North Grasslands Wildlife Area

China Island Unit

Water Management Plan

final plan submitted 23 Jun 2011

Section A - Background

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

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2. *Year refuge established* 1990

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

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	CCID	1425-FC-20-16770		6,967
Federal level 4	CCID	1425-FC-20-16770		3,483
State				
Appropriative				
Other, riparian				

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

At the time of its purchase, the China Island water conveyance system consisted of four irrigation ground water wells, five concrete pipelines (approximately 12,530 lineal feet), 2 low-lift pumps situated throughout the agricultural fields, and approximately 7,000 feet of earthen ditches. The existing wetlands were receiving some water from an existing well located north of the Newman Wasteway via a 36 inch flume. The Department augmented this system with 3 additional irrigation ground water wells during the drought in 1992. Ground water met a small portion of the water needs for optimum management of this unit. Ground water from the current well system cannot fulfill the water needs for full restoration of the China Island Unit, nor is it desirable to increase ground water pumping because of potential ground water over-drafting, poor water quality, and the high power cost to extract the water. However the well system is extremely valuable for providing management water during periods of drought.

Even though the San Joaquin River and Mud Slough North flow through or adjacent to the China

Island property, the Department does not have water rights of licenses on these water ways and water quality is often of unacceptable standards.

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

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

Habitat type	*Original size*	*1992 acres*	*2004 acres*	*2010 acres*
Seasonal wetland – timothy	NA	47	345	275
Seasonal wetland – smartweed	NA	0	30	45
Seasonal wetland - watergrass	NA	0	162	313
Permanent wetland	100	100	85	85
Semi-permanent wetland/brood pond	NA	22	70	97
Seasonal Wetlands	381	427	221	221
Riparian (flood plain)	1,243	1,243	1,243	1,243
Irrigated pasture	1,247	1,096	0	127
Upland (not irrigated)	322	322	451	264
Upland (managed)	NA	33	620	599
Upland (grains)	NA	0	55	12
Misc. habitat (<5%)	NA	0	0	0
Sub-total – habitat acres	3,293	3,290	3,282	3,281
Roads, buildings, etc.	22	25	33	34
Total (size of refuge)	**3,315 acres**	**3,315**	**3315**	**3,315**

Describe refuge habitat-type water use characteristics

Habitat type	*AF/ac*	*# of irrigations*	*Floodup date*	*Draw down date*
Seasonal wetland - smartweed	6.0	1	8/1-10/30	3/1-4/1
Seasonal wetland - timothy	5.0	1	8/1-10/30	3/15-4/15
Seasonal wetland - watergrass	8.0	1-2	8/1-10/30	4/15-5/15
Permanent wetland	12.0			
Semi-permanent wetland/brood pond	10.0		December	8/15-9/15
Riparian	4.0			
Irrigated pasture	5.0	10	Feb-Nov.	
Upland (not irrigated)				
Upland (managed)	3.0	3-4	Jan-Mar	Evaporation
Upland (grains)	2.0	3-5		
Other (>5%) San Joaquin River/ Mud Slough Flood Plain	5.0-6.0	Continues	Dec-Feb	March 1
Misc. habitat (<5%)				

1. *Habitat maps attached*

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 China Island Unit, along with the Salt Slough Unit, was part of the initial purchase of new lands to implement the San Joaquin Basin Action Plan/ Kesterson Mitigation Plan in 1990. The San Joaquin Basin Action Plan (SJBAP) provides a framework within which 23,500 acres of contiguous State and Federal wildlife refuges can be developed and managed in a coordinated manner. The SJBAP describes the acquisition of additional lands and the installation of water delivery features primarily to protect and enhance existing wetlands and to restore and develop new wetlands for migratory bird habitat in the North Grasslands are of Merced County, California.

This action plan meets the requirement for long-term mitigation for Kesterson Reservoir and contributes toward achieving the objectives for the SJBAP adopted by the Central Valley Habitat Joint Venture in support of the North American Waterfowl Management Plan. The SJBAP was initiated on October 9, 1990 by a cooperative agreement between the Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (Service) and the California Department of Fish and Game (DFG) to implement the concepts in the San Joaquin Basin Action Plan/ Kesterson Mitigation Plan report published in 1989. The SJBAP lands are owned by separate agencies but managed in a cooperative manner to form a large block of diverse wildlife habitat. This increase of wetlands and other habitats will fulfill the requirements of mitigation for the Kesterson Reservoir and will contribute to meeting objectives of the Central Valley Habitat Joint Venture and the North American Waterfowl Management Plan.

In 1972, The Federal Endangered Species Act (ESA) was passed to protect and conserve fish and wildlife species which are listed as endangered or threatened. In 1977, the California Endangered Species Act (CESA) was passed with intents similar to the federal act.

In 1990, the China Island Unit opened to public use and became part of the Pittman-Robertson (PR) program with the main objectives of providing habitat for wintering waterfowl, minimizing crop depredation by waterfowl, and providing public hunting opportunities.

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

The wildlife area staff prepares annual work plans which identify habitat management goals for the coming year. The work plans follow the Wildlife Area Habitat Committee (WAHC) guidelines for specific habitat management. In addition, the wildlife area is also guided by the San Joaquin Basin Action Plan. The current WAHC objectives are as follows:

Permanent Wetlands:

Permanent wetlands are wetlands which remain flooded all year. Typical permanent wetland habitat includes ditches, deep ponds and sloughs. The area management plan must identify permanent wetland habitat, ideally ranging in size from 2-20 acres and no less than 3% of the total wetland acreage.

Permanent wetlands should be spaced at a maximum of one mile intervals.

Semi-permanent Wetlands (Spring/Summer Wetlands):

Semi-permanent wetlands are wetlands that must be flooded from February 1 through September 15 annually, but may be drained as early as August 15 for habitat management purposes. Semi-permanent wetlands typically provide critical brood habitat for waterfowl and shorebirds as well as summer water essential to residential wildlife. The management goal is to provide semi-permanent wetlands in size from 2-20 acres, have shallow edges, and comprise no less than 3% of the total wetland acreage.

Semi-permanent wetlands should be spaced at approximately ½ mile intervals throughout the wildlife area.

Diverse Moist Soil Vegetation:

Diverse moist soil habitat is managed primarily for the production of plant species which produce desirable seeds and sustain invertebrates important to waterfowl and other wetland-dependent wildlife species. At least three major plant species, which may include but are not limited to swamp timothy, water grass, and smartweed, must be provided for in the area management plan. Each of the three plant species should account for a minimum of 25% of the total seasonal wetland acreage and, ideally, the three species should cumulatively provide a high level of nutrition and forage availability. The plant species should complement each other in such a way as to provide for a balance of nutritional and cover qualities. The selection of moist soil plant species should also take into account the abundance and availability of other moist soil habitats within the surrounding geographic area.

