

**Appendix G3. Habitat Management Plan for the Delta
Wetlands Habitat Islands**

Draft

**Habitat Management Plan
for the Delta Wetlands
Habitat Islands**

Prepared for:

**California State Water Resources Control Board
Division of Water Rights
and
U.S. Army Corps of Engineers
Sacramento District**

Prepared by:

**Jones & Stokes Associates, Inc.
2600 V Street
Sacramento, CA 95818
Contact: Marcus P. Rawlings
916/737-3000**

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INTRODUCTION

Project Overview

Delta Wetlands Properties (DW) proposes to divert and store water on two islands (Bacon Island and Webb Tract) in the Sacramento-San Joaquin Delta (Delta). Two additional islands (Bouldin Island and Holland Tract) would be dedicated primarily to management for wetland and wildlife habitat values to offset biological impacts resulting from the project. The water storage islands, hereafter referred to as reservoir islands, encompass approximately 11,000 acres of agricultural land in the central Delta (Figure 1). The wetland and wildlife management islands, hereafter referred to as habitat islands, encompass approximately 9,000 acres of agricultural land.

During periods of demand, stored water would be pumped from the reservoir islands into Delta channels for sale to exporters or for Delta outflow. Although reservoir islands would be operated primarily for water storage, the reservoir bottoms would include inner levee systems and would be managed in some periods of nonstorage as shallow-water wetlands. The frequency with which reservoir islands could be managed as shallow-water wetlands, however, is not predictable. (See environmental impact report/environmental impact statement [EIR/EIS] Chapter 3G, "Vegetation and Wetlands", and Appendix G2, "Prediction of Vegetation on the Delta Wetlands Reservoir Islands".)

The habitat islands would be managed primarily to offset impacts of water storage operations on state-listed threatened species, wintering waterfowl, and jurisdictional waters of the United States (jurisdictional wetlands) pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. These islands would also be managed to provide breeding and foraging habitat for other important wildlife species groups. Recreational activities that are compatible with primary management objectives, including upland game and waterfowl hunting, trap and skeet shooting, and wildlife viewing, would also be permitted. Consistent with the management goals described in this document for the habitat islands and with state water laws and codes, DW may use the habitat islands for incidental water storage.

Additional details concerning the need for the project and project operations are described in Chapter 2, "Delta Wetlands Project Alternatives", of the DW project EIR/EIS.

Purpose of This Document

This document describes the habitat management plan (HMP) developed to describe how the habitat islands will be managed to offset project impacts on state-listed threatened species, wintering waterfowl, and jurisdictional wetlands. Land management practices to benefit other wildlife species were also incorporated into the plan. The HMP specifically describes:

- goals and objectives for wildlife habitat management,
- design and functions of habitats,
- management guidelines for habitat and recreation,
- island infrastructure and levee maintenance,
- procedures for ensuring the short- and long-term success of project compensation, and
- a process for addressing changes in island management.

The California State Water Resources Control Board (SWRCB) will hold water right hearings to review the DW project and determine water right permit conditions for the project. Pursuant to Section 2081 of the California Fish and Game Code, DW and California Department of Fish and Game (DFG) will also negotiate and enter into an agreement for management of state-listed threatened and endangered species. The HMP therefore will be amended to incorporate SWRCB permit conditions and Section 2081 agreements that affect management of the habitat islands.

HMP Development

SWRCB staff requested the DFG and Jones & Stokes Associates (JSA) representatives on the habitat evaluation procedures (HEP) team (see Chapter 3H, "Wildlife", of the EIR/EIS) to design an HMP that, when implemented, would fully compensate for impacts on wildlife and wetlands caused by operations of the DW reservoir islands. The HMP design team developed the plan in consultation with SWRCB, DW, and JSA staff members. Representatives from the California Waterfowl Association, Ducks Unlimited, and the Contra Costa

County Fish and Wildlife Committee were also consulted to resolve technical management issues.

shorebirds, nongame water birds, and species associated with riparian habitats.

Habitat Types

The information used to determine habitat acreages and to estimate the project's impacts on wildlife and wetlands was first collected in 1987-1988 for preparation of the 1990 draft EIR/EIS. Information on the locations of Swainson's hawk nests and on the areas used by greater sandhill cranes has been updated to reflect current conditions. Table 1 describes habitat types present on the DW project islands in 1987 that would be affected by implementation of the DW project. Tables 2 and 3 describe management prescriptions for habitat types and acreages of habitat types to be developed with implementation of the HMP.

HMP GOALS AND OBJECTIVES

Three management goals for the habitat islands were identified by SWRCB, DW, and the HMP team. The HMP team designed island habitats, habitat juxtaposition, and habitat management criteria to achieve these goals, which are listed in order of descending priority:

- **Compensation goals.** Compensate for project impacts on species listed as threatened or endangered under the California Endangered Species Act; wintering waterfowl habitat; and jurisdictional wetlands, including riparian habitats. Compensation goals must be achieved to offset significant project impacts.
- **Species goals.** Without compromising compensation goals, implement land management practices to provide the greatest benefit to upland wildlife species; enhance breeding habitat for waterfowl, roosting habitat for greater sandhill cranes, and nesting habitat for Swainson's hawks; and provide potential habitats for other special-status species. Species goals should be implemented to enhance overall wildlife values associated with compensation habitats.
- **Other important goals.** Implement best land management practices that do not detract from compensation and priority species goals to enhance habitat conditions for other important species or species groups, such as migratory

Compensation Goals and Objectives

The primary management goal for the habitat islands is to offset project impacts on Swainson's hawks, greater sandhill cranes, jurisdictional wetlands, and wintering waterfowl. This goal is met through establishment of specified amounts of habitat on the habitat islands to compensate for project impacts on these resources. Table 4 summarizes the habitat compensation requirements that will be met through implementation of the HMP.

Additional details describing project impacts and calculation of compensation requirements are presented in California Endangered Species Act Biological Assessment: Impacts of the Delta Wetlands Project on Swainson's Hawk and Greater Sandhill Crane (JSA 1995) and in the following parts of the EIR/EIS: Chapter 3G, "Vegetation and Wetlands"; Chapter 3H, "Wildlife"; and Appendix G5, "Summary of Jurisdictional Wetland Impacts and Mitigation".

Swainson's Hawk

Swainson's hawk is a state-listed threatened species. With the exception of a small local wintering population, Swainson's hawks typically are found in the Delta as a breeding species from late March through September. Water storage on the reservoir islands will result in permanent loss of Swainson's hawk foraging habitat during the species' breeding season.

Compensation Requirements. Approximately 17,110 acres of suitable Swainson's hawk foraging habitat were present on the DW project islands in 1987 (Table 5). Suitable foraging habitat includes farmed and fallow agricultural fields, pastures, herbaceous uplands, and exotic marsh habitat. Approximately 10,048 acres of suitable foraging habitat would be lost with project implementation (9,021 acres on the reservoir islands and 1,027 acres on the habitat islands) (Table 6).

Calculations used to determine compensation requirements for the loss of 10,048 acres of foraging habitat are based on DFG Swainson's hawk mitigation guidelines (DFG 1993) and are described in the California Endangered Species Act biological assessment for DW

project impacts on Swainson's hawk and greater sandhill crane (JSA 1995). Based on DFG guidelines, approximately 6,708 acres of suitable Swainson's hawk habitat are required to be managed and protected on the habitat islands to compensate for project impacts (Table 4).

Compensation Provided on the Habitat Islands.

Six habitat types will be created and managed on the habitat islands to provide suitable Swainson's hawk foraging habitat: fields of corn rotated with wheat, small grain fields, mixed agriculture/seasonal wetlands, seasonal managed wetlands, pasture/hay fields, and herbaceous uplands (Table 4). A total of 7,539 acres, approximately 830 acres more than required for compensation, will be developed on the islands (Table 7, Figures 2 and 3).

Compensation acreages will be managed also to provide foraging habitat that is of higher quality than that normally associated with these habitat types. Beneficial management practices will include periodically mowing densely vegetated habitats to increase prey accessibility and maintaining upland border strips around seasonal wetlands to provide refugia for prey species (e.g., meadow voles) during flood periods (Table 8).

Greater Sandhill Crane

Greater sandhill crane is a state-listed threatened species. Greater sandhill cranes winter in the Delta and are generally present from October through March. Water storage on the reservoir islands will result in the permanent loss of foraging habitat for wintering greater sandhill cranes.

Compensation Requirements. Approximately 14,295 acres of suitable greater sandhill crane foraging habitat were present on the DW project islands in 1987 (Table 9). Potential foraging habitat included corn, wheat, milo, and fallow agricultural fields; pastures; herbaceous uplands; and exotic marsh habitats. Approximately 7,028 acres of suitable foraging habitat would be lost with project implementation (6,601 acres on the reservoir islands and 427 acres on the habitat islands) (Table 10).

DFG has not established formal guidelines for determining compensation requirements for the loss of foraging habitat for greater sandhill cranes. Consequently, the HMP team established a mitigation objective of replacing the affected foraging habitat acreage at a ratio of 1:1. Methods used to derive compensation requirements are described in the California Endangered Species Act bio-

logical assessment (JSA 1995). Approximately 7,028 acres of suitable crane foraging habitat are required to be maintained on the habitat islands to compensate for project impacts (Table 4).

Compensation Provided on the Habitat Islands.

Seven habitat types created on the habitat islands will provide suitable greater sandhill crane foraging habitat: fields of corn rotated with wheat, small grain fields, mixed agriculture/seasonal wetlands, seasonal managed wetlands, seasonal ponds, pasture/hay fields, and herbaceous uplands. A total of 7,673 acres of potential crane foraging habitat, approximately 645 acres more than required for compensation, will be developed on the islands (Table 11, Figures 2 and 3). To reduce the impact of hunter disturbance on foraging cranes, three closed hunting zones will be established on the habitat islands (Figures 4 and 5).

Compensation acreages will be managed also to provide foraging habitat that is of higher quality than that normally associated with these habitat types. Beneficial management practices will include leaving unharvested strips of corn in cornfields, periodically mowing densely vegetated habitats to improve access for foraging cranes, and maintaining dry or shallow-water conditions favored as roost sites by cranes in portions of habitats managed to attract wintering waterfowl (Table 12).

Jurisdictional Wetlands

Project impacts on wetlands protected under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 and compensation requirements for the loss of those wetlands are described in detail in Appendix G5 of the EIR/EIS and are summarized in Table 4.

Compensation Requirements. Ten types of jurisdictional wetland (i.e., artificial wetland) habitats are affected by the project: riparian woodland, riparian scrub, freshwater marsh, exotic marsh, open water, canals and ditches, grain and seed crops, annual grassland, exotic perennial grassland, and unvegetated disturbed areas (Table 13).

Approximately 394 acres of jurisdictional wetlands would be lost on the reservoir islands with DW project implementation (Table 13). Approximately 2 acres of riparian scrub and freshwater marsh habitats on Bouldin Island and Holland Tract would be affected by construction of recreation facilities adjacent to levees. Some existing freshwater marsh areas will be expanded or

incorporated as inclusions into other wetland habitat types. Compensation will also be required for 78.2 acres of exotic marsh habitats on Bouldin Island and Holland Tract (Table 13) that will be converted to higher quality wildlife habitats.

Compensation Provided on the Habitat Islands.

A total of 8,348 acres of riparian woodland, riparian scrub, emergent marsh, seasonal managed wetland, mixed agriculture/seasonal wetland, permanent lake, corn/wheat fields, small grain fields, canals, and herbaceous upland habitats will be created on the habitat islands (Table 3, Figures 2 and 3). The dominant plant species associated with these habitats will be those presently found in the Delta region.

Riparian woodland and scrub compensation habitats will be developed primarily through increases in the sizes of existing riparian habitats or by establishment of woody riparian vegetation adjacent to perimeter levees and interior canals. Emergent marsh habitats will be developed to compensate for loss of freshwater marshes and will be dominated by tules and cattails. Compensation for project impacts on exotic marsh habitat and unvegetated disturbed areas will be achieved through establishment of approximately 3,761 acres of seasonal managed wetland and mixed agriculture/seasonal wetland habitats dominated by watergrass and smartweed. Two large lakes will be established on Bouldin Island to compensate for the loss of open-water habitat associated with the two blowout ponds on Webb Tract.

Compensation for the loss of open water associated with canals and ditches on the reservoir islands would be achieved with the anticipated increase in the number of canals and ditches that would be required to manage permanent and seasonal wetland habitats on the habitat islands. Establishment of corn/wheat fields, small grain fields, and mixed agriculture/seasonal wetland habitats would offset the loss of grain and small seed crops. Management of herbaceous uplands to be established on the habitat islands specifically for wildlife would offset the loss of grassland habitats that constitute jurisdictional wetlands on the reservoir islands (Table 2).

Foraging Habitat for Wintering Waterfowl

Large numbers of wintering waterfowl, primarily swans, geese, and dabbling ducks, use the agricultural islands in the Delta. Typically, wintering waterfowl use the Delta from mid-August through mid-April. Currently, the period of peak waterfowl use and highest foraging values on the DW project islands is December

and early January. Water storage on the reservoir islands will result in substantial loss of the existing foraging habitat for wintering waterfowl.

Compensation Requirements. Approximately 19,380 acres of foraging habitat were present on the DW project islands in 1987 (Table 14). Some waterfowl foraging values are provided by sixteen habitats, including corn, wheat, milo, and fallow agricultural fields; pastures; herbaceous uplands; and marsh habitats. Waterfowl forage values will be degraded on approximately 10,514 acres on the reservoir islands (Table 14). Under existing agricultural management practices, these habitats provide low to moderate waterfowl forage values (JSA 1993).

Results of the HEP analysis (JSA 1993) (see Chapter 3H, "Wildlife", in the EIR/EIS) were used by the HMP team as a guideline for determining compensation requirements for wintering waterfowl. The team determined that compensation for lost foraging habitat could be achieved on approximately 8,220 acres if compensation habitats were managed as described in this HMP (Table 2).

Compensation Provided on the Habitat Islands.

Four habitat types will be created and managed specifically to provide high-value foraging habitat for wintering waterfowl: fields of corn rotated with wheat, mixed agriculture/seasonal wetlands, seasonal managed wetlands, and pasture/hay fields (Table 4). Approximately 6,549 acres of these habitats will be developed on the habitat islands (Table 15). An additional 1,670 acres of small grain fields, seasonal ponds, emergent marshes, lakes, and herbaceous uplands will also provide wintering waterfowl forage values, though of lower value than habitats specifically managed as foraging habitat for wintering waterfowl (Table 15, Figures 2 and 3). Three closed hunting zones will be established on the habitat islands to provide undisturbed foraging areas (Figures 4 and 5).

Compensation acreages will be managed to provide foraging habitat that is of higher quality than that normally associated with these habitat types. Beneficial management practices will include periodically mowing densely vegetated wetlands before flooding to provide open areas, harvesting only a portion of corn and wheat crops to increase food abundance, and flooding harvested fields and wetlands sequentially to increase the length of the period during which foraging habitat is available (Table 16).

Species Goals and Objectives

The primary consideration in developing habitat island design and management criteria was to ensure that state and federal agency compensation requirements are achieved. DW and the HMP team, however, recognize that the habitat islands could also be managed to benefit other species groups of local or regional importance without affecting compensation habitat values. Species goals and objectives include managing habitats to offset project impacts on upland wildlife species, increasing habitat availability for special-status species that occur or could occur on the habitat islands, and enhancing waterfowl breeding habitats.

Upland Wildlife Species

Water storage will result in an almost total loss of habitat for upland wildlife species on the reservoir islands. Upland habitats could develop on the reservoir islands during extended nonstorage periods; however, resident species, such as ring-necked pheasants and California voles, would be displaced after the initial storage event and would be unlikely to recolonize the islands in substantial numbers. Acreage of uplands will also be reduced on the habitat islands during fall and winter wetland flood periods.

Approximately 990 acres of small grain fields and herbaceous upland will be managed specifically to provide upland habitat values on the habitat islands (Table 3). An additional 6,683 acres of fields of corn rotated with wheat, mixed agriculture/seasonal wetlands, seasonal managed wetlands, seasonal ponds, and pasture/hay fields will provide upland wildlife habitat values during periods when they are not flooded to provide wintering waterfowl or greater sandhill crane habitat. The juxtaposition and management of these habitats would substantially offset project impacts on upland wildlife species.

Nesting Habitat for Swainson's Hawks

Swainson's hawks generally nest in large, mature trees. Most nest sites in the Central Valley are associated with riparian habitats. Swainson's hawks use traditional nesting territories and typically return annually to nest in the same or nearby trees. Swainson's hawks do not currently nest on the DW project islands; however, a small number of pairs are known to nest in the Delta (JSA 1995).

Existing and created riparian woodland and scrub habitats will provide suitable potential nest trees for Swainson's hawks. Habitat islands will be managed to protect approximately 122 acres of existing riparian habitat, and 265 acres of additional riparian habitat will be created (Table 3). Trees in newly established habitats are expected to be of sufficient size in 15-20 years to be used by hawks for nesting.

Roosting Habitat for Greater Sandhill Cranes

Greater sandhill cranes use traditional roosts from year to year and typically select roost sites that are remote and relatively free of human disturbances or other disturbances. Historically, large tracts of shallow-flooded and sparsely vegetated wetlands were used as roosts. Today, most roost sites are on lands managed as duck clubs. These sites typically consist of shallow-flooded fields 100 acres or larger in size. Cranes currently forage, but are not known to roost, on the DW project islands (JSA 1995).

In the Central Valley, cranes usually forage within 2-3 miles of roost sites. To increase the attractiveness of crane foraging habitats, and to foster the adoption by cranes of the habitat islands as a traditional winter use area, some seasonal managed wetlands in the closed hunting zone on eastern Bouldin Island (Figure 3) will be mowed and flooded in a manner that will optimize their value as potential crane roost sites (Tables 2 and 12). Other wetland habitats that are not specifically managed as potential roost sites, however, could also serve as roosts.

Waterfowl Breeding Habitat

Mallards, cinnamon teal, gadwall, and wood ducks are the predominant nesting duck species in the Delta. To breed successfully, ducks need suitable nesting and brood habitats near each other. A shortage of suitable brood water, combined with intensive farming, results in poor waterfowl breeding success on the DW project islands.

Approximately 5,490 acres of small grain fields, pasture/hay fields, mixed agriculture/seasonal wetland, seasonal managed wetland, seasonal pond, emergent marsh, and herbaceous upland habitats created on the habitat islands will provide suitable nesting cover for upland and wetland nesting species (Table 3). Harvest of small grain fields will be delayed until after most waterfowl nesting has occurred. DW also proposes to install

approximately 800 waterfowl nesting boxes and platforms on the two islands (Table 2), which would benefit waterfowl nesting.

Suitable brood water will be provided through development of seasonal ponds, emergent marshes, and permanent lakes and deferral of drawdown on some seasonal managed wetlands until July 15 of each year (Table 2). Borrow ponds, canals, and ditches will also provide lower quality brood habitat values.

Other Special-Status Species

In addition to Swainson's hawk and greater sandhill crane, approximately 22 special-status species occur or could occur on the project islands (Table 17). The quality and area of habitats presently available to special-status wildlife will be substantially increased. Long-term establishment of compensation riparian and wetland habitats may also attract species that currently are not found or that are found only infrequently, such as tricolored blackbird and peregrine falcon. Table 17 lists the special-status species that may benefit from establishment of compensation habitats.

Populations of five special-status plant species (Suisun Marsh aster, Mason's lilaopsis, California hibiscus, Delta tule pea, and Delta mudwort) are found on exterior perimeter levee slopes of the habitat islands (see Chapter 3G, "Vegetation and Wetlands", of the EIR/EIS). Before recreation facilities, pump stations, or other project facilities are constructed on perimeter levees, surveys will be conducted at proposed facility locations to ensure that special-status plant populations will be avoided.

Other Important Goals and Objectives

Design and management of the habitat islands to meet compensation and species goals and objectives will also provide substantial benefits to several other important species groups, including migratory and wintering shorebirds, other raptors, wading birds, other water birds, and riparian-associated wildlife species (Table 18). Habitat on the DW project islands for these species groups is currently limited or is of relatively low quality. The HMP also calls for reestablishment of native Central Valley plant communities, such as riparian woodland and scrub, herbaceous upland, and wetland habitats, that are currently uncommon in the Delta. Wetland habitats will include forested wetlands that flood seasonally (Table 2).

Other Project Features and Benefits

Recreation

Hunting of waterfowl and upland game birds is the primary recreational activity that will be conducted on the islands. To accommodate hunters and their guests, up to 16 recreation facilities will be established on perimeter levees (Figures 2 and 3). The Bouldin Island airstrip, which is located in the east Bouldin Island closed hunting zone (Figure 4), will be available for use by hunters and other recreationists to fly to the island. Restrictions have been placed on fixed-wing and helicopter use of the habitat islands to reduce disturbances to wildlife; these restrictions are presented in Table 19. Fixed-wing aircraft will be permitted to land and take off from the Bouldin Island airstrip only between 12:00 p.m. and 2:00 p.m. on hunt days during the waterfowl season. This restriction on the period during which the airstrip may be used is imposed to reduce aircraft disturbance of greater sandhill cranes and waterfowl using the closed hunting zone and other portions of the island on days when they would also be subjected to hunter disturbance. DW will be required to monitor the effects on greater sandhill cranes and waterfowl resulting from aircraft use of the airstrip on hunt days to ensure that aircraft are not affecting their use of the island (see "Compensation Monitoring Program and Performance Standards", below).

Hunting Program. Hunting of waterfowl, pheasants, mourning doves, and snipes will be permitted on the islands in compliance with DFG hunting regulations. Before and after the waterfowl season, furbearers and unprotected wildlife species also may be hunted or trapped. A moderate level of waterfowl hunting is required to disperse waterfowl and prevent severe disruption of existing waterfowl use patterns in the Delta-Central Valley region. The hunting program is designed to provide recreational hunting opportunities without compromising compensation objectives (Table 19).

Four types of hunting zones will be established on the habitat islands: closed hunting zones, free-roam hunting zones, upland game free-roam hunting zones, and spaced-blind hunting zones (Figures 4 and 5). To ensure that compensation objectives for greater sandhill cranes and waterfowl are met during hunting seasons, two closed hunting zones will be established on Bouldin Island and one closed zone will be established on Holland Tract (Table 20, Figures 4 and 5), and restrictions will be placed on the number of hunters and on hunting periods

(Tables 19 and 21). With the exception of a small tract adjacent to the northern edge of the Holland Tract closed zone, free-roam hunting will be prohibited adjacent to closed zones to reduce the potential for hunters to disturb wildlife that use the closed zones. Only spaced-blind hunting, which restricts hunter movement, will be allowed adjacent to closed zones (Figures 4 and 5).

