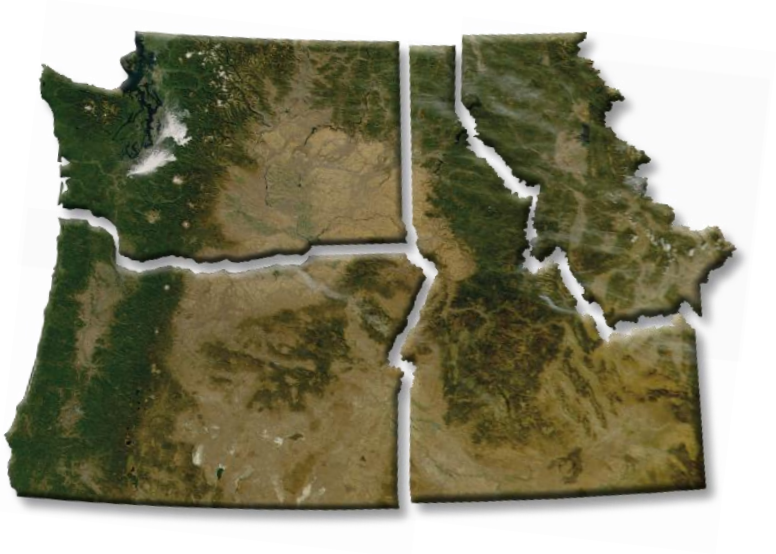
Department of the Interior

U.S. Geological Survey

Northwest Climate Science Center

FY 2011 Annual Report



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Northwest Climate Science Center

FY 2011 Annual Report

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INTRODUCTION

The Northwest Climate Science Center (NW CSC) was established in 2010, as one of the first of eight regional Climate Science Centers to be initiated by the Department of the Interior (DOI). The NW CSC is supported by an academic consortium with the capacity to generate climate science and tools in a coordinated fashion, thus serving stakeholders across the Pacific Northwest region. The NW CSC generally encompasses a geographic area that includes Washington, Oregon, Idaho, and western Montana. The NW CSC has overlapping boundaries with three Landscape Conservation Cooperatives (LCCs): the Great Northern, the Great Basin, and the North Pacific. Collaboration between the NW CSC and these three LCCs will address the highest priority regional climate science needs and deliver the necessary science and information required by Northwest natural resource managers.

The consortium of Northwest universities is key to the success of the NW CSC. This network of academic institutions is primarily represented by Oregon State University (OSU), University of Idaho (UI), and the University of Washington (UW), and includes other institutions in Washington, Oregon, Idaho, and western Montana with interests and expertise in climate science[1]. The consortium provides capabilities in climate science, ecology, impacts assessment, modeling, and advanced information technology, all of which will be necessary to address and respond to climate change in the Northwest. These universities are also critical for recruiting and training graduate students.

The purpose of this Annual Report is to summarize progress towards achieving full operational status of the NW CSC during Fiscal Year (FY) 2011. The following sections of the report represent the focal points and areas of emphasis for establishing the NW CSC.

MAJOR ACCOMPLISHMENTS FOR THE NW CSC IN FY 2011: PROGRESS TOWARDS FULL OPERATIONAL STATUS

1. Administration and management

1.1. Acting NW CSC Directors

Three USGS employees served as Acting Center Director since the establishment of the NW CSC. These include Carol Schuler, Director of USGS Forest and Rangeland Ecosystem Science

[1] Institutions that participate in the NW CSC consortium include: Boise State University, Idaho National Laboratory, Idaho State University, Montana State University, Oregon Health and Science University, Oregon State University, Pacific Northwest National Laboratory, Portland State University, University of Idaho, University of Montana, University of Oregon, University of Washington, Washington State University, and Western Regional Climate Center.

Center; Kevin Whalen, Deputy Chief of the USGS Cooperative Research Unit Program, and Nancy Lee, Deputy Regional Executive for the USGS Northwest Area.

1.2. Permanent NW CSC Director

Dr. Gustavo Bisbal was selected to be the Director of the Northwest Climate Science Center. He assumed this new role on December 5, 2011. Prior to his appointment, Dr. Bisbal served in the Bureau of Oceans, Environment and Science at the U.S. Department of State, since 2006. Securing permanent leadership at the NW CSC Director level is important for the Department of the Interior to advance its commitments to developing a program of climate science partnerships with the university consortium and others.

1.3 Leadership Team

The NW CSC Leadership Team (LT) was established to allow for open and frequent communication amongst key entities with involvement in the functions of the NW CSC. The LT includes the NW CSC Director, the USGS Regional Executive Office, and the primary academic institutions interfacing with the NW CSC (Appendix 1). The LT addresses NW CSC business matters, program management, communications and data management coordination, and other emerging issues through conference calls every 2 weeks and quarterly face-to-face meetings.

2. Federal-Academic partnership

In September, 2010, the USGS formalized a cooperative agreement (Award#G10AC00702) with the academic consortium of Northwest institutions. The performance period for this agreement will end in 2015. This engagement will eventually provide a seamless network to access the best science available to help meet the priority needs of natural and cultural resource managers in the Northwest. During this opening year, direct expenditures at the three primary universities in the NW CSC consortium (OSU, UI, and UW) emphasized two primary functions:

(1) providing the initial set-up infrastructure necessary for the functioning of the NW CSC, such as office space, administrative support, communications support, and information technology, data management, and cyber-infrastructure support.

(2) workforce development, through graduate research fellowships and an annual NW CSC "climate boot camp" (described in detail below) to educate and train graduate students in interdisciplinary research, outreach, and communication.

In addition to the collective progress by this academic consortium, each university took solid steps to advance their respective commitments within the statement of work outlined in the cooperative agreement. Those steps are summarized in Appendix 2.

3. Cross-Governmental coordination

The DOI Climate Science Centers are committed to a stakeholder-driven strategic process. Three activities of the NW CSC provided concrete steps toward federal integration and coordination of regional climate activities, including: (1) The establishment of the Executive Stakeholder Advisory Committee (ESAC), (2) the strong connection between the NW CSC and the NOAA-funded Pacific Northwest Climate Impacts Research Consortium (CIRC), and (3) the coordination effort in data management and cyberinfrastructure across several DOI, U.S. Department of Agriculture, and National Science Foundation-funded climate research and education projects in the region. Each deserves special consideration.

