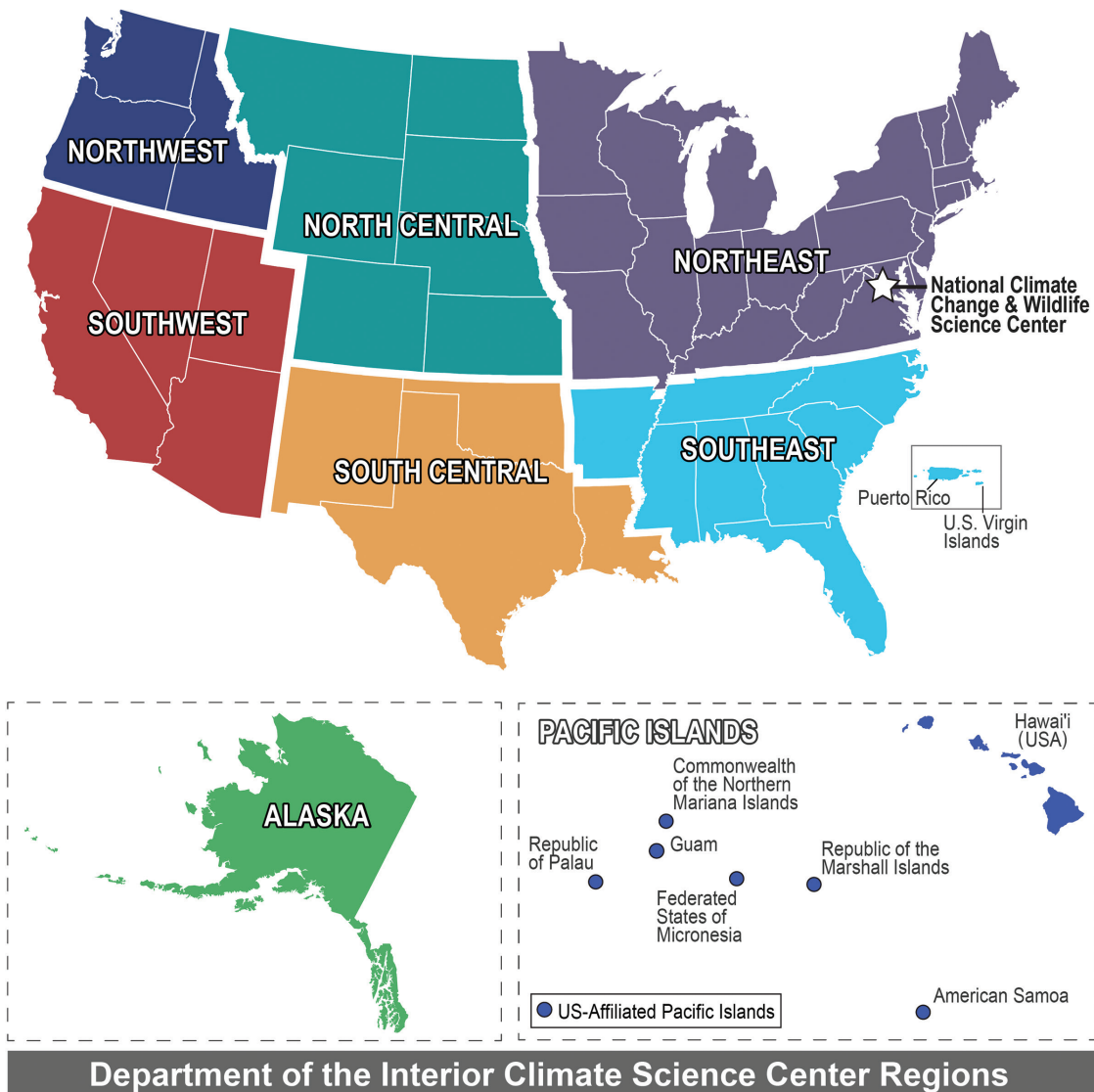


Five-Year External Reviews of the Eight Department of Interior Climate Science Centers

Southeast Climate Science Center



March 2017

American Fisheries Society
Cornell University Human Dimensions Research Unit
U.S. Geological Survey

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Cover image: 2016 map of the Climate Science Center regions and consortia. U.S. Geological Survey, www.sciencebase.gov.

Five-Year External Reviews of the Eight Department of Interior Climate Science Centers

Southeast Climate Science Center

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Executive Summary

In 2008, the U.S. Congress authorized the establishment of the National Climate Change and Wildlife Science Center (NCCWSC) within the U.S. Department of Interior (DOI). Housed administratively within the U.S. Geological Survey (USGS), NCCWSC is part of the DOI's ongoing mission to meet the challenges of climate change and its effects on wildlife and aquatic resources. From 2010 through 2012, NCCWSC established eight regional DOI Climate Science Centers (CSCs). Each of these regional CSCs operated with the mission to "synthesize and integrate climate change impact data and develop tools that the Department's managers and partners can use when managing the Department's land, water, fish and wildlife, and cultural heritage resources" (Salazar 2009). The model developed by NCCWSC for the regional CSCs employed a dual approach of a federal USGS-staffed component and a parallel host-university component established competitively through a 5-year cooperative agreement with NCCWSC. At the conclusion of this 5-year agreement, a review of each CSC was undertaken, with the Southeast Climate Science Center (SE CSC) review in February 2016.

The SE CSC is hosted by North Carolina State University (NCSU) in Raleigh, North Carolina, and is physically housed within the NCSU Department of Applied Ecology along with the Center for Applied Aquatic Ecology, the North Carolina Cooperative Fish and Wildlife Research Unit (CFWRU), and the North Carolina Agromedicine Institute. The U.S. Department of Agriculture Southeast Regional Climate Hub is based at NCSU as is the National Oceanic and Atmospheric Administration (NOAA) Southeast Regional Climate Center, the North Carolina Institute for Climate Studies, the North Carolina Wildlife Resources Commission, the NOAA National Weather Service, the State Climate Office of North Carolina, and the U.S. Forest Service Eastern Forest Environmental Threat Assessment Center. This creates a strong core of organizations operating in close proximity focused on climate issues.

The geographic area covered by the SE CSC represents all or part of 16 states and the Caribbean Islands and has overlapping boundaries with seven Landscape Conservation Cooperatives (LCCs): Appalachian LCC, Eastern Tallgrass Prairie and Big Rivers LCC, Gulf Coast Prairie LCC, Gulf Coastal Plains and Ozarks LCC, Peninsular Florida LCC, South Atlantic LCC, and Caribbean LCC. The SE CSC region also encompasses 134 U.S. Fish and Wildlife Service refuges and 89 National Park Service (NPS) units and is home to 11 federally recognized and 54 state recognized tribes.

The review had four primary objectives:

1. Evaluate the effectiveness of the CSC in meeting the project goals;
2. Assess the level of scientific contribution and achievement of the CSC with respect to climate modeling, climate change impacts assessments, vulnerability and adaptation of fish, wildlife, and habitats, and collaborative development of adaptation strategies for regional stakeholders;
3. Evaluate the competencies and efficiencies of each CSC host university in managing the administrative and program requirements; and
4. Aid NCCWSC in developing improved requirements for recompetition of the next university hosting agreements.

This report primarily addresses the first two purposes of the review while providing comments on the third as identified by the science review team. A separate report of recommendations for the recompetition, based upon compiled observation from all three reviews conducted in 2016, was submitted to NCCWSC on April 15, 2016 to assist with the development of recompetition documents. To further address host-university administrative competencies and efficiencies, separate interviews of host-university faculty and administrators were conducted by NCCWSC staff in conjunction with the on-site component of the reviews.

The review of the SE CSC was conducted as a project of the Cornell University Human Dimensions Research Unit (HDRU) in conjunction with the American Fisheries Society as a subcontractor. The review

was conducted in two parts: an on-site review by a 7-person science review team (SRT) and a subsequent Web-based survey of science users and producers. The SRT was chaired by a USGS science center director selected from outside of NCCWSC but with knowledge and interest in CSC activities. A second SRT member was a CSC federal director from one of the other seven CSCs. The five other SRT members were selected based upon a national solicitation of experts in the field of climate science and the impacts of climate change on fisheries, wildlife, and related environmental and cultural issues. The 7-member team was also selected to represent a variety of federal agencies and universities. The review was conducted on February 24–26, 2016 at the SE CSC offices on the campus of NCSU.

Prior to the on-site review, relevant SE CSC documents were compiled for examination by the SRT. These documents include the hosting cooperative agreement, annual reports, strategic plans, annual work plans, call for proposals, examples of communications documents, and access to all individual research project reports and publications. The on-site review consisted of a series of presentations, structured interviews, panel discussions, and informal dialogues between the members of the SE CSC and the SRT. A general design for the review was based upon the work of the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS), a federal advisory committee of NCCWSC. This defined four major review components:

- **Institutional development:** Measure the overall health of the CSC as an institution, with an emphasis on planning processes, management and operations, finances, and institutional coordination.
- **Actionable science:** Characterize performance of the CSC in providing relevant and useful scientific products and services, with an emphasis on the relevance, quality, processes, accessibility, and impact of research and science products and services carried out directly by the CSC and through its external grant funding.
- **Capacity building:** Address how well the CSC is building capacity for conducting and applying actionable science, with an emphasis on formal training (e.g., of graduate students and postdoctoral fellows) and providing training and capacity building to the broader community in how to use and apply climate science and services.
- **Partnerships:** Appraise the effectiveness of the CSC in working with partner organizations beyond the CSC consortium itself, which is included under institutional development, with an emphasis on breadth and scope of engagements and leverage.

The HDRU component of the review focused on evaluating the partnership aspects of the CSC and was designed to measure the quality and extent of partnership involvement at each CSC. This component of the CSC review consisted of two activities: a series of group interviews conducted as part of the on-site review and a standardized Web-based survey that was completed after the on-site review and focused on the following questions:

- To what extent are science users and producers involved with the CSC?
- What are the predictors 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 coproduction of actionable science? What are the predictors of this involvement?
- To what extent does the CSC play a role as a boundary organization, facilitating the coproduction of actionable science? What characterizes that role?

The work of the SRT resulted in 23 recommendations that are detailed in the report. To a substantial degree, the SRT found the SE CSC performed very well in addressing all of the main goals of the regional CSC model. The partnership with NCSU was both wide and deep. Programs such as the Global Change Fellows, the Global Environmental Change faculty, and Global Change Forum engaged faculty and graduate students from throughout the institution in a very positive, interdisciplinary manner. The reinvest-

ment of university facilities and administrative (F&A) funds into the SE CSC, resulting in the hiring of a full-time program coordinator, was also mutually beneficial. There was clearly an investment by NCSU into the success of the SE CSC and the result was a concrete value-added relationship that seemed to be appreciated by all parties involved. In return, the SE CSC was recognized as an increasingly useful organization not just for the additional direct science products, but also as a vehicle to convene faculty and create collaborative opportunities that wouldn't have existed without the SE CSC.

The commitment of the SE CSC to exploring and developing the coproduction of actionable science was evident throughout the discussions and by the SE CSC funding of research into the approach. This clearly is in line with the recommendations of ACCCNRS and will be integral to the future direction of the SE CSC. This does lead to serious and substantial questions that the SE CSC and NCSU will need to address, such as issues of scale, the challenge of understanding the real needs of users including a complete analysis of the actionable science pathway to ascertain the full usability of the products, and the concomitant expectations that this places on the users to be similarly dedicated to this pursuit. Indeed, the HDRU survey found that while science was being made available to decision makers, relatively few respondents felt as though the information was being used to inform or influence decisions. This issue deserves greater attention both to validate such survey findings and, if substantiated, to better understand why such a situation exists and how to develop and transfer science in order to make it more usable and impactful. The burden of this should not be placed solely on the SE CSC, but it is a challenge that should receive support of the CSC network and NCCWSC, as well as external funding sources.

Closely related to the issue of the coproduction of actionable science was the level of continued engagement by the SE CSC stakeholder advisory committee (SAC) variously described by presenters as a science planning team, the Science Implementation Panel, or the Science Advisory Committee, which is composed of LCC staff and various agency representatives. The SRT found the SAC to be underdeveloped and underutilized and that the SE CSC would benefit from a re-evaluation of the role of the SAC as well as a common definition of and clear and distinct role for the science advisory body. The SRT recognizes that each CSC develops a structure somewhat unique to the environment in which it operates. A clarification of roles and revision or modification of the CSC SAC Terms of Reference document (NCCWSC 2014) would help participants better understand the roles and contributions of these regional, science advisory committees.

Given the resources available to the SE CSC in relation to the expansive geographic operational area, the SRT found that the research products were reasonably dispersed, albeit with some anticipated bias towards North Carolina simply as a result of logistical pragmatism. However, the sentiment that the SRT received was that there were areas that they felt were underserved and somewhat distanced from the SE CSC. The SRT is hesitant to recommend that the SE CSC pursue a consortium model such as is done in multiple other CSCs. Such dispersion without additional resources, careful planning, and very effective partners could simply dilute the success of the SE CSC and result in little additional value. However, the identification and nurturing of another strategically located university or other partner would help ensure coverage of the Southeast and may be a useful strategy.

In addition to exploring this possible partnership with other universities, the opportunity to more effectively integrate the SE CSC with existing USGS science entities was considered to be an effective investment. The SE CSC does currently work with a limited number of USGS science centers and some of the CFWRUs. However, there are others that would be potential partners and may provide the geographic diversity that is needed to address some of the concerns expressed by the SRT.

Abbreviations and Acronyms

ACCCNRS	Advisory Committee on Climate Change and Natural Resource Science
AFS	American Fisheries Society
AFWA	Association of Fish and Wildlife Agencies
CFWRU	Cooperative Fish and Wildlife Research Unit
CLU	Climate and Land Use Change
CSC	Climate Science Center
CSC-Federal	Federal USGS-staffed component of the CSC
CSC-University	Host-university component of the CSC
DOI	U.S. Department of Interior
F&A	facilities and administrative
FY	fiscal year
GCF	Global Change Forum
HDRU	Cornell University Human Dimensions Research Unit
LCC	Landscape Conservation Cooperative
NCCWSC	National Climate Change and Wildlife Science Center
NCSU	North Carolina State University
NCTC	National Conservation Training Center
NGO	nongovernmental organization
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NW CSC	Northwest Climate Science Center
NWR	National Wildlife Refuge
OAG	Office of Acquisition and Grants
PI	principal investigator
RFP	request for proposal
RISA	Regional Integrated Sciences and Assessment
SAC	stakeholder advisory committee
SECAS	Southeast Conservation Adaptation Strategy
SE CSC	Southeast Climate Science Center
SERAP	Southeast Regional Assessment Project
SERCC	Southeast Regional Climate Center
SERCH	Southeast Regional Climate Hub
SERDP	Strategic Environmental Research and Development Program
SIP	Science Implementation Panel
SRT	science review team
TOR	Terms of Reference
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

Introduction

Review Purpose

In 2008, the U.S. Congress authorized the establishment of the National Climate Change and Wildlife Science Center (NCCWSC) within the U.S Department of Interior (DOI)¹. Housed administratively within the U.S. Geological Survey (USGS), NCCWSC is part of the DOI's ongoing mission to meet the challenges of climate change and its effects on wildlife and aquatic resources (TWS and ESA 2009). Further direction for NCCWSC was set forth in 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; Salazar 2009). Through this order, the original concept of eight "climate hubs" was redefined into the DOI Climate Science Centers (CSCs) and their mission was slightly expanded to "synthesize and integrate climate change impact data and develop tools that the Department's managers and partners can use when managing the Department's land, water, fish and wildlife, and cultural heritage resources" (Salazar 2009). As a result, NCCWSC established eight regional DOI CSCs from 2010 through 2012 (Figure 1) and has responsibility for their management. For the structure of the CSCs, NCCWSC developed a dual approach model that employs a federal USGS-staffed component (CSC-Federal) and a parallel host-university component (CSC-University), established competitively through a 5-year cooperative agreement with NCCWSC.

The first three regional CSCs, located in Alaska, the Pacific Northwest, and the Southeast, were established in 2010 (USGS 2011). These CSCs have completed their initial 5-year project cycle and are into their sixth year through a 1-year funding extension. As such, the university hosting agreements for these CSC regions are subject to a recompetition process by USGS for the host university. As part of the recompetition process, NCCWSC, with the engagement of the American Fisheries Society (AFS) and the Cornell University Human Dimensions Research Unit (HDRU), coordinated an operational and programmatic review and evaluation of the host universities to ensure that established goals and obligations under the hosting agreements were being met, as well as to identify obstacles and areas of improvement for future agreements.

This report covers only the findings from the programmatic evaluation of the first two goals of the Southeast Climate Center (SE CSC) review conducted by AFS and the HDRU and does not include any findings or discussions from the operational review conducted by NCCWSC. This report also does not discuss the fourth goal of developing recompetition recommendations, which were submitted to NCCWSC in a separate report.

NCCWSC and CSC Missions and Guiding Principles

In developing a review for the CSCs, it is important to understand their fundamental roles and audiences, as well as the services that they are expected to provide. The most basic documents for understanding this are the mission statements that NCCWSC and the CSCs have developed, based, in large part, on the directive provided in Secretarial Order 3289 (Salazar 2009). Their mission statements vary only slightly, with the CSCs including cultural resources in addition to the fish and wildlife emphasis of NCCWSC.

The mission of NCCWSC is to provide natural resource managers with the tools and information they need to develop and execute management strategies that address the impacts of climate change on fish, wildlife and their habitats. [USGS 2013.]

The mission of the DOI CSCs is to provide natural and cultural resource managers with the tools and information they need to develop and execute management strategies that address the impacts of climate change on a broad range of natural and cultural resources. [USGS 2013.]

¹ Consolidated Appropriations Act of 2008, Public Law 110–161, 110th Congress (26 December 2007). In this bill, NCCWSC was referred to as the National Global Warming and Wildlife Science Center.

Department of the Interior Climate Science Center (CSC) Regions

The CSCs collaborate across boundaries to address shared ecosystems, watersheds, and landscapes

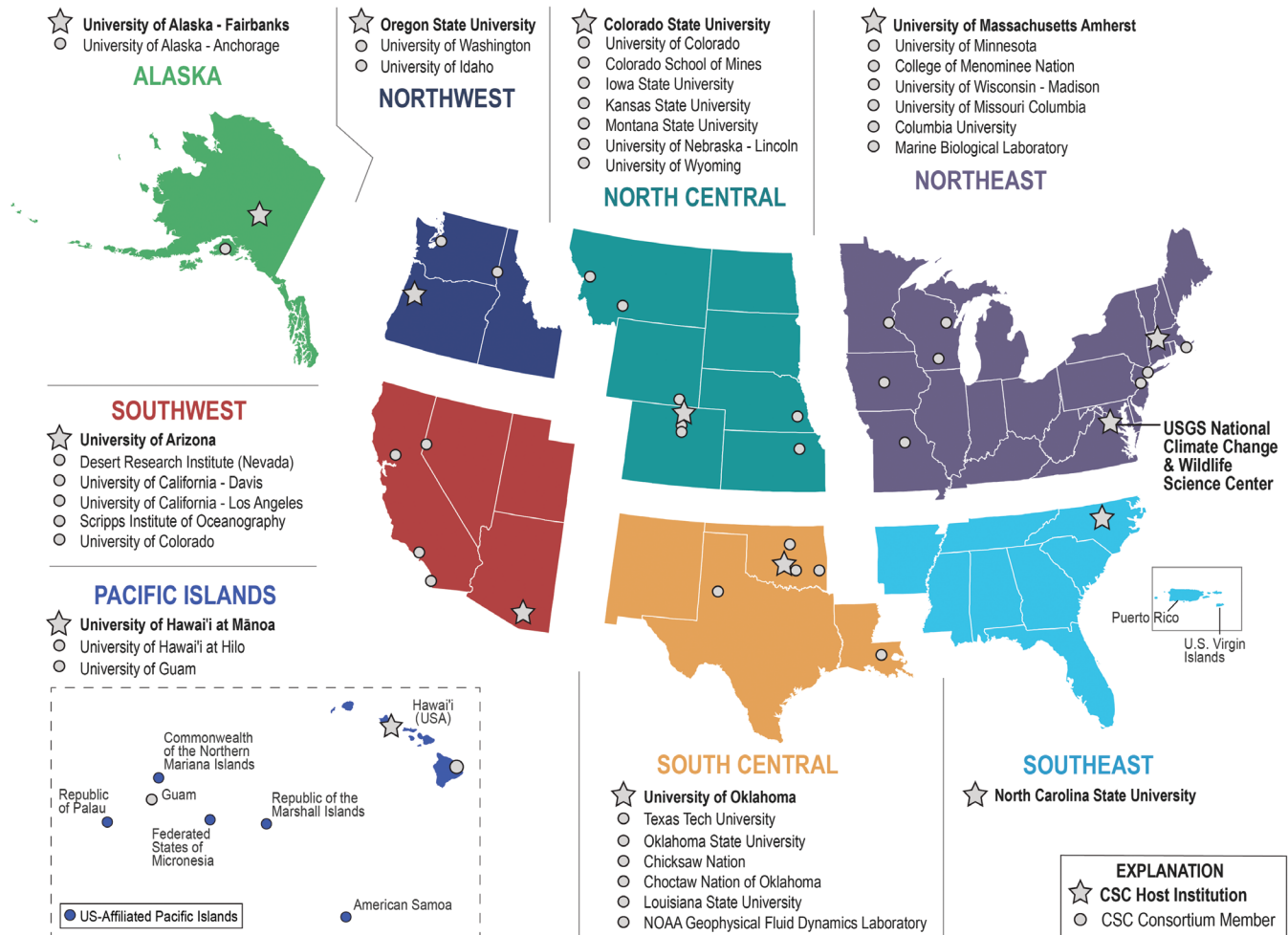


Figure 1. Map of the eight Climate Science Centers and consortia.

