Pixley National Wildlife Refuge

Water Management Plan

January 14, 2011

Section A - Background

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

   Name Nicholas Stanley Title Wildlife Refuge Manager

   Address P.O. Box 670; Delano, Ca 93216

   Telephone 661-725-1767 Fax 661-725-6041

   E-mail nick_stanley@fws.gov

2. *Year refuge established* 1959

Define year-type used consistently throughout plan March 1, 2009 through February 28, 2010

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	Water Well* on site	NA		1,280
Federal level 4	Delano-Earlimart ID	To be negotiated		4,720
State				
Appropriative				
Other, riparian				

* Electricity provided by CVP Project Power

Due to questions regarding the use of the Friant Kern Canal as a source for refuge water and the cost of a conveyance system from the Friant Kern Canal to the refuge, the Refuge is unsure when surface water will be available.

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

Pixley NWR was established in 1959 as a waterfowl refuge. However, no adequate water supply was provided that could sustain the proposed wetland habitat. When the current well was drilled in 1994, this supply made it possible to provide approximately 300 acres of wetlands from early fall through late spring. This habitat not only supports a significant waterfowl population but also provides suitable roosting and limited foraging habitat for up to 6,000 sandhill cranes throughout the winter months. Pixley is one of only two areas in the entire southern San Joaquin Valley that currently supports large numbers of cranes. Prior to CVPIA the only wetlands on Pixley were dependent on rate winter runoff that came as flood water and was placed on the refuge by the local irrigation district for ground water recharge purposes. This was normally outside of the period when wetlands would be beneficial to waterfowl.

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*	*1992 acres*	*1997 acres*	*2009 acres*
Seasonal wetland – timothy (not irrig)	NA	0	309	309
Seasonal wetland – timothy (irrigated)	NA	0		
Seasonal wetland – smartweed	NA	0		
Seasonal wetland - watergrass	NA	0		
Permanent wetland	NA	0		
Semi-permanent wetland/brood pond	NA	0		
Reverse cycle wetlands	NA	0		
Riparian	NA	0		
Irrigated pasture	NA	0		
Upland	NA	0		
Upland (not irrigated)	NA	5,360	5,360	6,124
Upland (managed)	NA	0		
Upland (grains)	NA	0		
Other (>5%)	NA	1,020	711	711
Misc. habitat (<5%)	NA	0		
Sub-total – habitat acres	NA	0		
Roads, buildings, etc.	NA	5	5	5
Total (size of refuge)	6,385	6,385	6,385	7,149

Describe refuge habitat-type water use characteristics

Habitat type	*AF/ac*	*# of irrigations*	*Floodup date*	*Draw down date*
Seasonal wetland				
Seasonal wetland - timothy	1.90	1	Aug-Sept.	March 1
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)*

The majority of purposes for Pixely NWR involve habitat for wetland dependant species. In this artificially created and maintained system efficient water management is critical to accomplishing these purposes.

Purpose for this Unit:

The authorities and corresponding purposes for which Pixley NWR as established are: (1) Bankhead-Jones Farm Tenant Act "… a land-conservation and land-utilization program …"7 U.S.C. 1011; (2) Secretarial Order 2843, dated November 17, 1959 " … for migratory birds and other wildlife …"; and (3) Endangered Species Act of 1973 "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants … " 16 U.S.C. 1534.

2. *Describe specific habitat management objectives. Include pertinent information from refuge management plans*

Seasonal Marshes – timothy: Marsh: By far the most numerous and diverse of the wetland habitat types, these units comprise about 91 percent of the wetland habitat base and are typically flooded from early mid-August through mid-April. Their diversity is the product of a variety of water depths that result in diverse patterns of plant species (vegetation) that, in combination, provide habitat for the greatest number of wildlife species throughout the course of a year. Through the fall and winter, seasonally flooded marshes are used by spectacular concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes, to name a few. In addition, a full compliment of raptors descend upon the waterbird prey base upon which they depend. As water is removed in the spring, large concentrations of shorebirds utilize the shallow depth and exposed mudflats on their northern migration. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the spring and summer. Flood-up in the fall makes this food available to early migrant waterfowl and other waterbirds.

Uplands: non-irrigated annual and perennial grasslands provide habitat for endangered species – i.e., Blunt nosed Leopard Lizard, Tipton Kangaroo Rat, San Joaquin Kit Fox.

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

On an annual basis conduct a review of the previous habitat management plan, which involves visiting each habitat unit to document accomplishments, establish needs and develop plans for the upcoming year and compile these findings to produce the next habitat management plan.