Fall flooding (started as early as mid-July) of moist soil habitat creates what is known as "seasonal wetlands" and provides important resting and feeding wetlands for waterfowl and shorebirds. Flooding should be timed to meet the needs of migrating wildlife. Staged flooding should begin in early August as migratory waterfowl and shorebirds start to migrate into the Central Valley of California. Stage flooding should continue through early December. Up to 25% of managed moist soil habitat should be flood by September 15. Drawdown should occur during late winter to early spring, depending on the target plant species' germination requirements.

Special Ecological Communities:

These include plant communities identified by area managers or recognized by the Natural Diversity Data Base (NDDB) as occurring on or within the vicinity of a wildlife area. The management objective is to protect existing habitat types with no net loss of acreage and to enhance, where possible, the quality of the community.

Riparian Habitat:

Riparian habitat is defined as plant communities supporting woody vegetation along rivers, streams, creeks, and sloughs. The riparian habitat on wildlife areas is most commonly associated with the water conveyance system (e.g. delivery ditches, natural sloughs, and creek and river banks).

The standard is to maintain existing habitat and to expand its acreage by 50% over the next 10 years.

Managed Nesting Habitat:

Managed nesting habitat objectives are to manage the structure of the habitat (height, density, plant species composition and soil moisture) in order to optimize nesting density and success for such upland nesting wildlife species as ducks, short-eared owls, northern harriers and pheasants). The standard is to maintain a minimum of 25% of the total upland habitat as managed nesting habitat with a minimum plot size of 5 acres.

Upland Foraging Areas:

These are areas managed primarily for upland foraging and grazing wildlife species such as raptors, geese, cranes and egrets where appropriate, the standard is to manage a total of 25% of the total upland habitat as upland foraging areas with a minimum plot size of 50 acres.

Cereal Grain Plantings:

Cereal grains are crops such as oats, wheat and corn planted and propagated for the benefit of

wildlife species. Cereal grains, such as winter wheat, planted early in the fall (prior to December1) can be considered as both managed nesting habitat and upland foraging areas. The standard for cereal grain plantings is a minimum of 10% of the total upland habitat. Ideally, plots of 5-20 acres will be managed for pheasants and other species (raptors), and plots 50 acres or larger will be managed for geese and sandhill cranes.

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

An Annual Management Work Plan is prepared each year to implement the overall management goals and objectives in the Wildlife Area Management Plan.
On an annual basis, the wildlife area staff in conjunction with state-wide representatives from the WAHC conducts site visits and review /assess the current habitat management plan. Changes are made as necessary to meet the habitat objectives.

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

Every year in our Annual Work Plans, we set more goals and objectives than can be accomplished under the current budgetary and personnel levels. Additional constraints that effect meeting the goals and objectives are old equipment that is needed for maintaining the habitats and infrastructure, man power reductions and budget cuts.
Another constraint that prevents meeting management objectives is the fluctuation of delivered water from the water district. Water fluctuations result in overflowing of the main delivery canal thus compromising the integrity of the canal banks, while reduction of flows results in a drop in pond water levels allowing for emergent vegetation to germinate. Emergent vegetation can affect the efficacy of insecticides used to control mosquito populations.
A further constraint may be mosquito abatement regulations which may have impact on our ability to flood selected ponds during the summer and fall months. To address mosquito abatement issues and management of wetlands for mosquito population control, the Central Valley Joint Venture has published a technical guide, Technical Guide to Best Management Practices (BMP) for Mosquito Control on Managed Wetlands, June 2004).

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

Additional funding, personnel and new equipment would alleviate the first two constraints. Continue working with the local water district to provide reliable deliveries, and continue working with the local mosquito abatement district to implement mosquito population control BMPs that are outlined in the CVJV Technical Guide to Best Management Practices for Mosquito Control on Managed Wetlands (June 2004).

Section C - Policies and Procedures

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

The USBR/CCID cooperative agreement for water delivery to China Island states: “The District shall ensure that the quality of water delivered at the Point(s) of Delivery will be maintained free of substances in concentrations that produce detrimental physiological responses in plant, animal and aquatic life, or adversely affects any beneficial use for wetland management. Specifically, refuge water will not contain dissolved oxygen levels below 5.0 mg/l, a pH level below 6.5 or greater than 8.5, or chemical constituents, pesticides, or salinity levels that adversely affect beneficial uses of the refuge water for fish and wildlife resources. Notwithstanding these provisions, in no case shall the District be required to deliver water that is of a better quality than the water taken by the District at the Point(s) of Acceptance.”

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

The January 2001 USBR/DFG refuge water supply contract addresses pooling in Article 6 and addresses transfers, re-allocations and exchanges of water in Article 7.

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 U.S. Bureau of Reclamation Water Contract # 01-WC-20-1756 Exhibit B are reduced pursuant to Article 9 of this Contract, the remaining Level 2 Water Supplies and/or the 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 percent (25%); Provided further, that the Contracting Officer 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 reallocations is permitted under the terms and conditions of the applicable underlying water rights permit and/or licenses; and Provided still further, that water made available under this Contract may not be scheduled for delivery outside the Contractor's boundaries without prior written approval of the Contracting Officer.

(b) An Interagency Refuge Water Management Team (IRWMT), to be chaired by the Contracting Officer and 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 Refuge(s) as depicted in Exhibit AB@; Provide, however, nothing in this Article is intended to require the Contractor to pool the water supply provided for in this Contract. The IRWMT shall be composed of designees from the Bureau of Reclamation, the United States Fish and Wildlife Service, the California Department of Fish and Game and the Grasslands Water District.

Transfers, 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 that 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 laws, and then-current applicable guidelines or regulations.

The China Island Unit of the North Grasslands Wildlife Area has no additional policies or procedures on pooling, transfers, reallocations or exchanges.

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

Inflows are measured by the agencies wheeling the water. Internal flows are monitored daily for purposes of tracking movement through the system to the proper place of use on the wildlife area. Outflow from the China Island Unit is not monitored at this time.

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

Based on established refuge purposes (se B1) and the projected water supply, we will determine critical habitat needs and analyze existing water use records by both refuge unit and habitat type to determine the amount, distribution, and timing of each habitat to be flooded during water shortages. The wildlife area has a drought contingency plan in place (2007).

