
CHAPTER IV A

Modoc National Wildlife Refuge Alternative Plans



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

CHAPTER IV A

MODOC NATIONAL WILDLIFE REFUGE

Modoc National Wildlife Refuge (Refuge) was authorized by the Migratory Bird Conservation Commission in 1959 and is currently managed by the Service. The original 5,966-acre tract was acquired in 1961 and subsequently expanded to 6,283-acres. The Refuge is located in Modoc County, south of Alturas in the Pit River Valley which is part of the Sacramento River Valley hydrologic basin. The North and South Forks of the Pit River merge near the northwest corner of the Refuge, as shown in Figure IV A-1.

Historically, the Refuge has been an important area for waterfowl migrating between the Malheur National Wildlife Refuge in the Harney Basin of Oregon and the Central Valley of California.

Water applied on the Refuge is used to irrigate grain crops, flood ponds and meadows, maintain pond levels, and circulate pond water. Typically, grain is planted on about 500 acres to provide forage for waterfowl. Cattle graze on part of the Refuge following the harvest. Most ponds remain flooded year-round to accommodate a large flock of Canada geese and other resident waterfowl. Nesting islands are constructed and maintained within the ponds. Occasionally, the water levels are withdrawn to allow repairs of dikes and water-control structures and rehabilitation of the nesting islands.

A. WATER RESOURCES

In general, the Refuge receives adequate water supply in most years to maintain existing wetlands. The Refuge receives water from the South Fork Pit River, Dorris Reservoir, and Pine Creek. The Refuge has the right to divert 18,550 acre-feet of water from the South Fork Pit River, North Fork Pit River, and Pine Creek. Dorris Reservoir impounds water from Pine Creek and North Fork Pit River via Parker Creek. Water quality is good for irrigation and wildlife. However, an adequate water supply is not available during August when the ponds need to be flooded, especially in the western portion of the Refuge along the South Fork of the Pit River.

1. Surface Waters

The South Fork Pit River flows are regulated by West Valley Creek Reservoir. The water is diverted to the Refuge at South Fork Dam and Sharkey Dam to irrigate the southern portion of the Refuge. Most of the water eventually returns to the river. That portion of the Refuge adjacent to the South Fork Pit River was part of the Dorris Ranch prior to acquisition by the Federal government. The Dorris Ranch was not part of the South Fork Pit River Decree No. 3273 which defines the water rights; therefore, the water rights are undefined. This water has been used on riparian land when water is

