Chapter 4. Yolo Bypass Habitat Opportunities and Constraints

INTRODUCTION

As stated in Chapter 1, the purpose of this document is to present a stakeholder-based strategy for the future of the Bypass. This strategy focuses on the appropriate ways to enhance fish and wildlife habitat, while maintaining the economic viability of landowners and protecting flood conveyance capacity in the Bypass.

As the development of the Management Strategy has progressed, the Working Group has discussed numerous habitat-related topics and ideas. As described in Chapter 3, the Working Group has also discussed numerous issues of concern and necessary assurances related to land use changes in the Bypass. Lastly, the Working Group has reviewed CALFED programmatic documents associated with the Bypass to better understand the CALFED concepts for the Bypass. Through these efforts, the Working Group has identified a set of potential land use options that could accomplish some of the CALFED concepts, while still maintaining landowner economic viability and flood conveyance capacity. This chapter presents these options and the opportunities and constraints associated with them.

REVIEW OF CALFED DOCUMENTS

The Working Group reviewed several CALFED programmatic documents for their relevancy to the Bypass. Specifically, the Working Group reviewed the ERPP Volume I and the ERPP Volume II, including the "Yolo Basin Ecological Management Zone" and the "Sacramento–San Joaquin Delta Ecological Management Zone".

From this review, the Working Group has gained a better understanding of the ecological goals of the CALFED program and, in particular, the "targets" and "programmatic actions" identified in the ERPP.

As stated on page 13 of the ERPP Volume II, a target is defined as "something to strive for but...may change over the life of the program with new information and progress or may vary according to the configuration of storage and conveyance in all alternatives". The ERPP further explains that "Target adjustments will be science-driven and based on the results of adaptive management". Lastly, and of particular interest to Bypass stakeholders, the ERPP states that "Targets are to be set based upon realistic expectations, must be balanced against other resource

needs, and must be **reasonable, affordable, cost effective, and practicably achievable**" (bold font provided by the Working Group). In addition to those statements, the Working Group asserts that targets should be locally acceptable.

On page 11 of the ERPP Volume II, a programmatic action is defined as "a physical, operational, legal, or institutional change or alternative means to achieve a target". The ERPP further states that "The number of actions and their level of implementation is subject to adjustment by adaptive management".

In general, a majority of Working Group members are interested in the scientific perspective of Bypass ecosystem functions presented in the ERPP. However, these stakeholders remain very concerned about the appropriateness and applicability of the CALFED concept on Bypass lands that are currently privately owned and that are part of the critical flood conveyance system of the FCP. Nonetheless, a majority of the Working Group is encouraged by the previous definitions that explicitly state that actions must be balanced against other resource needs, and that they must be reasonable, affordable, cost effective, and practicably achieved.

In that context, the Working Group acknowledges that there may be mutually beneficial opportunities for landowners, flood management agencies, and habitat advocates that could result in enhanced habitat conditions in the Bypass. As a first step to determining common ground between stakeholder interests and CALFED interests, the Working Group identified Bypass-specific/related targets and programmatic actions identified in the ERPP. These targets and programmatic actions are presented in Appendix D.

HABITAT OPPORTUNITIES AND CONSTRAINTS

In the context of the information in Appendix D, the following sections present the Working Group's recommendations of what **might be** "reasonable, affordable, cost effective, and practicably achieved" regarding habitat enhancement in the Bypass. Based on the Working Group's review of the CALFED documents, several of the following recommendations will require CALFED to broaden its vision of what can be achieved and what constitutes successful implementation of the CALFED program in the Bypass. These recommendations will require CALFED to become more flexible with regards to integrating existing and proposed land uses. It is the opinion of the Working Group that such changes on the part of CALFED proponents will be necessary if the program is to achieve any success in the Bypass.

As discussed in Chapter 3, numerous landowners wish to remain involved in agricultural and managed wetland land uses in the Bypass. However, some landowners might be interested in taking some or all of their land out of agricultural production if assurances can be provided and issues can be resolved. Other landowners might be interested in modifying their existing practices to accommodate habitat opportunities that are compatible with agriculture. Because these land use scenarios are very different, the rest of this chapter has been organized to reflect these differences as they relate to the opportunities and constraints of habitat enhancement in the Bypass (Figure 4-1).

The remainder of this chapter provides an analysis of the following general land use categories for properties in the Bypass:

- # agriculture with integrated habitat enhancement and
- # habitat enhancement as the primary land use.

The immediate following section provides descriptions of integrated agriculture and habitat-based land management and/or land use opportunities. Following each description is a discussion of the benefits that could occur from such a land use. Each discussion of benefits is divided into two parts: 1) a general description of environmental benefits and 2) the Working Group's interpretation of CALFED benefits (as presented in Appendix D) that could be achieved. Each section of the proposed CALFED benefits presents verbatim categories from the ERPP management zone descriptions (Volume II) and the specific programmatic actions defined under each category in the ERPP Volume II. Each section also presents a description of the constraints each opportunity faces. These constraints include issues such as ineffective or restrictive policies, funding requirements, technical uncertainties, data gaps, and public health concerns. Lastly, each section provides a list of potential funding sources for each opportunity.

Agriculture with Integrated Habitat Enhancement

The predominant crops grown in the Bypass are field crops, truck crops, and grains. Traditional farming practices used to grow these crops vary in the degree to which they accommodate the presence of wildlife. Some practices, commonly known as habitat-friendly farming practices, take into account the need for both a viable, sustainable farming operation and habitat for wildlife.

Some habitat-friendly farming practices present opportunities for habitat establishment or enhancement (as envisioned in the ERPP). In addition, some of these practices could provide potential benefits to farmers, such as:

- # improved water quality;
- # reduced soil erosion;
- # reclamation of irrigation water and topsoil;
- # groundwater recharge; and
- # nonchemical weed and pest control.

However, the unique physical characteristics and function of the Bypass present limitations to many habitat-friendly practices; flooding and inundation patterns make many suggested practices impractical or impossible.