Other Recreation. Other permissible recreation on the habitat islands includes skeet and trap shooting, wildlife observation tours, fishing, picnicking, and camping (see EIR/EIS Chapter 3J, "Recreation and Visual Resources"). Table 19 describes restrictions placed on these activities to ensure their compatibility with compensation objectives.

Incidental Water Storage

DW may use the habitat islands for incidental water storage for water transfer, banking, or future discharge and sale. Use of the habitat islands for these purposes shall be approved by DFG and the Habitat Management Advisory Committee (HMAC) (see "HMP Implementation Responsibilities and Authorities", below). To ensure that use of the islands for water storage is compatible with the goals and objectives of the HMP, DFG and the HMAC shall review siting of conveyance facilities, other associated infrastructure, water management operations, and other storage operation features that may be associated with proposed DW water storage operations:

Reduction of Island Subsidence

Farming of organic peat soils on Delta islands greatly accelerates the rate of subsidence (Bay-Delta Oversight Council 1993). Agricultural practices such as disking and plowing increase the rate of subsidence on islands by exposing peat soils and causing them to oxidize and decrease in volume. The rate of subsidence on the habitat islands will be substantially reduced by the conversion of approximately 2,660 acres of intensively farmed habitat to seasonal managed wetland, mixed agriculture/seasonal wetland, emergent marsh, seasonal pond, lake, riparian, and upland habitats that require relatively little ground disturbance to maintain. Corn and wheat will not be grown within 400 feet of island perimeters and only pasture and herbaceous upland habitats will be developed within 200 feet of island perimeters to reduce subsidence adjacent to perimeter levees.

DESIGN AND OPERATION OF THE HABITAT ISLANDS

Habitat Design

Design Criteria

To meet HMP goals and objectives, the HMP team established design criteria to guide the design process for the habitat islands. These criteria included considerations for habitat types, juxtaposition of habitats, and size requirements necessary to meet compensation management goals; physical constraints to design; best management practices for wildlife; compatibility with recreational hunting; and reduction of island subsidence. Specific design criteria included the following:

- Manage only those habitat types that can be feasibly established and sustained in the Delta region.
- Give priority to the habitat types that have the highest potential for meeting compensation objectives.
- Distribute habitat types and acreages between the two habitat islands by considering the relative potential of each island to meet compensation objectives (e.g., greater sandhill cranes winter predominantly on Bouldin Island, so locating and managing crane habitats should be emphasized more on Bouldin Island than on Holland Tract).
- Combine and juxtapose habitat types to increase overall habitat value of the islands or portions of the islands for particular species or species groups.
- Establish habitat units that are large enough to allow effective management and to ensure use by target species.
- Take advantage of, rather than disrupt, large existing infrastructure features, such as major canals and drains, access roads, the Bouldin Island airstrip, and other structures.
- Avoid potential underutilization of high-value habitats by wildlife that may result from traffic disturbance, and minimize the potential for road kills by not establishing high-value habitats for

special-status species and waterfowl adjacent to State Route (SR) 12.

- Use information about the islands' natural topography and soil suitability (e.g., sand versus peat soils) to determine the placement of upland, wetland, agricultural, and lake habitats.
- Designate areas closed to hunting to help establish traditional wintering populations of greater sandhill cranes and waterfowl by providing minimally disturbed habitat areas.
- Locate the intensive agricultural habitats away from the perimeter levees to reduce the rate of subsidence.
- Design the island habitats to be compatible with provisions of the Special Flood Control Project Program (Section 12316[e] of the California Water Code) as stipulated by the Delta Flood Protection Act of 1988.

Initial Construction Design

Figures 2 and 3 present the habitat design plans for Bouldin Island and Holland Tract, respectively. Figures 6 and 7 illustrate a representative cross section of each habitat island. Table 3 presents a summary of acreages of habitat types to be established on the habitat islands. Minor modifications to the design may be made during project engineering and construction to accommodate site-specific constraints identified during those phases of the project.

Habitat Descriptions and Species Objectives

Table 2 summarizes construction and management guidelines for each of the island habitats. Management guidelines may be adjusted in future years to improve the efficiency of habitat island management as long as the goals of the HMP are not compromised (see "HMP Implementation Responsibilities and Authorities", below).

Tables 8, 12, 16, 17, and 18 describe how each island habitat type and management prescription will achieve objectives for compensation species and other species groups. To ensure the availability of water to irrigate and flood compensation habitats, island infrastructure will be designed to allow delivery of water from

Delta diversions and alternate water sources (e.g., seepage water) if necessary.

Corn Rotated with Wheat. A total of 2,584 acres of corn will be established initially on the islands. To maintain productivity in the Delta, corn should be rotated with wheat every fourth year. In any one year, 25% of the acreage of this habitat on each island will be planted in wheat.

Cornfields are to be managed primarily to compensate for project impacts on foraging habitat for wintering swans, geese, and greater sandhill cranes. This habitat also provides high forage value for wintering ducks and moderate forage value for Swainson's hawks during a short period following harvest and fall flooding.

Corn will be rotated with spring wheat at suitable sites. In the Delta, corn is typically rotated with winter wheat; use of spring wheat, however, would provide higher waterfowl and crane forage value during fall and early winter. Wheat fields also provide nesting cover for ducks and other ground-nesting birds and, following harvest, foraging habitat for Swainson's hawks.

Small Grain Crops. A total of 258 acres of fields will be planted in small grains. This habitat type initially will be planted in winter wheat; however, barley, oats, or other grains may be used on suitable sites. To maintain productivity and provide diversity, approximately 25% of each wheat field will be planted with a barley/vetch seed mix, which will be rotated through fields every 4 years.

Small grain fields are primarily to be managed to provide nesting cover for ducks. Fields will also provide herbaceous forage for waterfowl and cranes following germination in spring, and suitable Swainson's hawk foraging habitat following harvest in July.

Mixed Agriculture/Seasonal Wetland. A total of 1,645 acres of mixed agriculture/seasonal wetland habitat will be initially established on the islands. This habitat type consists of strips of dwarf corn interspersed among seasonal wetlands dominated by watergrass and smartweed.

Mixed agriculture/seasonal wetland cells are to be managed primarily to compensate for project impacts on wintering waterfowl. Interspersing corn with wetlands is a relatively new waterfowl management concept. This type of wetland has been established on nearby Mandeville Island for several years. There, it receives high use by dabbling ducks; white-fronted geese also forage on the island, especially in spring (McLandress pers. comm.).

The value of mixed agriculture/seasonal wetland habitats to swans and geese, however, is not known. Corn is the preferred foraging habitat for these species in the Delta region.

Dry to shallow-flooded portions of cells will also provide suitable crane foraging areas and, following spring drawdown, dense vegetative growth in cells will provide nesting cover for ducks and other ground-nesting species. Portions of each cell will be mowed in mid-summer to enhance Swainson's hawk foraging habitat quality by reducing vegetation height.

Seasonal Managed Wetland. A total of 2,116 acres of seasonal managed wetland habitat will be established initially on the islands. This habitat type will consist of seasonal wetlands dominated by watergrass and smartweed. Species management objectives for seasonally managed wetland cells are the same as described for mixed agriculture/seasonal wetland cells.

Pasture/Hay. A total of 204 acres of pasture and hay fields will be established initially on the islands. Fields will be seeded with suitable grass/forb mixes and will be managed primarily to provide foraging habitat for cranes and Swainson's hawks.

Approximately 25% of each pasture/hay field will be harvested in early spring and summer to reduce vegetative cover and provide Swainson's hawk foraging areas. In fall, fields will be mowed to less than 2 inches in height and shallow-flooded to enhance the availability of invertebrate prey for cranes. Pasture/hay fields also will provide late winter herbaceous forage for waterfowl.

Seasonal Ponds. A total of 134 acres of small seasonal ponds, ranging in size from 2 acres to 10 acres, will be established. Seasonal ponds are not required as compensation for project impacts. Seasonal ponds, however, shall be designed and constructed first and foremost to provide habitat function and values for wildlife. If DW discontinues or changes management of seasonal ponds in future years, DFG and the HMAc will be notified. Replacement habitats for seasonal ponds proposed by DW must be compatible with the goals and objectives of the HMP and shall be approved by DFG in consultation with the HMAc.

Seasonal ponds will be managed primarily to provide high-quality duck brood habitat. Seasonal ponds will also provide brood habitat for other water birds, such as pied-billed grebes, and foraging areas for wading birds and shorebirds. Depending on water management constraints associated with each pond location, ponds may be

managed in one of three ways: reverse hydrologic cycle, a combination of reverse hydrologic cycle and permanent water, and late-season drawdown.

Reverse-cycle ponds are flooded from February through July. This reverse flooding cycle establishes higher densities of invertebrates, which are essential duckling food items, than do the typical wet winter/dry summer conditions associated with natural Central Valley flood periods. Approximately 70% of each combination pond will be under reverse-cycle management. The remaining pond area will be deeper and, except during vegetation maintenance periods, will be permanently flooded. To provide brood habitat in areas that cannot be managed in a reverse cycle because of seepage that precludes maintaining water in ponds, portions of some seasonal managed wetlands will not be drawn down until August.

Permanent Lakes. Two permanent lakes of 50 acres and 60 acres will be established on Bouldin Island. The primary purpose of the lakes is to compensate for the loss of the Webb Tract blowout ponds. To provide diversity of vegetation, the lake bottoms will be contoured to provide water depths ranging from 3 feet to 6 feet during summer. Shoreline contours will be designed to allow riparian, emergent wetland, and herbaceous vegetation to become established.

During winter, the lakes will provide resting areas for waterfowl. To enhance these values, the lakes will be closed to hunting and portions of the lakeshore will be managed to provide suitable waterfowl loafing habitat. The lakes will provide brood and foraging habitat for waterfowl and other water birds throughout the year.

Herbaceous Upland. A total of 732 acres of herbaceous upland initially will be established on the islands. Herbaceous uplands will consist of a mix of native and exotic grasses and forbs. Most uplands will be associated with perimeter levees. Seasonal managed wetland and mixed agriculture/seasonal wetland habitats (when dry), internal levees, and field border strips will also provide habitat values similar to those associated with herbaceous uplands.

Herbaceous uplands will be managed primarily to compensate for project impacts on Swainson's hawk, greater sandhill crane, and other upland nesting or foraging species, such as red-tailed hawk, mallard, ring-necked pheasant, western meadowlark, and voles. A portion of herbaceous uplands will be mowed after July 15, following the nesting season, to reduce vegetative cover and increase raptor and crane foraging values associated with

these habitats. Unmowed areas will provide refugia for rodents and other species associated with dense upland vegetation.

Emergent Marsh. A total of 402 acres of permanent emergent marsh dominated by tule and cattail will be established on the habitat islands. Emergent marsh will be established primarily to compensate for the loss of Section 404 jurisdictional wetlands as defined under the Clean Water Act and to benefit marsh-dependent species. Emergent marsh vegetation will be managed to provide 40%-70% open water. Marshes will be flooded from a saturated soil condition to a depth of 3 feet and will be drained periodically so that emergent vegetation can be removed when marshes exceed approximately 60% cover. Smaller tracts of emergent marsh vegetation will also exist in other wetland habitats, canals, and ditches.

Emergent marsh will provide habitat for waterfowl and other water birds, as well as nesting and foraging habitat for rails, yellow-headed blackbirds, red-winged blackbirds, marsh wrens, and other marsh-dwelling species. Marshes will also provide potential nesting habitat for tricolored blackbird, a special-status species not known to currently occur on the DW project islands (Table 17).

Borrow Ponds. Onsite borrow material will be needed to improve perimeter levees and construct inner levees required for initial project construction. Excavations associated with habitat establishment will provide sufficient borrow material for levee work on Holland Tract. Borrow material available from habitat construction on Bouldin Island, however, is not sufficient to meet borrow requirements on that island. For additional borrow to be obtained, approximately 90 acres of sand deposits will also be excavated on Bouldin Island (Figure 2).

Borrow sites will maintain permanent water once excavations have penetrated the water table. Wildlife values associated with these ponds are expected to degrade over time because of the periodic disturbances associated with continued borrow extraction, deepening of pond bottoms, and destabilization of shoreline areas.

Borrow material will also be required for long-term levee maintenance activities. To meet these needs, additional borrow ponds may be created in future years.

Riparian Scrub. A total of 122 acres of riparian scrub will be created and maintained on the islands. With the exception of willows that may be removed for levee maintenance, 40 acres of existing riparian scrub will also

be maintained. Willow shrubs and trees will be the dominant plant species in these habitats.

The primary management objective for establishing this habitat is to compensate for the loss of Section 404 jurisdictional wetlands as defined under the Clean Water Act. Riparian scrub will be created and maintained in relatively large tracts in association with riparian woodland habitats. Riparian scrub vegetation is also expected to become established naturally along ditches, canals, and levees; however, vegetation may be removed periodically to maintain essential water management functions of these features. Some willow scrub areas may be shallow flooded during winter to recreate historical Central Valley flood conditions, which will provide winter foraging areas for some dabbling duck species.

Riparian scrub habitats are expected to support a wide diversity of wildlife. Large populations of insects and other invertebrates are typically associated with this habitat, and high densities of resident and migratory insectivorous birds, such as western flycatchers, yellow warblers, and Wilson's warblers, may be attracted to this habitat type. Several species of voles and mice, and larger mammals, such as raccoons and beavers, are also associated with scrub habitats.

Riparian scrub habitat is expected to climax as cottonwood-willow-dominated riparian woodland. Consequently, maintenance activities, such as burning, mechanical clearing, or application of herbicides are expected to be required to maintain a portion of riparian scrub habitat in future years.

Riparian Woodland. Approximately 143 acres of riparian woodland will be established on the habitat islands. Approximately 99 acres of existing riparian woodland will also be maintained. Riparian woodland overstory will be dominated by mature cottonwood and willow trees. Midstory trees and shrubs will include alder, box elder, ash, wild grape, willows, and elderberry.

The primary management objective for establishing this habitat is to compensate for the loss of Section 404 jurisdictional wetlands as defined under the Clean Water Act. Riparian woodland will be created and maintained in relatively large tracts in association with riparian scrub habitats.

Once established, riparian woodland habitats are expected to support the greatest diversity of wildlife species among the island habitats. Large trees associated with forests provide suitable nest sites for Swainson's hawks and other tree-nesting raptors, American crows,

great egrets, and great blue herons. Cavities associated with older trees provide nest or roost sites for numerous species, including American kestrels, woodpeckers, bats, wood ducks, and raccoons. The dense foliage of the forest canopy also provides hunting perches for aerial foraging species, such as ash-throated flycatchers, and species that forage for prey on the ground, such as western bluebird and northern flicker. To provide winter foraging areas for some dabbling duck species, some woodlands will be shallow-flooded during winter, recreating forested floodplain conditions that historically occurred in the Central Valley.

Lake Islands. Ten islands, ranging in size from 0.2 acre to 0.5 acre, will be constructed in the Bouldin Island lakes and contoured to support emergent vegetation. The primary management objective of these islands is to provide nesting and escape cover for waterfowl.

Wetland Islands. Small islands, ranging in size from 0.01 acre to 0.02 acre, will be constructed in corn/wheat rotation, mixed agriculture/seasonal wetland, and seasonal managed wetland habitats. During flood periods, these islands will provide waterfowl loafing sites and refugia for small mammals.

Long-Term Management of the Habitat Islands

Allowance for Adjustments to Improve Management Efficiency

The HMP describes initial habitat design and establishment and outlines the way in which habitats will be managed to meet compensation objectives and other management objectives. The intent of long-term habitat island management is to allow adjustments in habitat acreages, design, and juxtapositions and habitat management prescriptions in future years to improve efficiency in habitat island management, as long as those adjustments do not compromise the goals of the HMP. Wildlife monitoring may be required to justify proposed changes in island management to ensure that the proposed management would continue to meet HMP goals (see "Monitoring Program and Performance Standards for Compensation Habitat", below). Restrictions placed on DW's hunting program and other activities may also be amended in future years if monitoring data indicate that higher levels of human activity can be allowed without compromising compensation objectives.

Annual Operating Plans

DW will develop and submit an annual operating plan (AOP) to the SWRCB Chief of the Division of Water Rights, the Corps, DFG, and the HMAAC (see "HMP Implementation Responsibilities and Authorities", below) for approval by May 15 of each year. Elements to be addressed in the AOP will include:

- pesticide and herbicide use;
- the hunting program;
- a summary of the previous year's hunter attendance, harvest, and violations of HMP hunting use restrictions;
- the anticipated maintenance program;
- water management operations;
- levee maintenance requirements;
- borrow requirements and excavation locations;
- farming operations; and
- types, acreages, and juxtaposition of habitats.

Schedule for Implementation

Necessary work related to constructing habitats will be completed within 2 years from the date when operating permits are issued. Related activities include grading; excavations; installation of plantings, siphons, and pumps; construction of inner levees, canals, and ditches; and improvements to perimeter levees.

HMP Implementation Responsibilities and Authorities

General Oversight

SWRCB's Chief of the Division of Water Rights will have oversight responsibility to ensure that the HMP is implemented by DW in compliance with the provisions of DW's water right permit. DW will be responsible for implementing the HMP and managing daily operation of the habitat islands. DFG will be responsible for oversight of daily DW operations to ensure permit compliance. In

addition, DFG will have the authority to approve or deny any requests by DW for deviations from the HMP and subsequent AOPs.

The HMAC will be established by SWRCB to provide long-term technical oversight of habitat island management. SWRCB will be responsible for designating agencies or organizations to serve on the HMAC. Table 22 describes the agencies and types of organizations that could be represented on the HMAC. With the exception of DW, private organizations serving on the team should have no monetary interest in DW or other conflict of interest with the DW project. Representatives from SWRCB staff and the Corps will serve in a non-voting role as liaisons between the lead agencies and the HMAC. The DFG representative on the HMAC will not have authority to adopt or reject HMAC recommendations on behalf of DFG; approval or disapproval by DFG of HMAC recommendations would be made through DFG agency plan-review processes. The SWRCB Chief of the Division of Water Rights will serve as decision maker for disputes between DFG and DW. Individual HMAC representatives and HMAC as a body will not be able to bring disputes before SWRCB.

DW will provide reimbursement for expenses, including travel and food costs, to HMAC representatives.

The HMAC will recommend that DFG approve, reject, or amend DW's management proposals and AOPs. The HMAC may consult with experts or interested organizations or agencies, such as mosquito abatement districts, in formulating its recommendations for DFG and DW. However, the HMAC cannot recommend changes in island management that conflict with applicable laws and regulations administered by DFG; the U.S. Fish and Wildlife Service (USFWS); the Corps; or other local, state, or federal agencies.

Although DFG will be a member of the HMAC, it also will have statutory authority over state-listed species, independent of the HMAC. Therefore, DFG maintains authority to reject any HMAC-recommended changes in proposed island management that violate the Section 2081 agreement between DFG and DW or that might adversely affect Swainson's hawks, greater sandhill cranes, or other species listed under the California Endangered Species Act. USFWS will have similar authority for federally listed species, and the Corps will have authority over management decisions that could affect areas that are considered jurisdictional waters of the United States pursuant to Section 404 of the Clean

Water Act and Section 10 of the Rivers and Harbors Act of 1899.

HMAC Responsibilities

The HMAC will be responsible for:

- reviewing DW and DFG proposals for changes in the HMP and island management,
- coordinating with mosquito abatement districts (MADS) to ensure compatibility of AOP activities with public health concerns,
- identifying and recommending research and monitoring requirements and implementation,
- reviewing monitoring data (see "Monitoring Program and Performance Standards for Compensation Habitat", below),
- identifying the need for implementing and formulating remedial measures (see "Monitoring Program and Performance Standards for Compensation Habitat"),
- reviewing AOPs, and
- providing management recommendations to DW and DFG for inclusion in AOPs.

Based on monitoring data, the HMAC will have the authority to recommend to DFG and DW changes in types and quantities of island habitats that are not required to meet minimum California Endangered Species Act species and jurisdictional wetland mitigation requirements.

Table 23 describes the AOP and compliance reporting schedules to be followed by DW and the HMAC. DW will submit to the HMAC by May 15 of each year an AOP for the following year's management of the islands. The HMAC will hold meetings as necessary from May 16 to July 31 (Table 23) of each year to initiate review of any changes in current island management requested by DW in its AOP for the following operating year (August 1 to July 31). By July 31, the HMAC will inform DFG and DW of whether proposed changes in management are approved or rejected or a monitoring period is recommended to implement requested changes. If an approved AOP is not adopted by August 1, the habitat islands would be managed as described in the previous year's AOP until outstanding issues are resolved. Additional

meetings may be held during the year as needed at the request of DFG or DW to resolve management issues or conflicts.

DFG Responsibilities

Initial Habitat Island Construction Oversight. DFG will be responsible for initial construction oversight. The HMAC will not be responsible for oversight of initial island construction because the HMAC will not be structured to provide rapid resolution of conflicts between the HMP design requirements and unanticipated constraints on actual implementation of some plan elements.

DW will submit construction specifications, including engineering plan drawings, for initial construction on the islands to DFG for review. DFG will review the plans to ensure that habitats will be constructed as described in the HMP. DFG will also designate a biologist empowered to make immediate changes to the plan to accommodate unanticipated physical constraints to plan implementation encountered during construction. Following construction, DW and DFG will submit to SWRCB, the Corps, and the HMAC a report summarizing changes in initial habitat island design made during construction.

Disagreements between DW and DFG during the plan design or construction phase may be submitted to the SWRCB Chief of the Division of Water Rights for resolution.

Routine HMP Implementation Oversight. Changes to AOPs may be required if unforeseen circumstances encountered during the operating year (such as high water table levels) render elements of the approved plan unfeasible or undesirable. DW may request the responsible DFG biologist to approve such changes in the AOP. DW and DFG will describe changes made to the previous year's AOP and provide justifications for those changes to the HMAC in the following compliance reporting period (Table 23).

CONSTRUCTION IMPLEMENTATION PLAN

DW is required to develop a construction implementation plan following development of detailed construction schedules, specifications, and plan drawings for implementation of the HMP, associated infrastructure,

levee reinforcement, and habitat island facilities. The plan will be submitted to SWRCB, the Corps, and DFG for approval. Disagreements between DW and DFG during the plan approval process may be submitted to the SWRCB Chief of the Division of Water Rights and to the Corps for resolution.