4. *Describe constraints that prevent attainment of objectives and explain the effect on operations*

The habitat planning process identifies a far greater workload than can be accomplished in a single year, given present funding, staffing and existing priorities. Typically, CVPIA budget cycles do not allocate water acquisition funding until six months into the fiscal year, preventing managers from planning an entire year of habitat management and results in inefficient water use and less than optimum habitat results.

5. *Describe the strategies used to remedy the constraints listed above*

Continue to refine management techniques, to improve efficiency, and develop alternate/additional funding sources to help address present staffing and water limitations.

Section C - Policies and Procedures

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

The Refuge currently relies completely on groundwater and does not take in agricultural drain water.

2. *Describe the refuge policies/procedures on water pooling, transfers, reallocations or exchanges*

The refuge has no Pixley NWR or USFWS policies or procedures on pooling, transfers, reallocations or exchange but follows those established by the CVPIA and in the water supply contracts.

POOLING OF WATER SUPPLIES

6. (a) Whenever the maximum quantities of Level 2 Water Supplies and/or the incremental Level 4 Water Supplies depicted in Exhibit AB@ are reduced pursuant to Article 9 of this Contract, the remaining Level 2 Water Supplies and/or Incremental Level 4 Water Supplies may be pooled for use on other Refuge(s); Provided, that no individual Refuge shall receive more Level 2 Water Supplies than would have been made available to it absent a reduction pursuant to Article 9 of this Contract; or be reduced by more than twenty-five (25) percent; Provided further, that the Contracting Office makes a written determination that pooling of water for use on other Refuge(s) would not have an adverse impact, that cannot be reasonably mitigated, on Project operations, other Project Contractors, or other Project purposes; Provided further, that the Contracting Officer determines that such reallocation is permitted under the terms and conditions of the applicable underlying water right permit and/or license; and Provided still further, that water made available under this contract may not be schedules for delivery outside the Contractor's Boundary without prior written approval of the Contracting Officer.

(b) An Interagency Refuge Water Management Team, to be chaired by the Contracting Officer and to be established upon execution of this Contract, shall be entitled to collaboratively allocate the pooled water supplies and provide a schedule for delivery of the pooled supplies to meet the highest priority needs of the Refuges(s) as depicted in Exhibit AB@; Provided, however, nothing is this Article is intended to require the Contractor to pool the water supply provided for in this Contract. The Interagency Refuge Water Management Team shall be composed of designees of the Bureau of Reclamation, the United States Fish & Wildlife Service, the California Department of Fish & Game, and the Grassland Water District.

TANSFERS, REALLOCATIONS OR EXCHANGES OF WATER

7. Subject to the prior written approval of the Contracting Officer, the Project Water made available under this Contract may be transferred, reallocated or exchanged in the Year to other Refuge(s) or Project contractors if such transfer, reallocation or exchange is requested by the Contractor and is authorized by applicable Federal and California State law, and then-current applicable guidelines or regulations.

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

The flow meter on the only well is read and recorded each day. Flood-up dates for each unit are recorded by the refuge manager in field note form. There is no outflow for the refuge. All spring draw-down water is released into a single wetland unit where all water percolates into the ground.

4.- Attach a copy of the refuge's shortage policies, drought plan, or any similar document.

Since the refuge is currently solely reliant on groundwater supplied by one well, all 309 acres of habitat are flooded on an annual basis. We also have no backup supply so in the event of a well failure we simply are unable to flood any wetlands on the refuge. There is no need for a water shortage plan.

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 **(Attachment 2)**

The attached map shows the location of the single well, turnouts (internal flow), and the conveyance system. Pixley NWR does not have storage facilities or an operational loss recovery system. All pumped water is metered at the well and water quality samples are collected at the first turnout (alfalfa valve) west of the well location.

2. *Water measurement*
   a. *Inflow/deliveries*

Total # of inflow locations/points of delivery 1
Total # of measured points of delivery 1
Percentage of total inflow (volume) measured during report year 100%

Delivering agency	*Conveyance facility*	*Measuring point*	*Refuge distribution facility*	*% of total inflow*	*Type of measurement*	*Measuring agency*
BOR	Well/pipeline	Road 88	Internal Pipeline	100	Impeller Meter	USFWS

   b. *Internal flow at turnouts*

Total # of refuge water management units (units) 6
Total # of refuge water management unit turnouts 5
Total # of measured turnouts 0
Estimated % of total internal flow (volume) during report year that was measured at a turnout 0
Number of turnouts supplying more than one unit or not directly off delivery system 1