The NCCWSC strategic plan (2009–2014) was developed to guide the efforts of the NCCWSC–CSC network (USGS 2009). The plan states three basic goals:

- 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.
- 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.
- Deliver these relevant tools and information in a timely and useful way directly to resource managers.

The NCCWSC strategic plan also identifies priority scientific activities to help meet its mission and goals:

- Use and create high-resolution climate modeling information and derivative products in order to produce key information that is needed to forecast ecological and population response at national, regional, and local levels.
- Integrate physical climate models with ecological, habitat, and population response models.
- Forecast fish and wildlife population and habitat changes in response to climate change.
- Assess the vulnerability and risk of species and habitats to climate change.

The purpose of the Climate Science Center review was to

- Evaluate the effectiveness in meeting the project goals;
- Assess the level of scientific contribution and achievement with respect to climate modeling, climate change impacts assessments, vulnerability and adaptation of fish, wildlife, and habitats, and collaborative development of adaptation strategies for regional stakeholders;
- Evaluate the competencies and efficiencies of each Climate Science Center host university in managing the administrative and program requirements; and
- Aid the National Climate Change and Wildlife Science Center in developing improved requirements for recompetition of the next university hosting agreements.

- Develop standardized approaches to modeling and monitoring techniques in order to facilitate the linkage of existing monitoring efforts to climate models and ecological/biological response models.

The NCCWSC strategic plan states that a key component of the NCCWSC–CSC network is to work with partners. Two major groupings of partners include (1) science partners (e.g., federal agencies, universities, scientific societies, and other nongovernmental organizations [NGOs]) and (2) conservation partners, which cover a broad category of those working to apply conservation (e.g., state and federal natural resources agencies, conservation NGOs). It is important to note that these two primary partner groups are not discrete and sometimes have overlapping membership. For example, many conservation partners are also science producers (e.g., Ph.D.-level U.S. Fish and Wildlife Service [USFWS] biologists). A major indicator of success of the NCCWSC–CSC network is, therefore, the degree to which partners are effectively engaged and benefit from the work of the NCCWSC–CSC network.

Recognizing that no single agency or organization has the capacity to effectively address the challenges of climate change, the DOI, through Secretarial Order 3289, launched a network of Landscape Conservation Cooperatives (LCCs) around the same time period as the establishment of NCCWSC and then the CSCs (Salazar 2009). The LCCs were developed to organize and coordinate large-scale conservation efforts through a partnership approach. The LCCs are primary CSC partners and consist of natural and cultural resource managers from federal, state, tribal, and other entities whose mandate is to work collectively to identify key resource issues and provide information and other support for integrated, landscape-scale conservation planning. The LCC network currently includes 22 geographic units across North America, the Caribbean, and U.S.-affiliated Pacific Islands, delivering unprecedented collaboration across jurisdictional boundaries (Figure 2).

The process of identifying the CSCs began in fiscal year 2010 with the identification of the University of Alaska as the location for the first CSC, after which the USGS initiated a competitive selection of host institutions for the additional centers (NCCWSC 2011). The Alaska, Northwest, and Southeast CSCs were formally established in September 2010, with fiscal year 2010 funds (NCCWSC 2011). Implementation of the Southwest and North Central CSCs was delayed by the late passage of appropriations legislation for fiscal year 2011, and these centers were established in June 2011 (NCCWSC 2011). The final three CSCs were established formally in March 2012 (Northeast, South Central, and Pacific Islands), completing the planned suite of eight regional CSCs (Varela-Acevedo and O'Malley 2013).

The NCCWSC–CSC network is committed to a partnership-driven model (NCCWSC 2011). As such, the CSC scientific agenda is not driven by an a priori national science agenda, but rather through the identified needs of the LCCs, as well as other land, water, wildlife, and other natural and cultural resource managers (NCCWSC 2011). All of the CSCs employ some form of a stakeholder advisory committee (SAC) as a means of formally engaging partners in the strategic direction of the CSC. The SAC provides

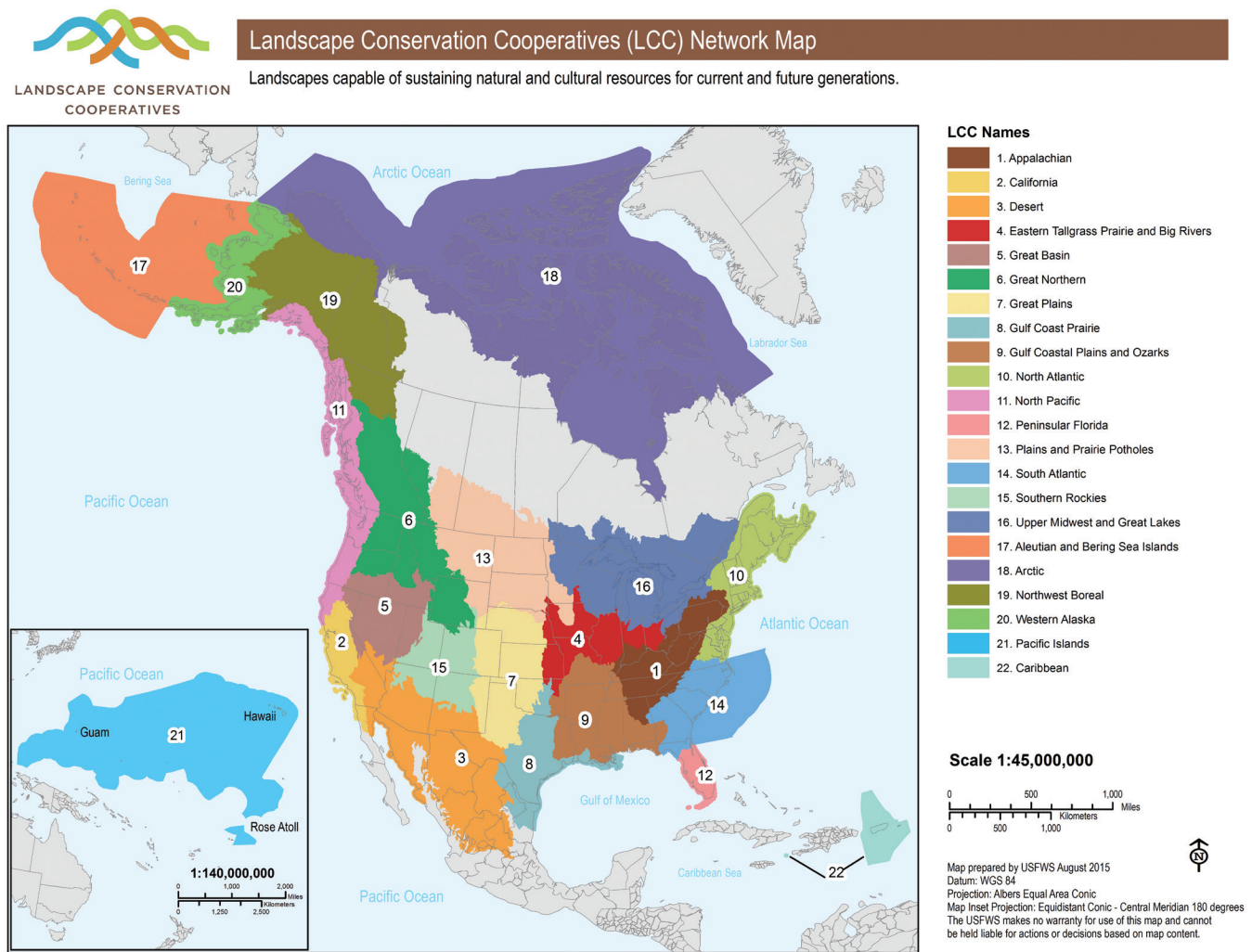


Figure 2. Map of the 22 Landscape Conservation Cooperatives.

a vehicle for building collaborative partnerships and identifying key regional science priorities. The National Climate Change and Wildlife Science Center established a set of guidelines (CSC Stakeholder Advisory Committee Terms of Reference [SAC TOR]) for the SACs, which defines membership, primary purpose, and other operating guidance (NCCWSC 2014). The CSC federal director, with input and guidance from its SAC, develops a 5-year strategic plan, as well as annual work plans, that drive science priorities and requests for proposals (RFPs; Jones and Dalton 2012). Regional priorities are similarly reconciled with input from NCCWSC, advisory committees, and other CSCs to build a higher level national-scale agenda. This supports the identification of multi-CSC needs and ideas in addition to the opportunity to more effectively leverage resources. Together, the NCCWSC–CSC network forms the cornerstones of DOI’s integrated approach to climate change science and adaptation and assesses climate impacts that typically extend beyond the borders of any single National Wildlife Refuge, national park, or Bureau of Land Management unit.

Review Process

Roles of AFS, the HDRU, and NCCWSC

The CSC evaluations consisted of two parts: an external programmatic review led by AFS and the HDRU and an internal operational review led by NCCWSC, which is not addressed in this report. To evaluate the

performance of the host university, AFS and the HDRU established a science review team (SRT) for each CSC. An SRT consisted of a team of five non-CSC affiliated experts selected through a national solicitation and review of credentials, as well as a nonvoting USGS science center director who served as chair and a CSC federal director from outside the reviewed CSC (both selected by the NCCWSC deputy chief; Appendix A). The American Fisheries Society was tasked with assembling the SRTs, developing review metrics, managing the on-site review process (data collection, interviews, and discussions), and developing review reports from evaluation findings, as well as logistical planning (travel, lodging, and food). HDRU investigators focused on the evaluation of CSC partnerships. During on-site reviews, the HDRU interviewed stakeholders and partners to assess the quality and extent of partnership involvement with the respective CSC. Using the interview data, the HDRU constructed a standardized survey that was sent out to all current and past CSC partners in each region to identify patterns of engagement with the CSCs, as well as barriers to engagement.

The SE CSC on-site review was conducted over a period of 3 days in Raleigh, North Carolina, on the campus of North Carolina State University (NCSU; Appendix B). The review process was designed to develop a full understanding of the SE CSC. The review included the administrative structure, foundational documents and processes (e.g., strategic and science planning), research projects, communications of results, and engagement of stakeholders and others in an actionable science pathway approach that includes assessment of the utility of the science products.

Program Evaluation Measures for CSCs

Currently, no satisfactory, systemwide CSC performance measures (e.g., specific deliverables or activities completed by given dates) exist. Each CSC was established within the general frameworks of both the NCCWSC and CSC missions and in response to the needs of their region. As described below, the SE CSC developed a strategic science and operational plan and annual work plans. These annual work plans establish objectives for the fiscal year (FY) within the six strategic science plan priorities. While these six science themes and the related annual work plan objectives could provide a basis for assessment, they are not consistent across the CSCs and are more reflective of activities than measures of impact. As a result, the construction of the CSC reviews sought other models upon which to construct the review process.

The Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS) is a multi-stakeholder federal advisory committee established by the DOI in 2012, chartered under the Federal Advisory Committee Act, to provide guidance and input on the overall NCCWSC–CSC network (USGS 2012). The committee has 25 members from the DOI, other federal agencies, state and local governments, tribal nations and partners, NGOs, academia, and the private sector (USGS 2012).

In the “Report to the Secretary of the Interior, March 30, 2015,” ACCCNRS provided recommendations to the Secretary of the Interior to enhance the CSC program, including program evaluation (ACCNRS 2015). The committee recommended that the following four-part framework be used when developing new CSC agreements and conducting CSC program evaluations:

- Institutional development: These measures are intended to capture the overall health of the CSC as an institution, with an emphasis on planning processes, management and operations, finances, and institutional coordination.
- Actionable science: These measures are intended to capture the performance of the center in providing relevant and useful scientific products and services, with an emphasis on the relevance, quality, processes, accessibility, and impact of research and science products and services carried out directly by the CSC and through its external grant funding.
- Capacity building: These measures are intended to capture how well the CSC is building capacity for conducting and applying actionable science, with an emphasis on formal training (e.g., of graduate

students and postdoctoral fellows) and providing training and capacity building to the broader community in how to use and apply climate science and services.

- **Partnerships:** These measures are intended to capture how well the CSC is working with partner organizations beyond the CSC consortium itself, which is included under institutional development, with an emphasis on breadth and scope of engagements and leverage.

HDRU Methodologies²

The partnership evaluation component of the CSC review was designed to measure the quality and extent of partnership involvement at each CSC. The activity focused on the following questions:

- To what extent are science users and producers involved with the CSC?
- What are the predictors 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 coproduction? What are the predictors of this involvement?
- To what extent does the CSC play a role as a boundary organization, facilitating the coproduction of actionable science? What characterizes that role?

This component of the CSC review consisted of two activities: a series of group interviews and a standardized Web-based survey.

Group interviews.—Two group interviews were conducted with partners of the SE CSC during the site visit. The purpose of the group interviews was to understand the range of perspectives and experiences of CSC partners in relation to their work with the SE CSC. Two groups were included: science producers (or science partners) and science users (or conservation partners).

Participants were recruited by the SE CSC with guidance from the HDRU. We attempted to include participants that represented a diversity of organizations and regions. Participants in the science producers group included faculty members, graduate students, and/or postdoctoral associates that had received research funding from the SE CSC. Participants in the science users group included representatives of agencies intended to benefit from the science produced by the SE CSC, including LCCs, federal natural resource agencies, state fish and wildlife agencies, tribal organizations, and NGOs. A total of 25 individuals participated in the two group interviews during the on-site visit, including 14 science producers and 11 science users.

Each interview consisted of a semi-structured conversation guided by a series of open-ended questions (Appendix C) and lasted approximately 2 hours. The questions were designed to explore how partners contributed to the work of the SE CSC and the factors that influenced the ability of the SE CSC to work with their partners. The specific topics of questions focused on how participants have worked with the SE CSC, reasons for becoming involved with the SE CSC, benefits of involvement with the SE CSC, challenges to involvement, and what the SE CSC could do to promote even more benefits from involvement. Additionally, we specifically explored how the SE CSC 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 SE CSC in connecting them.

Group interviews were conducted at each of the first three regional CSCs—Alaska, Northwest, and Southeast—and were used to inform the development of the survey. Thus, we do not report separately on their results.

Web-based survey.—A standardized, Web-based survey of partners and potential partners of the three CSCs was conducted. An initial sample for the survey was compiled from science producers and science users identified by each CSC, LCC staff and steering committee members within each CSC region, and

² The material in this section is a modified version of material presented in Dayer et al. (2016).

members of the Association of Fish and Wildlife Agencies (AFWA) Climate Science Committee. A total of 670 individuals were included in the survey sample. The results were analyzed by CSC region, with 142 total respondents from the Southeast region.

The survey documented the ways in which partners were engaged with the SE CSC and the factors affecting their engagement. The survey questions (Appendix D) were developed based on insights from the group interviews 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 adaptation science
- For science users,
 - o Use of climate adaptation science
 - o Limitations on use of climate adaptation science
 - o Importance of and engagement in coproduction of science
 - o Limitations on coproduction of science
- For science producers,
 - o Use of climate adaptation science produced by others
 - o Limitations on others' use of climate adaptation science
 - o Importance of and engagement in coproduction of science
- Perceptions of the role of the CSC

The survey instrument was reviewed by subject-matter experts, including NCCWSC staff, SRT members for each CSC, and other researchers. The same survey instrument was used for all the CSCs, with minor changes to reflect the region referenced.

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 five additional requests to complete the questionnaire by e-mail. The Web-based survey instrument was programmed and administered using SurveyMonkey, which provides a means of soliciting participation in a survey via e-mail and recording responses. SurveyMonkey 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 April 11, 2016 and concluded on May 9, 2016.

Institutional Development

The institutional development program evaluation component measures the overall health of the SE CSC as an institution, with regard to planning processes (e.g., 5-year strategic plans, annual science plans, advisory committees, and stakeholder engagement), management and operations (e.g., staffing, physical assets), finances (e.g., budget, hosting agreement), and institutional coordination (e.g., between CSC-Federal and CSC-University, among other consortia members, and with other federal agencies; ACCNRS 2015).

Overview of the SE CSC

The SE CSC is hosted by NCSU in Raleigh, North Carolina. The host university is a land-grant institution with capacity for extensive climate change research and services (Table 1). The U.S. Department of Agriculture (USDA) selected NCSU to host the Southeast Regional Climate Hub (SERCH). North Carolina

Table 1. The climate change research and services at North Carolina State University (NCSU).

Name	Host agency	Mission or purpose statement	Location
Southeast Regional Climate Hub	U.S. Department of Agriculture	Deliver science-based knowledge and practical information to farmers, ranchers, and forest landowners that will help them to adapt to climate change and weather variability by coordinating with local and regional partners in federal and state agencies, universities, nongovernmental organizations, private companies, and tribes.	NCSU
North Carolina Wildlife Resources Commission	State of North Carolina	Dedicated to the wise use, conservation, and management of the state's fish and wildlife resources and their habitats.	NCSU Centennial Campus
National Weather Service	National Oceanic and Atmospheric Administration (NOAA)	Provides hazardous weather warning information, as well as basic weather forecasts for much of the Piedmont and Coastal Plain of North Carolina.	NCSU Centennial Campus
North Carolina Cooperative Fish and Wildlife Research Unit	U.S. Geological Survey	Aims to address questions in fisheries and wildlife conservation and management that are of interest to state and federal natural resource management agencies, conservation organizations, and private landowners, including conserving and managing rare and endangered fish and wildlife, understanding the factors that affect fish population size and community composition, and developing habitat models.	NCSU Department of Applied Ecology
Eastern Forest Environmental Threat Assessment Center	U.S. Forest Service	To generate, integrate, and apply knowledge to predict, detect, and assess environmental threats to public and private forests of the east, and to deliver this knowledge to managers in ways that are timely, useful, and user friendly.	NCSU Centennial Campus
North Carolina Institute for Climate Studies	NOAA	To promote the discovery of new knowledge about global, regional, local climate variability and its impacts and to provide information that is critical for determining trends and validating climate forecasts at all of these spatial scales.	NCSU Office of Research, Innovation, and Economic Development

Table 1. Continued.

Name	Host agency	Mission or purpose statement	Location
State Climate Office of North Carolina	State of North Carolina	Extension efforts focus on providing climate services through direct contact, online databases and analysis tools, environmental monitoring, and routine climate summaries. We partner closely with other scientists in in agriculture, natural resources, public health, and water resource management to develop and deliver sector- focused climate services.	NCSU Centennial Campus

State University is also the host institution for the administrative and fiscal oversight of the North Carolina Institute for Climate Studies, a multi-campus institute of the University of North Carolina (UNC) System, funded by the National Oceanic and Atmospheric Administration (NOAA). North Carolina State University's Centennial Campus houses more than 70 government, industry, and nonprofit partners, including the North Carolina Wildlife Resources Commission, the NOAA National Weather Service, the State Climate Office of North Carolina, and the U.S. Forest Services (USFS) Eastern Forest Environmental Threat Assessment Center, along with more than 70 NCSU research and academic units (www.ncsu.edu/research). In 2007, UNC at Chapel Hill and NCSU were awarded the NOAA Southeast Regional Climate Center (SERCC; SCONC 2016).

