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**CHAPTER IV F**  
*Gray Lodge Wildlife Management Area*  
*Alternative Plans*



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

## CHAPTER IV F

### GRAY LODGE WILDLIFE MANAGEMENT AREA PLAN

In 1931 the State Division of Fish and Game purchased the 2,540 acre Gray Lodge Gun Club to establish the first Sacramento Valley wildlife refuge. The club was purchased with Governor's Conservation Fund monies. In 1971, the refuge area was increased to 8,400 acres under the authority of the cooperative State and Federal Pittman-Robertson Federal Aid to Wildlife Restoration Act which provides funds to acquire and develop wetlands. The refuge managed as a WMA by the DFG, is located within an intensively developed agricultural farming area about 10 miles southwest of Gridley in Sutter and Butte Counties. The refuge is adjacent to the Butte Sink which is an overflow area of Butte Creek and the Sacramento River. Numerous duck clubs are located on private wetlands in the Butte Sink.

Butte Basin extends from the City of Red Bluff in the north to Butte and Morrison Sloughs and Sutter Buttes in the south. The Butte Basin is bounded by the Sacramento River on the west and the Feather River on the east. Part of the Butte Sink still remains comparatively unchanged from the original conditions, although water developments have reduced flooding. The wetlands portions of the Butte Sink consists of natural and manmade levees, channels, permanent ponds, and winter flooded bulrush marshes and swamps which are maintained through repeated flooding by the Sacramento River, Butte Creek, and seepage. The Butte Sink is characterized by low land with swales typical of flood plains. Water for wetlands in the Butte Sink is derived from flood waters, Butte Creek, Sacramento River, and agricultural return flows from rice fields. During wet winters, Butte Basin flood waters flow into the Sutter Bypass flood control area and then into the Sacramento River, or directly into the Sacramento River. Within the Butte Basin, 67 organized duck clubs maintain over 52,000 acres of habitat including over 22,000 acres of flooded lands. The Butte Sink frequently contains more than one million ducks and thousands of geese, although normal waterfowl populations are about 550,000.

Gray Lodge WMA consists of marshlands, ponds, wheat fields, and uplands. Approximately 500 acres of the total 1,700 acres of uplands would be converted to marshlands for optimum wetland management. The natural ponds support sources of waterfowl food such as timothy grass and invertebrate populations. The upland areas of the refuge provide habitat for geese, upland birds, and other wildlife species. Intensive marsh management techniques are used on Gray Lodge WMA, including spring and summer irrigation to produce waterfowl foods, and flooding in fall and winter.

## A. WATER RESOURCES

Gray Lodge WMA receives water from the Biggs-West Gridley Irrigation District (BWGID) and Reclamation Districts 833 and 2054. Groundwater accounts for over 40 percent of water use in the refuge. The DFG has determined that the water needed to optimally manage the lands within the refuge is 44,000 acre-feet annually.

### 1. Surface Waters

Approximately 2,600 acres of Gray Lodge WMA is located within the BWGID. The BWGID is a member of the Sutter-Butte Joint Water District which owns and operates the Sutter-Butte Canal that conveys water from the Thermalito Afterbay. BWGID obtains up to 160,950 acre-feet of water per year which is used primarily on rice fields. During some years, the BWGID does not receive adequate water supplies and must attempt to purchase water from other districts. The BWGID has allocated 12,000 acre-feet of water per year to Gray Lodge WMA. However, only 8,000 acre-feet is available during the irrigation season from April to November, as indicated in Table IV F-1. The refuge turnouts are located at the end of the BWGID system and therefore, cannot receive water following de-watering of the BWGID canals in November for maintenance. Improvements of the BWGID canals, Sutter-Butte Canal, and the Reclamation District drainage system would be needed to maintain optimum year-round management.

Gray Lodge WMA also diverts water from Reclamation District 833 Drain and 2054 Drain. These canals convey agricultural return flows. The Reclamation Districts do not claim the flows and Gray Lodge WMA diverts the water under appropriative rights. Approximately 36 percent of the total refuge supply is obtained from the 833 Drain and 4 percent of the total supply is from the 2054 Drain. The return flows are primarily from rice fields and are only available during the summer and early fall when the rice fields are drained. Based upon existing data, water quality appears to be adequate for marsh management.

