
CHAPTER IV C

Delevan National Wildlife Refuge Alternative Plans



*U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION*

CHAPTER IV C

DELEVAN NATIONAL WILDLIFE REFUGE

Delevan National Wildlife Refuge (Refuge) was authorized in 1962 under the Migratory Bird Conservation Commission. Initially, 5,583 acres were purchased with Migratory Bird Hunting Stamp Act funds. In 1963, an additional 80 acres were acquired with the same funds. The land was purchased as a refuge and breeding ground for migratory birds and wildlife. The Refuge is located about seven miles east of Maxwell in Colusa County, to the east of Interstate Highway 5 and to the west of the Sacramento River. The Refuge, which is managed by the Service, is part of a group of refuges located in the Colusa Basin, as discussed in Chapter IV B. The Refuge is located midway between the Sacramento and Colusa NWR's, and provides wintering and resting areas for ducks and geese and reduces waterfowl damage to crops on neighboring farms.

The Refuge consists of permanent ponds, rice, millet fields, seasonal marshes, and irrigated pasture. The irrigated pasture is a feeding area for geese. The wetlands also support sources of waterfowl food such as swamp timothy and invertebrate populations. The upland areas of the Refuge provide habitat for geese, upland birds, and other wildlife species. The amount of land used for fields, ponds, and upland uses varies each year depending upon water availability.

A. WATER RESOURCES

The Refuge has no firm water supply, and currently only receives surplus Central Valley Project (CVP) water.

1. Surface Waters

The Refuge receives surplus CVP water through Glenn-Colusa Irrigation District (GCID). The Refuge used to receive surplus water from Maxwell Irrigation District; however, this water supply has not been used since 1979 due to poor water quality.

The GCID conveys CVP water to the Colusa Basin refuges, as discussed in Chapter IVB. A portion of the water supplied by GCID is from agricultural return flows. Under Contract 14-06-200-8181A with Reclamation, GCID conveys a maximum of 30,000 acre-feet to the Refuge. The contracts provide for a 25 percent conveyance loss. Quality of the water delivered by GCID appears to be suitable for refuge irrigation under most conditions. Agricultural return flows are generally of poorer quality than fresh water especially when flows are reused several times before being delivered to the Refuge.

When GCID dewateres their system in the winter, CVP water is transported through the Tehama-Colusa Canal (TCC) to the Wasteway Cross Channel. The Wasteway Cross Channel is used to divert water to the GCID facilities that serve the Refuge.

Reclamation District 2047 was formed in 1919 to construct a master drain, known as the Colusa Basin Drainage Canal or the 2047 Drain. The 2047 Drain conveys agricultural return flows to an area south of Willows making refuge deliveries possible. In the winter, the 2047 Drain transports stormwater runoff from the Colusa Basin.

The Refuge could apply to the State Water Resources Control Board for a permit to divert water from the 2047 Drain from September through June; however, the appropriation would be subject to prior appropriations. Therefore, only surplus water would be available. Quality of water in the 2047 Drain in the summer is influenced by the quality of agricultural return flows. Previous water quality analyses have detected DDT and toxaphene at concentrations above National Academy of Science action levels (SWRCB, 1984). During the winter, the quality of the 2047 Drain water appears to be adequate for the Refuge.

Water supply problems also occur due to the shutdown of the TCC and the GCID Main Canal during the winter, as discussed in Chapter IV B. Without the water from the TCC, water must be provided to the GCID Main Canal from other sources, such as Black Butte Reservoir. Winter water could be provided to the Refuge from the 2047 Drain if unappropriated water could be obtained and a pump was constructed.

2. Water Conveyance Facilities

During most of the year, GCID conveys water from the GCID Hamilton City Pumps through the GCID Main Canal to the Refuge. The water is transferred from the GCID Main Canal to Hunters Creek and diverted into the Refuge near the northwest corner through Hunters Creek No. 2 Weir, as shown in Figure IV C-1. This weir is used to back-up water in Hunters Creek for diversion to the Refuge. During irrigation season, Hunters Creek also conveys agricultural return flows.

In the winter when the GCID Main Canal is dewatered, water from the TCC has been conveyed through the Wasteway Cross Channel to the GCID Main Canal. The water is transferred to Hunters Creek and diverted to the Refuge through the No. 2 Weir. During floods, GCID may remove the weir structure to allow passage of the floodwaters. The weir is generally not replaced until the spring when the water levels have receded.

