

Project Title:

How do we monitor the ecological consequences of environmental change? Developing an Environmental Change Network in the California LCC: PHASE II

Proposal by:

Thomas Gardali, Director, Pacific Coast and Central Valley Group
PRBO Conservation Science
3820 Cypress Drive #11
Petaluma, CA 94954

415-868-0655
tgardali@prbo.org

Scope & Budget:

Location: CA LCC-Wide
Duration in months: 13
Requested Funding: \$100,000.00
Leveraged Funding: \$130,000.00

Briefly summarize the goals of the project, what products will result, and how the products support decision-making and conservation delivery for natural resource management within the CA LCC.

The scale and pace of anthropogenic pressures on natural systems requires monitoring to detect and attribute the effects of environmental change. The uncertainty of predicting impacts of change indicates we cannot rely on models alone, but must invest in monitoring programs. We propose to take the next steps to establish an Environmental Change Network (ECN) for all of California. An ECN is an integrated, multidisciplinary network of long-term monitoring stations that gather and share information using standardized protocols. We have already identified locations where the greatest changes in climate and bird communities are predicted to occur and will overlay locations of field stations, reserves, etc. in order to assess if existing infrastructure covers the spectrum of prioritized monitoring locations. We have consulted the literature for similar monitoring programs and have obtained expert opinion from scientists and resource managers within the LCC to determine what to monitor. The CA LCC ECN aims to monitor causes and consequences of environmental change in the same program, improving the ability to attribute causes of change, which is essential to developing conservation policy and management in the 21st century. Deliverables produced as part of this proposed work include a Business Plan that will 1) refine site selection by developing a decision model in combination with analyses of sites (or clusters of sites) arrayed by climate space, 2) work with the LCC science committee, Joint Ventures, and other partners to choose a manageable number of core monitoring variables, 3) develop and/or adopting existing protocols for those variables, 4) providing cost estimates/variable/station, and 5) provide a cost estimate for an online data management system.

For continuing 2010 CA LCC projects, describe the accomplishments and outcomes to date, why additional funds are needed, and what this proposal will add to the project.

Phase I of this project, funded by the CA LCC in 2010, has made substantial progress. We developed models relevant for management and policy decisions as well as to guide ECN site selection. The key accomplishments in Year One include: 1. An LCC-specific web portal to interact with, archive and share all spatial products (visually and down-loadable), data, and other resources as they become available (see <http://data.prbo.org/apps/ecn/>). The preliminary models were generated at 800m resolution for all of California and include: (1) Bird distribution response to climate change, (2) Bird species

richness response to climate change (two models), (3) Bird community dissimilarity between present and future (three models), (4) Local climate change variation (spatial and temporal), and (5) Current and future hotspot priorities (two models). 2. A manuscript entitled "Protected areas in climate space: What will the future bring?" is in press at the journal Biological Conservation³. 3. A preliminary list of prioritized monitoring topics based on input from scientists and resource managers in the LCC. Phase II is needed to complete the Business Plan for the CA LCC Environmental Change Network. The 2010 products provided the preparatory materials to facilitate the work in this proposed second phase and we will build upon these earlier successes. We have initiated conversations with several potential co-Principle Investigators that we will work with to develop initial monitoring protocols and associated cost estimates. Through the survey initiated in Year One, we have identified several important monitoring topics, key metrics, and several existing monitoring protocols and programs. Hence we are on track to be successful in Phase II.

Identify which National LCC Performance Measure(s), if any, your project addresses.

1. A risk and vulnerability assessment developed or refined for priority species and habitats. 2. Inventory and monitoring protocols developed or refined to capture data on fish and wildlife populations and their habitats to detect changes resulting from climate change. 3. A population and habitat assessment developed or refined to predict changes in species populations and habitats.

List Partners

PRBO Conservation Science: Project lead, climate modeling/site selection, protocol recommendations, informatics, and final report (Business Plan) Dwight Center for Conservation Science – protocol development Bay Area Early Detection Network – protocol development Conservation Commons – online data management system San Francisco Bay, Central Valley and Sonoran joint ventures – management issues and recommendations Other – we anticipate engaging other partners to aid in protocol development

Briefly describe how the project team (main PIs) provides the range of experience, expertise, and organizational capacity needed to accomplish the project. List recent and current projects (names, time-periods, PI time commitments, and total budgets). Also attach 1 page CVs for the principle investigator and/or project leaders per below under additional information.

Thomas Gardali directs PRBO's Pacific Coast and Central Valley Group at PRBO Conservation Science. Tom has over 15 years experience in avian monitoring; he has been involved in all aspects of monitoring – e.g., fieldwork, design, analysis, fundraising, etc. Tom leads the research at PRBO's Palomarin Field Station where monitoring has been conducted year-round since 1966. He has published over 40 peer-reviewed publications several of which have focused on validating and assessing avian monitoring protocols. Tom recently completed a large-scale avian monitoring protocol for two national parks (http://science.nature.nps.gov/im/units/sfan/vital_signs/landbirds/docs/SFAN_PRBO_protocols__4.4.pdf). He is actively involved in bridging the gap between research and management: He is an active participant in California Partners in Flight and works on several Joint Ventures. Gardali Current Projects: Title: Long-term Monitoring at the Palomarin Field Station; Source of Support: Several Foundations and Individuals; Time Period Covered: year-round/ongoing; Person Month/Year: 1; Total budget: \$280,000/year Title: Climate change vulnerability assessment for California's at-risk birds; Source of Support: CA Dept. Fish and Game; Time Period Covered: Dec 2009 – June 2011; Person Month/Year: 3; Total budget: \$130,000 Title: TomKat Ranch Field Station; Source of Support: TomKat Foundation; Time Period Covered: Apr 2011 – March 2012; Person Month/Year: 3; Total budget: \$238,000 Title: How do we monitor the ecological consequences of climate change? Developing an Environmental Change Network in the California Landscape Conservation Cooperative; Source: US Fish & Wildlife Service / California LCC; Period Covered: Oct 2010 – Sep 2011;