Additional water potentially could be obtained from the State Water Project Thermalito Afterbay through BWGID, the Cherokee Canal, Western Canal Water Users Association, or directly from the Thermalito Afterbay. The Cherokee Canal is an old mining drainage channel that conveys water from the Sierra Nevada foothills north of Oroville to Butte Creek. A portion of the Cherokee Canal is located within 1.5 miles of the northern refuge boundary. Water from the State Water Project could be conveyed to the Cherokee Canal by Richvale Irrigation District, another member of the Sutter-Butte Joint Water District. Water from the Cherokee Canal could be diverted to BWGID for delivery to the refuge. The WCWUA was formed in 1985 when the PG&E canal facilities were purchased. The canal facilities divert water from Thermalito Afterbay and are operated year-round to deliver

TABLE IV F-1  
WATER DELIVERIES  
GRAY LODGE WMA  
(acre-feet)

Year	BWGID(a)	Deep Wells	Reclamation District Drains 2054 and 833	Total
1977	6,000	13,626	16,200	35,826
1978	6,000	13,626	16,200	35,826
1979	8,000	14,000	14,000	36,000
1980	8,000	14,000	14,000	36,000
1981	8,000	14,000	14,000	36,000
1982	7,799	(b)	(b)	(b)
1983	9,257	(b)	(b)	(b)
1984	11,035	(b)	(b)	(b)
1985	11,234	(b)	(b)	(b)
1986	9,424	(b)	(b)	(b)

Notes:

(a) Biggs-West Gridley Irrigation District

(b) Data unavailable

Source: USBR, 1986a

water to duck clubs in the Butte Sink. The WCMUA could convey water to Cherokee Canal if a turnout was constructed on the Cherokee Canal.

## **2. Water Conveyance Facilities**

The BWGID delivers water to the refuge through four supply ditches: Rising River Ditch, Cassidy Ditch, Justeson Ditch, and Lateral C, as shown in Figure IV F-1. Water flows by gravity onto the refuge from the Rising River, Cassidy, and Justeson Ditch and is available from April to November. Water from Lateral C is diverted into a ditch on the western portion of the refuge and pumped onto the refuge. Lateral C is operated year-round. The estimated capacities of the Rising River, Cassidy, and Justeson Ditches are 80, 25, and 35 cfs, respectively. The estimated capacity of Lateral C is 10 cfs.

Water can be diverted year-round from the Reclamation District 833 Drain through the Gray Lodge Dam on the 833 Drain. Water may not be available after rice fields are drained in the fall. Water is available by gravity flow from the 2054 Drain from April to November.

The Gray Lodge WMA internal conveyance system is in good condition and only requires minor improvements. The improvements would reduce energy costs by diverting water onto the refuge at the highest elevations and allowing distribution by gravity flow or low-lift pumps.

## **3. Groundwater**

Gray Lodge WMA is located in the Butte Creek floodplain and uplands. The area is underlain by fine grained materials with sand lenses which may be part of or derived from the Tuscan Formation. The groundwater is located within 100 feet of the ground surface. Based upon existing data, the quality appears to be suitable for irrigation and waterfowl needs. The safe yield of the aquifer under Gray Lodge WMA based upon operational records has been estimated to be 12,000 acre-feet. The average annual withdrawal is considered to be 14,000 acre-feet.

The refuge has 22 deep wells of which 20 are used regularly from October through January. Based upon an average of the characteristics of the 22 wells, the average discharge rate appears to be 1750 gpm from depths of 80 feet. The average well is drilled to a depth of over 400 feet.

## **B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS**

To provide for full development of the refuge, the annual water requirement is 44,000 acre-feet. However, for the purposes of assessing the impacts of water delivery alternatives, four levels of water supply have been identified, as presented in Table IV F-2.

