



PACIFIC SOUTHWEST REGION INVENTORY & MONITORING INITIATIVE

Annual Work Plan FY 2015

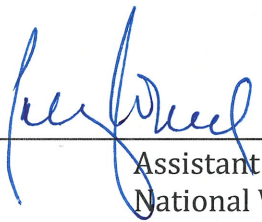


Pacific Southwest Region Refuges Inventory and Monitoring initiative provides information to support management of natural resources. Photo: Back: Rachel Esralew, Sharon Dulava, Giselle Block, Kaylene Keller; front: Karen Laing, Orien Richmond, Erin Aceituno. Not present: Sarah Michehl, Rita Howard

*FY 2015 Pacific Southwest Region Inventory & Monitoring Initiative
Annual Work Plan Approvals*

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Pacific Southwest Region I&M FY 2015 Annual Plan

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Introduction

The Pacific Southwest Region Inventory and Monitoring team (I&M, Table 1) provides information to support management of natural resources on National Wildlife Refuge System (NWRS) lands. We allocate I&M funds (Table 2) and staff time to Pacific Southwest Region National Wildlife Refuges and Wildlife Management Areas (Figure 1) to help NWRS staff measure success in managing biotic communities and physical resources such as water. We provide technical guidance and expertise on monitoring protocols, databases, and data analysis strategies so that information is available and accessible to make the best management decisions. We support science-based conservation planning and management by refuges. We coordinate with internal and external partners (Table 3), particularly Landscape Conservation Cooperatives (LCCs), to raise the quality of science and resource management across the landscape.

The regional I&M team is aligned with the national Inventory and Monitoring Coordination Team led by the national I&M office at the Natural Resource Program Center in Ft. Collins, Colorado. The national program began with guidance from the national 2010 documents *Strategic Plan for Inventories and Monitoring on National Wildlife Refuges: Adapting to Environmental Change* and *Operational Blueprint for Inventory and Monitoring on National Wildlife Refuges: Adapting to Environmental Change*. This regional annual work plan is aligned with the national I&M initiative through the *Inventory and Monitoring 7-Year Plan: 2013-2020 For the National Wildlife Refuge System* approved by NWRS in April 2013. Appendix 1 provides a crosswalk from our objectives to national 7 Year Plan topics.

This document outlines priorities for the Pacific Southwest Region I&M initiative for the Fiscal Year (FY) 2015 (October 2014 through September 2015). We present three long-term goals, established in 2013, that address high priority needs of refuges across the region:

- ❖ accessing information for effective decision-making
- ❖ assessing and managing threats to target resources
- ❖ strategic planning and partnering to meet priority refuge needs

The plan identifies seven major I&M thematic areas grouped under the three long-term goals, with 15 specific objectives to be achieved by October 2015. For each objective, essential “key actions” are listed. The planning process described below has been developed by the I&M team and our advisors (Table 4) since the initiation of the team in 2011.

Figure 1. National Wildlife Refuges and Wildlife Management Areas Served by the Pacific Southwest Region I&M Initiative (Approved Acquisition Boundaries)



The Planning Process

- Definitions:
 - **Goal:** long term vision
 - **Thematic areas:** groupings of objectives on topics of foundational importance to I&M
 - **Objective:** what success looks like; the outcome desired
 - **Key action:** task someone needs to do to achieve the outcome
- Long term goals and thematic areas were identified in our FY 2013 planning process. For FY 2015, the goals remain the same as in FY 2013 and FY 2014. Thematic areas are the same as FY 2014.
- We reviewed whether FY 2014 objectives should be changed in FY 2015 by considering the national I&M strategic planning documents listed above, the *FY 2013 Pacific Southwest Region Needs Assessment (Needs Assessment)* and regional projects ongoing in FY 2014. The team then evaluated the objectives by consensus based on **importance and impact** for resources and refuges, and on **feasibility**. The result of this process was that most FY 2015 objectives remain the same as in FY 2014. Feasibility was further examined by projecting staff time and resources required to implement, including interdependencies within the team and with partners.
- We clarified objectives using the **SMART** criteria (specific, measurable, achievable, relevant, and time-bound). All key actions were further tested and strengthened to ensure that every action in the plan is **essential** and together **sufficient** for achieving the objectives.
- In the Key Actions section below, each Thematic Area and Key Action lists a lead I&M team member (or members), and partners. See Table 1 for staff name abbreviations, and Table 3 for a complete list of partners.
- We provide definitions of acronyms in Appendix 2.

