

# Meeting Federal Managers Needs in Addressing Climate Change by Using the Pacific Northwest Cooperative Ecosystem Studies Unit (PNW CESU)



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## Cooperative Ecosystem Studies Units National Network

### Purpose

The Cooperative Ecosystem Studies Units (CESU) National Network is a network of cooperative units established to provide research, technical assistance, and education to federal resource and environmental managers. CESUs function as virtual organizations, linking federal agencies and research institutions to increase access to expertise and facilities. The CESU Network comprises 17 biogeographic regions, each served by a distinct CESU, with all regions connected in one national network.



Biogeographic Regions of the CESU Network

### Basic Strategy

Each CESU is structured as a working collaboration among federal agencies and universities. CESUs are based at universities and focused on a biogeographic region of the country. Universities provide space, basic administrative support, and access to university faculty, students, staff, and resources. Individual CESUs are administered and managed at the field/regional level.

Federal agencies contribute research scientists and other professionals who are supervised and supported by their respective agencies. Participating agencies provide scientific staff, project funds for specific research projects, and technical assistance. CESUs will create additional opportunities for interdisciplinary and multi-agency research, technical assistance, and education.

## Pacific Northwest Cooperative Ecosystem Studies Unit

The Pacific Northwest Cooperative Ecosystem Studies Unit (PNW CESU) is a cooperative venture among 17 leading academic institutions in the Pacific Northwest region, one state agency, and 11 federal land management and natural resource research organizations. The University of Washington serves as host to the PNW CESU.