Person Month/Year: 1.25; Budget: \$86,065 Title: The Migratory Bird Conservation Partnership; Source: Bechtel Foundation; Period Covered: July 2011 – July 2014; Person Month/Year: 3; Budget: \$2,000,000 Grant Ballard, PhD., Climate Change and Informatics Director at PRBO Conservation Science Dr. Ballard leads PRBO's core team of spatial and quantitative ecologists, GIS experts, and informatics engineers to develop data driven conservation decision support systems. He is a co-founder of the Avian Knowledge Network (www.avianknowledge.net), the leader of the California Avian Data Center (www.prbo.org/cadc) and has published several peer-reviewed articles documenting and predicting the effects of climate change on ecosystems. Ballard serves on the Science and Informatics Subcommittees of the USFWS California Landscape Conservation Cooperative as well as the Conservation Delivery Committee of the San Francisco Bay Joint Venture. Ballard Current Projects: Title: Adélie penguin response to climate change at the individual, colony and metapopulation levels; Source of Support: NSF/OPP; Period Covered: Aug 2010 – Jul 2015; Person Month/Year: 3.5; Budget: \$1,400,000 Title: Preparing for Sea-Level Rise Along the San Francisco Bay Area's Outer Coast; Source of Support: NOAA/SARP; Period Covered: Oct 2010 – Sep 2012; Person Month/Year: 0.5; Budget: \$300,000 Title: Scientific Review and Recommendations for Ecosystem Management of the Ross Sea; Source: Lenfest Foundation; Period Covered: 6/1/09 – 6/30/11; Person Months/Year: 0.75; Budget: \$100,000 Title: How do we monitor the ecological consequences of climate change? Developing an Environmental Change Network in the California Landscape Conservation Cooperative; Source: US Fish & Wildlife Service / California LCC; Period Covered: Oct 2010 – Sep 2011; Person Month/Year: 1.75; Budget: \$86,065 Title: Tidal Marsh Bird Population and Habitat Assessment for SF Bay Under Future Climate Change Conditions; Source: US Fish & Wildlife Service / California LCC; Period Covered: Oct 2010 – Sep 2011; Person Month/Year: 0.75; Budget: \$100,241 Title: Vulnerability Analysis and Monitoring Program for Detecting Changes in San Francisco Bay Tidal Marsh Bird Populations Resulting from Climate Change; Source: US Fish & Wildlife Service / California LCC; Period Covered: Oct 2010 – Sep 2011; Person Month/Year: 0.5; Budget: \$40,995 Christine A. Howell, PhD, Senior Conservation Scientist at PRBO Conservation Science. Dr. Howell's research program includes projected climate change impacts on California's avifauna, wildlife responses to restoration, conservation of riparian obligate bird species, landscape ecology, and potential renewable energy development impacts on wildlife. She has published several peer-reviewed papers on the predicted impacts of climate change, as well as approaches to species distribution modeling. She is currently editing a book on climate change adaptation case studies for California. She has 20 years of experience with avian monitoring programs and has been involved with all aspects of the design and implementation of monitoring plans. Howell Current Projects: Title: Current status of the Yellow-billed Cuckoo in the Sacramento Valley; Source of Support: CA Dept. Fish and Game; Time Period Covered: Apr 2011 – March 2012; Person Month/Year: 2.5; Total budget: \$100,000 Title: Evaluating novel riparian restoration techniques along the Cosumnes River; Source of Support: The Nature Conservancy and CA Dept. Fish and Game; Time Period Covered: Apr 2011 – Dec 2015; Person Month/Year: 2.5; Total budget: \$250,000 Title: Renewable energy development impacts to wildlife; Source of Support: California Energy Commission; Time Period Covered: Apr 2011 – March 2012; Person Month/Year: 1.5; Total budget: \$25,000

How do we monitor the ecological consequences of environmental change? Developing an Environmental Change Network in the California LCC: PHASE II

Thomas Gardali, Grant Ballard, PhD, and Christine Howell, PhD
PRBO Conservation Science, 3820 Cypress Drive #11, Petaluma CA 94954



Project Description:

The scale and pace of anthropogenic pressures on natural systems requires monitoring to *detect* and *attribute* the effects of environmental change. The uncertainty of predicting impacts of environmental change indicates we cannot rely on models alone, but must invest in monitoring programs. We propose to take the next steps to establish an Environmental Change Network (ECN) for the California Landscape Conservation Cooperative (CA LCC). An ECN is an integrated, multidisciplinary network of long-term monitoring stations that gather and share information using standardized protocols. The CA LCC ECN aims to monitor the causes and consequences of environmental change in the same program, improving the ability to attribute causes of change, which is essential to developing conservation policy and management in the 21st century.

Goal and Objectives

The goal of the CA LCC Environmental Change Network is to guide and prioritize conservation activities that benefit biodiversity while conserving ecosystems and ecosystem services.

