

**CONCEPTUAL HABITAT PLAN  
FOR THE GRIZZLY SLOUGH  
PROJECT AREA**



**Bay-Delta and Special Water Projects Division  
California Department of Fish and Game**

**May 1995**

State of California  
The Resources Agency  
DEPARTMENT OF FISH AND GAME

A REPORT TO THE  
CALIFORNIA DEPARTMENT OF WATER RESOURCES

CONCEPTUAL HABITAT PLAN FOR THE GRIZZLY  
SLOUGH PROJECT AREA

BAY-DELTA AND SPECIAL WATER PROJECTS DIVISION

May 1995

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Douglas P. Wheeler  
Secretary for Resources  
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Director  
Department of Fish and Game

## Introduction

The Department of Water Resources (DWR) has purchased 489 acres of land in Sacramento County approximately two miles northeast of the town of Thornton (Figure 1). The property, now referred to as the Grizzly Slough property, was acquired for several reasons. First, the property was cited by the Nature Conservancy, Ducks Unlimited, and the U.S. Fish and Wildlife Service as one of several good parcels near or adjacent to the Cosumnes River Preserve that would protect existing riparian habitat and provide a logical parcel for habitat creation and restoration and eventual expansion of the preserve. Second, DWR is interested in increasing the quality and quantity of wildlife habitat in the North Delta and using created and restored habitat as mitigation for future project impacts. Third, soils on the Grizzly Slough property were suitable for use as borrow material for levee reinforcement for DWR Delta projects. Currently the elevation of the Grizzly Slough Project Area approximately ranges from 7 to 15 feet above sea-level. Preliminary geological reconnaissance conducted by DWR determined that the top 8 to 12 feet of soil is satisfactory for impervious levee material.

The Department of Fish and Game (DFG) has been supportive of the Grizzly Slough property acquisition and proposed biological resources habitat enhancement on the subject property since the early stages of the project. DFG staff have also indicated that they would be supportive of additional land acquisitions in the Delta for similar purposes. In keeping with the desired goals to enhance and increase wildlife habitat and provide a mitigation site for future project impacts, DWR asked the DFG to develop a conceptual habitat design for the property. The Conceptual Habitat Plan for the Grizzly Slough Project Area (Plan) meets these goals while providing DWR with a portion of their borrow material needs. The focus of the Plan is to create a mosaic of habitat types which can be utilized by a diverse assemblage of flora and fauna native to the area. Variations in habitat will be achieved through active manipulation of habitat, topographic relief, and creation of large areas of "edge" between habitat types. Specific management efforts will be directed toward creation of habitats utilized by species such as the Swainson's hawk, western pond turtle, giant garter snake, greater sandhill crane, and/or other special status species.

Initial studies were conducted on the project site to evaluate the existing wildlife habitat of the area by DFG staff in the spring and summer of 1993 (B. Burkholder, DFG Biologist, pers. comm.). Efforts concentrated on small mammal trapping to determine species composition of the site. Incidental sightings of birds and reptiles were also recorded. Additional information pertaining to species occurrence was obtained from DWR staff and from the field notes of Dan Gifford, a DFG unit biologist. Species observed at the Grizzly Slough property are displayed in Table 1.

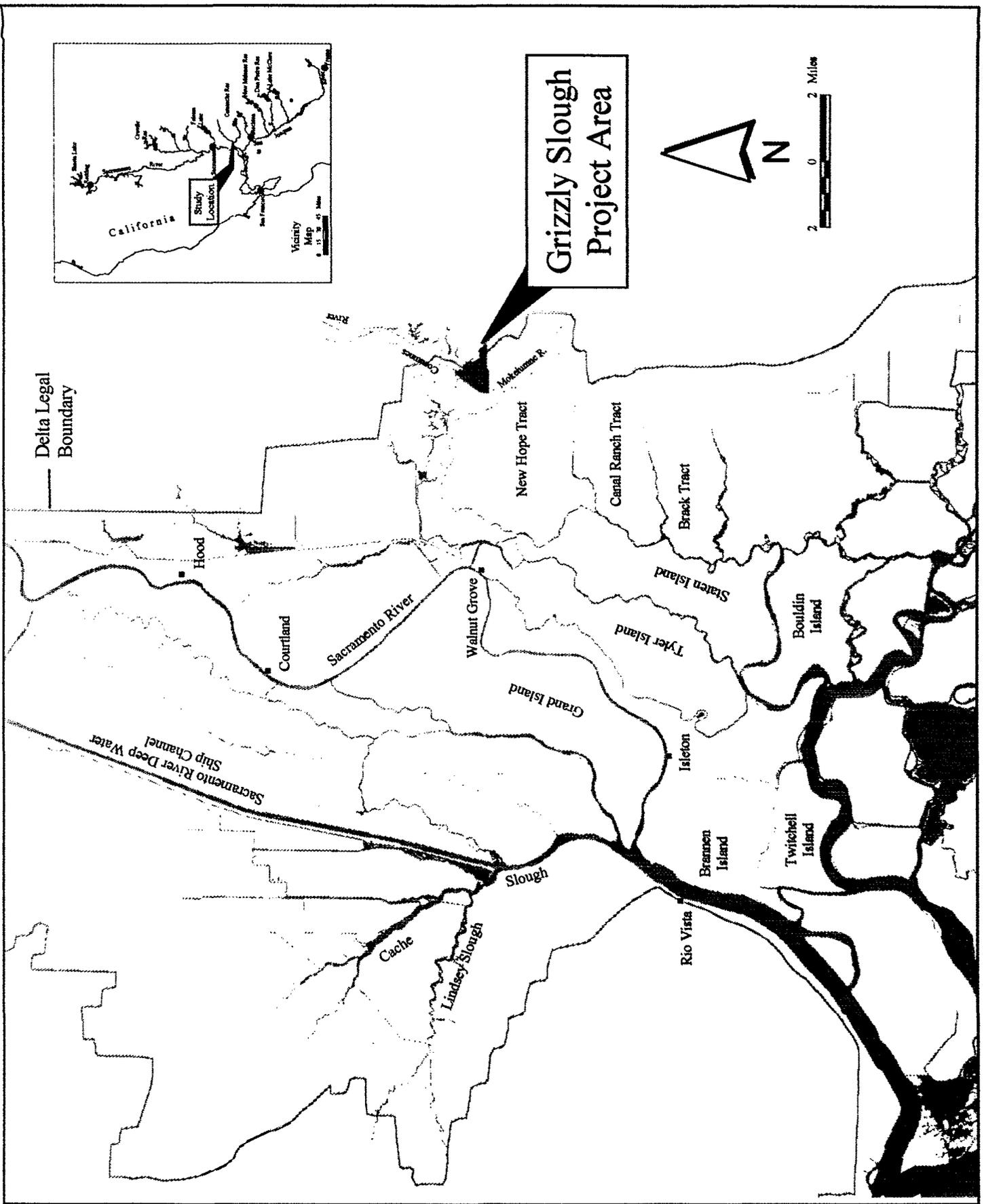


Figure 1. Conceptual Habitat Plan for the Grizzly Slough Project Area. Proximity Map.

Table 1. Conceptual Habitat Plan for the Grizzly Slough Project Area. Wildlife Species Observed at the Grizzly Slough Project Area.