(1) The establishment and implementation of the ESAC ensures broad participation by several segments of society. The ESAC is comprised of regional partners representing 22 federal, state, and tribal agencies and organizations (Appendix 3). The ESAC has a key role in setting the long-term science agenda for the NW CSC as well as ensuring that the NW CSC's annual science work plan reflects the highest of those strategic science priorities. The USGS NWA Regional Executive is the chair of the ESAC and in FY 2011 convened the ESAC in person for a full day meeting (March) and via phone (September). These meetings have been supplemented by e-mail correspondence. An ESAC Science Prioritization Working Group (whose members are a representative cross-section of the full ESAC) was created to formulate a prioritization process for FY12 NW CSC science funding. This group met again in late December 2011.

(2) CIRC is one of the Regional Integrated Sciences and Assessments (RISA) projects sponsored by the National Oceanic and Atmospheric Administration (NOAA). Both the NW CSC and CIRC are co-located at the Oregon State University, which ensures maximum integration of their respective activities. The CIRC Co-PI and staff also serve on the NW CSC Leadership Team. The two centers coordinate science and serve stakeholders across the Pacific Northwest region. The NW CSC and CIRC will closely and innovatively integrate science and field work across both projects, thus optimizing the utilization of federal investments in a region where stakeholders are paying close attention to climate change and incorporating it into their decisions.

(3) There is close coordination of data management and cyberinfrastructure efforts across federally funded climate projects in the region. The NW CSC was the first project in the region that dedicated funding to this type of coordination by supporting the Northwest Knowledge Network (NKN) at the University of Idaho as its data management provider.

Since then, NKN now serves as data provider for the USDA-funded Regional Approaches to Climate Change in Pacific Northwest Agriculture project (REACCH), and the NSF EPSCoR-funded Water Resources in a Changing Climate project. NKN now coordinates data management as a coordinated effort across these regional projects, increasing efficiency and effectiveness for each.

Interim NW CSC Directors also established important links with other DOI partners, including the North Pacific and Great Northern Landscape Conservation Cooperatives (LCCs). LCC leaders are represented on the ESAC, and USGS staff are represented on the respective LCC Steering Committees. Additionally, NW LCC staff are members of the ESAC Science Prioritization Working Group. This close collaboration will provide the necessary interaction to capture LCC science needs in the NW CSC Climate Science Agenda.

4. Tribal outreach

Tribal outreach and engagement has been a top priority of the NW CSC. Three tribal entities (the Columbia River Inter-Tribal Fish Commission, the Northwest Indian Fisheries Commission, and the Affiliated Tribes of Northwest Indians) are members of the ESAC and significant effort has been focused on providing opportunities for tribes to comment on the overall development of the DOI climate change infrastructure and the NW CSC Science Agenda. Specifics include:

- NW CSC staff presentation to the 2010 Annual Meeting of Affiliated Tribes of NW Indians (ATNI) (9/22/2010)
- Input from ESAC Tribal Representatives on the NW CSC Science Agenda (4/2011)
- NW CSC staff presentation to the National Tribal Forum Presentation (6/16/2011)
- Request for comments from ATNI member tribes on the NW CSC Science Agenda sent via letter and e-mail (7/2011)
- NW CSC sponsorship and coordination of “Exploring Traditional Ecological Knowledge’s Role in Responding and Adapting to Climate Change and Variability” workshop (9/15-16/2011)
- ESAC Chair presentation to the 2011 ATNI Annual Meeting Presentation (9/21/2011)
- Web Ex on the NW CSC Science Agenda hosted by ESAC Chair (10/4/2011)

5. Science Agenda

A draft NW CSC Science Agenda was developed by a USGS work team in consultation with the ESAC. This long term (5-year horizon) draft Science Agenda relies heavily on the regional input regarding climate information needed for management, coordination between regional science agendas of various agencies and projects, and detected climate science gaps. The relevance of this draft Science Agenda to the research and management communities in the Northwest

hinges on successful consultations with (1) the ESAC, (2) designated coordinators from associated LCCs, (3) tribal leaders, and (4) non-governmental organizations (NGOs) in the Northwest. Importantly, this draft Science Agenda will be used to make determinations about climate science projects to be funded by the NW CSC in the future. The draft Science Agenda was submitted to the National Climate Change and Wildlife Science Center (NCCWSC) in June, 2011, for review. The Key Science Needs section from the draft NW Science Agenda is provided in Appendix 4.

6. Strategic annual science planning

In FY 2011, the NW CSC Leadership Team progressed in establishing operational elements for science planning. The basic concept for annual science planning for the NW CSC is to convey and recast the broad Science Agenda strategic goals into subthemes whereby specific priorities, and ultimately research projects supporting them, can be selected. This process of taking high level strategic guidance and operationalizing this guidance into the delivery of science has not yet been completed in the NW CSC. The NW CSC established four basic principles for science planning:

- To fund priority science needs as determined by the collaborative efforts of the NW CSC Director, ESAC, and ESAC Science Prioritization Working Group, in concert with the Science Agenda and general analysis of the climate science of the NW;
- That University PIs within the NW CSC consortium play a key role in evaluating science priorities and identify research questions that address science gaps and promote the spirit of the joint NW CSC venture;
- To achieve the underlying DOI mission orientation of the NW CSC to serve and provide science for resource decision-making through close coordination and communication with LCC coordinators;
- That research proposals selected for funding are peer reviewed by an independent team, and comments are vetted and reconciled to the satisfaction of the NW CSC Director to ensure that funding investments reflect potential for the highest quality and robust science.

Additionally, science planning recognizes a formal milestone to coordinate with LCCs and to develop science projects that focus on the leveraged academic strength of university partners in the NW CSC consortium and USGS Science Centers.

7. NGO engagement

Non-governmental organizations (NGOs) were contacted to provide comments on the draft NW CSC Science Agenda. These comments were integrated into the draft submitted to NCCWSC for

review, in June, 2011. As a follow up action, the NW CSC Director was invited to participate in the steering committee of a planned National Conference on Climate Change Adaptation. This conference is expected to bring together the latest and most up-to-date information on the practice and science of adaptation for natural resources management. The location and timeframe for holding the conference are under discussion. However, this action-oriented relationship with the NGO community to work toward a common outcome will likely serve as a model for how the NW CSC will interact with external partners.

8. Website and communication plan

The NW CSC will be served by two complementary websites, one maintained and served by DOI; the other by the NW CSC academic consortium. The DOI site is currently available at <www.doi.gov/csc/northwest/index.cfm>. The consortium site is scheduled to come on-line in the near future.