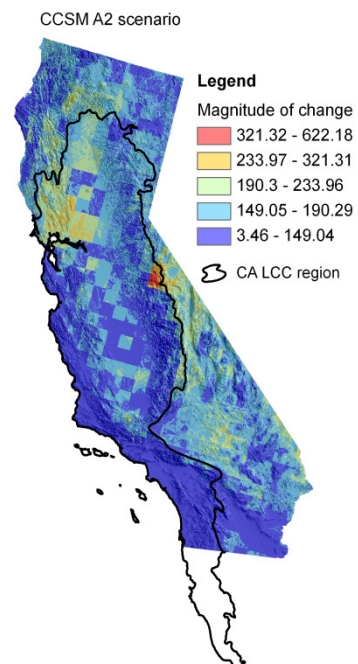
Specific CA LCC ECN objectives include:

1. Establish and maintain a network of sites covering the entire LCC to obtain comparable long-term datasets monitoring a range of common variables of major environmental importance.
2. Provide for the integration and analysis of these data, to identify environmental changes and improve understanding of the causes of change.
3. Distinguish short-term fluctuations from long-term trends, and predict future changes.
4. Develop and disseminate natural resource management recommendations to public and private interests.

Progress to Date

Phase I of this project, funded by the CA LCC in 2010, has made substantial progress. We developed models relevant for management and policy decisions as well as to guide ECN site selection. The key accomplishments in Year One include:

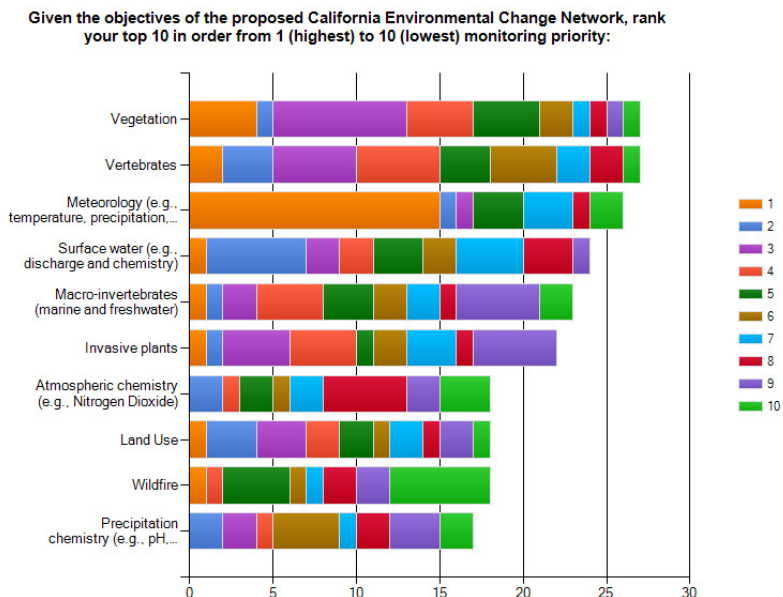
1. We constructed an LCC-specific web portal to interact with, archive and share all spatial products (visually and downloadable), data, and other resources as they become available (see <http://data.prbo.org/apps/ecn/>). The preliminary models were generated at 800m resolution for all of California and include:
 - a. Bird distribution response to climate change
 - b. Bird species richness response to climate change (two models)
 - c. Bird community dissimilarity between present and future (three models)
 - d. Local climate change variation (spatial and temporal).The figure to the right displays the magnitude of



projected future climate change. Warmer colors indicate greater climate change and cooler colors indicate less extreme climate change

e. Current and future hotspot priorities (two models)

2. A manuscript entitled “Protected areas in climate space: What will the future bring?” is in press at the journal *Biological Conservation*.
3. A preliminary list of prioritized monitoring topics based on input from scientists and resource managers in the LCC. Figure at right shows results from online survey; Y-axis is general monitoring topic, X-axis is number of survey participants, and key is rank – highest priority (1) to lowest (10).



Deliverables

The next phase of the ECN will be to develop a Business Plan for establishing and implementing a California Environmental Change Network. The Business Plan will include 1) refining site selection by developing a decision model in combination with analyses of sites (or clusters of sites) arrayed by climate space, 2) working with the LCC science committee, Joint Ventures, and other partners to choose a manageable number of core monitoring variables, 3) developing and/or adopting existing protocols for those variables (e.g., for vegetation, protocol development could largely build on work proposed by the California Early Detection Network – see Gluesenkamp proposal), 4) providing cost estimates/variable/station, and 5) providing a cost estimate for designing an online data management system (a service that could be largely or entirely provided by the California Climate Adaptation Commons if supported by the CA LCC – see DiPietro proposal).

The Business Plan is a natural extension of Phase I as it will not only provide the rationale for site selection and monitoring variables, but the associated costs for developing and implementing on-the-ground monitoring and data analysis and visualizations relevant to resource managers.

The Business Plan will build on prior scientific and technical preparatory work and will provide the framework for taking the ECN forward in well designed manner using a partnership approach and with an appreciation of the objectives and long-term nature of the commitments that will be required. The Business Plan will provide compelling reasons for why the CA ECN should be implemented as soon as possible, and will be designed such that it can be used as a proposal for future LCC funding, as well as be appealing to a broad-base of potential funders.