The construction implementation plan will identify methods for avoiding impacts on sensitive habitats or wildlife use areas (e.g., special-status species plant populations or Swainson's hawk nest sites) during construction. These methods may include using measures such as seasonal construction periods to avoid construction during sensitive wildlife use periods or fencing sensitive habitats to exclude construction activity.

Elements of the plan will identify:

- protocols for preconstruction surveys to locate special-status plant populations, nesting California black rails on the water side of perimeter levees, nesting Swainson's hawks, and greater sandhill crane roosts;
- measures that would be instituted to avoid affecting special-status plants, sensitive habitats, and state-listed wildlife species, including restriction of construction activities to areas at least 200 yards from nesting California black rails;
- construction monitoring methods and schedule to be implemented to ensure compliance with the construction implementation plan;
- existing sensitive habitats and wildlife use areas; and
- potential remedial measures to compensate for construction impacts not identified in the HMP.

Following construction, DW will submit a report describing success of avoidance measures for construction impacts to the SWRCB Chief of the Division of Water Rights, the Corps, DFG, and the HMAC.

MAINTENANCE PROGRAM FOR THE HABITAT ISLANDS

DW will be required to engage in both predictable and unpredictable maintenance activities to ensure that compensation objectives and other habitat island values are maintained. It will also be necessary for DW to protect levees and other island infrastructure with periodic maintenance. This section describes the types of maintenance activities that could be carried out without conflicting with the project's compensation requirements.

Routine Habitat and Levee Maintenance

To construct and maintain compensation habitats and other wildlife habitats, DW will engage in routine habitat- and levee-maintenance activities. DW is responsible for acquiring and complying with all local, state, and federal agency permits that are required for implementing maintenance work.

Exterior Levee Maintenance

Exterior levee maintenance includes routine replenishment of levees and crown fill to offset levee settlement and erosion. It also includes replenishment of riprap and, if necessary, removal of woody vegetation from levees. When feasible, levee maintenance work should be limited to the period between late spring and August to minimize disturbance to wintering waterfowl and greater sandhill cranes. Roads along levee tops will be graded as needed to maintain access.

Interior Levee and Road Maintenance

Interior levees and roads will require regular maintenance. After drawdown, some inner levees may be refurbished, relocated, or removed to accommodate maintenance needs or AOP objectives. When feasible, these activities should be conducted during summer.

Borrow Excavations

During periods of exterior and interior levee maintenance, additional borrow material may be excavated by DW from designated areas. When feasible, these activities should be conducted during summer. Additional

borrow areas may be required in future years if sufficient borrow is not available in the designated borrow areas to meet maintenance requirements. Approval would be required from DFG through the HMAP if additional borrow areas are to be developed. Mitigation would be required if compensation values would be affected by the development of new borrow areas.

Water Control

Permitted maintenance activities include removal or control of vegetation in ditches and canals to ensure or improve water delivery or drainage. Pumps, siphons, culverts, and other water control structures will be replaced, relocated, or installed as needed to accommodate maintenance needs or AOP objectives.

Fish Control

Fish are expected to become established in the permanent lakes to be created on Bouldin Island. DW will obtain necessary permits and control fish populations in future years if fish (e.g., carp) adversely affect compensation goals and objectives of the HMP as a result of their effect on aquatic communities.

Farm Operations

DW will engage in a variety of activities necessary to create and maintain island habitats throughout each year. These activities include, but are not limited to:

- disking, plowing, and other ground-disturbing activities associated with seedbed preparation, planting, and cultivation;
- grading and excavating necessary to maintain wetland and island contours;
- flights from the Bouldin Island airstrip for agricultural operations;
- aerial or ground applications of agricultural pesticides and herbicides approved by the U.S. Environmental Protection Agency (EPA);
- mowing or harvesting of agricultural, upland, and wetland habitats; and
- activities associated with irrigation, flooding, and dewatering operations.

Special and Emergency Maintenance Actions

DW may be required to undertake management actions that could conflict with project compensation management requirements to protect against loss of compensation habitat values and property, to uphold state and federal criminal laws, or to provide for human health and safety. The HMP authorizes DW and governmental agencies to engage in activities that are necessary to eliminate imminent threats to public health, life, and property. DW shall notify DFG of any emergency actions that have adversely affected habitat values and shall consult with DFG to determine corrective management actions that may be needed to mitigate habitat impacts.

DW should first obtain DFG concurrence before engaging in maintenance activities that conflict with the HMP but that may be necessary to prevent potential threats to public safety and property.

Fire Suppression

Local and state fire protection agencies, within their authorities, may take any actions deemed necessary to suppress wildland and structural fires. Failure to meet annual compensation habitat prescriptions because of unintentional fire damage or damage incurred in the course of suppressing fires will not constitute a violation of the project's permit conditions.

Flood Protection

DW may engage in any activities necessary to conduct levee repairs and other repairs to prevent imminent breaches to perimeter levees, seepage to other islands, or other threats of flooding. Failure to meet annual compensation habitat prescriptions because of construction necessary to prevent imminent threats of flooding or to control flooding will not constitute a violation of project permit conditions.

Levee Breaches

Failure to meet annual compensation habitat prescriptions as a result of flooding caused by levee breaches will not constitute a violation of the project's permit conditions.

Drought Conditions

During severe drought periods, sufficient water may not be available to DW to meet the prescriptions for flooding of compensation habitat. Failure to meet annual compensation habitat prescriptions because of water intake restrictions will not constitute a violation of the project's permit conditions.

Outbreaks of Diseases Carried by Mosquito or Wildlife Vectors

Public health, agricultural, and fish and wildlife regulations administered by local, state, and federal agencies may require emergency dewatering of wetland habitats, hazing of wildlife, or application of pesticides to prevent an imminent outbreak or spread of human diseases, domestic animal diseases, or wildlife diseases. Failure to meet the prescriptions for annual compensation habitat because of management actions required by responsible agencies to control the spread of human, domestic animal, or wildlife diseases will not constitute a violation of the project's permit conditions.

Control of Trespassing and Poaching

Authorized DW personnel and officials from law enforcement agencies that have jurisdiction in the project areas will have year-round access to all island areas to control trespassing and enforce wildlife, fish, and other applicable laws. Routine trespass patrols should not be permitted in closed hunting zones during hunting seasons. However, DW may enter closed hunting zones to apprehend trespassers if it has demonstrable reason to believe that someone has entered a closed hunting zone and if the appropriate enforcement agency has been notified.

MONITORING PROGRAM AND PERFORMANCE STANDARDS FOR COMPENSATION HABITAT

This section describes methods for monitoring vegetation and wildlife, compensation performance standards, and remedial measures that may be instituted if performance standards are not achieved.

The purpose of establishing monitoring and performance standards is to identify the minimum quantity and quality of compensation habitat that must be maintained by DW and to ensure that compensation activities meet

the requirements of CEQA and the conditions of DW's water right and Clean Water Act (Section 404) permits. Additional monitoring or performance standards that may be required pursuant to the California Endangered Species Act are not addressed in the HMP monitoring program. DFG, the HMAC, and the Corps, with DW's approval, can recommend changes in the monitoring methods and performance standards and goals described below if such changes will provide a more realistic basis for assessing compensation success. All proposed changes must be agreed upon by DFG, the Corps, and DW.

Three types of monitoring programs will be implemented: construction monitoring, compliance monitoring, and management monitoring.

DW and DFG Program Responsibilities

DW is responsible for implementing monitoring programs and remedial measures and for submitting monitoring reports to SWRCB's Chief of the Division of Water Rights, the Corps, DFG, and the HMAC. Monitoring will be conducted by a qualified biologist or habitat restoration specialist funded by DW to supervise all phases of the monitoring program.

DFG will be responsible for ensuring DW's compliance with the HMP through review of construction specifications and performance of onsite inspections. Compensation for DFG's responsibilities in the monitoring program will be addressed in a separate memorandum of understanding between DW and DFG.

Construction Monitoring

Construction monitoring is required to ensure that compensation habitats are constructed in conformance with approved construction specifications.

Monitoring Responsibility

Construction monitoring will be implemented by DFG and the Corps. Detailed grading and planting plans for construction of compensation habitats will be submitted to DFG and the Corps for review. DFG and the Corps will review these plans to ensure that contours, planting methods, and hydrology are sufficient for

successful establishment of each habitat type. DFG will also conduct onsite inspections to ensure that habitats are graded, planted, and maintained in accordance with the approved specifications. If site-specific conditions warrant deviation from the construction specifications, DFG will also have the authority to approve such deviations.

Monitoring Schedule

Construction monitoring will be performed throughout the construction period. The frequency of monitoring will be determined by DFG and may consist of both scheduled and unscheduled site inspections. Approximately 2 years are estimated for completion of construction (i.e., monitoring years -1 and 0).

Monitoring Methods

DFG and the Corps will inspect the habitat islands during construction to ensure that the compensation habitats are constructed as detailed in the approved construction specifications. After the compensation habitats are constructed, DW will provide DFG and the Corps with aerial photographs of the habitat islands. Aerial photographs will be used to determine acreages of compensation habitats and ensure that the minimum compensation acreage requirements described in the HMP have been achieved.

Performance Standards

Construction performance standards will consist of compliance with construction specifications to be developed by DW and approved by DFG and the Corps (Table 24). Variance from construction specifications is permissible to allow for site constraints identified during construction if such variance is approved by DFG or the Corps for jurisdictional wetland mitigation habitats. Any disagreements that arise between DW and DFG during the construction period may be submitted to SWRCB or the Corps for resolution.

Habitat Compliance Monitoring and Performance Standards and Goals

Monitoring

Compliance monitoring will be implemented to ensure that the appropriate acreage of each habitat type is constructed, that the management prescriptions for each habitat type are implemented, and that hunting and other recreational activities are conducted as described in the HMP and in subsequent AOPs (Figures 2, 3, 4, and 5; Tables 2, 3, 19, and 21).

The monitoring of compensation habitats will begin the year after construction of these habitats has been completed (designated monitoring year 1). The purpose of monitoring is to:

- document the footprint and acreage of each habitat type;
- document successes in achieving performance standards and goals (see below);
- assess the adequacy and efficiency of methods used to establish habitats;
- document compliance with the prescriptions for seasonal management of habitats; and
- determine whether remedial measures must be implemented.

Performance Standards and Goals

Performance standards are minimum management standards that must be achieved within a specified period to maintain compliance with the HMP goals and objectives. Failure to achieve performance standards may require DW to implement remedial measures to maintain compliance with project permits.

Compliance performance standards, presented in Table 24, have been established for monitoring years 4 and 10 and for the project life. Performance standards for all compensation habitats over the life of the project are based on the prescriptions for habitat management, habitat acreages, and recreation programs described in the HMP or in subsequent approved AOPs.

Performance goals, presented in Table 25, are established for monitoring years 1, 2, 3, 6, and 8. The purpose

of performance goals is to identify the need for management changes to improve the success of compensation habitat and to ensure compliance with performance standards (Table 24) in order to avoid the potential imposition of mandatory remedial measures in monitoring years 4 and 10.

Agricultural, Seasonal Wetland, and Herbaceous Upland Habitats

Agricultural habitats include corn fields rotated with wheat, small grain fields in a barley/vetch rotation, and pasture/hay fields. Seasonal wetland habitats include seasonal managed wetlands and mixed agriculture/seasonal wetlands. Seasonal ponds will be constructed by DW to provide high wildlife values (e.g., duck brood habitat). These ponds do not require monitoring or compliance with performance standards because they are not required to offset project impacts. DW, however, will be required to demonstrate that design and management of seasonal ponds provide high habitat functions and values for wildlife. If DW chooses to discontinue or change management of seasonal ponds, DFG and the HMAC will be notified and replacement habitats will be identified and constructed. The replacement habitats must be approved by DFG in consultation with the HMAC and must be compatible with the goals of the HMP.

Monitoring Responsibility. DW, DFG, and the Corps are responsible for monitoring agricultural, seasonal wetland, and herbaceous upland habitats to ensure that management prescriptions described in Table 2 are implemented. DW is required to record habitat management activities, such as flooding and drawdown dates (Table 23). DFG and the Corps are responsible for conducting field inspections to ensure that management prescriptions are implemented in compliance with the HMP.

Monitoring Schedule. Monitoring of agricultural, seasonal wetland, and herbaceous upland habitats is required annually for the project life. The monitoring activities will occur throughout each year. The timing and frequency of DFG site inspections are at the discretion of DFG.

Monitoring Methods. Agricultural, seasonal wetland, and herbaceous upland habitats will be monitored to confirm compliance with acreages, field locations, and management prescriptions described in the HMP and in subsequent approved AOPs. DW will maintain maps showing the location and acreage of each habitat type; a description of annual vegetation control activities; and planting, flooding, drawdown, and mowing dates for each

field that will be available for review by DFG. DFG will also conduct field visits to confirm compliance.

Performance Standards. Performance standards are presented in Table 24. Performance standards in future years will be based on management prescriptions described in approved AOPs.

Riparian Woodland

Monitoring Responsibility. DW is responsible for monitoring riparian woodland habitats. DFG, the Corps, and the HMAC will review monitoring results. DFG and the Corps may conduct site inspections to verify monitoring results.

Monitoring Schedule. Riparian woodlands will be monitored for a 10-year period, which will begin the year following completion of construction. Monitoring will be performed in June and July of monitoring years 1, 2, and 3 and in September of monitoring years 4, 6, 8, and 10.

Monitoring Methods. Riparian woodland habitats will be monitored to determine the number of seedlings/saplings established per acre of habitat, the species composition, and the percent canopy cover.

Seedling/Sapling Establishment and Species Composition. Each stand of riparian woodland will be sampled to determine the average per-acre seedling/sapling density and percent occurrence of cottonwood and willow trees, other native trees, and native shrubs among all tree and shrub species that have established. Seedling/sapling density and species composition will be determined through establishment and monitoring of a statistically significant number of random quadrants established in each riparian woodland stand.

Percent Canopy Cover. Percent canopy cover will be measured in monitoring years 4, 6, 8, and 10. Percent canopy cover will be determined using aerial photographs obtained in September of each monitoring year. If necessary, the canopy cover estimates will be reviewed qualitatively in the field.

Photographic Documentation. A minimum of five permanent photographic documentation sampling points will be established in each riparian woodland HMP map unit to provide a visual record of plant growth and canopy closure after planting unless complete photographic coverage of a unit can be obtained with fewer sampling points. Sampling points will be established before com-

pensation is implemented, and locations will be identified in the first-year monitoring report.

Performance Standards and Goals. Performance standards are presented in Table 24 and performance goals are presented in Table 25. For monitoring years 1 through 3, performance goals are applicable for each habitat island and for each stand of riparian woodland. The performance goals for the habitat islands establish the minimum percentages of total woody riparian plants on the islands that should be cottonwood or willow trees, other native trees, and native shrubs. Performance goals for individual stands require that a certain minimum number of seedlings/saplings be established per acre and specify the minimum and maximum percentages of total woody riparian plants in a stand that must be cottonwood or willow trees, other native trees, and native shrubs. These performance goals allow for flexibility in composition of a stand relative to the capabilities of a specific mitigation site.

To meet the Corps' desire that mitigation stands be self-sustaining (i.e., intensive management practices, such as continued irrigation or drainage, are not required to maintain stands), plant species diversity would be assumed to achieve its natural composition after 3 years of establishment. Some plant species other than cottonwood or willow initially planted in the mitigation sites may die out because they are not suited to specific site conditions or as a result of competition with other plant species that are better suited to the site conditions. This approach therefore provides the opportunity to increase plant species diversity in riparian woodland stands by initially establishing some plant species that are presently absent or that are uncommon on Delta Islands but also recognizes that some species may not survive unless long-term intensive management practices are applied to maintain them. Performance standards and goals in monitoring years 4, 6, 8, and 10 therefore are based on percent canopy cover, regardless of species composition.

Riparian Scrub

Riparian scrub will be established in linear and non-linear configurations and will be dominated by willow species. Linear willow scrub will be established adjacent to the south side of the east Bouldin Island closed hunting zone (Figure 4) to provide a visual screen to reduce disturbance of wildlife using the closed hunting zone by hunters in adjacent hunting zones.

Monitoring Responsibility. DW is responsible for monitoring riparian scrub habitats. DFG, the HMAC,

and the Corps will review monitoring results. DFG and the Corps may conduct site inspections to verify monitoring results.

Monitoring Schedule. Willow scrub habitats will be monitored for a 10-year period. The monitoring period will begin the year following completion of construction. Monitoring will occur in June and July of monitoring years 1, 2, and 3 and in September of monitoring years 4, 6, 8, and 10.

Following the 10-year monitoring period, DW, DFG, and the HMAC will review monitoring data to determine future monitoring requirements and schedules. Periodic monitoring will be required in future years to determine the need for maintenance of willow scrub habitats (see below).

Monitoring Methods. Riparian scrub habitats would be monitored to determine percent survival of initial plantings, percent canopy cover, and percent linear closure.

Willow Establishment. Nonlinear and linear stands of willow scrub will be sampled to determine the average density of established willow seedlings. In nonlinear stands, per-acre density of seedlings will be determined through establishment and monitoring of a statistically significant number of random quadrants in each habitat unit. In linear willow scrub stands, line transects will be established to determine the number of willows established per 100 linear feet of habitat.

Percent Canopy Cover. Percent canopy cover in nonlinear willow scrub will be measured in monitoring years 4, 6, 8, and 10. Percent canopy cover will be determined using aerial photographs obtained in September of each monitoring year. If necessary, these photographs will be reviewed qualitatively in the field.

Percent Linear Closure. After monitoring year 3, the percent linear closure in linear willow scrub will be measured in monitoring years 4, 6, 8, and 10. Percent linear closure will be determined using aerial photographs obtained in September of each monitoring year. If necessary, the photographs will be reviewed qualitatively in the field.

Photographic Documentation. A minimum of five permanent photographic documentation sampling points will be established in each riparian scrub HMP map unit to provide a visual record of plant growth and canopy closure after planting unless complete photographic coverage of a unit can be obtained with fewer points.

Sampling points will be established before compensation is implemented, and locations will be identified in the first-year monitoring report.

Performance Standards and Goals. Performance standards are presented in Table 24 and performance goals are presented in Table 25.

Long-Term Maintenance of Willow Scrub. DW may be required to periodically mechanically hedge the linear willow plantings adjacent to the east Bouldin Island closed hunting zone to maintain a shrub height that visually screens wildlife using the east Bouldin Island closed zone from hunters but does not impede wildlife access to and from the closed zone.

Nonlinear willow scrub habitats are expected to be succeeded eventually by willow-dominated riparian woodland. Consequently, through mechanical or other means, willow scrub habitats will require periodic treatment to set back succession to maintain this habitat type. DW is required, therefore, to treat willow scrub stands when percent canopy cover of trees more than 20 feet tall exceeds 30% of total canopy cover for each stand. With approval of the Corps and DFG in consultation with the HMAC, some stands may be permitted to achieve succession to riparian woodland.

Emergent Marsh

Monitoring Responsibility. DW is responsible for monitoring emergent marsh habitats. DFG, the HMAC, and the Corps will review monitoring reports. DFG and the Corps may conduct site inspections to verify monitoring results.

Monitoring Schedule. Emergent marsh habitats will be monitored for a 10-year period, which will be initiated in the year following completion of construction. Monitoring will be performed in June and July of monitoring years 1, 2, and 3 and in September of monitoring years 4, 6, 8, and 10.

Following the 10-year monitoring period, DW, the Corps, DFG, and the HMAC will review monitoring data to determine future monitoring requirements and schedules. Periodic monitoring will be required in future years to determine the need for maintenance of emergent marsh habitats (see below).

Monitoring Methods. Emergent marsh habitat will be monitored to determine percent of emergent vegetation cover. Percent cover will be determined using measure-

ments obtained along randomly placed transects during monitoring years 1, 2, and 3. Aerial photographs obtained in September would be used to determine percent cover in monitoring years 4, 6, 8, and 10.

Photographic Documentation. A minimum of five permanent photographic documentation sampling points will be established in each emergent marsh HMP map unit to provide a visual record of plant growth and canopy closure after planting unless complete photographic coverage of a unit can be obtained with fewer points. Sampling points will be established before compensation is implemented, and locations will be identified in the first-year monitoring report.

Performance Standards and Goals. Performance standards are presented in Table 24 and performance goals are presented in Table 25.

Long-Term Maintenance of Emergent Marshes. Emergent vegetation may eventually become established in solid stands in marsh habitats, reducing the value of the habitat to waterfowl and other water birds. Periodic removal of emergent vegetation to maintain open water areas is therefore desirable. The HMP recommends, as a best management practice, that DW drain marshes periodically and remove emergent vegetation mechanically (Table 2).

Permanent Lake

Monitoring Responsibility. DW and DFG are responsible for monitoring permanent lakes to ensure that the required distribution of summer water depths is maintained (Table 2). DW is required to record lake management activities, including flooding and drawdown dates. DFG is responsible for conducting field inspections to ensure that management prescriptions are implemented in compliance with the HMP.

Monitoring Schedule. Monitoring of permanent lakes is required annually throughout the project life. DW is responsible for recording habitat management activities at the time they are implemented. The timing and frequency of DFG site inspections are at the discretion of DFG.

Monitoring Methods. Permanent lakes will be monitored to assess compliance with the requirements for lake acreages and water depths. To determine that appropriate water depths are maintained, DW will establish and maintain staff gages in lakes. DW will maintain records of lake management activities that will be avail-

able for review by DFG. DFG will also conduct site visits to assess compliance.

Photographic Documentation. A minimum of five permanent photographic documentation sampling points will be established in each permanent lake HMP map unit to provide a visual record of habitat development unless complete photographic coverage of a unit can be obtained with fewer points. Sampling points will be established before compensation is implemented, and locations will be identified in the first-year monitoring report.

Performance Standards and Goals. Performance standards are presented in Table 24. Performance standards in future years will be based on management prescriptions described in approved AOPs. Performance goals are presented in Table 25.

Hunting Program and Other Recreational Use Restrictions

Monitoring Responsibility. DW shall be responsible for developing and implementing a monitoring program to ensure compliance with hunting and other use restrictions described in Tables 19 and 21. DFG is also responsible for conducting field inspections to ensure that DW's monitoring program is effective in maintaining compliance with use restrictions.

Monitoring Schedule. Monitoring of hunting and compliance with restrictions on other recreational uses is required for the duration of the project. DFG should conduct regular site inspections throughout the hunting season each year. The timing and frequency of DFG site inspections are at the discretion of DFG.