Measurement type	*Number of devices*	*Acres served*	*Accuracy (avg or range)*	*Reading frequency*	*Calibration frequency (months)*	*Maintenance frequency (months/days)*
Orifices						
Propeller						
Weirs						
Flumes						
Venturi						
Alfalfa valves	5	229	None	Monitored, not read	Never	Never
Metered gates						
Other, stop-log and screwgates	1	80	None	Monitored, not read	Never	Never

   c. *Outflow*

Outflow (AF/yr) 0
Total # of outflow locations/points of spill 2
Total # of measured outflow points 0

Percentage of total outflow (volume) measured during report year 0

Outflow point	*Measuring point*	*Type of measurement*	*Percent of total outflow (estimated)*	*Measuring agency*	*Acres drained*
Deer Creek Spillway	None	None	0	USFWS	
Unit I Ouflow	None	None	0	USFWS	309

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

Miles unlined canal	*Miles lined canal*	*Miles piped*	*Miles – other*
0	0	1.02	0

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

N/A The refuge has no canals that are used as part of a conveyance system. All water is transported in a pipeline.

4. *Describe the refuge operational loss recovery system*

Pump #	Location	HP
None	Groundwater Recharge Basin on bottom end of refuge	NA

5. *Groundwater*

Describe groundwater availability, quality and potential for use

The Pixley NWR is located in the Tule Subbasin of the San Joaquin Valley Groundwater Basin. The aquifers are generally quite thick in the San Joaquin Valley subbasins with groundwater well commonly exceeding 1,000 feet in depth. The maximum thickness of freshwater-bearing deposits (4,400 feet) occurs at the southern end of the San Joaquin Valley. Typical well yields in the San Joaquin Valley range from 300 gpm to 2,000 gpm with yields of 4,000 gpm possible.

The extensive use of groundwater in the San Joaquin Valley has historically caused subsidence of the land surface primarily along the west side and south end of the valley.

Groundwater Quality

In general, groundwater quality throughout the region is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are high TDS, nitrate, arsenic, and organic compounds.

The areas of high TDS content are primarily along the west side of the San Joaquin Valley and in the trough of the valley. High TDS content of west-side water is due to recharge of stream flow originating from marine sediments in the Coast Range. High TDS content in the trough of the valley is the result of concentrations of salts because of evaporation and poor drainage. In the central and west side portions of the valley where the Corcoran Clay confining layer exists, water quality is generally better beneath the clay than above it. Nitrates may occur naturally or as a result of disposal of human and animal waste products and fertilizer.

Areas of high nitrate concentrations are known to exist near the town of Shafter and other isolated areas in the San Joaquin Valley. High levels of arsenic occur locally and appear to be associated with lakebed areas. Elevated arsenic levels have been reported in the Tulare Lake, Kern Lake and Buena Vista bed areas. Organic contaminants can be broken into two categories, agricultural and industrial. Agricultural pesticides and herbicides have been detected throughout the valley, but primarily along the east side where soil permeability is higher and depth to groundwater is shallower. The most notable agricultural contaminant is DBCP, a now-banned fumigant and know carcinogen once used extensively on grapes. Industrial organic contaminants include TCE, DCE, and other solvents. They are found in groundwater near airports, industrial areas, and landfills.

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

Groundwater basin(s) that underlie the refuge

Name of basin underlying refuge	*Size (sq. mi.)*	*Usable capacity (AF)*	*Safe yield (AF/Y)*	*Management agency*	*Relevant reports*
San Joaquin – Tule SB	730	Unknown	Unknown	None	DWR Bulletin 118

Identify refuge-operated ground water wells

#	*Location*	*Status*	*HP*	*2003 (AFY)*	*Future plans*
1	Road 88	Good	150	775	Continue – Plan to add two new wells in 2011

Section E Environmental Characteristics

1. Topography - describe and discuss impact on water management
There are highly porous soils on the west end of the refuge. High sand content markedly reduces the use of Deer Creek as a conveyance system for refuge water. The refuge is very flat – 12 feet of fall from east to west. Water moves very slowly across the refuge and is easy to control but difficult to reuse.

2. Soils - describe and discuss impact on water management See Soils Map **(Attachment 3)**
The eleven soils types that have been mapped within Pixley Refuge's approved boundary include; Akers-Akers, Saline-Sodic Complex (18.3 acres); Biggriz-Biggriz, Saline-Sodic Complex (101 acres); Gambogy loam (469 acres); Gambogy-Biggriz, Saline-Sodic Association (4,157 acres); Gareck-Garces Association (2,101 acres); Hanford sandy loam (<1.0 acre); Houser silty clay (15 acres); Kimberlina fine sandy loam (580 acres); Lethent silt loam (2,193 acres); Nahrub silt loam (74 acres); and Riverwash (< 1.0 acre). All of these soils are alluvium derived mainly from granitic rock sources located in former fan terraces, alluvial fans, flood plains, and basin rims.

