

## **Program Support for the Pacific Northwest Cooperative Ecosystem Studies Unit and the Great Basin Cooperative Ecosystem Studies Unit Final Report**

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*Term of Agreement: 7/15/2012 – 7/14/2017*

The University of Washington (UW) and the National Park Service (NPS) have been collaborating since 2001 to host and administer the Pacific Northwest Cooperative Ecosystem Studies Unit (PNW CESU) program. The PNW CESU is part of the national CESU network, which is a consortium of federal agencies, universities, and other partners with a mission to work together on research, technical assistance, and education projects to enhance understanding and management of natural and cultural resources. Staff at the PNW CESU also provide some of the administrative and business needs for the Great Basin Cooperative Ecosystem Studies Unit (GB CESU), also a member of the national CESU network. This project is Task Agreement P12AC15056 under Cooperative Agreement H8W07110001 and continues the UW-NPS collaboration from Task Agreement J8W07070034 to support administrative functions of the PNW CESU and GB CESU including public outreach and development of financial assistance agreements for a wide variety of technical, research, and educational projects relevant to the mission of the CESU network.

The PNW CESU currently includes 12 federal agencies, 18 universities, and 1 state agency. Since its inception, over 815 cooperative projects have been conducted through this unit totaling nearly \$100 million. The funding under this task agreement (\$149,611) has supported the project objectives to provide program support to the PNW CESU, including funding for the Program Coordinator (PC). The NPS Research Coordinator (NPS RC) and the UW Principal Investigator serve as Co-Leaders of the PNW CESU, and along with the UW administrative PC, work to fulfill the PNW CESU mission.

The PC, under the guidance of the PNW CESU Co-Leaders, has acted as the primary point of contact for the PNW CESU members and organizations interested in becoming members. The PC assisted the NPS RC in reviewing and processing PNW and GB CESU Task Agreements and modifications, and sent out electronic project expiration notifications and requests for final reports. An audit of the PNW CESU database and hard copy records was performed in 2014, with any missing items requested from the federal agencies.

During this project's term, the PNW CESU submitted a Renewal Self-Assessment report and was successfully renewed for its third five-year term. Two new federal agencies, the Department of Defense and Bureau of Indian Affairs, and a new university partner, Seattle University, were welcomed as new members.

PNW CESU staff served on the National CESU Network Office Agreements Committee and the National CESU Indirect Cost Working Group, as well as participating in the Network Bi-Annual Meetings. The PC initiated a CESU Coordinators group and held teleconferences to address common challenges.

The PNW CESU and GB CESU project databases are regularly maintained and improved for efficiency and accuracy. The PNW CESU database was revised to include additional features (noting the NPS Contracting Office, NPS park where project work occurs, and completion memos status), and the GB CESU database was exported into a new stable MS Access database.

The PNW CESU website (<http://depts.washington.edu/pnwcesu/>) was redesigned in 2016 using the WordPress web content management system. The site includes a searchable database offering access to project summaries and reports ([http://depts.washington.edu/pnwcesu/project\\_library/](http://depts.washington.edu/pnwcesu/project_library/)). Data extracts are regularly performed to refresh the PNW CESU project library via phpMyAdmin to an SQL Server.

The PNW CESU newsletter, *Cooperative Ventures*, improved its direct to reader access by switching to the Mailchimp system and currently has over 600 subscribers. All newsletters from 2003 – 2017 are available on the website (<http://depts.washington.edu/pnwcesu/news-2/newsletter/>).

Additional outreach included the creation of agency and partner-focused newsletter content for the UW SEFS blog, SEFS *The Straight Grain* newsletters, and the Oregon State University Institute for Natural Resources website, along with agency specific activity reports. The UW contributed PNW CESU project data to the PNW CESU and GB CESU FY11 – FY16 Annual Reports to Congress. In addition, the PNW CESU contributed academic posters for Climate Science Conferences highlighting the PNW CESU activity and mission. The PNW CESU held in-person or teleconference meetings nearly annually, and share the meeting minutes on the website (<http://depts.washington.edu/pnwcesu/administration/annual-meetings/>).

The National Park Service collaborated with 14 universities and 1 state agency to initiate 127 new projects during this project’s term of agreement (7/15/2012 – 7/14/2017). From FY11-FY16, the PNW CESU processed 170 total new projects and 181 modifications to add funding to existing projects. Total NPS funding for FY11-FY16 was \$20,325,760.

<b>NATIONAL PARK SERVICE FUNDING SUMMARY FY11 - FY16</b>					
<b>Fiscal Year</b>	<b>New Project Funding</b>	<b># of New Projects</b>	<b>Funding added to existing projects</b>	<b># of existing projects receiving additional funding</b>	<b>Total Funding FY11 - FY16</b>
FY11	\$ 2,137,868	31	\$ 2,511,744	46	\$ 4,649,612
FY12	\$ 1,576,489	25	\$ 1,820,386	33	\$ 3,396,875
FY13	\$ 1,258,597	29	\$ 925,541	19	\$ 2,184,138
FY14	\$ 1,930,577	34	\$ 2,053,114	36	\$ 3,983,691
FY15	\$ 1,968,914	35	\$ 1,331,554	26	\$ 3,300,468
FY16	\$ 1,250,616	16	\$ 1,560,360	21	\$ 2,810,976
<b>TOTAL</b>	<b>\$ 10,123,061</b>	<b>170</b>	<b>\$ 10,202,699</b>	<b>181</b>	<b>\$ 20,325,760</b>

<b>NATIONAL PARK SERVICE FUNDING BY PARTNER FY11 - FY16</b>					
<b>Partner</b>	<b>New Project Funding</b>	<b># of New Projects</b>	<b>Funding added to existing projects</b>	<b># of existing projects receiving additional funding</b>	<b>Total Funding FY11 - FY16</b>
ADFG	\$ 794,986	8	\$ 344,890	8	\$ 1,139,876
CWU	\$ 99,405	5	\$ 18,000	2	\$ 117,405
OIT	\$ 16,807	1	\$ -	0	\$ 16,807
OSU	\$ 1,584,986	29	\$ 981,223	25	\$ 2,566,209
PSU	\$ 1,328,294	27	\$ 2,184,226	35	\$ 3,512,519
SMUMN	\$ 975,157	18	\$ 1,244,095	25	\$ 2,219,252
SOU	\$ 377,407	3	\$ 1,170,236	14	\$ 1,547,643
UAA	\$ 275,983	3	\$ 256,839	5	\$ 532,822
UAS	\$ 62,701	2	\$ 111,191	4	\$ 173,892
UID	\$ 407,929	12	\$ 530,183	11	\$ 938,113
UO	\$ 193,628	5	\$ 313,154	9	\$ 506,782
UVM	\$ 1,080,541	12	\$ 100,665	3	\$ 1,181,206
UW	\$ 2,043,950	31	\$ 1,813,009	31	\$ 3,856,959
WSU	\$ 214,245	8	\$ 10,040	1	\$ 224,285
WWU	\$ 667,042	6	\$ 1,124,948	8	\$ 1,791,990
<b>TOTAL</b>	<b>\$ 10,123,061</b>	<b>170</b>	<b>\$ 10,202,699</b>	<b>181</b>	<b>\$ 20,325,760</b>

Details by fiscal year of NPS funding, including type of projects (technical assistance, research, and education) and discipline (biological, physical, cultural, social, and interdisciplinary), along with examples of NPS funded projects, can be found within Attachment A: FY11-FY16 Reports to Congress. A list of all NPS projects initiated during this project's term of agreement is within Attachment B: NPS Project List.

Project specifics can be found in our Project Library by selecting 'National Park Service' under federal agency or entering the Project ID into the Keyword search option:

[http://depts.washington.edu/pnwcesu/search/project\\_library.php](http://depts.washington.edu/pnwcesu/search/project_library.php).

All the objectives and tasks under this Task Agreement have been completed.

## **P12AC15056 Final Report Attachment A FY11-FY16 Reports to Congress**

### **FY 2011 NPS Annual Report to Congress**

**Name of CESU:** Pacific Northwest Cooperative Ecosystem Studies Unit

**Coordinator:** Chris Lauver

**Number of Partners:** 28

**Number of Projects that went through the PNW CESU agreement in FY11:** 77  
(31 new task agreements, 46 cost modifications to existing task agreements)

**Total Funding obligated under the PNW CESU agreement in FY11:** \$4,649,612

#### **Trends and Accomplishments:**

This was another very active year for the PNW CESU. The number of new projects in FY 2011 was equal to the 10 year average of 31 new projects per year. However, the number of cost modifications (46) was nearly double the 10 year average of 25 cost mods per year. Although there were 20 fewer new projects than last year, total funding increased by 16% over FY 2010.

FY 2011 project funds were allocated to 12 of the 18 academic partners, down from 14 institutions in FY 2010. Three partners (Oregon State University, Saint Mary's University of Minnesota, and University of Washington) captured 52% (\$2,441,268) of the FY 2011 funding, with the host institution, University of Washington, receiving 21% of the total allocated. In FY 2010, the same three institutions received the highest amount of funding. Since the inception of the PNW CESU in 2000, nearly \$16 million in NPS funding for 343 projects has been processed under the cooperative agreement.

