(**#10** of **30)**

Project Title:

Develop Analyses, Modeling, and Decision Support System Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change

Project Leader:

Sam Veloz, Spatial Ecologist
PRBO Conservation Science
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Petaluma, CA 94954

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Scope & Budget:

Location: CA LCC Wide
Duration in months: 12
Requested Funding: $100,000.00
Leveraged Funding: $289,600.00

Partners:

Sam Veloz, Grant Ballard (PRBO): coordinate project and make materials available online. James Quinn, Patrick Huber (UC Davis): lead and host the in-person courses. Tom Stohlgren: provide tested training materials for managers, on-line models and remote sensing and invasive species data. Pat Lineback (FWS): provide liaison with managers, technical staffs, and coordinate future offerings. All partners will contribute with the development of course curriculum and help unify modeling tools and reference materials.

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.

Most natural resource managers, planners, and policy makers are now dependent upon spatially explicit environmental suitability and spatial allocation analyses to inform policy and management decisions. There is general recognition that these data, analyses and tools support improved science application and can improve extremely complex ecological decisions in an era of scarce resources to make cost effective decisions that optimize resource objectives. Unfortunately, staff across agencies have been unable to stay current on understanding and applying these new data, tools, and analyses. There is danger that that these data, tools, and analyses will be underutilized, or used inappropriately resulting in bad decisions and lowering credibility with the public they serve. Moreover, California LCC stakeholders would benefit from a more unified understanding and application of this modeling framework. We propose to collaboratively develop two training curriculums and pilot test delivery of these curriculums to staff across agencies and organizations. The material and content delivery will focus on best practices derived from current literature and experience. We will develop two courses, one for managers and another for GIS-statistical analysts. The training materials will be open-source and widely distributed, especially to California LCC stakeholders. We will work with agencies to develop long term support on the delivery and maintenance of this course content to ensure regular training updates in the future. Goals: 1. Educate managers and technical staff on current best practices for developing and using spatial environmental suitability models, resource allocation applications, and appropriate application of models and interpretation. 2. Train technical staff to complete their own analyses using appropriate tools, model outputs, and data. 3. Train both technical staff and managers to understand new data and analyses availability, including abundant climate change data, and appropriately apply to their local decision needs. 4. Emphasize educating staffs to better understand concept of uncertainty and consider it in their decision-making framework.

Briefly describe how the project team (main PIs) provides the range of experience, expertise, and organizational capacity needed to accomplish the project.

Dr. Sam Veloz, (1) Tidal Marsh Bird Population and Habitat Assessment for SF Bay Under Future Climate Change Conditions, Sept, 2010-March 2011. 5 months, $100,241.00, (2) Modeling the impacts of climate change on birds and vegetation on military lands, 2.5 months $148,563.00 (3) Confronting uncertainty in species distribution projections: Increasing the applicability of an essential tool in climate change adaptation planning. Co-PI with Healy Hamilton funded by the CA LCC, 2.5 months, $100,000.00 (4) Adapting to Sea Level Rise along the North Bay Shoreline. Funded by the North Bay Watershed Association, 1.5 months, $50,000.00 (5) Our Coast-Our Future: Planning for Sea Level Rise and Storm Hazards in the San Francisco Bay Area. 3 months $899,530.00, (6) Current and Future Distribution and Abundance of North Pacific Landbirds in the Context of Climate Change. Funded by the North Pacific LCC, 2 months, $95,000.00.