Pacific Southwest Region Inventory & Monitoring Long-Term Goals

- ❖ Goal 1 *Accessing Information for Effective Decision Making*: Refuges and their partners have **easy access to priority refuge natural resource data** to support effective analysis and decisions, meet legal requirements, protect NWRS investment in data collection, and provide continuity when staff changes.
- ❖ Goal 2 *Assessing and Managing Threats to Target Resources*: Refuges and their partners have the **information, resources and technical guidance needed to assess and manage the impact of key threats** or stressors on their target species and ecosystems at the local and landscape scales, starting with invasive species, water resources and climate change.
- ❖ Goal 3 *Strategic Planning and Partnering To Meet Priority Refuge Needs*: The Pacific Southwest Region I&M team demonstrates the **effective use of strategic planning and partnerships to meet priority refuge needs** and leverage the impact of our services and products.

FY 2015 Objectives (Obj)

GOAL 1: Accessing Information for Effective Decision-making

Thematic Area: Informatics

- Obj 1.1 ***Capture documents that are currently in refuge files and provide access through the Service Catalog (ServCat).*** Prioritize collection of documents that support management decisions, baseline inventories, monitoring and research.
- Obj 1.2 ***Provide NWRS staff and partners with access to information about refuge surveys*** to improve coordination among monitoring efforts. (Revised FY 2015)
- Obj 1.3 Provide NWRS staff with ***easy access to defensible species lists*** generated from existing refuge data to support refuge management and I&M plan development.
- Obj 1.4 Provide GIS support to develop ***functional GIS libraries and methods for long-term maintenance of spatial data.***
- Obj 1.5 Provide biostatistical support to refuges for ***analysis of high priority natural resource datasets.***
- Obj 1.6 Support NWRS staff in developing or adopting ***scientifically defensible survey methods and protocols for priority natural resource surveys on refuges.*** Survey protocols will be consistent with the national Survey Protocol Handbook.

GOAL 2: Assessing and Managing Threats to Target Resources

Thematic Area: Invasive Species

- Obj 2.1 ***Develop and begin to implement a framework to support strategic and adaptive invasive plant management on refuge lands.*** The framework will include 1) planning/data flow diagrams; 2) an updated Integrated Pest Management (IPM) plan template; 3) data collection and management systems; 4) framework protocols for inventory; and 5) tools to support prioritization of species, inventory targets and treatment actions. (Revised FY 2015)

Thematic Area: Refuge Water Resources

- Obj 2.2 Create ***Water Resources Inventories and Assessments (WRIAs) that can be used by refuge staff to make water management decisions;*** initiate or complete selected components of WRIA inventories for all refuges; and implement three high priority recommendations from completed WRIA reports. (Revised FY 2015)
- Obj 2.3 Develop water entitlement inventories for refuges ***to improve access to water rights information and ensure compliance with legal mandates.*** (Revised FY2015)

Thematic Area: Climate Change

Obj 2.4 Assess the vulnerability of refuge natural resources to climate change and use this information to ***develop specific climate adaptation strategies*** for at least 7 refuges by the end of FY 2015. Completion of adaptation strategies is dependent upon funding.

GOAL 3: Strategic Planning and Partnering To Meet Priority Refuge Needs

Thematic Area: Natural Resource Management Plans (NRMPs, formerly HMPs) And Inventory & Monitoring Plans (IMPs)

Obj 3.1 Test and refine the process for creating concise, user-friendly NRMPs and IMPs that will help refuge staff ***improve decision-making about managing natural resources of concern***. (Revised FY 2015)

Thematic Area: I&M Planning and Partnerships

Obj 3.2 Use information from needs assessment surveys, WRIAs, and NRMPs to ***inform I&M Program Planning (annual, 5-year) and to advocate for meeting Region 8 refuge needs***. (Revised FY 2015)

Obj 3.3 Ensure that all Pacific Southwest Region I&M program services and products ***reflect the natural resource priorities of refuges*** and address strategic input from key partners and stakeholders.

Obj 3.4 ***Collaborate with research, monitoring and conservation management partners to meet shared goals***.