With respect to project funding by discipline, biological projects received about 42% of the funding at \$1,935,619; and physical sciences projects received less than 9% at \$400,391. Projects dealing with cultural resources received \$934,940 or 20% of the funding, and visitor/use (social) projects got \$204,470, less than 5%. Approximately 22% of funds, \$1,017,781, went to interdisciplinary projects, which involve cultural and natural resources. Actions funding operational support of programs involved 3% of the annual total with \$156,411.

The PNW CESU was involved in several aspects of the 2<sup>nd</sup> Annual Pacific Northwest Climate Science Conference, held in September 2011 on the University of Washington campus. The unit was a co-sponsor of the conference, presented a poster, and participated in an invited panel presentation on National Climate Partnerships in the Pacific Northwest.

## **FEATURED PROJECT**

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***Title:* Understanding the Interactions Between Cruise Ships and Humpback Whales in and near Glacier Bay National Park**

***Fund source and year(s) funded:*** National Park Service, ONPS, 2008, 2009, 2010; and National Fish and Wildlife Foundation, National Park Foundation, and Pacific Life Foundation

***Stated Theme, Goal, or Action from the C2A:*** Theme: Preserving America's Special Places. Goal: Cultivate excellence in science and scholarship as a foundation for park planning, policy, decision making, and education.

***Description:***

Glacier Bay National Park (GLBA) is a highly coveted cruise ship destination, with more than 200 ship visits carrying more than 400,000 passengers annually. Glacier Bay is also a hotspot for humpback whales (*Megaptera novaeangliae*) that annually migrate to the park and adjacent waters to forage during the summer months. The National Park Service has been concerned over the potential impacts of ship and other vessel traffic to the whale population that uses park waters. Impacts include disturbance due to anthropogenic sounds, particularly cavitation from ship propellers, and occasional collisions between whales and ships. Consequently, a number of management measures aimed at reducing these impacts have been implemented, including limiting ship speed to 13 knots in areas of frequent whale activity, enforcing mid-channel course restrictions, and placing seasonal and daily maximums on the number of cruise ships permitted to enter the park. Yet there are limited empirical data to evaluate the frequency of interactions between ships and whales, and whether these management measures are effective. GLBA and the University of Washington collaborated on a study placing an observer on 49 different cruise ships to record real-time interactions between whales and ships in and near GLBA. The observer spent daylight hours on the bow of the ship using laser range finder binoculars and a hand-held GPS unit to record the geographic location of the ship and the distance and bearing of whales that surfaced within 1km in front of the bow. The frequency of ship whale interactions and their location relative to the bow of the ship were analyzed and compared among regions within the park and in adjacent waters. Results of the study indicate that when ships were traveling faster than 13 knots, whales surfaced with high frequency in front of the bow of ships compared with slower speeds. Whales also surfaced with high frequency in lower Glacier Bay and near the park entrance in Icy Strait around Point Adolphus, indicating that similar protection measures may be warranted in areas adjacent to Glacier Bay. Our findings provide important insight into the effectiveness of management measures designed to reduce the potential for ship-whale collisions. Full details of this project can be found in recently published articles entitled, "Spatial Pattern Analysis of Cruise Ship-Humpback Whale interactions in and near Glacier Bay National Park, Alaska" in the journal, *Environmental*

*Management*, and “A Bayesian approach for understanding the role of ship speed in ship-whale encounters” in the journal *Ecological Applications*.

Photo Caption: An observer stationed at the bow of the cruise ship recording the distance and bearing of whales surfacing near the ship using a GPS unit and laser range finder binoculars as the ships transited in and near Glacier Bay National Park.



## **FY 2012 NPS Annual Report to Congress**

**Name of CESU:** Pacific Northwest Cooperative Ecosystem Studies Unit

**Coordinator:** Chris Lauver

**Number of Partners:** 28

**Number of Projects that went through the PNW CESU agreement in FY12:** 57  
(25 new task agreements, 32 cost modifications to existing task agreements)

**Total Funding obligated under the PNW CESU agreement in FY12:** \$3,335,665

### **Trends and Accomplishments:**

National Park Service project activity at the PNW CESU continued at a high level in 2012. The number of new task agreements (25) was down from the 11-year average of 31 per year. The number of cost modifications (32) was above the 11-year average of 27 per year, but down from 46 cost mods in FY 2011. Because both of these figures were less than those in FY 2011, it is unsurprising that total funding in FY 2012 decreased by 28.5% when compared to the previous year.

FY 2012 project funds were allocated to 13 of the 18 academic partners, compared to 14 institutions in FY 2011. Three partners (Oregon State University, Saint Mary's University of Minnesota, and University of Washington) captured 53% (or \$1,751,698) of the FY 2012 funding, with the host institution, University of Washington, receiving 28% of the total allocated. In FY 2011, the same three institutions received nearly equal percentages of funding. In total, more than \$32 million in NPS funding for 368 projects has been processed under the PNW CESU cooperative agreement since the inception of the unit in 2000.

With respect to project funding by discipline, 52% of the funding (\$1,725,882) was allocated to biological projects, and just over 3% (\$104,253) was allocated to physical sciences projects. Projects involving cultural resources received 23% (\$761,615) of the funding, and visitor-related or social projects were allocated 7% (\$249,871) of the funding. Approximately 11% of funds (\$365,000) were allocated to interdisciplinary projects, involving both cultural and natural resources. Actions funding operational support of programs involved 4% of the annual total (\$129,044).

The PNW CESU held its annual partners meeting in November of 2011 at the University of Washington in Seattle. The meeting featured updates on several regional partnership efforts, including two Landscape Conservation Cooperatives (the North Pacific LCC and the Great Northern LCC), the North Cascadia Adaptation Partnership (a joint NPS-Forest Service climate change adaptation effort), and the newly forming Northwest Climate Science Center at three PNW CESU universities (Oregon State, Washington, and Idaho).

## FEATURED PROJECTS

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**Title:** Administration of the 2011 and 2012 George Melendez Wright Climate Change Fellowship Program

**Fund Source and Year(s) Funded:** National Park Service, Climate Change Response Program, 2011 and 2012

**Stated Theme, Goal, or Action from the C2A:** Connecting People to Parks: Develop and nurture life-long connections between the public and parks—especially for young people—through a continuum of engaging recreational, educational, volunteer, and work experiences.

**Description:**

The George Melendez Wright Climate Change Fellowship Program addresses climate change related research needs identified by upper level undergraduate and graduate students and their university advisors. This was a collaborative project between the National Park Service (NPS) and the University of Washington to administer the 2011 and 2012 George Melendez Wright Climate Change Fellowship Program. The following activities occurred during each year: a call for proposals was distributed; criteria were developed for use in evaluating and ranking proposals; an internet-based system was used to facilitate proposal review and ranking; a coordinated review of numerous research proposals was conducted by review panels consisting of academic and NPS experts; and the results of the evaluations were compiled and fellowship recipients were selected.

This fellowship program allows the best and brightest upcoming climate change researchers a chance to develop their skills on NPS lands. These fellows came from colleges and universities across the nation, making this a national program. The 2011 and 2012 fellowship awards supported research in 33 different parks conducted by 25 scholars. Samples of the 2012 participating parks, projects, and universities include:

- Glacier, Grand Teton and Yellowstone NPs: Wildfire burn severity patterns and forest transitions under a warming climate in national parks of the northern Rockies, University of Wisconsin.
- Lassen Volcanic NP: Pivotal Indicators of Environmental Change in Alpine Lakes: Investigating Past and Present Diatom Community Composition in Lassen Volcanic National Park, University of Nevada, Reno.
- Mount Rainier NP: Climatic Variability and its Influences on the Fire and Vegetation History of Subalpine Meadows- Mount Rainier National Park, Central Washington University.
- National Park of American Samoa: Acclimatization of reef building corals to increased temperatures, Stanford University.
- Saint Croix National Scenic River: Climate change refuge for at-risk, native brook trout of the wild and scenic Studentkagon River (St. Croix National Scenic River), University of Notre Dame.
- Sequoia & Kings Canyon and Yosemite NPs: Protecting forest biodiversity: Understanding climate change refugia for management, University of California.