The SE CSC is physically housed within the NCSU Department of Applied Ecology along with the Center for Applied Aquatic Ecology, the North Carolina Cooperative Fish and Wildlife Research Unit (CFWRU), and the North Carolina Agromedicine Institute. This extensive suite of research institutes creates significant potential for collaboration and can greatly enhance the research potential of the SE CSC.

There is also a history of climate change research at NCSU with the first Southeast regional-scale climate project, Southeast Regional Assessment Project (SERAP), being initiated at the university in 2009 (Jones and Dalton 2012). In anticipation of the CSCs and LCCs, the USGS and the Southeast region of the USFWS began SERAP, a large-scale, multidisciplinary project, to develop regional downscaled climate models, land cover change models, regional ecological models, regional watershed models, and other science tools to help answer resource management questions on potential impacts of climate change, land-use change, and sea-level rise on terrestrial and aquatic populations in the Southeast. In 2010, the project management of SERAP shifted to the SE CSC.

The geographic area covered by the SE CSC represents all or part of 16 states and the Caribbean Islands and has overlapping boundaries with seven LCCs: Appalachian LCC, Eastern Tallgrass Prairie and Big Rivers LCC, Gulf Coast Prairie LCC, Gulf Coastal Plains and Ozarks LCC, Peninsular Florida LCC, South Atlantic LCC, and Caribbean LCC (Figure 3; Jones and Dalton 2012). The SE CSC region also encompasses 134 USFWS refuges and 89 National Park Service (NPS) parks and is home to 11 federally recognized tribes and 54 state recognized tribes.

Funding for the SE CSC consists of two funding streams: (1) an annual allocation from USGS to conduct or support strategically important scientific activities that address science priorities at NCSU and the USGS science centers, either through RFPs or directed research projects (USGS allocations also cover salaries of the SE CSC federal researchers and a portion of the SE CSC federal director's salary), and (2) the cooperative agreement with the host university (hosting agreement), which is used for all components of university support, including faculty salaries and associated expenses, overhead costs, stipends for

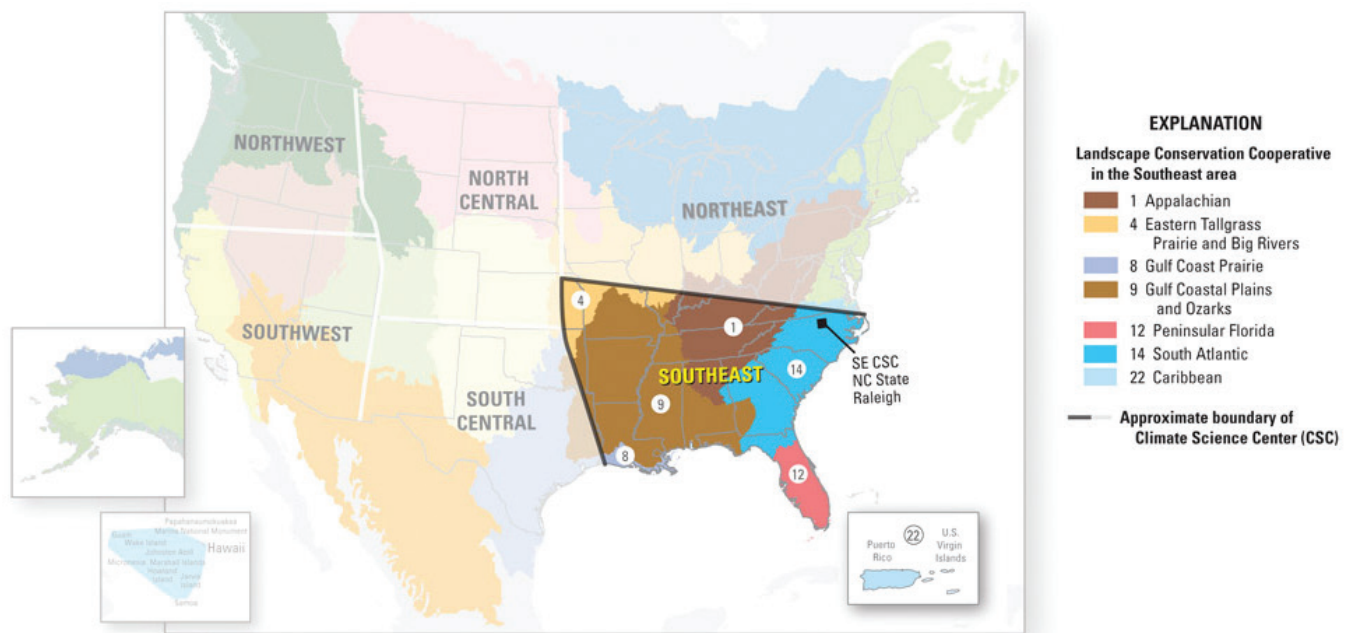


Figure 3. Locations of the Landscape Conservation Cooperatives in the Southeast area.

students and postdoctoral researchers, and all other aspects of university research administration and management. (The SE CSC receives the lowest hosting agreement base award in the CSC network [Table 2].)

SE CSC Operational and Strategic Planning

The SE CSC receives funding and oversight from NCCWSC, located at the USGS National Center in Reston, Virginia, as well as guidance for national science priorities, as part of the USGS Climate and Land-Use Change (CLU) mission area (Burkett et al. 2013). The USGS CLU science strategy (Burkett et al. 2013) specifically refers to NCCWSC and the CSCs as a major vehicle for addressing the document's

Table 2. Total Southeast Climate Science Center (SE CSC) funding (US\$) through the annual allocation to the federal component and the university consortium through the hosting agreement with North Carolina State University (NCSU). The allocation to NCSU is primarily used as a graduate student training grant. The allocation to U.S. Geological Survey (USGS) Southeast (SE) region science centers refers to funds directed to non-CSC-related USGS science centers in the Southeast region. The SE CSC federal staff payroll and travel budget is primarily devoted to support of SE CSC science projects, as well as coproduction-related convening (e.g. Landscape Conservation Cooperative meetings) and related activities.

Fiscal year	Annual allocation		SE CSC federal staff		Hosting agreement	Total expenditures
	NCSU	USGS SE science centers	Payroll	Travel		
2010	\$0	\$0	\$0	\$0	\$274,708	\$274,708
2011	\$0	\$0	\$0	\$0	\$299,445	\$299,445
2012	\$258,906	\$966,718	\$371,701	\$157,320	\$308,355	\$2,063,000
2013	\$657,990	\$656,463	\$274,042	\$26,505	\$317,556	\$1,932,556
2014	\$788,915	\$578,349	\$343,015	\$57,188	\$327,059	\$2,094,526
2015	\$859,534	\$336,624	\$425,528	\$54,110	\$327,059	\$2,002,856
2016	\$775,427	\$202,604	\$540,745	\$56,250	\$457,286	\$2,032,312
Total	\$3,340,772	\$2,740,758	\$1,955,031	\$351,373	\$2,311,468	\$10,699,403

seventh goal: “Improve understanding and prediction of biological responses to global climate change.” As an expression of this goal, the USGS vision statement was created: “The USGS will provide scientific knowledge needed to manage the Nation’s biological endowment affected by rapidly changing climate and land use” (Burkett et al. 2013). Furthermore, the science strategy (Burkett et al. 2013) identifies NCCWSC and the CSCs as one of the primary instruments for building collaborative partnerships and delivering science with particular emphasis on engagement with the LCCs, NGOs, and others.

The SE CSC is responsible for understanding and predicting climate change and variability in the southeastern United States and providing regional-scale science products and tools that address the local needs identified by its LCCs and other regional partners (Jones and Dalton 2012). Since its establishment in 2010, the SE CSC has been organized to accomplish three goals (Varela Minder et al. 2016):

1. Provide decision-focused, researched based information that supports transparent global change adaptation decisions.
2. Convene conversations among decision makers, scientists, and managers to identify: key ecosystem adaptation decisions driven by climate and land use change, the values and objectives that will be used to make decisions, and the research-based information needed to assess adaptation options.
3. Build the capacity of natural resource professionals, university faculty, and students to understand and frame natural resource adaptation decisions and develop and use research-based information to make adaptation decisions.

The SE CSC federal director reports to NCCWSC and is responsible for the SE CSC’s operations, including strategic decision making and administration of the SE CSC’s financial resources. Regarding finances, the technical officer of the cooperative agreement must confirm NCSU’s performance each year to the USGS Office of Acquisition and Grants (OAG), prior to allocation of the next year’s base award, and has direct responsibility for spending decisions related to USGS staffing and the annual science funds. The SE CSC federal director is also responsible for the preparation of

- SE CSC science and operational plan—This document describes the SE CSC’s operations and science priorities (Jones and Dalton 2012).
- Annual science work plans—The annual work plan is established at the fiscal year and provides specific guidance on coordination and implementation of science priorities during a 1- to 2-year period.
- Annual reports—While the hosting agreement stipulates an annual report by the university director, since 2011 a joint annual report has been developed by the SE CSC federal director and the SE CSC university director that summarizes the activities and achievements of the SE CSC during the previous fiscal year.

The SE CSC science and operational plan (2012–2017) was adopted in 2012 and describes the operational direction and overall goals of the SE CSC and establishes six major science themes, each with a set of tasks and near-term and long-term recommendations, to address information gaps in conservation science and management needs of the SE CSC’s regional partners (Jones and Dalton 2012).

The overall objectives of the SE CSC science and operational plan are that

The SE CSC will use long-term observational records and understanding of biological and physical processes that can be expressed in quantitative models to describe the consequences of global change on natural resources, provide scientifically valid information and tools that can be used to adapt resource management to changing environmental conditions, and apply these tools to produce regional assessments that are widely used by policy makers, resource managers, and the public. [Jones and Dalton 2012]

The SE CSC science and operational plan has six major science themes that guide the center’s strategic direction: (1) develop climate projections and determine appropriate projections to use for resource

management, (2) land use and land cover change projections, (3) impacts of climate change on water resources, (4) ecological research and modeling, (5) impacts of climate change on coastal and near-shore marine environments, and (6) impacts of climate change on cultural-heritage resources (Jones and Dalton 2012). These science themes were developed using management priorities identified by regional partners and stakeholders as well as SERAP, which was initiated in 2009 at NCSU in accordance with regional partners. The four main components of SERAP correspond collectively to five of the six science themes in the plan (Jones and Dalton 2012): (1) develop regionally downscaled probabilistic climate change projections (Theme 1), (2) integrated coastal assessment (Theme 5), (3) integrated terrestrial assessment (Themes 2 and 4), and (4) multi-resolution assessment of potential climate change effects on biological resources: aquatic and hydrologic dynamics (Themes 3 and 4). This allows research activities under the six science themes to build upon SERAP's previous work, using its data and completed products, to develop science products that inform managers on the potential future conditions and assess likely climate impacts that can be used to make informed management decisions (Jones and Dalton 2012).

The SRT recognizes that the first 5-year SE CSC science and operational plan was written to guide the center during its physical establishment and initial stages of operation. The science themes identified in the plan are broad and reflect the need for basic or applied research required to move data and models from the research environment to the operational environment where they are needed most (Jones and Dalton 2012). Furthermore, most of the science themes identified require a much greater time frame to address than the 5-year horizon of the plan. The science project portfolio of the SE CSC during the first 5 years included a mix of projects designed to help managers and scientists understand global changes processes and impacts at a regional scale, as well as projects designed to help managers use this information to help them make informed decisions. Although many projects during the first 5 years were not directly connected to specific management decisions identified by partners, they helped natural resource managers understand and become aware of potential management problems relating to climate change (Varela Minder et al. 2016).

The SE CSC annual reports for 2012–2014, while describing a diverse set of excellent projects and accomplishments, did not provide any mapping of work plans for proposed projects, such as goals, action steps, and a time frame related to accomplishments. For the SRT, this meant that a strict evaluation of deliverables against objectives was challenging. Furthermore, SE CSC annual reports and other administrative reporting documents were focused more on communicating to the conservation community the project accomplishments and future efforts with limited information on completion of strategic objectives, funding distribution, other funding contributions or match, administrative structure of the SE CSC, and other details on the financial and administrative management of the SE CSC.

Recommendations for SE CSC operational and strategic planning

- Future SE CSC strategic plans should have clearly defined objectives and deliverables and should be produced jointly with the CSC advisory bodies, LCCs, and CSC-University, with clearly defined roles and responsibilities for each entity.
- The SE CSC should view the expiration of the current science and operational plan in 2017 as an opportunity to incorporate additional goals and demonstrate how it is working to integrate these goals into a cohesive strategy.
- The SE CSC should include a tribal engagement strategy in its science plan that describes opportunities for collaboration between the SE CSC and the 54 Native American tribes within its geographic area.
- Implement an annual process that includes the development of an annual work plan and possibly two versions of an annual report: one being a fully documented report tied to the annual work plan (see next recommendation) and a second report designed to engage a broader, more general audience.

- The SE CSC–university partnership, with inclusion of comparable material from all university partners or research entities, should provide a complete annual report that addresses all financial components and research findings of the CSC-University agreement. This includes CSC-University funds leveraged into other projects, grants, and related activities, as well as any additional university contributions, such as indirect cost recovery. Mapping of annual action plan proposed work with accomplishments is recommended.

SE CSC SAC

The SE CSC federal director receives guidance on the regional science agenda from a SAC. The SAC seats are composed of both federal and nonfederal senior-level government agency executives throughout the southeastern United States. The SE CSC SAC is chaired by the USGS regional executive for the Southeast region. Current members include the USFWS Region 4 director, the NPS Southeast regional director, the NOAA regional climate services director, the USFS Region 8 forester, a representative from the Southeast AFWA, and the chair of the Southeast CSC LCC Advisory Committee (Jones and Dalton 2012).

The purpose, role, and membership of the SE CSC SAC is guided by NCCWSC through the CSC SAC TOR document (NCCWSC 2014).

During the initial phases of SE CSC development, the SAC was instrumental in scoping and setting the SE CSC’s strategic agenda by directing the work of a writing team and reviewing and approving the 5-year SE CSC science and operational plan. The management priorities provided by the SAC helped identify and develop strategic research-based information that could assist managers in the Southeast in making informed decisions regarding climate adaptation (Varela Minder et al. 2016). This strategic information was organized into six science themes with underlying tasks in the SE CSC science and operational plan (Jones and Dalton 2012).

However, after establishing the vision, objectives, and 5-year science agenda of the SE CSC, the SAC took a less active role, meeting every 2 to 3 years and providing counsel at the broadest level. This make sense since most of the highest ranking officials in the partner organizations are better suited for providing input on strategic management priorities, as well as guidance on developing the

The Climate Science Center Stakeholder Advisory Committee Terms of Reference

Purpose

Stakeholder Advisory Committees assist Climate Science Center (CSC) co-directors in the identification of regional natural and cultural resource management priorities and science needs. This guidance helps to shape the development and implementation of CSC strategic science plans and periodic funding actions. Stakeholder Advisory Committees are also crucial for providing feedback on the direction and effectiveness of the CSC program.

Roles and Responsibilities

- Provide counsel for the development and periodic updating of the regional science agenda (5-year) for the CSC.
- Provide counsel on the development of CSC planning and implementation documents, including periodic short-term science plans and strategic solicitation documents for periodic funding opportunities.
- Provide and facilitate feedback concerning how effectively CSC products meet the needs of stakeholders.

central mission and vision, rather than the tactical/operational guidance needed for a more mature SE CSC.

Other Advisory Committees

While the SAC provided the strategic direction to the SE CSC, ongoing year-to-year operation guidance on the science activities of the center were provided from several other sources. Landscape Conservation Cooperative coordinators meet with the SE CSC federal director on quarterly conference calls that provided an opportunity for two-way communication on science needs and project opportunities (Jones and Dalton 2012). This group, the SE CSC LCC Advisory Committee, is composed of LCC coordinators, designated LCC staff or a member of the LCC Steering Committee, and the SE CSC federal director. The chair of this committee serves on the SAC, representing the needs of the LCCs to the SAC, and is an annual rotating position among the respective LCC coordinators (Jones and Dalton 2012). Currently, the position is held by the Gulf Coastal Plains and Ozarks LCC coordinator. This committee also provides assistance and input to the Science Implementation Panel (SIP).

The SIP is composed primarily of LCC coordinators and science coordinators, along with representation of several federal agencies (USFWS, USFS, NOAA, NPS, and USGS; G. McMahon, SE CSC, personal communication). The SIP provides the SE CSC with guidance on the annual operational science priorities, which, in turn, guide the SE CSC annual science funding decisions (Jones and Dalton 2012; Varela Minder et al. 2016). The SIP also works with the SE CSC federal director to develop a strategy for allocating SE CSC science funds. During the first 5 years, both RFPs and directed science projects were used as mechanisms to distribute SE CSC science funds. Regardless of the funding mechanism, the SIP works with the SE CSC federal director to write the RFP or directed science project specifications for projects that meet SE CSC operational priorities, manage technical reviews of all proposed projects by independent researchers, and make funding recommendations to the SE CSC federal director (Jones and Dalton 2012). Science Implementation Panel members are not eligible to apply for SE CSC research funds.

Advisory committees have proven to be invaluable in scoping and in setting strategic approaches for new enterprises. The role and function of advisory committees inevitably change through time, especially when the enterprise is mature and is meeting the strategic vision. The SRT recommends that the SAC be reconvened to focus on mission and vision and that the SIP provide continued guidance on science priorities, RFPs, and reviews of project proposals.

While the SE CSC SIP includes LCC and federal agency staff, additional inclusion of practitioners, science users, and other mid-level managers such as the state agency resource manager may improve the ability of the SIP to effectively engage and reflect conservation practitioner climate science needs. The SIP would establish research priorities for the SE CSC, help screen grant proposals, and provide feedback on how well the CSC is using coproduction and how well CSC products are supporting climate adaptation decisions. This will ensure relevancy moving forward.

Most CSCs have a more or less formal SIP, but the composition of both the SAC and SIP could be reconsidered to take advantage of the resources and support across partners.

Recommendations for SE CSC Advisory Committees

- The SRT recommends that the SAC be reconvened and focus on SE CSC mission and vision and that the SIP provide operational oversight on annual science priorities.
- As the SE CSC continues to mature, more regular SAC meetings, possibly annually but at least every 2 years, are recommended to continue providing broad oversight and interagency coordination. Such meetings could include both a review of the state of science as well as an examination of strategic positioning of the CSC and re-evaluation of its future direction.
- It would be desirable for the SE CSC to establish a SIP composed of practitioners, science users, and other mid-level managers who are better versed in technical and science issues.

- The SIP would establish research priorities for the SE CSC, help screen grant proposals, and provide feedback on how well the CSC is using coproduction and how well CSC products are supporting climate adaptation decisions.
- A Terms of Reference document for the SIP should be created to provide guidance and direction similar to the CSC SAC TOR.

SE CSC Institutional Coordination

USGS and university host.—The SE CSC received strong support from NCSU, which was specifically conveyed to the SRT by NCSU Vice-Chancellor for Research Alan Rebar. The commitment to research by NCSU is important, and the university sees the SE CSC as a significant contributor to science development. The location of the SE CSC, physically in the Department of Applied Ecology, greatly facilitates interactions between SE CSC university staff and SE CSC federal staff; strong bonds between the two have been created. The SE CSC faculty have adjunct faculty status in the Department of Applied Ecology, can teach graduate-level courses, chair Master’s of Science committees, co-chair Ph.D. committees, collaborate on research projects, and attend faculty meetings. The members of the North Carolina CFWRU staff are also fully integrated into the Department of Applied Ecology. They hold academic rank but not tenure, teach graduate-level courses, chair committees, and collaborate on research projects.

Key examples of NCSU efforts that extended and integrated university programs with the SE CSC included the following:

- A cluster hire of faculty focused on global environmental change resulted in substantial new research linked, in many cases, directly to the work of the SE CSC. In fact, some of the hires specifically mentioned the work of the SE CSC as being a substantial component of the attractiveness of the NCSU hire.
- The Global Change Fellows Program (discussed further in the Capacity Building section) is a substantial effort by NCSU and the SE CSC to engage graduated students throughout the campus in a manner that facilitates interdisciplinary exchange among students and faculty.
- North Carolina State University hosts the Global Change Forum (GCF), a “The Global Change Forum is a virtual meeting place for researchers and resource managers in the conservation and production sectors. The GCF is hosted by North Carolina State University and fosters active collaboration among researchers and managers associated with the SE CSC and SERCH, as well as science colleagues around the world” (Global Change Forum, globalchange.ncsu.edu)
- North Carolina State University reinvests a substantial component of the F&A charges, after costs, back into the SE CSC. This has included support for the SE CSC program coordinator, student travel, invited speakers, and event support (e.g., the GCF).