More than 1,000 acres of land within the approved boundary has been leveled and reclaimed for irrigated croplands. Regular soil amendments are required to maintain productivity of cultivated crops. While Houser silty clay, Kimberlina fine sandy loam, Lethent silty loam, Nahrub silt loam, and Riverwash are not considered prime farmland, these soil types, with the exception of Riverwash, are farmed. However, about 340 acres are considered Farmland of Statewide Importance by the California Department of Conservation. The Department of Conservation defines Farmland of Statewide Importance as irrigated land similar to

Prime Farmland that has a good combination of physical and chemical characteristics for the production of agricultural crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops as some time during the four years prior to the mapping date.

Highly porous soils are located on the west end of the refuge. High sand content markedly reduces the use of Deer Creek as a conveyance system for refuge water.

3. Climate

National Weather Service – Corcoran (042012), July 1948 to December 2009

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
avg precip	1.49	1.34	1.11	0.66	0.24	0.05	0.01	0.01	0.16	0.32	0.72	0.99	7.10
avg. temp	45.6	50.9	55.4	61.3	69.1	78.3	81.2	79.5	74.4	63.6	53.4	45.4	63.2
max temp	54.6	61.9	68.2	76.0	85.4	93.1	99.0	97.0	91.4	80.9	66.1	54.9	77.4
min temp	36.5	39.8	42.7	46.5	52.8	58.7	63.4	61.9	57.3	49.2	40.6	35.8	48.8
ETo	1.59	2.20	3.66	5.08	6.83	7.80	8.67	7.81	5.67	4.03	2.13	1.59	57.06

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

Mild damp winters and long hot summers. While refuge objectives result in the majority of wetlands being flooded during the fall and winter those acres that remain flooded during the spring and early summer result in the greatest amount of water used per habitat acre. No microclimates.

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*
Dissolved Oxygen	Once Yearly	4.9 – 7.0 mg/l	5.9 mg/l
Conductivity	Once Yearly	170 – 230 umho/cm	202 umho/cm
Molybdenum	Once Yearly	Below Detection Level	<100 ug/l
Phosphorus	Once Yearly	<0.1 -0.16 mg/l	<0.1 mg/l
PH	Once Yearly	8.4 – 9.8	9.3
TDS	Once Yearly	110 – 180 mg/l	148
Boron	Once Yearly	<0.1 - .25 mg/l	0.15 mg/l
Sodium	Once Yearly	34 -36 mg/l	35 mg/l
Arsenic	Once Yearly	48 – 110 ug/l	69 ug/l
Selenium	Once Yearly	Below Detection Level	<0.05 mg/l
Total Nitrogen	Once Yearly	<0.4 -1.4 mg/l	0.74 mg/l

Discuss the impact of water quality on water management

None – Current water quality poses no management concerns.

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
None			

	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.

The refuge public use and outreach programs incorporate components designed to educate visitors and community members about the value of water conservation, the water needs of wildlife, the importance of the refuge, and the historic natural conditions of the local area. While the methodologies of these programs change in appearance over time the basic messages remain constant. Funding levels over the upcoming five year period are not anticipated to fluctuate significantly unless a new program is introduced that will require additional start-up funds.

Other CBMP's such as water monitoring, pump evaluations, and our cooperative efforts with other agencies and organizations are not anticipated to change within the next five years.

1. *Management programs*
   a. *Education*

Program	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Refuge Tours for the public and conservation groups	0.2	0.2	0.2
Interpretive talks to schools	0.2	0.2	0.2
Return of the Cranes Event	1.0	1.0	1.0

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

1. The refuge staff routinely conducts interpretive tours for the general public as well as conservation groups such as the Audubon Society or Sierra Club. These groups normally consist of approximately 25 – 40 people per trip.

2. Due to budget cuts, school group visits to the refuge are rare but staff will provide talks in the classrooms at local elementary and middle schools. These talks normally have around 100 students present per visit.