**Title:** Human and Environmental Dynamics at Cape Krusenstern National Monument, Two Hundred Generations: On the Beach of Their Time

**Fund source and year(s) funded:** National Park Service, ONPS, 2007, 2008, 2009, and 2010.

***Stated Goal or Objective from the Climate Change Response Strategy:***

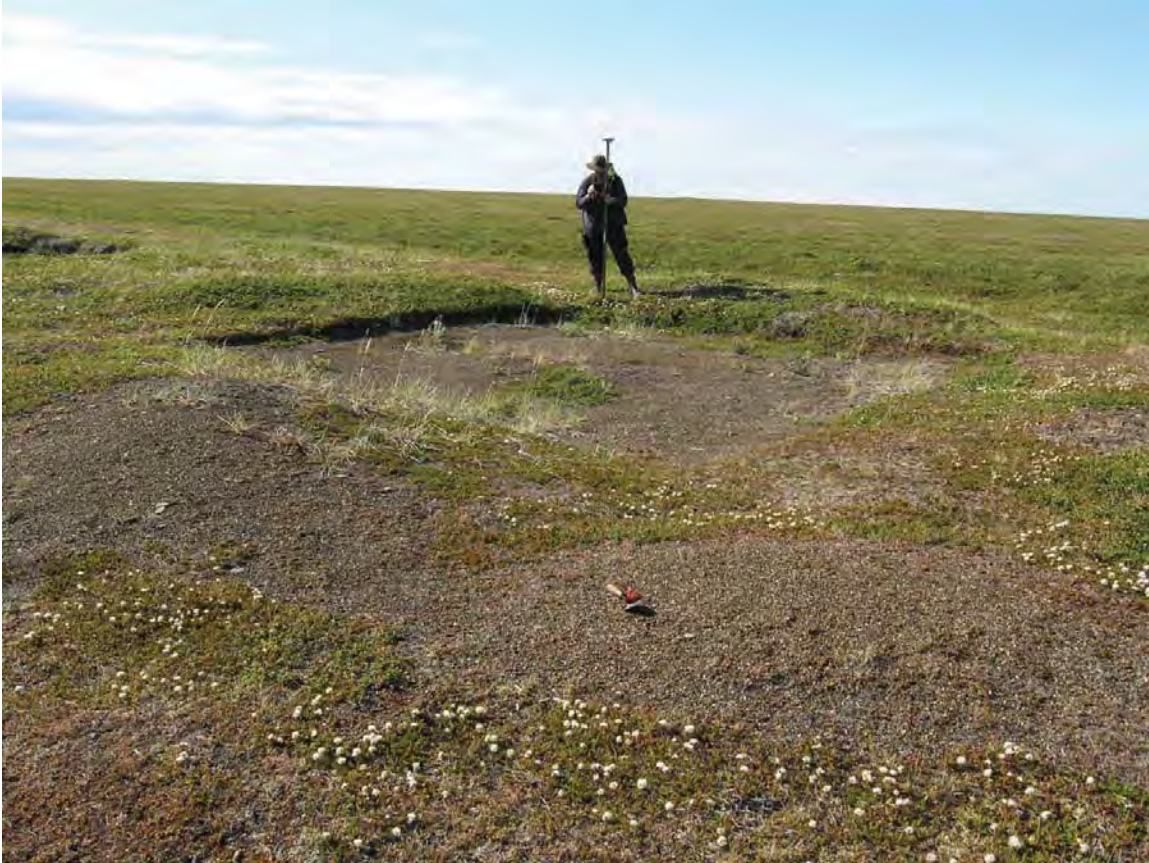
Objective 7.4: Expand NPS capacity to conduct inventory and monitoring of archeological sites in anticipation of climate change impacts and support curation of artifacts and associated documentation.

***Description:***

The National Park Service and the University of Washington collaborated on an interdisciplinary project at Cape Krusenstern National Monument (CAKR) in northwest Alaska to address selected long-standing research questions about human and environmental interactions. The project incorporated geomorphologic and palynological research with archaeological survey of the extensive beach ridge complex at CAKR. The initial objectives were to: 1) collect and use new data to re-evaluate the chronology and culture history established by previous researchers, 2) collect site location, condition, and other information needed to better inform future cultural resource management decisions and to facilitate future research at CAKR, and 3) involve the Kotzebue community in the project through community presentations, volunteer participation in fieldwork, and publication of educational materials and pamphlets. Field and laboratory research of the CAKR beach ridge complex contributed to archaeological research by providing greater understanding of prehistoric human activities across a landscape that is only afforded by a large scale, systematic survey. Numerous objectives were accomplished, including: 1) identification of many previously unknown archaeological sites and features, 2) refined the site settlement model and chronology, 3) collected highly accurate geospatial data for 2500 features, both newly identified and verified legacy locations, that are important for research and management purposes, 4) successfully integrated legacy data, which both contributes to the findings and expands the potential of future research on existing collections, 5) created an archaeological GIS (geographic information system) that can be utilized for research and management needs, and 6) raised community awareness of archaeological research at CAKR and increased local knowledge and involvement in archaeological research.

Results indicated some key areas and directions for future management of the archaeological resources within the CAKR beach ridge complex. Recommendations include the mitigation of natural destructive processes, additional legacy data compilation, continued collaboration with local community members, and use and maintenance of the archaeological GIS. Archaeological features along the active beach are currently subjected to coastal erosion and should be of immediate concern. Coastal erosion is expected to increase in the future, with climate change related shifts in storm systems, sea level, and permafrost. In areas where our survey included the interface with the active beach, we found rapid erosion occurring. However, portions of the active beach interface have not been surveyed, so some archaeological remains that are

threatened and actively disturbed may be undocumented. An initial response could focus on survey of the active erosion scarp to locate, map, and record all features currently disturbed by or under threat from erosion. This would greatly aid mitigation efforts and decisions on data recovery and/or acceptable losses of the archaeological record.



**Photo Caption:** Mapping an excavated house in the Old Whaling summer settlement (Photo: Adam Freeburg)

## **FY 2013 NPS Annual Report to Congress**

**Name of CESU:** Pacific Northwest Cooperative Ecosystem Studies Unit

**Coordinator:** Chris Lauver

**Number of Partners:** 29

**Number of Projects that went through the PNW CESU agreement in FY13:** 48  
(29 new task agreements, 19 cost modifications to existing task agreements)

**Total Funding obligated under the PNW CESU agreement in FY13:** \$2,184,138

### **Trends and Accomplishments:**

The number of National Park Service (NPS) new task agreements (29) at the Pacific Northwest CESU during FY13 was similar to the 12-year average of 31 new projects per year, and greater than last year's 25 new task agreements. The number of cost modifications (19) was below the 12-year average of 27 per year, and down from last year's 32 cost modifications. Collectively, project funding in FY13 decreased by 34% compared to the previous year. Funding for new task agreements in FY13 was about 20% less than in FY12, and funding for modifications (\$925,541 in FY13) was substantially lower than in FY12 (\$1,759,176). One factor in the funding decline is the federal budget sequestration that occurred in FY13.

FY13 new project funds were allocated to 10 of the 18 academic partners, compared to 13 institutions in FY12. Seven universities and one state agency (Alaska Dept. of Fish & Game) received funding for cost modifications. Portland State University captured the lion's share with 31% of the total funding with eight new projects and six cost modifications. Saint Mary's University of Minnesota received 17% of the total FY13 funds, Southern Oregon University received almost 12%, and the University of Vermont received 9%. The host institution, University of Washington, received 6.5% of the total allocated.

In reviewing FY13 project funding by discipline, biological projects received almost half of the funding, and cultural resource projects received 36% of the funding. Physical science projects received about 7%, visitor-related (social science) projects received almost 6%, and about 2% of the funds went to interdisciplinary projects, involving both cultural and natural resources.

Since the inception of the PNW CESU in 2000, nearly \$35 million in NPS funding has been processed under the cooperative agreement for 397 projects.

One new partner joined the unit in FY13, the US Department of Defense was added as a new federal partner.

## **FEATURED PROJECT related to *Climate Change Response Strategy***

**Title:** Climate Change Vulnerability Assessment for Badlands National Park

**Fund Source and Year(s) Funded:** National Park Service, 2010 (\$80,000)

**Stated Goal or Objective from the Strategy: Goal 6:** Implement adaptation strategies that promote ecosystem resilience and enhance restoration, conservation, and preservation of park resources. **Objective 6.1:** Collaborate with federal, state, and local partners and programs to acquire, evaluate, and develop tools, such as vulnerability assessments and scenario planning, to inform the development of adaptation plans at appropriate scales.

**Description: Executive Summary from:**

Amberg, S., K. Kilkus, S. Gardner, J. E. Gross, M. Wood, and B. Drazkowski. 2012. Badlands National Park: Climate change vulnerability assessment. Natural Resource Report NPS/BADL/NRR—2012/505. National Park Service, Fort Collins, Colorado.

The impacts of global climate change are a growing concern for natural resource managers worldwide, including those at Badlands National Park (BADL) in South Dakota. By 2100, conditions here are projected to become warmer and drier. The National Park Service (NPS) recognizes the importance of understanding the effects of climate change on park resources across the country and of developing adaptive management strategies to address these effects. Therefore, the NPS Climate Change Response Program initiated a climate change vulnerability assessment (CCVA) for BADL with two priorities in mind: 1) to assess the potential vulnerability to climate change of BADL natural and cultural resources through the development and implementation of a CCVA, and 2) to use the project as a pilot study for developing a methodology for projecting regional climate changes and a process for assessing natural and cultural resource vulnerability to these changes.

By the end of this century, average annual temperature in the BADL is projected to increase by 3-5° C (approximately 5-9° F). While precipitation is likely to increase slightly, conditions will likely become drier due to increased evapotranspiration. Extreme events (e.g., drought, heat waves, thunderstorms) are also likely to become more frequent as well. Climate change projections are discussed in detail in chapter 3.

This CCVA assesses the vulnerability of natural resources to climate change at two scales: plant communities and individual wildlife species (or groups of species, such as grasslands birds). Three ecological processes that shaped the BADL landscape (fire, grazing, and erosion) are also addressed, as well as the park's significant paleontological resources. Finally, the potential impacts of climate change on the park's cultural resources (e.g., historic roads, archeological sites, ethnographic resources) are discussed.

