Quality and Extent of Partnership Involvement in Climate Science Centers in the North Central & Southwest Regions

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EXECUTIVE SUMMARY

Background

A key component of the U.S. Geological Survey regional Climate Science Centers is to work with partners. Two major groupings of partners include: (1) science producers (many federal agencies, universities, scientific societies, and other NGOs), who contribute to the development of science information and tools; and (2) science users, which is a broad category covering those working to apply this science information and tools to conservation (e.g., state and federal natural resources agencies, tribes, conservation NGOs). A major indicator of success of each CSC is the degree to which partners are effectively engaged in and benefit from their work. One of the primary benefits expected from the CSCs is the development of "actionable science." In the climate science literature there is a great deal of discussion and consternation about climate information going unused (Lemos, 2015). Boundary organizations, which CSCs have evolved over the last three years to become (ACCNRS, 2015), can link varied social and organizational sectors, fostering innovation and two-way communications, aiming to align science production with user needs (Feldman & Ingram, 2009). Some refer to this involvement of stakeholders or practitioners as "co-production of knowledge" (e.g., Tribbia & Moser, 2008).

Research Objectives

We designed a partner survey to measure the quality and extent of partnership involvement at each of the CSCs. We focused on the following questions for two regional CSCs (North Central and Southwest) for which site reviews were conducted in FY 2017:

- To what extent are science users and producers involved with the CSC?
- What are the benefits of this involvement? What limits involvement?
- To what extent do partners believe the CSC is producing actionable science?
- To what extent are CSC-affiliated science users and producers involved in co-production? What limits this involvement?
- To what extent does the CSC play a role as a boundary organization, facilitating actionable science and co-production? What characterizes that role?

Methods

A standardized, web-based survey of partners and potential partners of the two CSCs was conducted. An initial sample for the survey was compiled from science producers and science users identified by each CSC, Landscape Conservation Cooperative staff and steering committee members with regions that overlap with the two CSC's regions, and members of the Association of Fish and Wildlife Agencies Climate Science Committee. Four hundred forty-five individuals were included in the survey sample. The survey documented the ways in which partners were engaged with the CSCs and the factors affecting their engagement.

Summary of Results

While results were analyzed by region, key findings and patterns were similar. Respondents represented both science users and science producers. Although a variety of types of partners were engaged with the CSCs, a large majority of them were from universities and federal agencies.

That most common way for survey respondents to be involved with the CSCs was as participants in CSC trainings, webinars, workshops or conferences. About one-third in each survey were grant recipients,

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applicants, or partners. Fewer than 20% were resource managers or decision makers who had used the science produced by the CSC.

For both CSCs, the top benefits of the CSC identified by survey respondents were being provided access to a network of people interested in climate adaptation science and receiving access to the science itself. The benefits of the CSC networks were discussed extensively in the focus groups. The most common limitations on partners' engagement with the CSC were the time they had available (given their other priorities).

About three-quarters of the survey respondents in both regions felt that climate adaptation science[1] in the regions was available to decision makers, and many also believed that decision makers use climate adaptation science to inform management. Nevertheless, many believed that climate adaptation science did not *necessarily* influence management actions taken, although a majority also believed that the CSCs had helped to reduce the disconnect between scientists and decision makers. When asked specifically about the science produced through the CSCs, the vast majority of the survey respondents agreed it can contribute to policy or management. Respondents were also generally positive about other characteristics of the CSC science, and the majority found it high quality, appropriate to the decisions being made, and able to integrate well with other information.

Science producers and science users differed in their perceptions about the use of climate science. Science producers were more likely to think their science was used by decision makers than were decision makers to say they used CSC science. These perspectives were not necessarily inconsistent. It is possible that a small group of decision makers had access to and made use of the climate science that was produced, while others did not. In focus groups in both regions, participants argued that one of the factors contributing to the use of CSC science was the engagement of potential users by scientists.

Co-production of climate adaptation science research was perceived as valuable by large majorities of producers and users. Users had less experience with co-production, however, than producers. Coproduction was more common in the early stages (setting priorities and identifying research questions) and late stages (interpreting and communicating results) of research than the middle stages. Science users who responded to the survey reported that their involvement in co-produced research projects is most limited by scientists not reaching out to them to collaborate and having different perspectives from scientists on what science is needed. In the focus groups, discussions of the limitations on coproduction centered on the amount of time required to coproduce science and a lack of rewards for scientists who engaged in coproduction. Focus group participants argued for greater expectations and support for coproduction in CSC-funded science.

The majority of survey respondents noted a variety of contributions of the CSCs including contributions to collaboration between scientists, awareness of available science, interdisciplinary science, and communication between scientists and decision makers.

Conclusions

Although the CSCs produced a number of benefits, several possibilities exist for enhancing those benefits. More diverse types of partners could be engaged beyond the prevalent federal agencies and university scientists. Engaging new partners may require new ways to make it easier for potential partners to become involved and more outreach to invite them to participate. There is also more work to be done to

[1] All climate adaptation science in the regions, not solely the science produced by the CSCs.

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facilitate actionable science and co-production in both of the regions. CSC efforts along these lines may be aided by defining more clearly those management issues that need attention, creating more opportunities for scientists and managers to work together or encouraging it through funding requirements, and improving the ways in which science is communicated.

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INTRODUCTION

In 2008, Congress authorized the establishment of a National Climate Change and Wildlife Science Center (NCCWSC) within the U.S. Geological Survey (USGS) as part of its ongoing mission to meet the challenges of climate change and its effects on wildlife and aquatic resources. In response to Secretarial Order 3289, "Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources," on September 14, 2009 (amended February 22, 2010), the NCCWSC established eight regional Department of the Interior (DOI) Climate Science Centers (CSCs) from 2010 through 2012 to provide scientific information and tools to natural and cultural resource managers to conserve these resources in a changing world. The model developed by the NCCWSC for the regional CSCs employed a dual approach of a federal USGS-staffed component (CSC-federal) and a parallel host-university component (CSC-university), established competitively through a five-year cooperative agreement with NCCWSC.

As the CSCs complete their initial five-year project cycle, the university hosting agreements for these CSC regions are subject to a re-competition process by USGS. As part of this process, NCCWSC, with the engagement of the American Fisheries Society (AFS) and the Human Dimensions Research Unit of Cornell University (Cornell), coordinated an operational and programmatic review and evaluation of host universities to ensure established goals and obligations under the hosting agreements were met, as well as to identify obstacles and areas of improvement for future agreements. This report presents the results of research conducted at the North Central and Southwest CSCs as part of these reviews. A previous sister report focused on the Northwest, Alaska, and Southeast CSCs (Dayer et al. 2017).

Purpose of Report

The NCCWSC has three basic goals: (1) work in close partnership with the natural resource management communities to understand their highest priority science needs regarding climate change impacts, and determine what is needed to fill those knowledge gaps; (2) work with the scientific community to develop the science information and tools in such a way that they can be readily used to generate management strategies for responding to climate change; and (3) deliver these relevant tools and information in a timely and useful way directly to resource managers.

Consequently, a key component of the CSCs is working with partners. Two major groupings of partners include: (1) science producers (many federal agencies, universities, scientific societies, and other NGOs), who contribute to the development of science information and tools and, (2) science users, which is a broad category covering those working to apply this science information and tools to conservation (e.g., state and federal natural resources agencies, tribes, conservation NGOs). Many agencies, particularly the large federal agencies, may represent both science users and producers. A major indicator of success of each CSC is the degree to which partners are effectively engaged in and benefit from their work.

One of the primary benefits expected from the CSCs is the development of "actionable science." In the climate science literature there is a great deal of discussion and consternation about climate information going unused (Lemos, 2015). The commonly held belief amongst scientists that "more and better information will improve decision-making" has been found to be a fallacy (Tribbia & Moser, 2008). Instead, more science often does not lead to better decision-making; there are barriers, other than lack of information, that inhibit science-based decisions. This issue is described as a knowledge-action gap (Cash et al., 2003), research-implementation gap (Knight et al., 2008), or a gap between production of science and use of science (Kirchhoff, Lemos, & Dessai, 2013). This gap may be due to a disconnect between "useful" (producers think it can be used) and "usable" (users apply to decision-making) science (Lemos, 2015).

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Both effective boundary organizations and the co-production of knowledge are touted as solutions to this issue (Lemos, 2015).Boundary organizations, which CSCs have been evolving to become over the last three years (ACCNRS, 2015), link varied social and organizational sectors, fostering innovation and two-way communications, aiming to align science production with user needs (Feldman & Ingram, 2009). The role of boundary organizations may be thought of as "information brokers" and "participant advocates" (Feldman & Ingram, 2009). As such, their facilitation of communication may be one of their most essential functions, as poor or nonexistent communications are thought to inhibit science informing practice (Vogel, Moser, Kasperson, & Dabelko, 2007).

Likewise, the often-used approach of "loading dock" science (Feldman & Ingram, 2009) where scientists prepare models, products, forecasts for use without consulting users but with the expectation that users will use it is increasingly recognized to be ineffective (Feldman & Ingram, 2009). Research has shown that there is a greater uptake of climate science if there is two-way communications and long-term relationships between users and producers (Kirchhoff et al., 2013). Some refer to this involvement of stakeholders or practitioners as "co-production of knowledge" (e.g., Tribbia & Moser, 2008), while others term it "joint production of knowledge" (Hegger, Lamers, Van Zeijl-Rozema, & Dieperink, 2012) or "cooperative production of knowledge" (Podesta, Natenzon, Hildago, & Toranzo, 2013). Regardless of the term, there is wide-spread acknowledgement that interdisciplinary (defined more broadly than simply academic disciplines) engagement is essential for addressing 21st century global challenges such as climate change (Podesta et al., 2013). The ACCNRS report also recognizes the potential for co-production of knowledge by Climate Science Centers, calling for more of it in their recommendations.

We designed a study of CSC partners to measure the quality and extent of partnership involvement at each CSC. We focused on the following questions for the two regional CSCs for which site reviews were conducted in FY 2017:

- To what extent are science users and producers involved with the CSC?
- What are the benefits of this involvement? What limits involvement?
- To what extent do partners believe the CSC is producing actionable science?
- To what extent are CSC-affiliated science users and producers involved in co-production? What limits this involvement?
- To what extent does the CSC play a role as a boundary organization, facilitating actionable science and co-production? What characterizes that role?

METHODS

Our partnership evaluation consisted of two components: a series of focus groups and a standardized web-based survey. Similar methods were used in a partnership evaluation conducted for three other CSCs (Dayer et al. 2017).

Focus Groups

Two focus groups were conducted with partners of the CSCs during each of the two site visits. The purpose of the focus groups was to understand the range of perspectives and experiences of CSC partners in relation to their work with the CSC. One group at each CSC included science producers and the other included science users.

In the Southwest region, participants were recruited by the CSC staff with guidance from Cornell. In the North Central region, Cornell recruited participants by emailing a list of participants suggested by the

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CSC staff. We attempted to include participants that represented a diversity of organizations and regions. Participants in the science producers groups included researchers that had received research funding from the CSC. Participants in the science users groups included representatives of agencies intended to benefit from the science produced by the CSC: Landscape Conservation Cooperatives, federal natural resource agencies, state fish and wildlife agencies, tribal organizations, and nongovernmental conservation organizations. A total of 55 individuals participated in the four focus groups (Table 1).

Table 1. Number of focus group participants from each Climate Science Center.

Climate Science Center	Number of science producers	Number of science users
North Central	12	14
Southwest	15	14

Each focus group consisted of a semi-structured conversation guided by a series of open-ended questions (Appendix A) and lasted approximately two hours. The questions were designed to explore how partners contributed to the work of the CSCs and the factors that influenced the ability of the CSCs to work with their partners. The specific question topics focused on: how participants have worked with the CSC, reasons for becoming involved with the CSC, benefits of involvement with the CSC, challenges to involvement, and what the CSC could do to promote even more benefits from involvement. Additionally, we specifically explored how the CSCs contributed to the coproduction of science and the generation of actionable science, with questions about interactions between science producers and science users and the role of the CSC in connecting them.

The focus groups were audio-recorded and transcribed. We coded the transcripts by breaking them into segments of one sentence to one paragraph in length. Each segment was coded as pertaining to one of the following topics:

- Perceived benefits of involvement with the CSC
- Challenges to being involved with the CSCs
- Actionability of climate science produced by CSC
    - Factors contributing to actionability
    - Factors limiting actionability
- Coproduction of climate science produced by CSC
    - Factors contributing to coproduction
    - Factors limiting coproduction

After the transcripts were coded, we reviewed all segments coded with the same category. In our results, we present excerpts from the transcripts that reflect as much of the range of perspectives expressed as possible.

Web-based Survey

A standardized, web-based survey of partners and potential partners of the two CSCs was conducted. An initial sample for the survey was compiled from science producers and science users identified by each CSC, Landscape Conservation Cooperative staff and steering committee members with regions that overlap with the two CSC's regions, and members of the AFWA Climate Science Committee. A total of 445 individuals were included in the North Central CSC survey sample, and 211 individuals were included in the Southwest CSC survey sample. Twenty-two individuals were in both samples.

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The survey documented the ways in which partners were engaged with the CSCs and the factors affecting their engagement. The survey questions (Appendix B - C) were developed based on insights from the focus groups conducted during the reviews of three previous CSCs and a review of the scholarly literature. The question topics included:

- Nature of respondents' work
- Perspectives on the importance of addressing climate change
- Extent of involvement with the CSC
- Benefits of involvement with the CSC
- Limitations on involvement with the CSC
- Perceptions of climate adaption science
- For science users:
    - Use of climate adaptation science
    - Limitations on use of climate adaptation science
    - Importance of and engagement in co-production of science
    - Limitations on co-production of science
- For science producers:
    - Use of climate adaption science produced by others
    - Limitations on others' use of climate adaptation science
    - Importance of and engagement in co-production of science
- Perceptions of the role of the CSC

The survey instrument was reviewed by subject matter experts including staff from the NCCWSC, members of the review teams for the Climate Science Centers, and other researchers. The same survey instrument was used for both Climate Science Centers, with minor changes to reflect the region referenced. An identical survey instrument had been used in 2016 with three other Climate Science Centers.

Individuals were e-mailed at the initiation of the survey and provided with a link to a web-based questionnaire. Individuals who did not respond to the first request received up to four additional requests to complete the questionnaire by e-mail. The web-based survey instrument was programmed and administered using Qualtrics, which provides a means of soliciting participation in a survey via email and recording responses. Qualtrics assigns each individual a unique web link to prevent individuals outside our study population from participating in the survey and prevent access to survey data by anyone other than the research team. Implementation of survey began on January 9, 2017 and concluded on February 7, 2017.

Non-respondent Telephone Survey

A short (5 minute) telephone survey of nonrespondents to the web-based survey was conducted by the Cornell University Survey Research Institute from February 13 to 22, 2017. The survey questions (Appendix D) included a sample of questions from the web-based survey to determine whether and how nonrespondents differ from respondents on key criteria. Twenty-seven nonrespondents from the North Central CSC and twenty-six from the Southwest CSC completed the questionnaire.

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RESULTS

Response rates to the web-based survey were 49% (n=215) for the North Central CSC and 66% (n=135) for the Southwest CSC (not including undeliverable e-mails). The number of completed surveys differs due both to the different response rates and differences in the size of the partner databases provided by each CSC. Respondents who reported that their work does not at all involve climate adaptation science, or management or policy related to climate change adaptation (n = 10) were excluded from our analysis as were those who reported that they had never heard of the CSC (5 additional respondents).

Results in this report are based on respondents to the web-based survey, but these respondents differed in some ways from the web survey nonrespondents who were reached subsequently through the phone survey. Nonrespondents tended to be less interested in and engaged with the Climate Science Centers than respondents. Nonrespondents were involved to a lesser extent in climate adaptation science or management or policy related to climate change adaptation. They were less likely to have at least some interest or involvement with the CSCs. Among those who had at least some involvement with the CSCs, nonrespondents interacted less frequently with USGS CSC staff (but not with the CSC's university leads/PIs). Nonrespondents were less likely to think that serving as a source of funding for climate adaptation science and providing access to climate adaptation science were important benefits of the CSCs. Finally, nonrespondents were more likely than respondents to be affiliated with federal agencies and tribes.

Respondents and nonrespondents did not differ in the degree to which they perceived climate change as a threat nor whether they thought that managers or policy makers should take action now to address climate change threats. Those respondents and nonrespondents who were involved with the CSCs had been involved for similar amounts of time.

North Central Results

Respondents

We sought to survey both partners and potential partners of the North Central CSC (as we did with other CSCs). Specifically, we attempted to include people who were working to address climate change either as "science producers" (those who produce climate adaptation science) or "science users" (those who make decisions about natural resource policy, management, or programs). Doing so is somewhat complicated because this population is not well defined. As described in the Methods section, we compiled our sample from three sources, but this approach may have yielded different numbers and types of partners from region to region. Consequently, we characterize our respondents in this section.

Thirty-four percent (n = 63) of the respondents reported that they make decisions about natural resource policy, management, or programs as part of their jobs. We refer to these individuals as science users. Thirty-four percent (n = 63) reported that they have produced climate adaptation science through an affiliation with the North Central CSC, while 22% (n = 42) have produced climate adaptation science but never with such an affiliation. We refer to both of these groups as science producers (56%; n = 105). Thirty of the respondents (16%) were both science users and producers.

Fifty respondents (27%) were neither users nor producers. These individuals were similar to other respondents in many ways, including the *types* of involvement they had with the North Central CSC. They were less engaged, however, in work involving "climate adaptation science" or "management or policy related to climate change adaptation." They also interacted less frequently with representatives and affiliates of the CSC.

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All of our respondents did work that involved climate adaptation science, management, or policy to at least some extent. Almost half of our respondents (44%, n=92) were involved to a large or very large extent (Table NC-1). About one-quarter (24%, n=50) were involved only to a small extent. Producers were more involved than users. Sixty-six percent (n=62) of producers were involved to a large or very large extent. Sixty-two percent (n=39) of users were only involved to a small or moderate extent.

Table NC-1. Respondents' extent of involvement with climate adaptation science or management or policy related to climate change adaptation.

Extent of involvement	User	Producer	Both User and Producer	Neither User nor Producer	Total
To a small extent	39%	11%	10%	40%	24%
To a moderate extent	42%	21%	30%	38%	31%
To a large extent	6%	39%	30%	14%	24%
To a very large extent	12%	29%	30%	8%	21%

Most respondents (85%; n = 164) reported that they have had at least some interest in or involvement with the North Central CSC (Table NC-2). Just 10% (n = 20) reported that they had no involvement but someone else in their agency or organization did, and another 5% (n = 10) had no interest or involvement at all. Those respondents who were users (but not also producers) were least likely to be interested or involved with the CSC. Fewer than half of them (46%; n = 15) had at least some interest or involvement with the CSC. Nearly one-quarter (24%; n = 8) had heard of the CSC, but had no interest or involvement.

Table NC-2. Respondents' relationships with the North Central CSC.

Extent of involvement	User	Producer	Both User and Producer	Neither User nor Producer	Total
Heard of the North Central CSC, but no interest or involvement	24%	0%	7%	0%	5%
No involvement with the North Central CSC, but someone else in my organization involved	30%	7%	3%	8%	10%
At least some interest or involvement with the North Central CSC	46%	93%	90%	92%	85%

Respondents worked in states throughout the North Central region, but particularly in Colorado, Montana, and Wyoming (Table NC-3). More than one-third (35%; n=71) also worked in states or regions outside of the North Central region.

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Table NC-3. States in which respondents work.

State	Percentage of respondents	n
Colorado	45%	93
Montana	32%	66
Wyoming	31%	63
South Dakota	23%	48
North Dakota	21%	42
Nebraska	19%	38
Kansas	14%	29

A majority of respondents worked at the regional/multi-state scale (62%; n=127) and the state scale (57%; n=116) for some or all of their work. Smaller percentages worked at the watershed (42%; n=86), local (41%; n=83), or national scale (38%; n=77). Only about one-quarter (24%; n=50) worked at the international scale.

The majority of respondents were affiliated with either federal agencies or universities (Table NC-4). Fewer were affiliated with non-profit organizations or state agencies. Very few were affiliated with private industry, tribal governments, or local governments.

Table NC-4. Respondents' affiliations.

Affiliation	Percentage of respondents	n
Federal agency	38%	77
University	33%	68
Non-profit organization	13%	27
State agency	10%	21
Private industry	2%	4
Tribal government	2%	3
Local government	1%	2

Most respondents held research positions (53%; n=108). One-quarter (25%; n=52) were in leadership/administration. Only a few were in operations (8%; n=17) or policy (6%; n=13).

Extent of Involvement with the CSC

On average respondents have been involved with the North Central CSC for 3.1 years. Respondents reported a variety of types of involvement (Table NC-5). Most common was as a participant in a CSC training, webinar, workshop, or conference (53%; n=87). More than one-quarter (29%; n=47) were CSC grant recipients, applicants, or partners on a grant. Relatively few (10%; n=17) were resource managers or decision makers who had used the science produced by the CSC.

The respondents reported on their frequency of interaction with five types of CSC representatives and affiliates (Figure NC-1). For three of the types (US Geological Survey CSC staff; University leads/PIs for the CSC; and CSC-affiliated researchers) the modal response was "up to a few times a year." Respondents interacted most frequently with the USGS CSC staff. For their interactions with CSC graduate or post-doctoral fellows and CSC Stakeholder Advisory Committee members, the modal level of interaction was "not at all," although 59% interacted with CSC graduate or post-doctoral fellows and 37% interact with Stakeholder Advisory Committee members at least some of the time.

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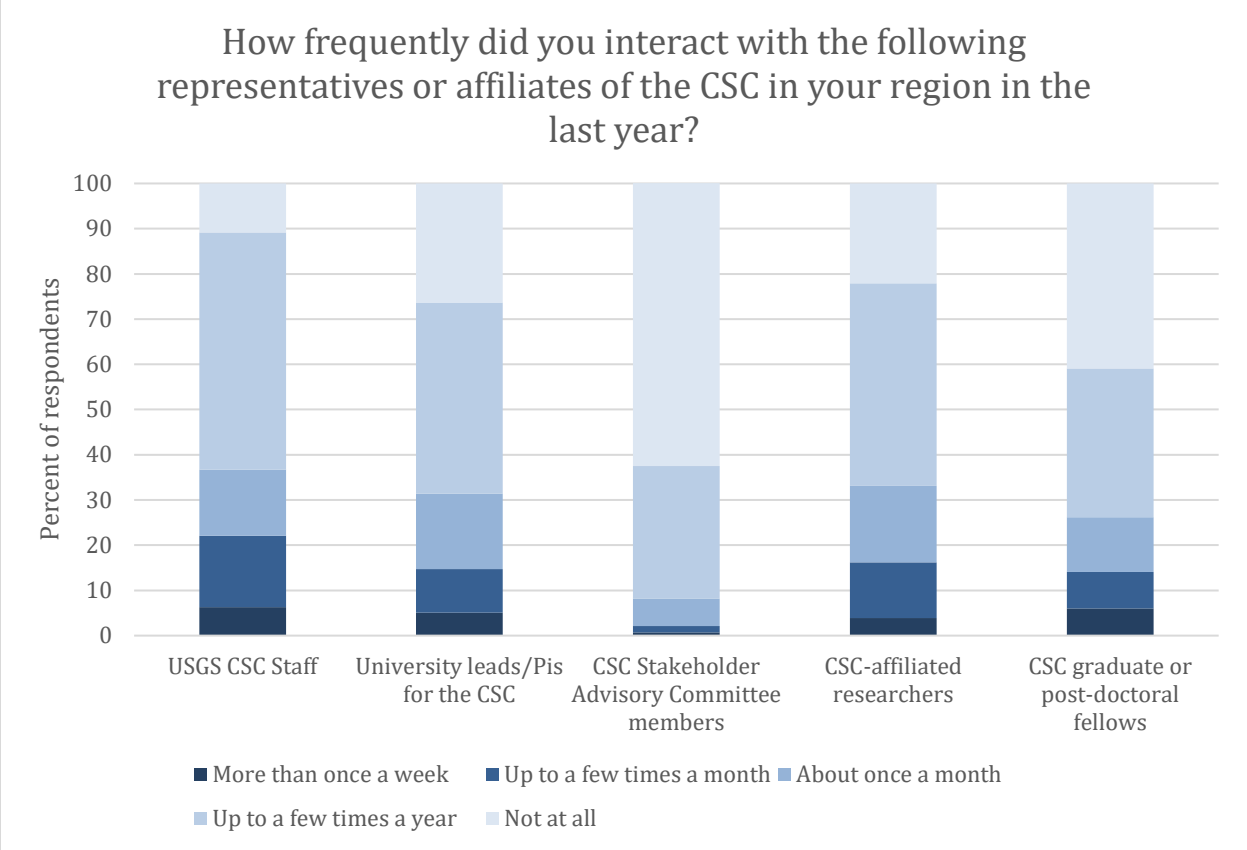
Table NC-5. Types of involvement with North Central CSC in the last five years.

Affiliation	Percentage of respondents	N
Participant in a CSC training, webinar, workshop, or conference	53%	87
CSC grant recipient, applicant, or partner on a grant	29%	47
University member affiliated with the CSC	20%	32
CSC-funded graduate student or postdoctoral fellow	14%	23
CSC Stakeholder Advisory Committee member	11%	18
Resource managers or decision maker who has used the science produced by the CSC	10%	17
LCC steering committee member	10%	16
CSC USGS staff	7%	12
LCC staff member	7%	12

Figure NC-1



Note: Based on survey question 8.