Dr. Thomas Stohlgren, (1) Integrated Bioclimatic-Dynamic Modeling of Climate Change Impacts on Agricultural and Invasive Plant Distributions in the United States, funded by USDA-CSREES, 4.8 months, $530,000.00, (2) Invasive Species Mapping, Modeling, and Forecasting. Funded by the USGS, 18 months, $600,000. Dr. James Quinn, (1) International Seminar on Climate Change and Natural Resource Management (Jan. 2010-Sept. 2015, 5 years, >$200,000 per year, $363,900 to date), Forest Service International Programs, (2) Design of Legacy Data Collection and Evaluation of Available Refuge Data (June 2011-Dec. 2013, $278,000) Fish and Wildlife Service, (3) Fuels and Fire Hazard in the Mojave Desert (July 2011- Sept. 2012, $151,000) USGS, (4) Parcel Data and Protocols (May 2011 – June 2013), California Strategic Growth Council. (For others see ice.ucdavis.edu)

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

A biological planning and conservation

Develop Analyses, Modeling, and Decision Support System Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change

Project Description: Spatially explicit environmental suitability and spatial allocation analyses are increasingly being employed by land managers to inform conservation decisions and climate adaptation planning. Powerful and general statistical and GIS tools to perform these analyses have arisen in the biodiversity-protection literature. For example, Maxent, a type of species distribution model which uses field observations and GIS derived environmental covariates to estimate site suitability where data aren't available, is one of the most commonly applied tools to estimate the response and vulnerability of species to climate change (http://data.prbo.org/apps/ecn/).

Despite the fact that there has been a proliferation of projects utilizing tools like Maxent to aid conservation decision making, many managers do not have the time or expertise to learn to use these new tools or to keep current with scientific developments in this field. For example, recent studies have investigated the advantages and limitations of Maxent and similar approaches. Additionally, new research has demonstrated how outputs from Maxent and related tools can feed conservation design software (Marxan, Zonation) that help managers choose low cost spatial allocations to satisfy multiple objectives and constraints (fuels treatment, nesting habitat, recreation, water retention) (Figure 1). These outputs can parameterize corridor design, critical habitat designations, land protection design, restoration priorities, , and other landscape-scale assessments..

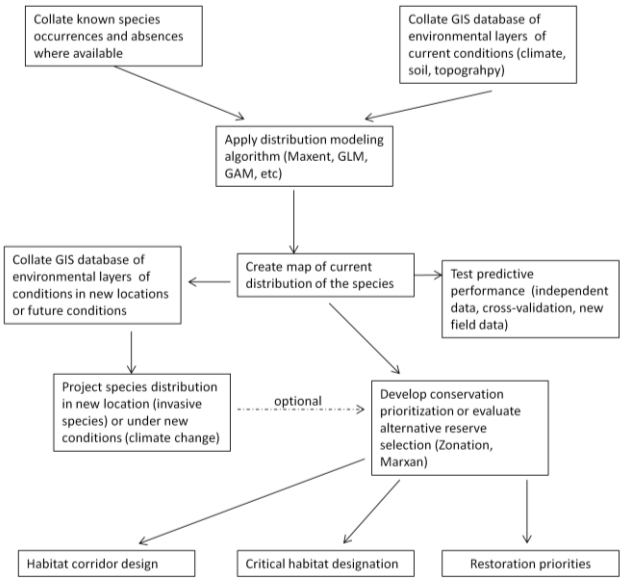

Figure 1 Workflow diagram illustrating the use of spatial environmental suitability models to aid natural resource management decision making.

However, land managers and their staff rarely have the time or the means to keep up to date with the most recent scientific literature on best practices and their applications. Further, the number of web sites and clearinghouses distributing data and information has increased and staff no longer have a complete understanding of available data and information which they could make use of. Informal surveys in the US Fish and Wildlife Service indicate an astonishing lack of knowledge and understanding of available and applicable climate change data and how to apply this new information to their local program needs. Thus, there is a danger that powerful tools are being underutilized or used inappropriately to make management or policy decisions.