Obj 3.5 Support the development of ***models and tools to aid conservation planning*** at refuge, complex and regional scales. (New in FY 2015)

FY 2014 Key Actions

GOAL 1: Accessing Information for Effective Decision-Making

Thematic Area: Informatics [Lead: Kaylene Keller]

Objective 1.1 *Capture documents that are currently in refuge files and provide access through ServCat. Prioritize collection of documents that support management decisions, baseline inventories, monitoring and research.*

Key Actions

1. Continue to scan and enter historical refuge documents into ServCat, including documents from Humboldt Bay NWR to support NRMP development. (KK, University of California Davis Information Center for the Environment Cooperative Ecosystems Studies Unit (CESU))
2. Submit all final I&M-created documents to ServCat. (All)

Objective 1.2 *Provide NWR staff and partners with access to information about refuge surveys to improve coordination among monitoring efforts. (Revised FY 2015)*

Key Actions

1. Update records in PRIMR (a database to catalog surveys conducted by refuges) as IMPs are developed, and opportunistically with refuge staff. (KL)
2. Complete Ash Meadows NWR rare plant survey datasets so that they meet minimum standards for species observation data format, quality control and documentation. (KK)
3. Provide on-going data management support for the Avian Knowledge Network Marshbird/Point Count Database. (EA, contractor for data management)

Objective 1.3 *Provide NWR staff with easy access to defensible species lists generated from existing refuge data to support refuge management and I&M plan development.*

Key Actions

1. Prepare and submit final recommendations for a species information system developed by the Biotic Inventories Team to the I&M Coordination Team. (KK, OR)
2. Conduct a baseline avian inventory of Anaho Island NWR, a highly-ranked survey in the refuge NRMP/IMP, and complete an interim performance report. Final report due in FY 2016. (OR, refuge staff, Great Basin Bird Observatory)
3. Analyze Anaho Island NWR legacy waterbird data and use this information to develop a site-specific protocol for monitoring waterbird reproductive success. (GB, Guthrie Zimmerman Migratory Bird Management).
4. Develop scripts for documenting existing species lists, develop process for integration of new species observation data and provide recommendations for regional species data management. (KK, University of California Davis Information Center for the Environment CESU)
5. Conduct small mammal, amphibian and reptile surveys targeting high-priority portions of Desert NWR and complete trip reports. Final report and species observation dataset due in FY

2016. This action is dependent on availability of a contractor for data management. (OR, refuge staff, California Academy of Sciences, contractor for data management)

Objective 1.4 *Provide GIS support to develop functional GIS libraries and methods for long-term maintenance of spatial data.*

Key Actions

1. Identify, collect and standardize available Central Valley refuges wetland water management data. (KL, RE, KK, University of California Davis Information Center for the Environment CESU, contractor for data management)
2. In collaboration with Don Edwards NWR staff, develop methods to automate map production for the San Francisco Bay Salt Pond Monitoring Data provided by US Geological Survey (USGS) and San Francisco Bay Bird Observatory. (KK, EA, contractor for data management)
3. Provide geographic information system (GIS) data development and data organization support for one complex: San Francisco Bay NWRC. (EA)
4. Develop draft management unit GIS datasets for Central Valley refuges, Humboldt NWRC, San Francisco Bay NWRC, and Stillwater NWRC. (EA)
5. Complete GIS vegetation map, report on mapping methods and documented vegetation field survey datasets for Ruby, Stillwater and Anaho Island NWRs. (KK, EA, University of Nevada Reno CESU)
6. Provide one refuge with technical support in cataloging digital data to bridge the knowledge gap when all staff leave a refuge. (KK, EA, contractor for data management)

Objective 1.5 *Provide biostatistical support to refuges for analysis of high priority natural resource datasets.*

Key Actions

1. Work with University of California Davis biometrician to write reports analyzing 20 years of Sacramento NWRC wildlife survey data and 2 years of Bitter Creek NWR vegetation survey data. Initiate development of a model for *Lepidium latifolium* spread at Stillwater NWR. (KK, University of California Davis CESU)

Objective 1.6 *Support NWR staff in developing or adopting scientifically defensible survey methods and protocols for priority natural resource surveys on refuges. Survey protocols will be consistent with the national Survey Protocol Handbook.*

