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RECLAMATION

Refuge Water Management Planner

**Developed to Meet the 2020 Refuge Criteria
for Refuge Water Management Plans
California-Great Basin Region**



Cover Photo: Kern NWR. (U.S. Fish and Wildlife Service)

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Refuge Water Management Planner

**Developed to Meet the 2020 Refuge Criteria
for Refuge Water Management Plans
California-Great Basin Region**

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CHAPTER 1 - Introduction

The Bureau of Reclamation (Reclamation) developed the Refuge *Water Management Planner* (Planner) to assist refuge managers in the preparation and implementation of the Refuge Water Management Plans (Plan), as required by the Reclamation Reform Act of 1982 (RRA) and the Central Valley Project Improvement Act of 1992 (CVPIA). An electronic copy of the 2020 Planner is will be available at <https://www.usbr.gov/mp/watershare/index.html>.

Summary of Changes in the 2020 Planner:

508 Compliance: Reclamation no longer requires Plans to be 508 compliant, other options are available and should be discussed with the Reclamation representative.

Public Review Process:

For Plans that need to meet both the Federal and State plan requirements, the public review process shall follow the applicable section of the State of California Water Code.

For Plans that solely need to meet the Plan requirements, the public review process will be the responsibility of each refuge and identified in the Refuge Standard Criteria.

Wholesaler's Plan to include subcontractors:

Each Wholesaler is responsible for their subcontractors' water conservation compliance. Wholesalers shall either include all subcontractors in a single Plan containing data and information on each subcontractor or require each retailer/subcontractor to prepare their own Plan and the wholesaler to include them in a single Plan submitted to Reclamation.

Non-Compliance Status:

Continued non-compliance status may result in delays in to water transfers and exchanges.

Recommendations for a more efficient Plan review process:

Follow the Plan Format: Specific information is necessary to review a Plan. Reclamation recommends that all Refuges follow the Plan format. If a Refuge/Contractor does not follow the recommended format, the Contractor should provide the section and page number of where the information can be found based upon the Plan Review Form.

Use Tables Provided: Tables and an accompanying narrative help clarify information.

Update Point of Contact Information: Ensure the point of contact information for the refuge manager and the water conservation coordinator is current and accurate.

Measurement Documentation: Under "Measurement calibration and maintenance frequency", more information will be requested for the following responses: "as needed" or "as manufacturer's suggestion". Documentation will be required to support either response. Please be

sure that if the manufacturer's specification sheets are included, the recommended maintenance and calibration frequency should be listed on the specification sheet. Sample documentation should be added as an addendum for various types of measuring devices and should be included for production and end-use measurement.

Do not Leave Blanks: All applicable sections must be answered. If a question or section does not pertain to your district, please state that this is not applicable to your district and explain why. Reclamation will not accept blank responses and will request a response.

Review the Plan Evaluation Form: All Contractors should review the Plan Evaluation Form in Chapter 6 to see how Reclamation reviews Plans. This form can also be used as a Plan checklist to ensure the Refuge has addressed all aspects of their Plan submittal.

BMP Exemptions

In order for a Refuge to be exempt from a best management practice (BMP), the Refuge must either state that it is not applicable for that BMP or provide the necessary documentation to substantiate a claim within the Plan.

Timely Response to Reclamation's Review: If Reclamation requests additional or clarifying information, a Refuge should respond promptly. A timely response both ensures an efficient review process and demonstrates a Refuge is working diligently and in good faith to complete their Plan.

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CHAPTER 2 – 2020 Refuge Criteria

The Criteria for Developing Refuge Water Management Plans (Refuge Criteria) provides a common methodology, or standard, for efficient use of water by Federal Wildlife Refuges, State Wildlife Areas, and resource conservation districts that receive water under provisions of the Central Valley Project Improvement Act (CVPIA). They document the process and format by which Refuge Water Management Plans (Refuge Plan) should be prepared and submitted to the Bureau of Reclamation as part of the Refuge/District Water Supply Contracts and Memorandum of Agreements. The Refuge Criteria refers to refuges, wildlife areas, and resource conservation districts as refuges.

Who Must Prepare a Refuge Plan

Those refuges that entered into water supply contracts with Reclamation and currently receive water, as a result of the CVPIA and subsequent Department of the Interior administrative review processes (Administrative Proposal¹) are required to prepare Refuge Plans using the Refuge Criteria.²

San Joaquin Valley

Grassland Resource Conservation District
Kern National Wildlife Refuge
Los Banos Wildlife Area
Mendota Wildlife Area
Merced National Wildlife Refuge
North Grassland Wildlife Area
Pixley National Wildlife Refuge³
San Luis National Wildlife Refuge
Volta Wildlife Area

Sacramento Valley

Colusa National Wildlife Refuge
Delevan National Wildlife Refuge
Gray Lodge Wildlife Area
Sacramento National Wildlife Refuge
Sutter National Wildlife Refuge³

When is the Refuge Plan Due

The initial 5-Year Refuge Plan was due in 2005 and updated plans once every 5 years thereafter. Refuges are responsible for submitting an electronic draft version of their Refuge Plan, which has been developed according to the Refuge Criteria, to Reclamation's appropriate area office for review. Upon receipt, refuges will receive, within 90 days, notification of Reclamation's acceptance or request for modification. Following notification by Reclamation that the Refuge Plan has conditionally met the requirements of the Refuge Criteria, refuges will submit a final electronic copy of the complete Refuge Plan. In addition, for Grassland Resource Conservation District (GRCD), the final electronic copy of its complete Refuge Plan shall include a resolution from the Board of Directors formally adopting the Refuge Plan.

¹ In 1995, Interior initiated a stakeholder process to address areas of concern related to the Implementation of CVPIA. To that end, Interior circulated for review, by interested parties, a draft Administrative Proposal on Refuge Water Supplies in July 12, 1996, and a revised draft on March 20, 1998.

² Pursuant to the provisions of the CVPIA, Central Valley Project (CVP) agricultural and municipal and industrial water service and repayment contractors currently prepare and submit Water Management Plans in accordance with the Standard Criteria for Evaluating Water Management Plans.

³ As of December 1, 2009, neither Pixley nor Sutter National Wildlife Refuges receive CVP Level 2 water.

The due date of your plan is every 5 years independent of when your last plan was completed or approved. For example, if your plan was due in 2015 and it took 4 years to get approved, in 2019, your next plan will be due the following year in 2020. Your final plan is due by December 31st. This is a final plan that has gone through the public review process not the initial submittal of your draft plan. It is recommended that you initially submit your plan in January or February of the year your plan is due, if not earlier, to allow sufficient time for review by Reclamation and the public.

The status of the Refuge's Plan will then be noticed. Copies of the document will be available for review at Reclamation's California-Great Basin – Interior Region 10 Office, the appropriate Area Office, and at Reclamation's WaterShare Web site at www.usbr.gov/mp/watershare/. If no comments are received within 30 days, the review process will officially be complete. If public comments are received, additional changes may be required.

Refuges are also responsible for submitting Annual Updates to Reclamation. The Annual Update will address the actions taken in implementing the Refuge Plan for the previous year and forecast implementation actions and proposed changes for the current year. The Annual Update is limited to reporting on Best Management Practices (BMPs). The final Refuge Plan and Annual Updates should be submitted to your Reclamation Area Office.

Non-Compliance

Article 17 of the Refuge Water Supply Contracts addresses Water Conservation. Article 17(a) requires the refuge to complete the original Refuge Plan within 1 year of the establishment of the Refuge Criteria. Article 17(b) states that prior to the refuge being afforded opportunities such as pooling and rescheduling of water supplies pursuant to Articles 3 and 6 of the water supply contract, the refuge must be implementing a Refuge Plan. Continued pooling and rescheduling benefits are contingent upon continued Refuge Plan implementation. Article 17(d) requires the refuge to submit Annual Updates each year on the status of the previous year's Refuge Plan Implementation. If the Contracting Officer determines the refuge is unable to implement its Refuge Plan due to circumstances beyond its control, the pooling and rescheduling of benefits can be continued so long as the refuge diligently works with the Contracting Officer to begin implementation as soon as the refuge constraints have ceased. See the individual refuge Contract for specific Contract language.

Key Terms are defined in the Guidebook.

Plan Content

Intent: The intent of the Refuge Plan is to describe general physical information about the refuge in order to form a basis for developing improved water BMPs.

Detail Expected in an Adequate Refuge Plan: The Refuge Plan should be prepared using the Refuge Plan format. The Refuge Plans shall describe the refuge water supplies, history, location and facilities, size, terrain and soils, environment, climate, operating rules and regulations, inflow, internal flow and outflow water measurements, water rate schedules and billing, and water shortage allocation policies.

Evaluation: In certain circumstances, specific information may not be available. In these circumstances, the section will be considered "adequately addressed," if the Refuge Plan describes how the information will be obtained for the next Refuge Plan revision.

Section A. Background

Give an overview of the refuge. Include the original size, historical water supplies, contract information with Reclamation and others, and changes in habitat type. Describe the water use characteristics of the habitat types maintained at the refuge. Define year (calendar, fiscal, contract, etc.) and enter data based on this year type consistently throughout the Refuge Plan and its tables.

Section B. Water Management Related Goals and Objectives

Describe the refuge mission relative to water management and specific habitat management objectives. Include pertinent information from other refuge documents. Describe the strategies used to attain these objectives, constraints that prevent attainment of objectives and explain how the constraints effect operations. Describe the strategies used to remedy the constraints as they pertain to water management and/or habitat/species.

Section C. Policies and Procedures

Describe the refuge policies and procedures on accepting agricultural drainage water as supply. Describe the refuge policies and procedures on water pooling, transfers, reallocations, or exchanges. Describe the refuge water accounting policies and procedures for inflow, internal flow, and outflow. Attach a copy of the refuge's shortage policies, drought plan, or any similar document. For GRCD, describe water allocation policy to customers, lead-time for water orders, policies for wasteful use of water, and pricing and billing policies.

Section D. Inventory of Existing Facilities

Attach existing facility's map(s) that show points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, ground water wells, and water quality monitoring locations. Describe in the body of the Refuge Plan the information contained in each attached map. Include information on the availability, quality, and potential for ground water use.

Section E. Environmental Characteristics

Describe the topography of the refuge and discuss the impact of topography on water operations and management. Attach a map showing major soil classifications and discuss how soil characteristics affect water management. Discuss the impact of climate and any microclimates on the refuge. Include historical information on average precipitation, maximum and minimum temperatures, and average evapotranspiration (ET).

If the refuge has a Water Quality Monitoring Program, list the analyses performed, frequency of measuring, and concentration range and averages and any exceedance of standards.

Section F. Transfers, Exchanges, and Trades

Provide information on water transfers, exchanges, and/or trades into or out of the refuge.

Section G. Water Inventory

Include a description of the refuge's surface water, ground water, other water supplies, water uses

within the refuge, outflow from the refuge, and a water inventory. Provide this information for the years specified in the tables. Describe the monthly acre-foot amounts of surface water, ground water, and other water delivered to or used by the refuge for the specified year. Describe the internal distribution system by component, including information on length and size, impacts of precipitation and evaporation, and the amount of seepage and spill. Describe the water-use characteristics of each habitat type at the refuge. Include information on size, water needs, impacts of precipitation and evaporation, seepage, and cultural practices. Complete a water inventory of the refuge water supplies, uses, and outflows. Provide a 10-year history of refuge water supplies.

Sections H and I - BMPs

Intent: To develop an implementation plan for BMPs that will result in improved water management. Detail expected in an adequate implementation plan: Describe the program that the refuge determines will best accomplish each BMP. Provide 5-year implementation plans with schedules, budgets, and monitoring plans. This should include specific descriptions, estimates and types of projects, location, and size. The refuge may need to study the most effective way to implement the BMP. If a BMP is to be studied, provide details and schedules of the study (see Section K, NA of Exemptible BMPs). See Section J – BMP Exemption Process for information on exemption requests.

Section H. Critical BMPs

Critical practices are those that every refuge is expected to implement. These BMPs are considered the basic elements of good refuge water management. Develop and implement a program for each BMP that will provide maximum benefit to the refuge.

For each BMP, report on the proposed implementation schedule for the next 5 years and the estimated direct and indirect costs for the next 3 years. Where appropriate, report the location, size, reason, and anticipated benefit of the proposed improvements.

1. Management Programs

- a. Education - Describe the refuge's proposed staff water efficiency education programs and goals. Attach the program materials.
- b. Water Quality Monitoring - If the refuge's supply includes ground water, upslope drain water, or poor-quality surface water, describe the water source, controlling regulations, planned or current testing program, constituents tested, frequency and results, and participating agencies.
- c. Cooperative Efforts - Describe proposed cooperative water management efforts with Federal and state agencies, other refuges, agricultural and urban contractors, public interest groups, and neighboring landowners.
- d. Pump Evaluations - Describe the number and types of pumps and any testing/replacement program.
- e. Policy Evaluation - Identify specific changes to the rules and regulations of the refuge's water suppliers and/or conveying entities that would allow for more efficient water use, improved water quality, and operations.

