
USFWS REGION 8 NATIONAL WILDLIFE REFUGE SYSTEM, INVENTORY & MONITORING PROGRAM

Work Plan FY 2011

Carol Damberg, Chief, Refuge Operations

Karen Laing, I&M Coordinator

Sallie Hejl, Regional Refuge Biologist

Kaylene Keller, Data Manager

Giselle Block, I&M Specialist and California LCC Liaison

Orien Richmond, I&M Biologist

Rachel Esralew, Hydrologist

Rita Howard, Administrative Officer

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Region 8 FY 2011 Inventory and Monitoring Program

Annual Work Plan

Approvals

Approved: Karen Laing Date: 4/15/2011
Regional Inventory and Monitoring Coordinator
National Wildlife Refuge System

Approved: Carol Penkey Date: 4/15/2011
Regional Chief, Refuge Operations
National Wildlife Refuge System

Approved: Therese J. Kolar Date: 4/15/2011
Regional Chief
National Wildlife Refuge System

1. Region 8 I&M Program: Introduction

1.1. Vision, Goals and Objectives

Preliminary Vision

The Region 8 Inventory and Monitoring Program (I&M Program) identifies important natural resources on National Wildlife Refuge System (NWRS) lands in conjunction with refuge staff and provides the means to evaluate conservation and management of these resources under the influence of climate change and other environmental stressors. Our basic philosophy is that inventory and monitoring information should support management decision making at multiple spatial scales, rather than stand alone with no clear relevance to management. The regional program steps down from the national *Strategic Plan* and *Operational Blueprint* (see Appendix 6).

Refuges and Wetland Management Areas are the foundation of the I&M Program. We provide support to the field stations by identifying priority conservation and management issues and tracking the status and trends of abiotic and biotic factors needed to effectively manage NWRS lands and waters. We provide technical guidance and expertise to stations to develop Inventory and Monitoring Plans, (IMPs), study plans, monitoring protocols, Comprehensive Conservation Plans (CCP), Habitat Management Plans (HMP), databases, and data analysis strategies so that information is available and accessible to make the best management decisions. We also coordinate with internal and external partners to share information, enhance cooperation, preventing duplication of efforts, and raise the quality of resource management across the landscape.

Long term Planning

During FY 2011, the inaugural year for our staff, we are working with refuges to develop a vision statement and long term (5-year) goals and objectives for the regional program. We will build from the foundational directives in the Draft Service Inventory and Monitoring Policy (I&M Policy). The I&M Policy provides guidance for developing an IMP for each refuge. As stated in the preliminary vision statement above, inventory and monitoring information should support management decision making and priorities. For each station, the IMP will step down from the Habitat Management Plan (5-year management outlook), which in turn steps down from the Comprehensive Conservation Plan (15-year management outlook). Regional I&M staff, in collaboration with the Regional Refuge Biologist and Planning Division, will assist Refuges to develop an HMP first, and will then support development of the IMP. This step-down process should ensure that inventory and monitoring programs are directly related to the management of refuges.

During the planning process we will identify new and evolving management questions that require new research or adaptive management approaches. The I&M Program will actively assist refuges to fund such projects when they are carefully developed, and when they address nationally or regionally identified high priority topics, such as management of important refuge resources and invasive species, and monitoring and adaptation to sea level rise and changing water regimes.

Planning will also include evaluation of monitoring activities on refuges that are requested or required by other USFWS Programs, such as Endangered Species, Migratory Bird Management, Fisheries or Landscape Conservation Cooperatives (LCCs). At the regional level, we will provide a process for identifying and prioritizing I&M efforts that a refuge should participate in because they support U.S. Fish and Wildlife Service goals or because they support conservation at larger scales (particularly LCCs).

The development and implementation of the I&M program in R8 will be an iterative process. We will evaluate implementation and make adjustments as needed based upon program development and annual evaluations. We will collaborate on I&M activities with other FWS Programs and LCC partners, where priorities and needs overlap.

1.2. Organization and Focus Areas

Organization

The initial staffing framework outlined for the I&M program includes a national office at the Service's Natural Resources Program Center (NRPC) in Ft. Collins, Colorado, regional I&M offices within each region, a presence within each LCC established, and field positions. The *Addendum to the Strategic Plan* (see Appendix 6) provides a detailed description of the program's conceptual organization and administration. Figure 1 summarizes the roles and responsibilities of the national office and the regional coordinators (as presented in the *Operational Blueprint* (see Appendix 6)); the roles of the Regional I&M program staff at the LCCs and field stations are expected to evolve and change as the program matures. The organizational structure developed by Region 8 mirrors the Addendum organization and structure (Figure 2: Organizational Chart for Region 8 I&M Program). We are currently re-evaluating the organizational structure shown in Figure 2. Other Regions have modified their organizational structure to meet specific regional needs.

Region 8 is a new region with a very small regional staff. The region had one Regional Biologist position (added in 2009) and no hydrologists prior to the development of the I&M program and consequently has a significantly smaller and underdeveloped biological program relative to all other Regional biological programs. Forming trusting relationships with refuge staff will be a high priority.

The majority of Region 8 I&M program staff will be based at California State University Sacramento (CSUS) with the California LCC and US Geological Survey scientists. One I&M biologist (Orien Richmond) has been placed at Don Edwards San Francisco Bay NWR and the I&M Specialist (Giselle Block) works from the CSUS office and at the USFWS Joint Venture Office in Fairfax, California. The move from the Sacramento Regional office to CSUS occurred in February 2011. By mid-February, the first five I&M positions were operational in Region 8 (Appendix 1: Staff Profiles), and by mid-March 2011, a term administrative support position was in place. Future position additions will be considered based on need and funding.

Focus Areas

In FY 2011, Region 8 will focus on planning, learning, communication, and data management. Both short-term planning (annual work plans) and long term planning (5 year planning) are a high priority this year. The *Operational Blueprint* outlines focus areas and tasks to be carried out by the national I&M team and the regional I&M teams in the early phases of the I&M Program. The short-term plan is to support and implement Phase I. In the first year, we will design protocols, test databases, explore potential partnerships, and begin to create an inventory of existing data (Table 1).

Educating the new I&M staff as well as the field and regional personnel about the components of the I&M program, the Regional Biological Program, the LCCs, and the NWRS will be a major focus (Table 2). The five new I&M employees will require time to learn about the NWRS, its history and current conservation and management issues, strategic plans (including CCPs and HMPs), and relevant policies and handbooks. The new staff will familiarize themselves with habitats and management issues on our field stations, as well as develop working relationships with the various field, regional, and national staff. Each field station will have special needs depending on its resources of concern, environmental

conditions, and management challenges. The budget for FY 2011 will allow us to begin new projects at the refuge and at regional scales (Appendix 3: Region 8 NWRS Inventory and Monitoring Program Budget FY 2011).

Communication and collaboration between the national program and regional programs will be an integral part of the NWRS I&M program and will include monthly national meetings among coordinators and data managers and the formation of subgroups that focus on particular areas of the I&M program (e.g., adaptive management). Opportunities will be available and encouraged for participation by field biologists in national or regional subgroups. Communication and collaboration among the regional I&M team and refuge field staff will also be an integral part of the Region 8 I&M program that will be facilitated through monthly conference calls with refuge biologists, participation in project leader conference calls and meetings, development of the I&M Sharepoint site, creation of a newsletter, and development of outreach events (webinars, etc.), to gain input and to keep field staff informed. As we work towards the goals of the National I&M program, we will prioritize our efforts in light of available resources, and we will continually refine goals and objectives that meet national needs but also address needs unique to our Region. The I&M program has not yet developed formal methods for determining regional priorities, but will consult with refuges, supervisors, and the Chief of Refuges, taking into consideration the needs of other Service divisions and programs.

The I&M program must build a strong data management infrastructure to ensure that data collection is properly planned, and that the data are analyzed, reported, and managed so as to provide the greatest value to the Refuge System. This will occur at the national and regional levels. Data also need to be available for sharing with our partners. The Regional I&M Data Manager has primary responsibility, in cooperation with the Regional I&M Coordinator and I&M data management staff in the national office, for advising refuges regarding data management and for developing quality data management systems for high priority projects, including local or regional adaptive management projects. The national I&M office has the lead for the overall design of the national I&M data management system. For example, central data systems will likely be developed for baseline refuge data sets (maps, HGMs, etc.), water inventories, biotic inventories, and some bird data sets. The Regional I&M Data Manager will work with the national I&M office on national I&M database development, as appropriate. Appendix 4 describes two database development projects.

The implementation of the I&M program in Region 8 will be an iterative and adaptive process. We expect that most program activities started in FY 2011 will evolve. We will make adjustments upon annual evaluation. We recognize that this I&M program is refuge-centric, but it is not refuge exclusive. Collaborative efforts where priorities and needs overlap will likely provide valuable information for other Service programs as well as LCCs and other conservation partners.