The Working Group has discussed several farming practices designed to enhance or create habitat. The following data sheets describe the practices that could potentially be feasible in the Bypass. CALFED programmatic actions and targets that can be achieved by such practices are listed

following the discussion of each practice. This section has been developed with extensive input from several Working Group members and from information derived from the following documents: Valley Habitats, A Technical Guidance Series for Private Land Managers in California's Central Valley, Numbers 1 through 18; Farming for Wildlife, Voluntary Practices for Attracting Wildlife to Your Farm; and Bring Farm Edges Back to Life, How to Enhance Your Agriculture and Farm Landscape with Proven Conservation Practices for Increasing the Wildlife Cover on Your Farm.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Water Management: Construct Tailwater or Seasonal Ponds

Tailwater ponds catch and store agricultural runoff water. They generally use a double pond system. The first, smaller pond in the flow system catches water-borne sediments. It is designed for easy access by equipment for excavation of silt and sediment, which can be redistributed on fields during fall groundwork. The second, larger pond serves to store water, provide groundwater recharge, and, in some cases, provide plant and wildlife habitat. The larger pond generally has a water return system to redistribute water for irrigation.

Construct Tailwater or Seasonal Ponds **Benefits**

Water and Soil Resources. Tailwater ponds provide potential benefits to farmers by aiding in the recovery of topsoil normally removed from fields by irrigation and winter rains and by increasing groundwater recharge (depending on soil type and number of ponds per managed area). By recapturing runoff as groundwater and surface water, tailwater ponds aid in the conservation and reuse of water, particularly during critical dry periods. By reducing topsoil loss, tailwater ponds decrease the need to replace these resources or amend the soil with costly mineral and chemical additives. Because of the inherent flood risk and the volume and velocity of floodflows in the Bypass, it is likely that such ponds might be of limited benefit to farmers for preserving topsoil. However, some soil preservation might occur, and the previously described water conservation benefits would very likely occur.

Managed Temporary Freshwater Emergent Marsh Habitat (Nontidal). Tailwater and seasonal ponds can provide open water and edge vegetation typically dominated by tules, sedges, smartweed, and similar endemic species. Depending on the width of such vegetated areas, these conditions can support a variety of avian, terrestrial, and fish species (Chapter 2).

The cover provided on the margin of such ponds can support upland mammalian species, such as mice, racoons, hares, and cottontails, as well as several amphibious and reptilian species. If such ponds are large enough, they can also support larger aquatic mammals, such as otters, muskrats, and beavers. The open water and edge vegetation can support several avian species, such as grebes, ibis, bitterns and other shorebirds and wading birds. If designed properly, the open water and adjacent freshwater marsh vegetation can provide brood pond habitat for resident waterfowl. Because of agricultural and wetland (duck club) management practices in the Bypass, numerous areas that could provide brood habitat are disturbed or drained as a result of field management activities, particularly in the critical spring and summer brood periods. Tailwater ponds could be an important addition of multibenefit habitat to the Bypass. When water levels drop in these ponds, particularly in the fall and early spring (after harvest and before first irrigation, respectively), they could provide important exposed mudflat habitat for migrating shorebirds. Mudflat habitat in the Bypass continues to be uncommon, and areas where it occurs have been known to attract thousands of shorebirds. Lastly, the presence of relatively undisturbed marsh vegetation adjacent to shallow water could provide important refugia and rearing habitat for fish species (assuming these species could passively [without pumps] return to perennial water features).

Construct Tailwater or Seasonal Ponds **Benefits (cont.)**

Managed Willow Scrub Riparian Habitat. Depending on the size and design of tailwater ponds, such ponds could also support a peripheral zone of willow scrub habitat or at least some vegetation species associated with such habitat. Specifically, these areas could include numerous willow species, as well as scattered cottonwoods. This vegetation commonly supports many small- and medium-sized mammal species that feed on seeds and young vegetation. When allowed to create a vegetated thicket, this habitat can support migratory and insectiverous birds because of the presence of insects that often live in the cover. Taller shrubs and trees provide important hunting and resting perches for avian species that forage in open or agricultural habitats, including raptors such as American kestrels and black-shouldered kites. This taller vegetation also provides similar perches and cover for birds that forage near open water, such as kingfishers and black-crowned night herons.

Waterfowl Production. The construction of tailwater ponds on private agricultural lands could increase the number of locally produced ducks. Nesting islands included into pond design would provide brood cover, assuming the ponds could be inundated in May and June. Such ponds could work very well in pasture lands used for grazing animals. Such grazing activities could be compatible with local waterfowl populations that would nest in mixed grasses and other upland vegetation.

Construct Tailwater or Seasonal Ponds **CALFED Benefits and Programmatic Actions**

Yolo Bypass Ecological Management Zone: ERPP Volume II

- Riparian and Riverine Aquatic Habitat
  Programmatic Actions 1A, 1B, 1C, 1D (see constraints below)

- Invasive Riparian and Marsh Plant Species
  Programmatic Action 1A (see constraints below)

- Predation and Competition
  Programmatic Action 1A (see constraints below)

- Stranding - (no applicable programmatic actions; however, see constraints below)

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Construct Tailwater or Seasonal Ponds **CALFED Benefits and Programmatic Actions (cont.)**

Sacramento–San Joaquin Delta Ecological Management Zone: ERPP Volume II

- # Natural Floodplain and Flood Processes
  Programmatic Action 4A

- # Fresh Emergent Wetland Habitat (Nontidal)
  Programmatic Action 1B

- # Seasonal Wetland Habitat
  Programmatic Action 1A

- # Riparian and Riverine Aquatic Habitats
  Programmatic Action 6A

- # Agricultural Lands
  Programmatic Action 1C

- # Invasive Aquatic Plants
  Programmatic Action 1A (see constraints below)

- # Contaminants
  Programmatic Action 1A

- # Stranding
  Programmatic Action 1A (see constraints below)

Construct Tailwater or Seasonal Ponds **Constraints**

Policies. The Yolo County Resource Conservation District (RCD), in coordination with the NRCS, supports the development of tailwater ponds in Yolo County. However, the RCD has a policy that prohibits the funding of tailwater ponds in flood bypasses because of the inherent flood risk. Specifically, the RCD/NRCS policy prohibits paying for portable pumps and associated piping that would recirculate water from ponds to fields because of the risk that these pumps would not be returned to their appropriate locations each year. There is apparently no enforcement mechanism in place that the RCD/NRCS can employ to ensure landowner compliance with funding requirements. A revision of this policy by the RCD/NRCS, support for better easement enforcement, and/or the identification of an alternate funding source for tailwater ponds need(s) to occur to make this opportunity economically feasible.