<u>Mammals</u>	<u>Birds</u>	<u>Reptiles and Amphibians</u>
desert cottontail	great blue heron	California tree frog
gray squirrel	great egret	bull frog
California ground squirrel	tundra swan	western pond turtle
western harvest mouse	white-fronted goose	gopher snake
house mouse	mallard	
California vole	northern pintail	
black rat	American wigeon	
muskrat	wood duck	
beaver	northern harrier	
raccoon	red-tailed hawk	
coyote	California quail	
gray fox	ring-necked pheasant	
red fox	sandhill crane	
black-tailed deer	mourning dove	
	belted kingfisher	
	northern flicker	
	red-winged blackbird	

## Site Description

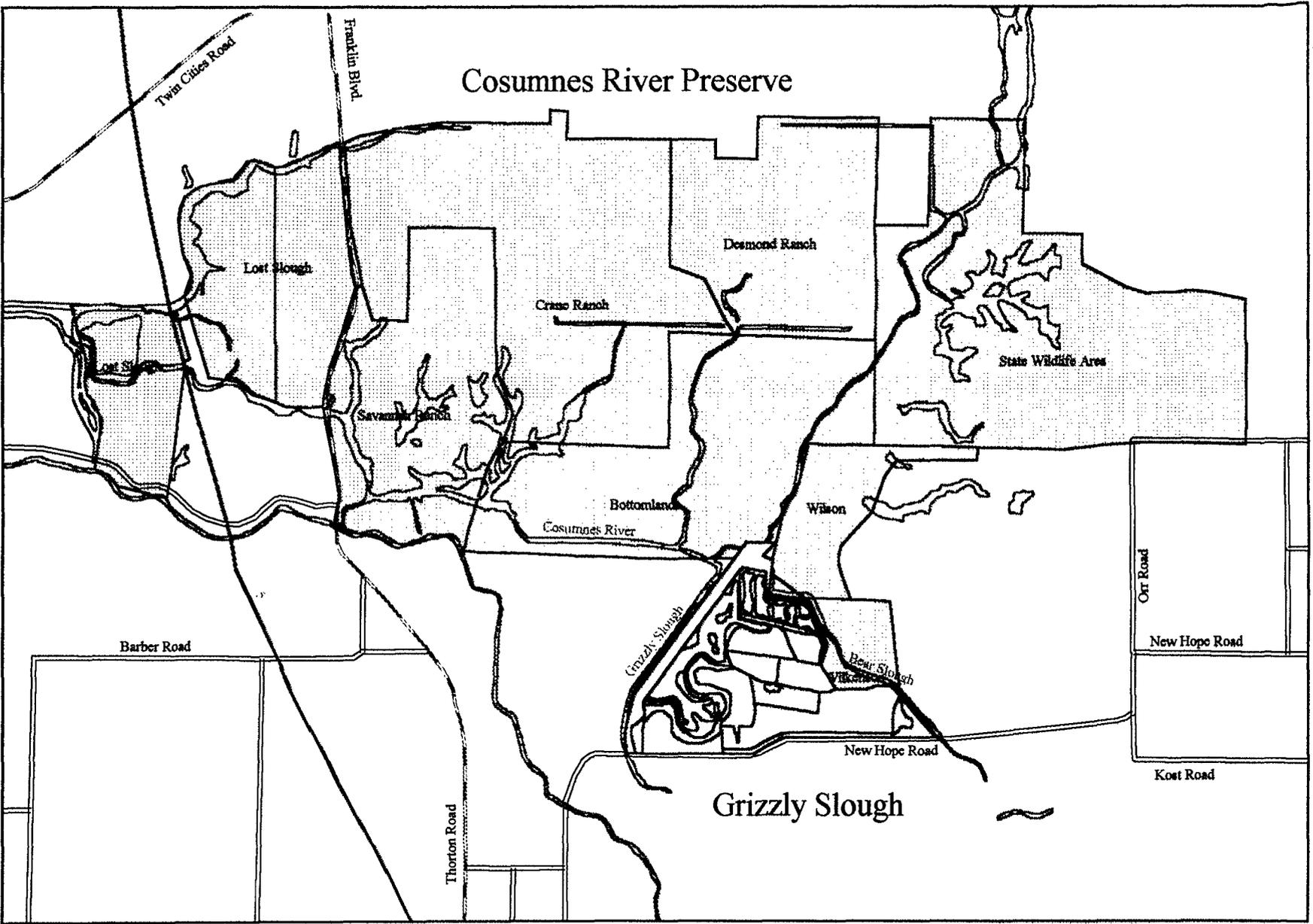
The Grizzly Slough Project Area is located adjacent to New Hope Road approximately two miles northeast of Thornton, in Sacramento County. The project area is roughly triangular and bordered on the northwest by Grizzly Slough, on the north by the Cosumnes River, on the northeast by Bear Slough, and on the south by New Hope Road. North of Grizzly Slough is the Nature Conservancy's Cosumnes River Preserve. The project area has historically been farmed for rice, tomatoes, sugarbeets, wheat, oats, and corn. In 1993 rice was grown on the southern and eastern portions of the property while the northern and western portions were used to raise a mixture of corn, tomatoes, and sugar beets; three small fallow fields were left. The Grizzly Slough parcel is adjacent to other units of the Cosumnes River Preserve (Figure 2).

### Thornton-New Hope Mitigation Area

A 34.6 acre area was dedicated at the Grizzly Slough Project Area as mitigation for the Thornton-New Hope Flood Control Project. Impacts to Valley oak woodland and mixed riparian forests associated with that project are scheduled to be mitigated for in the northern corner of the site (Figure 3). The mitigation site will be composed of 27 acres of Great-Valley valley oak riparian forest (VORF) and 7.6 acres of Great Valley mixed riparian forest (MRF).

### Habitat Objectives

The purpose of this conceptual habitat plan is to create by design and excavation a mosaic of habitats which can be utilized by a diverse assemblage of flora and fauna. Habitat will be created primarily through differences in soil, topography, and proximity to water. Micro-management for target species can be achieved by following specific management plans such as those given in Appendix A. The Plan proposes the creation of several habitat types including open water, emergent marsh, seasonal wetland, three varieties of riparian forest, and upland as well as maintaining the agricultural traditions of the property. The guidelines used to create this plan were taken from a DFG report entitled *Assumptions for Developing Conceptual Wildlife Area from Hypothetical Borrow Site for the North Delta Water Management Program* (DFG 1991). Key to the placement of habitats are their land elevations. Figure 4 displays an elevation continuum for the Grizzly Slough Project site and the habitat types likely to dominate that range of elevations. During implementation, gradations are expected in areas where elevations approach the upper and lower ranges of a specific habitat type. Once the correct elevations and soil conditions are met an aggressive revegetation campaign will be undertaken using plants recommended for the specific habitat type (Appendix B). Other sources of information used to generate this plan were the objectives and procedures used by the Nature Conservancy's Cosumnes River Preserve. Proposed habitat locations are shown in Figure 5 and acreages of various habitats are given in Table 2.



Conceptual Habitat Plan for the  
Grizzly Slough Project Area

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May 1995

Figure 2. Conceptual Habitat Plan for the Grizzly Slough Project Area. Units of the Cosumnes River Preserve.

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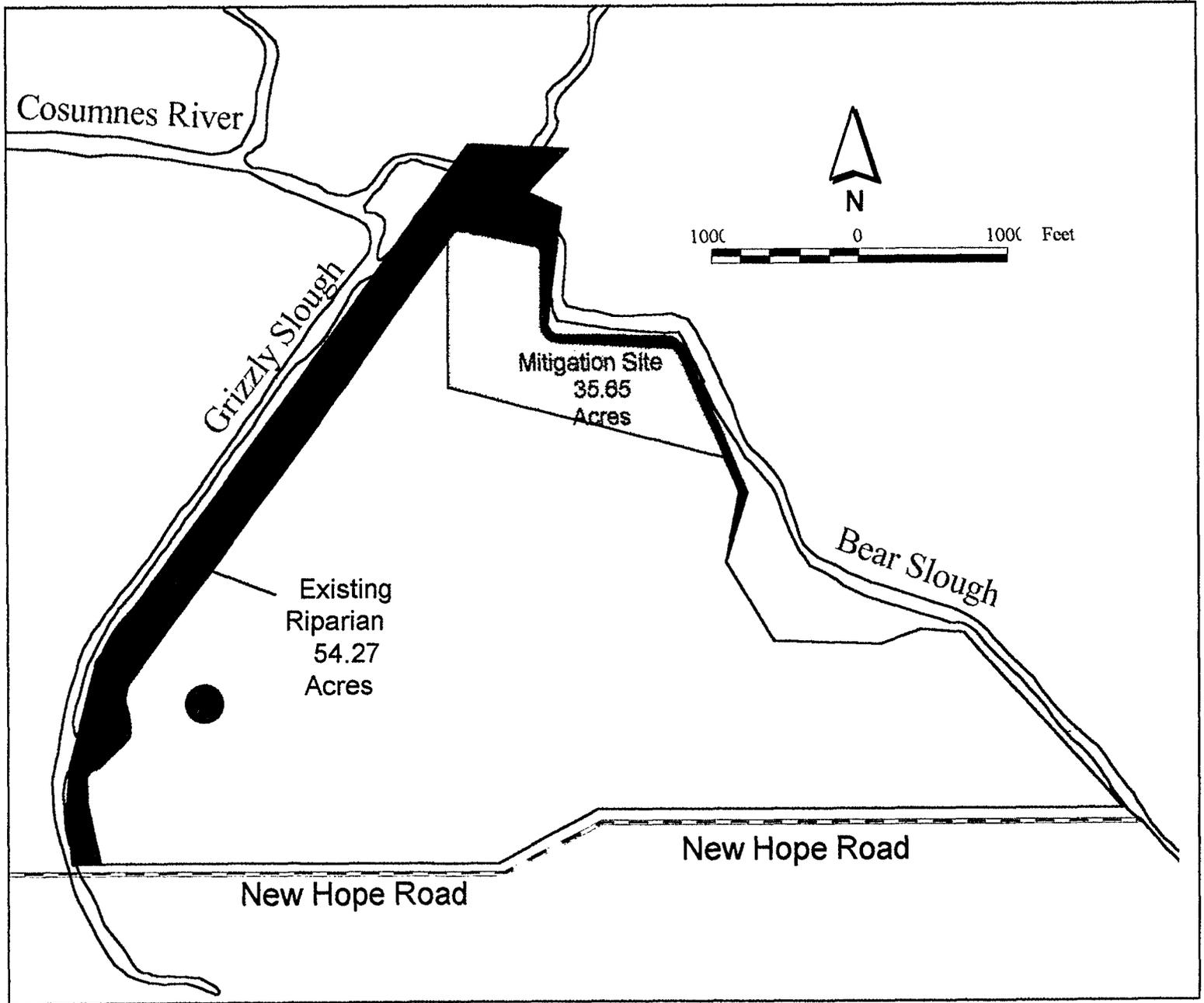