BADL is divided into four plant communities based on vegetation classifications. The grassland and sparse badlands plant communities comprise nearly 90% of the park, with the remaining 10% consisting of woodlands and shrublands. Vulnerability to climate change was scored using six variables, as described in chapter 2. The degree of certainty was evaluated for each variable and summed to create an overall confidence for vulnerability. The grassland plant community was categorized as least vulnerable to climate change, as it is not particularly sensitive to extreme climatic events (e.g., droughts, flash floods) and shows a relatively high intrinsic adaptive capacity. However, the predicted climate changes may favor short grasses (which typically occur on drier sites in the park) over mid-height grasses, resulting in a change in the structure and composition of the park's grasslands. The shrubland plant community was rated as moderately vulnerable, partially because climate change has the potential to exacerbate non-climate stressors

such as invasive plant species. Some shrubland community types, such as sandbar willow shrublands, are likely more vulnerable than others, due to their dependence on specific hydrologic conditions.

Some species (and groups of species) were found to be more vulnerable to projected climate changes in the region, while other species were determined to be less vulnerable. Several of the species (or groups of species) targeted for assessment were identified as being more vulnerable to climate change than other native species found in the park. These include black-footed ferrets, bighorn sheep, mule deer, herpetofauna, and grassland bird species. Several characteristics emerged among those species found to be more vulnerable, including having physiological sensitivities to temperature, increased susceptibility to diseases, and reliance on rare, sensitive or highly vulnerable habitat.

BADL's paleontological and cultural resources are also addressed in this assessment. Cultural resources are divided into five categories: ethnographic resources (plants and wildlife), archeological resources, museum collections, historic structures, and cultural landscapes. The primary climate-related concern for most of these resources is increased erosion. Climate change is likely to exacerbate this erosion stressor for paleontological and archeological resources, as well as several historic roads.

Overall, this CCVA defines a process for qualitative assessment of natural and cultural resources in BADL; it characterizes the projected regional downscaled climate changes and the best estimates of resource vulnerabilities based on available literature and professional judgment. This assessment shows that the physical, ecological, and cultural resources in BADL exhibit a wide range of climate change vulnerabilities and, consequently, it is likely that managers can expect to see substantial changes in the distribution of many of these resources in the next several decades. This CCVA is a very important first step in understanding how park resources may change with impending climate change. It provides managers a starting point from which to begin identifying the resources that may not cope well with climate changes and those that may be resilient to projected shifts.



Photo 1. Bighorn ram and ewe at BADL (NPS photo from NPS 2010). National Park Service (NPS). 2010. Mammals photo gallery. Badlands National Park. Online. (<http://www.nps.gov/badl/photosmultimedia/Mammals.htm>).



Photo 2. Dr. Larry Stetler from the South Dakota School of Mines and Technology taking stereo pair images of an erosion study site in BADL using photogrammetry techniques (photo by Emily French, SD School of Mines and Technology, 2011).

## **FEATURED PROJECT related to: *A Call to Action***

**Title:** Quantitative Forecasting of Above and Belowground Climate Change Impacts at Wind Cave National Park

**Fund Source and Year(s) Funded:** National Park Service, 2010 (\$38,618); 2011 (\$125,563)

**Stated Theme, Goal, or Action from the C2A:** Theme: Preserving America's Special Places.

**Goal:** Cultivate excellence in science and scholarship as a foundation for park planning, policy, decision making, and education.

**Description: Executive Summary from:**

King, D. A., D. M. Bachelet, and A. J. Symstad. 2013. Vegetation projections for Wind Cave National Park with three future climate scenarios: Final report in completion of Task Agreement J8W07100052. Natural Resource Technical Report PS/WICA/NRTR—2013/681. National Park Service, Fort Collins, Colorado.

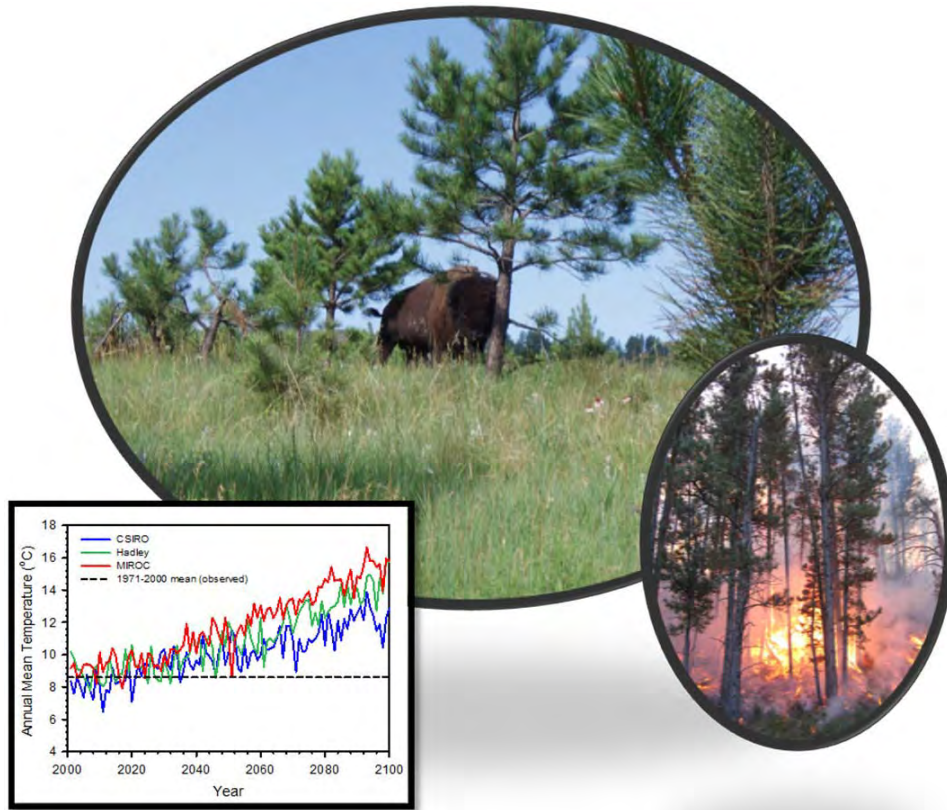
A 2009 workshop piloted the use of scenario planning for NPS natural resource management planning in the face of climate change. Wind Cave National Park (WICA) served as a case study in this workshop. Available information and expert opinion were used to construct a set of plausible, future scenarios. Future strategies were then derived based on common themes that emerged from the scenarios. Workshop participants found the process extremely useful for fostering conversations about natural resource management in a changing climate, but they concluded that a more rigorous process for building and validating scenarios would make the resulting conclusions more robust to public scrutiny.

Major uncertainties encountered when constructing scenarios for the 2009 workshop included how the direct effects of CO<sub>2</sub> on plants might mitigate warming effects, as well as whether park management practices would amplify or moderate climate-driven vegetation changes. MC1, a dynamic global vegetation model, incorporates these and other important processes (e.g., grazing) to simulate vegetation in future climates. We calibrated MC1 to the WICA landscape and then used this calibrated model to simulate vegetation in three future climate scenarios combined with a variety of fire and grazing scenarios chosen by WICA natural resource management staff.

Critical implications of these simulations are:

1. The current forest-grassland balance may be maintained, but at reduced tree biomass, with prescribed fires provided that targeted tree mortalities are attained. Moderate variation in the frequency and intensity of prescribed fires did not have large effects on these simulations. Prescribed fires have the potential to improve or maintain forest health, making it more resistant to mountain pine beetle outbreaks and wildfire, while preventing the incursion of trees into grasslands. Fire suppression would have the opposite effects.
2. The distribution of forest vs. grassland at WICA is quite sensitive to fire. Although no model can capture all the complexities that determine fire effects, increasing temperatures and concomitant drying of fuels are virtually certain. Simulations suggest an increase in frequency of high fire danger from 12 days per year in the 20th century to 20-100 days per year by 2100.
3. Future forage production was little impacted by grazing when up to 50% of aboveground production was removed, but prolonged 70% removal rates depressed productivity. Future annual forage production varied among climate scenarios, increasing in one and decreasing in another. Mid or late summer declines in plant production due to greater heat and drought could increase soil erosion and lead to late-season food shortages for grazers. Increased interannual variation in forage production supports the adoption of more conservative grazing regimes, particularly after 2030.

- Given uncertainties in the rate of increase in greenhouse gases and the response of local climate to this forcing, long-term monitoring of production phenology, range quality, species composition, and, in wooded areas, tree density and growth and seedling establishment and survival is of great importance.



**ON THE COVER of King et al. 2013**

Grass, ponderosa pine, and bison are among the major concerns of resource management in a changing climate at Wind Cave National Park. Graph shows three General Circulation Models' projections for mean annual temperature at the park for the 21<sup>st</sup> century, compared to the current (1971-2000) value. Photograph courtesy of USGS.



## **FY2014 Annual Report to Congress**

**Name of CESU:** Pacific Northwest Cooperative Ecosystem Studies Unit

**Coordinator:** Chris Lauver

**Number of Partners:** 29 (11 Federal, 17 Academic, 1 State)

**Number of Projects that went through the PNW CESU agreement in FY14: 70**  
(34 new Task Agreements, 36 Cost Modifications)

**Total Funding that went through the PNW CESU in FY14: \$3,983,691**

### **Short list of trends and accomplishments:**

The number of National Park Service (NPS) new task agreements (34) at the Pacific Northwest CESU during FY14 was greater than the average (FY01-FY13) of 30 new projects per year, and greater than last year's 29 new task agreements. The number of cost modifications (36) was greater than the 13-year average of 27 per year, and up from last year's 19 cost modifications. Collectively, project funding in FY14 increased by 82% compared to FY13, and was 67% greater than the average total funding of \$2,677,831. Funding for new task agreements in FY14 was 53% greater than in FY13, and funding for modifications (\$2,053,114) increased by 122% from FY13 (\$925,541).