Construct Tailwater or Seasonal Ponds **Constraints (cont.)**

Flood Conveyance. The current policy of the Reclamation Board is to restrict physical barriers to flow conveyance in the Bypass. The magnitude of flow resistance posed by a pond and surrounding freshwater marsh vegetation would vary, depending on the type of vegetation, size, and orientation of pond levels; however, it is assumed anecdotally that such resistance would be minimal. If a landowner or habitat enhancement advocate chose to expand the periphery of a pond to include willow scrub riparian habitat, this condition could pose a more significant resistance to flows. Such habitat would be more likely to snag flood-borne debris and to cause deposition of sediments downstream of the pond feature. It is possible that flood-sensitive design of ponds in the Bypass could minimize the risk of flow resistance. Figure 4-2 presents a conceptual representation of how a tailwater pond in the Bypass could accentuate a longer, linear, north-south trending orientation with no vegetation on the north and south ends. Such a design could allow floodflows to move through and over the pond with a minimal amount of flow resistance.

Erosion and Deposition. The introduction of pond features and associated vegetation could change the direction and velocity of floodflows on adjacent agricultural lands. Such changes could result in erosion or deposition of soil and sediment. This erosion or deposition could, in turn, pose a risk to land management and an economic burden to the adjacent landowner. Such conditions may need to be hydraulically modeled to ensure that pond design minimizes such conditions or compensation is provided to affected landowners for such impacts.

Brood Pond Design. Tailwater ponds must meet fairly exact design requirements to ensure that nesting hens and ducklings are not at risk to terrestrial and avian predators. These designs must include appropriate distances between pond edge, open water, and potential pond islands to ensure refuge from predators. Such design requirements would need to be integrated with the more critical design requirements for flood conveyance.

Water and Sediment Contamination. Tailwater ponds by definition are the lowest point on a property and act as the sink for all agricultural irrigation. Such irrigation water will carry traces of mineral and chemical amendments applied to the property, and these amendments may concentrate in the pond and associated sediments. It is unclear to the Working Group whether these concentrations pose a threat to species that might use the ponds and whether landowners would be held liable for any physiological damage that could occur to such species as a result of exposure to such concentrations.

Non-Native/Invasive Plant Species and General Vegetation Management. By creating seasonal ponds, there is an increased risk of plants providing habitat for the introduction and proliferation of non-native and invasive plant species. Without adequate compensation, there is little incentive for a landowner to dedicate the operations and maintenance costs associated with controlling these invasive populations. Additionally, without some comprehensive monitoring program, it will likely be unclear to landowners what operations and maintenance efforts will control such invasive plants. Lastly, the development and maintenance of native vegetation (particularly perennial grasses) can be time consuming, difficult, and oftentimes unproductive. Therefore, as part of implementation of such ponds, funding would have to be provided to compensate a landowner for self-management of a pond, develop a maintenance program provided by others to control such vegetation, and/or develop a monitoring program to measure the occurrence and magnitude of occurrence of invasive plants.

Construct Tailwater or Seasonal Ponds **Constraints (cont.)**

Agricultural Pests. Several plant species have been identified as host plants for beneficial insects, which can be used as a part of integrated pest management methods. Most of these plants cannot survive prolonged periods of inundation common to the Bypass. Only plants identified as "hydrophytic vegetation" can survive and flourish in such wet conditions. However, it remains unclear to the Working Group whether these hydrophytic plants species will act as hosts for agriculturally beneficial insects or harmful insects. If such plants pose harmful effects to farming practices and economics, farmers will likely require compensation for lost productivity.

Additionally, several mammal species that are commonly associated with riparian and wetland habitat (e.g., beaver, mice, voles) can also pose significant impacts to agricultural operations. If habitat areas are enhanced and/or expanded in the Bypass, they could provide refuge for increased numbers of these destructive species. As with the previously discussed issues regarding potential host plants, farmers will likely require compensation for lost productivity caused by increased crop damage.

Vector Control. All tailwater ponds must be designed in accordance with SYMVCD design criteria. Compensation to SYMVCD for additional services would need to be provided by parties other than landowners.

Fish Stranding. Traditional design of tailwater ponds does not require a lowpoint outflow feature to drain the pond. However, in the Bypass, such ponds could strand special-status fish if floodflows recede and isolate ponds with no hydraulic connection to other water delivery channels. Several options exist regarding this constraint. Ponds would have to be designed with a passive, lowpoint drain, such as a screwgate, flash board weir, or pipe riser, to drain water without the use of a pump. Alternatively, landowners would need to be granted safe harbor agreements or some similar legally binding agreement to indemnify them from any fish losses associated with such stranding.

Construct Tailwater or Seasonal Ponds **Funding Options**

Technical or funding support is available from the following agencies and organizations: BOR, California Rice Industry, FSA, CWA, DFG, California Department of Pesticide Regulation (DPR), DWR, Ducks Unlimited (DU), University of California (UC) Cooperative Extension, U.S. Environmental Protection Agency (EPA), USFWS, Yolo County RCD, and the California Wildlife Conservation Board (WCB).

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Water Management: Implement Alternative Flooding Regimes

Several alternatives for parcel-specific flooding regimes can be feasible in the context of unique Bypass conditions. These alternatives include:

- # maintenance of shallow water flooding after fall harvest until early March (during nonflood years),
- # early spring flooding (during nonflood years), and
- # maintenance of water in irrigation ditches after fall harvest.

Postharvest shallow water flooding can be accomplished by using existing agricultural levees or creating small temporary levees (similar to rice dikes) to isolate fields for the shallow water storage (2–12 inches deep). Levees should be constructed of soils suitable to prolonged inundation and resistant to shrink/swell conditions and erosion. These characteristics are particularly important in the Bypass, where flood conditions are always a possibility. Initial flooding of fields should coincide with the first arrival of migrating birds, usually late summer to early fall in the Bypass. If a landowner chooses to flood multiple fields, flooding should be staggered to provide a variety of flooded conditions as migratory bird populations increase. Flooding should be gradual over 3–5 weeks to ensure slow inundation of soils and maximize exposure of advancing waterlines for foraging birds.

Assuming that site-specific shallow flooding can be guaranteed, agricultural stubble does not need to be removed after harvest. In fact, such material should be retained on fields because it will be decomposed through the application of the shallow water, increasing nutrient cycling in the water system. Water control structures necessary to control flows, such as temporary check dams or flash board/stop log weirs, can be closed during seasonal storms to capture and retain rainwater. Surface water that can be legally diverted and legally applied to fields after harvest can be used to flood fields. Groundwater can also be applied if appropriate.