This has resulted in a clear value-added relationship between NCSU and the SE CSC. The role played by the SE CSC federal director, and the general characterization of the CSC as being a vehicle and center for collaboration, was also clearly instrumental in making the partnership effective. It was noted by several presenters that the convening ability of the SE CSC was extremely valuable in gathering diverse, interdisciplinary groups to address challenging issues. The SRT found the relationship between these two entities to be creative and intellectually stimulating. In many ways, this level of engagement can serve as a model for other CSCs.

There were some challenges identified, but these primarily focused on administrative and bureaucratic hurdles. Researchers noted that there are often significant challenges in working with the USGS OAG with respect to processing grant documents. Even minor changes were noted as being problematic. The SRT has been informed that process improvements in OAG are being addressed and anticipates that this issue will be less troubling in the future.

With other university partners and federal agencies.—A key opportunity for the SE CSC is to act as a vehicle to broadly engage partners throughout the university community, as well as among federal agencies with resource management responsibility. As noted above, the SE CSC and NCSU have been exemplary in creating opportunities for engagement across the NCSU campus. Externally, the SE CSC has developed productive relationships with a number of key partners. Several USGS science centers have had investigators regularly funded, including the Wetland and Aquatic Research Center in Lafayette, Louisiana and Gainesville, Florida, as well as the North Carolina and Georgia CFWRUs.

The SE CSC has also been engaged in projects funded by several outside sources, including the National Science Foundation Coupled Human-Natural Systems Program for a project on human response to sea level rise impact natural systems in Florida (co-principal investigators: Drs. Terando, Costanza, and Meentemeyer), as well as through the U.S. Department of Defense/U.S. Environmental Protection Agency/U.S. Department of Energy, Strategic Environmental Research and Development Program (SERDP) in a project investigating animal coat color, phenology and evolution (principal investigators [PIs]: Drs. Mills, Terando, and Kays). A wide variety of projects have involved federal agency programs, such as climate impacts on USFWS National Wildlife Refuge (NWR) System and NPS properties.

Funding priorities for each year are set by the LCCs via the SIP and are reflected in a call for proposals and in directed projects. U.S. Geological Survey funding reflects success in participating in these RFPs or in being asked to be involved in directed projects. Neither NCSU nor USGS (via Southeast region or individual USGS science centers) is involved in development of science priorities, by design, to avoid conflict of interest issues.

However, the SRT noted that funding for USGS researchers (excluding SE CSC staff) has declined in recent cycles mirroring the increase in funds for NCSU research, although this may be an artifact of some early projects being completed (e.g., SERAP), where there was substantial USGS involvement. This suggests a declining engagement of USGS Southeast region science centers, as well as a decline in the opportunities for involvement.

Observations provided to the SRT included the following:

- Funding directed to the USGS Southeast region science centers has declined while funds allocated to SE CSC federal staff and NCSU researchers has increased over the 5-year period.
- The concern of possible duplication of efforts within USGS that may be a result of lack of awareness of SE CSC projects.
- Although opportunities exist for affiliation with the SE CSC, some USGS staff were unclear on how to engage with the SE CSC and/or were not aware of opportunities that may have been available.
- The HDRU survey evaluated a series of possible limitations to engagement, with time being paramount. However, specific written comments noted that the CSC can be insular, only affiliated faculty are competitive for grants, and the SE CSC federal staff does not reach out enough to faculty members to develop projects and garner support for projects.

While the SE CSC federal director has begun a monthly call to discuss ongoing projects and opportunities with the USGS Southeast region science center staff and directors, the SRT agreed that better mechanisms are needed to engage USGS Southeast region science centers in discussions of science needs. Better engagement could foster new scientific talent and increase Southeast region science center resources through salary and other match.

Suggestions for increasing USGS Southeast region science center engagement were discussed, including (1) broadening engagement and awareness of RFPs to attract scientists that have not been previously engaged, (2) continuing the monthly calls with regional staff and CSC directors, (3) increased visits to other USGS science centers to highlight the work of the SE CSC and opportunities for engagement, (4) increased dialog with USGS science centers concerning cost share and matching funds to increase resources, and (5) providing mechanisms to access the talent of the Global Change Fellows. The Global

Change Fellows could benefit from interaction with other centers during their education (e.g., through gained knowledge of science opportunities throughout the region), as well as after their completion (e.g., through hiring opportunities).

The SRT unanimously agreed that USGS scientists should have similar engagement with the SE CSC as scientists at NCSU, where 55 researchers from six colleges have become faculty affiliates of the SE CSC. The SE CSC would certainly benefit from having the breadth of USGS scientific expertise available to their community. Mechanisms promoting increased communication and engagement (e.g., exchange of knowledge, ideas, and personnel) between NCSU and USGS via the SE CSC should be promoted.

In general, the SRT found the SE CSC to have thoughtfully and energetically approached the challenge of working with the broad university community and with the extensive list of possible federal agency partners. There are severe limitations to what one entity with limited resources, such as the SE CSC, can accomplish with regard to fully engaging all possible partners. The HDRU survey suggested that there was, indeed, fairly extensive awareness of the SE CSC (see detailed results in Partnerships section). Most respondents (77%) expressed interest or involvement with the SE CSC.

With other CSCs.—The SE CSC federal director facilitated a jointly funded project with the Northeast CSC, “Understanding Conservation Management Decisions in the Face of Sea-Level Rise along the U.S. Atlantic Coast.” The SE CSC federal director has also reached out to the Northeast and Southcentral CSCs on a climate communication project. Additional opportunities to work with the Southcentral CSC exist, particularly along the Gulf of Mexico and some of the larger river systems that cross boundaries (e.g., Red, Arkansas, etc.). These should be explored more regularly and deliberatively.

Recommendations for SE CSC Institutional Coordination

- The SRT agreed that better mechanisms are needed to engage the USGS Southeast region staff in discussions of science needs other than just monthly calls.
- Suggestions for increasing USGS Southeast region engagement included (1) broadening RFPs to attract scientists that have not been previously engaged, (2) continuing the monthly calls with USGS Southeast region science center staff and directors, (3) increased visits to USGS Southeast region science centers to highlight the work of the SE CSC, (4) increased dialog with USGS Southeast region science center directors concerning cost share and matching funds to increase resources, and (5) providing mechanisms to access the talent of the Global Change Fellows.
- The SRT agreed that USGS scientists across the bureau should have a similar level of engagement with the SE CSC as scientists at NCSU. Mechanisms promoting increased communication and engagement (e.g. exchange of knowledge, ideas, and personnel) between NCSU and USGS via the SE CSC should be promoted.
- The SRT also agrees that there should be more engagement across the CSC network.

Need to Extend Geographic Scope of the SE CSC Projects

The SE CSC boundary is intentionally nebulous to remove artificial barriers that may hamper innovation across traditional geopolitical boundaries. Even with fuzzy borders, there is no denying that the footprint of the SE CSC is large, extending roughly from Louisiana to Florida and Virginia to Missouri and also including both Puerto Rico and the U.S. Virgin Islands.

The SE CSC has done an excellent job in offering a regionwide perspective on what this future landscape may look like. The SLEUTH (named for the model input data sets: Slope, Land Use, Excluded, Urban, Transportation, and Hillshade) urbanization projections and connectivity models were among the products that stakeholders (particularly LCCs) identified as valuable. The current effort to bring more focus to the Southeast Conservation Adaptation Strategy (SECAS) was also universally cited by the LCCs as a valuable regionwide effort. Regional efforts along the Gulf of Mexico by SE CSC staff (e.g., Gulf

Coast Vulnerability Assessment, Gulf-wide Bird Monitoring Structured Decision Making Support) were also seen as useful and unique contributions of CSC staff. The focus on coproduction of actionable science is also a commendable enterprise. However, the coordination and communication costs associated with this effort should not be (and we believe are likely not) underestimated. The coproduction model requires substantial interaction among researchers and decision makers throughout the life of a project. This interaction is most effective in person and the complexities and nuances of management problems and the science needed to address them are best communicated in situ.

We believe the physical location of the SE CSC at the eastern extent of the Southeast region, or for that matter any location, creates natural challenges to implementing a successful coproduction model across the entire footprint of the SE CSC. Most of the specific decision problems are being addressed within a relatively narrow sphere of influence that reflects the general interest, professional network, and land grant mission of staff and NCSU (i.e., North Carolina and the adjacent states). Projects targeting adaptation at Cape Romain NWR, cultural resources at Cape Lookout National Seashore, pests in the urban forests of Raleigh, North Carolina, and so forth are tangible examples of this perceived insularity. Clearly, there were a number of decision-focused projects working on resource issues in other locations throughout the operational area of the SE CSC, such as the Everglades Headwaters NWR in Florida, Barrier Island restoration in Mississippi, the multiyear Caribbean Downscaling project, and the Gopher tortoise work in Georgia. Several of these efforts were led by USGS science centers' staff at in the field. A full mapping of projects by the SE CSC shows the diversity of projects undertaken (Southeast Climate Science Center Science Project Footprints, <http://ncsu.maps.arcgis.com/apps/MapSeries/index.html?appid=d41db93c9b-0844f6b5a322204f4e68b7>) throughout the Southeast region and beyond.

The SRT believes that these represent the types of work that we would like to see more of, particularly in the western part of the region in the Ozarks, West Gulf Coastal Plain, and Mississippi Alluvial Valley where no specific SE CSC work has taken place (Table 3). The SRT encourages the SE CSC to continue to work throughout the full geography of the Southeast region and with the USGS science centers throughout the region. Continuing to increase the diversity of locations, processes, and issues represented in funded projects will be important to fulfilling the mission of this and other regional CSCs.

Covering the full geographic scope of the Southeast region will never be possible, even with a much more robust budget. We recognize the need for the SAC—in addition to the SIP—to weigh in on the desired portfolio of regionwide versus local projects. The SRT believes that this will provide the SE CSC

Table 3. Projects of the Southeast Climate Science Center by geographical area. Data from Southeast Climate Science Center Science Project Footprints, <http://ncsu.maps.arcgis.com/apps/MapSeries/index.html?appid=d41db-93c9b0844f6b5a322204f4e68b7>.

Regional areas	Number of projects
Regionwide	11
Caribbean	4
Continental	3
South Atlantic Coast	3
Peninsular Florida	3
Gulf Coast	3
South Atlantic Interior	2
East Gulf Coastal Plain	1
Appalachian	0
Mississippi Alluvial Valley	0
West Gulf Coastal Plain	0
Ozark Highlands	0

staff and affiliates at NCSU a more adequate defense against even the perception of geographic disparity in attention. None of this is intended to point NCSU or the SE CSC in the direction of moving from a single host institution towards a consortium model. Indeed, one of the strengths of the SE CSC is the community that has coalesced around and feels ownership of the SE CSC—from students to faculty to USGS researchers to administrators. There is recognition that expansion of the SE CSC for simply geographic reasons could dilute this sense of community. Additional resources to the SE CSC could partially alleviate this concern.

Nevertheless, other alternatives exist. Fostering collaborations among researchers at NCSU and USGS science centers (particularly at the reaches of region) is one potential model. Partnering with the Northeast CSC, which is already supporting work in the Ozarks, and the South Central CSC, which is already supporting work in the West Gulf Coastal Plain, offers another opportunity for leveraging collaborations to expand the reach of the SE CSC. Both the Northeast and South Central CSCs have active consortia institutions in these regions in the University of Missouri and Louisiana State University, respectively. Taking advantage of natural and anthropogenic gradients across the region with regard to temperature, precipitation, and urbanization is another. The SRT believes that there are other creative solutions as well.

Recommendations on the geographic scope of the SE CSC projects

- The SRT recognizes the need for a SAC to weigh in on the desired portfolio of regionwide versus local projects. The SRT also believes this will provide the SE CSC staff and affiliates at NCSU with a more adequate defense against even the perception of geographic disparity in attention.
- Additional resources for the SE CSC could partially alleviate this geographic concern. The SRT urges the SE CSC to request additional dollars in its host agreement during the recompetes process.
- Fostering collaborations among researchers at NCSU and USGS science centers (particularly at the reaches of region) is one potential model to help alleviate geographic disparity.
- Taking advantage of natural and anthropogenic gradients across the region with regard to temperature, precipitation, and urbanization could also help develop broader collaborations in the region and with other CSCs.

Actionable Science

The Actionable Science program evaluation component measures the performance of the SE CSC in providing relevant and useful scientific products and services, with an emphasis on the relevance (support for stakeholder, regional, and national priorities; geographic scope of science priorities), quality (peer-reviewed publications, adherence to standards), processes (coproduction of science, RFP processes, and data management), accessibility (online accessibility of products and resources, tailored communication), and impact of research and science products and services carried out directly by the CSC and through its external grant funding (ACCNRS 2015).

Actionability Pathway

The 2015 ACCNRS report recommended that the CSCs conduct actionable science, which “provides data, analyses, projections, or tools that can support decisions regarding the management of the risks and impacts of climate change. It is ideally co-produced by scientists and decision makers and creates rigorous and accessible products to meet the needs of stakeholders” (ACCNRS 2015). While the SE CSC science and operational plan, which was published in 2012 before the ACCNRS report, does not explicitly refer to either actionable science or coproduction, it implicitly does so in stating that “the purpose of the SE CSC is to provide scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife, and cultural resources can use to anticipate, monitor, and adapt to climate change; actively engaging LCCs and other partners in translating science into management decisions” (Jones

and Dalton 2012). Since the SE CSC inception, the SE CSC science and operational plan has evolved to include not only decision-based research, but also a broader set of activities—convening conversations among decision makers, scientists, and managers and capacity building for students and professionals—considered all to be parts of actionable science (Varela Minder et al. 2016). Clearly, one important vehicle for describing the process of actionable science is the SE CSC science and operational plan. The development of the science themes relies on priorities identified by partners and stakeholders. Furthermore, the SAC is critical in contributing to and ensuring the identification, development and implementation of actionable science.

The science and operational plan consists of six broad themes, with near- and long-term task recommendations under each theme. The SE CSC university Web site (globalchange.ncsu.edu) lists each SE CSC project and the corresponding themes. Of the 31 SE CSC projects listed on the Web site, all correspond to at least one theme and most to several themes. The SE CSC is thus clearly making an effort to identify the linkages between projects and the science and operational plan. Although research projects may link to the science and operational plan, applied research projects such as “Connectivity for climate change in the Southeastern U.S.” are not necessarily connected with a specific management decision identified by the LCCs. However, they do help managers become aware of and understand potential decision problems brought about by global change.

Another important vehicle for describing the process of actionable science is in the SE CSC annual science planning process conducted by the SE CSC and the SIP. The SE CSC annual science plan for FY 2012 was developed during a 2012 workshop in St. Petersburg, Florida attended by 40 USGS, NCSU, and LCC staff and scientists. During this initial meeting of SIP, members identified five major science priorities for the FY12 RFPs, which emphasized the development of actionable scientific information that can support LCC management activities and future investment of CSC and/or LCC dollars with the expectation that funded investigators would collaborate with the LCCs in the identification of priority information needs.

The SIP developed the FY13 SE CSC annual science priorities through a series of conference calls. The two priorities were conservation and water governance, and local-scale climate adaptation. The SIP also identified several topics for directed projects, including dynamic downscaling in Puerto Rico, urban warming effects on biodiversity, resource-allocation decision making in the face of climate change, and the impacts of global change on coastal NWRs.

A formal FY14 science planning effort did not identify any themes for a call for proposals because most FY14 SE CSC science funding was committed to projects that started in FY13 and continued into FY14.

Fiscal year 15 SE CSC annual science priorities were focused on development of a SECAS, use of reserve design approaches for assisting coastal NWRs in responding to climate and land use threats to their missions, and climate change adaptation decisions associated with managing cultural resources. Each of these priorities reflects an emphasis on long-term climate change adaptation conservation priorities of federal, state, local, private, and NGOs.

SE CSC RFP Process—Federal

In terms of the science dollars, the process that SE CSC uses for allocating annual science funds is similar to other CSCs. The SE CSC federal director utilizes a wide variety of input on research project selection (e.g., SIP); however, the director retains discretion on both funding method (i.e., competitive or noncompetitive) and research priorities. Over the initial 5 years of the SE CSC (FY2011–2015), the total funds available through the annual allocation from the USGS was US\$6,081,530 (Tables 2 and 4). Of that amount, \$3,340,772 was distributed to NCSU and \$3,686,108 was made available to the USGS to conduct or support strategically important scientific activities that address science priorities, either through RFPs or directed research projects.

The Southeast Science Center Collaborative Approach to Climate Science

The project “Connectivity for Climate Change in the Southeastern United States” exemplifies the collaborative efforts of the Southeast Climate Science Center (SE CSC). This project is emblematic of the collaborative approach that is frequently utilized by the SE CSC to address climate science needs in the southeastern United States. The project goal was to assess how landscapes can be connected across the Southeast region as climate changes. The investigators assessed current and projected connectivity for three species (black bear *Ursus americanus*, Rafinesque’s big-eared bat *Corynorhinus rafinesquii*, and timber rattlesnake *Crotalus horridus*) that inhabit bottomland hardwoods throughout the Southeast region. Development of the project involved a diverse set of investigators from four institutions, including Curtis Belyea, Heather Cayton, Jen Costanza, and Nick Haddad from North Carolina State University; Ron Sutherland and others from the Wildlands Network; Stephanie Romañach with the U.S. Geological Survey; and James Watling at John Carroll University. The initial project scoping also involved a working session that included representatives from four Landscape Conservation Cooperatives: South Atlantic, Peninsular Florida, Gulf Coast Plains and Ozarks, and Appalachian.

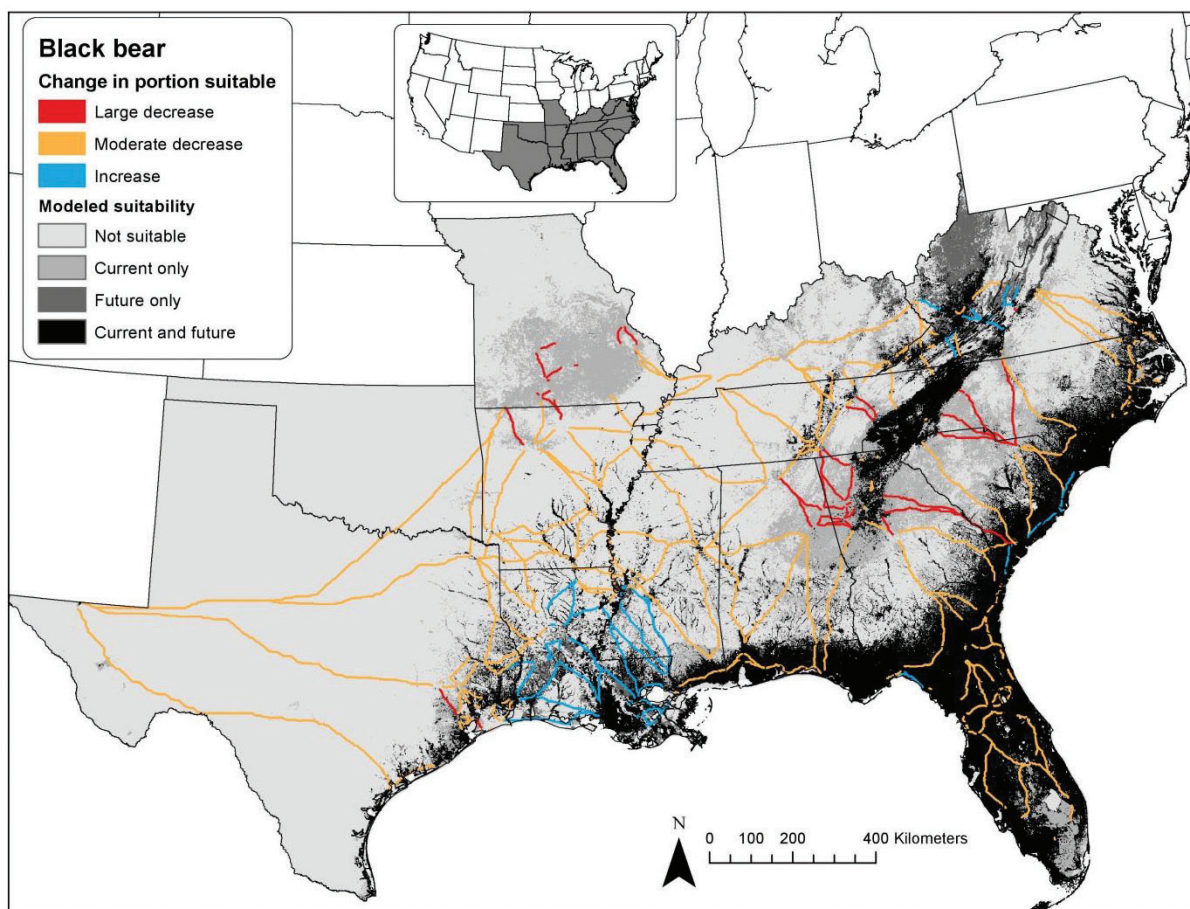


Table 4. Project funding from the Southeast Climate Science Center (federal allocation) for fiscal years (FY) 2011–2015.