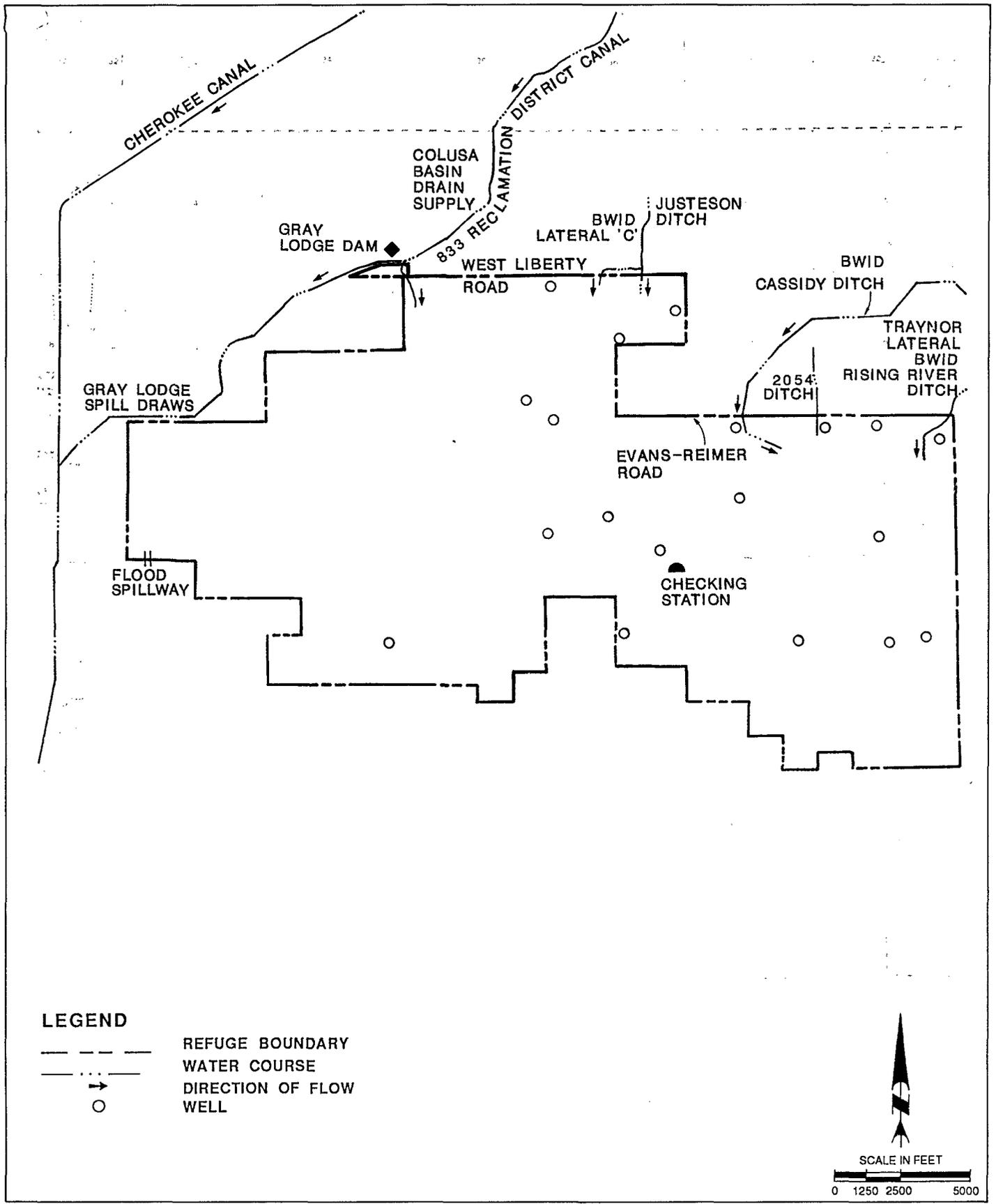


FIGURE IV F-1

GRAY LODGE WILDLIFE MANAGEMENT AREA  
EXISTING WATER SUPPLY FACILITIES



**TABLE IV F-2**  
**DEPENDABLE WATER SUPPLY NEEDS**  
**ALTERNATIVE SUPPLY LEVELS FOR THE GRAY LODGE WMA**

Month	Supply Level 1		Supply Level 2		Supply Level 3		Supply Level 4	
	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs
January	240	3.9	1,050	17.1	1,230	20.0	1,320	21.5
February	240	4.3	1,050	18.9	1,230	22.1	1,320	23.8
March	240	3.9	1,050	17.1	1,230	20.0	1,320	21.5
April	240	4.0	1,050	17.6	1,230	20.7	1,320	22.2
May	560	9.1	2,500	40.7	2,870	46.7	3,080	50.1
June	800	13.4	3,500	58.8	4,100	68.9	4,400	73.9
July	560	9.1	2,500	40.7	2,870	46.7	3,080	50.1
August	640	10.4	2,850	46.4	3,280	53.3	3,520	57.2
September	1,600	26.9	7,100	119.3	8,200	137.8	8,800	147.9
October	1,520	24.7	6,750	109.8	7,790	126.7	8,360	136.0
November	1,040	17.5	4,600	77.3	5,330	89.6	5,720	96.1
December	320	5.2	1,400	22.8	1,640	26.7	1,760	28.6
Total	8,000	132.5	35,400	586.4	41,000	679.2	44,000	728.9
Maximum	1,600	26.9	7,100	119.3	8,200	137.8	8,800	147.9

Notes:

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

Source: USBR, 1986a

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

Multi-objective project evaluation procedures, in accordance with concepts outlined by the Water Resources Council, is one of the tools used in evaluating and comparing alternatives. The Water Contracting EIS's will evaluate the national, regional, and site specific environmental impacts of providing water to the refuges and other users under the different water supply levels. Based on the results of the Water Contracting EIS's, water supply levels will be identified for each refuge. Following completion of the Water Contracting EIS's, the plans to meet the identified water level will be compared under the National Economic Development Account, Environmental Quality Account, and Social Account.

The beneficial and adverse effects of each alternative to provide additional water in the western portion of the refuge also were compared with respect to many criteria. A summary comparison of the alternatives to provide additional water to the refuge for water supply levels 1, 2, 3, and 4 is presented in Table IV F-3.

The following delivery alternatives have been considered to convey four of the identified levels of water supply described above.