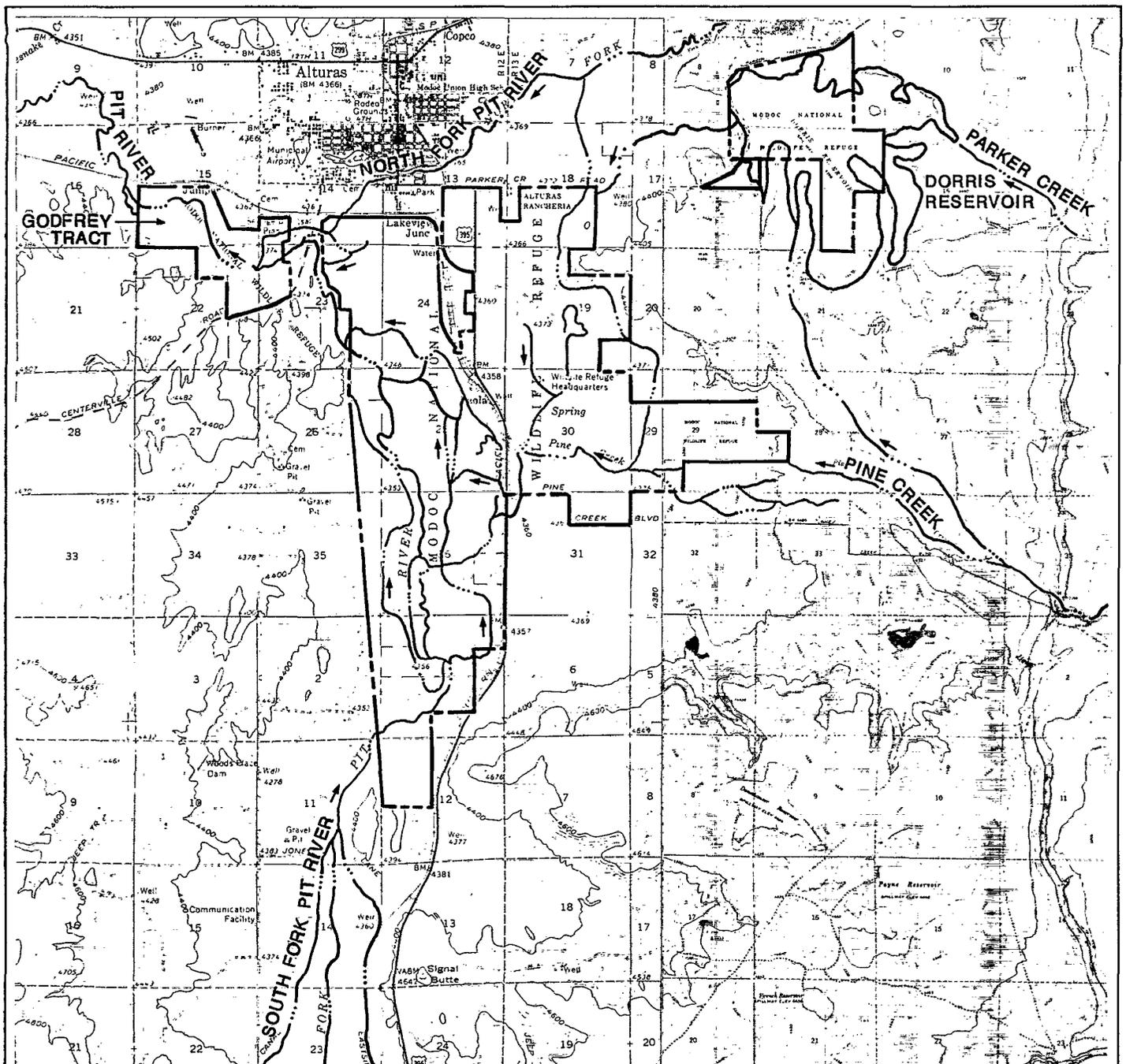
available in that portion of the river. All natural flows in the South Fork Pit River are allocated upstream of the Refuge except during the spring high flow period.

Dorris Reservoir, which is partially located within the Refuge boundaries, also provides a significant portion of the Refuge water supply. The reservoir stores water from runoff and snowmelt from Parker Creek, Pine Creek, and Stockdill Slough watersheds. The Refuge has a total storage and diversion right of 11,100 acre-feet of surplus water from the reservoir. This water right includes 6,100 acre-feet from Parker Creek under the North Fork Pit River Decree and Application 1321, 800 acre-feet from Stockdill Slough under the North Fork Pit River Decree and Application 1042, 3,100 acre-feet from Pine Creek under the Pine Creek Agreement and Applications 760 and 1042, and 1,100 acre-feet from Pine Creek under Appropriative License 4822 and Application 12263. The water is generally available during any season if the rights of other users have been met.

Under the North Fork Pit River Decree (Decree 4074), the Refuge has the right to divert 12.66 cfs of fourth class priority water at Diversion Point 142 from September 30 to April 1. An additional 37.98 cfs used to be diverted whenever the flow in the North Fork exceeds 52.08 cfs. However, this additional diversion has been withdrawn since Hughes Dam was destroyed in 1939.