CA LCC Priorities addressed:

The CA LCC ECN, spanning the entire geographic range of the LCC, addresses both LCC priority areas in multiple ways. In particular, we will continue to develop models relevant to managers (see <http://data.prbo.org/apps/ecn/> for progress to date), collect key standardized data to improve model performance and measure environmental change, provide an understanding of the causes of environmental change, and make all data and results easily available to a wide range of LCC partners to facilitate informed adaptive decision making. For example, decisions regarding how to allocate limited conservation resources can be informed by results that distinguish between short-term fluctuations and long-term trends as well as by understanding the causes of observed trends to answer questions like “What aspects of climate change are most responsible for changes in biodiversity? Then, together with resource managers, determine if there are adaptation strategies available for dealing with them.

CA LCC Criteria addressed:

Applicability to Conservation and Adaptation Decisions – The CA LCC ECN will provide information applicable to decision makers by making data and data summaries easily available at a scale relevant to the CA LCC. These data will improve decisions by reducing model uncertainty and by monitoring environmental change in real time. The concept of a California ECN has already garnered attention and excitement among scientists and resource managers (e.g., Gardali has been approached by San Francisco Bay Joint Venture and North Bay Climate Adaptation Initiative to discuss synergistic monitoring activities that inform conservation at multiple spatial scales).

Ecological or Ecosystem Response to System/Climate Change – It is important to ensure that it is possible to discriminate among effects of different causes of change so that management responses are directed in ways that are most likely to be effective. Long-term monitoring provides the necessary basis for this. In addition it provides a baseline against which future novel threats to species and ecosystems, such as pathogens, extreme weather events and increased fire risk can be judged. Additionally, our modeling approach highlighting the areas of greatest change and greatest uncertainty in projected future distributions and abundances of birds and other taxa will help ensure that areas most sensitive to climate change are identified and prioritized for monitoring.

Breadth of Understanding – The CA ECN aims to integrate data on a range of environmental variables that can both detect and attribute environmental change. We anticipate monitoring flora and fauna as well as several abiotic variables such as weather and surface water. See figure above from survey of scientists and resource managers in the LCC.

Accessibility – The CA ECN already has a web portal that makes all current products accessible (<http://data.prbo.org/apps/ecn/>) by online visualization and data download; we will continue to use that system. Further, we are actively exploring partnerships with the emerging California Climate Adaptation Commons and the Information Center for the Environment at UC Davis which would enhance our capacity to host, access, and analyze very large datasets.

Scope/Transferability – The CA ECN is modeled after the UK ECN concept developed and implemented over 15 years ago. Additionally, a network of monitoring stations is currently being developed for the United States as part of the National Science Foundation’s NEON project. Hence, the concept is one that already been transferred. The CA ECN is scaled to be LCC-wide but the concept, framework, and especially the protocols can be easily transferred to other LCCs.

Partnerships/Leveraging – The CA ECN is necessarily a multi-partner project. We anticipate collaborating with at least five subject area experts in order to develop appropriate monitoring metrics, protocols, and costs. These partners include but are not limited to Bay Area Early Detection Network (vegetation and invasive species), Dwight Center for Conservation Science (water/hydrology), Sonoma Ecology Center (connect to Climate Adaptation Commons, provide access to fine scale climate models), UC Davis/Information Center for the Environment (connect to Data One and California Digital

Library, provide urban growth, historic and future forest cover layers), Avian Knowledge Network (facilitate access to eBird citizen science data). We will also work closely with resource managers to ensure that the ECN meets their needs. These groups include the partners of the San Francisco Bay Joint Venture, Central Valley Joint Venture, and Sonoran Joint Venture (prioritize monitoring subjects relevant to each Joint Venture). Collectively, these Joint Ventures engage over 50 federal, state and regional agencies, NGOs, and businesses/industries.

Timeliness and Urgency – This work is timely and needed. Given the great uncertainties associated with climate and other environmental changes, data on which to base conservation decisions with limited resources is essential. The ECN aims to provide data on trends of various environmental attributes and, most importantly, attempt to attribute those attributes to causal factors. The ECN links environmental monitoring with in an adaptive management analytical framework and hence will improve decision making to conserve necessary habitat and provide valuable information over time to improve the long-term success of the CA LCC.

Approach and Scope of Work:

Phase II will necessarily engage a wide variety of partners to accomplish the work. In particular, we will contract experts to develop specific monitoring protocols and establish cost estimates (start up and ongoing) necessary to implement the protocols. We will consult with similar monitoring programs and in particular the UK ECN literature in order to most efficiently develop the CA ECN Business Plan. We will investigate how and if existing monitoring programs within the LCC boundaries might participate in the CA ECN. We will seek peer review from subject area experts as well as resource managers to ensure the quality and utility of the ECN concept. The primary tasks and associated timeline are (assuming a funding date of May 2011):

1. July 2011: Establish ECN Team and put sub-contracts into place
 - a. Define team expectations
 - b. Define deliverables and timelines for individual team members
2. August 2011: Conduct and summarize literature relevant to developing an ECN
 - a. Published literature
 - b. Gray literature
 - c. Online resources
 - d. Personal communications
3. September 2011: Develop Business Plan outline and specific monitoring objectives
 - a. Have ECN Team and LCC Science Committee review outline and objectives
4. November 2011: Using products developed in Year One (i.e., to ensure that areas most sensitive to climate change are identified and prioritized for monitoring, we developed models that highlighted areas of greatest change and greatest uncertainty in projected future distributions and of climate and birds), we will refine site selection by developing a decision logic-model and with analyses of sites stratified in climate space
 - a. Produce a prioritized set of recommended monitoring sites
5. December 2011: Develop protocols or adopt existing protocols
6. December 2011: Provide annual cost estimates/variable/station including beta version of online data management system
7. July 2012: Business Plan finalized

Products/Data Sharing:

The final product will be a Business Plan as described above. The full Business Plan including all monitoring protocols will be made available via the CA LCC ECN web portal. All supporting modeling work will be shared as well via interactive and downloadable map layers.

