Project Title:

Understanding impacts of climate change on ecology and habitats of waterfowl, shorebirds, and other waterbirds

Project Leader:

Joseph Fleskes, Wildlife Research Biologist
USGS-Western Ecological Research Center
6924 Tremont Road
Dixon, CA 95620

530-669-5074
joe_fleskes@usgs.gov

Scope & Budget:

Location: Central Valley
Duration in months: 12
Requested Funding: $79,460.00
Leveraged Funding: $181,050.00

Partners:

USGS-Western Ecological Research Center (Project lead, modeling, coordination, website, reporting, provide in-kind salaries/equip) Ducks Unlimited, Inc. (Application of TRUMET bioenergetics modeling, provide in-kind computers) Central Valley Joint Venture(Advise on management goals, provide in-kind salaries) PRBO Conservation Science (Shorebird/other waterbird ecology, provide in-kind computers) Stockholm Environment Institute (Adaptation/application of WEAP model, provide in-kind computers) University of California-Davis(Lead application of agent-based bioenergetics modeling, provide in-kind computers) Delta Waterfowl Foundation (Provide $80K/year to support new partnership with SEI and UCD)

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.

Funding is needed to support continuation of this multi-partner project which provides necessary data, tools, and support for the CVJV and other resource program managers to understand impacts of climate change, urbanization, and water supply management decisions on habitats and ecology of waterfowl, shorebirds, and other waterbirds in the Central Valley. Goals include 1) adapting the WEAP (Water Evaluation And Planning) model used by state and federal planners which accounts for water distribution system limitations to better predict water supplies available for wetlands and agricultural habitats important to waterbirds; 2) developing databases that are necessary to model habitat impacts of climate, urbanization, and proposed changes to management of water supplies; 3) applying various climate, urban growth, and water management scenarios in WEAP to estimate amount and temporal availability of water and supported waterbird habitats; 4) estimating impacts of each scenario on wintering waterfowl food supplies and avian bioenergetics and ecology; 5) identifying critical waterbird resources in the Central Valley most at risk; and 6) helping develop management strategies to account for climate and other factors in waterbird habitat conservation planning in the Central Valley. Products include: a) reports, presentations, and a website describing water supplies, supported habitats, and waterbird impacts under each scenario, b) improved WEAP-CV model that will produce accurate estimates of water needs for waterbird habitats when the model is used in the future by the State of California and others, and c) consultations with managers to apply project results and develop adaptive habitat conservation strategies. The project will improve planning and delivery of the CVJV and other programs by providing critical information and an improved modeling tool to understand projected impacts on habitat of climatic change, urbanization scenarios, and proposed changes to management of water supplies. Although this work will focus on waterfowl, shorebirds, and other waterbirds during the non-breeding period, it will also inform, and could be expanded to specifically address other periods and wetland-dependent species. Further, this work will provide a basis for similar evaluations in other regions. Thus, this project will help deliver and coordinate conservation planning to policy-makers, identify information still needed, and promote similar efforts in other regions.

For continuing 2011 CA LCC projects, describe the accomplishments and outcomes to date, why additional funds are needed, and what this proposal will add to the project.

The project is progressing well, and as evidenced by the continued support of numerous partners, continues to produce useful results and improved planning tools. Funding is needed to continue this work to evaluate habitat impacts of additional proposed changes in water management and expand into more Central Valley basins. During the last year, we

refined our approach to simulate surface and ground water supplies/demands completely within the WEAP model framework. To accomplish this, we recruited funding from the Delta Waterfowl Foundation to support collaboration with the WEAP developers (Stockholm Environment Institute) to improve the model and more fully utilize its capabilities. Although considerable upfront work was required to adapt WEAP to more accurately model waterbird habitats (e.g., add winter-flooded agricultural habitats not represented, update/correct area of wetlands, distinguish water supply sources not specifically represented, combine land cover datasets in a GIS to better calculate land cover class areas at a finer spatial resolution, etc.), the result is a model that now produces accurate estimates of water needs for waterbird habitats. These improvements are important not only for this project but also when WEAP is used in the future by the State of California and others. We used this refined modeling approach and compiled the necessary data to evaluate14 additional Butte Basin scenarios through year 2065 for projections combining 1) Climate (GFDL1-A2, PCM1-B1, and historical); 2) Urban development ("expansive growth", "strategic growth", and no growth); and 3) Water management (Butte Basin rice land idling, Butte Creek flow requirements, and current water mgmt). Results show that urbanization has a cumulative negative impact on habitat and the assumed rate of urbanization had the greatest impact on habitat among the factors (and levels of the factors) evaluated thus far. Drought that substantially reduced habitat was most frequent in GFDL-A2 scenarios. An Oct-Jun instream flow requirement of 40 cfs proposed for Lower Butte Creek is projected to have negligible habitat impact. Under some scenarios, water supplies will not be adequate to maintain habitat necessary to support CVJV goal populations of waterfowl and unless CVJV habitat planning is adjusted will result in late-winter food deficits for waterfowl and other waterbirds. Additional project info available at: http://www.werc.usgs.gov/Project.aspx?ProjectID=204

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

The project team was assembled to provide the required range of expertise necessary to address this complex subject and accomplish project goals. Dr. Joseph Fleskes (USGS-WERC) has 30+ years of research on ecology and habitats of waterfowl and other waterbirds in the Central Valley and other regions of the world. He has successfully led several large-scale multi-partner projects focused on providing information to guide landscape and population conservation. Mr. Elliott Matchett (USGS-WERC) has extensive experience in both waterfowl ecology research and water supply management in California. Dr. Mark Petrie (DU) developed the TRUEMET bioenergetics model and has applied the model to guide implementation of the CVJV, the Intermountain West Joint Venture, and numerous other conservation planning efforts in North America. Dr. David Purkey and Dr. Charles Young (SEI) developed and applied the WEAP model to guide water supply planning in California and other world-wide regions. Dr. Matthew Reiter (PRBO) is an expert in ecology of shorebirds and other waterbirds. Dr. John Eadie has conducted extensive research investigating and modeling ecology of waterfowl and other wildlife.

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

A risk and vulnerability assessment
A population and habitat assessment
A biological planning and conservation
A management evaluation action

Project Title: Understanding impacts of climate change on ecology and habitats of waterfowl, shorebirds, and other waterbirds

Project Leader: Dr. Joseph P. Fleskes /USGS-Western Ecological Research Center / Dixon Field Station, 6924 Tremont Road, Dixon CA 95620; 707-678-0682 ext. 628; 707-678-5039 fax; joe_fleskes@usgs.gov

Project Description: This multi-partner project uses scenario modeling to provide data, improved tools, and support that are necessary for the Central Valley Joint Venture and other resource program managers to understand impacts of climate change, urbanization, and water supply management on habitats and ecology of waterfowl, shorebirds, and other waterbirds in the Central Valley of California. Additional project information is available at: http://www.werc.usgs.gov/Project.aspx?ProjectID=204

Waterbird habitats in the Central Valley critical to waterfowl and other wetland birds are highly dependent on snow pack and other precipitation for water supplies. Hydrology of most waterbird habitats in the Central Valley, which include wetlands, flooded rice fields, and other flooded agricultural lands, has been greatly modified. Natural overflow flooding from snow-melt and rain has mostly been replaced by managed flooding with controlled diversions and pumped water delivery from ditches, rivers, sloughs, and wells. Thus, the amount of water stored in reservoirs and how that water is managed is crucial to determining the amount of waterbird habitat in the Central Valley. During years with average or above-average reservoir levels, water is available to allow summer irrigations and normal fall flooding and winter maintenance of managed habitats; winter rains provide additional winter habitat. Dry-to-extreme drought conditions can restrict summer irrigations, reducing wetland production of seeds, and reduce or delay fall and winter flooding.