3. Starting in 2009, the refuge initiated a new public use activity entitled "Return of the Cranes" which is an event that encourages people to visit the refuge and witness the evening flight of the Sandhill cranes that roost on the refuge every evening in the fall and winter period. This year the participation grew to over 150 visitors.

b. Water quality monitoring

Type of water	*Existing Estimated cost (in $1,000s)*

	2011	*2012*	*2013*
Surface – USBR and riparian			
Upslope drain			
Groundwater	0.5	1.5	0.5
Outflow			

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

Program for Pixley NWR involves the monitoring of basic inorganics once during the fall/winter pumping period @$500 per year and testing for organic constituents once every 2 years @ $1,000.

c. *Cooperative efforts*

Informal consultations with Pixley Irrigation District on local recharge basin activities. We are also involved in discussions with PID concerning the possible use of some of their groundwater recharge facilities to potentially replace some of the groundwater we pump by recharging surface water into the underground aquifer.

d. *Pump evaluations (mobile labs)*

Total number of groundwater pumps on refuge 1

Total number of surface water (low-lift) pumps on refuge 0

Groundwater pumps	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
# of groundwater pumps tested		1 @ 2.0	
# of pumps to be fixed or replaced			
# of low-lift pumps to be tested			
# of pumps to be fixed or replaced			

e. *Policy evaluation*

Due to questions about the use of the Friant Kern Canal as a source for refuge water and the lack of funding for construction of the water conveyance system from the Friant Kern Canal to the refuge, it is unknown when if ever surface water will be available for delivery to Pixley NWR.

4. Water management coordinator

Name: Nicholas Stanley *Title:* Wildlife Refuge Manager

Address: P.O. Box 670 Delano, CA 93216

Telephone: 661-725-2767 *E-mail:* nick_stanley@fws.gov

Section I Exemptible Best Management Practices

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

BMP's 1 and 2 a-d were addressed in 2010 with a major construction project on Pixley NWR. Swales were developed in Units 6 -9 to permit better distribution of water. An additional pipeline was installed that

connects Units 6 -9 and permits independent water control to each of these units and also connects to the existing well and distribution line. Two new wells are planned to be drilled in 2011 that will supplement the existing well and will also act as a backup water supply in the event of problems with well #1. A water schedule will be developed by the end of FY2011. BMP's 4 -8 are not applicable as described in each section. All existing refuge facilities have had GPS locations established and have been mapped. The new facilities installed in 2010 and the wells planned for 2011 will be located using GPS and mapped once they are complete.

1. *Improve management unit configuration*

Unit name	*Current acres*	*Reason for change*	*Proposed acres*	*Estimated cost (in $1,000s)*		
				2011	*2012*	*2013*
None						

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)*		
			2011	*2012*	*2013*
None					

   b. *Line/pipe sections of distribution system*

Proposed reach/sect.	*Reason for new structure*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
None				

   c. *Independent water control for each unit*

Proposed control point	*Reason for new control point*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
None				

   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)*		
			2011	*2012*	*2013*
None					

3. *Develop a Water Use Schedule*

Plan element	*Completion date*	*Estimated development/update cost (in $1,000s)*		
		2011	*2012*	*2013*
Floodup dates by unit	10/2011	0.2		

Drawdown dates by unit	10/2011	0.2		
Irrigation dates by unit	10/2011	0.2		

4. *Plan to measure outflow*

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

N/A The Refuge has no outflow	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Identify locations			
Estimate outflow quantity/rank			
Develop plan			
Estimate construction start date			
Estimate construction completion date			

6. *Construct and operate operational loss recovery systems*

Proposed location	*Reason for improvement*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
N/A	The system is completely piped and there are no spill points.			

7. *Optimize conjunctive use of surface and groundwater*

Proposed production/injection well	*Anticipated yield*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
Once L4 conveyance construction is completed via DEID, conjunctive use can be a reality	Unknown			

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 no recycled urban wastewater is available

9. *Mapping*

GIS map layers	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Mapping of WCS's installed in 2010		1.0	

10. CALFED Quantifiable Objectives

There are no QO's identified for Pixley NWR.

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:

Invasive unwanted species name	Estimated acres			*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*	*2011*	*2012*	*2013*