Additionally, the Refuge diverts water directly from Pine Creek to irrigate 340 acres of refuge land known as the Pine Creek Field, which is located at elevations above the diversion from Dorris Reservoir. Under the Pine Creek Agreement, the Refuge has the right to divert 10 cfs of first priority water and 20 cfs of second priority water from Pine Creek to irrigate 2,700-acres of land between April 1 and September 30. This agreement also states that the Dorris Ranch be allowed to divert 3.78 cfs or one-half of the Pine Creek flow, whichever is less, until the amount available from the North Fork Pit River decreases below 37.98 cfs. At that time, the amount of water diverted from Pine Creek can be increased up to one-half of the flow in Pine Creek. The agreement also gives the Refuge the right to divert 0.34 cfs of the first priority water and 0.45 cfs of second priority water from Pine Creek at Diversion Point 1 to irrigate 72 acres in the southern half of the southwestern quarter.

The Refuge does not have any water rights on the Pit River. All claims and water rights along the Pit River for the northwestern portion of the Refuge, also known as the Godfrey Tract, were sold in 1919. During wet years, surplus water is available during July and August for storage on the Refuge under the State Water Resources Control Board Decision 990.



LEGEND

- REFUGE BOUNDARY
- WATER COURSE
- DIRECTION OF FLOW

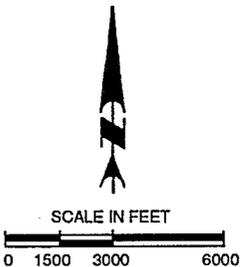


FIGURE IV A-1

MODOC NATIONAL WILDLIFE REFUGE

EXISTING WATER SUPPLY FACILITIES



2. Water Conveyance Facilities

Water is diverted at various locations from the South Fork of the Pit River and is used primarily on the west side of the Refuge. Land which is located along Pine Creek at elevations above Dorris Reservoir is irrigated with water diverted directly from Pine Creek. Most of the water from Pine Creek is transported through a ditch to Dorris Reservoir from November through April. The eastern and central portions of the Refuge receives water directly from Dorris Reservoir or from the Dorris Reservoir Canal located downstream of the reservoir. All surface waters are delivered by gravity flow.

3. Groundwater

The Refuge is located in the Alturas Groundwater Basin, which consists of volcanic and sedimentary formations. The principal water bearing deposits are included within the moderately consolidated Alturas Formation, which consists of moderately consolidated beds of tuff, ashy sandstone, and diatomite. This formation is separated into an upper and lower member by a Plio-Pleistocene basalt and the Warm Springs tuff member. Buried lava flows may yield more groundwater than other formations. Volcanic uplands surrounding the Refuge serve as recharge areas for the moderate to highly permeable aquifers of the Alturas Formation. Groundwater movement is from the mountains towards the valley floor. Groundwater movement along the valley floor is north towards Alturas. Groundwater often exists near the land surface. Groundwater levels in the vicinity of the Refuge are about 50 feet below the ground surface with slightly lower levels north of the Refuge towards Alturas. Most wells in the vicinity of the Refuge were drilled to depths of 250 to 350 feet (DWR, 1986a). Previous investigations have estimated that these wells should produce 300 to 1,000 gallons of water per minute. The groundwater quality has alkaline tendencies, but appears to be adequate for irrigation and waterfowl use (Service, 1978; DWR, 1986a).

The Refuge currently has one well. In the past, this well has not been used due to high power costs, and as a result, the pump has become inoperable. The pump would need to be rehabilitated to be used in the future. Reclamation estimates that the safe yield of the Refuge is 2,200 acre-feet. Portions of the Refuge in the Godfrey Tract and along the most easterly boundaries may be underlain by thinner permeable formations and may have lesser amounts of water.

B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

The Service estimates that 20,550 acre-feet of water would be required for full development and optimum management of the entire Refuge. For the purpose of assessing the impacts of water delivery alternatives, four levels of water supply have been identified, as

presented in Table IV A-1. Each of the water supply levels provide a different 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) (18,550 acre-feet)

Since this level represents the existing firm water supply, existing facilities would be used to provide a dependable conveyance system for the Refuge. Therefore, no alternatives were developed for Level 1. Water would not be available for the Godfrey Tract due to lack of facilities. During the month of August in all years and during drought years water may not be available in the central portion of the Refuge.