1.3. Integration with the Regional Refuge Biological Program

The Regional Refuge Operations Division Chief provides overall guidance and support for the Region 8 Biological Program, which currently consists of the Regional Biologist and I&M program staff. The Regional Biologist, Sallie Hejl, integrates into the overall regional biological program by supporting Refuge stations in the development and review of biological planning documents, and by assisting the I&M staff to review inventory and monitoring efforts locally, regionally and nationally.

Regional I&M staff will collaborate with NWRS programs such as Planning, Fire Management and Realty; and other Service programs including the Partners and Coastal Program, Migratory Bird

Management, Fisheries, Endangered Species and Water Resources to ensure that I&M activities have multiple benefits in the Region, and to avoid duplication of effort.

1.4. Coordination with Partners via Landscape Conservation Cooperatives

The I&M *Strategic Plan* and *Operational Blueprint* envision that the I&M program will work closely and seamlessly with LCCs that fall within Region 8 (Figure 3). In Region 8, we are carrying out this vision by co-locating our office (and most of our staff) with the California LCC and the US Geological Survey on the CSUS campus. Planning this move to new offices, and combining forces in terms of administrative support, information technology (IT) and technical expertise, is a focus of all staff in FY 2011. We expect that this arrangement will be beneficial in many ways. One challenge of the I&M program is to move among geographical scales: we will be integrating biological issues and information from the individual refuge scale to regional, national and global scales. Working daily with the California LCC will allow us to move among these scales more easily, and to identify opportunities and efficiencies quickly. Having the resources of the university and the US Geological Survey close at hand will also benefit our program. One I&M staff member is designated as liaison to the California LCC, and at least two staff members will serve on LCC teams. We share information about partner proposals for funding, so that projects of joint interest will be supported. We will develop similar linkages with other LCCs in the Region (North Pacific, Great Basin, and Desert) as they develop.

2. Staffing

Region 8 Biology and I&M Program staff members are listed below. Staff profiles are in Appendix 1.

- *Refuge Operations Division Chief*, Carol Damberg: program oversight and leadership (office: Regional Office)
- *Regional Biologist*, Sallie Hejl: habitat management reviews, CCP review and development, habitat management planning, regional invasive species coordinator, and Great Basin and Desert LCC liaison (Office: Regional Office)

I&M Staff

- *I&M Coordinator*, Karen Laing: program leadership (Office: CSUS)
- *I&M Specialist* (similar to *Zone Biologist* in some other regions), Giselle Block: field staff supervision, CA LCC liaison, climate change, invasive species and habitat management planning (Office: CSUS & Joint Venture Office)
- *Data Manager*, Kaylene Keller: GIS and database development and organization (Office: CSUS)
- *Wildlife Biologist*, Orien Richmond: hydrogeomorphic analysis (HGMs) and bird monitoring (Office: Don Edwards NWR)
- *Hydrologist*, Rachel Esralew: Water Resource Inventories and Assessments (WRIAs), HGMs and wetland assessments (Office: CSUS)
- *Administrative Officer*, Rita Howard: office management (Office: CSUS)
- *Vacancies* as listed on current organizational chart: *Data Manager*, *Botanist (2)*, *Hydrologist*, *I&M Specialist/Zone Biologist*, *Wildlife Biologist*

Key Cooperators in FY2011

- Region 8 NWRS staff: Planning, Realty, Visitor Services, Fire Management
- Region 8 staff: Migratory Bird Management
- Region 1 staff: Water Resources
- US Geological Survey

3. Planned Activities and Anticipated Products

Table 1 outlines the major activities and products expected of the Region 8 I&M program for FY 2011. The activities included in Table 1 reflect our current focus on preliminary planning; collecting and cataloging existing data; learning about existing resources and refuge needs; organization of data collection, storage and retrieval systems; and communication.

Figure 1. Roles and responsibilities of the NWRS Inventory and Monitoring Program (from the Operational Blueprint).

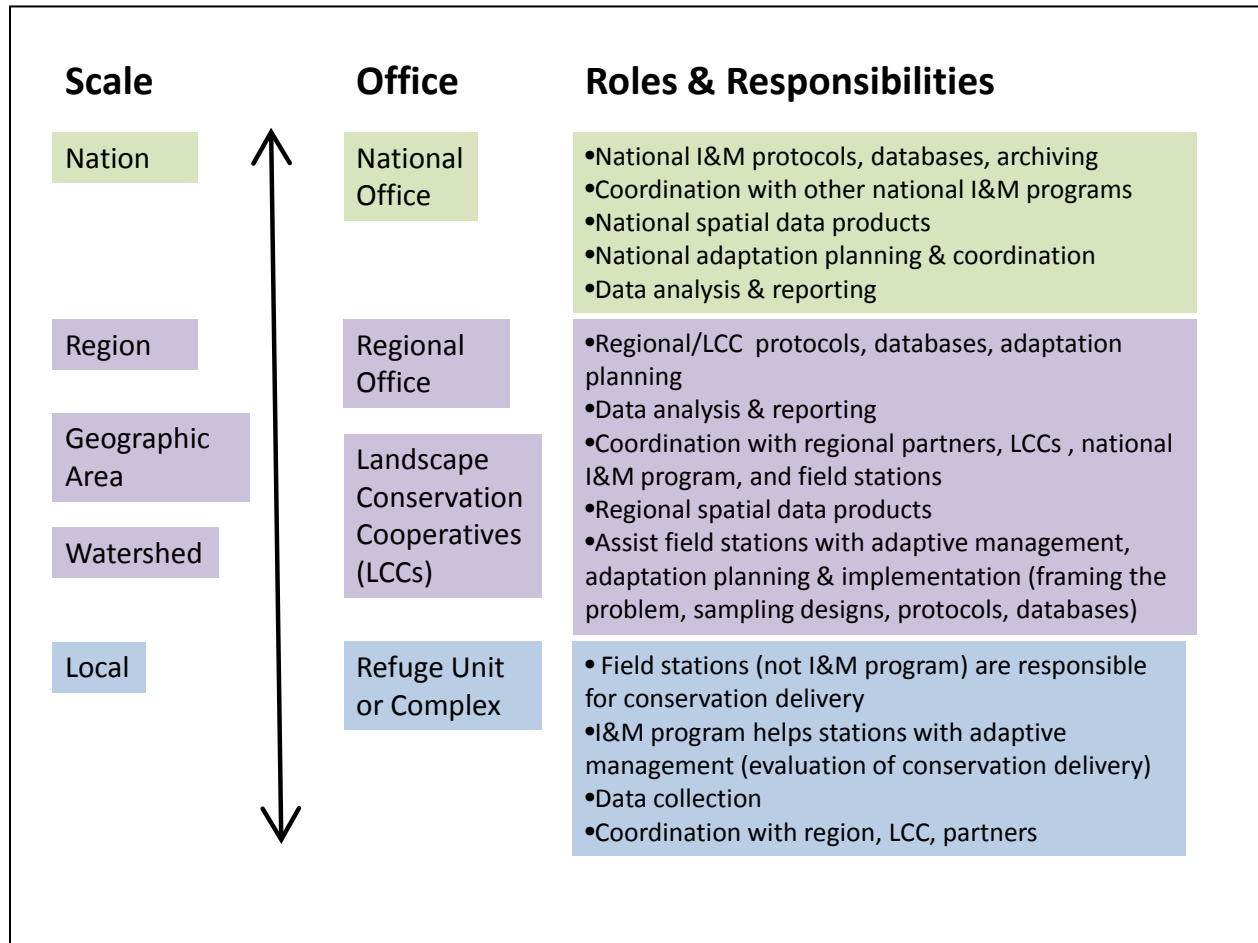
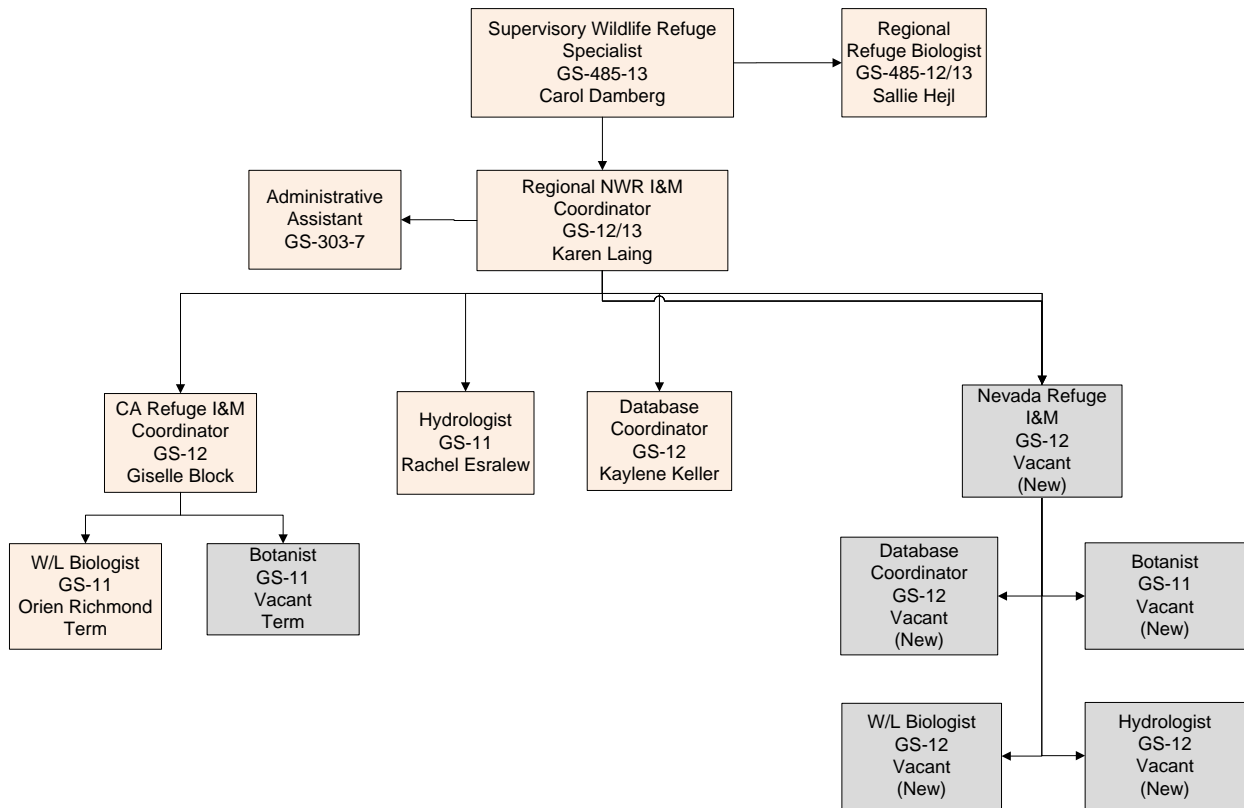