Figure 3. Conceptual Habitat Plan for the Grizzly Slough Project Area. Thornton-New Hope Mitigation Site.

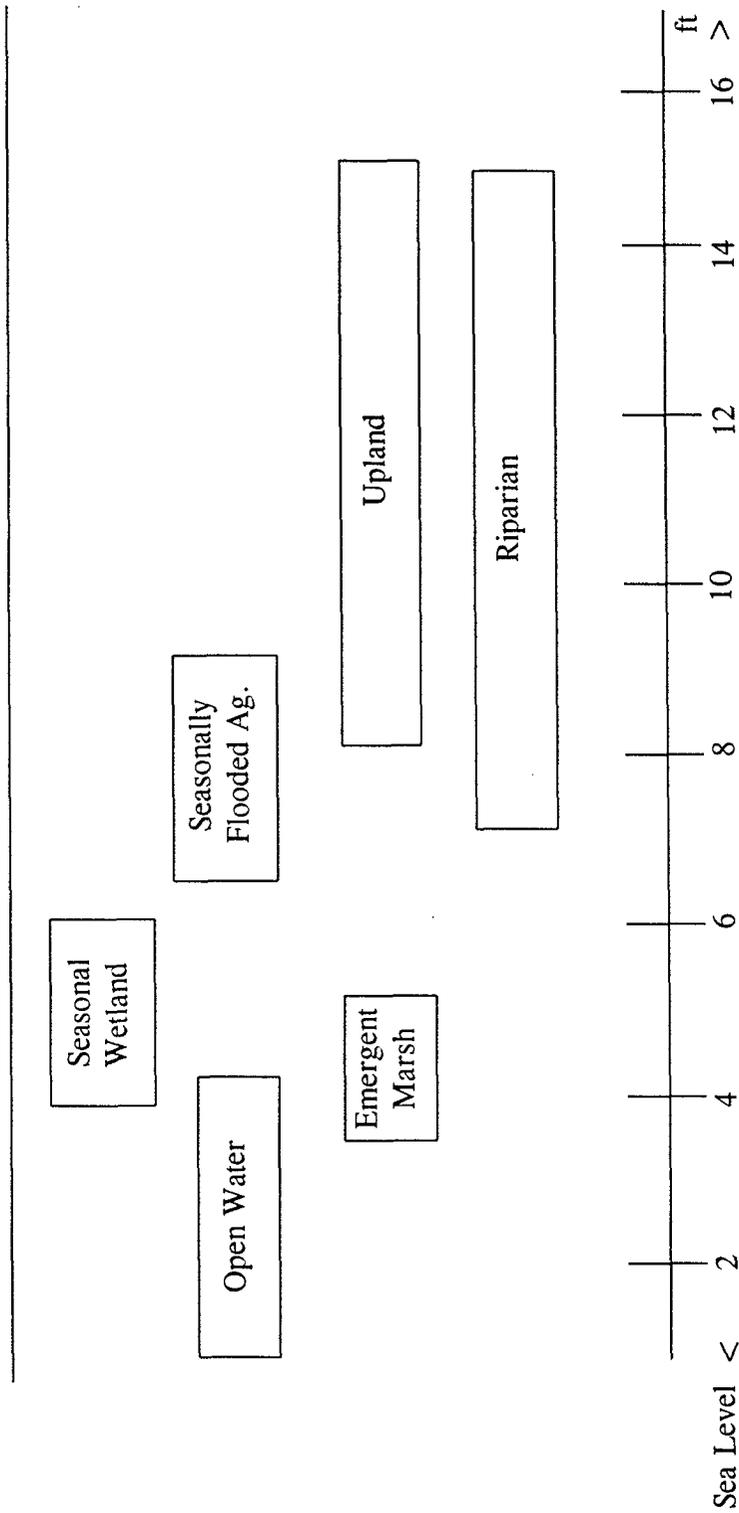


Figure 4. Conceptual Habitat Plan for the Grizzly Slough Project Area. Land Elevation Ranges for Various Habitat Types.

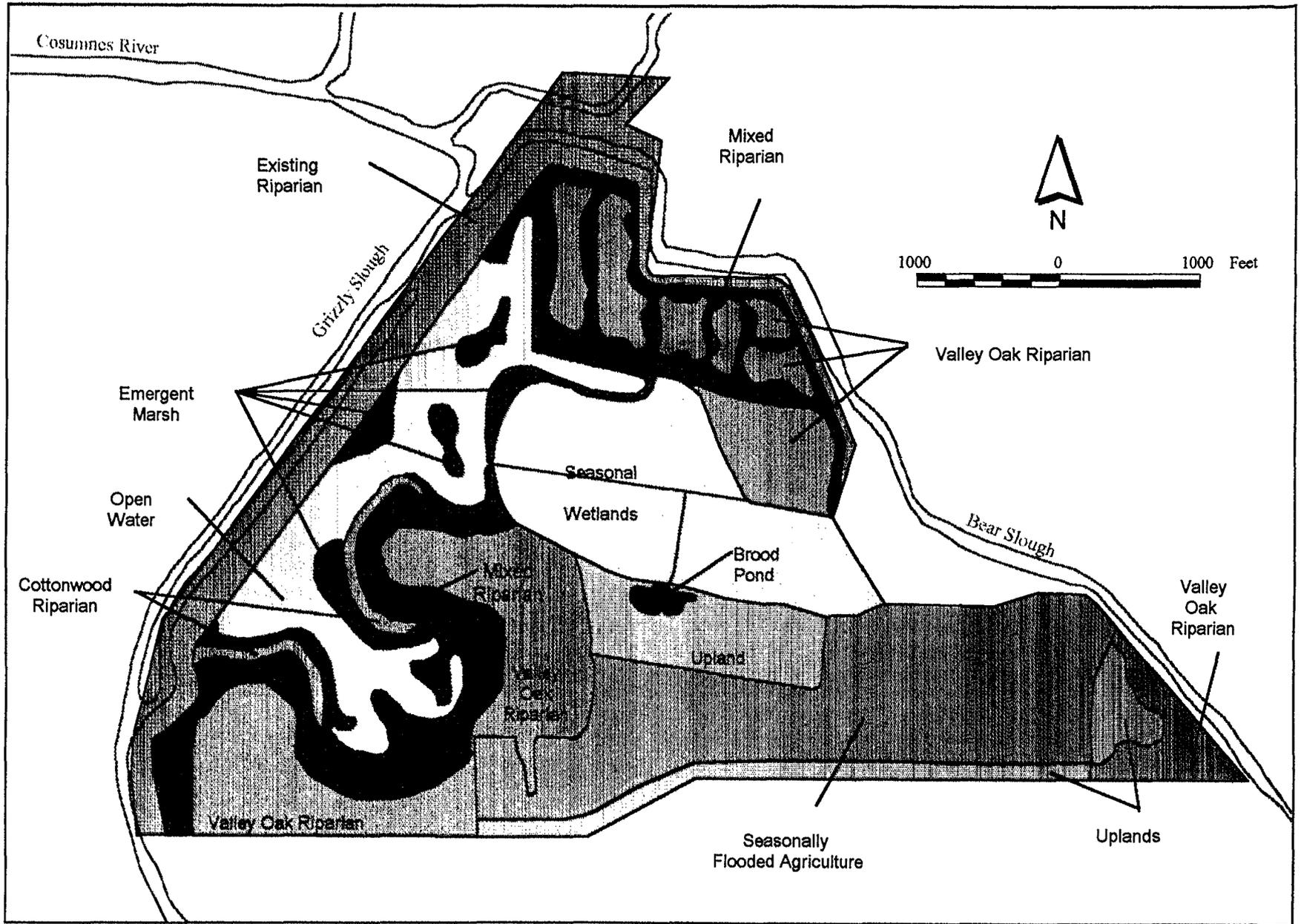


Figure 5. Conceptual Habitat Plan for the Grizzly Slough Project Area. Conceptual Habitat Map Showing Proposed Habitat Locations.