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

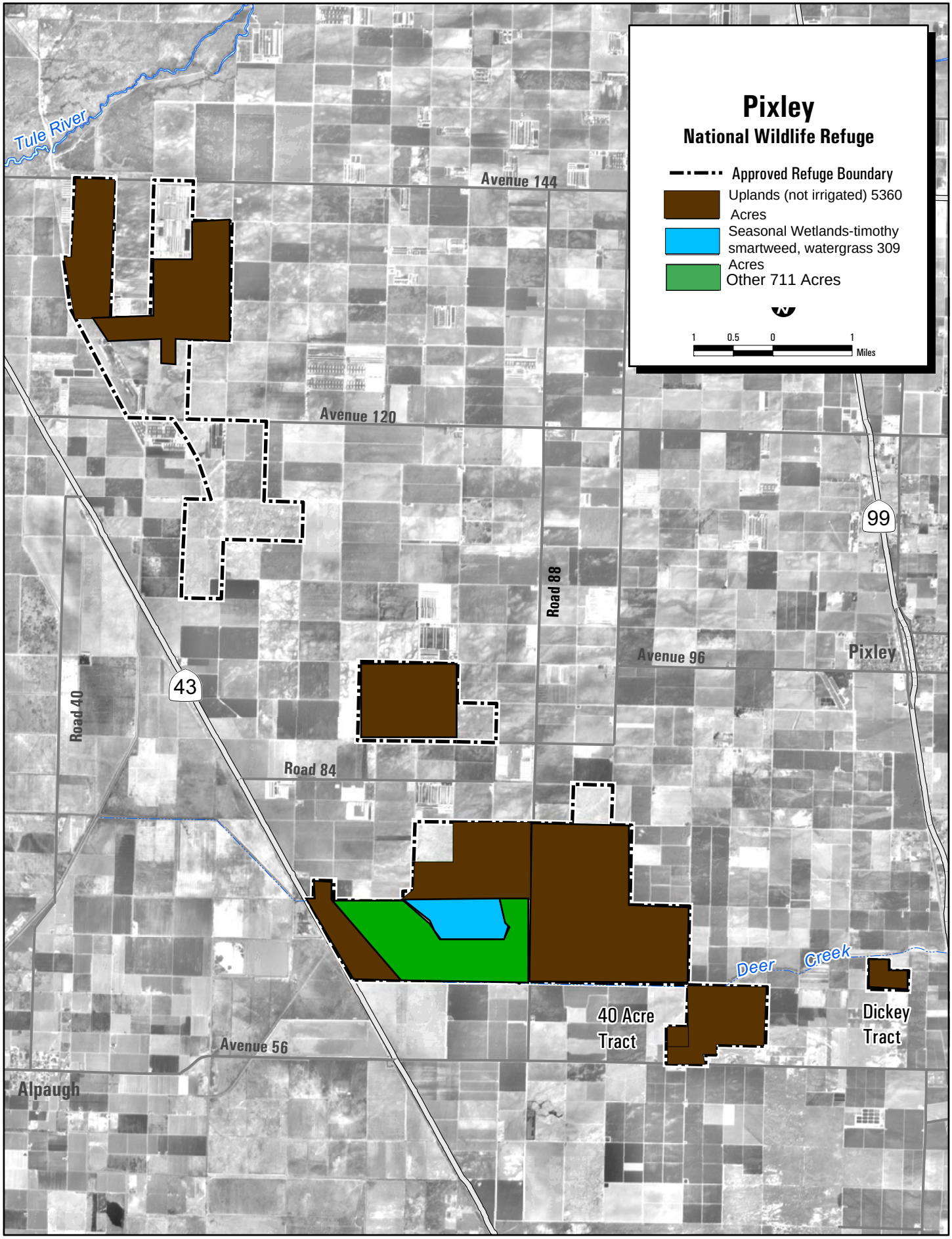
BMP	*Constraint*[1]	*Outstanding Need*[2]
		N/A