FY14 new project funds were allocated to 12 academic partners (11 universities and one state agency, Alaska Department of Fish & Game), compared to 10 institutions in FY13. Ten universities and one state agency (ADF&G) received funding for cost modifications, compared to FY13's seven universities and one state partner. Portland State University captured the lion's share with 24% (\$948,870) of the total funding with six new projects and 10 cost modifications. Saint Mary's University of Minnesota received 12% of FY14 funds (\$483,640; two new task agreements and seven cost modifications). Western Washington University received 12% (two cost modifications totaling \$477,992), and Oregon State University received nearly 11% (\$428,939, six new task agreements, three cost modifications). The University of Vermont received 2.2% (88,000, one new task agreement). The host institution, University of Washington, received 15.2% (\$605,658, five new task agreements and five cost modifications) of the total allocated.

Since the inception of the PNW CESU in 2000, nearly \$39 million (\$38,795,495) in NPS funding has been processed under the cooperative agreement for 431 projects. This represents nearly half of the \$82 million processed for all federal agencies through the PNW CESU.

The NPS Coordinator continued his service on two interagency collaborations related to climate change: the Northwest Climate Science Center Executive Stakeholder Advisory Committee, and the Science-Traditional Ecological Knowledge (STEK) subcommittee of the North Pacific Landscape Conservation Cooperative.

## **FEATURED PROJECT related to: *A Call to Action***

**Title:** Transportation as a Barrier to Visiting National Parks by Communities of Color

**Fund Source and Year(s) Funded:** NPS, 2011 (\$98,256) University of Vermont

**Stated Theme, Goal, or Action from the C2A: Theme:** Connecting People to Parks.

**Goal:** Connect urban communities to parks, trails, waterways, and community green spaces that give people access to fun outdoor experiences close to home.

**Description:** Research has shown transportation to be a barrier to visitation to parks and public lands for many communities of color. Research that examines transportation issues for communities of color can assist parks in removing barriers to access, allowing parks to better engage traditionally underserved populations. This is a collaborative project to examine transportation issues for selected national park units and surrounding communities of color. The program of research was commissioned by the NPS Facilities Planning Branch to help guide preparation of Long Range Transportation Plans (LRTPs) now being developed by the NPS. In particular, the study was designed to gauge the importance of transportation and related issues as barriers to visiting national parks and to develop insights into how transportation planning, management and policy might address the issue of under-representation of communities of color as visitors to national parks. Case study methodology was used to identify and explore how transportation options and knowledge impact access to national parks for communities of color. We used three large data bases to make the study design described above operational. The first data base is one that we created by conducting on-site surveys of visitors at five national parks: two iconic national-level parks (Grand Canyon National Park and Acadia National Park), one regional national park (Fire Island National Seashore), and two urban units of the national park system, one a conventional white/European-oriented park (General Grant National Memorial) and one a minority-oriented national park (African Burial Grounds National Monument). The second data base was created by conducting a general population survey of a major metropolitan area – New York City. The third data base is comprised of data collected by the Second Comprehensive Survey of the American Public (CSAP2) commissioned by the NPS. The final report includes a final chapter that synthesizes study findings to develop a series of overarching conclusions. Based on these conclusions, a series of planning and management implications are outlined suggesting ways in which racial and ethnic minorities might be more fully represented in the national parks. Some of these implications apply directly to the Facilities Planning Branch of the NPS while others suggest how the Facilities Planning Branch might partner with other divisions of the NPS as well as outside entities.

## **FEATURED PROJECT related to *Climate Change Response Strategy***

**Title:** Climate Change and Archaeology in Northwest Alaska: Nuluk Study

**Fund Source and Year(s) Funded:** NPS, 2012-2014 (\$146,004) Portland State University

**Stated Goal or Objective from the Strategy: Goal 3:** Inventory and monitor key attributes of the natural systems, cultural resources, and visitor experiences likely to be affected by climate change. **Objective 3.2:** Monitor, evaluate, and report the status and trends of park resources to facilitate adaptation planning.

**Description:** Arctic climate change projections predict rising sea levels, increased storm activity, and warming that will cause permafrost melt, reduced snow and ice cover, and increased water runoff. The impact of climate change on the Arctic archaeological record is potentially severe. The long-term record of human-environment interactions in the Arctic is threatened and lack of information about regional archaeology makes prioritization of sites for investigation difficult. Collaborative research by Portland State University and the National Park Service in coastal areas

of northwest Alaska is directed at addressing these issues through a study of a 56 km (35 mile) coastal region in the Bering Land Bridge National preserve. The current study has two goals: 1) to study why and how people adapted to and altered their environment during past episodes of environmental variability in this region, and 2) to evaluate how modern climate change is impacting archaeological sites in the study area. Two years of fieldwork are complete and analysis is underway. 30 new sites were identified during survey and 21 previously known sites relocated and assessed for climate change damage. Of these 51 sites, more than half are moderately to severely damaged, with significant loss of data in many cases. Wind erosion is the primary cause of damage in the study area, with coastal erosion a secondary impact. Additional results are forthcoming and will include recommendations for future research to mitigate further climate change caused damage to these sites.

Figure 1. Eroding coastal archaeological site (Photo by Shelby Anderson).



## **FY2015 Annual Report to Congress**

**Name of CESU:** Pacific Northwest Cooperative Ecosystem Studies Unit

**Coordinator:** Chris Lauver

**Number of Partners:** 30 (12 Federal, 17 Academic, 1 State)

**Number of Projects that went through the PNW CESU agreement in FY15:** 60  
(35 new Task Agreements, 25 Cost Modifications)

**Total Funding that went through the PNW CESU in FY15:** \$3,265,468

### **Short list of trends and accomplishments:**

The number of National Park Service (NPS) new task agreements (35) at the Pacific Northwest CESU during FY15 was greater than the average (FY01-FY14) of 31 new projects per year, and one more than last year's 34 new task agreements. The number of cost modifications (25) was less than the 14-year average of 27 per year, and down from last year's 36 cost modifications. Collectively, project funding in FY15 decreased by 18% compared to FY14, but was 18% greater than the average total funding (FY01-FY14) of \$2,771,107. Funding for new task agreements in FY15 was similar to FY14 levels (\$1,968,914), and funding for modifications (\$1,296,554) decreased by 37% from FY14 (\$2,053,114).

FY15 new project funds were allocated to 14 academic partners (13 universities and one state agency, Alaska Department of Fish & Game), two more than in FY14. Portland State University captured the greatest share with 18% of the total funding (\$595,933), with 7 new projects and 5 cost modifications. Oregon State University received 15% (\$480,707) with 5 new projects and 4 cost modifications, and Western Washington University with 9% (\$297,521), for 2 new projects. The host institution, University of Washington, received 12% (\$393,092, 4 new task agreements and 4 cost modifications) of the total allocated.

University of Idaho received 8% (\$259,071, with 3 new task agreements and 2 cost modifications), and Saint Mary's University of Minnesota received 7% (\$242,237, with 2 new task agreements and 2 cost modifications). Both the University of Alaska Anchorage (\$180,258, 2 cost modifications) and the Alaska Department of Fish & Game (\$186,992, 1 new task agreement and 2 cost modifications) received 6%. The University of Oregon (\$178,858, 3 new task agreements and 1 cost modifications) and Southern Oregon University (\$167,012, 2 cost modifications) each received 5%. The University of Vermont (\$113,936, 2 new task agreements) and Washington State University (\$100,044, 4 new task agreements) received 3%, Central Washington University received 2% (\$53,000, 1 new task agreement and 1 cost modifications), and Oregon Institute of Technology received 1% (\$16,807, 1 new task agreement).

Since the inception of the PNW CESU in 2000, over \$42 million (\$42,060,965) in NPS funding has been processed under the cooperative agreement for 466 projects. This represents nearly half of the \$90 million and over half of the total number of projects (764) processed for all federal agencies through the PNW CESU.

The NPS Coordinator continued his service on two interagency collaborations related to climate change: the Northwest Climate Science Center Executive Stakeholder Advisory Committee, and the Science-Traditional Ecological Knowledge (STEK) subcommittee of the North Pacific Landscape Conservation Cooperative.

**FEATURED PROJECT related to the Centennial Goal: “Connect with and create the next generation of park visitors, supporters, and advocates”**

**Title:** Administration of the 2011 George Melendez Wright Climate Change Fellowship Program  
**Fund Source and Years Funded:** NPS, 2011-2014 (\$294,906) University of Washington  
**Description** (from: Kirsten Feifel’s project report, University of Washington. Project: Harmful algal blooms and climate in Olympic National Park).