Table 2. Conceptual Habitat Plan for the Grizzly Slough Project Area. Habitat Types, Acreage, and Elevation of Habitats in the Grizzly Slough Project Area.<sup>1/</sup>

<u>Habitat Type</u>	<u>Acreage</u>	<u>Average Land Elevation After Borrow Removal</u>
Existing Riparian	54.27	N/A
Open Water (OW)	52.02	0.25 feet
Emergent Marsh (EM)	30.11	3.25 feet
Seasonal Wetland (SW)	58.91	3.0 feet
Cottonwood Riparian Forest (CRF)	5.70 <sup>2/</sup>	7 - 9 feet
Mixed Riparian Forest (MRF)	49.40 <sup>2/</sup>	10 - 11 feet
Valley Oak Riparian Forest (VORF)	98.74	11 - 15 feet
Seasonally Flooded Agriculture (SFA)	85.13	8.0 feet
Upland (U)	37.90	10.0 feet
Levees for SW	0.50 <sup>3/</sup>	5.25 feet
Levees for (SFA)	1.50 <sup>3/</sup>	10.0 feet
Brood Pond (BP)	1.45	4.0 feet
Miscellaneous <sup>4/</sup>	<u>13.37</u>	N/A
TOTAL	489.0	

1/ Acreages do not include riparian or open water habitats that already exist at the site. Acreages do include 27 acres of VORF and 7.6 acres of MRF in the Thornton-New Hope Mitigation Area.

2/ Cottonwood and mixed riparian habitats grade from one into another based on a variety of factors including soil moisture and elevation, therefore, only estimates of acreage for individual habitat types can be provided in this conceptual plan.

3/ These acreage values include areas designated for public parking, observation platforms, and trails.

4/ Roads, ditches, other existing miscellaneous features.

## Habitat Types and Descriptions

### Open Water

Open water habitat will be created by excavating borrow material along the western portion of the project area (Figure 5). Water depth will range from 3 to 5 feet to restrict growth of dense stands of emergent aquatic plants such as hardstem bulrush and cattail. Scattered brush piles and openings within the emergent marsh will provide forage and escape cover for numerous native fish, amphibians, and aquatic insects. Basking sites for western pond turtles would be created by scattering logs and snags throughout the pond. Increasing shallow water habitat can be beneficial to several special status species such as the delta smelt and Sacramento splittail. The hydraulic connection to Grizzly Slough could be made to allow unrestricted access during important spawning periods while still providing protection when needed from flooding of the Grizzly Slough Project area or adjacent properties. Currently this habitat type is restricted to water conveyance ditches and perimeter sloughs, therefore, increases in open water habitat should be beneficial to many fish and wildlife species.

#### Specifications:

- average depth to water table: 5 feet
- average depth of clay type soils: 11 feet
- acreage of habitat type: 52.02 acres
- current elevation of proposed habitat area: 9.25 feet
- average depth of borrow to be removed: 9 feet
- average elevation of soil after borrow is removed: +0.25 feet
- quantity of borrow available within this habitat type: 0.76 million cubic yards
- plant associations: duck weed, sago pondweed.
- wildlife species which benefit from habitat type: all fish species; western pond turtles, frogs, aquatic insects, and waterfowl.

### Emergent Marsh

Emergent marsh habitat will be formed along the boundary between open water habitat and adjacent habitats as well as subsurface islands scattered throughout the open water habitat (Figure 5). Elevation of the emergent marsh stands will range from 2.5 to 4 feet and will average 3.25 feet. Emergent marsh habitat provides breeding sites, escape cover, and forage for native fish, amphibians, birds, mammals, and aquatic insects. Currently this habitat type is generally restricted to the perimeters of both Bear and Grizzly sloughs, therefore, additional

acreage of emergent marsh habitat should benefit local populations of wildlife species. Opportunities exist to also create shaded riverine aquatic (SRA) habitat at the land water interface. Installing snags at that interface can accelerate the establishment of SRA.

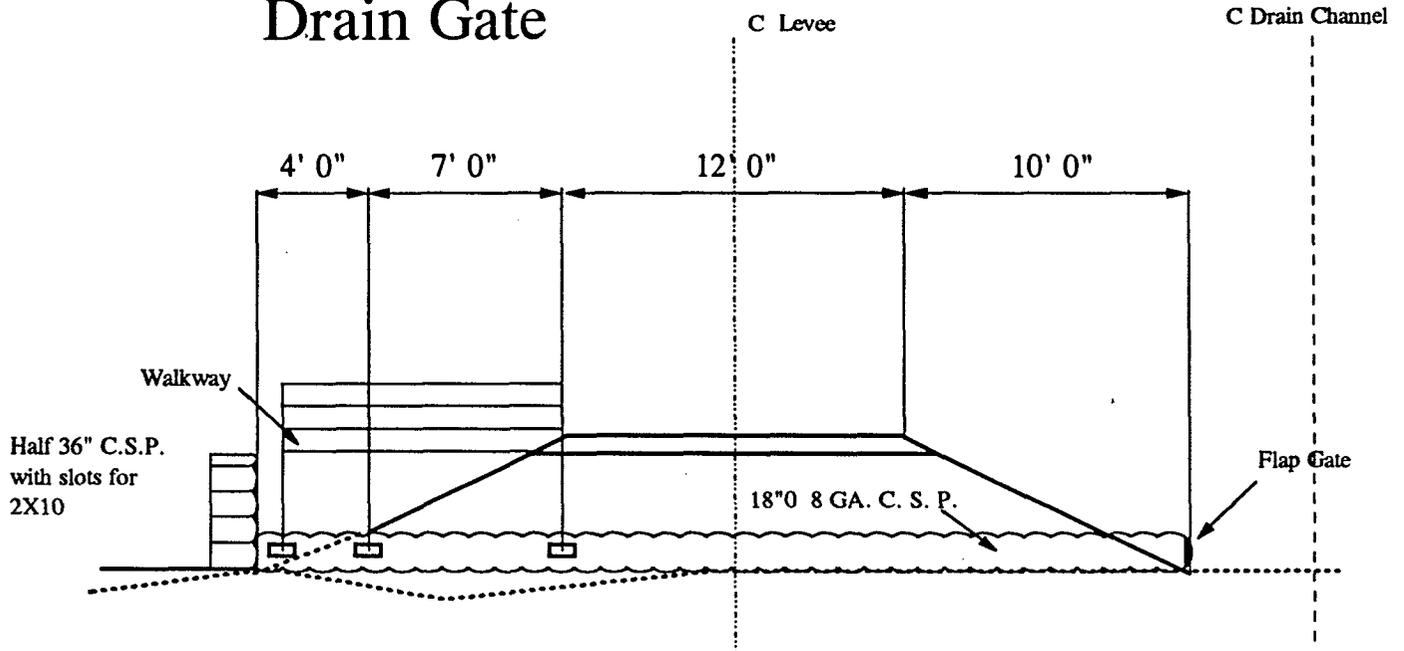
#### Specifications:

- average depth to water table: 5 feet
- depth of clay type soils: 11 feet
- acreage of habitat type: 30.11 acres
- current elevation of proposed habitat area: 9.25 feet
- average depth of borrow to be removed: 6 feet
- average elevation of soil after borrow is removed: 3.25 feet
- quantity of borrow available within this habitat type: 0.29 million cubic yards
- plant associations: hardstem bulrush, cattail, delta tule pea.
- wildlife species which benefit from habitat type: fish species; amphibians, giant garter snake, aquatic insects, tri-colored blackbirds, black-crowned night heron, American bittern, rails, and waterfowl.