- f. Provide Customer Services (GRCD only) - Facilitate physical/structural improvements for member units; provide management services and technical advice to raise funds for BMP Implementation and provide customers with water efficiency education programs.

2. *Pricing Structure (GRCD only)*

Adopt a water pricing structure for customers based at least in part on quantity delivered. Describe the proposed quantity-based water pricing structure, the cost per acre-foot, and when it will become effective.

3. *Plan to measure deliveries to customers (GRCD only).*

Measure the volume of water delivered to each club or customer with methods or devices that assure a reasonable degree of accuracy, under most conditions within +/- 6 percent. Provide a map showing customer and management unit boundaries and all turnouts. For each installation location, identify the type of measurement device, accuracy, cost, and date of planned installation.⁴

4. *Water Management Coordinator*

Designate an individual to develop and implement the Refuge Plan and develop progress reports. Include their name, title, address (if difference than the refuge address), phone number, and an e-mail address. Also, include the refuge web site address, if available. In the budget tables, quantify the water management budget and staff hours not related to any specific BMP.

Section I. Exemptible BMPs

For each exemptible BMP, report on the proposed implementation schedule for 5 years and the estimated direct and indirect costs for 3 years. Where appropriate, report the location, size, reason, and anticipated benefit of the proposed improvements. If the Refuge will study a BMP or conduct a pilot project, describe the projected program and timeline.

1. *Improve management unit configuration*

Describe the proposed unit to be modified, current acres, reason for change, proposed acres, and the estimated cost and actions. GRCD - Assist customers to improve management unit configurations.

2. *Improve Internal Distribution System*

- a. New control structures - Describe any new control structures proposed for the distribution system, proposed location and type of structure, reason for new structure, and the estimated cost and actions.
- b. Line/pipe sections of distribution system - Describe the proposed lining or piping, reason for the improvement, and the estimated cost and actions.
- c. Independent water control for each unit - Describe the proposed new control point, reason for new control point, and the estimated cost and actions.

⁴ All water delivered to the Refuges (Contractor) pursuant to their Contract is to be measured at the point(s) of delivery to reflect the quantities of Level 2 Water Supplies and Incremental Level 4 Water Supplies delivered to the Contractor's boundary.

- d. New Internal Distribution sections to provide water to existing and new habitat units - Describe the proposed new section, units served, reason for new section, and the estimated cost and actions. GRCD - Provide assistance to member units to improve internal distribution.

3. Develop a Water Use Schedule / Automate water distribution system

The water use schedule should indicate the planned flood up sequence including: the flood up dates for each habitat unit/cell, the number of acres to be flooded in each unit/cell, and a running total representing the percentage of total wetland acres that are flooded by certain dates. In addition, similar information could be included for spring drawdown, as well as for planned irrigations during the spring and summer months. If such schedules already exist as part of a larger management document, just include schedule summary pages (flood up, drawdown and irrigations) in the Refuge Water Management Plan.

4. Plan to Measure Outflow

Measure the volume of water leaving the Refuge with methods or devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 20 percent. Identify spill locations, prioritize spill locations by quantity of spill, determine best measurement method/cost, submit funding proposal, and provide the estimated cost and actions.

5. Incentive Pricing (GRCD only)

Implement a pricing structure that promotes one or more of the following goals:

- a. More efficient water use at the refuge level;
- b. Conjunctive use of ground water;
- c. Reduction in problem drainage;
- d. Improved management of environmental resources; and/or
- e. Effective management of all water sources throughout the season by adjusting seasonal rates based on current conditions

6. Construct and Operate Operational Loss Recovery Systems

Describe proposed location, reason for improvement, and the estimated cost and actions.

7. Optimize Conjunctive Use of Surface and Ground Water

Describe the proposed production and/or injection well, anticipated yield, and the estimated cost and actions.

8. Facilitate Use of Available Recycled Urban Wastewater that

- a. otherwise would not be used beneficially;
- b. meets all health and safety criteria; and
- c. does not cause harm to wildlife management goals.

9. Mapping

Develop Geographic Information System-based maps of the distribution system and drainage system. Include the estimated cost and actions.

10. CALFED

Provide a short narrative describing past, present, or future plans that address the CALFED Water Use Efficiency Program goals identified for this refuge. Respond only to questions for your specific refuge.

Sacramento and Delevan National Wildlife Refuges

- Describe actions that reduce the salinity of surface return water (Targeted Benefit (TB) 24)
- Describe actions that reduce nonproductive ET (TB 25)

Colusa and Sutter National Wildlife Refuges

- Describe actions that reduce nonproductive ET (TB 33)

Gray Lodge Wildlife Area

- Describe actions that reduce nonproductive ET (TB 46)

North Grassland, Volta, and Los Banos Wildlife Areas

- Describe actions that reduce selenium concentration in the Grassland Marshes. Reduce selenium concentration to 5 ug/L in the Grassland Marshes (TB 95)
- Describe actions that reduce San Joaquin River selenium and boron concentrations. Reduce San Joaquin River selenium concentration to 5 ug/L and boron concentration to 2 mg/L from March 15 to September 15 and to 2.6 mg/L September 16 to March 14 (TB 98)
- Describe actions that reduce salinity in the Grassland Marshes and Mud and Salt Sloughs. Reduce salinity in the Grassland Marshes and Mud and Salt Sloughs (TB 102, 103)
- Describe actions that reduce nonproductive ET. Reduce unwanted ET (TB 107)

San Luis National Wildlife Refuge and Grassland Resource Conservation District

- Describe actions that reduce salinity in the San Joaquin River, Grassland Marshes, and Mud and Salt Sloughs (TB 95, 96, 98)
- Describe actions that reduce salinity in the Grassland Marshes and Mud and Salt Sloughs (TB 102, 103, 104) (All of these six contaminant TBs could be incorporated into one Refuge manager response, e.g. addressed through the Grassland Drainage Program)
- Describe actions that reduce nonproductive ET (TB 107)

Merced National Wildlife Refuge

- Describe actions that provide additional flow to San Joaquin River (TB 148)
- Describe actions that reduce salinity at Vernalis (TB 154)
- Describe actions that reduce nonproductive ET (TB 157)

Mendota Wildlife Area

- Describe actions that reduce flows to salt sink (TB 167)
- Describe actions that reduce nonproductive ET. Reduce unwanted ET (TB 168)

Kern and Pixley National Wildlife Refuge

- Describe actions that reduce nonproductive ET (TB 189)

Section J. BMP Exemption Process

For each Exemptible BMP (Section I) for which the refuge is seeking an exemption, provide a detailed narrative and complete the summary table.

Some BMPs are not appropriate or possible for the refuge to implement. To document an exemption, provide the basis, rationale, and details for excluding a BMP. For a BMP to be classified exempt it is necessary for the refuge to document in a clear and concise manner the constraint to implementing the BMP. The exemption must document a specific legal, environmental, or economic issue that creates a constraint.

If the refuge determines there is no way to remove the constraint, a clear justification must be provided. Opportunities to acquire funding or other relevant assistance should be identified (consider Federal, State, and local funding that recognizes regional benefits). An exemption must be updated every year - showing current actions to remove the constraint.

Section K. NA of Exemptible BMPs

To establish that an Exemptible BMP (Section I) is not applicable to the refuge, the Refuge Plan should explain the reasons why the particular BMP does not apply to the refuge. This justification must be consistent with Section A of the Refuge Criteria titled: "Background". Examples of NA for exemptible BMPs are listed below. This list is not all-inclusive.

Exemptible BMPs:

2. Improve internal distribution system

b. Line/pipe sections of distribution system

NA if the current system can distribute water effectively with regular maintenance and on-going improvements to open channels - thus maximizing habitat.

6. Construct and operate operational loss recovery systems.

NA if system is completely piped and there are no spill points.

7. Optimize conjunctive use of surface and ground water

NA if there is no usable ground water

8. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.

NA if there is no recycled urban wastewater available.

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CHAPTER 3 – 2020 Refuge Management Plan Guidebook

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Key Terms

For the purposes of the Refuge Criteria, the following definitions will be used:

Acre Feet (AF) - A unit of volume equal to the volume of a sheet of water one acre in area and one foot in depth.

Acre Feet per Year – (AFY) - A time rate unit of water flow, about 141 liters per hour

Annual Update - Yearly report documenting actual implementation of a Refuge Plan for the previous year and forecast planned implementation for the current year. The Annual Update is limited to reporting on the BMPs.

BMPs - Best Management Practices. A policy, program, practice, or use of devices, equipment, or facilities that meets Reclamation Refuge Criteria. The Central Valley Project Improvement Act specifies that the Criteria identify BMPs including, but not limited to, efficient water management practices being developed pursuant to California State law or reasonable alternatives.

CALFED - The CALFED Bay-Delta Restoration Program, is a state and federal program formalized in June 1994 upon the execution of a Framework Agreement by state and federal agencies having management and regulatory responsibility in the Bay-Delta Estuary. The mission of CALFED is to develop and implement a long-term comprehensive plan that will restore the ecological health of the Bay-Delta.

CVP – Central Valley Project. Federally operated water management and conveyance system that provides water for agricultural, urban, and industrial users, and fish and wildlife in portions of California.

CVPIA – Central Valley Project Improvement Act. Title XXXIV of the Federal Act of October 30, 1992.

Contract - Water Supply Contracts and/or Memorandum of Agreements.

Contracting Officer - Department of Interior's duly authorized representative acting pursuant to the water supply contract.

Conveyance - A pipeline, canal, natural channel, or other similar facility that transports water from one location to another, typically to bring water to the refuge (see Internal Distribution on refuge water transport).

Conjunctive Use - The planned and coordinated use of surface and groundwater supplies to increase water supply reliability, as may be included in a Ground Water Management Plan or Banking Program.

Cultural Practices – Use of water for disease control, weed abatement, leaching, etc.

District - The physical boundaries of the Grassland RCD. For the purposes of the Refuge Criteria,

the District is referred to as a refuge.

Drawdown – Draining the water from a habitat unit.

Effective Precipitation - Net precipitation after losses by evaporation

Efficiency - Improved water management through implementation of BMPs, including water conservation.

Estimated Cost - A projection of the cost of implementing a project or practice.

Fiscal Year - Federal: October 1 through September 30, State: July 1 through June 30.

Five Year Refuge Plan Revisions - Refuges are required to revise and update and re-submit their Refuge Plan every 5 years. The refuges will use the most recently adopted Refuge Criteria, as applicable.

Flood up – Filling a habitat unit with water.

GRCD – Grassland Resource Conservation District - contains approximately 75,000 acres and is composed primarily of privately-owned hunting clubs and wildlife beneficial agriculture

GWD - Grassland Water District – A California water agency formed under Section 34000 of the State Water Code to receive and deliver Federal Central Valley Project water. The District's primary function is to protect, secure and deliver water to the critical wetland habitat within its boundaries. The District also delivers water to state and federal wildlife refuges on the behalf of the Bureau of Reclamation.

Habitat Types - Seasonal wetland – timothy, Seasonal wetland – smartweed, Seasonal wetland – watergrass, Permanent wetland, Semi-permanent wetland/brood pond, Reverse cycle wetlands, Riparian, Irrigated pasture, Upland, Other (>5%), Misc. habitat (<5%)

HP – horsepower – a unit of power equal to 550 foot-pounds per second (745.7 watts); in this case the horsepower in the pumps

Implementation - Securing and maintaining the staffing and funding necessary to successfully address the BMP programs described in the refuge's plan.

Inflow - Water that enters the refuge boundaries and is made available to meet planned habitat uses.

Interagency Refuge Water Management Team (IRWMT) - Article 6(b) of the Refuge Water Supply Agreement created an interagency team to work cooperatively on refuge water management issues, including supply, conveyance, and efficiency. The IRWMT consists of representatives from Reclamation, the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, and the Grassland RCD (see the Contract for specific team tasks, such as allocating pooled water and developing the Refuge Criteria).

Internal Distribution - A pipeline, canal, natural channel, or other similar facility that transports water from one location to another within the refuge boundary.

Internal Flow - Water that has entered the refuge boundaries and is moved to one or more habitat units.

Non-productive Evapotranspiration – Unwanted flora, usually found within channels or upon banks, that increases the quantity of consumptive water within a system.

Outflow -Water that leaves the refuge boundaries.

Policy - Usually a formal written statement adopted by the governing board or agency that specifies what action will be taken in certain situations.

Refuges - Lands in the units of the National Wildlife Refuge System and the State Wildlife Areas in the Central Valley of California and the Grassland Resource Conservation District.

The term refuge, as used in the Refuge Criteria, includes Federal Refuges and State Wildlife Areas and the private Grassland Resource Conservation District. Carries the same meaning as the term “Contractor” in the Water Supply Contracts.