Key Actions

1. Initiate draft initial survey instructions for 1-4 priority refuge surveys for Humboldt Bay NWRC as part of the Humboldt Bay NRMP/IMP. This action is dependent on availability of a contractor for data management. (OR, contractor for data management)
2. Conduct 1-2 missions using Unmanned Aircraft Systems (UAS) for monitoring waterbirds at Humboldt Bay and/or Anaho Island NWRs. Final report and species observation dataset due in FY 2017. (OR, refuge staff, California State University Humboldt, USGS)
3. Develop site-specific marsh bird monitoring protocols for Don Edwards San Francisco Bay and San Pablo Bay NWRs that are consistent with the I&M Survey Protocol Handbook. Final protocols due in FY 2016. This action is dependent on availability of a contractor for data management. (OR, refuge staff, Point Blue Conservation Science, contractor for data management)
4. Participate in the redesign of the San Francisco Bay Midwinter Waterfowl Survey in collaboration with the SFBJV Science Committee, and support data collection and development of an annual reporting procedure. This action is dependent on availability of a contractor for data management. (OR, Guthrie Zimmerman Migratory Bird Management, contractor for data management)

GOAL 2: Assessing and Managing Threats to Target Resources

Thematic Area: Invasive Species [Lead: Giselle Block]

Objective 2.1 *Develop and begin to implement a framework to support strategic and adaptive invasive plant management on refuge lands. The framework will include 1) planning/data flow diagrams; 2) an updated weed management plan (IPM) template; 3) data collection and management systems; 4) framework protocols for inventory; and 5) tools to support prioritization of species, inventory targets and treatment actions. (Revised for FY 2015)*

Key Actions

1. Work with at least one refuge to identify priority species/areas for invasive plant inventory and begin to develop a site-specific inventory protocol, using the prioritization tool developed in FY 2014. This action is dependent on availability of a contractor for data management. (GB, contractor for data management)
2. Compile and evaluate invasive plant inventory and early detection protocols (published or gray literature from other agencies, universities and organizations) and develop at least one invasive plant inventory framework protocol that meets national I&M standards. (GB, National I&M Invasive Species Working Group).
3. Develop a refuge guide for planning and conducting invasive plant inventories on Refuge lands. (GB, National I&M Invasive Species Working Group, Utah State University CESU).

4. Develop a geodatabase and evaluate hardware/software platforms to support collection and management of invasive plant inventory data. This action is dependent on availability of a contractor for data management. (GB, EA, contractor for data management).
5. Administer the Region 8 invasive species grant program: “request for proposals” development, proposal review, project tracking and reporting. (GB)

Thematic Area: Refuge Water Resources [Lead: Rachel Esralew]

Objective 2.2 *Create Water Resources Inventory and Assessments (WRIAs) that can be used by refuge staff to make water management decisions; initiate or complete selected components of WRIA inventories for all refuges; and implement three high priority recommendations from completed WRIA reports. (Revised FY 2015)*

Key Actions

1. Complete 50% of draft WRIA for Sacramento, Delevan, and Colusa NWRs. (SM, RE, contractor Great Basin Institute)
2. Complete final WRIA report for Ellicott Slough NWR. (SM, RE, contractor ICF)
3. Complete final WRIA report for Pixley NWR. (SM, RE, contractor ICF)
4. Assist Modoc NWR with establishment of route baseline water quality monitoring in support of upcoming requirements for the Total Maximum Daily Load (TMDL) program (WRIA Recommendation #1). (RE, California Department of Water Resources)
5. Assist Ruby Lake NWR with continuation of wetland water monitoring (WRIA Recommendation #1): Visit station when new staff arrive to train them on existing protocols. (RE)
6. Complete water infrastructure and flow maps for 3 refuges (San Joaquin River, Stillwater, and Sonny Bono Salton Sea NWRs), which is a critical component of the WRIA process. (RE, SM)

Objective 2.3 *Develop water entitlement inventories for refuges to improve access to water rights information and ensure compliance with legal mandates. (Revised FY2015)*

Key Actions

1. Complete water entitlement inventory and assessment for Delevan, Colusa, Sutter, and Ellicott Slough NWRs. (RE, contractor WestWater LLC)

Thematic Area: Climate Change [Co-Leads: Giselle Block and Rachel Esralew]

Objective 2.4 *Assess the vulnerability of refuge natural resources to climate change and use this information to develop specific climate adaptation strategies for at least 7 refuges by the end of FY 2015. Completion of adaptation strategies is dependent upon funding.*

Key Actions

1. Complete sea level rise response models for four coastal tidal marsh refuges. (GB, USGS, refuges)
2. Develop optimal climate adaptation strategies for San Pablo Bay NWR and Seal Beach NWR by December 2015. (GB, USGS, Point Blue Conservation Science, SF Bay Joint Venture).

