Cooperative Ecosystem Studies Units (CESU) Network is a national consortium of federal agencies, academic institutions, and other partners, organized around biogeographic areas. The CESUs were established to provide research, technical assistance, and education to federal resource and environmental managers. The Rocky Mountains Cooperative Ecosystem Studies Unit (RM-CESU) is one of 17 units in the CESU National Network.

The Rocky Mountains Cooperative Ecosystem Studies Unit has been operating for seventeen years. In 1999, the RM-CESU was one of four pilot CESUs established through a competitive process. It was then a partnership of four Federal agencies and 6 universities. The partnership has grown today to 9 Agencies and 22 Non-Federal partners. Members of the RM-CESU are the following:

- University of Montana-host 1999
- University of Idaho 1999
- Montana State University 1999
- Salish Kootenai College 1999
- Utah State University 1999
- Washington State University 1999
- University of Wyoming 2002
- Colorado State University 2004
- University of Colorado Boulder 2002
- University of Colorado Denver 2002
- University of Northern Colorado 2006
- University of Calgary 2007
- Metropolitan State University of Denver 2011
- Little Big Horn College 2012
- Northwest College 2013
- University of Utah 2013
- Chief Dull Knife College 2014
- Blackfeet Community College 2014
- University of Waterloo 2014
- Wildlife Conservation Society 2014
- Boise State University 2015
- Western State Colorado University 2015

USDI
- Bureau of Land Management 1999
- Bureau of Reclamation 2004
- Fish and Wildlife Service 2009
- Geological Survey 1999
- National Park Service 1999

USDA
- Forest Service 1999
- Natural Resources Conservation Service 2004

DOD
- US Army Corps of Engineer- Civil Works 2008
- Office of Deputy Under Secretary of Defense (Installations and Environment) 2009

Mission

The mission of the Rocky Mountains Cooperative Ecosystem Studies Unit is to improve and disseminate the knowledge base for managing natural and cultural resources in the rapidly changing social, cultural, and environmental landscape of the Rocky Mountain Region, and to extend its expertise to national issues where appropriate.
RM-CESU PROJECTS ACTIVITY FOR FY2016

This year, the RM-CESU facilitated 185 task agreements (TAs) obligating $17,409,809 to new projects ($12,055,754/121 TAs) and adding funds to existing projects ($5,354,055/64 TAs). A complete listing of projects may be found on the RM-CESU Project List for FY16 on the web site at http://www.cfc.umt.edu/cesu/projects/default.php (look under Annual Reports).

RM-CESU Activity by Agency Partners for FY2016

<table>
<thead>
<tr>
<th>Agency</th>
<th>FY15 # of Task Agreements</th>
<th>FY15 Total Funding</th>
<th>FY16 # of Task Agreements</th>
<th>FY16 Total Funding</th>
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<tbody>
<tr>
<td>RM-CESU</td>
<td>184</td>
<td>19,733,834</td>
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<td>BLM</td>
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</tr>
</tbody>
</table>

Observations:

- Six of the nine Agencies facilitated task agreements through the CESU this fiscal year. Although $ amount is down this year, the number of task agreements/modifications remained steady.
- NPS, both in terms of number of projects and $ amount, remains the most active user of the CESU.
- After five years of annual activity averaging 25 task agreements/modifications and $7.8 million the Department of Defense did not have any activity in FY16.
- Two Agencies, BLM and NRCS, had significant increases in activity (both in number of awards and funding) this year.
- RM-CESU facilitated $4.6 million in cultural, social and interdisciplinary projects in FY16.
RM-CESU projects provide needed research, technical assistance, and/or education to our Federal partners and cover the fields of natural resources, cultural resources, social sciences, and interdisciplinary.

**RM-CESU Activity by Non-Federal Partners for FY2016**
Fourteen of the twenty-two RM-CESU non-federal members received at least one project this year.
New partner, Boise State University, partnered with the National Park Service to look at bat conservation and conflict with people in Grand Teton National Park and with the US Fish and Wildlife Service to study survival, habitat use, and movement patterns of priority species of raptors in the Mountain Prairie Region.