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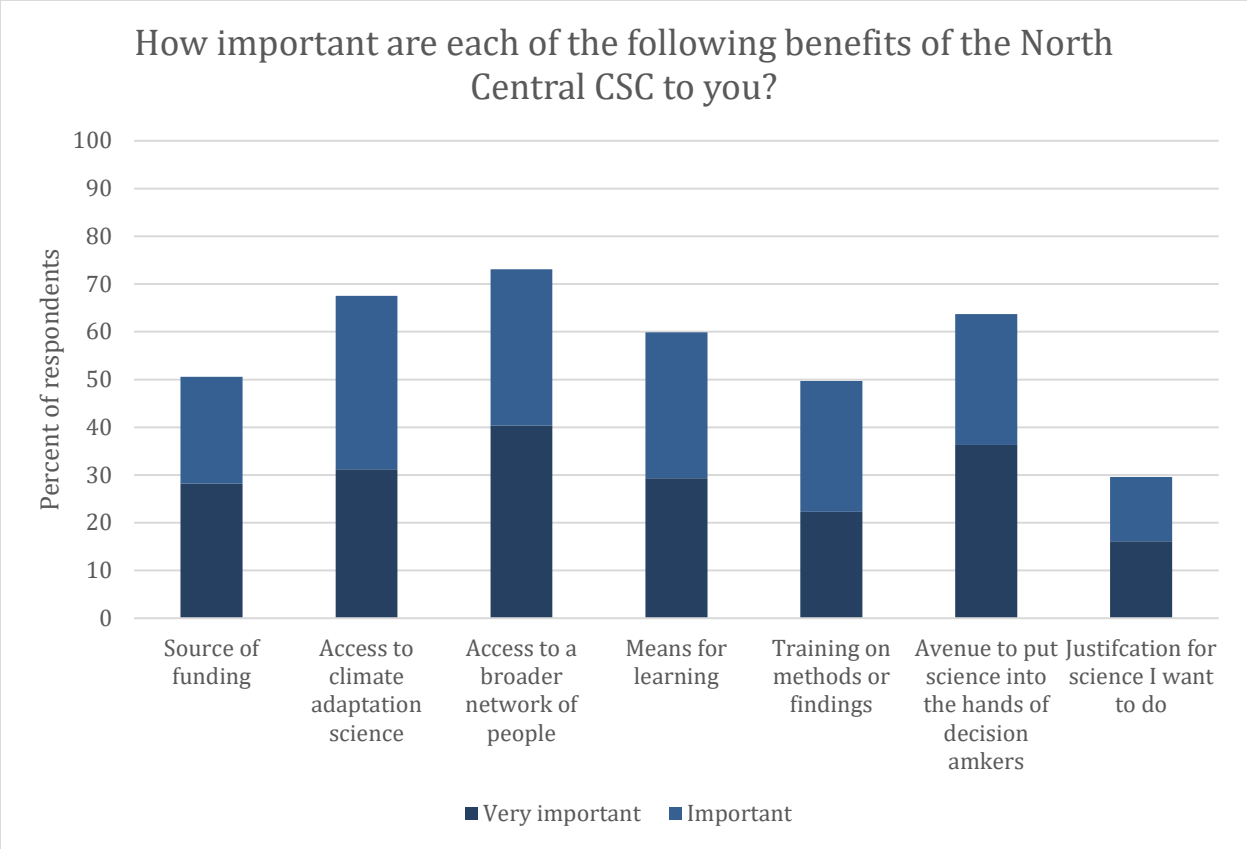
Benefits of Involvement

The most frequently identified benefit attributed to the CSC (Figure NC-2) was "access to a broader network of people interested in climate adaptation science" (73% described as "important" or "very important"; n = 114). Participants in the focus groups described the importance of this network frequently. The networking opportunities that the CSC provided were associated with a whole variety of other benefits. The networks the CSC helped cultivate provided opportunities to connect with other agencies, organizations, or individuals who could contribute to partners' work:

> *The Northern Plains Climate Hub is really charged with focusing on some kind of private land management, agricultural producers, private forests. And so we don't have a direct charge to work on public lands, and yet we know that a lot of our agricultural producers in this region rely heavily on public land for grazing and other uses. And so the Climate Science Center is our bridge to BLM and U.S. Fish and Wildlife Service, EPA, BIA whose activities and decisions directly impact our agricultural producers. (NC User FG)*

Figure NC-2



Note: Based on survey question 9. Text in items shortened for presentation in graph, and only "important" or "very important" responses are shown. Full results in table in appendix.

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These connections provided the opportunity for sharing information and developing a more complete understanding of climate-related work going on in the region:

> *One of the really wonderful things, the benefits of being funded by the Climate Science Center was being on some of these conference calls with other funded projects and learn what they're doing say up in Montana … So that was a huge benefit. (NC User FG)*

This type of interaction could lead to co-learning in which people learned from other people with different specialties:

> *Some of the … work with social scientists that were on our team through the marriage that we were forced into by the Climate Science Center, which was an absolutely wonderful thing … That really expanded our horizon. (NC User FG)*

The relationships that were established also laid the foundation for future work together:

> *I think what's outstanding from that project is our connections were strengthened to the University of Nebraska Lincoln and the National Drought Mitigation Center and the High Plains Regional Science Center.… We didn't have that strong ties before that project.… [It] has really helped elevate that relationship so that now we have that working relationship that we can go from there to continue to develop other projects. (NC Producer FG)*

Ultimately, many partners believed these working relationships led to better science and better management options:

> *We are partnering with … a whole bunch of other investigators…. There were actually originally several proposals that were combined, and it was an interesting experience. But it's turned out to be fantastic because we've been able to work with academia and natural resource managers and, and the Heritage Program and just a real group of diverse set of stakeholders to develop a better understanding of the social vulnerabilities to climate change.… This funding really enabled quite a diverse group of people to start working together to figure out how to develop practical adaptation strategies for natural resource managers who as you know really struggle in how to, how to plan for climate change and how to integrate it into their natural resource work. (NC User FG)*

A second benefit attributed to the CSC almost as frequently was "access to climate adaptation science" (68%; n = 106) (Figure NC-2). The access to high quality science or scientific products was discussed frequently by the science users in their focus group:

> *The science that we're connected to through people [affiliated with the CSC] and their project partners has been critical for our program. (NC User FG)*

> *Before the formation of the, of all the Climate Science Centers, we were starting to realize that climate change was really at the center of almost everything our program is doing… There's nothing we do that doesn't touch on climate change. And when the center formed we were super excited about this as a really critical resource, and they have been that ever since they formed. It's been a really valuable partnership…. They've been able to be able to connect us with the science we needed to get the work done. (NC User FG)*

> *Now we have regular drought maps developed just for Wind River, specific to Wind River. (NC User FG)*

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> *He just did a terrific job of building these climate scenarios and then continuing to help bring in more information (NC User FG)*

Nearly two-thirds of the survey respondents also thought that an important benefit of the CSC was as an "avenue to put climate adaptation science into the hands of decision makers" (64%; n = 100). Participants in the science users focus group referred to this benefit on several occasions:

> *The CSC provided a platform like no other because it's part of our mandate to support … tribes, and there's not a lot of other opportunities out there to bring this type of work specifically to tribes. And so that link is something that wouldn't have happened for me … in the way that it has, but with CSC. (NC Producer FG)*

> *From a climate products developer standpoint, the center was really important in developing linkages for us to the end users of the products we were developing … in really understanding their requirements and … how they were using the data.(NC Producer FG)*

A majority of survey respondents also believed that that an important or very important benefit of the CSC was as a "means for learning about climate adaptation" (60%; n = 94).

> *We're learning from each other. The climate change scientists are learning more about drought and drought indicators and [other] folks are learning more about the projections. (NC Producer FG)*

> *The CSCs and LCCs to some regard have filled … a hole where many of us on the … atmospheric side or … non-biological side have no idea what we're talking about. So it's good to have … federal relatives … that we can turn to with that expertise when necessary. (NC User FG)*

About half of the partners we surveyed thought that serving as a "source of funding for climate adaptation science" (51%; n = 79) and "training on climate adaptation science methods or findings" (50%; n = 78) were important benefits. Funding was mentioned occasionally during the focus groups. People considered the funding important, but discussed it much less frequently than some of the other benefits of being involved with the CSC.

> *The funding from … the NC CSC has been super important. It's really the only way we've had to sort of leverage all these different things that we're doing. It's been tremendously effective use of resources to receive that funding … which is ramified into benefits that have transferred … to all the other climate science projects that we're doing and will do … in the future. It has been an extremely effective use of funding for that. And really, it's at the center of the growth of our whole program into this new realization of what we can do. And without the Climate Science Center we would not have been able to grow into the roles that we have now. (NC User FG)*

One respondent to the survey also wrote in comments about the importance of CSC funding, despite the fact that that funding was limited:

> *The amount of science funding is negligible … but important as seed funds for collaborative research and partnerships. The real value of the CSC is providing a forum and collaboration space to share ideas, data, analytical techniques and researcher-practitioner integration. (NC CSC Survey)*

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Relatively few respondents considered "justification for science I want to do" as an important benefit of the CSC (30%; n = 46).

Limitations on Involvement

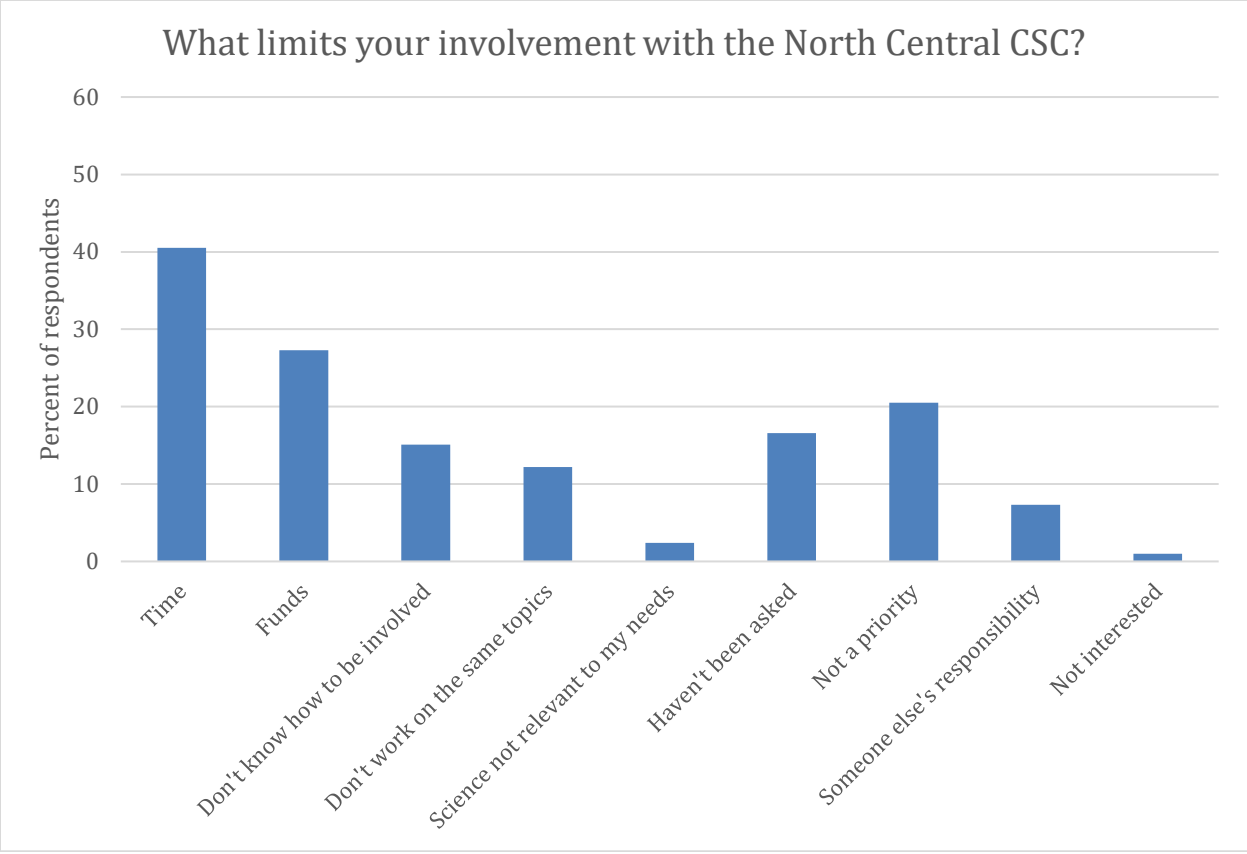
Most survey respondents (75%; n = 154) reported limits to their involvement with the CSC (Figure NC-3). The most common (41%; n = 83) limit was not having enough time, followed by not having enough funds (27%; n = 56). The focus group participants also recognized their available time as limiting their involvement:

> *We have two big challenges working with the CSC and one of them is internal in that we just don't have enough time to come over and participate in the activities. (NC User FG)*

Because of such constraints, focus group participants also recognized that it was easier for partners to be involved with the CSC if they worked at organizations that were located near to it.

> *Geographical co-location really, really helps things out. (NC User FG)*

Figure NC-3



Note: Based on survey question 10. Text in items shortened for presentation in graph. Full text in table in appendix.

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About one in five survey respondents said that working with the CSC was not as high of a priority as other work (21%; n = 42). Their work priorities were affected to some degree by the policies of their own organizations. One survey respondent wrote in comments arguing that the policies and perspectives of his or her organization made it challenging to spend time engaging with the CSC.

> *Institutional barriers… In my case, I have to work hard within my institution to make a case of my continued involvement with NC CSC and the relevant research and outreach I perform for it. Applied, inter- and trans-disciplinary are not easily supported. (NC CSC Survey)*

Focus group participants pointed out that spending the time needed to develop products that were relevant to science users when working with the CSC was not always recognized as a valuable contribution by their organizations.

> *All the extra work you do in terms of developing user relevant products that are not research papers and that kind of level of participation, just presenting and interacting and teaching with respect to climate adaptation work, I think that puts a real challenge to publishing papers. But also convincing your peers that we are doing this extra work that prevents us from any publishing of the same amount of papers. (NC Producer FG)*

A related topic that was discussed in the focus groups was that CSC staff were also constrained by the amount of time they had available to work with partners. This constraint placed limitations on the partners' engagement with them:

> *They don't have the capacity. We've … done our best to exploit the CSC (chuckle) to the maximum amount that we can. And unfortunately they work with all these other groups and so there have been times when we've gone and asked them for stuff…. They have a lot of things to offer us… And Jeff goes, "That's really nice but our whole staff is actually out of town this week meeting with [another partner]"…. They've been extremely accessible to us. They've been very receptive to our requests, but they do have a capacity issue. (NC User FG)*

This point was echoed by some of the staff themselves:

> *The time that it takes to do this type of work … it can't be understated…. I didn't publish pretty much all last year because I was managing projects, setting up projects, designing projects, implementing projects and responding to all the ad hoc requests all at the same time. So that is a real, real challenge for staff, staff scientists…. The ad hoc stuff, we just simply don't have the staff. We get so many requests…. I have to tell people, "no," all the time. And I hate it, but … it is what it is…. The need far outweighs our capacity to serve all of the requests that we get. (NC Producers FG)*

Fewer than one-fifth of survey respondents reported limits on their involvement of not being invited or asked to be involved (17%; n = 34) or not knowing how to be involved (15%; n = 31). Not knowing how to be involved was discussed in the focus groups.

> *I'm learning today just how groups have used the Climate Science Centers… Really, our fundamental challenge is using them to the full capacity, finding out how the Climate Science Center really can benefit the state wildlife agency… understanding of the true opportunities that are there that we have to take full advantage of. (NC User FG)*

Two LCC representatives, one a focus group participant and the other a survey respondent, described some of their unique challenges in knowing how to be involved with the CSC.

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The earliest framers of the LCC and CSC relationship thought the CSC would inform LCC work and vice versa but this doesn't seem to be happening. Since this would be my main avenue for interaction, it ends up being not much of an opportunity. (NC CSC Survey)

The LCC that I'm involved with … we engage with three different Climate Science Centers. And sometimes that does get to be rather a challenge… We have issues that transcend our entire geography and sometimes we're not quite sure which Climate Science Center to bring that issue to. So I wouldn't say that it's been a problem, but it is a challenge. (NC User FG)

Other limits on involvement noted by survey respondents included not working on the same topics as the CSC (12%; n = 25) or the CSC's science being perceived as irrelevant to their needs (2%; n = 5). Only two respondents reported not being interested in the CSC's work. Although these types of limits were not mentioned by many survey respondents, several took the time to write in additional comments about them. Two of these individuals maintained that the leaders of the CSC were not interested in their work.

I have reached out to the leaders of the NC CSC, have met with them, and have even participated in a short work-shop where I presented some of my work (both research and outreach to land managers). There seems to be some interest, and it is clear to me the contributions my work and the work of some of my partners could make to the NC CSC and vise-versa, but the leadership of the CSC don't seem that interested, and don't follow up with opportunities. I have decided there isn't enough interest on their part to warrant continued effort on my part, even though we are logical partners. (NC CSC Survey)

It's been some time since NC CSC showed interest in talking with me. (NC CSC Survey)

Is Climate Adaptation Science Actionable?

Respondents shared their perceptions both of climate adaptation science, in general, and of the climate adaptation science produced by the CSC. With regard to climate adaptation science in general, nearly three-quarters of respondents (73%; n = 127) agreed or strongly agreed that climate adaptation science in the North Central region is available to decision makers (Figure NC-4), and nearly as many (71%; n = 112) thought that water managers used this science to inform management. Only about half, however, thought that fish and wildlife managers (55%; n = 88) and land managers (49%; n = 84) used climate adaptation science to inform management. Only about one-third (36%; n = 59) believed that policy makers used this science to inform policies. More than two-thirds (68%; n = 112) maintained that what is known about climate adaptation does not necessarily influence actions taken by decision makers in the region. Nearly as many (66%; n = 95), however, agreed that the CSC has helped to reduce the disconnect between what is known about climate adaptation and the actions taken by decision makers in the region.

In terms of the North Central CSC science specifically, respondents (91%; n = 154) strongly or somewhat agreed the CSC science can contribute to policy or management (Figure NC-5). Respondents were also positive about other characteristics of the CSC science, finding it high quality (85%; n = 140) and appropriate to inform the types of decisions being made (83%; n = 139). A majority also thought that it integrated well with other information (69%; n = 112). Fewer than 10% thought that the North Central CSC's science was irrelevant to management (9%; n = 15) or biased (2%; n = 4).

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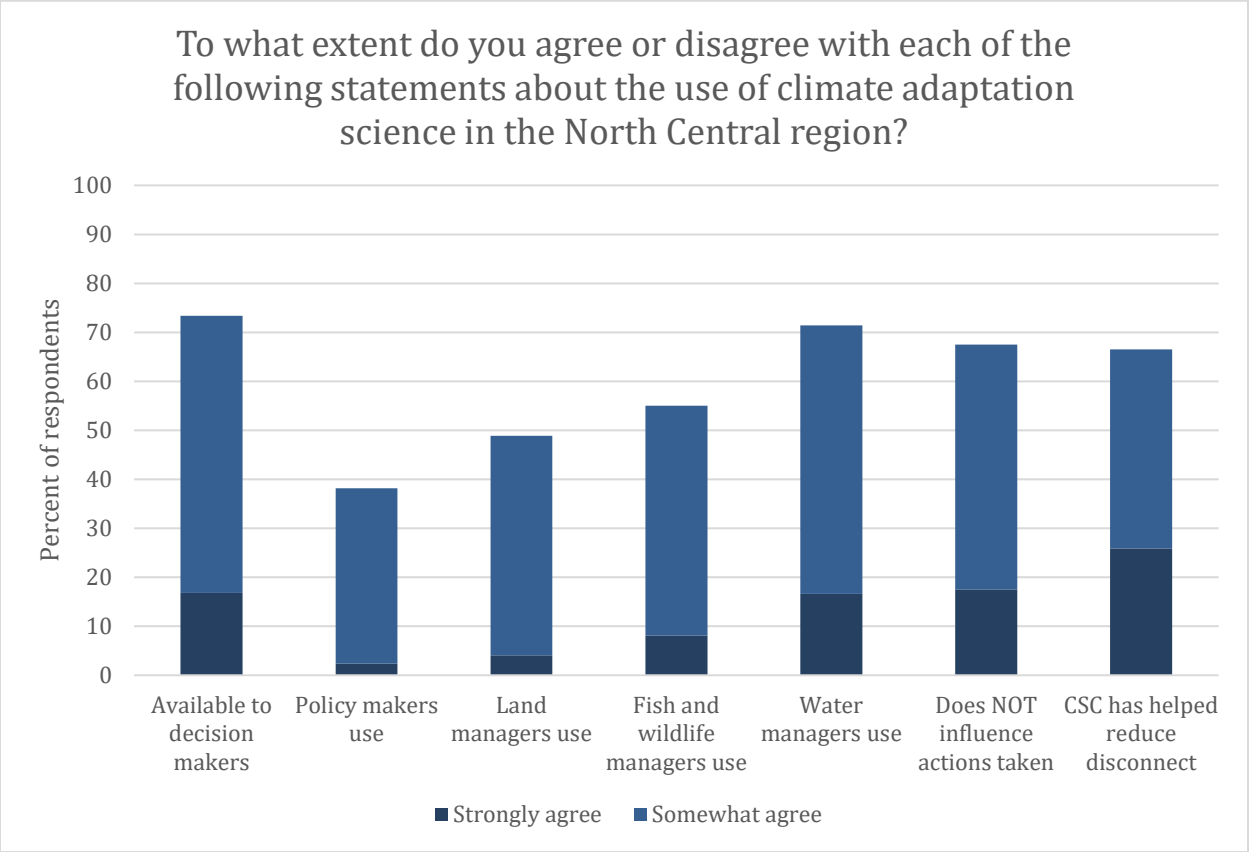
Figure NC-4



Note: Based on survey question 11. Text in items shortened for presentation in graph. Full text in table in appendix.

Science Users' and Producers' Use of Climate Adaptation Science

Among respondents who reported that they were science users, 66% (n = 31) reported that they or someone in their organization used climate adaptation science from sources affiliated with the North Central CSC. Nearly all (91%; n = 50) reported that they or someone in their organization used climate adaptation science from sources not affiliated with the CSC.

The most common way science users reported using the North Central CSC science (Figure NC-6) was to inform management plans (41%; n = 26). One-third reported using it to inform management actions (33%; n = 21) or inform training of conservation professionals (33%; n = 21). About one-quarter (27%; n = 17) used it to inform the public about climate change and its impacts. It was less frequently used to inform policy (19%; n = 12) or inform land acquisition priorities (11%; n = 7).

When science producers were asked a parallel set of questions about how the science they had produced had been used, the relative frequency of different types of reported uses was similar, but the absolute frequency was greater. Nearly two-thirds (64%; n = 67) said their science had been used to inform management plans, while about half said their science had been used to inform management actions (50%; n = 52) and inform training of conservational professionals (50%; n = 52). The differences between science users' and science producers' responses could reflect differences in perceptions about how

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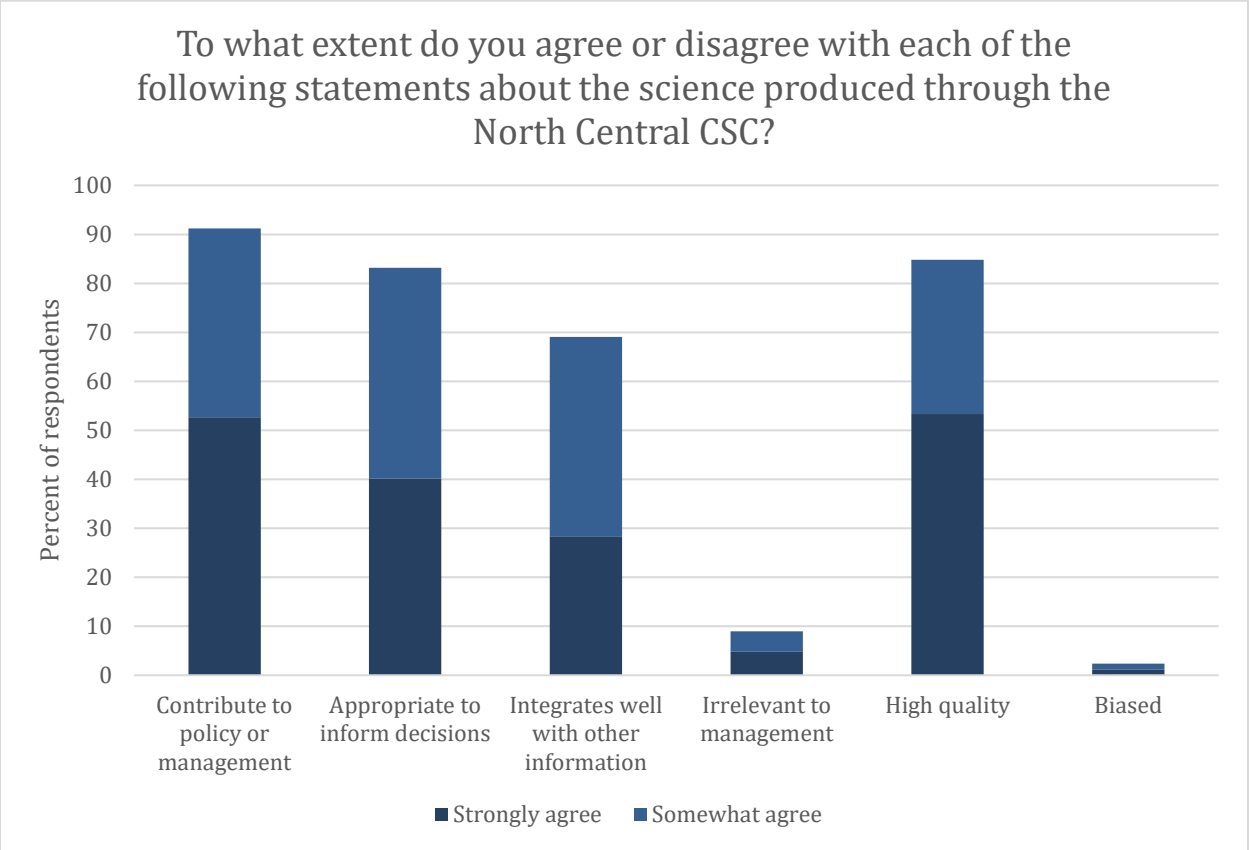
Figure NC-5



Note: Based on survey question 12. Text in items shortened for presentation in graph, and only "strongly agree", "somewhat agree", or "I'm unfamiliar with the science" responses are shown. Full results in table in appendix.

frequently CSC science is used. It could also reflect that the use of CSC science is concentrated in a subset of potential CSC science users.

In the focus groups, participants describe a number of reasons why they thought North Central CSC helped to meet decision makers' needs. First, they believed that the CSC made a concerted effort to tailor that science to the needs of managers. Part of this effort was directed toward helping scientists better understand science users' needs.

> *The center really allowed us to understand how some of the main climate datasets that were being used for impact research were being used, and how a lot of the products out there did not meet … the needs of the users at all. And helped us figure out exactly what to focus on and really nail down in terms of developing the new products. (NC Producer FG)*

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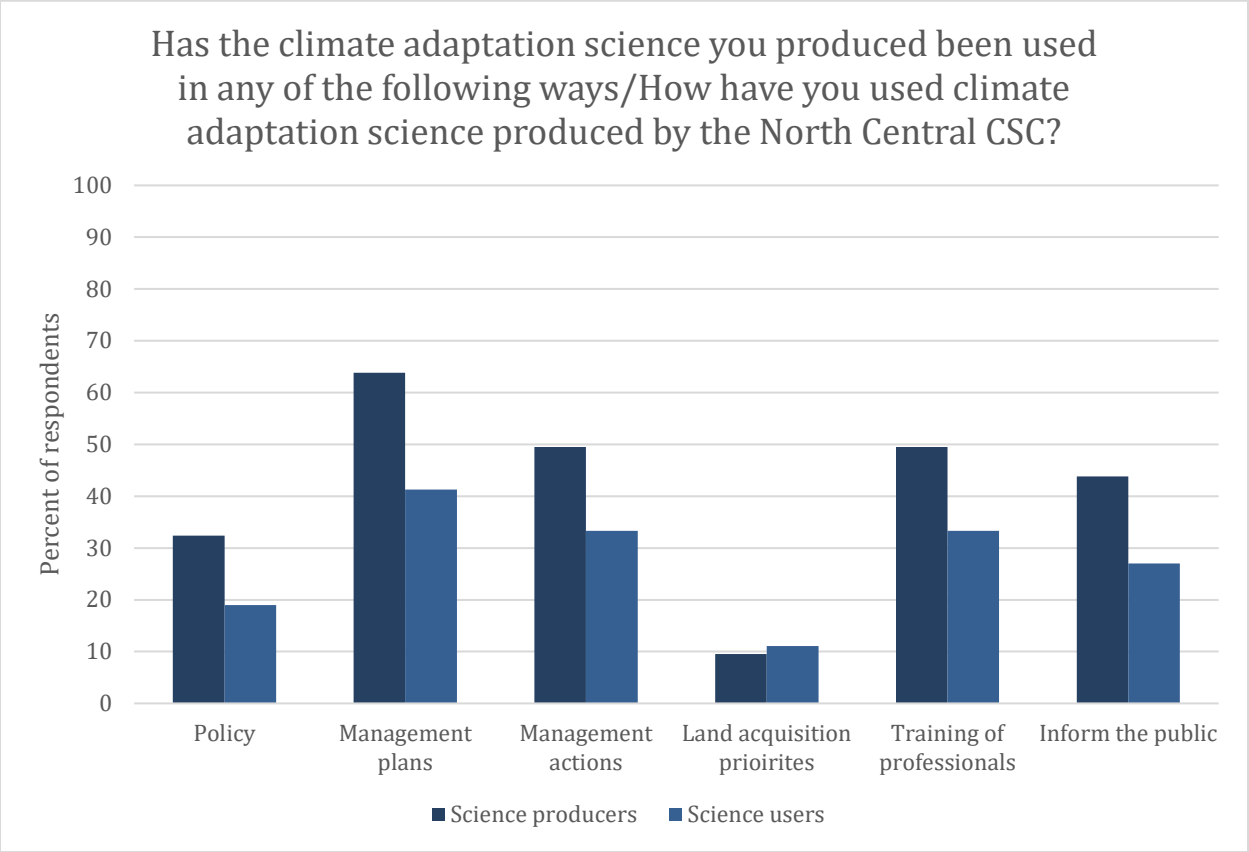
Figure NC-6



Note: Survey questions 15 & 21. Text in items shortened for presentation in graph. Full text in table in appendix.