#### Seasonal Wetland

Seasonal wetland habitat is centrally located in the Conceptual Habitat Plan and will be bordered by riparian, agricultural, and emergent marsh habitats (Figure 5). The elevation of the seasonal wetlands will range from 1.75 to 3.25 feet and average 2.25 feet. This elevation was selected to facilitate spring irrigation and fall ponding from the adjacent open water habitat. After the borrow material has been removed a foot of top soil will be evenly scattered over the area to provide the necessary organic material for plant growth. Water depth will range from six to eighteen inches and will average one foot. Three cells have been designed and each will be capable of independent operation for both flood-up and drawdown activities. Independent water control will allow the manager to raise specific marsh plants and in the event of a mosquito abatement problem or disease outbreak will allow for rapid drawdown or flood-up. During the summer, except for required irrigation, these units will remain dry to provide foraging habitat for raptorial species such as Swainson's hawk and will provide nesting cover for waterfowl. Currently there is no seasonal wetland on the project area, however, the Nature Conservancy is developing seasonal and permanent wetlands on their property to provide habitat for wintering waterfowl, shorebirds, and sandhill cranes. A suitable infrastructure consisting of small levees and fill and drain structures will be installed to allow for proper water management in the seasonal wetland areas (Figure 6).

# Drain Gate



# Water Supply Gate

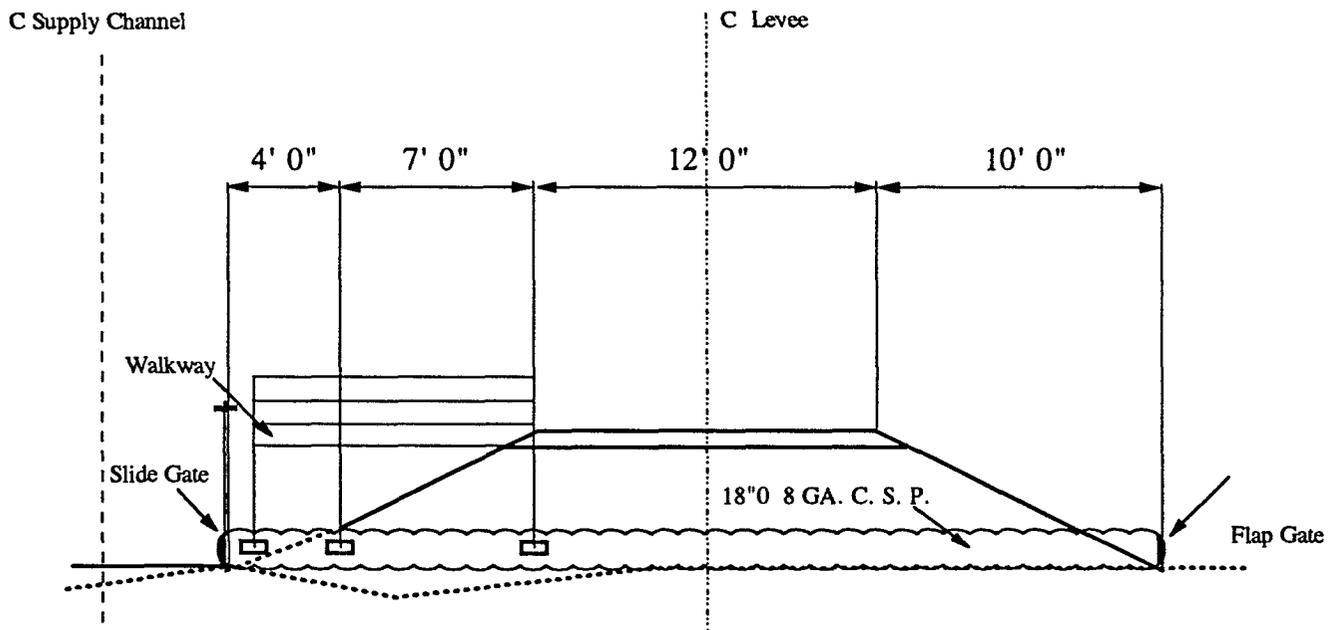


Figure 6. Conceptual Habitat Plan for the Grizzly Slough Project Area. Water Control Structures for Seasonal Wetland, Seasonally Flooded Agriculture and Brood Ponds.

Specifications:

- average depth to water table: 11 feet
- depth of clay type soils: 13 feet
- acreage of habitat type: 58.91 acres
- current elevation of proposed habitat area: 11.5 feet
- average depth of borrow to be removed: 8.5 feet
- average elevation of soil after borrow is removed: 3.0 feet
- quantity of borrow available within this habitat type: 0.81 million cubic yards
- plant associations: hardstem bulrush, smartweed, swamp timothy, watergrass, river bulrush, duck potato, and dock.
- wildlife species which benefit from habitat type: amphibians, giant garter snake, aquatic insects, tri-colored blackbirds, black-crowned night heron, American bittern, rails, Swainson's hawk, sandhill cranes and waterfowl.

**Riparian**

Currently there are scattered riparian patches throughout the interior portions of the area and extensive riparian corridors along the perimeter of both Bear and Grizzly sloughs. (Figure 5). Cottonwood riparian forest (CRF) is more water tolerant and consequently will occur adjacent to the water. Gradually CRF intergrades into mixed riparian forest (MRF) as soil moisture decreases and MRF is gradually replaced by valley oak riparian forest (VORF) in the higher, drier portions of the project area. The percent composition of each riparian type will be based upon topography, soil type and pond location not on specific management activities. North of the project area the Nature Conservancy is developing large areas of each of these riparian habitats and it is hoped that this will form a southern extension of their work. When these areas are mature they will provide habitat for numerous wildlife species.

Cottonwood Riparian Forest

Specifications:

- average depth to water table: variable (5 to 7 feet)
- depth of clay type soils: variable (11 to 13 feet)
- acreage of habitat type: 5.7 acres
- current elevation of proposed habitat area: 12.75 feet

- average depth of borrow to be removed: 4.75 feet
- average elevation of soil after borrow is removed: 7 -9 feet
- quantity of borrow available within this habitat type: 0.04 million cubic yards
- plant associations: Fremont cottonwood, box elder, creeping rye-grass, black willow, sandbar willow, yellow willow, arroyo willow, button brush, Oregon ash, blue elderberry, and California wild grape.
- wildlife species which benefit from habitat type: California quail, ring-necked pheasant; Cooper's and sharp-shinned hawks; Swainson's hawk; yellow-billed cuckoo; various woodpecker species; numerous passerine species; small rodents; rabbits, and insects.

#### Mixed Riparian Forest

##### Specifications:

- average depth to water table: variable (5 to 7 feet)
- depth of clay type soils: variable (11 to 13 feet)
- acreage of habitat type: 49.4 acres
- current elevation of proposed habitat area: 13.0 feet
- average depth of borrow to be removed: 2 feet
- average elevation of soil after borrow is removed: 10 to 11 feet
- quantity of borrow available within this habitat type: 0.16 million cubic yards
- plant associations: box elder, button brush, white alder, California pipestem clematis, California sycamore, northern California black walnut, Fremont cottonwood, black willow, red willow, yellow willow, arroyo willow, blue elderberry, California wild grape.
- wildlife species which benefit from habitat type: California quail, ring-necked pheasant; Cooper's and sharp-shinned hawks; Swainson's hawk; various woodpecker species; numerous passerine species; small rodents; rabbits, and insects.

#### Valley Oak Riparian Forest

##### Specifications:

- average depth to water table: variable (5 to 20 feet)
- depth of clay type soils: variable (6 to 20 feet)
- acreage of habitat type: 98.74 acres

- current elevation of proposed habitat area: 12.75 feet
- average depth of borrow to be removed: 1.75 feet
- average elevation of soil after borrow is removed: 11 to 15 feet
- quantity of borrow available within this habitat type: 0.28 million cubic yards
- plant associations: Dutchman's pipevine, California pipestem clematis, creeping rye-grass, Oregon ash, northern California black walnut, California sycamore, valley oak, California wild rose, blackberry, and blue elderberry.
- wildlife species which benefit from habitat type: California quail, ring-necked pheasant; Cooper's and sharp-shinned hawks; Swainson's hawk; various woodpecker species; numerous passerine species; small rodents; rabbits, and insects.

### Seasonally Flooded Agriculture

Agricultural habitat will be recreated after the removal of approximately five feet of borrow material and placing two feet of top soil over all areas of the project area slated for agricultural production (Figure 5). Agricultural practices which provide cover for small mammals that can be utilized as a food source for migrating Swainson's hawks have been identified as desirable for the project area. During the winter these areas will also provide forage habitat for sandhill cranes and geese. Agricultural lands are abundant in the area; however, forage sites adjacent to roost sites are desirable for both waterfowl and cranes and their ability to provide forage for migrating hawks should increase the value of the area for wildlife. An infrastructure will be developed composed of internal levees and water control structures (Figure 6) that will enable the harvested crops to be flooded to specified water depths for sandhill cranes and geese.

