



North Central Climate Adaptation Science Center

ANNUAL REPORT

October 1, 2024 - September 30, 2025



North Central
Climate Adaptation
Science Center

1. ADMINISTRATIVE

Principal Investigator (PI): Dr. William R. Travis (william.travis@colorado.edu)

Institution of the Award Recipient: University of Colorado Boulder (CU Boulder)

Issued to: The Regents of the University of Colorado

Attention: Genevieve Hurst

Office of Contracts and Grants

3100 Marine St, Boulder, CO 80303

Project Title: CU-Hosted NC CASC: Advancing the development and delivery of actionable science to help fish, wildlife, water, land and people in the North Central region adapt to a changing environment

Award Agreement Number: G24AC00632

Date of the Report: January 28, 2026

Performance Period: October 1, 2024 to September 30, 2025

No Cost Extension: October 1, 2025 to September 30, 2026

2. PURPOSE AND OBJECTIVES

The University of Colorado Boulder (CU Boulder) via the Cooperative Institute for Research in Environmental Sciences (CIRES) was awarded a five-year cooperative agreement (October 1, 2024-September 30, 2029) with the United States Geological Survey (USGS) to continue hosting the North Central Climate Adaptation Science Center (NC CASC). In this cooperative agreement, CU Boulder serves as the host for the NC CASC Consortium (**Figure 1**) and six Consortium Partner institutions: **Colorado State University (CSU)**; **Great Plains Tribal Water Alliance (GPTWA)**; **South Dakota State University (SDSU)**; **The Nature Conservancy (TNC)**; **University of Montana (UM)**; and **University of Wyoming (UW)**.

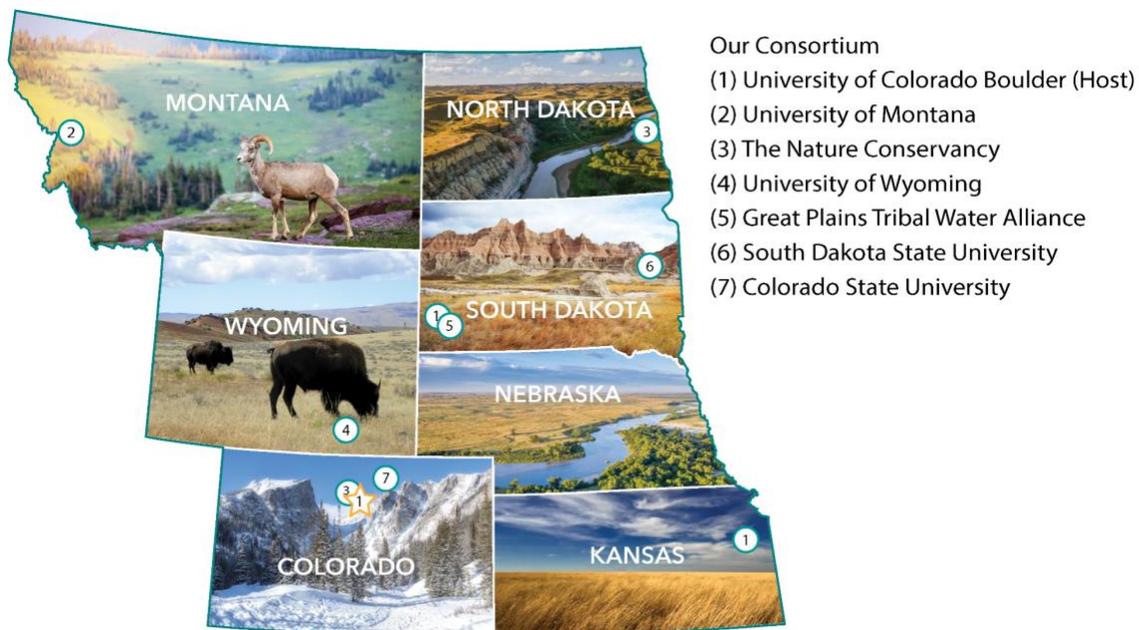


Figure 1. Map of the North Central Climate Adaptation Science Center Consortium (October 1, 2024 to September 30, 2029).

The NC CASC Consortium's Year 1 activities significantly advanced the development and delivery of actionable climate adaptation science relevant to the NC CASC's mission *to deliver science to help fish, wildlife, water, land and people adapt to a changing climate*.

Strong **Partnerships** with regional stakeholders, Tribal Nations, and other organizations, including the Department of Interior (DOI), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS) and the Bureau of Land Management (BLM) enabled the center to respond to high priority natural and cultural resource management challenges and foster substantive, sustained engagement between Consortium scientists and managers.

The Center's **Science** activities include interdisciplinary science, synthesis, and dataset and tool development. Key Year 1 science efforts include the completion of six [Rapid Climate Assessment Program](#) (RCAP) projects led by Consortium and USGS researchers, the [Working Group Science Synthesis](#) (WGSS) on Sagebrush ecosystems, climate adaptation tool development, and the Consortium coordination activities of the Actionable Science Working Group (ASWG).

Capacity Building activities include both *Research Capacity Building* and *Student/Early Career Capacity Building*. *Research Capacity Building* develops the skills and knowledge of researchers and managers to more effectively co-produce and use actionable climate adaptation science; in Year 1 this included the *Traditional Ecological Knowledge (TEK) Ethical Space Workshop* sessions convened in July 2025 (see web story: [Building Ethical Space](#)). Year 1 *Student/Early Career Capacity Building* activities included the six graduate research assistants (GRAs) involved in the 2025 RCAP projects. To learn more about these activities see **4.0 RESULTS**.

Communications were embedded in all aspects of the NC CASC's activities and supported the integration of climate adaptation science into natural and cultural resource management. In Year 1, the team produced 10 new Science Spotlight stories, translating NC CASC and partner research into accessible narratives for key audiences. New sub-pages were added to the NC CASC [website](#) to highlight key initiatives, including the [Rapid Climate Assessment Program \(2025\)](#), [Working Group Science Syntheses](#), and the [NC CASC Blog](#). These updates improved access to current projects, student writing and synthesis materials. To learn more about the Year 1 communications activities see **4.0 RESULTS**.

3. ORGANIZATION AND APPROACH

Throughout Year 1, the Host Team leveraged the efficient administrative, financial and compliance systems of CIRES and CU Boulder to effectively and responsibly manage the spending of the host agreement funds, subawards to Consortium Partner co-PIs, and USGS funded Pass-Through Projects. During Year 1, the proposal co-PIs (University Director/PI: William Travis; University Deputy Director: Jane Wolken; Lead Climate Scientist: Imtiaz Rangwala; and Lead Social Scientist: Heather Yocum) strategically expanded the Leadership Team from four to seven members. The inclusion of three additional senior research scientists (Actionable Science Lead: Christy Miller Hesed; and co-Lead Ecologists: Chelsea Nagy and Laura Dee) integrates a wider spectrum of CASC relevant science expertise and partnerships into key programmatic activities of the Consortium (e.g., selection of RCAP projects, WGSS topical focus, products and process, and coordination of the Consortium activities). Input from this broader Leadership Team also further addresses the recommendation made during the External Review of CU Boulder's first cooperative agreement as host of the NC CASC, which was to "*build leadership resiliency*" (see [NC CASC External Review Team Final Report, April 2023](#)) into the Center's organization and approach. Summary tables of CU Boulder personnel funded by the cooperative

agreement and leveraged contributions from individuals funded outside of the host agreement in Year 1 are in **APPENDIX I**.

Institutions receiving sub-awards: Within the host agreement, subawards to a consortium of universities, conservation nonprofits and Tribal boundary organizations extend the technical expertise and partnerships within the North Central region (*Figure 1*). Consortium Partner institutions and the associated co-Principle Investigators (co-PIs) include **Colorado State University (CSU)**: co-PIs Ana Davidson and Courtney Schultz; **Great Plains Tribal Water Alliance (GPTWA)**: co-PI Reinique Beck; **South Dakota State University (SDSU)**: co-PI Jeff Martin; **The Nature Conservancy (TNC)**: co-PIs Marissa Ahlering and Terri Schulz; **University of Montana (UM)**: co-PI Phil Higuera; and **University of Wyoming (UW)**: co-PI Corrine Knapp.

