INLAND WETLANDS CONSERVATION PROGRAM

2010 to 2016

State of California
Natural Resources Agency
Department of Fish and Wildlife
WILDLIFE CONSERVATION BOARD
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Sacramento, California 95814

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Wildlife Conservation Board
Inland Wetlands Conservation Program
2010 to 2016

EXECUTIVE SUMMARY

Pursuant to the requirements of Chapter 1645, Statutes of 1990, this report describes the activities of the Wildlife Conservation Board's (WCB) Inland Wetlands Conservation Program (IWCP). As defined in the enabling legislation, the sole purpose of the IWCP is to assist the Central Valley Joint Venture (CVJV) in its activities and programs, all designed with a goal to protect, restore and enhance wetlands and associated habitats to increase bird populations in the Central Valley.

The Central Valley of California, which runs from Red Bluff in the north to Bakersfield in the south, is the single most important waterfowl wintering area in the Pacific Flyway. Every fall, millions of ducks, geese, and swans, as well as many other birds such as sandhill cranes and shorebirds from areas as far away as Siberia, the Arctic tundra and the Canadian prairies find their way to the wetlands and agricultural fields of the Central Valley of California. Historically, the valley contained more than 4,000,000 acres of wetlands. By 1980, fewer than 300,000 acres remained.

In response to the dramatic decline of wetland habitat in the Central Valley and across the continent, coupled with prolonged droughts of the 1980's that decimated continental waterfowl populations, Canada and the United States signed an international agreement in 1986, with Mexico joining in 1994. Called the North American Waterfowl Management Plan (NAWMP), this plan provides a biological blueprint or framework for wetland and waterfowl conservation across North America. Within the NAWMP, thirty-two high priority areas were identified that are critical to the long term needs of North American waterfowl. The Central Valley of California is one of those critical areas.

As part of the NAWMP, the CVJV, a coalition of twenty-two federal, State and conservation organizations (see Figure 1), was formed in 1988. The purpose of the CVJV is to protect, restore, and enhance wetlands and associated habitats for waterfowl, shorebirds, waterbirds, and riparian songbirds, in accordance with conservation actions identified in the CVJV's Implementation Plan. The goal is to provide the local habitats that will increase all bird populations to levels identified in the NAWMP.

It is becoming increasingly clear that global climate change will make the attainment of these goals more difficult. Every year there is more evidence suggesting that some impacts of warming are inevitable, including higher air and water temperatures, accelerating sea level rise, increasing coastal storm surges, and more frequent extreme events, such as heat waves, floods, drought, and wildfires. The Association of State Wetland Managers, in their publication "Recommendations for a National Wetlands and Climate Change Initiative", state that "there is ample scientific evidence to suggest that climate change is now having and will have significant impacts on millions of coastal, estuarine, and freshwater wetlands throughout the Nation." The

NAWMP Committee, a group of wetland biologists that are in the process of updating the NAWMP, are also concerned, stating, “Global climate change should be given more consideration in JV regional targeting, program emphasis, and project design.” Fortunately, many managed wetlands in the Central Valley are somewhat more resistant to global climate change than other, less managed, habitats. However, worsening drought and flooding will adversely affect the way these wetlands can be managed. In addition, the Sacramento-San Joaquin River Delta and Suisun Marsh are extremely susceptible to sea level rise. The WCB staff is working with other CVJV partners to identify the climate change issues specific to the Central Valley and to develop goals and objectives to counteract those impacts. In the interim, the WCB has been implementing projects that are sustainable in the long-term and provide wetland managers with efficient water delivery.

Between 2011 and 2016, working in partnership with member of the CVJV and consistent with the objectives of the CVJV, the WCB has authorized the expenditure of more than $11,000,000 to protect, restore and/or enhance more than 8,000 acres of wetlands, uplands and agricultural lands critical to migrating waterfowl (See Appendix A).

Background

Each year as they have for thousands of years, millions of waterfowl make their annual fall migration from their breeding grounds in Canada, Alaska and northern tier of the continental United States (U.S.) to wintering areas farther south. Following traditional flight patterns, by mid-winter more than five million ducks and geese have found their way to their destination in the Central Valley (Valley) of California, the most important wintering waterfowl area in the Pacific Flyway. This is a remarkable number of birds, but from an historical standpoint, a tremendous decrease, perhaps by a factor of ten, in the total numbers of birds that once “darkened the skies” of the Valley.