3. Assess vulnerability of Central Valley refuges to climate change, and develop decision-support tool for water management of limited water supplies. (RE, University of California Davis Center for Watershed Sciences CESU)
4. Initiate assessment of vulnerability of water resources at Ruby Lake NWR to climate change. Project is a high priority need as identified by the WRIA completed in 2013. (RE, USGS California Water Science Center Interagency Agreement, UC Davis Information Center for the Environment CESU)

GOAL 3: Strategic Planning and Partnering To Meet Priority Refuge Needs

Thematic Area: Natural Resource Management Plans (NRMPs, formerly Habitat Management Plans, HMPs) And Inventory & Monitoring Plans (IMPs)
[Co-Leads: Giselle Block, Orien Richmond]

Objective 3.1 *Test and refine the process for creating concise, user-friendly NRMPs and IMPs that will help refuge staff improve decision-making about managing natural resources of concern. (Revised FY 2015)*

Key Actions

1. Develop a strategy and timeline for completing NRMPs and IMPs in Region 8 in partnership with regional and refuge leadership (Refuge Planning, Refuge PLs, Refuge Biologists, LCCs, Science Applications). This activity depends on the decision to move forward with developing NRMPs using the Open Standards process. (KL)
2. Refine NRMP and “resources of concern” (ROC) process guides and supporting tools/databases by December 2015. This work will follow completion of the Humboldt Bay NWR NRMP/IMP. (GB, OR, KK)
3. Complete draft Humboldt Bay NWR NRMP (GB, OR, KK, RE, contractor for data management)
4. Complete draft Inventory and Monitoring Plan (IMP) for Humboldt Bay NWR. This action is dependent on availability of a contractor for data management. (OR, GB, contractor for data management)
5. Refine the Miradi Share database to support development and implementation of refuge NRMPs and IMPs. This action is dependent on availability of a contractor for data management. (GB, Foundations of Success, contractor for data management)
6. Develop and test methods for annual reporting and work planning following NRMP/IMP development. Methods will be piloted at Anaho Island NWR. (GB)
7. Support development of a workplan for the Water Resources Branch by coordinating and communicating immediate water resources needs; support selected projects by WRB through sharing maps, datasets, or other information gathered through the WRIA process. (RE)

Thematic Area: I&M Planning and Partnerships: [Lead: Karen Laing]

Objective 3.2 *Use information from needs assessment surveys, WRIAs, and NRMPs to inform I&M Program Planning (annual, 5-year) and to advocate for meeting Region 8 refuge needs. (Revised FY 2015)*

Key Actions

1. Collect list of refuge survey protocol needs and create a prioritization process to determine which refuge surveys should receive support for protocol development. (KL)

Objective 3.3 *Ensure that all Pacific Southwest Region I&M program services and products reflect the natural resource priorities of refuges and address strategic input from key partners and stakeholders.*

Key Actions

1. Complete FY 2014 annual report and FY 2015 annual plan, drawing on the needs assessment surveys and regular communication with refuge staff; incorporate annual plan objectives and activities into performance plans and performance reviews of all staff members; use the plans to establish clear priorities and adapt to the unexpected. (KL)
2. Communicate with Refuges: Produce quarterly newsletter; attend at least one NWRS project leader meeting; provide I&M annual work plans and reports to receive feedback and share lessons learned; attend Refuge Biologists conference calls; evaluate the role of the Biological Advisory Council. (KL)

Objective 3.4 *Collaborate with research, monitoring and conservation management partners to meet shared goals.*