Section D - Inventory of Existing Facilities

1. Mapping

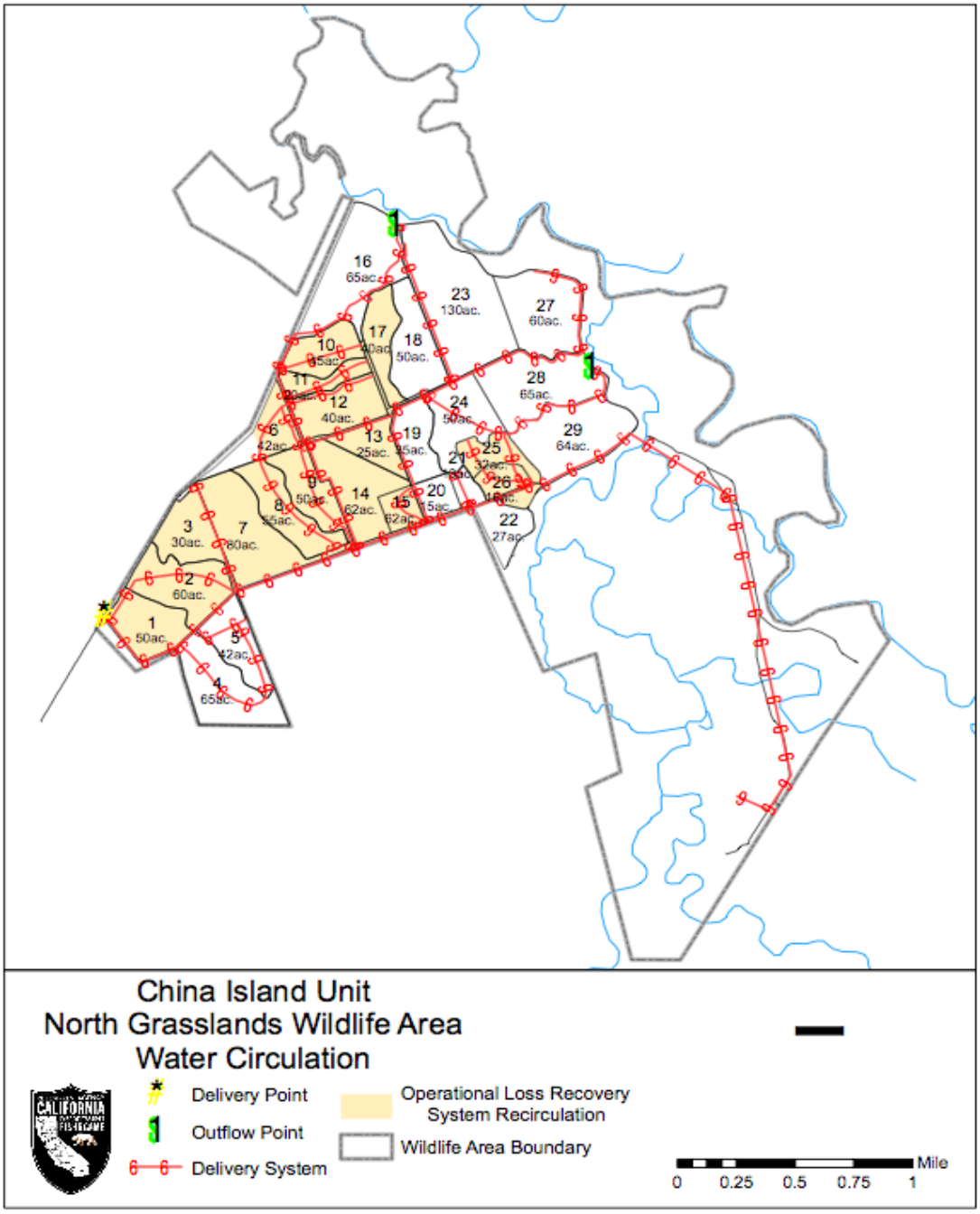
See attached maps for water distribution and conveyance infrastructure.

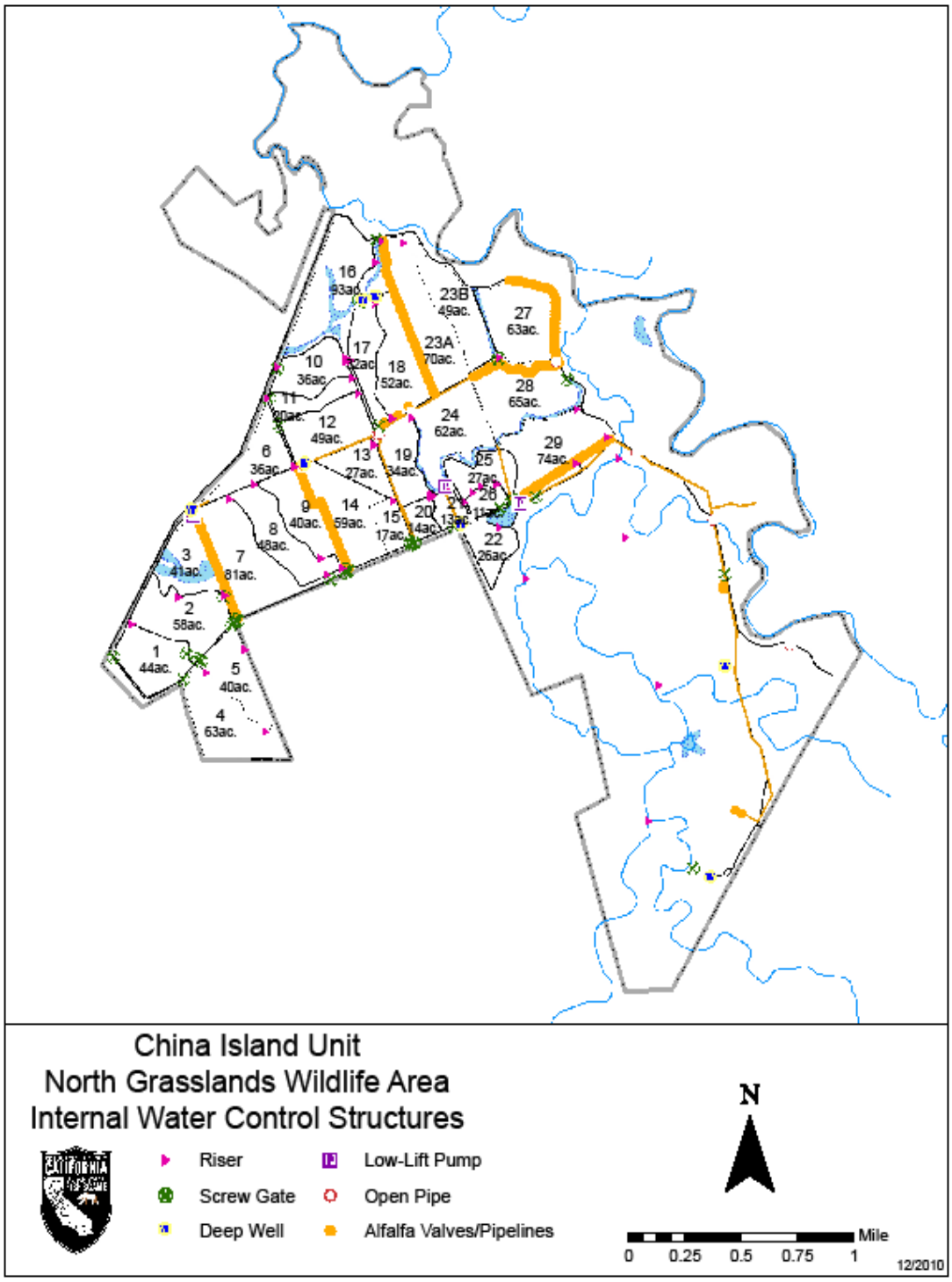
2. *Water measurement*
   a. *Inflow/deliveries*