Similarly, early spring flooding can be conducted on fields with stubble remaining from fall harvest or on fields cleaned during harvest. Water control structure requirements are identical to the previously discussed flooded fields. Spring flooded fields may be used to support bird or fish habitats. Field design and water depths may vary, based on the species to be supported. Fish habitats will require a passive delivery of water (e.g., no pump use).

Lastly, ditches used to deliver irrigation water during the growing season can have water control structures put in place to hold water surface levels of late season irrigation water, winter rainwater, and delivered water from wells and other legal sources.

Implement Alternative Flooding Regimes — Benefits

Weed Control. Postharvest flooding is a preferred method for controlling many undesirable weeds. Additionally, waterfowl feeding activity may also diminish the presence of the weed seed bank. Early spring flooding may aid in weed management by drowning early germinating weeds. Similarly, early flooding may aid in early germination of weeds that may then be tilled under during furrowing activities, following the recession of flood waters and the drying of fields.

Implement Alternative Flooding Regimes **Benefits (Cont.)**

Erosion and Subsidence Control. The Central Valley is periodically subject to strong, dry, northwesterly winds in late fall and early spring. Controlled inundation or maintenance of moist soil conditions in agricultural fields can minimize wind erosion. Groundwater recharge associated with flooding fields for an extended duration can minimize or halt ground subsidence, particularly where highly organic soils are present.

Waterfowl Hunting. Increasing waterfowl use on cultivated agricultural fields by flooding after harvest can provide new or improved waterfowl hunting opportunities for private landowners. Such conditions can also provide a source of winter income by leasing hunting rights to interested customers.

Food Sources and Nutrient Cycling. Retaining stubble on fields allows decomposition to take place over the winter season. This decomposition improves the nutrient cycling process that is critically important for the sustainability of downstream delta fishes, birds, and wildlife. Decaying vegetation provides excellent conditions for invertebrate population production. Such invertebrate populations are important in the support of many avian and fish species. Foraging activities by birds and other wildlife will further disrupt stubble, increasing the rate of decomposition.

Shallow water held in drainage ditches similarly supports improved invertebrate populations. Vegetation (discussed later in this chapter) along the banks of such flooded ditches can contribute important decomposing material to the aquatic system as it goes dormant and is disturbed or naturally deposited into the ditch water.

Improved Waterfowl Populations and Habitat Conditions. Inherently, increased wetted areas will tend to attract migrating waterfowl. Fields where stubble has been retained provide increased benefits to waterfowl. Such waterfowl arrive in the Central Valley requiring a diet rich in carbohydrates to replenish fat reserves lost during the fall migration. Waste grain found in agricultural stubble, particularly from crops common to the Bypass, such as corn and rice, provides easily accessible foods rich in these necessary carbohydrates. Fields flooded through late winter and early spring provide increased invertebrate populations (as previously discussed) that are important protein sources for molting and prelaying hens.

Flooded irrigation ditches can provide important “pair water” used by breeding ducks prior to nesting, particularly between February and May. Similar to flooded fields, these ditches can support improved invertebrate populations that can be an important protein source when such a diet is critically necessary.

Such flooded conditions in concert with adjacent grass-type or legume-based habitat can provide important nesting habitat for hens.

Improved Shorebird and Wading Bird Populations and Habitat Conditions. The combination of wetted soil areas and increased invertebrate populations should attract extensive shorebird use. This extensive use is particularly true during flood recession, as artificially created “mudflats” in the fields are exposed prior to tilling and turning. Fields inundated long enough or with enough connectivity to other water sources may attract fish, amphibians, and reptiles, as well as invertebrates. All of these animals are preferred prey of wading birds, which should therefore be similarly attracted to shallow flooded areas.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Implement Alternative Flooding Regimes **Benefits (cont.)**

Improved Special-Status Fish Populations and Habitat Conditions. Based on recent studies (Department of Water Resources 1999)**,** it has been hypothesized that shallow flooded habitat in the Bypass may provide spawning and rearing habitat for Delta smelt, splittail, chinook salmon, and white and green sturgeon. Increased flooded areas could provide shallow water habitat critical to support several of these species. The retention of stubble on fields may provide rearing habitat because of increased nutrient cycling and subsequent improved food web conditions. Additionally, it can provide important refugia from floodflows and predators.

Implement Alternative Flooding Regimes **CALFED Benefits and Programmatic Actions**

Sacramento–San Joaquin Delta Ecological Management Zone: ERPP Volume II

- # Nontidal Perennial Aquatic Habitat
  Programmatic Action 2D

- # Agricultural Lands
  Programmatic Actions 1A, 1B, 1F

Implement Alternative Flooding Regimes **Constraints**

Avian Population Health. Shallow flooded areas may require some minimal maintenance flow of water moving through it on a periodic or regular basis to decrease the chance of avian disease outbreaks. Such disease outbreaks can devastate waterfowl populations throughout an area such as the Bypass.

Funding Mechanisms. Although a variety of potential funding mechanisms are identified above (under Funding Options), in reality, these sources are very competitive and not adequately funded to support the potential acreage available throughout the state and country. There is no "one-stop shop" through which to pursue multiple funding options. Interested landowners do not often have the time to pursue this myriad of sources. Additionally, these funding sources may not have policies and procedures that can accommodate and support implementation of these flooding alternatives in an existing flood bypass, nor may they have program language that acknowledges or seeks to alleviate undue economic hardships to adjacent hunting clubs (see below).

Hunting Impacts. As previously discussed in this document, there are numerous hunting clubs located in the Bypass that rely on sustainable and consistent waterfowl populations to attract club members and remain economically stable. These hunting clubs represent a significant portion of the managed wetland habitat presently in the Bypass. A loss of economic stability of a club could result in that club losing its ability to financially support habitat management practices. Extensive reaches of nonhunted waterfowl habitat will provide refuge for waterfowl to loaf and avoid hunting pressures. Agreements between landowners and funding entities will need to be developed that will encourage newly flooded lands to either initiate hunting programs or at least conduct periodic disturbance of the birds to encourage movement and resettlement throughout the Bypass. It should be noted that intentional disturbance of waterfowl on nonhunted lands may be in violation of the California Code of Regulations, Title 14. Such activities could be construed as "herding", which is prohibited in Title 14, Subdivision 2, Chapter 1, 251.