The goals of our project are: 1. Educate managers and technical staff on current best practices for developing and using spatial environmental suitability models, resource allocation applications, and their use. 2. Train technical staff to complete their own analyses using appropriate tools, model outputs, and data. 3. Train both technical staff and managers to understand new data and applications, including abundant climate change data, and appropriately apply to their local decision needs. 4. Emphasize educating staffs to better understand concept of uncertainty and consider it in their decision-making framework. Our project will develop a training curriculum for teaching the best practices for the development of spatial models for conserving plants and animals in the face of climate change. We will develop two courses, one for managers and non-technical staff, and another for GIS-statistical analysts. The course for land managers will be geared towards understanding what tools and data are available, how they can be used, and identify existing data and information sources. We anticipate the course for managers will be two days long and the technical

class will be four days of "hands on" training. Both courses will be instructor led courses, but all course materials will be distributed and available. As an example, we will demonstrate the applications and limitations of commonly used tools such as Maxent, Zonation and Marxan for developing effective adaptation strategies to rapid environmental change. For the technical class, we will provide instruction on the whole modeling process; from acquiring data, to creating Maxent distribution models and applying them to derivative conservation planning applications such as Zonation. We will examine how uncertainty can be incorporated into model development or addressed in model outputs. Course content will be modularized, so that content can be independently used to build custom content outside of the curriculum. We will teach an interagency pilot of each course, and make open-source course materials, including sample data, available for more general application by LCC partners.

CA LCC Priorities addressed: Our project will provide pragmatic decision support for managers by teaching a synthesis of best practices, high quality data and tools, and how to intelligently use this new information. Our courses will help managers understand the tools that are available, including understanding and applying uncertainty associated with analytical products. Similarly, our hands on course will enable technical analysts in public agencies to complete their own analyses. By evaluating a set of existing tools in our test workshops we can provide feedback as to what is working and what is missing from available tools for climate adaptation planning. We expect that our courses will add value to existing conservation planning efforts by enabling managers to take advantage of the best available scientific tools.

Our courses and curriculum will provide a resource LCC partners can use to conduct analyses which examining ecosystem impacts and the ability to track change specific to managers needs. For example, using models we have already developed, we will demonstrate examples of how models of species distributions are being used to inform the design of renewable energy development for the Desert Renewable Conservation Plan in southern California (Howell and Veloz, 2011). After completing our courses, managers and their staff will have a better understanding of how species distribution models can be used to predict species habitat changes in response to climate change.

CA LCC Criteria addressed: 1) Our project will directly support resource managers and analysts in public agencies through development of a dynamic curriculum and delivering training to better inform understanding of the data, tools, and analyses being used to assess threats from rapid environmental change. Our curriculum will help managers and analysts to be able to use existing models for their conservation or adaptation decisions and will provide them with the training to create their own models when existing products do not meet their needs. 2) Through our courses, we will demonstrate how sources of uncertainty can be incorporated into a typical analysis workflow and we will present results from currently funded CA LCC projects which are investigating which sources of uncertainty are greatest with distribution modeling across the state of CA with birds and plants. 3) Our courses will be integrative as we will use examples of decision support tools for plants, birds, and invasive species. We will use the California Climate Commons (http://climate.calcommons.org/), Environmental Change Network (http://data.prbo.org/apps/ecn/) and the International Biological Information System (ibis.colostate.edu) as case studies for how existing tools can be used to acquire data and applied to support management decisions. 4) Our courses will be made widely accessible through the California Climate Commons or team members' websites. 5) Our team includes scientists from academic institutions, federal agencies and non-profit organizations and provides a strong connection between cutting edge science and the needs of managers. Each team member will be

leveraging a considerable expertise gained from work over the last decade in applying the spatial models we will be teaching for research and conservation applications. We also anticipate that the courses will provide opportunities for new collaborations between the instructors and participants as we explore how the needs of managers can be met through spatial modeling. 6) Our curriculum will provide training on tools and models that are currently being applied throughout the CA LCC as well as in many other LCCs across the continent. Our curriculum could be used to help ensure consistent methodologies are being applied within and across LCCs.

Scope of Work – Approach & Integration with Related Projects: We will develop a training curriculum for two training courses; one targeted at managers and non-technical staff and the other targeted at GIS analysts. By developing two courses we will be able to provide guidance at a more general level to managers that need to understand and use model outputs to guide decisions while also providing the technical details GIS analysts need to produce their own models and provide support for interpreting existing tools. Every module of these courses will follow instructional lesson plan guidelines including: module objectives, materials needed, procedures, practice, assignments, assessment checks, and evaluation.

