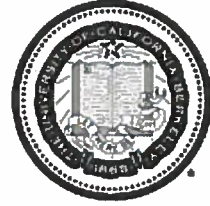




## Sponsored Projects Office

University of California, Berkeley  
2150 Shattuck Avenue, Suite 313  
Berkeley, CA 94704-5940



**Principal Investigator: Craig Moritz**

**Contact PI: Steve Beissinger**

**Fellow:**

**Project Title: Determining Landscape Connectivity and Climate Change Refugia  
Across the Sierra Nevada**

### Supplement F11AC00647: CA LCC Strategic Plan Implementation

Please accept the enclosed proposal submitted on behalf of The Regents of the University of California Berkeley campus. Should this proposal be selected for funding, award documents should be issued using the information provided below.

Endorsed for the Regents by:

Christine Luppino  
Contract and Grant Officer

5/15/13

If you have any questions or need additional information regarding this proposal, please contact:

Christine Luppino  
Phone: (510) 643-6113  
Fax: (510) 642-8236  
Email: cluppino@berkeley.edu

#### AWARDS SHOULD BE MADE TO:

##### **The Regents of the University of California**

c/o Sponsored Projects Office  
University of California, Berkeley  
2150 Shattuck Avenue, Suite 313  
Berkeley, CA 94704-5940

email address for electronics awards:  
spoawards@berkeley.edu

Main Office: 510-642-0120  
Fax: 510-642-8236  
Website: <http://spo.berkeley.edu>

#### CHECKS SHOULD BE MADE PAYABLE TO:

##### **The Regents of the University of California**

#### CHECKS SHOULD BE SENT TO:

Extramural Funds Accounting  
Attn: Todd Vizenor, Compliance Mgr.  
University of California, Berkeley  
2195 Hearst Avenue, Room 130  
Berkeley, CA 94720-1103  
Telephone: 510-643-6277  
Fax: 510-666-2559

## Determining Landscape Connectivity and Climate Change Refugia Across the Sierra Nevada

Project Lead: Craig Moritz, Museum of Vertebrate Zoology, U.C. Berkeley  
Co-PI: Steve Beissinger, Museum of Vertebrate Zoology, U.C. Berkeley

Contact Information:

Steve Beissinger: 3101 Valley Life Sciences Building, University of California, Berkeley, CA 94720-3160  
Contact for phone/email: Toni Lyn Morelli, 313-919-0191, morellitm@gmail.com

Focal Ecoregion: Sierra Nevada

### Partners and Management Relevance

Partners: *National Park Service (NPS), California Department of Fish and Wildlife (CDFW), U.S. Forest Service (USFS), U.S. Fish & Wildlife Service (USFWS), and U.S. Geological Survey (USGS)* will be key participants to the workshop and follow-up meetings. We have contacts from each of these agencies with whom we have worked throughout the original project, and they will be critical to reaching and including the key managers and decision makers to help the project achieve the most success in this outreach period. *EcoAdapt* is an additional partner that has been working with us to maximize the impact of results from this project, through their CA LCC-funded Vulnerability Assessment workshops. We are currently planning to work with them to optimize limited funding from the LCC and limited time available to natural resource staff by co-hosting proposed workshops/trainings for USFS, NPS, CDFW, and FWS.

Management Need Addressed: California natural resource managers need to develop climate change adaptation strategies to address the responses of species to overall warming trends and shifting precipitation regimes. The concept of climate change refugia, areas of more stable or buffered climate, has become of increasing interest but few studies have provided spatially explicit hypotheses of these refugia and even fewer have tested for them. In our original project, we sought to identify 1) putative connectivity between meadows and 2) climate change refugia across the Sierra Nevada and use data on persistence, stability, and genetic diversity of mammal populations to test these hypotheses, working with state and federal agencies throughout the project to ensure that outcomes such as maps and tools are user-friendly and management-relevant. However, recognizing that it is often difficult to reach time-limited natural resource managers and decision makers, we feel there is still a need to communicate and discuss results with the key people who can both incorporate results and implement them on the ground, from immediate, small-scale adaptation projects to region-wide changes in use, development, and planning of state and federal lands. The goal is to help managers to prioritize areas and landscapes in the Sierra Nevada that are critical to maintaining biodiversity in the face of climate change and thus to focusing limited resources for effective adaptation efforts.