Implement Alternative Flooding Regimes **Constraints (cont.)**

Agricultural Field Management. Information provided from Working Group members indicates that it is more economically difficult and risky to retain stubble on fields until the spring. Floodflows in the Bypass are uncertain. Stubble will not wash away if the Bypass does not flood and may not be fully decomposed from the shallow flooding only. Because of labor and equipment demands in the spring, it is difficult for Bypass farmers to clear, till, and furrow a field for planting in what is often a brief planting season. Therefore, a majority of Bypass farmers clean their fields in the fall. Encouraging the maintenance of stubble through the spring requires a commitment to minimize economic hardship on landowners. Such hardships need to be discussed, negotiated, and alleviated as part of any funding agreement to implement such flooding alternatives.

Water Rights for Initial and Maintenance Flooding. Landowners and funding entities must be extremely careful and deliberate in determining accurate water rights from appropriate governmental agencies (BOR and the State Water Resources Control Board [SWRCB]) regarding the delivery of shallow floodflows. Insufficient water rights from a perspective of amounts, timing, and/or location of application may prevent landowners from implementing flooding alternatives, even if a landowner and a funding entity are willing and able to support implementation. Similarly, if a water right exists, the legal water user will likely desire compensation for the use of this water, and this compensation may also require approval from the SWRCB.

Water Delivery. Delivery of water for shallow flooding is a necessary part of domestic and wild rice development. The delivery of this water requires the maintenance of small, temporary, adjustable water control devices that are used throughout the rice growing season but are removed prior to harvest. To maintain flexible water control for habitat-related flooding after harvest, the landowner will need to introduce permanent water control structures or replace the previously described temporary structures after harvest. Either of these options will require financial compensation.

Implement Alternative Flooding Regimes **Funding Options**

Technical or funding support for these alternatives is available from the following agencies and organizations: BOR, California Rice Industry, FSA, NRCS, The Nature Conservancy (TNC), CWA, DFG, DPR, DWR, DU, UC Cooperative Extension, EPA, USFWS, Yolo County RCD, and CVHJV.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Vegetation Management: Plant Hedgerows

Hedgerows are lines or groups of trees, shrubs, or perennial grasses planted along agricultural field edges or other unused areas.

Plant Hedgerows **Benefits**

Weed Management. As an alternative to scraping, cultivating, and spraying field edges, hedgerows can suppress weed growth by forming dense naturalized communities of native vegetation that out compete invasive weeds.

Water Quality. Hedgerows can improve water quality by filtering surface runoff water to prevent silt, associated nutrients, pesticides, and other amendments from entering waterways.

Soil Erosion. If spaced closely enough together, hedgerows can minimize wind velocities that sweep across open fields, resulting in decreased wind-related soil erosion.

Herbaceous Upland and Associated Overstory Habitat. Although generally narrow, hedgerows can provide habitat to a variety of small mammals. Consequently, raptors that prey on small mammals, including American kestrels, black-shouldered kites, red-tailed hawks, and northern harriers, use the taller shrubs and trees for important hunting and resting perches. Additionally, the dense vegetated corridor can provide habitat for seed-eating birds, such as ring-necked pheasants and certain sparrows and finches. Lastly, if built wide enough, hedgerows (in concert with other corridor-like features described later in this chapter) can provide cover for larger mammals, such as fox, coyote, bobcat, and, potentially, even mountain lion and bear, to move throughout the Bypass undetected and potentially into tributary corridors, such as Putah Creek, Cache Creek, and, to a lessor extent, the Knights Landing Ridge Cut

Plant Hedgerows **CALFED Benefits and Programmatic Actions**

Yolo Bypass Ecological Management Zone: ERPP Volume II

Riparian and Riverine Aquatic Habitat
Programmatic Actions 1B,1C, 1D (see constraints below)

Plant Hedgerows **Funding Opportunities**

Technical or funding support for development of hedgerows is available from the following agencies and organizations: California Native Grass Association (CNGA), California Rice Industry, FSA, NRCS, TNC, CWA, DFG, DPR, DWR, DU, UC Cooperative Extension, EPA, USFWS, Yolo County RCD, and CVHJV.

Plant Hedgerows **Constraints**

Hydrophytic Vegetation. Very few plant species recommended for hedgerows can survive the prolonged inundation that periodically occurs in the Bypass. As previously stated, such flooded conditions dictate a specific set of plants that can flourish. The Yolo Wildlife Area is currently experimenting with seed mixes (native and non-native) that could survive prolonged inundation. Landowners remain concerned about whether such plant species will attract pests harmful to agriculture and special-status species.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Plant Hedgerows **Constraints (Cont.)**

Flood Conveyance. As discussed previously, the Reclamation Board prohibits the implementation of physical features in the Bypass that could cause significant flow resistance. Because of these restrictions, hedgerows may only be feasible if oriented on a north-south access. East-west linear features in the Bypass could cause extensive sediment deposition immediately downstream of such a feature. Additionally, such features would intercept flood-borne debris. Funding entities would have to compensate affected landowners for the additional operations and maintenance costs associated with sediment and debris removal. Lastly, as previously discussed, such a habitat/agricultural feature may need to be hydraulically modeled to ensure that the hedgerow design minimizes impacts to floodflows.

Waterfowl Predation. Establishment of hedgerows (and the associated introduction of more vegetated complexity in and near wetlands) should be done in a manner that minimizes predation of waterfowl. Programs to monitor, assess, and modify hedgerow communities would need to be developed to ensure that such habitats do not increase predation in the Bypass.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Vegetation Management: Establish Riparian Corridors

As discussed in Chapter 2, numerous water delivery ditches/canals cross the Bypass north to south and east to west. These features are the "arteries" of the Bypass, providing the necessary water to irrigate close to 50,000 acres of agricultural lands and managed wetlands. These ditches/canals vary greatly in size. Some of these ditch/canals have some naturalized vegetation on their banks; however, most are fully cleared and cleaned on a regular basis. It is feasible to change management practices on these ditches/canals, allowing for more naturalized and native vegetation to establish in and adjacent to them. Several variations on this idea exist, including the following:

- establish perennial riparian vegetation on ditch slopes,
- establish perennial or semipermanent vegetation on ditch slopes and clean alternate ditch slopes on a multiyear cycle,
- create wider habitat corridors adjacent to ditches/canals, and
- expand riparian corridors along the Toe Drain/Tule Canal (and similar levee toe locations).

Planting perennial riparian vegetation would entail planting or encouraging the growth of grasses, rushes, tules, and related emergent freshwater marsh vegetation along banks of ditches. The focus would be on establishing plant species that will go dormant and tend to "lie down" during the winter months. An additional focus would be on establishing vegetation that is easily mowed or removed, thus allowing for ease of ditch/canal maintenance if necessary. It would likely take 2–3 years to permanently establish such vegetation, during which time spraying of preemergent herbicides and spot clearing of invasive weeds may be necessary.