Approximately 385 acres of land along the southeastern boundaries (Tracts 25, 31, 35, and 41) are hydraulically separated

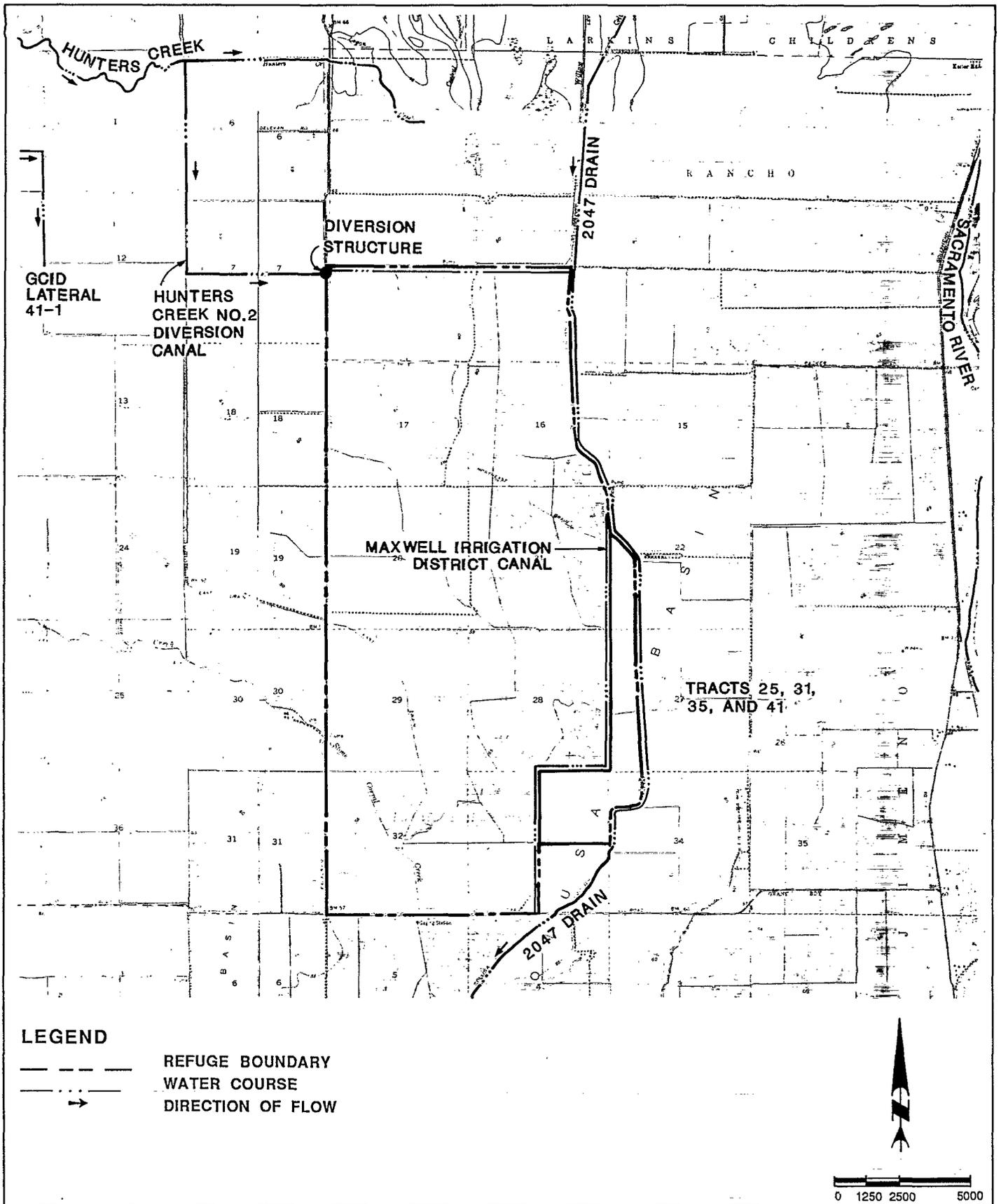


FIGURE IV C-1

DELEVAN NATIONAL WILDLIFE REFUGE
EXISTING WATER SUPPLY FACILITIES



from the rest of the Refuge water delivery system by the Maxwell Irrigation District Canal. This area is currently undeveloped due to lack of a water supply and distribution facilities.

The Refuge conveyance system is in relatively good condition, but allows for little reuse of water. The main delivery ditches on the northern and eastern boundaries need to be improved to increase conveyance capacity. Additional maintenance work is needed to repair levees and ditches which are damaged during periodic flooding.

