

North Central Climate Adaptation Science Center



North Central
Climate Adaptation
Science Center

External Review Team Final Report

Prepared with and on behalf of the NC CASC External Review Team

Author of this report: Donna Silverberg and her team Colby Mills, Tina Patterson, and Charles Wiggins; With acknowledgments to ERT Members Julien Lartigue (NOAA RESTORE Science Program), Beth Rose Middleton (UC Davis), John Tull (USFWS), and Anne Wein (USGS –Western Geographic Science Center)

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Table of Contents

<i>Background Information</i>	1
About the Review Process	1
Purpose of the Review	1
External Review Model Framework	1
External Review Categories and Process Schedule	2
External Review Team (ERT)	2
<i>Findings of the ERT – Administrative Management</i>	3
RECOMMENDATIONS: Administrative	8
<i>Findings of the ERT – Scientific Achievements</i>	9
RECOMMENDATIONS: Scientific Achievement	12
<i>Findings of the ERT – Collaborative Efforts</i>	14
RECOMMENDATIONS: Collaborative Efforts	16
<i>Findings of the ERT – Capacity Building</i>	18
RECOMMENDATIONS: Capacity Building	20
<i>Findings of the ERT – Outreach and Communications</i>	22
RECOMMENDATIONS: Outreach and Communications	23
<i>Findings of the ERT – Overall Effectiveness Towards Host Agreement</i>	24
OVERALL ERT RECOMMENDATIONS	25
<i>APPENDICES & ATTACHMENTS</i>	xxix
Appendix 1 – Attendees	xxix
Appendix 2 – Daily Review Session Agendas and Summaries	xxx
Day 1: Administrative & Fiscal Management	xxx
Day 2: Progress in Adaptation Science and Collaborative Efforts.....	xxxix
Day 3: Capacity Building & Outreach and Communications	liii
Day 4: Overall Effectiveness Towards Host Agreement.....	lx

Background Information

About the Review Process

The external review of United States Geological Survey (USGS) Regional Climate Adaptation Science Centers' (RCASCs or CASCs) Host-Universities is designed to gain information and insights from external reviewers about the activities and effectiveness of each RCASC Host-University, and to inform decisions about USGS's future development and administration of Host-University partnerships (this and additional information can be found [here](#).)

Donna Silverberg Consulting ([DS Consulting](#)) is the External Review Manager selected by the National Climate Adaptation Science Center (NCASC) through an open solicitation to design, coordinate, and conduct the structural and operational review component of the external reviews for all eight RCASC Host-Universities, including report-writing with and on behalf of the ERT. The DS Consulting team consists of:

Donna Silverberg, JD (Principal, and External Review Team Lead, Facilitator, & Manager)
Tina Patterson, MA Dispute Resolution, MDR, MCI Arb, CF APMP, CICM (Project Advisor and ERT Facilitation Support)
Colby Mills, BA Anthropology (Logistics and ERT Facilitation Support)
Michelle Helman, MA Peace & Conflict Studies (Evaluation Specialist)

Purpose of the Review

1. **Assess the competencies, efficiencies, challenges, and areas for improvement** of each RCASC Host-University in managing the administrative requirements and terms and conditions of the corresponding Host Agreement;
2. **Assess the contribution** by each RCASC Host-University and associated academic Consortium with respect to:
 - a. Scientific Achievements on climate impacts and vulnerability science;
 - b. Collaborative Efforts with stakeholders to develop adaptation products applicable to priority regional decision-making;
 - c. Education and Training of early career professionals; and
 - d. Outreach and Communication services;
3. **Review the effectiveness** of each RCASC Host-University and associated academic Consortium in meeting the goals established under their current Host Agreements;
4. **Aid** the National Climate Adaptation Science Center (NCASC) in developing improved requirements for re-competition of the next university Host Agreements.

External Review Model Framework

1. What was the Host's proposed approach?
2. What did the Host implement and how did they do it?
3. So what: What did the Host learn? How did they respond and adjust?

External Review Categories and Process Schedule

The North Central CASC (NC CASC) External Review Team (ERT) was asked to focus on specific categories stemming from the Host-University's Proposal Narrative. These categories and the dates devoted to their discussion follows. Daily summaries of the ERT Sessions and a listing of session attendees may be found in the Appendices.

	March 6	March 7	March 8	March 9
Topic	Administrative Management 	 Scientific Achievements and Collaborative Efforts 	 Capacity Building and Outreach & Communications 	Overall Effectiveness towards Host's Proposed Goals

External Review Team (ERT)

Review Team composition:

ERT members were nominated by USGS administrators and then selected by the ERT Manager based on the following criteria, with a goal of having an ERT that had varying degrees of experience and expertise to suit the CASC. Each member had:

1. Scientific, administrative, and/or stakeholder engagement process knowledge;
2. Working knowledge of the CASC Network;
3. Time, willingness, and support to serve on the ERT;
4. No conflict of interest (e.g., not receiving funding from any CASC at this time, nor expecting to receive funding from the CASC they were reviewing in the next funding cycle).

NC CASC ERT members included:

- Julien Lartigue, Ph.D., Director, National Oceanic and Atmospheric Administration (NOAA) RESTORE Science Program
- Beth Rose Middleton Manning, Ph.D., Professor, Dept. of Native American Studies, Yocha Dehe Endowed Chair in California Indian Studies, University of California, Davis
- John Tull, Ph.D. Nevada Science Coordinator, Science Applications, Region 8, U.S. Fish & Wildlife Service
- Anne Wein, Ph.D, Science Application for Risk Reduction, Western Geographic Science Center, U.S. Geological Survey

All ERT members signed Conflict of Interest and Non-Disclosure forms prior to participating in the review.

Findings of the ERT – Administrative Management

	Institutional Development <i>Staffing, Leadership Team, and Consortium Members</i>		Fiscal Management <i>Budget, awards, and grant management</i>
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The Host and Consortium

The ERT finds that the Host institution, and CIRES in particular, has both research strengths and an impressive institutional structure in place to support the university side of the NC CASC. University of Colorado-Boulder (CU-Boulder) (hereafter Host) is an R1 research institution that has experience working with NOAA and NASA programs, and now with the USGS CASC program. The NC CASC is hosted within the Cooperative Institute for Research in Environmental Sciences (CIRES), an institute that includes the Center for Microbial Exploration, the Center for Social and Environmental Futures, the Earth Science and Observation Center, the National Snow and Ice Data Center and, as of 2018, the NC CASC. CIRES is organized into six (6) divisions: Weather and Climate Dynamics; Ecosystem Science; Cryospheric and Polar Processes; Environmental Chemistry; Environmental Observation Modeling and Forecasting; and Solid Earth Sciences.

The Host has provided highly skilled staff, robust administrative and fiscal support, and on-campus offices for the CASC and federal scientists. As such, the NC CASC has opportunities to call upon other CIRES programs to help bolster all their teams. The Host noted the wide range of skills on the NC CASC team, emphasizing their efforts with Tribal liaisons, post-doctorate programs that help to build the future of professionals in climate science, data and technology development, as well as outreach and communications.

The ERT notes that the Host has put in place a solid structure of support for the Host CASC team and Consortium Partners, and has developed tools to streamline administrative and fiscal needs (e.g., a financial dashboard for examining project invoicing and balances). The ERT learned on Day 1 that the Host works with Tribal partners, regional universities, land managers at federal and state agencies, and USGS, to assess the impact of climate, climate variation, and climate change on species and ecosystems. In addition, they work together to address evolving issues such as wildfire, the frequency of drought, and the impacts these climate hazards have on regional natural resources.

The Host informed the ERT that they are committed to:

- Fostering an environment of respect and inclusion within their organization, and with the partners and communities with whom they collaborate;
- Remaining open to learning from mistakes;
- Supporting underserved communities to address their climate adaptation needs; and
- Training the next generation of climate-smart researchers and managers.

Leadership & Management Approach

To assist with strategic direction and alignment, the Host and USGS developed a unified ‘Theory of Change’ (TOC) through a strategic planning process that allowed the Host and its partners to co-develop a shared vision for the center. This process created a framework within which the NC CASC team (Host, USGS and Consortium Partners) could identify the Center’s aspirational goals and what they need to do to achieve this vision. The TOC lays out the impact the CASC hopes to have, the vision they share, and the outcomes they seek to achieve.

The Host-University leadership team is comprised of Director William Travis; Deputy Director Jane Wolken; Climate Science Lead Imtiaz Rangwala; Social Science Lead Heather Yocum; and Communications Lead, Ulyana Horodyskyj Peña. This group works together with their Consortium Partners (CPs). The NC CASC Consortium partnership provides a diverse set of expertise, interests, stakeholders, and geography:

- **Conservation Science Partners** (PI Caitlin Littlefield, formerly Shelley Crausbay): ecological scenarios and transitions, ecological drought, spatial analysis;
- **Great Plains Tribal Water Alliance** (GPTWA) (Tribal Engagement Specialist James Rattling Leaf, Sr. & Tribal Resilience Liaisons Stefan Tangen and Kynser Wahwahsuck): initial link to Tribal interests, which evolved into internal programs (e.g., Tribal Climate Leadership Program (TCLP), climate adaptation planning and training, and recently a strengthened formal partnership with GPTWA;
- **South Dakota State Univ.** (PI Laura Edwards & PI Jennifer Zavaleta Cheek): Great Plains working landscapes (ranching, cropping), grassland climate & ecology, links to Tribes and state agencies;
- **Univ. Montana** (PI Phil Higuera): Northern Rockies forests, fire, and forest stakeholders; and
- **Wildlife Conservation Society** (PI Molly Cross): Wildlife, ecology, climate and adaptive management, leadership in adaptation planning and evaluation, working with state wildlife agencies and other partners.

The Host leadership structure has evolved over the 5-year hosting agreement, with both leadership and staffing changes. The current meeting structure summarized below helps meet the day-to-day administrative and operational needs of the NC CASC:

- Weekly Host Leadership Team meetings (includes Host Director, Deputy Director, Climate Science Lead and Social Science Lead)
- Weekly Communication Team Meetings (includes Host Deputy Director, Communication Lead and Program Assistant)
- Bi-weekly Host Team meetings (includes Host Leadership and Program staff and scientists)
- Bi-weekly All Hands Staff calls (includes USGS Leadership and staff, Host Team and Consortium Partner PIs)

- Bi-weekly NC CASC Leadership (includes Host and USGS Directors, and Deputy Directors)
- Monthly Finance Administrative meetings (includes Host Director and Deputy Director, and CIRES Finance Administrators)
- Monthly Climate Science Support Platform (CSSP) calls (includes University and USGS scientists and staff)

The above list does not include project specific meetings, and cross-CASC meetings (e.g., University Directors meetings, cross-CASC communications calls, etc.).

The ERT finds that the Host, Host Consortium and USGS appear to have productive working relationships that have solidified after leadership and personnel shifts over the past five years.

Administrative & Fiscal Management

The ERT notes that the Host-University has a robust administrative infrastructure with strong human resource and financial management infrastructure in CIRES, centered on federal – university relationships. The pre- and post-award administrators are knowledgeable and, by being administratively housed within CIRES, the NC CASC, both Host and USGS, has access to additional administrative support during peaks in administrative activity.

The Host noted that requirements for federal funding can often be a barrier to under-resourced entities accessing federal funds. The NC CASC (Host and USGS) should be commended for providing subawards to collaborators who may not be able to receive federal funds directly, or to buffer the delays that sometimes come with federal funds tied to budget approval processes. The Host and USGS are able to leverage capacity from an overarching university institution (CIRES) that appears to provide capacity, resources, and expertise that are beneficial for the administrative functions related to budgets, grants, and human resource management.

One ERT member noted, “The management in CIRES is among the best I have seen in terms of structure, number of personnel, expertise, and experience with cooperative agreements and subawards.”

The ERT finds that the Host is fully grasping the administrative and fiscal requirements and is fully meeting the terms of their agreement with USGS.

Administrative Competencies

As noted above, the Host has access to substantial expertise in pre- and post-award administration by virtue of being administratively housed in CIRES, making for a competent administrative Host. CIRES has a robust financial and administrative team with experience working on federal cooperative agreements, awards, and contracts. Other competencies the ERT noted are:

- A strong and inclusive commitment statement that communicates thoughtful DEI, and a collaborative approach that includes respect for different knowledge systems, and sensitively and accurately refers to Tribal partners as rights-holders, not stakeholders;
- Tribal engagement;
- Extensive experience, capability, and capacity within administration of CIRES;
- Financial administration and guiding/supporting proposers through the process;
- Adaptability to disruptions (e.g., of Covid-19) and pivoting to opportunities (e.g., presented by Covid-19);
- Overcoming obstacles (e.g., contracting with GPTWA);
- Responding to partner/user needs (e.g., grasslands synthesis);
- TOC framework for common vision driving activities and indicators;
- CIRES support of scientists and their passion;
- University's ability to respond on administrative aspects faster than USGS;
- Institutional Review Board (IRB) review of human subjects research; and
- A clear commitment from and camaraderie of staff.

Administrative Efficiencies

The ERT finds the Host's fiscal management to be efficient and effective:

- The Host has a longstanding, proven pre- and post-award management system;
- CU-Boulder, and CIRES in particular, has a full-service business office that supports a full-scale set of researchers and academics, the NC CASC included;
- The Host is able to provide office space and administrative support for USGS personnel as well as visiting researchers, students, and interns (where appropriate);
- The Host has developed in-house measures of financial performance that allows them to conduct a more targeted review of a project's financial performance;
- The Host's administrative team has both deep and broad knowledge to assist the CASC:
 - Dedicated financial administration and consistency over time; and
 - Efficient pass-through systems that allow work to get done;
- The Host has created effective template emails for proposal support;
- The Host has a good working relationship with USGS program manager; and
- Going forward, the Host has learned a great deal about the complex and unique administration needs of the NC CASC.

Administrative Challenges

ERT members are impressed by how effectively the Host and its federal counterpart at the NC CASC applied creative solutions to manage the many challenges they faced over the past five years, while accomplishing a great deal in the face of those challenges. Challenges included:

- Consortium Partners do not have similar levels of expertise or experience managing federal funds, which creates administrative challenges for the managing Host;

- USGS has requirements for budget justification higher than NSF and other federal granting programs with which the university works;
 - It is difficult to develop long-term fiscal projections for the administrative demands due to annual Federal funding timelines and limited carryover, and hiring processes;
- Many key personnel are in positions that are classified as ‘research’ (soft-money positions). These personnel likely will need to consider other non-CASC employment options as a hedge, especially at the end of the Host Agreement, when continued support hinges on the Host successfully winning a re-compete and USGS being able to execute the funds in a timely fashion. This challenge could result in substantial turnover of personnel;
- The general challenge for all CASCs: the timing of funding delivery from USGS (the ERT recognizes that this is beyond the control of USGS staff as well as Host-University staff, and believe it must be noted);
- There are many different and overlapping efforts at CU and within CIRES, which creates the challenge of clarifying the boundaries and contributions of the NC CASC, specifically, while also recognizing that the NC CASC benefits from engagement with these other sub-institutions;
- Staff turnover and vacancies at the Host, and USGS staffing shortage and resulting delays;
- Institutional barriers to inclusiveness (e.g., a graduate school eligibility relocation requirement that makes attendance difficult for Tribal students and others);
- Covid-19 restrictions on activities originally budgeted (e.g., Climate Solutions Summit);
- Pass-through workflow and PI sign-off responsibility on a wide range of project topics;
- The right balances in cross-disciplinary coordination;
- The high number of collaborative projects involving researchers and partners;
- Complexity of contracting and partner ability to receive Federal funds and/or learn what is fundable;
- Unspent funding, that was an issue, but is diminishing;
- The time it takes for back and forth with USGS; and
- Considerable unanticipated needs from stakeholders and right-holders.

Opportunities for Improvement

While COVID and other challenges stopped planned progress, the ERT finds that the Host was able to pivot and make impressive progress on a variety of fronts. The ERT suggests considering the following opportunities to strengthen the longevity of the NC CASC:

- Given the personnel turnover, the Host needs to think constructively about succession planning and a structure that allows for individuals to be trained to cover the responsibilities of positions beyond their own. For example, the Host team should conduct succession planning for its director and generally spend time thinking about

how to create a robust staff planning process that could absorb the departures of key personnel around a re-competition of the CASC designation.

- At the Host-University, because of the relationship with CIRES, there should be adequate administrative backup, but that is likely not the case at consortium partner organizations where succession planning is likely needed.
- There may be a risk to the Host-University in the current approach to environmental compliance for projects. While the ultimate responsibility for environmental compliance lies with the USGS, the Survey seems to be operating on the assumption that the project teams are aware of their permitting and other Federal environmental compliance responsibilities. However, with the Host-University signing for every pass-through and subaward, a lapse or failure to adequately permit an activity funded through the CASC at a Consortium Partner could expose the Host-University to liability. If not already in place, the Host should consider requiring all project teams to submit copies of the necessary permits at the time of award.
- Further streamlining proposal and financial administration.
- Track progress and change against some of the TOC indicators.
- Continue to develop ways to track and evaluate actionable science.
- Continue the growth of Tribal work.

RECOMMENDATIONS: Administrative

As noted above, the ERT finds that the Host-University, and CIRES in particular, has both research strengths and an impressive institutional structure in place to support the university-side administration of the NC CASC. The following recommendations are areas that could continue to strengthen the Host's capabilities:

- 1) Enhance efforts with Consortium Partners** by fostering their engagement; reach out to sub-regions to work with more communities when ready, and identify opportunities to retain partners providing unique skillsets and breadth (e.g., WCS).
- 2) Build leadership resiliency** by developing draft standard operating procedures, developing lists of key partners and POCs, considering commitments and how to fill gaps if a leader were to leave (e.g., Bill and Jane), and draft a brief leadership transition plan.
- 3) After the comprehensive first step at metrics with TOC, build on them by focusing on a few to actually measure.**
 - Consider Alison Meadows' work with the CASC's societal-based evaluation.

Findings of the ERT – Scientific Achievements

	Scientific Achievements <i>Scientific Achievements on climate impacts, vulnerability, and adaptation science</i>
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The ERT finds that the Host has a strong understanding of the principles and practices of climate science co-production and has put them into practice. The Host noted that its science involves “interdisciplinary research, synthesis, datasets and tool development, informed by collaboration with stakeholders, to provide usable science and applications for climate-informed resource management”. The team’s goals are to develop open data tools and information to help managers access the information they need to make decisions about vulnerable systems. The Host science teams reportedly focused their work on how and where ecosystem resilience could be enhanced using Traditional Environmental Knowledge, Climate Smart Management, and climate informed conservation.

NC CASC’s major science efforts include:

1. Developing quantitative future climate scenarios for assessments of ecological impacts and adaptation strategies;
2. Focusing on impacts and needs related to ecological drought;
3. Cataloguing ecological recovery and transformation from climate-induced disturbance;
4. Identifying key information needs and synthesizing climate and ecological sciences for the North Central grasslands; and
5. Assessing future fire risk in the NC CASC region and beyond.