#### Specifications:

- average depth to water table: 15-17 feet
- depth of clay type soils: 16- 18 feet
- acreage of habitat type: 85.13 acres
- current elevation of proposed habitat area: 13 feet
- average depth of borrow to be removed: 5 feet
- average elevation of soil after borrow is removed: 8 feet
- quantity of borrow available within this habitat type: 0.69 million cubic yards
- plant associations: hay, alfalfa, low growing row crops such as corn, wheat, or rice

- wildlife species which benefit from habitat type: California quail, ring-necked pheasant; waterfowl, sandhill cranes; Swainson's hawk; small rodents; rabbits, and insects

## **Upland**

Permanent upland areas will be developed in a mosaic with the agricultural areas and will be intermixed with the emergent marsh and riparian areas. Upland areas adjacent to emergent marsh and open water areas can provide important reproductive, escape, and hibernation sites for special status reptiles such as the giant garter snake and western pond turtle. Upland habitat will be developed after zero to three feet of borrow material is removed. Management will include an aggressive program of reestablishing native upland grassland species including species listed in Appendix B.

### **Specifications:**

- average depth to water table: 20 feet
- depth of clay type soils: 16 feet
- acreage of habitat type: 37.9 acres
- current elevation of proposed habitat area: 13 feet
- average depth of borrow to be removed: 3 feet
- average elevation of soil after borrow is removed: 10 feet
- quantity of borrow available within this habitat type: 0.18 million cubic yards
- plant associations: native grasses
- wildlife species which benefit from habitat type: California quail, ring-necked pheasant; waterfowl, sandhill cranes; Swainson's hawk; small rodents; rabbits; burrowing owls, and insects

## **Brood Pond**

A brood pond will be developed in a portion of the site's upland area adjacent to the seasonal wetland. The pond and its location will serve a key role in improving waterfowl production, particularly for mallards. Typically, the limiting factor in Delta agricultural areas is the lack of suitable brood water. Small ponded areas managed with a reverse cycle flooding scheme have been demonstrated to provide critical brood water. A brood pond will be developed after 6 to 8 feet of borrow material is removed. An infrastructure will be developed consisting of internal levees and water control structures (Figure 6) which will allow the pond to be flooded in early February and then drawn down in early to mid-August. Vegetation management, e.g. discing and mowing, can take place following drawdown with a goal of

maintaining between 30 and 60 percent emergent cover.

Specifications:

- average depth to water table: 20 feet
- depth of clay type soils: 16 feet
- acreage of habitat type: 1.45 acres
- current elevation of proposed habitat area: 13 feet
- average depth of borrow to be removed: 9 feet
- average elevation of soil after borrow is removed: 3 - 4 feet
- quantity of borrow available within this habitat type: 0.02 million cubic yards
- plant associations: watergrass, smartweed, hardstem bulrush, cattail
- wildlife species which benefit from habitat type: waterfowl and shorebirds

### **Borrow Material**

In order to develop this Plan in the form outlined in this report, slightly more than 3 million cubic yards of borrow will be removed from the Grizzly Slough Project Area. Table 3 displays the estimated volume of borrow material that may be available by habitat type.

### **Baseline Evaluation and Future Monitoring**

Prior to project initiation, a Habitat Evaluation Procedure (HEP) will be conducted to determine baseline wildlife values of the project area as well as provide a yardstick to evaluate wildlife use of the area after site improvements are completed. The initial HEP will form the baseline to which subsequent HEP analyses would be compared to assess mitigation credit.

### Emergent Marsh and Open Water

Monitoring of emergent marsh and open water habitats should be conducted concurrently yearly for five years and document species diversity, percent cover, density, and intrusion of emergent marsh into open water habitat. Monitoring methods within the open water habitat should follow those for the emergent marsh and should include the extent of emergent marsh intrusion into the open water habitat.

Table 3. Conceptual Habitat Plan for the Grizzly Slough Project Area. Borrow Available While Developing Various Habitat Types at the Grizzly Slough Project Area.

Habitat Type	Acreage	Average Land Elevation After Borrow Removal	Volume of Borrow Available <sup>1/</sup>
Open Water (OW)	52.02	0.25 feet	0.76
Emergent Marsh (EM)	30.11	3.25 feet	0.29
Seasonal Wetland (SW)	58.91	3.00 feet	0.81
Cottonwood Riparian Forest (CRF)	5.70	7 - 9 feet	0.04
Mixed Riparian Forest (RMF)	49.40	10 - 11 feet	0.16
Valley Oak Riparian Forest (VORF)	98.74	11 - 15 feet	0.28
Seasonally Flooded Agriculture (SFA)	85.13	8.0 feet	0.69
Upland (U)	37.90	10.0 feet	0.18
Brood Pond (BP)	1.45	4.0 feet	0.02
TOTAL	419.36		3.23 <sup>2/</sup>

1/ in millions of cubic yards

2/ includes borrow that will be removed during development of the Thornton-New Hope Mitigation site

## Riparian

Additional monitoring in the riparian habitats should include plant species diversity, percent cover, survival rates of planted vegetation, percent canopy cover, diameter at breast height, percent herbaceous cover, and plant height. In addition to the quantitative information a description of the site should also be included. These monitoring efforts should be conducted yearly for five years and then every two years for the next ten years.

## Seasonal Wetland

Monitoring within seasonal wetland areas should include vegetation species diversity, percent composition of species, and an estimate of percent cover. These monitoring efforts should be conducted yearly for five years or until desired waterfowl food plants become established.

## Upland

Upland should be monitored yearly for five years to document species diversity and success of native herbaceous cover plantings.

## Wildlife Monitoring

Wildlife monitoring should be conducted quarterly for the first five years, then yearly during portions of the year when targeted special status species are most likely to occur as determined by a qualified biologist. Results of all monitoring efforts should be written in report form and submitted to the DFG yearly.

## **Recreation**

Recreation on the Grizzly Slough Project Area during the habitat development stage would be restricted to nature walks, photography, and bird watching on a very limited scale and by appointment in advance with DWR and DFG. Upon project completion and habitat maturation, public access and recreational activities should be reevaluated to determine which activities would provide acceptable public access without compromising maximum benefits to the biological resources in the project area.

A potential approach that could be considered is the construction of a small, 20 car parking area in the vicinity of the homestead site (Figure 7). From that parking area a foot trail could be constructed which enters the dense riparian corridor to the east of the parking area and loops up to a well hidden, slightly elevated, observation platform at the interface between