Consortium governance, operations, and interactions: In Year 1, the CP co-PIs served as connectors between researchers, stakeholders, rightsholders and partners in the North Central region, and conducted actionable climate adaptation science activities that were co-developed with the NC CASC Leadership Team. Engagement between the Host Team and CP co-PIs included bi-monthly Actionable Science Working Group meetings, bi-weekly NC CASC Full Team meetings with the NC CASC Host Team, Consortium Partners, USGS Partners, and BIA Tribal Climate Resilience Liaisons, monthly Climate Adaptation Science and Support calls, an in-person Annual NC CASC Consortium Meeting, and involvement in core Host-led activities (e.g., RCAP and WGSS).

4. RESULTS

Year 1 Consortium activities are summarized by the following categories: **Partnerships**, **Science**, **Capacity Building**, and **Communications**. Key Year 1 milestones include the summer 2025 *Rapid Climate Assessment Program* research projects, *Working Group Science Synthesis* on Sagebrush ecosystems, and strengthening collaborations with other regional CASCs through our engagement in a variety of virtual and in-person meetings (i.e., CASC Consortium Meeting in Juneau, AK in September 2025).

Partnerships

Partnerships with regional stakeholders and rightsholders enable the NC CASC to respond to high-priority natural and cultural resource management challenges and foster substantive, sustained engagement between scientists and managers. In Year 1, the NC CASC strengthened partnerships established in its first cooperative agreement with several organizations and individuals. Key partnerships in Year 1 include continued collaborations with Dr. Katherine Hegewisch (University of California Merced and developer of [ClimateToolbox.org](https://climatetoolbox.org)) to improve and develop climate tools to support NC CASC work; and strengthened partnerships with BLM via a summer 2025 RCAP project, *Risk Assessment for Canyons of the Ancients National Monument in Colorado*, as well as the development of the Sagebrush Adaptation Menu via the Sagebrush Working Group Science Synthesis activities (see **Science**).

Science

NC CASC science has the goal of advancing understanding of the impacts of climate change and variability on fish, wildlife, plants, water, land, and people to support sound resource management and adaptation.

In Year 1, the NC CASC engaged in several cross-partner science efforts that leveraged the host agreement and Consortium Partner subawards:

- 1) Climate Adaptation Science and Support:** The Climate Adaptation Science and Support (CASS) represents an integrated effort through the NC CASC Consortium to promote actionable climate adaptation science and provide ongoing support to practitioners. CASS includes the full spectrum of climate adaptation science, including climate, ecological and social science, development and advancements of tools and approaches, and effective and ethical applications. Through CASS, the Consortium assesses NC CASC’s partner engagement activities and science needs, informs science synthesis efforts via the Working Group Science Synthesis and Rapid Climate Assessment Program (both described below), and performs outreach activities via monthly webinars and the development of communication and outreach products. Two specific efforts where we provided targeted science support to partners and stakeholders include: (a) the development, refinement, and delivery of snow projection data at management-relevant spatial scales to inform wolverine habitat assessments in Montana, in close partnership with Montana Fish, Wildlife, and Parks (Justin Gude and Nathan Kluge), and in collaboration with scientists from NASA and the U.S. Fish and Wildlife Service, and (b) co-developing climate and ecological scenarios to support a climate adaptation/Resist-Accept-Direct effort for native riparian communities in the Black Ridge Canyons Wilderness in Colorado. This work included co-authoring a report published in April 2025 and was conducted in collaboration with BLM and the U.S. Forest Service, working closely with Kira Hefty, Jaclyn Rushing, and Nikki Grant-Hoffman.
- 2) Rapid Climate Assessment Program:** In Year 1, the Host Team continued its [Rapid Climate Assessment Program \(RCAP\)](#) to create syntheses of science information to serve as a baseline for further research and a foundation for future stakeholder engagement. During Year 1 the **RCAP supported six graduate research assistants** and their science mentors to conduct synthesis research on climate, ecological, and social science topics in partnership with federal, state, and Tribal resource managers across the NC CASC region. The 2025 RCAP project outputs include a guidebook for important cultural resources co-designed with Tribal resource managers; two draft adaptation menus for dealing with invasive tamarisk and conserving sagebrush ecosystems; a collaboration with BLM and Tribal partners on cultural resource management; and a synthesis of climate impacts on bison physiology, invasive species, and alpine ecosystems. Descriptions and results of the [RCAP projects in Year 1 \(2025\)](#) are available on our website.
- 3) Working Group Science Synthesis:** The [Working Group Science Synthesis \(WGSS\)](#) is a core NC CASC science activity that provides comprehensive science syntheses for management applications to facilitate in-depth exploration of priority topics or questions. In Year 1, the NC CASC launched its first WGSS focused on Sagebrush Ecosystems within the North Central region. Building on a preliminary needs assessment preceding the start of the current cooperative agreement, a set of [focal themes and questions](#) were drafted and refined in collaboration with partners in early 2025. These focus attention on management strategies and actions to maintain and restore sagebrush ecological integrity, effectiveness and social acceptance, under a changing climate and other emerging stressors. A working group with diverse experts and practitioners with a depth of experience researching and managing sagebrush ecosystems was convened and formally launched in June 2025 to inform the synthesis effort. The working group agreed on two target products: (a) a Sagebrush Adaptation Menu summarizing a wide range of management options for adapting to climate change; and (b) a synthesis of future climate and ecological scenarios to inform assessments of climate change vulnerabilities in the eastern sagebrush biome. Three Rapid Climate Assessment Program students furthered this effort over the summer of 2025, resulting in a preliminary draft of a Sagebrush Adaptation Menu, as well as a set of custom maps summarizing current conditions, historical trends, and future projections of climate and ecological change for sagebrush ecosystems

in the region. The draft Sagebrush Adaptation Menu is currently in revision following several rounds of input, including an in-person workshop at the NC CASC Annual Consortium meeting and subsequent virtual engagements with the working group.

- 4) Actionable Science Working Group Activities:** The [Actionable Science Working Group \(ASWG\)](#) includes all Consortium Partners and meets regularly to achieve two objectives: (a) Capacity Building by collectively building actionable science knowledge and skills across the NC CASC Consortium; and (b) Research with Consortium Partners and their collaborators to improve actionable science. During Year 1, Capacity Building activities occurred primarily via Zoom meetings every two months. The Actionable Science Lead (Miller Hesed) conducted one-on-one interviews with members of the ASWG in November 2024 to understand their current knowledge and experience with actionable science. Based on these conversations, the focus of the December 2024 meeting was to build shared literacy (i.e., vocabulary and definitions) of actionable science and co-determine a useful structure for ASWG meetings. Subsequent meetings focused on developing knowledge and skills in partner identification and engagement and included guest speaker Megan Moore (USGS ORISE Fellow) presenting on meaningful engagement with partners, ASWG member Terri Schulz and her TNC colleague presenting on identifying partners and interested parties, and a working session to co-develop an in-person tabletop exercise on partner engagement. The Actionable Science Lead facilitated that exercise for all attendees at the annual in-person NC CASC Consortium Meeting in August 2025. This exercise facilitated thinking and discussion on key factors that influence the appropriate level of engagement with different partners. Research activities in Year 1 were focused on the development and initiation of the research plan. The Actionable Science Lead drafted a research protocol and shared it with the ASWG for review and feedback. After iterating on the research plan several times, the research protocol was submitted for Institutional Review Board (IRB) review and approval.
- 5) North Central Invasive Species and Climate Change (NC RISCC) Network:** The expertise of members of the NC CASC Host Team (Wolken, Rangwala and Clark-Wolf) was leveraged by the NC RISCC team (Chelsea Nagy, NC RISCC founder and NC CASC co-Lead Ecologist) and partners to collectively draft and refine an Invasive Annual Grass Adaptation Menu, which is a product in development via the USGS funded Pass-Through Project, *Managing Ecological Transformation to Enhance Carbon Storage and Biodiversity* (G23AC00429). The collective knowledge of the cross-sector group will be used to create an adaptation menu for managing invasive annual grasses across ecosystems (e.g., forests, sagebrush, grasslands) under a changing climate.
- 6) Consortium Partner Research:** The NC CASC's six Consortium Partners (CPs) enable the Center to achieve a more comprehensive science agenda and leverage the strengths that come with institutional diversity and representation of knowledge and social networks across our region and its varied ecosystems. CPs allow us to more effectively meet the climate adaptation science needs of managers in the North Central region. Year 1 CP highlights are presented below (see **APPENDIX II** for a list that includes CP outreach products and activities):