Food availability is a key factor limiting waterbirds (waterfowl, shorebirds, waders) during migration and winter, and habitat conditions during the non-breeding period may influence reproductive success. Like most Joint Ventures working in waterbird wintering regions, the Central Valley Joint Venture (CVJV) uses a food energy (i.e., bioenergetics) modeling approach to establish habitat objectives for waterfowl and other waterbirds. First, waterbird population objectives, based upon historic bird use patterns and plan population goals (e.g., North American Waterfowl Management Plan) are set. Next, using daily energy requirements for individuals of each species, the amount of required energy for sustaining those goal "use-days" is determined. Finally, using data on food density produced by each type of waterbird habitat (e.g., wetland and flooded agriculture), the model compares population food energy needs and food energy supplied by the mix of available habitats. Timing and amounts of necessary water supplies can then be estimated based on the type and area of required habitats.

Climatic change, urbanization, and management of water supplies are all factors that impact the amount and timing of water that is available to support waterbird habitats. Climatic models indicate substantial changes in temperature and timing and amounts of precipitation with the severity depending upon projected CO_2 levels and circulation model. Urbanization affects habitat directly via habitat destruction and indirectly by increasing water demand for urban uses; the severity of impacts depend upon the rate of growth and how that growth is directed. Water supplies available to support waterbird habitats ultimately depends upon how water supplies are managed, a process that involves a myriad of supply prioritization decisions restricted by political, legal, and financial considerations and limited by the physical capacities of the complex, interconnected California water delivery system. The overall objective of this project is to aid conservation planning by providing the data, tools, and support necessary to understand the combined impacts of these factors on habitats and ecology of waterfowl, shorebirds, and other waterbirds in the Central Valley. Specific project goals are to:

- Improve the WEAP (Water Evaluation And Planning) model used by the State of California to better predict water supplies available for wetlands and agricultural habitats important to waterbirds

- Develop databases that are necessary to model habitat impacts of climate, urbanization, and proposed changes to management of water supplies
- Apply various climatic, urban growth and water management scenarios in WEAP to estimate amount and temporal availability of water and supported waterbird habitats
- Estimate impacts of each scenario on wintering waterfowl food supplies and avian bioenergetics and ecology
- Identify critical waterbird resources in the Central Valley that are most at risk
- Help develop management strategies to account for climate and other factors in waterbird habitat conservation planning in the Central Valley.

Products from this project will include:

- Reports, presentations, and a website describing water supplies, supported habitats, and waterbird impacts under each scenario
- Improved WEAP-CV model that will produce more accurate estimates of water needs for waterbird habitats when the model is used in the future by the State of California and others
- Consultations with resource managers to apply project results and develop adaptive habitat conservation strategies

CA-LCC Priorities addressed: This continuing project addresses seven CA-LCC priorities:

- Develop tools that help managers allocate resources based on scenario evaluation
- Add value to CVJV conservation by providing analyses of land use changes due to climate/urbanization/water supply scenarios
- Develop models at basin scale needed by CVJV to address need to judge if current habitat plan is adequate to support goal waterbird pops under climate/planning scenarios
- Model frequency/intensity/impact of climate-driven occurrence of water supplies that are inadequate for goal waterbird pops
- Identify/assess impacts of urbanization/changes in water management on waterbird habitat/ecology
- Better understand waterbird responses (condition/survival) to climate change
- Develop methods to predict waterbird habitat change for the CV

CA-LCC Criteria addressed: This continuing project meets all ten (7 + 3 for continuing projects) evaluation criteria by: 1) helping the CVJV determine if habitat goals are projected to be adequate to support waterbird populations under a variety of climate, urbanization, and water supply management scenarios; 2) improving understanding of impacts of above factors on habitat and waterbird ecology; 3) being integrative by including physical and biological data for wetland and agriculutural habitats that impact >75 waterbird species; 4) making project information accessible online and directly to resource managers via reports, presentations, consultations, and a project website; 5) leveraging resources and expertise to address information needs of 7 partners including the CVJV which represents 22 groups (partners providing $181K match in funding and in-kind salaries and equipment); 6) adapting water supply management model (WEAP) used by the state of California to produce results to guide the CVJV and serve as prototype for efforts elsewhere; 7) employing the expertise required for success; 8) producing critical information, including timely evaluations of the impacts to waterbird habitats of proposed changes to management of water supplies; 9) providing updates on progress and results; 10) managing costs so current funds can sustain project through FY12 but new funds are needed for FY13.

Scope of Work-Approach & Integration with Related Projects: To accomplish project goals, the project team is and will continue to conduct work: ***a)*** adapting the WEAP (Water Evaluation And Planning) water management model used by the State of California, which accounts for water

distribution system limitations to better predict water supplies available for wetlands and agricultural habitats of importance to waterfowl, shorebirds, and other waterbirds; ***b)*** applying various water management, climatic, and urban growth scenarios in WEAP to estimate amount and temporal availability of water for each habitat of importance to waterbirds; ***c)*** estimating impacts of each scenario on wintering waterfowl food supplies and avian bioenergetics using TRUEMET and agent-based modeling; ***d)*** identifying timing and locations of critical waterfowl, shorebird, and other waterbird resources that are most at risk due to climate change in the Central Valley; and ***e)*** developing adaptive management strategies to account for climate change in waterbird habitat conservation planning in the Central Valley.

Climate Projection Data: To assess the impacts of climate change, many global socio-economic scenarios are being developed by the Intergovernmental Panel on Climate Change (IPCC) to provide estimates of possible magnitudes of greenhouse gas emissions that are responsible for much of the climate change. The choice of greenhouse gas emissions scenarios which focused on A2 (medium-high) and B1 (low) emissions, was based upon implementation decisions made earlier by IPCC. The scenarios of CO_2 projections are used as boundary conditions for global circulation models (GCMs) that provide us with insight into how human behavior in the future may influence changes in climate. These GCMs have a coarse spatial resolution with a grid-cell size on the order of 2.5° × 2.5° (approximately 275 × 275 km^2). These simulations of climate change need to be downscaled for ecological scale modeling to a resolution on the order of 1000's or 100's of meters or less. Climate change data through 2099 that have been downscaled to 12 × 12 km^2 are currently available for a number of general circulation model (GCM)-emissions scenario combinations that can be used to model impacts of climate change on water supplies. The State of California has selected a series of GCM-emissions scenario combinations to produce a realistic simulation of aspects of California's recent historical climate. For climate change scenarios modeled in WEAP, we are using downscaled data from two of California's selected combinations representing relatively low and high projected climate impacts, respectively; these include: 1) Parallel Climate Model (NCAR-PCM1), B1 emissions, and 2) NOAA Geophysical Fluid Dynamics Laboratory model (GFDL-CM2.1), A2 emissions scenarios. In the future we may include within WEAP scenarios other more extreme climate change projections (available later this year) produced in conjunction with IPCC 5.