2. Delivery Alternative for Level 2 (18,550 acre-feet)

Under normal conditions, the surface waters are adequate to supply 18,550 acre-feet of water each year. However, during years which are drier than normal, adequate water is not available in the fall. This alternative would ensure delivery of average annual flows during dry years.

Alternative 2A - Rehabilitate Well. The existing well would be rehabilitated and used in dry years at the end of the summer and fall seasons to provide additional water (approximately 490 acre-feet) to portions of the Refuge when adequate water does not flow in the South Fork of the Pit River. During years when surplus water is available on the South Fork of the Pit River, the well would not be needed. This alternative would not require additional water rights or contracts. The location of the existing well is indicated in Figure IV A-2.

3. Delivery Alternative for Level 3 (19,500 acre-feet)

Under this level, existing conveyance facilities would be used to fully serve the currently developed portions of the Refuge. The additional water would be used to extend the duration of flooding to earlier in the spring and later in the fall. However, additional water supplies would be required through the acquisition of water rights or the use of groundwater. Because acquisition of new water rights may be difficult, the alternative for Level 3 would be similar to Alternative 2A.

TABLE IV A-1

DEPENDABLE WATER SUPPLY NEEDS

ALTERNATIVE SUPPLY LEVELS FOR THE MODOC 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	1,030	1,030	1,080	1,140
February	1,130	1,130	1,190	1,250
March	840	840	880	930
April	1,990	1,990	2,090	2,210
May	2,430	2,430	2,550	2,690
June	2,600	2,600	2,730	2,880
July	2,110	2,110	2,220	2,340
August	2,320	2,320	2,450	2,570
September	1,990	1,990	2,090	2,210
October	920	920	970	1,020
November	590	590	620	650
December	600	600	630	660
Total	18,550	18,550	19,500	20,550

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

Source: Doug Weinrich, Ecological Services, USFWS, 1987

Alternative 3A - Rehabilitate Well. The existing well would be rehabilitated and used to extend the duration of flooding and increase circulation on the reservoir. The well would provide 950 acre-feet of water.

4. Delivery Alternatives for Level 4 (20,550 acre-feet)

New facilities would be constructed to serve the western portion of the Refuge (Godfrey Tract) which is currently not developed. Two alternatives have been developed to provide water to the western portion of the Refuge under Level 4. Both alternatives would require implementation of Alternative 3A.

Alternative 4A - Construct Wells and Rehabilitate Dam Structure on Pit River. This alternative would allow diversion of additional water from the Pit River to the Godfrey Tract. The additional water could be obtained from wells or from unappropriated water which is only available during wet years. The wells would be located in the central portion of the Refuge, however, the exact location of the wells is not known at this time. During years when surplus water is available on the Pit River, the wells may not be needed.

Four 600 gpm wells would be constructed to a depth of 600 feet. The new wells would be located in the general vicinity of the existing well to reduce the cost of placing the electrical distribution facilities underground. The water would be discharged into ditches which would transfer the flow to the South Fork Pit River for continued flow into the Pit River. An existing dam on the Pit River would be rehabilitated to allow transfer of water to the Godfrey Tract, as indicated in Figure IV A-2.

A potential consideration under this alternative would be the use of groundwater in the central portion of the Refuge and use of surface water on the Godfrey Tract. This would require transfer of the place of diversion from the South Fork Pit River water to the Pit River. However, the transfer of the place of diversion probably could not be implemented because the existing water rights are for the use of the water on specific lands in the central portion of the Refuge.