Key Actions

1. Co-lead the national I&M Forest and Shrubland Bird Working Group, participate on tri-colored blackbird research subcommittee and participate on Joint Venture working groups. (OR)
2. Participate in the regular meetings of the National I&M Coordination Team and related working groups to ensure that the national I&M initiative incorporates the Pacific Southwest Region I&M priorities, needs and lessons learned into national priorities and activities. (KL)
3. Cooperate with the Alaska and Pacific Northwest Regional I&M staff on seabird monitoring databases. (KL)
4. Participate in the Central Valley Landscape Conservation Design project led by the California LCC, to support NWRS natural resource management decision making (e.g., wetland habitat management, land acquisition strategies) in the Central Valley. (KL)
5. Participate in the Central Valley drought monitoring coordination working group, to ensure that I&M provides refuges needed services and products to make management decisions during the current historic drought; and to gain insight in preparation for managing in a changing climate. (KL)

Objective 3.5 *Support the development of models and tools to aid conservation planning at refuge, complex and regional scales. (New in FY 2015)*

Key Actions

1. Develop a flexible process for quantifying the importance of refuge lands to 5-10 bird species of conservation concern relative to other public and private lands in Region 8. Apply the results of the process to two decision support tools: (1) the Land Acquisition Priority System (LAPS) tool for prioritizing land parcels for acquisition; and (2) the ROC tool for identifying priority conservation targets for refuges. Products: final report, R code and species observation dataset. This action is dependent on availability of a contractor for data management. (OR, Point Blue Conservation Science , contractor for data management)
2. Develop a transparent, user-friendly and shareable version of the TRUOMET bioenergetic model, which is used extensively for Central Valley Joint Venture planning. (OR, Ducks Unlimited)
3. Use bi-weekly LANDSAT data to estimate the distribution of water in the Central Valley in near real time by automating imagery pre-processing, planning a strategy to ground truth data, developing data summaries, and making this information available through online downloads. (RE, KL, Point Blue Conservation Science)
4. Initiate exploratory analysis of species distribution across refuges to predict distribution changes under future climate scenarios. Future work would apply the results to long-term refuge natural resource decision making and evaluation of conservation success. (KK)

Table 1: Pacific Southwest Region Inventory & Monitoring Team

<u>Regional Natural Resources Staff</u>	
Mark Pelz	Chief, Natural Resources Division
<u>I&M Staff</u>	
Erin Aceituno (EA)	GIS Specialist
Giselle Block (GB)	Regional Biologist
Rachel Esralew (RE)	Regional Hydrologist
Rita Howard (RH)	Administrative Support
Kaylene Keller (KK)	Regional Data Manager, Ecologist
Karen Laing (KL)	Regional I&M Coordinator
Kelsey McDonald (KM)	Pathways Student
Sarah Michehl (SM)	Hydrologist
Orien Richmond (OR)	Regional Biologist

Table 2: Projected FY 2015 Budget for the Pacific Southwest Region I&M Initiative

Projected FY 2015 Budget	
Salaries	\$930,000
Personnel costs	\$45,000
Fixed Costs & Assessments	\$185,500
Contracts/Agreements/Field	\$600,000
Supplies/Equipment/Vehicles	\$40,000
Total	\$1,800,000

Table 3: Partners of the Pacific Southwest Region I&M Initiative

Partner	Representative
California Academy of Sciences	Jack Dumbacher, Curator and Department Chair, Department of Ornithology and Mammalogy
California Department of Fish and Wildlife	Sarah Estrella, Associate Wildlife Biologist
California Department of Water Resources	Scott McReynolds, Water Quality Field Supervisor
California Invasive Plant Council	Doug Johnson, Executive Director
Central Valley Joint Venture	Ruth Ostroff , Assistant Coordinator; Greg Yarris, Science Coordinator
Ducks Unlimited	Dotti Dean-McMaster, Project Coordinator; Mark Petrie, Biologist
East Bay Regional Parks District	Doug Bell, Wildlife Program Manager
Eco Adapt	Laura Hansen, Executive Director
Great Basin Bird Observatory	Elisabeth Ammon, Executive Director
Humboldt State University	Dr. Tim Bean, Professor; Sharon Dulava, graduate student
Point Blue Conservation Science (formerly PRBO)	Leo Salas, Senior Scientist; Julian Wood, Wildlife Biologist
San Francisco Bay Bird Observatory	Catherine Burns, Executive Director
San Francisco Bay Joint Venture	Beth Huning, Coordinator
San Francisco Estuary Invasive Spartina Project, California Coastal Conservancy	Peggy Olofson, Director
The Nature Conservancy	Mark Reynolds, Lead Scientist
University of California, Davis: Agronomy and Range Sciences Department	Emilio Laca, Professor
University of California, Davis: Information Center for the Environment	James Quinn, Professor, and James Thorne, Professor
University of California, Davis: Center for Watershed Sciences	Josue Medellin-Azuara, Research Scientist, and Joshua Viers, Associate Director, Center for Watershed Sciences
University of Nevada, Reno	Elizabeth Ledger, Professor; Wendy Trowbridge, Researcher
U.S. Bureau of Reclamation	Jeff Milliken, GIS Remote Sensing Scientist
U.S. Geological Survey, California Water Science Center	Lorraine Flint, Research Hydrologist
U.S. Geological Survey, Western Ecological Research Center	Karen Thorne, Supervisory Research Wildlife Biologist; Dr. Susan de la Cruz, Wildlife Biologist
U.S. Geological Survey, National Unmanned	Jeff Sloan; Mark Bauer