During the twentieth century, this trend was seen throughout North America. By 1985, waterfowl populations had plummeted to record lows, in the Valley and throughout the North American continent. More than half of the original 221 million wetland acres found in the contiguous U.S. had been destroyed, and habitat that waterfowl depend on for survival was disappearing at a rate of 60 acres per hour. The picture was just as bleak across Canada, nesting grounds for a large percentage of the waterfowl that winter in the U.S.

Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of a shared resource, the Canadian and U.S. governments developed a strategy to restore waterfowl populations through habitat protection, restoration and enhancement. The strategy was documented in the North American Waterfowl Management Plan (NAWMP) signed in 1986 by the Canadian Minister of the Environment and the U.S. Secretary of the Interior, the foundation partnership upon which hundreds of others would later be built. With an update in 1994, Mexico became a signatory to the NAWMP.

The Plan is international in scope, but its implementation functions at the regional level. Its success is dependent upon the strength of partnerships, called joint ventures, involving federal, state, provincial, tribal and local governments, businesses, and conservation organizations. Each joint venture has developed implementation plans focusing on local areas of concern, with the goal of providing habitats locally that will provide the basis for recovering the continental bird populations identified in the Plan. From the long-established joint ventures to those in various stages of development, there are now nearly two dozen such partnerships at work across the continental landscape. In addition, three species-specific joint ventures are addressing the needs of the black duck, Arctic geese, and sea ducks throughout their international ranges.

Established in 1988, the Central Valley Joint Venture (CVJV) was one of the first joint ventures to be formed. Belying its small size, the importance of the Valley to the continent's waterfowl populations cannot be overstated. Simply put, the Valley is the most important wintering waterfowl area in the Pacific Flyway, providing habitat to more than 60 percent of the total Flyway waterfowl population. To put this into perspective, this represents between 25 and 30 percent of the total waterfowl population of North America. Sixty-five percent of all pintails in the U.S. spend all or part of each winter in the Valley. In an average year, the Valley supports 100 percent of the world's population of Aleutian Canada geese (a species formerly listed as threatened but recently taken off the list, in part because of habitat improvements in California). Additionally, the Valley is winter home to 100 percent of the world's population of tule geese; 80 percent of North America's Ross's geese and cackling geese; and 65 percent of North America's tundra swans and Pacific greater white-fronted geese. Wintering waterfowl, while the most visible of the bird life in the Valley, are not alone. The Valley also supports nearly a half million breeding ducks, hundreds of thousands of wintering shorebirds, tens of thousands of breeding shorebirds, large breeding colonies of herons, egrets and white-faced ibis, and more than sixty species of breeding riparian-dependent birds.

All of these birds are squeezed into a small remnant of the once extensive native habitats of the Valley. While the rest of the country was losing more than half its wetland acreage, the Valley's vast marshes, riparian forests and upland grasslands were reduced by more than 95% (see Figure 1). The largest of these, Tulare Basin, was the single largest freshwater wetland complex west of the Mississippi River, and is now reduced to a few thousand acres of wetlands scattered across the landscape. Other areas in the Valley may have fared a little better, but all wetlands have been greatly reduced and altered. As a result, few places on earth have greater concentrations of wintering waterfowl and other bird species than the Valley.

The jurisdiction of the CVJV has recently been expanded to include the surrounding foothills and mountains. Still, the habitats that support the vast majority of the birds described above lie on the valley floor, an area that averages perhaps 30 miles wide and extending 400 miles from Red Bluff in the north, to Bakersfield in the south. The Valley encompasses the following nine hydrologic basins: Butte, Colusa, Sutter, Yolo, American, Suisun Marsh, Delta, San Joaquin and Tulare (See Figure 2).

CVJV PARTNERS

Audubon California

California Association of Resource Conservation Districts

California Waterfowl Association

Defenders of Wildlife

Ducks Unlimited, Inc.