The course for managers will be two days long and will focus on introducing tools which are currently available for spatial models to support plant and animal conservation and adaptation planning for rapid environmental change and discussing the applications and limitations of various approaches. An important outcome of this training will be to give managers a list of questions they can ask to help assess a model's output. Further, managers will be exposed to existing data and information availability, particularly climate change data. The course material will be presented as a set of modules associated with a workflow. These modules include the assembly of model input data (occurrence data, environmental data); modeling of species distributions, conservation prioritization and planning; and connectivity analyses and planning for ecosystem services (i.e. reserve design planning, restoration priorities, water footprints) (Figure 1). Upon completion, managers will be able to identify which tools are best suited for their decision-making needs and they will be able to interpret and select from existing model outputs to support their conservation and adaptation efforts.

DRAFT Management course curriculum outline (2 day course):

- Pre-workshop review: A suggested reading list and a list of related online decision support tools to explore prior to the course.
- General overview
    - What are models and how should they be used to support decision making?
    - Describe the modeling workflow using existing projects as examples
    - Managing uncertainty
- Resources available
    - Data: Species occurrences, current and future climate data, etc.
    - Existing web application and clearinghouses such as climate change, species distribution sites
    - Dealing with lack of data.
- Species distribution models
    - Background
    - Maxent: Applications, assumptions, limitations

- Conservation applications (Marxan, Zonation, corridors)

The course for GIS analysts will be focused on the same general topics as the course for managers but will go into greater depth and will be a hands-on training. The curriculum will enable participants to use provided sample data to create models that they could use for application in their agency.

DRAFT GIS analyst course curriculum (4 day course)

- Pre-workshop review: A suggested reading list and a list of related online decision support tools to explore prior to the course, tutorials to try out existing tools.

- General overview
  - What are models and how should they be used to support decision making?
  - Describe the modeling workflow using existing projects as examples
  - What to do about uncertainty
- Resources available
  - Input data:
    - Species occurrences (standardized vs. citizen science vs. museum)
    - Climate data (observed data, general circulation models)
  - Web applications
    - California Climate Commons
    - Environmental Change Network
    - International Biological Information System
  - Dealing with lack of data.
- Species distribution modeling (Maxent)
  - Introduction to distribution modeling
  - Introduction to Maxent
    - Background, assumptions, applications, limitations
    - Using Maxent
    - Model selection
    - Evaluating predictive performance
    - Practice using with tutorials and sample data
- Conservation planning prioritization (Marxan/ Zonation)
  - Introduction and background
  - Applications: what tools are best for which questions
  - Practice using tools with output models from Maxent exercises
- Modeling with rapid environmental change
  - Climate Change
    - Changes is species distribution
    - No-analog climate and model extrapolation
  - Invasive species
    - Predicting introductions and expansions
    - Response to climate change
  - Connectivity
    - Can we facilitate the movement of species across a changing landscape?

We will develop the curriculum for both courses and then run pilot workshops to test and revise the course material. At the conclusion of each pilot workshop we will have participants fill out a workshop survey to evaluate the course. Based on feedback, we will revise the curriculum and distribute widely. The US Fish and Wildlife service has agreed to try to create a regular update and delivery process for course curriculums.

Products/Data Sharing: For our project we will develop a training curriculum for both courses that will include sample data, multimedia, and module lesson plans. The courses themselves will open to anyone interested but the target audiences will be planners, managers, and technical analysts (usually GIS Specialists). We will make final course content and curriculum available through partner websites and the California Climate Commons.

Measuring results: Our project will be successful if after finishing our courses, workshop attendees are able to critically evaluate existing models and tools and conduct their own analyses using the tools we have demonstrated. We will have all attendees evaluate the courses upon completion and will incorporate lessons learned into our curriculum which we will provide online. Further, we will encourage those who do not attend the workshop to access our curriculum through the California Conservation Commons where they can rate the courses and discuss the curriculum with other users.