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%


China Island Unit
North Grasslands Wildlife Area
Water Circulation
Delivery Point
Outflow Point
Delivery System
Operational Loss Recovery System Recirculation
Wildlife Area Boundary
Mile
0
0.25
0.5
0.75
1



Delivering agency	*Conveyance facility*	*Measuring point*	*Refuge distribution facility*	*% of total inflow*	*Type of measurement*	*Measuring agency*
CCID	J Lateral Canal	J Lateral at boundary	J Lateral Canal	100%	Flow meter/ staff gauge	CCID

b. Internal flow at turnouts

Total # of refuge water management units (units) 30

Total # of refuge water management unit turnouts 615

Total # of measured turnouts 0 (monitored daily, but not measured).

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 5

Measurement type	*Number of devices*	*Acres served*	*Accuracy (aver or range)*	*Reading frequency*	*Calibration frequency (months)*	*Maintenance frequency (months/days)*
Orifices						
Propeller						
Weirs						
Flumes						
Venturi						
Alfalfa valves	564	1,212	NA	Daily when in use (but not measured).	NA	As needed
Metered gates						
Other, stop-log and screwgates	57	3,289	NA	Daily when is use (but not measured).	NA	As needed

c. Outflow

Outflow (AF/yr) Unknown

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*
WC #1	None	None	72.5	DFG	659
WC #2	None	None	27.5	DFG	249
WC #3 (High water	None	None	Flood only	DFG	NA

outflow)					

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

Miles unlined canal	*Miles lined canal*	*Miles piped*	*Miles – other*
0.5	2.0	9.0	1.7 (natural channels)

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

The wildlife area staff has not identified any significant leaks or areas of higher than normal canal seepage, but staff continues to assess the water conveyance system and infrastructure on an annual basis and improve efficiency when possible. Past water distribution system improvements, such as pipelines, have improved the water conveyance capabilities and water use efficiency of the wildlife area.

Although there are some sand lenses present, there are no canals through those areas.

4. Describe the refuge operational loss recovery system

There are two low-lift recirculation pumps on the area: Field 3 Pump (CI-3) which can recirculated water from fields 1-3 back into the J-Lateral Canal for reutilization further downstream, and the CI-6 low-lift pump located at the north corner of Field 21 which can recirculate drain water and tail water back into the J-Lateral for reuse.

Pump #	Location	HP
CI-3	Field 3	15 hp
CI-6	North end Field 21	25 hp

5. Groundwater

Describe groundwater availability, quality and potential for use

There are 3 functioning groundwater wells which can augment CVPIA water deliveries. One of the wells, (CI-1, 60 hp pump), feeds water into the J-Lateral distribution system. The CI-2 well (60 hp pump), can supply water to a underground plastic pipeline which can provide water to fields 17, 18, 23, 27 and 29.
The CI-4 well pump (50 hp) services fields 16, 23 and 27. See USBR July 2004 "Evaluation of Groundwater Potential for Incremental Level 4 Refuge Water Supply" for more details.

Groundwater plan *No* **X** *Yes* _____

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	13,500	80,000,000	unknown	none	CH2M Hill

Identify refuge-operated ground water wells

#	*Location*	*Status*	*HP*	*Yield (AFY)*	*Future plans*
CI-1*	Field 3	Active	60	800	Continue use as funding allows
CI-2	Field 12	Active	60	300	Continue use as funding allows

CI-4	Field 16	Active	50	150	Continue use as funding allows
CI-5*	Pump Parking	Abandoned	NA	NA	Abandoned

