Project Title:

Assessing climate change vulnerability and developing a climate change adaptation strategy for Sierra Nevada birds

Proposal by:

Rodney Siegel, Executive Director
The Institute for Bird Populations
PO Box 1346
Point Reyes Station, CA 94956

415-663-2051
rsiegel@birdpop.org

Scope & Budget:

Location: Sierra Nevada
Duration in months: 14
Requested Funding: $82,390.00
Leveraged Funding: $18,106.00

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.

Ranges of many high-elevation species worldwide have contracted severely, and the first extirpations driven by anthropogenic climate change are of mountaintop biota. Mountain-dwelling birds have already responded to climate change around the world by shifting ranges upslope. Distributions of many Sierra birds have already begun to change, and in the coming decades increased temperature, decreased snowpack, altered fire regimes, and shifting plant communities will likely accelerate such changes and may restructure entire bird assemblages. Sierra land managers need an assessment of a) which species are most vulnerable to climate change in the region, and b) what can be done now to bolster resilience of species and their habitats, and help vulnerable species to persist. Project components: 1) We will use the NatureServe Climate Change Vulnerability Index tool to assess vulnerability of ca. 140 bird species that breed in the Sierra Nevada. The Index incorporates data about species' natural history and distribution with spatially explicit temperature and precipitation projections, to predict whether range contractions, population reductions, or both during the coming years are likely. 2) We will develop a peer-reviewed Climate Change Adaptation Strategy for Sierra Nevada bird species that are most vulnerable to climate change. The Strategy will provide recommendations for actions that managers can take now and in the future to bolster resilience to climate change. 3) We will conduct outreach efforts among Forest Service and National Park Service land managers, the California Partners in Flight community, and the general public to publicize the existence of the Strategy and the importance of proactive management to minimize negative consequence of climate change on Sierra Nevada birds. Forest Service and National Park Service land managers are eager to use our results to inform their climate change adaptation planning (see letters of support).

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.

NEW PROJECT

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. 4. A biological planning and conservation design project developed in response to climate change. 5. A management evaluation action evaluated for effectiveness in response to climate change and research activities conducted to address information needs in response to climate change.

List Partners

Dr. Rodney Siegel, Executive Director, The Institute for Bird Populations Diana Craig, Regional Ecologist, US Forest Service Sarah Stock, Wildlife Biologist, Yosemite National Park Dr. James Thorne, Research Scientist, UC Davis

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.

Rodney Siegel is a recognized expert on the ecology and conservation of Sierra Nevada birds, and will be responsible for directing all aspects of the project. Rodney has published over 20 peer-reviewed papers dealing with avian ecology and conservation (many of them addressing Sierra Nevada birds) and has produced dozen of reports for federal agencies and other land managers. Diana Craig will provide consultation and review of all project components; will help ensure that outputs are relevant and useful for FS land managers; and will conduct outreach to FS personnel to facilitate use of the Adaptation Strategy. Sarah Stock, also an expert on Sierra birds, will provide consultation and review of all project components; will help ensure that outputs are relevant and useful for NPS land managers; will conduct outreach to NPS personnel to facilitate use of the Adaptation Strategy; and will oversee production of podcast for outreach to general public. Jim Thorne will conduct GIS work to assess projected climate change exposure for each species, under multiple climate change scenarios and will collaborate on producing the deliverables and any associated manuscripts. Project PI Rodney Siegel is also the PI on the following recent and current projects: Evaluating bird species for Sensitive Species designation in USFS Region 5 Sponsoring agency: USDA Forest Service Region 5 Performance period: Aug 1, 2011 – Jul 15, 2011 Total budget: $120,000 Committed person-months from Rodney Siegel: 1.1 Landbird monitoring in the Sierra Nevada Network Sponsoring agency: National Park Service – Sequoia and Kings Canyon National Park Performance period: Apr 8, 2011 – Jul 15, 2010 Total budget: $65,367 Committed person-months from Rodney Siegel: 0.8 Assessment of avifauna within the Sierra Nevada Network Parks Sponsoring agency: National Park Service – Sequoia and Kings Canyon National Park Performance period: Jun 1, 2010 – Jul 30, 2011 Total budget: $39,518 Committed person-months from Rodney Siegel: 1.0 Monitoring Avian Productivity and Survivorship (MAPS) in Yosemite NP Sponsoring agency: National Park Service – Yosemite National Park Performance period: Dec 23, 2009 – Mar 31, 2012 Total budget: $56,237 Committed person-months from Rodney Siegel: 0.5 Black-backed Woodpecker MIS monitoring on Sierra Nevada national forests Sponsoring agency: USDA Forest Service Region 5 Performance period: Apr 22, 2010 – Apr 30, 2012 Total budget: $280,000 Committed person-months from Rodney Siegel: 4.0 Using radio-telemetry to measure home range and collect other information to support habitat management for Black-backed Woodpecker in the Sierra Nevada Sponsoring agency: USDA Forest Service Region 5 Performance period: Jun 15, 2010 – Dec 31, 2011 Total budget: $110,000 Committed person-months from Rodney Siegel: 1.8 Developing a conservation strategy for Black-backed Woodpecker in California Sponsoring agency USDA Forest Service Region 5 Performance period: Mar 14, 2011 – Sep 30, 2011 Total budget: $20,000 Committed person-months from Rodney Siegel: 0.55 Standardizing bird surveys at meadow restoration sites in California Sponsoring agency: National Fish and Wildlife Foundation Performance period: Jan 4, 2010 – Apr 29, 2011 Total budget: $92,822 Committed person-months from Rodney Siegel: 1.5 Landbird monitoring in the North Coast and Cascades Network – Year 5 Sponsoring agency National Park Service – North Cascades National Park Performance period: Sep 1, 2010 – Apr 4, 2012 Total budget: $97,388 Committed person-months from Rodney Siegel: 0.8