Salish Kootenai College, one of the four tribal college members, received additional funding from the BLM to continue the BLM-SKC Student Internship Program. This partnership gives Native students valuable experiential learning and introduces them to career opportunities with the BLM.

Although numbers are down this year without Department of Defense activity, Colorado State University (CSU) remains the largest recipient of CESU awards. CSU received $8.7 million in 69 task agreements/modifications with the National Park Service, Geological Survey, and Natural Resource Conservation Service.

University of Wyoming and University of Montana (UM) received over two million dollars in project funding and Montana State University (MSU) received over a million dollars. MSU also worked with the most Agency partners – seven, including BLM, NPS, NRCS, USFWS, USGS and USACE.
Thirty-four principal investigators receiving project funds in FY16 were using the RM-CESU agreement for the first time and contributed $3,275,184 to RM-CESU totals.

**Boise State University (2):** Jesse Barber (Sensory Ecology), Jim Belthoff (Raptor Biology)

**Colorado State University (9):** Randall Boone (Wildlife Ecology), Edward Gage (Forestry Rangeland Stewardship), Michael Gavin (Biocultural Diversity and Conservation), Adrian Howkins (Global Environment History), Jacob Job (Sound & Light Ecology), Sarah King (Feral Horse/Burro Ecology), Stephen Koontz (Resource Economics), Dan McGrath (Water Resources Engineering)

**University of Colorado Boulder (3):** Eve-Lyn Hinckley (Ecosystem biogeochemistry), Ben Livneh (Large-scale Computational Hydrology), Kim Vincent (Terrestrial Ecosystem Studies)

**Montana State University (6):** Jack Brookshire (Ecosystem Biogeochemistry), Julia Haggerty (Wildlife& Communities), Pol Llovet (Cyberinfrastructure), Lance McNew (Wildlife Habitat Ecology), John Scannella (Paleontology), Ryan Thum (Evolutionary and Molecular Ecology)

**University of Montana (6):** Brady Allred (Rangeland Ecology), Payton Gardner (Hydrogeology), Philip Higuera (Fire Ecology), Kelsey Jensco (Watershed Hydrology), Ulrich Kamp (Mountain Geography & Natural Hazards), Diana Six (Forest Entomology)

**Utah State University (3):** David Dahlgren (Wildland Resources), David Koons (Population Dynamics), Jordan Smith (Social and Geospatial Science)

**University of Utah (1):** Divya Chandrasekhar (Planning)

**University of Wyoming (4):** Ian Abernathy (Vertebrate Zoology), Jeffrey Beck (Wildlife Habitat Ecology), Michael Dillon (Insect Ecophysiology), Brandon McElroy (Sedimentology & Surface Processes)

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**PI Spotlight:** David Dahlgren, Assistant Professor, Wildland Resources, Utah State University  
Website: [https://qcnr.usu.edu/directory/dahlgren_david](https://qcnr.usu.edu/directory/dahlgren_david)

**RM-CESU Project:** Greater Sage Grouse Geophagy Study  
As an imperiled species of the western states, the Greater sage grouse is an iconic symbol of the American west and BLM public lands in the west. The goal of this project is to gain a better understanding of the process by which sage grouse select a geophagy site. Including, if the cause for selection and if the occurrence of the geophagy affects survival and/or productivity (nest and brood success) with the critical population of Greater sage grouse in southwest Wyoming. Specific objectives include: 1) conduct a nutrient preference study by presenting available supplemental nutrients of sodium, calcium and phosphorus at geophagy sites to determine if population of sage grouse demonstrate site selection for a particular nutrient; 2) conduct preliminary nutrient analyses on sagebrush plants that have been fed on and fecal pellets of wintering sage grouse in the areas with known geophagy sites; and 3) investigate relative frequency of use and correlate these use periods to winter location, movement, survivorship, productivity, and habitat variables. The knowledge gained from this study will help make informed conservation management decisions for the species.
Student Participation: The majority of all RM-CESU projects (and 75% of RM-CESU National Park Service projects) have student participation. Student participation includes research work by graduate and undergraduate students, as well as internships, field schools and class participation in projects.