9. Climate Boot Camp

A major objective of the NW CSC is to support and train graduate students across the region to work at the interface of scientific research on climate, climate impacts, or climate adaptation and resource management decision-making. A primary means to meet this objective was the inaugural NW CSC Summer 2011 Climate Boot Camp, collaboratively organized by OSU, UI, UW, and USGS. UW hosted the boot camp at its Pack Forest Conference Center, and led the curriculum design and development. USGS and OSU focused on logistics, and UI and OSU contributed to curriculum development and implementation. The Boot Camp brought together eleven participants from four universities and one federal science agency. Participants included three students from OSU, one from UI, three from UW, one from Portland State University, and three USGS scientists. The Boot Camp ran five days; participants contributed a range of research backgrounds, including geology, hydrology, biology, economics and climate/habitat modeling, as well as a genuine interest in each other's work and the application of that work to planning decisions. Participants received training in interdisciplinary science communication and development of climate change impact pathways, gave videotaped practice interviews and several small group presentations, interacted with leading local scientists and managers, and visited field sites in Mount Rainier National Park.

FY 2011 NW CSC FUNDING

Funding for the NW CSC comes from the U.S. Department of the Interior through the U.S. Geological Survey. The total funding allocation for the NW CSC in FY 2011 was $1,715,130. A summary budget sheet can be found in Appendix 5. The largest share of these funds (59.2 percent) was dedicated to support academic work. This includes a basic Cooperative Agreement with the university consortium (OSU-UI-UW)($680,130), and other grants provided on a competitive basis ($334,872). A summary of activities conducted under the basic Cooperative Agreement is described in Appendix 2. Of particular interest among these activities, is the universities' funding of seven graduate students. Synopses of their proposed work are presented in Appendix 6.

The second-largest share of NW CSC funding (25.7 percent) helped support several science projects designed by USGS Science Centers ($441,250). Because funding for the NW CSC came late in the federal fiscal year, there was not enough time to launch a Request for Proposals (RFP). Instead, proposals put forward in response to previous RFPs from the North Pacific, Great Northern, and Great Basin Landscape Conservation Cooperatives (LCCs), and from the National Climate Change and Wildlife Science Center (NCCWSC), were considered for funding. Each of these RFPs included a thorough review and prioritization of candidate proposals. Only those projects that proposed to conduct climate change science and were identified as top priority of the LCCs or the NCCWSC were considered for NW CSC funding. Some of those projects were put forward by universities, as described above; others originated at USGS Science Centers. Lastly, the NW CSC funded a few projects to support information management or climate change workshops. All proposals that received funding from the NW CSC in FY 2011 are listed in Appendix 6.

NW CSC administrative costs, including salaries and benefits, physical facilities, and other non-personnel expenditures reached $258,878 (15.1 percent).

APPENDIX 1: NW CSC LEADERSHIP TEAM (LT)

- Gustavo Bisbal, NW CSC Director
- Steven Daley-Laursen, UI PI
- Leslie Dierauf, NW CSC ESAC Chair
- Josh Foster, OSU, Program Management
- Greg Gollberg, UI, Data Management
- Lisa Graumlich, UW PI
- Stephanie Harrington, UW, Communications
- Lief Horwitz, USGS
- Nancy Lee, USGS
- Phil Mote, OSU PI

APPENDIX 2: SUMMARY OF FY 2011 ACTIVITIES BY PRIMARY UNIVERSITIES

Primary activities by the leading universities within the cooperative agreement between the USGS and the NW academic consortium during FY 2011 include:

Oregon State University (OSU)

Oregon State University will serve as the administrative center of the NW CSC. OSU hired a part-time project manager to oversee the university-side activities of the NW CSC. Along with the Principal Investigator (PI), the program manager also served as the program manager for the NOAA-funded Climate Impacts Research Consortium (CIRC), the NOAA RISA for the Pacific Northwest, ensuring maximum integration of the activities of the CIRC and NWCSC. OSU supported 3 annually awarded graduate student fellowships (out of 4 proposed slots— one student departed the area before he could complete his work or attend the climate boot camp). These fellowships covered standard graduate student salary, benefits, and tuition for between 1 and 4 quarters, depending on need. Students were supported in relevant fields and working on problems of relevance to the NW CSC draft science plan (see graduate student projects described below). Travel costs for all NW CSC graduate student fellows, as well as instructors, at the summer climate boot camp were supported by OSU.

University of Idaho (UI)

During the inaugural year of the NW CSC, UI led the initial deployment of the center's data management and cyber-infrastructure (DM and CI) effort. In FY 2011, expertise in data

architecture, operations, and systems administration was applied to the Center's data management build-out, providing leadership, management, and CI service to the research and outreach programs at all three Universities and in the federal portion of the NW CSC. The UI and the Department of Idaho National Laboratory purchased a hardware infrastructure and failover system with a combined capacity of 400 terabytes to provide basic data management services for the NW CSC. Through the effort of UI PIs, the NW CSC has been selected by USGS leadership to design and implement a data management and cyber-infrastructure pilot framework for the entire national Climate Science Center network. This flagship effort of the UI, supported through several key partnerships, is fundamental to the DOI's national climate science efforts, given the overwhelming volume of information and data existing and developed to support climate research. UI supported one graduate student fellowship covering salary, benefits, and tuition for 3 quarters. UI developed and implemented the interdisciplinary communications curriculum at the first NW CSC boot camp.

University of Washington (UW)

UW hired a part time communications lead to document and disseminate the results of NW CSC supported research. In addition, the UW helped to initiate the development of, and is prepared to host and maintain, a university-led NW CSC website (in progress). UW staff helped coordinate external activities, including hosting the second annual Pacific Northwest Climate Conference. UW led the development of the inaugural summer climate boot camp, focusing on curriculum design and delivery. UW hosted and supported the graduate student fellows, USGS Coop Students, NGO participants, and instructors during the training at the UW Pack Forest facility in Eatonsville, WA, and paid for classroom costs, room, board, field trips and instruction during the week. UW supported three CSC graduate student fellows in FY 2011, who received half-time salary, benefits, and tuition. These students attended the 2011 summer climate boot camp.