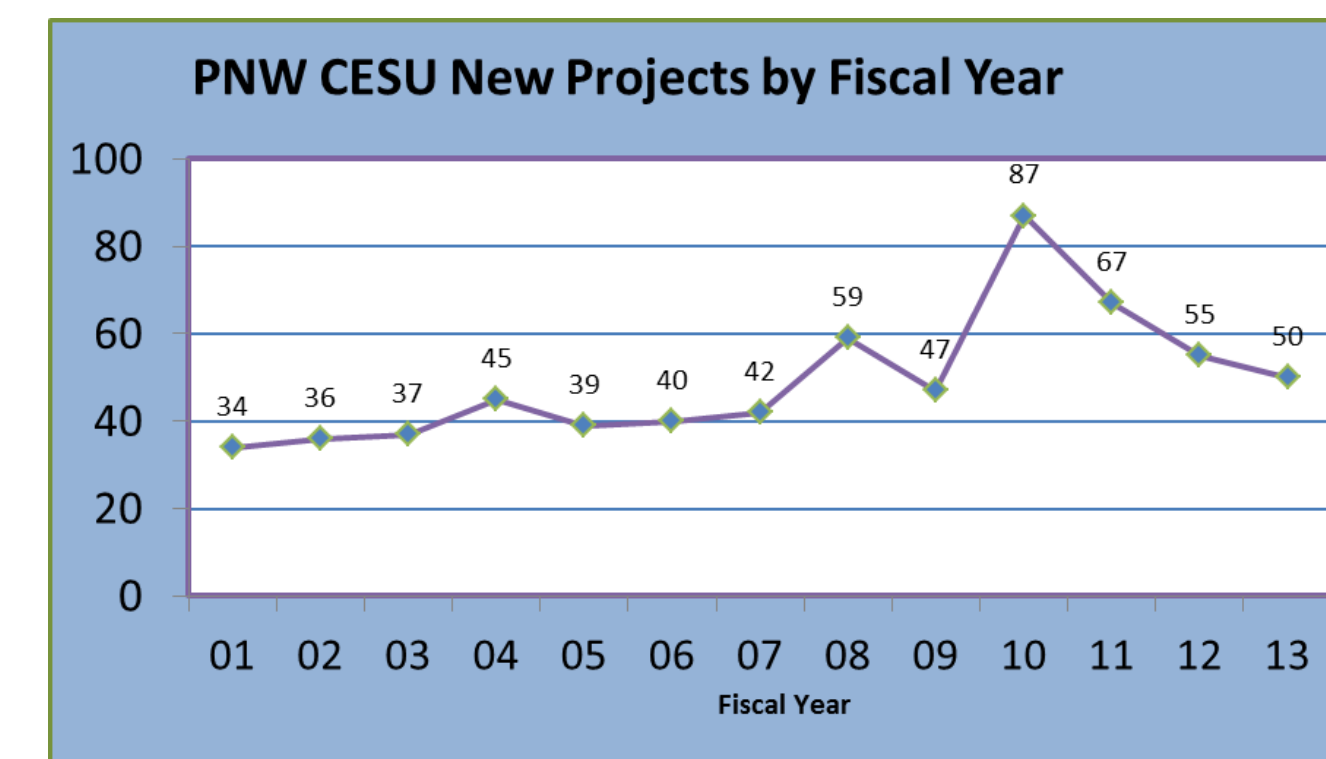
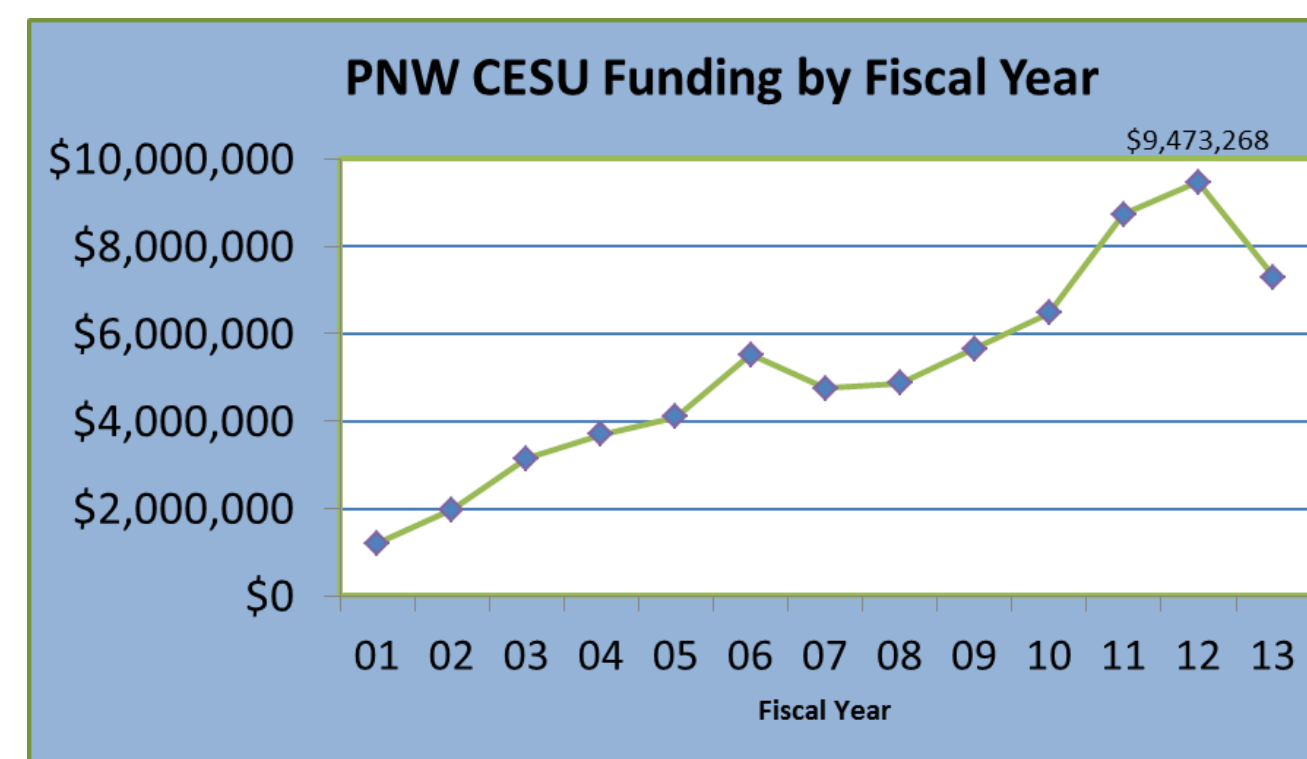
### Network of Science Partnerships