Reverse Cycle Wetlands - Managed wetland units that are flooded during the spring and summer (typically for brood habitat) and dry during the fall and winter.

Riparian – Habitat that consists of plants that exist between flowing water and adjacent upland habitat.

Water Conservation - Improved water management through the implementation of BMPs.

Water Inventory - An approach used in the Refuge Plan to identify and quantify inflows, outflows, and other uses of water from the refuge in order to identify areas of potential improved water management.

Year Type - A Refuge Plan contains data from a specified year. Refuges use a variety of year types to collect and maintain data. Year types include, but are not limited to, calendar year (January 1 to December 31), Federal Fiscal Year (October 1 to September 30), State Fiscal Year (July 1 to June 30), and Contract Year (varies by Contract). When developing a Refuge Plan, determine the Year Type that is most appropriate for your agency and use data based on that year type consistently throughout the Refuge Plan and each Plan submittal.

These Criteria for Developing Refuge Water Management Plans (Criteria) were developed by the United States Department of Interior (DOI), Bureau of Reclamation (Reclamation) in response to the Central Valley Project Improvement Act of 1992 (CVPIA) and in accordance with the Reclamation Reform Act of 1982 (RRA).

Plans should be electronically submitted using the Plan Format.

The Goal

Effective management and efficient use of water is of great importance to optimize the beneficial use of water resources for environmental, agricultural, municipal and industrial purposes. The Refuge Criteria outlines the process and format by which Refuge Water Management Plans should be prepared and submitted to Reclamation as part of the Refuge water service contracts.

Who Must Prepare a Water Management Plan

Those refuges that entered into water service contracts with Reclamation as a result of the CVPIA and subsequent DOI administrative review processes are required to prepare water management plans using Criteria for Developing Refuge Water Management Plans. These refuges are:

Sacramento Valley:

- Sacramento
- Delevan
- Colusa
- Sutter National Wildlife Refuges⁵
- Gray Lodge Wildlife Area.

San Joaquin Valley:

- San Luis
- Merced
- Pixley
- Kern National Wildlife Refuges
- Volta
- Los Banos
- North Grassland
- Mendota State Wildlife Areas
- Grassland Resource Conservation District (GRCD).

The Criteria refers to refuges and districts as refuges and to agreements and contracts as contracts.

Agricultural, municipal and industrial water suppliers currently prepare and submit similar Water Management Plans to Reclamation that are based on the Conservation and Efficiency Criteria developed for agricultural and urban entities in 1993 and subsequent revisions.

⁵ At this time, Sutter does not receive CVP water and is exempt from submitting a plan. This exemption will be evaluated with each revision of this Criteria.

What does a Plan Include

The plan contains two types of data. Part 1, Sections A through G, is completed using existing data. Part 2, Sections H through K, will contain proposed water management implementation plans, with budgets and schedules.

Section	Title
A	Background
B	Water Management Related Goals and Objectives
C	Policies and Procedures
D	Inventory of Existing Facilities
E	Environmental Characteristics
F	Transfers, Exchanges and Trades
G	Water Inventory
H	Critical Best Management Practices
I	Exemptible Best Management Practices
J	BMP Exemption Requests
K	N/A of Exemptible BMPs

Part One (Sections A – G) of the Plan details the refuge history, land use (habitat types), goals, objectives and water related facilities.

Part Two (Sections H – K) details best management practices (BMP) implementation Plans. The BMPs are divided into two categories: critical and exemptible. Both BMP categories must be addressed in the refuge Plan. Critical BMPs are considered universally applicable to all Refuge/Districts. The critical BMPs are: management programs (education, water quality monitoring, cooperative efforts, pump evaluations, policy evaluation and provide customer services), pricing structure, plan to measure deliveries to customers, and water conservation coordinator. Exemptible BMPs are considered generally applicable to refuges. The exemptible BMPs are: improve management unit configuration, improve internal distribution system to effectively provide water to existing and new habitat units (new control structures within distribution system, line/pipe sections of distribution system, independent water control for each unit, new sections to provide water to existing and new habitat units), develop a water use schedule, a plan to measure outflow, incentive pricing, construct and operate operational loss recovery systems, optimize conjunctive use of surface and groundwater, facilitate use of available recycled urban wastewater, develop and maintain detailed GIS based water management maps, and state and federal water use efficiency goals. An exemptible BMP may be excluded if it meets the exemption process explained in Section J.

When is the 5-Year Plan Due

Refuges are responsible for submitting an electronic draft version of their Refuge Plan, which has been developed according to the Refuge Criteria, to Reclamation's appropriate Area Office for review. Upon receipt, refuges will receive, within 90 days, notification of Reclamation's acceptance or request for modification. Following notification by Reclamation that the Refuge Plan has conditionally met the requirements of the Refuge Criteria, refuges will submit a final electronic copy of the complete Refuge Plan. In addition, GRCD will submit a resolution from the Board of Directors formally adopting the Refuge Plan.

Initial Plans are due by April 30th (or earlier) every five years, independent of when the last plan was

completed or approved. For example, if your plan was due in 2015 and it took four years to get approved (2019), your next plan will be due the following year in 2020.

A plan is considered final after it has gone through the review process with Reclamation staff and is due by December 31st. The final step is a public review process where the Refuge allow for public review and comments.

Public Review Process

For Plans that need to meet both the Federal and State plan requirements, the public review process shall follow the applicable section of the State of California Water Code.

For Plans that solely need to meet the Plan requirements, the public review process will be the responsibility of the Contractor and identified in the Refuge Standard Criteria.

If no comments are received within 30 days, the review process will officially be complete. If public comments are received, additional changes may be required.

Copies of the document will be available for review at Reclamation's California Great Basin Regional Office, the appropriate Area Office and at Reclamation's WaterShare website at www.usbr.gov/mp/watershare/.

Annual Updates

Refuge staff is responsible for submitting to Reclamation an Annual Update on the actual implementation of its Water Management Plan for the previous year and forecast planned implementation for the current year. Unlike the Plan, the Annual Update only reports about Best Management Practices (BMPs), documenting implementation, status of studies and updating exemption requests.. Reclamation will provide refuge-specific annual update forms to each refuge during February. The Annual Update form should be submitted electronically to your Reclamation Area Office by April 30th of each year.

How This Criteria Was Developed

In response to The Central Valley Project Improvement Act of 1992 and a subsequent Reclamation Administrative review process in 1995, the Interagency Coordinated Program for Wetland and Water Use Planning (ICP) was formed. The ICP was comprised of representatives from the Reclamation, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife and Grassland Resource Conservation District. The ICP developed the 1998 Task Force Report that outlined past, present and future wetland planning and management issues and a methodology for Water Management Planning Criteria.

To continue the work of the now disbanded ICP, an Interagency Refuge/District Water Management Team (IRWMT) was formed to continue working on wetland issues such as water delivery, including additional work on wetland Water Management Planning Criteria. The IRWMT is comprised of representatives from the Reclamation, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife and Grassland Resource Conservation District. IRWMT used the 1998 ICP report and Reclamation's 1999 Agricultural Water Management Plan criteria as the foundation for developing the Water Management Planning requirements, or Criteria. The Criteria

also incorporated comments, ideas and suggestions from Refuge/District managers, biologists, water conservation specialists, engineers, CALFED, and other Central Valley stakeholders. The 2020 Criteria for Developing Refuge Water Management Plans updates and streamlines the reporting requirements for the refuges.

Water Conservation Program

Reclamation's Water Conservation Program is responsible for overseeing development of the water management Criteria as well as review of submitted Refuge Water Management Plans.

Reclamation's contracting officers work with Water Conservation Program staff to ensure Plans submitted are adequate and meet water delivery contract requirements. Reclamation's Area Office staff or Regional Water Conservation Program staff can provide technical assistance for refuge Plan preparation.

Plan Review

Plans will be reviewed by Reclamation and determined to be adequate or in need of additional work. During the review process the Interagency Refuge Water Management Team may be asked for preliminary review and comments. Reclamation staff will contact the refuge manager regarding Plan adequacy. If the Plan needs additional work, Reclamation will coordinate with the refuge. If needed, Reclamation will assist the refuges to identify activities with National Environmental Policy Act and/or other compliance issues.

Non-compliance

Article 17 of the refuge water supply contracts addresses water conservation. Article 17(a) requires the refuge to complete the original Plan within one year of the establishment of the Criteria. The Criteria is presented by Reclamation in the remainder of this document. Article 17(d) requires the refuge to submit annual updates each year on the status of the previous year's Plan implementation. Article 17(b) states that prior to the refuge being afforded opportunities such as pooling and rescheduling of water supplies pursuant to Articles 3 and 6 of the Water Supply Contract, the refuge must be implementing a wetland habitat water management plan. Continued pooling and rescheduling benefits are contingent upon continued Plan implementation. If the Contracting Officer determines the refuge is unable to implement its Plan due to circumstances beyond its control, the pooling and rescheduling benefits can be continued so long as the refuge diligently works with the Contracting Officer to begin implementation as soon as the refuge constraints have ceased. See the individual refuge contract for specific contract language.

Water Saved

Article 17 of the refuge water supply contracts addresses water savings. 17(c) states that any water savings resulting from Plan implementation may be transferred/reallocated, to other wetland, wildlife and fishery needs or to other contractors in accordance with the recommendations of the Interagency Refuge Water Management Team. In such a case the Contracting Officer must determine that the transfer/reallocation of conserved water would not have an adverse impact, which cannot be reasonably mitigated, on Project operations, other Project contractors of other Project purposes.

Criteria Revision Process

Reclamation is responsible to revise the Criteria every five years. Reclamation will consult with the IRWMT during the revision process.

Part 1 – Existing Information

A. Background

Note: Enter the following information in the criteria format

1. *Staff member responsible for this plan*

Enter the name and contact information for the person responsible for developing and overseeing implementation of the plan.

2. *Year refuge established*

Enter the date that the refuge was established.

3. *Define year-type to be used consistently in plan*

Define year (calendar, federal fiscal, state fiscal, contract, etc.) and enter data based on this year type consistently throughout plan

4. *Water Supplies - List each annual entitlement of surface water under each water right and/or contract*

Provide information on the refuge's entitlement or contractual amount from each source (Reclamation, State Water Project, riparian, drain water contracts, long-term transfer agreements, etc.). Please include each contract's identifying number and any contract restrictions that affect refuge water management. Examples of restrictions include time of delivery or amount of water available per month. If these restrictions make some BMPs not applicable, beneficial, feasible, or legal for the refuge, please explain.

5. *Provide a narrative on pre-CVPLA refuge water supplies and water management.*

Explain the sources and types of water, water quality, economics/affordability, and availability. Identify any pre-CVPIA supplies that are no longer available for use. Explain why these supplies are not available. Reference any relevant documents.

6. *Land use history - identify refuge habitat-types with 5% or more of total acreage. Attach a refuge map showing habitat location and size.*

Habitat type definitions were developed in the ICP. Please use the provided categories:

Seasonal wetland - timothy: wetland units that target the management of swamp timothy as the primary moist soil food plant. These units are typically kept dry through much of the summer except during periodic irrigations.

Seasonal wetland - smartweed: wetland units that target the management of smartweed as the primary moist soil food plant. These units are typically kept dry through much of the summer except during periodic irrigations.

Seasonal wetland - water grass: wetland units that target the management of water grass as the primary moist soil food plant. These units are typically kept dry through much of the summer except during periodic irrigations.

Permanent wetland: managed wetland units that are rarely drawn down.

Semi-permanent wetland/brood pond: wetland units that are flooded most of the year including the spring and perhaps part of the summer, for the benefit of both wintering and breeding waterfowl.

Reverse cycle wetlands: managed wetland units that are flooded during the spring and summer (typically for brood habitat) and dry during the fall and winter.

Riparian: habitat within refuge boundaries that is managed for riparian vegetation.

Irrigated pasture: refuge uplands irrigated for the benefit of wildlife. Unlike seasonal wetlands, these lands are not flooded for extended periods of time.

Upland: habitat not flooded or irrigated by refuge managers.

Other (>5%): other habitat types not mentioned above and consisting of over 5% of the total habitat available on the refuge.

Misc. habitat (<5%): other habitat types not mentioned above and consisting of less than 5% of the total habitat available on the refuge.

Roads, buildings, etc.: the remaining acreage within the refuge boundary not accounted for all previously delineated habitat types.

GRCD should provide (as an attachment) this information for each customer and combine data from all customers/member units into the table presented in this section.

7. Attach an existing map (8.5” by 11” is sufficient) of the refuge that delineates habitat area boundaries.

8. *Describe refuge habitat-type water use characteristics*

For each habitat type included on the refuge, provide information on the acre-feet per acre necessary to provide quality habitat, the number of irrigations used to deliver this quantity, and the approximate (or range of) dates of flood-up and drawdown.