 - ❖ **Colorado State University (CSU):** As outlined in CSU's statement of work in the host award proposal, co-PI Ana Davidson's subaward activities focused on stakeholder engagement activities and building on existing projects. In Year 1, Davidson advanced an NSF-funded project relevant to NC CASC work by using NC CASC funding to provide a three-month undergraduate summer internship which strengthened the field and training elements of the prairie dog plague-resistance genomics project. The intern, Abby Kogan, worked with PhD student, Galen

Burrell, and a five-person field crew to collect prairie dog tissue (DNA) samples across five states, gaining hands-on experience in humane live trapping, safe animal handling, anesthesia-based processing, and intravenous blood collection. In parallel, Davidson recruited three additional CSU Fish, Wildlife, and Conservation Biology undergraduates through the Colorado Natural Heritage Program's summer internship program; one student, Reese Good, went on to complete an honors thesis with Davidson using project data (December 2025). To date, the team has sampled 22 sites across 11 states and collected >3,500 tissue samples, supported by a broad network of partners and assisting organizations (see [project web page](#)). NC CASC also supported Davidson's coordination with collaborators to identify and pursue funding to implement conservation action in top-ranked [Homes on the Range](#) sites. Although the primary funding opportunity was cancelled in 2025, this work continues and included strategic planning with regional partners at the Great Plains Conservation Network annual meeting (October 2025) at the American Prairie in Montana, alongside organizations such as World Wildlife Fund and Defenders of Wildlife. Finally, Colorado Natural Heritage Program staff (biologists, spatial analysts, and planners) also contributed to [Colorado Parks and Wildlife's \(CPW's\) State Wildlife Action Plan \(SWAP\)](#) through core working-group participation. This SWAP effort resulted in the development of Species of Greatest Conservation Need (SGCN) and habitat range maps, adaptation of the Colorado Conservation Data Explorer (CODEX) mapping tool to deliver SWAP spatial layers, and support for CPW's SWAP online data hub.

- ❖ **Great Plains Tribal Water Alliance (GPTWA):** Year 1 CP activities by co-PI Reinique Beck and Azmal Hossan (GPTWA Intern) included a review of Tribal water management documents, creation of an annotated bibliography, and additional interviews with Tribal water resource managers. The current effort expands previous NC CASC research on Tribal climate adaptation water needs in South Dakota to include interview data from Tribal water resource managers in Nebraska, Montana and Wyoming. To date, the project has engaged eight Tribes across South Dakota (Oglala Sioux Tribe, Rosebud Sioux Tribe, Lower Brule Sioux Tribe, Standing Rock Sioux Tribe, Yankton Sioux Tribe, Flandreau Santee Sioux Tribe, and Sisseton Wahpeton Oyate Sioux Tribe) and Nebraska (Ponca Tribe), with contacts established with water resource managers for three additional Tribes in Nebraska, one in Wyoming (Wind River Tribe in Wyoming) and one in Montana (Confederated Salish and Kootenai Tribe). The preliminary findings of the project were presented by Azmal Hossan at the NC CASC Annual Consortium Meeting (August 2025).
- ❖ **South Dakota State University (SDSU):** In Year 1, co-PI Jeff Martin and SDSU postdoctoral research fellow Alex Shupinski advanced the Consortium's objectives by (1) initiating and sustaining engagement with Tribal partners and key collaborators; (2) progressing bison climate-response research and management adaptation work; and (3) expanding Extension resources tailored for bison managers. Highlights include participation in the NC CASC's Actionable Science Working Group (ASWG), planning and IRB preparation for a nationwide bison-manager survey, delivery of a practical climate toolbox walkthrough for producers, and dissemination of preliminary research at the NC CASC Annual Consortium Meeting (August 2025).
- ❖ **The Nature Conservancy (TNC):** Co-PIs Marissa Ahlering and Terri Schulz actively engaged in NC CASC activities, including the NC CASC Full Team meetings and the Actionable Science Working Group (ASWG). Schulz and TNC colleague Olivia Millard led a webinar training for the ASWG on the Interested Party Engagement tool and how it is used to drive conservation engagement with partners at TNC. Additionally, Schulz and TNC colleagues Kelsey Molloy and Corinna Riginos

contributed knowledge and expertise in sagebrush systems on private lands to the NC CASC Sagebrush Working Group Science Synthesis (WGSS). In Year 1 Ahlering and Schulz also led a TNC project to identify project teams willing to engage in developing climate adaptation metrics. To date, they have mapped out the process for identifying project themes and teams willing to develop adaptation strategy measures, and evaluation metrics. They have also coordinated with NC CASC USGS colleagues (Meagan Oldfather and Molly Cross) to align the identified projects with the themes of USGS' meta-analysis of adaptation effectiveness.

- ❖ **University of Montana (UM):** In Year 1, co-PI Phil Higuera and UM postdoctoral research fellow Jamie Peeler focused on advancing and disseminating research on risk-informed wildfire planning, forest resilience, and carbon persistence. This period included one peer-reviewed journal article examining post-fire regeneration dynamics (see **APPENDIX II**: Vieira et al. 2024) and one interdisciplinary manuscript currently under review that evaluates how risk-based wildfire planning supports the persistence of large trees and their irrecoverable carbon. Project-supported findings were communicated through conference presentations delivered to national and international scientific and practitioner audiences. Higuera and Peeler also engaged directly with regional land and fire managers through ongoing consultations with staff from the Arapaho and Roosevelt National Forests and by organizing one practitioner-focused panel on wildfire, forest management, and public health that included air quality officials from Montana and Colorado.
- ❖ **University of Wyoming (UW):** Co-PI Corrine Knapp actively engaged in NC CASC Consortium activities, including participating in NC CASC bi-weekly Full Team meetings, monthly Climate Adaptation Science and Support calls, bi-monthly Actionable Science Working Group (ASWG) meetings, contributing to products (i.e., Sagebrush Adaptation Menu), and designing, implementing and mentoring a summer RCAP student (funded through a non-NC CASC source). The primary deliverable for Year 1 is a report (in development) that emerged from the UW RCAP summer student (Mariam Asaba) who conducted interviews with community leaders throughout Wyoming to understand what resilience means to small rural communities. In addition to contributing in these ways, Knapp also supported students, postdoctoral research fellows and research scientists working on climate adaptation-related projects, some of which are included in the list of outreach projects (**APPENDIX II**).

Capacity Building

NC CASC Capacity building activities help build a community of researchers and managers, and foster their leadership in science-based resource management. Year 1 Capacity Building activities included:

- 1) **Research Capacity Building** that develops the skills and knowledge of researchers and managers to more effectively co-produce and use actionable climate adaptation science. In Year 1 the primary *Research Capacity Building* activity was the NC CASC-hosted **Traditional Ecological Knowledge (TEK) Ethical Space Workshop** (see webstory: [Building Ethical Space](#)). In this two-part virtual workshop (July 29, 2025 and July 31, 2025) [James Rattling Leaf, Sr.](#) (NC CASC TEK Application Specialist and University of Colorado Boulder/CIRES Tribal Advisor) and [Gwen Bridge](#) (founder of Gwen Bridge Consulting, Tribal resource policy practitioner and facilitator) introduced participants to best practices for engagement and collaborative natural resources research and decision making with Indigenous Peoples, groups and Nations. The goals of the workshop were for participants to: (a) develop an understanding of a framework for engagement including individual preparation, organizational readiness, and engagement strategy; (b) learn how to integrate Ethical Space and

Indigenous worldview concepts into behavioral approaches to ensure organizational readiness for developing mutually beneficial projects; and (c) be better prepared to participate in more effective relationships with Indigenous Peoples around research collaboration and resource decision making.