#### **1. Delivery Alternative for Level 1 (No Action Alternative)**

The existing facilities are adequate to deliver 8000 acre-feet of water from the BWGID. This 8,000 acre-feet is the maximum amount available to the refuge on dependable basis. If the agricultural return flows are reduced, habitat would be adversely impacted.

#### **2. Delivery Alternatives for Level 2**

This level represents the current average water delivery. The following alternatives would improve water conveyance facilities, reduce the reliance on groundwater, improve the quality of circulated water, and increase the reliability of winter water supplies. However, if a selected alternative is not implemented, the refuge would continue to rely upon agricultural return flows and storm water run-off.

TABLE IV F-3

## SUMMARY COMPARISON OF WATER DELIVERY ALTERNATIVES

## GRAY LODGE WMA

	Levels 2, 3 & 4		Levels 3 & 4
	Alternative A	Alternative B	Alternative C
Availability of Water Supply	Maybe	Maybe	Maybe
Ability to Convey Water	Yes	Yes	Yes
Need New Water	Yes	Yes	Yes
Need New Conveyance Agreements	Yes	Yes	Yes
Type of Water Supply	Fresh Water and Agricultural Return	Fresh Water	Fresh Water and Agricultural Return
Operational Flexibility			
Wildlife Habitat	No Change	Improve	Improve
Public Use	No Change	No Change	Increase
Total Annual Costs (\$) <sup>(a)</sup>	206,660	122,660	85,570

Notes: Alternative A: Construct Ditch from Cherokee Canal  
Alternative B: Construct Canal from Thermalito Afterbay  
Alternative C: Improve BWGID System Capacity

(a) Total Annual Costs includes annualized construction cost, annual operation and maintenance cost, annual power and wheelage cost.

**Alternative A - Construct Ditch from Cherokee Canal.** To deliver water from Cherokee Canal to the refuge, an 11,000-foot long ditch could be constructed from the Cherokee Canal to the refuge. Water could be delivered to the Cherokee Canal from the Richvale Irrigation District's Cherokee Canal. Due to the location of the Cherokee Canal, the water would be delivered to the lowest elevation on the refuge and would require additional pumping to convey water on the refuge.

**Alternative B - Construct Canal from Thermalito Afterbay.** Under this alternative, a canal would be constructed from Thermalito Afterbay to convey State Water Project water to the refuge. The canal would be over 63,360 feet in length and would include siphons under State Highway 99, Southern Pacific Railroad tracks, and at least four local roads, as shown in Figure IV F-2.