APPENDIX 3: EXECUTIVE STAKEHOLDER ADVISORY COMMITTEE (ESAC)

(22 agencies and organizations: 3 State agencies, 3 Tribal organizations, 3 LCCs, 13 Federal agencies)

Affiliated Tribes of Northwest Indians
Army Corps of Engineers, Northwest Division
Bonneville Power Administration
Bureau of Indian Affairs
Bureau of Land Management, Oregon/Washington Office
Bureau of Reclamation, Pacific Northwest Region
Columbia River Inter-Tribal Fish Commission
Environmental Protection Agency, Region 10
Federal Highway Administration, Western Federal Lands Highway Division
Great Basin Landscape Conservation Cooperative
Great Northern Landscape Conservation Cooperative
Montana Fish, Wildlife, and Parks
National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center
National Park Service, Pacific West Region
Natural Resources Conservation Service, National Water and Climate Center
North Pacific Landscape Conservation Cooperative
Northwest Indian Fisheries Commission
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service, Pacific Region
U.S Forest Service, Pacific Northwest Research Station
U.S Forest Service, Region 6
U.S. Geological Survey, Northwest Area
Washington State Department of Ecology

APPENDIX 4: NW CSC SCIENCE AGENDA - KEY SCIENCE NEEDS

The identification of key science needs is a fundamental step in developing climate science for natural- and cultural-resource managers, Tribes, and other stakeholders in the Northwest. The key science needs that have been identified to date are organized into seven interrelated Research Themes that broadly reflect the scale of the relevant processes and the flow of information. The research themes are not intended to represent any hierarchy of importance, need, or order of effort. The NW CSC will work in cooperation with the ESAC to prioritize the

key science needs. Prioritization will reflect the needs of LCCs and other stakeholders, and consider ongoing efforts and identified science and information gaps. Once priorities have been identified, it is anticipated that priority science needs under multiple research themes will be addressed in parallel. The seven proposed research themes are as follows:

1. *Climate Science and Modeling* – Continue development of climate science and modeling capabilities to provide resource managers and researchers across all disciplines reliable and defensible information on the range of probable future climate conditions and associated uncertainty in the Northwest.

2. *Response of Physical Systems to Climate Change* – Characterize and model the response of physical systems (for example hydrologic, atmospheric, and earth-systems) to historic and future temperature and precipitation, taking into consideration the effects of uncertainty. Key among these processes is the hydrologic response, which directly influences streams and groundwater resources, ecosystems, historical and cultural resources, and ecosystem services.

3. *Response of Biological Systems to Climate Change* – Characterize and model the response of biota, terrestrial and aquatic ecosystems, and biogeochemical systems to changing climate, specifically including the effects of uncertainty. Characterization may include analysis of historic data, field research, and model analysis, as well as other approaches. The efforts in Research Theme 2 complement and provide the physical template for understanding the biological systems in this theme. The elements of this theme have importance to biodiversity, biotic components of culturally-important landscapes, as well as ecosystem services.

4. *Vulnerability and Adaptation* – Identify vulnerabilities of specific physical systems, ecosystems, human health, cultural resources, and infrastructure to climate change, and identify actions or practices that may improve prospects for adaptation. This theme complements understandings developed in Research Themes 2 and 3.

5. *Monitoring and Observation Systems* – Evaluate, enhance, develop (if necessary) new programs for monitoring and observation of key physical and biological systems, and develop systematic methods for analyzing, storing, and serving information. This theme centers on the need for data (including traditional knowledge) required to quantify physical and biological processes, track changes, and evaluate effectiveness of adaptation and mitigation measures.

6. *Data Infrastructure, Analysis, and Modeling* – Improve methods for data analysis and storage, modeling, forecasting, and decision-support. This cross-cutting theme relates to science application across the full range of disciplines, processes, and scales. Efforts

related to decision support systems should be coordinated with the Climate Impacts Research Consortium (CIRC) <http://pnwclimate.org/>

7. *Communication of Science Findings* – Develop strategies for communicating results and current thinking to the full range of agencies, stakeholders, and the general public. Efforts under this theme relate to all other research themes and should be coordinated with other major efforts such as the LCCs and CDSC as appropriate. Because of the importance of communication of science findings to society at large, particular attention should be paid to communication of science findings to non-science agencies, agency staff, and the general public.

APPENDIX 5: NW CSC FUNDING IN FY 2011

FY 2011 NW CSC Funding	**$1,715,130.00**

Personnel Costs	
Salary	$213,760.30
Awards	$8,003.00
Subtotal	**$221,763.30**

Non-Personnel Costs	
Travel	$14,243.54
Shipping (FedEx)	$103.35
Printing and Publications Services	$3,457.75
Other Services (conference registration)	$745.00
Supplies (chairs, office supplies)	$1,316.62
Equipment (Computer, docking station, Monitors)	$3,250.00
Subtotal	**$23,116.26**

Grants/Cooperative Agreements	
OSU - Basic NW CSC Co-op	$680,130.00
OSU – Downscaling	$75,232.00
OSU - NCA Workshop	$25,000.00
OSU – Disentangling	$74,640.00
UW - PNW Science Conference	$10,000.00
UW – Uncertainty	$150,000.00
Subtotal	**$1,015,002.00**

Funds Allocated to Other USGS Science Centers	
FRESC - Steven Knick (greater sage-grouse)	$29,000.00
FORT - Oyler-McCance (greater sage-grouse)	$10,000.00
FRESC - Jason Dunham (bull trout)	$100,000.00
WA WSC - Black (vulnerability prediction tools)	$100,000.00
OR WSC - Crammond (Support to NW CSC Science Agenda)	$15,000.00
WFRC - Maule (threats to fish habitat)	$89,500.00
EROS - Wylie (chetagrass die-off)	$97,750.00
Subtotal	**$441,250.00**

TOTAL Personnel and Non-Personnel Costs	**$1,701,131.56**
Carryover	**$13,998.44**

APPENDIX 6: NW CSC GRADUATE STUDENT PROJECTS IN FY 2011

CLIMATE, LAND COVER, AND THE DISTRIBUTION OF FOREST BIRDS

Sarah Frey (OREGON STATE UNIVERSITY)

Abstract. Climate change is expected to be a primary cause of species extinction and biodiversity loss worldwide. Current predictions about species sensitivity to climate change are often based on 'bioclimatic envelope models' that make several major assumptions. It is assumed that species distributions are driven primarily by climate variables and that these models are robust to changes in population size. Uncovering the relative importance of different drivers (i.e., climate, land cover, heterospecifics) to species distributions is critical for environmental policy and ecological theory. However, there have been few rigorous tests of these alternative hypotheses. I plan to use two extensive long-term bird datasets to test three fundamental assumptions of current climate envelope models: (1) that future projections are not sensitive to the population abundance of a species at the time of model development, (2) that species distributions are primarily governed by abiotic (i.e., climate) rather than biotic factors (e.g., competition from other species), and (3) that the behavioral traits of species do not have the potential to mediate the effects of climate change. I hope that by testing these assumptions the work will have broad-ranging implications for the validation of current projections and improvement of future biodiversity models. These models are fundamental for development of policy relating to climate effects on ecosystem health.