B. Water Management Related Goals and Objectives

1. *Describe the refuge’s mission and its relationship to water management. (i.e., crop depredation, legislative mandates)*

This information is usually found in the documents that established the refuge or more recent documents defining the refuge purpose.

2. *Describe specific habitat management objectives and habitat types for the refuge. Include pertinent information from refuge management Plans. Use habitat types listed in Section A5.*

A habitat objective priority might be ‘habitat for wintering waterfowl’ and this might be accomplished through autumn flood-up.

3. *Describe the strategies used to attain objectives listed above.*

These strategies may be developed during a periodic process that evaluates implementation of the refuge objectives.

4. *Describe constraints or issues that hinder or prevent full attainment of objectives. Explain the effect on refuge operations.*

An example would be a lack of water conveyance facilities resulting in partial water supply.

5. *Describe the water management strategies used to attain habitat management objectives or to remedy the listed constraints.*

Examples of strategies to attain objectives include drawdown and flood up timing, salt balance,

disease control, weed abatement, and predator control management. Examples of strategies to remedy constraints include working with the interagency refuge Water Management Team on rescheduling issues.

C. Policies and Procedures

A policy is generally officially adopted by the agency whereas a procedure is not formally adopted but is a common refuge practice. If the refuge does not have official policies please focus on procedures.

1. *Describe the refuge policies/procedures on accepting agricultural drainage water as supply.*

For instance, does the refuge divert and use agricultural drain water.

2. *Describe the refuge policies/procedures on water pooling, transfers, reallocations and exchange.*

Federal and/or state law or the supplying agency may determine these policies.

3. *Describe the refuge water accounting policies/procedures for inflow, outflow, and internal flow.*

In what format does the refuge maintain records of water distribution? Examples include the water master's hand-written notebooks or computer spreadsheets.

4. *Attach a copy of the refuge water shortage policies/procedures.*

Each refuge should have a written water shortage plan, drought plan or similar document. A water shortage contingency plan should address ways to maintain habitat during reductions in normal supply of up to 50 percent. Plans should contain criteria for prioritizing management units to provide the maximum amount of habitat considered critical during low rainfall periods.

Please attach or summarize. If water shortage procedures are informal, please describe.

Number 5 is for GRCD only since other Refuges do not have customers.

5a. *Describe the District's water allocation policy to its customers*

Describe the District's water allocation policy. Attach the relevant District regulations as an appendix to the Plan and list the appropriate page number in this section.

5b. *Describe the District's official and actual lead times necessary for water orders and shut-off to customers*

Attach the relevant District regulations as an appendix to the Plan and list the appropriate page number in this section. Describe any differences between actual operations and the official rules - such as water delivery orders being filled in 12 hours when the rules say 24 hours is the minimum.

5c. *Describe the District's policies that address wasteful use of water*

Describe (or attach) the district's current year policies that address wasteful use of water. Include information on enforcement methods. Attach the relevant District regulations as an appendix to the Plan and list the appropriate page number in this section.

5d. *Describe the District's water pricing and billing policies*

Describe the District's current year water charges - include dollar amounts for stand-by and

quantity charges. Describe the rate structure for water deliveries that are billed by quantity (e.g., declining, uniform or increasing block).

Attach the District's rate ordinance as an appendix to the Plan and list the appropriate page number in this section.

D. Inventory of Existing Facilities

1. Mapping.

Attach existing maps (8.5 x 11 inch is sufficient) that show water related facilities such as points of delivery, turnouts (internal flow) and outflow (spill) points with and without measurement, the conveyance system, storage facilities, operational loss recovery system, and wells, and water quality-monitoring locations.

2. Water measurement.

Use the definitions provided below (in the box) when discussing type of measurement: use M1, M2 or M3 for measured turnouts. If a turnout is unmeasured, use the Calculated (C), Estimated (E) or Other (O) categories to define how the amount of water passing through a turnout is determined. When providing data on the number of inflow, outflow and internal measured turnouts please identify how many are M1, M2, M3, C1, C2, C3, E1, E2, E3, and O1.

Method definitions

M1 Measured summation from calibrated measuring devices, accurate to within 6%.

M2 Measured summation from calibrated measuring devices.

M3 Measured summation from measuring devices.

C1 Calculated (more than summation) using information from calibrated devices (such as the difference between measurements upstream of diversion and down stream of diversion).

C2 Calculated (more than summation) using information from measuring devices.

C3 Calculated using estimates from pump times and energy usage.

E1 Estimated using measured information from similar conditions.

E2 Estimated using historical information.

E3 Estimated using observation.

O1 Other (describe other method used)

a. Inflow/deliveries

Provide the number of inflow points, how many of those are measured and the percentage of water delivered through measured points. List the names and locations of inflow points as shown on facilities map requested in D1. For each inflow point, identify the delivering agency, the conveyance facility, the refuge distribution facility that receives the water, the percent of total inflow delivered at each point, the type and accuracy of the measurement device, and which agency reads and maintains the measurement device.

b. Internal flow at turnouts

Provide information on the total number of management units, the total number of turnouts and the number of measured turnouts. Identify how many of each type of measurement device are in

use, and, for each type of device, the acres served, accuracy, and the frequency of reading, calibrating and maintenance. Since internal flow is used multiple times and the total water moved internally is greater than the total supply, provide an estimated percentage of total internal flow that was measured.

c. Outflow

Estimate the outflow (in acre-feet) during the report year and provide the number of outflow/spill points and how many of those are measured. Estimate the percentage of total outflow/spill that was measured during the report year.

List outflow names/locations as shown on previously submitted facilities map. For each outflow point, identify the measuring point, the type of measurement device (if any), an estimate of the percent of total outflow leaving the refuge at each point, and which agency reads, calibrates and maintains the measurement device. Include information on the acres served by each outflow point.

3. Identify the type and length of the refuge internal distribution system

Provide information on the miles of lined and unlined canals, natural channels, and pipelines in the internal distribution system. If known, identify distribution system problems (leaky pipes, high seepage areas, problem soils).

4. Describe the refuge operational loss recovery system.

If the refuge has a loss recovery system, please describe. Generally, a loss recovery system will consist of recovery ponds at the refuge boundary and pump stations to move the water back into the internal distribution system.

5. Groundwater

If the refuge overlies a usable groundwater basin, identify the name and size of the basin, usable capacity, safe yield, any management agency and management plan. Groundwater information may be obtained from the Department of Water Resources, Bulletin 118, California's Ground Water.

List groundwater well names/locations as shown on previously submitted facilities map. Provide information on well status (active, inactive, abandoned, etc.), yearly yield, and future plans.

E. Environmental Characteristics

1. Topography

Describe the topography (e.g. hilly, flat, sloping to a watercourse) of the refuge as it relates to water management. Discuss any impact of topography on refuge water management, such as drainage capture and reuse. An example of a topography impact would be water used in lower sections of the refuge that is not available to meet needs in the higher elevation sections of the refuge.

2. Soil

Provide refuge soil associations and acreages. A U.S. Natural Resource Conservation Service general soils map of the area will generally be the clearest way to present soils information. Describe any soil management problems (e.g., salinity or high-water table, high and low infiltration rates, etc.) and how that affects the use of water within the refuge. Identify any problems, number of acres with that problem and what impact(s) the problem has on water use.

The United States Department of Agriculture (USDA) NRCS (formally Soil Conservation Service) has soil survey information for most agricultural regions in California. Recent surveys (within the last twenty-five years) contain a single map called "General Soil Map". These generalized soil maps group soils into what are called Soil Associations and are appropriate for this plan. These soil groupings are made according to soil characteristic similarities such as texture, depth, salinity, slope, flooding potential, impervious layers, etc. An awareness of these soil groupings can help target BMP programs - such as in areas where distribution canals or habitat type might have high seepage rates.

3. *Climate*

For weather data, specify the period of record (30 years recommended). Historic weather data from the National Weather Service weather stations provide all the requested data. The website address is: <https://wrcc.dri.edu/weather/sage.html>. Identify which station you selected and how many years of records were available. Reference data source. Evapotranspiration (ET_o) data is available from the California Department of Water Resources CIMIS network at <https://cimis.water.ca.gov/>.

4. *Discuss the impact of climate, and any microclimates, on water management.*

Where appropriate, relate climate to water use – i.e., if there are special microclimates in the refuge that require more (or less) water than other microclimates. The impact of climate may be similar to the impact of soil and terrain.

5. *Water Quality Monitoring*

If the refuge has a water quality-monitoring program for surface water, groundwater or outflow/spill, describe the program – analyses performed and frequency, and concentration average and range.

6. *Discuss the impacts of the water quality problems on refuge water management.*

Describe the impact of water quality issues regarding refuge management.

F. Transfers, Exchanges and Trades

Provide information on any transfers, exchanges and/or trades into or out of the refuge

List the names of the transferring agency and receiving agency, the quantity of water transferred, exchanged or traded in the report year by those agencies and how the water was used (urban, agricultural, etc.)

G. Water Inventory

See Plan Format, Section G to view the tables. Use the provided Excel spreadsheet to accurately calculate the water inventory data and complete the tables.

Information developed in this section will allow you to calculate a water inventory. A water inventory is a simplified water balance

- quantifying water entering the refuge
- how that water is used within the refuge, and
- how much water leaves the refuge?

The water inventory tables are designed to help identify points where there is a potential for improved water management and/or efficiency.

Use the year type identified in Section A and enter the last complete data year based on this year type consistently throughout the tables.

Measured or calculated numbers for these tables are expected. Select the measurement definition (D2) that best describes the method used to determine each quantity. Where indicated, fill in the row marked “method” with the appropriate method definition identifier.

If two methods are used for one supply, select the predominant one. For some flows, there may be no flow rate or volumetric measurement. In this case, estimate the flow and fill in the method identifier.

Table 1 Water Supply

The numbers in this table should be the best information available on how much water actually entered the refuge during the reporting year. The reporting year is defined by the district (ie water year, calendar year, fiscal year, etc.)

Make sure all incoming flows are quantified. Water transferred in and small miscellaneous flows, may be combined in the “other” column. Do not include outflow/spill water pumped back into the internal distribution system

Refuge groundwater - refuge pumping should be measured or calculated. If only a yearly total is available, monthly amounts should be estimated based on experience or historical use.

Other Water (define) – an example would be “recycled urban” water.

Table 2 Internal Distribution System

The first column has the name or number of each section of the system, such as canal T-2, or Lower Reservoir. In the “length” column, enter the length of canal / ditch / reach. In the width column enter the average width of that section. In the “Surface Area” column, the surface area of each section is automatically calculated. Reservoir surface areas can be automatically calculated by entering the appropriate dimensions in the length and width columns.

In the “precipitation” column enter the estimated effective precipitation (if it increased the quantity of water available for delivery) that fell into the distribution system. The spreadsheet calculates this information automatically when the monthly rainfall is entered in those months when the internal distribution system is in use. However, the precipitation contribution is often assumed to be zero because the amount and timing is unpredictable.

In the “evaporation” column, enter the estimated evaporation (if it decreased the quantity of water available for delivery) from that section of the distribution system. The spreadsheet calculates this information automatically when the monthly evapotranspiration is entered in those months when the internal distribution system is in use.

In the “seepage” column, enter the estimated seepage. To estimate seepage the following approach

may be useful. In a canal (ditch), measure the quantity of water entering the canal over a set period (week, month, etc.) and subtract the total amount of water leaving the canal at all the turnouts, plus the evaporation and any spill. The remainder is the estimated seepage. For instance – during July a small lateral received 150 AF. The three turnouts diverted 125 AF, evaporation was 4 AF and there was no spill. The estimated seepage is 21 AF [$150 - (125 + 4 + 0) = 21$]. Estimating seepage from a reservoir is similar – measure the quantity of water entering the reservoir and subtract outflow, evaporation and spill – the difference is estimated seepage.

In the “operational losses” column, enter the estimated amount of spill from each section that leaves the refuge boundary.

The “Total” column automatically calculates the quantity of water that is unavailable for delivery due to evaporation, seepage or spill. It is unlikely that this number would ever be positive and would be the result of unusual amounts of precipitation, shallow groundwater or other extraordinary circumstances.

Table 3 Managed Lands Water Needs

The first column lists refuge habitat types. For each habitat type, list the area (acres), determined water need, quantity of water delivered during the report year, an estimate of the contribution from effective precipitation and shallow groundwater, and losses due to evapotranspiration, cultural practices (disease control, temperature control, etc.) and seepage.

In a shallow groundwater area, a management unit may have reduced seepage or even receive an inflow of water.

The “Balance” column combines these values to estimate the amount of water that was delivered but not accounted for in the other categories. The “Months irrigated” column will help to accurately determine which months precipitation and evapotranspiration are factors for each habitat type.

You may wish to combine habitat types that occupy less than 5 percent of the total managed acreage. To combine small habitat acreages, determine an average “water needs” number for the group of small habitats.