Figure 2. Organizational Chart for Region 8 NWRS Inventory and Monitoring Program



Draft 2/4/2011

Figure 3. Map of Region 8 LCCs and National Wildlife Refuges

(Note: This figure to be replaced with map developed by the national office).



Table 1. Region 8 Inventory and Monitoring Activities FY 2011

Blueprint Objectives and Tasks	Project	Products	Staff
	3.1.1. and 3.1.2. STATUS OF STATION HABITAT MANAGEMENT PLANS AND I&M PLANS		
	<i>Establishment of HMPs and IMPs in Region 8</i> Currently, no refuges in Region 8 have these plans.	Prioritize refuges for development of these plans	Hejl
	3.1.3. IDENTIFY I&M PRIORITIES		
Task A	<i>Strategic Planning</i> Develop long-term (5 year) strategic plan for the Region 8 I&M program.	Draft 5 Year Strategic Plan	Laing
Task B	<i>Communication with Refuge leadership</i> Provide updates to and receive guidance from R8 leadership team	Reports Attend meetings	Laing
	3.2.1. ABIOTIC RESOURCES		
1B	<i>Support Hydrogeomorphologic (HGM) evaluation projects on Bitter Creek, Ruby Lake, Ellicott Slough, San Luis, Kern, Pixley, Modoc and Stone Lakes NWRs</i> Develop an HGM Data Collection Plan that identifies a systematic process for gathering data needed for HGM analysis on the refuges listed above. Assist contractors and Refuges in gathering HGM data. Conduct meetings with Refuge staff to share information for the duration of each project. Participate on national I&M HGM team. <u>Note:</u> A hydrogeomorphologic evaluation is a modeling exercise that compares historical habitat conditions to current conditions and provides recommendations for future habitat management options to restore, maintain, or enhance habitats.	HGM Data Collection Plan HGM data files (and links to data) catalogued and archived Meetings with Refuge staff Contribute to national team tasks	Richmond Block Esralew Note: Esralew joined the staff in mid-Feb 2011
2A	<i>Water Resource Inventory and Assessment (WRIA) ranking and schedule</i> Develop ranking system and identify schedule for WRIAs for Region 8 refuges. This project fulfills activities identified in the national Climate Change Action Priorities for FY 2011.	Report explaining ranking process, prioritized list of Refuge WRIA's and schedule for completing WRIAs Initiate a WRIA on at least one refuge	Esralew
2A	<i>WRIA project</i> Work with the national water quality team, led by Mike Higgins of the NRPC, to refine the WRIA process and database.	Contribute to the refinement of the national WRIA database that will store data collected during the inventory. Data will be available to local and national offices.	Esralew

Blueprint Objectives and Tasks	Project	Products	Staff
2A	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
	3.3.1. BIOTIC RESOURCES: INVENTORIES		
1E	<p><i>Vegetation Mapping</i></p> <p>Assist the Division of Planning to prioritize refuges for vegetation mapping, and subsequently with the development of one priority refuge vegetation map.</p>	<p>Prioritized list of refuges for vegetation mapping assistance</p> <p>Contract for mapping and ground truthing of one priority refuge vegetation map</p> <p>Vegetation Summary Report</p>	Keller
1E	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
	3.3.2. BIOTIC RESOURCES: MONITORING		
4C	<p><i>Review bird monitoring efforts and tools</i></p> <p>Identify national and regional bird monitoring efforts and conservation plans that do or could encompass refuges. Develop processes for communication and coordination regarding bird management and monitoring, in partnership with Migratory Bird Management, Partners in Flight, PRBO, etc. Catalog existing bird monitoring protocols (e.g., Marsh Bird Monitoring Framework) in the FWS Reference database. Participate on national I&M bird monitoring team.</p>	<p>Database of partner organizations and contacts that are involved in bird monitoring efforts to facilitate future communication</p> <p>FWS Reference application populated with bird monitoring protocols</p> <p>Database of bird species of conservation concern</p>	Richmond
4C	<p><i>Document and support ongoing bird monitoring</i></p> <p>Conduct a pilot project at Don Edwards to test the Planning and Review of Inventory and Monitoring of Refuges database (PRIMR), developed by Region 1 to address requirements of the I&M Policy, and anticipated to be used nationally by the I&M program; this project will use the existing bird monitoring program and provide support to improve bird monitoring.</p>	Report on ongoing bird monitoring program at Don Edwards SF Bay NWR generated using PRIMR	Richmond
4C	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
	3.4. STRESSORS: CLIMATE CHANGE		
5B	<p><i>Coastal Sea Level Rise(SLR) Modeling</i></p> <p>Identify and collaborate with national and regional working groups, LCCs, local, State, and Federal agencies and non-governmental organizations to evaluate the extent of SLR modeling efforts (e.g., SLAMM, SET), their usefulness to refuges, future needs, and potential alternatives.</p>	Report on efforts to predict and measure SLR in Region 8: identification of current state of the technology, field data collection needs, and modeling needs	Block Esralew

Blueprint Objectives and Tasks	Project	Products	Staff
4B	<p><i>Evaluate the CA Plant Phenology Project</i></p> <p>In California the National Phenology Network is collaborating with the National Park Service to implement and test USA_NPN plant protocols and to test methods for engaging park staff and local communities in phenological monitoring. This is a collaborative effort between NPS, NPN, the National Ecological Observatory Network, UC Santa Barbara, and USGS. The role of the R8 I&M team will be to evaluate the Projects' future applicability to Refuges in R8.</p>	<p>Attend at least one pilot workshop at a National Park in R8.</p> <p>Identify partners and sources of information for plant or bird phenology monitoring in Region 8.</p>	Block
4B	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
3.4. STRESSORS: INVASIVE SPECIES			
3A	<p><i>Develop Invasive Plant Adaptive Management Process: Pilot Project</i></p> <p>Conduct a pilot project in a Region 8 refuge in partnership with the National Invasive Species Program, USGS and Utah State University. The pilot is funded by the national program. We will develop an invasive plant prioritization process, conduct an inventory of priority species, and model habitat relationships and spread (geospatial niche modeling).</p>	Progress report on the pilot project	Block
3A	<p><i>Early Detection Networks</i></p> <p>Identify and participate in Early Detection and Rapid Response (EDRR) Networks for invasive plants. EDRR increases the likelihood that localized invasive populations will be found, contained, and eradicated before they become widely established and cause environmental harm. EDRR can slow range expansion and avoid the need for costly long-term control efforts. By keeping current on regional invasive species issues and control techniques, I&M staff will improve our ability to assist refuges. This is an initial step toward refuge participation with EDRR Networks.</p>	Develop partnerships with Early Detection networks in Region 8	Block
3A	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
3.5. ADAPTIVE MANAGEMENT PROJECTS			