In addition, the CSC made a concerted effort to make sure that they communicated regularly with key users.

> *Jeff has done a really great job of involving us from the get-go. We've had a lot of face-to-face meetings and conference calls talking about the solicitations, the RFPs that would be announced and making sure that they were in line with LCC needs. (NC User FG)*

> *A lot of our interactions with them ended up being more ad hoc than systemized or institutionalized, and so Jeff basically decided that he was going to do something to systematize it more. So that was when he decided to have … at least one liaison at each of the LCCs in our region. (NC Producer FG)*

The CSC makes an attempt to put its science products in a tangible form that can be used by decision makers.

> *The very tangible products, that vulnerability assessment … We're also working on a publication … on the use of the visualization…. Those two parts are very tangible. But then it has also provided us with a tool to communicate a lot of climate science, climate change issues that we face and our mid-management partners seem to face as well…. Jeff … does a very good job at*

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communicating … how the products that the state created for us through this process … how to use those. (NC User FG)

One of the biggest impediments to acting on mitigation or adaptation is really just … not knowing … the realm of possibilities … being able to contextualize what that might look like. And then, especially with respect to adaptation, coming up with strategies which is sometimes what we're already doing, right? We've seen this with Parks and Wildlife. A lot of the adaptation strategies are things that we already do. It's just doing them slightly differently or on an enhanced timeline…. That kind of contextualization for policymakers and decision makers is really critical because it conveys the message that this is not this obtuse thing that we can't do anything about now…. You really need the science to be able to get at least a picture of what that range might be. (NC User FG)

From the science users' perspective, the efforts by the CSC to help users develop adaptation strategies based on the CSC's science products were critically important.

We're at the process of starting our adaptation…. They develop these vulnerability assessments, determine what's vulnerable, and then I think they just put them on the shelf. But you have to take that next step…. And I think that's where really … having the Climate Science Center be engaged with you can really make you do that next step. I mean you could do vulnerability assessments within your own organization … for these species or ecosystems or whatever, but what are you going to do with it? And I think that's where the Climate Science Center really comes in. (NC User FG)

Going to that next step after the vulnerability assessments to the adaptation, that really is the cutting edge of where we are in land management right now. (NC User FG)

Some of the CSC's decisions about how to use its resources helped in this regard. It hired not only scientific, but also technical, staff because the technical staff played an important role in helping in the use of the science products.

Rather than hiring, in some cases, hiring scientific staff … he's hired technical staff. And that's turned out to be really critical. So a number of the things that I've talked about today and yesterday also rely on the ability of having programmers and GIS people and technicians that can support a variety of products…. We have access in many cases to a rich set of scientists through the CSC… and oftentimes what you need is the technical kind of project management stuff that helps make the connections between projects, and that's not always … a job that's for a tenured faculty member. You know it's the Master's level programmer or the post-doc or whatever that helps glue everything together. (NC User FG)

The university director also spent time working with potential users and helping them to understand how they could and could not use CSC science.

We have a technical climate change advisory group that essentially serves as our advisory committee on all the studies that we do to make sure we're utilizing sound science in our decision making. Dennis sits on that committee… It really is an opportunity … to not only bring the science and information to the table but also to directly influence, like, "Yes you can use this to answer this question, but no you can't use that science to use to answer that question because that's a bit of a stretch." And we, we've had that sort of thing happen this discussion so that's, you know I think a big opportunity to go forward where they really, where you know the folks on

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that committee really do have direct influence and access to how information is used. (NC User FG)

Nevertheless, CSC partners recognized factors that limited the use of CSC science. Science users and producers differed in their perceptions of what these factors were (Figure NC-7). In all cases, more science producers than science users perceived limits to the use (not necessarily their own use) of CSC science to a moderate, large, or very large extent. Two of the most common limitations cited were the same for science users and producers: scientists not working closely with decision makers (science users – 34%; science producers – 71%) and management issues not defined clearly enough (science users – 40%; science producers – 64%). Most science producers (73%) also felt that decision makers not being aware of the science was a limitation, while few science users (23%) agreed. The same pattern was found for decision makers lacking the skills to use the science (science users – 15%; science producers – 66%). Neither group considered a lack of quality of the science to be a problem (science users – 4%; science producers – 12%).

Focus group participants discussed these and other limitations to the use of the Climate Science Center's science. For some, the science did not address the particular management problems they faced. In such a large region, work in the host universities was more likely to address problems in their vicinity, but not other parts of the region:

Where the Great Plains LCC I think has not benefitted … is even though we've been involved in the stakeholder advisory committee and putting input into those RFPs, what we have seen is that these funding opportunities have not come back with a lot of folks in the consortium that have brought proposals related to the Great Plains LCC…. The challenge for us has been, in my opinion, that researchers in the consortium haven't really put forth proposals and work related to the Great Plains LCC…. It seems like the Plains and Prairie Potholes, Great Northern … every time we've had proposal or funding opportunities there's been a lot of folks wanting to work up there. I think that's related to where those universities are obviously. So again that's been our challenge is getting … those folks to sort of look a little bit more southward towards our LCC. (NC User FG)

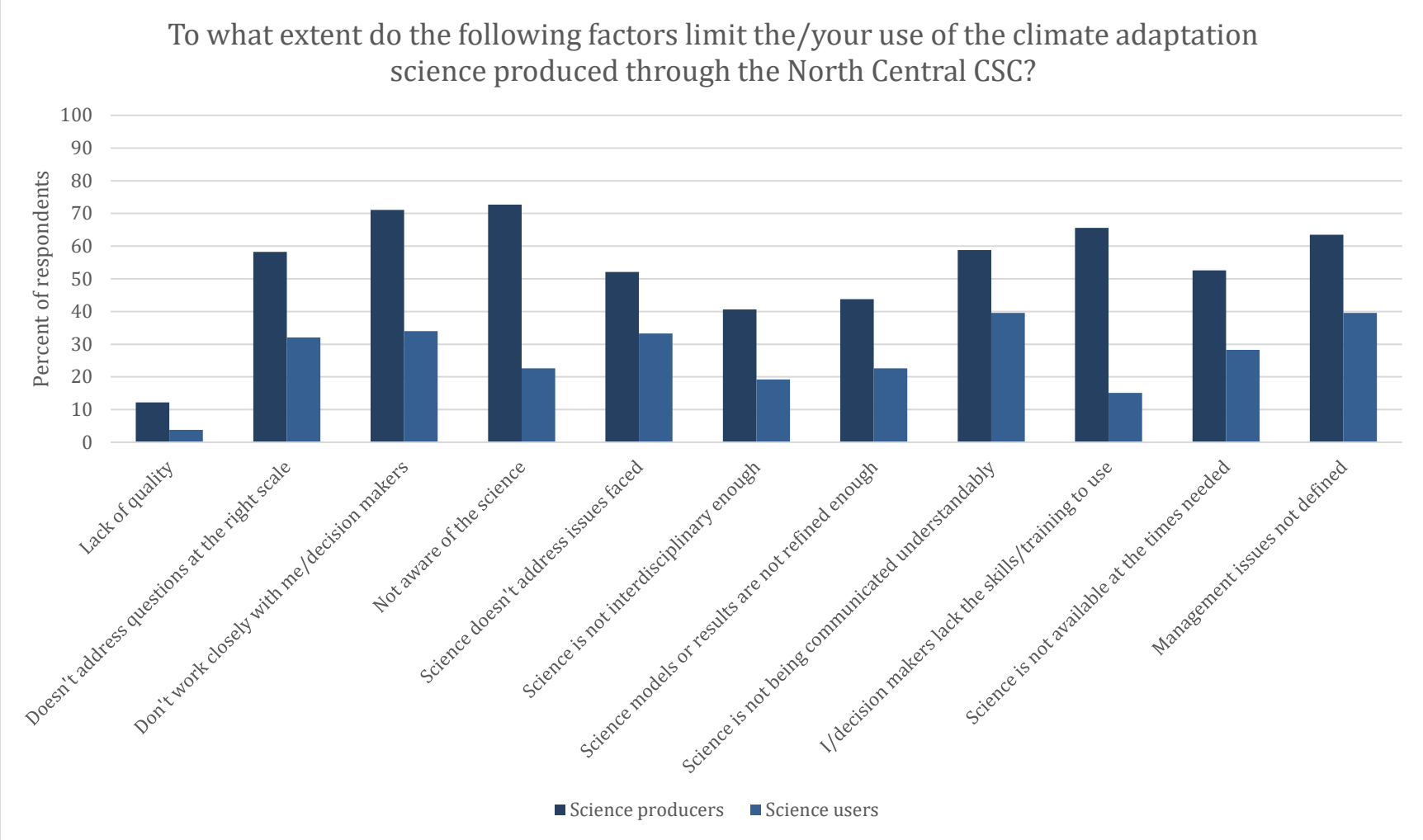
In other cases, the science was relevant to their needs, but it was difficult for science users to get "their heads around." Consequently, it was difficult for them to apply it to management decisions in a meaningful way.

They gave us … lots and lots of information. And the ecological response in all the five models told us a lot of things about the systems….And we had to sort of pare it down to something that people could get their hands on and their heads around. And so I think when we came up with adaptation strategies for those things, they wound up being on a pretty small scale. And maybe they didn't seem momentous enough for people to even want to argue about it. (NC Producer FG)

For agencies with particular geographic areas of interest, like a statewide focus of state agencies, identifying the CSC science that addressed their interests at the right scale could be challenging.

I … work across state agencies…. Jeff has been very open any time we have approached him with ideas or resources as to how he could help. But … there are so many different projects going on it's about kind of finding the best place for us to engage. And what is both concrete enough that it provides useable actionable science for us, but at the same time it's not so narrow and specific that it wouldn't be applicable statewide or wouldn't be informative statewide. Or at the same

Figure NC-7



Note: Survey questions 16 & 22. Text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Also, text varied slightly for science producers and users. Full results and text in tables in appendix.

time like maybe it's too broad, it's more of a regional effort and, and not necessarily something that can be downscaled to just specifically Colorado. (NC User FG)

Decisions makers faced constraints within their own organizations because sometimes the time windows during which scientific information could influence decision making were very narrow.

Our plans are very rigid and it's trying to find that window of when you incorporate the science into those plans…. We're doing a land use plan revision for our office…. They're just starting to develop their alternatives, and … we've been told … with the climate adaptation part, it's too late in the process already to incorporate that science. And it's like it's really frustrating when you know we haven't even released a draft plan. A draft plan won't come out for another 1½ years or so. Well, why can't we incorporate you know some of this climate information scenario planning … and eventually getting to adaptation type work in a land use plan? … I've been told that you need to do that well out in advance of a planning process. So it's like, "Well, tell me a plan that we're going to start two years from now. I'll get you the data that you can incorporate into it."(NC User FG)

In other cases, their time constraints were exacerbated because USGS's process of publishing results was a lengthy one, which could not always respond to immediate management needs.

The USGS publication process … sometimes don't fit so well with management agencies and the need to get stuff done quickly. And so we once or twice, actually several times, … we really need something. It would be nice to have like an official report or something and it gets tied up in the USGS publication process. And so that I don't think that's necessarily a CSC, but given the speed of management decisions and that we have deadlines … we're often working on a very tight schedule and anything that ties that up is going to be a problem. Again … I don't know that it's CSC-specific but we have run into that a couple times. (NC User FG)

One focus group participant argued that for organizations like the CSCs to have a real impact on decision making, they had to "persist through lengthy amounts of time" so that they could effectively engage with decision making processes.

Programs like the Climate Science Centers … need to persist through lengthy amounts of time that can sort of … be cognizant and patient about integrating with those land management cycles in appropriate ways. … How do you integrate novel information like climate science to those kinds of decision processes? … The BLM is figuring out how as an agency how they incorporate science at the landscape conservation planning and delivery. And the Climate Science Centers were there to help that and so it's not going to happen fast. And the barrier is just sort of you know institutional speed if you will and, and we all have to sort of recognize that and be willing to be patient just so that we can overcome those barriers with a little persistence and a little patience. (NC User FG)

Science Users' and Producers' Engagement in Co-production of Knowledge

Respondents reported on their beliefs about co-production of knowledge in general. An overwhelming proportion of both science users (90%; n = 51) and producers (93%; n = 95) expressed support for co-production, indicating it was important or very important for climate adaptation scientists and natural resources decision makers to work together to produce science research.

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Many science producers indicated experience in co-production in various phases of research projects, much more so than did science users[1] (Figure NC-8). For all phases of research projects except for "analyzing data," at least half of the science producers had experience collaborating with decision makers to a moderate, large, or very large extent. (These results apply to all types of research, not just CSC-sponsored research.) In contrast, when science users were asked about their experience collaborating on research with CSC science, there were only 3 phases of research with which at least 30% of science users had experience: communicating results of a research project (37%), identifying research questions (31%), and applying research results (30%). Both science users and science producers perceived collaboration between scientists and decision makers to be less common in designing research methods (science users – 19%; science producers – 58%), collecting data (science users – 19%, science producers – 56%), and analyzing data (science users – 23%; science producers – 47%).

The factors that survey respondents thought were most likely to limit science users' involvement in research projects were scientists not reaching out to them (51% agreed or strongly agreed; n = 29), followed by different perspectives on what science is needed (33%; n = 19). Other factors were perceived to limit the involvement of smaller numbers of respondents: the science users not having enough time (26%; n = 15); funders not supportive of collaboration between scientists and science users (25%; n = 14), different perspectives on how research projects should be conducted (19%; n = 11), and scientists not interested in listening to them (18%; n =10).

During the science producers focus group, in particular, participants engaged in a lengthy discussion of the factors that made coproduction challenging. To begin with, participants emphasized that coproduction was inherently a time-consuming process, which was difficult to complete in relatively short-term projects.

> *The additional goal of not only producing the science but then to coproduce this with your managers and help them figure out how to apply it. It's like all of that really is hard to do in a three-year period. (NC Producer FG)*

> *These are really long-term endeavors of these coproduction processes. And the scaling that has to happen, the relationship building that has to happen, and all of that. (NC Producer FG)*

The time required for coproduction is particularly challenging for young scientists who needed to maximize their publications to meet the expectations of their positions.

> *Coproduction, that takes a lot longer. Especially the young scientists … they need to be publishing papers, and that takes longer and if you're a research grade scientist in USGS or you're a young faculty or research scientist at the university. (NC Producer FG)*

> *At the university level … and I've been at the USGS level. Our … evaluations are based solely on our publications… Working with post docs and grad students, the pressure for them is they have to publish or they'll never get a job. And so I think the challenge is getting into cutting edge research that can get in high level journals but also doing it that's really appropriate for managers and applications…. I think the CSC … does a great job of helping us balance that…. It really is a balancing act. And I think for especially the young scientists that need to maintain a publication record, it's really a very hard challenge to do everything. (NC Producer FG)*

[1] As noted in a previous section, the science producers in our sample were also more extensively engaged with climate adaptation science, management, or policy – as well as with the CSC itself – than the science users in our sample.

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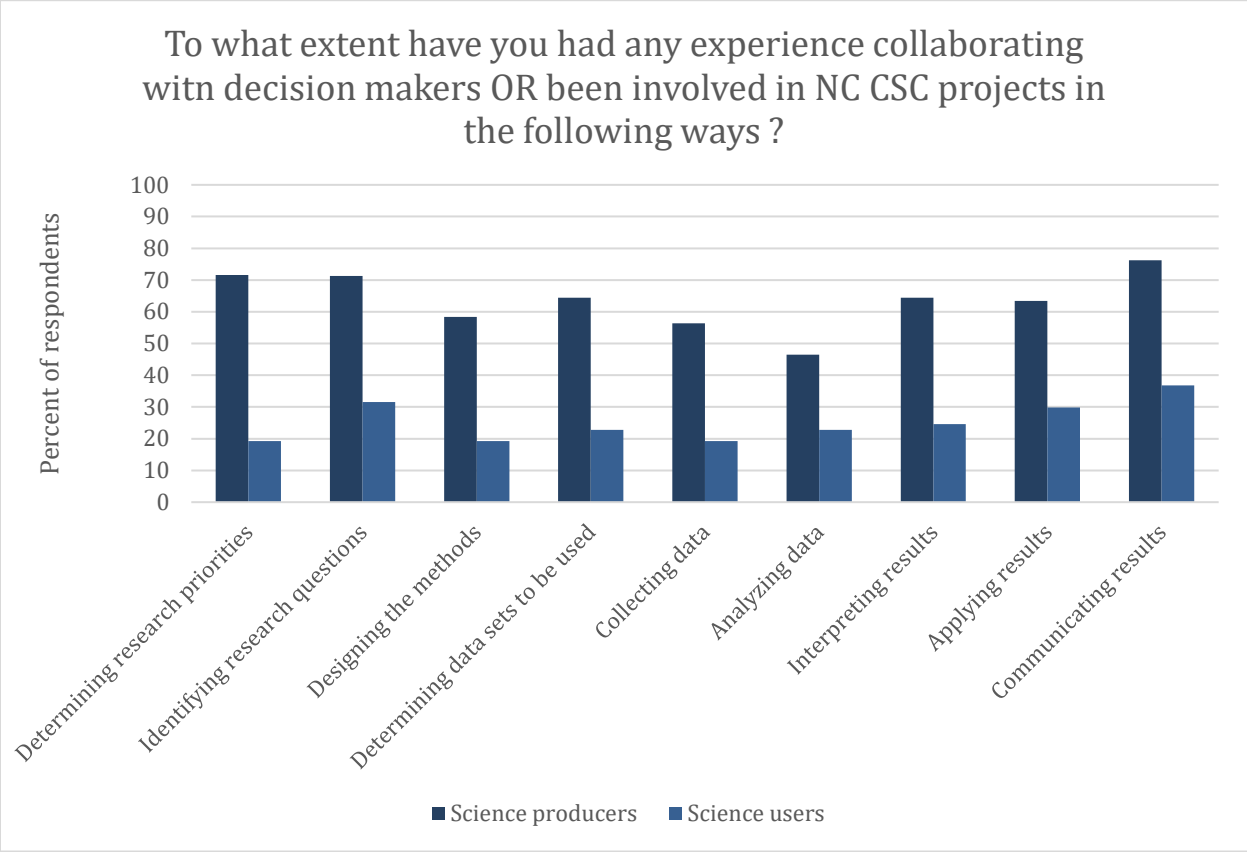
Figure NC-8



Note: Survey questions 18 & 24. Text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Additionally, the text of the question varied slightly for science producers and users (e.g., the users' version referencing "you or someone in your organization" and specifying a North Central CSC project). Full results and text in tables in appendix.

Because so much time is needed to coproduce science, it is not uncommon for key players to change jobs, undermining the relationships that serve as the foundation for coproduction:

> *There's staff turnover and so some of the people that are the most involved in what you're doing and giving you input upfront will end up moving from Bismarck to the regional office. And all of a sudden there's maybe no one to take that position for a while. And … they only have a certain amount of their time that they can really focus on this. So … the huge staff turnover. (NC Producer FG)*

Another challenge to coproduction is that scientists tend to be funded to work on projects over relatively short periods of two to three years. Science users will be making use of that research over much longer periods of time, however. Some support for their uses is needed.

> *There are several projects that are getting towards the end that we need to keep going and want to keep going. And aren't sure … how they're going to sustain themselves. So I think … being*

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> *able to sustain the types of activities is really challenging and of course that's not unique to the CSC, but it is one that I've observed. (NC Producer FG)*

> *You have the initial product development, and you develop the product, and then you put it out there…. But then come how do you maintain the product going forward? How do you operationalize it, how do you improve it, how do you co-produce improvements with end users? That's a challenge we haven't overcome yet is how to keep the product going for the center? Does the center take it? Do I … keep it going somehow in my spare time? … But one challenge is … figure out how to keep things going in terms of maintaining the products going forward. (NC Producer FG)*

Focus group participants also described the challenges posed by the different scales at which scientists and managers tended to work. This applied to the geographic scope of projects:

> *Just the challenge of scale… Anybody who has been doing climate work for a long time knows that this is always the case. But just trying to find that balance at the center between how do we service the region while at the same time servicing the managers – that are … inherently local scale, the types of things that they're dealing with. That's an ongoing struggle … It's really challenging. (NC Producer FG)*

Making time scales mesh is also difficult.

> *We are trying to figure out how to support ongoing planning process or upcoming planning processes…. We had a conference call with one of the managers there … A lot of our conversation had to do with the timing … the planning process that they go through and at what point does it make sense for us to jump into that process and when is it too late because the horses are already out of the stable…. So we had a big discussion about … when did it make sense and how do you catch these planning processes at the right time so that you can actually help them in developing their adaptation strategies. And that's not easy to do. (NC Producer FG)*

Scientists find it difficult to coproduce science when there are multiple types of stakeholders they are trying to serve.

> *When you're getting to the point of trying to work with these agencies … and you're trying to get them to think about adaptation strategies. Because they have different mandates, different missions, different pressures. How do you really come up with adaptation strategies that work in the landscapes here?.... How do you really work that out so the Forest Service and the Fish and Wildlife Service and the Park Service and the county commissioners, and everybody can agree, "Yeah, this is really great. This is robust over various scenarios in this landscape." So I think that's kind of an ongoing question.*

Working with tribes poses unique challenges.

> *In climate work, working with tribes is a whole other instance again…. They have their own … different sets of problems…. The Wind River Reservation Project, one of our biggest challenges is the fact that the two tribes are in a lawsuit because they're having a governance conflict that was imposed by the BIA many, many decades ago. (NC Producer FG)*

The North Central CSC was viewed as doing a number of things that helped to address the challenges of coproduction. To begin with, the CSC makes an effort to understand users' needs and use that information in designing funding opportunities:

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> *They have always been responsive, both of them. But what speaks specifically about the North Central … to LCC's express needs: very often reaching out to try to understand what our needs are, being very responsive in terms of crafting funding opportunities for researchers that are directed towards the LCC's express needs. And those benefits have been consistent in ways that we've … not been able to achieve through other science delivery mechanisms. (NC User FG)*

The CSC has also recognized and been supportive of the time required to do coproduction well.

> *We were able to get an extension … Every piece is so big. I think we have done a really good job of marching through it and getting done what we can, and they've been extremely supportive the whole way. (NC Producer FG)*

> *You have to have patience. And to toot Jeff and Dennis's horn again … they're so good at being flexible and being supportive for us about that stuff. And understanding that this is what happens. And you just got to be flexible and work around it and figure out a strategy to keep going and not burn bridges. (NC Producer FG)*

Perceptions of the Role of the CSC

The North Central CSC has helped facilitate various connections (Figure NC-9). The most common connections reported were with climate adaptation science (54%; n = 93) and climate adaptation scientists (52%; n = 90). Nearly half also reported getting connected with resources needed to conduct science (46%; n = 78) and professionals who might communicate science (45%; n = 77). Fewer reported help in connecting with decision makers who might use science (31%; n = 53).

Most than half of respondents agreed that the North Central CSC made a wide variety of contributions to the region (Figure NC-10). The contributions that were most widely perceived were awareness of available science (72%; n = 120), collaboration between scientists (71%; n = 119), communication between scientists and those who might use the science (71%; n = 117), and interdisciplinary science (70%; n = 116).

Summary of North Central Results

Survey respondents were comprised of one-third science users, slightly more than half science producers, and some individuals who fell into neither group. All were involved with climate work to some extent, but producers were more involved than users. All were aware of the North Central CSC, but more than half of the users (those who were not also producers) had no involvement with it themselves. Respondents included employees of a variety of types of organizations and agencies, but federal agencies and universities were most prominent.

Survey respondents were involved with the North Central CSC in a variety of ways, but the most common was as participants in CSC trainings, webinars, workshops, or conferences. Nearly one-third were CSC grant recipients, applicants, or partners on a grant. Only 10% were resource managers or decision makers who had used the science produced by the CSC. Partners interacted most frequently with USGS staff, and CSC-affiliated researchers.

The CSC provided many important benefits to partners with the top ones identified by survey participants being providing access to a network of people interested in climate adaptation science and providing access to the science itself. Focus group participants spoke at length about the value of the networks to

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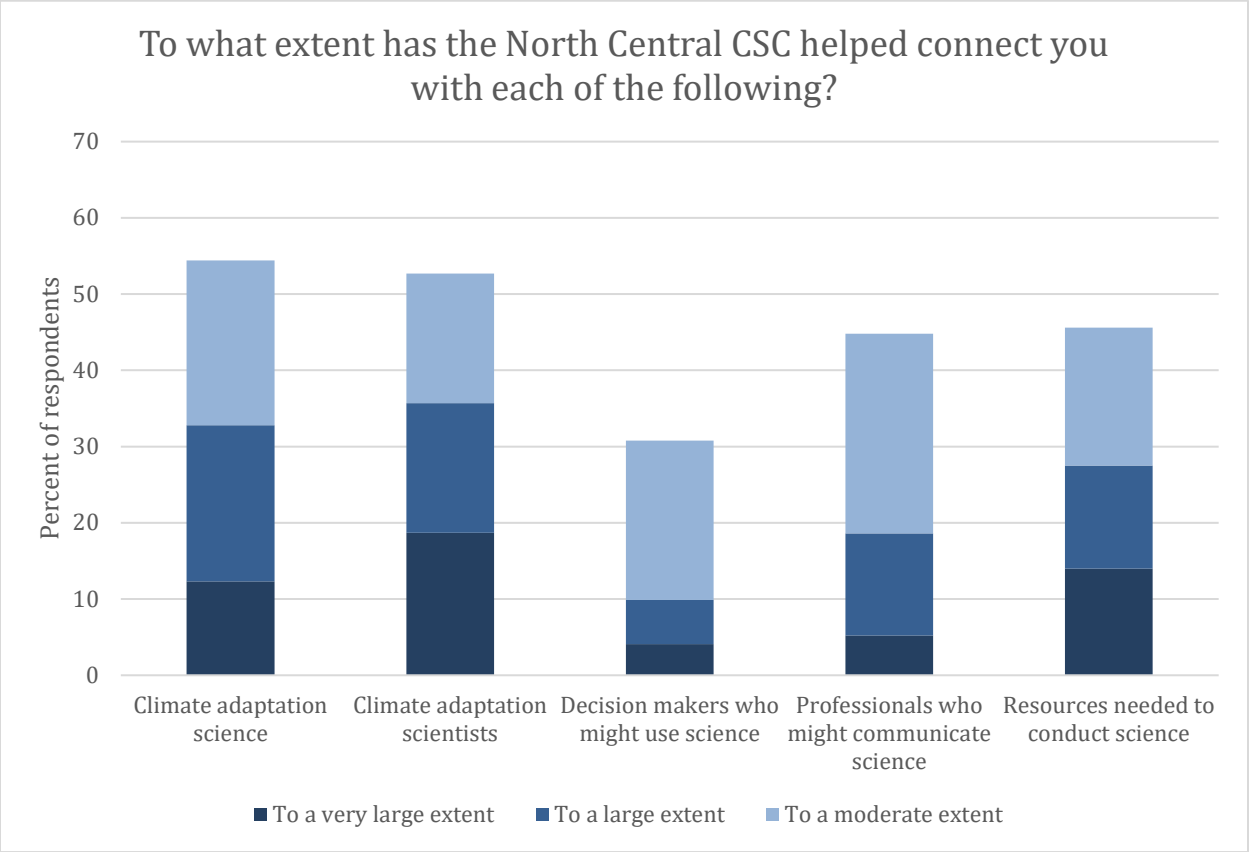
Figure NC-9



Note: text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Full results and text in tables in appendix.