Assessing climate change vulnerability and developing a climate change adaptation strategy for Sierra Nevada birds

Dr. Rodney Siegel – The Institute for Bird Populations
Diana Craig – US Forest Service, Pacific Southwest Region
Sarah Stock – National Park Service, Yosemite National Park
Dr. James Thorne – UC Davis

Project Description

Ranges of many high-elevation species worldwide have contracted severely, and the first populations and species that have been extirpated because of climate change are of mountaintop biota. Mountain-dwelling birds have already responded to climate change around the world by shifting ranges upslope. Distributions of many Sierra birds have already begun to change, and in the coming decades increased temperature, decreased snowpack, altered fire regimes, and shifting plant communities will likely accelerate such changes and may restructure entire bird assemblages.

Sierra land managers need an assessment of a) which species are most vulnerable to climate change in the region, and b) what can be done now to bolster resilience of species and their habitats, and maximize likelihood that vulnerable species will persist.

Project components:

1) We will use the *NatureServe Climate Change Vulnerability Index* to assess vulnerability of approximately 140 bird species that breed regularly in the Sierra. The *Index* is a tool that incorporates data about species' natural history and distribution, and spatially explicit temperature and precipitation projections, to predict whether range contractions, population reductions, or both are probable during the coming years.

2) We will develop a peer-reviewed *Climate Change Adaptation Strategy* for Sierra Nevada bird species that are most vulnerable to climate change. The *Strategy* will provide recommendations for actions that managers can take now and in the future to bolster resilience to climate change.

3) We will conduct outreach efforts targeting Sierra Nevada land managers (particularly Forest Service and National Park Service land managers), the California Partners in Flight (CalPIF) community, and the general public to publicize the existence of the plan and the importance of proactive management to minimize negative consequence of climate change on Sierra Nevada birds. Forest Service and National Park Service land managers are eager to use our results to inform their conservation planning in response to climate change (see letters of support).

California LCC Priorities Addressed

We will characterize bird species' responses to projected change under multiple climate scenarios, and will use the results to address pressing resource management needs – by developing a regional adaptation plan to assist managers in developing and prioritizing conservation actions to benefit vulnerable species.

We will seek input and review from the CalPIF community on the vulnerability assessment model inputs and the adaptation plan. Once completed, both components will be posted online

and their existence will be publicized with outreach efforts targeting Sierra Nevada land managers (especially within the FS and NPS), as well as the general public.

The Forest Service needs information related to climate change to inform both Land Management Planning (amendment and revision to individual Forest Land and Resources Management Plans) and project development and implementation. Specifically, the USDA Forest Service, as part of its mission to sustain the health, diversity, and productivity of the nation's forests and grasslands for present and future generations, has established requirements to address climate change and related stressors through the USDA 2010-2015 Strategic Plan, the USDA Forest Service Climate Change Roadmap, and the *Performance Scorecard for Implementing the Forest Service Climate Change Strategy*. The scorecard includes two performance questions/measures that are best achieved through working with partners: vulnerability assessments and adaptation activities. This project will result in a vulnerability assessment for birds in the Sierra Nevada which can be used by the National Forests in the Sierra Nevada to identify resources and ecosystem elements that are vulnerable to climate change. In addition, the resulting climate change adaptation strategy for Sierra Nevada birds will assist the Forest Service in developing an adaptation strategy that includes priority-setting and land treatment actions.

The National Park Service has similar needs for information on likely effects of climate change on wildlife. This information is essential for developing appropriate climate change adaptation options and informing management decisions, and the current lack of such information makes the NPS vulnerable to policy and legal challenges, particularly for special-status species.