***** Can pump into J-Lateral Canal.

Section E Environmental Characteristics

1. Topography - describe and discuss impact on water management

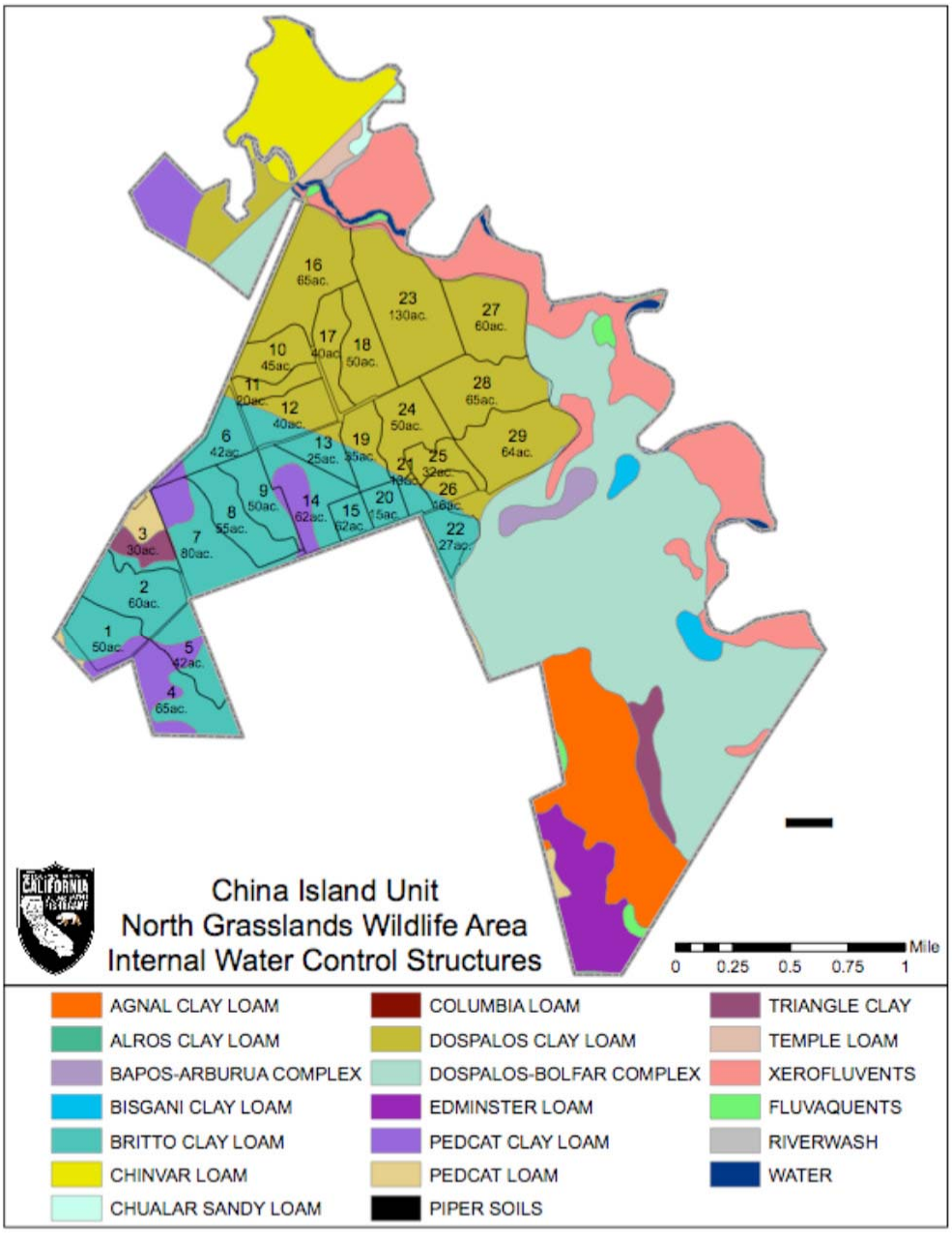
The topography is mostly flat, with the general fall going from south to north and a more localized fall towards either Mud Slough or the San Joaquin River. Most of the levees are built on a one foot or less contour. This allows for a fairly high level of control over water depths which enables staff to better manage wetlands for a diversity of water-dependent wildlife species that have different water depth needs.

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

The China Island Unit consists mainly of four soil types: Dos Palos clay loam (partially drained) in the northern one-fourth of the wildlife area, Dos Palos-Bolfar complex in the eastern one-fourth, Britto clay loam (leveled) in the western quarter, and Agnal clay loam mainly in the southern fourth of the area.

Groundwater levels in and around the wildlife area range from near ground surface to 20 feet below ground surface (bgs). Based on Sate Department of Water Resources (DWR) ground water level data, seasonal variation appears to result in a slight ground water level fluctuation between 2 and 5 feet (DWR 2003b). Water levels in the sub-basin have increased approximately 2.2 feet since 1970 (DWR 2003a).

Between 1 and 2 feet of subsidence has occurred near the China Island Unit (USDA 1990). Future subsidence may occur if pumping of groundwater is substantially increased.


16
65ac.
23
130ac.
27
60ac.
17
40ac.
10
45ac.
18
50ac.
11
20ac.
12
40ac.
28
65ac.
24
50ac.
29
64ac.
6
42ac.
13
25ac.
19
25ac.
21
25
32ac.
26
9
50ac.
14
62ac.
8
55ac.
15
62ac.
20
15ac.
22
27ac.
3
30ac.
7
80ac.
2
60ac.
1
50ac.
5
42ac.
4
65ac.
China Island Unit
North Grasslands Wildlife Area
Internal Water Control Structures
Mile
0
0.25
0.5
0.75
1
AGNAL CLAY LOAM
ALROS CLAY LOAM
BAPOS-ARBURUA COMPLEX
BISGANI CLAY LOAM
BRITTO CLAY LOAM
CHINVAR LOAM
CHUALAR SANDY LOAM
COLUMBIA LOAM
DOSPALOS CLAY LOAM
DOSPALOS-BOLFAR COMPLEX
EDMINSTER LOAM
PEDCAT CLAY LOAM
PEDCAT LOAM
PIPER SOILS
TRIANGLE CLAY
TEMPLE LOAM
XEROFLUVENTS
FLUVAQUENTS
RIVERWASH
WATER

3. Climate

National Weather Service – (Los Banos, CA)

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
avg precip	1.93	1.97	1.65	0.63	0.44	0.07	0.04	0.05	0.28	0.56	1.11	1.22	9.95
avg. temp	46	52	56	61	67	73	78	77	73	65	53	45	62
max temp	55	62	67	74	82	89	95	94	89	80	65	55	75.6
min temp	37	41	44	47	67	53	58	61	57	51	41	35	48.0
ETo	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9

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

The climate in this part of the San Joaquin Valley is characterized by the following:
The summers are hot and dry with low humidity. Daytime during the summer are from the mid-nineties to one hundred and ten degrees Fahrenheit. Summer nighttime lows are in the mid-sixties. Summer days are typically calm and clear which lends to stagnant and polluted air. Spring and Fall weather is generally mild with sunny skies and scattered clouds. Spring/ Fall temperatures range from over-night lows in the forties to daytime highs in the seventies. Fall weather is typically hazy and Spring weather is generally windy. Winter daytime highs are in the fifties and sixties with overnight lows in the low thirties (record low of 16 degrees Fahrenheit). Dense ground fog (tule fog) regularly forms through the winter months.

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*
None			

Discuss the impact of water quality on water management

Unknown

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

1. Refuge Water Supplies Quantified

Table 1 Surface water supplies, imported and originating within the District, by month.

Table 1 Ground water extracted by the Refuge, by month

Table 1 Upslope drain water, by month.
Table 1 Other supplies, by month.
Table 3 Precipitation by habitat type.
Table 4 Refuge water inventory.
Table 5 Ten year history of Refuge water supplies.

2. Water Use Quantified
Table2 – Conveyance losses, including seepage, evaporation, and operational losses.
Table 3 Applied habitat water, evapotranspiration, water for cultural practices (e.g. disease control, invasive weed control).
Table 3 Estimated deep percolation(seepage) within the habitat areas.
Table 4 Habitat spillage or drain water leaving the area.

Section H Critical Best Management Practices

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

1. *Management programs*
   a. *Education*

Program	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Annual Marsh Management Workshop*****	3	3	3
Public Outreach-Environmental Education Coordinator, GEECe *****	4.6*	4.6*	4.6*
Cal Poly Water Management Course*****	.5*	.5*	.5*

*** Los Banos and North Grasslands Wildlife Area Complex.**

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

Annual USFWS/ DFG Marsh Management Workshop-We are interested in sending 3-4 of our staff to the workshop. The workshop covers such topics as new methods of marsh management, including water conservation practices, studies being conducted on wetland management, and new materials that may be utilized for water control structures. Purpose of the workshop is to exchange information on marsh management techniques used by the various participants and refuges. Estimated costs are for travel and per diem.