3. Groundwater

The Refuge is located on flood plain deposits of the Sacramento River flood basin which is underlain by the Tehama Formation. No wells currently exist on the Refuge. However, shallow wells in the vicinity of the Refuge have produced less than 400 gpm and have experienced significant drawdowns. Wells drilled to depths of more than 400 feet may enter the Tehama Formation aquifer and could produce up to 1,000 gpm. Based upon existing data, the water quality appears to be suitable for irrigation and waterfowl needs. The safe yield of the aquifer under the Refuge has been estimated by Reclamation to be 6,800 acre-feet.

B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

The Service estimates that 30,000 acre-feet of water would be required for full development and optimum management of the entire Refuge. For the purposes of assessing the impacts of water delivery alternatives, four levels of water supply have been identified by the Service, as presented in Table IV C-1. Each of the water supply levels provide a different rate and volume of water, and are summarized as follows:

- Level 1 - Existing firm water supply
- Level 2 - Current average annual water deliveries
- Level 3 - Water supply needed for full use of existing development
- Level 4 - Water delivery needed for optimum management

1. Delivery Alternative for Level 1 (No Action Alternative) (0 acre-feet)

Because the Refuge does not have a firm water supply, no facilities are required.

2. Delivery Alternatives for Level 2 (20,950 acre-feet)

Alternatives 2A, 2B, and 2C have been developed to increase the dependability of the GCID water deliveries, especially during

TABLE IV C-1
 DEPENDABLE WATER SUPPLY NEEDS
 ALTERNATIVE SUPPLY LEVELS FOR THE DELEVAN NWR

Month	<u>Supply Level 1</u> ac-ft	<u>Supply Level 2</u> ac-ft	<u>Supply Level 3</u> ac-ft	<u>Supply Level 4</u> ac-ft
January	0	1,650	1,200	2,375
February	0	1,300	600	1,875
March	0	450	600	625
April	0	100	800	125
May	0	450	1,000	625
June	0	900	2,400	1,250
July	0	1,550	3,200	2,250
August	0	2,200	3,200	3,125
September	0	3,050	4,000	4,325
October	0	4,350	2,000	4,375
November	0	3,050	2,000	4,375
December	0	2,900	4,000	4,675
Total	0	20,950	25,000	30,000

Notes:

- Supply Level 1: Existing firm water supply
- Supply Level 2: Current average annual water deliveries
- Supply Level 3: Full use of existing development
- Supply Level 4: Optimum management

Sources: USBR, 1986a; USFWS, 1986d and 1986e

the winter months. Alternatives 2B and 2C were developed assuming that winter water would be provided to the GCID Main Canal.

Alternative 2A - Convey Water from Sacramento NWR. A pump station and 13,200-foot long pipeline would be constructed from the Sacramento NWR to the Refuge. Water would be conveyed to the Sacramento NWR as discussed in Chapter IV B. The pipeline would be constructed across agricultural fields. Rights-of-ways would be required for the pipeline alignment.

Alternative 2B - Construct Cross-over on Glenn-Colusa Irrigation District Lateral 41-1. A cross-over, or crosstie, ditch would be constructed to allow delivery of water to the northwestern corner of the Refuge from the GCID Main Canal when the flashboards in the Hunters Creek No. 2 Weir are removed. Water would be diverted from the TCC through the Wasteway Cross Channel to the GCID Main Canal and into GCID Lateral 41-1. A 5,250-foot long ditch and two siphons would be constructed from the GCID Lateral 41-1 to the existing ditch that conveys water from Hunters Creek No. 2 Diversion Canal to the Refuge, as shown in Figure IV C-2. The new ditch would bypass the Hunters Creek No. 2 Diversion Canal. This alternative also would reduce the need for use of waters in Hunters Creek during the late summer and fall months.

Alternative 2C - Improve Hunters Creek No. 2 Diversion Weir. Water would be delivered to the GCID Main Canal and diverted to Hunters Creek. A radial gate would be installed at Hunters Creek No. 2 Weir to allow continued operation of the weir during the winter. The radial gate could be easily opened to allow passage of flood flows and then closed even if water is present in the canal. This alternative also may be implemented if GCID dewateres the Main Canal because water can be diverted directly from the TCC to Hunters Creek if a turnout is constructed.

Alternative 2D - Implement a Conjunctive Use Plan. Twenty-eight wells would be constructed on the Refuge to deliver the maximum month water demand. The exact locations of the wells on the Refuge would be determined in a future study. The wells would be developed as part of a conjunctive use program. During dry years, water demands would be supplied by wells, as discussed in Chapter III. During wet years, the wells would probably not be needed if CVP water is provided. Implementation of this alternative also would require implementation of Alternatives 2A, 2B, or 2C.