Blueprint Objectives and Tasks	Project	Products	Staff
1F	<p><i>Pilot "Bio Brown Bag Lunch" at Don Edwards San Francisco Bay Refuge</i></p> <p>Initiate a pilot biology discussion and speaker series at Don Edwards that will provide support to refuge biologists in designing monitoring and adaptive management studies, analyzing data and interpreting results. Coordinate invited speakers and discuss current and relevant scientific literature.</p>	Six meetings at Don Edwards; broadcast invited speakers via webinar so that staff at other refuges can attend some sessions.	Richmond
1F	<i>Projects to be chosen from the Request for Proposals sent to Refuges in March 2011.</i>		
	3.6. DATA MANAGEMENT		
Task A	<p><i>Refuge Data Inventory Plan (RDIP)</i></p> <p>Develop a plan outlining the steps involved in inventorying refuge resources and developing strategies for tracking the inventory data. This project will incorporate step-down plans for abiotic datasets, priority biological resources, invasive species and HGM projects. It will contribute to the development of individual refuge Inventory and Monitoring Plans (IMPs). We will also begin to implement the RDIP by assembling information from Comprehensive Conservation Plans (CCPs), Habitat Management Plans (HMPs) and other priority sources.</p>	<p>First draft of RDIP</p> <p>Catalog of CCP and HMP data according to RDIP</p>	Laing Keller Richmond Block
1A	<p><i>Assemble Abiotic Data</i></p> <p>Develop an abiotic data step-down plan as part of the RDIP. The plan will identify existing abiotic datasets to be catalogued, and will prioritize which refuges will be addressed first. We will begin implementation of the step-down plan by assembling abiotic datasets for priority refuges. We will summarize data as it becomes available for each refuge so that it can be used and evaluated by refuges.</p>	<p>First draft of the abiotic data collection plan for RDIP</p> <p>Catalog of identified datasets using FWS Reference database</p> <p>Summary tables generated from identified datasets</p>	Keller
1F	<p><i>Initiate analysis of existing refuge I&M data to exemplify use of monitoring data to implement adaptive management in a Refuge habitat management program.</i></p> <p>Initiate an adaptive management pilot: analysis of existing refuge I&M data that supports adaptive management. The pilot will focus on control of <i>Lepidium latifolium</i> in tidal marshes of San Pablo Bay.</p>	Initial analysis of pre- and post-treatment data	Block
DM3	<p><i>Database Development</i></p> <p>Work with NRPC and other Regional data managers to identify and develop additional databases.</p>	Contribution to national data manager team projects	Keller

Blueprint Objectives and Tasks	Project	Products	Staff
DM5	<i>Planning and Review of Inventory and Monitoring of Refuges (PRIMR) Database</i> Provide technical support to Region 8 staff in the implementation and evaluation of PRIMR developed by Region 1 to meet the I&M Policy.	Population of PRIMR with information from one refuge as a pilot Comments to NRPC on PRIMR based on pilot	Keller
DM7	<i>I&M Data Standards and Governance teams</i> Participate on national I&M Data Standards and Data Governance teams.	Contribution to national I&M Data Standards and Data Governance guidelines.	Keller
3.7. COMMUNICATION			
General Task C	<i>Establish dialogue with refuge staff</i> Educate refuge staff about I&M program; include refuges in planning process; learn about refuge needs	Monthly conference calls with refuge biologists Summary of I&M program at Project Leader meetings and at field station visits Refuge staff presentations to educate I&M staff about refuges Queries to Project Leaders re: how to be involved in I&M planning Newsletter for refuge staff on regional biological/I&M program	All
General Task C	<i>Partnerships</i> Work with the California Landscape Conservation Cooperative (CA LCC) and other USFWS programs, exploring potential partnerships with Universities and conservation organizations within Region 8. Work with Great Basin and Desert LCCs as they develop (in FY 2011, these LCCs are still being formed).	Co-location of new offices with CA LCC; develop agreement to define working relations Joint projects with CA LCC initiated Contribute to the CA LCC Informatics Team Contribute to the Great Basin and Desert LCCs as they develop	Laing Block Keller Hejl
DM9	<i>Partnerships</i> Work with USGS information technology group to ensure that information technology (IT) needs are appropriately developed and designed to meet I&M program needs.	Development of working agreements with USGS	Keller

Table 2. Region 8 Inventory and Monitoring Symposia, Program Reviews, Training, and Workshops Planned for FY 2011 (Note: information still to be added to this table)

Blueprint Objectives and Tasks	Symposium, Program Review, Training, or Workshop	Planned Date	Staff
3A	Teach course: <i>Field Techniques for Invasive Plant Management (WLD2139)</i> , at the National Conservation Training Center (NCTC).		Block
3A	Teach Mapping Wildland Weeds: CA Invasive Plant Council course	August 3	Block
General Task C	California LCC Stakeholders Meetings	January 25-26	Block
General Task A	Meeting at San Luis NWR on fish screening	March	Esralew
Data Mgmt	Conference: <i>ESRI International User Conference</i>	July	Keller
Data Mgmt	National Meeting: <i>FWS GIS National Meeting (NCTC)</i>	March 1 -4	Keller
	National Meeting of I&M Coordinators/Data Managers	December 13-16	Laing Keller
General Task A	Regional Meeting: <i>South Bay Salt Pond Restoration Project Science Symposium</i>	Feb 3	Richmond
4C	Regional Meeting: Partners in Flight Western Working Group	March 28-31	Richmond
1B	HGM meetings at the following refuges: Bitter Creek, Ellicott Slough, Kern/Pixley, Modoc, San Luis, Stone Lakes	Various dates	Richmond, others

Appendix 1. Staff Profiles

Karen Laing

Position: Regional Coordinator, NWRS Inventory and Monitoring Program, Region 8

Location: 3020 State University Drive, East
Modoc Hall, Suite 2007
Sacramento, CA 95819

Phone: (916) 278-9425 (after 17 February 2011)

Email: Karen_laing@fws.gov

Education:

M.S. Animal Ecology, University of California, Davis, Davis, California
B.S. Biology, The Evergreen State College, Olympia, Washington
B.A. Art History, Stanford University, Stanford, California



Primary responsibilities/Activities: I lead the Region 8 NWRS I&M Program under the guidance of the Chief of Refuge Operations (Carol Damberg) and the Chief, Refuges (Marge Kolar), and in cooperation with our Regional Refuge Biologist (Sallie Hejl). I coordinate inventory and monitoring activities on national wildlife refuges in U.S. Fish and Wildlife Service Region 8, in cooperation with the Landscape Conservation Cooperatives and the national Inventory and Monitoring Program office. My position includes addressing biological monitoring and adaptive management needs at multiple spatial scales, and providing guidance and oversight regarding the use of standardized monitoring protocols and databases. I supervise inventory and monitoring scientists and administrative staff, and work cooperatively with Project Leaders and field inventory and monitoring biologists at field stations.

Areas of Expertise:

Avian population dynamics
Conservation biology
Migratory Bird Treaty Act and Endangered Species Act implementation

Active Projects: Short and long term planning for the Region 8 I&M Program
Guiding the implementation of a new program with new staff in a new office

Selected Publications:

Laing, K. 1985. Food habits and breeding biology of merlins in Denali National Park, Alaska. Raptor Research 19: 42-51.

- Singer, F.J., **K.K. Laing**, E.C. Murphy and L.K. Nichols. 1986. The effects of trophy hunting on Dall sheep rut behavior and ram survivorship in Alaska. Northern Wild Sheep and Goat Council. Proceedings of the Fifth Biennial Symposium. Gayle Joslin, ed. Pp. 110-112.
- Singer, F.J., E.C. Murphy, B.A. Cooper and **K.K. Laing**. 1991. Activity in a hunted and unhunted herd of Dall sheep. *Applied Animal Behavior Science* 29(1-4): 185-193.
- Laing, K.** 1991. Habitat and food selection, behavior and body composition of nesting emperor geese. M.S. Thesis, University of California, Davis.
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- Klosiewski, S. and **K. Laing**. 1994. Marine bird populations of Prince William Sound, Alaska, before and after the *Exxon Valdez* oil spill. Bird Study Number 2. Exxon Valdez Oil Spill State and Federal Natural Resources Damage Assessment Final Reports. U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Road, Anchorage, Alaska 99503
- Larned, W., M.R. Petersen, **K. Laing**, R. Platte and J.I. Hodges. 1995. Location and characteristics of spectacled eider molting and wintering areas 1993-1994. Report. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.
- U.S. Fish and Wildlife Service. 1998. Canada goose population management in Anchorage, Alaska. Environmental Assessment, prepared in consultation with the Anchorage Waterfowl Working Group. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, Alaska.
- Schmutz, J.A. and **K.K. Laing**. 2002. Variation in foraging behavior and body mass in broods of emperor geese (*Chen canagica*): evidence for interspecific density dependence. *Auk* 119: 996-1009.
- U.S. Fish and Wildlife Service. 2009. 12-Month Finding on a Petition to List the Yellow-billed Loon as Threatened or Endangered. Primary author. Federal Register March 25, 2009. 72 FR 12932-12968.