Water Evaluation And Planning Model (WEAP): We are using the WEAP model and software developed by Stockholm Environment Institute (SEI) to model Central Valley water supplies and area of habitats supported by water supplies that are projected to be available under each climate change and urban growth scenario. We obtained the WEAP Central Valley Planning Area model (WEAP-CV) from the State of California and SEI, and are adapting it as needed. The WEAP-CV model has undergone peer review, its use has been published, and it is currently being used by the State of California for water supply management and planning in the Central Valley. For each CVJV basin, we adapt the WEAP-CV model to more accurately model changes in waterfowl habitats in response to specific factors of interest. We are adding winter-flooded agricultural habitats that had not been represented, updating/correcting area of wetland habitats, distinguishing certain water supply sources not specifically represented, combining multiple land cover datasets in a GIS to better calculate areas of various land cover classes at a finer spatial resolution, and making other changes. The result is a model that will produce accurate estimates of water needs for waterbird habitats throughout the Central Valley. We are adapting the model to include projections of urbanization of agricultural land to 2099. In our scenarios, we evaluate climatic and water management factors in combination with one of three levels of urban development representing "expansive growth", "strategic growth", or no growth. Growth projections represent varying levels of: 1) future urbanization of agricultural land, and 2) change in urban and agricultural water demands related to projected urbanization. Initial assessment of model improvements has indicted enhanced model performance in estimating baseline water supplies and demands. These improvements to WEAP-CV are important not only for this project but also when the model is used in the future by the

State of California and others for planning water use in the Central Valley. We use the WEAP-CV Adapted Model to compare effects of recent and projected climate on water supplies used for existing waterfowl, shorebird, and other waterbird food habitats. We also examine effects of projected climate on water supplies needed for goal waterfowl food supplies following planned wetland restoration as established by the Central Valley Joint Venture (CVJV) in the CVJV Plan. Modeling provides results for monthly historical (1971-2000) and future (2001-2099) surface runoff for multiple streams and the water needed by the various water demands including habitats. Modeling results for each of the two climate change projections are subsequently divided into the "projection" periods of 2006-2035 (30 years), 2036-2065 (30 years), and 2066-2099 (34years). To date, we have successfully modeled multiple scenarios of varying climate, water management, and urbanization for the Butte Basin through 2065. We are expanding our analysis to other basins, through the 2066-2099 period, and to include a greater range of water management scenarios that have either been proposed or are under consideration and potentially more severe climate change related impacts (i.e., when more IPPC climate data become available).

Translating Changes in Water Supplies into Impacts on Ecology: We are utilizing three approaches to assess the impacts of changes in landscape due to urbanization and climate change on ecology of waterfowl and other waterbirds. First, we input estimates of habitat area supported by modeled water supplies (from the adapted WEAP-CV model) into the bioenergetics accounting model "TRUEMET" to compare avian food energy supply vs. energy demand of CVJV-goal wintering populations. TRUEMET is used by the CVJV (and other Joint Ventures) for conservation planning of wintering waterfowl and — although less completely developed — shorebirds. The approach is also possible for other wintering waterbirds but was not applied for conservation planning by the CVJV due to lack of information on existing and goal populations and other data. Secondly, for waterbird guilds for which the TRUEMET approach is not well developed but for which CVJV habitat goals are established (i.e., breeding waterfowl and shorebirds; other waterbirds), we will compare habitat area supported by water supplies under each scenario vs. CVJV habitat goals. Thirdly, our new partnership with UC Davis will allow us to also investigate the feasibility of agent-based modeling. Our new UC Davis partners have developed a prototype agent-based model to simulate the effect of wetland habitat change on energetics and carrying capacity of foraging waterbirds. This approach offers a significant improvement on our current TRUEMET model in: a) allowing spatially-explicit analysis of the effects of alternative water-management regimes on spatial juxtaposition and distribution of wetland habitats, b) expanding the capacity to generalize across taxa, including waterfowl, shorebirds and other wetland-dependent wildlife, c) incorporating other important determinants of species habitat use and carrying capacity, such as disturbance and dispersion of non-foraging (refuge) habitat, and d) offering the potential to integrate more directly and completely with existing models of water management and in-stream fish habitat.

Integrating Results into Conservation Planning: We will continue to provide periodic project updates to the CA-LCC and CVJV on progress and help adapt results into conservation planning. The website we established describing project goals and methods will be updated with new information on partners, results, and management implications. Once project results are finalized, we will work with the CVJV and their partners to apply results to aid development of management strategies that address critical waterfowl, shorebird, and other waterbird resources that are most at risk due to climate change and other factors.

Products/Data Sharing: Completed and planned products/data sharing include the following:
Completed:
1 Sep 2010 **-** Established project website (and periodically updated during 2011 and 2012). Available at: http://www.werc.usgs.gov/Project.aspx?ProjectID=204

28 *Feb 2011* – *Progress Update* (51 pages) provided to CJVV and CA-LCC summarizing project accomplishments during the first 6 months and results on water supplies, availability of wetland and agricultural habitats, and food supplies for wintering and migrating waterfowl and other waterbirds in the Butte Basin based upon various scenarios of downscaled climate model projections, urbanization, and water management.
15 Jun 2011 – Project summary presented at the CA-LCC Open House, Sacramento.
14 Jul 2011 – Project summary presented at the CVJV Water Committee meeting, Sacramento.
2 Aug 2011 – Project summary presented at the CVJV Waterfowl Working Group meeting, Davis
9 Nov 2011 – Project results presented at The Wildlife Society Annual Conference, Waikoloa, Hawaii.
2 Feb 2012 – Project results presented at The Wildlife Society-Western Section Meeting, Sacramento.
15 Mar 2012 – Project highlighted as Feature Article on CA-LCC webpage
18 & 19 Apr 2012 – Project results presented at the Interagency Ecological Program (IEP) Workshop and California Water and Environmental Modeling Forum (CWEMF) Annual Meeting, Sacramento.

Planned
1 Oct 2012 – A report summarizing water supplies, availability of wetland and agricultural habitats, and food supplies vs. need for wintering and migrating waterfowl and other waterbirds under numerous scenarios of climate, urbanization, and water management. (Most Butte scenarios have been completed and data to model other basins has been prepared. Having refined our approach during the Butte Basin work we expect to complete results for 1–2 more basins for the 2012 report.)
1 Oct 2013 – A report summarizing water supplies, availability of wetland and agricultural habitats, and food supplies vs. need for wintering and migrating waterfowl and other waterbirds under numerous scenarios of climate, urbanization, and water management. (We expect to be able to include results for 3–4 additional basins in the 2013 report [and complete other basins in 2014]).
Various dates – Project results will be presented at additional conferences/workshops/meetings.