The Host noted the following instances of significant engagement with stakeholders and partners:

- ❖ 16 FWS Species Status Assessments
- ❖ 5 National Parks Scenario Planning processes (in collaboration with NPS CCRP)
- ❖ Mountain Goat Structured Decision Making (DSM) - Montana Fish, Wildlife & Parks
- ❖ Statewide Habitat Plan 2020 - Wyoming Game & Fish Dept.
- ❖ Sicangu Lakota (Rosebud Sioux) Climate Adaptation Plan
- ❖ Prairie Pothole Region - USGS & USFWS HAPET
- ❖ Mancos River Resiliency - Mancos Conservation District, Ute Mountain Ute
- ❖ Prairie Dog Population Dynamics in the Great Plains - Colorado Natural Heritage Program
- ❖ Regional Conservation Assessment around the metro Denver region - The Nature Conservancy, Bio-habitats, and Metro Denver Nature Alliance
- ❖ Wyoming mule deer migration - USGS, FWS
- ❖ Bumble bee climate vulnerability - USGS, FWS

❖ Refugia Mapping NC region - USGS, State Wildlife Agencies

The Host also reported on its Climate Science Support Platform (CSSP) as a vehicle to provide data and tools to resource managers. The team (including scientists, graduate students, Tribes and other partners) developed its climate science applications in three areas: future climate scenarios, ecological scenarios and trajectories, and adaptation actions and strategies. Tools and applications include drought tools, R-Shiny Apps to plot and extract observed and future projections data, and a variety of climate futures scenarios. For example, the Future Climate Scatter tool examines and visualizes climate projections uncertainty and selects climate scenarios for a particular use case, and Imtiaz's 2021 publication addresses uncertainties in climate projections, gaps in the relevant variables, and uncertainty in biological/ecological responses.

The ERT finds that the Host's actionable science is the product of diverse researchers, stakeholder and rights-holder engagement, with co-production from project scoping through to publication.

There is a strong flow of work with the following steps:

- Becoming aware of or assessing ecological issues and/or climate predictions;
- Working with stakeholders to get a sense of their needs, and their perception/experience of the issues;
- Working with stakeholders to provide information and tools tailored to their needs;
- Working with stakeholders to assess applications of the resist-accept-direct (RAD) decision framework to deal with a particular issue; and
- Developing and applying adaptation strategies.

As noted, the Host is producing climate scenarios, modeling of future fire risks, climate and ecological science for grassland management, and drought information which are all contributing to climate adaptation science and its application. Cross-cutting collaborations in the Grassland synthesis project produced 70 research gap and management questions.

The ERT commends the Host's climate science contributions in the following areas:

- The Host is well established in climate scenarios and how to select and direct them in relation to a particular problem (e.g., particular species or ecosystem)
- Ecological drought
- Species and habitat assessment
- Grassland synthesis and fire trends at the national scale
- R-Shiny apps (tool development)
- Helping partners and decision-makers learn about and use the RAD decision-making framework

Overall, patterns the ERT observed included productive engagement with FWS, NPS, Tribes, and CPs. To date, BLM and state agencies have been mostly absent from the Host's efforts, but not because the Host didn't try to work with them; the Host has begun to develop important relationships with these partners that the ERT believes hold possibilities for future joint efforts.

The ERT applauds the interdisciplinary nature of many of the collaborative climate science projects. In addition to what has been noted, the ERT positively notes that the Grasslands and Fire Planning work both included social science components. In addition, the ERT notes that the Host's outreach activities via webinars, accessible reports, news coverage, etc., give their scientific work a broad reach.

The ERT also applauds the Host's Tribal focused work. The Ute Mountain Ute project stands out because it brought together interviews with elders and climate projections, showing the value of different knowledge systems in developing climate adaptation responses. Even in the context of significant Covid-19 pandemic impacts in Tribal nations, the Great Plains Tribal Water Assessment (GPTWA) and broader Tribal program made progress. As developed, GPTWA has the membership and reach to meet NC CASC Tribal Climate Resilience Liaison Stefan Tangen's stated goal of mainstreaming Tribal climate adaptation. GPTWA has the scope and reach to expand doing Tribal climate adaptation plans with Tribes, conduct interdisciplinary projects such as the one with Ute Mountain Ute noted above, and potentially to increase uptake of some of the more technical tools developed by NC CASC scientists. In addition, the ERT notes a separate meaningful model stemming from a Tribal public health issue (diabetes) and its relationship with and to climate change effects.

What factors limited the Host's scientific achievement results?

- With actionable science, the limiting factor is more often the connection to the user and personnel skilled at making and maintaining those connections. The Host and CPs have worked hard to build and maintain relationships with many important partners by 'meeting them where they are at' and building tools or applications that help them make future decisions.
- Covid-19 and its impacts on productivity (health), and the requirement of physical distancing which affected face-to-face relationship building opportunities with partners, especially the Tribes.
- Political restrictions on climate change research (e.g., gas and oil issues that affect the prairies but the Host and CASC were prohibited from assessing).
- Capacity, capacity, capacity!
- Location of researchers: the Host noted that the geographical distribution of stakeholders, and the challenges of Covid-19, have limited research engagement with them.

- Timing of establishing the Center: the dual factors of Covid-19 and a Federal government shut-down limited the Host's capacities in many ways (see administrative section for more on this).

What factors mitigated these challenges? (E.g., what did they do instead?):

The ERT finds that the Host was able to mitigate many challenges by integrating into their work social scientists who had experience engaging users of scientific findings and products.

This helped the Host mitigate the challenge of connecting with users during the covid-19 pandemic. Examples of this include: the Host was able to continue its scientific collaborations via Zoom and remote participation; the Host team was able to share results via webinars; and the team was able to pivot from a planned Climate Solutions Summit (in-person) to Climate Solution Days (on-line webinars that brought scientists and partners together to share and learn via online platforms). Creating tools and analyses that can be developed without in-person meetings or, in some cases, fieldwork, was a challenge. Still, the Host was able to mitigate these impacts by acknowledging and building on existing relationships, projects, and trust with partners.

The ERT finds that the Host's science is high quality and often is feeding into natural resource management, particularly with respect to planning for future climate impacts on managed species and habitats. The Host was able to adapt effectively to challenges stemming from Covid-19, government shutdown and restrictions, and the impacts these had on relationships with key scientific partners.

One thing that was not clear to the ERT was the process by which Host-funded (as opposed to USGS pass-through) projects were selected. In the absence of this transparency within the Host University and its Consortium Partners, the ERT cautions against inadvertently setting up a dynamic where researchers within the Consortium member institutions of the CASC see the Host as not interested in or unwilling to support their work. This could be problematic if, in the future, the Host and/or CASC needed their expertise.

ERT members also note that sometimes tools were developed that are accessible to specific users only. For example, the apps and models the Host has developed are first-rate, but they are not necessarily useful for non-agency land managers or Tribes (depending on the scope and resources of the Tribal natural resource departments).

RECOMMENDATIONS: Scientific Achievement

The ERT finds that the Host is committed to producing actionable science. To build on what the Host has begun, the ERT suggests the Host and its team consider the following:

- 1) **Clarify the selection process** by which the Host selects scientific partners and projects to enable a broadening of its already impressive list of Consortium and scientist partners.

- 2) Explore the robustness of plausible ecological responses.**
 - How will the Host robustly assess potential future conditions and trajectories?
 - Work to develop capacity for decision-making under uncertainty, in conjunction with effective communication of uncertainty with its various audiences.
- 3) Work with member institutions to modify employee evaluation criteria** to reflect the value of co-produced research, which may not result in the same quantity of publications and grant dollars as less applied research, or is discounted altogether.
- 4) Compile examples and learnings from the application of the RAD decision framework as a unifying concept for multiple decision makers.**
 - Contribute to the studies of the application of the RAD framework in various settings, at multiple scales, and among decision-makers.
- 5) Assess uptake/use/application of tools so you can maintain those most used into the future.**
 - Consider how to assess and handle tool overload.
 - Consider how these excellent high-tech tools might be more accessible and useful to more partners (not just the one for which it was developed).
 - Does the process build tools based on request/need or tool developer creativity?
- 6) Consider how outsourcing Species Status Assessments (SSA) lines up and is compatible with the FWS's SSA process.**
 - Be certain that the two approaches align and are additive to the work FWS is doing and needs done.
- 7) Regarding collaborative efforts and social science:**
 - State government agencies dropped off by 33%. What insights are there about this, and how might the Host better engage them in the future?
 - How might the Host measure success in collaboration, beyond numbers of partnerships and papers?
- 8) Continue adding more social scientists to the Consortium.** ERT members have found that including sociologists, anthropologists, and psychologists on their climate adaptation teams has enabled them to make their information more accessible to broader audiences.

Findings of the ERT – Collaborative Efforts

	Collaborative Efforts <i>Collaborate with stakeholders to develop and deliver adaptation products applicable to priority decision-making</i>
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The NC CASC’s partnerships with regional stakeholders, Tribal Nations, and other organizations enable them to respond to high priority natural and cultural resource management challenges, while also fostering substantive and sustained engagement between scientists and managers. Tracking this work with partners allows for evaluation efforts and to observe networking and engagement growth over time. Examples include the Grasslands Synthesis Project and the GPTWA. In addition, the Host showed excellent collaboration across the Host-University-based centers: CASC, Climate Hub, Earth Lab, RISSC, and the Western Water Assessment.

The ERT finds that the Host has made a concerted effort to understand the climate adaptation information needs of resource managers in the region and, where possible, has embarked on collaborative efforts to address them. In addition, the Host’s resident social scientist has taken a rigorous approach to tracking and understanding climate adaptation needs in the region and entraining them into how the CASC thinks about the science it supports and the application of that science. ERT members appreciated NC CASC Social Science Lead, Heather Yocum’s, clear presentation style in her overview of the approach to and process of sustaining collaborative partnerships, and Imtiaz Rangwala’s transparent approach to the complexities of climate scenarios and ecological responses to inform management. Productive relationships with partners and the internal team were evident throughout the Review.

The ERT finds the Host’s contributions in the area of Collaborative Efforts take the following forms:

- Convening stakeholders and rights-holders to identify, assess, and address issues, building on CASC- developed tools, information, data, and approaches;
- Developing and sharing information on climate change to support decision-making, and tools to identify climate change predictions (apps, models, etc.);
- Creating plans, reports, studies, and other documentation to synthesize information to support managers and decision-makers;
- Convening parties at CU-Boulder who work in the climate adaptation space to better streamline their work; and, simply,
- Making the effort to ‘meet people where they are at’ by going to their location, learning about their history and needs, and using that as the basis for a strong relationship in their work together.

The ERT notes common threads across collaborative efforts (see process list described above). The Host and CASC are productively filling gaps in expertise at state and Federal agencies (e.g., Wyoming and North Dakota), working with local landowners to produce actionable strategies

(e.g., grasslands work), predicting change at a landscape level to inform decision-making (e.g., fire and grassland studies), developing productive partnerships with Tribes to develop climate adaptation planning (e.g., Rosebud), assessing ecological change (e.g., Ute Mountain Ute), and sharing information and tools that can be used in climate planning (e.g., S. Tangen's Tribal conference participation).

The ERT finds that the projects described during the Review and in the Host's materials incorporate a broad range of partners, including state, Federal, private, and Tribal entities. The Host is effective with its collaborative efforts and is approaching the work with an intention to become even more so.

The ERT noted some factors which limited the Host's collaborative efforts process and results:

- Covid-19 limited the Host's ability to do planned, in-person collaboration with partners.
- Funding, and the timing of funding, for collaboratively co-produced climate adaptation science based in the university system is, and likely will always be, a limiting factor.

The Host and CPs overcame these challenges by starting high quality work on their own, and then broadening their efforts when Covid-19 restrictions allowed for that to occur. The Host worked with its social scientists and others to find ways to continue collaborations online. As such, collaborations continued remotely and the team created robust platforms for increasing communication and sharing resources remotely.

The ERT finds that the Host has relationships with stake- and rights-holders, has social scientists, has engagement processes in place, and is tracking all of its efforts well. In addition, the ERT finds the Host's emphasis on and explicit commitment to the importance of building strong, trusting relationships with Tribal members and Tribes to be noteworthy. The ERT encourages the Host to keep this commitment tied to future actions and decisions.

Opportunity for Growth/Food for Thought

The ERT noted that, while the Host generally does well to engage with the users of its findings and products through the use of co-production, the Host seems to have invested limited time and energy into collaborating among the other Consortium Partners. The result has been six Consortium Partners that are being productive with their own partners, but have not joined together to fully leverage the rich, multi-university expertise and geographic reach. The ERT offers the following considerations:

- If the Host were to more fully embrace the consortium model, it might be able to expand the reach of the excellent work the Host-University is doing.
 - For example, the Tribal Climate Leaders Program could use the reach of the Consortium to recruit participants from throughout the region or create opportunities for participants in the program to build a professional network across the Consortium members, thus increasing opportunities for the participants upon graduation and later in their careers.

- There are several mechanisms available to the Host and USGS to increase collaboration across the Consortium Partners:
 - One could be a body where a more senior representative from each of the Consortium Partners meets periodically (e.g., semi-annually) to discuss the direction of the CASC and opportunities for new work through USGS and other sources. The location of these meetings could rotate through the CPs or at least among those members with the infrastructure to host such a meeting.
 - In an application to the re-competition, the Host could construct more projects that cut across the CPs. Similarly, the USGS could prioritize cross-Consortium partner projects in its competition for pass-through funding.
- Seeking more collaboration across the Consortium will take time and that investment should be right-sized to the amount of funding available.

ERT members noted that a CASC can be a vehicle for the Host and Consortium Partners to receive funding from the USGS, with the flow of funding only from the USGS. Another option would be for the CASC to be a vehicle for receiving seed funding from the USGS which is used to build cross-Consortium, interdisciplinary teams that execute projects, and seek out other non-USGS funding. These teams could apply for non-USGS funding under the banner of the NC CASC, and could strengthen their applications by referencing their connection to CASC activities such as capacity-building, outreach, and communications.

The ERT encourages the Host and USGS to adopt this alternative view of how the CASC could function, if the NC CASC and USGS decide that more collaboration among the Consortium Partners is important.

RECOMMENDATIONS: Collaborative Efforts

- 1) **Grow Collaborative Efforts with Care.** The NC CASC will need to balance the regional needs they identify with the resources they have on hand to address them. The CASC will likely be better served to develop a few strong partnerships rather than many partnerships that are weak.
- 2) **Track Management Actions that Stem from NC CASC Projects** to assess their collaborative efforts, especially with the users of their findings and products. The Host should track major management actions, such as:
 - The information shared that led to increased knowledge and change in climate risk perceptions;
 - The level by which management decisions that were informed by CASC projects increased;
 - At a higher level, the CASC could also survey for overall changes in attitudes about the use of science and co-production by the resource management community in the region.

- Repeated engagement with stakeholders that is initiated by the stakeholder can also be a measure of success (if they keep coming back, they must value their interactions with the CASC).

3) Bolster Reciprocal Relationships with Tribes. The students participating in the Tribal Climate Leaders Program serve as a connection back to their Tribe.

- Consider creating multiple student cohorts and support student development through the program.
- Establish an alumni network to help students and Tribes stay connected to each other and the program.

4) Leverage Consortium Partners as Co-production Team Members more consistently.

The CPs seemed to have limited involvement across the spectrum of Consortium-related products and activities, almost like sub-contractors. Retention of CPs and value to the Consortium may be higher if CPs were given a stronger role in the Host-related leadership, executive, and work-planning activities.

Findings of the ERT – Capacity Building

	Capacity Building <i>Educate and train to build capacity of early career professionals and others</i>
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The ERT finds that capacity building is a particular strength of the NC CASC. The Host has developed excellent capacity building activities that serve a range of collaborators. A particular strength of the Host-University is the institution-wide support for capacity building activities for students. There are co-sponsorships and wrap-around support systems provided by other units on campus in order to support student success. The Host intentionally uses its post-doctoral program, Tribal Climate Leaders Program (TCLP), Climate Adaptation Scientists of Tomorrow (CAST), internal training via webinars, the Climate 101 training, and NC CASC Climate Solutions Days 2022, to build capacity for the application of climate science in the region. In addition, the Host’s Climate Science Support Platform allows those seeking specific information to find and use data that meet specific needs or interests.

The ERT notes that the Host’s capacity building activities target at least the following audiences:

- Diverse students, particularly Tribal college students;
- Resource manager communities (landowners, land managers, agency staff); and
- Tribal natural resource staff.

The NC CASC Host’s capacity building approaches were quickly modified to accommodate Covid-19 restrictions and have been targeted and designed to meet specific needs of stakeholders, while being designed collaboratively with stakeholders and researchers. The ERT notes the following as effective capacity building approaches employed by the Host:

- Tool building and how to use data tools;
- Student research projects and internships;
- Investigation of climate change interactions with specific Tribal issues (e.g., diabetes);
- Stakeholders’ capacity building developed via trainings and “thinking” (e.g., RAD and use of R-Shiny apps); and
- Building capacity in communications (e.g., planned storytelling workshop).

ERT members note that the manager communities are primarily served by the climate solutions days (trainings and tutorials), and the NC CASC and Earth Lab climate data trainings, which are open to both managers and students. ***The ERT finds the Grasslands and Climate Training to be an excellent example of capacity building:*** it built directly on CASC research collaboration, was targeted to managers, was collaboratively developed and implemented with multiple partners (NC CASC, SC CASC, NW CASC, and USFWS’ Grasslands Ecosystem Team), was responsive to stakeholder needs, and led to immediate outcomes and new opportunities.

The ERT finds that the Host-University is building regional capacity effectively, especially given the amount of funding devoted to capacity building. The ERT notes other key capacity-building areas in which the Host has excelled:

ERT members are particularly impressed by the strength of the NC CASC's capacity building programs with diverse students. The CAST creates an undergraduate research summer experience with comprehensive mentoring support provided on campus. The CAST is in its second and final year and will be applying to renew. The Tribal Climate Leadership Program is a collaborative effort on campus that is coordinated by NC CASC, with support from other partners, including the Center for Native and Indigenous Studies. The students work on projects that are relevant to their Tribal Nations or home Tribal communities and incorporate Indigenous perspectives and epistemologies, providing opportunities for capacity building both for the students and for the staff and researchers who are learning from the students. Finally, the Earth Science Data Corps is a summer experience for diverse undergraduates to build their climate data science literacy.

The ERT is impressed by the Host's strong communications across geographical and topic areas and the Host's participation in cross-CASC training, such as the early career workshop held in Albuquerque in Fall 2022, and mentoring postdocs in the fire and aquatic flows programs.

The ERT finds that, while the Host faced several capacity building challenges, such as Covid-19 and the staffing challenges noted above, the team overcame them with creative and cooperative solutions.

Relationships between partners enabled capacity building and training to continue remotely. Excellent co-sponsorships enabled wrap-around support to address the needs of underrepresented students.

The TCLP program revealed several impediments to students from Tribal Nations enrolling and completing a graduate program, and the CASC worked diligently to try to remove or mitigate these challenges. The ERT notes that the main limitation appeared to be linked to funding, so if the USGS decides that this type of capacity building is important and impactful, they should specifically request the Host and CASC to invest more resources in this type of work.

In the meantime, the Host also was effective at leveraging, using partial amounts of a Host-University employee's time for CASC activities, and having CASC supported personnel with diverse skillsets to overcome funding constraints.

The ERT finds that funding and coordination between the Host-University and the Consortium Partners are what is limiting capacity building activities. To maximize effectiveness, The ERT recommends the Host re-think its consortium design so it can develop Consortium Partners who can also provide the stellar training and tool development being done solely by the Host's direct team members. Currently, it also is possible that user bandwidth or resources is a limiting

factor; in other words, the Host might have more tools and trainings available than identified uses.

RECOMMENDATIONS: Capacity Building

1) Develop metrics and track the success of all capacity building programs.

- To date, it appears the Host has evaluated participation, but not effectiveness. The programs it has developed are apparently excellent; back this up with metrics that show the long-term effectiveness of the capacity building for climate science and adaptation.
- Consider an evaluation of effectiveness, e.g., evaluation of societal impacts. As an example: <https://researchinsociety.org/wp-content/uploads/2022/06/SocietalImpactsGuidebookMeadowOwen2020.pdf>.

2) Create an alumni network to support students.

- If the TCLP and CAST end up having multiple cohorts, develop a network of alumni both to recruit future cohorts as well as advance the careers of past cohorts.

3) Develop metrics for use of the many tools the Host has developed.