The final deliverables for this project will include: lesson plans, multimedia support such as powerpoints, and sample data. Our goal is that other instructors can reuse this content either wholly or as modules within their own instructional content.

Project Timeline

Task	Q1	Q2	Q3	Q4
Literature review including existing courses	x			
Develop course curriculum		x	x	
Incorporate feedback on proposed course content from potential users		x	x	
Hold test workshops			x	
Incorporate feedback from workshop participants/ revise curriculum				x
Distribute course curriculum online				x

References

C.A. Howell and S. D. Veloz. 2011. Priority Areas for Breeding Birds within the Planning Area of the Desert Renewable Energy Conservation Plan. PRBO Technical Report. PRBO contribution #1823.http://www.prbo.org/cms/docs/terre/PRBOTechnicalReport_PriorityAreasforBreedingBird%20intheDRECP_V4.0_122811.pdf

California Landscape Conservation Cooperative 2012 Proposal Budgets

Budget Categories	CA LCC Request	Partner(s) Contribution(s) (monetary)	Partner(s) Contribution(s) (non-monetary value/in-kind)	**Total**
Subcontract UC Davis ICE	$ 25,900.00		$ -	$ 25,900.00
Subcontract CSU/USGS	$ 8,000.00			$ 8,000.00
Salaries & benefits PRBO	$ 36,300.00			$ 36,300.00
Workshop costs	$ 3,000.00			$ 3,000.00
Travel	$1,000.00			$ 1,000.00
Supplies	$ 700.00	$ -		$ 700.00
Equipment			$ -	$ -
Testing teaching material and course content (USFWS)	$ -		$ 20,000.00	$ 20,000.00
Project Management/ Administration (UC Davis ICE)			$ 9,600.00	$ 9,600.00
Descion support tool development	$ -	$ -	$ 250,000.00	$ 250,000.00
UC Davis workshop adiminstration			$ 10,000.00	$ 10,000.00
Overhead	$25,091.50		$ -	$ 25,091.50
Total	$ 99,991.50	$ -	$ 289,600.00	$ 389,591.50

SAN FRANCISCO BAY JOINT VENTURE

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415-259-0340 fax

Rebecca Fris
Science Coordinator
California Landscape Conservation Cooperative
East Modoc Hall Suite 2007
3020 State University Drive
Sacramento, CA 95819

13 May 2012

Dear Ms. Fris:

I am pleased to send this letter of support by the San Francisco Bay Joint Venture (SFBJV) for the project entitled: "Develop Analyses, Modeling, and Decision Support System Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change," submitted by **Dr. Sam Veloz** (PRBO Conservation Science) for consideration of funding through the California Landscape Conservation Cooperative. The proposed project addresses development of a training curriculum for a host of analytical tools currently being used to assess threats from climate change. It will directly support resource managers and analysts in public agencies by providing much needed guidance to better understand and apply recently developed spatial modeling tools.

The SFBJV 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 SFBJV 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 recent years a large amount of conservation resources have been devoted to the development of species distribution models and related decision support tools, as for example the interactive San Francisco Bay sea level rise tool (http://data.prbo.org/apps/sfbslr/). However, managers frequently do not have the required training and experience to adequately use these tools or evaluate models and consider associated assumptions. The proposed curriculum and courses on a suite of available tools would therefore fill an extremely important management need by providing guidance and education to our staff and our partners' staff to both evaluate and use these tools to effectively aid their work. We also feel that the courses will meet the needs of a wide audience by providing training to both a technical and non-technical audience, which would benefit a variety of SFBJV partners.

If funded, the SFBJV will send staff, and encourage partner's attendance of the proposed courses. From our past collaborations with the project team we are confident that they possess both the skills and abilities to develop and deliver an effective course curriculum that will benefit conservation efforts in the San Francisco Bay Area. The SFBJV Management Board therefore fully supports this proposal to develop the proposed training curriculum development and implementation, and urges the California Landscape Conservation Cooperative to fund it in full.