Measuring results:

Short-term success of the CA ECN will be measured by the number of times resource managers and scientists use the ECN web portal to view or download data. Short-term success can also be measured by our ability to secure funding to implement the recommendations from the Business Plan and thereby initiate monitoring. Long-term success will be measured by the ability of the program to estimate trends and attribute those trends to environmental factors. Ultimately, the ECN should provide information about real-time effects of environmental change and to provide interpretation of the results for policy development, ecosystem assessment and management towards ecological conservation, including meeting targets and commitments and responding to observed changes.

Continuing Projects:

This is a continuation of a 2010 LCC project and has continued relevance in light of both 2011 LCC priorities. See *Progress to Date* above for a summary of our accomplishments in Year One.

Phase II, as described in this proposal, is needed to complete the Business Plan for the CA LCC Environmental Change Network. The 2010 products provided the preparatory materials to facilitate the work in this proposed second phase and we will build upon these earlier successes. We have initiated conversations with several potential co-Principle Investigators that we will work with to develop initial monitoring protocols and associated cost estimates. Through the survey initiated in Year One, we have identified several important monitoring topics, key metrics, and several existing monitoring protocols and programs. Hence we are on track to be successful in Phase II.

ATTACHMENTS

Letters of Support: (1) San Francisco Bay Joint Venture, (2) Bureau of Land Management, (3) River Partners

One page resume or curriculum vitae (CV) from the principle investigators.

PRBO – Thomas Gardali

PRBO – Grant Ballard

PRBO – Christine Howell

Gardali - Environmental Change Network 2011 Proposal Budget
Budget for complete Business Plan

Budget Categories	CA LCC Request	Partner(s) Contribution(s) (monetary) ⁴	Partner(s) Contribution(s) (non-monetary value/in-kind) ⁵	Total
Salaries ¹	\$ 43,102	\$ 74,906	\$ 20,000	\$ 138,008
Supplies	\$ -	\$ -	\$ -	\$ -
Overhead ²	\$ 22,585	\$ 25,094	\$ -	\$ 47,679
Equipment	\$ -	\$ -	\$ 10,000	\$ 10,000
Other (specify) ³	\$ 33,300	\$ -	\$ -	\$ 33,300
Total	\$ 98,987	\$ 100,000	\$ 30,000	\$ 228,987

Budget Explanation

¹Salaries cover PI (2.5 months), co-PIs (0.5 months each), Spatial Ecologist (1 month), Software Engineer (0.25 months)

²Overhead rate is 33.5%

³Other includes:

- (1) \$30k for sub-contractors to develop protocols and cost estimates
- (2) \$500 to provide food for meetings
- (3) \$1,800 for travel (mileage)
- (4) \$1,000 for printing

⁴Partner Contributions (monetary):

- (1) \$40k from Dept. of Defense (in hand)
- (2) \$40k CA Dept. Fish and Game (in hand)
- (3) \$20k Anonymous individual (in hand)

⁵Partner Contribution (in kind):

- (1) Salaries will cover GIS and Informatics support
- (2) Equipment includes computing infrastructure



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11 April, 2011

Rebecca Fris, Science Coordinator
California Landscape Conservation Cooperative
Pacific Southwest Region 8
US Fish and Wildlife Service
2800 Cottage Way, Suite W-2606
Sacramento, CA 95825

RE: PRBO Conservation Science's Landscape Conservation Cooperative Funding Request to develop a monitoring network for detecting environmental changes

Dear Rebecca,

I am writing to recommend that the California Landscape Conservation Cooperative (LCC) approve the requests for funding from PRBO Conservation Science for the project entitled "*How do we monitor the ecological consequences of environmental change? Developing an Environmental Change Network in the California LCC: PHASE II*".

This project has identified places suited to evaluate ecological changes related to climate change (see <http://data.prbo.org/apps/ecn/>). Phase Two of this project will provide a business plan that provides standardized survey protocols for a core set of variables, cost estimates per variable, proposes an organizational structure for a California LCC Environmental Change Network, and further refines where monitoring should occur in the LCC.

PRBO has several core strengths that make it uniquely suited to lead this project, including: vast experience with landscape-scale environmental monitoring, experience in conservation science, an ethic of partnership building, well-developed informatics infrastructure, and expertise in climate change effects on wildlife.

The work PRBO proposes to do will be extremely helpful to our efforts. Ecosystem response to change is especially important to River Partners as we restore hundreds of acres of riparian habitat annually throughout California. The mission of River Partners is to create wildlife habitat for the benefit of people and the environment. River Partners implements large scale habitat restoration along streams and rivers throughout the California LCC region, as well as into Arizona. Although our primary limitations to riparian habitat restoration are related to socio-political and economic challenges, a clear understanding of the anticipated ecological effects of climate change is important to direct limited resources towards restoration of particularly sensitive areas. Partnership with PRBO in the development of this network is important to our organization and our numerous partners in species recovery and habitat restoration. Therefore, I fully support PRBO's proposal to begin to establish and Environmental Change Network for California.

I urge the California Landscape Conservation Cooperative to fund it in full.

Sincerely,

A handwritten signature in black ink, appearing to read "Julie Rentner", is written over a light-colored rectangular background.