- Create a systematic means of getting feedback on tools and entraining that feed into the development process.
- When discussing tools, especially those developed to build climate adaptation capacity, lead with the types of management challenges or decisions that motivated the development of the tool, its current number of repeat users, and the mechanism the CASC uses to solicit feedback on the tool. Entrain that feedback into the development process; what the tool does is secondary to who is using it, how it is being used, and how it is being updated.

4) Develop a strong relationship between tool production and science pursuits with the Communications "Team."

- Make sure a communications plan is incorporated; and
- Provide a feedback loop on the relative value of products based on user input through communications outlets.

5) Help Users find the tool they need/want to develop their capacity.

- The Host's Climate Science Support Platform page has much to offer. The "Developed Resources" section would benefit from a 'tool to find the right tool'. A real problem for potential users is tool overload, combined with an inability to know how to find the right tool for their needs.

- Given the proliferation of tools being developed by the CASC and others, the CASC should consider partnering with other tool developers to construct a 'tool tree' or similar mechanism for matching novel users with appropriate tools if a survey of their users indicate such a tool tree would be useful. The Gulf TREE is an example. Alternatively, the CASC could use their own internal metrics of tool use to decide which tools to archive and which ones to consider further developing.

Findings of the ERT – Outreach and Communications

	Outreach & Communications <i>Manage and transfer information and data related to research activities</i>
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The ERT finds extensive development of the communications infrastructure at the NC CASC.

The Host re-directed resources to support a communications staff, developed a communications plan in Year 1, and developed metrics for measuring progress. The Host's new and diverse communication and outreach forms include social media, a YouTube channel, newsletters, webinars, and trainings, all updated iteratively in response to users' feedback and activity. Audiences being served include managers within the Department of Interior and state agencies, environmental organizations, landowners (big and small), and Tribal resource managers.

The CASC has developed a strong connection with Tribal Nations through the work of their Tribal Engagement Specialist and Consortium Partners with connections to Tribal Nations. In addition, ERT members noted that the Host has excellent support for communication staff and commend the development of the communications plan.

Since the Host is newly developing its communications arm, the ERT (and the Host) finds it difficult to trace the impact from an outreach or communication activity directly to a change in behavior of a person that leads to climate adaptation; it is difficult to measure effectiveness outside of number of clicks and attendance (which provide some measure of effectiveness, but not comprehensive evaluation). Because these strategies are new and evolving, it will take some time to measure effectiveness. ***The ERT finds this area of work is an important part of the NC CASC's evolving strategy to co-develop, share, and implement actionable climate science. In the meantime, ERT members feel the Host is clearly getting the word out and developing a community of people interested in climate adaptation, both of which are important contributions.***

The ERT notes a few factors that limited the Host's outreach and communications results:

- Need for research on best practices in communicating climate change risks (including addressing temporal and spatial proximity to climate impacts, skepticism, trust, and uncertainty).
- Like in other areas, funding seems to be the major limitation. The Host seems to have enough technical expertise in outreach and communication to do the activities in its communications plan. Having leveraged the funding and added personnel has helped and should provide dividends over time.
- It is difficult to measure impact; the Host is working on this and finding ways to measure what they can, such as participation in events and numbers of clicks.

The ERT finds that the Host showed flexibility and creativity in responding to a variety of challenges in the area of outreach and communications. The ERT commends the Host and team for intentionally developing and maintaining trusting relationships necessary to provide ways to reach people during a period when being together was restricted due to Covid-19.

RECOMMENDATIONS: Outreach and Communications

- 1. Consider a targeted set of impact metrics to evaluate the success and effectiveness of your outreach and communications work.**
 - What are the metrics for success and effectiveness, other than just listing the contributions? Focus on both outputs and outcomes.
 - Consider how you might relay the feedback received from end users of products as an established qualitative metric. Then consider, how do you publicize this success?
 - Having a few targeted measures will allow the Host and NC CASC to evaluate the effectiveness of their different communication and outreach methods and select the most effective ones for additional focus.
- 2. Link with students to assist with communications.**
 - The students from Tribal Nations could serve as a connection back to their Tribe and help to increase the delivery of outreach and communication activities into those Tribes.
- 3. Consider additional outreach tools to reach broader audiences.**
 - The Host has established a good broadcasting system and indicators. Consider how well the diversity of audiences are being served, priorities for frontline communities, and balance with the established listening system. Explore ideas for building more capacity e.g., usability of tools, partnering.
 - As a means of reaching broader communities, consider using a tool such as “ISeeChange,” (<https://www.iseechange.org>), to engage with communities and broaden awareness (of them and the CASC).

Findings of the ERT – Overall Effectiveness Towards Host Agreement

The ERT agrees that the Host and Consortium effectively met the goals set out in its proposal to, and agreement with, USGS. The NC CASC has been effective over the last five years in conducting meaningful climate science, working with partners in co-producing much of that science, building capacity of the current and next generation of climate scientists, and effectively communicating its work to a variety of audiences. The Host achieved all of this under challenging local and national circumstances, including a global pandemic. The Host's commitment to the time and effort needed to support co-production and climate science capacity building is impressive.

The ERT finds that the Host has been particularly effective in the following areas and encourages sharing its experience with the CASC Network, if it has not done so already:

- CU-Boulder highlights the importance of a Host that will support the CASC both specifically (the way CIRES does financially/administratively) and broadly (the way other centers on campus contribute to and help to support the diverse student training opportunities);
 - The CIRES host and the partnership of the Center for Native American and Indigenous Studies (CNAIS) in supporting training of Tribal college students in climate science both offer an excellent example of how much can be accomplished with broad and deep support on-campus, and Host-University support for a CASC;
- The Host shows the importance of coordinating between climate centers on campus to leverage research, capacity building, and application of actionable climate science;
- The Host also shows the importance of dedicated funding for Tribal outreach (at least three staff--- James Rattling Leaf, Sr., Stefan Tangen, and Kynser Wahwahsuck) and one Partner Institution (GPTWA) are focused on building meaningful and impactful relationships with Tribes; and
- The Host provides a very good example of the tangible and measurable benefits that can come out of integrating co-produced science (*Grasslands Project*) directly into training (*Grasslands and Climate training*).

The ERT finds that the Host has applied creative solutions for the challenging problems it faced during the award period. The Host's central focus on capacity building and co-production is laudable and important.

- The NC CASC has integrated social science techniques into some of its projects. If other CASCs have yet to do so, they could benefit from hearing about the NC CASC's approach and the lessons the NC CASC has learned.
- The NC CASC seems to have built effective connections with Tribal Nations and their work could be a model to other CASCs working to increase Tribal partnerships.

- We have all been challenged by Covid-19. The NC CASC and Host-University did a remarkable job of pivoting from in-person to remote, while still producing collaborative science, strong training opportunities, and science/planning in service of partner needs (i.e., supporting climate adaptation planning).
 - The ERT recommends revisiting the in-person Climate Summit that was affected by the pandemic now that restrictions have been lifted.

OVERALL ERT RECOMMENDATIONS

In addition to the recommendations noted above, the ERT makes the following recommendations about the review process and suggested approach for the Host, NC CASC, and consideration by NCASC with the entire CASC Network:

For this Host:

- **Re-vision the Consortium partnership and how it is managed.**
 - Maximize the benefits of the consortium model: what might scientists across the NC CASC network of partner institutions learn from one another and the Host institution? Work with partners to determine and set up strategies to support greater collaboration between the partner institutions and the Host. Use the Grasslands and fire projects as a model for more partnership engagement/co-production on projects moving forward.
- **Create more/stronger links between science produced and Tribal partnerships.**
 - Can the Tribal partners apply the R-Shiny apps? If no, why not? Would the R-Shiny apps even be of interest to Tribal partners? Can the Tribal perspectives on climate change inform the direction of the science, in an exercise of bi-directional learning that respects both parties' expertise (such as with the Ute Mountain Ute project)?
- **Clarify the Host's Vision.**
 - The joint Theory of Change is an excellent means of clarifying the shared goals of the CASC. ERT members wonder: What is the Host's vision for the NC CASC and its partnerships with USGS and Consortium Partners?

For FUTURE Host to learn from this Host:

- **Develop a clear vision of the role of the Host-University and Consortium Partners.**
 - Clarify the pillars of the work being done by the Consortium and the links to the TOC.
 - Develop clear decision-making models to make decisions regarding funding partners, projects and funding.
 - Develop criteria or a flow chart of questions used to make decisions.

- Show how these entities will maintain relationships and develop opportunities for collaboration and co-produced science across Host-University partners and Consortium scientists.
- **Institutionalize co-production workflows of research, including co-production as a meaningful evaluation metric for research staff supported by the Host-University (e.g., actionable science versus ‘publish or perish’).**
 - Recognize other forms of researcher and partner impact in addition to publications (outreach/co-production workflows).
 - Revise the annual work plan, with input from CPs, to reflect new/current highest priority research needs. Be flexible and adaptive to changing priorities whenever possible.
- **Demonstrate understanding of the uniqueness of the CASC operations** and how the Host-University’s administration can operate/support efficiently and effectively.
 - Demonstrate broad university support for CASC initiatives, particularly regarding DEI
- **Develop strong relationships with state and Federal management agency partners.** Create a plan that will support building and maintaining short- and long-term relationships.
- **Enhance tracking and use of developed tools** (e.g., a tools audit); consider retiring unused tools and reduce overproduction of tools and potential “tool clutter/overload”.
- **Carefully evaluate capacity needs and avoid over-promising and either under-delivering or overtaxing staff.** The success of CASC will be lessened if over-promising leads to partners not getting what they need/want, or if talented and committed researchers and staff get burned out or persuaded to join better funded enterprises where their work can get full credit and acknowledgement.

For USGS:

- **Work with the Host Universities to create a path for providing co-production of science tenure credits.**
 - Include in future agreements a commitment by Host-Universities to give credit for tenure purposes stemming from co-produced science in lieu of other academic tenure requirements.
- **Build capacity for Hosts and USGS CASC programs to hire additional staff and scientists.**
 - Limited staff, combined with the nature of student involvement and turnover, may lead to early burn-out if not addressed meaningfully. Provide funds to support this capacity, and be a timely partner to the universities as they continue to help the nation create a new generation of climate adaptation scientists.

- **Clarify priorities and expectations of Hosts.**
 - Clarify the roles and responsibilities that the federal side wishes to see in place at Host-Universities; include metrics for success such as ‘numbers of papers/publications/trainings/tools that stem from collaborative efforts’ and ‘provide actionable information to others.’
 - If leveraging the expertise of multiple Consortium Partners across a region is a priority for the USGS, then the USGS should require Host applications to provide tangible ways that the Host will build connections across the Consortium Partners. USGS could also require pass-through projects to include more than one Consortium Partner to be eligible for funding.
- **Support the expansion of the social science network within this and other CASCs.**
 - Work with the CASCs to create a shared vision for how social sciences could best support the work of CASCs. The very unsettling nature of climate change and the need to adapt to those changes has caused psychological, economic, social and other unrest for many. Bring social scientists into the fold to help explore and provide actions that can help in all these areas. Add emphasis to interactions of human and natural systems into impact assessments, analyses of adaptations strategies and trade-offs and implementation of adaptation/RAD.

REGARDING THE EXTERNAL REVIEW PROCESS

- ***The ERT finds that the review process was well structured and supported. The Host/NC CASC was organized, transparent, and produced quality and effective presentation materials. Diverse presenters (including students) offered insights into a range of NC CASC programs, impacts, and partnerships.*** The Host’s commitment to meeting preparation, efficiency and professionalism, breadth and quality of engagement, and candor with the ERT provided a strong and positive reflection of the Host-University and staff.
- **For future ERT reviews, the ERT recommends:**
 - Given the collaborative nature of the NC CASC (and likely others), it would be helpful if each CASC activity that is discussed comes with a graphic that illustrates, in terms of personnel, how much of the activity was supported by CASC personnel being paid with CASC funding versus other sources of personnel support. Similarly for funding that is not spent on personnel costs, a graphic illustrating how much funding is coming from the CASC vs. non-CASC sources would be helpful.
 - Include graphics and stories or presentations that ERT members and others may see that ‘show’ how the Host is doing its work.

- Add a section to the review and report dedicated to the application of the science being produced. Presently, application is not expressly considered in the definitions for any of the sections and, as a result, is mentioned in several different sections. For Centers where application is such a foundational piece, it seems like a missed opportunity not to have a section dedicated to it, or at least have it defined as being included in one or more of the other sections.
- USGS and the CASC Network should give strong consideration to continuing to hold ERT sessions online because 1) it reduces travel requirements, which can be a barrier to participation for some potential ERT members, and 2) it reduces the environmental impact of the review (e.g., lower carbon footprint).

END OF REPORT CONTENT

Scrivener's Note: This report was compiled by Donna Silverberg Consulting in active coordination with the ERT members listed on page 2. The ERT reviewed and refined a number of drafts until all Members could fully support having their names acknowledged on this ERT Final Report.

APPENDICES & ATTACHMENTS

Appendix 1 – Attendees

Attendees for all or part of the sessions, alphabetical by last name (affiliations included).

ERT Members: Julien Lartigue (NOAA-RESTORE Science Program), Beth Rose Middleton Manning (UC Davis), John Tull (USFWS), and Anne Wein (USGS-Western Geographic Science Center)

Host, Consortium and NC CASC Presenters: Waleed Abdalati (CU Boulder/CIRES), Jennifer Balch (CU Boulder/ESIL), Aparna Bamzai-Dodson (USGS), Laura Burfield (CU Boulder/CIRES), Kyra Clark-Wolf (CU Boulder), Shelley Crausbay (USFS), Molly Cross (WCS), Ted De Maria (CU Boulder/CIRES), Lisa Dilling (CU Boulder), Annie Fudale (CU Boulder/CIRES), John Guinotte (USFWS), Phil Higuera (UM), Ulyana Horodyskyj Peña (CU Boulder), Caitlin Littlefield (CSP), Brian Miller (USGS), Christy Miller Hesed (CU Boulder), Imtiaz Rangwala (CU Boulder), James Rattling Leaf, Sr. (CU Boulder), Hailey Robe (CU Boulder), Shelby Ross (CU Boulder), Amber Runyon (NPS), Jilmarie Stephens (CU Boulder), Rebecca Stossmeister (CU Boulder), Stefan Tangen (GPTWA), Prasad Thota (CU Boulder), Bill Travis (CU Boulder), Ty Tuff (CU Boulder/Earth Lab), Christine Wiedinmyer (CU Boulder/CIRES), Jane Wolken (CU Boulder), Heather Yocum (CU Boulder), and Jennifer Zavaleta Cheek (SDSU).

Observers: Doug Beard (USGS/NCASC), Gustavo Bisbal (USGS/NCASC), Ryan Boyles (USGS/SE CASC), Nicole DeCrappeo (USGS/NW CASC), Kristen Donahue (USGS/NCASC), Emily Fort (USGS/NCASC), Addie Rose Holland (NE CASC), Will Kazmier (NE CASC), Emma Kuster (SC CASC), Wynne Moss (NC CASC Affiliate), and Meagan Oldfather (USGS/NC CASC).

Facilitation Team: Colby Mills, Tina Patterson, and Donna Silverberg (DSC).

North Central Climate Adaptation Science Center – 2023 External Review

Appendix 2 – Daily Review Session Agendas and Summaries

Day 1: Administrative & Fiscal Management

Day 1	March 6, 2022: Administrative Management	
	Purpose: Reflect on the Competencies, Efficiencies, Challenges, and Areas for Improvement of the host-university in managing the administrative requirements and terms and conditions of the corresponding host agreement, with a focus on Institutional Development and Fiscal Management review categories.	
Mountain Time	Topic	Presenters, Titles & Affiliations
9:45 - 10:00	External Review Team - closed door: Get settled, frame the day	ERT Members and Facilitation Team
Introduction to the NC CASC: Who We Are, Leadership, Staffing, and Structure		
10:00-10:15	Welcome, Introductions & Role Clarification Brief welcome, round of introductions of ERT members, NC CASC team, and USGS team, and clarify roles	Donna Silverberg, ERT Manager/Facilitator, DS Consulting
10:15-10:25	Introduction - NC CASC Commitment Statement - VIDEO: 'Who We Are' - North Central CASC Region	Jane Wolken, NC CASC Univ. Deputy Director
10:25-10:35	NC CASC Cooperative Agreement - The CASC as a Federal-University Partnership - USGS Roles & Activities	Aparna Bamzai Dodson, NC CASC USGS Acting Director
10:35-10:45	Introduction to NC CASC Host & Consortium - CU as the Host Institution - Staffing and Structure - Consortium Roles	Bill Travis, NC CASC University Director
10:45-11:00	Break	
Review topic: Administrative Management Institutional Home, and Efficiency of Resources		
11:00-11:25	Institutional Home: CIRES - CIRES as Institutional Home of the NC CASC - CIRES as an International Leader in Conducting Cross-Cutting Environmental Research while Bridging Fundamental Science and Service to Society - Colocation and collaboration with Earth Lab & ESIL	Bill Travis, NC CASC University Director Waleed Abdalati, CIRES Director & Christine Wiedinmyer, CIRES Associate Director for Science Jennifer Balch, ESIL Director (founding NC CASC CU University Director)
11:25-11:30	How our Structure Enables Actionable Adaptation Science	Bill Travis, NC CASC University Director
11:30-11:45	Q&A: NC CASC Institutional Setting	Donna Silverberg

North Central Climate Adaptation Science Center – 2023 External Review

11:45-12:15	Lunch Break	
Review topic: Administrative Management <i>Review of Fiscal Management: Budgets, Awards, & Grant Management</i>		
12:15-12:20	Overview: Administrative Management/Fiscal Management	Jane Wolken, NC CASC Univ. Deputy Director
12:20-12:35	CU and CIRES Administrative, Fiscal & Compliance Systems	Annie Fudale, CIRES Finance Director & Ted De Maria, CIRES Proposal Director
12:35-1:05	NC CASC Fiscal Management Processes	Rebecca Stossmeister & Laura Burfield, CIRES Finance Managers for the NC CASC
1:05-1:20	Administrative Challenges and Adjustments	Rebecca Stossmeister, CIRES Finance Manager for NC CASC
1:20-2:00	Facilitated discussion with ERT regarding Administrative & Financial Management: ● <i>What are the host's Competencies, Efficiencies, Challenges and Areas for Improvement?</i>	Donna Silverberg
2:00-2:30	External Review Team - closed door: Initial reflections on the day. Questions, concerns, and insights	Facilitation Team and ERT

DAY 1: DRAFT Facilitator's Summary
March 6, 2023, 10:00am – 2:30pm MST
Topic: Administrative & Fiscal Management

Prepared by DS Consulting Facilitation Team

The following summary was intended to capture basic discussion, reflections, concerns, and insights from the session. It is not a verbatim transcript, but includes links to the presentation.

Attendees present for all or part of the meeting (in alphabetical order):

ERT Members: Julien Lartigue (NOAA-RESTORE Science Program), Beth Rose Middleton Manning (UC Davis), John Tull (USFWS), and Anne Wein (USGS-Western Geographic Science Center).

Host, Consortium and NC CASC Presenters: Waleed Abdalati (CU Boulder/CIRES), Jennifer Balch (CU Boulder/ESIIL), Aparna Bamzai-Dodson (USGS), Laura Burfield (CU Boulder/CIRES), Kyra Clark-Wolf (CU Boulder), Ted De Maria (CU Boulder/CIRES), Annie Fudale (CU Boulder/CIRES), Ulyana Horodyskyj Peña (CU Boulder), Caitlin Littlefield (CSP), Brian Miller (USGS), Imtiaz Rangwala (CU Boulder), Hailey Robe (CU Boulder), Rebecca Stossmeister (CU Boulder), Bill Travis (CU Boulder), Christine Wiedinmyer (CU Boulder/CIRES), Jane Wolken (CU Boulder), and Heather Yocum (CU Boulder).