Cal Poly Water Management Course – We are interested in sending one or two persons per year, if and when the budget allows, to the Cal Poly water management course taught by Dr. Charles Bart and Stewart Stiles. Cost is for travel and per diem. The course is free to participants.

Environmental Education Coordinator –Coordinates and conducts outdoor education program for the Grasslands Environmental Education Center (GEECe) located on the Los Banos/ North Grasslands Wildlife Area Complex. The coordinator conducts field trips on the wildlife areas and surrounding wetlands as well as visiting classrooms and conducting student activities in the GEECe. Curriculum focuses on the importance of wetlands for water quality, flood control, and wildlife value. Over 5, 300 children and adults visit the GEECe annually.

The dollar amount shown is the total amount spent for the Los Banos and North Grasslands wildlife areas.

b. Water quality monitoring

Type of water	*Existing Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Surface – USBR and riparian	$1	$1	$1
Upslope drain			
Groundwater			
Outflow	$4	$4	$4

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

Currently, there is no existing program. We plan to start a program that meet our requirements for water quality monitoring under the Central Valley Quality Control Board conditional waiver for waste discharge requirements.

c. Cooperative efforts

We are currently a partner with PG & E for pump efficiency testing. Also, DFG partners with the Westside San Joaquin Watershed Coalition to implement the Central Valley Regional Water Quality Control Board Agricultural waiver.

d. Pump evaluations

Total number of groundwater pumps on refuge 3 operational, 3 non-operational

Total number of surface water (low-lift) pumps on refuge 5

Groundwater pumps	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
# of groundwater pumps tested		1 @ $1	1 @ $1
# of pumps to be fixed or replaced			
# of low-lift pumps to be tested	1 @ 0.8	1 @ $0.8	
# of pumps to be fixed or replaced		1 @ $12	1 @ $12

e. Policy evaluation

If Central Valley Project (CVP) power could be obtained, it would enhance our ability to pump and distribute water for beneficial wildlife use on the area.

The quality of the habitat would improve with the flexibility to change scheduled monthly quantities of CVPIA water. To do so would enable the refuge to use the available supplies in response to unpredictable weather conditions and changing habitat needs.

4. Water management coordinator

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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)*		
				2011	*2012*	*2013*
Field 6	42	Improve drainage of fields 7 and 8 into 6. Create riparian and brood habitat.	12		$17	
Field 7		Improve drainage; enhance brood water acreage; improve water conveyance to Field 8.	15		$17	
Field 8	55	Create independent water flow to field 8.	55		$17	

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	See details below.				

No new water controls are planned for installation at this point. All the old corrugated metal water controls have been replaced with HDPE pipes and concrete weirs over the last 4 years.

b. Line/pipe sections of distribution system

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

There are no plans to construct new line/ pipe sections at this time. The majority of the water distribution system for China Island was constructed between 1993-2007 under CVPIA 3406(d). Additional pipelines were constructed to provide independent water supply to fields 19, 21, 24 and 25 in 2007. The system is new and there are no plans to upgrade at this time.

c. Independent water control for each unit

Proposed control point	*Reason for new control point*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
Field 8	To create independent water control to Field 8		$17	
Field 7	Create a point of independent water source to Field 7 brood pond.		$17	

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		See below for details.			

The internal distribution system is evaluated each year in the annual planning process. We have not identified any necessary changes at this point.

3. Develop a Water Use Schedule

Plan element	*Completion date*	*Estimated development/update cost (in $1,000s)*		
		2011	*2012*	*2013*
Floodup dates by unit	See note below.			
Drawdown dates by unit	See note below			
Irrigation dates by unit	See note below.			

Field management plans are developed each year to determine floodup, drawdown and irrigations dates. Dates may change according to weather, water allotments and individual pond management goals for the year.

4. Plan to measure outflow

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

	Estimated cost (in $1,000s)		
	2011	*2012*	*2013*
Identify locations			
Estimate outflow quantity/rank			
Develop plan			
Estimate construction start date			
Estimate construction completion date			

There are only 2 major points of outflow on the wildlife refuge. Measurement of outflow will be evaluated for feasibility.

6. Construct and operate operational loss recovery systems

Proposed location	*Reason for improvement*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
N/A	See details below.			

The China Island Unit currently has two recirculation pumps that can recirculated water back in to the J-Lateral Canal for redistribution to other habitat units. Any outflow is used to maintain habitat quality in downstream sloughs.

7. Optimize conjunctive use of surface and groundwater

Proposed production/injection well	Anticipated yield	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
N/A	See details below.			

The China Island Unit currently has a conjunctive use program. Groundwater can be pumped to supplement surface water supplies. See U.S. Bureau of Reclamation groundwater report (2004) for a discussion of the options for conjunctive use of surface and 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 - There is no recycled urban wastewater available in this area.

9. Mapping (See attached maps)

GIS map layers	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Map 1 – Distribution system			
Map 2 – Drainage system			

Updating of mapping of the water distribution and drainage systems was done in 2010. Data is being checked for accuracy at this time.

10. CALFED Quantifiable Objectives

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*
Perennial Pepper Weed	20	20	20	$1	$1	$1
Yellow Star Thistle	10	10	10	$1	$1	$1
Bermuda Grass	10	10	10	$1	$1	$1

2. 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)

   The China Island Unit currently accepts only water with a selenium concentration of less than 2 parts per million (Federal EPA standard).

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)

   The China Island Unit currently accepts only water with a selenium concentration of less than 2 ppm (Federal EPA standard) and a boron concentration of less than 6 ppm (based on Grasslands Water District standards).

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)

   The China Island Unit currently accepts only water with a salinity level of less than 1,500 ECs (standard based on local knowledge).

4. Describe actions that reduce nonproductive ET. Reduce unwanted ET. (TB 107)

   Non-native invasive weeds are removed and/or controlled on the refuge to reduce nonproductive evapotranspiration losses..

NORTH GRASSLANDS WILDLIFE AREA
DROUGHT CONTINGENCY PLAN
CHINA ISLAND UNIT
NORTH GRASSLANDS WILDLIFE AREA

During years when there is a low inflow of water into Shasta Reservoir, water allotments to the China Island Unit of the North Grasslands Wildlife Area may be greatly reduced. Should drastic reductions of water allotments occur, the wildlife area habitat management will be adjusted according to the severity of reduction and time of the year when water reductions are finalized.