Delivery Alternatives for Level 3 (25,000 acre-feet)

Water deliveries under Level 3 are similar to the Level 2 deliveries. The same alternatives considered for Level 2 were evaluated for Level 3.

Alternative 3A - Convey Water from the Sacramento NWR. This alternative is identical to Alternative 2A.

Alternative 3B - Construct Cross-over on Glenn-Colusa Irrigation District Lateral 41-1 This alternative is identical to Alternative 2B.

Alternative 3C - Improve Hunters Creek No. 2 Diversion Weir. This alternative is identical to Alternative 2C.

Alternative 3D - Implement a Conjunctive Use Plan. Twenty-eight wells would be constructed on the Refuge to deliver the maximum month water demand. This alternative is similar to Alternative 2D, and would require implementation of Alternatives 3A, 3B, or 3C.

4. Delivery Alternatives for Level 4 (30,000 acre-feet)

Surface drainage from the main portion of the Refuge to Tracts 25, 31, 35, and 41 is blocked by the Maxwell Irrigation District Canal. Due to a lack of water, this southeastern portion of the Refuge is currently not developed. The alternatives for Level 4 provide for conveyance of water to this undeveloped area.

Alternative 4A - Construct Pump Station on the 2047 Drain. A 25 cfs pump station would be constructed on the Reclamation District 2047 Drain. The pump station would transfer water from the 2047 Drain directly to the southeastern portion of the Refuge. A weir also would be required to ensure pump operation during low flow periods. The water delivered under this alternative would consist of CVP water co-mingled with agricultural return flows. Therefore, the water would be of lesser quality than 100-percent CVP water, but adequate for the refuge uses.

Alternative 4B - Construct Siphons Under the Maxwell Irrigation District Canal. To allow water to flow to the southeastern portion of the Refuge, three siphons would be constructed under the Maxwell Irrigation District Canal at the natural drainage courses. This alternative would maximize reuse of flows from the northern portions of the Refuge. Under this alternative, CVP water would be provided to the Refuge in the winter through facilities described in Alternatives A or B.

Alternative 4C - Implement a Conjunctive Use Plan. Thirty wells would be constructed on the Refuge to deliver the maximum month water demand. This alternative is similar to Alternative 2D, and would require implementation of Alternatives 3A, 3B, or 3C and Alternatives 4A, 4B, or 4C.

5. Summary of Alternatives

The beneficial and adverse effects of each alternative were compared with respect to the criteria listed in Chapter III.

There are no alternatives for Level 1 because the Refuge does not have a firm water supply.