**Alternative C - Improve Biggs-West Gridley Irrigation District System.** Under this plan, improvements would be completed on portions of the BWGID conveyance system to meet the needs of the refuge during the winter maintenance periods. The capacity of the Cassidy Ditch would be increased from 25 cfs to over 60 cfs through construction of a larger culvert or road crossing at Evans Reimer Road and improvements to 4,750 feet of the ditch.

#### **4. Delivery Alternatives for Level 4**

If water deliveries equal Level 4, a portion of the uplands would be flooded to improve refuge management. However, the water supply alternatives proposed under Levels 2 and 3 would be adequate to provide Level 4 water deliveries. Additional refuge conveyance improvements would be completed to flood the upland acreage. Therefore, the alternatives for Level 4 would be the same as discussed under Levels 2 and 3.

#### **5. Summary of Alternatives**

There are no alternatives for Level 1. Alternatives A and B have been considered for implementation of Levels 2, 3, and 4. Alternative C also has been considered for Levels 3 and 4. The alternatives were primarily developed to provide water to the refuge during the winter and to increase the firm water supply. However, because the full amount of water is not provided as a firm supply and sufficient groundwater is not available to meet all of the refuge needs, the Gray Lodge WMA requires long-term contracts to receive State Water Project water.

Alternative C would require long-term conveyance agreements with BWGID to transport additional water to the Gray Lodge WMA. Alternative A would require long-term agreements with Richvale Irrigation District to transport water to Cherokee Canal. Alternative B may be the most difficult to implement due to the need to acquire easements along an 11 mile alignment through agricultural lands which probably would not benefit from the