2) Student/Early Career Capacity Building aims to train the next generation of scientists, resource managers and land stewards. Year 1 *Student/Early Career Capacity Building* activities included the six graduate research assistants (GRAs) involved in the 2025 RCAP projects. The NC CASC also leveraged additional funds from USGS Cooperative Ecosystem Studies Unit (CESU) grants that support the [National CASC's Climate Adaptation Scientists of Tomorrow \(CAST\)](#) program. In Year 1, the CAST program added capacity to two ongoing host award activities: (1) a CAST undergraduate research fellow supported the RCAP project on managing invasive species in Mancos Canyon Tribal Park; and (b) a CAST graduate research assistant supported the development of Strategy 1 of the Sagebrush Adaptation Menu that is one of the products of the Sagebrush WGSS described above (see **Science**). Heather Yocum is the Program Coordinator for the CAST program. This year, CU Boulder hosted seven CAST program funded summer undergraduate research fellows, and seven graduate students to support research on understanding compound disturbances in streamflow, water quality, and forest regeneration; climate impacts on pollinators; climate adaptation; environmental changes in sagebrush ecosystems; and water management.

Communications

*Communications and outreach are embedded in all NC CASC activities, and integrate our **Partnerships, Science, Capacity Building, and Communications and Outreach** efforts.* During Year 1, communication activities emphasized expanding web-based content, strengthening digital engagement, and supporting partner outreach through storytelling, social media, video, and webinars.

Key Year 1 communications and outreach highlights (October 1, 2024 to December 31, 2025) include:

- **10 new Science Spotlight Stories** and **26 Science Bytes** were published, translating NC CASC and partner research into accessible narratives for resource managers, Tribal Nations, and the public.
- **New and updated webpages** were launched on the NC CASC website, including the Rapid Climate Assessment Program (2025), Working Group Science Syntheses (WGSS), and the NC CASC Blog, improving access to current projects, student writing, and synthesis materials.
- **Bi-monthly MailChimp newsletters** were distributed, maintaining consistent communication with over 1,300 subscribers.
- **Six webinars** were hosted as part of the NC CASC Webinar Series, highlighting ongoing research and priority topics for natural resource managers.
- **Continued growth across the Center's social media, website, and YouTube presence** was observed, demonstrating strong and sustained engagement from partners and the broader public.

NC CASC Website: In Year 1, increased effort from NC CASC Communications Lead (Ulyana Horodyskyj Peña) and NC CASC Program Assistant (Hailey Robe) resulted in an expansion of written and multimedia content. The website features 10 new Science Spotlight Stories and 26 Science Bytes for this reporting period. The Rapid Climate Assessment Program (2025), Working Group Science Syntheses, and NC CASC Blog pages were built to improve visibility of ongoing projects, student contributions, and synthesis products.

NC CASC Newsletter: The bi-monthly MailChimp newsletter continues to effectively drive web traffic and track engagement metrics. Seven issues were released during Year 1 (September/October 2024 through September/October 2025), featuring news stories, partner highlights, and upcoming events.

Analytics show sustained open and click-rates, with the majority of engagement directed toward new Spotlight Stories and project updates.

Social Media and Subscribers: The NC CASC maintains a strong online presence with steady audience growth. Facebook followers grew to **423**, up from 388 in 2024. LinkedIn followers grew to **504**, up from 362 in 2024.

NC CASC YouTube Channel: The Center’s YouTube channel (youtube.com/@NorthCentralCASC) continues to expand as a key platform for science storytelling and outreach. As of 2025, the channel hosts 197 videos with 247 subscribers and 26,873 total views.

NC CASC Webinar Series: Since July 2020, the Center has hosted a total of 73 webinars, including six more in Year 1. These sessions highlight current NC CASC Consortium research and provide a venue for dialogue on climate adaptation, resource management, and Tribal resilience.

NC CASC Help Tickets: The internal Help Ticket system (Spiceworks) continues to facilitate communication support across the Center. During Year 1, Robe and Peña processed 71 help ticket requests, most requiring multiple responses. These tickets supported weekly highlights, website updates, social media posts, and event coordination.

5. OUTREACH

In Year 1, the NC CASC Consortium produced numerous outreach products and engaged with partners and practitioners in the North Central region. **Table 1** summarizes the Year 1 outreach products and activities by category; see **APPENDIX II** for a detailed list of these products and activities.

Table 1: Summary of Year 1 NC CASC Consortium outreach products and activities by category (October 1, 2024 to September 30, 2025).

Outreach Product/Activity	Funded by the Host Agreement	Leveraged the Expertise of NC CASC Consortium Personnel
Peer Reviewed Journal Articles and Technical Reports	5	7
Pre-Published Research	2	4
Project-Related Conference Presentations, Seminars, Webinars, and Public Presentations	18	11
Major Engagements with Regional Decision-Makers, Stakeholders, and Resource Managers	20	6
Other Products: Webpages, Videos, Factsheets and Research Briefs	2	4
Data Releases	3	–
New Climate Tools and Applications Released	3	–
Media Mentions	2	–

6. NEXT STEPS

In Year 2, the NC CASC Consortium will continue to develop and deliver actionable science relevant to the NC CASC's mission *to deliver science to help fish, wildlife, water, land, and people adapt to a changing climate*. The Host Team is effectively leveraging the efficient administrative, financial and compliance systems of CIRES and CU Boulder to responsibly manage the spending on the host agreement funds, subawards to Consortium Partner institutions, and USGS funded Pass-Through projects.

Partnerships: In Year 2, we will continue to strengthen partnerships with regional managers involved in the development of the Sagebrush Adaptation Menu via the *Working Group Science Synthesis*. The Host Team is also in the process of identifying six research projects for our *Rapid Climate Assessment Program* (RCAP) in Summer 2026. These RCAP projects will be designed to serve as a baseline for further research and a foundation for future stakeholder engagement.

Science: Our Year 2 science efforts are nested within the NC CASC's key program activities:

- **Climate Adaptation Science and Support (CASS):** CASS will continue to engage closely with regional partners through applied tool development, data support, and capacity-building activities. This includes the ongoing development and usability testing of an R Shiny application designed to support prediction and interpretation of warm-season rainfall variability in the Northern Great Plains. We will also continue to provide and refine snow depth datasets for partners at Montana Fish, Wildlife and Parks to support the wolverine vulnerability assessment, with engagement in Year 2 focused on interpretation and appropriate use of snow data, and integration into biological assessments. In addition, CASS will sustain engagement with partners at the USFWS on species status assessments and refuge planning efforts (e.g., NE Sandhills; Red Rock Lakes).
- **Rapid Climate Assessment Program (RCAP):** The Host Team will identify research topics for six RCAP projects in Summer 2026. These projects will synthesize research on climate, ecological, and social science topics in partnership with federal, state, and Tribal resource managers across the NC CASC region.
- **Working Group Science Synthesis (WGSS):** In Year 2, the draft Sagebrush Adaptation Menu will be revised following several rounds of input. The Consortium will also consult with our research partners and collaborators to identify a topical focal area for the second WGSS effort that is set to launch in Year 3 of our host agreement.
- **Actionable Science Working Group (ASWG):** Year 2 ASWG activities will focus on identifying the best practices and obstacles for generating science that is actionable. This research includes the collection of data from NC CASC Consortium Partners and end-users of NC CASC research on their project goals, engagement processes, outcomes, and perceived successes and challenges.

Capacity Building: Year 2 capacity building activities include: (a) supporting **six summer graduate research assistants** to conduct NC CASC research as part of our *Rapid Climate Assessment Program* (Summer 2026); (b) hosting a **Practitioner Tools Workshop** (June 2026) focused on Tribal resource professionals, with the goal of strengthening applied climate and ecological decision-support capacity across partner organizations; and (c) collaborating in-person with our Consortium Partners, USGS colleagues and BIA Tribal Climate Resilience Liaisons at our Annual Consortium Meeting in June 2026.

Communications: In Year 2, the communications team will continue to offer training and writing support to graduate research assistants involved in the *Rapid Climate Assessment Program* (RCAP) projects

(Summer 2026) and provide graphic design support in the development of the RCAP outreach products (Fall 2026). The Center is also about to launch a new video series called *Science Speaks* that will highlight the scientists behind NC CASC work and the innovative research helping communities and ecosystems adapt to climate change. In each video, researchers will share how their science is making a difference across the North Central region, from supporting farmers and ranchers to protecting wildlife and water resources.