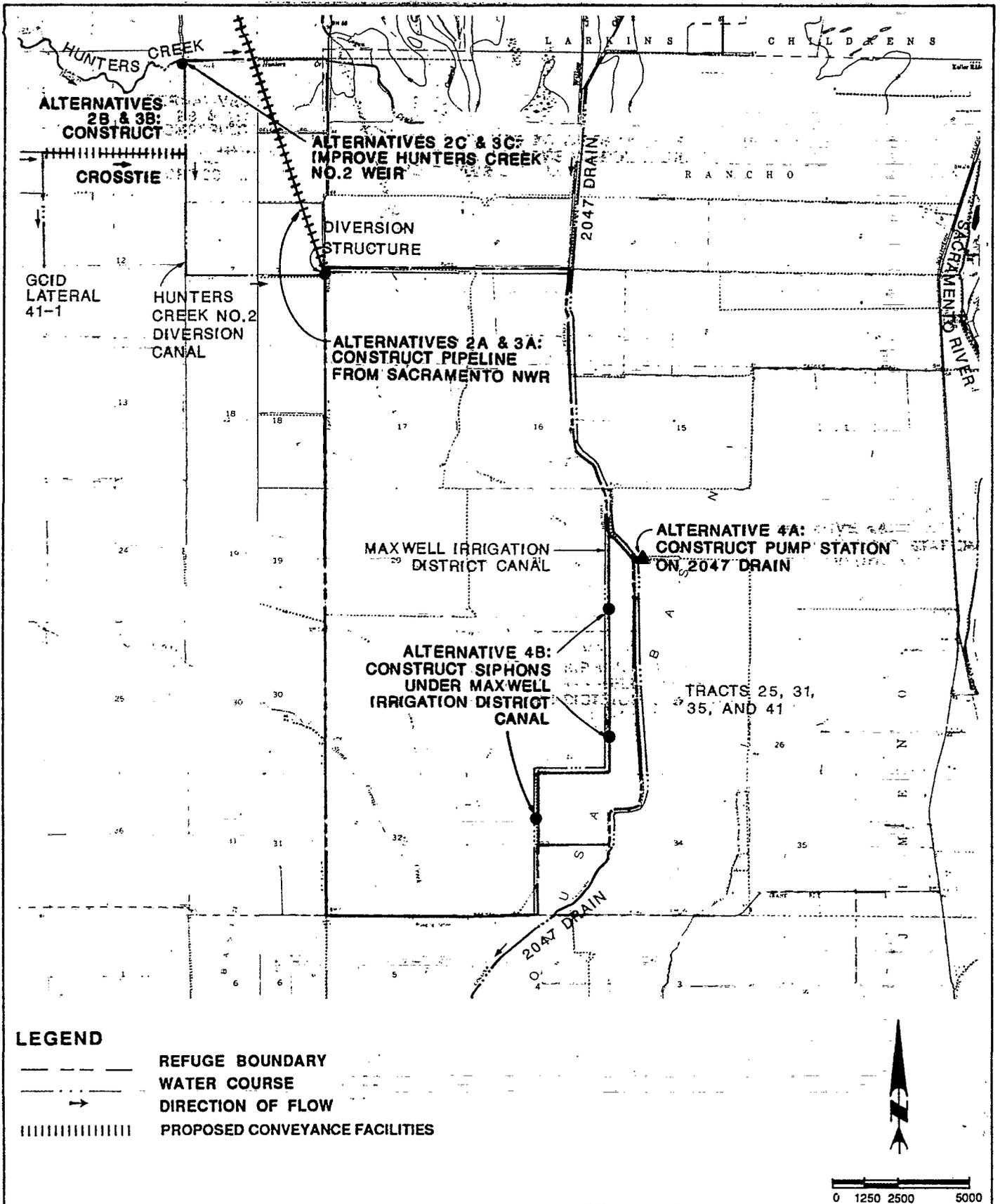


FIGURE IV C-2
DELEVAN NATIONAL WILDLIFE REFUGE
ALTERNATIVE WATER SUPPLY FACILITIES



Alternatives 2A and 3A would maximize the use of water allocated to Sacramento NWR and minimize the need to use GCID facilities during the winter. Alternatives 2B and 2C and Alternatives 3B and 3C would provide winter water when the Hunters Creek No. 2 Weir is opened. All of these alternatives assume that winter water will be provided to the TCC from the Red Bluff Diversion Dam or surplus water from Black Butte Reservoir. Alternatives 2B and 2C and Alternatives 3B and 3C would require long-term contracts with GCID.

Alternatives 4A and 4B would provide water to the undeveloped southeastern portion of the Refuge. Alternative 4B would have lower operating costs than Alternative 4A because Alternative 4B would not require construction and operation of additional lift stations. Alternative 4B also would allow water from the main part of the Refuge to be reused in the southeastern portion. The quality of water from the main part of the Refuge (Alternative 4B) may be of a better quality than water from the 2047 Drain (Alternative 4A) which contains agricultural return flows during portions of the year. Alternatives 4A and 4B would require implementation of Alternatives 3A, 3B, or 3C.

Alternatives 2D, 3D, and 4C would provide wells to be used during during dry years when CVP water may not be available. This alternative would cause overdraft conditions because the water needs would exceed the safe yield under the Refuge. Alternative 2D would require implementation of Alternatives 2A, 2B, or 2C. Alternative 3C would require implementation of Alternatives 3A, 3B, or 3C. Alternative 4C would require implementation of Alternatives 3A, 3B, or 3C as well as Alternatives 4A or 4B.

C. COSTS AND ECONOMICS ANALYSIS

Costs for the alternative plans to provide adequate water supplies under Levels 2, 3, and 4 are presented in Table IV C-2. The construction costs include factors to cover engineering, contingencies, and overhead costs. Annual operation and maintenance (O&M) costs include only the local cost of delivering water. The O&M costs do not include costs to purchase CVP water. During the advanced planning phase, these costs will be refined further.

Construction of the facilities under all of the alternatives would result in additional money being spent in the economy of Colusa County during the construction period. The construction could be completed within one summer season by construction workers who reside within the area.

Currently, the annual public use (Level 2) at the Refuge is about 7,800 visits per year. If additional water is provided the public use levels are not anticipated to increase.