This project will bolster parity of LCC efforts across LCC subregions by focusing on the Sierra Nevada, and will provide a model (suitable for other regions, LCCs, and taxonomic groups) for translating science into actionable conservation and adaptation recommendations that are useful to land managers – the participation of partners from the Forest Service and the National Park Service, which collectively manage the great majority of the Sierra land area, will help to ensure this.

California LCC Criteria Addressed

Applies to Conservation and Adaptation: We will identify species that need targeted adaptation and conservation actions, and suggest what those actions should be. Land management agencies have identified the need for this information (see letters of support from the Forest Service and National Park Service).

Ecosystem Response to Climate Change: We will provide the first broad assessment of risks for Sierra bird species under multiple climate scenarios.

Breadth: We will assess vulnerability of ca. 140 ecologically diverse Sierra bird species, under multiple climate scenarios for which we will provide spatially explicit projections.

Accessibility: Detailed results from our climate projection efforts, vulnerability assessments, and the adaptation plan itself, will be posted on IBP's website and perhaps the CalPIF website, and will be publicized through outreach efforts targeting Sierra Nevada land managers (particularly within the Forest Service and National Park Service). Products will be designed to be readily understood and used by land managers and will be supplemented by a public-outreach podcast.

Scope/Transferability: We will use a nationally known tool to conduct vulnerability assessments; our project will be a highly transferable model for translating such assessments into actionable adaptation plans.

Partnerships/Leveraging: We will establish a new partnership between IBP, UC Davis researchers, and land managers from the Forest Service and the National Park Service – agencies that collectively manage the great majority of the land area within the Sierra Nevada. Diana Craig's time (estimated at 1 month) will be contributed by the Forest Service at no cost, as will one month of time for a Park Service Writer-Editor to help produce a public-outreach podcast.

Timeliness: Information is needed so managers can act proactively to protect vulnerable species. Final products will be made publicly available within 12 months, and results will be well-timed to inform Forest Service Plan Revisions and National Park Service planning efforts.

Approach and Scope of Work

Assessing species vulnerability

Vulnerability of a species to climate change can be thought of as the integration of three factors: exposure to climate change, sensitivity to climate change, and capacity to adapt to climate change. Exposure is the magnitude of climate change the species is likely to experience across the portion of its range considered. Sensitivity is the degree to which the species is likely to respond to the change, either positively or negatively, given exposure. Adaptive capacity refers to the ability of the species to cope with or take advantage of climate change-induced stressors through evolutionary changes and/or plastic ecological responses. Adaptive capacity therefore has the potential to moderate otherwise negative consequences of exposure and sensitivity.

Diverse approaches have been developed to assess species vulnerability to climate change, ranging from purely qualitative expert panel assessments to quantitative computer modeling. We will conduct our assessment using NatureServe's Climate Change Vulnerability Index, a well-vetted tool that has been applied to ecological systems across the country. The NatureServe Index falls in the middle of the qualitative-quantitative gradient, combining knowledge of inherent species-specific ecological traits with modeled climate projections. The end result is a species- and region-specific vulnerability model that integrates projected exposure to climate change, intrinsic sensitivity to climate change, and likely capacity to adapt to climate change.

For assessing exposure to climate change, we will use bird species' range maps available from California Department of Fish and Game. We will explore further refining these maps using additional occurrence data from sources such as eBird and the California Avian Data Center, and information recently published by Dr. Siegel and colleagues on bird species' elevation ranges within the Sierra Nevada.

The UC Davis group led by Dr. James Thorne (a partner on this project) has developed downscaled climate data with funding from the California Energy Commission's PIER program. The data are in the form of 270-m grids representing monthly values for 14 variables including *minimum and maximum temperature*, *precipitation*, *runoff*, *soil moisture*, *climatic water deficit*, s*nowpack*, and *snowmelt*. The variables representing hydrologic conditions, which are critical factors in California's ecosystems, have been developed by USGS hydrologists. The time series goes from 1900-2100, incorporating re-formatted PRISM data for historic data, and having four future projections: the GFDL A2 and B1, and the PCM A2 and B1 scenarios. These scenarios have been shown to best reproduce California's climate in current time.

The UC Davis group has assembled a time series from these data representing 30-year means of monthly values. This permits decadal and other weather oscillations to be subsumed in a single measure, and the overall effects of climate change to be discerned. Time 'slices' of monthly values from 1970-2000 (current conditions) can be compared to 2010-2040, 2040-2070, and 2070-2100 to determine the bulk climate change for an area, the drying of soils, and surface water projected conditions. We will use these values in a GIS context to assess projected climate change exposure of Sierra Nevada bird species throughout their Sierra ranges. In addition to informing our climate change vulnerability assessments, resulting GIS files will be made available for other researchers and conservation planners. Dr. Thorne's group will conduct the GIS analyses using these climate data and the bird range maps described above, to project and map the climate change exposure for each species.

