration strategy seeks to balance. Approximately 70 people from local

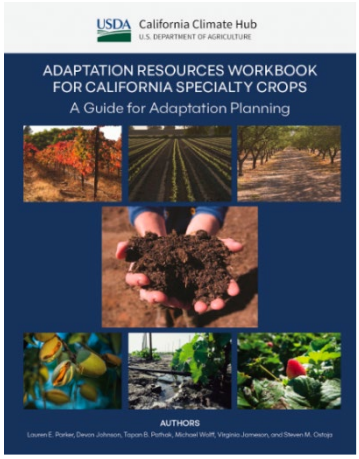
communities, agencies, and organizations attended and the workshop involved 6 different USFS scientists.

- Greater area burned in a warming climate is increasing need for reforestation. Assisted migration is a promising tool for maintaining forest resilience as the climate warms and fire activity increases. But land owners and managers need additional information and resources to effectively implement assisted migration. The Northwest Climate Hub hosted a workshop: "Northwest Reforestation: choosing plant materials suited to current and future climates" which promoted shared learning around selection of plant materials for climate-informed reforestation. In attendance were technology transfer specialists and practitioners from across ownerships (Tribes, private landowners, state and Federal agencies) in California, Oregon, and Washington and they discussed lessons learned from established assisted migration plantings and how to promote implementation of assisted migration plantings in the future. The workshop focused on assisted population migration (movement of seed sources within a species range). Assisted range expansion and species migration (movement of seed sources just outside and well beyond the current species range) was also discussed.

- In Washington state, small forest landowners (2-2500 acres) own 15% of forested lands, and their management decisions can affect Northwest forests. Understanding the impacts of climate change can help small forest landowners make management decisions that build climate resilience on their lands and throughout Northwest forests. The Northwest Climate Hub partnered with the Office of Sustainability and Climate the Pacific Northwest Research Station and the University of Washington, School of Environmental and Forest Sciences to produce the Climate Resilience Guide for Small Forest Landowners in Eastern Washington. This guide describes climate change impacts and potential management actions that landowners can take to increase resilience on their land.

- Climate change is affecting national forests in many ways, and national forest managers need climate change vulnerability assessments to help them develop adaptation strategies to reduce the negative effects of climate change. The Northwest Climate Hub gave a webinar on climate change vulnerability assessments in the western U.S. as a part of the Pacific Northwest Research Stations SciCast series. The webinar described an approach to vulnerability assessments, common vulnerabilities and adaptation options, and lessons learned from previous assessments.

Sharing adaptation practices



- The California Climate Hub, in partnership with experts from the California Department of Food and Agriculture and University of California Cooperative Extension, developed an Adaptation Resources Workbook for California Specialty Crops. The workbook includes guidance on developing a climate-informed, adaptation-focused farm management plan as well as a menu of strategies, approaches, and practices for adapting to and mitigating climate change on the farm. The workbook will support California specialty crop producers specifically, and likely other growers more generally, identify adaptation approaches and practices suitable to meet their needs and guide them through developing a farm adaptation plan. The workbook will also support technical service providers (e.g., cooperative extension, NRCS, RCDs, etc.) in working with producers to adapt their farms to climate change.

- There is abundant science related to climate adaptation in forests and grasslands, but interpreting and applying this science can be challenging for practitioners who often have conflicting priorities and little time to decide what has relevance for their location. The Adaptation Workbook, developed by NIACS, and applied in the Southwest, provides a structured process for integrating climate change considerations into management planning and activities. The Southwest Climate Hub and partners hosted two 2-day workshops to support 30 members of project planning teams from two National Forests in identifying adaptation actions that help address climate vulnerabilities while meeting goals and objectives. Managers walked away with localized climate-adaptive management actions for several projects. The actions consider the spectrum of adaptation options, ranging from resistance of current ecosystems to facilitating transitions to future conditions under a changing climate.

- Climate change impacts such as rising temperatures, increasing water scarcity, prolonged drought, and more frequent more destructive wildfires are all occurring in a region where there are huge disparities in the ability of communities to adapt to climate change. The Southwest Climate Hub joined the Southwest and South Central Climate Adaptation Science Centers to plan and host the 2022 Southwest Adaptation Forum (SWAF) in Albuquerque, NM. This meeting provided a platform for sharing and discussing advances in adaptation practice in the southwest as well as encouraging necessary conversations around environmental and climate justice. The Climate Hub learned that stakeholders in the Southwest are increasingly impacted by extreme events and need both space to share concerns and assistance in finding support. Participants requested bi-annual large gatherings along with smaller topical meetings to continue engagement.