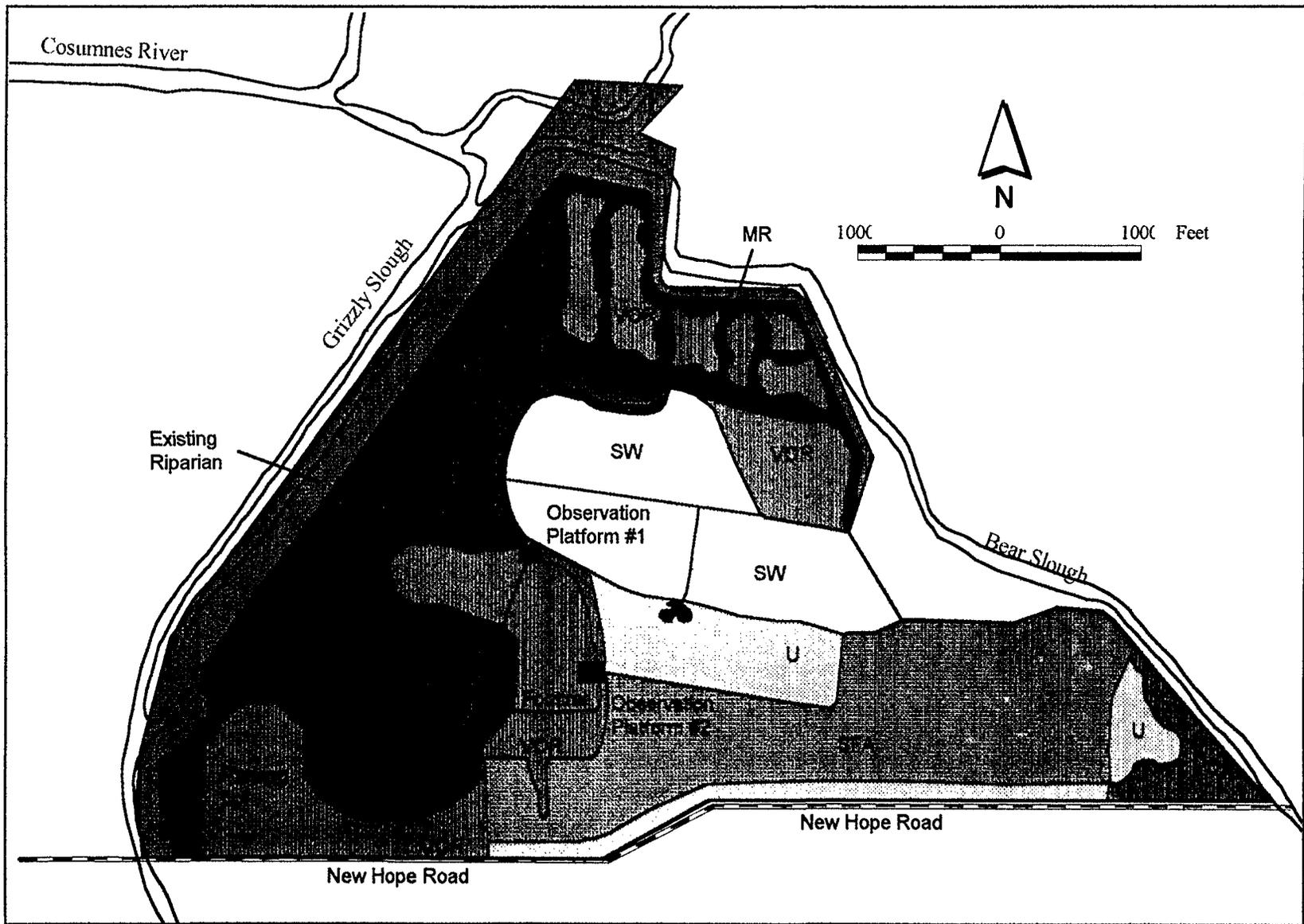
between the mixed riparian forest, valley oak riparian forest, emergent marsh, and seasonal wetland (Blind1). From there, the route could turn southward to another blind (Blind 2) overlooking the upland, brood pond, and seasonally flood agriculture areas before turning west to rejoin the trail to return to the parking area.

### Summary

The conceptual habitat design developed by the DFG should allow the DWR to remove a portion of the borrow material needed to help fulfill needs for levee rehabilitation and maintenance along the Mokelumne River as well as increase the quality and quantity of wildlife habitat in the Delta. Development of the features outlined in the Plan would result in approximately 489 acres of high quality wildlife habitat. The mosaic of habitats and their proposed juxtaposition will result in an area that is beneficial to numerous fish and wildlife species including several special status species (Figure 8).

Goals of the conceptual habitat design are to increase habitat diversity, increase wildlife diversity, and increase the wildlife use of the project area with particular interest paid to increasing special status species use. The DFG believes that development of this Plan will achieve all of these goals at the Grizzly Slough Project Area.

While the Plan should truly be considered conceptual, nevertheless, it illustrates a habitat development approach that could provide multi-species benefits. Further, the Plan can serve as an important first-step in completing a final, comprehensive plan for the Grizzly Slough Project Site.



Conceptual Habitat Plan for the  
Grizzly Slough Project Area

May 1995

Figure 7. Conceptual Habitat Plan for the Grizzly Slough Project Area. Conceptual Recreation Facilities.

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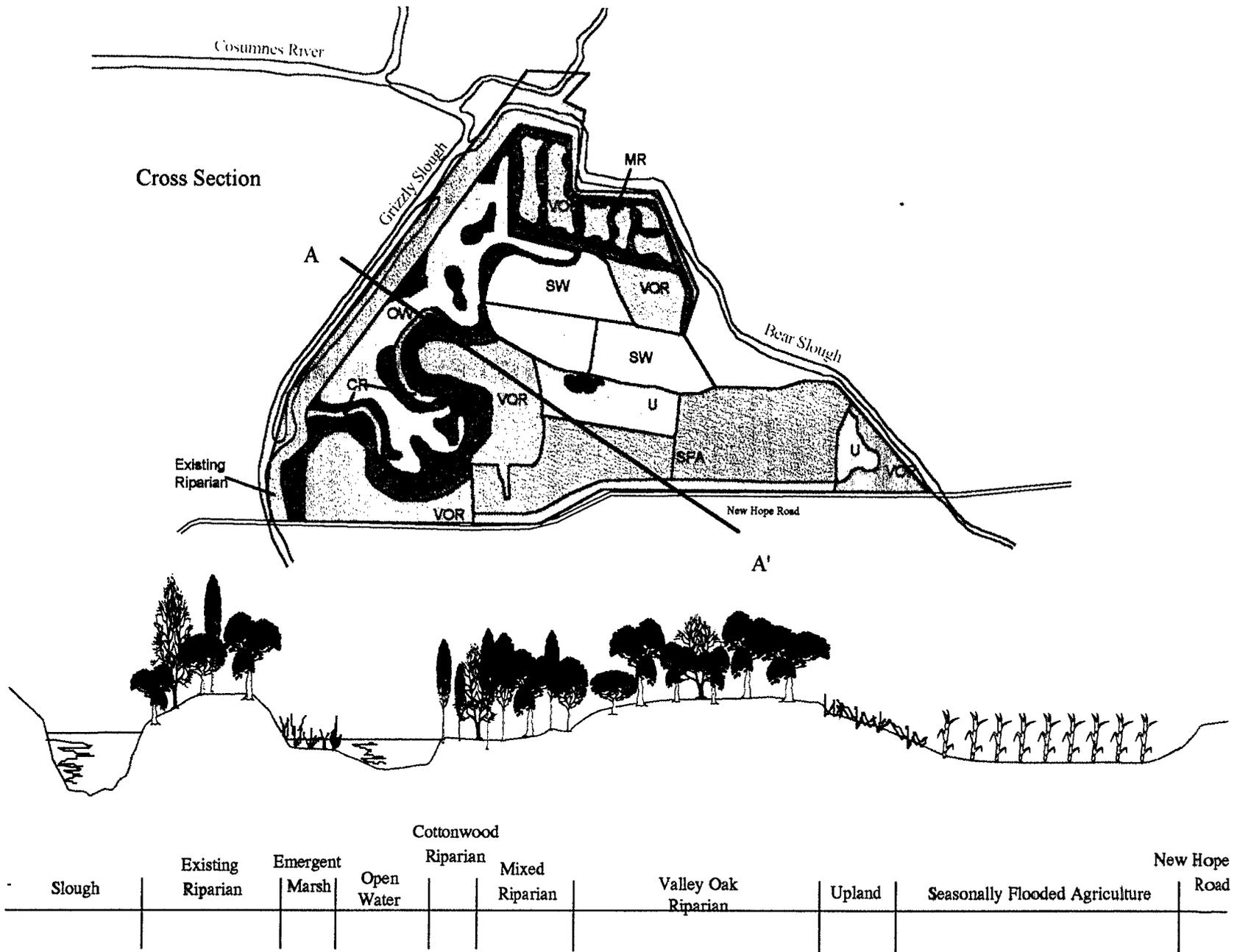


Figure 8. Conceptual Habitat Plan for the Grizzly Slough Project area. Cross Section of Proposed Habitats at the Grizzly Slough Project Area.

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**APPENDIX A**

**SPECIAL STATUS SPECIES  
HABITAT  
PRESCRIPTIONS**

## Appendix A

### Giant Garter Snake

The giant garter snake occupies marshlands, ditches and adjacent upland areas in the Central Valley (California Department of Fish and Game 1980). The giant garter snake forages in shallow open water and dense emergent vegetation. The snake requires dense emergent vegetation for cover, and adjacent herbaceous upland habitat for basking and hibernating (abundant rodent burrows are required for den sites). Optimal giant garter snake habitat has a series of parallel canals separated by upland herbaceous habitat (Brode pers. comm.). Giant garter snakes feed on small fish, amphibians, and small mammals (Brode pers. comm.). Young giant garter snakes are vulnerable to predation from non-native fish such as large-mouth bass, striped bass, green sunfish, and bluegill (Brode pers. comm.).