Measuring results: This project will provide critical information and support to improve planning and delivery of habitat and avian population conservation programs in the Central Valley by modeling alternative scenarios of climate change, management of water and habitats, and urban growth to better understand impacts of climatic change on habitats and ecology of waterfowl, shorebirds, and other waterbirds. Project information and products will continue to be made available on the project website, presented at scientific and technical conferences and workshops, and presented to the CVJV and CA-LCC. In addition, consultations will be provided to the CVJV on possible adaptive strategies and critical information gaps to account for climate change in habitat conservation planning. Finally, the improved WEAP-CV model and methods developed during this project will provide a tool that can be used by the CVJV and others in the future to evaluate habitat impacts of additional proposed changes to management of water supplies or other factors.

Measures of the project's ultimate success include:

- Integration of project results intofuture CVJV Implementation Plans
- Integration of project results into other regional conservation planning efforts
- Citation of project results by conservation and other organization(s) as basis of pro/con position on proposed changes to management of water supplies or planned urbanization
- Use of the improved WEAP-CV model to evaluate future proposed changes in water supply management
- Expansion of the method into other regions or for other taxa

Fleskes_etal_CC Impacts on Waterbird Ecology & Habitat 2012 Budget

Budget Categories	CA LCC Request	Partner(s) Contribution(s) (monetary)	Partner(s) Contribution(s) (non-monetary value/in-kind)	**Total**
Salaries	$ 67,200.00	$ 80,000.00	$ 50,000.00	$ 197,200.00
Supplies	$ 520.00	$ -	$ 5,000.00	$ 5,520.00
Overhead	$ 10,740.00	$ 11,050.00	$ -	$ 21,790.00
Equipment	$ -	$ -	$ 35,000.00	$ 35,000.00
Other (travel)	$ 1,000.00	$ -	$ -	$ 1,000.00
Total	$ 79,460.00	$ 91,050.00	$ 90,000.00	$ 260,510.00

The Delta Waterfowl Foundation has committed $80,000 funding for the project this year.
($40,000 contracted to support work on the project by the Stockholm Environment Institute).
(The other $40,000 to support agent-based modeling by UC-Davis).

Pending approval USGS will again provide cost share [$11,050] to reduce overhead burden.

Approximate Value of In-kind Salaries

Project Leader (USGS-WERC)	30,000
GIS/IT Specialist (USGS-WERC)	5,000
Statistical support (USGS-WERC)	10,000
CVJV Science Coordinator (FWS)	5,000
UC-Davis	5,000

Approx.Value of In-kind Equip & Supplies (i.e., computing, software, etc.)

USGS-WERC	15,000
Stockholm Environment Institute	15,000
UC-Davis	5,000
Ducks Unlimited	5,000

CENTRAL VALLEY JOINT VENTURE

North American Waterfowl Management Plan

May 1, 2012

To: California Landscape Conservation Cooperative
From: Robert D. Shaffer, Joint Venture Coordinator
Subject: Support for LCC Project:
"Understanding impacts of climate change on ecology and habitats of waterfowl, shorebirds, and other waterbirds: Guidance for the California LCC and other wetland habitat conservation programs in the Pacific Flyway"

Dear Madam or Sir:

I am writing to express the strong endorsement by the Central Valley Joint Venture (CVJV) for continuation of the multi-partner project, ***"Understanding impacts of climate change on ecology and habitats of waterfowl, shorebirds, and other waterbirds: Guidance for the California LCC and other wetland habitat conservation programs in the Pacific Flyway"***, being led by Dr. Joseph Fleskes. The project has already produced useful projections on how climate change and urban expansion would impact water supplies and habitats in the Butte Basin under several water management scenarios. We strongly support continuation of this project so this modeling effort can be conducted for other Central Valley regions and using additional management options.

Insights produced by this project are critical to evaluating how our restoration and enhancement goals might need adjusting to adapt to impacts of climate change, urbanization, and proposed changes to water management. This project will help achieve our partnership's goal of providing habitat necessary to support the large populations of waterfowl, shorebird and other waterbirds that rely on Central Valley habitats. I urge the California LCC to provide full funding for project.

The CVJV has recently recognized the need to better understand, and incorporate into conservation planning, the potential impacts of climate change on water supplies and managed wetland habitats and flooded ricefields. We feel strongly that the study being led by Dr. Fleskes will fill this information gap, and help improve conservation delivery our successful partnership.

The CVJV is a self-directed coalition which includes nine conservation organizations, 11 state and federal agencies and one corporation. This partnership directs its efforts toward the common goal of providing for the habitat needs of migrating and resident birds in the Central Valley of California.

The CVJV has worked with Dr. Fleskes and his colleagues in the past and we have full confidence that the proposed work will be accomplished in a timely and professional manner. I fully endorse the proposal.

Sincerely,

Robert D. Shaffer

Robert D. Shaffer, Coordinator

DELTA WATERFOWL FOUNDATION

The future of waterfowl and waterfowl hunting

May 1, 2012

To: California Landscape Conservation Cooperative

From: John L. Devney, Senior Director of U.S. Policy, Delta Waterfowl

Subject: Support for Dr. Joe Fleskes LCC Submission

Dear Sir or Madame:

I am writing to provide the perspective of the Delta Waterfowl Foundation in support of research being led by Dr. Joe Fleskes to quantify the effects of water scarcity on wintering waterfowl in the Central Valley of California. We are proud to be a funding partner in this important research effort and urge the members of the California LCC to fund this critical effort.

Nearly all researchers, managers and affected parties have determined one of the greatest risks to wintering waterfowl and a host of other bird species is the potential scarcity of water for wetland management in the future. Yet, this fear and concern has the lacked solid empirical evidence to quantify the magnitude of the risk. The research proposed by Dr. Fleskes will provide crucial insights as to the magnitude of the impact of water scarcity affecting the quantity and quality of wetland habitats that can be expected under reduced water availability and then model of that scarcity can affect carrying capacity of this reduced habitat base.

The results will provide partners within the Central Valley Joint Venture (CVJV) a means of assessing risks, targeting conservation actions and projecting management plans with the best available information in hand. In uncertain times, being equipped with this type of information will efficiently guide future wetland conservation and management planning.

Finally, Dr. Fleskes has a documented ability to conduct high quality research ensuring that all investments in this research will yield quality results.

In closing, we urge the review committee to support this important work. Certainly in the context of California's wintering waterfowl and other birds, there is no more pressing information need.

U.S. OFFICE
P.O. Box 3128 • Bismarck, ND 58502 • Office 701 222-8857 • Fax 701 224-1924 • Toll Free 1-888-987-3695 • E-mail: usa@deltawaterfowl.org

CANADA OFFICE
Unit 22 – 62 Scurfield Blvd. • Winnipeg, MB R3Y 1M5
Office 204 956-7766 • Fax 204 956-7755 • Toll Free 1-877-667-5656 • E-mail: canada@deltawaterfowl.org

www.deltawaterfowl.org

May 1, 2012

RE: California Landscape Conservation Cooperative

Dear Madam or Sir:

I am writing to express the strong endorsement of California Waterfowl for the research proposal, ***"Understanding impacts of climate change on ecology and habitats of waterfowl, shorebirds, and other waterbirds: Guidance for the California LCC and other wetland habitat conservation programs in the Pacific Flyway",*** that has been submitted by **Dr. Joseph Fleskes** for consideration of funding through the California Landscape Conservation Cooperative. This project is investigating projected impacts of climate change, urbanization, and water management scenarios on ecology and habitats of waterfowl and other waterbirds in the Central Valley of California. This information critical to the successful management of waterfowl populations and their habitats in California and I urge your organization to consider full funding for the project.