The Nature Conservancy

PRBO Conservation Science

River Partners

The Trust for Public Land

California Department of Fish and Game

California Department of Water Resources

California Natural Resources Agency

California State Parks

California Wildlife Conservation Board

PG&E

U.S. Army Corps of Engineers

U.S. Bureau of Land Management

U.S. Bureau of Reclamation

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Geological Survey

U.S. Natural Resources Conservation Service

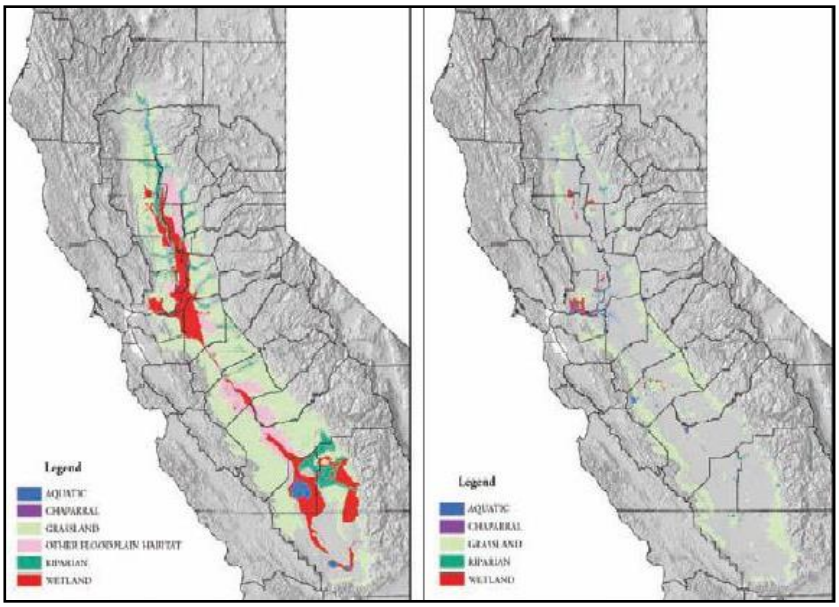

Figure 1. Central Valley wetland losses from the 1850's to now.

To achieve the goal of maintaining a diverse, abundant and healthy distribution of migratory bird populations in the Central Valley, the CVJV Implementation Plan (CVJV Plan), developed in 1990 and updated in 2006, established local habitat protection, restoration and enhancement objectives pursuant to the larger goals of the NAWMP. The CVJV Plan emphasizes the needs of waterfowl and focuses on wetland complexes, but also recognize that the Central Valley provides tremendous benefits to many other bird groups. The CVJV Plan now includes goals for six bird groups: 1) wintering/migrating waterfowl, 2) breeding waterfowl, 3) wintering/migrating shorebirds, 4) breeding shorebirds, 5) riparian and grassland associated passerines and 6) waterbirds (mainly herons, egrets, ibis, cranes and cormorants). These goals have been used to generate objectives for wetland restoration, wetland protection, wetland enhancement, and agricultural enhancement (See Figure3). The Plan also identifies the water needed to accomplish these goals, and each goal has been further refined for each of the nine hydrological basins.

Figure 2. Central Valley Basins

The Inland Wetlands Conservation Program

Chapter 1645, Statutes of 1990, authorized the creation of the Inland Wetlands Conservation Program (IWCP) within the Wildlife Conservation Board. The enabling legislation defines the purpose of the program, ". . . to carry out the programs of the Central Valley Habitat Joint Venture" (since renamed the Central Valley Joint Venture). In conjunction with other CVJV partners and many others, the program works to protect, restore and enhance wetlands and waterfowl habitat in the Central Valley.

The public and private partnerships that have been developed over the years are key to the WCB's ability to implement waterfowl and wetland protection projects. The program's legislative authority provides great flexibility, allowing the WCB to authorize grants and loans to nonprofit organizations, local governmental agencies and state departments; a procedure that has proved highly effective in restoring and enhancing wetlands and wildlife friendly agriculture. In addition, the WCB is authorized to acquire, lease, rent, sell or exchange any land or options acquired, with any proceeds going directly to the Inland Wetlands

Conservation Fund to further support the efforts of the CVJV and the wetland program. This menu of "programmatic options or authority," provides the ability to create and respond to opportunities designed to address all of the CVJV objectives.

CVJV Objectives

As mentioned above, the CVJV goals for wintering waterfowl have been developed by stepping down from the continental goals identified in the NAWMP. We know, in general, what percentage of the continental populations of waterfowl rely on the Valley for all or part of their fall, winter and spring needs. Studies have been conducted to determine food requirements for various species of waterfowl, and how many acres and what types of habitat are needed to supply those needs. Then, with an understanding of existing landscape conditions in the Valley, habitats that are lacking can be quantified, and locations where additional habitat can be restored identified. Recognizing the need to integrate habitat objectives for waterfowl with those of other wetland dependent bird groups, as identified in the NAWMP, similar approaches were undertaken for other bird groups. Once the needs for all bird groups were identified, to the extent allowed by existing information, total habitat objectives for the Valley, in acres restored and protected, were determined. These objectives were further stepped down to each of the nine hydrologic basins in the Valley.

Figure 3. Objectives for Each of the Hydrological Basins in the Central Valley.