The following habitat characteristics should be included to create suitable habitat including movement corridors and foraging habitat:

- Create approximately 10 acres of tule marsh habitat suitable for garter snakes.
- Provide two to three main channels approximately 20-30 feet across (inner bank to inner bank); the outer margins of the channels should be approximately 2 to 3 feet deep, which would allow tules and bulrushes to grow, the middle portion should be at least 4 feet deep, which would prevent too much emergent vegetation from growing and keep the center of the channel as open water.
- Provide at least five interconnecting channels with shallow open water.
- Introduce native fishes into the wetland as a food source for giant garter snakes, Sacramento blackfish, Sacramento perch, and hitch are considered suitable fish species (Brode pers. comm.).
- Create 10 acres of non-forest upland habitat adjacent to the wetlands to provide garter snake basking and hibernating areas.
- 75-100 feet of native or ruderal vegetation at least 30 feet from roads

### Western Pond Turtle

The western pond turtle inhabits quiet water of lowland ponds, streams, sloughs, marshes, and reservoirs. Pond turtles hibernate in upland herbaceous areas. They require rocks, logs, or banks for basking.

The following should be included to create suitable habitat including basking sites:

- Create open water areas suitable for foraging (open water, ponds, and sloughs).
- Provide three to five basking sites (e.g., particularly submerged logs) in shallow portions of the open water for western pond turtles.
- Create adjacent non-forest upland areas and upland riparian areas for reproduction and hibernation.
- Sandy banks or open grassy fields 10 - 70 m from river or ponds

### Yellow-billed Cuckoo

- Width of riparian 15-30 meters- Fair
- Width of riparian 30-90 meters - Good
- Width of riparian 90+ meters- Excellent
- dense riparian
- multi-story
- predominately cottonwood/tree willows

### California Black Rail

- Tidal tules and cattails > 3 meters in width

Continued

### Riparian Brush Rabbit

- 90,000 A of habitat historically now only 5,000 A.
- 261 A of occupied habitat at Caswell State Park is all that is left
- Dense brush understory
  - protected from flooding
  - grassy buffer around riparian
  - clumps of brush > 450 m<sup>2</sup> cover > 21 cm (8-10")
  - clumps contiguous or < 350 m apart
  - no willows
  - wild rose
  - coyote brush
  - elderberries
  - wild grape
  - box elders
  - valley oaks - cottonwoods

**APPENDIX B**

**CANDIDATE PLANT SPECIES FOR  
REVEGETATION OF  
GRIZZLY SLOUGH PROJECT AREA**

**Appendix B**

<b>Common Name</b>	<b>Scientific Name</b>
<b>Open Water</b>	
Duck weed	<i>Lemna minor</i>
Sago pondweed	<i>Potamogeton pectinatus</i>
<b>Emergent Marsh Species</b>	
Wooly Sedge	<i>Carex lanuginosa</i>
Rough Sedge	<i>C. senta</i>
Chufa	<i>Cyperus esculentus</i>
Tall Flatsedge	<i>C. eragrostis</i>
Spikerush	<i>Eleocharis ssp.</i>
Worled Penny-wort	<i>Hydrocotyle verticillata triradiata</i>
Delta Tule Pea	<i>Lathyrus jepsonii ssp. jepsonii</i>
Northern Mudwort	<i>Limosella aquatica</i>
Common Reed	<i>Phragmites australis</i>
Hard-stem Bulrush	<i>Scirpus acutus</i>
Olney's Bulrush	<i>S. Americanus</i>
California Bulrush	<i>S. Californicus</i>
Alkali Bulrush	<i>S. robustus</i>
Giant Burreed	<i>Sparganium eurycarpum</i>
Southern Cattail	<i>Typha domingensis</i>
Broad-Leaf Cattail	<i>T. latifolia</i>
S. American Vervain	<i>Verbena bonariensis</i>
<b>Riparian</b>	
Great Valley Cottonwood Riparian Forest	
Box elder	<i>Acer negundo californica</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
Creeping rye-grass	<i>Elymus triticoides</i>

<b>Common Name</b>	<b>Scientific Name</b>
Oregon ash	<i>Fraxinus latifolia</i>
Fremont cottonwood	<i>Populus fremontii</i>
Black willow	<i>Salix gooddingii variabilis</i>
Sandbar willow	<i>S. hindsiana</i>
Red willow	<i>S. laevigata</i>
Yellow willow	<i>S. lasiandra</i>
Arroyo willow	<i>S. lasiolepis</i>
Blue elderberry	<i>Sambucus mexicana</i>
California wild grape	<i>Vitis californica</i>
<b>Great Valley Mixed Riparian Forest</b>	
Box elder	<i>Acer negundo californica</i>
White alder	<i>Alnus rhombifolia</i>
Buttonbush	<i>Cephalanthus occidentalis</i>
California pipestem clematis	<i>Clematis ligusticifolia californica</i>
Northern California Black Walnut	<i>Juglans hindsii</i>
California sycamore	<i>Platanus racemosa</i>
Fremont cottonwood	<i>Populus fremontii</i>
Black willow	<i>Salix gooddingii variabilis</i>
Red willow	<i>S. laevigata</i>
Yellow willow	<i>S. lasiandra</i>
Arroyo willow	<i>S. lasiolepis</i>
Blue elderberry	<i>Sambucus mexicana</i>
California wild grape	<i>Vitis californica</i>
<b>Great Valley Valley Oak Riparian Forest</b>	
Dutchman's pipevine	<i>Aristolochia californica</i>
California pipestem clematis	<i>Clematis ligusticifolia var. Californica</i>
Creeping rye-grass	<i>Elymus triticoides</i>

Common Name	Scientific Name
Oregon ash	<i>Fraxinus latifolia</i>
Northern California black walnut	<i>Juglans hindsii</i>
California sycamore	<i>Platanus racemosa</i>
Valley oak	<i>Quercus lobata</i>
California wildrose	<i>Rosa californica</i>
Blackberry	<i>Rubus spp.</i>
Blue elderberry	<i>Sambucus mexicana</i>
<b>Seasonally Flooded Marsh - Vernal Marsh</b>	
Water-shield	<i>Brasenia shreberi</i>
Sedge	<i>Carex spp.</i>
Downingia	<i>Downingia spp.</i>
Coyote-thistle	<i>Eryngium spp.</i>
Hedge-hyssop	<i>Gratiola spp.</i>
Rush	<i>Juncus spp.</i>
Fringed water-plantain	<i>Machaerocarpus californicus</i>
Hairy pepperwort	<i>Marsilea vestita</i>
Swamp-timothy	<i>Heleochloa schoenoides</i>
Navarretia	<i>Navarretia spp.</i>
Smartweed	<i>Polygonum spp.</i>
Arrow-head	<i>Sagittaria spp.</i>
Stanford's arrow-head	<i>Sagittaria stanfordii</i>
Hardstem bulrush	<i>Scirpus acutus</i>
Bladderwort	<i>Utricularia spp.</i>
Watergrass	<i>Echinochloa crusgalli</i>
<b>Upland</b>	
California white yarrow	<i>Achillea borealis</i>
Blow wives	<i>Achyrrachaena mollis</i>

Common Name	Scientific Name
Bentgrass	<i>Agrostis spp.</i>
Goldenstars	<i>Bloomeria crocea</i>
Golden broadiaea	<i>Brodiaea lutea var. scabra</i>
California brome	<i>Bromus carinatus</i>
Common soap plant	<i>Chlorogalum pomeridianum var. pomeridianum</i>
Clarkia	<i>Clarkia spp.</i>
Shooting star	<i>Dodecatheon spp.</i>
California poppy	<i>Escholtzia californica</i>
Blue wildrye	<i>Elymus glaucus</i>
Creeping ryegrass	<i>E. triticoides</i>
Gilia	<i>Gilia spp.</i>
Meadow barley	<i>Hordeum brachyantherum</i>
Tidy tips	<i>Layia platyglossa</i>
Lupine	<i>Lupinus spp.</i>
California melic	<i>Melica californica</i>
Narrow-leaved owl's clover	<i>O. purpurasens</i>
Common owl's clover	<i>Plantago hookeriana var. Californica</i>
Pine bluegrass	<i>Poa scabrella</i>
Nodding neddlegrass	<i>Stipa cernua</i>
Purple needlegrass	<i>S. pulchra</i>
Plaintain grass	
<b>Agriculture</b>	
Corn	
Wheat	
Rice	
Alfalfa	
Permanent pasture	

Common Name	Scientific Name
<b>Brood Ponds</b>	
Hard-stem Bulrush	<i>Scripus acutus</i>
Broad-Leaf Cattail	<i>Typha latifolia</i>
Smartweed	<i>Polygonum spp.</i>
Watergrass	<i>Echinochloa crusgalli</i>

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