7. BUDGET

Budget Information Removed from this Version of the Annual Report

APPENDIX I: Funded University of Colorado (CU) Personnel (Table A) and Leveraged Contributions from Personnel Funded Outside of the Host Agreement (Table B) for Year 1

APPENDIX I Table A: Total months of effort of University of Colorado Boulder (CU) personnel funded on the Host Agreement during the Budget Year 1 period; CIRES=Cooperative Institute for Research in Environmental Sciences; CP=Consortium Partner; WGSS=Working Group Science Synthesis; RCAP=Rapid Climate Assessment Program; NC RISCC=North Central Regional Invasive Species and Climate Change network; and TEK=Traditional Ecological Knowledge.

Person	Role	Responsibility	Total Months of Effort on Host Agreement for Year 1 Funds
William Travis	University Director/ NC CASC CU Leadership Team	Oversaw the host cooperative agreement and Leadership Team.	***Content Removed from this Version***
Jane Wolken	University Deputy Director/ NC CASC CU Leadership Team	Oversaw the day-to-day university operations of the Consortium, annual reporting, budget tracking in coordination with CIRES Finance to manage the host award, CP subawards and Pass-Through Projects, engaged in cross-CASC activities (e.g., network calls, in-person meeting), WGSS, RCAP and NC RISCC activities, supervised the communications team, and hired graduate students for NC CASC projects.	
Imtiaz Rangwala	Lead Climate Science/ NC CASC CU Leadership Team	Provided primary climate expertise to the NC CASC-directed projects, worked with boundary organizations to facilitate effective integration of climate research into natural resource management and planning, conducted research on ecological drought and transformation, co-hosted the NC CASC Webinar Series, and mentored postdoctoral research fellows and graduate students.	
Heather Yocum	Lead Social Science/ NC CASC CU Leadership Team	Provided social science expertise to NC CASC projects, facilitated co-production and creation of usable science, led the RCAP, co-hosted the NC CASC Webinar Series, and mentored postdoctoral research fellows and graduate students.	
Christy Miller Hesed	Actionable Science Lead/ NC CASC CU Leadership Team	Supported the actionable science and social science efforts of the NC CASC Consortium through the coordination of the Consortium Partners, supported the RCAP and WGSS research efforts, and helped build contacts and capacity in the state of Kansas.	
Chelsea Nagy	Co-Lead Ecologist/ NC CASC CU Leadership Team	Provided expertise on invasive species, wildfire and ecological transformation in the North Central region, leveraged NC RISCC program, supported RCAP and WGSS activities, and supervised graduate students.	

Laura Dee	Co-Lead Ecologist/ NC CASC CU Leadership Team	Provided expertise on ecology, ecosystem services and co-production with end-users to inform conservation and resource management under climate change.	***Content Removed from this Version***
Kyra Clark-Wolf	Co-Lead Ecologist	Provided expertise on ecological impacts and transformation under climate change, and co-led the WGSS focused on Sagebrush ecosystems.	
Ulyana Horodyskyj Peña	Communications Lead	Translated the science, capacity building and communication activities of the center into engaging outreach products for a diversity of audiences and outlets, led updates to the NC CASC Communication and Outreach Plan, and supported the science communication activities of the CASC-network.	
Hailey Robe	Program Assistant	Assisted the Host Team with daily operational activities, coordinated with the Communications Lead to keep the website and social media platforms up-to-date, compiled the <i>Weekly Highlights</i> , created communication products, supported the administration and event planning activities for the center.	
James Rattling Leaf, Sr.	TEK Application Specialist	Performed outreach and engagement activities to build/strengthen partnerships with Tribal organizations and colleges in the North Central region, and led the center's TEK-Ethical Space Framework workshop.	
Danyan Leng	Graduate Research Assistant	Conducted research in support of the RCAP.	
Patrick McKenzie	Graduate Research Assistant	Conducted research in support of the RCAP.	
Miles Moore	Graduate Research Assistant	Conducted research in support of the RCAP.	
Yuying Ren	Graduate Research Assistant	Conducted research in support of the RCAP.	
Chilton Tippin	Graduate Research Assistant	Conducted research in support of the RCAP.	
Elizabeth Woolner	Graduate Research Assistant	Conducted research in support of the RCAP.	

APPENDIX I Table B: Leveraged contributions from personnel funded outside of the Host Agreement.

Person	Institution	Role	Responsibility
Prasad Thota	CU Boulder	PhD Student supported by CIRES Fellowship	Conducted research in support of NC CASC efforts to understand the predictability for warm season precipitation in the northern Great Plains region.
Caitlin White	CU Boulder	Postdoctoral Associate	Provided ecological expertise and supported the Sagebrush WGSS effort and advised a related Sagebrush RCAP.
Katherine Hegewisch	University of California Merced	Project Scientist and Web Developer	Co-developed new tools and improved existing tools on ClimateToolbox.org .

APPENDIX II: NC CASC Consortium Outreach Products and Activities

In Year 1, the NC CASC Consortium developed and engaged in a variety of outreach products and activities. Note that NC CASC Host Team members and Consortium Partners appear in **bold** text; * indicates a product was not funded by the NC CASC, but leverages the expertise of NC CASC personnel:

Published peer reviewed journal articles and technical reports:

- **Clark-Wolf, K.**, Moss, W.E., Miller, B.W., **Rangwala, I.**, Sofaer, H.R., Schuurman, G. Magness, D., Symstad, A., Coop, J.D., Bachelet, D.B., Barsugli, J.J., Ciocco, T., Crausbay, S.D., Hoecker, T., Lewinsohn, J.S., Oldfather, M.F., Richmond, O.M.W., Rondeau, R., Runyon, A., Russell, R.E., and Wilkening, J.L. (2025). Ecological scenarios: embracing ecological uncertainty in an era of global change. *Ecosphere*, <https://doi.org/10.1002/ecs2.70278>.
- **Clark-Wolf, K.**, Miller, B.W. and **Rangwala I.** (2025). Managing forests and other ecosystems under rising threats requires thinking across wide-ranging scenarios. *The Conversation*, May 27, 2025, <https://theconversation.com/managing-forests-and-other-ecosystems-under-rising-threats-requires-thinking-across-wide-ranging-scenarios-253842>.
- Cross, M.E., **Ahlering, M.**, **Miller Hesel, C.D.**, Symstad, A., Szymanski, M.L., Vest, J., Mclean, K.I., Post van der Burg, M., Anteau, M.J., and Oldfather, M.F. (2025). Climate adaptation case studies for the 2025 revisions of the North Dakota State Wildlife Action Plan. USGS Cooperators Report, 20pp., <https://www.sciencebase.gov/catalog/item/68235709d4be025fcee55b1e>.
- ***Davidson, A.D.**, Thiesen Brum, F., Houts, M., Menefee, M. Sterling-Krank, L., Van Pelt, W., and Augustine, D.J. (2025). Potential landscapes for conservation of the black-tailed prairie dog ecosystem. *Diversity and Distributions*, 31(1):e13945, <https://doi.org/10.1111/ddi.13945>.
- *Donaldson, E., Wilmer, H., **Knapp, C.** and Derner, J. (2025). Understanding how ranchers adaptively manage for drought in Northeastern Colorado. *Journal of Rangeland Management*, 98:83-93, <https://doi.org/10.1016/j.rama.2024.08.026>.
- *Evans, A.E., Brewington, L, Brown Lima, C., Fusco, E., Gregg, R.M., Lieurance, D., Parsons, E., **Nagy, R.C.**, Thurman, L., and Morelli, T.L. (2025). Challenges and priorities for climate-informed invasive species management across multiple scales. *Conservation Science and Practice*, 7(7):e70074, <https://doi.org/10.1111/csp2.70074>.
- *Lynch, A.J., Ashander, J.D., Ciocco T.W., Cravens, A.E., Dassow, C.J., **Dee, L.E.**, Dunham, J.B., Eaton, M.J., Embke, H.S., Hennessy, J.M., Latzka, A.W., Lawrence, D.J., Littell, J.S., Miller, B.W., Palasti, L.A.; Runge, M.C., Sass, G.G., Shultz, A.D., Siegel, K.J., Svancara, L.K., Thompson, L.M., Thurman, L.L., Valler, J.B., Weiskopf, S.R., and **Yocum, H.M.** (2025). RAD (Resist-Accept-Direct) switch points and triggers for adaptation planning. *Journal of Environmental Management*, 392:126419, <https://doi.org/10.1016/j.jenvman.2025.126419>.
- Oldfather, M., Runyon, A., **Clark-Wolf, K.**, Moss, W., **Rangwala, I.**, Ciocco, A., Bamzai-Dodson, A., Sofaer, H., and Miller, B. (2025). Drought and deluge—opportunities for climate-change adaptation in US national parks. *Frontiers in Ecology and the Environment*, 23(7):e2858, <https://doi.org/10.1002/fee.2858>.
- **Rangwala, I.** (2024). Future climate scenarios for Colorado’s Front Range forests *In* Colorado Front Range climate change vulnerability assessment for National Forests. Hanberry, Brice B., ed. General Technical Report RMRS-GTR-438, Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, <https://doi.org/10.2737/RMRS-GTR-438>.
- *Vieira, S.T., Davis, K.T., Holden, Z.A., Larson, A.J., and **Higuera, P.E.** (2024). Western larch regeneration more sensitive to wildfire-related factors than seasonal climate variability. *Forest Ecology and Management*, 565: 122011, <https://www.sciencedirect.com/science/article/pii/S0378112724003232>.