Aircraft Systems Project Office	
USFWS Natl I&M Invasive Plant Working Group	Regional I&M staff, invasive species coordinators
USFWS National Invasives Program	John Klavitter, Coordinator
WestWater Research, LLC	Harry Seely, Managing Director
Utah State University	Dr Corey Ransom, Professor of Weed Science

Table 4: Advisors and Partners Consulted in Planning Process, 2011-2014

Carol Damberg (FY13) and Mark Pelz (FY14), Chief, Natural Resources Division
Curt McCasland, Refuge Supervisor
National Wildlife Refuges via needs assessment surveys
National I&M Coordination Team via concurrent national planning process
Pacific Southwest Region Refuges Biological Advisory Council
Audrey Newman, Planning Facilitator

Appendix 1: Pacific Southwest Region I&M FY 2015 Objectives Crosswalked with Topics from the *Inventory and Monitoring 7-Year Plan: 2013-2020 For the National Wildlife Refuge System*

National 7 Year Plan Topics in Priority Order (Italicized topics are addressed in the Pacific Southwest Region I&M FY 2015 Annual Work Plan).

I&M Planning (IMPI)

Water Resources Inventory and Monitoring (WRIM)

Data Management (DM)

Systems Development (SM)

Invasive Species Inventory and Monitoring (ISIM)

Endangered Species Act Reporting (ESAR)

Vegetation Mapping (VM)

Abiotic Data (AD)

Bird Inventory and Monitoring (BIM)

Baseline Biotic Inventories (BBI)

Phenological Monitoring (PM)

Adaptive Management (AM)

Wilderness Character Monitoring (WCM)

Surrogate Species Monitoring (SSM)

Fire Monitoring (FM)

Coastal Marine Systems (CMS)

Refuge Condition Assessments (RCA)

Wildlife Health (WH)

Air Quality Biomonitoring (AQB)

Pacific Southwest Region I&M FY 2015 Objectives (Corresponding 7 Year Plan topics listed in Red)

GOAL 1: Accessing Information for Effective Decision-making

Thematic Area: Informatics

Obj 1.1 ***Capture documents that are currently in refuges files and provide access through the Service Catalog (ServCat).*** Prioritize collection of documents that support management decisions, baseline inventories, monitoring and research. (Data Management (DM))

Obj 1.2 ***Provide NWR staff and partners with access to information about refuge surveys*** to improve coordination among monitoring efforts. (Revised FY 2015) (Data Management (DM), Baseline Biotic Inventories (BBI))

Obj 1.3 Provide NWR staff with ***easy access to defensible species lists*** generated from existing refuge data to support refuge management and I&M plan development. (Data Management (DM), Systems Development (SD), Bird Inventory and Monitoring (BIM), Baseline Biotic Inventories (BBI), Surrogate Species Monitoring (SSM))

Obj 1.4 Provide GIS support to develop **functional GIS libraries and methods for long-term maintenance of spatial data**. (Data Management (DM))

Obj 1.5 Provide biostatistical support to refuges for **analysis of high priority natural resource datasets**. (Invasive Species Inventory and Monitoring (ISIM), Endangered Species Act Reporting (ESAR), Bird Inventory and Monitoring (BIM))

Obj 1.6 Support NWR staff in developing or adopting **scientifically defensible survey methods and protocols for priority natural resource surveys on refuges**. Survey protocols will be consistent with the national Survey Protocol Handbook. (Invasive Species Inventory and Monitoring (ISIM), Endangered Species Act Reporting (ESAR), Vegetation Mapping (VM), Bird Inventory and Monitoring (BIM), Surrogate Species Monitoring (SSM))