Currently management of the nation's lands and waters requires skillful public service supported by sound science. The challenges of the 21st century and the environmental choices facing the American people demand even more skill and science.

Cooperative Ecosystem Studies Units are an important innovation in how federal agencies can work together, and with the nation's universities. They promise to play a useful role in the delivery of scientific information to federal resource managers.

CESUs and their network of science partnerships are critically important in serving the federal government and its partners in responding to current demands, including climate change.

Since October 2000, almost **\$68 million** has funded **640** projects through the PNW CESU



## PNW CESU Partner Agencies and Institutions

### Federal Agencies

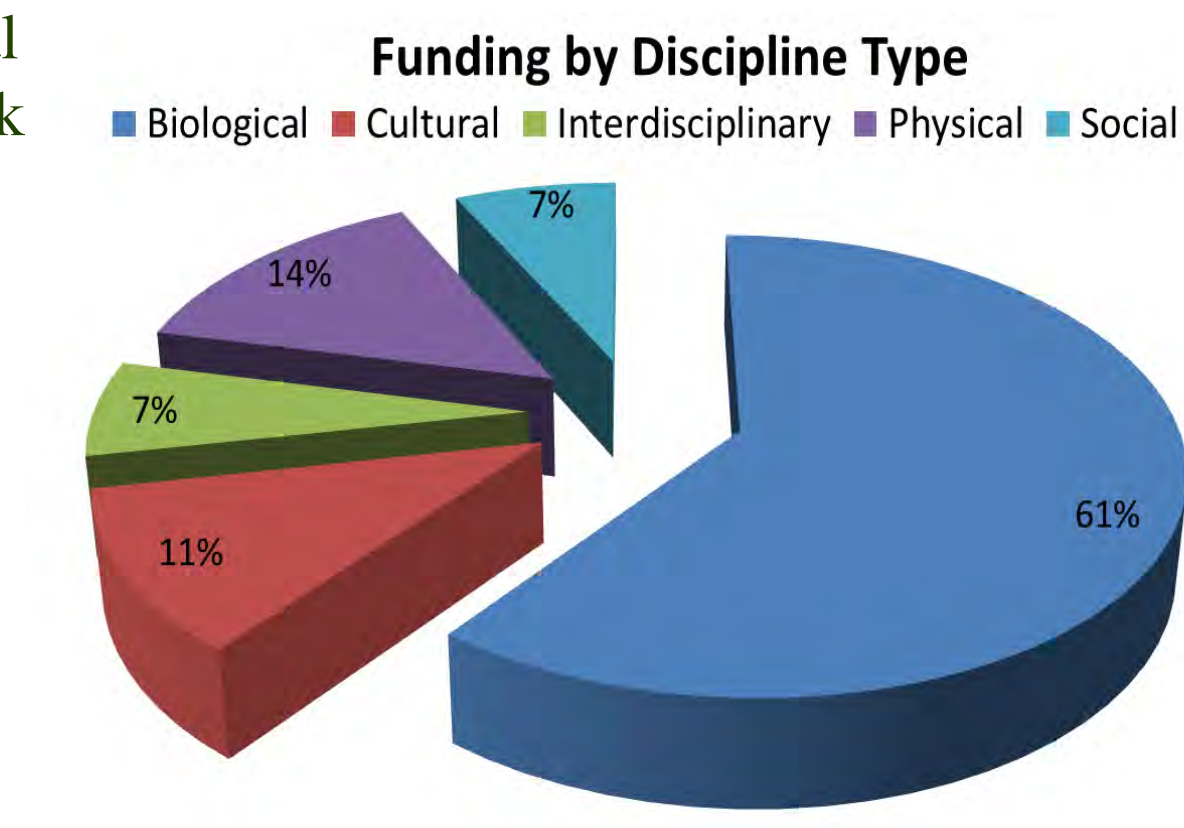
- Bureau of Land Management
- Bureau of Ocean Energy Management
- Bureau of Reclamation
- Department of Defense
- National Oceanic and Atmospheric Administration
- National Park Service
- Natural Resources Conservation Service
- US Army Corps of Engineers
- US Fish and Wildlife Service
- US Forest Service
- US Geological Survey