Observers: Gustavo Bisbal (USGS/NCASC), Ryan Boyles (USGS/SE CASC), Nicole DeCrappeo (USGS/NW CASC), Addie Rose Holland (NE CASC), Will Kazmier (NE CASC), and Emma Kuster (SC CASC).

DS Consulting Team: Facilitator: Donna Silverberg, Reporting and Support: Tina Patterson, Colby Mills.

North Central Climate Adaptation Science Center – 2023 External Review

Purpose for Day 1: To reflect on the competencies, efficiencies, challenges, and areas for improvement of the Host-University in managing the administrative requirements and terms and conditions of the corresponding Host Agreement, with a focus on institutional development and fiscal management review categories.

Welcome, Introductions & Role Clarification

Facilitator, Donna Silverberg, welcomed the group and conducted a round of introductions that included NC CASC ERT Members, USGS and CU Boulder, NC CASC Host and session observers.

NC CASC Introduction

Host Deputy Director, Jane Wolken, welcomed the group and began her presentation by sharing with the ERT the agenda for the day. Jane described the NC CASC's Theory of Change (TOC), a strategic planning process that allowed the Host and its partners to co-develop a shared vision for the center. This process created a framework within which the NC CASC team (Host, USGS and Consortium Partners) could identify the center's aspirational goals, and what they need to do to achieve this vision. The TOC lays out the impact they hope to have, the vision they share, and the outcomes they seek to achieve. The presentation is available [here](#) (see pages 2 and 3).

Jane shared with the ERT, the NC CASC Commitment:

"We are committed to:

- Fostering an environment of respect and inclusion within our organization, and with the partners and communities with whom we collaborate;
- Remaining open to learning from our mistakes;
- Supporting underserved communities to address their climate adaptation needs; and
- Training the next generation of climate-smart researchers and managers.

We would like to honor the connection that Indigenous peoples have as caretakers of the lands that comprise the United States of America. The Indigenous peoples of our region and beyond have deep relationships to the land, and we honor their past, present and future stewardship. We recognize the importance and value of Indigenous Knowledges in addressing the environmental challenges we face today. We acknowledge that historical injustices have amplified the impacts of climate changes to underserved and underrepresented communities and we seek to address this in the climate services we provide. Further, we recognize that access to education and science are not necessarily the shared experiences of the diverse individuals and organizations with which we work. And we acknowledge that our implicit biases may unknowingly influence our collaborative work.

This acknowledgement is an imperfect offering of our commitment to grow and promote a culture of diversity, equity, inclusion and accessibility in our work."

Jane continued her presentation by sharing the seven states included in the NC CASC region: Colorado, Montana, Wyoming, North Dakota, South Dakota, Nebraska, and Kansas. The ERT then watched the video "Who We Are", (see presentation page 6).

Introduction to the NC CASC: Federal Role

USGS NC CASC Interim Director, Aparna Bamzai-Dodson, explained USGS' roles and responsibilities in the partnership (see presentation pages 8 to 13). She noted that the USGS staff was small, but they were able to leverage additional work through other federal agencies, such as 2 Tribal liaisons via the Bureau of

North Central Climate Adaptation Science Center – 2023 External Review

Indian Affairs, a Partnership Ecologist from USFWS, two additional USGS ecologists, and a central Data Steward and fiscal administrators from the National CASC office. Aparna reiterated that the NC CASC's collaborative approach toward a common vision (from the TOC) and reminded the ERT that the Host is the focus of this review, so they will not see all of the federal components. Aparna shared that USGS convenes an advisory committee that helps set the five-year regional science plan by focusing on priority ecosystems and regional management needs. She noted management challenges for 2018-2023 ranged from the COVID pandemic, administrative changes, and a federal government shutdown that occurred early in the Host's start-up phase. As a result, the advisory committee is now being reconstituted.

Aparna described that the partnership with NC CASC was like no other within the USGS. Bill added that the partnership is also unique for the Host; it is not a traditional grant like the National Science Foundation (NSF), but rather is a cooperative agreement that includes in-resident federal scientists and other close collaborations.

Introduction to the NC CASC: University Host

Bill presented an overview of the Host, consortium, and USGS' approach and role in institutional development (see presentation pages 15 to 18, *Introduction to the NC CASC: University Host*). Bill shared an overview of the NC CASC efforts related to science, collaborative efforts, capacity building, outreach and communications. Bill presented a schematic of the NC CASC staff and structure, noting that CU Boulder is an R1 research institute that has experience with NOAA and NASA programs. As such, they have opportunities to call other programs to help bolster their teams. They were able to flex to host and house federal scientists on campus. They have a wide range of skills on the NC CASC team and he emphasized their efforts with Tribal liaisons, post doc programs that help to build the future of professionals in science, technology, outreach and communications.

Institutional Home: Cooperative Institute for Research in Environmental Sciences (CIRES)

Waleed Abdalati, Director of CIRES, spoke to the ERT about the Cooperative Institute for Research in Environmental Sciences (CIRES), the cooperative institute where the NC CASC is housed (see page 21 of the presentation). He noted that the institute has the administrative intellectual capacity to do robust science and complex activities. Waleed shared that NC CASC's relationships with CIRES support numerous activities to be successful. Because of CIRES' size (more than 900 work at CIRES) and diversity, there are opportunities for a great deal of cross-disciplinary engagement, such as with the Western Water Assessment (WWA).

Christine Wiedinmyer, CIRES Associate Director for Science, expanded the explanation of CIRES, noting that CIRES is organized into six (6) divisions: Weather and Climate Dynamics, Ecosystem Science, Cryospheric and Polar Processes, Environmental Chemistry, Environmental Observation, Modeling, and Forecasting, and Solid Earth Sciences. She noted the possibilities for cross-over work between these programs and NC CASC (See page 22 of the presentation).

Institutional Home: Environmental Data Science Innovation and Inclusion Lab (ESIIL)

Jennifer Balch, former NC CASC University Director, founder of Earth Lab, and now ESIIL Director explained ESIIL's variety of stakeholder engagement and pathways: universities and non-governmental organizations (NGOs), National Future of Fire postdoc network, leveraging the CASC network via working groups, hackathons, and innovation summits. Jennifer wrapped up her presentation noting that NSF's next generation data synthesis center will take place in May 2023. More information about the innovation summit is available at www.esiil.org.

North Central Climate Adaptation Science Center – 2023 External Review

Questions from the ERT about Institutional Setting:

- *Question:* Are there specific ways the NC CASC has worked with Tribal communities and specific needs (sub awards, intellectual property)?
 - For starters there was an assessment of the Tribal Climate Leaders Program.
 - In addition, the set up with the Host supports needed informal conversations with Tribal communities instead of USGS' more formal government-to-government consultation, which is subject to Freedom of Information Act (FOIA) requests.
 - Building relationships and supporting Tribal communities is part of NC CASC's commitment. The partnership enables long-term commitment to Tribal relationship building.
 - In addition, NC CASC works in collaboration with Tribal colleges and universities.
- *Question:* What are some of the challenges the vacancies have created and how have you addressed this?
 - CIRES has a robust HR group with a deep pool from which to draw. As such, there is a critical mass to help fill and manage roles. In addition, the size and quality of people have mitigated this staffing challenge. Retention in the department is among the highest on campus. People want to come to CIRES and then want to stay.
 - Vacancies on the federal side have been more impactful to the NC CASC work. Because there was no travel due to COVID, hiring was slow. The USGS Director position will be filled soon. The Research Coordinator vacancy also should be filled soon.
 - On the Tribal side, James Rattling Leaf (NC CASC Tribal Engagement Specialist) helped develop the original Host Agreement.
 - It's the people, energy, and skills that bring about actionable science.
- *Question:* Is there a catchup needed with Tribal and rural communities?
 - NC CASC has relied heavily on the two Bureau of Indian Affairs (BIA)-funded Tribal Resilience Liaisons (Stefan Tangen and Kynser Wahwahsuck). The Tribal Liaisons engage in bi-weekly All Hands calls (includes the Host, USGS, Consortium Partners and Tribal Resilience Liaisons), plus a monthly Stakeholder Engagement call, and it is an area for growth. Additionally, James Rattling Leaf (NC CASC Tribal Engagement Specialist) has been doing extensive outreach with Tribes in the North Central region.
 - The current Host Agreement ends September 2023. Discussions are underway about what else could be done. That said, this review covers what is happening now, not in the future.

NC CASC Administrative, Fiscal & Compliance Systems

Annie Fudale, CIRES Finance Director, provided an overview of the Host's administrative, fiscal, and compliance systems (see pages 29 and 30). Anne shared that CIRES' strength is in the numbers. As the research administration capacity has grown, the team has grown. The campus sees CIRES as a very attractive place to work, so turnover is low. Growth is due to a supportive Institute.

NC CASC Pass-Through Funding and Proposal Preparation

Ted De Maria, CIRES Proposal Director, spoke to the ERT about the pass-through funding process and proposal process (see pages 31 to 32, *Pass through Funding Process and Proposal Preparation*). Ted explained that the Authorized Organization Representative (AOR) department is the largest department at CU Boulder. People often move from other CU departments to work in AOR. The Central Office is available to all programs for guidance. The CIRES team sees the full spectrum of proposals such as funding cost reimbursable, fixed process, white papers, and controlled unclassified information (CUI). The team

North Central Climate Adaptation Science Center – 2023 External Review

strives to alleviate scientist burn out from grant processes. Ted walked the group through phases I through III of his office’s assistance to researchers and research programs.

NC CASC Fiscal Management Processes

Rebecca Stossmeister and Laura Burfield, CIRES Finance managers for NC CASC, explained the Host’s administrative fiscal management process for NC CASC (see pages 33 to 37, *Fiscal Management Process*). Rebecca manages all funds directed to CIRES personnel. She has experience with the full lifecycle of proposals- policy, policy interpretation, and travel. Laura manages all funds outgoing from CIRES to Consortium Partners. Previously, Laura was with the Office of Contracts and Grants (OCG). In addition, two other CU Boulder departments manage funds for pass through projects, so there is ample experience managing these types of projects at the Host-University.

Administrative Performance Challenges and Adjustments

Laura Burfield discussed NC CASC Administrative Challenges and Adjustments (see pages 38 to 41, *Administrative & Fiscal Management*). Challenges noted included: volume, complexity, and award restrictions/budget limitations. Adjustments included: increased finance and proposal staff support, leveraging expertise by aligning experience with operations, building a shared knowledge base, and prioritizing long term planning, and building tools through internal systems. Laura discussed tools and processes that NC CASC has employed to address administrative challenges: sub award action support and a customized tool for invoices versus budget tracking. In addition, she noted a need to have funds expended in a short time, which the Host has been able to support. With the adjustments presented, NC CASC is able to make informed finance decisions and provide real time access. In addition, CIRES is uniquely positioned to advocate for workable policies and procedures.

Facilitated Discussion on Administrative and Fiscal Management

- *Question:* When you pass-through a project, is the project funded by CU Boulder?
 - All the funding is dedicated to NC CASC.
 - About 30% is Host Agreement, 25% is pass-through. A solicitation is released with constraints so that only Host-Universities would apply.
 - Money comes either from USGS to NC CASC or from USGS to the Host-University.
- *Question:* The Host Overview mentioned that there were difficulties in spending money. Can you say more about this?
 - There is a restriction in the hosting agreement that the money cannot be used beyond the designated budget year. Because of Covid-19, some funding for travel and lodging wasn’t used.
 - There are compounding delays in sub-awards to the CPs who were supposed to receive funds in Y1 and Y2 (and to the GPTWA), since the contract modification to get that funding to the CPs was delayed.
 - In the new cooperative agreement, NC CASC is hoping to “catch up”, since the expectation is that COVID-related constraints on spending in some cost categories (i.e., travel and participant support) will no longer be an issue.
- *Question:* How do you manage projects with different fiscal calendars?
 - Projects are split into two groups; Projects with federal funding are paid following the federal fiscal year.
- *Question:* How frequently do pass throughs get reported?
 - Each pass through is a new cooperative agreement. The details are posted publicly.
- *Question:* Is CIRES training partners to provide capacity?
 - There’s no formal training.

North Central Climate Adaptation Science Center – 2023 External Review

- We use the federal partner demonstration template. We point out elements of the award, and what the partner can do to comply with the terms and conditions.
 - USGS has limited funding authority. As such, All USGS projects are supposed to be agreements versus grants.
- *Question:* Is there better efficiency in reporting earlier?
 - USGS relies on the university's knowledge, expertise, and performance. The mandatory deliverables used to schedule time with the grant recipient could impact co-production, which will be discussed later in the week.
- *Question:* When it comes to environmental compliance (e.g., NEPA), how is it done? Are there subrecipient questions that must be answered?
 - Each PI is responsible for following the federal laws, regulations and rules. They must answer any of those questions directly.
- *Question:* Why weren't consortium agreements set-up sooner than later?
 - It was a matter of getting requested documents and interfacing with USGS. When the government shutdown occurred, USGS grants personnel were considered non-essential staff. As a result, 35 days of work were missed. When staff returned, many of the agreements had expired.
 - Congress has shown high level, bi-partisan support of the CASC system and want it to succeed.
- *Question:* Regarding the relocation requirement for Tribal students, is there more to be said?
 - CU Boulder is responsible for student appointments and funding the fellowships. The students were mostly Masters students, but one TCLP student enrolled in a PhD program. CU Boulder came up with scholarships and other funding so students could continue beyond the 2 years of funding CU had already provided. The programs that individuals enrolled in are not normally considered remote or distance learning, but students were given exemptions from being in-person during COVID and CU worked with them to extend those extensions after the university went back to in-person learning. There will be a presentation on the TCLP program, and opportunities to ask questions about it, on Day 3.

Donna thanked the ERT, CASC Members, and Observers for their participation, engagement and attendance at the session.

ERT Reflections on the Day

The ERT met in closed session to discuss what they had heard. The ERT asked clarifying substantive questions for the Host to answer at some point during the next sessions: *(Answers provided from Host after Day 1 session)*

1. **Can consortium partners make subawards to entities that are not consortium partners? If you can, has that happened (no examples necessary)?**
 - A Consortium Partner (CP) may make a subaward to a non-CP with the USGS OAG's approval.
 - A CP is responsible for all subrecipient monitoring of the second-tier subawards from the CP to the non-CP. The CP is also required to flow-down the federal terms and conditions.
 - Most second-tier subawards on NC CASC projects are included at proposal and approved by the USGS via the award.

North Central Climate Adaptation Science Center – 2023 External Review

- At post-award, if a CP would like to add a second-tier subaward, the USGS OAG’s prior approval is required. In CU Boulder’s experience, this has been an administrative-intense process. The USGS OAG requires and scrutinizes both revised documentation from the CP (budget, budget narrative) as well as the non-CP’s documentation (budget, narrative, etc.). It can take a long time and there is a lot of back-and-forth but it is indeed achievable.
- 2. Your region covers 7 states, yet only 3 are part of your consortium. Can you say more about how you work with the entire region?**
- While we do show maps of our region organized by states, our work is not. The consortium is not organized by states, but by natural resource and climate challenges. States are not members of the consortium. The original proposal stressed ecosystems; projects and tools like the Grasslands Synthesis Project, and climate scenarios are not structured by state boundaries. The two universities in the consortium address regional climate adaptation issues: wildfire (Univ. Montana), and grasslands use and management (SDSU). Some projects are focused on state agencies, because they are important stakeholders, and are inevitably organized by that rubric. We may have given the wrong impression by mentioning how the NOAA Western Water Assessment wished to have a representative in each of its three states (Utah, Wyoming and Colorado), but we seek to cover the ecological, climate, and cultural coverage in the region. State boundaries are not very relevant when working with Federal agencies (e.g., FW R6, NPS, BLM) and Tribes where those spaces span across state boundaries and jurisdictions.
 - Outreach and work with stakeholders and partners across the region is done by the University Host team, the CPs, the BIA Tribal Resilience Liaisons, and the USGS team, and we build off of each other’s efforts. This means that we coordinate together to ensure that we are working across our entire region.
 - You will hear more about the work that the University team, the BIA Tribal Resilience Liaisons, and the Consortium Partners are doing during presentations on days 2 and 3, but listing a few details here in the meantime:
 - a. We keep track of Consortium Partner and University engagement with stakeholders and partners so that we know who we’re working with, who we’re not, and can plan to address any gaps (Day 2)
 - b. The Grasslands Synthesis Project was a major, multi-year effort to establish a baseline of information that will enable the NC CASC to engage more directly with grassland managers in the eastern portion of our region (Day 2).
 - i. Christine Miller Hesed (formerly the Grasslands Project Coordinator, now CU research scientist), is now the Regional Climate Adaptation Specialist (funded via a USGS pass-through project) and based in Hesston, KS in order to deepen our connections in this part of the region.
 - c. Molly Cross (WCS) and her work as a Consortium Partner to support the Wyoming Game and Fish Dept to incorporate climate information into their State Habitat Plan (Day 2).
 - d. Kynser Wahwahsuck (one of two BIA Tribal Resilience Liaisons in our region) is also based in Kansas. Again, this is to help us strategically engage more deeply with Tribal Nations in KS and NE especially. She has another commitment and won’t be presenting at our review, but Stefan Tangen will present an overview of both his and Kynser’s work on Day 2.

North Central Climate Adaptation Science Center – 2023 External Review

- We also have collaborative relationships with USGS researchers based in other states who are funded on NC CASC funds through the USGS (not administered through CU) and who conduct research in these areas (e.g., Owen McKenna and Symstad in ND).
3. **If you haven't already planned to include end-users of your products in the review, could you perhaps invite some to day 4 so they can say how your products have (or have not) been helpful to them?**
- You'll hear from two of these folks on Day 2.
4. **One piece you might address sooner than later is: why is CIRES so important to the Host/CASC? Why was there such an emphasis on CIRES on day 1? ERT members think they understand why, but I think you might want to underline that!**
- CIRES finance and administration is more specialized and more responsive than CU's general Office of Contracts and Grants or HR departments, and therefore streamline many of the administrative functions that the NC CASC has to deal with, so that we can spend more time doing science.
 - One of the major selling points for the CU proposal to host the CASC was its affiliation with CIRES, and the experience that CIRES has with managing federal cooperative agreements. This meant that the administrative structure was already in place for the NC CASC to move to CU and not have to spend valuable time and funds to create this administrative infrastructure.
 - CIRES finance and HR departments are much smaller, and therefore more specialized, than those at CU. For example, it can take several more months to hire someone thru centralized CU HR than it does thru CIRES HR. Similarly, CIRES has extensive experience with federal grants and agencies that streamline grant administration and make it much easier for PIs rather than working with the whole CU Office of Contracts and Grants. This infrastructure enables PIs and researchers to focus on doing the science instead of doing paperwork. One example of this is that Waleed has (sometimes) offered CIRES finance personnel support to other departments and PIs not connected to CIRES because of the incredible support we receive preparing, submitting, and then administering grants. This offer has been recognized by those non-CIRES PIs as a significant, in-kind contribution (e.g., Heather can answer more questions about this with regard to the Center for Native American and Indigenous Studies and the TCLP).
 - As Waleed mentioned, CIRES provides the "intellectual community and the administrative support", and this includes a group of scientists that are already thinking about interdisciplinary research.
 - All of the folks involved in the original proposal were CIRES employees, and we wanted the NC CASC to benefit from the breadth and depth of researchers and administrators there.
 - CIRES support with grant proposals is key to retaining key staff at the NC CASC. Because many of the researchers on the NC CASC staff (e.g., Rangwala, Yocum, and others) are research faculty, and therefore fully grant funded. Support from the CIRES finance team to write proposals and get them funded is important for retaining these people.

