

**Department of the Interior
U.S. Geological Survey
Southwest Climate Science Center**

2013 Annual Science Workplan



Introduction

The mission of the Southwest Climate Science Center (SW CSC) is to provide the region's resource managers with essential scientific knowledge and tools to anticipate and adapt to climate change. The SW CSC is committed to providing the best science available, and to working in partnership with stakeholders in the Department of the Interior and other agencies and organizations to identify critical knowledge needs and to share information. Although the SW CSC is primarily focused on the southwestern United States, it collaborates with other CSCs across the country to develop capacity at the national level and address regional challenges.

The general science objectives, staffing needs, and operating principles for the SW CSC over the next 3 to 5 years are described in the Science Agenda. This Annual Science Workplan details the specific research priorities and planned actions for the SW CSC during federal fiscal year 2013 (FY 13).

Stakeholder Engagement

In FY 13, the SW CSC will actively engage with the Stakeholder Advisory Committee and the Landscape Conservation Cooperatives (LCCs) in the region. The first Stakeholder Advisory Committee (SAC) meeting was held in December 2011; the SW CSC will work with the SAC to plan a second meeting in FY13. A key purpose of the 2013 meeting will be to facilitate communication among SAC members, LCC representatives, and the recently appointed permanent SW CSC Director, Steve Jackson. Jackson will also schedule in-person or telephone meetings with representatives of the LCCs in the region in the coming months. The climate-science information needs expressed in the Science Agenda and the research themes intended to meet those needs (see below) reflect guidance provided in 2011 and 2012 by the SAC, the LCCs, and other resource-management agencies. The FY 13 meetings will build on the previous discussions to clarify stakeholder needs and priorities, present scientific capacities and uncertainties, and identify gaps and emerging needs for scientific knowledge. The meetings also will provide opportunities for the SAC and LCCs to review and provide feedback on research priorities and to ensure that the SW CSC is on track to address stakeholder needs.

Research Priorities

The SW CSC Science Agenda ([link](#)) describes 5 research themes. The research themes are based on climate-science information needs that have been communicated by the resource-management agencies with which the SAC members and LCCs are affiliated. Given limited resources and needs for particular information in a given fiscal year, the SW CSC prioritizes research objectives annually. All themes may not be addressed in a given year.

Theme 5, Establishing best practices, is particularly critical to success of the SW CSC. Accordingly, starting in FY 13, the SW CSC will launch a major, long-term integrative project aimed at understanding, testing, and assessing approaches to scientist-stakeholder engagement

that produce effective management and scientific outcomes. The ultimate objective is to identify a set of best practices for collaboration and knowledge exchange between researchers and stakeholders. This initiative reflects the high priority the SW CSC places on effective stakeholder collaboration, as indicated in the SW CSC Goals outlined in the Science Agenda.

In addition, during FY 13 the SW CSC will release two requests for proposals (RFPs) – one each for projects starting in FY 13 and FY 14 – for projects that address other research themes identified in the Science Agenda. These projects not only will provide new knowledge for resource managers, but also may test potential best practices. They will be directed toward providing timely information on specific issues to resource managers. The SW CSC anticipates that many of the projects will complement the longer-term integrative project, and that all will contribute to identification of best practices and communicate results in ways that inform management actions.

The RFP for FY 13 project starts will be released in mid-January 2013. The RFP for FY 14 project starts will be released during summer 2013.

Long-term, Integrative Project

Much knowledge exists about climate variability and change and its interactions with physical and biological systems, but this knowledge is not always synthesized, interpreted, or communicated in ways that inform actions by resource managers. Often, a result published in a scientific journal may be relevant to a particular management issue, but connections between results and management actions in journal articles may be ambiguous or tangential. Additionally, researchers often do not understand the needs and priorities of resource managers, whereas resource managers often misunderstand the capacities and uncertainties in the science. Therefore, there is a need to

- understand decision frameworks and constraints within agencies and other stakeholder entities,
- identify the ways in which scientific research can be most effectively designed and implemented within those frameworks,
- determine how knowledge can be integrated for use in decision-making across multiple jurisdictions, and
- develop networks for knowledge exchange among researchers and decision-makers.

In FY13, the SW CSC will initiate an ambitious, long-term effort to develop best practices for reconciling the information needs of stakeholders with available scientific knowledge and capacities, consistent with Research Theme 5 in the SW CSC Science Agenda. Through the long-term initiative, the SW CSC will identify, implement, and assess a suite of approaches for

collaboration between researchers and stakeholders. These approaches will be implemented in multiple stakeholder-driven projects. A subset of these projects will be part of the long-term initiative and others will be shorter-term projects selected from submissions to the RFPs described above. Participants in the integrative project will include physical, ecological, and social scientists and stakeholders representing diverse agencies and management contexts. A component of the project will be development of a climate-knowledge network and data exchange for the region that will allow scientists and stakeholders to both obtain and contribute information. This project will provide a solid, long-term foundation for effective use of SW CSC resources, and will benefit other CSCs and entities involved in collaboration and knowledge co-generation among researchers and managers.