Basin	Seasonal Wetlands Restored (acres)	Seasonal Wetlands Enhanced[a] (acres/year)	Semi-Permanent Wetlands Restored (acres)	Riparian Habitat Restored (acres)	Winter-flooded Rice[b] (acres)	Waterfowl-friendly Agriculture[c] (acres)	Type I Agriculture Easements[d]	Type II Agriculture Easements[e]
American	20,396	1,957	425	675	50,000	69,000	Needed	Needed
Butte	17,396	3,381	425	1,125	62,000	104,000	Needed	Needed
Colusa	2,396	2,057	425	1,350	45,000	85,000		
Sutter	4,396	527	425	675	10,000	18,000	Needed	Needed
Yolo	3,170	973	508	675	3,000	8,000		
Delta	19,170	2,118	1,208	1,500	0	23,000		Needed
Suisun	0	2,675	333	0	0	0		
San Joaquin	20,340	6,752	2,815	2,500	0	0		Needed
Tulare	21,263	3,442	5,935	1,500	0	0		
Total	**108,527**	**23,882**	**12,499**	**10,000**	**170,000**	**307,000**		

a Annual seasonal wetland enhancement objectives assume that all seasonal wetlands need some form of enhancement on average every twelve years.

b The amount of harvested rice that must be flooded to meet wintering duck and wintering shorebird needs when wetland restoration objectives are met for the Central Valley.

c Waterfowl-friendly agriculture is defined as the amount of winter flooded rice plus rice and corn acres that are not flooded and are not deep plowed following harvest.

d Agricultural easements that protect and maintain waterfowl food resources on agricultural lands.

e Agricultural easements that protect ag land to buffer existing wetlands from urban and residential development.t

The CVJV Plan also considered non-biological factors when establishing conservation objectives. Human population growth, changing land use, and competition for limited water supplies all present real challenges to bird conservation efforts in the Central Valley. By taking into consideration biological factors, socio-economic forecasts, potential changes in agricultural practices, and an increasingly competitive water market, habitat programs can identify where

restored habitat would most likely to be successful, and to anticipate and to some degree mitigate for landscape changes that are otherwise detrimental to birds.

Inland Wetland Conservation Program Projects

The following sample of six projects help illustrate how the Inland Wetland Conservation Program at the WCB has helped further the goals of the CVJV. These projects were chosen to demonstrate the breadth and flexibility of the IWCP, with its ability to protect land through fee acquisition or easements, and to restore or enhance habitats, including wetlands, riparian habitat, uplands or wildlife friendly agricultural lands, on public or private lands.

North Grasslands Wildlife Area Gadwall Unit Wetland Restoration

In 2011, the WCB agreed to fund a grant to the California Waterfowl Association (CWA) for a cooperative project with the California Department of Fish and Wildlife (CDFW) to restore and enhance 623± acres of wetland and upland habitat on the DFW's Gadwall Unit of the North Grasslands Wildlife Area. The property, acquired by the WCB in two separate actions in 1999 and 2009, lies in western Merced County and is part of the Grasslands Ecological Area (GEA). The GEA encompasses over 160,000 acres of wetlands and associated grasslands. It has been recognized as a Globally Important Bird Area by the National Audubon Society and American Bird Conservancy, and as one of 40 Internationally Significant Shorebird Habitats by the Western Hemisphere Shorebird Reserve Network. The Ramsar Convention recognized the GEA as a Wetland of International Importance, one of only 39 sites so recognized in the Unites States.

The project restored 526 acres of property into wetland and upland habitat, and enhanced 97 acres of existing wetland habitat. The Gadwall Unit was historically used as farmland, primarily as an irrigated pasture. The project removed existing infrastructure and restored a more natural topography to the previously leveled ground to create the wetland and upland units. A lift pump was rehabilitated, and water distribution infrastructure was installed to control water in the wetlands. Local and migrating waterfowl and shorebirds, which were documented at a pre-project average of 25,000, directly benefit from these improvements. Additionally, federally and state listed threatened or endangered species benefit from the improvements to this area, including but not limited to: giant garter snake, valley elderberry longhorn beetle, Swainson’s hawk, and greater sandhill cranes. This project directly assists in meeting Goal #2 of the CVJV Implementation Plan by restoring and protecting seasonal wetlands.