Wetland Management

A. Moist Soil Wetlands-Initial fall flooding may begin in August and continue through November. Drawdown is done from mid-March through April. Irrigations generally are done in the spring and early summer of watergrass and smartweed units.
In a reduced water year, spring and summer irrigations of swamp timothy and watergrass would be reduced. Fall flood-up of seasonal wetland fields would be prioritized on a field to field basis taking in to consideration water holding capability, importance to the public hunt program, and water bird use. Refer to the Drought Contingency Map for field priority for fall flood-up.

B. Semi-permanent Wetlands- flooded October through July. The acreage flooded through the spring and summer would be reduced. The quality of the habitat would determine whether a field would be flooded or not.

C. Permanent Wetlands- flooded all year. There would be no change in management of these wetlands.

Upland Management

A. Planted Cereal Grain Crops- planted March through May.
Safflower would be planted and irrigated to maturity. Some safflower plots could be irrigated utilizing drain water from seasonal wetlands.
Sudax, milo and corn acreage would be reduced depending on severity of the water reduction.

B. Managed Nesting – usually irrigated December through April. There would be a reduction in the number of irrigations. Some areas could be irrigated by using seasonal wetland drain water lifted by low lift pumps into pipelines.

C. Upland Foraging Habitat- irrigations generally done in June and July. Depending on the severity of the water reduction, irrigations would not be done.

D. Managed Brood Habitat- a reduction in irrigated acreage would occur depending on the severity of the water reductions.

DISCLAIMER

Data, including estimated habitat acreages and water requirements for optimal production and maintenance, included in this document and associated tables are referenced from the San Joaquin Basin Action Plan/Kesterson Mitigation Plan Report (1989) and Report on Refuge Water Supply Investigations (1989), developed by the Bureau of Reclamation, Fish and Wildlife Service, and the Department of Fish and Game. Precipitation data was drawn from local weather stations and may be unrepresentative given the expansive distribution of the CVPIA wetlands. Evaporation and seepage data were derived from gross estimates and are unrepresentative of actual conditions given the high variability in vegetation and soil type. Furthermore, estimated applied acre feet per wetland acre data was calculated based on the aforementioned assumptions and water delivery estimates. Given the inherent numerous assumptions utilized to generate the data included in this document and associated tables, this information is not intended for any other purpose and should not be used without the written consent of the author agencies

Table 1

Water Supply

2010	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	**C2**	**C2**		**E2**			
Jan-2011	307	0	0	5	0	0	**312**
February	813	0	0	5	0	0	**818**
Mar-2010	625	0	0	5	0	0	**630**
April	580	114	0	5	0	0	**699**
May	359	286	0	5	0	0	**650**
June	200	395	0	5	0	0	**600**
July	57	250	0	5	0	0	**312**
August	650	243	0	5	0	0	**898**
September	262	500	0	5	0	0	**767**
October	0	722	0	5	0	0	**727**
November	215	390	0	5	0	0	**610**
December	736	583	0	5	0	0	**1,324**
TOTAL	**4,804**	**3,483**	**0**	**60**	**0**	**0**	**8,347**

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

Table 2

Internal Distribution System

Year	2010								
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)
Unlined canal	2,640	25	66,000	0.00	0.00			E3	**0**
Lined canal	10,560	15	158,400	2.07	17.56			E3	**(15)**
Pipeline	42,240		0	0.00	0.00			E3	**0**
Natural sloughs	8,976	30	269,280	3.52	29.85			E3	**(26)**
			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	**64,416**		**493,680**	**6**	**47**	**0**	**0**		**(42)**
			11	**acres**					

Enter precipitation and evaporation data only for months the distribution system was in use.

AFY carried by canal	length miles	Distribution System Precip work sheet					Distribution System Evaporation work sheet				
			inches precip	ft precip	acres	AF/Y		inches evap	ft evap	acres	AF/Y
750	0.50	**Jan-10**	0.82	0.07	0.00	0.00	**Jan-10**	1.24	0.10	0.00	0.00
2,000	2.00	**Feb-10**	0.16	0.01	3.64	2.07	**Feb-10**	2.24	0.19	3.64	17.56
variable flows	8.00	**Mar-09**	1.3	0.11	0.00	0.00	**Mar-09**	3.72	0.31	0.00	0.00
variable flows	1.70	**Apr**	0.83	0.07	6.18	3.52	**Apr**	5.7	0.48	6.18	29.85
		May	0	0.00	0.00	0.00	**May**	7.44	0.62	0.00	0.00
		Jun	0	0.00	0.00	0.00	**Jun**	8.1	0.68	0.00	0.00
		Jul	0	0.00	0.00	0.00	**Jul**	8.68	0.72	0.00	0.00
		Aug	0	0.00	0.00	0.00	**Aug**	7.75	0.65	0.00	0.00
		Sept	0.1	0.01	0.00	0.00	**Sept**	5.7	0.48	0.00	0.00
		Oct	0.27	0.02	0.00	0.00	**Oct**	4.03	0.34	0.00	0.00
		Nov	1.15	0.10	0.00	0.00	**Nov**	2.1	0.18	0.00	0.00
		Dec	2.2	0.18	0.00	0.00	**Dec**	1.24	0.10	0.00	0.00
		TOTAL	**6.83**	**0.57**	0.00	0.00	**TOTAL**	**57.94**	**4.83**	0.00	0.00
	12				**9.82**	**5.59**				**9.82**	**47.41**

Measurement 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 down stream 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 3

Managed Lands Water Needs

Year	2010										
Habitat Type		Area (habitat acres)	Habitat Water Needs (AF/ac)	AF/ac water Delivered (AF/ac)	Delivered Water (Total AF)	Precip (AF/Ac)	Shallow Groundwtr (AF/Ac)	Evap (AF/Ac)	Cultural Practices (AF/Ac)	Seepage (AF/Ac)	Balance (acre-feet)
Seasonal wetlands: timothy		345	5.00	5.00	1,725	0.50	0.00	1.69	1.50	1.25	**366**
Seasonal wetlands: smartweed		50	6.00	6.00	300	0.57	0.00	2.84	1.50	1.50	**37**
Seasonal wetlands: watergrass		203	8.00	8.00	1,624	0.57	0.00	2.84	1.50	2.00	**453**
Permanent wetlands		85	12.00	12.00	1,020	0.57	0.00	4.83	3.00	3.00	**148**
Semi-perm wetlands/brood pond		103	10.00	10.00	1,030	0.57	0.00	4.83	2.00	2.50	**128**
Riparian		1,243	12.00	0.00	0	0.57	0.00	2.84	0.00	1.00	**(4,065)**
Irrigated pasture		108	5.00	5.00	540	0.38	0.00	4.23	0.00	0.38	**83**
Upland (Unmanaged)		451	0.00	0.00	0	0.07	0.00	3.14	0.00	1.25	**(1,948)**
Upland (Managed)		580	4.00	4.00	2,320	0.19	0.00	0.60	0.00	0.00	**2,082**
Uplands (sm. Grain crops)		12	1.50	1.50	18	0.19	0.00	3.92	0.00	0.38	**(31)**
Total Habitat Acres		**3,180**	**7.39**	**2.70**	**8,577**						**(2,748)**