Julie Rentner, San Joaquin Valley Regional Director
[signed electronically]



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MANAGEMENT BOARD:

*Bay Area Audubon Council
Bay Area Open Space Council
Bay Planning Coalition
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Ducks Unlimited
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Vector Control District
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Service
Natural Resources
Conservation Service
Regional Water Quality Control
Board, SF Bay Region
San Francisco Estuary Project
U.S. Army Corps of Engineers
U.S. Environmental
Protection Agency
U.S. Fish & Wildlife Service
U.S. Geological Survey
Wildlife Conservation Board*

April 11, 2011

Debra Schlafmann
Coordinator
California Landscape Conservation Cooperative
3020 State University Dr. East #2007
Sacramento, CA 95819

Dear Debra:

I am pleased to send this letter of support by the San Francisco Bay Joint Venture for the second phase of the LCC research project entitled "How do we monitor the ecological consequences of environmental change? Developing an Environmental Change Network in the California LCC: PHASE II".

The San Francisco Bay Joint Venture is one of 17 wetland habitat Joint Ventures operating under the certification of the North American Waterfowl Management Plan, a Congressional agreement between the United States, Canada, and Mexico. It is a partnership of non-governmental organizations, utilities, landowners, and non-voting agencies. The goal of the San Francisco Bay Joint Venture is to protect, restore, increase and enhance all types of wetlands, riparian habitat and associated uplands throughout the San Francisco Bay region to benefit birds, fish and other wildlife. The Management Board consists of 27 agencies and private organizations whose members agree to support and promote the goal of the Joint Venture and who represent the diversity of wetlands interests found in the San Francisco Bay region.

In the context of climate adaptation and effectiveness of future implementation of wetland protection, restoration and management activities, practitioners need specific, localized guidance on projected environmental changes and related rates of change to guide them. This project is poised to deliver this information and has already identified the places throughout California most suited to evaluate changes due to climate change, and also those areas that are going to be the most important to conserve via acquisition, restoration, and/or connectivity (see: <http://data.prbo.org/apps/ecn/>). It has laid the groundwork for determining the most useful variables to monitor within the California LCC in order to evaluate environmental change impacts on ecological systems, which are also directly applicable to monitoring and evaluation efforts of California Joint Ventures.

Phase II of this project will provide a business plan that provides standardized survey protocols for a core set of variables, cost estimates per variable, proposes an organizational structure for a California LCC Environmental Change Network, and further refines where monitoring should occur in the LCC and Joint Venture regions. This is in direct alignment with the San Francisco Bay Joint Venture's goal to implement integrated monitoring and evaluation of wetland habitats and target species at the project, San Francisco Bay area region, and Pacific flyway scales.

The Joint Venture Management Board believes that PRBO has several core strengths that make it uniquely suited to lead this project and develop important science and conservation tools that will help both the LCC and the Joint Venture in achieving their goals. Some of the core strengths that will help PRBO succeed in their proposed work are: vast experience with environmental monitoring, experience in conservation science, an ethic of partnership building, well-developed informatic infrastructure, and expertise in climate change effects on wildlife.

The San Francisco Bay Joint Venture Management Board would like to recommend this proposal as a priority for achieving the Joint Venture goals. This effort represents an important step in achieving standardized monitoring at local, regional and eco-regional scales, relevant indicators and datasets to address climate change impacts. As such it will directly contribute significant information to downscaled climate modeling, future wetland conservation planning, and the effective implementation of restoration and enhancement actions to benefit wetlands restoration and conservation within our region.

The SFBJV Management Board fully supports PRBO's proposal to continue their pursuit to establish an Environmental Change Network for California, and urges the California Landscape Conservation Cooperative to fund it in full.

Sincerely,

A handwritten signature in cursive script that reads "Bettina K. Ring". The signature is written in dark ink and is positioned above the typed name and title.

Bettina Ring
Vice Chair, SFBJV Management Board



United States Department of the Interior



BUREAU OF LAND MANAGEMENT
California State Office
2800 Cottage Way, Suite W-1623
Sacramento CA 95825
www.ca.blm.gov

In Reply Refer To:
7200 (CA930)P

EMS TRANSMISSION:

Ms. Rebecca Fris, Science Coordinator
California Landscape Conservation Cooperative
Pacific Southwest Region 8
US Fish and Wildlife Service
2800 Cottage Way, Suite W-2606
Sacramento CA 95825

Subject: PRBO Conservation Science's Landscape Conservation Cooperative Funding Request to Develop a California LCC-wide Monitoring Network

Dear Ms. Fris:

I am writing on behalf of the USDI Bureau of Land Management (BLM) California State Office to recommend that the California Landscape Conservation Cooperative (LCC) approve the request for funding the PRBO Conservation Science project: *"How do we monitor the ecological consequences of environmental change? Developing an Environmental Change Network in the California LCC: PHASE II"*.

In Phase I, this project has already identified places best suited to evaluate climate change and the most important landscapes to conserve and restore because of their biological diversity and habitat connectivity. By formal analysis to determine the most useful variables to monitor within the California LCC area, the project will allow the BLM to evaluate environmental change impacts on ecosystems. A monitoring network to document change impacts is relevant to the BLM as multiple BLM public lands of significance are included in key areas for monitoring, in particular: the Cosumnes Preserve, the Cache Creek Natural Area, the Sacramento Bend Area of Critical Environmental Concern, and San Benito Mountain Wilderness Study Area.