The NatureServe Index requires scoring up to 17 natural history traits that influence climate change sensitivity for each species. We will base these scores on information from published and unpublished literature and extensive personal knowledge of the Sierra Nevada avifauna. We will document our rationale for each species' scores and solicit peer review of them.

Accounting for uncertainty

Our vulnerability assessments will incur uncertainty from two main sources: limitations in our ability to assess species' sensitivity to climate change (based on finite knowledge of natural history traits), and uncertainty in our predictions of future climate change. The NatureServe Index tool includes a module that uses Monte Carlo simulations to assess the effects of uncertainty associated with classification of natural history traits on uncertainty in the overall vulnerability score obtained for each species.

We will also employ methods to assess uncertainty associated with the climate change projections we use. Climate uncertainty can be partitioned into three sources: 1) the internal variability of the climate system, 2) model response uncertainty, and 3) emissions scenario uncertainty. Internal variability describes the natural climatic fluctuations which are independent of anthropogenic climate change. Model response uncertainty refers to the variation among global circulation model (GCM) predictions given the same levels of radiative forcing. Scenario uncertainty refers to the range of possible emissions levels and thus future radiative forcing due to unknown changes in future human population growth, energy use, and technology. We will focus on climatic uncertainty as it pertains to model response and emission scenario uncertainty. We will not consider internal variability, which makes up a significant part of projection uncertainty only a decade or two into the future before anthropogenic climate change greatly outpaces any natural annual and decadal fluctuations. For our estimates of exposure to climate change, we will assess projected climate change across each species' range within the Sierra Nevada under multiple GCMs and emissions scenarios. We will use the range of vulnerability scores under these various models and scenarios to assess the influence of climate uncertainty on each species' vulnerability score, and rate confidence in those scores accordingly.

Conservation planning

After we complete the climate change vulnerability assessments, we will draft a "*Climate Change Adaptation Strategy for Sierra Nevada Birds*", focusing on the species that our assessment indicates are most vulnerable. The plan will provide summary information, general adaptation approaches, and specific, actionable conservation recommendations for bolstering resilience of vulnerable bird species. We will solicit and incorporate peer review of the *Strategy*,

and then post the document on the internet, and publicize its existence through multiple means (see below). The strategy will be published as 'Version 1.0', subject to updates, revision, and expansion (through other funding sources) as more information becomes available and the science of climate change adaptation grows.

Outreach to land managers and the general public
Diana Craig and Sarah Stock will conduct outreach activities within the Forest Service and National Park Service (respectively), so that land mangers know about the *Strategy* and related products, and are able to make use of them in their planning and management activities. Rodney Siegel will publicize the project products within California Partners in Flight and throughout California's bird conservation community. To reach the general public, Sarah Stock and National Park Service colleagues will produce new interpretive materials including a video podcast highlighting the challenges posed by climate change to Sierra birds.

Products/Data Sharing

This project will yield two primary products:

1) Compiled and analyzed inputs for the vulnerability assessment

- GIS layers indicating projected climate change exposure for ca.140 individual bird species
- a vulnerability assessment matrix providing our vulnerability scores for individual natural history traits of each species, along with rationales explaining the scores

The GIS analysis and vulnerability assessment matrix will be drafted within 6 months, and then will be peer-reviewed and finalized within 8 months.

2) *"Climate Change Adaptation Strategy for Sierra Nevada Birds"*
The *Strategy* will be drafted within 10 months, and then peer-reviewed and revised within 12 months. The strategy will provide specific, actionable suggestions for bolstering resilience to climate change for vulnerable species and their habitats.

All products will be posted online within 12 months. During the 2 months after posting the *Strategy* and other components of the vulnerability assessment, we will conduct outreach efforts to publicize its existence and facilitate its use by land managers. The total project duration will thus be 14 months, but all deliverables will be publicly available within 12 months.

Measuring Results

In the short-term, progress on this project will be measured by the on-time posting of peer-reviewed deliverables, including the adaptation *Strategy* and its associated data products. Through the web, we will also solicit comments and input from users of those products, particularly with regard to how and by whom they are being used, and what sort of improvements might make them more useful in the future. Long-term results can be assessed by the degree to which land managers use and cite our *Strategy* and the associated data products in their own planning efforts, and the extent to which our suggested actions are adopted and implemented.