Short-term, Tactical Project Priorities

During FY 13 and 14, the SW CSC will fund a total of 4 to 6 projects of 1-2 years' duration that are designed to address specific information needs of stakeholders. The FY 13 and 14 project priorities, stakeholder information needs, and SW CSC research themes are closely related (figure 1). The FY 14 RFP will solicit proposals to meet some needs not included in the FY 13 priorities. Some research themes identified in the Science Agenda in which the SW CSC already has invested heavily will receive reduced support in the FY 13 and 14 RFPs. Projects to be funded through upcoming RFPs will comprise targeted, short-term efforts that apply directly to specific management challenges, either locally or broadly across the landscape. Each project will target one or more issues faced by stakeholders, generate knowledge to address that challenge, and communicate the results to stakeholders in actionable ways. Six major priorities will be identified in the RFPs:

- 1. Anticipating climate change and variability at intermediate timescales.** Current forecasting ability is concentrated on short time spans of weeks to months, and long time spans of a few decades, with a major gap at intermediate time spans. Yet the strong variability and changes that occur at annual to decadal frequencies in the Southwest will modulate longer-term trends, and profoundly affect hydrological and ecological realizations in the coming decades. Intermediate-scale climate variability poses challenges and opportunities for resource managers. Assessments of how annual to decadal climate variability might influence climate extremes and long-term trends are needed. These assessments may include original research or reviews of the state of the science and prospects for intermediate-scale forecasting.

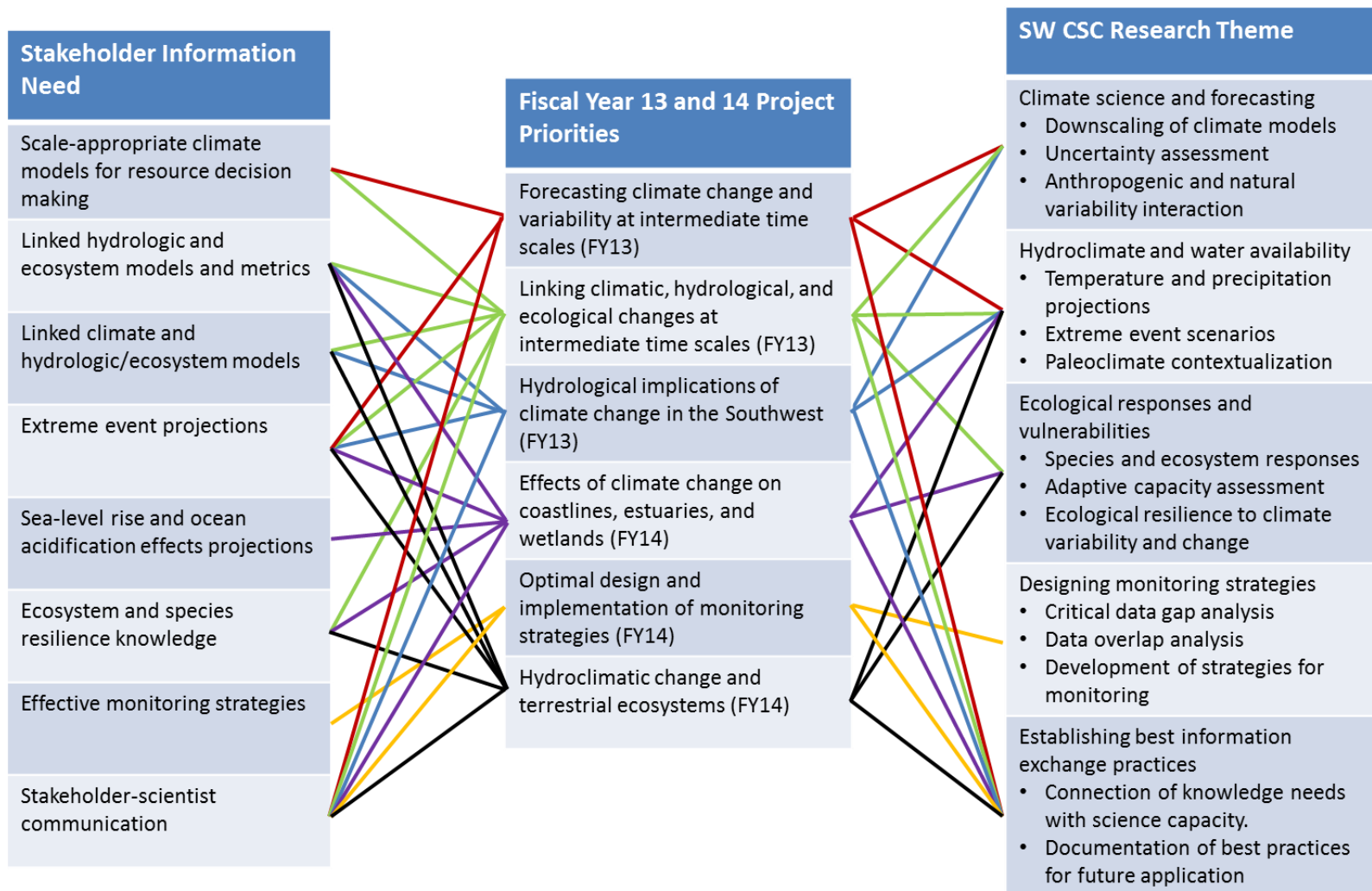


Figure 1. Relations between fiscal year 13 and 14 project priorities, stakeholder information needs, and Southwest Climate Science Center research themes.