Sallie Hejl

Position: Regional Refuge Biologist, Region 8

Location:

1624 Hood Franklin Road
Elk Grove, CA 95757

Phone: (916) 943-6662

Email: Sallie_Hejl@fws.gov

Education:

PhD. Zoology. Northern Arizona University, Flagstaff, Arizona

M.A. Zoology, University of California, Davis, Davis, California

B.S. Environmental Education, University of California, Davis, Davis, California



Primary responsibilities/Activities: I lead the Region 8 NWRS Biological Program under the guidance of the Chief of Refuge Operations (Carol Damberg) and the Chief, Refuges (Marge Kolar) and in cooperation with Region 8's Inventory and Monitoring Coordinator (Karen Laing). I provide biological expertise and support to Pacific Southwest refuges. This work includes developing and coordinating workshops and monthly phone calls for refuge biologists, providing input to Comprehensive Conservation Plan (CCP) development, leading habitat management reviews, and reviewing refuge documents such as CCP planning documents. I also serve as an active member of the National Refuge Biological Leadership Team (NRBLT), which promotes innovative resource management, cooperation, coordination, and consistency across regions in the collection, analysis, review, and application of biological information for management of the National Wildlife Refuge System. The team provides leadership in the science of resource management to meet NWRS commitments to address conservation of fish, wildlife, and plants and their habitats; ensure that the biological integrity, diversity, and environmental health of the System are maintained; and monitor the status and trends of fish, wildlife, and plants in each refuge. I am the Invasive Species Coordinator for Region 8, which entails keeping abreast of and sharing information on invasive species issues, reviewing grant proposals at regional and national levels, and working with refuges to develop strategic methods to combat invasive species. I also provide input to other USFWS programs, including reviewing listing decisions for endangered species and being a member of the Science Advisory Team for the California Landscape Conservation Cooperative (LCC).

Areas of Expertise:

Avian ecology

Wildlife-habitat relationships

Conservation biology

Active Projects: Conducting Habitat Management Reviews for Bitter Creek NWR, Blue Ridge NWR, and Hopper Mountain NWR

Selected Publications:

- Hejl, S. J.**, J. Verner, and R. P. Balda. 1988. Weather and bird populations in true fir forests of the Sierra Nevada, California. *Condor* 90:561-574.
- Hejl, S. J.**, and J. Verner. 1990. Within-season and yearly variations in avian foraging locations. *Studies in Avian Biology* 13:202-209.
- Hejl, S. J.** 1994. Human-induced changes in bird populations in coniferous forests in western North America during the past 100 years. *Studies in Avian Biology* 15:232-246.
- Hejl, S. J.**, R. L. Hutto, C. R. Preston, and D. M. Finch. 1995. Effects of silvicultural treatments on birds in the Rocky Mountains. Pp. 220-244 In: T. E. Martin and D. M. Finch (eds.), *Ecology and management of Neotropical migratory birds: a synthesis and review of critical issues*. Oxford Univ. Press, New York.
- Hejl, S. J.**, and K. M. Granillo. 1998. What managers really need from avian researchers. Pp. 431-437 In: J. M. Marzluff and R. Sallabanks (eds.), *Avian conservation: research and management*. Island Press, Washington D.C.
- Hejl, S. J.** 2000. A strategy for maintaining healthy populations of western coniferous forest birds. Pages 97-102 In: R. Bonney, D. N. Pashley, R. Cooper, and L. Niles (eds.), *Strategies for bird conservation: The Partners in Flight planning process; Proceedings for the 3rd Partners in Flight Workshop*. USDA Forest Service Proc. RMRS-16, and at <<http://birds.cornell.edu/pifcapemay>>
- Hejl, S. J.**, J. A. Holmes, and D. E. Kroodsma. 2002. Winter Wren (*Troglodytes troglodytes*). In *The Birds of North America*, No. 623 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Hejl, S. J.**, D. Evans Mack, J. S. Young, J. C. Bednarz, and R. L. Hutto. 2002. Birds and changing landscape patterns in conifer forests of the north-central Rocky Mountains. *Studies in Avian Biology* 25:114-130.
- Hejl, S. J.**, K. R. Newlon, M. E. McFadzen, J. S. Young, and C. K. Ghalambor. 2002. Brown Creeper (*Certhia americana*). In *The Birds of North America*, No. 669. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Carolin, T., S. Gniadek, **S. Hejl**, D. LaFleur, J. Lapp, L. Marnell, R. Menicke, and J. Potter. 2007. Challenges of managing Glacier National Park in a regional context. Pages 260-284 In: T. Prato and D. Fagre (eds.), *Sustaining Rocky Mountain Landscapes*. RFF Press, Washington D.C.
- Werner, S. M., **S. J. Hejl**, and T. Brush. 2007. Breeding ecology of the Altamira Oriole in the Lower Rio Grande Valley, Texas. *Condor* 109:908-920.
- Marx, D. E., **S. J. Hejl**, and G. Herring. 2008. Wintering grassland bird habitat selection following summer prescribed fire in a Texas Gulf Coast tallgrass prairie. *Fire Ecology* 4:46-62.

Kaylene E. Keller

Position: Ecologist / GIS and Data Manager (Inventory & Monitoring)

Location: 3020 State University Drive, East
Modoc Hall, Suite 2007
Sacramento, CA 95819

Phone: 916-278-9419

Email: Kaylene_Keller@fws.gov



Education:

Ph.D. Ecology, University of California, Davis

B.S. Environmental Biology and Management, University of California, Davis

Primary responsibilities / Activities:

Coordinate and develop GIS and data management tools for Region 8 Inventory and Monitoring Program. Develop spatial analysis to meet monitoring program goals. Coordinate inventory of data and implementation of data management plan.

Areas of Expertise:

Watershed analysis

GIS, spatial analysis, modeling

Data management

Decision analysis and adaptive management

Conservation Biology

Active Projects:

Testing available databases and cataloging available abiotic data

Identify data needs and recommend solutions to meet needs

Summarize available data and provide information to I&M program

Selected Publications

Friedlander, A., **K. Keller**, L. Wedding, A. Clarke, M. Monaco (eds.). 2009. A Marine Biogeographic Assessment of the Northwestern Hawaiian Islands. NOAA Technical Memorandum NOS NCCOS 84. Prepared by NCCOS's Biogeography Branch in Cooperation with the Office of national Marine Sanctuaries Papahānaumokuākea Marine National Monument. Silver Spring, MD. 363pp.

Suchanek, T.H., Cooke, **K. Keller**, S. Jorgensen P.J. Richerson, C.A. Eagles-Smith, H.J. Harner, and D.P. Adam. 2009, A mass balance mercury budget for a mine-dominated lake: Clear Lake, California. Water, Air and Soil Pollution 196(1):51-73.

Dylan S. Ahearn, Richard W. Sheibley, randy A. Dahlgren and **Kaylene E. Keller**, 2004 "Temporal Dynamics of stream water chemistry in the last free-flowing river draining the western Sierra Nevada, California" *Journal of Hydrology*, 295 (2004) pp. 47-63

Kaylene E. Keller, 2003. Landscape Scale Analysis of Riparian Resotriaton, Site Selection and Adaptive Management in California's Cosumnes River Floodplain. Ph.D. Dissertation, University of California, Davis.

Giselle Block

Position: Inventory and Monitoring Specialist

Location:

Sacramento State University
Sacramento, CA

Phone: 916-531-6546

Email: Giselle_block@fws.gov

Education:

M.S. Wildlife and Fisheries Management – University of
Arizona, Tucson
B.S. Biology – University of California, Berkeley



Primary responsibilities/Activities: My work will include building conservation partnerships at multiple scales to advance information exchange and translation, identify data gaps and needs, avoid duplication of efforts, and increase our capacity to gather and apply scientifically credible data that supports refuge management and contributes to conservation at larger spatial scales. I will be working with individual refuges to catalogue past and present inventory and monitoring information and identify needs (e.g., data, analysis, protocols) that will support adaptive management of refuge resources, especially relative to environmental stressors (e.g., fire, invasive species, climate change). Technical aspects of my duties will include use of conceptual models, structured decision making and other tools to identify critical I&M needs; assist refuges with development of I&M plans; developing and reviewing survey protocols and sampling designs; planning and delivering training, and assisting with I&M data collection and management, analysis, interpretation, and reporting.

Areas of Expertise:

Invasive species ecology and management
Wetland restoration and enhancement
Monitoring program development
Estuarine ecology
Small mammal ecology

Active Projects:

- Spatial ecology and control of *Lepidium latifolium* in tidal marsh environments; development of invasive plant early detection networks; invasive plant prioritization methods; ecology of the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*); vulnerability of salt marsh harvest mice to extreme weather events as a result of climate change.