*This session summary was submitted by the DS Consulting Facilitation Team.
Edits were welcome and sent to the Scribe: Tina Patterson*

North Central Climate Adaptation Science Center – 2023 External Review

Day 2: Progress in Adaptation Science and Collaborative Efforts

March 7, 2023: Progress in Adaptation Science and Collaborative Efforts		
Purpose: Reflect on the host-university and associated academic consortium's contributions with respect to: <i>Scientific Achievements</i> and <i>Collaborative Efforts</i> .		
Mountain Time	Topic	Presenters, Titles & Affiliations
9:45-10:00	External Review Team - closed door	ERT Members and Facilitation Team
Review topic: Progress in Adaptation Science <i>Scientific achievements on climate impacts, vulnerability, and adaptation science</i>		
10:00-10:30	Overview of Progress in Adaptation Science	Bill Travis, NC CASC University Director
10:30-11:10	Climate Science Support • Climate & Ecological Scenarios • USFWS Species Status Assessments • Climate Tools • Ecological Drought & Transformation • Testimonials from Partners	Imtiaz Rangwala, NC CASC Climate Science Lead
11:10-11:25	Break	
11:25-11:50	Leveraged Science Efforts • Grasslands Synthesis Project • Fires of Unusual Size: Future of Extreme and Novel Wildfire in a Warming Continental United States • Climate Futures Toolbox	Imtiaz Rangwala, NC CASC Climate Science Lead Heather Yocum, NC CASC Social Science Lead & Christy Miller Hesed, Regional Climate Adaptation Scientist Jilmarie Stephens, NC CASC Future of Fire CAP Fellow Ty Tuff, Earth Lab Data Scientist
11:50-12:00	Q&A	Donna Silverberg
12:00-12:15	Break	
12:15-12:45	Consortium Partner Science • Social-Ecological Resilience to Wildfire • Improving the Conservation Planning Process to Better Prepare for Climate Variability • Ecological Transformation • Using Co-Produced Climate Information to Support Habitat Management in Wyoming	Jane Wolken, NC CASC Univ. Deputy Director Phil Higuera, CP PI, Univ. of Montana Jennifer Zavaleta Cheek, CP co-PI, South Dakota State Univ. Shelley Crausbay, NC CASC Affiliate, USFS, Climate Adaptation Specialist Molly Cross, CP PI, Wildlife Conservation Society

North Central Climate Adaptation Science Center – 2023 External Review

12:45-1:00	Facilitated discussion with ERT, and Q&A regarding Progress in Adaptation Science: • <i>How is the host university managing their program and doing Actionable Science?</i> • <i>What is the process? What patterns have emerged? What is/is not working well?</i> • <i>What are the Host and its academic consortium's contributions to climate adaptation science?</i>	Donna Silverberg All
1:00-1:15	Break	
Review topic: Collaborative Efforts <i>Collaborations with stakeholders to develop and deliver adaptation products applicable to priority decision-making</i>		
1:15-1:30	Overview of Collaborative Efforts	Heather Yocum, NC CASC Social Science Lead
1:30-1:45	Collaborating with Tribal Nations and Tribal Partners	Stefan Tangen & Kynser Wahwahsuck, NC CASC Tribal Climate Resilience Liaisons
1:45-2:00	Facilitated discussion with ERT and Q&A regarding Collaborative Efforts: • <i>How effective is the Host at engaging others in activities? How do the Host's Collaborative Efforts to design, implement, and evaluate their activities enhance the Host's overall effectiveness?</i>	Donna Silverberg All
2:00-2:30	External Review Team - closed door: Initial reflections on the day. Questions, concerns, and insights	Facilitation Team and ERT

DAY 2: DRAFT Facilitator's Summary

March 7, 2023, 10:00a – 2:30p MST

Topic: Progress in Adaptation Science and Collaborative Efforts

Prepared by DS Consulting Facilitation Team

The following summary was intended to capture basic discussion, reflections, concerns, and insights from the session. It is not a verbatim transcript, but includes links to the presentation.

Attendees present for all or part of the meeting (in alphabetical order):

ERT Members: Julien Lartigue (NOAA-RESTORE Science Program), Beth Rose Middleton Manning (UC Davis), John Tull (USFWS), Anne Wein (USGS-Western Geographic Science Center).

Host, Consortium and NC CASC Presenters: Aparna Bamzai-Dodson (USGS), Kyra Clark-Wolf (CU Boulder), Shelley Crausbay (USFS), Molly Cross (WCS), Lisa Dilling (CU Boulder), John Guinotte (USFWS), Phil Higuera (UM), Caitlin Littlefield (CSP), Brian Miller (USGS), Christy Miller Hesed (CU Boulder), Imtiaz Rangwala (CU Boulder), Hailey Robe (CU Boulder), Amber Runyon (NPS), Jilmarie Stephens (CU Boulder), Stefan Tangen (GPTWA), Bill Travis (CU Boulder), Ty Tuff (CU Boulder/Earth Lab), Jane Wolken (CU Boulder), Heather Yocum (CU Boulder), and Jennifer Zavaleta Cheek (SDSU).

Observers: Gus Bisbal (USGS/NCASC), Ryan Boyles (USGS/SE CASC), Will Kazmier (NE CASC), Wynne Moss (NC CASC Affiliate), and Meagan Oldfather (NC CASC-USGS).

North Central Climate Adaptation Science Center – 2023 External Review

DS Consulting Team: Facilitator: Donna Silverberg, Reporting and Support: Tina Patterson, Colby Mills.

Purpose for Day 2: To reflect on the Host-University and associated academic consortium’s contributions with respect to their progress in adaptation science and collaborative efforts.

Welcome, Introductions & Role Clarification

Facilitator, Donna Silverberg, welcomed the group and conducted a round of introductions that included NC CASC ERT Members, USGS and CU Boulder, NC CASC Host, and session observers. Host Deputy Director, Jane Wolken, recapped that CU Boulder’s science and collaborative efforts fit within their strategic Theory of Change (TOC) framework. The TOC helps the Host make progress towards the shared NC CASC vision that natural and cultural resource managers use actionable and open data, tools, and innovative science and information to make climate-informed decisions that support resilient ecosystems. Presentation available [here](#) (see Pgs. 2-4).

Progress in Adaptation Science: Scientific Achievements on Climate Impacts, Vulnerability, and Adaptation Science

Overview of Progress in Adaptation Science

NC CASC University Director, Bill Travis, provided an overview of the Host-University’s adaptation science achievements, highlighting the focus of the NC CASC on “adaptation science” (Pg. 6). He described adaptation science as multi- and inter-disciplinary, problem-focused, co-produced, goal and mission-oriented, rooted in the scientific approach, based in data and observation, theory and practice. He described it as science that tests alternative ideas and approaches while building tools and assisting in user application. He believes this type of science enables us to move towards the prediction of ecological transitions and build climate adaptation services to match those transitions.

A video, the NC CASC “[Research Reel](#),” showcased the CASC’s major science efforts including advancement in developing quantitative future climate scenarios for assessments of ecological impacts and adaptation strategies, as well as identifying key information needs for the North Central region. The video highlighted how the NC CASC provides science, training, and synthesis that is directly relevant to the decisions being made by resource managers, while working to build the next generation of resource managers and scientists to help the region and greater areas adapt and thrive in changing conditions.

Bill continued, noting that the CASC has been working in recent years to expand its communications efforts, which wasn’t formally emphasized in the original Host Agreement (HA). He ended the overview by highlighting an early climate assessment project in SW Colorado focusing on sage grouse habitat that started while CU Boulder was still a consortium partner. The project included climate, species, habitat, and social scientists working to understand how people understand climate impacts and how willing they are to make changes to adapt.

Climate Science Support

NC CASC Climate Science Lead, Imtiaz Rangwala, presented on the science that the NC CASC provides to support stakeholders and partners (Pgs. 8-36), specifically the Climate Science Support Platform (CSSP). The CSSP is a collaborative network of diverse science expertise at the NC CASC, made up of CASC scientists (CU, USGS, Consortium Partners “CPs”) and collaborators. This network performs stakeholder engagement, research, syntheses, and development of datasets, tools and communication products to identify, develop and provide the best available and actionable science. Broadly this covers: climate

North Central Climate Adaptation Science Center – 2023 External Review

science data & applications; stakeholder engagement & needs assessment; ecological response and impact assessment; and adaptation science & applications.

The CU Boulder’s climate adaptation science applications development process fits into 3 buckets: Future Climate Scenarios, Ecological Scenarios & Trajectories, and Adaptation Actions & Strategies.

NC CASC’s major science efforts include:

1. Developing quantitative future climate scenarios for assessments of ecological impacts and adaptation strategies;
2. Ecological drought;
3. Ecological recovery and transformation from climate-induced disturbance;
4. Identifying key information needs and synthesizing climate and ecological sciences for the North Central grasslands; and
5. Assessing future fire risk in the NC CASC region and beyond.

Imtiaz provided instances of significant engagement with numerous stakeholders and partners, including 16 USFWS Species Status Assessments (SSAs), scenario planning for 5 National Parks (in collaboration with NPS CCRP), state FWS, and the Sicangu Lakota (Rosebud Sioux) Climate Adaptation Plan. He noted that scientists on these projects are often funded by the NC CASC.

NC CASC develops climate tools and data sets, including drought tools, R-Shiny Apps to plot and extract observed & future projections data, tools developed in collaboration with ClimateToolbox.org, and is developing workflows to extract or derive downscaled climate projections data. Within the CSSP, Imtiaz emphasized peer-reviewed research articles written with stakeholders/partners as an example of co-production, as well as science synthesis work that the NC CASC does to bring understanding to managers and partners for stakeholder consumption. Highlights include the 2021-23 Future of Fire Climate Adaptation Postdoctoral Fellow research project and The Grasslands Synthesis Project.

The presentation also highlighted the Host’s approach for advancing and developing Scenario Planning to incorporate future climate uncertainty into impact assessment, climate science support for USFWS SSAs, and critical collaboration with Tool Developers outside the CASC for highly accessible tools for stakeholders/partners. Imtiaz noted the NC CASC’s engagement in research, tool development, and science synthesis for ecological drought and transformation, and future ecological response and trajectories to assess the relationship between climate change drivers and biological responses. The NC CASC published 65 peer reviewed articles in the first 4 years.

In closing, the ERT heard partner testimonials from John Guinotte, Ph.D., a Biologist and Spatial Ecologist with USFWS, and Amber Runyon, Ph.D., a Climate Change Ecologist with NPS, on their engagement with the NC CASC at CU Boulder. John emphasized a fruitful partnership, noting that USFWS leans heavily on the NC CASC and their biologists to help guide the SSAs process, as the Agency does not have the necessary scientific background/expertise. Most important from John’s perspective are the NC CASC’s contributions to the [Climate Toolbox](#), that provides a platform for staff scientists to get their species assessments started, and climate training workshops that provide much needed hands-on training. Further needs include future drought and fire risk projections.

Amber noted that the NC CASC helps the NPS translate and synthesize the best available science. She added that the CASC is a great partner for co-production and a resource for technical information to help

North Central Climate Adaptation Science Center – 2023 External Review

the NPS understand, interpret, and share climate science and data. This helps park stewardship, capacity building at NPS, scenario planning for more park units, and climate-informed strategies in the parks.

Questions and Comments from the ERT for Partners:

- *Question:* How do the SSAs line up with USFWS' internal climate program? (Branch of Species Status Assessment Science Support)
 - John noted USFWS' internal program has been very helpful, but staff are spread thin and do not provide the support the CASC offers. The Service is very dependent on the NC CASC for climate consultation and interpretation of climate information.
- *Question:* How did you find the CASC and its products? Who reached out to whom?
 - John joined USFWS in 2016, when the SSA for wolverine was just starting, and the CASC supported this effort. John has been on ¼-time detail with the CASC for the last few years; he functions as a conduit between the CASC and USFWS in Region 6, which USFWS management has supported. They want the supportive relationship to continue, and can't hire the necessary climate staff internally.
 - The relationship between NPS and the NC CASC developed prior to Amber joining in 2016. Proximity may have played a role initially, and the program was established around the time the CASC was established; they have been working together ever since.
- *Question:* While understanding climate scenarios and how to produce them, have you connected these with the Resist-Accept-Direct (RAD) framework yet?
 - Amber noted that the project that initially developed RAD was co-developed with the CASC and NPS and other Federal agencies. NPS has fully integrated the RAD framework into their adaptation planning, and it is a fundamental tenet in their Planning for a Changing Climate guidance, which is used across the Service. The RAD framework has provided clarity for managers in how to adapt in ways that other frameworks have not.
 - John reported that for ecological services, integrating RAD into their workflows is still in the early stages; not a lot of action in terms of putting into practice.
- *Comment:* RAD is still being socialized across DOI Bureaus, and NPS has been a frontrunner in this effort.

Leveraged Science Efforts

Three Leveraged Science Projects were presented that address the NC CASC science and service priorities (Pgs. 38-61): The Grasslands Synthesis Project, The Future of Fire Climate Adaptation Postdoctoral (CAP) Fellows Project, and the Climate Futures Toolbox (CFT). These projects have been substantially supported by NC CASC scientists through the Host Award (HA).

Regional Climate Adaptation Scientist, Christy Miller Hesed, reviewed The Grasslands Synthesis Project (Pgs. 39-51), that the CASC began in 2020. The project lays the foundation for future actionable research to inform successful management of grasslands in a changing climate. The project was designed to synthesize grassland managers' goals, challenges and information needs, in conjunction with existing climate and ecological science to inform those needs and identify gaps in the science. Two working groups (Management Priorities and Climate & Ecology) were formed, with feedback provided by an Advisory Committee. The project has extensive engagement with two forthcoming reports that are expected to be available next month. Christy noted that the project identified further necessary research, informed the NC CASC FY2022 RFP process, and has led to a grasslands-climate training for USFWS.

NC CASC Future of Fire CAP Fellow, Jilmarie Stephens, presented her regional work, "Fires of Unusual Size: Future of Extreme and Novel Wildfire in a Warming Continental United States," from the Future of

North Central Climate Adaptation Science Center – 2023 External Review

Fire CAP Fellows Program (Pgs. 52-60). Jilmarie built the research off a previous post-doc project model to predict where future fires will happen using climate, fire, and population data. Fire data came from the monitoring trends in burn severity (MTBS) dataset that maps burn severity and the extent of large fires across the country; population data predicts population changes in areas where future fires may occur. Jilmarie reviewed the model workflow, Continental United States (CONUS)-wide results, and key project findings.

The ERT then viewed a [video](#) from Earth Lab Data Scientist, Ty Tuff, on the [Climate Futures Toolbox](#) (Pg 61), which is a software package that seeks to help people take data from a large online data repository and actually use it with insight. The CFT downloads the Multivariate Adaptive Constructed Analogs (MACA) data set which is a scaled down version of a larger climate model, with a gridded output. The project was produced to address the NPS' Climate Change Response Program, to plan for the future of Parks. Roughly 6 months ago, the CFT was published on the Comprehensive R Archive Network (CRAN) and has since received great feedback, with about 6 new users daily. The CFT is able to translate complex climate data into relatable metrics for users. Ty noted that solving a problem for the NPS solved a problem for many other people. With the CFT published on CRAN, decision-makers have a free and open-sourced way to plan for the climate future of their local area. CFT has become a centerpiece of the NC CASC's training efforts for Tribal colleges and universities.

Questions from the ERT:

- *Question:* Regarding funding that comes to the Host-University versus the CASC funding: does the Host look for strategic strength using both sources to compliment and build, or is funding siloed? How does the science compliment between the two entities and funding streams?
 - The Grasslands Project was Leveraged Science (some scientists funded by USGS, some by Host-University funds). This maximized the amount of expertise provided while minimizing the Host funds that were diverted to a project that wasn't outlined originally in the HA (while encompassed in the overall vision).
- *Question:* How is the Host's strategic plan uniquely built within the Host & Consortium, versus driven by the USGS-side priorities? What is the Host doing to help advance the overall CASC mission?
 - Some projects have taken additional resources (e.g., Grasslands took additional resources and did comport with the strategic science plan). The Host-University team is always thinking about developing tools and capabilities at the CASC and not always thinking about it in terms of each dollar serving specific elements of the strategic science plan.
 - Leveraged research and tool development efforts (supported by external USGS funding) have been critical in supporting, advancing and scaling up the NC CASC's mission to do the science and service to partners.
- *Question:* Regarding the Fire study results, what did you assume for management strategies when producing those projections?
 - There was no accounting for any kind of thinning or fire management in terms of suppression etc. The paper is under review at PNAS and there are some known gaps, including no strict vegetation input.

Consortium Partner Science

NC CASC University Deputy Director, Jane Wolken, introduced the NC CASC Consortium Partners (CPs) and reviewed CP science (Pgs. 64-103). CPs of the NC CASC include Conservation Science Partners (CSP), Great Plains Tribal Water Alliance (GPTWA), South Dakota State University (SDSU), University of Montana (UM), and the Wildlife Conservation Society (WCS). The unique structure of universities, consortium

North Central Climate Adaptation Science Center – 2023 External Review

nonprofits, and Tribal boundary organization allows the Host-University to leverage unique capabilities to address the diverse stakeholder needs in the region.

CP PI University of Montana, Phil Higuera, presented examples of CP work supported by the CASC, under the broad understanding of Social-Ecological Resilience to Changing Wildfire Activity (Pgs. 66-73), with the intent of sharing it with local communities and across the country. Examples include: Kim Davis' (USFS) work on vulnerability to post-fire conifer tree regeneration failure, a major group effort on how past, ongoing, and future climate change is interacting with the severity of wildfires; Jamie Peeler's work on opportunities to stabilize carbon with pre-wildfire treatments (relevance to last year's Infrastructure Act); and Phil's own work on characterizing the causes and changing patterns of fire-caused home and structure loss. This work combines different drivers of recent changes in fire activity in human impacts among climate and human-caused ignitions, and looks at trends in structure losses due to wildfires, and how wildfires and structure loss vary by state.

Jennifer Zavaleta Cheek, CP co-PI South Dakota State University, presented CP work on Improving Conservation Planning Process to Better Prepare for Climate Variability in South Dakota (Pgs. 74-86). She noted that conservation planning is critical for addressing climate change, with the goal of conserving biodiversity, ecological processes that sustain biodiversity, and ecosystem services that include and benefit people. The project asks, "How can we improve conservation planning processes to better prepare for climate variability?" using a social-ecological systems approach to better understand planning problems. Results of note found that most park managers are starting to manage for increased inclement weather and are most worried about summer weather, although they are focused on day-to-day tasks. In the future, the project seeks to better understand how to improve the planning process in South Dakota.

NC CASC Affiliate Shelley Crausbay, USFS Climate Adaptation Specialist, presented CP work on CASC science to address Ecological Transformation (Pgs. 87-96). This science includes the RAD decision-making framework, a science agenda to support RAD decisions, and completed pieces of the science agenda. One noted project focuses on ongoing ecological transformation at the Ute Mountain Ute Tribe, and uses modeling, elder interviews and scenario planning for how the Tribe can adapt to ecological transformation using the RAD framework. Shelley reported a significant uptake in the conservation science and management community on this framework and science agenda.

CP PI Wildlife Conservation Society, Molly Cross, presented the CP project, Using Co-Produced Climate Information to Support Habitat Management in Wyoming (Pgs. 97-103), a management planning opportunity to co-produce actionable science with the Wyoming Game & Fish Department (WGFD). The project focused on informing Wyoming's 2020 Statewide Habitat Plan (SHP). Previous versions of this plan had not considered climate change, and the Agency decided to include consideration in the 2020 update, but were unsure where to begin. Shared project goals included incorporating climate-informed actions into the SHP, identifying management-relevant gaps in climate information, and advancing learning on co-production methods. The core activity was the 2020 WGFD Climate Change Workshop, with participation from over 25 WGFD managers and more than 10 climate researchers. Significant outcomes included the use of the co-produced climate change information in the 2020 SHP, and targeted work to identify management-relevant climate information needs. Regarding project evaluation, the methods were found to be effective and replicable, and the participation of a "boundary spanner" who could connect agency managers with researchers from the climate change research community was a key factor. Molly emphasized that it is important for the NC CASC / National CASC to continue to build this role.