- Elm, ash, and other foundational forest species face serious health threats from invasive pests and pathogens, land use stresses, and climate change. The loss of these species has threatened city canopies, natural ecosystems, and ways of life and being for communities that depend on them. Recognizing the fundamental social and ecosystem roles of these species, and to proactively anticipate coming threats to similar keystone trees, scientists at the USDA Forest Service Northern Research Station (NRS) have worked to identify techniques to preserve, propagate, or replace these species and support the communities that depend on them. NRS researchers enlisted the Northern Forests Climate Hub and NIACS, to facilitate discussions among scientists and land managers in two conference settings (Baltimore, MD, and Duluth, MN). These meetings focused on the ongoing loss of these species, dissemination of research results, and understanding the real-world operational capacity to respond to these threats.

- In 2022, the Sustainable Forestry Initiative (SFI) Forest Management Standard introduced a new Objective on "Climate-Smart Forestry." This means that groups wanting SFI certification must now have a climate change adaptation plan in place that considers climate change risk assessment, adaptation, and carbon management. The Northern Forests Climate Hub and the Northern Institute of Applied Climate Science (NIACS) hosted a workshop that was designed to help the Maryland Forest Service complete a climate change risk analysis and adaptation plan on State certified lands that helps to meet the SFI certifications standards. The Northwest Climate Hub facilitated a workshop for SFI-certified groups in the Northwest.

- Landscape climate change adaptation is a challenge in the Northeast with regional forests fragmented by private ownership. In a series of facilitated workshops within the state of New Hampshire, the Northern Forests Climate Hub worked with the Nature Conservancy (TNC) to engage key landowners and managers adjacent to TNC owned conserved lands to develop a landscape-wide approach to forest adaptation and management. In two regional workshops "New Hampshire Climate Resilient Forest Management Workshops (Southwest NH and Mt. Washington Valley)", managers developed customized forest management plans for their properties of concern, using the USFS Forest Adaptation Resources and the Adaptation Workbook.

- Urban forests provide immense value to people all across the country, and urban forests are exposed to a unique array of stresses from climate change. The USDA Northern Forests Climate Hub provided direct training for urban and community forestry professionals in the greater Boston and Indianapolis regions to integrate climate change vulnerability and

adaptation considerations in local planning projects. American Forests (AF) engaged the Northern Forests Hub and NIACS to host workshops to support adaptation planning in urban settings. Participants received training to use Regional Tree Species Vulnerability Assessment publications, AF Tree Equity tools, and the Climate and Health Adaptation Menu resources co-developed by AF, the Northern Forests Hub, NIACS, the USDA Forest Service, and regional partners. Workshop participants received coaching and feedback on their own real-world urban climate adaptation projects.

Building, curating and sharing decision-relevant tools and technologies for climate-smart practices

- For decades, scientists, Extension, Tribes, government agencies, and individuals have sought solutions to water scarcity in the southwest. Yet there is no central location for archiving these efforts and making the information more accessible. Therefore, the Southwest Climate Hub has been developing a Water Adaptation Techniques Atlas (WATA) which compiles information about responses to southwestern water scarcity, presented in the form of case studies. During 2023, the Southwest Hub continued to share WATA with partners and stakeholders, inviting feedback and critique to refine the tool database and to make it more user-friendly.

- In the Midwest and Northeast U.S., a missing piece of information about climate change and changing seasonality is a regionwide soil temperature climatology. To help resolve this issue the Midwest Climate Hub is partnering with the Midwestern Regional Climate Center at Purdue to develop a Midwestern soil temperature climatology and assessment of first 50°F and 32°F dates in the fall and last dates in the spring. The Freeze Date Tool provides information about the climatology of freezing temperature dates and changes over time across the north-central and northeastern United States.

- The Caribbean Climate Hub has updated and enriched their Farm Planning Tool with critical climate projection data. Previously limited to Puerto Rico, the tool now covers the U.S. Virgin Islands. With its refreshed interface and comprehensive data, including soil information, hydrology data, and crucial climate projections for 2041-2060, such as projected rainfall changes, maximum and minimum temperatures, and sea-level rise, this tool empowers users to make proactive and climate-resilient decisions.

- California producers need information and resources to support and guide management decisions in the face of increasingly variable weather and a changing climate. In response, the California Climate Hub partnered with scientists at University of California Agriculture and Natural Resources and University of California Agriculture Merced to develop a one-stop-shop of web-based decision support tools and informational resources. Called

'CalAgroClimate' the website was publicly launched in November 2022 and has garnered positive feedback from users. With plans to expand its scope and reach, CalAgroClimate will serve as a much-needed resource for California producers moving forward.

- Preserving key grassland ecosystem services under increased pressures of droughts and wildfires calls for new conservation tools to manage livestock grazing proactively. The Southern Plains Climate Hub partnered with Oklahoma State University, the Sustainable Southwest Beef Project, and New Mexico State University to host a field day on virtual fencing (VF) for ranchers of the Panhandle region. Approximately 50 participants from OK, KS, TX and NM were able to interact with VF vendors, peers, researchers, extension specialists, and both USDA and Oklahoma Conservation Commission staff to learn about VF systems, their configuration, uses, and available government programs that would support this technology.