Selected Reports and Publications

- Ericson J, Hubbard T, Hanson M, Barnett D, **Block G.** 2009. Engaging volunteers in invasive species management. In: Espinosa-García F, Hubbard T, Van Devender TR, Harper-Lore B, editors. Invasive Plants on the Move. Controlling them in North America: Proceedings of Weeds Across Borders 2006 Conference, Hermosillo, Sonora. University of Arizona Press.
- Block, G.** and M. L. Morrison. 2010. Large-scale effects on bird assemblages in desert grasslands. *Western North American Naturalist* 70(1): 19-25.
- Block, G.**, L. Liu and M. Perlmutter. 2008. Tubbs Island and Lower Tolay Creek Tidal Marsh Enhancement Project Monitoring Plan. San Pablo Bay NWR, Petaluma, CA. 42pp.
- Hogle, I., R. Spenst, S. Leinenger, and **G. Block.** 2007. San Pablo Bay *Lepidium latifolium* Control Plan. San Pablo Bay NWR, Petaluma, CA. 61pp.
- Takekawa, J. Y., M. A. Bias, I. Woo, K. L. Turner, A. R. Westoff, **G. T. Downard**, and F. A. Reid. 2005. Restoration research and monitoring in bayland wetlands of the San Francisco Bay Estuary: The Tolay Creek project. U. S. geological Survey, Unpubl. Prog. Rep. Vallejo, CA 67pp.
- Kuenzi, A. J., **G. T. Downard**, and M. L. Morrison. 1999. Bat distribution and hibernacula use in west central Nevada. *Great Basin Naturalist* 59(3): 213-220.
- Kuenzi, A. J., M. L. Morrison, D. E. Swan, P. Hardy, and **G. T. Downard.** 1999. A longitudinal study of Sin Nombre Virus prevalence in rodents, southeastern Arizona. *Emerging Infectious Diseases* 5(1): 114-117.

Orien Richmond

Position: Wildlife Biologist (Inventory and Monitoring)

Location:

Don Edwards San Francisco Bay National Wildlife Refuge
Newark, CA

Phone: (510) 792-0222 x144

Email: orien_richmond@fws.gov

Education:

Ph.D. Environmental Science, Policy & Management –
University of California, Berkeley

M.S. Earth Systems – Stanford University, Stanford, California

B.S. Earth Systems – Stanford University, Stanford, California



Primary responsibilities/Activities: My primary roles on the R8 I&M team are to lead the Bird Monitoring task and to co-lead the Hydrogeomorphic Analysis (HGM) task. For bird monitoring, I conduct reviews of existing bird monitoring programs and protocols, both within refuges and across other divisions and organizations, to identify gaps in knowledge, species of concern and potential partners. I also participate on the national I&M bird monitoring team, pilot databases for storing bird monitoring data and develop biological study proposals, survey designs and scopes-of-work. For the HGM task, I support our HGM contractor in collecting and storing data, test pilot databases for HGM-related abiotic and/or legacy data and participate on the national I&M HGM team. I provide leadership within the San Francisco Bay National Wildlife Refuge Complex regarding adaptive management by coordinating a monthly “Bio Brown Bag Lunch” series to support refuge biologists in designing monitoring studies, analyzing data and using results to inform management. In this role I review survey protocols and sampling designs, coordinate invited speakers and facilitate discussions of current and relevant scientific literature. Finally, I analyze existing monitoring datasets using quantitative models (e.g., occupancy models) to test scientific hypotheses about species-habitat relationships and species interactions (e.g., associations between small mammals and habitat characteristics, and competitive interactions between small mammal species).

Areas of Expertise:

Occupancy and wildlife-habitat relationship modeling

GIS and remote sensing

Conservation biology

Marsh birds

Active Projects:

- (1) Identify and catalog bird monitoring programs and protocols and support/improve existing bird monitoring efforts in R8;
- (2) Support data collection, test data storage tools and coordinate with contractors and refuges for 4 refuge hydrogeomorphic analyses (HGMs); and
- (3) Lead and coordinate monthly “Bio Brown Bag Lunch” series to support adaptive management and facilitate communication between biologists and managers.

Selected Publications:

- Richmond, O.M.W.**, J.E. Hines and S.R. Beissinger. 2010. Two-species occupancy models: a new parameterization applied to co-occurrence of secretive rails. *Ecological Applications* 20(7): 2036-2046.
- Richmond, O.M.W.**, J.P. McEntee, R.J. Hijmans and J.S. Brashares. 2010. Is the climate right for Pleistocene rewilding? Using species distribution models to extrapolate climatic suitability for mammals across continents. *PLoS ONE* 5(9): e12899.
doi:10.1371/journal.pone.0012899
- Richmond, O.M.W.**, S.K. Chen, B.B. Risk, J. Tecklin and S.R. Beissinger. 2010. California black rails depend on irrigation-fed wetlands in the Sierra Nevada foothills. *California Agriculture* 64(2): 85-93.
- Richmond, O.M.**, J. Tecklin and S.R. Beissinger. 2008. The distribution of California Black Rails in the Sierra Nevada foothills. *Journal of Field Ornithology* 79(4): 381-390.

Rachel Esralew

Position: Hydrologist (Inventory and Monitoring)

Location:

California State University, Sacramento, California

Phone:

Email: Rachel_Esralew@fws.gov



Education:

M.S. Applied Geosciences/Hydrogeology – University of Pennsylvania, Philadelphia, Pennsylvania

B.S. Natural Resources Management, Environmental Geomatics (minor) – Rutgers University, New Brunswick, New Jersey

Primary responsibilities/Activities: I assist the Region 8 Refuge Inventory and Monitoring (I&M) Coordinator in coordination with Refuge Operations and the California Landscape Conservation Cooperative. I assist with acquiring, developing, and protecting Service water rights and water resources, and provide technical assistance to other Divisions and field stations related to hydraulics, hydrology, hydrogeology, and water quality. My duties focus on hydrologic aspects of the inventory and monitoring program, including the application of structured decision making and adaptive management to resolve resource management problems related to water resources; assessment of current and future inventory and monitoring projects with respect to hydrologic information; and development and review of hydrologic monitoring data collection and management, analysis, interpretation, and reporting.

Areas of Expertise:

Hydrologic and climate trend analyses

Probabilistic hydrologic modeling

Surface water, groundwater, and water quality data collection and analysis

Geographic Information Systems (GIS)

Environmental flow assessments

Active Projects: Development, coordination, and completion of Water Resources Inventory and Assessments (WRIA) for Refuges in Region 8.

Selected Publications:

- Baker, R.J., and **Esralew, R.A.**, 2010, Relation of water quality to land use in the drainage basins of six tributaries to the lower Delaware River, New Jersey, 2002–07: U.S. Geological Survey Scientific Investigations Report 2010–5151, 68 p.
- Esralew, R.A.**, Allen, M.L., Andrews, W.J., 2011, Methods of estimation and and trends analysis of concentrations and loads of nutrients and sediment in the Eucha-Spavinaw Basin, Arkansas and Oklahoma, 2002-2010; U.S. Geological Survey Scientific Investigations Report [in press]
- Esralew, R.A.**, Andrews, W.J., Smith, S.J., 2011, Summary and trends of land cover, streamflow, and water quality in the North Canadian River Basin near Oklahoma City, Oklahoma, 1969-2009, U.S. Geological Survey Scientific Investigations Report [in press]
- Esralew, Rachel A.**, 2010, Determination of baseline periods of record for selected streamflow-gaging stations in and near Oklahoma for use in modeling applications: U.S. Geological Survey Scientific Investigations Report 2010-5106, 64 p.
- Esralew, Rachel A.**, Tortorelli, R.L., 2010, Nutrient concentrations, loads, and yields in the Eucha Spavinaw Basin, Arkansas and Oklahoma, 2002-2009: U.S. Geological Survey Scientific Investigations Report 2010-5119, 40 p.
- Esralew, Rachel A.**, Lewis, J.M., 2010, Trends in base flow, total flow, and base-flow index of selected streams in Oklahoma through 2008: U.S. Geological Survey Scientific Investigations Report 2010-5104, 143 p.
- Esralew, Rachel A.**, Smith, S.J., 2009, Methods for estimating flow duration and annual mean-flow statistics at ungaged streams in Oklahoma: U.S. Geological Survey Scientific Investigations Report 2009-5267, 131 p.
- Esralew, Rachel A.**, 2009, Development of regression equations to estimate flow duration statistics at ungaged streams in Oklahoma using a regional approach: Conference Proceedings, American Society of Civil Engineers Environmental Water Resources Institute, 2009 World Environmental and Water Resources Congress, Kansas City, MO, May 17-21, 2009.
- Esralew, Rachel A.**, Baker, Ronald J., 2008, Determination of baseline periods of record for selected streamflow-gaging stations in New Jersey for determining ecologically relevant hydrologic indices (ERHI): U.S. Geological Survey Scientific Investigations Report 2008-5077, 72 p.
- Turton, D., Fisher, W., Seilheimer, T.S., **Esralew, R.A.**, 2009, An assessment of environmental flows for Oklahoma: Oklahoma Water Resources Research Institute Research Report, available online at <http://water.usgs.gov/wrri/08grants/progress/2008OK107B.pdf>