Monitoring Methods. Restrictions on hunting and other recreational uses will be monitored through site visits by DW and DFG and by review of DW records by DFG.

Hunting Club Register. During hunting seasons, all individuals shall register with the hunting club before entering the habitat islands from recreational facilities or other access points. Hunters and their guests shall also be required to sign out when leaving hunting areas to demonstrate that the occupied blind quotas and hunter quotas are not exceeded. Hunters will also record in the club register the number, species, and sex of birds harvested at the end of each hunt day. Club registers shall be made available to DFG for inspection on request.

Monitoring of Hunter Compliance. DW's compliance monitor shall record the time, date, and location of each compliance monitoring visit and shall note any violation of the use restrictions described in Tables 19 and 21. These records will be maintained onsite and made available to DFG for review on request.

Additionally, DFG personnel will have access to the habitat islands to monitor, without notice, compliance with use restrictions.

Other Recreational Uses. Restrictions on recreational uses shall be printed and included in the DW's hunting club bylaws. Printed material and bylaws shall be approved by DFG to ensure that all hunting use and other restrictions presented in the HMP are adequately described. All hunting club members shall sign the bylaws, thereby acknowledging their understanding and acceptance of the recreational element of the HMP. Pamphlets describing use restrictions shall be posted in recreational facilities and provided to hunting club members and their guests and to other recreationists who use the habitat islands.

Performance Standards. Performance standards are based on compliance with restrictions on hunting and other recreational uses described in Tables 19 and 21. Performance standards in future years will be based on use restrictions described in approved AOPs.

Monitoring of Effects of Airstrip Operations on Greater Sandhill Cranes and Waterfowl

DW will be permitted to use the Bouldin Island airstrip for fixed-wing aircraft takeoffs and landings on hunt days during the waterfowl season (Table 19). The airstrip is located in the east Bouldin Island closed hunting zone (Figure 4). To reduce potential disturbance of greater sandhill cranes and waterfowl by aircraft during hunt periods, aircraft will be permitted to use the airstrip only between 12:00 p.m. and 2:00 p.m. Flights to and from the airstrip therefore would be limited to a period during which these species typically would be resting. Consequently, because few waterfowl would be flying, hunting activity typically would also be lowest during this period, thereby reducing the cumulative effect of hunter and aircraft disturbance on greater sandhill cranes and waterfowl. It is not known, however, what the actual effect of airstrip use on hunt days would be on these species.

DW shall develop a monitoring plan, in consultation with DFG and the HMAC, and implement the plan to

determine whether airstrip use on hunt days has a deleterious effect on greater sandhill cranes and waterfowl. DW will be required to submit the monitoring plan to SWRCB's Chief of the Division of Water Rights within one year of the issuance of project operating permits.

Following will be the major elements of the monitoring plan:

- criteria for evaluating monitoring data that would be used to determine whether use of the airstrip on hunt days is having a significant impact on greater sandhill cranes and waterfowl,
- criteria for determining appropriate mitigation requirements for offsetting significant impacts based on the level of impact airstrip use has on these species,
- a detailed description of monitoring protocols, and
- a monitoring schedule that estimates when data would be sufficient to determine whether airstrip use on hunt days has significant impacts on greater sandhill cranes or waterfowl.

If, based on monitoring results, airstrip use on hunt days is found to have a significant impact on greater sandhill cranes or waterfowl, DFG, in consultation with the HMAC, may recommend to SWRCB's Chief of the Division of Water Rights that airstrip use be modified to ensure that the goals for establishment of the closed hunting zone are met. Depending on the level of impact, recommendations could include closing hunting on Bouldin Island during the landing and takeoff period, restricting the number of flights permitted per day, changing the landing and takeoff period to reduce impacts, or closing the use of the airstrip on hunt days. Conversely, if monitoring indicates that there is no significant impact on greater sandhill cranes or wintering waterfowl, DFG, in consultation with the HMAC, could recommend that the proposed initial aircraft use restrictions remain in place or be reduced.

Management Monitoring Programs and Performance Standards

Management monitoring will measure the wildlife values provided by compensation habitats to determine whether the quality of wildlife habitats created with

implementation of the HMP meets predicted habitat conditions. If actual compensation habitat conditions provide fewer wildlife values than expected or if better habitat management strategies are developed, modification of habitat prescriptions or habitat types may be desirable in future years. Consequently, management monitoring may be required to determine whether changes proposed in habitat island management by DW, DFG, or the HMAC would continue to meet or exceed the compensation goals and objectives of the HMP. Results of management monitoring would be used by DFG and the HMAC to determine whether changes in island management should be recommended to the SWRCB Chief of the Division of Water Rights.

DFG and the HMAC may recommend to the SWRCB Chief of the Division of Water Rights that requests for changes in habitat island management be addressed in one of five ways:

- the requested change should be authorized without a requirement for management monitoring;
- management monitoring should be required in order to determine whether a change in management should be authorized;
- management monitoring should be required, before and after implementation of a management action, to determine the effect of the action on wildlife use levels and habitat conditions;
- a change in management should be authorized, with a concurrent requirement for management monitoring; or
- the request for a change in management should be denied.

Development Guidelines for Management Monitoring Programs

Management monitoring programs and performance standards will be developed jointly by DW, DFG, and the HMAC. Because the specific changes that may be requested in future years in island management are unknown, the HMP team developed guidelines to be used by DW, DFG, and the HMAC for identifying requirements for monitoring programs and performance standards.

At a minimum, management monitoring programs and performance standards developed by DFG, the HMAC, and DW should include the following information:

- a statement of the goals and objectives of any change in management;
- a detailed description of the proposed management change, including descriptions of affected locations and of management prescriptions;
- a detailed description of monitoring protocols;
- a detailed description of the study area;
- a monitoring schedule that estimates when data are sufficient for a management decision to be made;
- a description of how wildlife use will be measured for comparison of use levels before and after implementation;
- minimum performance standards to be met in order for a change in management to be authorized; and
- a schedule for preparing monitoring reports.

Management Monitoring for Species Listed under the California Endangered Species Act

To ensure compliance with the California Endangered Species Act, DFG may require that management monitoring be performed to confirm that project impacts on greater sandhill cranes and Swainson's hawks are adequately offset by compensation. DFG therefore may require that use of the habitat islands by greater sandhill cranes and Swainson's hawks be monitored after project construction to determine whether use levels are at least as high as use levels before project construction and to provide information on how these species use the island habitats. The latter information may be used to assess the potential effects on these species of changes in management proposed in future years.

Monitoring requirements, performance standards, and potential remedial measures for greater sandhill cranes and Swainson's hawks will be developed by DFG in consultation with DW and will be described in DFG's 2081 agreement with DW, in accordance with the California Endangered Species Act. The HMP will be amended to incorporate final agreements between DW

and DFG regarding management of species listed under the California Endangered Species Act.

Monitoring Reports

A construction monitoring report describing changes made to the approved construction specifications will be prepared by DW in consultation with DFG. This report will be submitted to the SWRCB Chief of the Division of Water Rights, the Corps, and the HMAC on May 15 in the year following completion of construction.

Compensation monitoring reports will be submitted by DW to the SWRCB Chief of the Division of Water Rights, the Corps, DFG, and the HMAC on May 15 of each monitoring year. Submittal of monitoring reports will coincide with DW's submittal of habitat island AOPs (Table 23). Compensation monitoring reports will include:

- a summary of monitoring results for each compensation habitat;
- a qualitative description of the growth and vigor of woody plants in riparian habitats;
- a description of environmental factors that may be affecting mitigation success;
- a description of hunter use levels and other recreationist use levels, and a summary of violations of use restrictions;
- a summary of hunting harvest;
- a description of proposed and implemented remedial measures; and
- a description of and justification for proposed amendments to the compensation program that result from monitoring and from practical experience gained during implementation.

The schedule and content of management monitoring reports will be established by DW, DFG, and the HMAC during the development of each management monitoring program.

Remedial Measures

If DW has failed to meet construction and compliance performance standards (Table 24), DFG and the HMAC may recommend to SWRCB's Chief of the Division of Water Rights and to the Corps that DW be required to implement remedial measures. If performance goals (Table 25) are not achieved, DW may request authorization from DFG and the HMAC to implement additional management measures in monitoring years 1, 2, 3, 6, and 8 to increase the likelihood that performance standards (Table 24) will be met.

Based on monitoring data, DFG, in consultation with the HMAC, will identify remedial measures that must be implemented by DW in the event that compensation efforts fail. The specific remedial measures and level of effort required will be determined based on the magnitude and causes of failure. DFG and the HMAC may recommend to the SWRCB Chief of the Division of Water Rights that remedial measures not be implemented if monitoring data indicate that compensation efforts are in an upward trend and compensation objectives would be achieved without implementation of remedial measures.

Table 26 lists examples of remedial measures that could be applied to improve compensation success.

Monitoring of compensation habitats that require implementation of remedial measures would be performed for a 10-year period after measures are implemented or until performance standards are met.

Long-Term Dedication of Compensation Habitats

Compensation areas will be protected for the project life under provisions of DW's water right permits, Section 404 permit, and conservation easements and memorandums of understanding between DW and DFG that may be required under the California Endangered Species Act. Failure to maintain compensation areas in conformance with the water right permits or the Section 404 permit could result in revocation of the DW project operating permits by SWRCB and the Corps.

CITATIONS

Printed References

Bay-Delta Oversight Council. 1993. Draft briefing paper on Delta levee and channel management issues. December. California Department of Water Resources. Sacramento, CA.

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Jones & Stokes Associates, Inc. 1988. Habitat type mapping: Bedford Properties Delta islands project. Final report. (JSA 87-119.) Sacramento, CA. Prepared for Bedford Properties, Lafayette, CA.

_____. 1993. Habitat evaluation procedures (HEP) report for the revised Delta Wetlands project. Prepared for California State Water Resources Control Board. Sacramento, CA.

_____. 1995. California Endangered Species Act biological assessment: impacts of the Delta Wetlands Project on Swainson's hawk and greater sandhill crane. Draft. (JSA 87-119.) Sacramento, CA. Prepared for California State Water Resources Control Board, Division of Water Rights, and U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA.

Personal Communications

McLandress, Bob. Director of research. California Waterfowl Association, Sacramento, CA. January 13, 1994 - meeting.

Table 1. Classification of Existing Habitat Types on the DW Project Islands

Habitat Group	Code	Habitat Type	Comments	Dominant or Typical Plant Species
Riparian	R1	Cottonwood-willow woodland	Cottonwood and willow trees	Fremont cottonwood, red willow, yellow willow
	R2	Great Valley willow scrub	Willow shrubs and trees	Red willow, yellow willow, sandbar willow, Goodding's willow
Marsh	M1	Freshwater marsh	Inside islands	Cattail, bulrush, yellow nutsedge, pondweed, buttonbush
	M3	Exotic marsh*	Dense upland and wetland weeds (sometimes dry in summer)	Annual smartweed, peppergrass, amaranth, wild radish, nettles, cocklebur, watergrass
Herbaceous upland	H1	Annual grassland	True uplands and sand hills	Wild oats, barley, rip-gut brome, Italian rye-grass
	H2	Exotic perennial grassland*	Mixed weeds in fields and on levee slopes	Bermuda grass, perennial ryegrass, Johnson grass
Agriculture	A1	Grain and seed crops		Corn, wheat, sunflowers, potatoes
	A2	Perennial crops		Asparagus, vineyards
	A3	Pasture	Permanently grazed	Tall fescue, orchard grass, canary grass, ryegrass, legumes
	A4	Waterfowl food crops	Managed wetlands	Smartweed, watergrass, bulrush
	A5	Fallow	Short-term fallow fields	Yellow star-thistle, Russian thistle, houseweed, lamb's quarter, telegraph weed
Open water	O1	Canals and ditches	Permanent water	Dallis grass, knot grass, Himalaya berry, smartweed
	O2	Permanent ponds	Still water	Water hyacinth, water primrose, azolla
Developed	D1	Structures	Buildings and marinas	Largely unvegetated
	D2	Paving and exposed earth	Roads, landfills, and unvegetated exposed areas	

* Exotic habitats are dominated by weedy plant species that are not native to the Delta.

Source: JSA 1988.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
Seasonal Managed Wetland			
<ul style="list-style-type: none"> ■ Provide foraging habitat for wintering greater sandhill crane. ■ Provide foraging habitat for wintering swans, geese, and dabbling ducks. ■ Provide late spring, summer, and fall foraging habitat for Swainson's hawk. 	<ul style="list-style-type: none"> ■ Seasonal managed wetlands shall be located as shown in Figures 2 and 3. ■ Wetland cells shall be at least 65 acres in size and dominated by watergrass, smartweeds, and other desirable wetland waterfowl food plants. ■ Bottom contouring of wetlands shall be irregular to provide for vegetative diversity. ■ Wetlands shall be contoured and have water control structures that will allow for rapid flooding and drawdown to control mosquito production. ■ Annually, approximately 10% (or more if required) of each wetland cell shall be disked to maintain field productivity. Cells shall also be disked to control cattail and tule encroachment so that these species occupy ≤ 25% of a cell. If portions of cells require mowing to meet some species management objectives, mowing will be implemented in a manner that avoids destruction of nests and complies with federal waterfowl baiting regulations. Fields shall be irrigated as necessary to ensure optimal seed production. ■ Cells shall be slowly flooded and drained over 2 weeks on a staggered schedule. Cells shall be flooded to depths of 0-12 inches, with no more than 25% of each cell in a dry condition. Cell flooding and draining schedules shall be 25% flooded from September 1 to October 1 and drained from March 1 to March 15, 25% flooded from November 1 to November 15 and drained from March 15 to April 15, 25% flooded from November 1 to November 15 and drained from April 15 to May 1, and 25% flooded from December 1 to December 15 and drained from May 15 to June 1. 	<ul style="list-style-type: none"> ■ Provide suitable duck nesting habitat. ■ Provide greater sandhill crane roost sites. ■ Provide waterfowl loafing habitat. 	<ul style="list-style-type: none"> ■ Islands should be constructed to provide waterfowl loafing habitat and small mammal refugia. ■ Islands should be constructed at a density of approximately one island per 10 acres of seasonal managed wetland habitat. ■ Islands should be .01-.02 acre in size with lengths 3-10 times longer than island widths. ■ To encourage establishment of a greater sandhill crane roost site, wetland cells in the closed hunting zone area on east Bouldin Island should be managed as described in the compensation guidelines, except that: <ul style="list-style-type: none"> A. water depths should not exceed 6 inches; B. at least 75% of cell vegetation should be mowed by October 15 to a height of less than 4 inches; C. islands should be constructed as described above; and D. island vegetation should be mowed to a height of less than 1 inch.
Mixed Agriculture/Seasonal Wetland			
<ul style="list-style-type: none"> ■ Provide foraging habitat for wintering greater sandhill crane. ■ Provide foraging habitat for wintering swans, geese, and dabbling ducks. ■ Provide late spring, summer, and fall foraging habitat for Swainson's hawk. 	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetlands shall be constructed as shown in Figures 2 and 3. ■ This habitat type shall be managed to provide strips of corn interspersed among watergrass- and smartweed-dominated wetlands. Minimum wetland cell size shall be 65 acres. ■ A dwarf corn variety shall be planted in July. Corn shall be planted in strips no more than 12 rows in width separated by unplanted strips equivalent to no less than 36 corn planting rows. Corn shall not be harvested; however, following drawdown and the waterfowl hunting season, remaining standing corn shall be mowed or chopped to increase food availability for wildlife. 	<ul style="list-style-type: none"> ■ Provide suitable duck nesting habitat. ■ Provide waterfowl loafing areas. ■ Provide refuge for rodents to maintain prey populations for foraging raptors during flood periods. 	<ul style="list-style-type: none"> ■ Islands should be constructed to provide waterfowl loafing habitat and small mammal refugia. ■ Islands should be constructed at a density of approximately one island per 10 acres of mixed agriculture/seasonal wetland habitat. ■ Islands should be 0.01-0.02 acre in size with lengths 3-10 times longer than island widths.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
	<ul style="list-style-type: none"> ■ Areas not planted with corn shall be managed as seasonal wetland dominated by naturally occurring watergrass, smartweed, and other wetland-associated plants. Approximately 50% of wetlands shall be mowed as required between July 1 and August 15 to maintain plants in a low growth form. ■ Wetland cells shall be flooded on a staggered schedule to depths of 0-12 inches, with no more than 25% of each cell in a dry condition. Cell flooding and draining schedules shall be 25% flooded from October 1-15 and drained from January 1-15, 25% flooded from October 15 to November 15 and drained from January 15 to March 15, and 50% flooded from November 15 to December 15 and drained from March 15 to April 1. 		
Fields of Corn Rotated with Wheat			
<ul style="list-style-type: none"> ■ Provide foraging habitat for wintering greater sandhill crane. ■ Provide foraging habitat for wintering swans, geese, and dabbling ducks. ■ Provide fall foraging habitat for Swainson's hawk. 	<ul style="list-style-type: none"> ■ Corn fields shall be located as shown in Figures 2 and 3. ■ Minimum field size shall be 65 acres. ■ Corn/wheat rotations shall be approximately 50% corn to corn; 25% corn to wheat; and 25% wheat to corn. Except as noted below, fields shall be flooded on a staggered schedule to depths of 0-12 inches, with no more than 25% of each field in a dry condition. ■ Fields in a corn-to-corn rotation shall be planted in mid- to late April. Approximately 67% of the corn shall be harvested in a manner that leaves 20-yard-wide strips of standing corn separated by 40 yards of harvested corn. Fields shall not be disked until spring. Following the end of waterfowl hunting season, standing corn shall be mowed or chopped to increase food availability for wildlife. Field flooding and draining schedules shall be 25% flooded from October 1-15 and drained from January 15 to February 1, 25% flooded from November 1 to November 15 and drained from March 1 to March 15, 25% flooded from December 1 to December 15 and drained from March 15 to April 1, and 25% flooded by February 1 following mowing or chopping after the end of waterfowl hunting season and drained from April 1 to April 15. 	<ul style="list-style-type: none"> ■ Provide dabbling duck nesting habitat. ■ Provide waterfowl loafing areas. ■ Provide refuge for rodents to maintain prey populations for foraging raptors during flood periods. ■ Provide optimal greater sandhill crane foraging areas adjacent to wetlands managed as crane roost sites. 	<ul style="list-style-type: none"> ■ Spud ditches in wheat fields should be configured in a manner that allows ducklings to cross or escape the ditches. ■ Islands should be constructed at a density of approximately one island per 10 acres of corn/wheat fields. ■ Islands should be 0.01-0.02 acre in size with lengths 3-10 times longer than island widths. ■ Fields shall be managed as described in compensation guidelines, except that 80% of fields shall be harvested.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
	<ul style="list-style-type: none"> ■ Fields in a corn-to-wheat rotation shall be planted with an early corn variety and harvested by September 1. Approximately 66% of each field shall be harvested in a manner that leaves 20-yard-wide strips of standing corn separated by 40-yard-wide strips of harvested corn. Field flooding and drainage schedules shall be approximately 25% flooded from September 1-15 and drained from January 1 to January 15, 25% flooded from September 15 to October 15 and drained from February 1 to February 15, and 50% flooded from October 15 to November 1 and drained from February 15 to March 1. Standing corn in fields drained by January 15 and February 15 shall be chopped following drainage. ■ Fields in a wheat-to-corn rotation shall be planted with a fast maturing spring wheat variety following field drawdown. Approximately 50% of the fields shall be harvested after July 15 in a manner that leaves equal-width strips of harvested and unharvested wheat. Field flooding and drainage schedules shall be approximately 25% flooded between October 1 and November 1 and drained between January 15 and February 1, 25% flooded between December 1 and December 15 and drained between March 1 and March 15, and 50% remaining dry. 		
	<p>Small Grain Fields with a Barley/Vetch Rotation</p>		
<ul style="list-style-type: none"> ■ Provide summer and fall foraging habitat for Swainson's hawk. ■ Provide winter foraging habitat for greater sandhill crane. ■ Provide winter foraging habitat for swans, geese, and dabbling ducks. 	<ul style="list-style-type: none"> ■ Fields shall be located as shown in Figures 2 and 3. ■ Fields shall be initially planted with winter wheat. ■ Approximately 25% of each field shall be planted with a barley/vetch mix. ■ Fields shall not be flooded. ■ Fields shall be at least 65 acres in size. ■ Field preparation and planting shall begin by November 1 and be completed by December 31. 	<ul style="list-style-type: none"> ■ Provide dabbling duck nesting habitat. ■ Provide nesting habitat for other ground-nesting birds. 	<ul style="list-style-type: none"> ■ Seedbeds should be 36-48 inches wide to protect the nests of ducks and other ground-nesting bird species from flooding during irrigation periods. ■ Fields should be 50% harvested after July 15. Barley/ vetch stands should be completely rotated through each field every 4 years. ■ Spud ditches should be configured in a manner that allows ducklings to cross or escape from the ditches.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
Pasture/Hay			
<ul style="list-style-type: none"> ■ Provide foraging habitat for wintering greater sandhill crane. ■ Provide foraging habitat for wintering swans, geese, and dabbling ducks. ■ Provide summer and fall foraging habitat for Swainson's hawk. 	<ul style="list-style-type: none"> ■ Pastures shall be located as shown in Figures 2 and 3. ■ Pastures shall be at least 65 acres in size, seeded with suitable grass-forb mixes, and irrigated as needed during the growing season. ■ Between October 1 and November 1, 90% of each pasture shall be mowed to a height of 1-2 inches. ■ During fall and winter, approximately 75% of each pasture shall be flooded to a depth of 1-2 inches on a staggered schedule. Field flooding and draining schedules shall be 25% flooded from November 1-15 and drained from December 1-15, 25% flooded from December 1-15 and drained from January 1-15, and 50% flooded from January 1-15 and drained from February 1-15. 	<ul style="list-style-type: none"> ■ Provide optimal foraging habitat for greater sandhill crane. ■ Provide refugia for small mammals. 	<ul style="list-style-type: none"> ■ To enhance foraging value for greater sandhill crane, establishment of alkali bulrush, chufa sedge, and other tuberous plant species should be encouraged. ■ Pastures should be mowed for harvest to an average height of 6 inches in early March and July. ■ Approximately 25% of each field should remain unharvested during each mowing. Portions of pastures to remain unharvested should be rotated among mowing cycles.
Seasonal Ponds			
		<ul style="list-style-type: none"> ■ Provide duck nesting and brood habitat. 	<ul style="list-style-type: none"> ■ Ponds should be constructed as shown in Figures 2 and 3. ■ Construct ponds ranging in size between 2 acres and 10 acres. ■ Ponds may be specifically constructed to provide late season brood water or may be created by deferring drawdown in portions of managed seasonal wetland cells. ■ Ponds should be located within or close to suitable waterfowl nesting habitats. ■ Ponds should be managed as reverse cycle, combination reverse hydrologic cycle and permanent water, or semi-permanent ponds, depending on the physical constraints related to water management at each pond location. Ponds should be managed to support watergrass, smartweed, pondweeds, and saggitaria. ■ Reverse-cycle ponds should be flooded to depths of 6 to 12 inches from February 1 through August 1 and drawn down from August through January to provide optimal invertebrate prey populations for broods.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
Permanent Lakes	<ul style="list-style-type: none"> ■ Replace acreage of two Section 404 jurisdictional lakes lost on reservoir islands at a ratio of 1:1. ■ Lakes shall be located as shown in Figures 2 and 3. ■ Create two lakes ranging between 40 acres and 70 acres in size, with a combined total acreage of at least 108 acres. ■ Lake bottoms shall be unevenly contoured to provide water depths ranging from 3 feet to 6 feet during summer. Approximately 25% shall be <3 feet deep, 25% between 4 and 6 feet deep, and 50% between 3 and 4 feet. 	<ul style="list-style-type: none"> ■ Provide waterfowl resting areas. ■ Provide nesting and escape cover for waterfowl. 	<ul style="list-style-type: none"> ■ Combination ponds should be managed as described for reverse-cycle wetlands with the following exceptions. Approximately 30% of ponds should be excavated to a depth sufficient to provide flooding depths to 5 feet from February 1 through August 1. Following drawdown, deep water areas should be mowed or disked to maintain emergent vegetation cover at less than 60%. Following maintenance, deep water areas should be flooded to depths of 6-12 inches until the deep water flood period. ■ Seasonal ponds in locations that cannot be managed in reverse-cycle or combination flooding regimes should be flooded from November through July.
Herbaceous Upland	<ul style="list-style-type: none"> ■ Provide suitable foraging habitat for Swainson's hawk. ■ Provide suitable foraging habitat for greater sandhill crane. ■ Herbaceous uplands shall be located as shown in Figures 2 and 3. ■ Approximately 75% of uplands associated with island levees and 50% of other upland areas shall be mowed as needed to maintain low vegetation height after July 15. 	<ul style="list-style-type: none"> ■ Provide suitable duck nesting habitat. ■ Provide habitat for small mammals and other upland wildlife species. 	<ul style="list-style-type: none"> ■ The lakeshore should be contoured to slopes that will encourage growth of emergent marsh and riparian forest and scrub vegetation. ■ Approximately 40% of the lakeshore should be managed to provide herbaceous cover ≤ 1 inch high from October through March to provide suitable waterfowl loafing sites. ■ Approximately 10 islands should be established in each lake ranging from 0.2 acre to 0.5 acre in size to provide waterfowl loafing and nesting habitat and escape cover. Islands should be contoured to allow tule and cattail to become established on the islands. ■ Herbaceous uplands should be seeded and managed to provide a desirable mix of native and exotic grasses and forbs. ■ Upland border strips approximately 5 acres in size should remain unflooded between seasonal wetland cells (not shown in Figures 2 and 3).