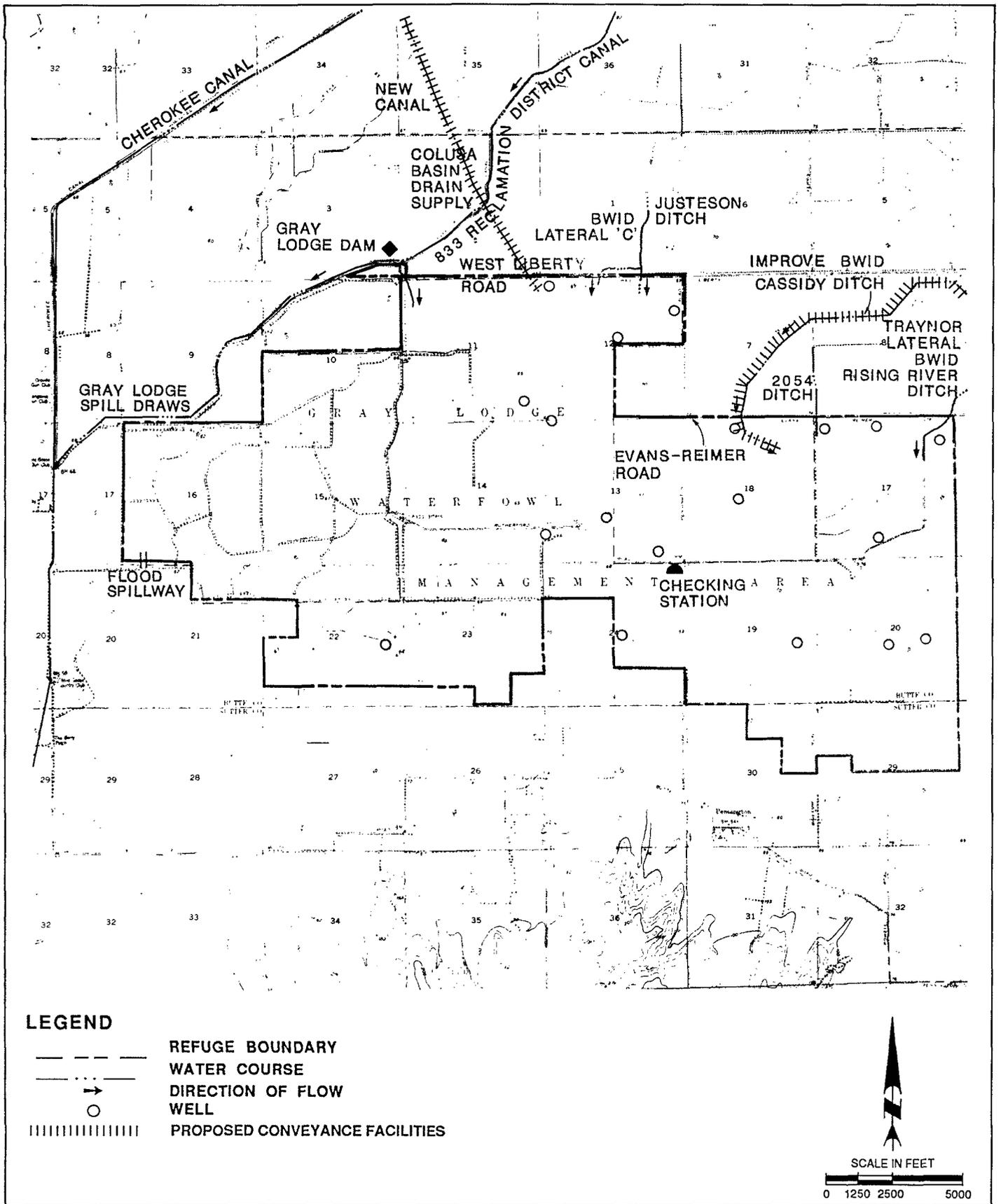


FIGURE IV F-2

**GRAY LODGE WILDLIFE MANAGEMENT AREA**  
**PROPOSED WATER SUPPLY FACILITIES**  
**ALTERNATIVE B**



canal. Alternative C does not require construction and operation of additional pump stations and has a lower operating cost than Alternative A. Alternative C has lower capital and operation costs and ease of implementation. Continued diversions from the existing canal systems and negotiations for a firm water supply from BWGID is needed to maintain Level 3 water deliveries.

### C. COSTS AND ECONOMIC ANALYSIS

Costs for the alternative plans to provide adequate water supplies under Levels 1, 2, 3, and 4 are presented in Table IV F-4 and the Cost Estimating Appendix. The construction costs include factors to cover engineering, contingencies, and overhead. During the advanced planning phase, these costs will be refined further.

Construction of the facilities under Alternative A would result in additional money being spent in the economy of Sutter and Butte Counties during construction. The construction could be completed within one summer season by construction workers who reside within the area. Because most of the refuge is developed, the additional water may not increase attendance levels significantly.

### D. WILDLIFE RESOURCES

The average annual waterfowl use on the Gray Lodge WMA was over 550,000 in the late 1970's and has exceeded one million during some years. Butte Basin is one of the most important wintering areas for the endangered Aleutian Canada goose. Wildlife and fishery resources associated with the refuge are presented in Table IV F-5. The only listed threatened species associated with Gray Lodge WMA is the Valley elderberry longhorn beetle, Desmocerus Californicus Dimorphus. Candidate species associated with the Gray Lodge WMA include the white-faced ibis, Plegadis chichi; tricolored blackbird, Agelaius tricolor; Sacramento anthicid beetle, Anthicus Sacramento; California hibiscus, Hibiscus californicus, as listed in Table IV F-6.

Implementation of the alternative plans 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. The improved habitat would increase the number of waterfowl use days, as indicated in Table IV F-7. Detailed field investigations will be completed during the advanced planning phase of the project. Implementation of the plan would result in overall beneficial environmental effects. The No Action Plan could result in the loss of habitat if interim water supplies are not available in the future. The results of the preliminary environmental analysis for the alternative plans are presented in the Environmental Appendix. Additional environmental analyses will be completed as part of the Water Contracting EIS's.

TABLE IV F-4  
SUMMARY OF ESTIMATED COSTS OF ALTERNATIVES  
GRAY LODGE WMA

Items	Water Delivery Levels		
	2, 3, & 4		3 & 4
	Alternatives		
	A	B	C
Total Construction Costs	\$ 275,000	\$1,082,700	\$ 54,800
Power Costs (\$/acre-feet)	2.20	0.00	0.00
Water Wheelage Costs (\$/Ac-Ft)	1.80	0.00	1.80
Annualized Construction Costs (8.875%, 30 Years)	26,460	104,160	5,270
Annual Operations & Maintenance Costs	4,200	18,500	1,100
Annual Power Costs	96,800	0	0
Annual Water Wheelage Costs	79,200	0	79,200
Total Annual Costs	\$206,660	\$122,660	\$ 85,570