North Central Climate Adaptation Science Center – 2023 External Review

Facilitated Discussion with the ERT & Questions Regarding Progress in Adaptation Science

The ERT was asked to consider the following questions regarding the Host-University's progress in adaptation science:

1. *How is the Host-University managing their program and doing Actionable Science?*
 2. *What is the Process? What patterns have emerged? What is/is not working well?*
 3. *What are the Host and its academic consortium's contributions to climate adaptation science?*
- *Question:* How do you define co-production? What methods were most effective?
 - Specific effective methods included everything from start to finish: the facilitated discussion around shared project goals; the virtual workshop where new information was developed; follow-up workshop surveys to identify information gaps and needs for management decision-making; and all interactions with the Agency core team.
 - *Question:* Were all of these CP projects selected through USGS requests/proposals? What was the origin of the projects?
 - It's a blend, some work is solely funded off the HA, while some work uses a combination of funded supplemental projects and HA funding as leveraged funds to combine together; a little bit of both.
 - The projects were built into the Host Agreement (not each individual effort was in the original proposal). The consortium is a requirement of the Host Agreement. Rather than a sole institution using its own management and science contacts, involve multiple institutions to take on projects with co-production & diverse stakeholders to meet goals of the CASC and region. The Host and CPs communicate regularly, and the Host keeps track of and encourages emerging CP efforts, occasionally discouraging work not viewed by the Host management team as central to strategic goals.
 - Many project ideas were already on the minds of CPs, and having flexible consortium partner funds to work closely with CU Boulder and USGS teams to align the projects with CASC priorities helped shape the work produced and provided flexibility for exciting work. Again, not all CP new project ideas are supported, depending on how they comport with CASC goals.
 - *Question:* Can you elaborate on what the "uptake on the RAD framework" looks like?
 - The RAD framework is something that natural resource managers across several federal agencies have been developing since 2012-2014. It is an integral part of guidance for many Federal Agencies (NPS, USFWS, NOAA, BLM, USFS). Molly's paper (released just over a year ago) has already been cited 50 times; people are hungry for how to figure out how to deal with transforming landscapes, and the RAD framework provides a clear roadmap to lineout all potential decisions. It feels like an answer and hopeful clarity in the face of discouraging climate change impacts.
 - *Question:* What guides the selection of projects out of Host funds? Science plan? Science strategy?
 - This depends on the type of project; leverage pieces (ongoing things with pass-throughs) are on the USGS side, while CP science is the Host aligning activities with input from USGS.
 - The original plan and approach to establishing a consortium included working with new stakeholders, and thinking about solutions via Working Groups (which came to fullest fruition in Grasslands initiative); each consortium member would identify problems and stakeholders in the strategic plan, confirm with the Host, then produce. All have similar qualities, and universal questions to climate adaptation.

North Central Climate Adaptation Science Center – 2023 External Review

- In MT for fire, the Host helped turn longstanding and leading research on post-fire forest regeneration into a bigger effort that involved stakeholder meetings with people on the ground. Project ideas have come up that don't quite fit the regional effort and have been discouraged. Unlike the pass-through funding, the Host doesn't formulate an NSF-like proposal review (USGS does for pass-through projects). Once it comes through, the Host is able to also capitalize on the extra resources provided and people involved. The consortium is eligible for those projects, but they must align with the science plan and allow the Host to build in the same direction.
- The Science Strategy is a USGS-generated document. Under the previous administration they were not allowed to publish that strategy, so it is not fully fleshed out (it is used to inform the project solicitations and internal work on aligning work with manager needs).
- There is a great deal of background effort, not always evident in statements of work, for the processes of co-production or creating actionable science; including constant discussions of evolving needs. Leveraged funding addresses this underlying effort, as specific project funds are not always available to support evolving efforts, which are hard to capture. One thing about the Host funding that is hard to articulate, is the freedom and flexibility to have conversations that could lead to co-production, or not.
- The Host proposal aligned the science/research with USGS' draft Science Plan. Our ongoing interaction with USGS colleagues informs how USGS' science strategy evolves.

Collaborative Efforts: Collaboration with stakeholders to develop and deliver adaptation products applicable to priority decision-making

Overview of Collaborative Efforts

NC CASC Social Science Lead, Heather Yocum, presented on how the NC CASC collaborates with key partners and stakeholders, and how they work with other centers and organizations to build transdisciplinary and interinstitutional relationships (*Pgs. 106-117*). NC CASC's partnerships with regional stakeholders, Tribal Nations, and other organizations enable them to respond to high priority natural and cultural resource management challenges, while also fostering substantive and sustained engagement between scientists and managers. Tracking this work with partners allows for evaluation efforts and to observe networking and engagement growth over time. Heather noted that Tribal Nations and Tribal members are rights holders, not stakeholders, and are included as key partners with whom the CASC works.

In addition to stakeholders, the Host collaborates with other centers and organizations to increase capacity to generate stakeholder-driven science, for example, Earth Lab (data synthesis center based at CU). Heather highlighted collaborative efforts such as the Drought Index Portal (DrIP), education and capacity building, and logistics support. The NC CASC also hosts the Regional Invasive Species & Climate Change (RISCC) Management Network, and coordinates with the USDA Climate Hubs and the Western Water Assessment (WWA) to consult on projects so as to avoid overlap and spread awareness on different projects. To conclude, Heather highlighted the collaborative efforts resulting in the production of the Future Climate Scenarios Tool and the US Climate Resilience Toolkit.

Collaborating with Tribal Nations and Tribal Partners

NC CASC Tribal Climate Resilience Liaison, Stefan Tangen, presented on the Tribal Resilience Liaison Program (TRLP), how the liaisons work directly with the CASC, and how the Host utilizes the TRLP (*Pgs. 118-121*).

North Central Climate Adaptation Science Center – 2023 External Review

The Bureau of Indian Affairs (BIA), the Great Plains Tribal Water Alliance (GPTWA) and the USGS have a Memorandum of Agreement for the inter-Tribal organization (the GPTWA) to host liaisons through a BIA grant. The NC CASC provides a work station, and connects the resources at the CASC to Tribal partners in the region. Stefan and Tribal Climate Resilience Liaison, Kynser Wahwahsuck, cover the same 7 states as the NC CASC, working directly with Tribal managers that work for the 32 federally recognized Tribal governments, and reporting directly to the GPTWA, a non-profit inter-Tribal organization with 5 board members, each representing a different Tribal Nation.

The TRLP's overall goal for the region is to mainstream climate change into all Tribal departments at each of the 32 federally recognized Tribes. The liaisons utilize the resources, generally at the NC CASC but sometimes at other locations, and connect them directly to the needs expressed from Tribal partners. Stefan highlighted events that have built relationships between CU Boulder and its CASC partners and Tribal partners; these are opportunities to hear Tribal partner needs and relay what is available to address those needs. Events included: GPTWA Water Conferences 2018-19, 2022; Western South Dakota Water Conference 2019; Lower Missouri River Tribes Climate Resilience Workshop Series 2018-2022 (became model for peer-to-peer learning); Tribal webinars 2020-2021; and the Climate Conference with Standing Rock Sioux Tribe Bismarck, ND 2021.

Stefan highlighted some of the applied TRLP projects that have helped to address Tribal partner needs. The liaison role is to bridge the gap between the science and the practice; to reflect the actual interest and address the concerns of the Tribes. Collaboration highlights include stakeholder engagement meetings (big picture how to best meet needs), strategic planning via the Theory of Change Process (how can we be most effective through a Tribal lens), Tribal Engagement Strategy (to identify how the Host is most effective at partnering with Tribes), Climate Solution Days (Tribal session to showcase available Host resources), CSSP (regular engagement). Tribal engagement was extremely challenging during the height of the Covid-19 pandemic.

Facilitated Discussion with the ERT & Questions Regarding Collaborative Efforts

The ERT was asked to consider the following questions regarding the Host-University's collaborative efforts:

1. *How effective is the Host at engaging others in activities?*
 2. *How do the Host's collaborative efforts to design, implement, and evaluate their activities enhance the Host's overall effectiveness?*
- *Question:* Regarding engagement with state government agencies: this dropped from 15 to 10 by year 4. How can states be better engaged? Did a changing government force collaborations to dissolve?
 - The Host does not count entities that it is not actively working with, so this could be a reflection of concluded projects. Changing administrations at the state level provide an interesting and challenging dynamic for engagement. The Host is always looking for opportunities to work with state governments
 - USGS had hired a temporary outreach position assigned to state partners, but the Host side doesn't track those interactions on pass-through projects/USGS team. Numbers provided are only Host team or consortium teams.
 - *Question:* How common is the MOU structure between the BIA, GPTWA and NC CASC?
 - This is consistent across all CASC regions; each region has an inter-Tribal organization that provides a liaison; this is a service for the CASC to utilize to connect to Tribal partners. Liaisons are utilized differently depending on the region and CASC capacity.

North Central Climate Adaptation Science Center – 2023 External Review

- *Question:* Regarding the TOC: is there something specific learned in Tribal context?
 - It helps tie together communications and the strategic document, to create connections between Tribal managers and researchers, and the process in which that could occur. It could be used to help Tribal partners fully understand the type of science available while building understanding among scientists and research of Tribal partner needs and barriers, and how to be effective in different spaces and create a better perspective of what is heard.
 - A lot hinges on the depth of the relationship between the CASC and a partner (varied, on different ends of the needs spectrum); having a shared cultural literacy and knowing what's important to those affected.
 - The team has benefitted from coalescing around the shared vision and understanding the Host's place, strengths of colleagues and the CASC. Aligning activities and how they fit the overall mission. There is a framework now to retroactively evaluate what's being done and how to expand it.
- *Question:* It's hard to measure the success of partnerships and collaborations. What metrics does the Host have to account for its success in collaboration and partnership?
 - This continually is the most difficult question to address. The gold standard is to work with partners and produce a project, while tracing the process evolution and outcomes (which might come quite further down the time-line). In collaboration with NOAA RISA, they will be looking at good ways to measure success.
 - There are so many ways to measure this: stakeholders that keep coming back, depth of relationships, interactions that work and continue, spreading positive experiences with the Host to others. The Host is tracking different projects and creating a stakeholder tracking sheet; it is tough to track.
 - The draft TOC report brainstorms a framework of indicators to use for evaluation metrics and has a table that documents 'Indicators of Success' which lists some metrics. This was developed after the HA was put in place, so this is not work included in the original award and the Host is not currently collecting this data (or expected to). These are a robust set of ideas for when there is capacity to implement them in the future.
 - ERT Member: a good example of implementation success would be what Stefan just presented!
 - Should the Host do evaluation retroactively or focus it on process?
 - NC CASC USGS Acting Director, Aparna Bamzai-Dodson, did evaluate the work done under Cycle 1 of the NC CASC (CSU Host) but CU Boulder hasn't tackled this yet:
<https://doi.org/10.3390/su142114026>.
- Metrics will take as much time as you give them. It's great that the Host is measuring outputs, and qualitative stories of larger outcomes is important as a communications device. They will always be undercounting.
- A plug for external evaluation: You will hear things you did not know. Evaluation is very important; it's insightful to think about why things are done, and what is trying to be achieved.
- One ERT member said they used the following tool to qualitatively evaluate partnership impact noting that, as a non-social scientist, it helped him think about impact in collaboration:
<https://www.onetam.org/partnership-impact-model>

Bill noted that evaluation is not in the Host's current 5-year plan. Anecdotes and testimonials help support success, and identify weaknesses. This is something the Host could do more of, although he is convinced that the Host team has a good sense of what is working and what isn't based on feedback and shared experiences. Stefan added that "you don't know what you don't know," and there is constant

North Central Climate Adaptation Science Center – 2023 External Review

learning of what needs are, and bringing in resources to meet those needs. The TOC has helped, and the Host team is constantly working to get better as things move forward. Imtiaz concluded with the importance of evaluating along different aspects of the process; the Host has a firm idea of who they engage with effectively, and has identified areas for improvement in engaging more with Tribes and BLM. There is good clarity in terms of where things are working well and what can be improved to help in the CASC's mission to serve its stakeholders.

Donna thanked the ERT, Consortium & CASC Members, and Observers for their participation, engagement and attendance at the session. The meeting was adjourned.

ERT Reflections on the Day

The ERT met in closed session to discuss what they had heard. The ERT asked clarifying substantive questions for the Host to answer at some point during the next sessions: *(Answers provided from Host after Day 2 session)*

1. How do you choose which science projects you work on? Do you have criteria that are clear and accessible to others or is it more random than that?

- All projects need to align with the USGS science plan and the major, emerging themes from that. This science plan is routinely updated based on feedback from the NC CASC Science Advisory Committee. The Host leadership team then decides which CP activities are funded via the Host award based on their knowledge of the evolving program, gaps, and opportunities. We do not have specific review criteria, but nor is it a random process. Sometimes we re-direct CP energy back toward CASC-centered goals if their internal incentives send them in other directions.
- Consortium Partner efforts envisioned in the Host Agreement were originally agreed upon after collaborative conversations between the CU team and the Consortium Partners during the contract modifications process when they had to create budgets and specific statements of work. These were general science areas, which would be refined as we engaged with partners and their specific expertise (e.g., habitat connectivity, post fire regeneration).
 - Originally, we had proposed to hold Climate Solutions Summits in Year 3 and Year 5 to bring together researchers and partners in order to refine the research priorities that the Consortium Partners were working on; however, we had to change that model during COVID. After consultation with our Consortium- and USGS-partners we opted instead to pivot to a virtual format we called Climate Solutions Days 2022 (CSD). CSD provided an à la carte offering of presentations, workshops and trainings scheduled throughout Earth week where scientists and practitioners shared insights on climate change impacts from findings in the North Central region. One of the goals of CSD was to create reusable video content that is available on our YouTube Channel ([here](#)). Themes were woven into panel presentations, working groups, listening sessions, trainings and tools included:
 - Climate Impacts and Adaptation in the North Central Region
 - Science Tools & Applications
 - Tribal Partnerships in Climate Adaptation
 - Future of Fire

North Central Climate Adaptation Science Center – 2023 External Review

- Grasslands Synthesis Project
 - Science Communication
 - Stakeholder Needs and Outreach
 - As there have been changes in the Consortium Partner network (for example, when Shelley Crausbay moved from CSP to USFS; Jennifer Zavaleta Cheek became a co-PI at SDSU), we continue these collaborative discussions between the CU team (previously Jennifer Balch; now Bill Travis and Jane Wolken) and the Consortium Partners in question.
 - Other projects are proposed by the USGS team and the CU team responds. For example, the idea for a project to increase engagement with the grassland ecosystems of our region came from USGS leadership as one of the first priorities when the NC CASC moved to CU. The CU team was tasked with developing a project to address this, and we collaboratively worked with the Consortium Partners to create a proposal for USGS to solicit directed funding to support it. Often, we are also responding to our partners' needs for science, data and information which often are time-bound.
 - Sometimes, it is literally just a question of capacity. For example, Imtiaz often has more organizations and people asking for his services than he has time.
2. **With regards to collaboration, if a new or emerging need is identified, how does money get redirected to meet that need?**
- Oftentimes a need is jointly recognized that we collaborate with USGS to address. The following are examples of this collaborative budget planning:
 - A Communication Specialist was not built into the original Host Agreement, as the Host initially planned to rely on CIRES Communication to meet this need. When it became evident that the NC CASC had a need for more communication and outreach capacity, the Host and USGS collaborated to build in supplemental funding to support a part-time communication specialist position. The mechanism used to direct this additional funding to CU in a timely manner was via a pass-through project, Creating a North Central Regional Invasive Species and Climate Change (NC RISCC) Management Network (Research PI R. Chelsea Nagy). The Host was then able to add to this USGS-supplemental funding using unspent salary from changes in program staff FTE (e.g., as a result of COVID-related childcare issues Wolken opted to work at 75%FTE; some of the unspent salary was used to increase funding for the communication position that is filled by Ulyana Horodyskyj Peña).
 - Due to a combination of COVID-constraints on spending and personnel turnover at Conservation Science Partners (CSP), the Host and CSP recognized that they would be unable to concurrently spend BY4 and BY5. As a result, the CU Leadership team (Travis, Wolken, Yocum and Rangwala) decided to redirect CSP's BY5 funds to the Great Plains Tribal Water Alliance (GPTWA), as they were now in a position to receive Consortium Partner funding and develop a statement of work in support of Tribal climate adaptation needs in the region. NC CASC Administrative Finance Managers

North Central Climate Adaptation Science Center – 2023 External Review

(Stossmeister and Burfield) then worked with the CU team to request a budget change and set-up a subaward to GPTWA (in progress).

- Sometimes collaborative adjustments are made through the Host funds, and sometimes they are made through directed funding from USGS (e.g., grasslands project; we went through a proposal process, but it wasn't in response to a particular, open RFP process). Host funds are also channeled to support leveraged projects that helps to expand and scale up our science and service efforts
- We have some limited Host funds for GRA's to hire to assist specific projects, so that is one way we can fill emerging needs.
- A portion of the salary time of research scientists supported on Host funds (e.g., Yocum and Rangwala) can also be flexible to address new and upcoming projects. For example, we plan to conduct a series of Rapid Assessments in the summer and fall of 2023, and we will use Host funds from Y5 to support this effort for Yocum, Rangwala, and others.
- One of the benefits of having the Consortium Partner funding structured as we now do, is that it provides flexible topics and time that we can use to respond to emerging stakeholder needs or to take advantage of particular opportunities (e.g., Molly Cross' work with WY Game and Fish)

*This session summary was respectfully submitted by the DS Consulting Facilitation Team.
Edits were welcome and sent to the Day 2 Scribe: Colby Mills.*

North Central Climate Adaptation Science Center – 2023 External Review

Day 3: Capacity Building & Outreach and Communications

Day 3	March 8, 2023: Capacity Building & Outreach and Communications	
	Purpose: Reflect on the host-university and associated consortium's contributions with respect to Capacity Building and Outreach & Communications.	
Mountain Time	Topic	Presenters, Titles & Affiliations
9:45-10:00	External Review Team - closed door	ERT Members and Facilitation Team
Review topic: Capacity Building <i>Education and training to build capacity of early career professionals and others</i>		
10:00-10:10	Overview of Capacity Building Activities	Heather Yocum, NC CASC Social Science Lead
10:10-10:25	Justice, Equity, Diversity, and Inclusion in STEM programs ● CAST program ● Tribal Climate Leaders Program (TCLP)	Heather Yocum, NC CASC Social Science Lead
10:25-10:30	Student Research Highlight	Shelby Ross, PhD Candidate, Geography/TCLP
10:30-10:45	Supporting Tribal Climate Adaptation Planning	James Rattling Leaf, Sr., NC CASC Tribal Engagement Specialist
10:45-11:00	NC CASC Trainings ● Climate Data 101 ● Earth Data Science Corps (EDSC)	Nate Quarderer, Earth Lab Interim Education Director & Elsa Culler, Earth Lab Education Trainer
11:00-11:15	Break	
11:15-11:30	CASC-Network Capacity Building Activities ● Climate Adaptation Postdoctoral (CAP) Fellows Program ● CASC Collaborative Visioning Discussions ● Early Career Training (October 2022)	Jane Wolken, NC CASC Univ. Deputy Director
11:30-11:40	Graduate Research Assistant Spotlight: R Shiny Apps for Scenario Planning	Prasad Thota, NC CASC GRA; Climate Data, Tools and Science Support
11:40-11:55	Collaborative Development of Grasslands-Climate Training Series	Christy Miller Hesed, NC CASC Regional Climate Adaptation Scientist
11:55-12:15	Facilitated discussion with ERT, regarding Capacity-Building: ● <i>How is the Host and associated consortium doing their Capacity Building? What is the process? What patterns have emerged? What is/is not working well?</i> ● <i>How effective is the Host and associated consortium in designing, implementing, and evaluating these Capacity Building activities?</i> ● <i>What is the Host and associated consortium's contribution to Capacity Building?</i>	Donna Silverberg
12:15-12:30	Break	

North Central Climate Adaptation Science Center – 2023 External Review

Review topic: Outreach & Communications <i>Manage and transfer information and data related to research activities</i>		
12:30-12:35	Overview of Outreach & Communications	Jane Wolken, NC CASC Univ. Deputy Director
12:35-12:50	Building a Successful NC CASC Communications Program	Ulyana Horodyskyj Peña, NC CASC Communications Lead
12:50-1:15	Advancing Climate Adaptation Efforts Through Effective Communication • Spotlight Stories • Webinars • Tribal Webinars • Climate Solutions Days • Outreach Publications • Social Media	Ulyana Horodyskyj Peña, NC CASC Communications Lead
1:15-1:30	Break	
1:30-1:40	Tribal Outreach Activities	James Rattling Leaf, Sr., NC CASC Tribal Engagement Specialist
1:40-2:00	Facilitated discussion with ERT, regarding Outreach & Communications: • <i>How is the Host and associated consortium providing Outreach & Communications? What is the process? What patterns have emerged? What is/ is not working well?</i> • <i>How effective is the Host and associated consortium in these Outreach & Communications activities? How do these activities enhance the Host's effectiveness?</i> • <i>What factors limited outreach and communication and how were they mitigated?</i>	Donna Silverberg All
2:00-2:30	External Review Team - closed door: Initial reflections on the day. Questions, concerns, and insights	Facilitation Team and ERT

DAY 3: DRAFT Facilitator's Summary

March 8, 2023, 10:00am – 2:30pm MST

Topic: Capacity Building & Outreach and Communications

Prepared by DS Consulting Facilitation Team

The following summary was intended to capture basic discussion, reflections, concerns, and insights from the session. It is not a verbatim transcript, but includes links to the presentation.