The precipitation and evapotranspiration in your area can be found using CIMIS at <http://www.cimis.water.ca.gov/cimis/welcome.jsp>. Effective precipitation by habitat should be determined locally or you may contact Reclamation for assistance.

Table 4 Refuge water inventory

Much of the data for this table is entered automatically from the previous tables.

- Total water supply – entered automatically from the total in Table 1
- Precipitation – entered automatically from the precipitation total in Table 2
- Evaporation – entered automatically from the evaporation total in Table 2
- Seepage – entered automatically from the seepage total in Table 2
- Operational Losses – entered automatically from the operational losses total in Table 2
- Deliveries to managed lands – a calculated number that adds or subtracts the internal delivery system inputs and outputs from the Total water supply to determine the quantity of water

delivered to habitat units

- Managed lands need - entered automatically from the Delivered water total in Table 3
- Difference – a calculated number that determines the amount of internal distribution system outflow or unmet needs
- Balance - entered automatically from the Balance total in Table 3
- Water inventory balance – a calculated number that adds the Difference and Balance numbers to determine the total amount of refuge outflow/spill or unmet needs.

Table 5 Annual water quantities delivered under each right or contract

Quantify the amount of each type of water the refuge actually received in each of the last ten years. If the refuge has sources of surface water that are not listed in the table, add the necessary data in the “Other” columns.

Part 2 – Best Management Practices

H. Critical Best Management Practices

Critical BMPs are those that every refuge is expected to implement. These BMPs are considered to be the basic elements of good water management. Select a program design for each BMP that will provide maximum benefit to the refuge. The success of some of the practices will depend on cooperative work with other entities.

For each BMP, describe how the plan will be carried out, including actions and timelines. Budgets, staff, and projected results (e.g. changes in water and energy use, improved habitat) need only be provided for the first 3 years of the Plan. Identify how each practice will be monitored to see if it is achieving the projected results.

Note, if the requested information is not available, describe how that information will be obtained for the next Plan revision or state that the information is historical and cannot be reconstructed.

The Critical BMPs are:

1. *Management Program*
 - a. *Education*
 - b. *Water Quality Monitoring*
 - c. *Cooperative Efforts*
 - d. *Pump Evaluations*
 - e. *Policy Evaluation. (be specific about issues and suggested solutions)*
 - f. *Provide Customer Services (GRCD only)*
2. *Pricing Structure (GRCD only)*
3. *Plan to Measure Deliveries to Customers (GRCD only)*
4. *Water Conservation Coordinator*

The following information provides BMP implementation ideas and approaches.

1. *Management Program*

a. *Education*

Describe the refuge's proposed staff and public education programs and goals. Attach program materials.

The refuge should either sponsor or conduct educational seminars/workshops for staff and public. Examples of workshop topics include: information on weather, habitat characteristics and water delivery scheduling, and water distribution planning. Input from technical experts will be important when determining the content of these seminars/workshops.

Educational seminars/workshops can serve the refuge in several ways. They can be used to: (1) communicate the importance of conservation programs; (2) describe conservation procedures that can be utilized by staff; and (3) provide a forum for refuge staff and public to exchange ideas and experiences. These meetings also provide refuges an opportunity to exchange ideas.

Information included in the Plan should include: program description, cooperators (if any), and yearly participation targets

Various local, state and federal agencies such as the Agricultural Research Service and U. C. Cooperative Extension offer technical assistance and will work with the refuge to provide educational seminars and workshops to staff.

b. Water Quality Monitoring This BMP has three parts (surface water inflow, groundwater and outflow/spill) – none of which may apply to a refuge.

If the refuge's supply includes groundwater, upslope drain water or poor-quality surface water (containing salts, selenium, waste chemicals, etc.) then a monitoring program may be necessary. If a refuge does not receive any of the above, indicate Not Applicable (N/A).

If the refuge is in a drainage problem area or outflow/spill water quality might be of concern, then a monitoring program may be necessary. If a refuge does not meet the above criteria, indicate Not Applicable (N/A).

If the refuge has water sources with a range of constituents that affect habitat quality, identifying temporal changes in water quality can potentially improve habitat quality. When the quality of the water supply changes, refuges can make appropriate delivery adjustments.

If the refuge has a program, or will have a program, describe the type and frequency of analyses, projected costs and any cooperators.

c. Cooperative Efforts

Describe proposed cooperative efforts (related to water management) with federal and state agencies, other refuges, agricultural and urban contractors, public interest groups and neighboring landowners. Programs might include water supply trades based on water year precipitation, pooling of supply or training programs.

Include proposed program description - cooperators, timing, duration, budget, water management impacts.

If the program is described elsewhere, please identify.

d. Pump Evaluations

Some refuges operate groundwater or low-lift pumps as part of their delivery facilities. A program to evaluate and improve the efficiencies of such pumps may result in energy savings, peak load reductions, or reveal capacity limitations due to inefficient facilities.

Pump replacement may allow the refuge to reduce operational costs and improve operational efficiency. This may make currently unused water supplies cost-effective.

Provide information in the Plan on the refuge's groundwater and surface water pump testing program.

e. Policy Evaluation

Identify specific changes to the rules and regulations of the refuge's water suppliers and/or conveying entities that would allow for more efficient water use and operations.

Water Projects (CVP, SWP, etc.) provide water based on policies that sometimes make refuge water management more difficult. For instance, policies that require scheduling water months in advance or that restrict carry-over of unused water, can encourage unnecessary water use. Other examples include: restrictions on timing and duration of deliveries or limited flexibility in scheduling changes. Identify any policies that reduce the refuge's ability to improve water management and provide suggestions for improvement.

f. Provide customer services (GRCD only)

Facilitate physical /structural improvements for member units - this may include acting as the coordinating agency for planning and equipment.

Provide management services, technical advice - this may include providing technical advisors to advise member units on operations and management, fees, regulations and habitat management.

Facilitate fundraising- this may include acting as the lead agency for state and federal grant and/or loan programs and dispersing the funds to the member units

2. Pricing Structure (GRCD Only)

Adopt a water pricing structure for district water users based at least in part on quantity delivered. Describe the proposed quantity-based water pricing structure and when it will become (or became) effective. Financial variables influence the way customers use water and pricing structures should reflect the conditions and overall objectives of the District. For example, when agricultural customers pay for each AF of water received, they are more likely to order an amount closer to the actual crop water need. Ordering only what is needed can reduce demand on distribution system capacity, reduce tailwater, and increase supply reliability.

3. Plan to Measure Deliveries (GRCD Only)

Measure the volume of water delivered to each customer with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6 percent. Identify the number of turnout and connection delivery points, the number of delivery points that serve more than one farm, the number or delivery points that are measured, the percentage of water delivered to the contractor that was measured at a delivery point (of all of the water that has entered the distribution system, what percentage was sold and measured at the turnouts), the number of delivery points not billed by quantity, and complete the measurement device table. Three categories of measurement devices that may meet this criterion are devices with totalizers, standard flow measurement devices, and non-standard but calibrated devices.

4. Water Management Coordinator

Provide the name, title, business mailing address, phone number and e-mail address of the Refuge staff person responsible for Plan development and implementation. If a consultant is hired to write this Plan, the district should designate a district staff member as conservation coordinator to manage the work and communicate with Reclamation.

Reclamation offers workshops to assist with Plan development and will provide technical assistance to the Refuge during Plan preparation and implementation. When necessary, Reclamation area office staff will meet with a Refuge's conservation coordinator to assist with the preparation, implementation, and evaluation of the Plan.

I. Exemptible Best Management Practices

The exemptible BMPs are:

1. *Improve management unit configuration*
2. *Improve internal distribution system*
 - a. *New control structures within distribution system*
 - b. *Line/Pipe sections of distribution system*
 - c. *Independent water control for each unit*
 - d. *New internal distribution sections to provide water to existing and new habitat units.*
3. *Automate water distribution system*
4. *Plan to measure outflow*
5. *Incentive Pricing (GRCD only)*
6. *Construct and operate operational loss recovery systems.*
7. *Optimize conjunctive use of surface and groundwater*
8. *Facilitate use of available recycled urban wastewater*
9. *Mapping*
10. *CALFED*

Refuges should implement the following BMPs unless the refuge demonstrates that the practice is not appropriate. Some refuges may spend time studying the most effective way to implement a BMP or conduct a pilot study to determine if a BMP is appropriate for that refuge. For appropriate BMPs, provide a description of the implementation plan and include time schedules, budgets and monitoring plans. If a BMP is to be studied, or a pilot study conducted, provide details and schedules of the study.

These studies must be completed expeditiously and initiated before the next Plan revision. Annual Update reports should provide progress reports on these studies. The refuge should follow the exemption criteria (see Section J) to justify exemptions and document the exemption in this Section. Some Exemptible BMPs may not be applicable to the refuge. See Section K for examples of circumstances under which Exemptible BMPs are not applicable (N/A).

The following information provides BMP implementation ideas and approaches.

1. *Improve management unit configuration*

Study current management unit configuration and evaluate whether modifications to units would improve habitat, water distribution and assist with other refuge objectives. GRCD should provide technical assistance to the member units to facilitate the development of these studies.

2. *Improve internal distribution system*

a. *New control structures within distribution system*

Study current distribution system configuration and evaluate whether modifications to canals, pipelines and gates would improve habitat, water distribution and assist with other refuge objectives. Grassland Water District should provide technical assistance to the member units to facilitate the development of these studies.

b. *Line/Pipe sections of distribution system*

Line or pipe distribution systems to increase distribution system flexibility and capacity, decrease

maintenance and reduce seepage. Seepage and evaporation losses in earthen ditches and canals can be minimized by replacement with pipelines or lining with bentonite clay. Refuges would probably only consider lining canals with concrete or pour-in-place plastics/textile membranes in areas of unusually high seepage.

Describe the program to line or pipe the distribution system reaches with the greatest loss per foot or those, which have the greatest negative impact on delivery flexibility and capacity. Lining or piping canals and laterals is an expensive program; therefore, consider lining or piping canals with the greatest seepage rates.

A refuge may identify this BMP as “Not Applicable” if one of the following applies: completely piped system, unlined systems or sections that are used as part of a planned conjunctive use program.

c. Independent water control for each unit

Study the effectiveness of current water control at each habitat unit and evaluate whether improvements to the control structures would improve habitat, water distribution and assist with other refuge objectives. Grassland Water District should provide technical assistance to the member units to facilitate the development of these studies.

d. New sections to provide water to existing/ new habitat units.

Study the effectiveness of the distribution system to provide the quantity of water necessary at the correct time to each habitat unit and evaluate whether new or improved delivery system sections would improve habitat, water distribution and assist with other refuge objectives. Grassland Water District should provide technical assistance to the member units to facilitate the development of these studies.

3. Automate water distribution system

Automation of canal structures may increase flexibility in water deliveries and increase the refuge’s control over its water supplies; thereby, providing the opportunity to improve the efficiency of water use.

Estimate annual operation spills by reach. Identify locations for automated canal structures and other distribution system improvements. Estimate annual water savings (AFY) resulting from the evaluated projects. Describe program to automate distribution system.

A refuge may identify this BMP as “Not Applicable” if the refuge has a completely piped system that has no delivery constraints.

4. Plan to measure outflow

Measure the volume of water leaving the refuge with methods or devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 20 percent.

Steps - Identify all outflow locations (refer to Section A 2c), determine quantity of outflow from each location and rank by percentage of total outflow, determine best measurement method and estimated cost.

A refuge may identify this BMP as “Not Applicable” if the refuge has a completely piped system that has no outflow/spill.

5. Incentive Pricing (GRCD only)

Adopt a water pricing structure for GRCD's water users based at least in part on quantity delivered. Describe the proposed quantity-based water pricing structure and when it will become (or became) effective. Financial variables influence the way customers use water. Incentive pricing moves away from rate schedules based solely on per-acre fixed charges and toward rate schedules that incorporate both fixed charges and charges based on the amount of water that the farmer actually uses. Incentive pricing promotes one or more of the following goals: (1) encouraging more efficient water use at the farm level, (2) supporting planned conjunctive use of groundwater, (3) increasing groundwater recharge, (4) reducing problem drainage, and (5) improving management of environmental resources.

6. Construct and operate operational loss recovery systems.

The design and operation of a refuge's conveyance system has a significant role in the quantity of annual operational spills.

A refuge should measure the annual spill from each canal and determine the percentage that could be captured for beneficial use. This data is essential to correctly site and size spill recovery systems.

Interceptor systems can be designed to capture and transport operational spills throughout an internal distribution system. One design adds lateral-connector canals. In this design, a secondary canal is constructed at the terminus point of a series of laterals to capture operational spill. The system is designed to either pump spills back into the laterals or transport them to habitat unit.

7. Optimize conjunctive use of surface and groundwater

Describe the potential for increased conjunctive use and identify programs to achieve this potential.