Progress/Results. My time under the support of the PNW Climate Science fellowship involved both field and analysis components of my overall dissertation project. The preliminary analyses I conducted aimed at understanding how microclimate resulting from complex terrain (i.e., the Oregon Cascades) influences within-season movement of a Neotropical migrant bird. I found that the distribution of the Hermit Warbler (*Dendrioca occidentalis*) within a season was in fact dynamic during the early parts of the breeding period and was likely in response to temperature (using elevation as a rough proxy). Additionally, sites that appeared to be less buffered from large temperature increases throughout the breeding season were more likely to be vacated by Hermit warblers as they chose a breeding territory. These results were presented at the 2011 Annual Symposium for the US Regional Association of the International Association for Landscape Ecology in Portland, OR and the 2011 Research Advances in Fisheries, Wildlife and Ecology Symposium at Oregon State University. 2011 marked my third year of field work conducting bird surveys at the Andrews Experimental Forest in the Central Cascades of Oregon. A new addition to this year's field work was the deployment of an additional 128 HOBO temperature sensors, resulting in fine scale temperature data being taken at all of our 184 sample sites. These new data will help me dig deeper into the role of microclimate in mountainous systems on bird distributions.

FORECASTING THE IMPACT OF CLIMATE CHANGE AND LAND USE ON TERRESTRIAL ANIMALS IN THE PACIFIC NORTHWEST

Jesse Langdon - (UNIVERSITY OF WASHINGTON)

Abstract. Forecasting the Impact of Climate Change and Land Use on Terrestrial Animals in the Pacific Northwest. I will develop current and future habitat suitability models for 210 terrestrial animal species. These species have been selected based on their inclusion in the Pacific Northwest Vulnerability Assessment. Two habitat suitability models will be developed for each species: a current distribution model based on current climatic, ecological, and land-cover conditions, and a future distribution based on these same variables. First, climate envelope models will be built for each of the 210 species of interest. The models will rely on high resolution bioclimatic data derived from the Lund-Potsdam-Jena (LPJ) dynamic global vegetation model. Downscaled versions of these models will produced at a 1 kilometer spatial resolution. Bioclimatic datasets will include historic conditions (1960-1990) and projected future conditions based on 30-year averages (2070-2100). Second, current and future habitat suitability maps will be developed for each species based on wildlife-habitat relationships (WHRs). The ReGap WHRs associate species with ecological systems, based on the USGS ReGap Level 3 ecosystem classification (source). We will develop current and future potential vegetation maps based on abiotic variables – 44 climate variables, and 6 soil variables. The potential vegetation classes will correspond to the USGS Landfire Biophysical Settings (BPS). Third, anthropogenic land use, both current and future, will be represented by modeled housing density outputs

developed for the EPA's Integrated Climate and Land-Use Scenarios project (EPA, 2009). These outputs represent housing density patterns based on the IPCC's Special Report on Emission Scenarios (SRES) storylines. Housing density will represent development-related land-use patterns. Finally, the climate envelope maps will be intersected with WHR classifications and housing density maps to produce a final set of current and future habitat suitability models.

REGIONAL CLIMATE MODELING WITH LARGE ENSEMBLES USING VOLUNTEER COMPUTING: REGIONAL CLIMATE PREDICTION DOT NET (REGCPDN)

Meredith Li - (OREGON STATE UNIVERSITY)

Abstract. I recently came from China to pursue my Ph.D degree here and have started to work on the regional climate prediction dot net(RegCPDN) for the western US region. My current research is focused on how the annual, DJF and JJA regional mean temperature of the western US region (here longitude runs from -128 to -108 degrees and latitude from 29 to 53 degrees to encompass the western US region) is affected by all the parameters of the perturbed physics. My initial plan is to use the standard physics run as a bar to explore the extent to which the regional mean temperature of the western US region is dependent on the perturbed physics. Hopefully, my research will provide some insights to which parameter perturbations have the most effect on the regional mean temperature of the western US region, which could be further used to select the parameter perturbations that produce the most realistic regional climate. The end result is to characterize future regional climate change of the western US with fine resolution. And by yielding a rich comprehensive set of output variables of environmental properties, with societal and environmental applications in mind, it's possible to better inform a wide range of decisions.

MINIMIZING THE GAP BETWEEN CLIMATE SCIENCE AND RESOURCE MANAGEMENT: DEVELOPING A WEB-ASSESSABLE DATABASE OF EXPERT SCIENCE

John Peters - (UNIVERSITY OF WASHINGTON)

Abstract. This research is intended to create two distinct deliverables. A white paper report examining current government level climate change adaptation efforts in the Pacific Northwest, and a database of academic and expert climate change science related to issues faced in the Northwest. The White Paper report initially discusses the unique relationship between climate change information and resource management decision-making. Within this context, the associated key challenges and needs are outlined, the current level of adaptation efforts are discussed, and a general overview of the proposed outlook moving forward is presented. A first draft of this report has been compiled and is in the first round of reviews. The final draft should is scheduled for completion by the end of the year. The database being created is an effort to help address the challenge of access to relevant climate change information. The database will be a web-searchable tool, where the user can search a set of keywords resulting in a list of scientists conducting research in the keyword identified field. The search result will provide the user with the scientist's names, a geographic location, and general summary of their research. In addition to this information, links to the scientists research overview, full Curriculum Vitae, listed publications, personal website, and affiliations, will be included if the scientist has made them available online. Currently, a sample database has been created and reviewed. The formal structuring is underway and population will likely begin in November. The scheduled completion date is early March.

ADAPTING TO CLIMATE CHANGE ON FEDERAL LANDS IN WASHINGTON: A PROPOSED SCIENCE-MANAGEMENT PARTNERSHIP

Ronda Strauch - (UNIVERSITY OF WASHINGTON)

Abstract. Assessing Changes in Access Resulting from Climate Change within Federal Lands in the North Cascadia Region, Washington: Changes in access to National Park (NP) and National Forest (NF) lands are expected to be a fundamental climate change impact pathway in the Pacific Northwest. Impaired access to NP and NF resources reduces the ability of land managers to sustain their missions. Reliable, sensible, and strategic access is critical for

facilitating recreational enjoyment, monitoring resource health, regulating responsible use of assets, responding to emergencies, and managing limited funds. Climate change alters the patterns of long-term trends in temperature and precipitation as well as the seasonal timing, magnitude, and duration of weather events. Both these long and short-term pressures dramatically affect the built, natural, and cultural resources of NP and NF lands. Climate disruption and the secondary impacts on resources may dramatically affect accessibility and mobility within these agency jurisdictions. Roads and trails provide a transportation network within and between NP and NF lands. This transportation network is threatened by flooding, land and debris slides, river meanders and aggrading streams, culvert and roadbed failures, and other influences. This project will assess the vulnerability of access within federal lands to warming climate and its consequent outcomes in support of the North Cascadia Adaptation Partnership (NCAP) project, a science-management partnership between NPS and FS.