California Landscape Conservation Cooperative 2011 Proposal Budgets

Budget Categories	CA LCC Request	Partner(s) Contribution(s) (monetary)	Partner(s) Contribution(s) (non-monetary value/in-kind)	**Total**
Salaries				
IBP (includes benefits)	$ 38,891.00	$ -	$ -	$ 38,891.00
Forest Service partner	$ -	$ -	$ 12,076.00	$ 12,076.00
Park Service partner	$ 11,163.00	$ -	$ 6,030.00	$ 17,193.00
UCD reseach group	$ 15,000.00	$ -	$ -	$ 15,000.00
Supplies	$ -	$ -	$ -	$ -
Overhead	$ 17,186.00	$ -	$ -	$ 17,186.00
Equipment	$ -	$ -	$ -	$ -
Other (specify)	$ 150.00	$ -	$ -	$ 150.00
Total	$ 82,390.00	$ -	$ 18,106.00	$ 100,496.00

Other:

In-kind contributions include 1 month of salaried time for Forest service partner and 1 month of salaried time for NPS Writer-Editor.Travel expenses for coordinating among partners - mileage reimbursement and parking fees.

United States Department of the Interior

NATIONAL PARK SERVICE
North Cascades National Park
Lake Chelan National Recreation Area
Ross Lake National Recreation Area
810 State Route 20
Sedro-Woolley, Washington 98284-9394

IN REPLY REFER TO:
N2219

April 7, 2011

To whom it may concern:

I am writing to endorse the proposed project *"Assessing climate change vulnerability and developing a climate change conservation strategy for Sierra Nevada birds"* submitted by The Institute for Bird Populations (IBP) and cooperators. As a biologist for the National Park Service at North Cascades National Park Complex, I have worked cooperatively with IBP as the NPS lead for the National Park Service's North Coast and Cascades Network Landbird Monitoring Program since September 2000. IBP played a significant role in the development, writing, and implementation of a protocol to monitor landbirds in five Pacific Northwest National Park units.

IBP is enthusiastic and very professional in all aspects of conducting our monitoring program. They consistently provide products of very high quality and always complete assigned tasks in a timely manner. It has been a pleasure to work collaboratively with IBP over these past 11 years. IBP has shown themselves to be a respected organization that has been and continues to be a leader in the field of bird conservation science.

If you have questions or need further details, please contact me at 360-854-7320 (robert_kuntz@nps.gov).

Sincerely,

Robert C. Kuntz II
Wildlife Biologist
North Cascades National Park Complex

United States Department of the Interior

NATIONAL PARK SERVICE
Yosemite National Park
P.O. Box 577
Yosemite, California 95389

IN REPLY REFER TO:
N22 (RMS-YOSE)

APR 5 2011

California Landscape Conservative Cooperative
TSuchanek@usgs.gov

RE: Dr. Rodney B. Siegal

To Whom it may concern:

This letter is to express the strong support of the National Park Service for Dr. Siegel's California Landscape Conservation Cooperative proposal "Assessing climate change vulnerability and developing a climate change conservation plan for Sierra Nevada birds". Already, research in the park suggests that some bird species are shifting their ranges upslope in elevation; and some bird populations are declining. Many climate change scenarios include forecasts of increased temperature, decreased snowpack, more severe fires, and shifting plant communities. As a resource manager in Yosemite, I am very concerned about how climate change is going to further impact the park's biotic communities and the cascading effects that these changes will have on the very ecosystems I am charged with protecting. Without information on how different species will respond to climate change, park managers are unable to develop and prioritize informed management actions appropriately.

This proposed study incorporates a modeling approach into development of a climate change conservation plan for Sierra birds. The modeling would assess the vulnerability of ~140 bird species that regularly occur in the Sierra by integrating each species' life history traits with predictions about its unique climate change exposure, developed from a set of downscaled, fine-resolution projected climate models that represent the state of the art in climate modeling for the Sierra Nevada region. The resulting climate change conservation plan would serve as a science-based guide to assist Yosemite's managers with making decisions needed to prioritize the protection of Yosemite's most vulnerable bird species.

In summary, the proposal by Dr. Siegel and his colleagues – who include an academic landscape ecologist/climate modeler with great expertise in the Sierra Nevada region, and wildlife biologists/land managers with expertise on birds from both the US Forest Service and the National Park Service – would contribute greatly to our knowledge of how climate will affect Yosemite's avifauna. It will also provide the National Park Service and other agencies and resource managers with a standardized tool for designing adaptation and mitigation strategies that are at the heart of our policy on managing climate change.

Sincerely,

s/s Joe Meyer *(original signature on file)*

Joe Meyer
Acting Division Chief
Resources Management and Science

cc: Dr. Rodney B. Siegal, rsiegal@birdpop.org

USDA United States Department of Agriculture
Forest Service
Pacific Southwest Region
Regional Office, R5
1323 Club Drive
Vallejo, CA 94592
(707) 562-8737 Voice
(707) 562-9240 Text (TDD)

File Code: 2600
Date: APR 0 1 2011

Rodney Siegel, Ph.D.
Executive Director
The Institute for Bird Populations
P.O. Box 1346
Point Reyes Station, CA 94956-1346

Dear Dr. Siegel:

This letter is to document the support of the Pacific Southwest Region of the USDA Forest Service (Region 5) for the California Landscape Conservation Cooperative project proposal entitled "Assessing climate change vulnerability and developing a climate change conservation plan for Sierra Nevada birds."