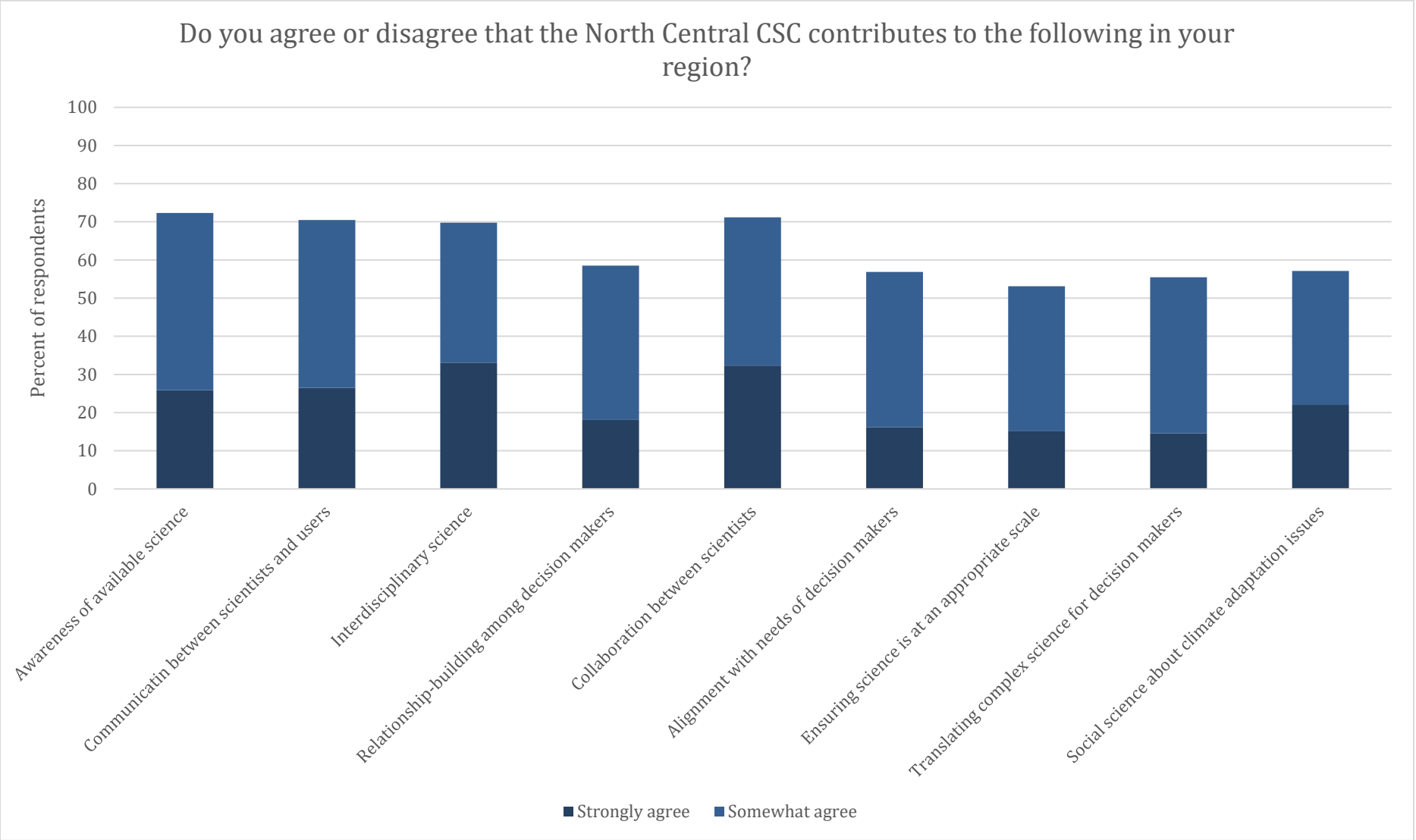
which the CSC gave them access. Survey respondents reported they were limited in their involvement with the CSC by a variety of factors with the most common ones being time, funds, and other priorities.

About three-quarters of the survey respondents felt that climate adaptation science in the North Central region[1] was available to decision makers, and many also believed that decision makers, particularly water managers, use the climate adaptation science to inform policies and management. Nevertheless, many believed that climate adaptation science did not *necessarily* influence management actions taken, although a majority also believed that the North Central CSC had reduced the disconnect between scientists and decision makers. When asked specifically about the science produced through the North Central CSC, the vast majority of the survey respondents agreed it can contribute to policy or management. Respondents were also generally positive about other characteristics of the CSC science, and the majority found it appropriate, high quality, and able to integrate well with other information.

The most common ways science users and producers reported that the North Central CSC science was used were to inform management plans, inform management actions, and contribute to the training of professionals. Focus participants elaborated on a number of reasons they thought the CSC science was used. These included efforts by the CSC to help scientists understand user needs, regular communication

[1] All climate adaptation science in the region, not solely the science produced by the CSC.

Figure NC-10



Note: text in items shortened for presentation in graph, and only "strongly agree" or "somewhat agree" responses are shown. Full results in table in appendix.

between the CSC and science users, efforts to produce tangible products from CSC science, providing assistance to science users in developing adaptation strategies, and hiring of technical staff who could provide assistance to users.

Science users and producers differed in their perceptions of what limits the use of CSC science. Science producers perceived issues to be more limiting, than science users found them to be. Focus group discussions centered on limitations in capacity: both the capacity of the CSC to work with all interested users and the capacity of scientists and decision makers to work with each other. Focus group participants also spoke at length at how the geographic scales and time frames over which scientists and decision makers worked were often difficult, making it more challenging for them to work together. They also noted that the CSC's science focused on only some parts of the North Central region, making it less useful to those outside of those areas.

An overwhelming proportion of both science users and producers expressed support for coproduction of knowledge. While many of the science producers indicated experience in coproduction in various phases of research projects, many fewer science users reported first-hand experience. Coproduction was more common in the early stages (setting priorities and identifying research questions) and late stages (interpreting and communicating results) of research than the middle stages. Science users who responded to the survey reported that their involvement in co-produced research projects is most limited by scientists not reaching out to them to collaborate and having different perspectives from scientists on what science is needed. In the focus groups, discussions of the limitations on coproduction centered on the amount of time required to coproduce science, the lack of rewards for scientists to spend the time needed on coproduction, and turnover in the people who are involved in coproduction (either as scientists or decision makers).

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Southwest Results

Respondents

Our intention was to survey partners and potential partners of the Southwest CSC, but this population is not well defined. Specifically, we attempted to include people who were working to address climate change either as "science producers" (those who produce climate adaptation science) or "science users" (those who make decisions about natural resource policy, management, or programs). As described in the Methods section, we compiled our sample from three sources, but this approach may have yielded different numbers and types of partners from region to region. Consequently, we characterize our respondents in this section.

Thirty-nine percent (n = 49) of the respondents reported that they make decisions about natural resource policy, management, or programs as part of their jobs. We refer to these individuals as science users. Thirty-nine percent (n = 49) reported that they have produced climate adaptation science through an affiliation with the Southwest CSC, while 24% (n = 30) have produced climate adaptation science but never with such an affiliation. We refer to both of these groups as science producers (63%; n = 79). Twenty of the respondents (16%) were both science users and producers. Eighteen respondents (14%) were neither users not producers.

The work of all of our respondents involved climate adaptation science, management, or policy to at least some extent. We found that nearly two-thirds of our respondents (65%, n=85) were involved in climate adaptation science, management, or policy to a large or very large extent (Table SW-1). Only one-tenth (11%, n=14) were involved only to a small extent. Those respondents who were only producers were most involved with climate change adaptation; 44% (n = 26) were involved to a very large extent and 73% (n = 43) were involved to a large or very large extent.

Table SW-1. Respondents' extent of involvement with climate adaptation science or management or policy related to climate change adaptation.

Extent of involvement	User	Producer	Both User and Producer	Neither User nor Producer	Total
To a small extent	10%	9%	5%	28%	11%
To a moderate extent	28%	19%	35%	17%	23%
To a large extent	31%	29%	35%	39%	32%
To a very large extent	31%	44%	25%	17%	34%

Most respondents (88%; n = 113) reported that they have had at least some interest in or involvement with the Southwest CSC (Table SW-2). Just 10% (n = 13) reported that they had no involvement but someone else in their agency or organization did and another 2% (n = 2) had no interest or involvement at all. Those respondents who were producers (but not also users) were most likely to be interested or involved with the CSC. Ninety-eight percent had at least some interest or involvement compared to 79-83% for the other groups.

Respondents worked in states throughout the Southwest region, but particularly in California and Arizona (Table SW-3). Half (50%; n=65) also worked in states or regions outside of the Southwest region.

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Table SW-2. Respondents' relationships with the Southwest CSC.

Extent of involvement	User	Producer	Both User and Producer	Neither User nor Producer	Total
Heard of the Southwest CSC, but no interest or involvement	0%	0%	5%	6%	2%
No involvement with the Southwest CSC, but someone else in my organization involved	21%	2%	15%	11%	10%
At least some interest or involvement with the Southwest CSC	79%	98%	80%	83%	89%

Table SW-3. States in which respondents work.

State	Percentage of respondents	n
California	52%	68
Arizona	45%	59
Nevada	30%	39
Utah	20%	26

A majority of respondents worked at the regional/multi-state scale (75%; n=98), the state scale (59%; n=76), and the watershed scale (52%, n = 67) for some or all of their work. Smaller percentages worked at the local (43%; n=56), national (36%; n=47), or international (30%, n = 39) scales.

Most respondents were affiliated with either federal agencies or universities (Table SW-4). Smaller percentages were affiliated with state agencies or non-profit organizations. Only one individual was affiliated with a tribal government and none were affiliated with private industry or local government.

Table SW-4. Respondents' affiliations.

Affiliation	Percentage of respondents	n
Federal agency	42%	54
University	36%	47
State agency	12%	15
Non-profit organization	10%	13
Tribal government	1%	1

Most respondents held either leadership/administration (44%; n=57) or research positions (42%; n=54). Only a few were in operations (7%; n=9) or policy (3%; n=4).

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Extent of Involvement with the CSC

On average respondents have been involved with the Southwest CSC for 3.5 years. Respondents reported involvement with the CSC in a variety of ways (Table SW-5). Most common was as a participant in a CSC training, webinar, workshop, or conference (45%; n=59). Nearly one-third (30%; n=39) were CSC grant recipients, applicants, or partners on a grant, and about one-quarter (26%; n= 34) were LCC steering committee members. Relatively few (6%; n=8) were resource managers or decision makers who had used the science produced by the CSC or CSC USGS staff (4%; n = 5).

Table SW-5. Types of involvement with Southwest CSC in the last five years.

Affiliation	Percentage of respondents	n
Participant in a CSC training, webinar, workshop, or conference	45%	59
CSC grant recipient, applicant, or partner on a grant	30%	39
LCC steering committee member	26%	34
University member affiliated with the CSC	20%	26
Resource managers or decision maker who has used the science produced by the CSC	17%	22
CSC Stakeholder Advisory Committee member	15%	19
LCC staff member	14%	18
CSC-funded graduate student or postdoctoral fellow	6%	8
CSC USGS staff	4%	5

The respondents reported on their frequency of interaction with five types of CSC representatives and affiliates (Figure SW-1). For their interactions with three of the types (US Geological Survey CSC staff; University leads/PIs for the CSC; and CSC-affiliated researchers) the modal response was “up to a few times a year.” For their interactions CSC Stakeholder Advisory Committee members, the modal level of interaction was between “not at all” and “up to a few times a year.” Respondents interact with CSC graduate or post-doctoral fellows the least, but 52% interacted with them at least some of the time.

Benefits of Involvement

The two most important benefits that survey respondents believed the CSC provided were “access to a broader network of people interested in climate adaptation science” (73% described as “important” or “very important”; n = 82) and “access to climate adaptation science” (71%; n = 79) (Figure SW-2). Both of these benefits were discussed in the focus groups.

The value of the networks the CSC created was described by both science producers and science users. Science producers often mentioned how networking opportunities led to the development of new collaborative projects.

> *In terms of the funded projects I have … They came out of meetings that the center put together with Fish and Wildlife Services folks and USGS folks and conversations … saying, “You know, I*

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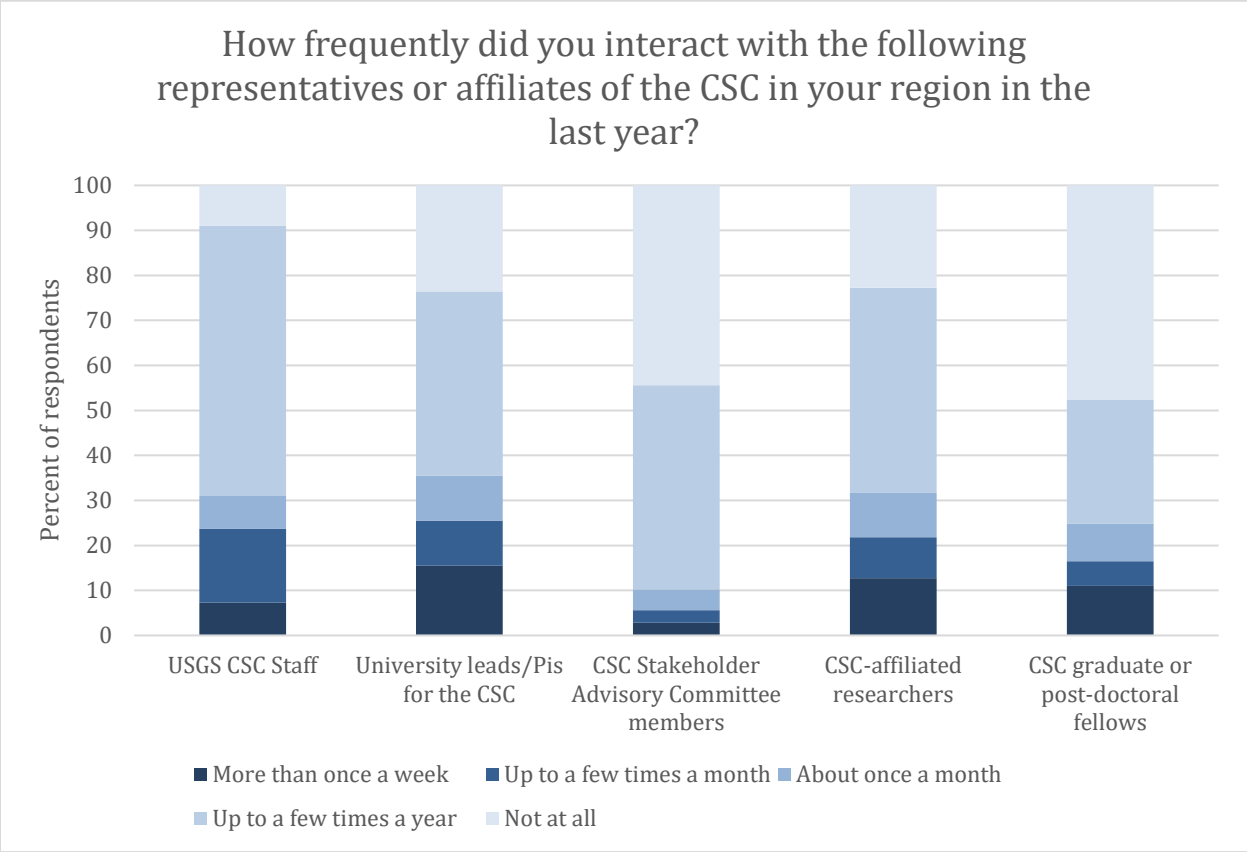
Figure SW-1



Note: Based on survey question 8.

> *have an idea for something…. What do you think? Let's toss it around."… So my funded projects have been snowballed from there. (SW Producer FG)*
>
> *We knew the work that [other researchers] were doing in California. I think they knew about our work, but we hadn't collaborated previously. And this absolutely catalyzed that so that was at the level of the research and PI collaboration. And then you know we work with ten national parks really closely with sampling in each one of them. And those were existing relationships, but they were expanded and activated for this particular purpose. And so there was no question that that would not have happened to that level of detail, and I think that's created opportunities for ongoing collaboration that at least in our case would not have existed. (SW Producer FG)*

Science users described how the networks allowed them to share ideas and concerns and find opportunities to coordinate in their work.

> *One of the things I valued about the Southwest Climate Science Center and also … in the northwest is that we would initially have calls where all three of us and other LCCs, too, we'd get on the call and talk about the challenges, meeting managers demands, how to coproduce science…. It was just really helpful to have a network of colleagues and know that you're not alone trying to push the ball uphill, that others are facing similar challenges. (SW Users FG)*

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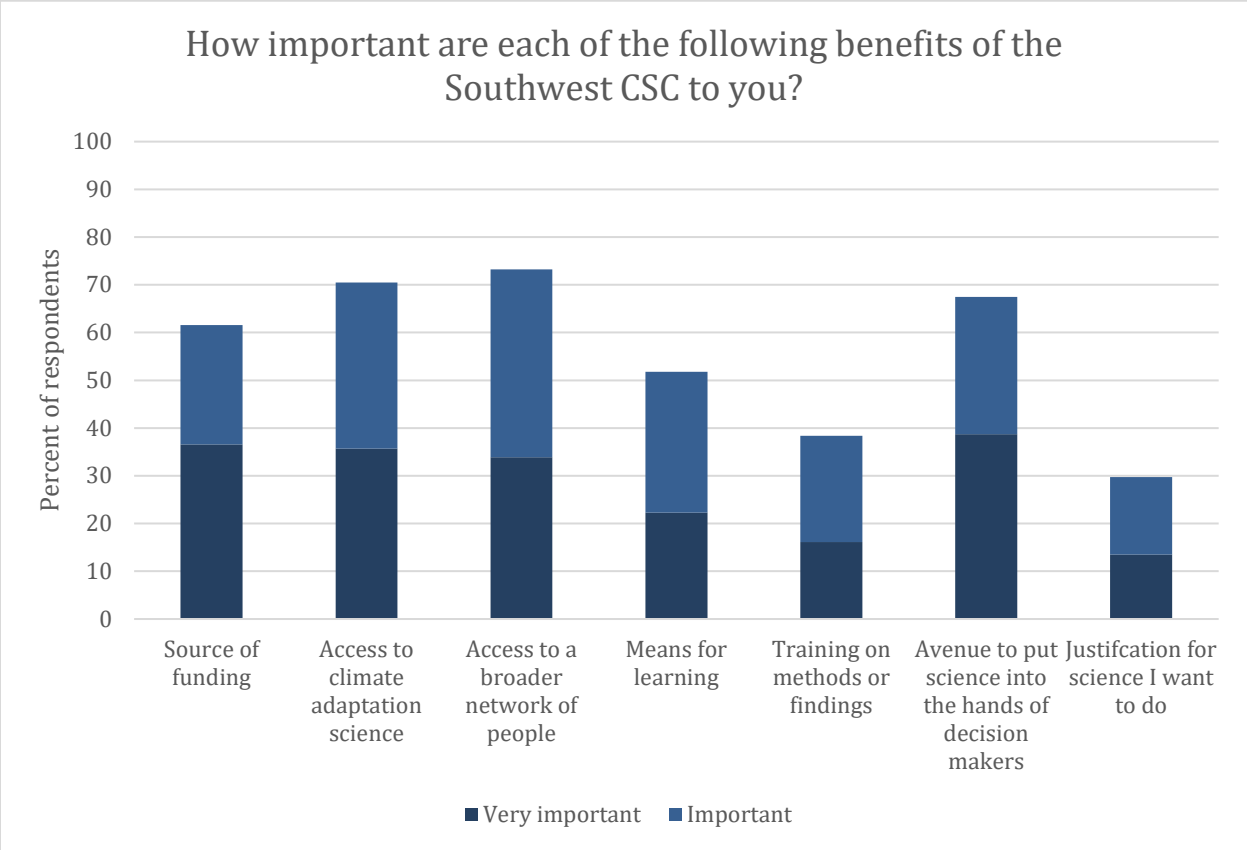
Figure SW-2



Note: Based on survey question 9. Text in items shortened for presentation in graph, and only "important" or "very important" responses are shown. Full results in table in appendix.

> *Knowing where Southwest CSC was going with … tribal issues…. Their investigators really set the stage to allow the Great Basin LCC to just add on to the tribal adaptation cause and training. (SW User FG)*

Science users also discussed the value of having access to climate adaption science through the CSC.

> *One of the things … that the Southwest did recently was led the Southwest Climate Summit which was a great success. There were an awful lot of people and an awful lot of good conversations that came out of that…. It was focused on science and getting information to specific user groups. I thought that was a really good benefit for the Great Basin LCC. (SW Users FG)*

> *We'll be relying on the Southwest Climate Science Center … to help us define what's possible in terms of long-term conservation planning in the southwest. In terms of what we can expect through climate and other things. And then using that to help support what the adaptation strategies are that we can use to maximize … our potential to achieve on the ground conservation goals with our partners. (SW Users FG)*

Science producers believed that CSC support allowed them to make science and data more broadly available to those who wanted access to it.

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> *The CSC allowed us to build some data infrastructure for data delivery that would not have likely happened otherwise. And while it was originally aimed at the PIs of this group, it's actually getting used now quite a bit externally to much broader audience…. While at the moment probably geared a bit more for the researcher, we want … to see also how to do some tuning or some applications of it directly for management. (SW Producer FG)*

More than two-thirds of the survey respondents also believed that the CSC provided an "avenue to put climate adaptation science into the hands of decision makers" (68%; n = 75). Science producers in the focus groups discussed the importance of connecting their work with stakeholders.

> *I got involved by submitting a proposal because it's one of the few programs that funds science that also supports collaborations with stakeholders. (SW Producer FG)*

> *My work for many decades actually has been connecting science and decision making and they provide you know a good avenue for that so the partnership was very obvious. (SW Producer FG)*

> *I don't think we would have the Native Nations Climate Adaptation Program in anything like its current version without the Climate Science Center. I really think it's got fundamental components, maybe a third of the total funding but I think maybe more than a third in terms of the commitment to making it happen. (SW Producer FG)*

Some particularly valued the opportunity to engage in coproduction of science.

> *The opportunity to be in an … environment that steers towards coproduction in a very real sense…. That was written in the RFPs…. I've had to go out and work with the stakeholders from the very beginning setting the stage. It was very exciting to me and you know that has really helped spread that idea…. So it really is that coproduction piece … in the commitment of the centers that attracted me. (SW Producer FG)*

The CSC not only provided the opportunity to coproduce science, but to study and improve the way that coproduction occurred.

> *Given my interest in studying that process and how to do that better, it also gave me an opportunity to use all of them as guinea pigs and understand how to do that better. And so I think that has been a really unique and fascinating experience that I would not have had especially watching them, watching the whole network grow up over the last 5 or 6 years. (SW Producer FG)*

A majority of survey respondents thought that the CSC served as an important "source of funding" (62%; n = 69). Several focus group participants described how this funding could meet needs that other sources of funding could not.

> *I think its funding has been timely and I'll call it nimble. The nimble part is we had this unprecedented drought in California that has gone beyond any of the historical records in severity. And we have [a project] that's meant to try to use it as a preview of the future…. It's really hard to get funding on real short turn around. Yet the Climate Science Center listened and was able to give us funding on a short turn around. We still had to submit a full proposal, but they were nimble in recognizing that the data we wanted to get were perishable and if we didn't get them now we would never get them. (SW Producer FG)*

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> *In continuity of research, that has been really critical … where we've had to just kludge together emergency funding. We got a bunch … together in 2015. 2016 was going to be a gap in our data, and yet it was a critical year. And they filled that gap and now we're back on the bandwagon with other sources of funds. (SW Producer FG)*

A number of producers maintained that the CSC was willing to fund different types of science.

> *I honestly don't think we could have done the kind of work we were doing without this type of funding. Again to go back to the more traditional sources, NSF, you know they really want theoretical component, and we have that but our interest was much more applied. And honestly applied research is always a harder sell in the very competitive programs. Those of us who believe it's at least as important if not more important are often frustrated by that but that's a reality. And so I think that the orientation of this program is unique. (SW Producer FG)*

> *I would echo a lot of comments that have already been said on the issue of disciplinary boundaries and the more traditional funding … like NSF or NOAA. So for me particularly doing regional atmospheric modeling with integrated with hydrologic modeling … the combination of those two things, I think was for me very advantageous to seek the interaction of the CSC. (SW Producer FG)*

Just over half of survey respondents thought the CSC provided a "means for learning about climate adaptation" (52%; n = 58). Focus group participants discussed both learning about the science behind climate adaptation and putting that science to use.

> *The ability to work with people whose expertise is climate. I'm an ecologist. There's a lot of not very good understanding of climate in ecology. People are thinking about climate all the time …. But it's rare that you have the opportunity to really understand, as an ecologist, understand climate as a discipline and to be able to work with people that have that expertise and vice versa so on the science side it's been extraordinary to have that chance. (SW Producer FG)*

> *I went back to the Nation … where I'm the Director of Water Resources. And I … met a lot of people from the Southwest Climate Science Center. And they started updating me and giving me information that I needed to start to put together a climate change adaptation plan. And I initially went to the center for climate adaptation science and solutions … We've completed our draft so there's a direct effect right there…. In September, we'll get a council resolution. And so we've come a long way, and that's how there is a direct effect there. (SW User FG)*

Fewer than half of the partners we surveyed thought that "training on climate adaptation science methods or findings" (38%; n = 43) or "justification for science I want to do" (30%; n = 33) were important benefit of the CSC.

Limitations on Involvement

Most survey respondents (79%; n = 102) reported limits to their involvement with the CSC (Figure SW-3). The most common (46%; n = 60) limit was not having enough time, followed by not having enough funds (22%; n = 29). Focus group participants also referred to these types of constraints on their ability to be involved.