Year project initiated	Number of funded projects	Total research dollars
FY2011	5	\$674,000
FY2012	9	\$1,085,263
FY2013	9	\$1,918,951
FY2014	3	\$1,142,985
FY2015	5	\$2,517,034

In FY2012, projects were identified and selected by the SE CSC and SIP. Beginning in 2012, funds were allocated via either directed research or through utilization of an RFP. Project PIs included researchers from USGS National Wetlands Research Center, North Carolina CFWRU, USGS Tennessee Water Science Center, NCSU, Georgia CFWRU, USGS New Jersey Water Science Center, and the USGS Western Fisheries Research Center. Notably, eligible project applicants include only researchers from NCSU or USGS Southeast region science centers, North Carolina CFWRU, and USGS field stations or laboratories. Other parties may participate on funded projects but only as subawards on proposals with NCSU or USGS PIs.

Project funding from the SE CSC (federal allocation) ranged from \$36,900 to \$300,000 and ranged in duration from 1 to 5 years; most projects had a duration of 1 or 2 years. This short time frame does not provide continued support for researchers and resource managers to advance working relationships.

The RFPs have focused on a subset of priority needs identified by the SIP. For example, the 2012 RFP focused on

1. A synthesis of the state of the science regarding six topics important to the LCC efforts to manage sustainable landscapes: regional downscaling of global climate models, ecohydrology, sea-level rise, modeling of urban growth, unique climate-vulnerable and climate-sensitive ecosystems, and the communication of scientific uncertainty to decision makers.
2. A terrestrial connectivity analysis across the entire Southeast region.
3. A conceptual model for regional-scale sustainable landscapes.
4. The impact of mangrove migration on coastal ecosystems.
5. Snowfall and snow depth projections for the eastern United States.

Applicants are required collaborate with the LCCs in the identification of priority information needs, and project results should result in a deliverable product that is suitable for distribution to a broad range of stakeholders within the conservation community. In a similar manner, the RFP for FY2015 focused on SECAS and impacts of climate change on cultural resources. (SE CSC 2015).

To review the statements of interest and full proposals, the SE CSC federal director established the SIP, a panel of federal and university climate science professionals. Because of the potential conflict of interest, SIP members applying for a CSC RFP may not be involved in the RFP development or review. The SE CSC federal director makes the final determination of award recipients. Accountability and transparency mechanisms are important to avoid conflicts and ensure effective, efficient allocations of resources.

Recommendations for SE CSC RFP process—federal

- The SRT recognizes the value of the RFP process as a possible mechanism to engage new potential science partners in the SE CSC research program. While this provides an opportunity for NCSU and USGS researchers, it is somewhat limited for those outside of the CSC partnership. The SRT encourages the SE CSC to continually find ways to increase involvement, particularly from areas that have been underserved by the SE CSC.
- While SE CSC projects have incorporated a variety of USGS research entities, continued efforts by

USGS to expand involvement of its researchers are encouraged. This should be a joint effort of the USGS regional leadership, the SE CSC, and NCCWSC.

SE CSC Science Conveyance and Dispersion

The SE CSC science and operational plan states that SE CSC will readily and effectively communicate scientific findings and strategies with the LCCs and other partners in a timely and efficient manner so that they can begin to synthesize assessments and plan adaptive-management strategies. Communications specialists working with the SE CSC (Holly Menninger, director of public science for Your Wild Life and a research associate in biological sciences at NCSU, and Susan Joy Hassol, director of Climate Communications, a nonprofit climate outreach organization) have embraced the philosophy that “the science is not finished until it is communicated” (Sir Mark Walport, UK Government Chief Scientific Adviser, 2013). It was emphasized that researchers need to think about communications right from the beginning of project development. Concomitant with this goal was the clear recognition that the SE CSC needs to complete a systematic review of how it communicates climate science.

The SE CSC and NCSU appear to be dedicating significant effort to the challenges of communicating climate change information and research results. As examples, the GCF Web site (globalchange.ncsu.edu) was designed as a virtual meeting place for researchers associated with the SE CSC, the SERCH and associated programs, and researchers. The SE CSC sponsored two public documentary film screenings, *Shored Up* and *Chasing Ice*, with Q&A with expert panels, to delve into topics such as receding glaciers, sea level rise, and coastal community impacts. In 2015, the SE CSC hosted a coastal and climate impacts workshop for media professionals, and a separate training session focused on engaging with the media for climate and global change scientists in North Carolina. Ongoing work by Adam Terando, SE CSC research ecologist, is working to address state agency challenges with communicating climate change. The SE CSC is also working with the extension specialists that are an integral part of the land grant institution component of NCSU and that offer some excellent opportunities to benefit from the experience of extension expertise developed in comparable fields. Finally, and in a listing that is clearly not exhaustive, in a manner similar to the NCSU cluster hire on global environmental Change, NCSU is engaged in a cluster hire with a focus on public science. Engagement of these new faculty with the SE CSC could potentially create new opportunities to research the conveyance of science to decision makers and the coproduction of actionable science model.

There does appear to be a significant recognition within the SE CSC of the importance of communications. Furthermore, the SE CSC staff clearly recognize that the challenges of communication are immense and impact all aspects of the operations of the CSC from the development of a coproduction of actionable science model to helping the public to recognize the current and potential impacts of climate change.

Recommendations for SE CSC Science Conveyance and Dispersion.—The SRT recognizes that it does not contain expertise in climate communication and is therefore limited in its ability to provide specific guidance on communications efforts of the SE CSC. However, the SRT did have several recommendations:

- The embracement and incorporation of communications experts by the SE CSC is an approach that is welcome and necessary. Without utilization of outside experts, development of affiliates, and core researchers with communications expertise and a clear and unambiguous commitment to communications, progress will not be made.
- The SE CSC should, as should the CSC community, recognize that funding targeted to communications is of equal or more importance than traditional research on biological and ecological impacts of climate change. The HDRU survey identified that translation of science to policymakers and decision makers was an area of uncertainty and weakness. Understanding how to engage key administra-

tors early in the coproduction of actionable science process, build effective relationships, and convey research findings in a manner that leads to full understanding is a challenge that can only be addressed with a concerted effort. That this is being addressed through current work of the SE CSC is an encouraging and forward-thinking effort.

- Continued work to leverage the climate communications efforts throughout the CSC network, NCCWSC, and key partners, such as the USDA regional climate hubs, NOAA's Regional Integrated Sciences and Assessments (RISA) program, and other entities is important. The lessons learned, joint funding, focused workshops and other exercises, collaborative efforts, and products will only help the SE CSC, as well as other climate science partners. National leadership is needed and could come as easily from the SE CSC as from NCCWSC or other sources. It was noted that Susan Hassol, Climate Communication, is currently working on a three-CSC joint communications effort that is heading down this pathway.
- Future project RFPs and commensurate research awards should provide guidance and expectations on communications products for each project. At the very least, each research project should meet or otherwise engage in dialogue with a communications professional to evaluate options for communicating project activities and results from project initiation through final submittal of close-out documents.

Capacity Building

The Capacity Building program evaluation component measures how well the CSC is building capacity for conducting and applying actionable science, with an emphasis on formal training (e.g., graduate students and postdoctoral fellows) and providing training and capacity building to the broader partner/stakeholder community (e.g., webinars, workshops) in how to use and apply climate science and services (ACCNRS 2015).

Training the Next Generation of Scientists and Managers

In order to deal with the challenges posed by global change, there is a need for individuals trained in rigorous approaches to investigating the science of climate change. Training of the next generation of scientists and managers to address climate change is a priority of the CSCs and NCCWSC. In keeping with the national priority, a major objective of the SE CSC is to “not only support research that is useful to those who live and work in the region but also work with NCSU to educate and train undergraduate and graduate students in the skills necessary to research and communicate about climate-change science” (Jones and Dalton 2012). One clearly valuable program is the Global Change Graduate Fellows Program. This program not only created a strong foundation for the students, but was also noted by numerous participants in the review as a vehicle that acted as a “convening force” or as a vehicle to enhance collaboration among faculty. In essence, the half-time, 1-year fellowship acted as a carrot to entice faculty in the Global Exchange Program to nominate students for a fellowship.

In 2015, the inaugural NCSU Global Change Symposium was held and attended by more than 200 individuals, including NCSU faculty, staff, postdoctoral associates, graduate students, and affiliates. The purpose of the symposium was on networking and community building in order to explore how NCSU can most effectively respond to issues associated with global change. The symposium was organized by SE CSC in partnership with the NCSU Global Environmental Change and Human Well-Being Faculty Cluster and received support from the Colleges of Agriculture and Life Sciences, Natural Resources, Sciences, and Engineering and the NCSU Office of Research, Innovation and Economic Development.

Partner/Stakeholder Capacity Building

The SE CSC is building capacity among decision makers and other stakeholders through professional development training courses, workshops, and forums, including

The Southeast Science Center Collaborative Approach to Climate Science



Global Change Graduate Fellows (2015–2016) and staff

The Global Change Graduate Fellows Program is designed to provide financial, scientific, and professional development support for incoming master's and doctorate students as well as post-doctoral researchers who are interested in multidisciplinary research related to climate and global change. The program, sponsored by the Southeast Climate Science Center (SE CSC) and North Carolina State University (NCSU), brings together students and faculty across six NCSU academic departments. To date, the program has supported 38 Global Fellows between fiscal year (FY)11 and FY15. All fellows have worked with advisers who are faculty affiliates to the SE CSC and (or) principal investigators to SE CSC funded projects. The Global Fellow research is grounded on stakeholder needs and priorities and is not just curiosity driven. Every fellow project funded by the SE CSC has supported at least one or more science themes from the science and operational plan. Global Fellows also receive training through two courses on climate change and conservation, a week-long workshop on structured decision making (SDM) methods, workshops on science communication, and seminar lecture series. There is also a Global Change Fellows LinkedIn Group for fellows to stay connected.

Every year, the SE CSC takes around 10 Global Fellows and staff to the National Conservation Training Center (NCTC) for a week-long training in SDM. This intensive introductory course introduces the basics in SDM to develop structured approaches in order to make a complicated decision-making process more explicit, transparent, and clear. It teaches practical approaches to critical thinking, logic, reasoning, and structuring decisions that support day-to-day work. This professional development opportunity provides the SE CSC community with a deeper understanding of the use of SDM to approach difficult and complex problems in natural resource stewardship under climate change and how to arrive at an optimized decision given competing values and uncertainty. Each newly trained cohort continues to work with SDM, applying it to SE CSC-funded projects.

Another training opportunity at NCTC for Global Fellows is the Climate Academy Course. The purpose of this course is to cover the fundamentals of climate science, provide tools and resources for climate adaptation, increase climate literacy and communication, and provide guidance for maintaining literacy using shared online resources.

- **Climate-Smart Agriculture: Innovation and Resiliency.** The SE CSC co-hosted a French Ameri-Can Climate Talk in 2015 to engage NCSU community and stakeholders in The Triangle (also known as the Research Triangle) and Southeast regions to enhance public awareness of the interconnectedness of climate and agriculture to advance greater understanding of economic, environmental, and societal impacts, as well as opportunities for innovation, adaptation, and solution-driven approaches.
- **Science Video Training Workshop.** A combination of lecture, discussion, and hands-on exercises to train scientists on how to make videos that communicate their science.
- **Science Communication Workshop.** This training was open to global change fellows and federal agency partners, including the North Carolina State Climate Office and a member of the North Carolina Science Advisory Panel.
- **Triangle Climate and Landscape Researchers' Brown Bag.** This is a face-to-face forum for climate and landscape researchers in The Triangle to sit down and discuss a new topic each month. Everyone involved in climate or landscape research is welcome to attend.

As noted previously, the immense geographic scope of the SE CSC creates challenges in servicing the entire geography in an equal manner. For those activities where presence is necessary for participation in the training, this is clearly an obstacle. However, where capacity building activities can be done through distance learning or other remote technologies, the solution is easily implemented. A number of presenters during the on-site review noted the perception that the SE CSC tended to provide more services to the local community than to those throughout the Southeast region.

Recommendations for SE CSC Capacity Building

- The Global Change Graduate Fellows Program was a model program that created an integrated community of graduate students from various disciplines that may not normally interact in such a concerted manner. This program, or components of it, would be good to emulate in other CSCs where possible.
- U.S. Geological Survey science centers may provide valuable opportunities for work with the Global Change Graduate Fellows Program. Fellows should be provided with information about the science centers, areas of research emphasis, and points of contact. Likewise, science centers should all be provided information about the fellows and be encouraged to identify opportunities for involvement and collaboration.
- The programs of the SE CSC are of high quality and well received by partners. Expanded access by research and management partners throughout the USGS Southeast region was noted as a common request. Where possible, expansion of remote technologies would be helpful. Alternatives would be to develop program-delivery partners with one or two key institutions with the charge of replicating programs throughout a broader component of the SE CSC operational area. Although challenging, exploring ways to expand the Global Change Fellows program to other institutions may be beneficial.

Partnerships

The partnership program evaluation component measures how well the CSC is doing in terms of engaging and collaborating with partner organizations beyond the CSC consortium itself (which is included in institutional development), with an emphasis on breadth and scope of engagements and leverage. Evaluation subcategories include breadth and scope of engagements, leverage, and outcomes (ACCCNRS 2015).

Summary of SE CSC Results

Survey respondents represented science users and science producers (both those affiliated with the CSC and those not so affiliated) and a variety of types of organizations and agencies and types of positions, with federal agencies and universities being the most prominent.

Most of the respondents had at least some interest in or involvement with the SE CSC. This involve-

ment came in a variety of forms, with the most common involvement being as a CSC-funded graduate student or postdoctoral fellow, a university member affiliated with the CSC, or a participant in a training, webinar, workshop, or conference. The level of interaction respondents had with USGS CSC staff was slightly higher than with university leads/PIs.

The most important benefits provided by the CSC were putting science in the hands of decision makers, providing science access to partners, and providing climate adaptation science to a network of people interested in learning about climate adaptation. Respondents reported that they were limited in their involvement with the CSC by a variety of factors, with the most common ones being time, other priorities, and funds.

About two-thirds of the respondents felt that climate adaptation science in the Southeast is available to decision makers, but relatively fewer respondents believed that various types of decision makers use the climate adaptation science to inform policies and management. Specific to the science produced through the SE CSC, the majority of the respondents agreed that 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 well-integrated with other information.

The most common ways science users and producers reported using the SE CSC science were to inform management plans or management actions. However, science users and producers differed in their perceptions of what limits the use of CSC science. Science producers perceived the limitations on the use of CSC science to be greater than science users found them to be.

Both science users and producers expressed support for coproduction of science. While many of the science producers had experience in coproduction in various phases of research projects, much fewer of the science users reported first-hand experience. Coproduction was more 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 reported that their involvement in coproduced research projects was most limited by scientists not reaching out to them, having different perspectives from scientists on what science is needed, and the lack of support for collaboration by funders.

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

Concluding Comments

To a substantial degree, the SRT found the SE CSC to have performed very well in addressing all of the main goals of the regional CSC model. The partnership with NCSU was both wide and deep. Programs such as the Global Change Graduate Fellows and the Global Environmental Change faculty and Global Change Forum engaged faculty and graduate students from throughout the institution in a very positive, interdisciplinary manner. The reinvestment of university F&A funds into the SE CSC, resulting in the hiring of a full-time program coordinator, was also mutually beneficial. There was clearly an investment by NCSU into the success of the SE CSC and the result was a definite value-added relationship that seemed to be appreciated by all parties involved. In return, the SE CSC was recognized as an increasingly useful organization not just for the additional direct science products, but also as a vehicle to convene faculty and create collaborative opportunities that would not have existed without the SE CSC.

The commitment of the SE CSC to exploring and developing a coproduction of actionable science approach was evident throughout the discussions and by the SE CSC funding of research into the approach. This clearly is in line with the recommendations of ACCCNRS and will be integral to the future direction of the SE CSC. This does lead to serious and substantial questions that the SE CSC and the CSC institution will need to address, such as issues of scale, the challenge of understanding the real needs of users including a complete analysis of the actionable science pathway to ascertain the full usability of the products, and the concomitant expectations that this places on the users to be similarly dedicated to this pursuit.

Indeed, the HDRU survey found that while science was being made available to decision makers, relatively few respondents felt like the information was actually being utilized to inform or influence decisions. This issue deserves greater attention both to validate such survey findings and, if substantiated, to better understand why such a situation exists and how to develop and transfer science in order to make it more usable and impactful. The burden of this should not be placed solely on the SE CSC, but it is a challenge that should receive support of the CSC network and the NCCWSC, as well as outside funding sources.

Closely related to the issue of coproduction of actionable science is the SE CSC SAC, as differentiated from the SE CSC science advisory body variously described by presenters as a science planning team, the SIP, or the Science Advisory Committee, which is composed of the LCCs and various agency representatives. The SRT found the SAC group to be somewhat underdeveloped, and the SE CSC would benefit from a re-evaluation of the role of the SAC as well as a common definition of the science advisory body. The SRT recognizes that each CSC develops a structure somewhat unique to the environment in which it operates. A clarification of roles and revision or modification of the CSC SAC TOR document would help participants to better understand the roles and contributions of these bodies.

Given the resources available to the SE CSC in relation to the expansive geographic operational area, the review team found that the research products were reasonably dispersed albeit with some anticipated bias towards North Carolina simply as a result of logistical pragmatism. However, the sentiment that it received was that there were areas that felt underserved and somewhat distanced from the SE CSC. The SRT is hesitant to recommend that the SE CSC pursue a consortium model such as is done in multiple other CSCs. Such dispersion without additional resources, careful planning, and very effective partners could simply dilute the success of the SE CSC and result in little additional value. However, the identification and nurturing of a key university or other partner strategically located to better provide coverage for the vast extent of the Southeast may be a useful strategy.

In addition to exploring this possible partnership with other universities, the opportunity to more effectively integrate the SE CSC with existing USGS science entities may be an effective investment. The SE CSC does currently work with a limited number of USGS science centers and some of the CFWRUs. However, there are others that would be potential partners and may provide the geographic diversity that is needed to address some of the concerns expressed to the SRT.

Acknowledgments

The SRT would like to extend its sincere appreciation to the SE CSC federal hosts and the NCSU partners in providing critical support for this review. Federal CSC Director Gerard McMahon was gracious with his time, intellect, and energy in helping the review team to schedule review activities, visits, and identify participants for on-site discussions and the Web survey of partners. Southeast Climate Science Center federal staff Mitchell Eaton, Adam Terando, and Cari Sasser Furiness and SE CSC university staff Aranzazu Lascurain were exceedingly helpful in all aspects of the review. The host-university team, led by Ryan Boyles and including Nick Haddad and many others, were similarly generous with their time and resources throughout the entire review process. We would like to particularly thank Ms. Lascurain for all of her assistance with the many logistical challenges of the review. McMahon and Boyles and their respective staffs engaged numerous faculty and graduate students for presentations and discussions and invited critical university leadership to meet with the review team as part of illustrating the connection of the SE CSC with the host university. We also greatly appreciate their efforts in support of the AFS and HDRU teams to identify speakers, develop contacts lists for the HDRU review, and provide insight and recommendations for structuring the on-site review team schedule. We fully recognize that we can do only limited justice to the extensive work of the SE CSC with our time limited to less than 3 days on site, the review of a substantial yet still a limited set of documents and reports, and various other discussions that the review cannot hope to fully understand the full nature and extent of the CSC through its 6 years of work. The SRT

cannot hope to fully understand the full nature and extent of the SE CSC that has developed through its 6 years of work. We can only hope that through the collective observations of the SRT members, the various related discussions and preparations, and the introspection of the SE CSC staff, that the observations and recommendations of this review will add value to the efforts of the SE CSC to better serve the natural resource conservation community of Southeastern U.S. and Caribbean region.