Alternative 4B - Construct Wells in the Godfrey Tract. Water wells would be constructed in the Godfrey Tract to provide an additional 2,000 acre-feet per year with a maximum of 280 acre-feet in June. However, the water bearing formations are not extensive in this area and the maximum well production may be limited to 50 gpm (DWR,1986a). As a result, the wells may not produce adequate water supplies. In addition, the aquifer may be connected to the surface waters. Therefore, if large amounts of water are withdrawn from the Godfrey Tract, the stream flows may decrease.

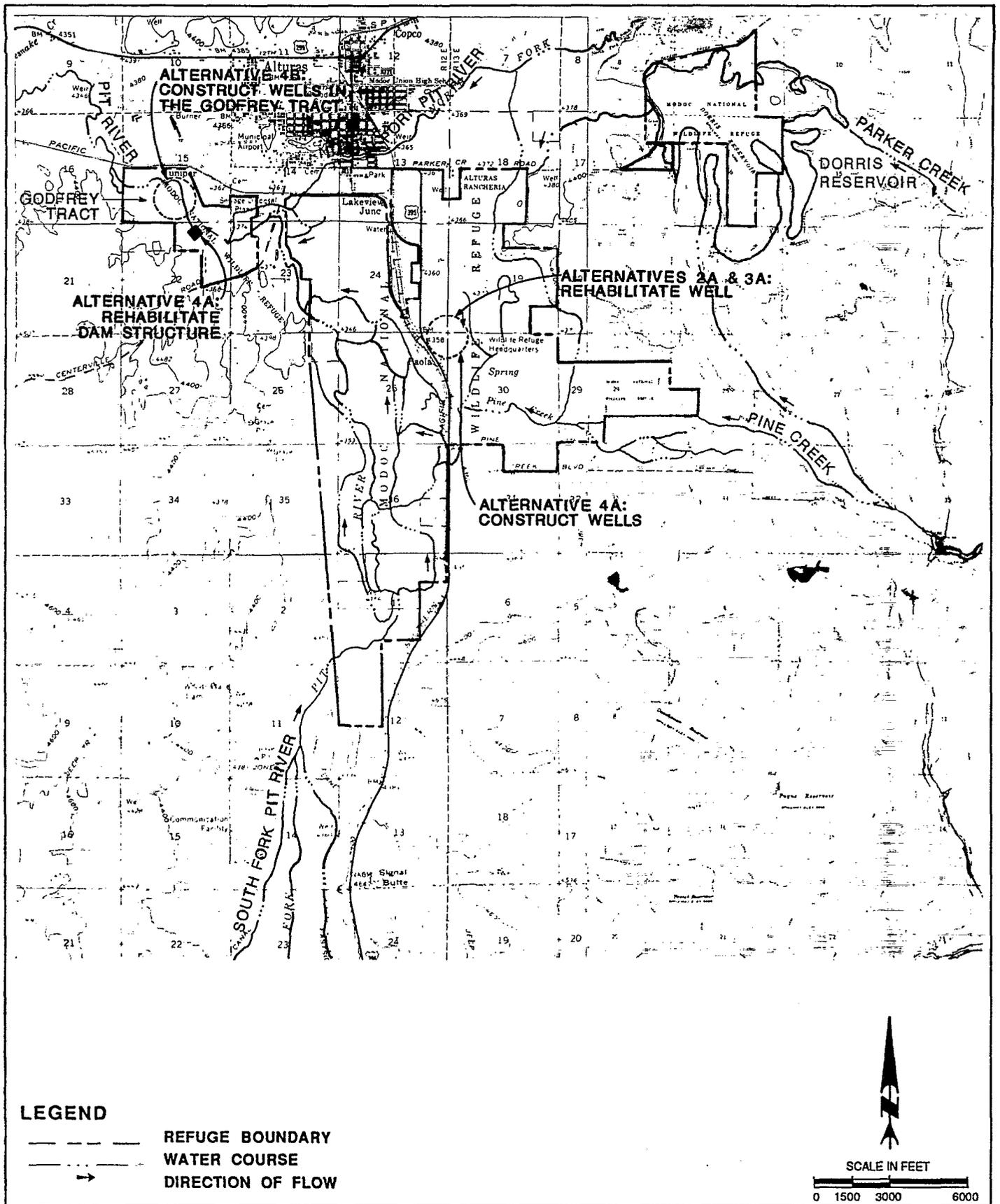


FIGURE IV A-2

MODOC NATIONAL WILDLIFE REFUGE
ALTERNATIVE WATER SUPPLY FACILITIES



5. Summary of Alternatives

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

There are no facilities alternatives necessary for Level 1.