This project would provide valuable information for the National Forests in California to advance our on-the-ground conservation objectives. Specifically, the USDA Forest Service, as part of our mission to sustain the health, diversity, and productivity of the Nation's forests and grasslands for present and future generations, has established requirements to address climate change and related stressors in our on-going management through the USDA 2010-2015 Strategic Plan, the USDA Forest Service Climate Change Roadmap, and the *Performance Scorecard for Implementing the Forest Service Climate Change Strategy.*

In order to meet the Strategic Plan Strategic Goal to "Ensure our National Forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources" by an objective to "Lead efforts to mitigate and adapt to climate change," the USDA Forest Service has developed a Climate Change Roadmap and a Performance Scorecard for Implementing the Forest Service Climate Change Strategy. The "Assessing climate change vulnerability and developing a climate change conservation plan for Sierra Nevada birds" project will advance work in Region 5 to address three of the performance questions/measures identified in the Scorecard and provide important information to the forests in the Sierra Nevada that will inform forest planning and on-the-ground project development and implementation: (1) vulnerability assessments; (2) adaptation activities; and (3) engagement (develop partnerships and transfer knowledge).

The project will result in a vulnerability assessment for birds in the Sierra Nevada; this information can be used by Region 5 and the ten National Forests in the Sierra Nevada to identify the vulnerability of key resources and ecosystem elements to the impacts of climate change. In addition, the resulting climate change conservation plan for Sierra Nevada birds will assist the Forest Service in identifying an adaptation strategy that helps incorporate the vulnerability of resources into priority setting and land treatment actions. Lastly, this project will contribute to the engagement/partnership performance measure in Region 5.

Printed on Recycled Paper

In addition to the clear benefits of this project for the Forest Service, we want to acknowledge the confidence we have that the Institute for Bird Populations (IBP) will be able to conduct this project in a timely and useful manner. Region 5 has partnered with the IBP on a variety of projects, including the on-going black-backed woodpecker Sierra Nevada Management Indicator Species Monitoring Project and a Forest Service Sensitive Species assessment of birds. IBP has always provided high-quality, timely products that are extremely useful to management of our National Forests.

Sincerely,

RANDY MOORE
Regional Forester

cc: Barnie Gyant, Diana Craig, Bruce Goines

RODNEY B. SIEGEL, Executive Director
The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956

Education

Ph.D. 1998 Ecology. University of California at Davis
B.A. 1991 Environmental Studies and Political Science, *Cum laude*. Yale College, New Haven, CT

Research Interests

I have been monitoring and studying Sierra Nevada bird populations for the past 13 years, with particular emphasis on the effects of wildfire, forest management, and climate change on Sierra birds; design of bird monitoring programs on public lands; conservation of meadow birds; and owl ecology and conservation. I have authored or coauthored over 20 peer-reviewed publications and dozens of technical reports to government agencies.

Selected Peer-reviewed Journal Articles Relevant to Sierra Nevada Birds

Siegel, R. B., R. L. Wilkerson, J. F. Saracco, and Z. L. Steel. *In press.* Elevation ranges of birds on the Sierra Nevada's west slope. *Western Birds*.

Saracco, J. F., **R. B. Siegel**, and R. L. Wilkerson. 2011. Occupancy modeling of Black-backed Woodpeckers on burned Sierra Nevada forests. *Ecosphere* 2:art31. [doi:10.1890/ES10-00132.1]

Bond, M. L., D. E. Lee, and **R. B. Siegel**. 2010. Winter movements by California Spotted Owls in a burned landscape. *Western Birds* 41:174-180.

Bond, M. L., D. E. Lee, **R. B. Siegel**, and J. P. Ward. 2009. Habitat use and selection by California Spotted Owls in a postfire landscape. *Journal of Wildlife Management* 73:1116-1124.

Siegel, R. B., R. L. Wilkerson, and D. F. DeSante. 2008. Extirpation of the Willow Flycatcher from Yosemite National Park. *Western Birds* 39:8-21.

Siegel, R. B., and D. F. DeSante. 2003. Bird communities in thinned versus unthinned stands of Sierran mixed conifer forest. *Wilson Bulletin* 115:155-165.

Nott, M. P., D. F. DeSante, **R. B. Siegel**, and P. Pyle. 2002. Influences of the El Nino/Southern Oscillation and the North Atlantic Oscillation on avian productivity in forests of the Pacific Northwest of North America. *Global Ecology and Biogeography* 11:333-342.