If feasible, refuges should prepare and implement long-range plans to conjunctively use surface water and ground water to meet current and future demands. Conjunctive use is managing surface and groundwater in a coordinated way to achieve increased water supply.

Where feasible, refuges may wish to develop programs with neighboring groundwater users.

A refuge may identify this BMP as "Not Applicable" if the refuge does not overlie a useable ground water basin and thus the refuge cannot pump or use groundwater

8. Facilitate use of available recycled urban wastewater

The use of recycled urban wastewater for refuge irrigation provides an opportunity for use of an available water supply. Reuse of urban wastewater can be an important element in overall water management.

Identify the source of recycled water and the yearly quantity that is available. Provide the cost of the recycled water and describe its quality in relation to the crops the water will irrigate. Describe the program that will promote the use of the recycled water by refuge customers and identify the GRCD's role in the program.

9. Mapping

Develop and maintain at least two detailed water management GIS maps containing at least the

following elements:

Map 1(layer 1) – Distribution System

Diversion locations and control structure details, including wells

Conveyance - canals and pipeline locations with capacity

Map 2 (layer 2) – Drainage System

Refuge turnout and outflow location and measurement device details

Conveyance - canals and pipeline locations with capacity

10. CALFED

The CALFED Bay-Delta Program is a cooperative effort among state and federal agencies and the public to ensure a healthy ecosystem, reliable water supplies, good quality water and stable levees in California's Bay-Delta System. The Water Use Efficiency element of CALFED has four components: agricultural, urban, managed wetlands and recycling. There are two drivers of the agricultural and managed wetlands components 1) encourage more water users and water suppliers to implement local, cost-effective efficient water management practices; and 2) provide funding to foster the implementation of practices that are cost effective from a statewide perspective. In addition, the Water Use Efficiency element is continually being revised and updated as implementation and new information is developed.

Purpose of Water Use Efficiency Element

The Water Use Efficiency (WUE) element is committed to using incentives to motivate water suppliers and water users to institute practices that can more effectively and efficiently address regional or statewide objectives. The terms Targeted Benefit are part of a conceptual model to make a relevant and credible WUE program that can be implemented and verified. CALFED has developed numerical targets for specified locations that represent CALFED's initial estimates of the practical, cost-effective contribution irrigated agriculture can potentially make to attain these identified benefits. Implementation of water use efficiency practices, based on actions proposed by locals, are targeted at achieving region-specific, CALFED benefits related to water quality, quantity and in-stream flow and timing.

Explanation of Targeted Benefits

Targeted Benefits represent a specific listing of CALFED related goals that are associated with agricultural and, by extension, refuge water management practices. The Targeted Benefits originate mainly from CALFED's Ecosystem Restoration and Water Quality elements, and local knowledge of flows to salt sinks. The Water Use Efficiency element has identified 196 Targeted Benefits that relate to water quality, quantity and in-stream flow and timing. The targeted benefits are quantified by month and year type (wet, dry, etc). These Targeted Benefits are specific for the sub-regions that represent the Central Valley.

Targeted Benefits are quantified by comparing the identified need to the existing condition. For example, the CALFED Ecosystem Restoration element has specified the in-stream flow and timing needs for the Stanislaus River. The incremental need is determined by comparing the existing Stanislaus River flow to the Targeted Benefit. The difference between the existing flow and the targeted flow is the Quantified Targeted Benefit.

The following is a list of CALFED Water Use Efficiency Targeted Benefits that apply to the listed state and federal managed wetlands. The following requests for information are presented in the

present tense, however, please respond with a short narrative regarding past, present, or future plans that address the request. If no action or plans exists to address the request, please indicate.

Sacramento and Delevan NWR's

1. Describe actions that reduce the salinity of surface return water. This addresses TB 24 - Reduce electrical conductivity in Colusa Drain.
2. Describe actions that reduce nonproductive evapotranspiration (ET). This addresses TB 25 - Reduce nonproductive ET.

Colusa and Sutter NWR's

1. Describe actions that reduce nonproductive evapotranspiration (ET). This addresses TB 33 - Reduce nonproductive ET.

Gray Lodge WA

1. Describe actions that reduce nonproductive evapotranspiration (ET). This addresses TB 46 - Reduce nonproductive ET.

North Grassland, Volta, and Los Banos WA's

1. Describe actions that reduce selenium concentration in the Grassland Marshes. Reduce selenium concentration to 5 ug/L in the Grassland Marshes (TB 95).
2. Describe actions that reduce San Joaquin River selenium and boron concentrations. Reduce San Joaquin River selenium concentration to 5 ug/L and boron concentration to 2 mg/L from March 15 to September 15 and to 2.6 mg/L September 16 to March 14 (TB 98).
3. Describe actions that reduce salinity in the Grassland Marshes, Mud and Salt Sloughs. Reduce salinity in the Grassland Marshes, and Mud and Salt Sloughs (TB 102, 103).
4. Describe actions that reduce nonproductive evapotranspiration (ET). Reduce unwanted ET (TB 107).

San Luis NWR, Grassland RCD

1. Describe actions that reduce salinity in the San Joaquin River, Grassland Marshes, Mud and Salt Sloughs. TB 95, 96, 98 - Reducing selenium concentrations for Grassland, Mud Slough, Salt slough and the San Joaquin River
2. Describe actions that reduce salinity in the Grassland Marshes, Mud and Salt Sloughs. TB 102, 103, 104 - Reducing salinity to Grassland and Mud and Salt Slough (all of these six contaminant TB's could be incorporated into one refuge manager response - e.g. addressed through the Grassland Drainage Program)
3. Describe actions that reduce nonproductive evapotranspiration (ET). TB 107 - Reducing unwanted ET

Merced NWR

1. Describe actions that provide additional flow to San Joaquin River. TB 148 – Provide flow to San Joaquin River
2. Describe actions that reduce salinity at Vernalis. TB 154 – Reduce salinity levels at Vernalis
3. Describe actions that reduce nonproductive evapotranspiration (ET). TB 157 – Reduce unwanted ET

Mendota WA

1. Describe actions that reduce flows to salt sink. Reduce existing flows to salt sinks (TB 167).

2. Describe actions that reduce nonproductive evapotranspiration (ET). Reduce unwanted ET (168).

Kern and Pixley NWR

1. Describe actions that reduce nonproductive evapotranspiration (ET). TB 189 ñ Decrease nonproductive ET

J. BMP Exemption Process

For each BMP for which the refuge is seeking an exemption, provide a detailed narrative and complete the summary table.

Some BMPs are not appropriate or possible to implement. To document an exemption, provide the basis, rationale, and details for excluding a BMP. Such documentation shall address, as appropriate, cost-effectiveness, financial feasibility, and environmental or legal constraints to BMP implementation.

To determine if a BMP is exemptible follow this Exemption Process. For a BMP to be classified exempt it is necessary for the refuge to document in a clear and concise manner the constraint to implementing the BMP. The exemption must document a specific legal, environmental, or economic issue that creates a constraint. Details necessary for justifying each exemption are explained in the following subsections:

A Legal Constraint exemption will document:

- A known law, regulation, court decision, or other legal constraint that makes it illegal for the refuge to implement the BMP
- What would be required to remove this constraint?
- What has the refuge done to remove this constraint? (include work with other agencies)

An Environmental Constraint exemption will document:

- critical environmental laws, biological issues, and known negative impacts of the BMP that restrict implementation of this BMP
- why effective mitigation of these impacts is not possible.
- What the refuge done to reduce the negative impacts or improve mitigation.

An Economic/Budget Constraint exemption will document:

- funding needed to implement the BMP
- actions taken to secure grant/loans to implement the BMP (include work with other agencies)
- list of current funding priorities

If the refuge determines there is no way to remove the constraint this must be clearly stated. If there are opportunities to acquire funding or other relevant assistance this should be identified (consider federal, state and local funding that recognizes regional benefits). An exemption must be updated every year – showing current actions to remove the constraint.

In the plan, fill out the summary table listing the BMPs for which the refuge has completed detailed exemption documents. Include each exemption document in the plan, immediately following the summary table.

K. N/A of Exemptible BMPs

To establish that a BMP is not applicable to the district, the Plan should explain the reasons why the BMP does not apply to the district. This justification must be consistent with Section 1 of the Criteria entitled, "Describe the District." Examples of N/A for each exemptible BMP are listed below. This list is not all-inclusive.

Exemptible BMPs: (examples)

2. Improve the Distribution System

b. Line/pipe sections of distribution system

N/A if the current system can distribute water effectively with regular maintenance and on-going improvements to open channels - thus maximizing habitat.

6. Construct and operate operational loss recovery systems.

N/A if system is completely piped and there are no spill points.

7. Optimize conjunctive use of surface and ground water

N/A if there is no usable ground water

8. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.

N/A if there is no recycled urban wastewater available.

(District Name) Refuge Water Management Plan - Plan Format Chapter 4

Date of First Draft - (date)
Date of Final - (date)

(refuge name)

Water Management Plan

(first submittal date)
(final plan submittal date)

Section A. Background

1. Identify the staff member responsible for developing and implementing the Plan. Provide their contact information

Name _____ Title _____
 Address _____
 Telephone _____ Fax _____
 E-mail _____

2. Year refuge established _____

Define year-type used consistently throughout plan _____

3. Water supplies

List each annual entitlement of surface water under each water right and/or contract

Supplier	Water source	Contract #	Contract restrictions	Acre-feet/year
Federal level 2				
Federal level 4				
State				
Appropriative				
Other, riparian				

4. Provide a narrative on pre-CVPLA refuge water supplies and water management

5. Land use history--Identify habitat types specific to this refuge.

Attach a refuge map showing habitat location and size

List refuge habitat-types with 5% or more of total acreage

Habitat type	Original size	2010 acres	2015 acres	2020 acres
Seasonal wetland – timothy (not irrig)				
Seasonal wetland – timothy (irrigated)				
Seasonal wetland – smartweed				
Seasonal wetland - watergrass				
Permanent wetland				
Semi-permanent wetland/ brood pond				
Reverse cycle wetlands				
Riparian				
Irrigated pasture				
Upland				
Upland (not irrigated)				
Upland (managed)				
Upland (grains)				
Other (>5%)				
Misc. habitat (<5%)				
Sub-total – habitat acres				
Roads, buildings, etc.				

Total (size of refuge)				
------------------------	--	--	--	--

Describe refuge habitat-type water use characteristics

Habitat type	AF/ ac	# of irrigations	Flood up date	Draw down date
Seasonal wetland				
Seasonal wetland - timothy				
Seasonal wetland - watergrass				
Permanent wetland				
Semi-permanent wetland/ brood pond				
Riparian				
Irrigated pasture				
Upland (not irrigated)				
Upland (managed)				
Upland (grains)				
Other (>5%)				
Misc. habitat (<5%)				

Section B. Water Management Related Goals and Objectives

1. Describe the refuge mission relative to water management. (i.e. crop depredation, legislative mandates, service to landowners)
2. Describe specific habitat management objectives. Include pertinent information from refuge management plans
3. Describe the strategies used to attain objectives listed above
4. Describe constraints that prevent attainment of objectives and explain the effect on operations
5. Describe the strategies used to remedy the constraints listed above

Section C. Policies and Procedures

1. Describe the refuge policies/procedures on accepting agricultural drainage water as supply
2. Describe the refuge policies/procedures on water pooling, transfers, reallocations or exchanges
3. Describe the refuge water accounting policies/procedures for inflow, internal flow and outflow
4. Attach a copy of the refuge's shortage policies, drought plan, or any similar document.
5. (GRCD only) Describe water policies as they pertain to:
 - a. water allocation policy to customers (attach),
 - b. lead time for water orders (attach sample water order form),
 - c. policies for wasteful use of water (attach policy), and
 - d. pricing and billing policies (attach sample bills)

<i>Fixed Charges</i>			
<i>Charges (\$ unit)</i>	<i>Charge units (\$/ acre), (\$/ customer) etc.</i>	<i>Units billed during year (acres, customer) etc.</i>	<i>\$ collected (\$ times units)</i>

<i>Volumetric charges</i>			
<i>Charges (\$ unit)</i>	<i>Charge units (\$/AF), (\$/HCF), etc.</i>	<i>Units billed during year (AF, HCF) etc.</i>	<i>\$ collected (\$ times units)</i>

Section D. Inventory of Existing Facilities

1. Mapping

Attach existing facilities map(s) that show points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations. Describe in the body of the plan the information contained in each attached map

2. Water measurement

a. Inflow/deliveries

Total # of inflow locations/ points of delivery _____

Total # of measured points of delivery _____

Percentage of total inflow (volume) measured during report year _____

<i>Delivering agency</i>	<i>Conveyance facility</i>	<i>Measuring point</i>	<i>Refuge distribution facility</i>	<i>% of total inflow</i>	<i>Type of measurement</i>	<i>Measuring agency</i>

b. Internal flow at turnouts

Total # of refuge water management units (units)_____

Total # of refuge water management unit turnouts_____

Total # of measured turnouts_____

Estimated % of total internal flow (volume) during report year that was measured at a turnout_____

Number of turnouts supplying more than one unit or not directly off delivery system _____

<i>Measurement type</i>	<i>Number of devices</i>	<i>Acres served</i>	<i>Accuracy (avg or range)</i>	<i>Reading frequency</i>	<i>Calibration frequency (months)</i>	<i>Maintenance frequency (months/ days)</i>
<i>Orifices</i>						

<i>Propeller</i>						
<i>Weirs</i>						
<i>Flumes</i>						
<i>Venturi</i>						
<i>Alfalfa valves</i>						
<i>Metered gates</i>						
<i>Other, stop-log and screw gates</i>						

c. *Outflow*

Outflow (AF/yr) _____

Total # of outflow locations/ points of spill _____

Total # of measured outflow points _____

Percentage of total outflow (volume) measured during report year _____

<i>Outflow point</i>	<i>Measuring point</i>	<i>Type of measurement</i>	<i>Percent of total outflow (estimated)</i>	<i>Measuring agency</i>	<i>Acres drained</i>

3. *Identify the type and length of the refuge internal distribution system*

<i>Miles unlined canal</i>	<i>Miles lined canal</i>	<i>Miles piped</i>	<i>Miles – other</i>

Describe the location and types of identified leaks and areas of higher than average canal seepage, and any relation to soil type.