Establishing perennial or semipermanent vegetation is similar to the previous idea; however, it differs in the diversity of the vegetation community and the projected period of time the vegetation would remain in place. In this condition, emergent marsh vegetation and willow scrub riparian vegetation would be established along ditch/canal banks and could perhaps also extend away from the ditch/canal to create a wider habitat corridor. This vegetation would be planted and managed for several years (with methods similar to the previous example), allowing it to reach some level of maturity and diversity. In this process, the opposite side of the ditch/canal could be kept completely clean or could be planted in strictly perennial vegetation, as previously described. The goal would be to have one side of a ditch/canal always accessible for maintenance, while keeping the other side as a viable mature habitat corridor. Periodically, the land manager would conduct critical maintenance on the side with established vegetation, removing some or all of that vegetation and replanting similar species in similar densities on the opposite bank of the ditch/canal.

Some landowners may be willing to establish broader habitat corridors on one or both sides of a ditch/canal. Such a feature could include recontouring bank slopes to create more gradual transitions from field grade to the invert of the ditch. These regraded slopes would support a wider habitat corridor with a more diverse mix of native vegetation than the previous two ideas. It could also include more naturalized aquatic features, such as snags and other woody debris, that increase habitat complexity to benefit numerous species. Such features would still provide ditch/canal access locations to ensure that landowners could clean and maintain the ditch bottom and areas adjacent to pump intakes regularly, thus ensuring that water delivery would be maintained and pumps would not blocked or damaged.

Vegetation Management: Establish Riparian Corridors (cont.)

Lastly, opportunities exist to create extensive riparian corridors adjacent to the Tule Canal/Toe Drain along the east side of the Bypass. Riparian habitat of varying ages and sizes presently exists along the Tule Canal/Toe Drain; however, these areas could be enhanced.

Establish Riparian Corridors **Benefits**

Agricultural Benefits. The concept of expanded ditch/canal vegetated corridors provides some benefits to agricultural landowners. Maintaining vegetation on bank slopes should minimize bank erosion by increasing stability through the presence of root systems and by protecting the bank face from erosive flow velocities. It should be pointed out that few Working Group members have indicated that erosion in ditches and canals is a problem. Nonetheless, increased vegetation could improve such conditions. Additionally, after the labor period required to establish natural vegetation, a landowner should see a decrease in labor and materials costs as they no longer have to clear, clean, and spray such features on a regular basis. This decrease in costs does not preclude the landowner from incurring new management costs caused by the new habitat conditions; however, hopefully such costs would be less than previous efforts. Lastly, as a stand-alone feature or in concert with tailwater ponds, expanded habitat corridors on ditches/canals should improve irrigation water quality as the vegetation traps excess sediment and fine silts.

Managed Temporary Freshwater Emergent Marsh Habitats (Tidal and Nontidal) and Managed Willow Scrub Riparian Habitats. Similar to the previously described tailwater ponds, numerous habitat and related species benefits could result from the establishment of such riparian/wetland corridors. The species benefitting from tailwater ponds would equally benefit from such corridors and perhaps more so because of the moderate replication of riparian slough-like conditions. One particular benefit that could result from the enhancement of ditch/canal corridors would be the creation of somewhat continuous habitat corridors and "nodes" (tailwater ponds). This mosaic of habitat features would greatly enhance species sustainability in the Bypass, while simultaneously supporting continued agricultural activities.

Ditches/canals in the upper Bypass would be planted with freshwater vegetation species endemic to nontidal conditions. However, in the lower Bypass, vegetation species could reflect tidal influences, increased soil salinity, and other similar hydrologic and soil differences.

Riparian Aquatic Habitat. As previously described, one purpose of the enhancement/expansion of ditches and canals is to support a wide variety of species. As discussed in Working Group meetings, the Bypass does support a variety of native fish species. To the extent practicable, linking vegetated and widened ditch/canal corridors together could create slough-like conditions, which have largely disappeared from the Delta. Such conditions are important rearing and spawning habitats for many native Delta fishes. Although clearly these corridors would not be sloughs hydrologically or morphologically, they could still significantly improve rearing habitat for species such as Delta smelt, Sacramento splittail, white and green sturgeon, and chinook salmon (assuming hydrologic connectivity to perennial waters could be maintained).

It is important to note that the Working Group has emphatically identified several constraints (discussed below) regarding the introduction of special-status fish species into water delivery/drainage ditches and canals. These constraints are very serious and will require resolution (as discussed in Chapter 3) before landowners are willing to expand habitat values for fish and other species.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Establish Riparian Corridors **Benefits (cont.)**

Mixed Riparian Forest. As previously stated, sparse riparian overstory is presently located adjacent to parts of the Tule Canal/Toe Drain. This spotty habitat could be widened and linked to a continuos north-south trending riparian corridor parallel to the Tule Canal/Toe Drain and the East Bypass Levee. Typically and historically, mixed riparian forests support very dense and diverse vegetative and wildlife communities in the Sacramento Valley. Of particular note is the role that such a corridor could play for yellow-billed cuckoo habitat. The yellow-billed cuckoo is a special-status avian species that requires mature riparian forests with a minimum width of approximately 100 meters.

Surveys of the East Bypass Levee indicate significant damage has been incurred to the inboard side of the levee because of prolonged wave action when the Bypass is inundated. Wave fetch and similar wave action from prevailing west-east winds have created numerous ledges and terraces where the levee has been eroded away. It is possible that a relatively wide and mature stand of riparian trees and associated understory located west of the Tule Canal/Toe Drain could dramatically dissipate this wave energy and minimize the wave damage.