Sincerely,

Diane Ross-Leech
Chair, SFBJV Management Board

State of California -The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
1416 9th Street, 12th Floor
Sacramento, CA 95814
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EDMUND G. BROWN, JR, Governor
CHARLTON H. BONHAM, Director

(916) 324-6906

May 8, 2012

California Landscape Conservation Cooperative
3020 State University Drive E. #2007
Sacramento, California 95819

Subject: Letter of Support for Proposal to Develop Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change

Good people,

I would like to express California Department of Fish and Game's support for the proposal "Develop Analyses, Modeling, and Decision Support System Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change."

Government agencies are having increasing difficulty with implementing analytical applications and data outputs focused on delineating species distribution ranges, assessing habitat connections, and evaluating future climate change scenarios. Newly available applications such as MaxEnt and Marxan are robust tools that can improve our capacity to better model species ranges and optimize conservation design in an era of scarce resources. Unfortunately, most agencies don't understand these applications well enough to independently assess, apply, and review these complex model outputs. This proposed training curriculum development and pilot training will help us to improve our understanding and appropriate use.

There are astonishing new levels of downscaled climate data that has become available from multiple sources that will enhance our ability to anticipate and plan for change. Our staff has a compelling need to understand these different sources and how to appropriately apply this data to future scenarios impacting our planning and management activities. This training will benefit us through its focus on compiling, summarizing, and delivering appropriate levels of information. Even though these new analytical tools will improve our analytical capacities, it is extremely important that our staff be able to understand these applications uncertainty. I'm particularly delighted that this new training will support better understanding of model output uncertainty and how we can better consider it within our decision-making framework.

The climate change tools, data, and information now available have overloaded our staffs' capacity to keep current and informed. This training curriculum proposal seems to be an effective way to help our management and technical employees stay informed and current. An interagency approach to teaching these skills is the best approach.

I want to express my enthusiastic support for this proposal. Please contact me at the letterhead number if you have any questions.

Sincerely,

Thomas Lupo, Chief
Biogeographic Data Branch
1807 13th Street, Suite 202
Sacramento, CA 95811

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region
2800 Cottage Way, Suite W-2606
Sacramento, California 95825-1846

In Reply Refer To:
FWS/R8/ES

Debra Schlaffman
Ca LCC Coordinator
3020 State University Dr. E. #2007
Sacramento, California 95819

Subject: Letter of Support Ca LCC Proposal

Dear Deb,

I am writing to express my enthusiastic support for the proposal "Develop Analyses, Modeling, and Decision Support System Training Curriculum to Support Improved Plant and Animal Conservation in the Face of Climate Change." It is hard to overstate the importance of the role that species modeling serves in the world of conservation planning. Whether the need is to fill data gaps or to utilize existing data for analysis, species modeling has become a crucial tool in providing a robust and sound scientific basis to aid the decision making of conservation planners. Unfortunately, staff too often lacks the skills to operate the models or even understand the results of model runs produced by others.

In the realm of Habitat Conservation Plans, we often either utilize or should have utilized models like Marxan and Maxent to improve our planning process. By formulating best practices for the development of spatial models, model outputs will improve, thus increasing not only our scientific quality but also improving conservation implementation for HCP's and all areas that the Service utilizes such models.

This proposal, if funded, would fill a key need in not only educating staff about useful models, but would also improve the modeling process and framework for conservation planners. Project contributors are well versed in the subject matter and will provide excellent leadership in guiding the process through completion. This project is in good hands with a diverse, highly-qualified group of experts to lead it.

Thank you very much for your support in improving a key need of the Service, please contact me if you have any questions.

Dan Cox
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EDUCATION

Ph.D. Ecology, University of California Davis, September 2002-July 2008
B.A. Environmental Studies, Minor in Latin American Studies, University of California, Santa Cruz, June 1997.