Gray Lodge Wetland Enhancement and Pump Installation

In 2013, WCB approved funding for the Gray Lodge Wetland Enhancement and Pump Installation project to improve water supply and enhance habitat on Fields 46, 48, 56, 57 and 59 at the Gray Lodge Wildlife Area near Gridley, in Butte and Sutter Counties. This is one of many projects in which WCB has partnered with Ducks Unlimited, Inc. (DU) to perform infrastructure and habitat improvement projects on Gray Lodge Wildlife Area. The project enhanced 558 acres of habitat including 281 acres of seasonal and semi-permanent wetlands, 58 acres of wetland associated uplands, and 65 acres of riparian habitat in fields 55, 56, 57 and 59. Additionally, the project enhanced 64 acres of seasonal wetlands and 15 acres of uplands in field 46, and in field 48 enhanced 65 acres of seasonal wetlands and 10 acres of uplands.

Prior to 1931, when the state acquired 2,540 acres from the Gray Lodge Gun Club, the property was used mostly as pasture land, and lower areas were flooded in fall/winter for waterfowl hunting. The state dedicated the site as a waterfowl sanctuary until 1953. Over the years, the state has acquired 6,649 additional acres for a total of 9,189 acres, which include seasonal, semi-permanent, and permanent wetlands; riparian habitat; wetland-associated uplands; and wildlife food plots. The area provides critical habitat for over 200 species of birds and numerous fish, reptiles, amphibians, and mammals, including several special status species. Grey Lodge WA is one of most important wetland areas in Pacific Flyway, as it is home to approximately 1 million ducks and 100,000 geese in winter.

Gray Lodge WA is managed primarily to provide wetland habitat for waterfowl and other wildlife, alternate foraging habitat to reduce crop damage from waterfowl, and public opportunities for hunting and other wildlife-oriented recreation. Public use of Gray Lodge WA is extensive and includes waterfowl, upland game, and big game hunting; fishing; environmental education; and other wildlife-oriented recreation such as bird watching, photography, and nature study.

Upper Butte Basin Wildlife Area – Little Dry Creek Habitat Restoration

In 2014, WCB funded a grant from CWA for the habitat restoration of 734± acres of the Little Dry Creek Unit in the Upper Butte Basin Wildlife Area, located west of towns Gridley and Biggs. Over the years, the previously restored units of the Upper Butte Basin WA have had new infrastructure installed which has allowed for proscribed management strategies and delivery of adequate water supplies with increased efficiency. During past years numerous projects have been funded by the WCB, the North American Wetlands Conservation Act (NAWCA) and the California Duck Stamp Program. The Little Dry Creek Unit,

historically a working rice farm, needed the basic wetland management infrastructure developed in similar manner to the previously funded units.

In total, the project restored 527.5 acres of new habitat (281 acres of seasonal wetlands, 56 acres of semi-permanent wetlands, 111.5 acres of perennial grasses, 5.5 acres of riparian habitat, and 73.5 acres of cereal grain habitat. On the privately-owned Mom's Farm duck club this project enhanced 202 acres wetland habitat). The completed construction of manageable units that function efficiently, and now have enhanced water delivery systems, have significantly increased management capabilities and habitat quality. The development and expansion of desired seasonal and semi-permanent wetlands, along with areas seeded with perennial upland grasses, are now providing nesting cover, brood rearing, and wintering habitat for wetland and upland dependent wildlife species. In addition, a portion of the project has been dedicated to the production of cereal grains, specifically to provide wintering sandhill cranes with food resources.

Various species found at the Wildlife Area include great horned owl, western screech owl, cinnamon teal, golden eagle, and American kestrel. Also, federally or state threatened species that can be found include bald eagle, Swainson's hawk, and willow flycatcher.

Willow Creek Ranch Water Distribution Improvements

In 2014, WCB approved a proposal from Ducks Unlimited, Inc. (DU) to conduct a comprehensive assessment and upgrade of the entire water distribution system on Willow Creek Ranch, which is in Colusa and Glenn Counties, about 4 miles west of the town of Princeton. Tens of thousands of wintering waterfowl use the Willow Creek Lurline Wetland Management Area, of which Willow Creek Ranch is a part, managed by the United States Fish and Wildlife Service (USFWS). The wetlands at Willow Creek Ranch receive extensive use by mallard, northern pintail, American wigeon, gadwall, greater white-fronted goose, snow goose, and many other waterfowl species.

The water distribution system improvements and the habitat restoration enhancements ultimately benefit approximately 5,105 acres of seasonally managed wetlands.