### Universities and State Agencies

- University of Washington (host)
- Alaska Department of Fish & Game
- Central Washington University
- Eastern Washington University
- Heritage University
- Oregon State University
- Oregon Institute of Technology
- Portland State University
- Saint Mary's University of Minnesota
- Southern Oregon University
- University of Alaska – Anchorage
- University of Alaska – Southeast
- University of British Columbia
- University of Idaho
- University of Oregon
- University of Vermont
- Washington State University
- Western Washington University

### Research, Technical Assistance, and Education

The overarching goal of the CESU network is to improve the scientific base for managing federal lands by providing resource managers with high-quality scientific research, technical assistance, and education.



Ecosystem studies involve the biological, physical, social, and cultural sciences needed to address resource issues and interdisciplinary problem solving at multiple scales and in an ecosystem context. Resources encompass natural and cultural resources.

### Climate Change and Archaeology in Northwest Alaska: Nuluk Study

Shelby Anderson, Portland State University, and Michael Holt, National Park Service (NPS)

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. Lack of information about regional archaeology makes prioritization of sites for investigation difficult. PSU and the National Park Service completed a two-year study of a 56 km (35 mile) coastal region in the Bering Land Bridge National preserve.



Eroding coastal archaeological site (Photo by Shelby Anderson)

### Objectives:

- Study why and how people adapted to and altered their environment during past episodes of environmental variability in this region.
- Evaluate how modern climate change is impacting archaeological sites in the study area.

### Findings:

- Thirty new sites were identified during the 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 damage caused by climate change to these sites.

## Selected PNW CESU Climate Change Projects

### George Melendez Wright Climate Change Fellowship Program

Lisa Graumlich, University of Washington, and Tim Watkins, National Park Service (NPS)  
 From 2010 - 2013, this program funded 57 research fellows, with \$948,079 awarded to students

### Understanding Diatom Communities in Lassen, Kerry Howard

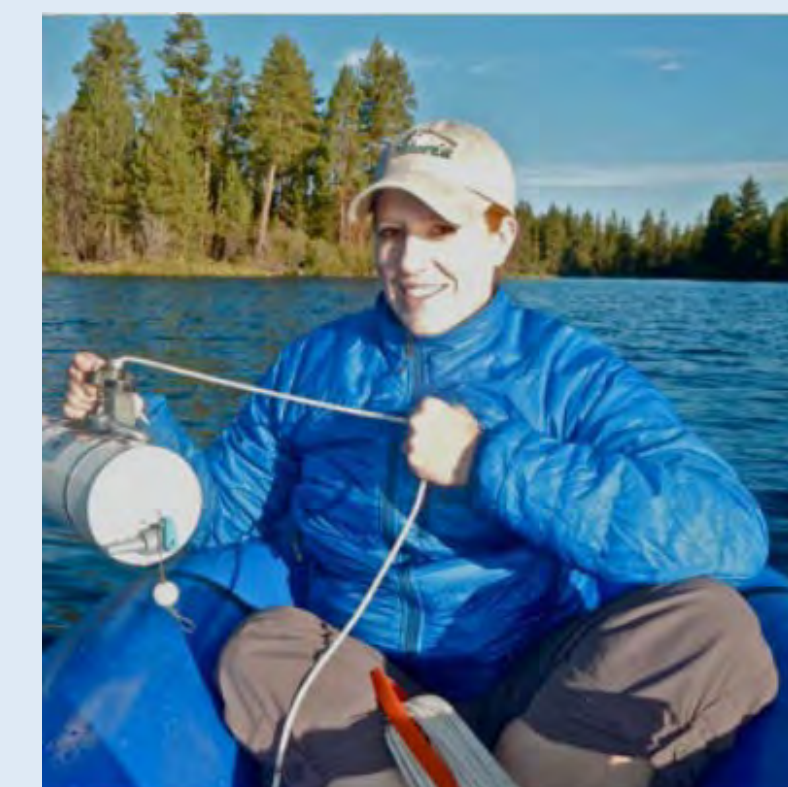
Kerry Howard investigated the effects of environmental change on diatom community composition in the small subalpine lakes of Lassen Volcanic National Park. Diatoms are an important type of plankton that help form the foundation of the marine food chain.