Attendees present for all or part of the meeting (in alphabetical order):

ERT Members: Julien Lartigue (NOAA-RESTORE Science Program), Beth Rose Middleton Manning (UC Davis), John Tull (USFWS), and Anne Wein (USGS-Western Geographic Science Center).

Host, Consortium and NC CASC Presenters: Aparna Bamzai-Dodson (USGS), Lisa Dilling (CU Boulder), Ulyana Horodyskyj Peña (CU Boulder), Christy Miller Hesed (CU Boulder), Imtiaz Rangwala (CU Boulder),

North Central Climate Adaptation Science Center – 2023 External Review

James Rattling Leaf, Sr. (CU Boulder), Hailey Robe (CU Boulder), Shelby Ross (CU Boulder), Prasad Thota (CU Boulder), Bill Travis (CU Boulder), Jane Wolken (CU Boulder), and Heather Yocum (CU Boulder).

Observers: Ryan Boyles (USGS/SE CASC), Kristen Donahue (USGS/NCASC), Emily Fort (USGS/NCASC), Addie Rose Holland (NE CASC), Will Kazmier (NE CASC), and Emma Kuster (SC CASC).

DS Consulting Team: Facilitator: Donna Silverberg, Reporting and Support: Tina Patterson, Colby Mills.

Purpose for Day 3: To reflect on the Host-University and associated consortium’s contributions with respect to Capacity Building & Outreach and Communications. Today’s presentation slides are available [here](#).

Welcome, Introductions & Role Clarification

Facilitator, Donna Silverberg, welcomed the group and conducted a round of introductions that included NC CASC ERT Members, USGS and UC Boulder, NC CASC Host, and session observers.

Overview of Capacity Building Activities

NC CASC Social Science Lead, Heather Yocum, began with an overview of the morning’s agenda (see presentation page 4). After the agenda overview, Heather provided an overview of NC CASC’s capacity building efforts: Graduate Research Assistants, Postdoctoral Researchers, working with stakeholders and partners, working with Tribal Nations, and building capacity across all CASC regions (see presentation pages 5 to 13).

Justice, Equity, Diversity, and Inclusion in STEM programs

Heather continued her presentation to the ERT with a discussion of NC CASC’s work on Justice, Equity, Diversity, and Inclusion (JEDI) in Science Technology Engineering and Mathematics (STEM) in two programs: Climate Adaptation Scientists of Tomorrow (CAST) Program and the Tribal Climate Leaders Program (TCLP), as well as next steps for the programs (see presentation pages 15 to 21).

Student Research Highlight

PhD Candidate in Geography/TCLP, Shelby Ross, spoke with the ERT about the focus of her work “Climate change impacts on the Native American Type 2 Diabetes epidemic of the Northern Great Plains Region”. The presentation included research questions, proposed methods, and funding (see presentation pages 22 and 23).

Supporting Tribal Adaptation Planning

NC CASC Tribal Engagement Specialist, James Rattling Leaf, Sr. shared with the ERT his efforts as NC CASC’s Tribal Engagement Specialist working with other Tribal communities. James highlighted his work with the InterTribal Buffalo Council and US Department of Agriculture (see presentation page 24).

NC CASC Trainings

Nathan Quarderer, Interim Education Director and Postdoctoral Associate (CIRES; Earth Lab; ESIL) shared with ERT an overview of two training programs: Climate Data 101 (CD 101) and the Earth Data Science Corps (EDSC) as examples of how NC CASC contributed to building a community of researchers and managers, while fostering leadership in science-based resource management. The presentation included before and after participant feedback about their increased level of confidence managing climate data, use of Python, and other relevant GIS, Earth/Environmental science. Nate shared that the next step is

North Central Climate Adaptation Science Center – 2023 External Review

ESIIL Stars, <https://esiil.org/esiil-stars> ESIIL Stars will be modeled after ESDC (see presentation pages 25 to 48).

NC CASC Network Capacity Building

Jane Wolken explained to the ERT that NC CASC's network-wide capacity building activities are carried out via a combination of the Host Agreement, and supplemental USGS program funding (e.g., National CASC CAP Fellows Program) and includes collaborative activities/initiatives with the broader CASC-Network. She provided information about NC CASC's leadership and involvement in cross CASC efforts such as the Climate Adaptation Postdoctoral (CAP) Fellows Program, CASC-Network Collaborative Visioning, and CASC-Network Trainings. (See presentation pages 50 to 57).

Graduate Research Assistant Spotlight: R-Shiny Apps for Scenario Planning

Prasad Thota, NC CASC Graduate Research Assistant for Climate Data, Tools, and Science Support, shared with the ERT the R Shiny Apps for scenario planning created for user interface with climate data. Output generated by the app can be selected by options including location name, latitude or longitude. Prasad also discussed several CSSP Tools from the R Shiny Apps: Drought Indices App, Evaporative Demand App, Grasslands Productivity and Climate App, and Potential Future Apps and Datasets. The apps were collaboratively developed by NC CASC and CU Boulder (see presentation page 58 to 67).

View the poster presented at CIRES Rendezvous:

- https://insideci.res.colorado.edu/rendezvous/uploads/Rendezvous_2022_8305_1652119115.pdf

View apps from the poster:

- <https://nccasc.colorado.edu/climate-science-support-platform-cssp>
- <https://nccasc.colorado.edu/resources/tools>

Collaborative Development of Grasslands-Climate Training Series

NC CASC Regional Climate Adaptation Scientist, Christy Miller Hesed, noted that the training series included 1 online session, 3 live webinars and 1 in person workshop. The recorded webinars have been viewed 564 times. She shared five key points about the training series. The training series was:

- Informed by NC CASC Science
- Targeted to Key Stakeholders
- Collaboratively Planned & Implemented
- Responsive to Stakeholder Needs
- Generated Immediate Outcomes & New Opportunities

The series used a variety of interactive engagement tools including Jamboard and Mentimeter (see presentation pages 68 to 76).

Facilitated Discussion Regarding Capacity Building:

- *Question:* How accessible is the app? What level of user? What training is provided to use it?
 - The app is extremely user friendly and can be quickly downloaded to Excel, so a user would need to be at that level to use it effectively.
 - The important thing here is relevance. What is relevant? What indices are important? Can I use the point data to make sense of a larger region? Context is important.
 - Note: NC CASC doesn't have dedicated information technology development, so they have a concern about future maintenance of the apps.
- *Question:* Do you have ways of measuring how many users use the app?
 - There's a way to measure utility. It varies across tools.
- *Question:* Christy, did you use the grassland app in your workshop?

North Central Climate Adaptation Science Center – 2023 External Review

- We used the climate toolbox for Fish and Wildlife Service (FWS) training. We could do training with other apps since one tool doesn't provide everything. In the future we hope to provide more.
- *Comment:* Excellent examples of capacity building tools and capacity building.
- *Question:* What are you doing to help the novice user find where they need to be?
 - We're working on it and will say more in the communications portion.
- *Question:* How do you make sure you get responses from state agencies?
 - We are very cognizant of stakeholder fatigue. So, the team did an initial needs assessment using surveys of potential participants and reviewing agency documents to find indicators of substantive training needs.

Overview of Outreach & Communications

Jane provided an overview of the Host's outreach and communication agenda. She reminded the ERT that communication and outreach are embedded in all aspects of the NC CASC's work and integral to fostering their core values of equity, trust, communication, accessibility, and achieving NC CASC's shared vision (see presentation page 79).

Building a Successful NC CASC Communications Program

NC CASC Communications Lead, Ulyana Horodyskyj Peña, joined the team in the last year and spoke to the ERT about the need for an external facing program to advance NC CASC goals and the mechanisms selected: web presence via Facebook, Twitter, and dedicated YouTube channel. Ulyana shared NC CASC's communication and outreach strategic goals (accessibility, support, visibility, and effectivity) followed by details of how NC CASC implemented their communication plan Years 1 through 4 and indicators of progress (see presentation pages 88 to 113).

View the NC CASC YouTube Channel:

- <https://www.youtube.com/c/NorthCentralCASC>

View the NC CASC Trainings Assessment Report:

- <https://doi.org/10.6084/m9.figshare.16755046.v1>

Advancing Climate Adaptation Efforts Through Effective Communication

Ulyana presented NC CASC's communication efforts through various approaches: Spotlight Stories, Webinars, Tribal Webinars, Climate Solutions Days, outreach publications, social media, and newsletters (see presentation pages 114 to 123). Ulyana also noted NC CASC's upcoming communication training series and concluded with NC CASC Communication key messages (see presentation page 124 and 125). In addition to these efforts, NC CASC Consortium Partner, Molly Cross, testified to Congress in the last year or two.

Jane shared that NC CASC meets periodically with CU's Federal Relations contact to help them get messages out about the CASC.

Questions and Comments from the ERT Regarding Communications:

- *Comment:* Kudos on all you have done in a short timeframe!
- *Question:* Do you have formal metrics?
 - It's is being built. The information currently is captured in tables and goes into the annual reports. It would be nice to compile everything.
- *Question:* Is there any way you feed information to partner organizations?

North Central Climate Adaptation Science Center – 2023 External Review

- We use hashtags (#climatetwritter) and tags. There are many cross CASC tags. NC CASC is obligated to submit weekly highlights. There's also the NCASC communications team.

Tribal Outreach Activities

NC CASC Tribal Engagement Specialist, James Rattling Leaf, Sr. explained his approach to Tribal outreach activities is represented by three Rs: Respect, Reciprocity, and Relationality. He shared examples of these through stories, including work with a Tribal chair to help develop the Tribal Climate Summit held during Covid-19 (see presentation page 127).

Facilitated Discussion Regarding Outreach & Communications

- *Question:* Do you see Tribal participation is relative to size?
 - Tribal engagement works for those who are willing to do so. Size is not a factor.
- *Question:* What ways do you find to be reciprocal?
 - Although Tribes may be near each other geographically, they are different culturally. I can and do travel to where Tribes are. This is reciprocal and shows respect for the different cultures, which is important.
 - The youth of Tribal nations have the energy and are the leaders of climate work. The elders can provide guidance while the youth lead.
- *Comment:* An ERT member felt inspired hearing about the relationships of trust James and NC CASC have developed, noting that this reflects well upon the Host-University. It is clear the Center is nimble and supportive, as seen by the Tribal chair's request for assistance with the Summit.
- *Question:* Do relationships with students (ECSD, TCLP) also expand to the nation that the student represents?
 - Yes. Each applicant is asked about their relationship/kinship with their Tribe. Once selected, James visits the family and the Tribe as all are part of the program.
 - It has also helped to add the Tribal Seven Generations thinking into the Tribal Climate Leaders program. We don't take students away from their Tribe; instead, we help students add to their Tribe.
- *Question:* What is the biggest communications bang for the buck?
 - You have to have strong internal communications first. There is a great deal of input from the entire team to make sure we are producing what is important to the community.
- *Question:* How do you get feedback about your communication materials from outside the CASC?
 - Pls are asked to describe how their products are going to be made available and to describe how they will gather evidence of impacts. There are a lot of ways to get feedback and it varies.
 - In addition, a cross CASC communication team meets monthly.
- *Question:* How do you know you're making a difference?
 - Time of climate projects makes this a difficult question to answer. The kind of skills NC CASC is employing and feedback from users is the current measure.
- *Question:* What can you learn from your partners?
 - How to best communicate stories about the work they are doing and the effects they are seeing with end users.

Donna thanked the ERT, CASC Members, and Observers for their participation, engagement and attendance at the session.

ERT Reflections on the Day

North Central Climate Adaptation Science Center – 2023 External Review

The ERT met in closed session to discuss what they had heard. The ERT asked clarifying substantive questions for the Host to answer on Day 4: *(Answers provided from Host after Day 3 session)*

1. Other CASCs created a ‘key elements checklist’ consisting of the key contract/requirements of their Host Agreement with USGS. Do you have one (already done) that says what you did or didn’t do from the original proposal? If yes, please share it. If no, don’t create one overnight! The main question is: What progress DIDN’T get made?

Along these lines, did the ERT miss information about how you addressed cultural resources and oil & gas? If so, please restate. If not, what’s the plan for those areas?

- We think we addressed this in our Day 4 presentation and discussion.
2. As noted above, the ERT believes you have shown your strengths well. What are your weaknesses? Where could you improve if given a chance to do so? What would you need to support any improvements?
 - We think we addressed this in our Day 4 presentation and discussion.
 3. Has there been any substantial budget re-programming since the proposal (other than travel)? If so, what has that been and why?
 - Yes, we have definitely had substantial budget re-programming since the proposal began. Major deviations include:
 - Re-budget to set up the Consortium Partner (CP) subawards for CP activities. This process was substantially delayed by the government shutdown.
 - Recent changes in the CP PIs. Examples include CSP and SDSU. The changes at CSP resulted in their inability to spend their CP funds before the No Cost extension expired. We pivoted by redirecting CSP’s Year 5 funds to set up a new subaward to the Great Plains Tribal Water Alliance. All of this required and received USGS approval, but also resulted in some delays.
 - And then there were budget spend down issues related to Covid-19. Examples include reduced FTE by team members in order to balance work and remote schooling and illness.

*This session summary was respectfully submitted by the DS Consulting Facilitation Team.
Edits were welcome and sent to the Day 3 Scribe: Tina Patterson*

North Central Climate Adaptation Science Center – 2023 External Review

Day 4: Overall Effectiveness Towards Host Agreement

Day 4	March 9, 2023: Overall Effectiveness Towards Host Agreement	
	- Review the overall effectiveness of the host-university and associated consortium in meeting the goals established under their current host agreement; - Aid the NCASC in developing improved requirements for re-competition of the next university hosting agreements; and - Make recommendations regarding possible cross-CASC & NCASC learning from this Host.	
	Mountain Time	Presenters, Titles & Affiliations
	9:45-10:15	ERT Members and Facilitation Team
Review topic: Overall Effectiveness Towards Host Agreement		
10:15-11:30	Recap of NC CASC Consortium Activities and Next Steps	NC CASC CU Leadership Team: • Bill Travis, University Director • Jane Wolken, Univ. Deputy Director • Imtiaz Rangwala, Climate Science Lead • Heather Yocum, Social Science Lead
11:30-12:00	Lunch Break	
12:00-1:45	Facilitated discussion with ERT regarding the Overall Effectiveness Towards Host Agreement and any questions left over from prior days	Donna Silverberg
1:45-2:00	Closing Remarks & Adjourn	Donna Silverberg
2:00-2:30	External Review Team - closed door Discuss ideas and insights gleaned from the four days: • What stands out? What needs comment in the ERT report? What are your initial thoughts about the overall effectiveness of this Host? Clarify next steps in the process: • What is due and when?	Facilitation Team and ERT

DAY 4: DRAFT Facilitator's Summary

March 9, 2023, 10:00a – 2:30p MST

Topic: Overall Effectiveness Towards Host Agreement

Prepared by DS Consulting Facilitation Team

The following summary was intended to capture basic discussion, reflections, concerns, and insights from the session. It is not a verbatim transcript, but includes links to the presentation.

Attendees present for all or part of the meeting (in alphabetical order):

ERT Members: Julien Lartigue (NOAA-RESTORE Science Program), Beth Rose Middleton Manning (UC Davis), John Tull (USFWS), Anne Wein (USGS-Western Geographic Science Center).

Host, Consortium and NC CASC Presenters: Aparna Bamzai-Dodson (USGS), Imtiaz Rangwala (CU-Boulder), Hailey Robe (CU-Boulder), Bill Travis (CU-Boulder), Jane Wolken (CU-Boulder), Heather Yocum (CU-Boulder).

Observers: Gus Bisbal (USGS/NCASC), Ryan Boyles (USGS/SE CASC), Emily Fort (USGS/NCASC).

North Central Climate Adaptation Science Center – 2023 External Review

DS Consulting Team: Facilitator: Donna Silverberg, Reporting and Support: Tina Patterson, Colby Mills.

Purpose for Day 4: To review the overall effectiveness of the Host-University and associated academic consortium in meeting the goals established under their current Host Agreements; aid the NCASC in developing improved requirements for re-competition of the next university hosting agreements; and to consider ERT recommendations for cross-CASC & NCASC learning from this Host.

Welcome & Recap

Facilitator, Donna Silverberg, welcomed the group that included NC CASC ERT Members, NC CASC Host-University and USGS teams, and session observers. She highlighted that in consideration of the overall effectiveness of the Host-University, today was an opportunity for them to identify areas of growth for the future within the program while meeting the goals of the Host Agreement (HA). NC CASC University Deputy Director, Jane Wolken, reminded the ERT of the topics covered in days 1-3: administrative management, progress in adaptation science, collaborative efforts, capacity building, and outreach & communications. Presentation available [here](#) (see Pgs. 2-3).

NC CASC Achievements and Strengths

NC CASC University Director, Bill Travis, reviewed the NC CASC achievements and strengths (see Pg. 4), emphasizing the Host's perspective that they view their weaknesses as opportunities for future growth and strength. He noted one of their key strengths is an openness to learn and then implement. The NC CASC is a nimble and adaptive organization with a strong team (both University and Federal teams) to support their climate, ecology, and social science base. The Host can call on a wide range of necessary expertise from faculty, undergrad and graduate students; NC CASC personnel at CU have to-date all been part-time. Bill stressed how critical the effective administrative support from CIRES is for this complex program and cooperative agreement.

Noteworthy achievements and strengths also include robust stakeholder relationships and partnerships (e.g. the NPS and USFWS relationships), CASC-produced datasets and tools, responsive and adaptive training efforts, and a strong communication and outreach program. In addition, cross-CASC collaborations and activities have helped advance the science and tool-building; NC and others have been helping to develop a working plan for a future "Climate Service". The Host has the people and systems in place which enables them to hire highly skilled personnel efficiently, and scientists and staff are highly motivated to work for the NC CASC, incentivized and energized by opportunities for hands-on co-produced climate science, stakeholder interaction, collaboration and tool-building.