> *I really care about the goals of the Climate Science Center. I've come to really care about a lot of the people that I work with in the Climate Science Center. But at some point there aren't enough*

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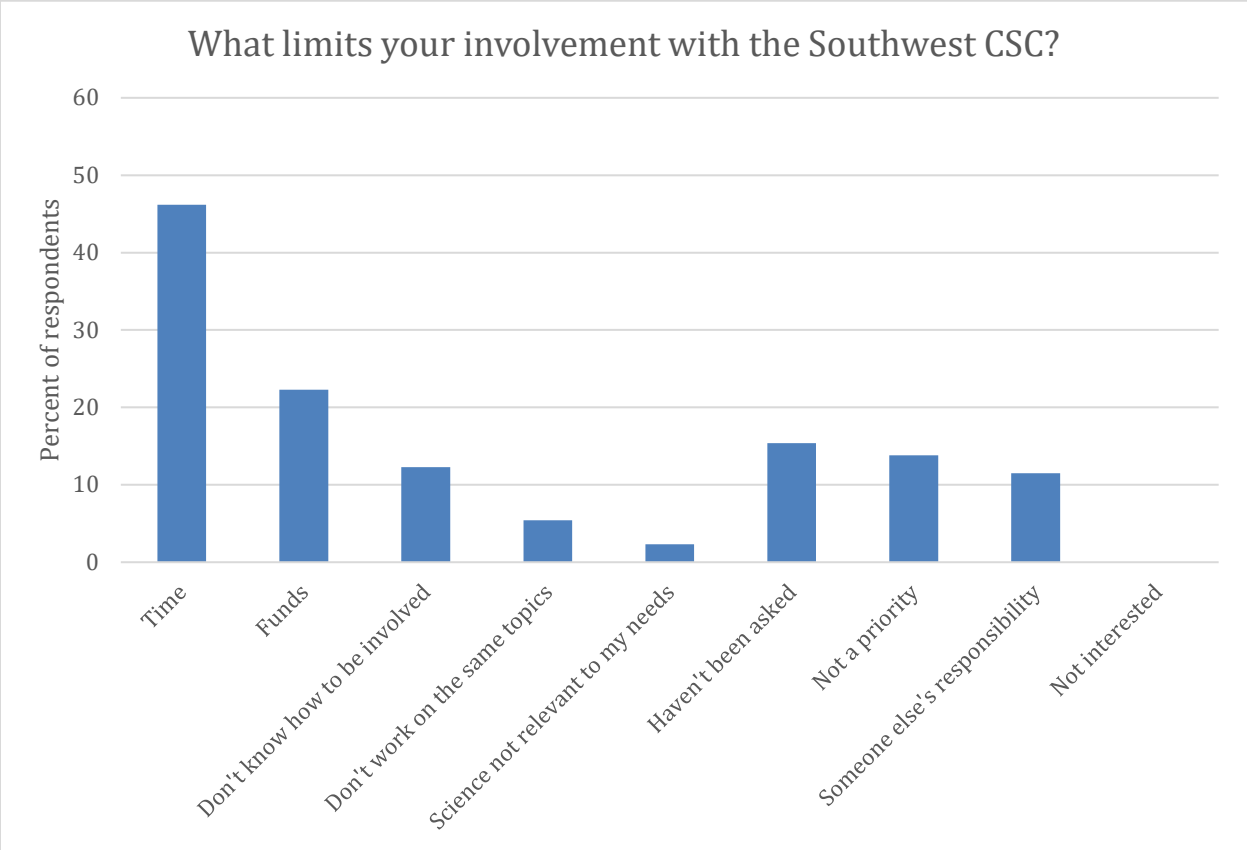
Figure SW-3



Note: Based on survey question 10. Text in items shortened for presentation in graph. Full text in table in appendix.

> *hours in the day for things that are labors of love. And we want to sustain it and most of us will put in a lot of unpaid work, but we still would like to get paid, and we still have obligations that the money is coming from. And so you just at some point get maxed out…. I think that for a lot of the programs that are being established now a trend towards more realism about what can be accomplished through the dollars that are available…. But let's be honest about what is not going to be accomplished with the dollars, what's going to be accomplished by labors of love. (SW Producers FG)*

A minority of survey respondents reported that their involvement with the CSC was limited by not invited/being asked to be involved (15%; n = 20) or not knowing how to be involved (12%; n = 16). One survey respondent described shortcomings they perceived in how the CSC made efforts to engage partners.

> *They don't seem very organized and don't always alert me to their meetings in a timely manner. They don't seem very interested in engaging with their stakeholders and they haven't made it clear what their mission is. They also seem to constantly have staff turnover so I'm not always clear who the correct contact is. (SW CSC Survey)*

Related topics also arose during the focus groups. Some participants pointed out the fact that limitations existed on who could apply for CSC funding.

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> *My colleagues in USDA have felt somewhat excluded by the RFP requirements, PIs needing to be part of the CSC host institution or USGS Science Center. Of course, it stimulates working relationships with people there but it's one more place where you can't be the initiator. So that's just been a bit of filter for people in USDA. (SW Producer FG)*

Both science producers and science users described barriers to effective integration of the work of the CSCs and the LCCs.

> *This is not actually specific to the Climate Science Center, but the integration between what's going on with the Landscape Conservation Cooperative and the Climate Science Centers, at least to me seems really impenetrable…. I don't actually know what the problem is. I don't actually think it is the Climate Science Centers, but somehow these programs need to be better integrated…. And, of course, their boundaries are absolutely no relationship to each other. And anyway the whole thing is really complicated…. I'm not having problems interacting with the Climate Science Center, but I am very confused about what's going on in the intersections that these programs have. (SW Producers FG)*

> *The challenge I'm going to bring up actually applies to all of the LCCs…. Early on we each got our funding, different amounts of funding. You know the CSCs got their funding…. But one of the challenges early on was just funding opportunities coming at different times and sometimes a little out of the blue. And we have since coordinated on that to where the Great Basin is funding every other year and those are opposite years of the Climate Science Centers and that's helping us coordinate. But early on it was a bit of a scramble in that you got money and had to get it out the door. And RFPs would come out a week later, and you'd be like, "Oh, I wish I knew they were going to put that in the RFP."… But that process has improved greatly and that's just a growing pain to me. (SW User FG)*

A small number of survey respondents also said that their involvement with the CSC was limited by this involvement being as high of a priority as other work for respondents (14%; n = 18) and it being someone else's responsibility within their organizations (12%; n = 15).

Within the focus groups, participants occasionally referred to the fact that the CSCs own capacity to engage with its partners and pursue its mission was limited.

> *You know the only problem I see is that it's not scaled up to the level of support and activity that's going to be needed to address the challenge. Proof of concept, yes. Scale, not yet. (SW Producer FG)*

> *I think the challenge … is the time chiefly…. There's not a … lot of staff at the Climate Science Center. Effectively there's currently about four full time people that are consistent and, and they are there all the time…. I would say that really all of the challenges are based on just time and the resources… (SW User FG)*

These limitations were sometimes aggravated by cumbersome administrative procedures within the federal government.

> *The other really big issue … is we have internally within the federal government a lot of administrative burdens on how we can fund things, and challenges for how we can actually truthfully move money around. (SW User FG)*

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In addition, the geographic limitations that had been placed on the CSCs work sometimes made it more difficult to address important scientific questions.

> *The geography at the U.S. border – complete ecological continuity between our part of the southwest and the Sierra Madre Oriental and Occidental. It would be great to be able to study that continuity fully within this purview. And the same questions apply to Mexico … a really interesting contrast in many ways in terms of land management and forest industry. So I realize that constraint comes from on high but it's interesting to think about and maybe something we could look, look to in the future. (SW Producer FG)*

Is Climate Adaptation Science Actionable?

Respondents shared their perceptions both of climate adaptation science, in general, and of the climate adaptation science produced by the CSC. With regard to climate adaptation science in general, nearly three-quarters of respondents (73%; n = 87) agreed or strongly agreed that climate adaptation science in the Southwest region is available to decision makers (Figure SW-4). A majority also believed that it was used to inform management decisions by water managers (85%; n = 93), fish and wildlife managers (70%; n = 78), and land managers (59%; n = 66). Only about one-third (36%; n = 40), however, believed that policy makers used this science to inform policies. More than half (60%; n = 69) maintained that what is known about climate adaptation does not necessarily influence actions taken by decision makers in the region. Nearly as many (59%; n = 57), however, agreed that the CSC has helped to reduce the disconnect between what is known about climate adaptation and the actions taken by decision makers in the region.

In terms of the Southwest CSC science specifically, respondents (90%; n = 102) strongly or somewhat agreed the CSC science can contribute to policy or management (Figure SW-5). Respondents were also positive about other characteristics of the CSC science, finding it to be of high quality (90%; n = 98) and appropriate to inform the types of decisions being made (80%; n = 90). A majority also thought that it integrated well with other information (71%; n = 77). Few thought that the Southwest CSC's science was irrelevant to management (13%; n = 14) or biased (2%; n = 2).

Science Users' and Producers' Use of Climate Adaptation Science

Among respondents who reported that they were science users, 74% (n = 25) reported that they or someone in their organization used climate adaptation science from sources affiliated with the Southwest CSC. Slightly more (86%; n = 36), reported that they or someone in their organization used climate adaptation science from sources not affiliated with the CSC.

The most common way science users reported using the Southwest CSC science were to inform management plans (55%; n = 27). Forty-three percent reported using it to inform management actions (n = 21), and nearly as many used it to inform training of conservation professionals (41%; n = 20). Slightly more than one-third (37%; n = 18) used it to inform the public about climate change and its impacts. It was less frequently used to inform policy (18%; n = 9), and no one reported using it to inform land acquisition priorities.

When science producers were asked a parallel set of questions about how the science they had produced had been used, the relative frequency of different types of reported uses was similar (although not identical), but the absolute frequency was greater. More than four-fifths (82%; n = 65) said their science had been used to inform management plans. Nearly two-thirds (65%; n = 51) had work that had been

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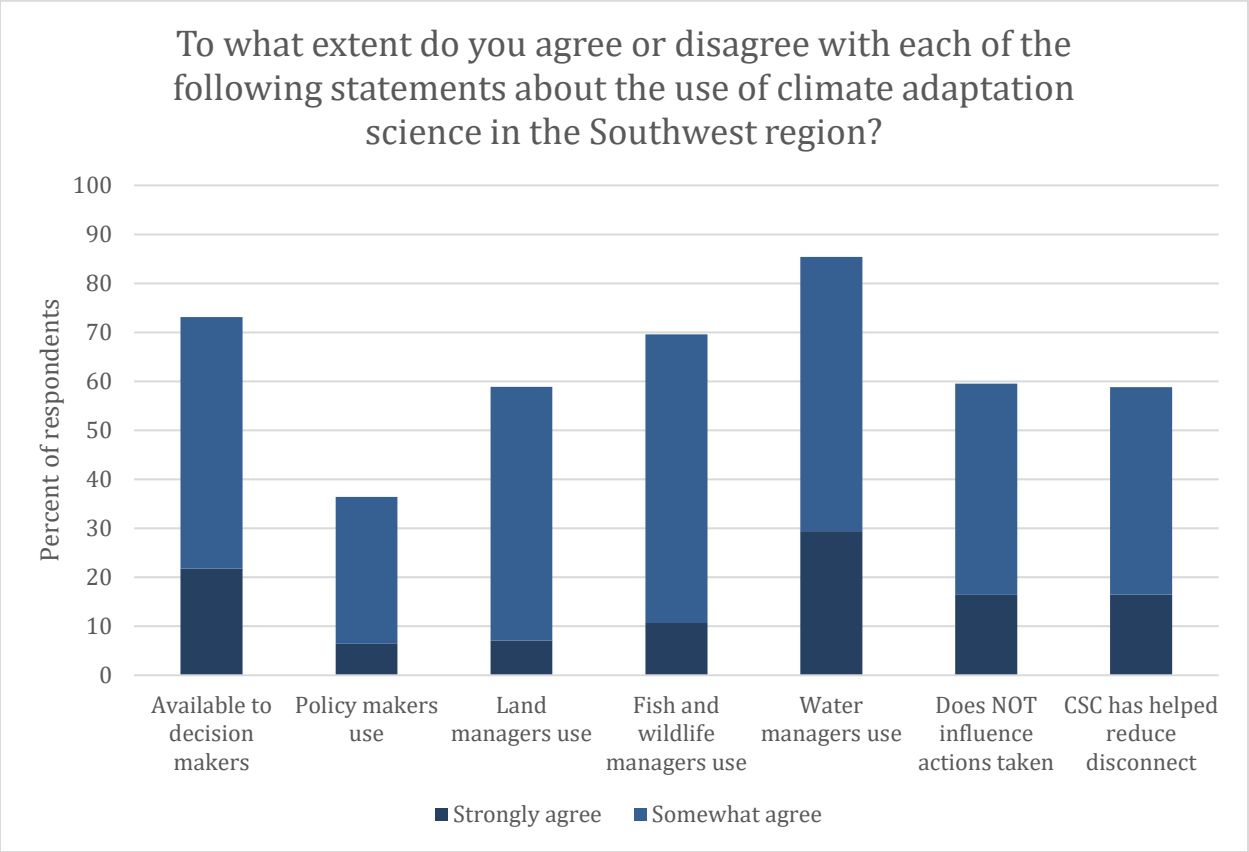
Figure SW-4



Note: Based on survey question 11. Text in items shortened for presentation in graph. Full text in table in appendix.

used to inform the public. More than half said their work had informed management actions (61%; n = 48) or had contributed to the training of professionals (57%; n =45). Nearly half (49%; n = 39) reported that their work had informed policy, which was relatively much more frequently than the science users had reported. The differences between science users' and science producers' responses could reflect differences in perceptions about how frequently CSC science is used. It could also reflect that the use of CSC science is concentrated in a subset of potential CSC science users.

Some of the focus group discussions explored the conditions under which CSC science could be useful to decision makers. Some participants argued that stakeholder engagement was a key to ensuring that the science was used.

> *It takes time to be able to take the climate science and have it applied…. That takes time and it also takes the connections. I think the connections are being made with the right folks through the LCCs and through the agencies and tribes…. The structure is starting to happen but we're just still at the beginning basically. (SW User FG)*

> *We have questions that may or may not be directly amenable to a research project, where we actually need something at the end of the day…. That almost sounds more like the contractor group services. So that's a fine line we encounter a lot, and I think that you know strong stakeholder engagement is the key to finding that middle ground. (SW User FG)*

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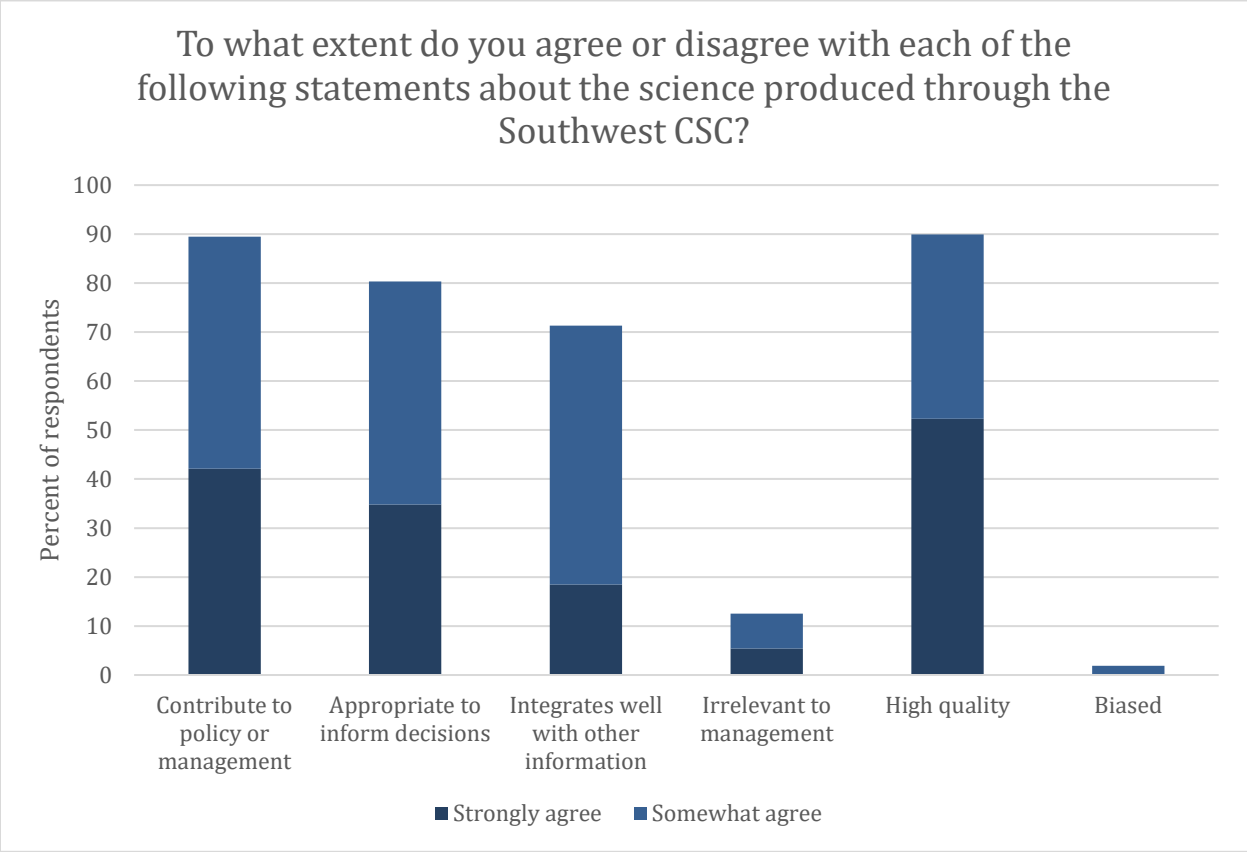
Figure SW-5



Note: Based on survey question 12. Text in items shortened for presentation in graph, and only "strongly agree", "somewhat agree", or "I'm unfamiliar with the science" responses are shown. Full results in table in appendix.

In some cases, scientists engaged stakeholders from the beginning of their projects to be sure that they understood their needs.

> *We incorporated that element in the project design from the get-go and we had a series of meetings that, one, was work formulation of project methodological approach, and then the other was particularly for review of project results. It was in that first initial meeting where we reviewed project methodological approach that we had an entire section of the meeting devoted to presentations and discussions by our water resource providers. And we know from the get-go what their priorities are, how they use information and, more importantly from the technical standpoint, how did we need to work with them to format information so it would be useful to them? And that's an often overlooked issue. (SW Producer FG)*

In other cases, the LCCs were involved in intensive efforts working with stakeholders helping them to understand the CSC science and translated it into forms that were useful for decision making.

> *One project that we talk about often is the sea level rise effort that USGS has done … The Northwest Climate Science Center was involved. The Southwest Climate Science Center was involved. Very labor intensive effort where specific sites all along the Pacific Coast from*

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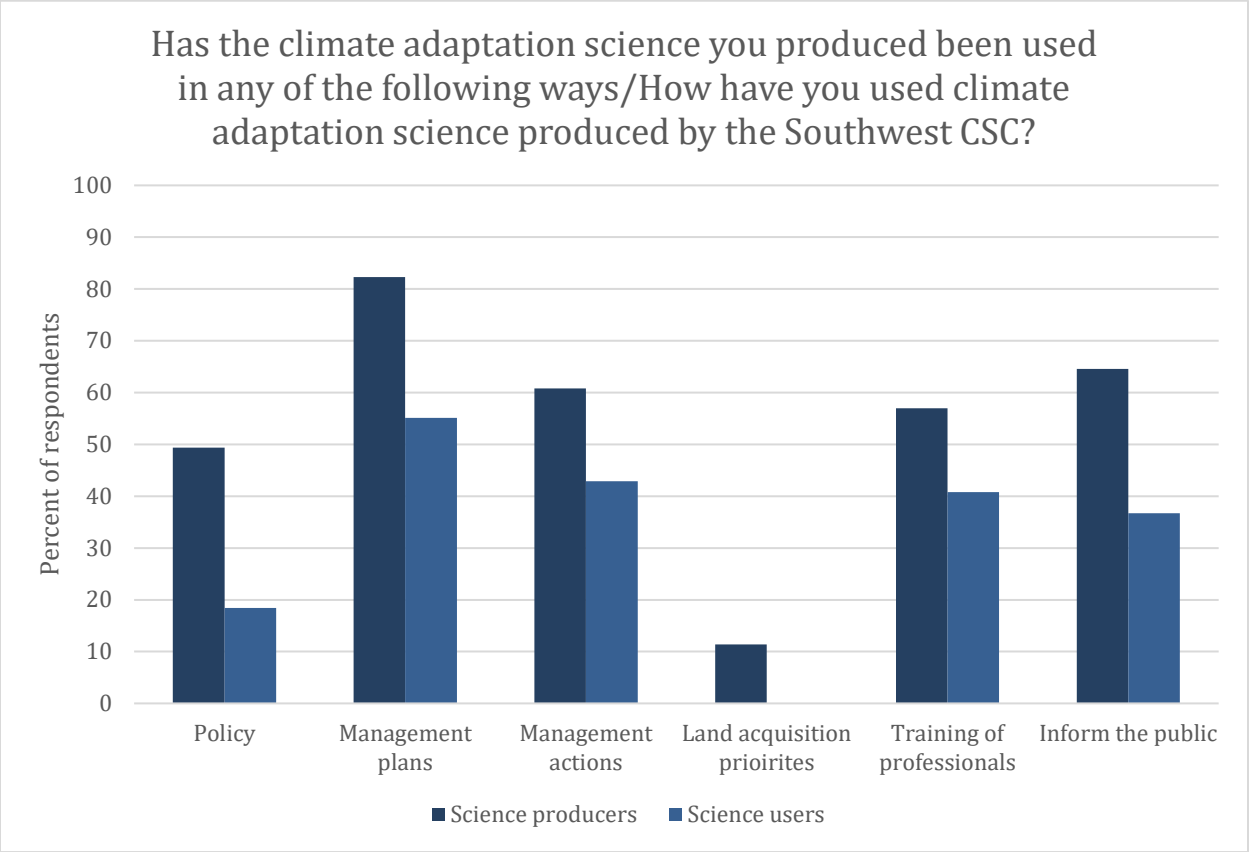
Figure SW-6



Note: Survey questions 15 & 21. Text in items shortened for presentation in graph. Full text in table in appendix.

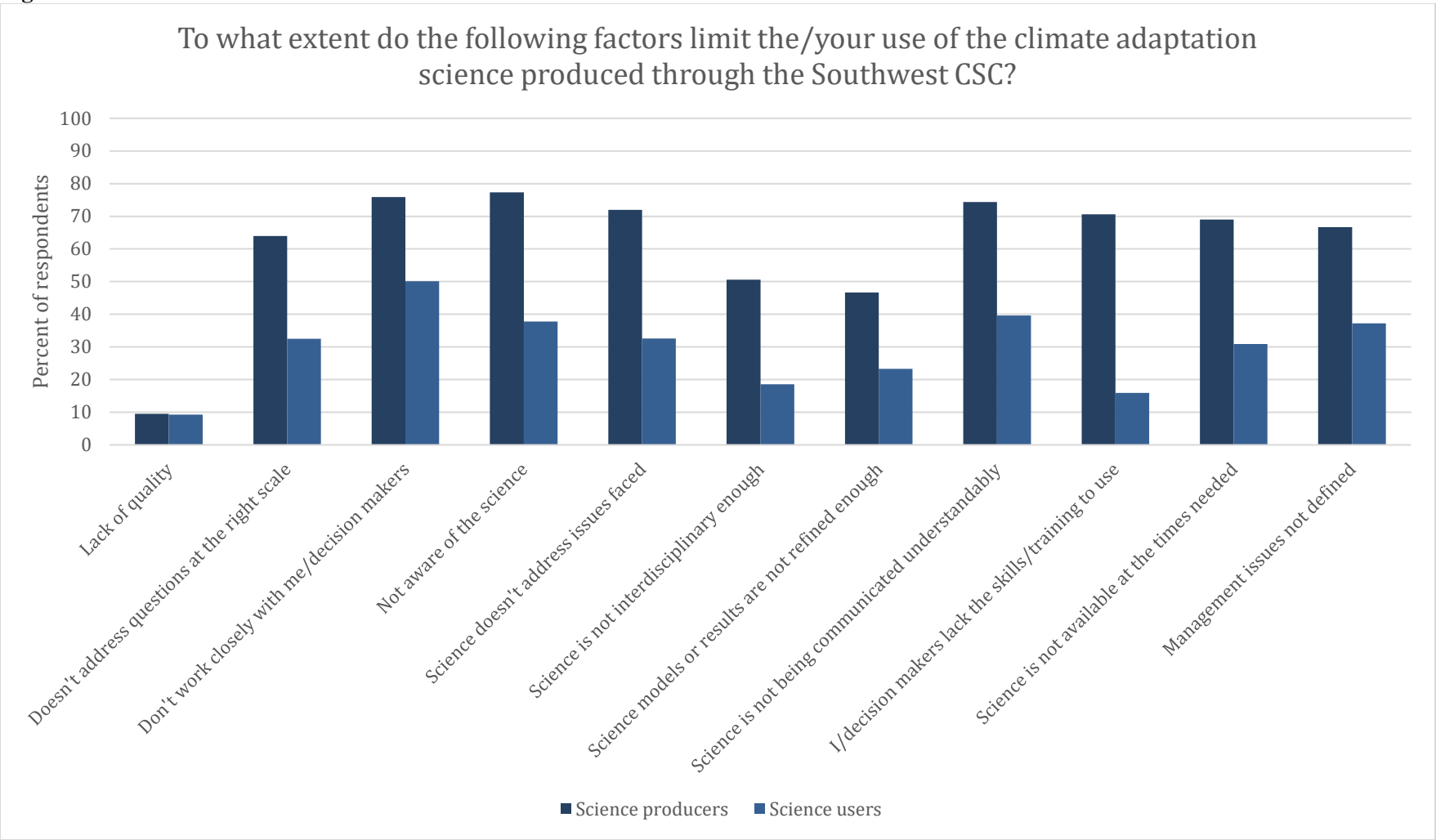
> *California to Washington were measured primarily looking at National Wildlife Refuges but state areas as well…. And then scaled up models, climate models to show on a specific site … what is predicted for sea level rise and very, very applicable for, for the refuge managers there…. The LCCs then helped with supporting workshops where the managers and the scientists were there together and there was eleven different workshops up and down the coast to spend one-on-one time in a small group translating what the science says, what it's really going to do on the ground. And to help as a small partnership, how are these folks going to address that now and how are their goals going to change? (SW Users FG)*

One participant maintained that the CSC science helped decision makers understand the range of conditions they might encounter in the future, which informed their planning efforts.

> *Some of our partners are a little long with the dire outlook … really interested in one specific outcome…. The CSC has helped us with that … to look at broader planning goals. So instead of planning for something that is not within the range…. So again it's more just dealing with reality of like the scenarios as well as the uncertainty that we're struggling. (SW User FG)*

Science users and producers differed in their perceptions of what limits the use of CSC science (Figure SW-7). In virtually all cases, more science producers than science users perceived limits to the use (not necessarily their own use) of CSC science to a moderate, large, or very large extent. At least sixty-four

Figure SW-7



Note: Survey question 16 & 22. Text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Also, text varied slightly for science producers and users. Full results and text in tables in appendix.

percent of the producers believed that the use of the CSC's science was limited by all of the factors listed, except for three factors having to do with the nature of the science itself: the science not being interdisplinary enough (51%; n = 38), the science models or results not being refined enough (47%; n = 35), and a lack of quality of the science (10%; n = 7). Producers believed that the top barriers were lack of awareness of the science (77%; n = 58), scientists not working closely enough with decision makers (76%; n = 57), and science not being communicated understandably (74%; n = 55). The most frequently cited barriers for science users also included scientists not working closely enough with decision makers (50%; n = 22), science not being communicated understandably (40%; n = 17), and decision makers not being aware of the science (38%; n = 17). The science users were much less likely to consider a lack of skills and training among decision makers to be a barrier (16%; n = 7) than science producers did (71%; n = 53).

Focus groups participants discussed these and other limitations to the use of the Climate Science Center's science. To begin with, they argued that applying climate science in decision making is a complex process that takes time:

> *It takes time to be able to take the climate science and have it applied. That means changing goals potentially, re-evaluating your targets, making adjustments on the ground. Even if you know what you're doing, it still takes five years….The expectations that's going to be applied immediately, and we'll see some changes on the ground, that's going to take decades. (SW User FG)*

That process is even more challenging if there is a mismatch between the type of science being produced and the types of products that decision makers would like to see.