Alternatives 2A and 3A would provide supplemental water for the central portion of the Refuge when adequate water is not available from the South Fork Pit River.

Alternatives 4A and 4B would supply water to the Godfrey Tract. Alternative 4A would require construction and operation of wells and a dam structure. In addition, implementation of Alternative 4A would require approvals from the State Water Resources Control Board and State Department of Water Resources to convey water through the South Fork Pit River and Pit River to the western portion of the Refuge. This alternative also would require implementation of Alternative 3A.

Alternative 4B would only require construction and operation of wells. However, these wells would be located in areas which may not have sufficient water bearing formations. Therefore, adequate water may not be provided under this alternative. This alternative would require implementation of Alternative 3A.

C. COSTS AND ECONOMIC ANALYSIS

Costs for alternative plans to provide adequate water supplies under water delivery Levels 2, 3, and 4 are presented in Table IV A-2. The construction costs include factors to cover engineering, contingencies, and overhead costs. The operation costs only represent the incremental cost to provide additional water. The costs do not include the cost to provide water under Level 1. During the advanced planning phase, these costs will be refined further.

Improvements described under the alternatives plans to provide Levels 2, 3, or 4 would result in additional money being spent in the economy of Modoc County during construction. The construction could be completed within one summer season by construction workers who reside in Modoc County.

D. WILDLIFE RESOURCES

The annual bird use on the Refuge is approximately 3,356,000 use-days based upon the annual average use from 1981 through 1985. Approximately 68 and 32 percent of the bird use are by ducks and geese, respectively, including many species which nest on the Refuge. Fish and wildlife resources associated with the Refuge are presented in Table IV A-3. The listed threatened and endangered species associated with the Refuge are the bald eagle, Haliaeetus

TABLE IV A-2
SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES
MODOC NWR

Items	Alternatives			
	2A	3A	4A	4B
Additional Water (ac-ft)	490	950	2,000	2,000
Construction Cost				
Wells	\$ 16,500	\$ 16,500	\$186,000 ^(a)	\$963,200 ^(b)
Dams/Diversion Structures	---	---	20,000	---
Subtotal	\$ 16,500	\$ 16,500	\$206,000	\$963,000
Other Costs	---	---	16,500 ^(c)	26,500 ^(c)
Total (d)	\$ 16,500	\$ 16,500	\$222,500	\$979,000
Annualized Construction Costs (8.87%, 30 yrs)	\$ 1,590	\$ 1,590	\$ 21,410	\$ 94,180
Additional Annual Costs				
Operation & Maintenance ^(e)	\$ 650	\$ 650	\$ 2,600	\$ 27,500
Power	1,960 ^(f)	3,800 ^(f)	4,200 ^(g)	4,200 ^(g)
Subtotal	\$ 2,610	\$ 4,450	\$ 6,800	\$ 31,700
Other Costs	---	---	4,450 ^(c)	4,450 ^(c)
Total (d)	\$ 2,610	\$ 4,450	\$ 11,250	\$ 36,150
Total Annual Costs	\$ 4,200	\$ 6,040	\$ 32,660	\$130,330
Cost/Additional Acre-Foot	\$ 8.60	\$ 6.40	\$ 16.40	\$ 65.20

Notes: Alternative 2A: Rehabilitate Well
Alternative 3A: Rehabilitate Well
Alternative 4A: Construct Wells and Rehabilitate Dam Structure on Pit River
Alternative 4B: Construct Wells in the Godfrey Tract.