- Southwestern ranchers face a future climate with warmer temperatures, changed precipitation patterns, and in some areas, declining rangeland forage production. Frequent droughts and spatially variable precipitation are also typical of the region. Virtual fencing and remotely monitoring water troughs, rain gauges, and cattle locations, can help producers adapt by providing more flexibility in grazing management and vital information about remote pastures. However, there is limited information in circulation about these technologies. The extension team of the Sustainable Southwest Beef Project, (led by the Southwest Climate Hub), have developed fact sheets (in English and Spanish), a short video, and a slide deck to share information from the project's research into Precision Ranching Technologies and Criollo cattle.

- Federal rangelands span more than 36 million acres across Idaho, Oregon, and Washington. In the Northwest, ecosystem services from rangelands and the human communities they support are vulnerable to climate change effects. To support climate-informed decision making the Northwest Climate Hub developed a compendium of tools to help federal land managers understand, prepare for, and better respond to the effects of climate change. The online tools provide information on weather, climate, stream flow, vegetation from satellite images, and some real-time information to see changes unfold across a large landscape. This compilation of tools provides several resources on climate information all in one place to support federal land management.

- After large wildland fires, reforestation is required on National Forest System lands. Recent drought and changes in climate have left forest land managers wondering what to plant that will survive now and into the future to meet their management goals. To assist forest land managers in identifying where to plant or source seeds or seedlings, the Seedlot Selection Tool was developed (funded in part by the Northwest Climate Hub). To support managers, the Northwest Climate Hub partnered with the National Forest System to develop a video

tutorial for the Seedlot Selection Tool that works through two scenarios. This video tutorial and guidebook support managers in making climate-informed decisions.

- In response to the concern related to fire, climate change and other stressors on natural and working lands, there has been a recent explosion in decision support tools and systems intended for resource manages to enable climate informed decision making. However, an unintended consequence of this investment has been that forest and natural resource managers are overwhelmed and/or unsure where and how they can assess, interpret information etc. so that it can be used in routine management operations. The California Climate Hub staff developed and led a virtual training for USFS staff across four forest Zones on use of climate data tools and interpreting their outputs. Training attendees practiced applying climate data tools to project climatic changes in their area of interest and consider how those changes impacted natural resources as well as implementation of management efforts.

- As the climate becomes hotter and drier in the Southwest US, forests are experiencing more drought, wildfires, and pest pressure. Forest managers rely on resources and decision-support tools to help forests adapt to a changing climate. However, available tools and resources are numerous and often created with limited coordination. This makes it difficult for decision-makers to assess options and choose the most appropriate action for their objectives. To address this, the USDA Southwest Climate Hub, in collaboration with the South Central and Southwest Climate Adaptation Science Centers (CASCs), developed Forest Resource Index for Decisions in Adaptation (FRIDA), a library of tools and resources for forest management in the southwest.

Building climate literacy

With the USDA workforce

- The USDA Action Plan for Climate Adaptation and Resilience calls on the Climate Hubs to support climate literacy within the USDA workforce to enable staff to best serve stakeholders in the decades ahead. Therefore, the Northern Plains Climate Hub collaborated with the Office of the Chief Economist, the Economic Research Service and the Forest Service to co-design and co-present a webinar titled, "Bringing People into Climate Science." This was the final installment in USDA's Climate, Agriculture, and Forest Science Webinar Series. Over 400 USDA staff attended, gaining social science insights about drivers of adoption of climate-smart agriculture practices, and how the impacts of climate change ripple across global markets.

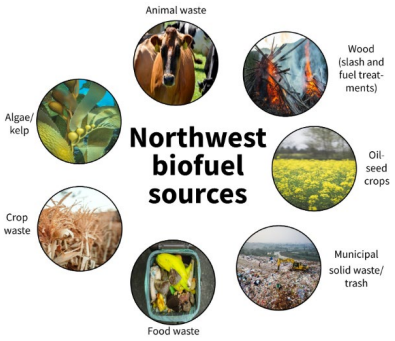
- The Midwest Climate Hub has been establishing and strengthening connections with NRCS and the Farm Service Agency (FSA) to better develop working relationships and help address literacy needs around climate change. In FY 2023, they conducted three outreach events with state level NRCS and FSA. For example, the Midwest Climate Hub conducted a webinar with around 170 FSA staff in Iowa which was a culmination of a

recently established collaboration with Iowa FSA leadership. The webinar focused on climate change, impacts, and resources for Iowa agriculture.

- In Oregon, the average temperature has increased 2.5˚F since 1895; the average annual temperature in the warmest year was 3.9˚F above average in 2015. With this increase in temperature, there is less snowpack and thus less water for irrigation of crops. To improve climate literacy, the Natural Resources Western Technical Center hosted a workshop, Climate Smart Mitigation, COMET Tools and Conservation Planning, for NRCS staff in Oregon. The Northwest Climate Hub provided state-specific information on climate change, climate indicators for agriculture and forestry, as well as noted conservation practices that also act as adaptation or mitigation practices.