This project was composed of three phases, with WCB funds contributing to Phase III. Work funded by WCB completed the remaining water distribution system improvements needed in the 1,045-acre northeastern portion of WCR. WCB funds were applied to survey and engineering design, construction management, pipeline installation, earthwork, water control structure installation, tree planting and tule transplanting, and wetland and upland seeding. The remainder of the direct costs for habitat enhancement work was covered by USFWS and private landowner funds conveyed through DU. These upgrades have increased the efficiency of water use, improved habitat conditions on important private wetlands by improving water and vegetation management capabilities, upsized the system to handle additional water if it becomes available in the future, and reduced water delivery and drainage conflicts between rice and wetlands. It allows drain water from rice lands and wetlands to be recaptured and moved back through the delivery system to be used again for habitat management and agricultural production.

Imperial Wildlife Area Wetland Restoration, Phase II

WCB, in 2015, approved the allocation for a grant to the CWA for a cooperative project with the CDFW to incorporate and restore 150 acres from a defunct fish farm into the Imperial Wildlife Area, located on the southeastern shoreline of the Salton Sea in Imperial County. The Salton Sea and surrounding wetlands has been identified by the National Audubon Society as one of the most important places for birds in North America. Historically, the sea has supported the migration and nesting of approximately 1 million birds, making it a globally significant Important Bird Area. In recent years, the water level of the sea has dropped significantly making it a priority for former Governor Edmund G. Brown, Jr., who created the Salton Sea Task Force in May of 2015.

The completed restoration efforts expanded the wildlife area by 106± acres of seasonal wetland habitat and 39± acres of managed green feed habitat. The increase in wetland acres to the Wildlife Area provides much needed wetland resources to the habitat complex. It has also helped to expand the hunting acreage on the wildlife area. This has provided additional hunters access to the property for outdoor recreational activities. The moist soil management results have rapidly allowed the new units to grow significant stands of swamp timothy and emergent cover allowing for increased bird use after just one year. The new water delivery pipeline extension and valves have proven to be extremely water efficient, while allowing for easy operation of the system by Wildlife Area staff.

These accomplishments have allowed the Wildlife Area staff to implement their management strategies successfully to the benefit of over 400 hundred bird species, 41 mammal species, 18 reptile species, and 4 amphibian species that have been identified in the wildlife area. Wildlife species are responding to the much-improved habitat conditions on the ground. By providing not only an increase in wetland acres, but a much higher quality wetland habitat base along with improved green feed resources, the results are increasing foraging resources for all wetland and upland dependent bird species.

North Grasslands Wildlife Area Enhancement and Security

In 2014, WCB approved CWA's proposal for an enhancement project in the North Grasslands, the Gadwall Unit and the China Island Unit, located in Merced County. The Gadwall Unit, in the San Joaquin Valley and by the city of Newman, encompasses 855 acres of seasonal wetlands, 255 acres of upland habitat, and 14 acres of riparian habitat. The China Island Unit totals 598 acres of seasonal wetlands, 457 acres of upland habitat, and 204 acres of riparian habitat. This project was a continuation of the Phase I project, also funded by WCB, which was completed in December 2012. It features multiple components and areas of focus, such as gravity flow water

delivery, upland development, riparian area, security fencing and pump rehabilitation, fencing, and public use.

Combined the two units see an average waterfowl usage of 50,000, in addition to thousands of shorebirds. Many of the riparian areas have nesting Swainson's Hawks. A number of species in the area have been classified federally and/or by the CDFW species of special concern, including bald eagle, greater sandhill cranes, and willow flycatcher. There are many species dependent on the units seasonal and semi-permanent wetland habitats, such as but not limited to: northwestern pond turtle, western spadefoot toad, American bittern, tricolored blackbird, black tern, and osprey. Species that benefit from the riparian enhancements include warbling vireo, common yellowthroat, and Cooper's hawk. Lastly, species that benefit from the upland area restoration and enhancement include golden eagle, northern harrier, whitetail kite, merlin, short eared owl, California horned lark, and the burrowing owl.

Along with the restoration and enhancement projects, a public viewing area was created along Highway 152 in the northeastern corner of the Gadwall unit – the only one of its kind along Highway 152 in the Grasslands. The overall result is a great opportunity for the public to view wildlife and increase awareness of the public wildlife areas.

Global Climate Change

Every year, the wetland community faces ever more difficult challenges including such issues as a critical need for water in a world where water increasingly is at a premium, the potential for wetlands to methylate mercury and their ability to produce mosquitos, the fragmentation of wetlands by roads, canals and powerlines, and the encroachment of urban development, all in an area of the State where the human population is expected to triple by 2040. Global climate change is likely to make many of the problems facing wetland managers even more challenging. The following is a short list of issues that may become more intractable in a warming climate.