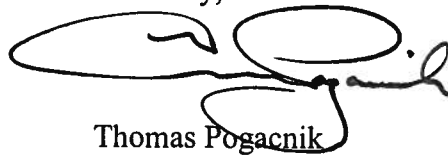
Phase Two of this project will provide standardized survey protocols for the core set of variables, cost estimates per variable, and an organizational structure for a California LCC Environmental Change Network (ECN) from which the BLM will benefit for strategic decision making to achieve long-term conservation goals in a changing environment.

The BLM and PRBO Conservation Science have a working partnership that is now entering its second decade. Experience has shown the BLM that its core organizational strengths make PRBO Conservation Science uniquely suited to lead this project. These strengths include wide-ranging experience in environmental monitoring, sound applications of conservation science, an ethic of partnership building, a well-developed informatics infrastructure, and proven expertise for understanding climate change effects on wildlife.

ECN products will help the BLM prioritize management decisions among the different regions and geographies where the BLM works within the boundary of the California LCC. Therefore, we fully support PRBO's proposal to continue to establish an Environmental Change Network for California.

I urge the California Landscape Conservation Cooperative to fund the project submission from PRBO Conservation Science in full.

Sincerely,

A handwritten signature in black ink, appearing to read 'Thomas Pogacnik', with a large, stylized flourish extending to the left.

Thomas Pogacnik
Deputy State Director, Natural Resources

Biographical Sketch: Thomas Gardali

EDUCATION

University of California at Santa Cruz. Graduated June 1992, Bachelor of Arts degree in Environmental Studies. Concentration in Agricultural Ecosystems (Agroecology).

APPOINTMENTS

- Pacific Coast and Central Valley Group Director, PRBO Conservation Science
- Councilor, Association of Field Ornithologists (2010-present)
- Chair, Creeks Committee, San Francisco Bay Joint venture (2010–present)
- Member, Riparian Landbird Committee, Central Valley Joint Venture (2009 –present)
- Associate Editor, *Western Birds* (2008–present)
- Bird Focus Team of the San Francisco Bay Upland Habitat Goals project (2008–2010)
- Scientific Advisory Board for San Francisco Bay Bird Observatory (2004–present)
- Vice President and Founder, Oikonos—Ecosystem Knowledge (2001–2008)
- Coordinator for California Partners in Flight, Riparian Conservation Plan (1999–2000)

CURRENT RESEARCH

- Climate Change Vulnerability Assessment of California's Birds (with Dept. Fish and Game)
- Developing an Environmental Change Network in the California Landscape Conservation Cooperative (funded by US Fish and Wildlife Service)
- Doing restoration in a climate change context: recommendations for riparian systems
- Long-term demographic monitoring at the Palomarin Field Station

SELECTED PEER REVIEWED PUBLICATIONS

- Gardali, T.** and A. Holmes. In press. Maximizing benefits of riparian restoration efforts: local- and landscape-level determinants of avian response. *Environmental Management*.
- Jennings, S., **T. Gardali**, N.E. Seavy, G.R. Geupel. 2009. Effects of mist-netting on reproductive performance of Wrentits and Song Sparrows in central coastal California. *The Condor* 111:488-496.
- Seavy, N.E., **T. Gardali**, G. H. Golet, F. T. Griggs, C, A. Howell, T. R. Kelsey, S. Small, J. H. Viers, J. F. Weigand. 2009. Why climate changes makes riparian restoration more important than ever: recommendations for practice and research. *Ecological Restoration* 27:330-338.
- Golet, G., **T. Gardali**, J. Hunt, D. Koenig, and N. Williams. 2009. Temporal and taxonomic variability in response of fauna to riparian restoration. *Restoration Ecology* no. doi: 10.1111/j.1526-100X.2009.00525.x
- Richardson, T.W., **T. Gardali**, and S. Jenkins. 2009. Review and meta-analysis of camera effects on avian nest success. *Journal of Wildlife Management* 73:287-293.
- Shuford, W.D., and **T. Gardali**. 2008. California Bird Species of Special Concern: a ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. *Studies of Western Birds* No. 1.
- Gardali, T.**, A.L. Holmes, S.L. Small, N. Nur, G.R. Geupel, and G.H. Golet. 2006. Abundance patterns of songbirds in restored and remnant riparian forests on the Sacramento River, California, USA. *Restoration Ecology* 14:391-403.

Biographical Sketch: Grant Ballard

EDUCATION

- University of Auckland, Auckland, NZ. PhD (2010): Ecology, Evolution and Behavior.
- Cornell University, Ithaca NY. English. BA (1989): English

APPOINTMENTS

- 2011 – Climate Change and Informatics Director, PRBO Conservation Science
- 2007 – 2011 – Informatics Division Director, Antarctic Program Leader, Climate Change Initiative Leader - PRBO
- 2006 – 2007 - Senior Conservation Scientist and Informatics Program Director, PRBO.
- 1994 - 2006. Senior biologist, data manager, and analyst, PRBO.

SELECTED CURRENT AND RECENT PROJECTS

- 2010-2015: (co-PI) Adélie penguin response to climate change at the individual, colony and metapopulation levels – funded by National Science Foundation- [more information](#)
- 2010-2011: (co-PI) How do we monitor the ecological consequences of climate change? Developing an Environmental Change Network in the California Landscape Conservation Cooperative – funded by US Fish and Wildlife Service – [more information](#)
- 2010-2011: (PI) Tidal Marsh Bird Population and Habitat Assessment for SF Bay Under Future Climate Change Conditions – funded by US Fish and Wildlife Service – [more information](#)
- 2010-2012: (co-PI) Preparing for Sea-Level Rise Along the San Francisco Bay Area's Outer Coast – funded by NOAA –SARP – [more information](#)
- 2006-2010: (co-PI) Multi-scaled data in ecology: Scale dependent patterns in the environment - funded by National Science Foundation.