Alternative A - Construct Ditch from Cherokee Canal

Alternative B - Construct Canal from Thermalito Afterbay

Alternative C - Improve BWGID Conveyance system

**TABLE IV F-5**  
**WILDLIFE RESOURCES**  
**GRAY LODGE WMA**

**Ducks**

Hooded Merganser Mallard <sup>(a)</sup> Canvasback European Wigeon American Wigeon Common Merganser Green-winged Teal	Cinnamon Teal <sup>(a)</sup> Blue-winged Teal Northern Shoveler Wood Duck <sup>(a)</sup> Gadwall <sup>(a)</sup> Pintail <sup>(a)</sup> Redhead <sup>(a)</sup>	Scaup Ring-necked Duck Common Goldeneye Buffle Head Ruddy Duck <sup>(a)</sup> Red-breasted Merganser
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**Geese and Swans**

Ross Goose Cackling Canada Whistling Swan	Snow Goose Honker Canada	White-fronted Goose Lesser Canada
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**Coots**

American Coot<sup>(a)</sup>

**Shore and Wading Birds**

Common Gallinule <sup>(a)</sup> Great Blue Heron <sup>(a)</sup> Great (Common) Egret <sup>(a)</sup>	American Avocet <sup>(a)</sup> Green Heron <sup>(a)</sup> Common Snipe	Black-necked Stilt <sup>(a)</sup> Snowy Egret <sup>(a)</sup>
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**Upland Game**

Pheasant Jackrabbit	Dove Cottontail
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**TABLE IV F-5**  
**WILDLIFE RESOURCES**  
**GRAY LODGE WMA**  
**(Continued)**

**Raptorial Birds**

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American Kestrel<sup>(a)</sup>  
 Great Horned Owl<sup>(a)</sup>  
 Red-tailed Hawk<sup>(a)</sup>

Marsh Hawk<sup>(a)</sup>  
 Burrowing Owl<sup>(a)</sup>  
 Turkey Vulture

Screech Owl<sup>(a)</sup>  
 White-tailed Kite<sup>(a)</sup>  
 Golden Eagle

**Fish**

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Large Mouth Bass  
 Carp

Catfish  
 Pan Fish

**Furbearers**

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Opossum  
 Mink  
 Muskrat

Raccoon  
 Beaver

Coyote  
 Skunk

**Others**

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Mule Deer

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**Notes:**

(a) Birds nesting on refuge

Source: Environmental Assessment Reports, Gray Lodge Wildlife Area, and Refuge records



**TABLE IV F-7**  
**WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS**  
**GRAY LODGE WMA**

Item	Water Delivery Levels			
	Level 1	Level 2	Level 3	Level 4
<b>Habitat Acres</b>				
Permanent Pond	0	2,200	2,200	2,700
Native Marsh	2,600	3,800	3,800	3,800
Cereal Grains (Wheat)	300	300	300	300
Upland	1,700	1,700	1,700	1,200
Administration	400	400	400	400
<b>Public Use Days</b>				
Consumptive	18,350	29,800	34,600	37,000
Non-Consumptive	83,250	135,400	157,000	168,000
<b>Annual Recreational Benefits</b>	<b>\$2,200,660</b>	<b>\$3,578,230</b>	<b>\$4,150,060</b>	<b>\$ 4,440,300</b>

#### **E. SOCIAL ANALYSIS**

The social consequences of constructing and operating the facilities of the alternative plans and improving the BWGID facilities would be positive due to the potential increase in public use and the shared benefit to BWGID of providing improvements to the water conveyance facilities. The local social environment is discussed in the Social Appendix.

#### **F. POWER ANALYSIS**

Pacific Gas & Electric Company (PG&E) serves the Gray Lodge WMA under the PA-1 rate schedule for agricultural users. The power is used for the 20 wells and 20 ditch pumps. Timers have been installed on many pumps to automate the system and increase offpeak pump operations.

A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver CVP power to the refuge is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter IV B.

#### **G. PERMITS**

Construction of the Cassidy Ditch improvements would require several permits. Butte County would issue approvals for construction to ensure that existing drainage facilities would not be adversely effected. To obtain additional State Water Project water, approvals from DWR would be required. Construction along the Cassidy Ditch may require a Stream Alteration Permit from DFG and a Corps of Engineers permit for construction in wetlands or riparian corridors. Agreements with BWGID for water conveyance also would be required for the preferred alternative.