> *Well, I think one of the … most important things that comes out of the back end of these projects is the question of, "Where do we go from here?" In our project … we did climate change projections from water resources. And … they weren't as much interested in this IPCC-based water resource projections for forty years in the future as they were issues of "Can you do an historical water resource projection?" using historical re-analyses or … sub-seasonal to seasonal forecasting. So it was a little confounding to me as a principal investigator. How do we communicate all of this great feedback that's coming from our water resource people? (SW Producer FG)*

> *I think one of the challenges that you encounter is … that fine line between … a contracting service for a very specific deliverable that will in fact be useable in your process… vs. more of the research paradigm where you may or may not get something … that really meshes well. (SW User FG)*

Consequently, both science producers and science users argued that different types of products might be needed.

> *There's a lot of people in the upper levels with the policy world that actually have tons and tons of reports on climate. They have all kinds of reports on climate change, okay? But they're, they're not actually doing anything with them, and part of it's capacity but part of it is we're not sending up something that says, "You have to do this right now. This is action that needs to be taken." … We're not actually sending stuff for most cases that is actually actionable, that says this is the problem and this is what you can do about it…. So I think we kind of got to be real here in terms of what we're delivering as a product and maybe we need to kind of rethink that a little bit. (SW Producer FG)*

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Another benefit that I think … is really fundamental for us is to take climate science and get it to the form that actual users can use. It takes several steps. And where I feel like the Southwest Climate Science Center is that initial broad step as well as getting a few levels down. And where … the LCCs can help pick that up and take that … a few levels … where it can be more relevant to the users themselves. So it, it takes several different I'd say partnerships. (SW User FG)

The challenges in producing products that decision makers would find useful is aggravated by an ineffective system for identifying stakeholder priorities.

This stakeholder advisory committee tends to be regional scale. It's bigger questions. But I know from talking to almost all of you that you're working with the ground levels managers for the most part, if not exclusively. And so there's some disconnect within the agencies about what's necessary at what scale of decision… We're sort of codifying that in the way that the CSCs got designed and said, "Oh well … these CSCs … have to draw from big scale managers and leaders within the agencies." But that's not always reflecting those individual needs…. My understanding is at the beginning the LCCs were supposed to be making some of those links and making some of those partnerships more clear. And I just don't think that that's the way the network evolves. (SW Producer FG)

Focus group participants believed that scientists needed to find better mechanisms for connection with users.

We still need improvement of the mechanism by which the science demands out there come to us, and we can see what the priorities are. What are the things that a number of people are talking about that fit what we in partnership with the Department of Interior … can tackle? And I think that we still need that. (SW Producer FG)

Creating an easier path for engagement with municipalities, with the public health sector, with things that are more immediately tied to people's day-to-day lives … It would be great to have an entity to do that. (SW Producer FG)

Some potential users, such as tribes, did not initially have their priorities addressed by the Southwest CSC's science because their needs were different than many other users.

It's just my perception that everybody got territorial in the beginning…. And the tribes, for a while they were not in the loop or not at the table. I was at the table, but I don't represent the 562 tribal nations in the United States, so I can't speak for all of them…. The challenge was that some of the projects that … I thought … were significant, they were being pushed out … by a consensus of more people…. And I think that was kind of a problem because then why were we involved, you know?... It's changed, and I'm glad. (SW User FG)

In addition, potential users often do not have the resources to implement actions informed by the scientific information they receive.

In the land management agencies … there's a very complex operational hierarchy, right? That goes from a district level all the way up to national policy, and the disconnects along that gradient are truly breathtaking…. Policy proclamations are made and they sound great and they resonate with the kinds of things the CSC does…. The people on the ground don't see any of that…. They certainly don't get any resources to implement this, and so it poses for us a real challenge…. We get the buy-in at the local level, but resources are not coming down to put this

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on the ground…. We're basically having to ask them to redirect resources they're using already say for thinning or prescribed burning or for long duration fires or for insect studies or what have you…. Although the will may be there, the lack of resources to do anything different is a serious obstacle. Obviously, that's not a challenge that CSC can solve, but it's clearly a challenge that the CSC needs to recognize. (SW Producer FG)

The problem, it's not the planning. People can plan. It's actually finding out if there's projects out there … that the tribes can tap into that are really ongoing. … A lot of tribes … they don't have a full staff. So they're asking one person to write a climate adaptation plan. That's hard. So maybe that's where some of the planning and scenario planning can help tribes by saying if they don't have an environmental person … and how can we help you to put that template together? And also to collaborate and communicate with federal and state agencies…. Why invent the wheel when people are already doing research?... You can train the Native people, but we still need to know somebody to help us write it. And after you help us write it then we'll still need to be current. And then by being current I mean that we don't want to do research that everybody else in the area is doing. (SW User FG)

What do we need in the realm of climate change? One of the things that we really need is technical assistance. You know I have field offices who come to me and say, "We have a permittee who is interested in developing a habitat conservation plan, and they don't have the expertise to draft the climate change sections….And we don't have the expertise in-house." …. With that in mind, I think one of the things that would be really helpful is to find a way to have technical assistance provided whereby program experts in climate science would be able to provide that technical assistance to our folks in-house. (SW User FG)

Consequently, one recommendation was to devote more resources to train decision makers in how to make use of science.

Regardless of how much research is out there, I think the resource managers still … don't feel equipped to take it and apply it. So … our LCC has changed gears a little bit and are putting a lot of emphasis on training and how to move forward with uncertainty and how to recognize that … we can apply the climate science…. It's not that difficult to get folks past paralysis, and we're finding out that that's been helpful. It is desired by many to have this training, so we can't put on enough of them. It would be great to have the Climate Science Center as part of that … to just be able to translate some of the information … what's … coaching more one-on-one…. And so if we could do that in a more structured setting, I think that would be helpful for us.(SW User FG)

Current institutions do not typically support the engagement of scientists in providing technical assistance.

The challenge … is that faculty at the research institutions … aren't necessarily in a role where they are recognized for technical assistance…. What they're recognized for is traditional research and publications…. I just think it's something that we all need to work through is to bring out ways of researchers being rewarded and incentivized to provide technical assistance to decision makers and conservation practitioners. (SW User FG)

Finally, participants recommended more investment in evaluating the outcomes of projects funded by the CSC.

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We do have opportunities to be much more systematic in the way that we harvest information and outcomes from all of the projects and demonstrate that…. I am essentially talking, evaluating projects and seeing which ones were have been really successful. (SW Producer FG)

Science Users' and Producers' Engagement in Co-production of Knowledge

Respondents reported on their beliefs about co-production of knowledge in general. An overwhelming proportion of both science users (94%; n = 44) and producers (89%; n = 70) expressed support for co-production, indicating it was important or very important for climate adaptation scientists and natural resources decision makers to work together to produce science research.

Many science producers indicated experience in co-production in various phases of research projects, much more so than did science users (Figure SW-8). For all phases of research projects except for "analyzing data," at least half of the science producers had experiencing collaborating with decision makers to a moderate, large, or very large extent. (These results apply to all types of research, not just CSC-sponsored research.) In contrast, when science users were asked about their experience collaborating on research with CSC science, there were only four phases of research with which at least 30% of science users had experience: identifying research questions (44%), applying research results (42%), determining research priorities (35%, and communicating results of a research project (31%). Both science users and science producers perceived collaboration between scientists and decision makers to be less common in designing research methods (science users – 27%; science producers – 55%), determining data sets to be used (science users – 27%; science producers – 51%), collecting data (science users – 22%, science producers – 55%), and analyzing data (science users – 18%; science producers – 47%).

During the focus groups, some examples of effective coproduction practices were discussed:

One of the really positive experiences we have is working with Connie Woodhouse and her project on drivers of drought and temperature and precipitation in Colorado. Because I think that her engagement with the broad stakeholder group that she's identified has been very consistent and sort of agile in terms of having it really be a dynamic back and forth um as opposed to one-sided science to land managers. (SW Users FG)

Focus group participants pointed out that one of the factors making coproduction easier in the Southwest region was that the CSC had invested resources in better understanding what made coproduction work.

Some of the work that was funded related to coproduction has been really important, and we're starting to use that information in the LCC. I'm using in a way that I'm developing some of the criteria for our own funding opportunities so that we can start incorporating some of the things into the way that we're doing our procedures. (SW User FG)

This is a really complex landscape here and the Climate Science Centers are just a piece of that landscape. But I do feel like they're embracing what has been learned about coproduction …. They have actively been trying to get up that learning curve very quickly. (SW Producer FG)

The CSC also made an effort to give its partners the training they needed to work well with certain groups, such as the tribes:

I mention tribes … They opened the door for us. They helped us get through…. I had no experience with tribes before. I changed my position, and so they helped me understand the protocols, sensitivities. I went to a TEK training in California…. I learned a whole lot but those

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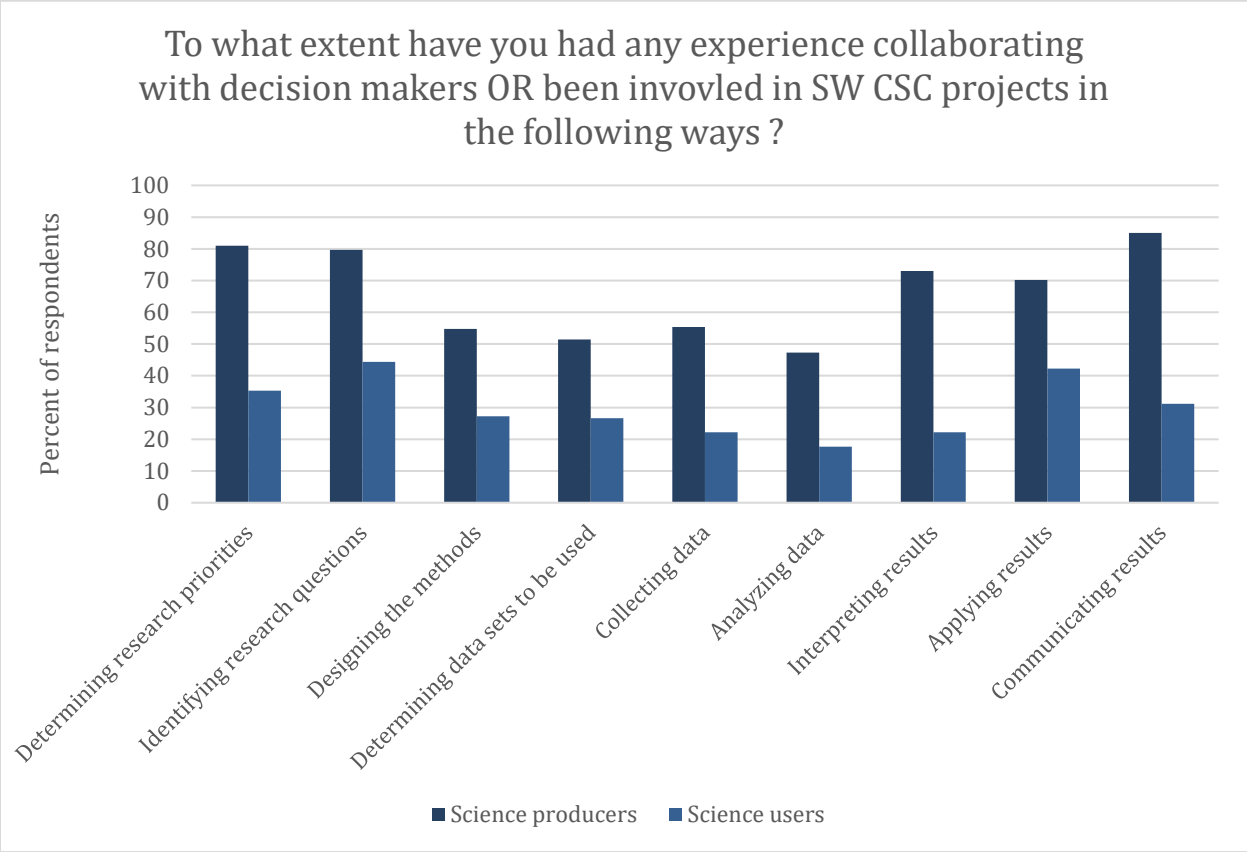
Figure SW-8



Note: Survey questions 18 & 24. Text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Additionally, the text of the question varied slightly for science producers and users (e.g., the users' version referencing "you or someone in your organization" and specifying a Southwest CSC project). Full results and text in tables in appendix.

> *opportunities were there because of the Climate Science Center, both the Northwest and Southwest. (SW User FG)*

The factors most likely to limit science users' involvement in research projects were scientists not reaching out to them (41% agreed or strongly agreed; n = 19), followed by different perspectives on what science is needed (39%; n = 18) and funders not supportive of collaboration between scientists and science users (33%; n = 15). Other factors were perceived to limit the involvement of smaller numbers of respondents: the science users not having enough time (24%; n = 11), different perspectives on how research projects should be conducted (20%; n = 9), and scientists not interested in listening to them (13%; n =6).

Focus group participants offered a variety of perspectives on the factors that made coproduction challenging. One of these was the need for extended periods of time.

> *The two-year timeframe is just too short for the projects if you're trying to work with stakeholders, particularly if you don't have relationships. It's just way too short. I mean three years is better, but even that's too short. We really need longer periods. (SW Producers FG)*

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They also argued that not all scientists understand how to engage in coproduction.

> *Some have worked with LCCs and Climate Science Centers for several iterations … or have worked with other users side-by-side, and they totally understand the coproduction of science. And others are new. Others have maybe … written proposals for NSF … or NASA, and they're now finding this RFP and are new to the applied science arena.*

They suggested increasing the expectations for building coproduction in to projects.

> *Publications [should] be a middle point in the research cycle rather than an endpoint in the research cycle. And I think the traditional model is a peer-reviewed publication as an endpoint in the research cycle. But we're really talking about … to get research done which can be applied…. It's really working with decision makers to help them use that information. And so I think there are mechanisms that could be made available on … cooperative grants and agreements. And deliverables … would include things up to a draft document of peer-reviewed quality, but that will … really be a mid-point that would only be the first half of the deliverable. And the second half of the deliverable would then be how these researchers are actively going to work with conservation organizations, land managers, conservation practitioners to ensure that that information, that knowledge that was gained is given them into the decision making process. (SW Users FG)*

> *I think one thing that Climate Science Center could more strongly emphasize and maybe even do some coaching is … what constitutes applied science and what constitutes sort of working with potential users of that science in advance of even thinking through a project. How would that fit into the decision-making context? How would users use that science so that the research is … ready to go, and that stakeholders are engaged in the scoping of the research already? So I think there's a learning process and a coaching that needs to take place on the PIs side, on the scientist's side. And from reviewing those proposals some were clearly very knowledgeable about how to do that, and others were not. (SW Users FG)*

In addition, they argued that more support for stakeholder engagement was needed during proposal development.

> *I think that it's unreasonable to say, "Go out and find your partners. Get this all done in 2 years." I think what actually would be more important is continued and even greater emphasis on getting us together with the partners first before we put in the proposal. In other words, the proposals in a sense should be coproduced and I think any mechanism that we can have to put us in touch with the planners and the people that then need the data [so] that we can then coproduce that proposal. I think that's really important. (SW Producer FG)*

> *I think the question revolves around whether that partnership building process is considered part of the project or kind of external to it before the clock starts….If there had been a kind of a pilot partnership-building round, which would be a tenth of the funding to do the research just to get the people together and to work through the ideas…. I think it would have already had its legs on the ground…. Even to build a partnership around a particular question, that takes time. And if there were a mechanism for getting people together you know for even just a couple of days or virtually to work through that with support from the CSC and then the RFP is answered later on, I think we'd build a better proposal. We'd have a better timeline. And we'd… have a head start before the clock started running. (SW Producer FG)*

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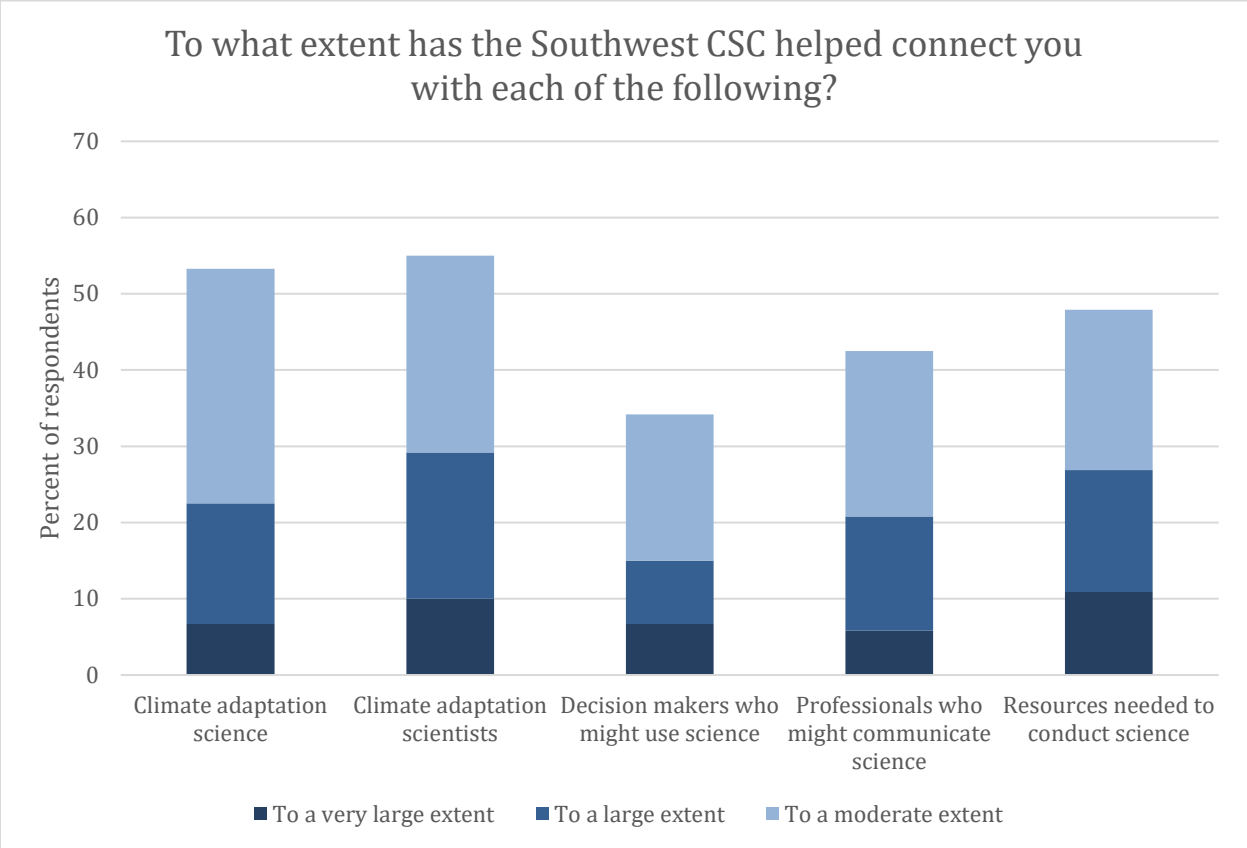
They also perceived barriers to coproduction among decision makers. A chief barrier was that potential collaborators in coproduction among decision makers simply did not have the capacity to engage.

> *Most of the state agencies in Arizona that have anything to do with natural resources have been … emasculated so there's really no capacity to engage in science per se. They're literally fighting fires … or whatever it is…. There needs to be capacity for people to engage, which is the same issue with tribes. (SW Producer FG)*

Perceptions of the Role of the CSC

The Southwest CSC has helped facilitate various connections (Figure SW-9). The most common connections reported were with climate adaptation scientists (55%; n = 66) and climate adaptation science (53%; n = 64). Nearly half also reported getting connected with resources needed to conduct science (48%; n = 57). Fewer reported help in connecting with professionals who might communicate science (43%; n = 51) and decision makers who might use science (34%; n = 41).

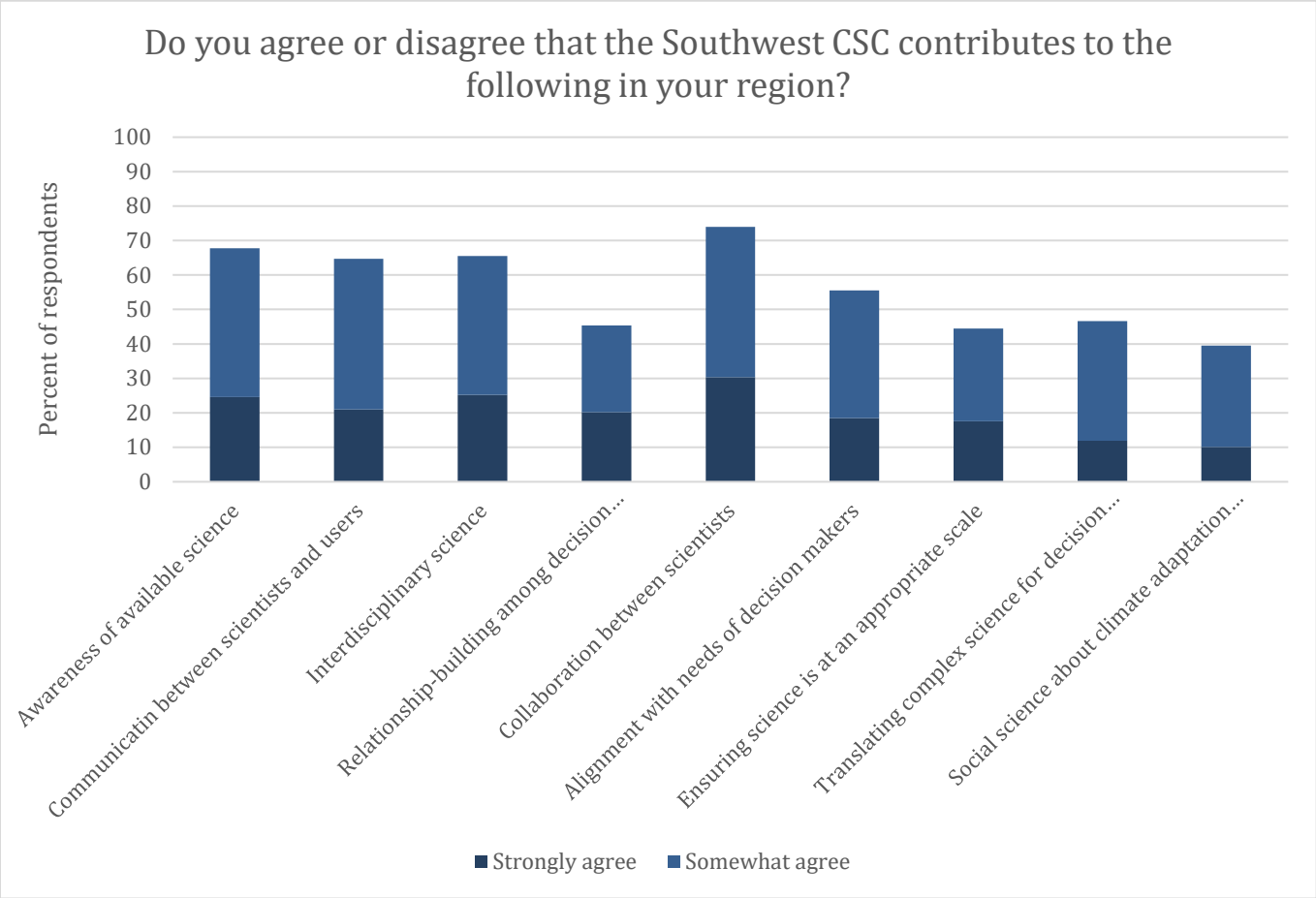
Figure SW-9



Note: text in items shortened for presentation in graph, and only "to a moderate extent", "to a large extent", or "to a very large extent" responses are shown. Full results and text in tables in appendix.

Most than half of respondents agreed that the Southwest CSC made a wide variety of contributions to the region (Figure SW-10). The contributions that were most widely perceived were collaboration between scientists (74%; n = 88), awareness of available science (68%; n = 80), interdisciplinary science (66%; n = 78), and communication between scientists and those who might use the science (65%; n = 77).

Figure SW-10



Note: text in items shortened for presentation in graph, and only "strongly agree" or "somewhat agree" responses are shown. Full results in table in appendix.

Summary of Southwest Results

Survey respondents were comprised of more than one-third science users, nearly two-thirds science producers, and some individuals who fell into neither group. All were involved with climate work to some extent, but producers were somewhat more involved than users. All were aware of the Southwest CSC to at least some extent. Respondents included employees of a variety of types of organizations and agencies, but federal agencies and universities were most prominent.

Survey respondents were involved with the Southwest CSC in a variety of ways, but the most common was as participants in CSC trainings, webinars, workshops, or conferences. Nearly one-third were CSC grant recipients, applicants, or partners on a grant. Only 17% were resource managers or decision makers who had used the science produced by the CSC.

The CSC provided many important benefits to partners with the top ones identified by survey participants being providing access to a network of people interested in climate adaptation science and providing access to the science itself. Focus group participants spoke about both of these benefits as well as the opportunities the CSC provided to connect scientists with decision makers and the critical needs CSC funding could fill. Survey respondents reported they were limited in their involvement with the CSC by a variety of factors with the most common one being limits on their time.

About three-quarters of the survey respondents felt that climate adaptation science in the Southwest region[1] was available to decision makers, and many also believed that decision makers use the climate adaptation science to inform management. Nevertheless, many believed that climate adaptation science did not influence *necessarily* management actions taken, although a majority also believed that the Southwest CSC had reduced the disconnect between scientists and decision makers. When asked specifically about the science produced through the Southwest CSC, the vast majority of the survey respondents agreed it can contribute to policy or management. Respondents were also generally positive about other characteristics of the CSC science, and the majority found it high quality, appropriate to the decisions being made, and able to integrate well with other information.

The most common ways science users and producers reported that the Southwest CSC science was used were to inform management plans, inform management actions, and contribute to the training of professionals. Focus participants described effective stakeholder engagement as a key to having the CSC science used. This engagement might occur before, during, or after research was conducted.

Science users and producers differed in their perceptions of what limits the use of CSC science. Science producers perceived issues to be more limiting, than science users found them to be. Focus group participants maintained that one on the limits on the use of the science was the amount of time that needed to be invested to ensure that the science was used. This need posed a particular barrier because time was typically limited for both science producers and science users. Participants also pointed out that needs of scientists and decision makers were not always compatible, and so their priorities differed with regard to the type of science and scientific products to be produced.

An overwhelming proportion of both science users and producers expressed support for coproduction of knowledge. While many of the science producers indicated experience in coproduction in various phases of research projects, many fewer science users reported first-hand experience. Coproduction was more

[1] All climate adaptation science in the region, not solely the science produced by the CSC.

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common in the early stages (setting priorities and identifying research questions) and late stages (interpreting, applying, and communicating results) of research than the middle stages. Science users who responded to the survey reported that their involvement in co-produced research projects is most limited by scientists not reaching out to them to collaborate, having different perspectives from scientists on what science is needed, and funders not being willing to support collaboration between scientists and science users. In the focus groups, discussions of the limitations on coproduction centered on the amount of time required to coproduce science and a lack of understanding by some scientists about how to coproduce science. They argued for greater expectations and support for coproduction in CSC-funded science.

The majority of survey respondents noted a variety of contributions of the Southwest CSC, including contributions to collaboration between scientists, awareness of available science, interdisciplinary science, and communication between scientists and decision makers.

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Summary of All CSC Results

While results were analyzed by region (NC and SW), key findings and patterns were similar across the CSCs. Respondents represented science users and science producers. Although a variety of types of partners were engaged with the CSCs, a large majority of them were from universities and federal agencies.