- (a) 4 Wells, 600-feet deep, 40-foot lift.
- (b) 43 Wells, 200-feet deep, 40-foot lift.
- (c) Alternatives 4A and 4B would require implementation of Alternative 3A.
- (d) The cost for Water Supply Level 1 is not included.
- (e) Basis for O&M costs are discussed in Appendix F.
- (f) Unit Pumping Cost = \$4/af.
- (g) Unit Pumping Cost = \$2.10/af.

TABLE IV A-3

FISH AND WILDLIFE RESOURCES

MODOC NWR

Ducks

Common Merganser	Northern Shoveler(a)	Ring-necked Duck
Mallard(a)	Pintail(a)	Common Golden eye
Gadwall(a)	Wood Duck	Barrow's Golden eye
American Wigeon(a)	Redhead(a)	Bufflehead
Green-winged Teal(a)	Canvasback(a)	Ruddy Duck(a)
Blue-winged Teal(a)	Lesser Scaup	Cinnamon Teal(a)

Geese and Swans

Snow Goose	Canada Goose(a)
Ross Goose	Cackling Goose
White-fronted Goose	Tundra Swan

Coots

American Coot(a)

Shore and Wading Birds

Double-crested Cormorant	Virginia Rail(a)	Common Snipe(a)
White Pelican	Sora(a)	Long-billed Dowitcher
American Bittern(a)	Wilson's Phalarope(a)	Least Sandpiper
Least Bittern	American Avocet(a)	Greater Yellowlegs
Great Blue Heron	Lesser Sandhill Crane	Solitary Sandpiper
Great (Common) Egret(a)	Pied-billed Grebe(a)	Willet(a)
Snowy Egret	Western Grebe(a)	Spotted Sandpiper(a)
Black-Crowned Night Heron(a)	Eared Grebe(a)	Black-bellied Plover
Greater Sandhill Crane(a)	Black-Necked Stilt(a)	Horned Grebe

TABLE IV A-3
FISH AND WILDLIFE RESOURCES

MODOC NWR
(Continued)

Upland Game

Ring-necked Pheasant^(a)

California Quail^(a)

Raptorial Birds

Turkey Vulture
Northern Harrier^(a)
Cooper's Hawk
Red-tailed (Harlan) Hawk^(a)
Bald Eagle

Swainson's Hawk
Rough-legged Hawk
American Kestrel (Sparrow Hawk)^(a)
Barn Owl^(a)

Long-eared Owl^(a)
Short-eared Owl
Flammulated Owl
Great Horned Owl^(a)
Golden Eagle

Fish

Bass
Suckers
Chubs

Catfish
Brook Trout
Rainbow Trout

Brown Bullhead

Furbearers

Muskrats
Skunk
Badger

Mink
Coyote
Weasel

Beaver
Raccoon

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, NWRS Public Use Report (1)) and refuge records.

leucocephalus and the peregrine falcon, Falco peregrinus anatum. Candidate species associated with the Refuge include the white-faced ibis, Plegadis chichi; tricolored blackbird, Agelaius tricolor; and prostrate buckwheat, Erigonum prociduum, as listed in Table IV A-4.

Alternatives 2A and 3A would improve the viability of the vegetation during drought years in the central portion of the Refuge. Alternatives 4A and 4B would improve habitat in the western portion of the Refuge. The water would be used to flood an additional 70 acres of seasonal wetlands, provide 120 acres of seasonal marsh, and improve management of 50 to 80 acres of emergents. The improved habitat would increase the number of nesting pairs of waterfowl and upland birds. The number of wildlife and recreational use days also would increase under Level 3, as indicated in Table IV A-5.