4. *Describe the refuge operational loss recovery system*

<i>Pump #</i>	<i>Location</i>	<i>HP</i>

5. *Groundwater*

Describe groundwater availability, quality and potential for use

Groundwater plan *No* _____ *Yes* _____ *(please attach or provide web link).*

Groundwater basin(s) that underlie the refuge

<i>Name of basin underlying refuge</i>	<i>Size (sq. mi.)</i>	<i>Usable capacity (AF)</i>	<i>Safe yield (AF/Y)</i>	<i>Management agency</i>	<i>Relevant reports</i>

Identify refuge-operated ground water wells

<i>#</i>	<i>Location</i>	<i>Status</i>	<i>HP</i>	<i>2020(AFY)</i>	<i>Future plans</i>

Section E. Environmental Characteristics

- 1. Topography - describe and discuss impact on water management
- 2. Soils - describe and discuss impact on water management (see attached map)
- 3. Climate

National Weather Service – (weather station name and id, data period - years)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
avg precip													
avg. temp													
max temp													
min temp													
ET _o													

Discuss the impact of climate, and any microclimates, on water management

- 4. Water quality monitoring (attach water quality test result forms)

If the refuge has a water quality monitoring program complete this table

Analyses performed	Frequency range	Concentration range	Average

Discuss the impact of water quality on water management

Section F. Transfers, Exchanges and Trades

Provide information on any transfers, exchanges and/or trades into or out of the refuge

From whom	To whom	Report year (AF)	Use
	TOTAL		

Section G. Water Inventory

See Tables

Section H. Critical Best Management Practices

Describe the 5-year implementation plan and the proposed 3-year funding budget.

1. *Management programs*
 - a. *Education*

<i>Program</i>	<i>Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>

Describe the specifics of each program (number of participants, topics, purpose, etc.) and attach program materials, if available.

- b. *Water quality monitoring*

<i>Type of water</i>	<i>Existing Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>
<i>Surface – USBR and riparian</i>			
<i>Upslope drain</i>			
<i>Groundwater</i>			
<i>Outflow</i>			

Short description of existing or planned program – i.e., required by which agency, coordinated with whom, constituents monitored and frequency

- c. *Cooperative efforts*

- d. *Pump evaluations (mobile labs)*

Total number of groundwater pumps on refuge ____

Total number of surface water (low-lift) pumps on refuge _____

<i>Groundwater pumps</i>	<i>Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>
<i># of groundwater pumps tested</i>			
<i># of pumps to be fixed or replaced</i>			
<i># of low-lift pumps to be tested</i>			
<i># of pumps to be fixed or replaced</i>			

- e. *Policy evaluation*

- f. (GRCD only) *Provide Customer Services - Facilitate physical/ structural improvements for member units; provide management services and technical advice to raise funds for BMP Implementation and provide customers with water efficiency education programs.*

- 2. (GRCD only) Pricing structure
- 3. (GRCD only) Plan to measure deliveries
- 4. Water management coordinator

Name: _____ Title: _____

Address: _____

Telephone: _____ E-mail: _____

Section I. Exemptible Best Management Practices

Describe the 5-year implementation plan and the proposed 3-year funding budget.

1. Improve management unit configuration

Unit name	Current acres	Reason for change	Proposed acres	Estimated cost (in \$1,000s)		
				2021	2022	2023

(GRCD only) Assist customers to improve management unit configurations.

2. Improve internal distribution system

a. New control structures within distribution system

Proposed location	Type of structure	Reason for new structure	Estimated cost (in \$1,000s)		
			2021	2022	2023

b. Line/pipe sections of distribution system

Proposed reach/sect.	Reason for new structure	Estimated cost (in \$1,000s)		
		2021	2022	2023

c. Independent water control for each unit

Proposed control point	Reason for new control point	Estimated cost (in \$1,000s)		
		2021	2022	2023

d. New internal distribution sections (pipe, canal) to provide water to existing and new habitat units

Proposed new section	Units served	Reason for new section	Estimated cost (in \$1,000s)		
			2021	2022	2023

(GRCD only) Provide assistance to member units to improve internal distribution

3. *Develop a Water Use Schedule*

<i>Plan element</i>	<i>Completion date</i>	<i>Estimated development/ update cost (in \$1,000s)</i>		
		<i>2021</i>	<i>2022</i>	<i>2023</i>
<i>Floodup dates by unit</i>				
<i>Drawdown dates by unit</i>				
<i>Irrigation dates by unit</i>				

4. *Plan to measure outflow*

Identify locations, prioritize, determine best measurement method/ cost, submit funding proposal

	<i>Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>
<i>Identify locations</i>			
<i>Estimate outflow quantity/ rank</i>			
<i>Develop plan</i>			
<i>Estimate construction start date</i>			
<i>Estimate construction completion date</i>			

5. *(GRCD only) Incentive pricing*

6. *Construct and operate operational loss recovery systems*

<i>Proposed location</i>	<i>Reason for improvement</i>	<i>Estimated cost (in \$1,000s)</i>		
		<i>2021</i>	<i>2022</i>	<i>2023</i>

7. *Optimize conjunctive use of surface and groundwater*

<i>Proposed production/ injection well</i>	<i>Anticipated yield</i>	<i>Estimated cost (in \$1,000s)</i>		
		<i>2021</i>	<i>2022</i>	<i>2023</i>

8. *Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.*

9. *Mapping*

<i>GIS map layers</i>	<i>Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>

10. CALFED

Describe any past, present, or future plans that address the goals identified for this refuge

If reducing nonproductive ET involves removing invasive plants, complete the following:

<i>Invasive unwanted species name</i>	<i>Estimated acres</i>			<i>Estimated cost (in \$1,000s)</i>		
	<i>2021</i>	<i>2022</i>	<i>2023</i>	<i>2021</i>	<i>2022</i>	<i>2023</i>

Sacramento and Delevan National Wildlife Refuges (NWRs)

1. Describe actions that reduce the salinity of surface return water. (Targeted Benefit (TB) 24)
2. Describe actions that reduce nonproductive ET. (TB 25)

Colusa and Sutter NWR's

1. Describe actions that reduce nonproductive ET. (TB 33)

Gray Lodge Wildlife Area (WA)

1. Describe actions that reduce nonproductive ET. (TB 46)

North Grassland, Volta, and Los Banos WA's

1. Describe actions that reduce selenium concentration in the Grassland Marshes. Reduce selenium concentration to 5 ug/L in the Grassland Marshes. (TB 95)
2. Describe actions that reduce San Joaquin River selenium and boron concentrations. Reduce San Joaquin River selenium concentration to 5 ug/L and boron concentration to 2 mg/L from March 15 to September 15 and to 2.6 mg/L September 16 to March 14. (TB 98)
3. Describe actions that reduce salinity in the Grassland Marshes and Mud and Salt Sloughs. Reduce salinity in the Grassland Marshes and Mud and Salt Sloughs. (TB 102, 103)
4. Describe actions that reduce nonproductive ET. Reduce unwanted ET. (TB 107)

San Luis NWR, Grassland Resource Conservation District

1. Describe actions that reduce salinity in the San Joaquin River, Grassland Marshes and Mud and Salt Sloughs. (TB 95, 96, 98)
2. Describe actions that reduce salinity in the Grassland Marshes and Mud and Salt Sloughs. (TB 102, 103, 104) (All of these six contaminant TBs could be incorporated into one Refuge manager response, e.g. addressed through the Grassland Drainage Program.)
3. Describe actions that reduce nonproductive ET. (TB 107)

Merced NWR

1. Describe actions that provide additional flow to San Joaquin River. (TB 148)
2. Describe actions that reduce salinity at Vernalis. (TB 154)
3. Describe actions that reduce nonproductive ET. (TB 157)

Mendota WA

1. Describe actions that reduce flows to salt sink. (TB 167)
2. Describe actions that reduce nonproductive ET. Reduce unwanted ET. (TB 168)

Kern and Pixley NWR

1. Describe actions that reduce nonproductive ET. (TB 189)

Section J. BMP Exemption Requests

For each BMP for which the refuge is seeking an exemption, provide a detailed narrative and complete the summary table

Summary of BMP exemptions

BMP	Constraint ¹	Outstanding Need ²
		N/A

1. *Constraint – list existing constraint. Use additional rows for multiple BMPs or constraints. Identify Legal (L), Environmental (EN), or Economic (EC) issues using code. If the BMP is not seen as beneficial, provide detailed information*
2. *Outstanding need – identify assistance required to implement the BMP. State specific funding or other assistance required*

Provide a detailed exemption request below for each BMP listed in the summary table

Section K. Non-Applicability (N/A) of Exemptible BMPs

To establish that a BMP is not applicable to the Refuge, the Plan should explain the reasons why the BMP does not apply to the Refuge. This justification must be consistent with Section A of the Criteria titled, “Background.” Examples of non-applicability for each exemptible BMP are listed below. This list is not all-inclusive.

Section I, B. Exemptible Best Management Practices

2. Improve the Distribution System

b. Line/pipe sections of distribution system

N/A if the Current system can distribute water effectively with regular maintenance and on-going improvements to open channels – thus maximizing habitat.

6. Construct and operate operational loss recovery systems

N/A if system is completely piped and there are no spill points.

7. Optimize conjunctive use of surface and groundwater N/A

N/A is there is no usable groundwater

8. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.

N/A is no recycled urban wastewater is available

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Chapter 5 – Refuge Water Inventory Tables and Instructions (as Requested in Criteria Section II.G)

The Refuge Water Inventory should be entered on the MS Excel tables, please contact Reclamation to receive the tables via email. Contact information is on our website, <https://www.usbr.gov/mp/watershare/index.html>. Enter data in the white cells on the spreadsheets. Shaded cells are locked and cannot be changed. Start by entering the data year (either the last complete calendar year or the last complete water year) in cell D1.

Table 1. Refuge Water Supply

The numbers in this table should be the best information available on how much surface water actually entered the district distribution system. Make sure all the incoming surface water flows are represented. If necessary, define each water source with a descriptive title.

Year of Data 2020 **Enter Data Year Here**

2020 Month	Federal Water Level 2 (acre feet)	Federal Water Level 4 (acre feet)	Local Water (acre feet)	Refuge Grd Wtr (acre feet)	Upslope Drain Wtr (acre feet)	Other Riparian (acre feet)	Total (acre-feet)
Method							
January	0	0	0	0	0	0	-
February	0	0	0	0	0	0	-
March	0	0	0	0	0	0	-
April	0	0	0	0	0	0	-
May	0	0	0	0	0	0	-
June	0	0	0	0	0	0	-
July	0	0	0	0	0	0	-
August	0	0	0	0	0	0	-
September	0	0	0	0	0	0	-
October	0	0	0	0	0	0	-
November	0	0	0	0	0	0	-
December	0	0	0	0	0	0	-
Total	-	-	-	-	-	-	-

Measured numbers for the water quantities detailed in these tables are expected. Select a method below that best describes the measurement method for each supply. Fill in the row marked “Method” with the appropriate measurement method type. If two methods are used for one

supply, select the predominant one. If there is no flow rate or volumetric measurement, fill in the appropriate estimation method.