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
Emergent Marsh			
<ul style="list-style-type: none"> ■ Replace the acreage of jurisdictional emergent marsh on reservoir islands at a ratio of 2:1. 	<ul style="list-style-type: none"> ■ Emergent marshes shall be located as shown in Figures 2 and 3. ■ Create 390 acres of emergent marsh dominated by cattail and tule. Some wetland cells shall be managed specifically to establish and maintain emergent marsh habitat. Cattails and tule will also naturally occur in association with seasonal managed wetlands, mixed agriculture/seasonal wetlands, summer seasonal ponds, and permanent lakes. ■ Areas managed specifically as emergent marsh shall be flooded all year, except during vegetation control periods. Water depths shall vary from saturated soil to 36 inches. 	<ul style="list-style-type: none"> ■ Create suitable duck brood habitat. ■ Provide nesting and foraging habitat for duck species associated with emergent marsh habitats. 	<ul style="list-style-type: none"> ■ Marshes should be managed in a condition that maintains 40%-70% open water. Marshes should be drained and dense vegetation controlled to maintain open water areas when 60% vegetation cover is achieved. A minimum of 30% vegetation cover should be allowed to remain and marshes re-flooded following treatment. ■ Open water areas should be seeded with duck potato, pondweeds, and other aquatic species important to wildlife.
Borrow Ponds			
<ul style="list-style-type: none"> ■ Provide borrow material for initial perimeter island and interior wetland levee construction with minimal loss of habitat acreage and disturbance to wildlife. 	<ul style="list-style-type: none"> ■ Borrow sites shall be limited to existing borrow sites on Holland Tract and new borrow sites on Bouldin Island as shown in Figure 2. ■ Future borrow shall be excavated in designated areas between April 1 and August 31 to minimize disturbance to wildlife on adjacent lands. 	<ul style="list-style-type: none"> ■ Provide waterfowl resting areas. ■ Provide nesting and escape cover and loafing sites for waterfowl. 	<ul style="list-style-type: none"> ■ Borrow sites should be excavated in a manner that provides shorelines at slopes suitable for supporting riparian and emergent marsh vegetation.
Riparian Scrub			
<ul style="list-style-type: none"> ■ Replace the acreage of jurisdictional riparian scrub lost on reservoir islands at a ratio of 2:1. 	<ul style="list-style-type: none"> ■ Riparian scrub shall be located as shown in Figures 2 and 3. ■ Existing riparian scrub shall be maintained and approximately 123 additional acres of riparian scrub shall be created. ■ Riparian scrub habitats shall be dominated by willow shrubs and trees. Scrub habitats shall be managed to provide between 35% to 70% shrub cover. 	<ul style="list-style-type: none"> ■ Provide foraging habitat for some wintering waterfowl species. 	<ul style="list-style-type: none"> ■ Riparian scrub should not be developed within waterfowl nesting areas to reduce the likelihood of nest predation. ■ Approximately 10% of riparian scrub habitats should be shallow-flooded during winter after woody vegetation has become dormant to provide duck foraging areas.

Compensation Management Goals ^a	Compensation Management Guidelines ^a	Species Management Goals ^b	Best Management Practice Guidelines ^b
Riparian Woodland			
<ul style="list-style-type: none"> ■ Replace the acreage of jurisdictional riparian forest lost on reservoir islands at a ratio of 3:1. 	<ul style="list-style-type: none"> ■ Riparian woodland shall be located as shown in Figures 2 and 3. ■ Existing riparian woodland shall be maintained and approximately 143 additional acres of riparian woodland shall be created. ■ Riparian woodland habitats shall be dominated by willow and cottonwood trees. Forest habitats shall be managed to provide 65%-80% crown cover. 	<ul style="list-style-type: none"> ■ Provide foraging habitat for some duck species. 	<ul style="list-style-type: none"> ■ Riparian woodland should not be developed within waterfowl nesting areas to reduce the likelihood of nest predation. ■ Approximately 10% of riparian forest habitats should be shallow-flooded during winter after woody vegetation has become dormant to provide duck foraging areas. ■ Riparian woodland habitats should also be planted with other native tree and shrub species such as white alder, flowering ash, coast live oak, valley oak, boxelder, button-bush, dogwood, elderberry, California rose, California blackberry, and wild grape to increase woodland diversity and wildlife values.
<p>^a Compensation management goals and guidelines are required to offset significant project impacts.</p>			
<p>^b Species management goals and best management practice guidelines are recommended to enhance overall wildlife habitat values associated with compensation habitats.</p>			

Table 3. Acreages of Habitat to Be Developed on the Habitat Islands

Habitat Type	Bouldin Island		Holland Tract		Habitat Islands Combined	
	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres
Corn/wheat	1,629	27	955	31	2,584	29
Small grains	106	2	152	5	258	3
Mixed agriculture/seasonal wetland	1,014	17	631	21	1,645	18
Seasonal managed wetland	1,723	29	393	13	2,116	23
Seasonal pond	66	1	68	2	134	1
Pasture/hay	132	2	72	2	204	2
Emergent marsh*	208	3	194	6	402	4
Riparian*	170	3	217	7	387	4
Lake*	111	2	33	1	144	2
Herbaceous upland*	479	8	253	8	732	8
Developed	177	3	58	2	235	3
Canal*	70	1	10	0	80	1
Borrow pond	89	1	0	0	89	1
Total	5,974	100	3,036	100	9,010	100

* Includes existing acres of habitat unaffected by the DW project.

Note: Minor discrepancies in totals are the result of rounding.

Table 4. Summary of DW Project Impacts and Compensation Requirements and Habitats

Project Impact	Impact Acreage	Compensation Method	Compensation Acreage Required	Compensation Acreage Provided on Habitat Islands	Habitat Island Compensation Habitats
Loss of Swainson's hawk foraging habitat	10,048.2	DFG mitigation guidelines (based on distance of foraging habitat from nest site)	6,708.3	7,539	<ol style="list-style-type: none"> 1. Corn/wheat fields 2. Small grain fields 3. Mixed agriculture/seasonal wetland 4. Seasonal managed wetland 5. Pasture/hay 6. Herbaceous upland
Loss of greater sandhill crane foraging habitat	7,027.7	Replace affected acreage at a 1:1 ratio (from guidelines formulated by the HMP team)	7,027.7	7,673	<ol style="list-style-type: none"> 1. Corn/wheat fields 2. Small grain fields 3. Mixed agriculture/seasonal wetland 4. Seasonal managed wetland 5. Seasonal pond 6. Pasture/hay 7. Herbaceous upland
Loss of wintering waterfowl foraging habitat	10,513.8	Replace DW island existing habitat values using previous HEP analysis results as a guideline (see Chapter 3H, "Wildlife", of the EIR/EIS)	Not applicable	8,219	<ol style="list-style-type: none"> 1. Corn/wheat fields 2. Small grain fields 3. Mixed agriculture/seasonal wetland 4. Seasonal managed wetland 5. Seasonal pond 6. Pasture/hay 7. Emergent marsh 8. Permanent lake 9. Herbaceous upland
Loss of Section 404 jurisdictional riparian woodland habitat*	47.5	Replace affected acreage with in-kind habitat at a 3:1 ratio (from guidelines formulated by the HMP team)	142.5	143.1	<ol style="list-style-type: none"> 1. Riparian woodland
Loss of Section 404 jurisdictional riparian scrub habitat*	61.0	Replace affected acreage with in-kind habitat at a 2:1 ratio (from guidelines formulated by the HMP team)	122.0	122.0	<ol style="list-style-type: none"> 1. Riparian scrub
Loss of Section 404 jurisdictional freshwater marsh*	27.2	Replace affected acreage with in-kind habitat at a 2:1 ratio (from guidelines formulated by the HMP team)	54.4	353.1	<ol style="list-style-type: none"> 1. Emergent marsh
Loss of Section 404 jurisdictional exotic marsh*	147.1	Replace affected acreage with out-of-kind habitat at a 2:1 ratio (from guidelines formulated by the HMP team)	294.2	3,761	<ol style="list-style-type: none"> 1. Seasonal managed wetland 2. Mixed agriculture/seasonal wetland 3. Seasonal pond
Loss of Section 404 jurisdictional open water*	97.9	Replace affected acreage with in-kind habitat at higher quality than affected habitat at a 1:1 ratio (from guidelines formulated by the HMP team)	97.9	111.0	<ol style="list-style-type: none"> 1. Permanent lake

Table 4. Continued

Project Impact	Impact Acreage	Compensation Method	Compensation Acreage Required	Compensation Acreage Provided on Habitat Islands	Habitat Island Compensation Habitats
Loss of Section 404 jurisdictional canals and ditches, grain and seed crops, annual grasslands, exotic perennial grasslands, and unvegetated disturbed areas ^a	188.1	Manage similar habitats to be established on habitat islands to provide greater wildlife values than are associated with those habitats under existing conditions	Not applicable	7,335.0 ^b	<ol style="list-style-type: none"> 1. Corn/wheat fields 2. Mixed agriculture/seasonal wetland 3. Small grain fields 4. Herbaceous upland 5. Seasonal managed wetland 6. Canals and ditches

^a See Table 1 for habitat-type descriptions.

^b Does not include the acreage of canals and ditches that would be established on the habitat islands.

Table 5. Suitable Foraging Habitat Types for Swainson's Hawk on the DW Project Islands in 1987

Crop/ Cover Type	Suitability Rank ^a	Bacon Island		Webb Tract		Bouldin Island		Holland Tract		All Islands	
		Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total
Corn	L	775.8	19.2	2,222.9	44.3	2,459.2	42.8	131.8	5.6	5,589.7	32.7
Wheat	M	0.0	0.0	445.0	8.9	1,182.8	20.6	482.5	20.0	2,110.3	12.3
Milo	L	83.6	2.1	0.0	0.0	0.0	0.0	0.0	0.0	83.6	0.5
Potato	M	1,882.6	47.0	0.0	0.0	0.0	0.0	0.0	0.0	1,882.6	11.0
Sunflower	L	190.7	4.8	0.0	0.0	888.3	15.5	0.0	0.0	1,079.0	6.3
Pasture ^b	M	0.0	0.0	61.0	1.2	34.2	0.6	349.8	14.5	445.0	2.6
Herbaceous upland ^b	M	528.4	13.2	838.8	16.7	349.1	6.1	564.1	23.4	2,280.4	13.3
Fallow ^b	M	355.3	8.9	637.9	12.72	711.6	12.4	689.1	28.6	2,393.9	13.9
Exotic marsh ^b	L	30.4	0.8	783.3	15.6	114.7	2.0	195.5	8.1	1,123.9	6.5
Unknown agriculture	L	<u>158.8</u>	<u>4.0</u>	<u>26.8</u>	<u>0.5</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>185.6</u>	<u>1.1</u>
Total		4,005.6	100.0	5,015.7	100.0	5,739.9	100.0	2,349.4	100.0	17,174.0	100.0

Note: Minor discrepancies in totals are the result of rounding.

^a Suitability rank definitions:

L = low.

M = moderate.

^b See Table 1 for crop/cover type definitions.

Table 6. Summary of Losses of Foraging Habitat for Swainson's Hawk
on Reservoir and Habitat Islands

Island	Acreage Lost
Bacon Island	4,005.6
Webb Tract	5,015.7
Bouldin Island	986.1
Holland Tract	<u>40.8</u>
Total	10,048.2

Table 7. Acreages of Compensation Habitats for Swainson's Hawk
to Be Developed on the Habitat Islands

Habitat Type	Bouldin Island		Holland Tract		Habitat Islands Combined	
	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres
Corn/wheat	1,629	32.0	955	38.9	2,584	34.3
Small grains	106	2.1	152	6.2	258	3.4
Mixed agriculture/seasonal wetland	1,014	19.9	631	25.7	1,645	21.8
Seasonal managed wetland	1,723	33.9	393	16.0	2,116	28.1
Pasture/hay	132	2.6	72	2.9	204	2.7
Herbaceous upland	<u>479</u>	<u>9.4</u>	<u>253</u>	<u>10.3</u>	<u>732</u>	<u>9.7</u>
Total	5,083	100.0	2,456	100.0	7,539	100.0

Note: Minor discrepancies in totals are the result of rounding.

Table 8. Management Strategies for Swainson's Hawk on the Habitat Islands

Management Goal	Management Objectives	Habitat Management Strategies
1. Provide suitable foraging habitat for summer populations.	<p>A. Develop and manage pastures and herbaceous upland habitats specifically to provide foraging habitat.</p> <p>B. Manage corn/wheat rotation, small grain, mixed agriculture/seasonal wetland, and seasonal managed wetland habitats to provide foraging habitat during periods when fields are not flooded.</p>	<p>1. Portions of pastures and herbaceous uplands should be mowed as needed to maintain open areas to allow accessibility to prey. Unmowed areas will continue to provide escape cover for voles and other prey species.</p> <p>2. Flooding of pastures to provide waterfowl habitat should be deferred (except during summer irrigation periods) until summer Swainson's hawk populations have migrated from the Delta.</p> <p>3. Corn/wheat rotation fields should be harvested in a manner that provides open strips between unharvested rows of corn to allow accessibility to prey. Fall flooding of corn and wheat fields is expected to concentrate voles and other prey species as fields are flooded. Flooding should be staggered between fields to provide high prey concentrations over a longer period.</p> <p>4. Small grain fields should be completely harvested after July 15 and should not be flooded.</p> <p>5. Portions of seasonal managed wetland and mixed agriculture/seasonal wetland should be mowed as needed to maintain open areas to allow accessibility to prey. Unmowed areas will continue to provide escape cover for voles and other prey species. Unflooded upland border strips should be maintained around wetlands to provide escape cover for voles during flood periods and to maintain vole populations of sufficient size to ensure repopulation of wetlands during dry periods.</p> <p>6. When feasible, the use of pesticides or herbicides known to affect nesting success should be avoided.</p>
2. Provide foraging habitat for wintering populations.	A. Develop and manage herbaceous upland habitats specifically to provide foraging areas.	<p>1. Portions of herbaceous uplands should be mowed during the growing season to maintain open areas to allow accessibility to prey.</p> <p>2. Upland herbaceous habitats should not be flooded. Relatively high prey densities should be available in upland strips adjacent to flooded habitats because these areas will provide escape cover for voles during flood periods.</p>

Management Goal	Management Objectives	Habitat Management Strategies
3. Provide suitable nesting habitat.	A. Establish and maintain riparian habitats that support suitable nesting trees. B. Protect stands of existing trees.	1. Encourage establishment of cottonwood and willow trees in riparian forest habitats. 2. Discourage types of human disturbance known to cause nest abandonment in the vicinity of nest sites.

Table 9. Suitable Foraging Habitat Types for Greater Sandhill Crane
on the DW Project Islands in 1987

Crop/ Cover Type	Suitability Rank ^a	Bacon Island		Webb Tract		Bouldin Island		Holland Tract		All Islands	
		Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total
Corn	L	775.8	44.3	2,222.9	45.8	2,459.2	51.7	238.2	8.1	5,696.1	39.8
Wheat	M	0.0	0.0	445.0	9.2	1,182.8	24.9	879.5	29.9	2,507.3	17.5
Milo	L	83.6	4.8	0.0	0.0	0.0	0.0	0.0	0.0	83.6	0.6
Pasture ^b	M	0.0	0.0	61.0	1.3	34.2	0.7	570.7	19.4	665.9	4.7
Herbaceous upland ^b	M	528.4	30.2	838.8	17.2	349.1	7.3	564.1	19.2	2,280.4	16.0
Fallow ^b	M	174.3	10.0	471.9	9.7	613.6	12.9	428.7	14.6	1,688.5	11.8
Exotic marsh ^b	L	30.4	1.7	783.3	16.2	114.7	2.4	259.7	8.8	1,188.1	8.3
Unknown agriculture	L	<u>158.8</u>	<u>9.1</u>	<u>26.8</u>	<u>0.6</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>185.6</u>	<u>1.3</u>
Total		1,751.3	100.1	4,849.7	100.0	4,753.6	99.9	2,940.9	100.0	14,295.5	100.0

^a Suitability rank definitions:

L = low.

M = moderate.

^b See Table 1 for crop/cover type definitions.

Table 10. Summary of Losses of Foraging Habitat for Greater Sandhill Crane on Reservoir and Habitat Islands

Island	Acreage Lost
Bacon Island	1,751.3
Webb Tract	4,849.7
Bouldin Island	417.7
Holland Tract	<u>9.0</u>
Total	7,027.7

Table 11. Acreages of Compensation Habitats for Greater Sandhill Crane
to Be Developed on the Habitat Islands

Habitat Type	Bouldin Island		Holland Tract		Habitat Islands Combined	
	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres
Corn/wheat	1,629	31.6	955	37.8	2,584	33.7
Small grains	106	2.1	152	6.0	258	3.4
Mixed agriculture/seasonal wetland	1,014	19.7	631	25.0	1,645	21.4
Seasonal managed wetland	1,723	33.5	393	15.6	2,116	27.6
Seasonal pond	66	1.3	68	2.7	134	1.7
Pasture/hay	132	2.6	72	2.9	204	2.7
Herbaceous upland	<u>479</u>	<u>9.3</u>	<u>253</u>	<u>10.0</u>	<u>732</u>	<u>9.5</u>
Total	5,149	100.0	2,524	100.0	7,673	100.0

Note: Minor discrepancies in totals are the result of rounding.

Table 12. Management Strategies for Greater Sandhill Crane on the Habitat Islands

Management Goal	Management Objectives	Habitat Management Strategies
1. Provide suitable foraging habitat for wintering populations.	<p>A. Manage portions of harvested corn/wheat rotation fields to provide optimal grain availability.</p> <p>B. Manage portions of mixed agricultural wetland and seasonal managed wetland habitats to provide invertebrate, vegetative, and nonagricultural seed crop foraging areas.</p> <p>C. Manage pastures to provide invertebrate foraging areas.</p> <p>D. Manage small grain fields to provide green shoots for forage.</p>	<p>1. Portions of each corn and wheat field, and mixed agricultural/seasonal wetland and seasonal managed wetland cells flooded to attract waterfowl should remain in a dry or shallow-flooded condition (i.e., soil saturated to 2-inch depth) to provide suitable crane foraging habitat.</p> <p>2. Portions of mixed agricultural/seasonal wetland and seasonal managed wetland cells and surrounding berms should be mowed prior to flooding to remove vegetative cover to create suitable foraging conditions.</p> <p>3. Pastures should be mowed prior to the arrival of wintering cranes and shallow-flooded to create suitable foraging conditions.</p> <p>4. Small grain should be sown early enough to produce shoots for grazing during late winter and early spring periods.</p>
2. Establish traditional wintering crane use areas.	<p>A. Attract cranes by managing a portion of suitable foraging and roosting habitats to minimize human disturbance.</p> <p>B. Manage some seasonal managed wetlands to provide suitable crane roosting habitat.</p>	<p>1. A portion of suitable foraging and roosting habitats should be closed to hunting to minimize human disturbance.</p> <p>2. Suitable roost sites should be created within closed zones by completely mowing selected seasonal managed wetland cells to reduce vegetation height and flooding the cells to depths of less than 4 inches.</p>

Table 13. Acreages of Section 404 Jurisdictional Wetland Habitat on the DW Project Islands in 1987

Wetland Habitat Type ^a	Bacon Island	Webb Tract	Bouldin Island	Holland Tract	All Islands
Riparian woodland	0.0	47.5	6.9	67.7	122.1
Riparian scrub	2.4	56.2	7.9	14.3	80.8
Freshwater marsh	1.0	24.7	16.5	13.9	56.1
Exotic marsh	2.0	66.9	65.3	12.9	147.1
Open water	0.8	97.1	0.0	13.2	111.1
Canals and ditches	17.8	19.7	35.3	21.8	94.6
Grain and seed crops	0.0	2.6	0.0	0.0	2.6
Annual grassland	0.0	17.0	93.1	0.3	110.4
Exotic perennial grassland	0.0	16.6	0.0	0.0	16.6
Unvegetated disturbed areas	<u>0.0</u>	<u>21.3</u>	<u>0.0</u>	<u>0.0</u>	<u>21.3</u>
Total	24.0	369.6	225.0	144.1	762.7

^a See Table 1 for habitat definitions.