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Appendix A

Southwest Climate Science Center Review Team Members

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Appendix B

Southeast Climate Science Center Schedule of Activities

Tuesday, February 23, 2016, Aloft Raleigh Hotel

Time	Preparatory or on-site activity	Desired output
5:00–6:00 pm	Pre-meeting of Science Review Team (SRT) members. <ul style="list-style-type: none"> • Review schedule of meetings and discussions • Overview of goals and expected products • Writing expectations • Identification of additional information needs. 	
6:00 pm	Dinner gathering of SRT members (only review team members and U.S. Geological Survey [USGS]-Reston staff)	

Wednesday, February 24, 2016, North Carolina State University

Time	Preparatory or on-site activity	Desired output
Day 1— morning session	Introductions—SRT and hosts (Southeast Climate Science Center [SE CSC] and university representatives)	Goal is to develop a full understanding of the SE CSC structure, including federal and university components.
8:00–8:30	Gather for coffee and get settled.	
8:30–9:00	Welcome, introductions, and charge.	
9:00–10:30	Review of fundamental SE CSC strategic vision, planning, funding history, administrative structure, and 5-year status report. Presentations: <ul style="list-style-type: none"> • Introduction by SE CSC director and overview of SE CSC staff, structure, and brief history (McMahon) • Review of Stakeholder Advisory Committee (SAC) or comparable structure—frequency of meetings, membership, summary of recommendations • Climate Science Center strategic plan, annual science planning, and grant process overview • Review of key accomplishments • CSC communication and outreach strategy • Advantages to U.S. Geological Survey collaborating with North Carolina State University (NCSU) 	
10:30–10:45	Break	Develop a full understanding of the structure of the SE CSC, including core documents and key processes.
10:45–11:00	SE CSC facilities tour and discussion (if applicable). Take group up to Coop Unit.	
11:00–12:45	Introduction by university-host principal investigators (PIs) and working lunch:	
		Full understanding of the host-university

Wednesday, February 24, 2016, North Carolina State University (continued)

Time	Preparatory or on-site activity	Desired output
	<ul style="list-style-type: none"> Description of host agreement, accomplishments, and integration of SE CSC within various university structures. This should also include a description of the broader host-university consortium if that exists beyond the core host institutions. Description of climate change structures within the host institutions. This may include presentations by key entities, including their engagement with the SE CSC. 	component of the SE CSC, including the primary hosts as well as other university partners.
1:00–1:15	Break	
1:15–3:15	<p>Establishment of the climate change science and conservation context of the SE CSC—selected presentations on significant climate change issues that characterize the SE CSC operational area.</p> <p>Participants:</p> <p>USGS: Johnson (refuge/sea level rise) Románach (connectivity/reserve design) Meyers (Gulf Barrier Islands) Eaton (value of information), Terando (urbanization)</p> <p>NCSU: Boyles (downscaling) Haddad (connectivity) Dunn/Frank (climate change and wildlife)</p>	Understanding of the main drivers of science—management needs that define the SE CSC and relevant other climate science providers. What is the context of the SE CSC with regard to the most significant conservation challenges?
3:15–3:30	Break	
3:30–4:30	<p>CLOSED SESSION</p> <p>SRT briefing and discussion with university-host institution PIs and relevant other university partners only.</p>	
4:30–5:30	Closed session #1 (SRT only)	
6:15	Group dinner—all review participants are invited and encouraged to join us.	

Thursday, February 25, 2016, North Carolina State University

Time	Preparatory or on-site activity	Desired output
8:00–8:30	Gather. Review day-1 notes and day-2 schedule of activities	Understanding of linkage among research projects and defined needs, levels of engagement, transferal of information, and actionability pathway.
8:30–10:00	<p>SE CSC and host-university research forum—graduate and postdoctoral research updates, outreach, and engagement</p> <p>Confirmed participants: Zimova (Mills) Elisita (Haddad) Emily Meineke (Dunn)</p>	

Thursday, February 25, 2016, North Carolina State University

Time	Preparatory or on-site activity	Desired output
	Adrienne Wootten (Boyles) Georgina Sanchez (Ross) Michael Just (on student structural decision-making apprenticeship).	
10:00–10:15	Break	
10:15– noon	Partnership dialogue #1 (Cornell team): Science producers	
Noon–1:15	Working lunch	
1:15–2:45	Partnership dialogue #2 (Cornell team): Science users	
2:45–3:00	Break	
3:00–4:30	CLOSED SESSION Review panel briefing and Q&A with USGS staff only Meanwhile... SE CSC operational review (Ryan and NCSU SE CSC staff) with Grants Management Office, Emily Fort and Janet Cushing of the National Climate Change and Wildlife Science Center.	Review responses to submitted questions and information requests; open discussion of SE CSC.
4:30–5:30	Closed session #2 (SRT only)	
Evening	Working dinner (SRT only)	

Friday, February 26, 2016, North Carolina State University

Time	Preparatory or on-site activity	Desired output
8:00–8:15	Gather. Review day-2 notes and day-3 schedule of activities.	
8:15–9:45	Flex time available for additional discussion topics. This may include 1. Communications and engagement of constituents. 2. Other issues to be determined.	
9:45–10:00	Break	
10:00–11:00	Closed session #3 (SRT only)	Identify key initial observations. Discuss writing assignments.
11:00–noon	Report out of review team to SE CSC/university hosts <ul style="list-style-type: none"> • Open discussion and Q&A about initial observations. • Develop list of follow-up items, responsibilities and time lines. • Draft report development, review and finalization timeline. 	
Noon	Lunch and adjourn meetings	
Afternoon option	Depending upon travel schedules, SRT could assemble for writing/work session	

Appendix C

Partnership Effectiveness Focus Group Questions

Science Producers

1. Why did you become involved with the Climate Science Center (CSC)?
2. What are the benefits of your involvement with the CSC? [Probe for benefits to them as individuals, to scientific knowledge, to people who are in need of scientific information, to professional development of others.]
3. What are the challenges you face in your involvement with the CSC?
4. To what degree have you worked with the intended users of your climate science, produced with or for the CSC?
5. Tell us more about your efforts to work with these potential climate science users. Why and how have you worked with them?
6. What challenges have you faced in working with or reaching out to science users?
7. How have you overcome (or tried to overcome) barriers to working with or reaching out to climate science users (or to ensuring that the science you produce is used)? [Probe for whether and how the CSC staff has played a role in overcoming barrier.]
8. Generally speaking, what could generate more benefits from your involvement with the CSC—whether to you individually, to scientific knowledge, to people who use currently or could use climate scientific information, and so forth?

Science Users

1. Why did you become involved with the CSC?
2. What are the benefits of your involvement with the CSC? [Probe for benefits to them as individuals, to scientific knowledge, to people who are in need of scientific information, to professional development.]
3. What are the challenges you face in your involvement with the CSC?
4. To what degree have you worked with climate scientists or used the science produced in association with the CSC?
5. Tell us more about your impressions of this climate science. Has it been useful? How have you used it?
6. What challenges have you faced in using the science as part of the CSC? [Probe for challenges in working with scientists in using science.]
7. How have you overcome (or tried to overcome) barriers to using climate science? [Probe for whether and how the CSC staff has played a role in overcoming barriers.]
8. Generally speaking, what could generate more benefits from your involvement with the CSC—whether to you individually, to scientific knowledge, to people who use currently or could use climate scientific information, and so forth.

Appendix D

Report from the Human Dimensions Research Unit of Cornell University: Southeast Climate Science Center Results

Respondents

Forty-six percent ($n = 55$) of the 142 total respondents reported (22 skipped or were excluded from this question) that they make decisions about natural resource policy, management, or programs as part of their jobs. We refer to them as “science users.” Thirty-five percent ($n = 41$) reported that they have produced climate adaptation science through an affiliation with the Southeast Climate Science Center (SE CSC), while 23% ($n = 27$) have produced climate adaptation science but never with such an affiliation. We refer to both of these groups as “science producers” (57%; $n = 68$). Twenty-three of the respondents (19%) were both science users and producers.

Respondents to the survey reported working in all 12 of the states and the one territory in the SE CSC’s region, yet most respondents (47%; $n = 51$) reported working in North Carolina (where the SE CSC is located). Florida (27%; $n = 29$), Louisiana (19%; $n = 21$), and South Carolina (19%; $n = 20$) were the next most common states reported by respondents. Missouri (4%; $n = 4$), Arkansas (7%; $n = 8$), and Kentucky (8%; $n = 9$) were least common. Additionally, 19 respondents wrote that they worked in other states in the United States or nationwide or in the U.S. Virgin Islands.

Most of the respondents (73%; $n = 79$) worked at the scale of the state, while 66% ($n = 71$) worked at the regional or multistate scale, 47% ($n = 51$) at the local scale, or 45% ($n = 49$) at the national scale. A smaller percentage conducted all or some of their work at the international (29%; $n = 31$) or watershed scales (39%; $n = 42$).

The greatest proportion of respondents was affiliated with federal agencies (34%; $n = 37$) or universities (34%; $n = 37$). Fewer respondents were affiliated with state agencies (19%; $n = 21$) or nonprofit organizations (11%; $n = 12$). One individual was affiliated with tribal governments, and one was affiliated with private industries. No one was affiliated with local governments.

Nearly half of the respondents (47%; $n = 51$) held research positions in their agency or organization, while about a third (34%; $n = 37$) held leadership/administration positions. Few held policy (4%; $n = 4$) or operations (17%; $n = 7$) positions. Nine respondents wrote in other types of positions, including communications/outreach, education, consultant, and partnership coordinator. A full report of the Cornell University Human Dimensions Research Unit (HDRU) work is available from the National Climate Change and Wildlife Science Center (NCCWSC).

Extent of Involvement with the Climate Science Center

Most of the respondents (77%; $n = 102$) reported that they have had at least some interest in or involvement with the SE CSC. Just 13% ($n = 17$) reported that they had no involvement but that someone else in their agency or organization did, and another 8% ($n = 10$) had no interest or involvement even though they had heard of it. A very small percentage (3%; $n = 4$) of the respondents had never heard of the SE CSC.

Respondents reported a variety of forms of involvement with the SE CSC. Most common (31%; $n = 31$) was involvement as a participant in a SE CSC training, webinar, workshop, or conference, followed by SE CSC-funded graduate student or postdoctoral fellow (26%; $n = 26$), a university member affiliated with the SE CSC (23%; $n = 23$), a SE CSC grant recipient, applicant, or partner (21%; $n = 21$), or a resource manager or decision maker who had used the science produced by the SE CSC (17%; $n = 17$). Only six (6%) SE CSC Stakeholder Advisory Committee (SAC) members responded to the survey, and 1% ($n = 1$) was a U.S. Geological Survey (USGS) SE CSC staff member. Additionally, about a quarter (26%; $n = 27$) were Landscape Conservation Cooperative (LCC) Steering Committee members, while 10% ($n = 10$) were LCC staff members. On average, respondents have been involved with the SE CSC for 3.5 years.

The respondents reported on their frequency of interaction with five types of CSC representatives (Figure D.1). For their interactions with three of the types (USGS CSC staff, university leads/principal investigators (PIs) for the CSC, and CSC-affiliated researchers), the modal response was “up to a few times a year.” For their interaction with CSC graduate or postdoctoral fellows, the modal level was lower: 38% of respondents interacted with them not at all and 32% interacted with them up to a few times a year. For their interaction with CSC SAC members, the interaction was lowest: 56% of respondents interacted with them not at all and 32% interacted with them up to a few times a year. The level of interaction respondents had with USGS CSC staff was slightly higher than with university leads/PIs.

Benefits of Involvement

The benefits of the CSC that were reported as important or very important to the highest number of respondents were “access to a broader network of people interested in climate adaptation science” (72%; $n = 73$), “access to climate adaptation science” (70%; $n = 71$), “avenue to put climate adaptation science into the hands of decision makers” (67%; $n = 68$), “means for learning about climate adaptation” (66%; $n = 67$), and “source of funding for climate adaptation science” (61%; $n = 60$; Figure D.2). In contrast,

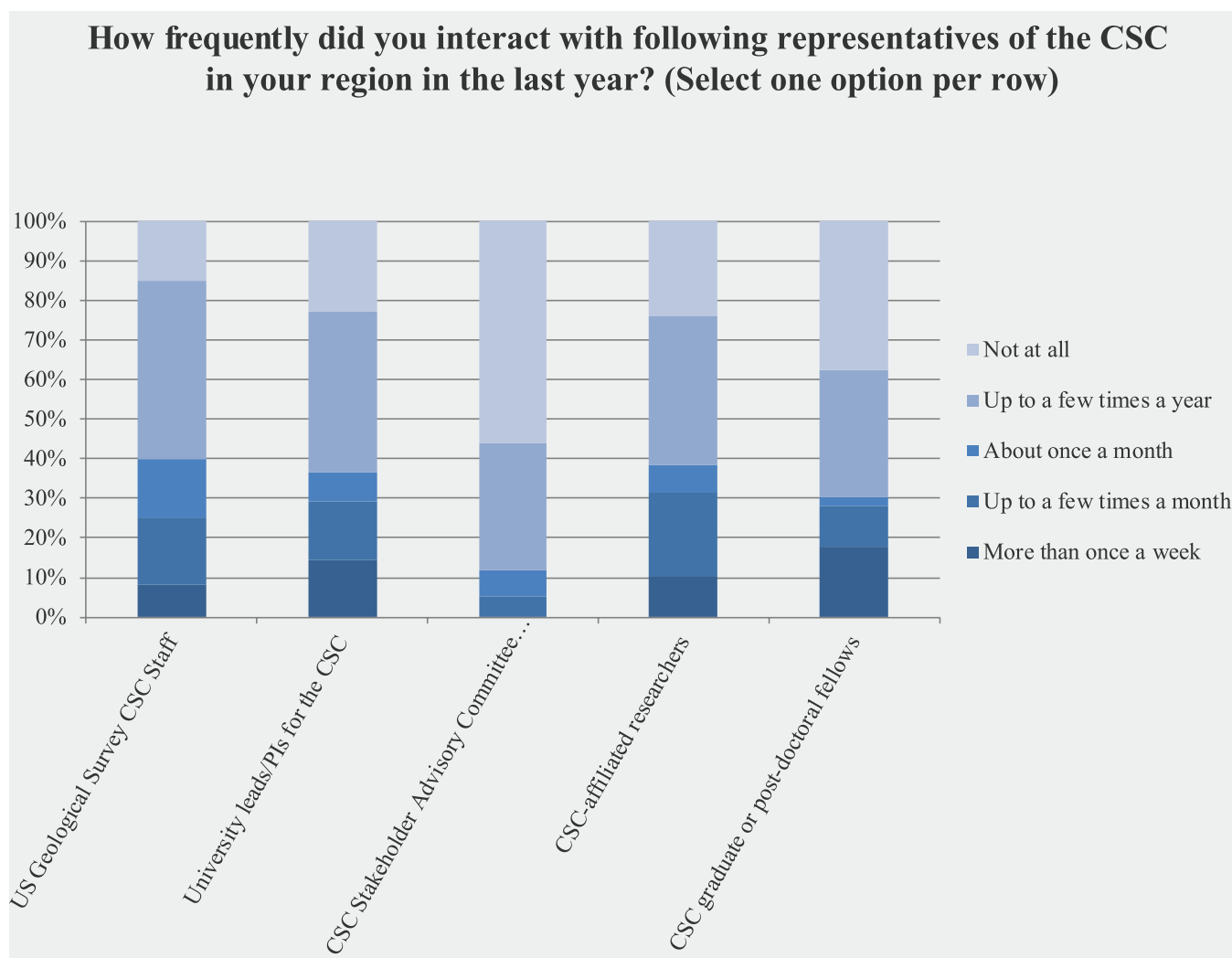


Figure D.1. Responses to the HDRU partnership survey regarding interaction with SE CSC staff. It should be noted that SAC members are not representative of the SE CSC, but rather reflect an interaction between a survey respondent and a person who, by nature of being an SAC member, would be expected to have substantial knowledge of the SE CSC and can provide input into the strategic direction of the SE CSC.

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

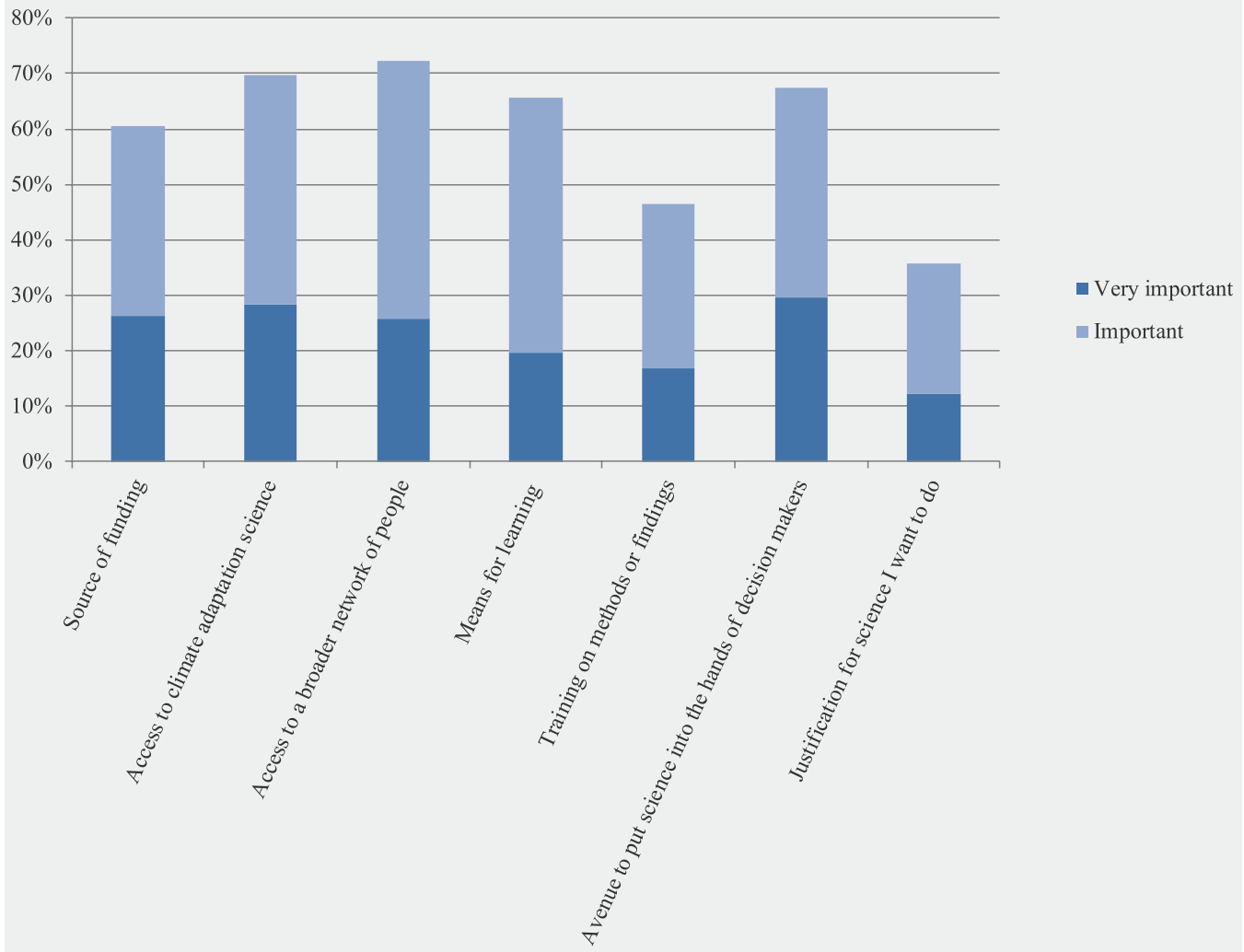


Figure D.2. Responses to the HDRU partnership survey regarding importance of SE CSC benefits to survey respondents. Note: text in items shortened for presentation in graph, and only “important” or “very important” responses are shown.

the benefits that were important or very important to the least number of respondents were “justification for science I want to do” (36%; $n = 35$) and “training on climate adaptation science methods or findings” (47%; $n = 47$).