With the public through outreach and education

- Farmers, ranchers, foresters, and natural resource managers have many questions about climate change and the actions they can take to maintain sustainable operations. The Northwest Climate Hub provides information via our webpage that synthesizes science on topics relevant to decision making for working lands. In this fiscal year, Northwest Climate Hub received over 62,000 people engaging with our web materials. Our most popular page is on Biofuel production with almost 15,000 people viewing it. Content produced in the previous fiscal year is still relevant, like their presentation for youth education, "What is Climate Change?" which has been viewed by almost 3000 people. This information builds climate literacy and provides resources for climate-informed decision making.



- Climate Hubs continue to use innovative solutions to increase climate literacy. The Southwest Climate Hub has seen success in reaching partners and the general public through their podcast "Come Rain or Shine" with 2,163 downloads in 2023. During 2023, they released 12 episodes, spanning such topics as wildfire drivers and post-fire restoration, cultural burning, innovations for water efficiency in agriculture, and managing rangelands in a changing climate.

Supporting climate-smart agriculture and forestry practices and products that reduce Greenhouse emissions and increase carbon sequestration

- Nature-based carbon offset projects are an important climate-smart strategy for compensating forest landowners who manage their forests to increase carbon storage and offset rising carbon dioxide levels. However, forest landowners, forest managers, and their advisors often don't fully understand how

FOCCE
Forest Owner Carbon and Climate Education

evolving carbon market opportunities align with their financial and management plans. Therefore, the Northeast, Northern Forests, and Southeast Climate Hubs partnered with Penn State University and others to develop the Forest Owner Carbon and Climate Education (FOCCE) program to deliver timely educational and training resources on how to manage forest land for carbon. In FY 2023, the FOCCE program published 12 online Extension articles covering forest carbon management, incentives, finance, and planning and two case studies summarizing landowner experiences with carbon payment programs and climate-smart forest programs. They conducted one workshop with forest land owners and forest managers using the Peer's and Pro's 360° method of participatory knowledge building, and they also delivered four free online training courses that were attended by 195 participants. The workshop and courses facilitate basic literacy in forest carbon and climate issues, with a focus on incentive opportunities, such as forest carbon markets and government programs. FOCCE also provides access to new and existing tools and resources to help guide planning and structured decision-making and foster community around carbon and climate topics so participants continue to build knowledge through collaborative learning and collective engagement.

- Land management actions such as prescribed fire and forest harvest can sometimes present tradeoffs between achieving ecological outcomes and increasing carbon storage. The Nature Conservancy, the Northern Forests Climate Hub, and NIACS are partnering on a project to help illustrate and describe these potential tradeoffs. Using the Adaptation Workbook, a team of technical specialists developed adaptation responses that meet biodiversity goals, while also considering the implications of management actions on carbon storage and sequestration. The workshop targeted the TNC Meyer Preserve in southeast Wisconsin with a focus on oak savanna (oak opening and oak woodlands) and non-forested wetland natural communities present at the Preserve.

Supporting environmental justice and equity

Tribal communities

- Increased variability in rainfall patterns and more frequent extreme heat events are posing new challenges for farmers and ranchers in the Southern Great Plains. Renewed interest in the ancient technique of rainwater harvesting prompted the Southern Plains Climate Hub to partner with the Texas USDA NRCS to provide demonstrations and information on such systems. Members of the Alabama-Coushatta, Absentee Shawnee, Kickapoo, and Quapaw Tribes as well as the Kaw Nation, Chickasaw Nation, and Comanche Nation participated in workshops and one-on-one consultations. The Southern Plains Hub helped with design of systems tailored to the needs of Tribal partners who anticipate using rainwater harvest and storage to boost water reserves for wildfire control, livestock watering needs, and small-scale horticulture, among other uses. Approximately 120 members of historically underserved rural communities received information or direct support through this program. The Southern Plains Climate Hub and partners are also working on the installation of a demonstration rainwater harvest system for wildfire mitigation on

Alabama-Coushatta Tribal lands in Texas. A system design plan was developed, funding from BIA was secured, installation work is scheduled to begin in FY2023.

- Soil Climate Analysis Network (SCAN) and Tribal SCAN (TSCAN) meteorological station data is collected across the Northeast, but must be presented in usable and useful ways to relevant stakeholders. With the Northeast Climate Hub's support, Cornell University is hosting focus groups for tribal stakeholders to learn about climate-smart tools built on data from SCAN and TSCAN networks, and generate ideas for new tools that would be most useful to those tribal stakeholders. A factsheet describing SCAN and TSCAN has been published, one listening session was completed, and two presentations have been given for the purpose of soliciting feedback on existing tools, and brainstorming new ones. Approximately 100 people participated in a "tools cafe" where SCAN and TSCAN were described in a lightning talk, and participants were then given the opportunity to learn about the tools in a one-on-one session and provide feedback.