ECOSYSTEM SERVICES: CARBON SEQUESTRATION AND RANGELAND MANAGEMENT

Seth Wiggins - (OREGON STATE UNIVERSITY)

Abstract. Ecosystem services--carbon sequestration and rangeland management: Rangelands are one of the most important uses of public and private land in the Pacific Northwest, the inter-mountain region and the northern Great Plains. This fact raises the possibility that changes in land management in rangelands could represent an important opportunity to mitigate greenhouse gas (GHG) emissions by sequestering additional carbon in rangeland soils, and also improving the sustainability of these systems. These areas are likely to be impacted in important ways by climate change. Despite its potential importance, relatively few studies of technical potential for rangeland carbon sequestration exist, and there are no economic studies of economic potential, over large geographic areas such as the Northern Great Plains. This is most likely due to the paucity of data, particularly economic data, on the benefits and costs of alternative rangeland management practices that could sequester carbon in rangeland soils. Accordingly, in this study we plan to use a new "minimum data" (MD) methodology proposed by Antle and Valdivia (2006) to study ecosystem service supply under alternative land management practices and policy regimes, such as a national carbon offset policy, public subsidies for soil conservation and other types of sustainable management, and related management on public lands. Agricultural census data will be combined with regional soils and climate data to implement the analysis. Supplemental data on rangeland management practices and their costs will be collected. The impacts of climate change on provision of ecosystem services will be incorporated into the analysis, following the methods presented in Antle et al. (2004, 2007).

Progress/Results. With the aid of the Climate Science Center fellowship, I researched the potential of a carbon sequestration on Pacific Northwest rangelands. By choosing different management practices, rangeland operators have the potential to sequester a substantial amount of carbon in rangeland soils. However as these practices bring higher costs to the operations, a payment scheme is needed to induce farmers to adopt them. The main research questions in this study are: At a given level of payment, how many farmers would be persuaded to adopt? How much carbon would be sequestered? How does that cost per amount sequestered compare to other potential greenhouse gas reduction strategies? And how sensitive are these predictions to uncertain parameters, such as the rate of carbon sequestration, costs of changing practices, and productivity changes? To answer these questions this project is using farm-level data from the 2007 USDA Census of Agriculture. Working under the supervision of Dr. John Antle and Dr. Jetse Stoorvogel, I have compiled the data from the Oregon Field Office of the National Agricultural Statistics Service in Portland. To evaluate the research questions, this project is using the Tradeoff Analysis model developed by Dr. Antle, which allows this type of parsimonious data to be used to inform policy decisions. This project is currently in its data analysis phase, and is scheduled for completion June of 2012.

POTENTIAL IMPACT OF PREDICTED FUTURE DROUGHT FOR THE WESTERN US: DEVELOPING INDICES THAT DESCRIBE DROUGHT FREQUENCY, INTENSITY AND DURATION

Jacob Wolf - (UNIVERSITY OF IDAHO)

Abstract. Drought takes on many forms, each form with varying pressure across the many aspects of land management (e.g., wildfire risk, insect epidemics, exotic species invasions, wildlife habitat and recreational resource migration, etc.). Drought is a complex phenomenon in the western United States due to intersecting

meteorological, physiographic and societal facets. The work involves incorporating downscaled climate scenarios to disseminate the complex spatio-temporal nature of drought across the western US for the 21st century. Moisture surpluses and shortfalls can be realized over short distances in the western United States due to sharp physio-climatic gradients. Furthermore, the influence of changes in temperature and precipitation can result in nonlinear changes in moisture stress and subsequent drought impacts. The work will utilize downscaled monthly temperature and precipitation projections developed by Moore and Walden (2010) to develop high-resolution (4-km) monthly drought metrics over the 21st century. Drought metrics will include both widely used indices such as the Palmer Drought Severity Index (PDSI) and Standardized Precipitation Index (SPI), as well as physically relevant metrics such as Potential Evapotranspiration (PET) and water balance deficit. Mature approaches to calculating PDSI, SPI and PET will be used.

Progress/Results. Downscaled drought scenarios will be developed for the Pacific Northwest, spanning the continental United States north of 41N and west of 110W. Moore and Walden (2010) developed a scenario of downscaled monthly climate datasets from the Coupled Model Intercomparison Project 3 (CMIP3) datasets using the Bias Corrected-Spatial Downscaling. These scenarios will be used to develop drought projections for the 21st century. Four drought indices will be created from 10 BCSD-downscaled GCMs and 3 emission scenarios. The SPI and SPEI drought indices have been calculated, and the PDSI and ARID (modified PDSI) are currently being calculated. Deliverables include:

1. Historical drought indices and metrics at monthly time-scales covering the time period 1895-2010.
2. Scenarios for monthly PDSI and monthly 1,2,3,4,5,6,9,12,24,36-month SPI.
3. Scenarios for monthly PET and water balance deficit.
4. Report summarizing robust changes in drought statistics across the Pacific Northwest.
5. Presentation at annual PNW climate science meeting.

Deliverables from this project may also be important in studies focused on vegetation modeling. Longer-term changes in seasonal water availability are reasoned to be important factors in future vegetation ranges and productivity. Likewise, variability in moisture may serve as a catalyst for invasive grasses in semi-arid regions of the PNW.

APPENDIX 7: NW CSC SCIENCE PROJECTS FUNDED IN FY 2011

DISENTANGLING THE EFFECTS OF CLIMATE AND LANDSCAPE CHANGE ON BIRD POPULATION TRENDS IN THE WESTERN U.S. AND CANADA

PIs: Matthew Betts (OSU), Susan Shirley (OSU), and Joan Hagar (USGS)

Project Summary: Climate change has been implicated in the range shifts and population declines of many species, but the confounding of climate change with other variables, particularly landscape change, hampers inference about causation. Climate envelope models have been used to predict population trends and future distributions, but the reliability of such predictions remains relatively unknown; without tests of model accuracy, policy development will be based on highly uncertain ground. Our team proposes to assemble recent developments in change detection mapping and species modeling; specifically, our objectives are to: (1) use 32-year data on bird distributions to test the reliability of climate envelope models, (2) test whether changes in climate are linked to bird population declines over the past 32 years and, (3) assess the relative importance of climate versus landscape change in explaining changes in species distributions. (Budget: FY 2011 - $74,640)

IDENTIFICATION AND LABORATORY VALIDATION OF TEMPERATURE TOLERANCE FOR MACROINVERTEBRATES: DEVELOPING VULNERABILITY PREDICTION TOOLS

PI: Robert Black (USGS)