Rita Howard

Position: Administrative Officer (Inventory and Monitoring)

Location:

California State University, Sacramento

Phone: 916-278-9443

Email: rita_howard@fws.gov

Education:

B.A. Business Administration – Grantham University, Kansas City, MO

Primary Responsibilities/Activities: I serve as the principal source of administrative expertise for the Refuge Inventory and Monitoring (I&M) Program. My responsibilities are to assist with budget issues, such as reimbursable agreements, cooperative agreements, grants, contributed funds, cross program funding, and multiple natural resource accounts. I have primary responsibility for administrative support activities such as budgetary and fiscal accounting, procurement, personnel, and various Automated Data Processing (ADP) Programs. I assist Refuge I&M staff in developing/reviewing preliminary contract specifications prior to forwarding to Contracting and General Services (CGS) Regional Office. I assist staff with travel arrangements and process travel vouchers. Additionally, I prepare reports dealing with property, training, energy, equipment, safety, travel and various other special reports as required.

Appendix 2. Region 8 NWRS Inventory and Monitoring Program Accomplishment Report

FY 2010

Region 8 (Pacific Southwest Region) initiated the development of the Refuge I&M program with a first year budget allocation of \$1,112,991.00.

Funding was used to support the following tasks:

- 1) Hire 5 new positions – (\$191,000)
 - I&M Coordinator
 - I&M Specialist
 - Wildlife Biologist (Term)
 - Hydrologist
 - Database/GIS Manager
- 2) Establish a new Office Co-located with the California Land Conservation Cooperative (LCC) at Sacramento State University – 5 positions of the I&M program will operate from this office. (\$36,000)
- 3) Contract Hydrogeomorphic Evaluations on 7 National Wildlife Refuges (\$490,000)
 - Modoc NWR
 - Ellicot Slough NWR
 - Ruby Lake NWR
 - Stone Lakes NWR
 - Kern & Pixly NWR
 - San Luis NWR
 - Bitter Creek NWR (Nationally funded)
- 4) Purchase support equipment for the new I&M program: computers, printers, vehicles, GPS, Survey equipment. (\$153,000)
- 5) Assist to fund on-going Refuge Station I&M projects and Equipment needs within Region 8 (\$241,000)
 - San Diego NWR – Gull Billed Tern and Least Tern Monitoring
 - Sacramento NWR – GPS and Survey Equipment for Monitoring Restoration Projects
 - Bitter Creek NWR – Condor Long Term Monitoring Equipment
 - Stone Lakes NWR – I&M Office Space Setup & Field Equipment
 - Desert NWR – Vegetation Mapping Project
 - San Luis NWR – Water Monitoring Equipment
 - Kern NWR – Water Monitoring Equipment
 - Klamath Complex NWR – Aerial Waterfowl Surveys – long term monitoring
 - Don Edwards NWR – Waterbird Monitoring
 - Sonny Bono NWR – I&M Equipment Needs

Appendix 3. Region 8 NWRS Inventory and Monitoring Program Budget FY 2011

NOTE TO REVIEWERS 4/1/2011: KAREN WILL EDIT THIS BUDGET AFTER RFP REVIEW NEXT WEEK

COST CATEGORY	PROJECTED COST
Projected Funds Available in FY 2011: \$1,100,000.00	
Personnel	\$474,566.00
Sac State Offices	\$63,200.00
Vehicles	\$6,125.89
Travel/Training	\$20,803.68
PCS Moves	\$86,316.00
Equipment, Supplies	\$24,743.94
Total	\$708,731.51

POTENTIALLY AVAILABLE FOR PROJECTS	391,268.49
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Appendix 4. Potential Projects for Region 8 NWRS Inventory and Monitoring Program FY 2011, depending on final FY 2011 Budget for I&M Program.

Funding Idea	Description	Priority	Amount	Lead
Biometrician	Contract Employee	1	\$50-150K	Keller, Richmond,Hejl
Computer needs	Computer hardware/software purchases	2	\$25-30K	Keller
CESU Contracts	Assist Refuges to develop monitoring plans or analysis of existing data	3	\$50-100K	Keller
Vegetation Mapping	Assist refuges with vegetation mapping, coordinated with Planning Office priorities	3	\$75K	Keller
WRIA	WRIA-related contracting or equipment; contract hydrologist to assist with water rights/water use work	3	\$25K	Esralew
Challenge Cost Share Proposals	Possible funding of projects that are relevant to I&M	4		Damberg
Data entry	Data entry (Step, Term, Intern (CESU)) to test and populate new I&M databases (e.g. FWSReference, PRIMR) species of concern list, Objectives & Goals of CCPs/HMPs, data mining for HGMs	4	\$15K	Richmond
Invasive Species Early Detection Network Project	Partnership project described in Table 1.		\$20K	Block
RFP to Refuges for Projects	Request for Proposals to Refuges to apply for funds for projects, products or equipment	4	\$100-300K	Laing

Appendix 5. Database Development

The I&M program is making a strong commitment to data management to ensure that data are synthesized and turned into useful information for managers and partners. The full implementation of a data management system will evolve over the life of the program. To achieve the goal of an integrated data management system, we will take small steps each year. During FY 2011 and FY 2012, data management projects will be initiated to catalog legacy datasets and inventory existing monitoring data. In FY 2011, we will initiate the FWS Reference Database and the Planning and Review of Inventory and Monitoring of Refuges (PRIMR) Database.

FWS Reference Database: The NPS maintains a robust, web-based database application that allows field stations to describe, upload, and make discoverable a wide variety of legacy documents including geospatial datasets. FWS has contracted with NPS to convert the existing system into a system that will accommodate FWS data. The web version is scheduled to be available Fall 2011, but until it is available regions can test a desktop version. The testing phase will provide regions with access to the system and the ability to provide content that can be incorporated into the web version. Once populated and available the system will allow FWS easy access to reference information related to Refuges.

Planning and Review of Inventory and Monitoring of Refuges (PRIMR) Database: This database and an accompanying handbook were developed by I&M staff in Region 1, and is now being evaluated by the I&M programs in all regions in anticipation that it will be adopted nationally as a standard tool. The database can be used to gather and store information for current and future inventory and monitoring (I&M) activities (surveys) occurring on the refuge by refuge staff and by its partners, cooperators and contractors. Based upon current I&M activities, the handbook provides a process to identify and document a prioritized set of surveys for the future. This prioritization process may identify surveys not currently being conducted, but are needed to support important resource management decision making on the refuge. Using PRIMR to document a comprehensive, prioritized set of surveys for the refuge will result in completing Part I of a refuge Inventory and Monitoring Plan (IMP) that will be required by the new, draft I&M policy (863 FW 1). The handbook also provides procedures for using the database tool to store information about historical surveys and their legacy data as a separate and lower priority exercise. In Region 8, we will be testing the database and handbook by using it at the Don Edwards San Francisco Bay NWR.

Appendix 6. Background on the New Inventory and Monitoring Program

Acquiring and analyzing inventory and monitoring information on biological resources, ecological processes, and components of the physical environment is critical to meeting the mission and legislated mandates of the National Wildlife Refuge System (NWRS). The NWRS is developing a new national inventory and monitoring program to generate information critical to the Refuge System's ongoing contributions to the conservation of the nation's fish, wildlife, and plant resources in the face of climate change and other environmental stressors. The program emphasizes collaboration within the NWRS and with other Service programs as well as State, Federal, and private partners, which will lead to effective integration of inventory and monitoring data needed to advance conservation at landscape scales. To accomplish this vision, the NWRS Inventory and Monitoring (I&M) Program must be integrated not only with existing refuge field and regional biological staff, but also with the newly established Landscape Conservation Cooperatives (LCCs).

This draft annual work plan describes the implementation of the NWRS I&M Program within Region 8 in FY 2011 and how it will integrate with the existing regional biological program. It also identifies the highest priority tasks that the Region 8 I&M Program will address in FY 2011 and provides a draft conceptual plan for how the program may develop in the long-term. Although the 2011 draft plan was delayed in development, it is important for us to get feedback from field stations. The development of future annual plans will be more pro-active and effective in gathering field input.