Olympic National Park, located along the western coast of Washington State, has jurisdiction over the natural resources found within its coastal intertidal zone. Over the past decade, Olympic National Park has had multiple HAB (harmful algal blooms) outbreaks that forced managers to limit recreational and tribal shellfish harvests. In 2008 and 2010, resource managers at the Olympic National Park were forced to close shellfish harvesting due to blooms of the harmful alga *A. catenella*. However, a dearth of data has precluded the ability of managers to assess if HABs of *A. catenella* are truly increasing in Olympic National Park and, if so, what the cause is. One way to begin to examine the relationship between historical climate variability and HABs is to develop long-term records using sediment cores. Some HAB forming species in the Pacific Northwest, such as *A. catenella*, can form a dormant cyst after a bloom that can become entrained in the sedimentary record; we presume that changes in cyst abundance over time reflects historical changes in *A. catenella* populations. The research objective of this project was to better assess the historical occurrence and range of *A. catenella* along the Olympic coast by extracting sediment cores along five transect lines extending from shoreline to depths of 150 m and in one nearby inlet. It is thought that the toxins found in the shellfish along the Olympic National Park coastline originate from HABs found in the waters within the adjacent Olympic National Sanctuary but, it is unknown where the cyst beds reside and how long the cysts have been present in the region. **Key Findings: Olympic coast transects:** Sediments nearshore (0--50 m) were generally classified as “gravel” or “sand”, a product of the relatively high wave energy environment found along the coastline. Muddy sediments were found far off shore, at depths of 100 and 150 m along the coast and at 5 m in the quiescent waters of Neah Bay. We first examined the sediment samples that were primarily composed of mud because we thought they would have the highest concentrations of *A. catenella* cysts. *A. catenella* cysts are non-motile and thus, will be transported like a passive particle in the ocean. Thus, the highest cyst concentrations should be found in similar grain sizes or fine sediments such as mud. In general, very few *A. catenella* cysts were found in our samples. One cyst was found at both the 100 and 150 m depths off of Kalaloch beach. Another three cysts were found at the 150 m depth off of Makkaw Bay. No *A. catenella* cysts were found in the surface samples collected in the nearshore environment (0--50 m). Cyst beds at these concentrations are considered to have little ecological relevance when compared to the cyst beds found elsewhere in Puget Sound. For example in 2012, Bellingham Bay, located to

the north, had cyst concentrations of 1070 cysts cm<sup>-3</sup> and Quarter Master Harbor, located in southern Puget Sound, had cyst concentrations of 708 cysts cm<sup>-3</sup> (PS-AHAB website, 2012).



Figure 1. Collecting sediment cores for analysis.

**FEATURED PROJECT related to: *A Call to Action***

**Title:** Impacts of Fire Management on Carbon Stock Stability in Yosemite and Sequoia & Kings Canyon National Parks

**Fund Source and Years Funded:** National Park Service, 2010-2015 (\$115,163), University of Washington.

**Stated Theme, Goal, or Action from the C2A:** Theme: Preserving America's Special Places.

**Goal:** Cultivate excellence in science and scholarship as a foundation for park planning, policy, decision making, and education.

**Description: Abstract/Executive Summary from:**

Matchett, J.R., J.A. Lutz, L.W. Tarnay, D.G. Smith, K.M.L. Becker, and M.L. Brooks. 2013. Impacts of Fire Management on Carbon Stocks in Yosemite and Sequoia & Kings Canyon National Parks. Natural Resource Technical Report NPS. National Park Service, Fort Collins, Colorado.

Forest biomass on Sierra Nevada landscapes constitutes one of the largest carbon stocks in the state of California and the stability of that carbon stock is tightly linked to fire and the ecological factors that drive the fire regime. Recent research suggests that over a century of fire suppression, fuel accumulation, and the reintroduction of fire in Sierra Nevada forests have reduced the amount of carbon that such suppressed landscapes store, while increasing the likelihood of catastrophic, stand-replacing fire. For over 30 years, fire management at Yosemite (YOSE) and Sequoia & Kings Canyon (SEKI) National Parks has led the nation in restoring fire to park landscapes, however the impacts of that restoration on the stability and magnitude of carbon stocks are not yet known.

The purpose of this project was to examine the effects of fire on carbon stocks in these two parks. Our approach to this question was focused on evaluating the effect of fire on the: 1) amount of above-ground carbon on the landscape (limited to trees and standing snags); and 2) rate of carbon accumulation by individual trees. In 2010, we were successful in designing and planning the plot work, and building the foundational database for this analysis through an interagency agreement with U.S. Geological Survey and through a CESU agreement with University of Washington. In 2011, we hired and trained the field crew and acquired the plot data, including tree core specimens, from the 117 out of 200 target plots. In 2012, we completed the interpretive component and began the analyses of the plot data. In 2013, processing of tree cores began (at Utah State University, due to the move of investigators Lutz and Becker). In 2014, final processing of tree cores, data analyses, and manuscript preparation will be completed for objectives 1 and 2. This final report addresses and maps the quantitative amount and stability of tree carbon stocks relative to fire for both YOSE and SEKI. This research became the seed for a much larger effort that will continue to lead to results beyond those outlined in the original proposal.

Examining carbon densities across the landscape in burned vs. unburned areas, our analysis of the effect of fire history on carbon densities showed no significant difference (at the 95% confidence level) between burned and unburned plots in the areas sampled (15-16 years post-fire in most plots), though there was a non-significant tendency toward lower carbon in some vegetation types, especially red fir.

In order to quantify carbon and the potential difference between burned and unburned areas in these parks, we had to account for all sources of error and propagate that error as we summed carbon densities across various landscape strata. Using Monte Carlo simulation methods, we found that mapping uncertainty was the largest source of uncertainty, while measurement uncertainties arising from using general allometry were relatively small. For managers, this report presents a map of carbon that incorporates these uncertainties, and a recommended method for propagating these uncertainties across selected areas of management interest.

To illustrate the utility of this map for looking at areas of management interest, our report uses this tool to look not only the total amount of tree carbon in YOSE (25 Tg C) and SEKI (19 Tg C), but also look at the amount of carbon in different vegetation types (red fir and sugar pine –white fir dominated forest comprise the bulk of the carbon stocks in both parks) and (in YOSE only) how much carbon is in areas of varying degrees of “departure” from historic fire return intervals as a proxy for the stability of our carbon stocks. For YOSE, about 10 out of the 25 Tg C (mostly red fir, Jeffrey pine, and western white pine) is relatively “secure” in low risk areas, another ~10 Tg (mostly red fir and western white pine) lies in areas that have missed two fire return intervals, with the rest of the C (largely ponderosa pine and white fir – sugar pine) in higher risk areas that have missed 9 or more fire return intervals.

Finally, we compare these results to remotely sensed carbon (NASA-CASA, <http://geo.arc.nasa.gov/sgc/casa/>) and find that, accounting for likely biases and uncertainties in our plot-based estimates, the two methods roughly agree. Our analysis and intercomparisons clearly show however that accounting for fire severity within fire perimeters should be part of any future effort to map and quantify the effects of fire across landscapes. We illustrate the potential importance of this with an example using the 2013 Rim Fire, which burned an area containing over 5 Tg C, but likely left a large fraction of that C on the landscape if one accounts for fire severity.



Photo caption: High severity postfire landscape within Yosemite National Park  
Photograph by: Leeland Tarnay



## **FY2016 Annual Report to Congress**

### **Name of CESU: Pacific Northwest Cooperative Ecosystem Studies Unit**

**Coordinator: Chris Lauver**

#### **Short description of notable trends and accomplishments this year:**

The number of new FY16 NPS task agreements (16) through the Pacific Northwest CESU was significantly less than the average of 31 new projects per year (FY01-FY15), and 19 fewer than last year's 35 new agreements. Of the 16 new projects, at least nine indicated students are involved. The number of cost modifications (21) was six fewer than the 15-year average of 27 per year, and five fewer than last year's 26 cost modifications. The CESU coordinator assisted with four new projects (totaling \$80,367) that were processed for other CESUs through the PWR Contracting Office.

Collectively, project funding in FY16 (\$2,810,976) decreased by nearly 15% from FY15 (\$3,300,468) and was almost equal to the average total funding (FY01-FY15) of \$2,806,398. Funding for new task agreements in FY16 (\$1,250,616) decreased by 36% from FY15 (\$1,968,914), while funding for modifications (\$1,560,360) increased by 17% from FY15 (\$1,331,553).

FY16 new project funds were allocated to nine partners (eight universities and one state agency), three fewer partners than in FY15. The University of Washington (host institution) captured the greatest share (29%) of the total FY16 funding (\$821,911, 4 new projects and 3 cost modifications). Portland State University received 19% (\$535,006, 1 new project and 5 cost modifications). The Alaska Department of Fish & Game received almost 13% (\$364,193, 1 new project and 1 cost modification). The University of Idaho (\$250,931, 3 new projects and 3 cost modifications), Oregon State University (\$233,595, 2 new projects and 3 cost modifications), and the University of Vermont (\$229,674, 2 new projects and 1 cost modification) each received over 8% of the total funding. Southern Oregon University, the University of Oregon, Saint Mary's University of Minnesota, Western Washington University, and Central Washington University received the remaining FY16 funds through new projects and modifications.

Since 2000, almost \$45 million (\$44,906,941) in NPS funding has been processed through the Pacific Northwest CESU for 482 projects. This represents over 45% of the nearly \$100 million (\$99,329,558) and almost 60% of the total number of projects (816) processed for all federal agencies through the Pacific Northwest CESU.