RESEARCH EXPERIENCE

PRBO Conservation Science, Spatial Ecologist current
Bryson Interdisciplinary Climate People and the Environment postdoctoral fellow, Department of Geography, Center of Climatic Research, University of Wisconsin Madison. 8/2009-7/2010. Advisor: Jack Williams
Postdoctoral Researcher, Department of Environmental Science and Policy, UC Davis,7/08-8/09
Advisors: Susan Harrison/ Hugh Safford.
Doctoral Research, UC Davis, 9/02- 9/08
Environmental Services Intern, Calif. State Parks, Monterey District. (10/98 – 8/02)

PEER REVIEWED PUBLICATIONS

Veloz, S.D., John Williams, Feng He, Zhengyu Liu, Bette Otto-Bliesner. 2012. No-Analogue Climates and Shifting Realized Niches During the Late Quaternary: Implications for Species Distribution Models. *Global Change Biology*, 18: 1698-1713.

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Williams, J. Kharouba, H., **Veloz, S.D**. McLachlan,J., Vellend, M., Liu, Z., Otto-Bliesner, B., He, F. 2012. The Ice Age Ecologist: Testing Methods for Reserve Prioritization and Biodiversity Conservation During the Last Global Warming. *Global Ecology and Biogeography*, In Press.

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Veloz, S.D. (2009) Spatially autocorrelated sampling falsely inflates measures of accuracy for presence-only niche models. *Journal of Biogeography*. 36: 2290-2299.

James Franklin Quinn

Professional Preparation:

Harvard University	Biology	AB *cum laude*, 1973
University of Washington	Zoology	PhD, 1979

Appointments:

1981-present Assistant, Associate and Full Professor, Environmental Science and Policy, UC Davis
1994-present Director, Information Center for the Environment, UC Davis
1979-1981 Lecturer in Biology, University of Pennsylvania

Selected Relevant Publications:

Parks BO, Fornwall MD, **Quinn JF**. (2004). First NBII Biodiversity Modeling Workshop: Results and Recommendations. Proceedings of NBII Biodiversity Modeling Workshop, July 27-31, 2003, Maui, HI.Prepared by the North American Consortium for Biodiversity and Ecosystem Informatics (NAC-BDEI) at the University of Colorado at Boulder for the National Biological Information I nfrastructure. Denver,CO: U. S. Geological Survey, Center for Biological Informatics. http://www.nbii.gov/about/pubs/NBIIBiodiversityModeling.pdf

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Thode, A; JW van Wagtendonk; JD Miller; **JF Quinn**. Quantifying the Fire Regime Distributions for Severity in Yosemite National Park, California, USA. International Journal of Wildland Fire (in press)

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Underwood, EC, AD Hollander and JF Quinn, in press. Geospatial Tools for Identifying and Managing Invasive Plants, in Invasive Plant Ecology, S. Jose, H. Singh, D. Batish and R. Kohli, eds., CRC Press/Taylor & Francis (June 2011)

Other Significant Publications:

Thorne J, Huber P, Girvetz E, Quinn J, McCoy M. (2009). Effects of Roads and Traffic on Wildlife Populations and Landscape Function. Ecology and Society, 14(1): 47. [online] URL: http://www.ecologyandsociety.org/vol14/iss1/art47/

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USA. AVIRIS Proceedings 2002. Jet Propulsion Laboratory http://popo.jpl.nasa.gov/docs/workshops/02_docs/2002_Viers.pdf

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Education

University of California, Berkeley	Forestry	B.S.	1978
California State University, Fresno	Biology	M.A.	1982
University of California, Davis	Ecology	Ph.D.	1990

Professional Employment

1991, 1995-present	Affiliate Faculty, Dept. Ecosystem Science and Sustainability and Graduate Degree Program in Ecology, Colorado State University
1991-present	Senior Scientist, Natural Resource Ecology Laboratory, Colorado State University; "Distinguished Ecologist" in 2012.
1991-present	Research Scientist, Fort Collins Science Center, U.S. Geological Survey, National Institute of Invasive Species Science (previously titled Ecologist in the Department of the Interior, 33 years)