2. Linking climatic, hydrological and ecological changes at intermediate timescales.

Climate variation at annual to decadal timescales has a large influence on hydrological and ecological systems. Hydrological extremes, both high and low, pose challenges for managers of water and other natural resources. Composition and structure of terrestrial ecosystems are strongly influenced by annual to decadal variability in spatially extensive disturbances (wildfires, mass mortality of trees) and recruitment, which in turn reflect climatic variability. Effects of such variation in disturbances and recruitment can persist for decades or longer in terrestrial ecosystems across the Southwest. Furthermore, geographic ranges and population sizes of many species are highly sensitive to interannual to decadal climate variability, which will affect their responses to longer-term climate trends. Hydrological and ecological responses to intermediate-scale climate variability need careful study. These dynamics will occur regardless of climate change, and they will influence ecological trajectories during the longer-term changes in climate over the next century. An important scientific challenge is to anticipate the array of intermediate-scale hydrological and ecological outcomes. That will in turn help resource managers identify threats and opportunities posed by alternative intermediate-scale scenarios.

3. Hydrological effects of climate change in the Southwest. Projections of 21st-century hydrological changes represent a critical need for stakeholders in the Southwest. The most recent results from the Coupled Model Intercomparison Project (CMIP5) provide an opportunity to update and improve forecasts of long-term trends in precipitation, snowpack, runoff, soil moisture, and groundwater in the region. The long-term projections (circa 2035 – 2100 CE) can be integrated and validated using observational and paleohydrological data. Projections of future hydroclimate and hydrology, with accompanying specifications of uncertainties, will be invaluable for stakeholder planning and decision-making, particularly if closely coordinated with one or more groups of stakeholders.

4. Effects of climate change on coastlines, estuaries, and wetlands. Coastal regions and estuaries will be affected by sea-level rise, which will interact with changes in ocean and atmospheric circulation to alter land cover and species habitats along the California coast. The recent identification of transient ‘atmospheric rivers’ highlights the potential vulnerability of coastal regions and freshwater wetlands to extreme events. The most recent generation of climate projections (e.g., CMIP5), sea-level assessments, and research on climate extremes can be brought to bear in determining vulnerability of coastal, estuarine, and freshwater-wetland ecosystems, and developing effective management strategies.

- 5. Design and implementation of monitoring strategies.** Multiple arrays of monitoring programs and networks exist in the Southwest and adjacent regions. These networks are useful for diagnosing trends, identifying emerging threats and opportunities, determining success of past and ongoing management initiatives, and assessing accuracy of past projections. Many networks have developed haphazardly or opportunistically, and systematic assessment of existing monitoring networks and their utility for current decision-making is timely. Such assessment should be closely coordinated with stakeholders to determine how monitoring data are used, whether existing networks and data streams are adequate for decision-making, and ways in which monitoring can be improved. Emphasis will not be on supporting monitoring programs *per se*, but on determining how monitoring strategies can best meet the needs of stakeholders.

- 6. Hydroclimatic change and terrestrial ecosystems.** Changes in hydroclimate are expected to cause substantial changes in terrestrial ecosystem properties, ranging from fundamental attributes of land cover and species habitats (e.g., vegetation composition and structure) to ecosystem functions (carbon storage, primary productivity, runoff and infiltration, forage, fuel accumulation, local to regional climate *via* albedo, evapotranspiration, and latent heat flux). Such changes can be assessed using a variety of approaches, including field observation, remote sensing, state-and- transition models, and simulations. In some settings, paleoecological and paleoclimatic studies can contribute to sensitivity assessment and model validation. Local to regional studies of terrestrial ecosystem responses to hydroclimatic change, developed in close coordination with stakeholders, will provide valuable information for decision-making and planning.

Proposals addressing these 6 priorities may be local or regional in scope, and may incorporate one or multiple complementary approaches. However, all proposals are expected to be developed in coordination with local or regional stakeholders, and to include a clear plan for engagement and communication with stakeholders throughout the project. Furthermore, all recipients of funds will be expected to work with the SW CSC and partners to complement the long-term integrative project regardless of when the short-term or long-term projects are initiated. The SW CSC is prepared to dedicate travel funds toward meetings among principal investigators of the short-term projects and the long-term integrative project.

Workforce Planning

The SW CSC aims to build capacity to meet major research challenges while minimizing redundancy with existing capacity within USGS Science Centers and the SW CSC host institutions. The skills needed by the SW CSC will be defined iteratively, in collaboration with the SAC, LCCs, and neighboring CSCs and USGS Centers, as science priorities are met and gaps in capability are identified. In essence, the staffing decisions made by the SW CSC will

adapt to short- and long-range needs as they arise. Generally, the SW CSC intends to recruit individuals with interdisciplinary training or experience in bridging science and resource management.