Table 14. Suitable Foraging Habitat Types for Wintering Waterfowl on the DW Project Islands in 1987

Habitat Group	Code ¹	Bacon Island		Webb Tract		Bouldin Island		Holland Tract		All Islands	
		Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total	Acres	Percentage of Total
Marsh	M1	2.7	0.05	172.0	3.22	21.1	0.36	27.8	0.93	223.5	1.15
	M3 (Section 404)	13.2	0.26	112.2	2.10	78.5	1.33	112.1	3.75	316.0	1.63
	M3 (not Section 404)	17.2	0.33	671.1	12.56	36.2	0.62	83.4	2.79	807.9	4.17
Herbaceous upland	H1	260.8	5.04	534.6	10.00	349.1	5.94	369.0	12.35	1,513.5	7.81
	H2	267.6	5.18	304.2	5.69	0.0	0.00	263.8	8.83	835.6	4.31
Agriculture	A1 (corn)	775.8	15.00	2,222.9	41.60	2,459.2	41.83	131.8	4.41	5,589.7	28.84
	A1 (wheat)	0.0	0.00	445.0	8.33	1,182.8	20.12	419.1	14.02	2,047.0	10.56
	A1 (milo)	83.6	1.62	0.0	0.00	0.0	0.00	0.0	0.00	83.6	0.43
	A1 (potato)	1,882.6	36.41	0.0	0.00	0.0	0.00	0.0	0.00	1,882.6	9.71
	A1 (sunflower)	190.7	3.69	0.0	0.00	888.3	15.11	0.0	0.00	1,079.0	5.57
	A1 (unknown)	158.8	3.07	26.8	0.50	0.0	0.00	0.0	0.00	185.6	0.96
	A2 (asparagus)	1,069.1	20.68	0.0	0.00	0.0	0.00	423.0	14.15	1,492.1	7.70
	A3	0.0	0.00	61.0	1.14	34.2	0.58	349.8	11.71	445.0	2.30
A4	0.0	0.00	0.0	0.00	0.0	0.00	63.4	2.12	63.4	0.33	
A5 (fallow)	355.3	6.87	637.9	11.94	711.6	12.10	689.1	23.06	2,393.9	12.35	
Open water	O1	91.8	1.78	49.7	0.93	118.1	2.01	39.4	1.32	299.0	1.54
	O2	1.5	0.03	105.7	1.98	0.0	0.00	16.6	0.55	123.8	0.64
Total		5,170.7	100.00	5,343.1	100.00	5,879.1	100.00	2,988.31	100.00	19,381.2	100.00

Note: Minor discrepancies in totals are the result of rounding.
¹ See Table 1 for cover type/code definitions.

Table 15. Acreages of Compensation Habitat for Wintering Waterfowl to Be Developed on the Habitat Islands

Habitat Type	Bouldin Island		Holland Tract		Habitat Islands Combined	
	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres	Total Acres	Percentage of Total Acres
Corn/wheat	1,629	29.8	955	34.7	2,584	31.4
Small grains	106	1.9	152	5.5	258	3.1
Mixed agriculture/seasonal wetland	1,014	18.5	631	22.9	1,645	20.0
Seasonal managed wetland	1,723	31.5	393	14.3	2,116	25.7
Seasonal pond	66	1.2	68	2.5	134	1.6
Pasture/hay	132	2.4	72	2.6	204	2.5
Emergent marsh	208	3.8	194	7.1	402	4.9
Lake	111	2.0	33	1.2	144	1.8
Herbaceous upland	<u>479</u>	<u>8.8</u>	<u>253</u>	<u>9.2</u>	<u>732</u>	<u>8.9</u>
Total	5,468	100.0	2,751	100.0	8,219	100.0

Note: Minor discrepancies in totals are the result of rounding.

Table 16. Waterfowl Management Strategies for the Habitat Islands

Management Goal	Management Objectives	Habitat Management Strategies
<p>1. Provide suitable foraging habitat for wintering swans, geese, and ducks.</p>	<p>A. Manage corn/wheat rotation, mixed agriculture (i.e., corn)/seasonal wetland, and seasonal wetland habitats to provide optimal waterfowl foraging habitat.</p> <p>B. Manage pastures and small grain fields to provide waterfowl grazing habitat.</p> <p>C. Manage some riparian areas to provide foraging areas for some ducks.</p>	<p>1. Corn/wheat rotation fields should be harvested in a manner that allows waterfowl access to fields and provides optimal yields of grain throughout the winter period.</p> <p>2. Portions of seasonal wetlands and wetland portions of mixed agricultural/seasonal wetlands should be mowed to allow waterfowl access to wetland cells.</p> <p>3. Mixed agriculture/seasonal wetland and seasonal wetland habitats should be managed to establish watergrass, smartweed, and other preferred waterfowl food plants.</p> <p>4. Mixed agriculture/seasonal wetland and seasonal wetland habitats should be treated, as needed, to control less desirable climax plant species and maintain the dominance of more desirable waterfowl food plant species.</p> <p>5. Flooding and draining of wetlands and grain fields should be staggered throughout fall and winter to maintain a range of habitat conditions favorable to various species.</p> <p>6. Water levels should be maintained at depths most favorable to swans, geese, and dabbling ducks.</p> <p>7. Pastures should be mowed and shallow-flooded prior to the arrival of most wintering waterfowl in the Delta to create suitable foraging habitat.</p> <p>8. Small grain fields should be sown early enough to produce shoots for grazing during late winter and early spring.</p> <p>9. Portions of riparian scrub and forest habitats should be shallow-flooded during winter to simulate historical riparian flooding conditions.</p>
<p>2. Establish reliable traditional wintering waterfowl use areas.</p>	<p>A. Establish lakes of sufficient size to provide suitable waterfowl rafting areas.</p>	<p>1. Lakes and a portion of suitable foraging habitats should be closed to hunting to minimize human disturbance.</p>

Management Goal	Management Objectives	Habitat Management Strategies
3. Provide suitable duck nesting habitat.	B. Manage lakes and a portion of suitable foraging habitats to minimize human disturbance.	
3. Provide suitable duck nesting habitat.	A. Manage small grain fields to provide suitable nesting habitat and enhance nesting success.	1. To minimize nest losses, wheat and small grain fields should not be harvested until after July 15 to ensure that most nesting is completed.
3. Provide suitable duck nesting habitat.	B. Manage portions of herbaceous uplands, mixed agriculture/seasonal wetland, and seasonal wetland habitats to provide suitable nesting habitat.	2. To provide some suitable nesting habitat, no more than 50% of herbaceous upland, mixed agriculture/seasonal wetland, and seasonal wetland habitats should be mowed to meet other species' management objectives.
3. Provide suitable duck nesting habitat.	C. Establish and manage seasonal and permanent wetlands that are flooded during spring and summer to provide shoreline and island nesting habitat.	3. Suitable nesting cover should be maintained adjacent to permanent emergent marshes and summer seasonal wetlands.
3. Provide suitable duck nesting habitat.	D. Establish and maintain nesting boxes and platforms.	4. Riparian corridors should not be established within suitable nesting habitats to reduce the likelihood of nest predation by predators typically associated with riparian habitats.
3. Provide suitable duck nesting habitat.	D. Establish and maintain nesting boxes and platforms.	5. Wood duck nest boxes and goose nesting platforms should be constructed and maintained in suitable habitats to encourage establishment of nesting populations.
4. Increase duck brood success.	A. Provide suitable foraging and escape habitat for duck broods.	1. Permanent marshes and some seasonal wetlands should remain flooded from early spring to late summer to provide suitable brood habitat.
4. Increase duck brood success.	B. When consistent with other management goals, juxtapose habitats in a manner that optimizes nesting and brood success.	2. Small seasonal ponds should be distributed throughout suitable nesting habitats.
4. Increase duck brood success.	B. When consistent with other management goals, juxtapose habitats in a manner that optimizes nesting and brood success.	3. Where practicable, seasonal ponds should be drawn down through fall and winter to encourage establishment of large invertebrate populations that would be available to broods during flood periods.

Management Goal	Management Objectives	Habitat Management Strategies
		<ol style="list-style-type: none">4. Dense cattail and tule growth in seasonal ponds and permanent marshes should periodically be controlled to maintain open water areas.5. Water levels in summer ponds and emergent marshes should be maintained at depths preferred by broods.

Table 17. Habitat Use by Special-Status Wildlife Species That Occur or Could Occur on the Habitat Islands

Species	Legal Status	Preferred Habitats	Occurrence in the Delta Region ^b	Foraging or Roosting Habitats	Breeding Habitats ^c
	Federal/State ^a				
Valley elderberry longhorn beetle	T/--	Elderberry shrubs in riparian habitats	R	<ul style="list-style-type: none"> ■ Elderberry shrubs planted in riparian scrub and riparian woodland habitats 	<ul style="list-style-type: none"> ■ Elderberry shrubs planted in riparian scrub and riparian woodland habitats
Western pond turtle	C2/SSC	Marshes, streams, and ponds	R	<ul style="list-style-type: none"> ■ Seasonal pond ■ Emergent marsh ■ Permanent lake ■ Canal ■ Borrow pond 	<ul style="list-style-type: none"> ■ Herbaceous upland
Giant garter snake	T/T	Marshes, streams, and ponds	R	<ul style="list-style-type: none"> ■ Seasonal managed wetland ■ Seasonal pond ■ Emergent marsh ■ Permanent lake ■ Canal ■ Borrow pond 	<ul style="list-style-type: none"> ■ Herbaceous upland
American white pelican	--/SSC	Marshes and open water	W	<ul style="list-style-type: none"> ■ Seasonal managed wetland ■ Seasonal pond ■ Emergent marsh ■ Permanent lake ■ Borrow pond 	N/A
Double-crested cormorant	--/SSC	Open water for foraging and roosting; valley oaks and cottonwood forests for nesting	NR	<ul style="list-style-type: none"> ■ Emergent marsh ■ Permanent lake ■ Borrow pond 	N/A
White-faced ibis	C2/SSC	Freshwater marshes (rookery sites)	NR	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Emergent marsh ■ Seasonal pond
Aleutian Canada goose	T/--	Wetland and agricultural habitats	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake ■ Herbaceous upland 	N/A

Table 17. Continued

Species	Legal Status	Federal/State*	Preferred Habitats	Occurrence in the Delta Region ^b	Foraging or Roosting Habitats	Breeding Habitats ^c
Black-shouldered kite		--/FP	Riparian habitats for nesting; wetlands and grasslands for foraging	R	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Riparian woodland ■ Riparian scrub ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub
Bald eagle		E/E	Streams and lakes	W	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Emergent marsh ■ Riparian woodland ■ Riparian scrub ■ Herbaceous upland 	N/A
Northern harrier		--/SSC	Marshes and meadows and seasonal and agricultural wetlands	R	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake 	<ul style="list-style-type: none"> ■ Small grain ■ Seasonal managed wetland ■ Pasture/hay ■ Emergent marsh ■ Herbaceous upland
Sharp-shinned hawk		--/SSC	Riparian habitats	W	<ul style="list-style-type: none"> ■ Riparian woodland ■ Herbaceous upland 	N/A
Swainson's hawk		--/T	Agricultural habitats for foraging and riparian habitats for nesting	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain fields ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub
Cooper's hawk		--/SSC	Riparian habitats and oak woodlands for nesting	R	<ul style="list-style-type: none"> ■ Riparian woodland ■ Herbaceous upland ■ Pasture/hay ■ Seasonal managed wetland ■ Mixed agriculture/seasonal wetland 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub

Table 17. Continued

Species	Legal Status		Occurrence in the Delta Region ^b	Foraging or Roosting Habitats	Breeding Habitats ^c
	Federal/State ^a	Preferred Habitats			
Peregrine falcon	E/E	Marshes and seasonal and agricultural wetlands	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake ■ Herbaceous upland 	N/A
Prairie falcon	--/SSC	Uplands, marshes, and seasonal and agricultural wetlands	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake ■ Herbaceous upland 	N/A
Greater sandhill crane	--/T	Forages in agricultural habitats and roosts in shallow wetlands	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay 	N/A
California gull	--/SSC	Widespread in winter	NR	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake ■ Herbaceous upland ■ Borrow pond 	N/A
Yellow-billed cuckoo	--/E	Deciduous riparian forests	R	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub 	<ul style="list-style-type: none"> ■ Riparian woodland
Short-eared owl	--/SSC	Marshes and seasonal and agricultural wetlands	R	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Herbaceous upland

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Species	Legal Status	Preferred Habitats	Occurrence in the Delta Region ^b	Foraging or Roosting Habitats	Breeding Habitats ^c
	Federal/State ^a				
Long-eared owl	--/SSC	Roosts in riparian habitats; feeds in wetlands, grasslands, and agricultural habitats	W	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Riparian woodland ■ Riparian scrub ■ Herbaceous upland 	N/A
Burrowing owl	--/SSC	Forages in open grassland and agricultural habitats; ground burrows in sparse grassland for nesting	R	<ul style="list-style-type: none"> ■ Corn and wheat fields ■ Small grain ■ Pasture/hay ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Herbaceous upland
Willow flycatcher	--/SSC	Riparian habitats	M	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub 	N/A
Yellow warbler	--/SSC	Riparian habitats	M	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub 	N/A
Tricolored blackbird	C2/SSC	Nonwoody riparian habitats, weedy vegetation, and marshes for breeding; marshes and agricultural wetlands for feeding	R	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake 	<ul style="list-style-type: none"> ■ Seasonal managed wetland ■ Seasonal pond ■ Emergent marsh ■ Permanent lake

^a Status definitions:

Federal

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.

C2 = Category 2 candidate for federal listing. Category 2 includes species for which USFWS has some biological information indicating that listing may be appropriate but for which further biological research and field study are usually needed to clarify the most appropriate status. Category 2 species are not necessarily less rare, threatened, or endangered than Category 1 species or listed species; the distinction relates to the amount of data available and is therefore administrative, not biological.

-- = no listing status.

State

E = listed as endangered under the California Endangered Species Act.

FP = fully protected under California Fish and Game Code.

T = listed as threatened under the California Endangered Species Act.

SSC = DFG species of special concern.

-- = no listing status.

^b W = wintering species.

NR = nonbreeding resident.

M = migrant.

R = resident.

^c N/A = not applicable.

Table 18. Habitat Use by Wildlife Species Groups on the Habitat Islands

Species Group	Representative Species	Foraging Habitats	Breeding Habitats
Raptors	Red-tailed hawk American kestrel Great horned owl	<ul style="list-style-type: none"> ■ Unflooded corn and wheat ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub
Upland birds	Ring-necked pheasant Western meadowlark	<ul style="list-style-type: none"> ■ Unflooded corn and wheat ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland
Small mammals	California vole Deer mouse	<ul style="list-style-type: none"> ■ Unflooded corn and wheat ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub ■ Developed 	<ul style="list-style-type: none"> ■ Unflooded corn and wheat ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub ■ Developed
Furbearers	Raccoon Striped skunk	<ul style="list-style-type: none"> ■ Corn and wheat ■ Small grains ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Pasture/hay ■ Emergent marsh ■ Permanent lake shoreline ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub ■ Canals ■ Developed 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub ■ Developed
Migrating and wintering shorebirds	Western sandpiper Dowitcher Long-billed curlew Dunlin	<ul style="list-style-type: none"> ■ Shallow-flooded corn and wheat ■ Shallow-flooded mixed agriculture/seasonal wetland ■ Shallow-flooded seasonal managed wetland ■ Seasonal pond ■ Shallow-flooded and dry pasture/hay ■ Shallow-flooded emergent marsh ■ Permanent lake shoreline 	Not applicable

Table 18. Continued

Species Group	Representative Species	Foraging Habitats	Breeding Habitats
Breeding shorebirds	American avocet Black-necked stilt	<ul style="list-style-type: none"> ■ Shallow-flooded corn and wheat ■ Shallow-flooded seasonal managed wetland ■ Seasonal pond ■ Shallow-flooded emergent marsh ■ Permanent lake shoreline 	<ul style="list-style-type: none"> ■ Shallow-flooded seasonal wetland ■ Seasonal pond ■ Emergent marsh
Cavity-nesting birds	Nuttall's woodpecker House wren	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub 	<ul style="list-style-type: none"> ■ Riparian woodland ■ Riparian scrub
Wading birds	Great blue heron Great egret Black-crowned night heron	<ul style="list-style-type: none"> ■ Corn and wheat ■ Small grains ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Permanent lake shoreline ■ Herbaceous upland 	<ul style="list-style-type: none"> ■ Seasonal managed wetland ■ Emergent marsh ■ Riparian woodland ■ Riparian scrub
Migratory and resident songbirds	White-crowned sparrow Yellow warbler Yellow-rumped warbler Savannah sparrow Plain titmouse Bushitit	<ul style="list-style-type: none"> ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub 	<ul style="list-style-type: none"> ■ Small grains ■ Unflooded mixed agriculture/seasonal wetland ■ Unflooded seasonal managed wetland ■ Pasture/hay ■ Herbaceous upland ■ Riparian woodland ■ Riparian scrub
Wetland songbirds	Marsh wren Red-winged blackbird Yellow-headed blackbird	<ul style="list-style-type: none"> ■ Mixed agriculture/seasonal wetland ■ Seasonal managed wetland ■ Seasonal pond ■ Pasture/hay ■ Emergent marsh ■ Herbaceous upland ■ Canals 	<ul style="list-style-type: none"> ■ Seasonal managed wetland ■ Seasonal pond ■ Emergent marsh ■ Canals

Species	Hunting Restrictions			
	Spaced-Blind Hunting Zone ^a	Free-Roam Hunting Zone ^a	Closed Hunting Zone ^a	Other Use Restrictions
Waterfowl	<ol style="list-style-type: none"> 1. Spaced-blind hunting zones shall be designed as shown in Figures 4 and 5. 2. Only waterfowl are permitted to be hunted in spaced-blind hunting zones. 3. Hunter-occupied blinds shall not exceed an average density of one blind per 50 acres. The total number of blinds constructed on each island shall not exceed two times the number of allowable hunter-occupied blinds (Table 20). 4. Blinds shall not be established within 200 feet of the borders of the Holland Tract closed zone and the western closed zone on Bouldin Island. Hunters shall not be permitted to hunt within the 200-foot buffer strip but shall be permitted to retrieve birds from the buffer strip. 5. Blinds shall not be established within 200 yards of the eastern closed zone on Bouldin Island until riparian willow thickets along the closed hunting zone border have grown to a height of at least 5 feet to visually screen hunter activity from birds using the closed zone. Hunters shall not be permitted to hunt within the 200-yard buffer strip but shall be permitted to retrieve downed birds from the buffer strip. When the visual screen has developed, blind location and hunter restrictions shall be as described for the other two closed zones. 6. Hunters may only hunt within a 100-foot radius of designated blind locations. 7. Hunters are not permitted to change blind locations without notifying and receiving permission from the hunting program manager. 	<ol style="list-style-type: none"> 1. Free-roam hunting zones shall be designated as shown in Figures 4 and 5. 2. Total hunter density shall not exceed one hunter per 60 acres. 3. Hunting will only be permitted on Saturdays, Sundays, Wednesdays, and 2 additional days to be designated by DW prior to the opening of waterfowl season. 	<ol style="list-style-type: none"> 1. Closed hunting zones shall be designated as shown in Figures 4 and 5. 2. No hunting or recreational trapping shall be permitted. 3. Hunters or dogs shall not be permitted to retrieve birds. 4. No human access shall be permitted, except that associated with approved habitat management practices and biological monitoring studies. 5. No fishing shall be allowed along perimeter levees adjacent to closed zones or at lakes and ponds in closed zones during the waterfowl season. 6. Firearms shall not be permitted. 7. Closed hunting zone boundaries shall be posted with no trespassing signs. 	<ol style="list-style-type: none"> 1. Only hunters and DW operating and maintenance personnel, except as noted elsewhere in the HMP, are permitted access to island interiors during hunting seasons. 2. Shotguns shall be the only firearms used for hunting. 3. Trap and skeet ranges shall be restricted to recreational facilities (Figures 2 and 3). Ranges shall be configured to avoid deposition of lead shot into wetland habitats. 4. External lighting associated with recreational facilities shall be positioned in a manner that avoids casting light into habitat areas immediately adjacent to recreational facilities. 5. Picnicking and camping shall be restricted to recreational facilities (Figures 2 and 3). 6. Dogs shall not be permitted to roam freely in habitat areas outside the control of their owners. 7. No vehicles shall be permitted on interior island areas from October through January, except for vehicle traffic necessary for maintenance, management, and hunter access activities.

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Species	Hunting Restrictions			
	Spaced-Blind Hunting Zone ^a	Free-Roam Hunting Zone ^a	Closed Hunting Zone ^a	Other Use Restrictions
	<p>8. Hunting will only be permitted on Saturdays, Sundays, Wednesdays, and 2 additional days to be designated by DW prior to the opening of waterfowl season.</p>		<p>8. With review and approval of DFG and the HMAc, alteration of the airstrip would be permitted only if the values provided by the HMP are not reduced, and future construction shall be limited to resurfacing the airstrip and replacing existing structures.</p> <p>9. The airstrip will remain a private facility.</p> <p>10. The airstrip will be used only for flights related to farming or habitat management or to provide access to the DW islands.</p> <p>11. Helicopters will be permitted to land and take off only from recreation facilities.</p> <p>12. Helicopters may not fly over the islands between September 1 and March 31 and must approach or leave recreation facilities only from the water side of the habitat islands.</p> <p>13. Airstrip and aircraft use restrictions related to flights for farming or habitat management are as follows:</p> <ul style="list-style-type: none"> ■ when feasible, overflights of flocks of geese and sandhill cranes will be avoided; ■ takeoffs, landings, and habitat island overflights are restricted during the waterfowl hunting season to nonhunt days between sunrise and sunset, except for medical and other emergencies; and ■ takeoffs, landings, and habitat island overflights from September 1 until the first day of waterfowl season and from the last day of waterfowl season to March 31 will be limited to four days a week between sunrise and sunset except for medical and other emergencies. 	