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

Non-Applicability (N/A) of Exemptible BMPs

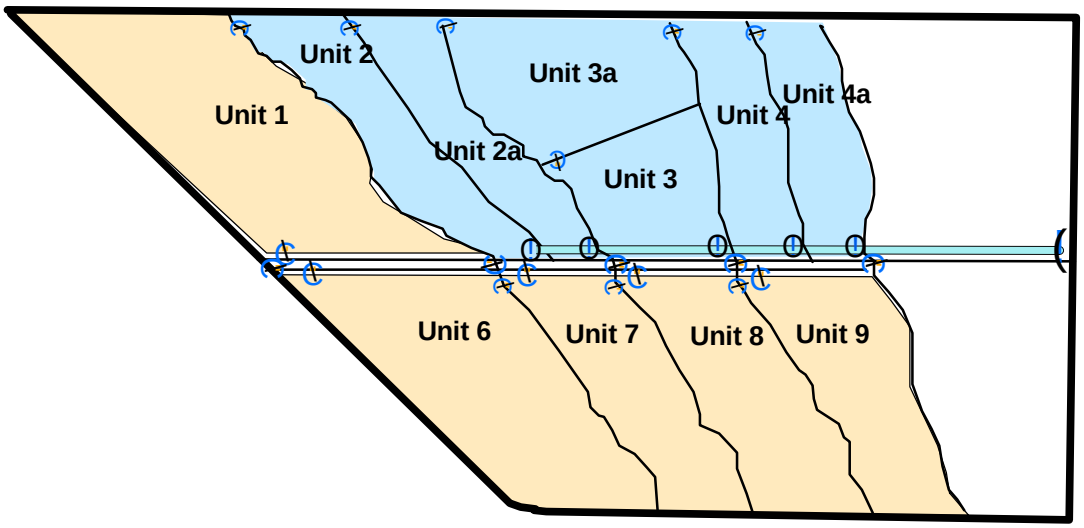
Attachment 1: Habitat Types



CA/NV Refuge Planning Office - Aug 2003

Attachment 2: Refuge Facilities

Pixley Wetlands



Legend

- Water Control Structure
- Water Valves
- Well
- Pipeline
- Future Wetlands
- Wetlands