Explanation of how work implements the CA LCC Strategic Plan: This work would focus on delivery of science tools and knowledge to natural resource managers and decision makers to impact on-the-ground strategies. Coordinating with these key agency staff as well as prominent scientists, we would help improve conservation in the Sierra Nevada landscape and beyond. The ultimate result would be to make the climate change refugia concept more accessible and better known as a clear and important tool of the CA LCC. Thus this project helps to meet Objective 1 of the CA LCC Strategic Plan because it a) enhances information exchange between scientists and managers to advance decision-making at the landscape scale; b) engages in partner collaboration to achieve these goals while maximizing limited resources; and c) delivers training and information to key audiences to encourage climate smart conservation.

### Work Summary

Status of existing product deliverables and outreach efforts:

1. Two postdoctoral researchers and 3 undergraduate researchers were trained under this project
2. Project results were presented in several venues, including a Climate Science Center webinar and in meetings with USFS, NPS and USGS staff. A webinar is being scheduled with CDFW, FWS, and NPS colleagues. Final results will be presented at the American Society of Mammalogists meeting (June 2013) as well as The Wildlife Society, Society of Conservation Biology, and Ecological Society of America conferences in 2013-2014

3. Peer-reviewed articles are to be submitted to *Molecular Ecology* and *Global Change Biology* in June 2013
4. Stronger collaborations were built between U.C. Berkeley and CDFW, FWS, NPS, USGS, and USFS
5. Tools designed with input from natural resource agency colleagues were produced, including meadow connectivity and climate refugia maps and a fine-scale analysis of meadows in the Yosemite NP area

Description of additional work relative to existing work: The focus of the additional funds will be direct outreach to natural resource managers and decision makers. We are planning the following activities:

1. *Regional workshop on climate change refugia:* A 3-day workshop, broadcast remotely to optimize participation, would bring together prominent scientists, natural resource managers, and decisions makers from across California. Presentations from ongoing research into climate refugia would be interspersed with presentations from agency staff on how the CDFW, FWS, NPS, and USFS would incorporate data from our CA LCC-funded project and these other projects into on-the-ground decisions. We are requesting travel funds for agency staff to try to increase participation in this time of restricted travel allowances.
2. *Targeted agency meetings:* The workshop would be supplemented by intensive meetings with key agency partners (primarily NPS and USFS, but including CDFW, FWS, and USGS), held at their offices to discuss and incorporate the ideas from the workshop. Parts of this activity will be coordinated with Lara Hansen's team at EcoAdapt, who are proposing intensive Vulnerability Assessment trainings focused on the Sierra Nevada. Their current CA LCC-funded work has already incorporated some of our results in their stakeholder workshops.
3. *Webinar/Seminar:* We would hold a seminar/webinar to communicate project and workshop results.
4. *Enhanced website:* We are requesting funds for an undergraduate to build an enhanced dynamic/interactive website, not just showcasing results from our specific project and linking to results from other climate refugia work but also highlighting the work that particular agencies are doing to incorporate climate refugia and connectivity into their on-the-ground decisions, including discussions arising from the workshop.

Description of value added to existing work: Through this extension of the originally funded research project, we believe there will be enormous value in terms of impact on natural resource management decisions. The original project was set up to answer *Where are the key conservation areas to target in the face of climate change?* This phase of the project would answer *How can these key areas be targeted by agencies?* Over the last two years since we originally proposed the research, it has become even clearer that climate change refugia are of great interest to natural resource agencies trying to manage in the face of climate change. However, little specific information appears available for how to apply the climate change refugia concept to management decisions. From the responses we've received about project results, it seems the biggest limit to the interest, and potential applicability, of this work is the availability of results and the lack of a forum for managers to discuss how to incorporate them. Thus, we expect this proposed outreach will greatly increase the impact of our project.