**Project Data for FY16 – NPS-funded projects only**

**Total number of projects that went through your agreement: 37**

New agreements:	16
Funded mods:	21

**Total funding that went through your agreement: \$2,810,976**

New agreements:	\$1,250,616
Funded mods:	\$1,560,360

**Number of partners engaged in those projects (summed across new and funded mods): 11**

**Number of projects in each category (new and funded mods):**

Research:	23
Technical assistance:	12
Education:	2

**Number of projects in each discipline (new and funded mods):**

Natural resources:	16
Cultural resources:	6
Social sciences:	2
Other:	13
Interdisciplinary: 12	
Physical: 1	

## **Project Descriptions**

**Please describe 1 or more projects completed this year that you want to highlight as significant contributions. You may want to consider projects that broaden the reach of CESUs to atypical programs or disciplines, projects that engage youth, projects that meet Servicewide and Regional priorities, etc. Please copy the formatting as necessary.**

***Title:*** Providing Cultural Research Assistance to Lewis and Clark National Historical Park (P11AC91181)

***New or Mod:*** New in FY11, 5 modifications, now complete.

***Fund Source and Amount:*** ONPS and Reimbursable; \$67,150

***Partners:*** Portland State University

***Description:*** Portland State University collaborated with NPS in the study and documentation of several culturally significant sites in the Columbia-Pacific region of Washington and Oregon that are directly related to the mission of Lewis and Clark National Historical Park (LEWI). The study sites included Ecola Creek, Par-Tee, and Middle Village. The project included historical research, production of reports documenting cultural significance and integrity, and the development of recommendations for site protection. The results will help the park in guiding future study, interpretation, and cultural resource management relating to these sites. The project results also can be used by park-associated tribes to support their efforts to identify and preserve traditionally significant resources. A major product of the project includes the publication cited below, which was reviewed by the Washington State Historical Society.

Deur, Douglas. 2016. Empires of the Turning Tide - A History of Lewis and Clark National and State Historical Parks and the Columbia-Pacific Region. National Park Service, Pacific West Region: Social Science Series, Publication Number 2016-001. 426 pp.

***Photo Caption (photo must be in public domain or permission to use must be on file):***

From: Deur (2016): "Figure 11.1 – Prior to the development of railroads in the 1880s, beach tourism was the domain of a handful of hardy souls, such as these Long Beach visitors – willing to travel for a day or more from more urban settings, bringing many of their supplies with them." Photo courtesy of the Washington State Historical Society, WSHS photo 1986.39.1.



A. S. GRAHAM & Co. Photo. L. Landscape Photographers  
K. J. Whiting  
Mrs. Chapman  
Mrs. Charles  
Mrs. Brown  
Miss Lane  
Mrs. Jones  
Mrs. Smith  
Aug 27. 1885

National Park Service Projects  
Initiated under Task Agreement P12AC15056  
7/15/2012 - 7/14/2017

Project ID	Partner	Project Title
P12AC10794	UW	Assessing the Effects of Nitrogen Deposition on High-Elevation Plant and Soil Communities
P12AC11995	OSU	Virtual Research and Learning Centers Network Management
P12AC15003	OSU	Developing a Monitoring Plan for Brachyramphus Murrelets in Alaska
P12AC15004	OSU	Humpback Whale ( <i>Megaptera novaeangliae</i> ) Genetic and Demographic Structure within Southeastern Alaska
P12AC15007	WWU	Process, Arrange, and Catalog Archives at the Western Archeological and Conservation Center
P12AC15010	UVM	Analyzing the Importance of Night Sky Quality to Park Visitors
P12AC15013	SMUMN	Image interpretation and Classification of Land Cover Change in Lake Clark and Kenai Fjords National Parks between 1954 and 2009
P12AC15015	OSU	Lichen Inventory for the Southwest Alaska Network
P12AC15016	OSU	Natural Resource Condition Assessments for San Juan Island National Historical Park and Ebey's Landing National Historical Reserve
P12AC15026	UW	George Melendez Wright Climate Change Youth Initiative
P12AC15051	ADFG	Communicating Marine Science to Alaskan Communities through Discovery Labs
P12AC15056	UW	Program Support for the Pacific Northwest Cooperative Ecosystem Studies Unit and the Great Basin Cooperative Ecosystem Studies Unit
P12AC15072	UW	Glacier Retreat, Outburst Floods, and Kinematic Waves— Long-Term Nisqually Glacier Changes Related to Climate Change
P13AC00136	OSU	Enhanced Monitoring and Data Synthesis of Sagebrush Steppe Communities in Upper Columbia Basin Network parks
P13AC00212	UAS	Developing a Natural Sounds Library of the Voices of Glacier Bay National Park and Preserve
P13AC00685	UW	Hydrologic and Ecological Monitoring of Montane Wetlands in North Cascades, Mount Rainier, and Olympic National Parks
P13AC00706	UW	Developing a GIS-based Geospatial Decision Support Tool for Assessing Climate Change Impacts on Flood Risks in Northern Cascadia Road Networks
P13AC00713	WSU	The Effects of Climate on Bumble Bee Pollinator Community Composition and Genetic Diversity in the North Coast & Cascades Network
P13AC00714	SOU	Administrative Support for the Klamath Network-Southern Oregon University Inventory, Monitoring, and Research Partnership
P13AC00833	UW	Elwha River Revegetation 2013 - Plant Performance Study
P13AC00860	OSU	Enhanced Monitoring for Improved Management and Restoration Decision-making in the Wetland Camas Prairies of the Upper Columbia Basin Network
P13AC00923	UVM	Conduct Field Schools to Assess and Stabilize the Evening Star and Bronze (Live Oak) Mines, Mojave National Preserve
P13AC00955	WSU	Determining the Sensitivity of High Elevation Lakes in Mount Rainier, North Cascades, and Olympic National Parks to Atmospheric Nitrogen Deposition through Nutrient Enrichment Experiments
P13AC00983	UID	Administrative Support for the Upper Columbia Basin Network Inventory and Monitoring Program
P13AC00992	PSU	Investigating the Nisqually Glacier Outburst Flood Potential
P13AC01005	PSU	Northern Alaska National Historic Landmark Condition and Vulnerability Assessment

National Park Service Projects  
Initiated under Task Agreement P12AC15056  
7/15/2012 - 7/14/2017

P13AC01053	CWU	Monitoring and Studying the Effects of Atmospheric Deposition and Other Water Quality Threats to Parks in the North Coast and Cascades Network
P13AC01093	SMUMN	Natural Resource Condition Assessment for Glacier Bay National Park
P13AC01117	PSU	Yakutat Tlingit Traditional Cultural Property Study, Glacier Bay National Park and Preserve
P13AC01120	PSU	Traditional Use Study with the Native Village of Kiana for Kobuk Valley National Park
P13AC01146	PSU	Public Education Regarding Site Protection Options for Off-Reservation Resources Along the Lewis and Clark National Historic Trail
P13AC01149	SMUMN	Natural Resource Condition Assessment for White Sands National Monument
P13AC01151	UVM	The Role of Biofilms and Lichens in the Preservation of Archaeological Features in the Bandelier Tuff, Bandelier National Monument
P13AC01152	PSU	Providing Anthropological Planning and Resource Management Assistance about Ethnographic Resources of Yosemite National Park
P13AC01162	SMUMN	Natural Resource Condition Assessment for Colorado National Monument
P13AC01165	SMUMN	Natural Resource Condition Assessment for Grant-Kohrs Ranch National Historic Site
P13AC01167	SMUMN	Natural Resource Condition Assessment for Fossil Butte National Monument
P13AC01168	SMUMN	Natural Resource Condition Assessment for San Antonio Missions National Historical Park
P13AC01169	SMUMN	Natural Resource Condition Assessment for Big Thicket National Preserve
P13AC01175	OSU	Assessment of Semi-Volatile Organic Compounds in Fish from a High Elevation Lake in Yosemite National Park
P13AC01223	PSU	Ethnographic Overview and Assessment for Devil's Postpile National Monument and Sequoia-Kings Canyon and Yosemite National Parks
P13AC01460	PSU	A Traditional Use Study of the Chulitna River-Sixmile Lake Area at Lake Clark National Park and Preserve
P14AC00787	CWU	Geoarchaeological Context of the Mid-Holocene Human Occupation at the Frank Slaven Roadhouse Site, Yukon-Charley Rivers national Preserve, Alaska
P14AC00846	ADFG	Upper Tanana Community Harvest Assessment
P14AC00863	PSU	An Ethnohistory of the Klamath Tribes at Crater Lake National Park
P14AC01100	SMUMN	Natural Resource Condition Assessment for Carlsbad Caverns National Park
P14AC01244	OSU	Updating PRISM Climate Maps for Alaska (using 1981 -2010 data) and Developing Monthly Time Series Maps for Temperature and Precipitation
P14AC01262	UID	Developing a Sage Grouse Long-term Monitoring Protocol for the Upper Columbia Basin Network
P14AC01344	ADFG	Determining Moose and Wolf Population Estimates for the International Chisana Caribou Herd Management Plan
P14AC01349	PSU	An Ethnohistory Study for John Day Fossil Beds National Monument
P14AC01390	UVM	Natural Resource Condition Assessment for the National Park of American Samoa
P14AC01393	UAS	Current and Historical Mercury Sources and Deposition to Remote Southeast Alaskan Lakes
P14AC01396	UW	George Melendez Wright Initiative For Young Leaders in Climate Change