### Objectives:

- Improved knowledge of diatom community response to environmental change and the varying nature of water resources in small subalpine watersheds.
- Examine modern diatom community composition in park lakes and the associated physical and chemical parameters in these lakes.
- Extract sediment cores from several lakes to study algae community composition changes and environmental changes through time.

### Findings:

- Changes in diatom community composition may be attributed to increasing temperatures (climate change), modifications in landscape, increases in atmospheric nutrient deposition, or a complex interaction of these forcing factors, particularly where multiple forcing factors affect the region.
- Data from her study are being merged with lake monitoring data from the park so managers can also gain a more detailed picture of the status of park lakes, and approach resource management decisions from multiple perspectives.



### Combating Coral Bleaching in American Samoa, Rachel Bay

Rachael Bay worked on Ofu Island in the National Park of American Samoa studying coral reefs, which are diverse ecosystems providing homes for thousands of species and food for millions of people. Because they are so sensitive to environmental change, increasing ocean temperatures associated with climate change threaten coral reefs worldwide. Stress associated with temperatures can cause a condition called bleaching, when corals expel symbiotic algae which provide them with nutrients, ultimately resulting in the death of the coral.

### Objectives:

- Research the mechanisms corals might use to increase their heat tolerance.
- Learn how different temperature regimes increase a coral's heat.
- Test whether corals acclimate to increasing temperatures by setting up a series of experimental tanks with different water temperature regimes; over time, subjecting corals to a tank of even hotter water.