- Storms are expected to be more intense, which likely will result in more severe winter flooding. While floods and wetlands in general are compatible, managed wetlands contain structures – levees, roads and water control structures, etc. – that can be damaged by high water and increase maintenance costs.

- The snowpack is likely to be shallower, resulting in drier summers and less water for delivery to these wetland areas. Less water will mean additional competition between wetland managers and all other water users.

- Climate change will change the nature of wildlife habitats, including wetlands. Specialist species, including most threatened and endangered species, being more restricted in their habitat needs than more common, generalist species, will be more adversely affected by any changes to their habitat.

- Invasive species, short-lived generalists generally, have the ability to adapt and will likely become even more common.

- Increased temperatures will increase evapo-transpiration, which will mean that seasonal wetlands, including vernal pools, will dry earlier in the year thereby reducing wildlife habitat values.

- With warmer temperatures, mosquito abatement will be required longer into the fall and will start earlier in spring.

- The thousands of acres of managed wetlands in the Suisun Marsh and the Delta that have been managed for waterfowl, shorebirds and other wildlife for many decades are at great risk to sea level rise. Should the protecting levees breach, and the wetlands behind become tidal, the wildlife values associated with these lands would change from habitats that support birds and terrestrial animals to purely aquatic habitats.

Of all of these, ensuring an affordable and reliable water supply for wetland management may be the State's biggest challenge in the future. While a very few wetlands in the Central Valley still flood naturally, most now rely on managed water supplies for seasonal flooding. These water sources are the same as for everything else in California; the water is captured in dams and delivered by canal or through stream channels to provide water for everything from agriculture and urban uses, to wetlands and instream flow for fish. Demand for this water increases every year. And while some wetland managers have relatively reliable surface water rights, many must rely on irrigation drain water, wastewater discharges, low priority water contracts, non-binding agreements with water districts, and groundwater pumping to flood their properties. But no matter the source, water gets more expensive every year. And finally, even if funds are found for acquisition, water delivery capacity in many areas is limiting.

The WCB, working with many partners, is helping develop strategies to address these issues in the Valley. The following list of potential strategies, while incomplete and in transit, indicates the directions that the WCB and many of its partners are headed:

- Continue to work toward providing a secure, reliable and affordable water supply for wetland habitat. This will include all of the following: purchase long-term water rights, upgrade delivery systems to make sure that any water acquired can be delivered, restore and enhance wetlands with an eye toward efficient water use, and work toward developing a conjunctive use program where urban and agricultural water supplies could be used for wetland flooding. All wetland water purchases should be coordinated with other environmental programs, such as the purchase/management of in-stream flows for anadromous fish, so that these programs are not in direct competition with each other…water should be purchased for ecosystem purposes.

- Continue restoring wetlands. The NAWMP goals have not been met, and wetland habitats for migratory birds and other species is in short supply. But in addition, wetland restoration, creation and enhancement, properly located and constructed, also help reduce the impact of climate change by protecting existing carbon stores, sequestering additional carbon, reducing flood risk and restoring groundwater stores.

- Assure long-term viability for new wetlands. Fragmentation of wetlands should be prevented, and corridors established to permit migration of plant and animal species. Acquisition and restoration work in tidally influenced areas should be focused in the highest elevations. Existing wetland habitats that have demonstrated long-term stability should be expanded, providing corridors and allowing for efficient management. Restoration projects should be constructed with infrastructure sufficiently robust to withstand flooding and should be designed for resilience and management efficiency. If invasive species move in as a result of climate change, agencies and organizations should be prepared to act quickly and aggressively to control populations before they have had a chance to spread.

- Design restoration projects for flexibility and cost effectiveness. Often, once a managed wetland is constructed, the same infrastructure can be used to provide seasonal wetlands, semi-permanent or permanent wetlands, riparian habitat, or uplands. As new information arises or water availability changes, management can change to accommodate. In addition, efforts should be made to develop methods to control mosquitoes that limit the use of pesticides – the cost of mosquito abatement discourages landowners from restoring habitat and high pesticide use reduces the quality of current habitat.

- Protect and develop projects that provide multiple benefits, e.g., wildlife habitat, flood control, wildlife-friendly agricultural production, and recreation. Acquire agricultural conservation areas to buffer wetlands from incompatible uses.

- Monitor and apply adaptive management techniques. Both success and failure should be identified, and strategies developed to continue to implement those practices that work and to change those that don't. Continue to work to identify trends associated with global climate change that affect the long-term success of wetland protection and restoration activities. Make both successes and failures broadly available to the public.