Siegel, R. B., D. F. DeSante, and M. P. Nott. 2001. Using point counts to establish conservation priorities: how many visits are optimal? *Journal of Field Ornithology* 72:228-235.

Selected Technical Reports Relevant to Sierra Nevada Birds

Steel, Z. L., M. L. Bond, **R. B. Siegel**, and P. Pyle. *In review*. Avifauna of Sierra Nevada Network parks: assessing distribution, abundance, threats, and conservation opportunities for 145 bird species. Report to the Sierra Nevada Network national parks. The Institute for Bird Populations, Point Reyes Station, CA.

Siegel, R. B., R. L. Wilkerson, and M. Goldin Rose. 2010. Bird monitoring protocol for national parks in the Sierra Nevada Network. Natural Resource Report NPS/SIEN/NRR--2010/231. National Park Service, Fort Collins, CO.

Stock S. L., **R. B. Siegel**, and D. R. Kaschube. 2010. Declines in Yosemite's bird populations. *In* Rethinking Protected Areas in a Changing World: Proceedings of the 2009 GWS Biennial Conference on Parks, Protected Areas, and Cultural Sites, S. Weber, editor**.** Hancock, Michigan: The George Wright Society**.**

Pyle, P., **R. B. Siegel**, and M. K. Chambers. 2009. Evaluating bird taxa for consideration as Sensitive Species in the US Forest Service Pacific Southwest Region. Report to USFS Pacific Southwest Region. The Institute for Bird Populations, Point Reyes Station, CA.

Siegel, R. B., and D. R. Kaschube. 2007. Landbird monitoring results from the Monitoring Avian Productivity and Survivorship (MAPS) Program in the Sierra Nevada. Report to USFS Pacific Southwest Region. The Institute for Bird Populations, Point Reyes Station, CA.

Siegel, R. B., and D. F. DeSante. 1999. Draft avian conservation plan for the Sierra Nevada Bioregion: a report to California Partners in Flight. The Institute for Bird Populations, Point Reyes Station, CA.

Curriculum Vitae

Diana L. Craig

PERSONAL INFORMATION

Home Mailing Address: 20 Ivy Court, Yountville, CA 94599
Work Mailing Address: 1323 Club Drive, Vallejo, CA 94592
Email: dcraig01@fs.fed.us
Phone Number: 707-562-8930
Country of Citizenship: United States of America

EDUCATION

M.A. Biology	San Jose State University, San Jose, CA May 1986
B.A. Wildlife Zoology	San Jose State University, San Jose, CA May 1982
High School Diploma	Leland High School, San Jose, CA June 1978

WORK EXPERIENCE

February 2004 – Present: Regional Wildlife Ecologist, USDA Forest Service, Pacific Southwest Region, 1323 Club Drive, Vallejo, CA 94592

August 1997 – February 2004: Regional Wildlife Program Leader, USDA Forest Service, Pacific Southwest Region, 1323 Club Drive, Vallejo, CA 94592

December 1993 – November 1994: Biologist / Writer/Editor, CA Spotted Owl EIS Team, USFS Region 5-Regional Office, Sacramento, CA 95821

May 1990 – August 1997: Assistant Forest Wildlife Biologist, Tahoe National Forest, Nevada City, CA 95959

August 1988 - May 1990: Sales Manager, Aris Helicopters DBA International Helicopter Parts, Lincoln, CA 95648

January 1986 – July 1988: Secretary / Accounts Payable, Aris Helicopters, San Jose, CA 95110

January 1986 – May 1987: Research Consultant, San Jose State University, San Jose, CA 95192

January 1984 – May 1984: Graduate Teaching Assistant, San Jose State University, San Jose, CA 95192

August 1983 – December 1985: Graduate Researcher, San Jose State University, San Jose, CA 95192

January 1982 – January 1984: Veterinary Assistant, Lincoln Avenue Veterinary Clinic, San Jose, CA 95162

NAME

Sarah Stock

PRESENT ADDRESS

Wildlife Biologist
Yosemite National Park
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EDUCATION

M.S.	Zoology	University of Idaho	2002
B.S.	Conservation Biology	The Evergreen State College	1996

RELEVANT EXPERIENCE

As Park Ornithologist at Yosemite National Park for the past five years, I will provide the project with knowledge of the backcountry and familiarity with Sierra bird assemblages. I have overseen numerous research and management projects in the park, and collaborated on a wide variety of projects, including conducting bird surveys for the Grinnell Resurvey project, habitat restoration projects, and wildlife impact assessments; and promoting wildlife and climate change education. I also have expertise with a variety of census techniques for birds and relevant statistical analyses. Over the past 14 years I have conducted research on birds and habitat restoration in over 30 field projects in California, Idaho, Hawaii, the Marianas Islands, Louisiana, and Alaska. I have supervised full-time and seasonal staff, managed multiple budgets, written numerous management plans, scientific reports, and journal publications, and honed my communication, leadership, and organizational skills. I served on the Executive Steering Committee for California Partners in Flight (2001-2004), served as Scientific Advisor to San Francisco Bay Bird Observatory (2003-2004), and have been a reviewer for ornithological scientific journals, including *The Auk*, *Journal of Field Ornithology*, and *Journal of Raptor Research*, since 2001.