### Findings:

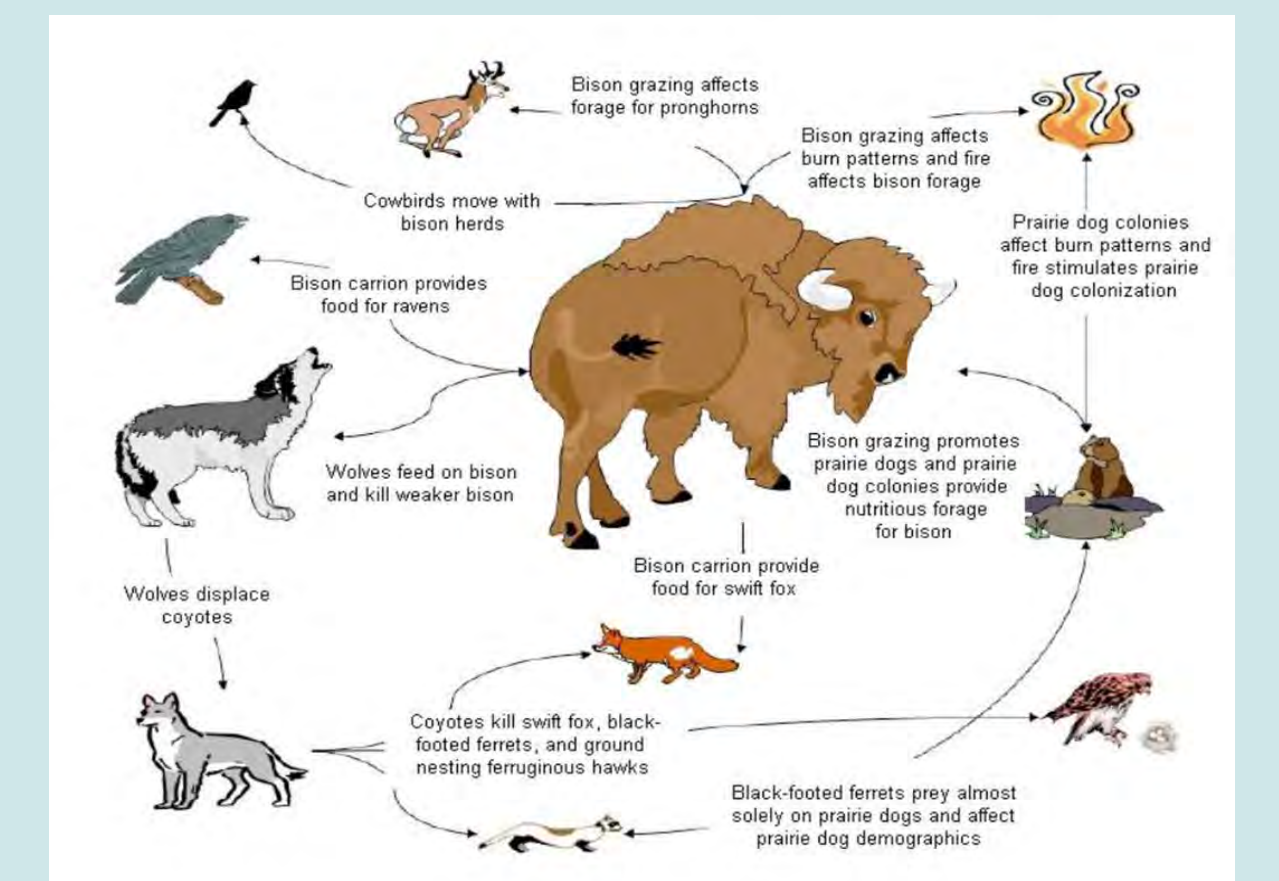
- Preliminary results indicate that the corals exposed to warmer temperatures could survive the intense heat while other corals bleached.
- Results can contribute to the development of management actions to combat coral death.

### Climate Change Vulnerability Assessment for Badlands National Park

Barry Drazkowski, St. Mary's University of Minnesota, and John Gross, Melanie Wood, and Brian Kenner, National Park Service (NPS)

By 2100, conditions at Badlands National Park (BADL) in South Dakota are projected to become warmer and drier. NPS, recognizing 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, initiated a climate change vulnerability assessment (CCVA) for BADL.

A CCVA is an assessment of the likelihood and extent to which projected climatic shifts (including such variables as precipitation and temperature) will have adverse or beneficial influences on a select natural or cultural resource (e.g., species or plant community, sacred sites, archeological artifacts).



Historical interactions of bison and other wildlife in the Northern Great Plains (Gitzen et al. 2010)

### Objectives for the BADL CCVA include:

- Identify species, plant communities, and other resources likely to be most affected by projected climate shifts and the associated physical and ecological changes.
- Provide an understanding of why these resources are likely to be vulnerable, including the interaction between climate variation and existing stressors to resources.
- Provide an example for conducting vulnerability assessments that engage natural and cultural resource managers and key stakeholders who have a similar need for vulnerability assessment.



Conducting a prescribed burn in BADL (NPS photo, in Wienk et al. 2007)



Black-footed ferret (NPS photo, from NPS 2007)



Archaeologists surveying on the Chukchi Sea Coast (Photo by Shelby Anderson)