Student Spotlight: Effects of glacial loss on alpine streams and riparian plants in Glacier National Park, Cristina McKernan – Graduate Degree Program in Ecology, Colorado State University

Glaciers are an important part of alpine ecosystems and Glacier National Park is experiencing rapid glacial loss. The loss of glaciers can impact streams by changing the timing, frequency, and duration of disturbance events such as floods. Streamside, or riparian, wetlands occupy a small percentage of the landscape but are important and highly sensitive ecosystems that are formed and maintained by the disturbance events of streams.

To understand how glacier loss impacts streams and riparian plants that are adapted to disturbance, such as willow (Salix) species, we studied streams and riparian wetlands directly connected to glaciers, permanent snowfields, and seasonal snowpack. We compared the physical characteristics of streams and the plants of riparian wetlands to evaluate changes in a future climate change scenario where temperatures continue to rise and glaciers transition to permanent snowfields and then to seasonal snowpack.

Our study found that glaciers support significantly different streams and have more willow (Salix) communities compared to streams supported by permanent or seasonal snow. Under a future climate scenario, as we lose glaciers from the landscape, willow communities and biological diversity in the alpine are also at risk.

Christina McKernan is a recipient of a 2013 Jerry O’Neal NPS Student Fellowship.
**RM-CESU ACTIVITY FY12-FY16**

In last five years of operation, the RM-CESU has facilitated **993 task agreements/modifications obligating 101 million dollars** to non-federal partners for project work.

![Bar chart showing RM-CESU FY2012-FY2016: # of Task Agreements and Funds obligated (in $ millions)]

**RM-CESU HIGHLIGHTS & ACCOMPLISHMENTS**

- **Two Students Selected for Jerry O'Neal National Park Service Student Fellowship** The Jerry O’Neal National Park Service Student Fellowship, funded through the Crown of the Continent Research Learning Center at Glacier National Park, is named for the former deputy superintendent at Glacier NP, in honor of his dedication to science and research in the NPS. The Fellowship is for work in Glacier National Park, Grant-Kohrs Ranch NHS, or Little Bighorn Battlefield NM. The competition is facilitated through the Rocky Mountains CESU and is open to students at all of the RM-CESU universities. **This year’s Fellowship recipients are:**

  Elena Nikolaeva, PhD candidate – Resource Conservation, University of Montana, Exploring knowledge, perceptions and benefits of a “peace park” designation in Glacier National Park  

  Elena’s study will help gain a deeper understanding of the meaning and possible benefits of the “peace park”
designation and its implications for the broader community of park managers, visitors, local residents and other stakeholders at local to global scales. A deeper analysis of the symbolic value of peace and its impact on different aspects of environmental, social and economic performance, including implications of the “peace park” status for sustainable tourism development is planned.

Andrew Spencer, M.S, Hydrological Engineering, Montana Tech, Relationships between irrigation fluctuations and ground or surface water temperatures, Grant-Kohrs Ranch Through this study, Andrew will determine if irrigating practices affect the temperature in groundwater and surface water in the Clark Fork River (CFR) and/or its tributaries. This will be determined using temperature tracers to detect fluxes within the hyporheic, streambed and saturated zone environments. Secondary objectives include determining baseline temperature fluctuations along the CFR, delineating zones of losing and gaining reaches along the CFR in GKR and identifying the important parameters along each gaining/losing reach.

❖ 2016 RM-CESU Student Award

The RM-CESU Student Award program was established in 2007 as a way to recognize outstanding accomplishments by students involved in RM-CESU projects. The recipient of the 2016 Student Award is Greg Wann, Colorado State University.

Greg was nominated for this award by Dr. Cameron Aldridge (CSU) and Dr. Zack Bowen (USGS) for his contributions to RM-CESU project “Demography and Vulnerability of Grouse Populations (Oct 2014 - Oct 2016).” Greg’s research is focused on understanding population dynamics of white-tailed ptarmigan. Specifically, he is investigating factors that are affecting the individual fitness and population viability of the species in
Colorado, in an attempt to understand why some populations are declining. His research will directly help managers within the National Park Service (NPS) and the US Forest Service (USFS) to better understand population dynamics and potential management and conservation strategies. Although just completing his Doctoral Dissertation, Greg is already recognized as one of the world’s leading authorities on the white-tailed ptarmigan.