Attachment 3: Soils

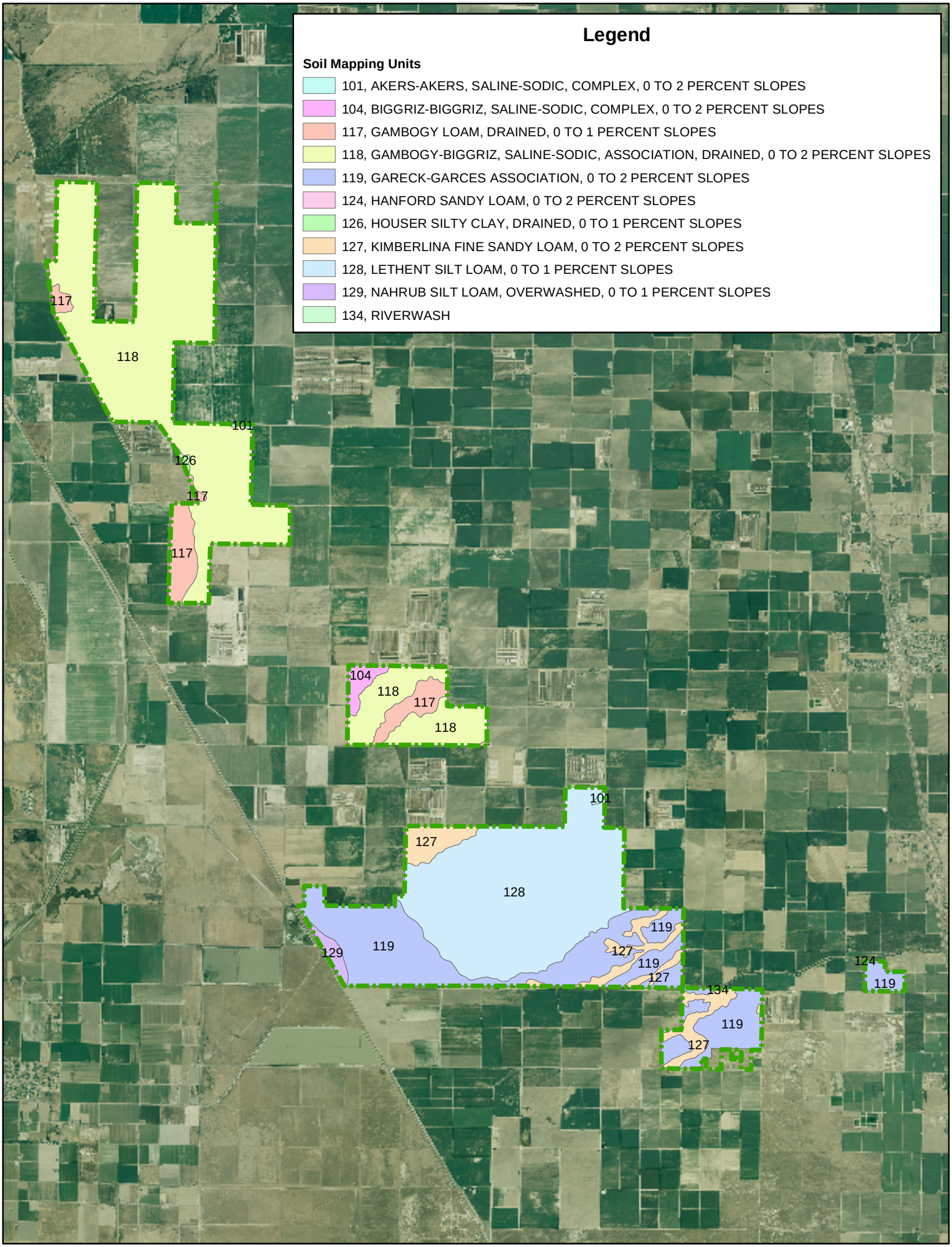


Table 1 **March 1, 2008 to February 28, 2009**

Water Supply

2009	Federal Wtr Level 2 (acre-feet)	Federal Wtr Level 4 (acre-feet)	Local Water Supply (acre-feet)	Refuge Groundwtr (acre-feet)	Up Slope Drain Wtr (acre-feet)	other (define) (acre-feet)	Total (acre-feet)
Method							
Jan-2010	0		0	0	0	0	**0**
February	0		0	0	0	0	**0**
Mar-2009	0		0	0	0	0	**0**
April	116		0	0	0	0	**116**
May	0		0	0	0	0	**0**
June	0		0	0	0	0	**0**
July	0		0	0	0	0	**0**
August	107		0	0	0	0	**107**
September	104		0	0	0	0	**104**
October	62		0	0	0	0	**62**
November	128		0	0	0	0	**128**
December	75		0	0	0	0	**75**
TOTAL	**592**	**0**	**0**	**0**	**0**	**0**	**592**

***March 1, 2009 - February 28, 2010**

Measurement Method Definiti	
M1	Measured sum
M2	Measured sum
M3	Measured sum
C1	Calculated (mc
C2	Calculated usir
C3	Calculated usir
E1	Estimated usin
E2	Estimated usin
E3	Estimated usin
O1	Other (attach a

Table 2

Internal Distribution System

Year	2009								
Canal, lateral	**Length (feet)**	**Width (feet)**	**Surface Area (square feet)**	**Precip. (acre-feet)**	**Evaporation (acre-feet)**	**Seepage (acre-feet)**	**Operational losses (acre-feet)**	**Measure method see Cell K5**	**Total (acre-feet)**
Pipeline	5,400		0	0.00	0.00			E2	**0**
			0	0.00	0.00			E2	**0**
			0	0.00	0.00			E2	**0**
			0	0.00	0.00			E2	**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
			0	0.00	0.00				**0**
TOTAL	**5,400**		**0**	**0**	**0**	**0**	**0**		**0**
			0	**acres**					

Table 3

Managed Lands Water Needs

Year	2009									
Habitat Type		Area habitat acres	Habitat Water (AF/ac)	AF/ac water (AF/ac)	Delivered Water (Total AF)	Precip (AF/Ac)	Shallow Groundwtr (AF/Ac)	Evap (AF/Ac)	Cultural Practices (AF/Ac)	Seepage (AF/Ac)
Seasonal wetlands: timothy		309	5.00	1.90	587	0.51	0.00	1.74	0.50	1.20
Seasonal wetlands: smartweed			5.00		0	0.57	0.00	2.16	0.50	1.20
Seasonal wetlands: watergrass			8.00		0	0.57	0.00	2.16	0.50	1.50
Permanent wetlands			12.00		0	0.57	0.00	2.16	0.00	0.00
Semi-perm wetlands/brood pond			10.00		0	0.57	0.00	2.16	0.00	0.00
Riparian			12.00		0	0.57	0.00	2.16	0.00	2.00
Irrigated pasture			3.00		0	2.86	0.00	18.50	0.00	0.00
Upland					0	0.67	0.00	5.08	0.00	0.00
(define)			6.00		0	0.51	0.00	1.67	0.50	1.20
(define)					0	0.00	0.00	0.00	0.00	0.00
Total Habitat Acres		**309**	**5.00**	**1.90**	**587**					

Table 4

Refuge Water Inventory

Year	2009	Reference		
Total Water Supply		**Table 1**		592
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	592
Managed Land needs		**Table 3**	**minus**	1,545
Difference		**(calculated)**		(953)
			Balance (Table 3)	(318)
			Water Inventory Balance	(1,271)

Table 5

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Wtr Level 2 (acre-feet)	Federal Wtr Level 4 (acre-feet)	Local Water Supply (acre-feet)	Refuge Groundwtr (acre-feet)	Up Slope Drain Wtr (acre-feet)	other (define) (acre-feet)	Total (acre-feet)
2000	852		0	0	0	0	**852**
2001	820		0	0	0	0	**820**
2002	771		0	0	0	0	**771**
2003	775		0	0	0	0	**775**
2004	684		0	0	0	0	**684**
2005	632		0	0	0	0	**632**
2006	990		0	0	0	0	**990**
2007	585		0	0	0	0	**585**
2008	681		0	0	0	0	**681**
2009	592	0	0	0	0	0	**592**
Total	**7,382**	**0**	**0**	**0**	**0**	**0**	**7,382**
Average	**738**	**0**	**0**	**0**	**0**	**0**	**738**