Months irrigated (list all)		Evap	Cultural	Seepage	Balance	Total	B1 Wtr Needs
Sep-March		583	518	431	366	1,898	1,725
Sep-Apr, Jun		142	75	75	37	328	300
Sep-Apr, Jun		576	305	406	453	1,740	1,624
all months		410	255	255	148	1,068	1,020
all months		497	206	258	128	1,089	1,030
Sep-Apr, Jun		3,529	0	1,243	(4,065)	707	14,916
Apr-Dec		457	0	41	83	581	540
Apr-Aug		1,416	0	564	(1,948)	31	0
Jan-Mar		0	0	0	2,082	2,082	2,320
Mar-Sept		0	0	5	(31)	(27)	18
	TOTALS	**7,610**	**1,358**	**3,277**	**(2,748)**	**9,498**	23,493

Table 4

Refuge Water Inventory

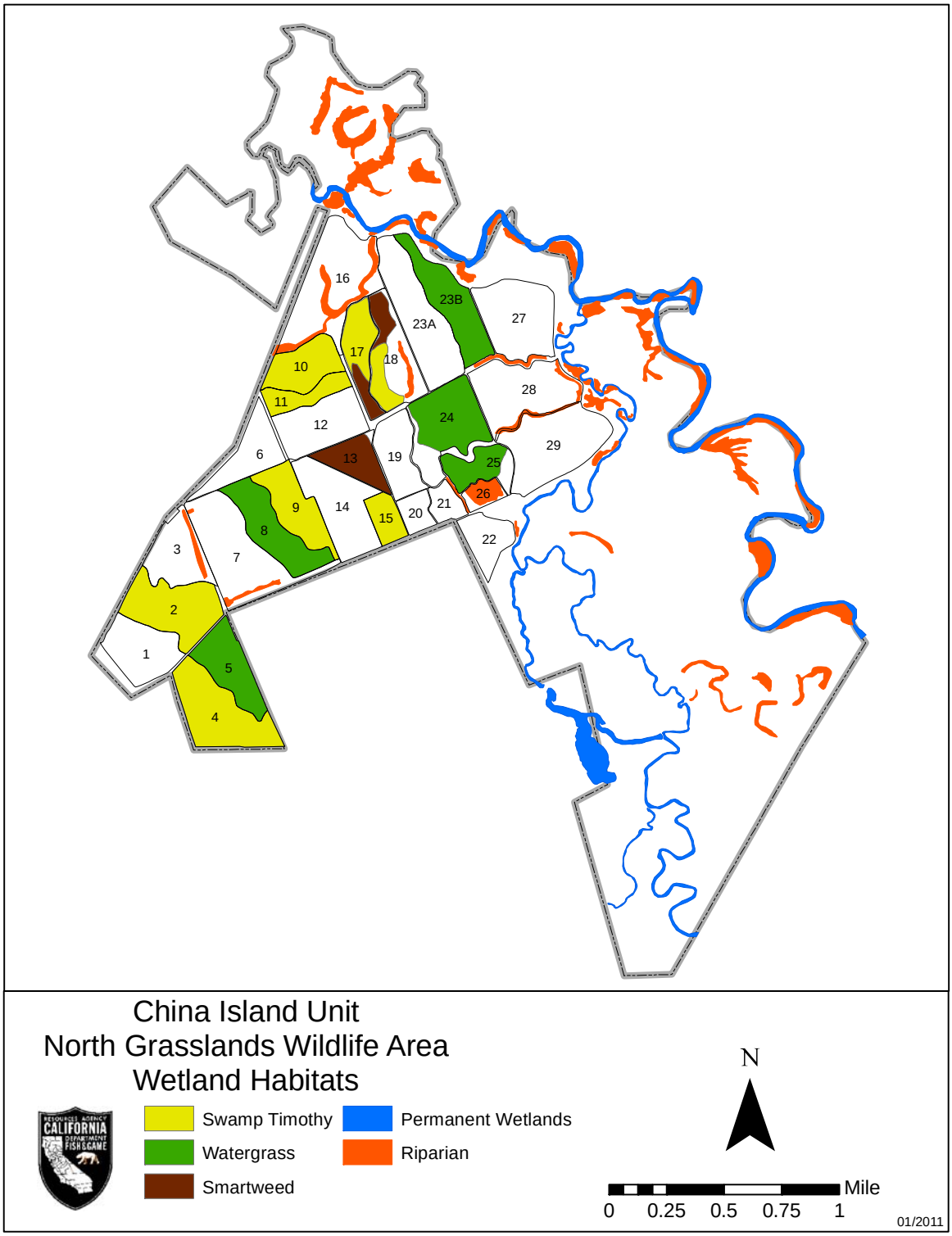
Year	2010	Reference		
Total Water Supply		**Table 1**		8,347
Precipitation		**Table 2**	**plus**	6
Evaporation		**Table 2**	**minus**	47
Seepage		**Table 2**	**minus**	0
Operational Losses		**Table 2**	**minus**	0
			Deliveries to Managed Lands	8,305
Managed Land needs		**Table 3**	**minus**	23,493
Difference		**(calculated)**		(15,188)
			Balance (outflow?) (Table 3)	(2,748)
			Water Inventory Balance	(17,936)

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)
2001	2,748	0	0	0	0	0	**2,748**
2002	5,479	0	0	80	0	0	**5,559**
2003	7,800	0	0	85	0	0	**7,885**
2004	6,319	0	0	85	0	0	**6,404**
2005	6,190	0	0	80	0	0	**6,270**
2006	6,253	0	0	80	0	0	**6,333**
2007	7,050	0	0	85	0	0	**7,135**
2008	6,921	0	0	85	0	0	**7,006**
2009	6,295	0	0	80	0	0	**6,375**
2010	4,804	3,483	0	60	0	0	**8,347**
Total	**59,859**	**3,483**	**0**	**720**	**0**	**0**	**64,062**
Average	**5,986**	**348**	**0**	**72**	**0**	**0**	**6,406**

Wetland Habitat Map



3. Upland Habitat Map