Project Summary: This project has two primary objectives; 1) empirically (ie. statistically) derive thermal tolerance ranges for macroinvertebrates common to national and state monitoring programs, and 2) experimentally determine the tolerance ranges for several (approximately 40) key invertebrate species and compare these values to the empirically derived values. Aquatic insects are a key biomonitoring group because of their dominance in the total biodiversity found in a given habitat and their central role in ecosystem functioning (organic matter processing and food to higher trophic groups). Further, as poikilotherms, insect growth, survival, and persistence at a site is highly temperature dependent. Thus, they are key "sentinel" species to; 1) quantify (described herein), 2) monitor (done routinely nationwide), and 3) predict (product of this proposal) the effects of climate change. By combining a statistical description of critical (and therefore exploitable for prediction) temperature ranges in key species with laboratory testing of the thermal range of that same species, we seek to "add value" to existing biomonitoring programs by developing species specific temperature tolerance values. These values can then be used by scientists and resource managers to predict locations and communities (based on their species assemblages) of greatest vulnerability to changing temperatures. (Budget: FY 2011 - $100,000; FY2012 - $125,000).

RANGE-WIDE CLIMATE VULNERABILITY ASSESSMENT FOR THREATENED BULL TROUT

PIs: Jason Dunham (USGS), Stephen Zylstra (USFWS), and Tim Mayer (USFWS)

Project Summary: This project aims to integrate new and existing data with expert opinion in a decision support model for assessing contemporary threats and climate vulnerability for threatened bull trout (*Salvelinus confluentus*) across the species' contemporary range in the conterminous United States. Results will include a synthesis document outlining key considerations for developing a climate vulnerability assessment, and the assessment itself, which will include the following: 1) new spatial data and maps of the current distribution of bull trout, their habitats, and threats to these habitats, 2) a synthesis of the most recently available scientific information and expert opinion, and 3) a linked decision support tool (Bayesian network). The assessment will represent a complementary extension of existing efforts to address climate impacts on inland trout and salmon and the coldwater ecosystems they depend on in the western US. (Budget: FY 2011 - $100,000; FY2012 - $125,000).

CONTRIBUTION OF LANDSCAPE CHARACTERISTICS AND VEGETATION SHIFTS FROM GLOBAL CLIMATE CHANGE TO LONG-TERM VIABILITY OF GREATER SAGE-GROUSE

PIs: Steven Knick (USGS) and Sara Oyler-McCance (USGS)

Project Summary: The range-wide distribution of greater sage-grouse (*Centrocercus urophasianus*) may consist primarily of small populations surrounding a few large core populations. The extent to which individuals disperse among breeding populations is important for maintaining genetic diversity and to sustain or recolonize regions experiencing declining population trends. Barriers to dispersal thus can fragment large populations, restrict exchange among small populations, and limit the ability of populations to track shifts in sagebrush land cover predicted in climate change scenarios. We propose to use genetic information, obtained from feathers collected at leks (breeding locations), to estimate relatedness among populations and assess gene flow relative to landscape features. Our study will identify the characteristics of barriers, including geographic distance, topographic features, anthropogenic land uses (agriculture, transmission corridors, highways and infrastructure), that influence dispersal and genetic exchange. We will develop the design in the first year that provides a statistically valid sample of the >3,000 leks in the western portion of the sage-grouse range. Subsequent years, pending funding, will be used to conduct the genetic analysis, develop the landscape models of cost-surface, and delineate the features that influence genetic relatedness among sage-grouse populations. Ultimately, this information permits us to estimate population vulnerability to stochastic or environmental risks and will aid managers forced to make

difficult decisions about which populations may be more vulnerable due to potential lack of connectivity between other core populations. (Budget: FY 2011 - $50,000, FY2012 - $30,000).

TOWARD NEXT GENERATION DOWNSCALING FOR HYDROLOGIC PREDICTION IN THE PACIFIC NORTHWEST (USING MULTIVARIATE ADAPTIVE CONSTRUCTED ANALOGS – VARIABLE INFILTRATION)

PIs: Dennis Lettenmaier (UW), John Abatzoglou (UI), and Philip Mote (OSU)

Project Summary: A wide range of planning activities, scientific research, and decision support tools require representations of future hydrology at local to regional scales. For example, understanding and predicting wildfire risk, drought, migration of vegetation, invasive species, water quality, agricultural and rangeland productivity, flood control, and many other practical applications require estimates of means and extremes of future streamflow, soil moisture, snowpack, and other hydrologic variables. The state-of-the-art physically based, distributed Variable Infiltration Capacity (VIC) hydrologic model has been widely used for regional climate assessments. In its most commonly used form, the model is forced by gridded daily (or shorter time step) observations of six variables: precipitation, temperature, surface wind, downward solar and longwave radiation, and dew point. We plan to evaluate the separate but related problems concerning the implications of a) alternative downscaling and bias correction assumptions on hydrologic simulations using the VIC model, and b) the use of climate model output for variables other than precipitation and temperature. We propose herein to test alternate approaches to estimating these variables via a new multivariate statistical approach that links them more directly to climate model predictions at the daily time step than has previously been possible. This project will evaluate four different downscaling methods in conjunction with both temperature indexing approaches for estimation of solar and downward longwave radiation and humidity outlined above. Our primary focus will be on the Columbia River Basin, however, we will consider a broader domain as well. The downscaling methods include (i) bias correction and spatial downscaling (BCSD); (ii) Multivariate Adaptive Constructed Analogs (MACA); (iii) direct interpolation of RCM output (most likely from the North American Regional Climate Change Assessment Program (NARCCAP); and (iv) bias corrected and interpolated RCM (probably NARCCAP) output. (Budget: FY 2011 - $74,811).

UNCERTAINTY AND EXTREME EVENTS IN FUTURE CLIMATE AND HYDROLOGIC PROJECTIONS FOR THE PACIFIC NORTHWEST: PROVIDING A BASIS FOR VULNERABILITY AND CORE/CORRIDOR ASSESSMENTS.

PIs: Jeremy Littlel, Alan Hamlet, Nathan Mantua, Eric Salathe (UW)

Project Summary: Climate information (historical data, downscaled future climate projections, regional climate simulations, hydrologic and ecohydrologic variables) is a key component of prioritizing adaptation actions and conducting vulnerability assessments. However, despite the increasing availability of climate information in the Pacific Northwest and Northern Rockies, a rigorous and physically-based treatment of uncertainty (ranges of projections and sources of model disagreement) in future climate scenarios for the region does not exist. This is particularly true of the extreme climate and weather events that affect aquatic and terrestrial ecosystem vulnerability. We propose to leverage existing University of Washington Climate Impacts Group (UW CIG) products and partnerships to develop a comprehensive assessment of the uncertainty in future climate and hydrologic scenarios and their likely impacts on vegetation and aquatic habitat in the Pacific Northwest region, including WA, OR, ID, northwest MT to the continental divide, Northern CA and NV, UT, and the Columbia Basin portion of western WY. (Budget: FY 2011 - $150K).