That most common way for survey respondents to be involved with the CSCs was as participants in CSC trainings, webinars, workshops or conferences. About one-third in each survey were grant recipients, applicants, or partners. Fewer than 20% were resource managers or decision makers who had used the science produced by the CSC.

For both CSCs, the top benefits of the CSC identified by survey respondents were being provided access to a network of people interested in climate adaptation science and receiving access to the science itself. The benefits of the CSC networks were discussed extensively in the focus groups. The most common limitations on partners' engagement with the CSC were the time they had available (given their other priorities).

About three-quarters of the survey respondents in both regions felt that climate adaptation science in the regions was available to decision makers, and many also believed that decision makers use the climate adaptation science to inform management. Nevertheless, many believed that climate adaptation science did not influence management actions taken, although a majority also believed that the CSCs had reduced the disconnect between scientists and decision makers. When asked specifically about the science produced through the CSCs, the vast majority of the survey respondents agreed it can contribute to policy or management. Respondents were also generally positive about other characteristics of the CSC science, and the majority found it high quality, appropriate to the decisions being made, and able to integrate well with other information.

Science producers and science users had different perceptions about the use of climate science. The percentage of science producers who thought their science was used by decision makers was much higher than the percentage of decision makers who say they used CSC science. These perspectives were not necessarily inconsistent. It is possible that a small group of decision makers had access to and made use of the climate science that was produced, while others did not. In focus groups in both regions, participants argued that one of the factors contributing to the use of CSC science was the engagement of potential users by scientists.

Co-production of climate adaptation science research was perceived as valuable by large majorities of producers and users. Users had less experience with co-production, however, than producers. Coproduction was more common in the early stages (setting priorities and identifying research questions) and late stages (interpreting and communicating results) of research than the middle stages. Science users who responded to the survey reported that their involvement in co-produced research projects is most limited by scientists not reaching out to them to collaborate and having different perspectives from scientists on what science is needed. In the focus groups, discussions of the limitations on coproduction centered on the amount of time required to coproduce science and a lack of rewards for scientists who engaged in coproduction. They argued for greater expectations and support for coproduction in CSC-funded science.

The majority of survey respondents noted a variety of contributions of the CSCs including contributions to collaboration between scientists, awareness of available science, interdisciplinary science, and communication between scientists and decision makers.

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Although the CSCs produced a number of benefits, several possibilities exist for enhancing those benefits. More diverse types of partners could be engaged beyond the prevalent federal agencies and university scientists. Engaging new partners may require new ways to make it easier for potential partners to become involved and more outreach to invite them to participate. There is also more work to be done to facilitate actionable science and co-production in all of the regions. CSC efforts along these lines may be aided by defining more clearly those management issues that need attention, creating more opportunities for scientists and managers to work together or encouraging it through funding requirements, and improving the ways in which science is communicated.

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APPENDICES

A. Focus Group Scripts
B. Survey Instrument with Tables of Results – North Central
C. Survey Instrument with Tables of Results – Southwest
D. Phone Survey Instrument
E. Comparison of Respondent (Web-based) and Nonrespondent (Phone) Surveys

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Appendix A. Focus Group Scripts

Science Producers

(0-5 minutes) Introduction:

- Welcome.
- Introduction of focus group leaders
- Thanks for coming to our session today.
- Purpose: to develop an understanding of how partners have contributed to and benefitted from the work of the CSC and what has influenced the ability of the CSC to work with its partners.
- We are hosting two focus groups. One with those who tend to produce climate science and those who tend to use climate science. This focus group is focused on the former.
- We have included a diverse set of partners in the focus groups to try to get a range of perspectives.
- In the process of the interview we will ask some open-ended questions – both myself and members of the team that is conducting the CSC review. There are no right and wrong answers, and it is OK to disagree with what others have said.
- As you can see, the Science Review Team will also be listening in to this discussion. They will be learning about the CSC from this discussion and may use material anonymously as part of their report. We will also allow them to ask follow-up questions that elaborate on topics of interest.
- We will use an audio-recorder, so that we can listen to the discussion and transcribe the full details later.
- Your responses will be kept anonymous in any reporting of the focus groups.
- Your participation in this group is voluntary.
- Timing: The session today will last for two hours.

(5-15 minutes 1) We'd like to start with everyone introducing themselves. We will go around the room. Please tell us your name, your affiliation, and in what ways you interact with the Climate Science Center and with whom. And I'll also have the Review Team briefly introduce themselves.

(15-25 minutes) 2) What were the reasons you became involved with the Climate Science Center?

(25-40 minutes) 3) What are the benefits of your involvement with the Climate Science Center? (probe for benefits to them as individuals, to scientific knowledge, to people who are in need of scientific information, to professional development of others)

- What are some concrete examples of how you were able to leverage personnel or resources based on your involvement with the Climate Science Center?

(40-55 minutes) 4) What are the challenges you face in your involvement with the Climate Science Center?

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(55-60 minutes) 5) To what degree have you worked with other people who are affiliated with the Climate Science Center – either those who want to make use of the science it produces or the climate scientists who produce the CSC science?

(60-75 minutes) 6) Tell us more about your efforts to work with these people. Why and how have you worked with them?

(75-90 minutes) 7) What challenges have you faced in working with or reaching out to people who might use your climate science?

(90-105 minutes) 8) How has the CSC helped to overcome barriers to working with or reaching out to science users? [or to ensuring that the science you produce is used]?

(105-120 minutes) 9) Generally speaking, how could your involvement with the CSC generate more benefits – whether to you individually, to scientific knowledge, to people who use currently or could use climate scientific information, etc?

- How would you like to be engaged with the Climate Science Center in ways that you currently are not?

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Science Users

(0-5 minutes) Introduction:

- Welcome.
- Introduction of focus group leaders
- Thanks for coming to our session today.
- Purpose: to develop an understanding of how partners have contributed to and benefitted from the work of the CSC and what has influenced the ability of the CSC to work with its partners.
- We are hosting two focus groups. One with those who tend to produce climate science and those who tend to use climate science. This focus group is focused on the latter.
- We have included a diverse set of partners in the focus groups to try to get a range of perspectives.
- In the process of the interview we will ask some open-ended questions – both myself and members of the team that is conducting the CSC review. There are no right and wrong answers, and it is OK to disagree with what others have said.
- As you can see, the Science Review Team will also be listening in to this discussion. They will be learning about the CSC from this discussion and may use material anonymously as part of their report. We will also allow them to ask follow-up questions that elaborate on topics of interest.
- We will use an audio-recorder, so that we can listen to the discussion and transcribe the full details later.
- Your responses will be kept anonymous in any reporting of the focus groups.
- Your participation in this group is voluntary.
- Timing: The session today will last for two hours.

(5-15 minutes 1) We'd like to start with everyone introducing themselves. We will go around the room. Please tell us your name, your affiliation, and in what ways you interact with the Climate Science Center and with whom. And I'll also have the Review Team briefly introduce themselves.

(15-25 minutes) 2) What were the reasons you became involved with the Climate Science Center?

(25-40 minutes) 3) What are the benefits of your involvement with the Climate Science Center? (probe for benefits to them as individuals, to scientific knowledge, to people who are in need of scientific information, to professional development)

- What are some concrete examples of how you were able to leverage personnel or resources based on your involvement with the Climate Science Center?

(40-55 minutes) 4) What are the challenges you face in your involvement with the Climate Science Center?

(55-60 minutes) 5) To what degree have you worked with other people who are affiliated with the Climate Science Center – either those who want to make use of the science it produces or the climate scientists who produce the CSC science?

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(60-75 minutes) 6) To what degree have you used the science produced through the Climate Science Center?

- Tell us more about your impressions of this climate science. Has it been useful? How have you used it?

(75-90 minutes) 7) What challenges have you faced in using the science as part of the CSC? (probe for challenges in working with scientists in using science)

(90-105 minutes) 8) How has the CSC helped to overcome barriers to using climate science?

- How has the CSC helped you to develop relationships with climate scientists?

(105-120 minutes) 9) Generally speaking, how could your involvement with the CSC generate more benefits – whether to you individually, to scientific knowledge, to people who use currently or could use climate scientific information, etc.?

- How would you like to be engaged with the Climate Science Center in ways that you currently are not?
- How can the CSC better meet the needs of your organization and constituencies?

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Appendix B. Survey Instrument with Tables of Results – North Central

1. To what extent does your work involve climate adaptation science, or management or policy related to climate change adaptation? (Select one option)

Answer Options	Response Percent	Response Count
Not at all	0.0%	0
To a small extent	24.4%	50
To a moderate extent	30.7%	63
To a large extent	24.4%	50
To a very large extent	20.5%	42
Answered question		**205**
Skipped question		**0**

2. How serious of a threat do you believe that climate change is to natural resources, relative to other stressors? (Select one option)

Answer Options	Response Percent	Response Count
Much lesser threat	1.0%	2
Lesser threat	6.2%	12
Similar threat	37.3%	72
Greater threat	34.2%	66
Much greater threat	21.2%	41
Answered question		**193**
Skipped question		**12**

3. How important do you believe it is that managers or policy makers take action now in the North Central region to address climate change threats? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	6.3%	12
Moderately important	8.9%	17
Important	34.4%	66
Very important	50.5%	97
Answered question		**192**
Skipped question		**13**

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4. How important do you believe it is that climate adaptation science informs decisions about natural resource management in the North Central region? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.5%	1
Slightly important	3.6%	7
Moderately important	8.3%	16
Important	26.4%	51
Very important	61.1%	118
Answered question		**193**
Skipped question		**12**

5. Which statement best characterizes your relationship with the North Central Climate Science Center (CSC)? (Select one option)

Answer Options	Response Percent	Response Count
I have never heard of the North Central CSC.	0.0%	0
I have heard of the North Central CSC, but have no interest in or involvement with it.	5.2%	10
I have had no involvement with the North Central CSC, but someone else in my agency or organization has.	10.3%	20
I have had at least some interest in or involvement with the North Central CSC.	84.5%	164
Answered question		**194**
Skipped question		**11**

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6. In what ways have you been involved with the North Central Climate Science Center (CSC) in the last five years? (Select all that apply)

Answer Options	Response Percent	Response Count
CSC Stakeholder Advisory Committee member	11.0%	18
University member affiliated with the CSC	19.5%	32
CSC-funded graduate student or postdoctoral fellow	14.0%	23
CSC US Geological Survey staff	7.3%	12
Landscape Conservation Cooperative Steering Committee member	9.8%	16
Landscape Conservation Cooperative staff member	7.3%	12
CSC grant recipient, applicant, or partner on a grant	28.7%	47
Participant in a CSC training, webinar, workshop, or conference	53.0%	87
Resource manager or decision maker who has used the science produced by the CSC	10.4%	17
Other (please specify)	21.3%	35
Checked at least one		**158**
Checked none		**6**

7. How long (in years) have you been involved with the CSC? (Fill in number of years, or zero, if none)

Answer Options	Average number of years involved with CSC	Response Count
	3.1	158
Answered question		**158**
Skipped question		**6**

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8. How frequently did you interact with following representatives or affiliates of the CSC in your region in the last year? (Select one option per row)

Answer Options	Not at all	Up to a few times a year	About once a month	Up to a few times a month	More than once a week	Response Count
US Geological Survey CSC Staff	10.8%	52.5%	14.6%	15.8%	6.3%	158
University leads/PIs for the CSC	26.3%	42.3%	16.7%	9.6%	5.1%	156
CSC Stakeholder Advisory Committee members	62.6%	29.3%	6.1%	1.4%	0.7%	147
CSC-affiliated researchers	22.1%	44.8%	16.9%	12.3%	3.9%	154
CSC graduate or post-doctoral fellows	40.9%	32.9%	12.1%	8.1%	6.0%	149

9. How important are each of the following benefits of the North Central CSC to you? (Select one option per row)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important	Response Count
Source of funding for climate adaptation science	17.9%	16.7%	14.7%	22.4%	28.2%	156
Access to climate adaptation science	4.5%	10.8%	17.2%	36.3%	31.2%	157
Access to a broader network of people interested in climate adaptation science	3.8%	9.6%	13.5%	32.7%	40.4%	156
Means for learning about climate adaptation	5.7%	13.4%	21.0%	30.6%	29.3%	157
Training on climate adaptation science methods or findings	10.8%	13.4%	26.1%	27.4%	22.3%	157
Avenue to put climate adaptation science into the hands of decision makers	8.3%	10.8%	17.2%	27.4%	36.3%	157
Justification for climate adaptation science I want to do	28.4%	18.7%	23.2%	13.5%	16.1%	155
Other (please specify)						13

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10. What limits your involvement with the North Central CSC? (Select all that apply)

Answer Options	Response Percent	Response Count
I don't have enough time	40.5%	83
I don't have the funds	27.3%	56
I don't know how to be involved	15.1%	31
I don't work on the same topics as the CSC	12.2%	25
The CSC's science is not relevant to my needs	2.4%	5
I haven't been invited or asked to be involved	16.6%	34
It's not as high a priority as my other work	20.5%	42
It's someone else's responsibility in my organization	7.3%	15
I'm not interested in this work	1.0%	2
Other (please specify)	17.1%	35
Checked at least one		**154**
Checked none		**51**

11. To what extent do you agree or disagree with each of the following statements about the use of climate adaptation science in the North Central region? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing/I don't know
Climate adaptation science is available to decision makers.	16.8%	56.6%	13.3%	10.4%	2.9%	32
Policy makers use climate adaptation science to inform policies.	2.4%	33.3%	23.6%	24.2%	16.4%	40
Land managers use climate adaptation science to inform management.	4.1%	44.8%	21.5%	21.5%	8.1%	33
Fish and wildlife managers use climate adaptation science to inform management.	8.1%	46.9%	17.5%	22.5%	5.0%	45
Water managers use climate adaptation science to inform management.	16.6%	54.8%	15.9%	12.7%	0.0%	48
What is known about climate adaptation does not necessarily influence actions taken by decision makers in the region.	17.5%	50.0%	13.9%	14.5%	4.2%	39
The CSC has helped reduce the disconnect between what is known about climate adaptation and the actions taken by decision makers in the region.	25.9%	40.6%	25.2%	7.0%	1.4%	62

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12. To what extent do you agree or disagree with each of the following statements about the science produced through the North Central CSC (their staff, university affiliates, those funded by the CSC)? (Select one option for each row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing/I don't know
It can contribute to policy or management.	52.7%	38.5%	7.7%	0.0%	1.2%	36
It is appropriate to inform the type of decisions being made.	40.1%	43.1%	11.4%	4.2%	1.2%	38
It integrates well with other information.	28.4%	40.7%	25.9%	4.9%	0.0%	43
It is irrelevant to management.	4.8%	4.2%	10.2%	25.9%	54.8%	39
It is high quality.	53.3%	31.5%	11.5%	3.0%	0.6%	40
It is biased.	1.2%	1.2%	13.7%	17.3%	66.7%	37

13. Is making decisions about natural resource policy, management, or programs part of your job?

Answer Options	Response Percent	Response Count
Yes	33.7%	63
No. I do NOT make decisions about natural resource policy, management, or programs.	66.3%	124
Answered question		**187**
Skipped question		**18**

14. Have you or your organization used climate adaptation science produced by the following sources to inform decisions about natural resource policy, management, or programs? (Select one option per row)

Answer Options	Yes	No	Response Count	Missing/I don't know
North Central CSC (e.g., from CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC)	67.4%	32.6%	46	17
Organizations or scientists who are NOT affiliated with the North Central CSC	92.6%	7.4%	54	9

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15. How have you used the climate adaptation science produced by the North Central CSC, if at all? (Select all that apply)

Answer Options	Response Percent	Response Count
To inform policy	19.0%	12
To inform management plans	41.3%	26
To inform management actions	33.3%	21
To inform land acquisition priorities	11.1%	7
To inform training of conservation professionals about climate change and its impacts	33.3%	21
To inform the public about climate change and its impacts	27.0%	17
None of the above	12.7%	8
Other (please specify)	14.3%	9
Checked at least one		**47**
Checked none		**16**

16. To what extent do the following factors limit your use of the climate adaptation science and tools produced through the North Central CSC? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Lack of quality of the science	90.6%	5.7%	3.8%	0.0%	0.0%	10
The science doesn't address questions at the right scale	43.4%	24.5%	20.8%	7.5%	3.8%	10
The scientists don't work closely enough with me	41.5%	24.5%	18.9%	7.5%	7.5%	10
I'm not aware of the science	44.2%	32.7%	13.5%	9.6%	0.0%	11
The science does not address issues I face	47.2%	30.2%	11.3%	11.3%	0.0%	10
The science is not interdisciplinary enough	48.1%	32.7%	13.5%	5.8%	0.0%	11
The science models or results are not refined enough	45.3%	32.1%	9.4%	9.4%	3.8%	10
The science is not being communicated in ways that are understandable	35.8%	24.5%	32.1%	5.7%	1.9%	10
I lack the skills or training to make use of the science	52.8%	32.1%	11.3%	3.8%	0.0%	10
The science is not available at the times at which it is needed for decision making	37.7%	34.0%	26.4%	1.9%	0.0%	10
The management issues for which science is needed have not been clearly defined	24.5%	35.8%	28.3%	9.4%	1.9%	10

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17. In your opinion as a natural resource decision maker, how important is it that climate adaptation scientists and natural resource decision makers work together to produce science? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	3.5%	2
Moderately important	7.0%	4
Important	19.3%	11
Very important	70.2%	40
Answered question		**57**
Skipped question		**6**

18. Some climate adaptation scientists collaborate with the end-users of their science in various stages of the research process. We are interested in whether you, as a natural resource decision maker, have any experience collaborating with climate adaptation scientists. To what extent have you or someone in your organization been involved in the following stages of research in one or more North Central CSC projects (led by others)? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Determining research priorities for the CSC as a whole	50.9%	29.8%	12.3%	3.5%	3.5%	6
Identifying the research questions for a research project	42.1%	26.3%	19.3%	5.3%	7.0%	6
Designing a research project's methods	59.6%	21.1%	8.8%	10.5%	0.0%	6
Determining data sets to be used for a research project	57.9%	19.3%	17.5%	5.3%	0.0%	6
Collecting data for a research project	57.9%	22.8%	14.0%	5.3%	0.0%	6
Analyzing data for a research project	61.4%	15.8%	15.8%	7.0%	0.0%	6
Interpreting results of a research project	53.6%	21.4%	12.5%	10.7%	1.8%	7
Applying results of a research project	43.9%	26.3%	17.5%	5.3%	7.0%	6
Communicating results of a research project	45.6%	17.5%	24.6%	3.5%	8.8%	6

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19. To what extent do you, as a natural resource decision maker, agree or disagree that the following items limit your involvement in research projects? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing
Scientists have different perspectives than me on what science is needed.	5.3%	28.1%	28.1%	19.3%	19.3%	6
Scientists have different perspectives from me on how research projects should be conducted.	1.8%	17.5%	43.9%	14.0%	22.8%	6
Scientists don't reach out to me to collaborate.	10.5%	40.4%	19.3%	10.5%	19.3%	6
Scientists aren't interested in listening to me.	1.8%	16.1%	32.1%	23.2%	26.8%	7
I don't have time to collaborate with scientists.	1.8%	24.6%	21.1%	21.1%	31.6%	6
Funders don't support collaboration between scientists and science users.	7.0%	17.5%	31.6%	14.0%	29.8%	6

20. Have you produced climate adaptation science through an affiliation with the North Central CSC (e.g., as CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC) or otherwise? (Select one option) As a reminder, by "climate adaptation science," we mean "science that helps fish, wildlife, ecosystems, and the communities they support adapt to climate change."

Answer Options	Response Percent	Response Count
I have produced climate adaptation science through an affiliation with the North Central CSC	34.6%	63
I have produced climate adaptation science but never through an affiliation with the North Central CSC	23.1%	42
No, I have not produced climate adaptation science	42.3%	77
Answered question		**182**
Skipped question		**23**

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21. Has the climate adaptation science you produced been used in any of the following ways? (Select all that apply)

Answer Options	Response Percent	Response Count
To inform policy	32.4%	34
To inform management plans	63.8%	67
To inform management actions	49.5%	52
To inform land acquisition priorities	9.5%	10
To inform training of conservation professionals about climate change and its impacts	49.5%	52
To inform the public about climate change and its impacts	43.8%	46
None of the above	3.8%	4
Checked at least one		**90**
Checked none		**15**

22. In other settings, various factors have been found to limit decision makers' use of science. From your perspective as a scientist, to what extent do the following factors limit the use of the climate adaptation science produced (not specifically by you) through the North Central CSC? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Lack of quality of the science	63.3%	24.5%	8.2%	3.1%	1.0%	7
The science doesn't address questions at the right scale	17.3%	24.5%	31.6%	18.4%	8.2%	7
The scientists don't work closely enough with decision makers	11.3%	17.5%	35.1%	24.7%	11.3%	8
Decision makers are not aware of the science	9.3%	18.6%	27.8%	33.0%	11.3%	8
The science does not address issues decision makers face	18.8%	29.2%	29.2%	14.6%	8.3%	9
The science is not interdisciplinary enough	30.2%	29.2%	21.9%	13.5%	5.2%	9
The science models or results are not refined enough	25.0%	31.3%	27.1%	14.6%	2.1%	9
The science is not being communicated in ways that is understandable to decision makers	13.4%	27.8%	26.8%	19.6%	12.4%	8
Decision makers lack the skills or training to make use of the science	9.4%	25.0%	29.2%	25.0%	11.5%	9
The science is not available at the times at which it is needed for decision making	14.7%	32.6%	31.6%	16.8%	4.2%	10
The management issues for which science is needed have not been clearly defined	11.5%	25.0%	39.6%	17.7%	6.3%	9

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23. In your opinion as a scientist, how important is it that climate adaptation scientists and natural resource decision makers work together to produce science research? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	1.0%	1
Slightly important	2.0%	2
Moderately important	3.9%	4
Important	14.7%	15
Very important	78.4%	80
Answered question		**102**
Skipped question		**3**

24. Some climate adaptation scientists collaborate with the end-users of their science in various stages of the research process. To what extent have you, as a climate adaptation scientist, had any experience collaborating with natural resource decision makers in the following ways? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Determining research priorities	5.9%	22.5%	30.4%	25.5%	15.7%	3
Identifying the research questions for a research project	5.9%	22.8%	30.7%	22.8%	17.8%	4
Designing a research project's methods	17.8%	23.8%	28.7%	14.9%	14.9%	4
Determining data sets to be used for a research project	13.9%	21.8%	30.7%	21.8%	11.9%	4
Collecting data for a research project	19.8%	23.8%	23.8%	17.8%	14.9%	4
Analyzing data for a research project	27.7%	25.7%	21.8%	10.9%	13.9%	4
Interpreting results of a research project	13.9%	21.8%	26.7%	18.8%	18.8%	4
Applying results of a research project	14.9%	21.8%	23.8%	27.7%	11.9%	4
Communicating results of a research project	6.9%	16.8%	26.7%	28.7%	20.8%	4

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25. To what extent has the North Central CSC helped connect you with each of the following? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Climate adaptation science	17.5%	28.1%	21.6%	20.5%	12.3%	34
Climate adaptation scientists	19.3%	28.1%	17.0%	17.0%	18.7%	34
Decision makers who might use climate adaptation science	37.8%	31.4%	20.9%	5.8%	4.1%	33
Professionals who might communicate climate adaptation science	26.7%	28.5%	26.2%	13.4%	5.2%	33
Resources needed to conduct climate adaptation science	25.1%	29.2%	18.1%	13.5%	14.0%	34

26. Do you agree or disagree that the North Central CSC contributes to the following in your region? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing
Awareness of available science	25.9%	46.4%	19.9%	6.0%	1.8%	39
Communication between scientists and those who might use science	26.5%	44.0%	22.3%	5.4%	1.8%	39
Interdisciplinary science	33.1%	36.7%	21.1%	7.2%	1.8%	39
Relationship-building among decision makers who might be interested in science	18.1%	40.4%	27.7%	10.8%	3.0%	39
Collaboration between scientists	32.3%	38.9%	20.4%	6.0%	2.4%	38
Alignment of science with needs of decision makers	16.2%	40.7%	31.1%	9.0%	3.0%	38
Ensuring science is at an appropriate scale	15.1%	38.0%	37.3%	7.8%	1.8%	39
Translating complex science for decision makers	14.6%	40.9%	32.3%	8.5%	3.7%	41
Social science about climate adaptation issues	22.0%	35.1%	29.2%	9.5%	4.2%	37

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27. What state(s) do you work in? (Select all that apply)

Answer Options	Response Percent	Response Count
Colorado	45.4%	93
Kansas	14.4%	29
Montana	32.2%	66
Nebraska	18.5%	38
North Dakota	20.5%	42
South Dakota	23.4%	48
Wyoming	30.7%	63
Other state(s)	18.5%	38
Other (please specify)	22.4%	46
Checked at least one		**174**
Checked none		**31**

28. What scale(s) do you address in your work? (Select all that apply)

Answer Options	Response Percent	Response Count
International	24.4%	50
National	37.6%	77
Regional/multi-state	62.0%	127
State	56.6%	116
Watershed	42.0%	86
Local	40.5%	83
Checked at least one		**176**
Checked none		**29**

29. What is your affiliation? (Select all that apply)

Answer Options	Response Percent	Response Count
Federal agency	37.6%	77
Tribal government	1.5%	3
State agency	10.2%	21
Local government	1.0%	2
University	33.2%	68
Non-profit organization	13.2%	27
Private Industry	2.0%	4
Other (please specify)	2.9%	6
Checked at least one		**177**
Checked none		**28**

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30. What type of position do you hold in your agency, university, or organization? (Select one option that best describes your type of work)

Answer Options	Response Percent	Response Count
Leadership/administration	25.4%	52
Policy	6.3%	13
Research	52.7%	108
Operations	8.3%	17
Other (please specify)	12.7%	26
Checked at least one		**177**
Checked none		**28**

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Appendix C. Survey Instrument with Tables of Results – Southwest

1. To what extent does your work involve climate adaptation science, or management or policy related to climate change adaptation? (Select one option)

Answer Options	Response Percent	Response Count
Not at all	0.0%	0
To a small extent	10.8%	14
To a moderate extent	23.8%	31
To a large extent	31.5%	41
To a very large extent	33.8%	44
Answered question		**130**
Skipped question		**0**

2. How serious of a threat do you believe that climate change is to natural resources, relative to other stressors? (Select one option)

Answer Options	Response Percent	Response Count
Much lesser threat	0.0%	0
Lesser threat	2.3%	3
Similar threat	32.0%	41
Greater threat	49.2%	63
Much greater threat	16.4%	21
Answered question		**128**
Skipped question		**2**

3. How important do you believe it is that managers or policy makers take action now in the Southwest region to address climate change threats? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	0.0%	0
Moderately important	13.4%	17
Important	25.2%	32
Very important	61.4%	78
Answered question		**127**
Skipped question		**3**

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4. How important do you believe it is that climate adaptation science informs decisions about natural resource management in the Southwest region? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	0.8%	1
Moderately important	5.5%	7
Important	23.6%	30
Very important	70.1%	89
Answered question		**127**
Skipped question		**3**

5. Which statement best characterizes your relationship with the Southwest Climate Science Center (CSC)? (Select one option)

Answer Options	Response Percent	Response Count
I have never heard of the Southwest CSC.	0.0%	0
I have heard of the Southwest CSC, but have no interest in or involvement with it.	1.6%	2
I have had no involvement with the Southwest CSC, but someone else in my agency or organization has.	10.2%	13
I have had at least some interest in or involvement with the Southwest CSC.	88.3%	113
Answered question		**128**
Skipped question		**2**