Initial efforts in FY 2010 focused on funding hydrogeomorphologic evaluations(HGM) for seven refuges; purchasing computers, printers, vehicles and other equipment; hiring five new positions (Appendix 1 – Staff Profiles); and making preliminary plans for co-location of the program with the California Landscape Conservation Cooperative (CA LCC) (Appendix 2 – Region 8 NWRS Inventory and Monitoring Program Accomplishment Report FY 2010).

National I&M Program

The purpose of the NWRS I&M Program is to collect and synthesize information that supports management at multiple geographic scales and informs decisions at all organizational levels. The I&M program will document the status, assess the condition, and detect changes in the NWRS' diverse fish, wildlife and plant communities; physical resources including water, air and soils; and ecological processes to support science-based conservation planning and management at multiple spatial scales. The information generated will be scientifically credible, relevant and valued by the Service, its partners in the conservation community, and the public. I&M program protocols and standards will provide the basis for consistent data collection and data management throughout the Refuge System, ensuring the timeliness, availability, and long-term integrity of the information collected.

The NWRS I&M program is based on three documents: the *Strategic Plan for Inventories and Monitoring on National Wildlife Refuges: Adapting to Environmental Change (Strategic Plan)*; the *Operational Blueprint for Inventories and Monitoring on National Wildlife Refuges – Adapting to Environmental Change (Operational Blueprint)*; and *Addendum to the Strategic Plan (Addendum)*. These documents are on the Region 8 I&M Sharepoint website (<http://sharepoint.fws.net/Programs/nwrs/IM/R8/default.aspx>) which is nested under the national site (http://sharepoint.fws.net/Programs/nwrs/IM/defaultand_refuge.aspx) to distribute and share information among national and regional I&M teams, other regional offices and refuge staff.

The *Strategic Plan* is the foundation document of the I&M Program. The *Operational Blueprint* was developed from the *Strategic Plan* and serves to guide Program activities during the next several years by identifying general tasks, initial objectives and step-down tasks for those objectives, and data management tasks. Please refer to these documents, especially the *Operational Blueprint*, for more in-depth discussion of I&M program development, vision and goals, and program foci at national and regional scales. The National and Regional office staff of the I&M Program, once hired, will refine and prioritize long-term goals and objectives presented in the *Strategic Plan*.

Goals of the National I&M Program

1. Meet the Refuge System's legal mandate to monitor the status and trends of fish, wildlife, and plant populations on refuges, and collect and manage information needed to maintain biological integrity, biological diversity, and environmental health, and preserve the character of designated wilderness within the System
-

2. Advance fish and wildlife conservation at the refuge scale and broader landscape scales in an adaptive management cycle by providing scientific information that supports conservation planning and design, guides learning through evaluation of conservation delivery, and offers a basis for assumption-driven research.
 3. Implement monitoring of fish, wildlife, and plants; physical resources; and ecological processes to reduce uncertainty related to impacts of climate change and other stressors; provide early warning of changing conditions; and guide development of management actions that facilitate adaptation to climate change.
 4. Synthesize, interpret, and report on the condition of fish, wildlife, plants, and habitats conserved by the Refuge System in a manner that documents the contributions of the Refuge System within the context of the larger conservation estate and clearly communicates its value to the American public.
 5. Enhance effectiveness and reduce costs by coordinating and integrating monitoring of natural resources at landscape scales through collaboration with other Service programs, agencies, and organizations.
-

Development of Regional Annual Work Plans in FY 2011

For FY 2011, each region will choose to implement tasks listed in the *Operational Blueprint*. The *Operational Blueprint* general tasks, main objectives and their step-down tasks, and data management tasks are listed below. A more detailed description of each task and its development can be found in the *Strategic Plan* and *Operational Blueprint*. Tasks to be addressed or initiated by Region 8 in FY2011 are marked with an asterisk here, and are described in more detail in Table 1.

General Tasks = Overarching National I&M Tasks:

- A) Information needs assessment (= determine our Refuge biological information needs).*
- B) Coordinate I&M program with existing NWRS programs and Service leadership.*
- C) Collaborate and build partnerships with other Service programs, the LCCs, and other agencies and conservation partners.*

Main Objectives and step-down tasks:

1. *Objective: Collect, synthesize, and manage information needed to increase the resilience of existing protected areas by informing refuge planning and management and the future growth of the Refuge System. Support and evaluate adaptation strategies at multiple spatial scales.*
 - Task 1a: Assemble existing abiotic data sets needed by NWRS managers to set management objectives through the Comprehensive Conservation Plan (CCP) process.*
 - Task 1b: Complete baseline hydrogeomorphic (HGM) analyses at selected NWRS stations.*
 - Task 1c: Design and implement a strategic plan for compiling, organizing, interpreting, and serving legacy data within the NWRS for the purpose of documenting historic and current occurrences of species.*
 - Task 1d: Design and implement at least four pilot studies across the NWRS to contrast approaches for inventorying the occurrence of vertebrates, vascular plants, and a subset of invertebrates.

- Task 1e: Design, fund, and implement a strategic process for completing vegetative inventories and cover mapping, using the National Vegetation Classification Standard on all refuges.*
 - Task 1f: Support monitoring for adaptive management by providing guidance, coordination, data management, and documentation of monitoring within an adaptive management framework.*
2. *Objective: Collect, synthesize, and manage information needed to assess the vulnerability of the Refuge System as related to broad-scale climate and non-climate stressors: water shortages, changes in precipitation and disturbance patterns, changes in fire risk, contaminants, and land use changes. Support and evaluate adaptation strategies at multiple spatial scales.*
- Task 2a: Complete a baseline, reconnaissance-level inventory of water resources, including an assessment of water quality, at all refuges.*
 - Task 2b: Fire Regimes - Scope an approach for establishing and reporting standard reference points for measuring long-term, landscape-scale, fire regime shift under climate change and other stressors.
3. *Objective: Collect, synthesize, and manage information needed to assess the vulnerability of the NWRS to increases in weed species and changes in insect pests and disease pathogens. Support and evaluate adaptation strategies at multiple spatial scales.*
- Task 3a: Develop pilot projects focused on mapping and monitoring invasive plants in at least two regions, with a long-term vision of supporting an integrated landscape approach to the management of invasive species across the Refuge System.*
4. *Objective: Collect, synthesize, and manage information needed to detect shifts in biomes and species ranges, elevated extinction rates, and changes in the timing of migrations and other phenological phenomena. Support and evaluate adaptation strategies at multiple spatial scales.*
- Task 4a: Prioritize geographic areas and species based on ecosystem vulnerability.
 - Task 4b: Partner with the USA National Phenology Network by developing a landing page or portal for the NWRS on the USA-NPN web page.
 - Task 4c: Coordinate bird monitoring with Migratory Birds and other partners.*
5. *Objective: Collect, synthesize, and manage information needed to assess the vulnerability of the Refuge System's coastal and marine resources to sea-level rise, rising ocean temperatures, and ocean acidification. Support and evaluate adaptation strategies at multiple spatial scales.*
- Task 5a: Coordinate with science partners (federal agencies, academia) to understand the relevance of models and predictions of changes in ocean temperature, acidification, and other oceanographic variables for refuge management; gather information needed to plan and evaluate adaptation strategies.*
 - Task 5b: Complete initial sea-level rise modeling for coastal refuges.*

6. *Objective: Collect, synthesize, and manage information needed to assess the vulnerability of the Refuge System's Arctic and other high-latitude resources, including ice-dependent species. Support and evaluate adaptation strategies at multiple spatial scales.*

- Task 6a: Coordinate with science partners (federal agencies, academia) to understand the relevance of models and predictions of changes in Arctic and high-latitude environmental changes for refuge management; gather information needed to plan and evaluate adaptation strategies.

Database Management Tasks

1. Task: Determine the data, information, and functional requirements for Phase 1 I&M priority tasks.*
2. Task: Assess existing Service IT infrastructure capacity and draft technical specifications to procure hardware/software and establish IT agreements/contracts.*
3. Task: Investigate, establish and maintain an easily accessible centralized repository for I&M related documents.*
4. Task: Develop and maintain web site for the I&M program and provide standards, templates, and procedures for geographic areas to maintain individual pages.
5. Task: Establish mechanisms to support refuges biologists to efficiently manage refuge specific monitoring data as identified in the draft NWRS I&M policy.*
6. Task: Collaborate with IRTM and system owners to streamline the capability of the Corporate Master Table (CMT) and other applicable Service database products so they can be easily integrated with the I&M data management system.
7. Task: Assemble the national I&M Data Standards and Data Governance teams to begin the process of identifying data standards and establishing workflow processes for Phase 1 priority I&M tasks.*
8. Task: Assess the existing land bird/marsh bird monitoring database applications maintained by the USGS and develop a long-term strategy for supporting land bird/marsh bird monitoring by refuges.*
9. Task: Establish formal working agreements with appropriate external and internal IT development teams that present opportunities for information sharing and/or technology exchange.
10. Task: Determine data management staffing and contracting strategies for application and systems development in Phase 2.