Limitations on Involvement

Most of the survey respondents (83%; $n = 104$) reported that there are limits to their involvement with the SE CSC (Figure D.3). The most common limit was not having enough time (48%; $n = 61$), followed by their involvement not being as high of a priority as other work for respondents (28%; $n = 35$), and not having enough funds (21%; $n = 27$). A smaller percentage of respondents reported limits that could be

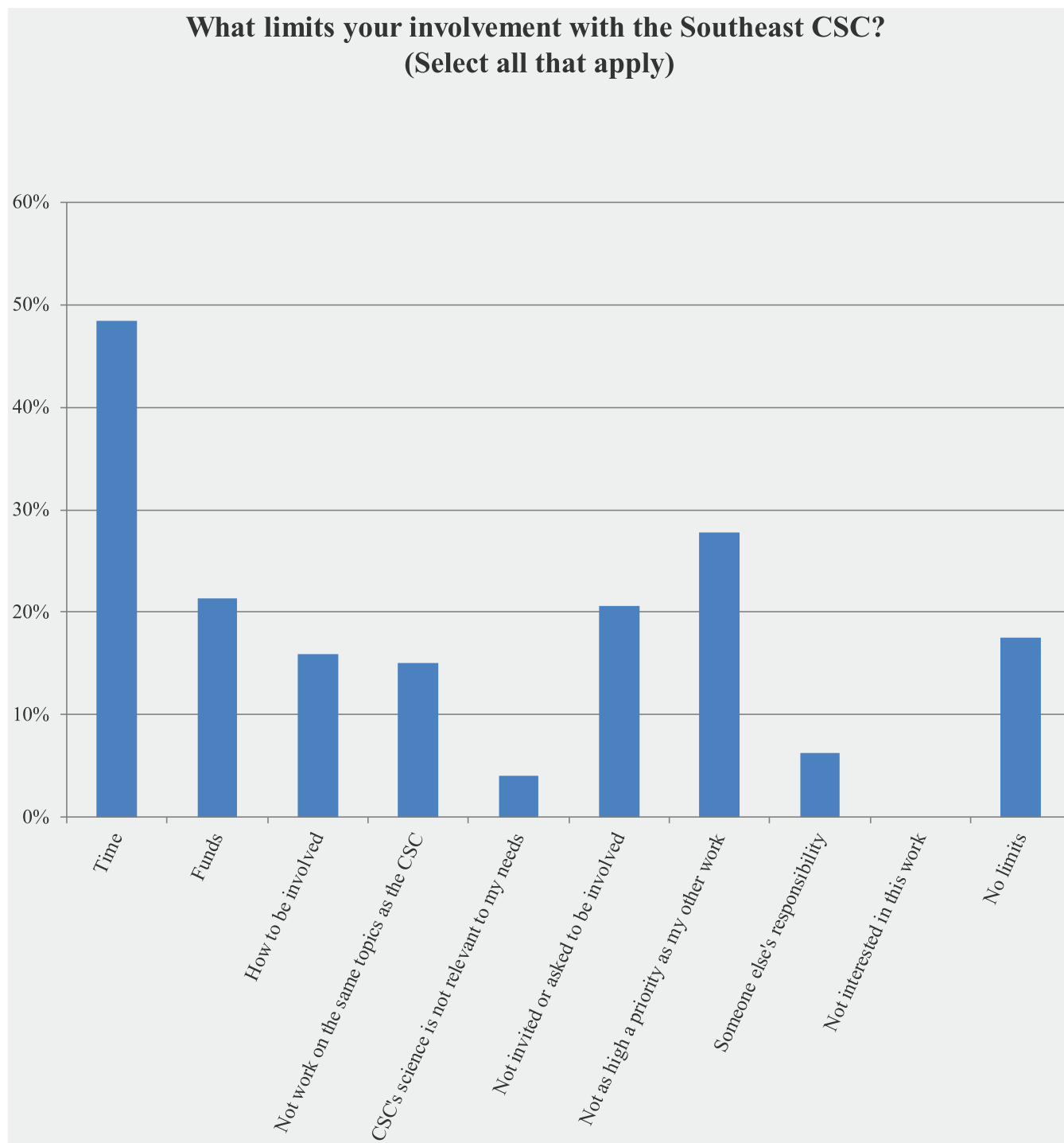


Figure D.3. Responses to the HDRU partnership survey regarding limitations to involvement in the SE CSC. Note: text in items shortened for presentation in graph.

addressed by the SE CSC, including not being invited/being asked to be involved (21%; $n = 26$) or not knowing how to be involved (16%; $n = 20$). Other limits that may be more of a challenge for the SE CSC to address included not working on the same topics as the CSC (15%; $n = 19$) and the perception that the SE CSC's science was irrelevant to their needs (4%; $n = 5$). No respondents reported not being interested in the SE CSC's work. Sixteen respondents provided additional comments about limitations, including multiple comments about working with another CSC or an LCC instead. Notable concerns respondents had about the CSE SC included CSCs can be insular, only affiliated faculty are competitive for grants,

and the USGS AK CSC staff do not reach out enough to faculty members to develop projects and garner support for projects like USGS Cooperative Unit staff do.

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 SE CSC. With regard to climate adaptation science in general, about two-thirds of the respondents (64%; $n = 79$) agreed or strongly agreed that climate adaptation science in the Southeast is available to decision makers (Figure D.3), but fewer of the respondents believed that various types of decision makers used the climate adaptation science to inform policies and management. Of the types of decision makers, the greatest number of respondents (50%; $n = 62$) believed that fish and wildlife managers used the science, followed by water managers (45%; $n = 55$) and land managers (41%; $n = 51$). The fewest number of respondents (24%; $n = 30$) believed that policymakers used the science. More generally, about 60% ($n = 76$) of the respondents felt that climate adaptation science did not influence actions taken by decision makers. Yet, about half of the respondents (46%; $n = 57$) felt that the SE CSC has helped reduce the disconnect between what is known about climate adaptation and the actions taken by decision makers in the region.

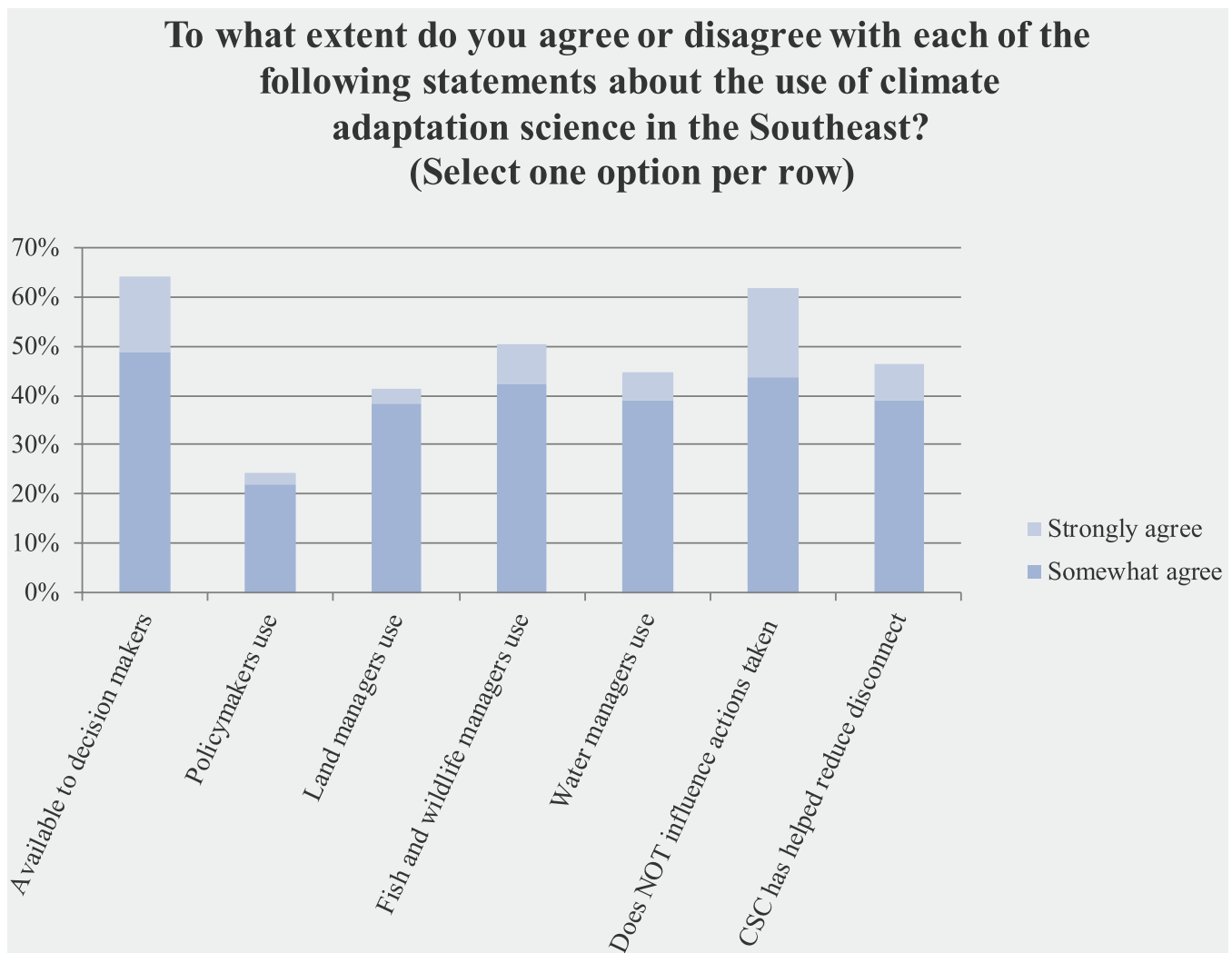


Figure D.3. Responses to HDRU partnership survey regarding utilization of SE CSC climate science products. Text in items shortened for presentation in graph, and only “strongly agree” and “somewhat agree.”

Specific to the science produced through the SE CSC (their staff, university affiliates, those funded by the SE CSC), the majority of the respondents (81%; $n = 100$) strongly or somewhat agreed that the SE CSC science can contribute to policy or management (Figure D.4). Of those that did not agree, most were unfamiliar with the science (11%; $n = 14$). Respondents were also generally positive about other characteristics of the CSC science, finding it appropriate (76%; $n = 94$), high quality (65%; $n = 81$), and able to integrate well with other information (64%; $n = 78$). Three respondents (2%) believed the science was biased, and 15% ($n = 18$) of the respondents strongly or somewhat agreed that it was irrelevant to management. For these items, 11–15% of the respondents reported that they were unfamiliar with the science and did not respond about its characteristics.

Science Users' and Producers' Use of Climate Adaptation Science

Among respondents who reported that they were science users, 43% ($n = 23$) reported that they or someone in their organization used climate adaptation science from someone affiliated with the SE CSC. In contrast, 70% ($n = 38$) reported that they or someone in their organization has used climate adaptation science from sources not affiliated with the SE CSC.

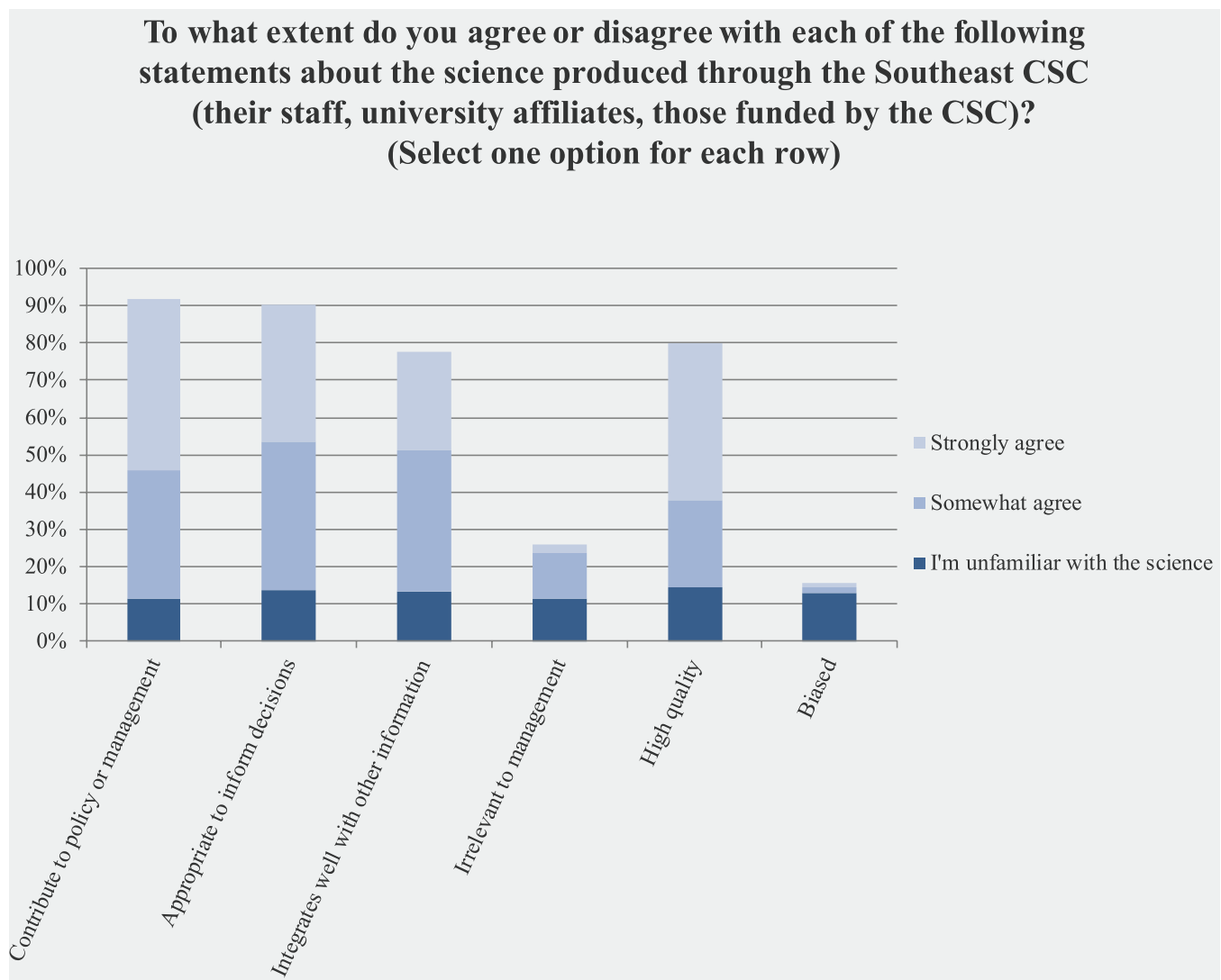


Figure D.4. Responses to the HDRU partnership survey characterizing contribution of SE CSC products to policy, management, and quality and biases of science products. Note: text in items shortened for presentation in graph, and only “strongly agree,” “somewhat agree,” or “I’m unfamiliar with the science” responses are shown.

The most common ways science users reported using the SE CSC science were to inform management plans (38%; $n = 20$) or management actions (30%; $n = 16$). Less common ways science users reported using SE CSC science were to inform training of conservation professionals (26%; $n = 14$), the public about climate change and its impacts (23%; $n = 12$), policy (17%; $n = 9$), and land-acquisition priorities (9%; $n = 5$).

Responses to this same question posed to science producers yielded a similar pattern of the most common and least common ways science was used, but with a greater frequency for most items—sometimes even double that of users (Figure D.5). The most common ways science producers reported that their science was used included informing management plans (61%; $n = 38$) or management actions (58%; $n = 36$). Less common ways science producers reported using SE CSC science were to inform training of conservation professionals (42%; $n = 26$), the public about climate change and its impacts (48%; $n = 30$), policy (29%; $n = 18$), and land-acquisition priorities (24%; $n = 15$).

Science users and producers differed in their perceptions of what factors limit the use of SE CSC science (Figure D.6). In nearly all cases, more science producers than science users perceived limits (not specifically to them) to using SE 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

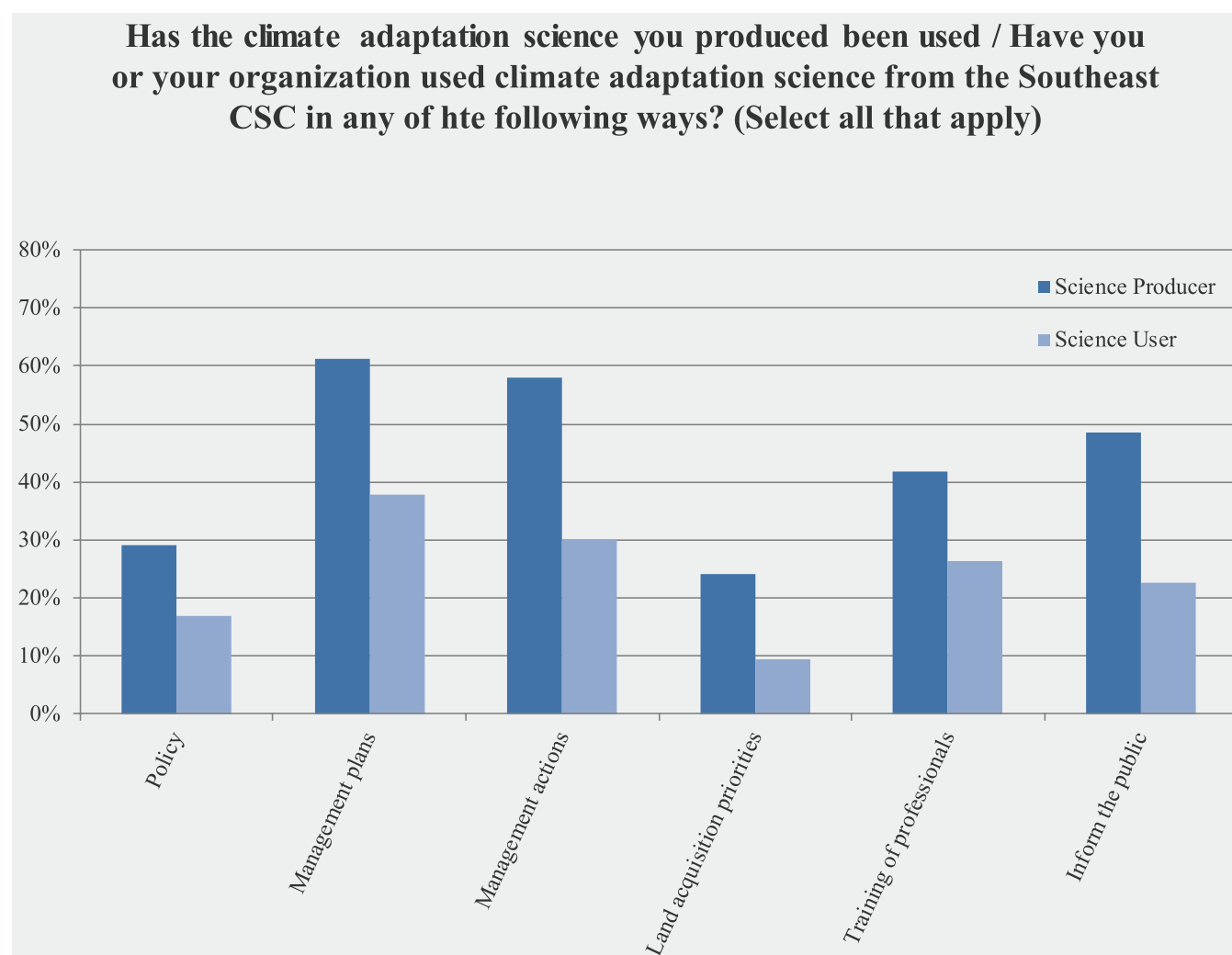


Figure D.5. Responses to the HDRU partnership survey regarding utilization of SE CSC science products. Note: text in items shortened for presentation in graph. Additionally, text varied slightly for science producers and users.