- .Regional tribes are identifying shared climate adaptation priorities with National Forests to advance implementable on-the-ground projects as part of the Tribal Forest Protection Act (TFPA). In FY2023, the Northern Forests Climate Hub held two workshops to convene Tribes and their associated National Forests. Participants identified mutual climate adaptation priorities and co-developed projects that can be initiated through the TFPA. The workshops generated 17 distinct projects, several of which have been formally approved by the Regional Forester of the Forest Service Eastern Region. Projects included promoting regeneration of culturally important trees and understory medicinal plants, the indigenous use of prescribed fire, restoring wild rice, and more. Funding for this project came from Forest Service R&D through the Northern Research Station.

- The climate is changing faster in Alaska than in anywhere else in the U.S. Climate changes are affecting subsistence of Alaska Natives, but there is little information on how climate change will likely continue to affect important subsistence species. The Northwest Climate Hub conducted a webinar, titled Vulnerability of Alaska Native Tribes in Prince William Sound and Adjoining Kenai Peninsula to Selected Climate and Nonclimate Stressors, to provide participants with the key findings of a new report on climate change effects on Alaska Native Tribe subsistence.

- Many Tribal nations lack the capacity and resources to conduct climate change vulnerability assessments to guide revisions of management plans. In particular, many tribal forest management plans are outdated and do not integrate climate change. The Northwest Climate Hub is working with forestry staff of the Nez Perce Tribe to conduct a climate change vulnerability assessment for forests and update the Nez Perce forest management plan. The Northwest Climate Hub produced a climate change vulnerability assessment for the Tribe and is continuing to work with forestry staff to integrate the assessment information in the Tribal forest management plan and apply it in forest management decision processes.

- Indigenous communities are often disproportionately impacted by climate change. The Southwest Climate Hub works to collaborate with Tribal Nations on climate resilience and adaptation. In 2023, the Southwest Hub held two workshops, attended by 117 individuals, to engage with Tribal members on drought resilience tools and strategies. The Southwest Hub also supported development of a Train-the-Trainer course on Beekeeping & Pollinator Stewardship for Indigenous Stewards with 33 enrollees at the Institute of American Indian Arts Land Grant Program.

Non-tribal, historically underserved communities

- The Southern Plains Climate Hub and partners held a one-day workshop on Climate Smart Agriculture for historically underserved farmers and ranchers in Okmulgee, Oklahoma on May 20. Presentation and discussion topics included a report on regional climate trends, NRCS and FSA assistance programs, USDA 1890 scholarship programs and the Oklahoma CARE project. Also provided during the workshop were hands-on demonstrations on goat husbandry, low-cost vegetable garden planter development, and rainwater harvest systems. The Climate Hub partnered with Mr. Dwight Guy who organized and facilitated the meeting, and with collaborators from Oklahoma State University, Langston University and peer USDA agencies. Participants became familiar with up to date information on regional climate change as well as USDA programs that support farming and ranching. They also had the opportunity to provide feedback regarding their needs and priorities.

- Language is one of the most consistent barriers to climate equity and is particularly relevant to climate change and working lands in the Northeast as immigrant and Spanish-speaking workers make up a large portion of relevant stakeholders in the region. There is consensus amongst climate equity literature that efforts need to be put towards translation at all levels such as funding mechanisms, public resources and programming and even weather warning systems for outdoor workers. As a first step, translating the most viewed pages of the USDA Northeast Climate Hub website to Spanish elevates the level of access and allows for more diverse audience reach.

- To meet the public's climate-related needs, regional service-providers are building and leveraging partnerships. In support, the Northern Plains Climate Hub (NPCH) hosted a retreat for 20 members of the DOI North Central Climate Adaptation Science Center (NC-CASC), NOAA Climate Adaptation Partnerships team at Western Water Assessment (WWA), and the Hub. Each center offers unique expertise in agriculture (NPCH), water (WWA), and ecosystems (NC-CASC)—essential and interwoven fibers of the region's landscapes and rural communities. These three Federal climate centers meet twice per year to enhance efficiency through coordination, knowledge exchange, and collaboration. This retreat's focus was serving frontline communities

Education

- Climate education at all ages is a critical agent in addressing climate change. Teaching young people about protecting the planet in a playful and solutions focused way can help them feel empowered to make a difference. The Caribbean Climate Hub and Atencion Atencion Foundation have worked together to create three bilingual web-based learning modules on climate change, the importance of forest conservation and agriculture,for children aged 3 through 8 about climate, forests, and agriculture. In the first two months after the lessons were launched, these climate change lessons were accessed by over 26,000 students and 4,000 teachers, helping increase climate literacy and education among children in the Caribbean region and in Latin America.

- Earth Day is often celebrated with creative ways for the public to engage in conservation and stewardship issues. In many states, Envirothon® is hosted on Earth Day, providing an environmental and natural resource conservation problem-solving, team-building, and leadership experience and competition for high school students across the United States, and beyond. In Montana, the Northern Plains Climate Hub collaborated with Cascade County Conservation District and Montana State University Extension to co-develop a presentation on how agriculture in the state is adapting to climate change. This information reached 115 high school student and teacher participants at Montana's successful 2023 Envirothon® event.