SIX SELECTED PUBLICATIONS AND REPORTS

Maurer, J., C. Barnes, and **S. L. Stock**. 2011. Peregrine Falcon Recovery in Yosemite National Park. Final Report to the Yosemite Fund, Yosemite National Park.

Stock, G., J. Roche, M. Buhler, **S. L. Stock**, J. Holmquist, J. Schmidt-Gengenbach, T. Russo, and A. Fisher. 2010. Looking downstream report: Physical and ecological responses to an experimental pulse flow downstream of Hetch Hetchy Reservoir, Yosemite National Park.

Stock, S. L., and L. Cline. 2010. Yosemite Environmental Education Center Annual Wildlife Assessment Report – Preconstruction Phase, Yosemite National Park.

Stock, S.L., R.S. Siegel, and D.R. Kaschube. 2010. Declines in Yosemite's bird populations. S. **Weber, ed. 2009.** *Rethinking Protected Areas in a Changing World: Proceedings of the 2009* **George Wright Society** *Biennial Conference on Parks, Protected Areas, and Cultural Sites.* **Portland, Oregon: The George Wright Society.**

Carlisle, J. D., C. H. Trost, **S. L. Stock**, and G. S. Kaltenecker. 2006. Autumn landbird communities in the Boise Foothills and Owyhee Mountains of southwestern Idaho. Western Birds 37:215-227.

Stock, S. L., P. J. Heglund, G. Kaltenecker, J. D. Carlisle, and L. Leppert. 2006. Comparative ecology of the Flammulated Owl and Northern Saw-whet Owl during fall migration. Journal of Raptor Research 40:120-129.

JAMES H THORNE Ph.D. March 2011 Curriculum Vitae

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Academic Background

2005-2010 Adjunct faculty, Geography Graduate Group, University of California, Davis, CA. http://ggg.ucdavis.edu/people/faculty
2006-2009 Research Scientist, Information Center for the Environment, UC Davis.
2003-2005 Post-Doct, Center for Applied Biodiversity Studies, Conservation International
2003 Ph.D. Ecology, University California, Davis
1997 M. A. Geography, University of California, Santa Barbara
1985 B.A. Environmental Studies, University of California, Santa Cruz

Recent Publications

Dobrowski, S.Z., J.H. **Thorne**, J.A. Greenberg, H.D. Safford, A.R. Mynsberge, S.M. Crimmins, A.K. Swanson. *In Press.* Modeling plant distributions over 75 years of measured climate change in California, USA: Relating temporal transferability to species traits. *Ecological Monographs*

Thorne, J.H., P.R. Huber, S. Harrison. 2010. Exploring tradeoffs among conservation goals in serpentine-rich landscapes. *In.* Harrison and Rajakaruna *eds.* Serpentine: A model for evolution and ecology. University of California Press.

Forister, M.L., A.C. McCall, N.J. Sander, J.A. Fordyce, J.H. **Thorne**, J. O'Brien, D.P. Waetjan, A.M. Shapiro. 2010. Compounded effects of climate change and habitat alternation shift patterns of butterfly diversity. *Proceedings of the National Academy of Sciences.* 107:1-5.

Thorne, J. H., P. Huber, E. Girvetz, J. F. Quinn, M. McCoy. 2009. Integration of regional mitigation assessment and conservation planning. *Ecology and Society* 14:47

Thorne, J. H., J.H. Viers, J. Price, D. M. Stoms. 2009. Spatial patterns of endemic plants in California. *Natural Areas Journal* 29:137-148.

Current Projects

Climate Change Vulnerability Assessment for California – California Energy Commission
I serve as a landscape ecologist, modeler and data coordinator for a multi-investigator effort to improve projections of vulnerability to California across multiple sectors including agriculture, water availability, fire, and biodiversity. My group is producing downscaled historic and future climates, urban growth models, and a dynamic vegetation model output. Overall project is for 18 months and $4M.

Resource Management Under Uncertainty, US National Parks. I am the landscape ecologist in an effort to assess biological and ecosystem vulnerability to climate change in Sequoia and Kings Canyon National Parks. Proactive vulnerability assessments, and development of conservation management strategies is a new area of research for the US National Parks, which is grappling with whether it is possible to increase biological resilience to climate change, and what management strategies might be required. Our funding is $60,000.