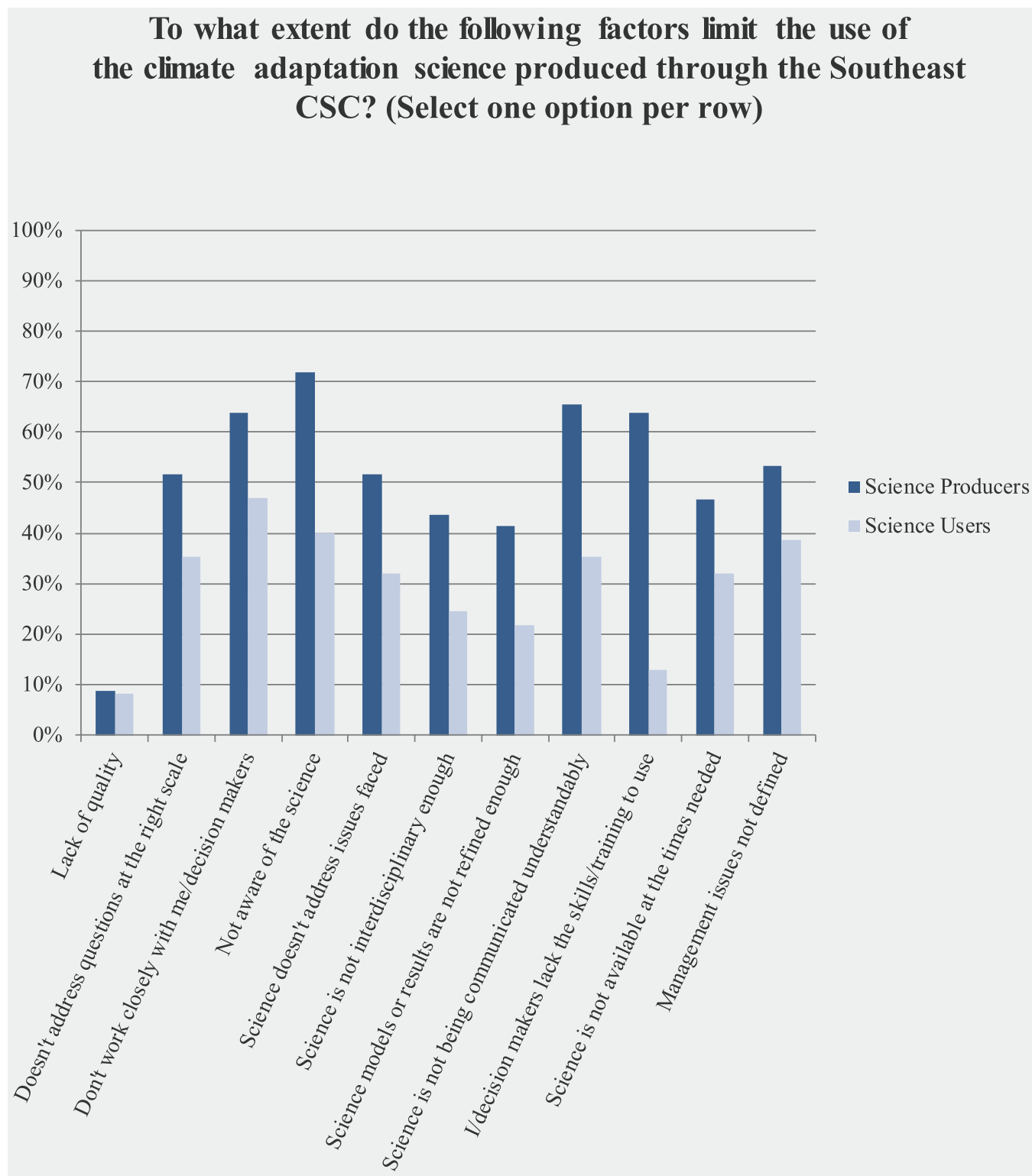


Figure D.6. Responses to the HDRU partnership survey regarding limitations to the use of AK CSC products. Note: text in items shortened for presentation in graph, and only “to a moderate extent,” “to a large extent,” or “to a very large extent” responses are shown. Additionally, text varied slightly for science producers and users.

with decision makers (science users—47%; science producers—64%) and decision makers not being aware of the science (science users—40%; science producers—72%). A majority of science producers (66%) also felt that science not being communicated in ways that is understandable to decision makers was a limitation, while it was not a top response among science users (35%). The same pattern was found for decision makers lacking the skills to use the science (science users—13%; science producers—64%). Both groups had a similar least common limitation: lack of quality of the science (science users—8%; science producers—9%).

Science Users' and Producers' Engagement in Coproduction of Knowledge

Respondents reported on their beliefs about coproduction of knowledge in general. A similarly high proportion of both science users (80%; $n = 41$) and science producers (84%; $n = 51$) expressed support for coproduction, indicating that it was important or very important for climate adaptation scientists and natural resources decision makers to work together to produce science research.

While many science producers indicated experience in coproduction in various aspects of research projects, far fewer of the science users reported experience with each aspect (Figure D.7). It should be noted that this question was asked in reference to the SE CSC specifically for users, but that specification was not made for producers. For all aspects of research projects, at least 40% of the science producers reported experience collaborating with decision makers to a moderate, large, or very large extent, while the science users' experience with collaborating on all aspects ranged from a very low 8% with experience analyzing data to 33% with experience applying results. For both groups, communicating results (science users—25%; science producers—64%) and applying results (science users—33%; science producers—60%) were two of the aspects with which respondents reported most collaborative experience. Two of the other aspects with a high proportion of science producers reporting experience were not relatively higher for science users: determining research priorities (science users—22%; science producers—66%) and identifying research questions (science users—18%; science producers—67%).

Regarding science users' limitations to involvement in research, scientists not reaching out to them to collaborate was the most common issue (56%; $n = 29$ agreed or strongly agreed), followed by different perspectives on what science is needed (31%; $n = 16$), and funders do not support collaboration between scientists and decision makers (31%; $n = 16$). Other factors only limited the involvement of a minority of the respondents: different perspectives on how research projects should be conducted (25%; $n = 13$) and scientists not being interested in listening to them (13%; $n = 7$). Notably, not having enough time was a limitation for few science users (21%; $n = 11$), although it had limited their involvement in the SE CSC (see above).

Perceptions of the Role of the Climate Science Center

The SE CSC has helped facilitate various connections, with most respondents reporting help making connections “to a moderate extent” (Figure D.8). The most common connections reported were with climate adaptation scientists (53%; $n = 55$), climate adaptation science itself (52%; $n = 54$), professionals who might communicate climate adaptation science (50%; $n = 51$), and resources needed to conduct science (40%; $n = 41$). Fewer respondents reported help in connecting with decision makers who might use science (35%; $n = 36$).

When evaluating the SE CSC's contributions, the greatest number of respondents agreed that it contributed to awareness of available science (75%; $n = 75$), collaboration between scientists (71%; $n = 72$), interdisciplinary science (66%; $n = 67$), and communication between scientists and decision makers (68%; $n = 68$; Figure D.9). About half of the respondents indicated that the CSC contributes to relationship building among decision makers, alignment of science with needs of decision makers, translating complex science for decision makers, social science about climate adaptation issues, and ensuring that science is at an appropriate scale.

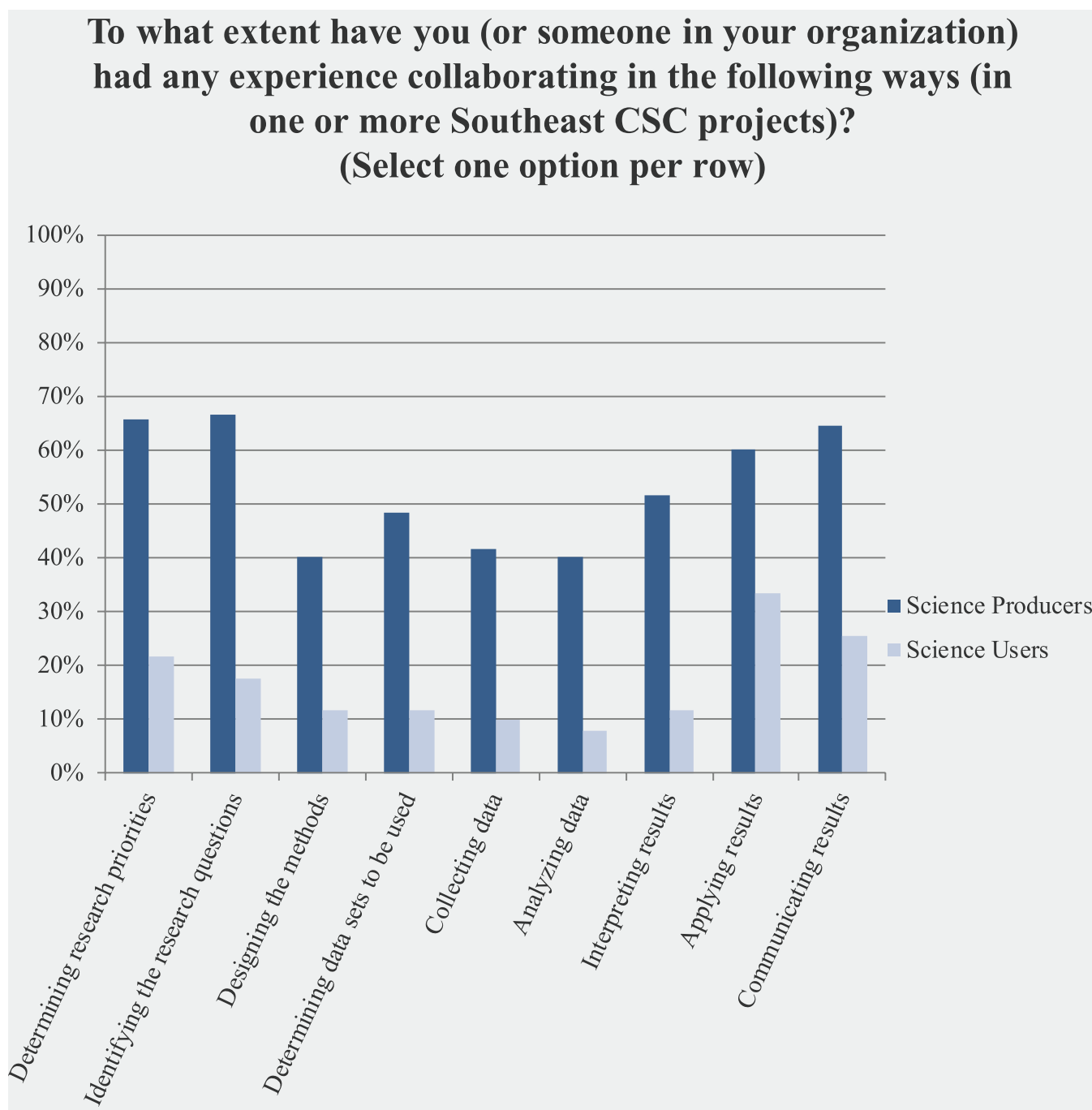


Figure D.7. Responses to the HDRU partnership survey regarding collaboration activities with the SE CSC. Note: text in items shortened for presentation in graph, and only “to a moderate extent,” “to a large extent,” or “to a very large extent” responses are shown. Additionally, the text of the question varied slightly for science producers and users (e.g., the users’ version referencing “you or someone in your organization” and specifying a SE CSC project).

Summary of Southeast Results

Respondents represented science users and science producers (both those affiliated with the SE CSC and those not so affiliated) and a variety of types of organizations and agencies and types of positions, with federal agencies and universities being most prominent.

Most of the respondents had at least some interest in or involvement with the SE CSC. This involvement came in a variety of forms, with the most common involvement being as a SE CSC-funded graduate

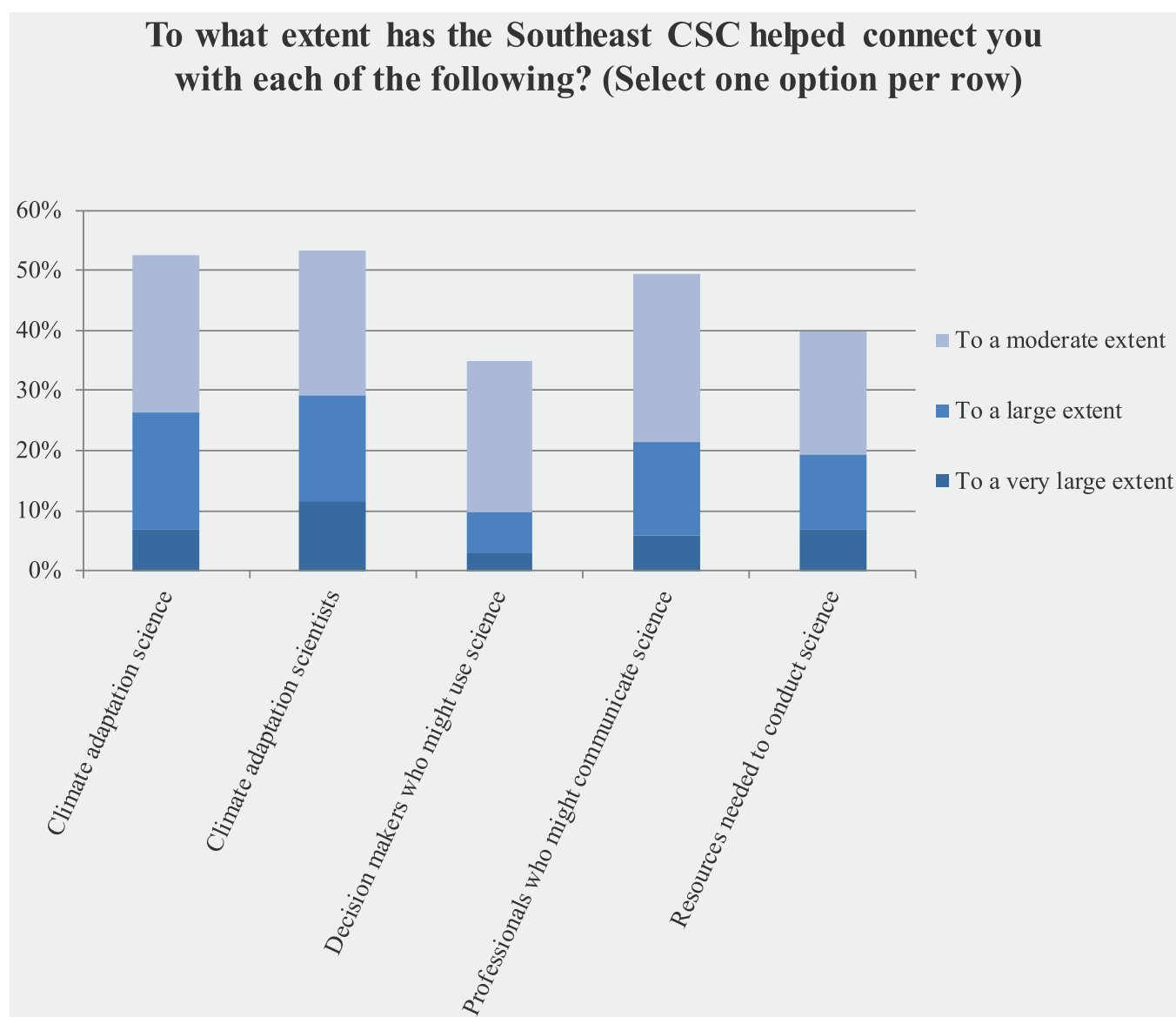


Figure D.8. Responses to the HDRU partnership survey regarding the establishment or enhancement of connections developed through or as a result of the SE CSC. Note: text in items shortened for presentation in graph, and only “to a moderate extent,” “to a large extent,” or “to a very large extent” responses are shown.

student or postdoctoral fellow, university member affiliated with the SE CSC, or participant in a training, webinar, workshop, or conference. The level of interaction respondents had with US CSC federal staff was slightly higher than with university leads/PIs.

The SE CSC provided many important benefits to partners, with the top ones being putting science in the hands of decision makers, providing access to science, providing access to a network of people interested in climate adaptation science, and as a means for learning about climate adaptation. Respondents reported that they were limited in their involvement with the SE CSC by a variety of factors, with the most common ones being time, other priorities, and funds.

About two-thirds of the respondents felt that climate adaptation science in the Southeast is available to decision makers, but relatively fewer respondents believed that various types of decision makers use the climate adaptation science to inform policies and management. Specific to the science produced through the SE CSC, the majority of the respondents agreed that it can contribute to policy or management. Re-

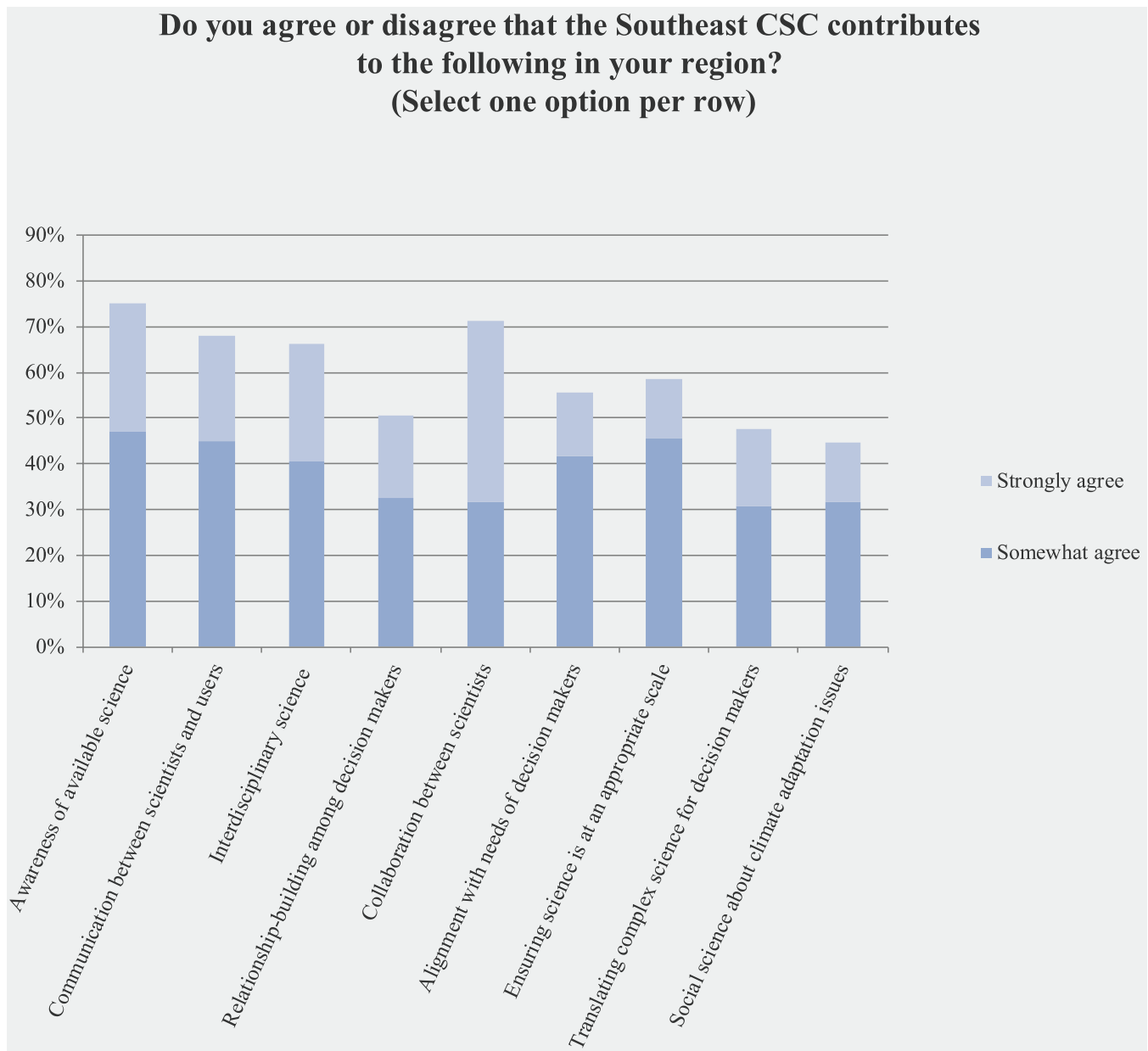


Figure D.9. Responses to the HDRU partnership survey regarding SE CSC contributions to a variety of potential benefits of the SE CSC. Note: text in items shortened for presentation in graph, and only “strongly agree” or “somewhat agree” responses are shown.

spondents were also generally positive about other characteristics of the SE 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 using the SE CSC science were to inform management plans or management actions. However, science users and producers differed in their perceptions of what limits the use of SE CSC science. Science producers perceived the limitations on the use of SE CSC science to be greater than science users found them to be.

Both science users and producers expressed support for coproduction of science. While many of the science producers had experience in coproduction in various phases of research projects, much fewer of the science users reported first-hand experience. Coproduction was more common in the early stages (setting priorities and identifying research questions) and late stages (interpreting, applying, and com-

municating results) of research than the middle stages. Science users reported that their involvement in coproduced research projects was most limited by scientists not reaching out to them, having different perspectives from scientists on what science is needed, and the lack of support for collaboration by funders.

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