- The Southern Plains Climate Hub gave a rainfall simulator demonstration to approximately 700 elementary school students as part of the Deer Creek Conservation District education day in Weatherford, Oklahoma, and the two-day Kingfisher Conservation District education event in, Kingfisher, Oklahoma. The Southern Plains team also demonstrated the adaptation benefits of agricultural practices known to enhance soil health.

- Ensuring that tomorrow's leaders and agricultural producers are prepared to address the challenges associated with climate change requires climate literacy programs that begin in elementary school. The Southern Plains Climate Hub partnered with Asombro Institute for Science Education and BlueSTEM Agri-Learning Center to host two workshops for elementary and middle school teachers from across the state of Oklahoma. Participants learned about current research on climate adaptation strategies for ranching and climate change and received access to standards-aligned lessons that break down this global issue into bite-sized pieces for their students. Many among the 30 teachers that participated in these workshops expressed excitement about returning to their classrooms to deliver these lessons to their students.

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APPENDIX A. Peer-reviewed papers

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Appendix B. FY23 Non-peer reviewed products.

	Hub	Title and link
Report (39)		
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135	SW	Alessi, J. (2023). “Testing a Model for the Prediction of Isolated Waters in the Sonoran Desert.” CART. Retrieved from https://arcg.is/0nH8uy.
136	SW	Alessi, J., R. (2023). “Using Mulch and Compost for Rangeland Restoration.” CART. Retrieved from https://arg.is/XYZ123.
137	SW	Cohen, S., Dinan, M. (2023). “Developing a Tool to Help Decision-Makers Navigate Complex Drought Scenarios.” CART. Retrieved from https://arcg.is/0uLm8S.
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139	NE	https://www.climatehubs.usda.gov/hubs/northeast/topic/daily-runoff-forecasting-agricultural-watersheds-promising-tool-nutrient
140	NE	https://www.climatehubs.usda.gov/hubs/northeast/topic/testing-novel-shallow-well-hart-farm-maine
141	NE	https://www.climatehubs.usda.gov/hubs/northeast/topic/assessment-programs-incentivize-ecosystem-services-across-northeast
142	NE	https://www.climatehubs.usda.gov/hubs/northeast/news/words-matter-how-language-climate-change-has-changed
143	NE	https://www.climatehubs.usda.gov/hubs/northeast/topic/daily-runoff-forecasting-agricultural-watersheds-promising-tool-nutrient
144	NE	http://n151.mjt.lu/nl3/uh3M_DOFPGo-raptru7EWA?hl=en
145	NE	http://n151.mjt.lu/nl3/TgjxO_LHtTNCY1EWh5CwBA?hl=en
146	NE	http://n151.mjt.lu/nl3/UtC6j006PhpNmXDcsuc5dg?hl=en
147	NE	http://n151.mjt.lu/nl3/eSjKUNfrec5W5eAmkMGFVw?hl=en
148	NE	http://n151.mjt.lu/nl3/rhYkuijE4SaIn0yCzURWqg?hl=en
149	NE	http://n151.mjt.lu/nl3/uuKfUHE0ExnXWVsBZEOw7Q?hl=en
150	NE	http://n151.mjt.lu/nl3/HcnUIoJQfi7vjPpt24pv-A?hl=en
151	NE	http://n151.mjt.lu/nl3/3PhP0hY5aWwWgLuuq0yNFA?hl=en
152	NE	http://n151.mjt.lu/nl3/nT9YRp0iIJpMiWClpr-dnA?hl=en
153	NE	http://n151.mjt.lu/nl3/6G9iRznFg_dhGVQleQhPlg?hl=en
154	NE	http://n151.mjt.lu/nl3/lScYLEBwErpdIrqGZv4xdw?hl=en
155	NE	http://n151.mjt.lu/nl3/10raDzrd1dBA8KvW9MgTrQ?m=AVoAABwqZIUAAc3FGKgAAQuPjuoAAYCrzkIAJunsAAmJRABknY2zf3mkgYdtR8ec81JjEtGBFAAJCWQ&b=bbb8cbb2&e=be00ca54&x=PZcG1MdrGsHzcORV6_Ko7Ai30eJ0b-bCvsCn8xTKhOw
156	NE	http://n151.mjt.lu/nl3/7QBZPtkwkxwp1eKoysctOw?hl=en
157	NE	http://n151.mjt.lu/nl3/FoWow07gkunIeHGu6RQ2Dw
158	NE	http://n151.mjt.lu/nl3/su_6Xz3hK_fmFNwoOtKsXQ
159	NE	http://n151.mjt.lu/nl3/cWiSzd-h41DJma4L312LfQ
160	NE	http://n151.mjt.lu/nl3/gVhQRJ7B_Zjibs3h0qYHGQ
161	NE	http://n151.mjt.lu/nl3/sezADqpFMNKG6j5NhSz3Bw
162	NE	https://n151.mjt.lu/nl3/lU_Ifp6Cc3sXgx6wo3vl9w
163	NE	https://n151.mjt.lu/nl3/__G7-uouSQdlUY0eUR3aMg
164	NE	http://n151.mjt.lu/nl3/pUhOpAj4m15BgQZ60WLKUw
165	NE	https://n151.mjt.lu/nl3/_PgjVoycvFCu7LGcQQ3Qpw
166	NE	The Pulse: UN Stocktake, Moose parasites, and Elm Zigzag Sawfly (mjt.lu)
167	NE	The Pulse: Conservation, Carbon Credits and Biochar (mjt.lu)
168	NE	The Pulse: Carbon markets for small landowners (mjt.lu)
169	NE	http://n151.mjt.lu/nl3/07OJydZ5SDcm6XS-d8AXTA?hl=en
170	NE	http://n151.mjt.lu/nl3/wZeDULRVG5i3iieeMnuhUA?m=AWAAAA-3NkAAAc3DATQAAQuPjuoAAYCrzkIAJunsAAmJRABkEyDmLh2Lv2XITZSwJYrlMY6G7gAJCWQ&b=5a4fc100&e=1f01e3c8&x=PZcG1MdrGsHzcORV6_Ko7Ai30eJ0b-bCvsCn8xTKhOw
171	NE	http://n151.mjt.lu/nl3/2boSnFpU6pauu-S4ZsgQBA?hl=en
172	NE	http://n151.mjt.lu/nl3/8-ncaO-7rmEWeRRrGfdCtw?hl=en