Species	Hunting Restrictions			
	Spaced-Blind Hunting Zone ^a	Free-Roam Hunting Zone ^a	Closed Hunting Zone ^a	Other Use Restrictions
Ring-necked pheasant	<ol style="list-style-type: none"> 1. No ring-necked pheasant hunting shall be permitted in spaced-blind hunting zones. 2. Ring-necked pheasant hunting shall be permitted on levees adjacent to spaced-blind hunting zones. 	<ol style="list-style-type: none"> 1. Total waterfowl and upland game hunter density shall not exceed one hunter per 60 acres. 2. Hunting shall only be permitted on Saturdays, Sundays, Wednesdays, and 2 additional days to be designated by DW prior to the opening of waterfowl season consistent with state hunting regulations. 	<ol style="list-style-type: none"> 14. Airstrip and aircraft use restrictions related to flights for other purposes are as follows: <ul style="list-style-type: none"> ■ except for medical or other emergencies that jeopardize life or property, a maximum of 100 takeoffs and landings not related to farming or habitat management will be permitted during the waterfowl hunting season; ■ from September 1 until the first day of waterfowl season and from the last day of waterfowl season to March 31, takeoffs and landings will be restricted to between sunrise and sunset; ■ except during airstrip takeoffs and landings, habitat island overflights will not be permitted from September 1 through March 31; and ■ fixed-wing aircraft will be permitted to land and take off from the airstrip only between 12:00 p.m. and 2:00 p.m. on hunt days. 	
Mourning dove	<ol style="list-style-type: none"> 1. No mourning dove hunting shall be permitted in spaced-blind hunting zones. 	<ol style="list-style-type: none"> 1. Total waterfowl and upland game hunter density shall not exceed one hunter per 60 acres. 		

Species	Hunting Restrictions			
	Spaced-Blind Hunting Zone ^a	Free-Roam Hunting Zone ^a	Closed Hunting Zone ^a	Other Use Restrictions
	<ol style="list-style-type: none"> Mourning dove hunting shall be permitted on levees adjacent to spaced-blind hunting zones. 	<ol style="list-style-type: none"> Hunting shall only be permitted on Saturdays, Sundays, Wednesdays, 2 additional days to be designated by DW prior to the opening of waterfowl season, and the opening day of dove season consistent with state and federal hunting regulations. 		
Common snipe	<ol style="list-style-type: none"> No common snipe hunting shall be permitted in spaced-blind hunting zones. 	<ol style="list-style-type: none"> Total waterfowl and upland game hunter density shall not exceed one hunter per 60 acres. Hunting shall be permitted on Saturdays, Sundays, Wednesdays, and 2 additional days to be designated by DW prior to the opening of waterfowl season consistent with state and federal hunting regulations. 		
All other wildlife species	<ol style="list-style-type: none"> Hunting or recreational trapping of species not significantly affected by the project shall be permitted in spaced-blind hunting zones before and after the waterfowl hunting season as long as these activities do not adversely affect compensation values of the HMP. 	<ol style="list-style-type: none"> Hunting or recreational trapping of species not significantly affected by the project shall be permitted in free-roam hunting zones before and after the waterfowl hunting season as long as these activities do not adversely affect compensation values of the HMP. 		

^a See Figures 4 and 5 for hunting zone locations.

Table 20. Summary of Hunting Zone Acreages by Habitat Type

		Bouldin Island Totals				Holland Tract Totals			Habitat Island Totals			
		Closed Hunting Zone	Free-Roam Hunting	Spaced-Blind Hunting	Upland Game Free-Roam Hunting	Closed Hunting Zone	Free-Roam Hunting	Spaced-Blind Hunting	Closed Hunting Zone	Free-Roam Hunting	Spaced-Blind Hunting	Upland Game Free-Roam Hunting
Corn/wheat	(acres)	375	465	789	0	343	247	364	718	712	1,153	0
	(%)	23	29	48	0	36	26	38	28	28	45	0
Small grains	(acres)	0	0	106	0	77	75	0	77	75	106	0
	(%)	0	0	100	0	51	50	0	30	29	41	0
Mixed agriculture/seasonal wetland	(acres)	9	577	428	0	125	147	358	134	725	786	0
	(%)	1	57	42	0	20	23	57	8	44	48	0
Seasonal managed wetland	(acres)	403	790	531	0	62	271	60	465	1,061	591	0
	(%)	23	46	31	0	16	69	15	22	50	28	0
Seasonal pond	(acres)	16	28	22	0	17	43	8	33	71	30	0
	(%)	24	43	34	0	25	63	12	24	53	23	0
Pasture/hay	(acres)	132	0	0	0	72	0	0	204	0	0	0
	(%)	100	0	0	0	99	0	0	100	0	0	0
Emergent marsh	(acres)	50	128	29	0	0	115	79	50	243	108	0
	(%)	24	62	14	0	0	59	41	12	61	27	0
Riparian	(acres)	43	82	45	0	9	148	61	52	230	105	0
	(%)	25	48	26	0	4	68	28	13	59	27	0
Lake	(acres)	111	0	0	0	0	33	0	111	33	0	0
	(%)	100	0	0	0	0	100	0	77	23	0	0
Herbaceous upland	(acres)	110	225	40	104	3	225	3	135	451	43	104
	(%)	23	47	8	22	1	89	1	18	61	6	14
Developed	(acres)	10	30	0	0	0	0	0	10	30	0	0
	(%)	6	17	0	0	0	0	0	4	13	0	0
Canal	(acres)	11	6	53	0	0	4	0	11	9	53	0
	(%)	16	8	76	0	0	36	0	14	12	66	0
Borrow pond	(acres)	9	0	79	0	0	0	0	9	0	79	0
	(%)	<u>10</u>	<u>0</u>	<u>89</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10</u>	<u>0</u>	<u>90</u>	<u>0</u>
Total*	(acres)	1,279	2,331	2,122	104	1,279	1,308	933	2,008	3,639	3,055	104
	(%)	21	39	36	2	21	43	31	22	40	33	1

* Sixty-four acres of recreation facilities (i.e., developed habitat) and canals on Holland Tract and 137 acres of recreational facilities on Bouldin Island, representing 2.1% and 2.3% of habitats, respectively, on each island, are not within hunting zones and are not included in table calculations.

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Table 21. Maximum Hunter Use Permitted on Hunt Days
by Hunting Zone

Hunting Zone	Bouldin Island	Holland Tract	Total
Hunter-occupied blinds in spaced- blind hunting zones ^b	42 (84) ^a	19 (38) ^a	61 (122) ^a
Hunters in free-roam hunting zones	39	22	61

^a Numbers in parentheses are the maximum allowable number of blinds that may be constructed.

^b Up to four hunters may occupy each blind.

Table 22. Habitat Management Advisory
Committee Representatives

Agency or Organization	Team Member Qualification Requirements
California Department of Fish and Game	Delta wildlife or refuge management experience
U.S. Fish and Wildlife Service	Refuge management or waterfowl research experience
Waterfowl conservation organization (e.g., Ducks Unlimited or California Waterfowl Association)	California waterfowl management or research experience
Nongame conservation organization (e.g., National Audubon Society, Defenders of Wildlife, or The Nature Conservancy)	Nongame wildlife management or research experience
Delta Wetlands	Project representative
California State Water Resources Control Board	Lead agency liaison
U.S. Army Corps of Engineers	Lead agency liaison
Contra Costa County Fish and Wildlife Advisory Committee	Hunter representative
San Joaquin County Sportsman Group	Hunter representative
Owners of land adjacent to the DW project islands	Farm and hunting club representatives

Table 23. Annual Operating Plan and Compliance Reporting Schedules

Date	Action
May 15	DW submits an annual operating plan (AOP) to the HMAC, DFG, SWRCB, and the Corps describing planned operations for the following August 1-July 31 operating year for review.
May 16-July 31	HMAC and agencies meet with DW as needed to resolve any issues with the proposed AOP.
August 1	An approved AOP is issued to DW; if the approved AOP is not adopted by August 1, the islands would be managed as prescribed in the previous year's AOP.
	<p>DW submits a report to the HMAC, DFG, SWRCB, and the Corps describing compliance/noncompliance with the habitat footprint identified in the previous year's AOP, a summary of habitat management prescriptions implemented during the previous operating year (e.g., flooding and drawdown dates for each wetland cell and corn/wheat field), and a description of management actions DW intends to implement between August 1 and December 31. Although the AOP is approved on the same date this report is submitted, circumstances dictating DW's ability to manage the islands as described in the May 15 AOP may have changed between May 15 and the August 1 AOP approval date. If no changes from the approved AOP are proposed, the report would include a statement confirming that the AOP describes the intended management actions for August 1 to December 31.</p>
	This report would serve as the agency sign-off document for acceptance of mitigation compliance for the previous operating year.
December 31	DW submits a report to the HMAC, DFG, SWRCB, and the Corps describing management activities that were implemented from August 1 to December 31 and a forecast of planned management activities that would occur from January 1 to March 31.
April 1	DW submits a report to the HMAC, DFG, SWRCB, and the Corps describing management activities that were implemented from January 1 to March 31 and a forecast of planned management activities that would occur from April 1 to July 31.

Table 24. Construction and Compliance Performance Standards for Compensation Habitats

Habitat Type or Activity	Plant Species	Monitoring Parameter	Construction Monitoring Periods		Compliance Monitoring Periods		
			Year -1	Year 0	Year 4	Year 10	Project Life
Agricultural, seasonal wetland, and herbaceous upland	N/A	Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and Corps	N/A	N/A	N/A
	N/A	Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
Riparian woodland	N/A	Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and the Corps	N/A	N/A	N/A
	N/A	Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
	All species	Percent canopy cover	N/A	N/A	>30%	65%-80%	Compensation management guidelines in Table 2 or approved AOPs are implemented
Riparian scrub	Nonlinear willow scrub	Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and the Corps	N/A	N/A	N/A

Table 24. Continued

Page 2 of 3

Habitat Type or Activity	Plant Species	Monitoring Parameter	Construction Monitoring Periods		Compliance Monitoring Periods		
			Year -1	Year 0	Year 4	Year 10	Project Life
		Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
		Percent shrub canopy cover	N/A	N/A	>30%	>65%	Compensation management guidelines in Table 2 or approved AOPs are implemented
	Linear willow scrub	Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and the Corps	N/A	N/A	N/A
		Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
		Percent linear closure	N/A	N/A	50%	90%	N/A
Emergent marsh	Bulrushes and cattail	Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and the Corps	N/A	N/A	N/A

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Table 24. Continued

Habitat Type or Activity	Plant Species	Monitoring Parameter	Construction Monitoring Periods		Compliance Monitoring Periods		
			Year -1	Year 0	Year 4	Year 10	Project Life
Permanent lake	Open water	Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
		Percent emergent cover	N/A	N/A	40%-70%	40%-70%	N/A
		Construction specifications	Construct to construction specifications approved by DFG and the Corps	Construct to construction specifications approved by DFG and the Corps	N/A	N/A	N/A
		Management prescriptions	N/A	N/A	N/A	N/A	Compensation management guidelines in Table 2 or approved AOPs are implemented
Hunting and other use restrictions	N/A	Use restrictions	N/A	N/A	N/A	N/A	Hunting and other use restrictions in Tables 19 and 21 or approved AOPs are implemented

Table 25. Compliance Performance Goals

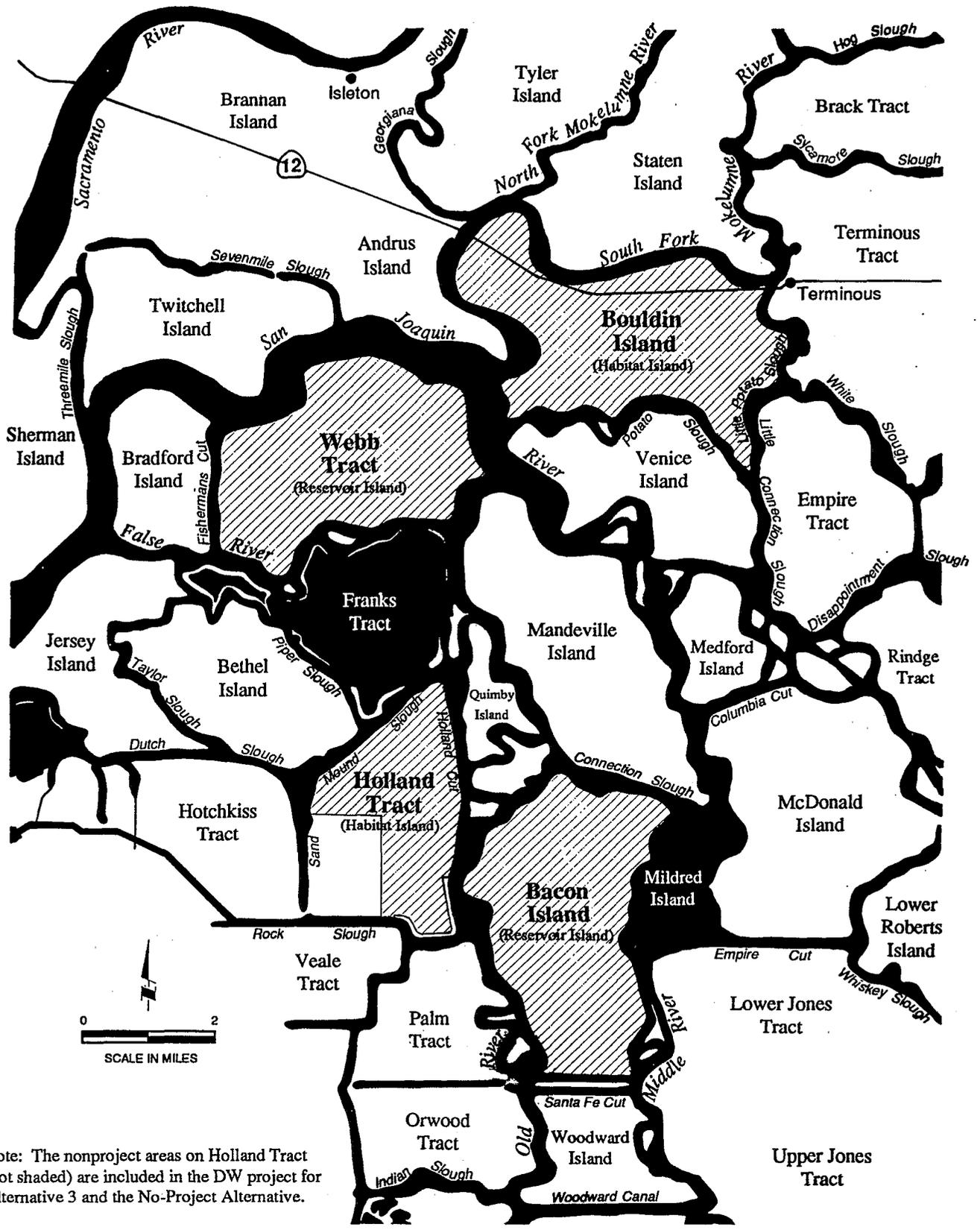
Habitat Type	Plant Species	Monitoring Parameter	Monitoring Years 1, 2, and 3			Monitoring Years 6 and 8		
			Year 1	Year 2	Year 3	Monitoring Parameter	Year 6	Year 8
Riparian woodland	All species	Seedlings/saplings per acre	>200	>300	>350	Percent canopy cover	50%-80%	60%-80%
	Fremont cottonwood and willow tree species	Percent composition on each island	≥ 50%	≥ 50%	≥ 50%	N/A	N/A	N/A
		Percent composition in each stand	20%-100%	20%-100%	20%-100%	N/A	N/A	N/A
	Other native tree species	Percent composition on each island	≥ 5%	≥ 5%	≥ 5%	N/A	N/A	N/A
		Percent composition in each stand	0%-50%	0%-50%	0%-50%	N/A	N/A	N/A
	Native shrubs and vines	Percent composition on each island	≥ 5%	≥ 5%	≥ 5%	N/A	N/A	N/A
		Percent composition in each stand	0%-50%	0%-50%	0%-50%	N/A	N/A	N/A
Riparian scrub	Nonlinear willow scrub	Seedlings per acre	>200	>300	>350	N/A	N/A	N/A
	Linear willow scrub	Seedlings per 100 feet	≥ 10	≥ 8	≥ 6	N/A	N/A	N/A
Emergent marsh	Bulrushes, cattail, and other emergent species	Percent cover	>5%	>20%	>30%	Percent cover	40%-70%	40%-70%

Table 26. Example Remedial Measures to Ensure Compliance with Performance Standards

Habitat Type or Activity	Monitoring Parameter	Potential Remedial Measure
Agricultural habitat, seasonal wetland, and herbaceous upland	Construction specifications	<ul style="list-style-type: none"> ■ Reconstruct or replant agricultural fields, seasonal wetlands, and herbaceous uplands to conform with construction specifications ■ Construct and manage additional compensation habitats ■ Adjust management of other habitat island habitats to increase wildlife values ■ Reduce disturbance levels on islands to increase wildlife values
	Management prescriptions	<ul style="list-style-type: none"> ■ Construct and manage additional compensation habitats ■ Adjust disturbance levels on islands to increase wildlife values
Riparian woodland	Construction specifications	<ul style="list-style-type: none"> ■ Reconstruct or replant riparian woodland habitats to conform with construction specifications
	Management prescriptions	<ul style="list-style-type: none"> ■ Burn, cut, or use herbicides to thin stands to desired canopy cover
	Percent canopy cover	<ul style="list-style-type: none"> ■ Plant or seed additional trees to increase tree density ■ Alter groundwater hydrology or irrigate to increase rate of tree growth and survival ■ Establish additional riparian woodland habitat in locations better suited for establishment of riparian habitats
Riparian scrub (nonlinear and linear)	Construction specifications	<ul style="list-style-type: none"> ■ Reconstruct or replant riparian scrub habitats to conform with construction specifications
	Management prescriptions	<ul style="list-style-type: none"> ■ Burn, cut, or use herbicides to prevent succession to a woodland condition
	Percent shrub cover	<ul style="list-style-type: none"> ■ Plant willow cuttings or other suitable shrub species to increase shrub density ■ Alter groundwater hydrology or irrigate to increase rate of shrub growth and survival ■ Establish additional riparian scrub habitat in locations better suited for establishment of riparian habitats ■ Burn, cut, or use herbicides to prevent succession to a woodland condition

Table 26. Continued

Habitat Type or Activity	Monitoring Parameter	Potential Remedial Measure
Emergent marsh	Percent linear closure	<ul style="list-style-type: none"> ■ Plant willow cuttings or other suitable shrub species to increase shrub density ■ Alter groundwater hydrology or irrigate to increase rate of shrub growth and survival ■ Burn, cut, or use herbicides to prevent succession to a woodland condition
	Construction specifications	<ul style="list-style-type: none"> ■ Reconstruct or replant marsh habitats to conform with construction specifications
	Management prescriptions	<ul style="list-style-type: none"> ■ Construct and manage additional marsh habitats ■ Adjust disturbance levels in marshes to increase wildlife values
Permanent lake	Percent cover	<ul style="list-style-type: none"> ■ Plant additional plugs of emergent vegetation ■ Manage water levels in a manner that encourages establishment of desirable emergent plants
	Construction specifications	<ul style="list-style-type: none"> ■ Recontour lake bottoms and shorelines or reinstall water control structures to conform with construction specifications ■ Construct additional permanent lakes ■ Reduce disturbance levels on islands to increase wildlife values
	Management prescriptions	<ul style="list-style-type: none"> ■ Change lake level management or install additional water control structures ■ Construct additional permanent lakes ■ Reduce disturbance levels on islands to increase wildlife values
Hunting and other use restrictions	Use restrictions	<ul style="list-style-type: none"> ■ Increase level of compliance monitoring ■ Implement more effective compliance monitoring methods ■ Adjust hunter or other disturbance levels on islands to increase wildlife values ■ Construct and manage additional high value wildlife habitats



Note: The nonproject areas on Holland Tract (not shaded) are included in the DW project for Alternative 3 and the No-Project Alternative.

Source: Adapted from California Department of Water Resources 1993.