CLIMATE CHANGE THREATS TO FISH HABITAT CONNECTIVITY: GROWTH AND PREDATION

PIs: Alec Maule, Patrick Connolly, Matthew Mesa, Jill Hardiman, James Hatten (USGS)

Project Summary: An interdisciplinary USGS team has been working with local stakeholders in the Methow River (a tributary of the Columbia River) in arid eastern Washington State to develop decision support tools with which to evaluate possible climate change effects on natural resources, human economies and Native American cultural values. A stakeholders' workshop was held, which was attended by local politicians; federal, state and NGO resource managers; ranchers/farmers and Tribal representatives. Products from the workshop included stakeholder-defined goals for adapting to climate change. An important aspect of adaptation of aquatic resources in the Methow Basin is the role of habitat connectivity on the ability of native fishes to obtain food. Native fishes participate in feeding both as predators and as prey. With funds from the Great Northern LCC and the Northwest Climate Science Center (NW CSC), we will examine the influence of temperature, habitat availability, and flow under normal conditions and under climate change scenarios to simulate growth and consumption by fish and estimate the potential impact of predation on juvenile ESA-listed salmon. Specific tasks to be completed are: (1) determine if large bodied fish (bull trout, cutthroat trout and mountain whitefish) feeding in the mainstem Columbia River experience increased growth, which increases their predation on juvenile salmon in the Methow River; (2) develop parameters for bioenergetics models for bull trout and mountain whitefish to predict their growth under predicted climate change scenarios; and (3) determine current and potentially available side-channel connectivity, which provides rearing areas and refugia from predation for juvenile fish, in the mainstem Methow River. Thus far, we have (1) collected otoliths from mountain whitefish (our surrogate, non-ESA listed, large-body predator); (2) validated bioenergetics parameters for bull trout; and (3) completed a preliminary on-the-ground assessment of side channels in the Methow. With NW CSC funds we will model possible effects of climate change on fish habitat by completing the side channel assessment and combining that with existing tributary and mainstem models that predict flow under several climate change scenarios. These predicted changes will be run through an existing fish habitat decision support system to predict changes in habitat. (Budget: FY 2011 - $89,500).

MODELING EFFECTS OF CLIMATE CHANGE ON CHEATGRASS DIE-OFF AREAS IN THE NORTHERN GREAT BASIN

PIs: Bruce Wylie (USGS), Stephen Boyte (USGS), and Donald Major (BLM)

Project Summary: Cheatgrass (*Bromus tectorum*) is a dominant invasive species across large areas of the Great Basin. In recent years, the die-off of cheatgrass has been observed across relatively large areas in the region with an estimated 500,000 acres of affected area reported in the general vicinity of Winnemucca, NV. However, actual extent of the phenomenon could be considerably larger as die-offs are occurring in smaller areas across portions of the Northern Great Basin. As part of the BLM's Integrated Cheatgrass Dieoff Project, USGS EROS Center scientists in collaboration with Don Major, BLM Landscape Ecologist, have developed a cheatgrass performance model that incorporates seasonally integrated normalized difference vegetation index (NDVI) from the enhanced Moderate Resolution Imaging Spectroradiometer (eMODIS) along with environmental attributes. Based on the die-off areas in the area surrounding Winnemucca and in the Owyhee Uplands, we propose to predict areas of potential cheatgrass die-offs under future climate projections and make climate-based forecasts of these die-off areas. (Budget: FY 2011 - $97,750).

Information Management/Workshop Support Projects

DEVELOPMENT SUPPORT FOR THE NW CLIMATE SCIENCE CENTER SCIENCE AGENDA

PI: Dar Crammond (USGS)

Project Summary: The Oregon Water Science Center will provide the scientific, bibliographic, and administrative support needed to prepare a Science Agenda for the NW Climate Science Center (NW CSC). The Science Agenda will be the basis for guiding the science program of the NW CSC. (Budget: FY 2011 - $15,000).

SUPPORT TO THE NATIONAL CLIMATE ASSESSMENT

PIs: Phil Mote and Josh Foster (OSU)

Project Summary: In 2011-12, the National Climate Assessment (NCA) effort encourages regional workshops in each of the defined regions, including the Northwest. Stakeholder engagement has been considered an essential staple of NCA activity and likewise engagement with regional stakeholders from the NW Climate Science Center and the Climate Decision Support Center (CDSC) are having input to the development of their research agenda and priorities. CDSC has been designated as the lead university partner with responsibility for conducting the regional northwest NCA workshop in cooperation with designated federal agencies in the region. The NCA workshop will bring together regional stakeholders that are most interested in understanding regional climate impacts, exploring their climate related problems, and in applying adaptive solutions for their sectors. Beyond mere engagement the workshop also will begin an iterative process of participatory activities and communication about the NCA in the region and as a backdrop to regional assessment processes that also will contribute to the national process as a whole. The planned regional NCA workshop will have two main objectives: 1) convene and launch a process for coordinating the NCA in the northwest region working with Federal agency leads, NW CSC, three regional LCCs, and other relevant stakeholders, including how technical input to the report and NCA will be coordinated; and 2) Outline and initiate development of a regional NCA synthesis for delivery to the NCA by March 2012. Funding will be used to support the workshop and to fund travel for selected stakeholders. (Budget: FY 2011 - $25,000).

SUPPORT FOR THE SECOND ANNUAL PACIFIC NORTHWEST CLIMATE SCIENCE CENTER CONFERENCE

PIs: Amy Snover (UW)

Project Summary: The Second Annual Pacific Northwest Climate Science Conference will be held in Seattle September 13-14, 2001 at the University of Washington's Kane Hall. The conference aims to stimulate a place-based (rather than discipline-based) exchange of information about the latest in PNW climate, climate impacts, and climate adaptation research. The conference will also include time for presentation of emerging policy and management goals, objectives, and information needs related to climate impacts and adaptation. The conference will feature cross-cutting plenary sessions covering emerging science and policy efforts of broad interest, more focused concurrent sessions, and plenty of time for discussion and networking, including at an evening poster session/reception. Funding Request: $10,000 to help offset conference costs (including, e.g., facilities, supplies & materials, website development, registration logistics, outreach support, tribal & student scholarships, speaker travel). (Budget: FY 2011 - $10,000).