GOAL 2: Assessing and Managing Threats to Target Resources

Thematic Area: Invasive Species

Obj 2.1 **Develop and begin to implement a framework to support strategic and adaptive invasive plant management on refuge lands**. The framework will include 1) planning/data flow diagrams; 2) an updated weed management plan (IPM) template; 3) data collection and management systems; 4) framework protocols for inventory; and 5) tools to support prioritization of species, inventory targets and treatment actions. (Revised for FY 2015) (Invasive Species Inventory and Monitoring (ISIM), Vegetation Mapping (VM))

Thematic Area: Refuge Water Resources

Obj 2.2 Create **Water Resources Inventories and Assessments (WRIAs) that can be used by refuge staff to make water management decisions**; initiate or complete selected components of WRIA inventories for all refuges; and implement three high priority recommendations from completed WRIA reports. (Revised FY 2015) (Water Resources Inventory and Monitoring (WRIM))

Obj 2.3 Develop water entitlement inventories for refuges **to improve access to water rights information and ensure compliance with legal mandates**. (Revised FY2015) (Data Management (DM), Water Resources Inventory and Monitoring (WRIM))

Thematic Area: Climate Change

Obj 2.4 Assess the vulnerability of refuge natural resources to climate change and use this information to **develop specific climate adaptation strategies** for at least 7 refuges by the end of FY 2015. Completion of adaptation strategies is dependent upon funding. (Water Resources Inventory and Monitoring (WRIM), Coastal Marine Systems (CMS))

GOAL 3: Strategic Planning and Partnering To Meet Priority Refuge Needs

Thematic Area: Natural Resource Management Plans (NRMPs, formerly HMPs) And Inventory & Monitoring Plans (IMPs)

Obj 3.1 Test and refine the process for creating concise, user-friendly NRMPs and IMPs that will help refuge staff **improve decision-making about managing natural resources of concern**. (Revised FY 2015) (I&M Planning (IMPI))

Thematic Area: I&M Planning and Partnerships

Obj 3.2 Use information from needs assessment surveys, WRIAs, and NRMPs to **inform I&M Program Planning (annual, 5-year) and to advocate for meeting Region 8 refuge needs.** (Revised FY 2015) (I&M Planning (IMPI))

Obj 3.3 Ensure that all Pacific Southwest Region I&M program services and products **reflect the natural resource priorities of refuges** and address strategic input from key partners and stakeholders. (I&M Planning (IMPI))

Obj 3.4 **Collaborate with research, monitoring and conservation management partners to meet shared goals.** (I&M Planning (IMPI), Water Resources Inventory and Monitoring (WRIM), Coastal Marine Systems (CMS), Bird Inventory and Monitoring (BIM))

Obj 3.5 Support the development of **models and tools to aid conservation planning** at refuge, complex and regional scales. (New in FY 2015). (I&M Planning (IMPI), Surrogate Species Monitoring (SSM))

Appendix 2: Acronyms

CESU	Cooperative Ecosystems Studies Unit
GIS	Geographic Information System
FY	Fiscal Year: Federal agency fiscal years begin October 1 and end September 30 of the following calendar year.
HMP	Habitat Management Plan
IMP	Inventory and Monitoring Plan
IPM	Integrated Pest Management: an environmentally sensitive approach to managing pest species using a combination of strategies
I&M	Inventory and Monitoring initiative of the U.S. Fish and Wildlife Service
LAPS	Land Acquisition Priority System: an online system used by NWRS
LCC	Landscape Conservation Cooperative: an applied conservation partnership started by the U.S. Fish and Wildlife Service
NRMP	Natural Resources Management Plan
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System: a program of the U.S. Fish and Wildlife Service
PRIMR	Planning and Review of Inventory and Monitoring on Refuges: a database to catalog natural resource surveys conducted by refuges
ROC	Resources of Concern: a term used in NWRS natural resource planning
ServCat	Service Catalog: an online system to store and access documents
TMDL	Total Maximum Daily Load: a calculation of pollutants used by the U.S. Environmental Protection Agency to monitor water quality
TRUEMET	A model that calculates wildlife population energy needs
UAS	Unmanned aircraft system

USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRIA	Water Resources Inventory and Assessment