- *Witinok-Huber, R., **Knapp, C.N.**, Lund, J., Eaton, W., Ewers, B.W., de Figueiredo, A.R., Geerts, B., Gunshenan, C.I., Inouye, M.C., Keller, M.L., Lumadue, N.M., Ryan, C.M., Shuman, B.N., Spoonhunter, T., and Williams, D.J. (2025). Does knowledge co-production influence adaptive capacity?: A framework for evaluation. *Environmental Science & Policy*, 164: 104008, <https://doi.org/10.1016/j.envsci.2025.104008>.
- *Willard, S., Gennet, S., Anderson, T., **Knapp, C.**, Lavalley, J., Ritten, J., Feldman, E., Hulvey, K., Nasto, M., Jacobs, M., and Watts, J. (2025). Examining potential climate benefits from range and pasture management practices in the United States: Opportunities, tradeoffs, and information gaps. *npj Sustainable Agriculture*, 3, 63, <https://www.nature.com/articles/s44264-025-00105-w>.

Pre-published research:

- *Bamzai-Dodson, A., Cravens, A.E., Clifford, K.R., **Yocum, H.M.**, and Arsenault, M. (*In Review*). Under the waterline: Illuminating the invisible labor of co-produced research. Submitted to *Sage Open*.
- **Peeler, J.L., Higuera, P.E.**, and O'Connor, C.D. (*In Review*). Risk-based wildfire planning supports persistence of large trees and their irrecoverable carbon. *Frontiers in Ecology and the Environment*.
- *Preston, C., Bennett, N., Goolsby, J., Ciocco, A., and **Yocum, H.M.** (*In Review*). The centrality of ethics in decisions about ecological transformation. Submitted to *Environmental Values*.
- Gonzalez Coffin, S., **Miller Hesed, C.D.**, **Yocum, H.M.**, and Roberts, R. (*In Revision*). Social science for climate-resilient grasslands: Strategies for individual and systemic adaptation. Submitted to *iScience*.
- *Phillips, A., Widga, C., **Martin, J.M.**, Ovchinnikov, I.V., Todd, L.C. , Baldes, J., and Cannon, K.P. (*In Press*). Diet and morphological variation in bison (*Bison bison*) from the Bighorn Basin, Wyoming, USA. The North American Bison Management System: Sustainability, One Health, Ecological Restoration, and Ecological Resilience. Submitted to *Frontiers in Ecology and Evolution – Themed Article Collection*.
- ***Shupinski, A.B.**, **Martin, J.M.**, Brock, B.L., Otárola-Castillo, E., Hill, M.E., Jr., Widga, C., Rudnik, J., and Short, R.A. (*In Press*). Significant northwest shift in suitable climate expected for North American bison by the Year 2100. The North American Bison Management System: Sustainability, One Health, Ecological Restoration, and Ecological Resilience. Submitted to *Frontiers in Ecology and Evolution – Themed Article Collection*, <https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2025.1695457/abstract>.

Data releases:

- Standardized Precipitation Evapotranspiration Index (SPEI) Projections Data to support the NC CASC's scenario planning work: <https://nccasc.colorado.edu/news/new-climate-dataset-offers-high-resolution-projections-future-drought-risk-across-us>
 - Data published on USGS ScienceBase: <https://www.sciencebase.gov/catalog/item/672bdd7bd34e16b32e739aff>
 - Data published on a Thredds Server: http://thredds.northwestknowledge.net:8080/thredds/cires_nccasc_drought_catalog.html.
- Updated Landscape Evaporative Response Index (LERI) data (2000-2024) hosted on USGS ScienceBase: <https://www.sciencebase.gov/catalog/item/5c8020d7e4b0938824459be9?a=1747078545852>.

New climate tools and applications released:

The climate tools and workflows listed below were released on Climate Toolbox (climatetoolbox.org) and originated from the USGS funded Pass-Through Project, *On-Demand Quantitative Climate Scenario Summaries Tool for Species Status Assessments and Scenario Planning* (G22AC00394). They are included

here, as the host award (G24AC00632) supports the sustained collaboration required to maintain and enhance these tools and applications over time. Host award support enabled continued engagement with the Climate Toolbox developer, Katherine Hegewisch, as well as contributions from several NC CASC staff to refine existing tools, add new variables and datasets, and improve selection and reporting features. These activities represent ongoing maintenance, expansion, and stakeholder-driven improvement supported by the host award funding rather than development tied to a single project:

- Climate Scenarios Workflow page on Climate Toolbox: <https://climatetoolbox.org/climate-scenario-workflow>
- Added individual model projections to [Future Time Series tool](#) on Climate Toolbox
- Continuing improvements to [Future Climate Scenarios Tool](#), in particular adding new abilities for region selection and display of final report

Project-related conference presentations, seminars, webinars, workshops, and public presentations:

- **Ahlering, M., Schulz, T.,** and Hall, K. (October 23, 2025): Developing best practices for creating and implementing climate adaptation measures for conservation actions. *NC CASC Climate Adaptation Science and Support Monthly Call*, virtual presentation.
- **Clark-Wolf, K.** (June 12, 2025): Ecological scenarios: embracing ecological uncertainty for climate change adaptation. *NC CASC Webinar*, virtual presentation.
- **Davidson, A.D.** (January 2025): Uncovering the genetic fingerprint and evolutionary trajectory of plague resistance in prairie dogs. *Black-Footed Ferret Recovery Implementation Meeting 2025*. Fort Collins, Colorado.
- **Davidson, A.D.** (January 2025): Addressing America's biodiversity crisis across the Central Grasslands. *Black-Footed Ferret Recovery Implementation Meeting 2025*. Fort Collins, Colorado.
- **Davidson, A.D.** (February 18, 2025): Addressing America's biodiversity crisis across the Central Grasslands. *Drivers of Biodiversity Crisis: America at a Crossroads Seminar Series, Defenders of Wildlife*, Denver, Colorado.
- **Davidson, A.D.** (February 2025): The importance of Western Grasslands in prairie dog ecosystem conservation and updates on prairie dog-plague research in Thunder Basin. *Thunder Basin Research Initiative*, Douglas, Wyoming.
- **Davidson, A.D.** (May 2025): The importance of Western Grasslands in prairie dog ecosystem conservation and updates on prairie dog-plague resistance research. *The Wildlands Network*, virtual presentation.
- **Davidson, A.D.** (August 13, 2025): Conserving the prairie dog ecosystem: Priority areas, management tools and genomic insights. *North Central Climate Adaptation Science Center Annual Consortium Meeting*, University of Colorado Boulder, Boulder, Colorado.
- **Davidson, A.D.** (September 2025): Conserving the Prairie Dog ecosystem: Priority areas, management tools, and genomic insights. *United States Fish and Wildlife Service*, Fort Collins, Colorado.
- **Davidson, A.D.** (December 2025): From Fort Collins natural areas to the Central Grasslands: genomics, decision support, and priority areas for prairie dog ecosystem conservation, *City of Fort Collins Natural Areas*, Fort Collins, Colorado.
- **Horodyskyj Peña, U., Travis, W., Wolken, J., Robe, H., Rangwala, I., Yocum, H., Miller Hesed, C., Clark-Wolf, K.,** Cross, M., Miller, B., and **Rattling Leaf, J., Sr.** (May 15, 2025): The North Central Climate Adaptation Science Center: Serving the States of Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota and Wyoming. Poster presentation at *CIRES Rendezvous*, University of Colorado Boulder, Boulder, CO.