D. WILDLIFE RESOURCES

The annual bird use on the Refuge is approximately

TABLE IV C-2
SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES
DELEVAN NWR

Items	Alternatives										
	2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C
Additional Water (ac-ft)	20,950	20,950	20,950	20,950	25,000	25,000	25,000	25,000	30,000	30,000	30,000
Construction Costs											
Wells	\$ ---	\$ ---	\$ ---	\$1,439,200 ^(d)	\$ ---	\$ ---	\$ ---	\$1,439,200 ^(d)	\$ ---	\$ ---	\$1,545,000 ⁽ⁱ⁾
Diversion Structures	---	---	225,000 ^(c)	---	---	---	225,000 ^(c)	---	---	---	---
Pipelines/Canals	567,200 ^(a)	153,400 ^(b)	---	---	567,200 ^(a)	153,400 ^(b)	---	---	---	21,000 ^(h)	---
Pump Stations	---	---	---	---	---	---	---	---	120,000 ^(f)	---	---
Subtotal	\$567,200	\$153,400	\$225,000	\$1,439,200	\$567,200	\$153,400	\$225,000	\$1,439,200	\$120,000	\$21,000	\$1,545,000
Other Costs	---	---	---	567,200 ^(e)	---	---	---	567,200 ^(e)	567,200 ^(g)	567,200 ^(g)	588,200 ^(j)
Total ^(l)	\$567,200	\$153,400	\$225,000	\$2,006,400	\$567,200	\$153,400	\$225,000	\$2,006,400	687,200	588,200	2,133,200
Annualized Construction Cost (3.87%, 30 yrs)	\$54,570	\$14,760	\$21,650	\$193,020	\$54,570	\$14,760	\$21,650	\$193,020	\$66,110	\$56,590	\$205,220
Operation & Maint. ^(k)	\$2,850	\$3,070	\$1,100	\$48,900	\$2,850	\$3,070	\$1,100	\$48,900	\$1,100	\$2,110	\$52,500
Power	---	---	500 ^(m)	125,700 ^(n,o)	---	---	500 ^(m)	150,000 ^(n,o)	5,000 ^(p)	---	180,000 ^(n,o)
Local Conveyance Cost ^(q)	---	31,430	31,420	---	---	37,500	37,500	---	7,500	7,500	---
Subtotal	\$2,850	\$34,500	\$33,020	\$174,600	\$2,850	\$40,570	\$39,100	\$198,900	\$13,600	\$9,610	\$232,500
Other Costs	---	---	---	1,430 ^(e,o)	---	---	---	\$1,430 ^(j,o)	2,850 ^(g)	2,850 ^(h)	6,230 ^(e,o)
Total ^(l)	\$2,850	\$34,500	\$33,020	\$176,030	\$2,850	\$40,560	\$39,100	\$200,330	\$16,450	\$12,460	\$238,730
Total Annual Costs	\$57,420	\$49,260	\$54,670	\$369,050	\$57,420	\$55,330	\$60,750	\$393,350	\$82,560	\$69,050	\$443,950
Cost/Additional Acre/Foot	\$2.80	\$2.40	\$2.60	\$17.70	\$2.30	\$2.20	\$2.40	\$15.80	\$2.80	\$2.30	\$14.80

Notes: Alternatives 2A and 3A - Convey Water from Sacramento NWR.
 Alternatives 2B and 3B - Construct Cross-over on Glenn-Colusa Irrigation District Lateral 41-1.
 Alternatives 2C and 3C 2D, 3D, 4C - Implement a Conjunctive Use Plan.
 Alternative 4A - Construct Pump Station on 2047 Drain.
 Alternative 4B - Construct Siphons under the Maxwell Irrigation District Canal.

TABLE IV C-2
SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES
DELEVAN NWR
(Continued)

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- (a) 13,200-foot long, 30-inch diameter pressure pipeline; 3 siphons
 - (b) 5,250-foot canal, 120 cfs; including eight 48-inch diameter, 80-foot long siphons.
 - (c) Radial gate.
 - (d) 28 wells, 500-feet deep, 100-foot lift.
 - (e) Alternative 2C assumes implementation of Alternative 2A, and Alternative 3C assumes implementation of Alternative 3A.
 - (f) 25 cfs, 10-foot lift pump.
 - (g) Alternatives 4A and 4B would require implementation of Alternative 3A.
 - (h) Three 36-inch, 80-foot long siphons.
 - (i) 30 wells, 500-feet deep, 100-foot lift.
 - (j) Alternative 4C assumes implementation of Alternative 4B.
 - (k) Basis for O&M costs are discussed in Appendix F.
 - (l) Costs have not been included in this analysis to fund facilities described in Chapter IV-B to provide winter water supplies.
 - (m) Power Cost for moving radial gate is \$500/year.
 - (n) Unit Pumping Cost = \$12.00/af.
 - (o) Values were multiplied by 0.5 because facilities are assumed to be used only 5 out of 10 years.
 - (p) Unit Pumping Cost = \$1.00/af.
 - (q) Unit Conveyance Cost = \$1.50/af.