California Waterfowl is a statewide nonprofit organization, whose principal objective is the preservation, protection, and enhancement of California's waterfowl resources, wetlands, and associated hunting heritage. *California Waterfowl* works closely with government agencies and private landowners to improve habitats and manage for healthy waterfowl populations in California. Wetland restoration and enhancement projects focus on breeding and migratory waterfowl habitat and work to increase public hunting opportunity.

California Waterfowl recognizes the importance of understanding all important factors that may impact water supplies, wetland habitats, and waterfowl ecology. We feel strongly that the study is providing critical information for our conservation mission. *California Waterfowl* has worked with Dr. Fleskas and his colleagues on a variety of successful projects. I have full confidence that, if funded, the proposed work will be accomplished. As such, we fully endorse the proposal.

Sincerely,

Jake Messerli
Vice President, Conservation Programs

4630 Northgate Blvd., Suite 150, Sacramento, CA 95834
916.648.1406 • www.calwaterfowl.org

JOSEPH P. FLESKES
Wildlife Research Biologist, U. S. Geological Survey, Western Ecological Research Center, Dixon Field Station, Dixon, CA. 95620 (707) 678-0682 ext 628, joe_fleskes@usgs.gov

Education: **Ph.D.** 1999, Wildlife Science, Oregon State University; **M.S.** 1986, Wildlife Biology, Iowa State University, **B.S.** 1980, Fisheries and Wildlife Biology, Iowa State University

Professional Experience: *Dec 1994-present.*Wildlife Research Biologist, USGS-WERC, Dixon, CA; *Jan 1994-Dec 1994*. Graduate Research Asst., Oregon State Univ.; *June 1993-Jan 1994*. Wildlife Biologist, National Biological Service, California Science Center, Dixon, CA; *Apr 1993-June 1993*. Graduate Research Asst., Oregon State Univ.; *Jul 1986-Apr 1993*.Wildlife Biologist, USFWS-Northern Prairie Wildlife Research Center, Pacific States Ecology Section, Dixon,CA; *Mar 1985-Jul 1986*. Refuge Manager, USFWS-Union Slough National Wildlife Refuge, Titonka, IA; *Feb 1984-Jul 1986*. Graduate Research Asst., Iowa State Univ., Iowa Cooperative Wildlife Research Unit; *Mar 1981-Feb 1984*. Biol. Tech. USFWS-NPWRC, Jamestown, ND & Patuxent Wildlife Research Center, Vicksburg, MS; *Mar 1978-Mar 1981* (Intermittent). Wildlife Research Technician, Iowa Dept. Natural Resources; *Mar 1980-June 1980*. Undergrad Teaching Asst., Iowa State Univer., Dept. Animal Ecology.

Research Program: Research goal to inform management of wildlife and their habitats with focus on ecology of migratory waterfowl, other waterbirds and their predators and how they respond to landscape-scale changes. Research conducted in throughout North America with emphasis since 1986 in the Central Valley of California and other parts of the Pacific Flyway. Research often includes leading large multi-agency teams and has resulted in over 120 presentations at international conferences and technical meetings, >80 scientific articles, and 1 book chapter. To aid resource managers in applying research results, serves on numerous technical advisory committees and recent Chair of Central Valley Joint Venture Waterfowl Working Group and Chair of the Pintail Action Group, an international group of public and private interests dedicated to conservation of the northern pintail.

Selected Publications:

Fleskes, J. P. In press. Wetlands of the Central Valley and Klamath Basin. I*n* D. Batzer and A. Baldwin, editors, Wetland Habitats of North America: Ecology and Conservation Concerns. Univ. California Press, Berkeley.

Fleskes, J. P., and C. Gregory. 2010. Dynamics and distribution of waterbird habitat during spring in Southern Oregon-Northeastern California. Western North American Naturalist 70: 26-38.

Fleskes, J. P., A. C. Fowler, M. L. Casazza, and J. M. Eadie. 2010. Population structure and relatedness among northern pintails (*Anas acuta*) in three California wintering regions. Waterbirds 33: 1-9.

Moss, R. C., S. C. Blumenshine, J. L. Yee, and **J. P. Fleskes**. 2009. Emergent insect production in post-harvest flooded agricultural fields used by waterbirds. Wetlands 29: 875-883.

Pearce, J. M., A. M. Ramey, P. L. Flint, A. V. Koehler, **J. P. Fleskes**, J. C. Franson, J. S. Hall, D. V. Derksen, and H. S. Ip. 2009. Avian influenza at both ends of a migratory flyway: characterizing viral genomic diversity to optimize surveillance plans for North America. Evolutionary Applications 2:457-468. ("Editor's Choice").

Fleskes J. P., J. L. Yee, G. S. Yarris, M. R. Miller, and M. L. Casazza. 2007. Pintail and mallard survival in California relative to habitat, abundance, and hunting. Journal of Wildlife Management 71: 2238-2248.

Ackerman, J., J. Y. Takekawa, D. L. Orthmeyer, **J. P. Fleskes**, J. L Yee, and K. L. Kruse. 2006. Spatial use by wintering greater white-fronted geese relative to a decade of habitat change in California's Central Valley. Journal of Wildlife Management 70:965-976.

Fleskes, J. P, J. L. Yee, M. L. Casazza, M. R. Miller, J. Y. Takekawa, and D. L. Orthmeyer. 2005. Waterfowl distribution, movements and habitat use relative to recent habitat changes in the Central Valley of California: A cooperative project to investigate impacts of the Central Valley Habitat Joint Venture and changing agricultural practices on the ecology of wintering waterfowl. Final Report. USGS-WERC. 190 pp.

Miller, M. R., J. Y. Takekawa, **J. P. Fleskes**, D. L. Orthmeyer, M. L. Casazza, and W. M. Perry. 2005. Spring migration of northern pintails from California's Central Valley wintering area tracked by satellite telemetry: routes, timing, and destinations. Canadian Journal of Zoology 83: 1314-1332.

Fleskes, J. P., W. M. Perry, K. L. Petrik, R. Spell, and F. Reid. 2005. Change in area of winter-flooded and dry rice in the northern Central Valley of California determined by satellite imagery. Calif. Fish Game 91:207-215.

Fleskes, J. P., R. L. Jarvis, and D. S. Gilmer. 2003. Selection of flooded agricultural fields and other landscapes by female northern pintails wintering in Tulare Basin, California. Wildlife Society Bulletin 31:793-803.

Van Kessel, C., J. Eadie, W. Horwath, F. Reid, J. Hill, and **J. Fleskes**. 2002. Integrating agronomic management practices with waterfowl populations in rice fields: opportunities and mutual benefits. Pgs.51-59 *in* J. E. Hill & B. Hardy, eds. Proceedings of the Second Temperate Rice Conference. Sacramento, CA. Los Banos (Philippines): International Rice Research Institute.