- ***Higuera, P.H.** (March 1-8, 2025): Wildfires are inevitable. How can we minimize human suffering? *IEEE Aerospace Conference*, Yellowstone Conference Center, Big Sky, MT.
- ***Knapp, C.** (May 19, 2025): The status of climate-related research in the United States. *Umea University*, Umea, Sweden.
- ***Knapp, C.** (May 23, 2025): Navigating uncertainty: Harnessing scenario planning to address uncertainties, envision futures and identify actions. *The Royal Skyttean Society*, Umea, Sweden.
- ***Knapp, C., Witinok-Huber, R. and Lamsal, U.** (May 26, 2025): Understanding and measuring capacity for change. *Umea Transformation Research Initiative*, Umea, Sweden.
- **Leng, D., Shupinski, A.B., Rangwala, I., and Martin, J.M.** (August 13, 2025): Unraveling the consequences of climate change on the bison presence and sustainability across the U.S. continent. *Annual NC CASC Consortium Meeting*, University of Colorado Boulder, Boulder, CO.
- ***Martin, J.M.** (April 1-4, 2025): A climate toolbox for bison managers. *North American Bison Summit*, Loveland, CO.
- ***Martin, J.M.** (April 5, 2025): Invited Keynote Speaker, “25-Year ranch planning: Climate change adaptation by 2050,” *Educational Spring Conference of the Minnesota Bison Association*, Detroit Lakes, MN.
- **Miller Hesel, C.D.** (December 20, 2024): The North Central Climate Adaptation Science Center Rapid Climate Assessment Program: Findings and opportunities for the Bureau of Land Management, *Bureau of Land Management Adaptive Management Community of Practice Monthly Meeting*.
- ***Peeler, J.L., Riley, K., Houtman, R., and Zimmer, S.** (2025): Mapping wildfire risk to carbon for the contiguous US using a tree-level forest dataset. *Wildfire Risk Management Science Webinar Series*, Rocky Mountain Research Station, USDA Forest Service, Invited Presentation.
- **Rangwala, I.** (November 19, 2024): Climate tools and methods for climate adaptation, *CASC Futures Forum*, Intercontinental Hotel, San Diego, CA.
- **Rangwala, I.** (June 3, 2025): Climate change and impacts for Colorado’s west slope. Teacher Workshop on *Resilient Futures in Rural Colorado: Climate Change Science, Adaptation & Mitigation*, Gunnison, CO.
- **Schulz, T.** and Millard, O. (April 8, 2025): TNC’s Interested Party Engagement Tool. *NC CASC Actionable Science Working Group bi-monthly call*, virtual presentation and discussion of how this tool is used to drive conservation engagement with partners at TNC.
- **Shupinski, A.B. and Martin, J.M.** (March 27, 2025): North American habitat suitability modeling of bison (*Bison bison*) to identify regions for long-term adaptation and restoration. *North Central Climate Adaptation Science Center Climate Adaptation Science and Support Monthly Call*, virtual presentation.
- ***Shupinski, A.B., Martin, J.M., Rudnik, J., and Short, R.A.** (June 15-20, 2025): Leveraging 21,000 years of past data to anticipate change in climate suitability of North American bison (*Bison bison*) by 2100. *International Congress for Conservation Biology*, Brisbane, Australia.
- **Thota, S.S.S.P., Rajagopalan, B. and Rangwala, I.** (December 11, 2024): Drivers and predictability of the warm-season precipitation in the Northern Great Plains. *American Geophysical Fall Meeting*, New Orleans, LA.
- ***White, C.** and Merchant, T. (May 29, 2025): From fire to function: Leveraging big data to navigate ecosystem change and restoration in the Great Basin sagebrush sea. Presentation at monthly *NC CASC Climate Adaptation Science and Support Monthly Call*, virtual presentation.
- ***Witinok-Huber, R., Knapp, C., Lamsal, U.** (June 12, 2025): When does knowledge co-production mitigate climate change disparities?: Operationalization of a framework to measure progress towards adaptive capacity in socio-ecological systems, *International Association for Society and Natural Resources Conference*, Vancouver, BC, Canada.

- *Witinok-Huber, R., **Knapp, C.**, and Lamsal, U. (June 17, 2025): Operationalization of a framework to measure progress towards adaptive capacity in socio-ecological systems, *Climate Adaptation Science Centers Evaluation Working Group*, virtual presentation.

Major engagements with regional decision-makers, stakeholders, and resource managers:

- *Black, J., Wahwahsuck, K., Durglo, M., and **Yocum, H.M.** (October 15-17, 2024): NC CASC Host Team member Yocum co-hosted a *Tribal Climate Workshop* in Polson, MT. This engagement was funded by the Bureau of Indian Affairs and the Environmental Protection Agency, and leveraged Heather Yocum’s time on the NC CASC Host Agreement.
- **Clark-Wolf, K., Rangwala, I., Miller Hesed, C.D., Yocum, H.M., Wolken, J.M.**, and Bradford, J. (June 9, 2025): *Sagebrush Working Group Science Synthesis Introductory Meeting*. This virtual engagement included 14 working group participants outside of the NC CASC Host Team and launched the ongoing Sagebrush Working Group Science Synthesis ([WGSS](#)) effort, a core science activity on the NC CASC Host Agreement.
- **Horodyskyj Peña, U., Rangwala, I. and Yocum, H.M.** (April 8, 2025): Members of the NC CASC Host Team participated in the inaugural *CIRES Science Summit* hosted by the Cooperative Institute for Research in Environmental Sciences (CIRES). The meeting strengthened internal networks at the University of Colorado Boulder, fostered collaborations, encouraged innovative thinking and amplified research, outreach and engagement efforts within CIRES, University of Colorado Boulder, Boulder, CO.
- **Knapp, C.** (Summer 2025): Rural Community Resilience Assessment. Co-PI Corrine Knapp at the University of Wyoming conducted 37 interviews with rural community leaders from throughout Wyoming.
- **Knapp, C.** (2025-2026): Wind River Tribal Water Assessment and Planning. This engagement includes ongoing meetings with Tribal partners, the Tribal Water Board, and key leaders to design a project to assess perceptions of change.
- ***Knapp, C.**, Bourque, M. and Hamerlinck, J. (December 5-7, 2025): Organized a *Climate Change Wayfinding Workshop*, University of Wyoming, Laramie, Wyoming.
- **Miller Hesed, C. and Yocum, H.** (and NC CASC USGS Colleagues). 2025. Meetings with the Colorado Office of Climate Preparedness and Disaster Recovery, Colorado Governor’s Office regarding updating the Climate Preparedness Roadmap.
- **Miller Hesed, C.** collaborated with Kynser Wahwahsuck (NC CASC Tribal Climate Resilience Liaison) and Brett Ramey (Tribal Consultant and Iowa Tribe of Kansas and Nebraska Climate Resilience Planner) to engage with the Environmental Protection Agency Regional Tribal Operations Committee (including 9 Tribes across Kansas, Nebraska, and Iowa) on incorporating community engagement and Traditional Ecological Knowledge into their environmental projects and planning. This engagement is also laying the foundation for a Tribal Adaptation Menu workshop.
- **Peeler, J.L.** (Ongoing Year 1 Effort): Connected with fire and forest management staff for the Arapaho and Roosevelt National Forests about findings from an all-lands study on seasonal wildfire hazard in the Colorado Front Range.
- **Rangwala, I., Robe, H. and Wolken, J.M.** (September 15-18, 2025): Attended the *CASC Consortium Meeting*, Juneau, AK. This meeting hosted by the Alaska Climate Adaptation Science Center convened Consortium members from the nine regional Climate Adaptation Science Centers. Attendees engaged in discussions on aligning research efforts with new Administration/DOI priorities, and evaluating cross-regional to network-scale research activities and opportunities.
- **Rattling Leaf, J., Sr.** and Bridge, G. (December 18, 2024): Presentation on Economic Futures 2025 at the *Oceti Sakowin Treaty Conference & Climate Conference*, Rapid City, SD.