NC CASC Challenges, Weaknesses and Area for Improvement

NC CASC Climate Science Lead, Imtiaz Rangwala, identified challenges, weaknesses, and areas for improvement for the NC CASC (see Pg. 5), emphasizing their resolve to turn these challenges into opportunities. The team had challenges managing and supporting the Consortium system in general, while guiding Consortium Partner (CP) project choices and changes, and doing this while navigating through the Covid-19 pandemic. The NC CASC can develop better working relationships with other DOI agencies like BLM (historically difficult for a variety of reasons) and State agencies, and enhance NC CASC scientist engagement with the Tribes and Tribal practitioners' use and understanding of the quantitative tools. Enhancing the current capacity to develop ecological tools and datasets, outreach and tracking the usage of tools are opportunities for improvement.

The team also experienced constraints approving projects and moving funds related to USGS administrative requirements and capacity. Personnel turnover at CU Boulder, the CPs and USGS affected

North Central Climate Adaptation Science Center – 2023 External Review

ongoing projects and planning as an integrated unit. Capacity was and is stretched for scientists to engage with the larger stakeholder network. The Host always is considering how to be most effective with the limited time and funding available.

Questions and Comments from the ERT:

- *Question:* Utilizing people at part-time can provide a diverse set of expertise, with the flip side being soft-source funds are dependent on awards. For those at 0.5 or 0.75 time, is the other source of their funding stable? What is the risk of key players scattering at the end of an award cycle?
 - Everything is soft money; having the NC CASC provides stable long-term soft money support; CIRES scientists tend to put their funding eggs in different baskets.
 - Example: Heather is grant funded, and her NC CASC funding is the most stable of her funding options. She was hired as a research scientist, but spends a lot of time administering different aspects of the program (e.g., Tribal Climate Leaders Program). CASC-funded people are pulled in different directions, which decreases returns on how much time and attention are spent on projects. CU Boulder makes it possible to work with Western Water Assessment and other boundary organizations, and program administration comes with the job. CASC work is more mission-oriented, but career advancement in the university system is rewarded for traditional research activities like publishing a peer-reviewed paper or developing a tool. The alignment of incentives is something to think about as soft-money scientists.
 - Jane is 0.75 time, categorized at CIRES as a research scientist, but devoted mostly to project administration. Reallocating the remaining 0.25 time has created an opportunity to hire for much needed and successful communications capacity within the NC CASC. The NC CASC tries to remain flexible in addressing varying personal needs (e.g., Covid-19-related constraints on balancing work and schooling and child care).
- *Question:* The lack of recognition as “researchers” or evaluation on the important work being done at the Host-University speaks to a wider (national) conversation about giving due attention to and support for participatory research, community engagement, actionable science, and having it count more in university-based promotion and review processes.
 - CIRES has started to make strides this way in our evaluation. For example, last year, they added explicit language/sections on work with and support for historically excluded and underserved communities/DEI work. This year, we'll be able to ID if our work predominately falls into research or program management. A big part of that is advocacy from our team, and other teams doing similar work. There is still work to be done.
 - Bill noted that barriers to professional well-being exist, but it is getting better in support for efforts to diversify work and teams in the institute. Faculty are still evaluated on more traditional scientific paper/production counting; faculty with tenure can devote more effort to co-production and science administration. Research staff on grants can focus on the grant mission. Proper incentive structure is critical to long-term wellbeing and continuity of staff.
- *Question:* The R-Shiny tools are impressive! Regarding how to increase Tribal engagement, especially: the NC CASC has made good investment in the communications team and communication surrounding the tools and trainings. Increasing the use of these tools can stem from the NC CASC's great Tribal engagement. Their commitment to bi-directional learning could pivot to tailoring tools and responding more to the needs of Tribal practitioners' concerns in the future.
 - The Rosebud Climate Adaptation Plan used NC CASC tools and could have benefitted further from their newest tools. Future efforts will have the latest tools to meet needs more efficiently. Imtiaz hopes the Rosebud example will be a catalyst for other Tribes across the region.
- *Question:* Can you clarify the Host's capability gaps (along with capacity in dollars)?

North Central Climate Adaptation Science Center – 2023 External Review

- The Host is covering a huge breadth of science. There is complexity in dealing with the socio-ecological systems, and the system response to stressors; capability gaps exist in this area and they are working to fill them. To do the climate and ecology applications well, the networks of collaborators are available to help address gaps. The Host is constrained by the time needed for personnel to do deeper dives into collaborative processes.
- Continuing tool building requires maintenance; we will have to consider long-term IT support and continuity. Tools have benefited from grad student projects, but students that develop tools move on in their career paths so gaps may be felt when that occurs.
- The need for adaptation science support is more than the capacity available; the Host could have a more diverse set of skills and there is demand for it. To date, they have focused deeply on the needs of FWS and NPS. For other projects, they try to identify people and skills to compliment those already on the team.
- *Question:* Are there plans for building trust and work with BLM?
 - Some partners are more enthusiastic than others, have more freedom to engage, and we have done so. Re: BLM, one key member of the Grasslands working group just moved from USGS to BLM; this may provide a conduit to the agency.
 - There are a couple Pass-Through projects with a BLM connection.
 - The unique structure of BLM has made it harder to make regional connections. Instead, there are individual conversations with managers on the ground. The new administration has changed policy so all decisions need to be climate-informed; this will help.
 - The CASC could potentially involve the BLM to assist with rapid ecological assessments with a climate change lens: <https://landscape.blm.gov/geoportal/catalog/REAs/REAs.page>
- *Comment:* Creating local focus for climate-oriented science work is challenging, especially for on-the-ground practitioners. Keep pushing! State and other agency representatives, and what they can safely work with, are pushed by political administration goals.
 - The prior administration discouraged climate work with oil, gas and land making it tough to work with BLM. Things may be improving in this regard.

Key Elements of the NC CASC Host-University Proposal

NC CASC Social Science Lead, Heather Yocum, reviewed key elements of the original proposal that the Host felt were missed, turned out differently than planned, or that required significant pivots in order to fulfill (*see Pg. 6*). Covid-19 along with the resulting travel restrictions played a substantial role in many of these changes in planned activities. In-person Climate Solutions Summits did not take place due to Covid-19-related constraints, rather they were re-envisioned as Climate Science Days (CSD) instead in Year 3 (note that CSD was carried out in Year 4 under a No Cost Extension on Budget Year 3 funds), and Rapid Climate Assessments planned later in Year 5. There were fewer than planned interactive and in-person regional stakeholders' meetings ("Ideas Colliders" and "Solutions Colliders") with and at CP locations to inform CP science priorities. However, successful events did include a Snow Collider, University of Montana (UM) Fire workshop, Wildlife Conservation Society's (WCS) Wyoming Game & Fish (WYGF) workshops, and monthly CP and Climate Science Support Platform (CSSP) calls.

With CP subawards and work delayed, the Host worked on other projects to build their network (e.g. fire, grasslands) and was successful at building internal capacity while waiting to start Consortium Partner work. There also was a delay getting the Great Plains Tribal Water Alliance (GPTWA) set up as a formal CP; the Host continues to work on developing and supporting the Consortium.

National synthesis working groups did not materialize as originally envisioned; instead, the Grasslands Synthesis Project, Ecological Transformation projects, NC Regional Invasive Species and Climate Change

North Central Climate Adaptation Science Center – 2023 External Review

(RISCC) Management Network, and the CAP fellows program served some of this same purpose (thinking beyond just the North Central region). It was noted that the NC RISCC launched as a Pass-Through project under the direction of a PI (R. Chelsea Nagy) in Earth Lab. The 2-day in-person Climate Science Training Workshops for Resource Managers did not take place and were reimagined as Climate Science 101 workshops while leveraging the Earth Data Science Corps (EDSC) in collaboration with Earth Lab. Additionally, there was Grasslands training and the CP work with WYGF.

Questions and Comments from the ERT:

- The ERT can appreciate all of the Host's pivoting to meet NC CASC goals and deliverables; what about on the science side? Were the science goals adapted as well?
 - This language, "Potential management & adaptation themes that *could* drive actionable science of the NC CASC, with referenced examples of relevant CU and Consortium work," came from the original Host Proposal led by the former University Director (Jennifer Balch) before USGS's science plan was completed and identified the priority habitats and management challenges for the region. The earlier iteration of that plan was very siloed. During the revision they tried to think more critically about how to deliver more solutions-based science; this led to pivoting and a negotiated process.
 - The recent proposal states the different management issues identified in the strategic plan, and the CASC would like to drive actionable science to some or all of these issues. Actionable science is driven by stakeholder engagement and what emerges from it. For example, the broader issue of sustainable resource use in public lands is being addressed.
- Regarding cultural resources, have these been integrated at all through your work with Tribal engagement?
 - Great work is being done via work with partners (USGS side & NPS) that is not being covered in this Review regarding cultural resource management and scenario planning. One current project is a cross-CASC effort working with NPS personnel across 4 regions (Glacier National Park in NC region). This involves working with Confederated Salish and Kootenai Tribes on their perceptions of adaptation and climate change, and management of natural resources in and near the park and on the reservation near the park. Some work already has been done on this, but not exclusively by current Host personnel, since it is funded as a pass-thru project.
 - Bill has heard from NCASC Director Doug Beard, that more may be in the works as NPS considers how to use the Infrastructure Bill to support climate adaptation.
 - Work from one of the TCLP students is on climate impacts to a culturally important plant species. The Host looks forward to the possibility of expanding this work and research.

NC CASC Wish List

Bill reviewed a "Wish List" of solutions that could in theory address some of the most significant challenges that the Host-University faces (*see Pg. 7*). Some of these may be outside of USGS' and NC CASC's control, and the CASC is overall widely meeting their goals.

- Regular schedule for USGS Pass-Through Statement of Interests
- Faster turnaround on USGS requests for approval (USGS capacity issue)
- About 2x current budget (not 3, just 2!)
- Cross-CASC coordinator for collaborative initiatives
- IT development and maintenance

Bill thought the NC CASC is making the most out of the available funds and resources. He also acknowledged what he described as his struggle as University Director in managing the Consortium

North Central Climate Adaptation Science Center – 2023 External Review

Partner system, which is supported both by Host funds and by USGS pass-through projects. NC CASC USGS Acting Director, Aparna Bamzai Dodson, said that the CASC is at the mercy of the US DOI's and USGS' processes and policies, noting specifically that the USGS grants office has been chronically understaffed for the last 5 years, which slows down review and funding processes. Another major constraint (not unique to the NC CASC) is working within the Federal annual appropriation cycle, and how long it takes funds to trickle down for use. FY2023 proposals have been reviewed but not approved, because the funding level is still unknown; FY2024 solicitations cannot be released until FY2023 proposals have been approved. Additionally, DOI and USGS policy forces funds to be spent within the calendar year; therefore, they need to be spent as quickly as possible. In addition to training new people, the federal hiring-to-work process takes about 1-year.

The timeline for the Request For Proposal Ideas is daunting, with quick turnarounds and about a 30-50% success rate; this can be a barrier to bringing on new partners or engagement with historically underserved communities and almost puts a ceiling on the work able to be accomplished. Traditionally underserved partners are not used to these processes, and have been frustrated by the timeline the CASC must follow. Additionally, USGS has specific authorization to distribute external funds for science or data collection, which makes some partnership-building or the Fellows program challenging to fit into the USGS mission.

The CASC tries hard to find a balance between supporting stakeholder engagement and the formation of actionable science through projects, both Host-funded and USGS solicitations, while also getting enough accounting from PIs to have an idea of the net investment of taxpayer funds. The Host clarified that PIs for Pass-Through funds must be either at the Host-University, a CP, or USGS.

Facilitated Discussion with the ERT Regarding the Overall Effectiveness Towards the Host Agreement and Remaining Questions

- *Question:* The Bipartisan Infrastructure and Inflation Reduction Acts are full of additional grant programs and will further strain the federal granting apparatus across all agencies.
 - Yes, and that is only going to increase the asks that we will receive. This raises the capacity issue for the Host to be able to respond to those asks. Great opportunities exist, and they want to be ready to respond.
- *Question:* What does the NC CASC do to raise awareness about the Pass-Through competition and get the word out?
 - The team lets people know when it is coming out and administrative support is prepared. There is specific guidance from USGS as how this information can be shared, as it is not an open-competition. E.g., Email network blasts, but not allowed to be posted on social media.
- *Question:* How is the Consortium's email list built?
 - The NC CASC created and maintains a Google Sheet between both sides of the NC CASC.
 - The newsletter email list has subscription via the NC CASC website; additional email lists were developed by NC CASC predecessors (from both the Host and USGS), and include CP department chairs and directors, and previous PIs of funded projects. Prior to the pandemic, the Host made CASC-intro presentations to partners. The Host hopes to do more face-to-face community building with the recompet.
 - Regional CASC members, including Jane, Emily Fort, and others at the National CASC are working to streamline this process and share ideas as to how best to spread the word.

North Central Climate Adaptation Science Center – 2023 External Review

ERT members thought the conversation was productive in showing the unique ways CASCs are situated as Host-University & USGS counterparts. Each regional CASC and USGS relationship is different. Donna asked the Host to elaborate on the ERT's earlier question about their relationship to CIRES to amplify their opening day presentation. Jane answered that CIRES is the institutional home (research institute) for the Host, and that puts their administration (finance, HR, IT) close by, they don't have to work up the entire University ladder to get things done. CIRES assists, addresses, and evaluates their efforts. Bill added that CIRES mirrors the institutional structure of the University itself; it is designed to help projects like the NC CASC, and is essential to building more climate adaptation science efforts in the region.

Imtiaz detailed further the history of the origin of NC CASC at CU. Most University CASC staff were part of CIRES first, given its strengths in climate, impacts and adaptation work (e.g., through the NOAA agreement, Western Water Assessment, etc.) and saw the value of making it a home for NC CASC because CIRES could comfortably support with administrative work and technical capacity in a climate and ecology space. Other CU colleges and programs haven't developed an outlet for significant research staff to the degree CIRES has.

- *Question:* What percentage of projects involve more than one CP? Does funding go to more than one CP working on a project? Or, what proportion of projects are led by CPs?
 - Most projects probably don't involve more than one CP. The Host Leadership will consult on CP projects and track progress.
 - CPs come together on specific projects; mostly, CU draws on them as the center Host. The Grasslands Synthesis project is a good example of CP collaboration, smaller projects not as much. CPs keep in touch and update each other via the monthly CP calls.
- *Question:* Is there a Point of Contact or Leadership person that facilitates or coordinates CP work? How does the Host coordinate this during the life cycle of the award? Firsthand experience shows there is great value in getting CPs to work together.
 - Each CP has their own 5-year pot of money (varies by each CP) with a general theme under which to work. There are monthly check ins, but things were slow to get started due to staff changes at the Host, Covid-19, and funding issues discussed in prior days. The Host is working now to re-engage more effectively with them into the broader network; considerations include determining the correct plug-in point (e.g., monthly CP check-ins, larger NC CASC team meetings, and one-on-one meetings with NC CASC CU Leadership).
 - Once money goes to a CP, they decide on their projects using Host guidance and meetings with Bill & Jane as needed. This includes coordination on the dollar spending and progress tracking. Monthly CP check-ins have pivoted to bi-weekly All Hands staff calls, and the Host is still ironing out focused discussions with CPs. Jane and Aparna meet to confer on this. There is a balance between spending the money available most effectively while making the best use of everyone's time.
 - Bill offered that the recompute process could be a good time to reassess CP engagement, accountability, and structure and requested advice from the ERT on this front.
 - Imtiaz noted that finding the right CPs at the start up was a slightly rushed process, and added that, if CPs are not delivering, this can reflect poorly on the Host and this presents a challenge when staff capacity is already maxed out. The Host is responsible for CPs. Some CP institutions get more from the Pass-Throughs than through the Host, not necessarily through individual CP personnel.
- *Question:* The work being done is strongly ecological and perhaps less of a human/social element. How do you, or might you, incorporate these elements into your work?

North Central Climate Adaptation Science Center – 2023 External Review

- The Host is fortunate to have social scientists on the team to focus on social science (and USGS is open to this). With Heather Yocum on the team, and Christy Miller Hesed recently joining the team, both of who are anthropologists, there is increased capability and a track-record for social elements.
- Another addition to the “Wish List” would be to include clearer guidance from USGS/NCASC on what types of social science they are looking for and willing to fund? RAD-decision making, which incorporates people’s perceptions of needs and values, is used for monumental decisions like letting a species go or relocating a group of people. This helps to understand how people feel about the decisions agencies need to make with the science. The Host has been light on the social side and is building up a sub-community within the CASC to answer more basic social science questions to understand adaptation as a whole.
- There is definitely momentum growing on the social science side within the CASC-network, given the types of conversations we have been having.
- Previous administrations (Federal/USGS) did not want to include social science efforts. However, the new Administration has encouraged addressing social science aspects related to values around natural resource management and needed actions. The social aspect is subject to political winds, not due to a lack of interest.
- Human/decision making contexts (esp. in the Tribal context) are embedded in our science but might seem invisible. The team has great value for how tools are being used by the end users.
- *Question:* How far along is the Climate Services plan? What’s the status?
 - The idea of “climate services” became more of a realized concept when the head of NOAA said they would create the National Climate Service. There are several plans out about what it could and should be, and also claims that something like this already exists at NOAA. Doug Beard is in conversations in Washington, DC about this (e.g., through USGCRP), and the private sector is weighing in as well. The CASC (via the CASC-Network Collaborative Visioning Discussions that began in June 2021) has a sub-group that created a template for their contribution to a Climate Science Service in terms of adaptation, and they are doing more work on this. Bill noted his idea is to provide climate services without becoming a standing “Climate Service.” In the CASC Visioning Discussions, one of the WGs focused on Climate Extension Services. We wanted to ID what the CASC network could uniquely offer and they included ideas in a concept paper. It will be interesting to see where that series of discussions takes the CASC Network.
 - Imtiaz believes NC CASC is already doing climate service as part of its regional effort, rather than on a national scale.
 - This is a broader conversation within USGS. One approach is to step away from Climate “Services,” and towards climate adaptation technical support. Having an infrastructure to have scientists who are not focused on research but technical assistance and how to use the information and increase technical capacity. The Host is working on a strategic effort, for this CASC, other CASCs, and USGS broadly. What is the USGS role in translating science for decision-making? Navigating tools is complex for most practitioners, so engaging stakeholders and maybe co-developing approaches to address their project needs is a solution. Human interaction and resources are integral for any climate service.
- *Question:* Considering the NC CASC’s sustainability and climate footprint, does the Host/CPs/USGS require thought be given to this?
 - The Host does consider its climate footprint regularly, although USGS does not formally mandate it. CU, CIRES and the Host are personally committed and acknowledges that it

North Central Climate Adaptation Science Center – 2023 External Review

needs to be done strategically and to be sensitive to their community who vary in location and access. CU puts thought into it as an institution. Zoom has transformed how the CASC is working and connecting with partners and collaborators at long distances; it has also closed some doors, as broadband access is variable depending on location and, post-pandemic, in-person travel is not always an option. The nature of the virtual world has changed how the Host and stakeholders interact.

Closing Remarks & Adjourn

In closing, the Host expressed appreciation for thoughtful discussions, suggestions, and considerations with the ERT; they remain open with a mindset for growth. The ERT commended keeping NC CASC's connection to user communities in the front of mind.

Donna thanked the ERT, CASC & Consortium Members, and Observers for their participation, engagement and attendance at all of the Review sessions. The meeting was adjourned.

*This session summary was respectfully submitted by the DS Consulting Facilitation Team.
Edits were welcome and to the Day 4 Scribe: Colby Mills (colby@dsconsult.co).*

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