PEER REVIEWED PUBLICATIONS (2010 - 2011; full list available [here](#))

- Ballard, G., K.M. Dugger, N. Nur, D.G. Ainley. 2010. Foraging strategies of Adélie penguins: adjusting body condition to cope with environmental variability. *Marine Ecology Progress Series* 405: 287–302.
- Ballard, G., V. Toniolo, D.G. Ainley, C.L. Parkinson, K.R. Arrigo, P.N. Trathan. 2010. Responding to climate change: Adélie penguins confront astronomical and ocean boundaries. *Ecology* 91(7):2056-2069.
- Blight, L.K., D. G. Ainley, S. F. Ackley, G. Ballard, et al. 2010. Fishing For Data in the Ross Sea. *Science* 330: 1316.
- Dugger, K.M., D.G. Ainley, P.O'B. Lyver, K. Barton and G. Ballard. 2010. Survival differences and the effect of environmental instability on breeding dispersal in an Adélie penguin meta-population. *PNAS*; www.pnas.org/cgi/doi/10.1073/pnas.1000623107.
- Lescroël, A., G. Ballard, V. Toniolo, K. J. Barton, P. R. Wilson, P.O'B. Lyver, & D.G. Ainley. 2010. Working less to gain more: when breeding quality relates to foraging efficiency. *Ecology* 91(7):2044-2055.

SYNERGISTIC ACTIVITIES

Member of the Landscape Conservation Cooperative Science & Informatics subcommittees, California Department of Fish and Game Climate Stakeholders Working Group; delegate to USGS National Climate Change and Wildlife Climate Science Center organizational workshop (2009) and USFWS CA Landscape Conservation Cooperative organizational workshops (2010/11); leader of the Avian Knowledge Alliance (2007-2008); Co-founder and board member, Oikonos, ecosystem knowledge (www.oikonos.org).

Biographical Sketch: Christine Howell, PhD – Sr. Conservation Scientist

Education

PhD, Ecology and Evolutionary Biology, University of Missouri-Columbia, Missouri

BA, Integrative Biology, University of California-Berkeley, California

Current Research

Species distribution modeling, spatial analyses, and landscape ecology to inform conservation planning efforts in California

Climate change impacts and potential adaptation strategies for California birds

Wildlife response to riparian restoration design and conservation of riparian obligate birds

Guiding renewable energy siting efforts to reduce wildlife impacts

Selected Publications

Howell, C. A., J. K. Wood, M.D. Dettling, K. Griggs, C. C. Otte, L. Lina, T. Gardali. 2010. Least Bell's Vireo breeding records in the Central Valley following decades of extirpation. *Western North American Naturalist* 70:105-113.

Seavy, N. E. and **C.A. Howell**. 2010. How can we improve delivery of decision support tools for conservation and restoration? *Biodiversity and Conservation* 19:1261–1267.

Wiens, J.A., Stralberg, D., D. Jongsomjit, **C.A. Howell**, M.A. Snyder. 2009. Niches, models, and climate change: assessing the assumptions and uncertainties. *Proceedings of the National Academy of Sciences*. vol. 106 no. Supplement 2 19729-19736

Stralberg, D., D. Jongsomjit, **C.A. Howell**, M.A. Snyder, J.D. Alexander, J.A. Wiens, T.L. Root. 2009. Re-shuffling of species with climate disruption: a no-analog future for California birds? *PLoS ONE* 4: e6825.

Seavy, N. E., T. Gardali, G. H. Golet, F. T. Griggs, **C. A. Howell**, T. R. Kelsey, S. Small, J. H. Viers, J. F. Weigand. 2009. Why climate change makes riparian restoration more important than ever. *Ecological Restoration* 27:330-338.

Meynard, C., **C.A. Howell**, J.F. Quinn. 2009. Comparing alternative systematic conservation planning strategies against a politically-driven conservation plan. *Biodiversity & Conservation* 18:3061-83.

G. H. Golet, T. Gardali, **C.A. Howell**, J. Hunt, R. A. Luster, B. Rainey, M. D. Roberts, J. Silveira, H. Swagerty, and N. Williams. 2008. Wildlife Response to Riparian Restoration on the Sacramento River. *San Francisco Estuary and Watershed Science*. Vol. 6, Issue 2 (June), Article 1.

Howell, C.A., P. Porneluzi, R.L. Clawson, and J. Faaborg. 2004. Breeding density affects point count accuracy in Missouri forest birds. *Journal of Field Ornithology* 75:123-133.

Loiselle, B.A., **C.A. Howell**, C. Graham, T. Brooks, K. Smith, and P. Williams. 2003. Avoiding Pitfalls of Using Species-Distribution Models in Conservation Planning. *Conservation Biology* 17:1591-1600.

Howell, C.A., S.C. Latta, T. Donovan, G. R. Parks, P. Porneluzi, and J. Faaborg. 2000. Landscape Effects Mediate Breeding Bird Abundance in Midwestern Forests. *Landscape Ecology* 15: 547-562.

Service

- Member of team (with T.L. Root, K. Hall, and M. Herzog) advising graduate students and post-docs on their research on climate change impacts on California wildlife.
- Member of the Independent Science Advisory Panel for the Desert Renewable Energy Conservation Plan.