- **Rattling Leaf, J., Sr.** (January 8, 2025): Presentation at the *Upper Missouri River Basin Soil Moisture & Snowpack Network Annual Meeting*, online meeting.
- **Rattling Leaf, J., Sr.** (February 18, 2025): Presentation on Centering Tribal Nations in Biodiversity at the *Defenders of Wildlife Colorado Biodiversity Symposium*. James Rattling Leaf's presentation may be viewed at 12:15 minutes in this link: <https://www.youtube.com/watch?v=u6U0fPvqwvQ>.
- **Rattling Leaf, J., Sr.** and Bridge, G. (July 29 and July 31, 2025): Co-led two virtual sessions for the NC CASC hosted *Traditional Ecological Knowledge Ethical Space Workshop*.
- **Rattling Leaf, J., Sr.** (August 9, 2025): Presentation at the meeting of the *USGS Biodiversity and Climate Change Assessment*.
- **Rattling Leaf, J., Sr.** (December 8, 2025): In this *Buffalo Restoration Mixer* hosted by the *Colorado Buffalo Collective* at the University of Colorado Boulder, James Rattling Leaf, Sr. met with undergraduate and graduate students from various departments at the University of Colorado Boulder to discuss ongoing Buffalo restoration efforts.
- ***Shupinski, A.B., Rudnik, J., Short, R.A., and Martin, J.M.** (August 20, 2025): Presented research on evaluating bison climate suitability in North America to identify regions for long-term restoration, *Board Meeting, InterTribal Buffalo Council*, Rapid City, SD.
- ***Shupinski, A.B., Martin, J.M., Rudnik, J., and Short, R.A.** (January 23, 2025): Presented research on identifying regions for long-term restoration of bison in North America using habitat suitability modeling, *Annual Winter Conference, National Bison Association (NBA)*, Broomfield, CO.
- ***Shupinski, A.B., Martin, J.M., Rudnik, J., and Short, R.A.** (January 20, 2025): Presented research on identifying regions for long-term restoration of bison in North America using habitat suitability modeling, *Continental Bison Working Group Conference, INDIGENOUS LED*, Broomfield, CO.
- **Wolken, J.M.** (November 6, 2025): *CIRES Science Summit*, University of Colorado Boulder, Boulder, CO. Building off the successes of the Science Summit hosted by CIRES in April 2025, this meeting further strengthened internal networks at the University of Colorado Boulder, fostered collaborations, encouraged innovative thinking and amplified research, outreach and engagement efforts within the CIRES community.
- **Wolken, J.M.** (December 6-7, 2025): Jane Wolken was invited to participate in the *Climate Wayfinding Workshop* at the Center for Rural Community Resilience & Innovation, University of Wyoming, Laramie WY. This workshop convened by NC CASC Consortium Partner Corrine Knapp provided opportunities for the NC CASC Host Team to establish connections with researchers at the University of Wyoming.
- **Wolken, J., Travis, W., Rangwala, I., Yocum, H., Miller Hesed, C.D., Clark-Wolf, K., Horodyskyj Peña, U., Robe, H., and Rattling Leaf, J., Sr.** (August 13-15, 2025): *NC CASC Annual Consortium Meeting*, University of Colorado Boulder, Boulder, CO. This workshop convened the NC CASC Consortium, including the Host Team, Consortium Partners, Tribal Climate Resilience Liaisons and USGS partners to reflect on the center's successes and challenges of the Year 1 actionable science activities, increase capacity for ethical work with Tribal nations and engagement with Traditional Ecological Knowledges, and strategically plan for activities in Year 2 and beyond to address emerging needs and opportunities for successful management of natural and cultural resources in a changing climate.
- ***Yocum, H.M., Cravens, A.E., Tangen, S., Goolsby, J., and Chaffin, B.** (November 4-5, 2024): Heather Yocum and research collaborators hosted a workshop on white bark pine with Confederated Salish Kootenai Tribes and Glacier National Park. This activity was fully funded by a USGS Pass-Through Project.

- **Yocum, H., and Miller Hesed, C.** and colleagues at Western Water Assessment. (2025): Meetings with Western Water Assessment regarding input on the Climate Change in Colorado Report for the Colorado Water Conservation Board.
- **Yocum, H.M., Wolken, J.M. and Rattling Leaf, J., Sr.** (December 8, 2025): NC CASC team members participated in a new [Sustainability Research Initiative](#) at the University of Colorado Boulder. This one-day in-person workshop brought together researchers from different academic units and disciplines to share expertise, find synergies and identify opportunities to address the sustainability challenges associated with the rapid expansion of AI systems and data centers.
- Several members (**R.C. Nagy, J.M. Wolken, K. Clark-Wolf, I. Rangwala, C. White**) of the NC CASC Host Team helped facilitate a *North Central Regional Invasive Species Climate Change (NC RISCC) Invasive Annual Grass Adaptation Menu Workshop* to review and refine a draft adaptation menu focused on annual invasive grass management. This workshop was held on November 12-13, 2025 with stakeholders primarily from local and state government, as well as other partner organizations. A separate workshop was held in January 2026 to gather input from additional members of the federal government who were unable to attend the first workshop.

Other products (e.g., websites, factsheets and research briefs created for project-related information):

- Asaba, M., **Knapp, C.**, Hamerlinck, J. and Gansauer, G. (2025). Center for Rural Community Resilience and Innovation Rural Community Resilience Report. Deliverable from Summer 2025 RCAP project.
- ***Davidson, A.D.** HOMES ON THE RANGE: Potential landscapes for conservation of the Black-Tailed prairie dog ecosystem, Colorado Natural Heritage Program, <https://cnhp.colostate.edu/projects/hotr/>.
- ***Davidson, A.D.** ENABLING DISCOVERY THROUGH GENOMICS: Uncovering the genetic fingerprint and evolutionary trajectory of plague resistance in prairie dogs, Colorado Natural Heritage Program, <https://cnhp.colostate.edu/projects/pdogedge/>.
- Hefty, K., Fox Rushing, J., Ben-Horin, D., Spencer, A., Grant-Hoffman, M., Weeks, D., **Clark-Wolf, K., Rangwala, I.**, Parks, S., Klasner, F. and Hollingsworth, T. (2026). RAD Decisions in Rad Landscapes: Black Ridge Canyons Wilderness. *Zenodo*, <https://doi.org/10.5281/zenodo.18224903>.
- ***Martin, J.M.** (2025). Climate toolbox how-to: Preparing your ranch for future climate scenarios. *South Dakota State University Extension Article*, <https://extension.sdstate.edu/climate-toolbox-how-preparing-your-ranch-future-climate-scenarios>.
- ***Watts, J., Ganett, S., Knapp, C.N., Lavalee, J., Ritten, J., Hulvey, K., Nasto, M., Feldman, E., Willard, S. and Toureene, C.** (2025). Grazing lands management practices: An assessment of climate outcomes. *Technical Advisory Network for Climate Smart Agricultural Practices*, <https://zenodo.org/records/15750303>.

Media mentions:

- **Clark-Wolf, K. and Rangwala, I.** (May 2025): University of Colorado News Brief about piece published in The Conversation. <https://www.colorado.edu/today/2025/05/27/managing-forests-and-other-ecosystems-under-rising-threats>.
- **Clark-Wolf, K. and Rangwala, I.** (May 2025): Cooperative Institute for Research in Environmental Sciences (CIRES) News Brief highlights paper published in Ecosphere, <https://cires.colorado.edu/spotlights/embracing-ecological-uncertainty-era-global-change>.