Professional Affiliations/Activities

In 2009, Stohlgren was recognized as one of the top ten most productive scientists in the world in the field of biological invasions (Qiu and Chen 2009; Scientometrics 81(3): 601–610). Stohlgren is USGS Liaison to Neon and helps design biological sampling, and on scaling issues for NEON; Director of the National Institute of Invasive Species Science http://www.NIISS.org. Service to the broader ecological community includes: Ecological Society of America (member since 1984); Editorial Board for Ecology and Ecological Monographs, February 2001-2011. He teaches graduate ecology classes at Colorado State University and trains students.

*Selected Publications (*from over 190 total; 56 since 2007):

1. Stohlgren, TJ, P Pysek, J Kartesz, M Nashino, A Pauchard, M Winter, J Pino, D Richardson, JR Wilson, B Murray, M-L Li, L Celesti, and X Font. 2011. Widespread Plant Species: Natives vs. Aliens in our Changing World. Biological Invasions 13:1931–1944. DOI 10.1007/s10530-011-0024-9
2. Stohlgren, T. J., D.T. Barnett, S. Kumar, and P. H. Evangelista. 2011. Using maximum entropy modeling for optimal selection of sampling sites for monitoring networks. Diversity 2011, 3, 252-261; doi:10.3390/d3020252
3. Stohlgren, T.J., C. Jarnevich, W. Esaias, and J.T. Morisette. 2011. Bounding Species-Environmental Matching Models. Current Zoology 57 (5): 642-647.
4. Stohlgren T.J., P. Ma, S. Kumar, M. Rocca, J.T. Morisette, C.S. Jarnevich, and N. Benson. 2010. Ensemble habitat mapping of invasive plant species. Risk Analysis 30(2): 224-235.
5. Stohlgren, T.J., C.S. Jarnevich, and C. Giri. 2010. Modeling the human invader. Journal of Applied Remote Sensing 4, 043509 (Feb 18, 2010); http://dx.doi.org/10.1117/1.3357386.
6. Jarnevich, C. S. and T. J. Stohlgren. 2009. Near term climate projections for invasive species distributions. Biological Invasions 11:1373-1379.
7. Stohlgren, T.J., D.T. Barnett, C.S. Jarnevich, C. Flather, and J. Kartesz. 2008. The myth of plant species saturation. Ecology Letters 11:313 -326.
8. Stohlgren, T.J. 2007. Measuring Plant Diversity: Lessons from the Field. Oxford University Press, New York, New York. 390 pp.

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EDUCATION

- California State Polytechnic University, Pomona, CA. Secondary Teaching Credential (1985): Science and Agriculture
- Michigan State University, East Lansing, MI. MS (1980): Parks and Recreation Resources Management
- California Polytechnic State University, San Luis Obispo, CA. BS (1978): Natural Resources Management

PROFESSIONAL EXPERIENCE

2010 - Present; Regional GIS Coordinator, Region 8 US Fish and Wildlife Service, Sacramento, CA
1994 - 2010; GIS Coordinator, US National Park Service, Sequoia and Kings Canyon National Parks, Three Rivers, CA
1991 – 1994; GIS Planner, US National Park Service, Denver Service Center, Lakewood, CO
1989 – 1991; District Ranger, US National Park Service, Lake Meredith National Recreation Area, Fritch, TX

SELECTED CURRENT AND RECENT PROJECTS

2012 – 2013: (Coordinator) Develop and Integrate National Data Standards for Improving Habitat Conservation Planning Process
2011 - 2012: (Coordinator) Develop Interagency Data Delivery Standards and Specifications Template for Improving Contracts and Agreements
2009 – 2010: (Coordinator) Natural Resources Condition Assessment for Sequoia and Kings Canyon National Parks
2000 – 2003: (PI) Develop a Landscape Scale Framework for Interagency Wildland Fuels Management Planning, Southern Sierra Geographic Information Cooperative