Establish Riparian Corridors **CALFED Benefits and Programmatic Actions**

Yolo Bypass Ecological Management Zone: ERPP Volume II

- # Riparian and Riverine Aquatic Habitat
  Programmatic Actions 1A,1B, 1C, 1D (see constraints below)

- # Water Diversions
  Programmatic Action 1A (see constraints below)

- # Invasive Riparian and Marsh Plant Species
  Programmatic Action 1A (see constraints below)

- # Predation and Competition
  Programmatic Action 1A (see constraints below)

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Establish Riparian Corridors **CALFED Benefits and Programmatic Actions (Cont.)**

Sacramento–San Joaquin Delta Ecological Management Zone: ERPP Volume II

- # Natural Floodplain and Flood Processes
  Programmatic Action 4A

- # Delta Sloughs
  Programmatic Action 1A

- # Fresh Emergent Wetland Habitat (Tidal)
  Programmatic Action 1A

- # Fresh Emergent Wetland Habitat (Nontidal)
  Programmatic Action 1B

- # Riparian and Riverine Aquatic Habitats
  Programmatic Action 6A

- # Agricultural Lands
  Programmatic Action 1C

- # Invasive Aquatic Plants
  Programmatic Action 1A (see constraints below)

- # Invasive Riparian and Salt Marsh Plants
  Programmatic Actions 1A, 2B

- # Contaminants
  Programmatic Action 1A

- # Stranding
  Programmatic Action 1A (see constraints below)

Establish Riparian Corridors **Constraints**

Presence of Special-Status Fish Species. The Working Group remains supportive of the concept of improving habitat conditions for special-status fish species but not at the expense of landowner lifestyles and livelihood. Before habitat for special-status fish species is improved, the following constraints must be resolved.

Establish Riparian Corridors **Constraints (cont.)**

- # Legally binding safe harbor agreements must be written and signed by appropriate agency representatives. These agreements must indemnify landowners, agencies, and water users from endangered species take violations associated with agricultural and managed wetland practices and lowpoint ponded conditions resulting in fish stranding;

- # Any fish screens required to minimize take of endangered species should be paid for by a party or parties other than an individual landowner and water user; and

- # All future operations, maintenance, repair, and replacement costs associated with fish screens should be assumed in perpetuity by a party or parties other than an individual landowner and water user.

Flood Conveyance. As with previously discussed ideas in this chapter, resolution of this issue is critical. Because of flow patterns in the Bypass, east-west trending linear habitat features are less feasible than north-south trending linear habitat features. Therefore, the previously discussed riparian corridors may likely be feasible only on north-south trending ditches/canals. This limitation may result in an inability to create east-west linkages of habitat corridors. Additionally, the proposed riparian corridor adjacent to the Tule Canal/Toe Drain could pose a significant hydraulic barrier and impact to floodflows. These ideas will remain a constraint until such time as the Reclamation Board and the USACE can technically determine whether habitat enhancement in the Bypass at a parcel-specific and linear-feature level will negatively impact floodflow conveyance and capacity. Such technical efforts are underway by the TAC (Chapter 1).

Sediment and Debris Deposition. As with the previous constraint, this issue will remain a concern as long as the landowner is held responsible for maintenance and removal of flood-related sediment and debris associated with enhanced habitats. Because of the unique flooding conditions of the Bypass, landowners would expect to be fairly compensated as part of any habitat enhancement agreements for the additional operations and maintenance costs associated with flood events.

Increased Predation of Duck Club Waterfowl Populations. Increased riparian habitat could result in increased avian and mammalian predation of nesting hens and their young. A balance of management techniques should be employed across the Bypass to ensure that habitat improvements in one location do not result in habitat/economic damage elsewhere.

Bypass Topography. The Bypass generally slopes toward the east. Therefore, it may not be feasible to create a linked set of ditches and canals with passively delivered water at all times because of differences in elevation from north to south and east to west. Some check dams (or similar structures) may be in place and may need to remain in place to hold stage levels in ditches and canals. Therefore, fish passage through a series of enhanced ditches and canals throughout the Bypass may not be feasible without fish passage structures interspersed at key locations.

Agricultural Pests and Vector Control. Constraints are similar to previous discussions.

Non-Native / Invasive Vegetation Species and General Vegetation Management. Constraints are similar to previous discussions.

Establish Riparian Corridors **Funding Options**

Technical or funding support for these alternatives is available from the following agencies and organizations: CNGA, FSA, NRCS, TNC, CWA, California Department of Forestry and Fire Protection, DFG, DPR, DU, UC Cooperative Extension, EPA, USFWS, Yolo County RCD, CVHJV.

AGRICULTURE WITH INTEGRATED HABITAT ENHANCEMENT

Crop Management: Unharvested Crops, Food Plots, and Unused Areas

Small areas of cropland can be left unharvested as forage for wildlife. Alternatively, landowners or tenants can plant wildlife food plots with crops such as safflower, milo, corn, vetch, sunflowers, sudan grass, and cereal grains in areas that normally go unused. Both types of land can be mowed after seed has set to make the seed more available to wildlife. When possible, such food plots should be located as close to surface water sources as possible.

Historically, unused areas (different from fallowed land) still required management to minimize weed and insect populations from colonizing and spreading. These unused areas can be planted in native and non-native beneficial perennial vegetation. Such vegetation takes several years to become established; however, such areas can result in long-term economic and habitat benefits.

Unharvested Crops, Food Plots, and Unused Areas — Benefits

Avian and Other Species Population Improvements. Seeded sites provide excellent food sources and winter cover for song birds, doves, upland game birds and waterfowl. Depending on size, unused areas can provide breeding and denning habitat for many mammals, amphibians, and reptiles.

Willow Scrub Riparian, Freshwater Emergent Marsh, and Seasonal Wetland Habitats. General habitat improvements can occur on land that would otherwise be unproductive. A range of vegetation can be established, depending on the soil moisture and type, proximity to water, and similar variables. Although such areas will likely not support extensive bird and mammal populations, they are nonetheless improvements over repetitive disking, burning, and herbicide application.

Economic Impacts. If unused areas are set aside for habitat, the landowner can save money by eliminating long-term maintenance efforts, including labor and agricultural amendment costs. This savings assumes several years of start up and establishment before such areas are largely self-sustaining.

Unharvested Crops, Food Plots, and Unused Areas — CALFED Benefits and Programmatic Actions

Sacramento–San Joaquin Delta Ecological Management Zone: ERPP Volume II

Agricultural Lands
Programmatic Actions 1A, 1C, 1D, 1E, 1F

Unharvested Crops, Food Plots, and Unused Areas — Constraints

Economic Stability. In periods of depressed agricultural commodity values, leaving unharvested crops in fields could pose an economic hardship unless such efforts were compensated for. This issue is not expected to be a critical constraint.