Figure 1.
DW Project Islands

**DELTA WETLANDS
PROJECT**
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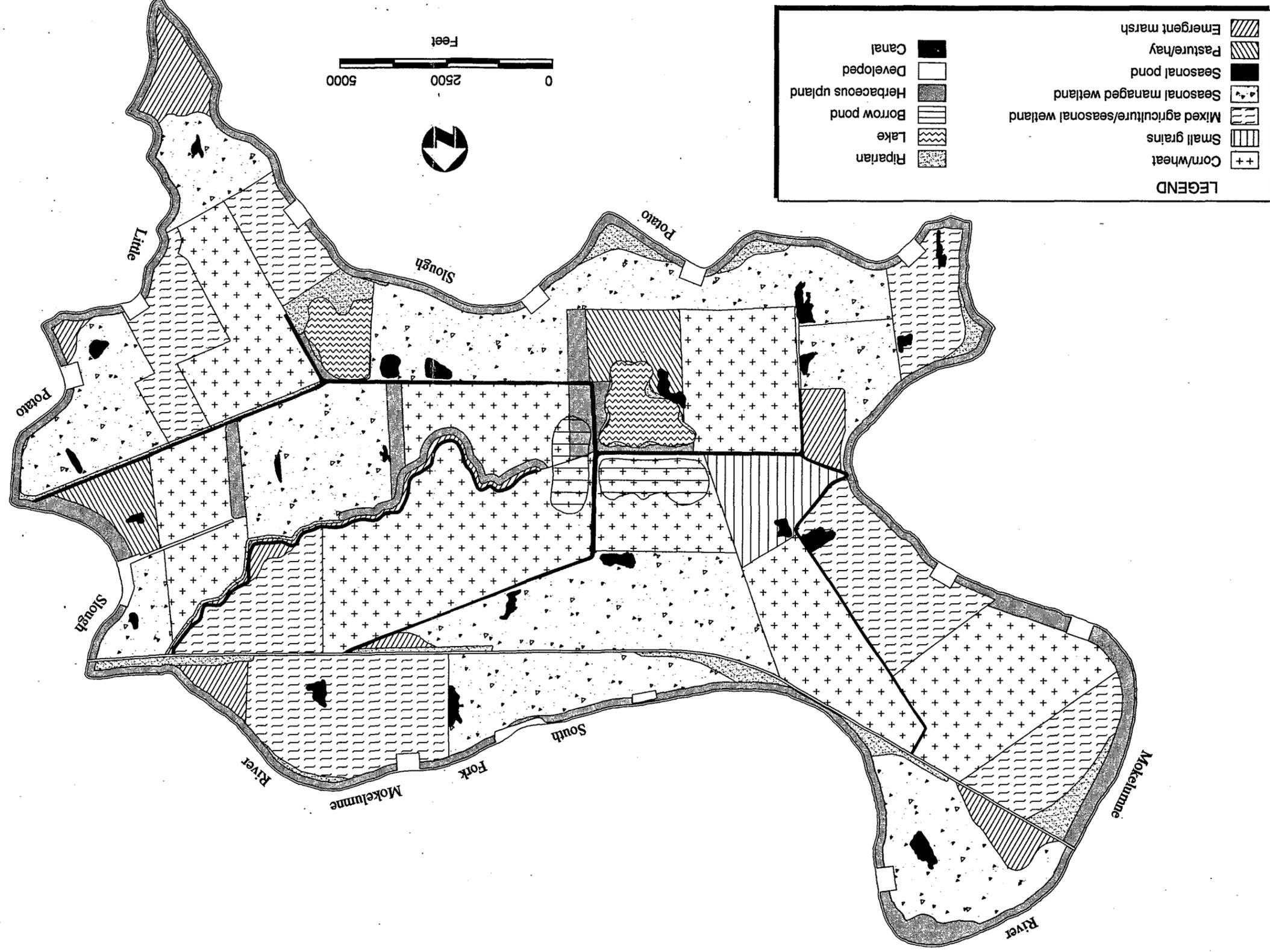


Figure 2.
 Bouldin Island Habitats
 under the HMP

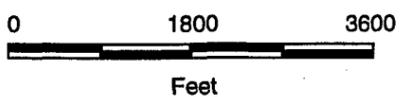
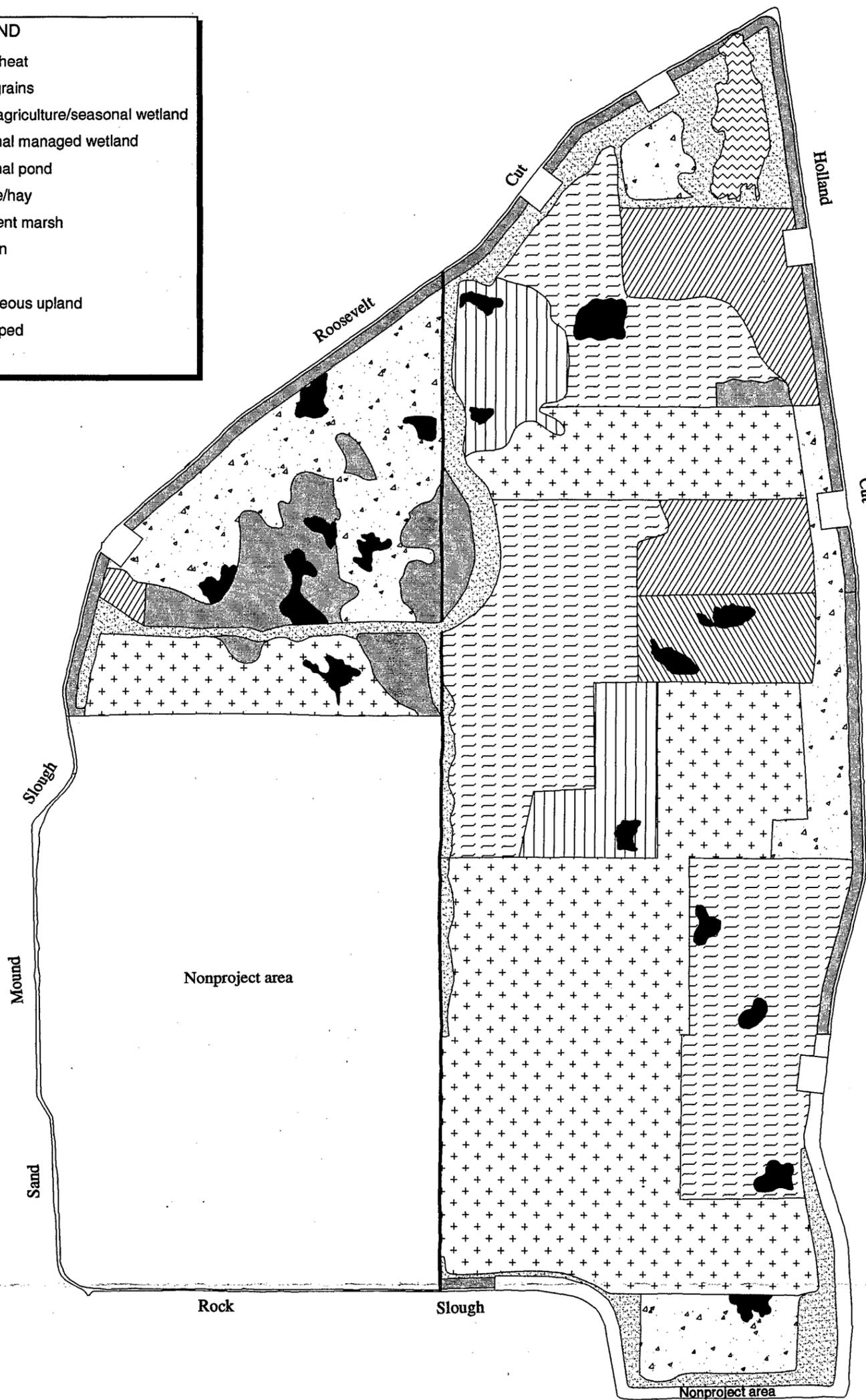
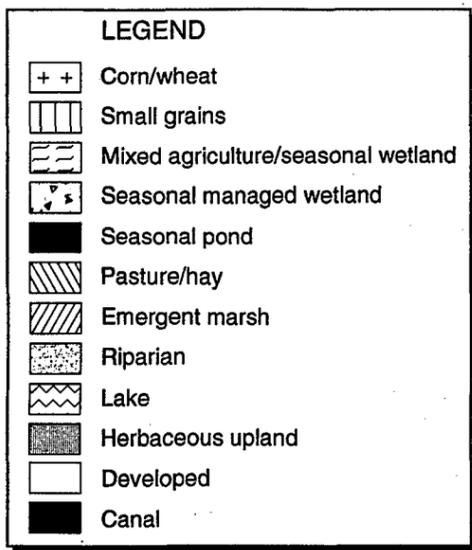
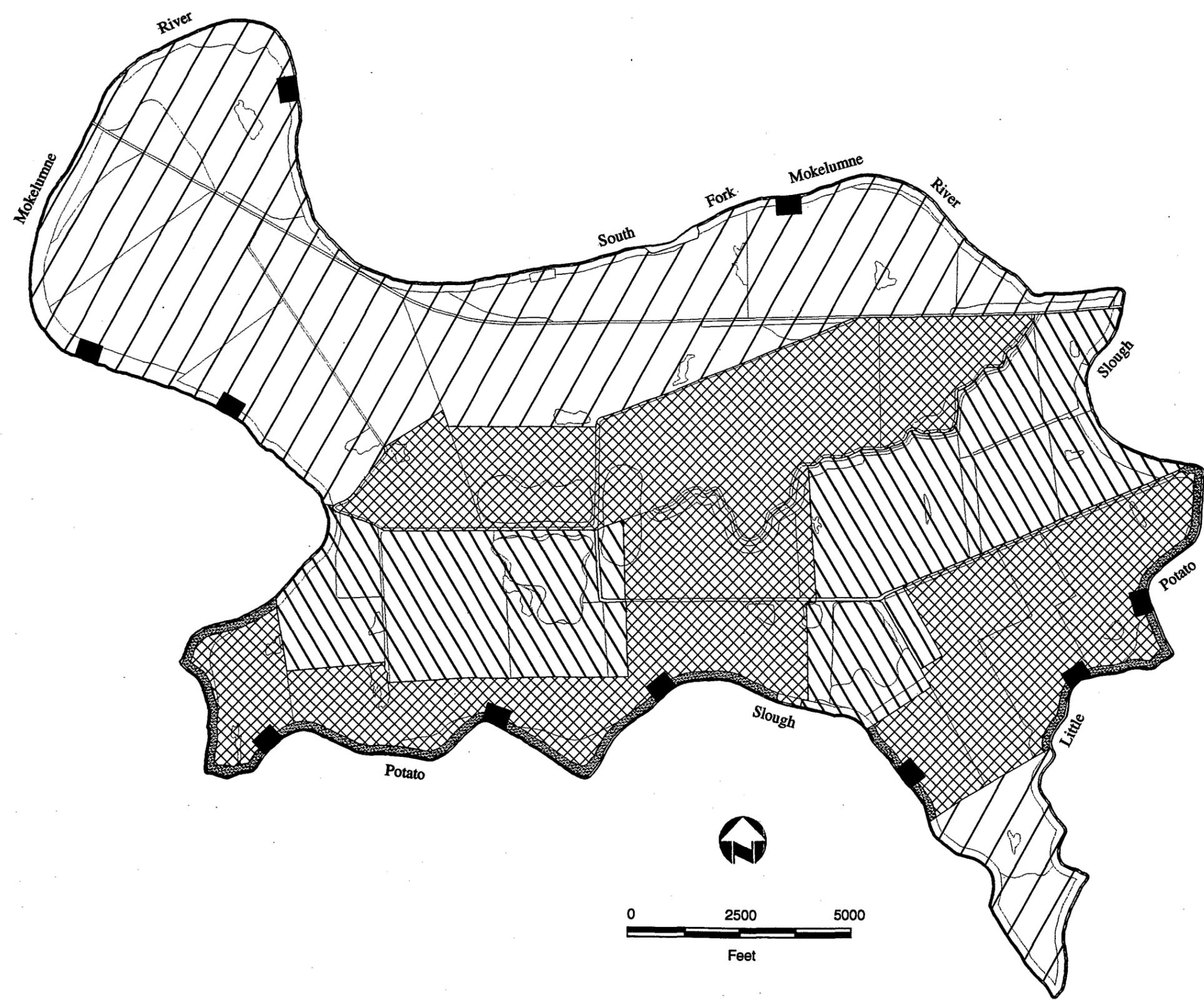


Figure 3.
Holland Tract Habitats under the HMP

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Figure 4.
Bouldin Island Hunting
Zones under the HMP



LEGEND

-  Recreation facility
-  Closed hunting zone
-  Free-roam hunting zone
-  Spaced-blind hunting zone
-  Upland game free-roam hunting zone

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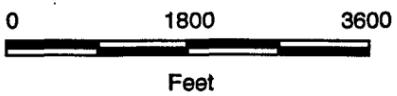
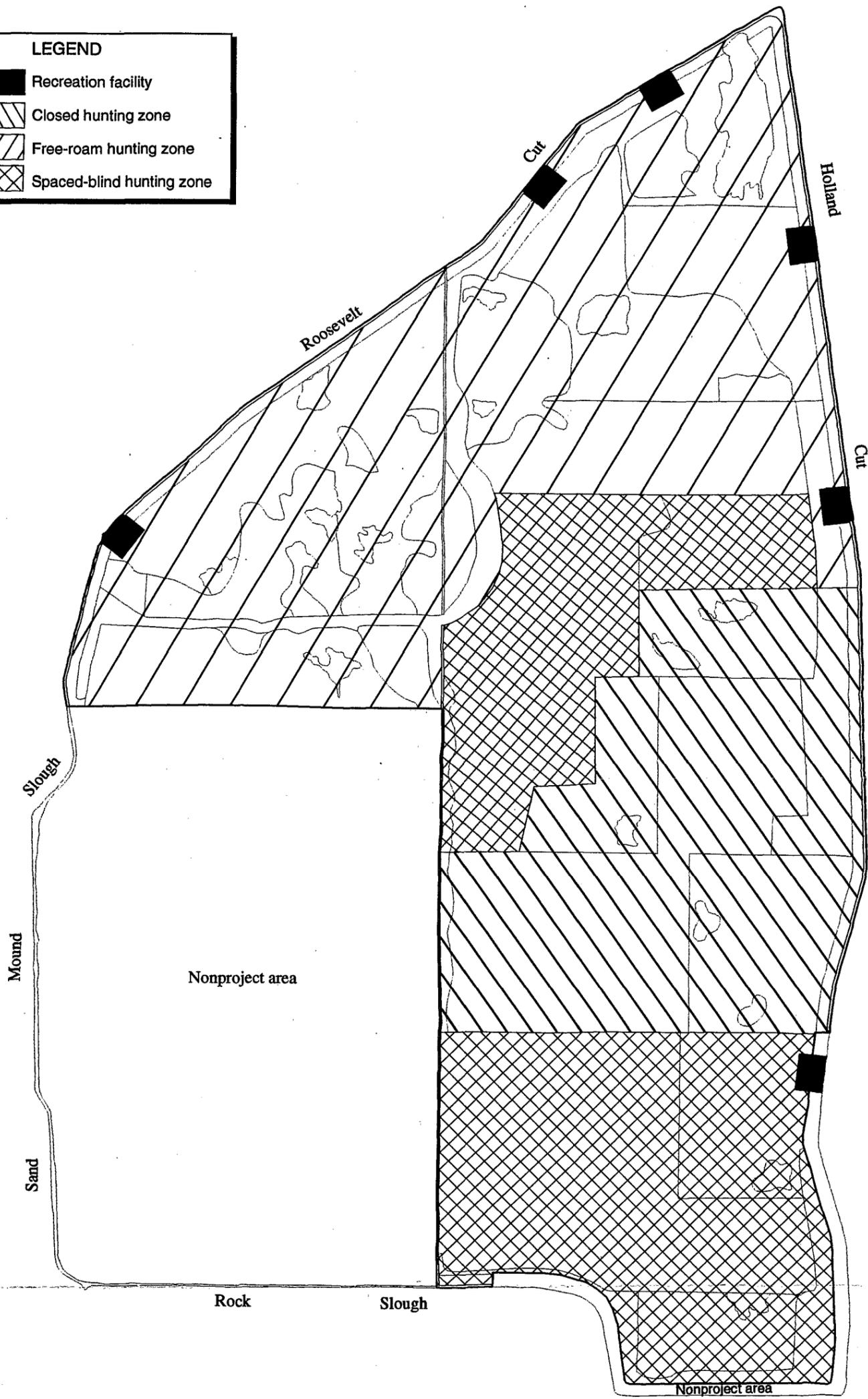


Figure 5.
Holland Tract Hunting Zones
under the HMP

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PROJECT**
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Figure 6.
Bouldin Island under Fall
Management Conditions

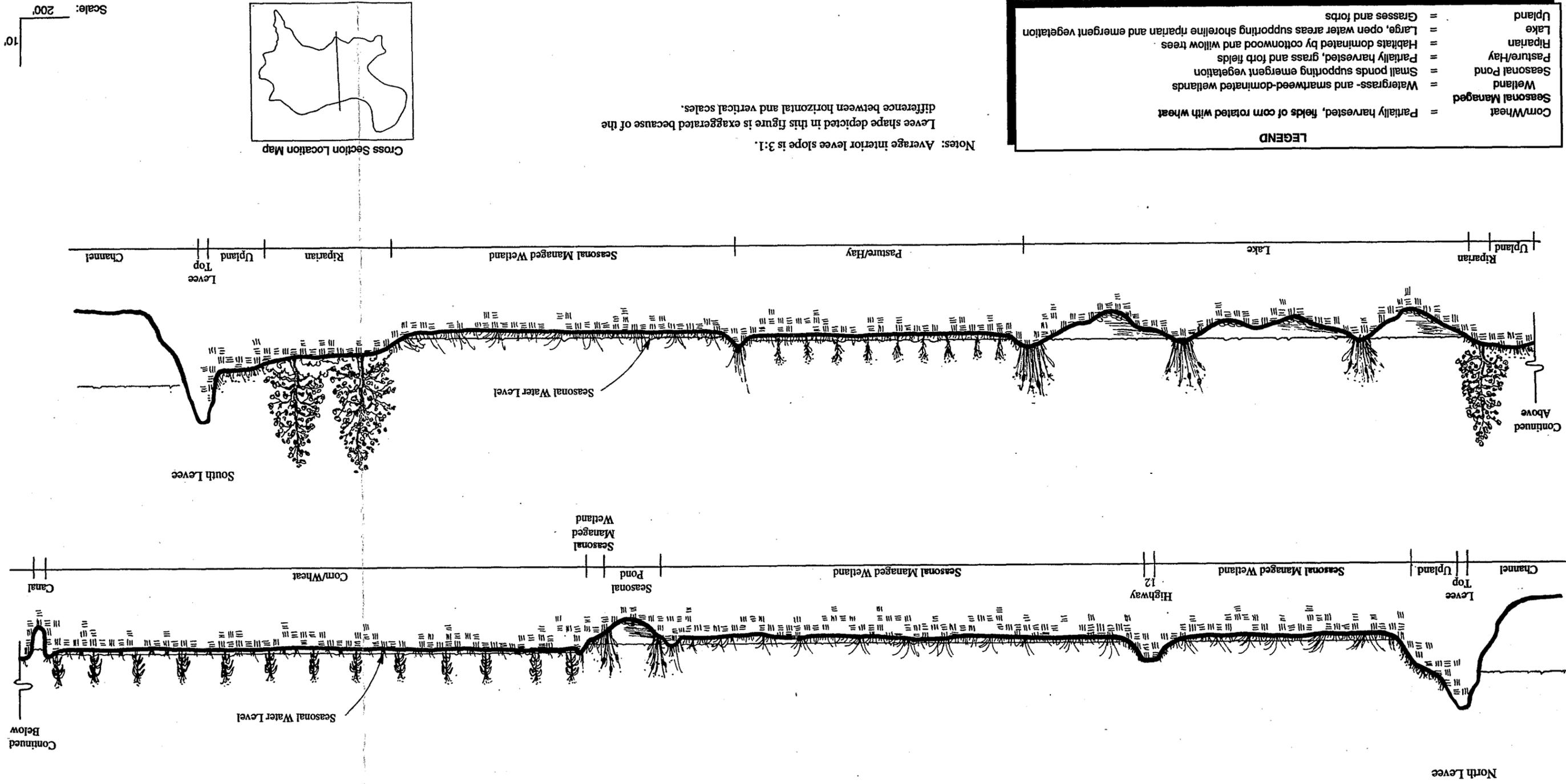
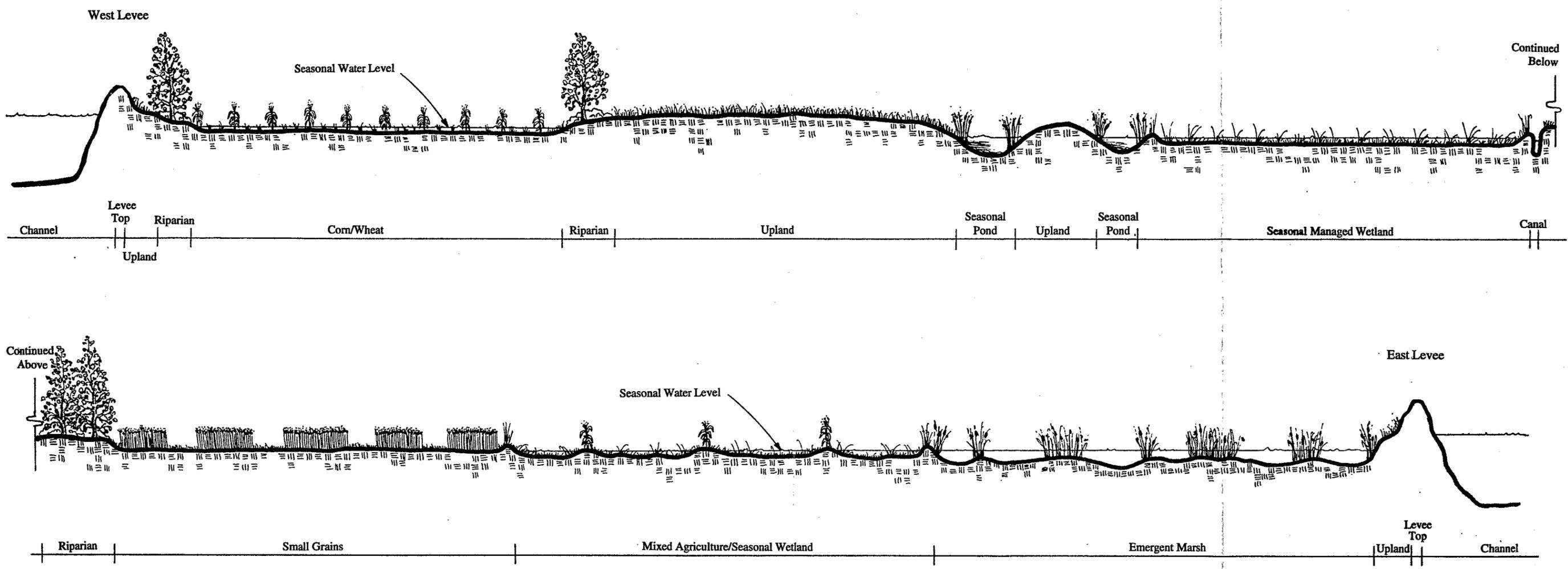


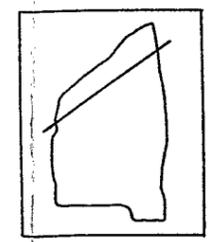
Figure 7.
Holland Tract under Fall
Management Conditions



LEGEND	
Corn/Wheat	= Partially harvested, fields of corn rotated with wheat
Small Grains	= Wheat fields mixed with barley and vetch
Mixed Agriculture/ Seasonal Wetland	= Watergrass- and smartweed-dominated wetlands mixed with standing corn
Seasonal Managed Wetland	= Watergrass- and smartweed-dominated wetlands
Seasonal Pond	= Small ponds supporting emergent vegetation
Emergent Marsh	= Tule- and cattail-dominated permanent wetlands
Riparian	= Habitats dominated by cottonwood and willow trees
Upland	= Grasses and forbs

Notes: Average interior levee slope is 3:1.
Levee shape depicted in this figure is exaggerated because of the difference between horizontal and vertical scales.

Cross Section Location Map



Scale: 200' 10'