173	NE	http://n151.mjt.lu/nl3/S6UF8RxTEJkcB-W3BzCRAg?hl=en
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175	NE	http://n151.mjt.lu/nl3/aW3-KJ99AGsggQFQsadLoA?hl=en
176	NE	http://n151.mjt.lu/nl3/nlqkiljQ3YbBiv1r11hZhA?hl=en
177	NE	http://n151.mjt.lu/nl3/DWcPH2JTniyJkmx4npDRxQ?hl=en
178	NE	http://n151.mjt.lu/nl3/A9P9kYeRqlI8SsQwK_-KqQ?hl=en
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187	NE	http://n151.mjt.lu/nl3/UtC6j006PhpNmXDcsuc5dg?hl=en
188	NE	http://n151.mjt.lu/nl3/eSjKUNfrec5W5eAmkMGFVw?hl=en
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190	NE	http://n151.mjt.lu/nl3/uuKfUHE0ExnXWVsBZEOw7Q?hl=en
191	NE	http://n151.mjt.lu/nl3/HcnUIoJQfi7vjPpt24pv-A?hl=en
192	NE	http://n151.mjt.lu/nl3/3PhP0hY5aWwWgLuuq0yNFA?hl=en
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195	NE	http://n151.mjt.lu/nl3/lScYLEBwErpdIrqGZv4xdw?hl=en
196	NE	http://n151.mjt.lu/nl3/10raDzrd1dBA8KvW9MgTrQ?m=AVoAABwqZIUAAc3FGKgAAQuPjuoAAYCrzkIAJunsAAmJRABknY2zf3mkgYdtR8ec81JjEtGBFAAJCWQ&b=bbb8cbb2&e=be00ca54&x=PZcG1MdrGsHzcORV6_Ko7Ai30eJ0b-bCvsCn8xTKhOw
197	NE	http://n151.mjt.lu/nl3/7QBZPtkwkxwp1eKoysctOw?hl=en
198	NE	http://n151.mjt.lu/nl3/FoWow07gkunIeHGu6RQ2Dw
199	NE	http://n151.mjt.lu/nl3/su_6Xz3hK_fmFNwoOtKsXQ
200	NE	http://n151.mjt.lu/nl3/cWiSzd-h41DJma4L312LfQ
201	NE	http://n151.mjt.lu/nl3/gVhQRJ7B_Zjibs3h0qYHGQ
202	NE	http://n151.mjt.lu/nl3/sezADqpFMNKG6j5NhSz3Bw
203	NE	https://n151.mjt.lu/nl3/lU_Ifp6Cc3sXgx6wo3vl9w
204	NE	https://n151.mjt.lu/nl3/__G7-uouSQdlUY0eUR3aMg
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207	NE	The Pulse: UN Stocktake, Moose parasites, and Elm Zigzag Sawfly (mjt.lu)
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210	NE	http://n151.mjt.lu/nl3/07OJydZ5SDcm6XS-d8AXTA?hl=en
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212	NE	http://n151.mjt.lu/nl3/2boSnFpU6pauu-S4ZsgQBA?hl=en
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214	NE	http://n151.mjt.lu/nl3/S6UF8RxTEJkcB-W3BzCRAg?hl=en
215	NE	http://n151.mjt.lu/nl3/CNOmotBSSPg_xYxJWq_kDw?hl=en
216	NE	http://n151.mjt.lu/nl3/aW3-KJ99AGsggQFQsadLoA?hl=en
217	NE	http://n151.mjt.lu/nl3/nlqkiljQ3YbBiv1r11hZhA?hl=en
218	NE	http://n151.mjt.lu/nl3/DWcPH2JTniyJkmx4npDRxQ?hl=en
219	NE	http://n151.mjt.lu/nl3/A9P9kYeRqlI8SsQwK_-KqQ?hl=en
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221	SP	Southern Plains Climate Hub 2023: July Newsletter. https://www.climatehubs.usda.gov/content/july-newsletter-2023
222	SP	Southern Plains Climate Hub 2023: August Newsletter. https://www.climatehubs.usda.gov/content/southern-plains-climate-hub-newsletter-august-2023
223	NW	USDA Northwest Climate Hub 2023. Check It Out: Ensuring that Hazelnuts in Oregon and Washington Stay Resilient. https://www.agclimate.net/2023/04/06/check-it-out-ensuring-that-hazelnuts-in-oregon-and-washington-stay-resilient/
Blog	**(7)**	
224	SP	Southern Plains Climate Hub 2023: Conflicting ag headlines can make you scratch your head. https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements
225	SP	Southern Plains Climate Hub 2023: Have you lost livestock due to heat? Now would be a good time to talk to the USDA Farm Service Agency. https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements
226	SP	Southern Plains Climate Hub 2023: Another week, another story about how the changing climate is impacting insurance. https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements
227	SP	Southern Plains Climate Hub 2023: Extreme weather continues making headlines in the region. Are we giving enough thought on how to get ready for it? https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements

228	SP	Southern Plains Climate Hub 2023: Coming to a TV station near you-Severe Wildfire warnings. https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements
229	SP	Southern Plains Climate Hub 2023: Record rain, record heat, sudden changes and more wild weather on the way. When it comes to weather, "the Summer of surprises" keeps on surprising. https://www.climatehubs.usda.gov/hubs/southern-plains/topic/latest-blogs-videos-podcasts-and-public-service-announcements

Appendix C. Climate Hubs FY23 budget as reported by the Office of Budget and Planning Analysis (OBPA) 12/23. Numbers are reported by agencies to OBPA. (Thousand Dollars)

Agency / Program	**2022**	**2023**
Agricultural Research Service (ARS):	9,325	12,484
National Institute of Food and Agriculture (NIFA) *(1) (2)	9,000	10,587
Forest Service (FS)	6,360	6,250
Farm Service Agency (FSA)	0	0
Natural Resources Conservation Service (NRCS) *(3)	2,344	10,152
Risk Management Agency (RMA)	0	0
Animal and Plant Health Inspection Service (APHIS)	0	0
Office of the Chief Economist (OCE)	500	600
Economic Research Service (ERS)	0	0
Foreign Agricultural Service (FAS)	0	670
USDA Total Climate Hub Funding	**27,529**	**40,743**

(1) NIFA does not directly award funding to a Climate Hub; instead thru Agriculture and Food Research Initiative (AFRI) Extension, Education and USDA Climate Hubs Partnership (A1721) funding for extension work with Climate Hubs is made possible thru competitively awarded proposals.
(2) Funding for Climate Hubs in FY23 was $40.743 million, or $30.156 million when including NIFA funding ($10.15 million) geared towards Climate Hubs-extension partnerships through extramural, competitively awarded proposals.
(3) The large increase in NRCS FY23 actual funding over “enacted” is due to the investment of $8M in IRA-C funds in a 4-year agreement with the Hubs to support IRA implementation activities. The remaining Hub support funds come from NRCS discretionary funds.

Appendix D. Contact information (FY23).

William Gould, National Climate Hub Lead, william.a.gould@usda.gov
Julian Reyes, National Climate Hub Coordinator, julian.reyes@usda.gov

Hub Directors

California Climate Hub, Steven Ostoja, steven.ostoja@usda.gov
Caribbean Climate Hub, Nora Alvarez, nora.l.alvarez-berrios@usda.gov
Midwest Climate Hub, Dennis Todey, dennis.todey@usda.gov
Northeast Climate Hub, Lindsey Rustad, lindsey.rustad@usda.gov
Northern Forests Climate Hub, Maria Janowiak, maria.janowiak@usda.gov
Northern Plains Climate Hub, Dannele Peck, dannele.peck@usda.gov
Northwest Climate Hub, Jessica Halofsky, jessica.halofsky@usda.gov
Southeast Climate Hub, Steve McNulty, steven.mcnulty@usda.gov
Southern Plains Climate Hub, Andres Cibils, andres.cibils@usda.gov
Southwest Climate Hub, Emile Elias, emile.elias@usda.gov
International Climate Hub, Barbara Bennett, barbara.bennett1@usda.gov