Staff involvement and capabilities: *Project Lead Craig Moritz and Co-PI Steve Beissinger* helped lead the MVZ's Grinnell Resurvey Project, with regular interaction and collaboration with biologists from NPS, USFS, and CA State Parks, and acted as leads on the original CA LCC-funded project. *Toni Lyn Morelli* conducted the genetic analysis for the original project and has extensive experience conducting ecological studies in the Sierra Nevada. Her current half-time position as Program Manager for the Northeast Climate Science Center has provided a good understanding about effectively bringing climate science to natural resource management decisions. One month's funding is requested for her to coordinate the project, including facilitation of the workshop and packaging and delivery of results. *Postdoctoral researcher Sean Maher* met with agency partners and conducted the geospatial analysis for the original project at U.C. Berkeley under the supervision of Steve Beissinger. One month's funding is requested for him to coordinate and attend meetings with agency colleagues and packaging and delivery of results.

Timeline for deliverables: Expected reports and products finished in March 2014

1. *Regional workshop on climate change refugia:* Projected November 2013, dependent on key partner schedules, with an ultimate outcome of a peer-reviewed publication on the latest science and application of this concept
2. *Targeted agency meetings:* Planned for late fall through early winter, although dependent on key partner schedules and location (some locations are not easily accessed during that time)
3. *Webinar/Seminar:* A webinar could be held in late summer 2013 to communicate original project results; primary seminar/webinar, including results from workshop and meetings, would be held in February 2013
4. *Enhanced website:* Work on the website would begin in September 2013 and would continue in order to incorporate results throughout the project

**California Landscape Conservation Cooperative 2013 Budget**

Budget Categories	CA LCC Request	Partner(s) Contribution(s) (monetary)	Partner(s) Contribution(s) (non-monetary value/in-kind)	Total
Salaries	\$ 11,334.00			\$ 11,334.00
Supplies	\$ 19,369.55			\$ 19,369.55
Overhead	\$ 17,347.76			\$ 17,347.76
Equipment	\$ -	\$ -	\$ -	\$ -
Other (specify)				\$ -

<b>Total</b>	\$ 48,051.31	\$ -	\$ -	\$ 48,051.31
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**Other:**



## United States Department of the Interior

### NATIONAL PARK SERVICE

Yosemite National Park

P. O. Box 577

Yosemite, California 95389

IN REPLY REFER TO  
2215 (YOSE-RMS)

**MAY 14 2013**

Rebecca Fris, Science Coordinator  
California Landscape Conservation Cooperative (CA LCC)  
3020 State University Drive E., Suite 2007  
Sacramento, California 95819  
Rebecca\_Fris@fws.gov

Dear Ms. Fris:

This letter is to express the strong support of Yosemite National Park for the extension of the project "Determining Habitat Connectivity and Climate Change Refugia Across the Sierra Nevada", led by U.C. Berkeley.

We know that changes in temperature and snowpack have been occurring in the Central Sierra Nevada for a number of years. This makes it difficult to plan appropriate management alternatives for an ecosystem that is likely to be severely altered by changes in climate. Research coming out of the LCC-funded U.C. Berkeley project is providing valuable information for managing montane meadows in California. They have provided opportunities for staff at Yosemite National Park to advise and guide the research along the way to improve its applicability to our staff and management needs. We believe that the project will aid natural resource managers in their climate adaptation decisions.

The extension of this grant, however, would provide the extra outreach that could aid our staff as they discuss potential applications of these results to specific resource decisions. The U.C. Berkeley team is offering to facilitate a small training and discussion forum on the subject of climate change refugia, which is of increasing but still conceptual interest for us at Yosemite National Park. The goal would be for our natural resource staff to discuss what opportunities there are in incorporating the results of the climate change refugia and connectivity mapping into climate change adaptation decisions we are making.

In summary, the U.C. Berkeley team, including Dr. Craig Moritz and Dr. Toni Lyn Morelli, has been a good partner in the first phase of this project and their results will be useful to us going forward. Nevertheless, there are further discussions and training around the products of the research that could help the National Park Service and other resource managers in designing effective climate change adaptation strategies that are at the heart of our policy on managing climate change.

Sincerely,

Linda C. Mazzu  
Chief, Resources Management and Science