ELLIOTT MATCHETT

EDUCATION

M.S., Environmental and Natural Resource Sciences, University of Nevada, Reno, Nevada, 2005
B.S., Wildlife and Fisheries Biology and minor in Plant Biology, University of California, Davis, California, 1999

PROFESSIONAL EXPERIENCE

Wildlife Biologist, USDI, USGS, Western Ecological Research Center, Dixon Field Station, Dixon, CA (May 2010- present)
Environmental Scientist, State of California, State Water Resources Control Board, Division of Water Rights, Sacramento, CA (August 2007- April 2010)
Wildlife Biologist, Joe Sullivan, Woodland, CA (March 2007- April 2007)
Wildlife Biologist, California Waterfowl Association, Sacramento, CA (February 2006- December 2007)
Graduate Student Researcher, Department of Natural Resource and Environmental Science, University of Nevada, Reno, NV (Apr. 2002- Sept. 2003, Jan. 2004- Nov. 2005)
Environmental Scientist, Huffman and Carpenter environmental consulting company, Reno, NV (April 2004- July 2004)
Teaching Assistant, Dynamics and Management of Wildlife Populations, Department of Natural Resource and Environmental Science, University of Nevada, Reno, NV (Sept. 2003- Dec. 2003)
Wildlife Biologist, California Waterfowl Association (CWA), Sacramento, CA (April 2000- Dec. 2000, July 2001- Oct. 2001)
Aquatic Ecologist, Department of Environmental Sciences and Policy, University of California, Davis, CA (Jan. 2001- June 2001)
Wildlife Researcher, Department of Wildlife, Fisheries and Conservation Biology, University of California, Davis, CA (March 1998- June 1998, Oct. 1998- Aug. 1999)
Student Intern, Department of Wildlife, Fisheries and Conservation Biology, University of California, Davis, CA (March 1997- June 1997)

SELECTED PUBLICATIONS AND REPORTS

Matchett, E. L. and J. S. Sedinger. 2008. A change in waterfowl species composition in the Honey Lake Valley, California. California Fish and Game 94: 44-52.

Conservation Reserve Enhancement Program. 2006. Conservation Reserve Enhancement Project (CREP) evaluation report from California Waterfowl Association to California Department of Fish and Game.

Matchett, E.L. 2005. Nesting ecology of waterfowl in a western Great Basin Ecosystem. M.S. Thesis. University of Nevada, Reno.

AWARDS/MEMBERSHIPS

- Undergraduate Department of Defense Fund Fellowship.
- Presidential Undergraduate Fellowship (PUF) for undergraduate research studying nesting ecology, survival, and habitat use of wood ducks.
- Jay Dow, Sr. Wetlands Scholarship for graduate research
- Graduate Student Association Travel Award to present at the Eleventh Annual Wildlife Society Conference.
- Wildlife Society member
- UC Davis Alumni Association Member

Mark J. Petrie
Director, Conservation Planning
Ducks Unlimited Inc., Pacific Northwest Field Office
17800 SE Mill Plain Blvd., Suite 120
Vancouver, WA 98683
(360) 885-2011; mpetrie@ducks.org

EDUCATION

1998. Ph.D., Wildlife Ecology, University of Missouri, Columbia, MO.
1994. M.S., Wildlife Ecology, University of Missouri, Columbia, MO.
1989. B.S., Forestry, University of New Brunswick, Fredericton, NB.

EMPLOYMENT HISTORY

2001 – Present: **Director, Conservation Planning,** Ducks Unlimited Inc., Western Regional Office
1999 – 2001 **Assistant Director,** Institute for Wetland and Waterfowl Research, DU, Memphis, TN
1997 - 1999 **Research Scientist,** Institute for Wetland and Waterfowl Research, DU, Memphis, TN

SELECT PUBLICATIONS

1992. Parker, G. R., **M. J. Petrie,** and D. T. Sears. Waterfowl distribution relative to wetland acidity. Journal of Wildlife Management 56:268:274.

1996. **Petrie, M. J**., R. D. Drobney, and D. A. Graber. Evaluation of true metabolizable energy for waterfowl. Journal of Wildlife Management 61(2):420-425.

2000. **Petrie, M. J**., R. D. Drobney, and D. T. Sears. Mallard and black duck breeding parameters in New Brunswick: a test of the reproductive rate hypothesis. Journal of Wildlife Management 64:832-838.

2002. Checkett, J. H., R. D. Drobney, **M. J. Petrie**, and D. A. Graber. True metabolizable energy of moist-soil seeds. Wildlife Society Bulletin 30:1113-1119.

2004. Ballard, B. M., J. E. Thompson, **M. J. Petrie**, M. J. Checkett, and D. G. Hewitt. Diet and nutrition of northern pintails wintering along the southern coast of Texas. Journal of Wildlife Management 68:371-382.

2005. Hoekman, S. T., T. S. Gabor, **M. J. Petrie**, R. Maher, H. R. Murkin, and M. S. Lindberg. Population dynamics of mallards breeding in agricultural environments of eastern Canada. Journal of Wildlife Management 70: 233-239.

2006. Ballard, B. M., J. E. Thompson, **M. J. Petrie.** Carcass composition and digestive tract dynamics of northern pintails wintering along the lower Texas coast. Journal of Wildlife Management.

2006. Greer, A. K., B. D. Dugger, D. Graber, and **M. J. Petrie.** Influence of fall vs. spring flooding on the availability of seed resources for spring migrating waterfowl. Journal of Wildlife Management 71: 1561-1566.

2006. **Petrie**, **M. J**., B. Shaffer, R. Holbrook, R. Ostroff, and C. Hickey. Central Valley Joint Venture Implementation Plan.

2006 D. Paullin, K. Abraham, M. Anderson, H. Berlanga, R. Bishop, E. Carrera, R. Clark, L. Colpitts, J. Eadie, **M. Petrie**, E. Reed, F. Rohwer, A. Rojo, and M. Tome. North American Waterfowl Management Plan progress assessment 1986-2006. Conclusions and recommendations after 20 years of conservation.

2007. Dugger B. D., M. L. Cline, R. S. Finger, and **M. J. Petrie**. True metabolizable energy of four common moist-soil seed species in the western U.S. Journal of Wildlife Management 71:1964-1967.

2008. Dugger B. D., **M. J. Petrie**, and D. Mauser. Bioenergetic approach to conservation planning for waterfowl at Lower Klamath and Tule Lake National Wildlife Refuges. Prepared for the Fish and Wildlife Service, Department of the Interior.

2008. Greer, D. M., B. D. Dugger, K. J. Reinecke, and **M. J. Petrie**. Depletion as rice as a food of wintering waterfowl in the Mississippi Alluvial Valley. Journal of Wildlife Management 75:1125-1133.

2008. **Petrie, M. J**. Pacific Coast Joint Venture Implementation Plan: Puget Sound Focus Area.

2010. Ballard, B. M., J. D. James, R. L. Bingham, **M. J. Petrie**, and B. C. Wilson. Coastal pond use by redheads wintering in the Laguna Madre, Texas. Wetlands 30:669-674.

2011. **Petrie, M. J**., M. G. Brasher, G. J. Soulliere, J. M. Tirpak, D. B. Pool, and R. R. Reker. Guidelines for establishing Joint Venture waterfowl population abundance objectives. National Science Support Team Technical Document (Draft Report).