35,478,000 use-days based upon census data from 1987. Approximately 71 and 26 percent of the waterfowl use are by ducks and geese, respectively, including many species which nest on the Refuge. Wildlife and fishery resources associated with the Refuge are presented in Table IV C-3. The listed threatened and endangered species associated with the Refuge are: bald eagle, Haliaeetus leucocephalus; peregrine falcon, Falco peregrines anatum; Aleutian Canada Goose, Branta Canadensis Leucopareia; and the valley elderberry longhorn beetle, Desmocerus Californicus Dimorphus. Candidate species associated with the Refuge include the white-faced ibis, Plegadis chichi; tricolored blackbird, Agelaius tricolor; and California hibiscus, Hibiscus californicus, as listed in Table IV C-4.

Facilities discussed under any of the alternatives would provide a more reliable water supply and additional water to improve habitat and develop additional ponds, seasonal marsh, and watergrass areas. The improved habitat would increase the number of bird-use days, as indicated in Table IV C-5.

Implementation of the plans probably would not adversely affect the listed candidate, threatened and endangered species of birds, and would improve habitat that could be used by the white-faced ibis and Aleutian Canada goose. Detailed field investigations will be completed during the advanced planning phase of the project. Implementation of any of the alternatives would result in overall beneficial environmental effects. The No Action Alternative would result in the loss of habitat and associated recreation and wildlife use. Additional regional environmental analyses will be completed as part of the Water Contracting EIS's.

E. SOCIAL ANALYSIS

The social consequences of constructing and operating the ditches and siphons, or new wells would be positive due to the potential public use.

F. POWER ANALYSIS

The Pacific Gas & Electric Company (PG&E) serves the Refuge under the PA-1 rate schedule for agricultural users. A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver CVP project-use power to the Refuge is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A detailed discussion of project-use power and wheeling agreements is provided in Chapter II.

G. PERMITS

Construction of the ditches, siphons, or wells would require several permits. Colusa County would require approvals for construction along stream banks and within natural drainage courses to ensure that existing drainage facilities would not

TABLE IV C-3

FISH AND WILDLIFE RESOURCES

DELEVAN NWR

Ducks

Hooded Merganser	Blue Winged Teal ^(a)	Ring Necked Duck
Mallard ^(a)	Northern Shoveler ^(a)	Common Goldeneye
Gadwall ^(a)	Pintail ^(a)	Greater Scaup
European Wigeon	Wood Duck ^(a)	Lesser Scaup
American Wigeon	Redhead ^(a)	Buffle Head
Green winged Teal ^(a)	Canvasback	Common Merganser ^(a)
Cinnamon Teal ^(a)	Ruddy Duck ^(a)	

Geese and Swans

Snow Goose	White-fronted Goose	Cackling Canada Goose
Ross' Goose	Canada Goose	Lesser Canada Goose
		Tundra Swan

Coots

American Coot^(a)

Shore and Wading Birds

Western Grebe ^(a)	Virginia Rail ^(a)	Common Snipe
Eared Grebe	Sora ^(a)	Long-billed Dowitcher
Pied-billed Grebe ^(a)	Common Gallinule ^(a)	Least Sandpiper
Double-crested Cormorant	Ring-billed Gull	Dunlin
White Pelican	Caspian Tern ^(a)	Western Sandpiper
American Bittern ^(a)	Forster's Tern	Greater Yellowlegs
Least Bittern ^(a)	Black Tern ^(a)	Long-billed Curlew
Great Blue Heron ^(a)	Wilson's Phalarope	Killdeer ^(a)
Great (common) Egret ^(a)	American Avocet	Black-crowned Night Heron ^(a)
Snowy Egret ^(a)	Black-Necked Stilt	Greater Sandhill Crane
Green-backed Heron ^(a)		

TABLE IV C-3

FISH AND WILDLIFE RESOURCES

DELEVAN NWR
(Continued)

Upland Game		
Ringed-necked Pheasant ^(a) California Quail (a)	Rock Dove	Mourning Dove ^(a)
Raptorial Birds		
Turkey Vulture Sharp-shinned Hawk ^(a) Rough-legged Hawk Great Horned Owl ^(a) Bald Eagle	Black-Shouldered Kite ^(a) Cooper's Hawk ^(a) American Kestrel ^(a) Red Shouldered Hawk ^(a)	Northern Harrier Red-tailed Hawk ^(a) Barn Owl ^(a) Golden Eagle Peregrine Falcon
Fish		
Steelhead Trout Catfish	Salmon Black Crappie	Largemouth Bass
Furbearers		
Opossum Raccoon Skunk	Gray Fox Beaver Muskrat	Coyote Mink
Others		
Black-tailed Deer		

Notes:

(a) Birds nesting on refuge

Source: USFWS computerized annual printout for NWR Birds, Department of Interior, USFWS (RF11650-2 9-79) (July 1973 to June 1974, NWR Public Use Report (1)) and refuge records.