National Park Service Projects  
Initiated under Task Agreement P12AC15056  
7/15/2012 - 7/14/2017

P14AC01403	PSU	A Stable Isotope Approach to Understanding Contaminant Distribution in Food Webs of Stocked versus Fishless Montane Lakes
P14AC01456	OSU	Supporting the Ocean Noise Reference Station Network with Underwater Acoustic Monitoring at the National Park of American Samoa
P14AC01482	UO	Dissemination Strategies for Honoring Tribal Legacies in the Studies of Lewis and Clark: An Epic Journey of Healing
P14AC01527	CWU	Monitoring and Studying the Effects of Atmospheric Deposition and Other Water Quality Threats to Parks In the North Coast and Cascades Network
P14AC01558	UW	Determining if Managed Wildfires and Prescribed Fires Conserve Critical Habitat Structure for Pacific Fishers in the Southern Sierra Nevada
P14AC01576	OSU	Lepidoptera (Butterflies and Moths) of Crater Lake National Park
P14AC01577	WSU	Community-Specific Biogeochemical Responses to Atmospheric Nitrogen Deposition in Subalpine Ecosystems
P14AC01578	WSU	Analyzing Archaeological Materials from Redwood National Park to Investigate Historical Marine Environments
P14AC01585	UID	Development of Inventory and Monitoring Outreach Products for the Sierra Nevada network
P14AC01636	OSU	Evaluating Impacts of a Pneumonia Epizootic and Potential for Disease Transmission Among Desert Bighorn Sheep Herds in and near Mojave National Preserve
P14AC01637	OSU	Lichen Community Analysis for Environmental Monitoring
P14AC01651	UAA	Document Expressive Culture of Area Dena'ina
P14AC01653	UAA	Economic Assessment of the Ambler Mining District Road Access through Gates of the Arctic National Park and Preserve on Subsistence Users
P14AC01693	UW	Assessment of Water Quality Conditions in and around Four Pacific Northwest Coastal Parks
P14AC01708	UW	Using LiDAR to Guide Forest Restoration in the Crater Lake Panhandle
P14AC01711	OSU	Landscape Change Detection in North Coast and Cascades Network (NCCN) Parks in Support of NCCN Landscape Dynamics Monitoring
P14AC01726	PSU	A Telaquana Trail Cultural Landscape Report within Lake Clark National Park and Preserve
P14AC01727	PSU	The Identification and Evaluation of Five Natural Areas as Potential National Natural Landmarks in the Pacific West Region
P14AC01742	PSU	Support for Protection, Interpretation, and Public Education of the NeCus Village Site, Lewis and Clark National Historic Trail
P14AC01774	UW	Evaluate Productivity and Abundance of Selected Salmonid Populations in Olympic National Park
P14AC01776	UID	Technical Assistance (GIS, Database, Science Communication) for the Upper Columbia Basin Network
P14AC01777	SMUMN	Natural Resource Condition Assessment for Obed Wild and Scenic River and Shiloh National Military Park
P14AC01780	ADFG	Energetics, Survival, and Dispersal of Dall's Sheep Rams Under Differing Harvest Management Strategies
P15AC00198	ADFG	Hughes Subsistence Harvest Survey
P15AC00332	OSU	Investigating the Effects of Vessel Traffic on Marine Mammal Vocalizations in Glacier Bay National Park and Preserve
P15AC00448	SMUMN	Extending Alaska Region National Hydrography Dataset Editing Protocols and Data Production to Accommodate Wetlands and other Value Added Attributes
P15AC00582	PSU	Oligohaline Tidal Wetland Plant Community Restoration and Response to Changes in Tidal Flooding and Salinity

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P15AC00632	WSU	Nutritional Ecology of Brown Bears on the Coast of Katmai National Park
P15AC00958	OSU	Modeling the Effects of Heavy Metals on Vegetation in Cape Krusenstern National Monument and Noatak National Preserve
P15AC00967	UID	Long-term Monitoring of Quaking Aspen ( <i>Populus tremuloides</i> ) in the Upper Columbia Basin Network
P15AC00987	WWU	Plant-Pollinator Interactions in Montane Meadows at Mount Rainier National Park: Assessing Butterfly Distributions, Phenological Relationships, and Climatic Responses
P15AC00989	UW	Using Satellite Data to Detect Changes in Glaciers in the Washington Cascades
P15AC00990	PSU	Olympic National Park Vegetation Inventory Map Product Development
P15AC01013	UW	Population Dynamics of Forest Carnivores in Denali
P15AC01014	OSU	"Qamani: Up the Coast, in My Mind, in My Heart" Iñupiaq Place Names, Vol. 2
P15AC01026	UID	Identify Vulnerable Populations of Dall's Sheep in Alaska's National Parks Using Climate Models
P15AC01044	SMUMN	Natural Resource Condition Assessment for Chickamauga and Chattanooga National Military Park
P15AC01065	OSU	High-resolution hydrologic modeling of Glacier Bay National Park
P15AC01248	UW	Strategic Approaches for Climate Change Vulnerability Assessment across the National Park System
P15AC01278	WSU	An Evaluation of eDNA Technology to Detect Clandestine Human Activity at Sequoia and Kings Canyon National Parks
P15AC01313	WSU	Nutrient Enrichment Critical Loads of Atmospheric Nitrogen Deposition for Aquatic Ecosystems in the Western U.S.
P15AC01372	PSU	Fort Vancouver National Historic Site Traditional Use Study
P15AC01490	PSU	Analysis, Summary, and Public Archaeology Outreach of Artifacts from an Archaeological Field School at Fort Vancouver National Historic Site
P15AC01497	CWU	Sitka NHP Scholars-in-Parks Program
P15AC01564	PSU	Historic Resource Study of Vancouver Barracks at Fort Vancouver National Historic Site
P15AC01579	PSU	An Ethnohistory Study for Pinnacles National Park
P15AC01585	UVM	Develop Technical Engineering Solutions to address Structural Deficiencies in Significant Traditionally-Built Structures
P15AC01591	OIT	Climate Change Scenario Planning for Montane and Subalpine Species
P15AC01594	UO	Study of Climate Change Impacts on Cultural Landscapes in the Pacific West Region
P15AC01598	OSU	Development of a National Parks and Protected Areas Cooperative Studies Program on the Oregon State University Cascades Campus
P15AC01599	WSU	Using eDNA Technology to Detect Amphibians in Yosemite National Park
P15AC01626	UW	Using LiDAR Data to Assess Forest Structure and Fuels at Oregon Caves National Monument and Preserve and at Whiskeytown National Recreation Area
P15AC01644	WWU	Preparing National Park Service Records for Improved Public Access
P15AC01669	UO	Technical Assistance in Cultural Landscape Climate Change Adaptation Approaches for the National Park System
P15AC01735	UID	Air Quality for Land Managers
P15AC01754	PSU	An Ethnohistory of Native American Land and Resource Use at Whiskeytown National Recreation Area



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P15AC01792	UVM	Conducting Historic Preservation Field Schools to Assess and Stabilize the Silver Bell and Golden Bell Mines, Joshua Tree National Park
P15AC01828	UO	Historic Structure Report of the Oregon Caves Chalet
P16AC00082	UW	Evaluate displacement of birds by recreational activities in Denali National Park
P16AC00135	UVM	Integration and Synthesis of the Scientific and Professional Literature on Soundscapes and Night Skies and Their Relationship to Outdoor Recreation
P16AC00349	OSU	Supporting the Ocean Noise Reference Station Network with Underwater Acoustic Monitoring at Buck Island Reef National Monument
P16AC00701	UW	Development of a Strategic Marketing Plan to Improve Concession Opportunities
P16AC00848	SOU	Completing Vegetation Mapping Products of Crater Lake National Park and Updating Vegetation Maps of Oregon Caves National Monument
P16AC01044	ADFG	Yukon-Charley Rivers National Preserve Harvest Surveys
P16AC01065	WWU	Assessing the Ecological Condition of Lakes in the North Cascades National Park Service Complex
P16AC01075	UVM	Stabilization and Repair of the Bartlett Cabin, Pecos National Historical Park
P16AC01362	OSU	Determining Status of Surface Water Quality in Parks of the Pacific West Region
P16AC01416	UID	Avian Inventory and Habitat Analysis of the Weippe Prairie, Nez Perce National Historical Park
P16AC01458	UID	Technical Assistance in Developing Vegetation Monitoring Protocols for the Upper Columbia Basin Network
P16AC01483	PSU	Traditional Cultural Properties and Planning at Yosemite National Park
P16AC01609	UID	Camas Propagation Research for Restoration of Weippe Prairie, Nez Perce National Historical Park
P16AC01754	SMUMN	Natural Resource Condition Assessments for Cumberland Island and Cape Hatteras
P16AC01781	UW	Natural Resource Condition Assessment and Climate Change Vulnerability Assessment for Oregon Caves National Monument and Preserve
P16AC01846	UW	Leadership, Coordination, and Administrative Oversight for the Pacific Northwest Cooperative Ecosystem Studies Unit (PNW CESU)