Implementation of any of the alternative plans probably would not adversely affect the listed and candidate threatened and endangered species of birds and would improve habitat that could be used by the white-faced ibis. However, the candidate plant, prostrate buckwheat, may be impacted under implementation of Alternatives 4A or 4B by the flooding of upland areas in the western portion of the Refuge. Detailed field investigations would be necessary prior to the design phase of the project. Implementation of the alternative plans would result in overall beneficial environmental effects.

The No Action Alternative would result in the management of the Refuge under the current water supply and conditions. The Godfrey Tract would not be developed in accordance with the management plan under the No Action Alternative.

E. SOCIAL ANALYSIS

The social consequences of any of the alternatives would be similar because public use would not change.

F. POWER ANALYSIS

Pacific Power and Light Company serves the Refuge. If CVP project-use power were determined to be available, the Refuge may not be able to receive the CVP power, as Pacific Gas & Electric Company (PG&E) has entered into an agreement with Reclamation to convey CVP power to CVP customers within a specified area, also known as a "wheeling area". The Refuge is located outside of this area. However, a similar agreement has been negotiated with PG&E to convey power to the Truckee-Donner Public Utility District which also is located outside of the wheeling area and the PG&E service area. That agreement provided for PG&E to supply CVP power through the PG&E-Sierra Pacific Power Company intertie. Therefore, an agreement would be needed to allow PG&E to convey the power through an intertie with Pacific Power and Light Company. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter II.

TABLE IV A-4

FEDERAL LISTED, PROPOSED, & CANDIDATE, THREATENED & ENDANGERED SPECIES

MODOC NWR

Listed Species

Birds

Bald eagle, Haliaeetus leucocephalus (E)
Peregrine Falcon, Falco peregrinus anatum (E)

Proposed Species

None

Candidate Species

Birds

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

Plants

Prostrate buckwheat, Erigeron prociduum (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 A-5
WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS
MODOC NWR

	No Action Alternative	Alternatives			
		2A	3A	4A	4B
Habitat Acres					
Wetlands	1,278	1,278	1,478	1,668	1,668
Uplands	3,403	3,403	3,203	2,943	2,943
Croplands & Others	1,500	1,500	1,500	1,570	1,570
Bird Use Days					
Ducks	1,980,000	1,980,000	2,080,000	(a)	(a)
Geese	953,000	953,000	978,000		
Others	423,000	423,000	509,500		
Total	3,356,000	3,356,000	3,567,500		
Public Use Days					
Consumptive	6,430	6,430	6,430	6,430	6,430
Non-Consumptive	7,870	7,870	7,870	7,870	7,870
Total	14,300	14,300	14,300	14,300	14,300
Total Annual Cost	--	\$ 4,200	\$ 6,040	\$ 32,660	\$130,400
Incremental Cost/Additional 1000 Bird Use Days	N/A	N/A	\$ 28.60	(a)	(a)
Incremental Cost/Additional Public Use Day	N/A	N/A	N/A	(a)	(a)

Note: Alternative 2A: Rehabilitate Well
Alternative 3A: Rehabilitate Well
Alternative 4A: Construct Wells and Rehabilitate Dam Structure on Pit River
Alternative 4B: Construct Wells in the Godfrey Tract

(a) Data not available for Level 4.

G. PERMITS

Construction of the wells under Alternative 2A, 3A, 4A, or 4B and the rehabilitation of the dam under Alternative 4A would require several permits. Modoc County would issue permits for well construction.

Rehabilitation of the dam on the Pit River would require approvals from Modoc County, DWR, State Water Resources Control Board, DFG, and State Lands Commission. Modoc County would issue a permit for construction along the banks of the Pit River and South Fork Pit River to ensure that existing drainage facilities would not be adversely affected. Alternative 4A also would require approvals from DWR and State Water Resources Control Board for water transfer through the South Fork Pit River to the Pit River and diversion from the Pit River. A Stream Alteration Permit from DFG and Corps of Engineers permits would be required for construction of the dam rehabilitation measures. A permit also may be needed from the State Lands Commission for construction within the banks of the Pit River.