David R. Purkey, Ph.D.

133 D St., Suite F
Davis, CA 95616
(530) 753.3035
dpurkey@sei-us.org

I am the Director of the Water Resources Group of the Stockholm Environment Institute-US Center and am responsible for all hydrological assessment and modeling work conducted by the Center. Much of this work involves the development of data management systems, including GIS databases, and the application of water resources models to explore the implications of future management strategies regarding the use, conservation and protection of water resources. The Water Evaluation and Planning (WEAP) system developed by SEI is central to much of this work. My career has evolved from an early focus on irrigation engineering to a broader focus on the hydrology of irrigated catchments, to my current focus on integrated water management at a variety of scales, including consideration of climate change impacts and possible adaptation. My areas of technical expertise include, surface water hydrology, hydrogeology, and water resources systems analysis.

Education and Training

1998	Ph.D., Hydrology. University of California, Davis. Thesis: A Coupled Surface-Subsurface Model of the western San Joaquin Valley, California.
1989	M.S., Water Science and Engineering. University of California, Davis. Thesis: Infiltration Under Surge Flow Irrigation.
1983	B.A., Geology. Carleton College, Northfield, Minnesota. Thesis: An Investigation into the St. Peter Sandstone Aquifer.

Selected Refereed Publications

Yates, D., **D. Purkey**, J. Sieber, A. Huber-Lee, H. Galbraith, J. West, S. Herrod-Julius, C. Young, B. Joyce and M. Rayej (2009). Climate driven water resources model of the Sacramento Basin, California. *Journal of Water Resources Planning and Management*, 135 (5): 303-31 **(winner *2010 Environmental and Water Resources Institute Best Practice Paper)***

Young, C.A., M.I. Escobar-Arias, M. Fernandes, B. Joyce, M. Kiparsky, J.F. Mount, V.K. Mehta, D. **Purkey**, J.H. Viers and D. Yates (2009). Modeling the hydrology of climate change in California's Sierra Nevada for subwatershed scale adaptation. *Journal of the American Water Resource Association*, 45 (6): 1409-1423.

Mosepele, K, P. Moyle, G. Merron, **D. Purkey**, B. Mosepele. 2009 *Fish, floods, and ecosystem engineers: Aquatic conservation in the Okavango Delta, Botswana*. Bioscience 59(1):53-64

Purkey, D., B. Joyce, S. Vicuna, M. Hanemann, L. Dale, D. Yates and J. Dracup. (2008) Robust analysis of future climate change impacts on water for agriculture and other sectors: a case study in the Sacramento Valley. *Climatic Change*. 87 (Suppl 1):S109-S122

Vicuna, S., D. Maurer, B. Joyce, J. Dracup, **D. Purkey**. 2007. *The sensitivity of California water resources to climate change scenarios.* Journal of the American Water Resources Association. Vol. 43, No. 2. pp. 482-498.

Purkey, D., A. Huber-Lee, D. Yates, M. Hanemann. 2007. *Integrating a climate change assessment tool into stakeholder-driven water management decision-making processes in California*. Water Resources Management. Vol 21. pp. 315-329.

Purkey, D., A. Huber-Lee. 2006. *A DSS for long-term water utility planning.* Southwest Hydrology. Vol. 4. pp. 18-31.

Sieber, J., D. Yates, A. Huber Lee, and **D. Purkey**, 2005. *WEAP a demand, priority, and preference driven water planning model: Part 1, model characteristics*. Water International. Vol. 30, No. 4. pp. 487-500

Yates, D., **D. Purkey**, H. Galbraith, A. Huber-Lee, and J. Sieber, 2005. *WEAP a demand, priority, and preference driven water planning model: Part 2, Evaluating freshwater ecosystem services*. Water International. Vol. 30, No. 4. pp. 501-512

Purkey, D.R. and W.W. Wallender. 2001. *Drainage reduction under land retirement over a shallow water table.* ASCE Journal of Irrigation and Drainage Engineering. Vol. 127, No. 1. pp. 1-7. (**winner 2001 Environmental and Water Resources Institute's *Best Practice Paper***).

Charles A. Young, Ph.D.

133 D St., Suite F
Davis, CA 95616
(530) 753.3035
cyoung@sei-us.org

Charles A. Young is a Senior Scientist with the Stockholm Environment Institute. He has over 20 years of professional and research experience in water management issues. His research focuses on the application of numerical models for analysis of reservoir operations, rainfall-runoff processes, plant growth, and groundwater flow. Recent projects have included the development of a computer simulation model to study the effects of climate change on crop water use and yield, a rainfall-runoff and reservoir operations model for the analysis of climate change in the Sierra Nevada of California, and a detailed cottonwood growth model for analysis of California's Central Valley Project operations to enhance riparian forest regeneration.

Education and Training

2004	PhD, *Agricultural and Biological Engineering*, University of California, Davis, California. USA. Thesis on issues in regional scale unsaturated zone modelling.
1997	MS, *Agricultural and Biological Engineering*, University of California, Davis, California, USA. Thesis on calculating spatially distributed water and salts balances for the Panoche Irrigation District.
1989	BSc, *Agricultural Engineering Technology*, University of Delaware, Newark, Delaware, USA.

Selected Refereed Publications

2009	Young, C., M.I. Escobar-Arias, M. Fernandes, B. Joyce, M. Kiparsky, J.F. Mount, V.K. Mehta, D. Purkey, J.H. Viers, and D. Yates (2009). Modeling the hydrology of climate change in California's Sierra Nevada for subwatershed scale adaptation. *JAWRA* 45(6):1409-1423.
2009	Yates, D., D. Purkey, J. Sieber, A. Huber-Lee, H. Gailbraith, J. West, S. Herrod-Julius, C. Young, B. Joyce, and M. Rayej (2009). Climate driven water resources model of the Sacramento Basin, California. *J. Water Resour. Plng. And. Mgmt*, 135(5):303-313.
2007	Young, C., Wallender, W., Schoups, G., Fogg, G., Hanson, B., Harter, T., Hopmans, J., Howitt, R., Hsiao, T., Panday, S., Tanji, K., Ustin, S., Ward, K. (2007) Modeling shallow water table evaporation in irrigated regions. *Irrig Drainage Syst*, 21:119-132.
2005	Schoups, G., Hopmans, J.W., Young, C.A., Vrugt, J.A., Wallender, W.W., Tanji, K.K., and Panday, S. (2005). Sustainability of irrigated agriculture in the San Joaquin Valley, California, *Proc. of the National Academy of Sciences*, 102, 15352-15356.
2004	Huber-Lee, A., D. Yates, D. Purkey, W. Yu, C. Young, and B. Runkle. "How Can We Sustain Agriculture and Ecosystems? The Sacramento Basin." Chapter in the book, Climate Change in Contrasting River Basins. Edited by J. Aerts and P. Droogers. CABI Publishing, UK.
2002	Young, C.A., W.W. Wallender. (2002) Spatially distributed irrigation hydrology: water balance. *Trans. of ASAE* 45(3): 609-618.