Unharvested Crops, Food Plots, and Unused Areas — Funding Opportunities

Technical or funding support for maintenance of food plots and similar unused areas is available from the following agencies and organizations: California Rice Industry, FSA, NRCS, TNC, CWA, DFG, DPR, CDF, DWR, DU, UC Cooperative Extension, EPA, USFWS, Yolo County RCD, and CVHJV

Habitat Enhancement as the Primary Land Use

As previously stated, some landowners may be interested in taking their land out of agricultural production if they are adequately compensated for such a decision. Such properties could theoretically be made available for large-scale habitat enhancement as the primary land use. Although such landowner decisions may be driven largely by economics, other variables must be considered to determine if such land use modification is appropriate. The following section describes several variables that must be considered when converting blocks of agricultural land to long-range or permanent habitat.

It is important to reiterate that this Management Strategy has been developed by the Working Group, which is made up largely of landowners, water users, and landowner tenants in the Bypass. The focus of this chapter thus far has been on habitat opportunities that can coexist with, rather than replace, agriculture and hunting clubs because, in large part, these are the issues the Working Group is most comfortable with. Large-scale habitat management is not the primary role of most Bypass landowners; however, it was determined that this distinctly different land use scenario should be addressed in some way. That stated, it should be noted that the following section is not written to the level of detail of the previous section. Furthermore, much of the information in this section has been previously and extensively discussed in this document and other documents. To avoid duplication, this section should be considered a reference guide to other information sources.

.

Habitat Enhancement Variables

The Working Group has identified five key variables to be considered/resolved when converting large parcels of agricultural land to habitat. These five variables are:

- easement and acquisition funding opportunities,
- hydraulic impacts,
- habitat type suitability,
- economic impacts, and
- special-status species.

Easement and Acquisition Opportunities. Chapter 2 of this document and Chapter 7 of the suitability analysis present extensive descriptions of funding programs for purchasing conservation easements and/or fee title acquisition. Briefly, conservation easements can be developed with a myriad of restrictive terms and conditions, focused on conserving property and resources on a property. These restrictions can be enacted for limited periods or in perpetuity. Such easements are almost always negotiated between a landowner (or landowner representative) and a buyer (or project proponent). Conversely, fee title acquisition is an outright sale/purchase of a property. Such sales usually deed full responsibility and use rights of a property from a seller to a buyer. Occasionally, properties have perpetual easements or restrictions placed on them regardless of who purchases it in the future. Such is the case in the Bypass regarding the state flowage easements (Chapter 2). The

recent CALFED proposal process has provided a grant to extend the efforts of the Working Group. Phase II of this work will focus on assessing economic conditions in the Bypass and developing fair market compensation rates for habitat-related land uses in the Bypass. Work on these topics is expected to begin in winter, 2001.

Hydraulic Impacts. As previously stated, all lands in the Bypass have easements that describe certain land use/modification restrictions. These restrictions are in place to ensure the appropriate and necessary flood conveyance function of the Bypass. Any proposed land use changes to a property in the Bypass should be reviewed by the USACE and the Reclamation Board to ensure that the proposed changes do not negatively affect flood conveyance or capacity. As discussed in Chapter 3, the development of more coordinated and sensitive hydraulic impact analysis tools would be beneficial to landowners and buyers seeking to change land uses. As discussed in Chapter 1, the TAC is addressing this issue.

Habitat Type Suitability. The 1995 suitability analysis discusses appropriate habitat types and locations in the Yolo Basin, a geographic area that includes but is larger than the Bypass. Appendix E presents the conclusions and habitat suitability maps from that document.

Economic Impacts. All private lands in the Bypass contribute to the property tax base of Yolo and Solano Counties. Additionally, most of these privately owned lands support employees and associated services that additionally support the economies of the two counties. Lands taken out of agricultural production can affect the local economy in several ways. Payments in lieu of taxes are paid by the federal government under the Federal Revenue Sharing Act (Public Law 95-469); however, studies indicate that in-lieu taxes are paid to counties at an approximate average of 76 % of total assessed value. Anecdotal information provided by Working Group members indicates that actual payments to counties may fall far below that percentage in California. This occurs due to inconsistencies and shortfalls in congressional appropriations for these taxes. Lands purchased by or entered into state government easements are less susceptible to tax revenue shortfalls because the State assumes property tax responsibility differently than the federal government.

Lands that are changed from agriculture to habitat can have an effect on the local economy because of losses of field jobs and loss of retail revenues associated with agricultural industries. Many variables can affect these economic conditions, and it would be erroneous to conclude that such job losses and revenue losses are not partially or completely offset by other gains associated with habitat development. Chapters 3.4 and 4.4 of the NDNWR EA present background information on these economic conditions.

Special-Status Species. As stated several times in this document, it is critical that landowners [and adjacent agencies] be protected from liability associated with the introduction, relocation, or expansion of special-status species populations. Without safe harbor agreements or some similar, legally binding documents, landowners will remain reluctant to modify their lands if they believe that such changes will result in legal problems over time. The previously described CALFED proposal also includes a task to address safe harbor issues with local and regional agency representatives and elected officials. Work on this topic is expected to begin in winter 2001.

Ongoing Large-Scale Habitat Opportunities

While private discussions occur frequently about land sales in the Bypass, very few major land use/management efforts have been implemented since the construction of the Yolo Wildlife Area. An exception to that is the recently proposed NDNWR. Although not completed, the environmental compliance process for the NDNWR has provided a great deal of background material to the Working Group process. The following paragraph describes the proposed refuge.

The USFWS has developed alternatives for a NDNWR of various sizes. The core of the proposed refuge is an approximate 9,000-acre area consisting of Little Holland Tract (1,640 acres and owned by the USACE), Prospect Island (1,228 acres and owned by the Bureau of Reclamation), and Liberty Island (5,000 acres and owned by the Trust for Public Lands). The three previously described landowners support the establishment of the proposed NDNWR and have indicated a willingness to convey their property to the USFWS for long-term management of a refuge. Additionally, four other private landowners in the Southern Bypass have expressed a willingness to sell their land to USFWS for the refuge. These private land holdings total approximately 3,600 acres of additional potential refuge land. Chapter 1 of this strategy presents a description of the environmental compliance document the USFWS completed in 1999 to assess potential impacts associated with the proposed NDNWR. That document provides descriptions of the types and locations of habitats proposed to be developed as a part of the NDNWR. Chapter 3 of this strategy presents a detailed discussion of assurances sought by the Working Group with regards to the establishment of additional habitats in the Bypass. Included at the end of Chapter 3 is a focused description of assurances related specifically to the establishment of the proposed NDNWR.

To date, the Working Group has taken no position on the proposed NDNWR.