TABLE IV C-4

FEDERALLY LISTED, PROPOSED, & CANDIDATE THREATENED & ENDANGERED SPECIES

DELEVAN NWR

Listed Species

Birds

Aleutian Canada goose, Branta canadensis leucopareia (E)
Bald Eagle, Haliaeetus leucocephalus (E)
Peregrine Falcon, Falco peregrines anatum (E)

Invertebrates

Valley elderberry longhorn beetle, Desmocerus californicus dimorphus
(T)

Proposed Species

None

Candidate Species

Birds

White-faced ibis, Plegadis chihi (2)
Tricolored blackbird, Agelaius tricolor (2)

Plants

California hibiscus, Hibiscus californicus (2)

Source: USFWS, June 4, 1987

(E)—Endangered

(T)—Threatened

(CH)—Critical Habitat

(1)—Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(2)—Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

TABLE IV C-5
WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS
DELEVAN NWR

	No Action Alternative	Alternatives										
		2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C
Habitat Acres												
Permanent Pond	--	53	53	53	53	70	70	70	70	86	86	86
Seasonal Marsh	--	3,407	3,407	3,4067	3,407	3,750	3,750	3,750	3,750	4,000	4,000	4,000
Watergrass	--	316	316	316	316	316	316	316	316	450	450	450
Rice	--	204	204	204	204	204	204	204	204	204	204	204
Bird Use Days												
Ducks	--	25,165,000	25,165,000	25,165,000	25,165,000	27,440,000	27,440,000	27,440,000	27,440,000	29,970,000	29,970,000	29,970,000
Geese	--	9,172,000	9,172,000	9,172,000	9,172,000	10,000,000	10,000,000	10,000,000	10,000,000	10,920,000	10,920,000	10,920,000
Waterbirds	--	1,141,000	1,141,000	1,141,000	1,141,000	1,240,000	1,240,000	1,240,000	1,240,000	1,355,000	1,355,000	1,355,000
Endangered Species	--	100	100	100	100	100	100	100	100	100	100	100
Total	--	35,478,100	35,478,100	35,478,100	35,478,100	38,680,100	38,680,100	38,680,100	38,680,100	42,245,100	42,245,100	42,245,100
Public Use Days												
Consumptive	--	5,600	5,600	5,600	5,600	5,900	5,900	5,900	5,900	6,200	6,200	6,200
Non-Consumptive	--	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Total	--	7,800	7,800	7,800	7,800	8,100	8,100	8,100	8,100	8,400	8,400	8,400
Total Annual Cost	--	\$ 57,420	\$ 49,260	\$ 54,670	\$ 369,050	\$ 57,420	\$ 55,330	\$ 60,750	\$ 393,350	\$ 82,560	\$ 69,050	\$ 443,950
Incremental Cost/Additional 1000 Bird Use Days	N/A	\$ 1.60	\$ 1.40	\$ 1.50	\$ 10.40	\$ 1.50	\$ 1.40	\$ 1.60	\$ 10.20	\$ 2.00	\$ 1.60	\$ 10.50
Incremental Cost/Additional Public Use Day	N/A	\$ 7.40	\$ 6.30	\$ 7.00	\$ 47.30	\$ 7.10	\$ 6.80	\$ 7.50	\$ 48.60	\$ 9.80	\$ 8.20	\$ 52.90

Notes: Alternatives 2A and 3A - Convey water from Sacramento NWR
 Alternatives 2B and 3B - Construct cross-over on Glen-Colusa Irrigation District Lateral 41-1
 Alternatives 2C and 3C - Improve Hunter's Creek No. 2 Diversion Weir
 Alternatives 2D, 3D, and 4C - Implement a Conjunctive Use Plan
 Alternative 4A - Construct Pump Station on 2047 Drain
 Alternative 4B - Construct Siphons under the Maxwell Irrigation District Canal

be adversely affected by the new ditches and siphons. Colusa County also would issue permits for well construction under Alternatives 2D, 3D, or 4C. Construction of Alternative 4B facilities under the Maxwell Irrigation District Canal would require approvals from Maxwell Irrigation District. Construction within streams would require Stream Alteration Permits from DFG and possibly Corps of Engineers permits for construction in wetlands or riparian corridors.

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