Curriculum Vitae MATTHEW E. REITER *2011*

PRBO Conservation Science
Pescadero, CA 94060
760-417-9997
mreiter@prbo.org

EXPERIENCE

QUANTITATIVE AVIAN ECOLOGIST– Shorebird Monitoring & Adaptive Management
May 2009 – Present Wetland Ecology Division
PRBO Conservation Science

PH.D. RESEARCH ASSISTANT– Species Interactions & Nesting Geese
September 2006 – August 2009 Minnesota Cooperative Fish & Wildlife Research Unit
University of Minnesota

M.S. RESEARCH ASSISTANT – Predator, Prey, & Alternative Prey Dynamics
July 2003 – August 2006 Minnesota Cooperative Fish & Wildlife Research Unit
University of Minnesota

TEACHING ASSISTANT – Analysis of Populations
January – May 2006 Department of Fisheries, Wildlife, and Conservation Biology
University of Minnesota

BIOLOGICAL TECHNICIAN – Avian Disease Dynamics & Management
January 2001 – July 2003 U.S. Geological Survey
Hawaii Volcanoes National Park

RESEARCH ASSISTANT – Avian Disease Mosquito Vector Population Surveys
September 1998 – May 1999 U.S. Geological Survey
Hawaii Volcanoes National Park

EDUCATION

2006 –2009
Ph.D. Candidate: Wildlife Conservation
University of Minnesota

2003 – 2006
M.S. Wildlife Conservation
Minor: Statistics
University of Minnesota

SELECTED PUBLICATIONS

Reiter, M.E., and D.E. Andersen. 2011**.** Arctic foxes, lemmings, and Canada goose nest survival at Cape Churchill, Manitoba. Wilson Journal of Ornithology 123:266-276.

Reiter, **M.E.,** D.A. LaPointe, and C.T. Atkinson. 2009. Source habitat of avian malaria vector, *Culex quinquefaciatus*, in altered mid-elevation mesic-dry forests of Hawaii. Journal of Vector Ecology 34:208-216.

Reiter, M.E. and D.E. Andersen. 2008. Comparison of egg flotation and egg candling techniques for estimating incubation day of Canada goose nests. Journal of Field Ornithology 79:429 – 437.

Reiter, M.E., and D.E. Andersen. 2008. Historical trends in collared lemming abundance near Cape Churchill, Manitoba, Canada. Journal of Mammalogy 89: 138 – 144.

Reiter, M.E., C.W. Boal, and D.E. Andersen. 2008. Species composition, distribution, and habitat associations of anurans in a subarctic tundra landscape near Cape Churchill, Manitoba, Canada. Canadian-Field Naturalist 122:129-137.

Reiter, M.E., and D.A. LaPointe. 2007. Landscape factors influencing the spatial distribution and abundance of the mosquito (*Culex quinquefaciatus*) vector in a mixed residential/agricultural community in Hawaii. Journal of Medical Entomology 44: 861-868.

MEMBERSHIPS

The Wildlife Society
Chair, Program for Regional & International Shorebird Monitoring
Central Valley Joint Venture Shorebird and Waterbird Research & Monitoring Committee

AWARDS

2008 – 2009 Doctoral Dissertation Fellow – UMN
Wildlife Oral Presentation Award – Midwest F&W Conference
2001 Star Award – U.S. Geological Survey

JOHN McALLISTER EADIE

Department of Wildlife, Fish & Conservation Biology, University of California, Davis CA 95616

PROFESSIONAL PREPARATION

PhD 1989. Zoology. University of British Columbia, Vancouver, BC
MS 1982. Biology. Queen's University, Kingston, Ontario
BS Honors 1978. Zoology. University of Western Ontario, London, Ontario

APPOINTMENTS

1995 – Present. **Professor**, Raveling Waterfowl Professor, Dept. of Wildlife, Fish & Conservation Biology, University of California, Davis

1988–1995. **Assistant/Associate Professor** (with tenure). Division of Life Sciences, Scarborough Campus, University of Toronto

SELECTED RECENT PUBLICATIONS

Eadie, J. M., J. N. M. Smith, D. Zadworny, U. Kuhnlein, and K. Cheng. 2010. Probing parentage in parasitic goldeneyes: an evaluation of methods to detect conspecific brood parasitism. Journal of Avian Biology 41:163-176.

Fleskes, J. P., A. C. Fowler, M. L. Casazza, and J.M. Eadie. 2010. Population structure and relatedness among female Northern Pintails (*Anas acuta*) in three California wintering regions. Waterbirds 33 (1): 1-9.

McEachern, M.B., D. H. Van Vuren, C. Floyd, B. May and J. M. Eadie. 2010. Bottlenecks and rescue effects in a fluctuating population of golden-mantled ground squirrels (Spermophilus lateralis). Conservation Genetics 12: 285-296.

Odell, N. S. and J. M. Eadie. 2010. Do Wood Ducks use the number of eggs in a nest as a cue to the prospective value of a nest? Behavioral Ecology 21 (4): 794-801.

Berg, E. C., J. M. Eadie, T. A. Langen and A.F. Russell. 2009. Reverse sex-biased philopatry in a cooperative bird: genetic consequences and a social cause. Molecular Ecology 18: 3486-3499.

Fowler, A. J., J. M. Eadie and A. Engilis. 2009. Differentiation of endangered Hawaiian ducks (*Anas wyvilliana*), introduced North American mallards (A. platyrhynchos), and their hybrids using multilocus genotypes. Conservation Genetics 10: 1747-1758.

Miller, M.R., E.G. Burns, B. E. Wicklund and J. M. Eadie. 2009. Diet and body mass of wintering ducks in adjacent brackish and freshwater habitats in California. Waterbirds 32: 374-387.

McEachern, M. B., R. McElreath, D. Van Vuren, and J. M. Eadie. 2009. Another genetically promiscuous "polygynous" mammal: mating system variation in *Neotoma fuscipes*. Animal Behaviour. 77 (2): 449-455.

Roy, C., J. M. Eadie, E. M. Schaubel, N. S. Odell, E. Berg and T. Moore. 2009. Public information and conspecific nest parasitism in wood ducks: does nest density influence the quality of information? Animal Behaviour 77: 1367-1373 (featured article, see In Focus, Animal Behaviour 77: 1365)

Anderson M. G., J. M. Eadie, M. T. Huang, R. Johnson, M. D. Koneff, J. K. Ringelman, M. C. Runge and B. C. Wilson. 2008. Harvest potential and habitat are inextricably linked. in Current Status and Future Directions of Waterfowl Harvest Management. R. J. Blohm (ed). Wildlife Management Institute, Arlington VA. Pp 101-115.

de Valpine, P. and J. M. Eadie. 2008. Conspecific brood parasitism and population dynamics. American Naturalist 172: 547–562.

Eadie, J. M., C. S. Elphick, K. Reinecke, and M. R. Miller. 2008. Wildlife Values of North American Ricelands. In Conservation in Ricelands of North America: Current State of Our Knowledge and a Course for Future Research and Education. S. W. Manley, editor. The Rice Foundation, Stuttgart, AR.

Lyon, B. and J. M. Eadie. 2008. Conspecific brood parasitism in birds: a life-history perspective. Annual Reviews of Ecology, Evolution and Systematics 39: 343-363.

Total Graduate Students: PhD students: **12**; MS students: **24**; Postdoctoral Fellows: **6**