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6. In what ways have you been involved with the Southwest Climate Science Center (CSC) in the last five years? (Select all that apply)

Answer Options	Response Percent	Response Count
CSC Stakeholder Advisory Committee member	14.6%	19
University member affiliated with the CSC	20.0%	26
CSC-funded graduate student or postdoctoral fellow	6.2%	8
CSC US Geological Survey staff	3.8%	5
Landscape Conservation Cooperative Steering Committee member	26.2%	34
Landscape Conservation Cooperative staff member	13.8%	18
CSC grant recipient, applicant, or partner on a grant	30.0%	39
Participant in a CSC training, webinar, workshop, or conference	45.4%	59
Resource manager or decision maker who has used the science produced by the CSC	16.9%	22
Other (please specify)	9.2%	12
Checked at least one		**111**
Checked none		**4**

7. How long (in years) have you been involved with the CSC? (Fill in number of years, or zero, if none)

Answer Options	Average number of years involved with CSC	Response Count
	3.5	110
Answered question		**110**
Skipped question		**5**

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8. How frequently did you interact with following representatives or affiliates of the CSC in your region in the last year? (Select one option per row)

Answer Options	Not at all	Up to a few times a year	About once a month	Up to a few times a month	More than once a week	Response Count
US Geological Survey CSC Staff	9.1%	60.0%	7.3%	16.4%	7.3%	110
University leads/PIs for the CSC	23.6%	40.9%	10.0%	10.0%	15.5%	110
CSC Stakeholder Advisory Committee members	44.4%	45.4%	4.6%	2.8%	2.8%	108
CSC-affiliated researchers	22.7%	45.5%	10.0%	9.1%	12.7%	110
CSC graduate or post-doctoral fellows	47.7%	27.5%	8.3%	5.5%	11.0%	109

9. How important are each of the following benefits of the Southwest CSC to you? (Select one option per row)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important	Response Count
Source of funding for climate adaptation science	13.4%	8.9%	16.1%	25.0%	36.6%	112
Access to climate adaptation science	6.3%	10.7%	12.5%	34.8%	35.7%	112
Access to a broader network of people interested in climate adaptation science	0.9%	10.7%	15.2%	39.3%	33.9%	112
Means for learning about climate adaptation	8.0%	15.2%	25.0%	29.5%	22.3%	112
Training on climate adaptation science methods or findings	15.2%	17.9%	28.6%	22.3%	16.1%	112
Avenue to put climate adaptation science into the hands of decision makers	6.3%	13.5%	12.6%	28.8%	38.7%	111
Justification for climate adaptation science I want to do	25.2%	26.1%	18.9%	16.2%	13.5%	111
Other (please specify)						4

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10. What limits your involvement with the Southwest CSC? (Select all that apply)

Answer Options	Response Percent	Response Count
I don't have enough time	46.2%	60
I don't have the funds	22.3%	29
I don't know how to be involved	12.3%	16
I don't work on the same topics as the CSC	5.4%	7
The CSC's science is not relevant to my needs	2.3%	3
I haven't been invited or asked to be involved	15.4%	20
It's not as high a priority as my other work	13.8%	18
It's someone else's responsibility in my organization	11.5%	15
I'm not interested in this work	0.0%	0
Other (please specify)	14.6%	19
Checked at least one		**102**
Checked none		**28**

11. To what extent do you agree or disagree with each of the following statements about the use of climate adaptation science in the Southwest region? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing/I don't know
Climate adaptation science is available to decision makers.	21.8%	51.3%	11.8%	13.4%	1.7%	11
Policy makers use climate adaptation science to inform policies.	6.4%	30.0%	17.3%	33.6%	12.7%	20
Land managers use climate adaptation science to inform management.	7.1%	51.8%	17.9%	19.6%	3.6%	18
Fish and wildlife managers use climate adaptation science to inform management.	10.7%	58.9%	15.2%	11.6%	3.6%	18
Water managers use climate adaptation science to inform management.	29.4%	56.0%	6.4%	6.4%	1.8%	21
What is known about climate adaptation does not necessarily influence actions taken by decision makers in the region.	16.4%	43.1%	24.1%	10.3%	6.0%	14
The CSC has helped reduce the disconnect between what is known about climate adaptation and the actions taken by decision makers in the region.	16.5%	42.3%	37.1%	3.1%	1.0%	33

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12. To what extent do you agree or disagree with each of the following statements about the science produced through the Southwest CSC (their staff, university affiliates, those funded by the CSC)? (Select one option for each row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing/I don't know
It can contribute to policy or management.	42.1%	47.4%	8.8%	1.8%	0.0%	16
It is appropriate to inform the type of decisions being made.	34.8%	45.5%	13.4%	6.3%	0.0%	18
It integrates well with other information.	18.5%	52.8%	21.3%	7.4%	0.0%	22
It is irrelevant to management.	5.4%	7.1%	13.4%	14.3%	59.8%	18
It is high quality.	52.3%	37.6%	9.2%	0.0%	0.9%	21
It is biased.	0.0%	1.9%	13.9%	13.9%	70.4%	22

13. Is making decisions about natural resource policy, management, or programs part of your job?

Answer Options	Response Percent	Response Count
Yes	39.2%	49
No. I do NOT make decisions about natural resource policy, management, or programs.	60.8%	76
Answered question		**125**
Skipped question		**5**

14. Have you or your organization used climate adaptation science produced by the following sources to inform decisions about natural resource policy, management, or programs? (Select one option per row)

Answer Options	Yes	No	Response Count	Missing/I don't know
Southwest CSC (e.g., from CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC)	73.5%	26.5%	34	15
Organizations or scientists who are NOT affiliated with the Southwest CSC	85.7%	14.3%	42	7

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15. How have you used the climate adaptation science produced by the Southwest CSC, if at all? (Select all that apply)

Answer Options	Response Percent	Response Count
To inform policy	18.4%	9
To inform management plans	55.1%	27
To inform management actions	42.9%	21
To inform land acquisition priorities	0.0%	0
To inform training of conservation professionals about climate change and its impacts	40.8%	20
To inform the public about climate change and its impacts	36.7%	18
None of the above	14.3%	7
Other (please specify)	10.2%	5
Checked at least one		**43**
Checked none		**6**

16. To what extent do the following factors limit your use of the climate adaptation science and tools produced through the Southwest CSC? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Lack of quality of the science	81.4%	9.3%	7.0%	2.3%	0.0%	6
The science doesn't address questions at the right scale	39.5%	27.9%	27.9%	2.3%	2.3%	6
The scientists don't work closely enough with me	38.6%	11.4%	27.3%	11.4%	11.4%	5
I'm not aware of the science	35.6%	26.7%	22.2%	6.7%	8.9%	4
The science does not address issues I face	37.2%	30.2%	20.9%	7.0%	4.7%	6
The science is not interdisciplinary enough	46.5%	34.9%	16.3%	2.3%	0.0%	6
The science models or results are not refined enough	41.9%	34.9%	16.3%	7.0%	0.0%	6
The science is not being communicated in ways that are understandable	34.9%	25.6%	16.3%	14.0%	9.3%	6
I lack the skills or training to make use of the science	52.3%	31.8%	11.4%	4.5%	0.0%	5
The science is not available at the times at which it is needed for decision making	47.6%	21.4%	23.8%	7.1%	0.0%	7
The management issues for which science is needed have not been clearly defined	30.2%	32.6%	30.2%	7.0%	0.0%	6

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17. In your opinion as a natural resource decision maker, how important is it that climate adaptation scientists and natural resource decision makers work together to produce science? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	0.0%	0
Moderately important	6.4%	3
Important	23.4%	11
Very important	70.2%	33
Answered question		**47**
Skipped question		**2**

18. Some climate adaptation scientists collaborate with the end-users of their science in various stages of the research process. We are interested in whether you, as a natural resource decision maker, have any experience collaborating with climate adaptation scientists. To what extent have you or someone in your organization been involved in the following stages of research in one or more Southwest CSC projects (led by others)? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Determining research priorities for the CSC as a whole	28.9%	35.6%	24.4%	8.9%	2.2%	4
Identifying the research questions for a research project	22.2%	33.3%	28.9%	11.1%	4.4%	4
Designing a research project's methods	56.8%	15.9%	6.8%	15.9%	4.5%	5
Determining data sets to be used for a research project	53.3%	20.0%	11.1%	13.3%	2.2%	4
Collecting data for a research project	60.0%	17.8%	17.8%	2.2%	2.2%	4
Analyzing data for a research project	60.0%	22.2%	13.3%	2.2%	2.2%	4
Interpreting results of a research project	48.9%	28.9%	11.1%	6.7%	4.4%	4
Applying results of a research project	33.3%	24.4%	28.9%	6.7%	6.7%	4
Communicating results of a research project	33.3%	35.6%	15.6%	6.7%	8.9%	4

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19. To what extent do you, as a natural resource decision maker, agree or disagree that the following items limit your involvement in research projects? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing
Scientists have different perspectives than me on what science is needed.	2.2%	37.0%	30.4%	10.9%	19.6%	3
Scientists have different perspectives from me on how research projects should be conducted.	2.2%	17.4%	47.8%	17.4%	15.2%	3
Scientists don't reach out to me to collaborate.	10.9%	30.4%	21.7%	15.2%	21.7%	3
Scientists aren't interested in listening to me.	4.3%	8.7%	32.6%	26.1%	28.3%	3
I don't have time to collaborate with scientists.	2.2%	21.7%	39.1%	15.2%	21.7%	3
Funders don't support collaboration between scientists and science users.	4.3%	28.3%	32.6%	15.2%	19.6%	3

20. Have you produced climate adaptation science through an affiliation with the Southwest CSC (e.g., as CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC) or otherwise? (Select one option) As a reminder, by "climate adaptation science," we mean "science that helps fish, wildlife, ecosystems, and the communities they support adapt to climate change."

Answer Options	Response Percent	Response Count
I have produced climate adaptation science through an affiliation with the Southwest CSC	40.2%	49
I have produced climate adaptation science but never through an affiliation with the Southwest CSC	24.6%	30
No, I have not produced climate adaptation science	35.2%	43
Answered question		**122**
Skipped question		**8**

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21. Has the climate adaptation science you produced been used in any of the following ways? (Select all that apply)

Answer Options	Response Percent	Response Count
To inform policy	49.4%	39
To inform management plans	82.3%	65
To inform management actions	60.8%	48
To inform land acquisition priorities	11.4%	9
To inform training of conservation professionals about climate change and its impacts	57.0%	45
To inform the public about climate change and its impacts	64.6%	51
None of the above	2.5%	2
Checked at least one		**75**
Checked none		**4**

22. In other settings, various factors have been found to limit decision makers' use of science. From your perspective as a scientist, to what extent do the following factors limit the use of the climate adaptation science produced (not specifically by you) through the Southwest CSC? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Lack of quality of the science	58.9%	31.5%	6.8%	2.7%	0.0%	6
The science doesn't address questions at the right scale	8.0%	28.0%	34.7%	24.0%	5.3%	4
The scientists don't work closely enough with decision makers	2.7%	21.3%	33.3%	25.3%	17.3%	4
Decision makers are not aware of the science	4.0%	18.7%	37.3%	29.3%	10.7%	4
The science does not address issues decision makers face	8.0%	20.0%	41.3%	18.7%	12.0%	4
The science is not interdisciplinary enough	16.0%	33.3%	40.0%	9.3%	1.3%	4
The science models or results are not refined enough	18.7%	34.7%	30.7%	14.7%	1.3%	4
The science is not being communicated in ways that is understandable to decision makers	2.7%	23.0%	31.1%	20.3%	23.0%	5
Decision makers lack the skills or training to make use of the science	1.3%	28.0%	41.3%	21.3%	8.0%	4
The science is not available at the times at which it is needed for decision making	6.8%	24.3%	44.6%	17.6%	6.8%	5
The management issues for which science is needed have not been clearly defined	9.3%	24.0%	33.3%	26.7%	6.7%	4

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23. In your opinion as a scientist, how important is it that climate adaptation scientists and natural resource decision makers work together to produce science research? (Select one option)

Answer Options	Response Percent	Response Count
Not at all important	0.0%	0
Slightly important	1.3%	1
Moderately important	10.1%	8
Important	19.0%	15
Very important	69.6%	55
Answered question		**79**
Skipped question		**0**

24. Some climate adaptation scientists collaborate with the end-users of their science in various stages of the research process. To what extent have you, as a climate adaptation scientist, had any experience collaborating with natural resource decision makers in the following ways? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Determining research priorities	4.1%	14.9%	35.1%	24.3%	21.6%	5
Identifying the research questions for a research project	5.4%	14.9%	29.7%	32.4%	17.6%	5
Designing a research project's methods	13.7%	31.5%	32.9%	13.7%	8.2%	6
Determining data sets to be used for a research project	17.6%	31.1%	24.3%	14.9%	12.2%	5
Collecting data for a research project	18.9%	25.7%	29.7%	12.2%	13.5%	5
Analyzing data for a research project	31.1%	21.6%	24.3%	13.5%	9.5%	5
Interpreting results of a research project	12.2%	14.9%	29.7%	23.0%	20.3%	5
Applying results of a research project	9.5%	20.3%	32.4%	18.9%	18.9%	5
Communicating results of a research project	2.7%	12.3%	27.4%	24.7%	32.9%	6

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25. To what extent has the Southwest CSC helped connect you with each of the following? (Select one option per row)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent	Missing
Climate adaptation science	13.3%	33.3%	30.8%	15.8%	6.7%	10
Climate adaptation scientists	14.2%	30.8%	25.8%	19.2%	10.0%	10
Decision makers who might use climate adaptation science	32.5%	33.3%	19.2%	8.3%	6.7%	10
Professionals who might communicate climate adaptation science	20.8%	36.7%	21.7%	15.0%	5.8%	10
Resources needed to conduct climate adaptation science	23.5%	28.6%	21.0%	16.0%	10.9%	11

26. Do you agree or disagree that the Southwest CSC contributes to the following in your region? (Select one option per row)

Answer Options	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Missing
Awareness of available science	24.6%	43.2%	24.6%	6.8%	0.8%	12
Communication between scientists and those who might use science	21.0%	43.7%	26.9%	6.7%	1.7%	11
Interdisciplinary science	25.2%	40.3%	30.3%	3.4%	0.8%	11
Relationship-building among decision makers who might be interested in science	20.2%	25.2%	37.0%	16.0%	1.7%	11
Collaboration between scientists	30.3%	43.7%	21.0%	2.5%	2.5%	11
Alignment of science with needs of decision makers	18.5%	37.0%	30.3%	11.8%	2.5%	11
Ensuring science is at an appropriate scale	17.6%	26.9%	43.7%	10.9%	0.85	11
Translating complex science for decision makers	11.9%	34.7%	35.6%	14.4%	3.4%	12
Social science about climate adaptation issues	10.1%	29.4%	43.7%	12.6%	4.2%	11

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27. What state(s) do you work in? (Select all that apply)

Answer Options	Response Percent	Response Count
Arizona	45.4%	59
California	52.3%	68
Nevada	30.0%	39
Nebraska	18.5%	38
Utah	20.0%	26
Other state(s)	26.2%	34
Other (please specify)	26.9%	35
Checked at least one		**123**
Checked none		**7**

28. What scale(s) do you address in your work? (Select all that apply)

Answer Options	Response Percent	Response Count
International	30.0%	39
National	36.2%	47
Regional/multi-state	75.4%	98
State	58.5%	76
Watershed	51.5%	67
Local	43.1%	56
Checked at least one		**121**
Checked none		**9**

29. What is your affiliation? (Select all that apply)

Answer Options	Response Percent	Response Count
Federal agency	41.5%	54
Tribal government	0.8%	1
State agency	11.5%	15
Local government	0.0%	0
University	36.2%	47
Non-profit organization	10.0%	13
Private Industry	0.0%	0
Other (please specify)	3.8%	5
Checked at least one		**123**
Checked none		**7**

`

30. What type of position do you hold in your agency, university, or organization? (Select one option that best describes your type of work)

Answer Options	Response Percent	Response Count
Leadership/administration	43.8%	57
Policy	3.1%	4
Research	41.5%	54
Operations	6.9%	9
Other (please specify)	9.2%	12
Checked at least one		**123**
Checked none		**7**

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Appendix D. Phone Survey Instrument

The purpose of this survey is to learn more about the experiences of scientists, managers, and decision makers who may have interacted with the [INSERT REGION] Climate Science Center. Even if you haven't had much interaction with the Climate Science Center, your responses are important. Information about the needs and perspectives of scientists and potential users of science that is relevant to climate change adaptation will help the U.S. Geological Survey and the [INSERT REGION] Climate Science Center better serve their partners.

This survey is a cooperative effort of the Cornell University Department of Natural Resources, the U.S. Geological Survey, and the American Fisheries Society.

Your participation in this survey is voluntary, but we encourage you to respond. We estimate that it will take less than 5 minutes to complete the survey. Hearing back from as many people as possible will help ensure that the results of the survey are valid and adequately represent the perspectives of scientists and potential users of science in the region. Please be assured that your identity will be kept strictly confidential, and your responses will never be associated with your name.

Throughout the survey, we will be asking you questions about climate change and climate adaptation science. By "climate adaptation science", we mean "science that helps fish, wildlife, ecosystems, and the communities they support adapt to climate change."

1. To what extent does your work involve climate adaptation science, or management or policy related to climate change adaptation? (Select one option)
Not at all (If selected, respond: Thanks for your participation in the survey. We have no further questions.)
To a small extent
To a moderate extent
To a large extent
To a very large extent

Even among professionals who work on climate adaptation science, management, or policy, perspectives differ on the importance of climate change relative to other environmental problems.

2. How serious of a threat do you believe that climate change is to natural resources, relative to other stressors? (Select one option)
Much lesser threat
Lesser threat
Similar threat
Greater threat
Much greater threat

3. How important do you believe it is that managers or policy makers take action now in the [INSERT REGION] to address climate change threats? (Select one option)
Not at all important
Slightly important
Moderately important
Important
Very important

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4. Which statement best characterizes your relationship with the [INSERT REGION] Climate Science Center (CSC)? (Select one option)
I have never heard of the [INSERT REGION] CSC. (If selected, skip to question 8)
I have heard of the [INSERT REGION] CSC, but have no interest in or involvement with it. (If selected, skip to question 8)
I have had no involvement with the [INSERT REGION] CSC, but someone else in my agency or organization has. (If selected, skip to question 8)
I have had at least some interest in or involvement with the [INSERT REGION] CSC.

5. How long (in years) have you been involved with the CSC? (Fill in number of years, or zero, if none)

6. How frequently did you interact with following representatives of the CSC in your region in the last year?
(Select one option for each – Not at all; Up to a few times a year; About once a month; Up to a few times a month, More than once a week).

US Geological Survey CSC staff
University leads or PIs for the CSC

7. How important are each of the following benefits of the [INSERT REGION] CSC to you? (Select one option for each – Not at all important, Slightly important, Moderately important, Important, Very important)
Source of funding for climate adaptation science
Access to climate adaptation science
Means for learning about climate adaptation

8. Is making decisions about natural resource policy, management, or programs part of your job?
Yes
No. I do NOT make decisions about natural resource policy, management, or programs.

9. Have you produced climate adaptation science through an affiliation with the [INSERT REGION] CSC (e.g., as CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC) or otherwise? As a reminder, by "climate adaptation science," we mean "science that helps fish, wildlife, ecosystems, and the communities they support adapt to climate change." (Select one option)

I have produced climate adaptation science through an affiliation with the [INSERT REGION] CSC
I have produced climate adaptation science but never through an affiliation with the [INSERT REGION] CSC
No, I have not produced climate adaptation science

10. What is your affiliation? (Select all that apply)
Federal agency
Tribal government
State agency
University
Non-profit organization
Other

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Appendix E. Comparison of Respondent (Web-based) and Nonrespondent (Phone) Surveys

1. To what extent does your work involve climate adaptation science, or management or policy related to climate change adaptation? (Select one option)

Answer Options	Not at all	To a small extent	To a moderate extent	To a large extent	To a very large extent
Phone respondents	5.7%	34.0%	18.9%	20.8%	20.8%
North Central web-based respondents	0.0%	24.4%	30.7%	24.4%	20.5%
Southwest web-based respondents	0.0%	10.8%	23.8%	31.5%	33.8%
All web-based respondents	0.0%	19.1%	28.1%	27.2%	25.7%

2. How serious of a threat do you believe that climate change is to natural resources, relative to other stressors? (Select one option)

Answer Options	Much lesser threat	Lesser threat	Similar threat	Greater threat	Much greater threat
Phone respondents	0.0%	6.4%	31.9%	36.2%	25.5%
North Central web-based respondents	1.0%	6.2%	37.3%	34.2%	21.2%
Southwest web-based respondents	0.0%	2.3%	32.0%	49.2%	16.4%
All web-based respondents	0.6%	4.7%	35.2%	40.2%	19.3%

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3. How important do you believe it is that managers or policy makers take action now in the [INSERT REGION] to address climate change threats? (Select one option)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important
Phone respondents	0.0%	2.0%	12.0%	28.0%	58.0%
North Central web-based respondents	0.0%	6.3%	8.9%	34.4%	50.5%
Southwest web-based respondents	0.0%	0.0%	13.4%	25.2%	61.4%
All web-based respondents	0.0%	3.8%	10.7%	30.7%	54.9%

4. Which statement best characterizes your relationship with the [INSERT REGION] Climate Science Center (CSC)? (Select one option)
   I have never heard of the [INSERT REGION] CSC. (If selected, skip to question 8)
   I have heard of the [INSERT REGION] CSC, but have no interest in or involvement with it. (If selected, skip to question 8)
   I have had no involvement with the [INSERT REGION] CSC, but someone else in my agency or organization has. (If selected, skip to question 8)
   I have had at least some interest in or involvement with the [INSERT REGION] CSC.

Answer Options	Haven't heard	No interest/ involvement	Someone else involved	Some involvement/ interest
Phone respondents	8.0%	18.0%	28.0%	46.0%
North Central web-based respondents	0.0%	5.2%	10.3%	84.5%
Southwest web-based respondents	0.0%	1.6%	10.2%	88.3%
All web-based respondents	0.0%	3.7%	10.2%	86.0%

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5. How long (in years) have you been involved with the CSC? (Fill in number of years, or zero, if none)

Answer Options	Years
Phone respondents	3.6
North Central web-based respondents	3.1
Southwest web-based respondents	3.5
All web-based respondents	3.3

6. How frequently did you interact with following representatives of the CSC in your region in the last year?
   6a. US Geological Survey CSC staff

Answer Options	Not at all	Up to a few times a year	About once a month	Up to a few times a month	More than once a week
Phone respondents	27.3%	50.0%	18.2%	4.5%	0.0%
North Central web-based respondents	10.8%	52.5%	14.6%	15.8%	6.3%
Southwest web-based respondents	9.1%	60.0%	7.3%	16.4%	7.3%
All web-based respondents	10.1%	55.6%	11.6%	16.0%	6.7%

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6b. How frequently did you interact with following representatives of the CSC in your region in the last year? University leads or PIs for the CSC

Answer Options	Not at all	Up to a few times a year	About once a month	Up to a few times a month	More than once a week
Phone respondents	26.1%	39.1%	30.4%	4.3%	0.0%
North Central web-based respondents	26.3%	42.3%	16.7%	9.6%	5.1%
Southwest web-based respondents	23.6%	40.9%	10.0%	10.0%	15.5%
All web-based respondents	25.2%	41.7%	13.9%	9.8%	9.4%

7. How important are each of the following benefits of the [INSERT REGION] CSC to you?

7a. Source of funding for climate adaptation science. (Select one option for each – Not at all important, Slightly important, Moderately important, Important, Very important)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important
Phone respondents	39.1%	17.4%	21.7%	4.3%	17.4%
North Central web-based respondents	17.9%	16.7%	14.7%	22.4%	28.2%
Southwest web-based respondents	13.4%	8.9%	16.1%	25.0%	36.6%
All web-based respondents	16.0%	13.4%	15.3%	23.5%	31.7%

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7b. How important are each of the following benefits of the [INSERT REGION] CSC to you? Access to climate adaptation science. (Select one option for each – Not at all important, Slightly important, Moderately important, Important, Very important)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important
Phone respondents	13.0%	4.3%	39.1%	30.4%	13.0%
North Central web-based respondents	4.5%	10.8%	17.2%	36.3%	31.2%
Southwest web-based respondents	6.3%	10.7%	12.5%	34.8%	35.7%
All web-based respondents	5.2%	10.8%	15.2%	35.7%	33.1%

7c. How important are each of the following benefits of the [INSERT REGION] CSC to you? Means for learning about climate adaptation
(Select one option for each – Not at all important, Slightly important, Moderately important, Important, Very important)

Answer Options	Not at all important	Slightly important	Moderately important	Important	Very important
Phone respondents	13.0%	17.4%	34.8%	21.7%	13.0%
North Central web-based respondents	5.7%	13.4%	21.0%	30.6%	29.3%
Southwest web-based respondents	8.0%	15.2%	25.0%	29.5%	22.3%
All web-based respondents	6.7%	14.1%	22.7%	30.1%	26.4%

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8. Is making decisions about natural resource policy, management, or programs part of your job?
   Yes
   No. I do NOT make decisions about natural resource policy, management, or programs.

Answer Options	Yes	No
Phone respondents	58.0%	42.0%
North Central web-based respondents	33.7%	66.3%
Southwest web-based respondents	39.2%	60.8%
All web-based respondents	35.9%	64.1%

9. Have you produced climate adaptation science through an affiliation with the [INSERT REGION] CSC (e.g., as CSC staff; university faculty, staff or students funded by or affiliated with the CSC; others funded by the CSC) or otherwise? As a reminder, by "climate adaptation science," we mean "science that helps fish, wildlife, ecosystems, and the communities they support adapt to climate change." (Select one option)

   I have produced climate adaptation science through an affiliation with the [INSERT REGION] CSC
   I have produced climate adaptation science but never through an affiliation with the [INSERT REGION] CSC
   No, I have not produced climate adaptation science

Answer Options	Yes through CSC	Yes, not through CSC	No
Phone respondents	22.0%	34.0%	44.0%
North Central web-based respondents	34.6%	23.1%	42.3%
Southwest web-based respondents	40.2%	24.6%	35.2%
All web-based respondents	36.8%	23.7%	39.5%

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10. What is your affiliation?

10a. Federal agency (Select all that apply)

Answer Options	Yes, Federal agency
Phone respondents	56.0%
North Central web-based respondents	37.6%
Southwest web-based respondents	41.5%
All web-based respondents	39.1%

10b. What is your affiliation? Tribal government (Select all that apply)

Answer Options	Yes, Tribal government
Phone respondents	8.0%
North Central web-based respondents	1.5%
Southwest web-based respondents	0.8%
All web-based respondents	1.2%

10c. What is your affiliation? State agency (Select all that apply)

Answer Options	Yes, State agency
Phone respondents	14.0%
North Central web-based respondents	10.2%
Southwest web-based respondents	11.5%
All web-based respondents	10.7%

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10d. What is your affiliation? University (Select all that apply)

Answer Options	Yes, University
Phone respondents	28.0%
North Central web-based respondents	33.2%
Southwest web-based respondents	36.2%
All web-based respondents	34.3%

10e. What is your affiliation? Non-profit organization (Select all that apply)

Answer Options	Yes, Non-profit organization
Phone respondents	10.0%
North Central web-based respondents	13.2%
Southwest web-based respondents	10.0%
All web-based respondents	11.9%