Method Definitions:
M1 Measured summation from calibrated measuring devices, accurate to within +/- 6 percent
M2 Measured summation from calibrated measuring devices
M3 Measured summation from measuring devices
C1 Calculated (more than summation) using information from calibrated devices (such as the difference between measurements upstream and downstream of diversion)
C2 Calculated using information from measuring devices
C3 Calculated using estimates from pump run-times and pump efficiency
E1 Estimated using measured information from similar conditions
E2 Estimated using historical information
E3 Estimated using observation
O1 Other (attach a note with descriptions of other methods used)

Table 2. Refuge Distribution System

The first column should have the name or number of part of the distribution system, such as Canal T-2, or Section D laterals. In the “Length” and “Width” columns, enter the length and average width of those canals and the reservoirs and the surface area will be automatically calculated. The “Precipitation” and “Evaporation” columns will also auto fill. In the “Spillage” column, enter the estimated amount of unrecovered spillage from those canals. Spillage is recovered if it reenters the distribution system later. Enter estimated annual seepage for each unlined portion of the distribution system, storage or regulating reservoir.

2020 Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre feet)	Evaporation (acre feet)	Seepage (acre feet)	Operational Losses (acre feet)	Total (acre-feet)
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0

	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
	0	0	0	0.0	0.0	0	0	0
Total				0.0	0.0	0	-	0

Table 2a. Distribution System

Enter the monthly precipitation for the current year in the Precipitation Worksheet. Enter the monthly evaporation for the current year in the Evaporation Worksheet.

2020 Precipitation Worksheet					2020 Evaporation Worksheet				
	inches	ft	acres	AF/Year		inches	ft	acres	AF/Year
	precip	precip				evap	evap		
Jan	0.0		-	-	Jan	-		-	-
Feb	0.0		-	-	Feb	-		-	-
Mar	0.0		-	-	Mar	-		-	-
Apr	0.0		-	-	Apr	-		-	-
May	0.0		-	-	May	-		-	-
Jun	0.0		-	-	Jun	-		-	-
Jul	0.0		-	-	Jul	-		-	-
Aug	0.0		-	-	Aug	-		-	-
Sept	0.0		-	-	Sept	-		-	-
Oct	0.0		-	-	Oct	-		-	-
Nov	0.0		-	-	Nov	-		-	-
Dec	0.0		-	-	Dec	-		-	-
	0.0		-	-		-		-	-
	0.0		-	-		-		-	-
Total		0.0	0.00		Total	0		0.00	

Table 3. Managed Lands Water Need

For each crop, provide the irrigated acres, crop evapotranspiration (ET_{crop}), leaching requirement, and water used for cultural practices (frost protection, pre-irrigation, etc.). Table 5 will combine these values to determine the total water demand of each crop. You may wish to combine crops grown on less than 5% of the total irrigated acreage. To combine crops, determine an average ET_{crop} leaching and cultural requirement for this group of small acreage crops. It is possible for the total irrigated acres to exceed the size of the district due to double cropping. The ET_{crop} for crops in your area can be found using the California Irrigation Management Information System (CIMIS) at <http://www.cimis.water.ca.gov/cimis/welcome.jsp>, Department of Water Resources (DWR)

CIMIS Database, <https://www.fresnostate.edu/jcast/cit/>, or obtained from the local farm advisor. The University of California Cooperative Extension (UCCE) can also provide information on coefficients required to determine ETcrop and estimating water used for leaching and cultural practices.

Table 3

Managed Lands Water Needs

Year	WY 20XX-YY	Habitat Area	Habitat Water	AF/ac water	Delivered Water	Precip	Shallow Groundwtr	Evap	Cultural Practices	Seepage	Balance	Months irrigated
Habitat Type	habitat acres	(AF/ac)	(AF/ac)	(Total AF)	(AF/Ac)	(AF/Ac)	(AF/Ac)	(AF/Ac)	(AF/Ac)	(AF/Ac)	(acre-feet)	(list all)
Seasonal wetlands: timothy				0	0.00	0.00	0.00	0.00			0	Sep-March
Seasonal wetlands: smartweed				0	0.00	0.00	0.00	0.00			0	Sep-Apr, Jun
Seasonal wetlands: watergrass				0	0.00	0.00	0.00	0.00			0	Sep-Apr, Jun
Permanent wetlands				0	0.00	0.00	0.00	0.00			0	all months
Semi-perm wetlands/brood pond				0	0.00	0.00	0.00	0.00			0	all months
Riparian				0	0.00	0.00	0.00	0.00			0	Sep-Apr, Jun
Irrigated pasture				0	0.00	0.00	0.00	0.00			0	Apr-Dec
Upland (Irrigated)				0	0.00	0.00	0.00	0.00			0	Apr-Aug
Grain Crops				0	0.00	0.00	0.00	0.00			0	(define)
(define)				0	0.00	0.00	0.00	0.00			0	(define)
Total Habitat Acres	0	#DIV/0!	#DIV/0!	0							0	

	Evap	Cultural	Seepage	Balance	Total	B1 Wtr Needs
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0

Table 4

Refuge Water Inventory

Year	WY 20XX-YY	Reference		
Total Water Supply		Table 1		0
Precipitation		Table 2	plus	0
Evaporation		Table 2	minus	0
Seepage		Table 2	minus	0
Operational Losses		Table 2	minus	0
			Deliveries to Managed Lands	0
Managed Land needs		Table 3	minus	0
Difference		(calculated)		0
			Balance (outflow?) (Table 3)	0
			Water Inventory Balance	0

Table 5. Annual Water Quantities Delivered Under Each Right or Contract

Quantify the amount of each type of surface water the District actually received in each of the last 10 years. If the District has sources of surface water that are not listed in the table, add the necessary data in the “Other” column. Adjust years as necessary.

Table 5

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal		Refuge				Total
	Federal Wtr Level 2 (acre-feet)	Wtr Level 4 (acre-feet)	Local Water Supply (acre-feet)	Groundwater (acre-feet)	Up Slope Drain Wtr (acre-feet)	Riparian (acre-feet)	
2010			0				0
2011			0				0
2012			0				0
2013			0				0
2014			0				0
2015			0				0
2016			0				0
2017			0				0
2018			0				0
2019	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Average	0	0	0	0	0	0	0

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CHAPTER 6 - 2020 REFUGE CRITERIA EVALUATION FORM

Refuge _____ Date Plan Received _____

Area Office

Reviewer _____ Date Reviewed _____

EVALUATION

I have reviewed this plan and become familiar with the Refuge. I have compared the contents of the plan to my knowledge of the Refuge and the Plan Criteria appropriate for this Refuge. It is my opinion that this plan

_____ is satisfactory.

_____ is not satisfactory and should be improved in the areas noted on the attached form.

Reviewer Signature _____ Date _____

Regional Office

Reviewer _____ Date Reviewed _____

EVALUATION

I have reviewed this plan and become familiar with the Refuge. I have compared the contents of the plan to my knowledge of the Refuge and the Plan Criteria appropriate for this Refuge. It is my opinion that this plan

_____ is satisfactory.

_____ is not satisfactory and should be improved in the areas noted on the attached form.

Reviewer Signature _____ Date _____

Date Refuge Notified of Additional Information Needed _____

Date Refuge Notified of Acceptance and Three Copies Requested _____

Date of Final Submission _____

Date of Federal Register Notice _____

Public Comments Received _____ Yes _____ No

Notes and special considerations:

Other important activities and dates:

Evaluation Form for the USBR Criteria for Refuge Water Management Plans

A = adequate, NA = not applicable, NP = next plan, MI = missing information, E=Exempt

Section A - Background

1 Identifies the staff member and contact information -----	A	NA	NP	MI
2 Provides year refuge established -----	A	NA	NP	MI
3 Defines year-type used throughout plan -----	A	NA	NP	MI
4 Lists annual entitlements of surface water under each water right and/or contract -----	A	NA	NP	MI
5 Provides narrative on pre-CVPIA refuge water supplies and water management -----	A	NA	NP	MI
6 Attach a refuge map showing habitat location and size -----	A	NA	NP	MI
7 Lists refuge habitat-types with 5% or more of total acreage-----	A	NA	NP	MI
8 Describes refuge habitat-type water use characteristics-----	A	NA	NP	MI

Section B - Water Management Related Goals and Objectives

1 Describes the refuge mission relative to water management -----	A	NA	NP	MI
2 Describes specific habitat management objectives -----	A	NA	NP	MI
3 Describes the strategies used to attain objectives listed above -----	A	NA	NP	MI
4 Describes constraints that prevent attainment of objectives and effect on operations-----	A	NA	NP	MI
5 Describes the strategies used to remedy the constraints listed above-----	A	NA	NP	MI

Section C - Policies and Procedures

1 Describes the refuge policies/procedures on accepting agricultural drainage water as supply-----	A	NA	NP	MI
2 Describes the refuge policies/procedures on water pooling, transfers, reallocations, exchanges -----	A	NA	NP	MI
3 Describes the refuge water accounting policies/procedures for inflow, internal flow, outflow-----	A	NA	NP	MI
4 Describes the refuge water shortage policies/procedures-----	A	NA	NP	MI
5 Describe water allocation policy to customers, lead-time for water orders, policies for wasteful use of water, and pricing & billing policies (GWD only --	A	NA	NP	MI

Section D - Inventory of Existing Facilities

1 Attached existing facilities map(s) ----- (points of delivery, internal turnouts, outflow points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations)	A	NA	NP	MI
2 Measurement -----	A	NA	NP	MI
2a Inflow/deliveries (# of inflow point, # of measured inflow points, % of inflow measured -----	A	NA	NP	MI
2b Internal flow at turnouts ----- (# of units and unit turnouts, # of measured turnouts, % internal flow measured	A	NA	NP	MI

2c Outflow (AF/y, # of outflow locations, # of measured outflow point, % of outflow measured -----	A	NA	NP	MI
3 Identifies the type and length of the refuge internal distribution system -----	A	NA	NP	MI
3a Describes location & types of leaks & areas of higher than average canal seepage -----	A	NA	NP	MI
4 Describes refuge operational loss recovery system -----	A	NA	NP	MI
5 Describes groundwater availability, quality and potential for use -----	A	NA	NP	MI
5a Attached Groundwater Plan -----	A	NA	NP	MI
5b Identifies groundwater basin(s) that underlie the refuge -----	A	NA	NP	MI
5c Identifies refuge-operated deep wells -----	A	NA	NP	MI

Section E Environmental Characteristics

1 Describes impact of topography on water management -----	A	NA	NP	MI
2 Describes impact of soils on water management -----	A	NA	NP	MI
2a Attached soils map -----	A	NA	NP	MI
3 Provides average precipitation, temperature and ET _o -----	A	NA	NP	MI
4 Discusses the impact of climate, and any microclimates, on water management -----	A	NA	NP	MI
5 Describes the water quality monitoring (Analyses, Frequency, Conc., Avg) -----	A	NA	NP	MI
6 Discusses the impact of water quality on water management -----	A	NA	NP	MI

Section F Transfers, Exchanges and Trades

Provides information on transfers, exchanges or trades into or out of the refuge --A NA NP MI

Section G Water Inventory

Table 1 -----	A	NA	NP	MI
Table 2 -----	A	NA	NP	MI
Table 3 -----	A	NA	NP	MI
Table 4 -----	A	NA	NP	MI
Table 5 -----	A	NA	NP	MI

Section H Critical Best Management Practices

1 Management programs -----	A	NA	MI
1a Education - describes each program (# of participants, topics, purpose, etc.) ---	A	NA	MI
1b Water quality monitoring (surface, upslope drain, groundwater, outflow) A---	A	NA	MI
1c Cooperative efforts -----	A	NA	MI
1d Pump evaluations (# of groundwater pumps & surface water (low-lift) on refuge) -----	A	NA	MI
1e Policy evaluation -----	A	NA	MI
1f Customer service (GWD only) -----	A	NA	MI

- 2. Water Shortage Contingency Plan: Attached or completion date ----- A NA MI
- 3. Pricing Structure (GWD only) ----- A NA MI
- 4. Plan to measure deliveries to customers (GWD only) ----- A NA MI
- 5. Water Conservation staff (GWD only) ----- A NA MI

Section I Exemptible Best Management Practices

- 1 Improve management unit configuration ----- A E NA MI
- 2 Improve internal distribution system ----- A E NA MI
 - 2a New control structures within distribution system ----- A E NA MI
 - 2b Line/pipe sections of distribution system----- A E NA MI
 - 2c Independent water control for each unit ----- A E NA MI
 - 2d New internal distribution sections to provide
water to existing/new habitat units ----- A E NA MI
- 3 Automate water distribution system ----- A E NA MI
- 4 Plan to measure outflow)----- A E NA MI
- 5 Incentive pricing (GWD only) ----- A E NA MI
- 6 Construct and operate operational loss recovery systems ----- A E NA MI
- 7 Optimize conjunctive use of surface and groundwater ----- A E NA MI
- 8 Facilitate use of available recycled urban wastewater ----- A E NA MI
- 9 Mapping----- A E NA MI
- 10 CALFed Quantifiable Objectives
(Identifies and discusses goals for this refuge) ----- A E NA MI