Conclusion

Over the years, the WCB, through the IWCP, has proven adept at developing coalitions and partnerships that benefited not only migrating waterfowl but agricultural operations, water interests and local economies. Every year, however, more challenges arise, making partnerships even more critical and testing the WCB's abilities to respond to the changing landscape. The WCB will continue to utilize the same techniques that have proven successful in the past; that is, work with many partners, continue to leverage dollars from federal and private sources, and protect and restore wetlands in ways that allow for efficient water use that will provide wetland benefits for decades to come. In addition, again working with many partners, the WCB will work toward fine tuning the acquisition and restoration techniques and processes to assure that wetland values and functions continue well into the future.

The Central Valley is critically important to a wide range of wildlife species, and increasingly important to the people of California not only for food production and places to live and work, but for outdoor recreation. The IWCP has the goal of providing wildlife habitat, pursuant to the goals of the CVJV, and to do so in ways that benefit the people of California. Wetlands habitats support millions of waterfowl and many other species, which are enjoyed by thousands of people every

year, from hunters and anglers to bird watchers. In addition, wetlands can be a part of the solution to the some of the issues that face all Californians, from flood control to groundwater supply. The legislation that created the IWCP clearly provided the tools to allow the WCB to address these myriad issues on many fronts.

The sample projects described above in this report, all accomplished in the last three years, clearly demonstrate the breadth and flexibility of the IWCP, but they are only the most recent of many years of habitat protection and restoration. Since the inception in 1990 of the IWCP, the WCB, in partnership with members of the CVJV, has authorized the expenditure of more than $91,000,000 to protect, restore and/or enhance more than 194,000 acres of wetlands, uplands and agricultural lands critical to migrating waterfowl. This includes the acquisition of 23,604 acres in fee and 10,773 acres of conservation easements, and the restoration and enhancement of 160,924 acres of wetlands and associated grasslands and riparian habitat.

To better illustrate the WCB's IWCP contributions toward fulfilling the CVJV objectives, Appendix A provides a complete list of all IWCP projects funded by the WCB.

INLAND WETLAND CONSERVATION PROGRAM
2011 - 2016

PROJECT NAME	BOARD DATE	COUNTY	EXPENDED	ACRES EASEMENT	ACRES FEE	ACRES RESTORED/ ENHANCED	CVHJV Basin
Restore and Protect Wetlands							
North Grasslands Wildlife Area Gadwall Unit Wetland Restoration	02-Jun-11	Merced	$575,000.00			623	San Joaquin
North Grasslands Wildlife Area Wetland Restoration	23-Feb-12	Merced	$327,000.00			140	San Joaquin
Los Banos Wildlife Area, Island Wetland Enhancement	29-Nov-12	Merced	$859,000.00			335	San Joaquin
North Grasslands Wildlife Area Enhancement and Security	22-May-14	Merced	$800,000.00			226	San Joaquin
Badger Almond Wetland Enhancement	02-Jun-16	Kern	$722,000.00			327	Tulare
Restoration Sub-Total			**$3,283,000.00**			**1,651**	
Enhance Existing Wetlands							
Castle Wetland Hydrology Enhancement	08-Dec-11	Merced	$85,000.00			240	San Joaquin
Grizzly Island Wildlife Area, Crescent Unit Water Conveyance	29-Nov-12	Solano	$350,000.00			500	Suisun
Gray Lodge Wildlife Areas Wetland Enhancement	31-May-12	Butte	$700,000.00			711	Butte
Gray Lodge Wetland Enhancement and Pump Installation	04-Sep-13	Butte	$1,038,000.00			560	Butte
Imperial Wildlife Area Wetland Restoration	21-Nov-13	Imperial	$1,000,000.00			367	N/A
Upper Butte Basin Wildlife Area - Little Dry Creek Habitat Restoration	20-Feb-14	Butte	$515,000.00			734	Butte
Grasslands and Mendota Wildlife Areas Enhancement	21-May-15	Fresno, Merced	$853,000.00			70	San Joaquin
Kern National Wildlife Refuge Recirculation Project	02-Jun-16	Kern	$1,308,000.00			2,500	Tulare
Central Region State Wildlife Area Habitat Enhancement Project	16-Nov-16	Merced	$993,000.00			956	San Joaquin
Enhancement Sub-Total			**$6,842,000.00**			**6,638**	
Enhance Agricultural Land for Wildlife							
Hughes Ranch Wetland Enhancement	04-Jun-13	Butte	$315,000.00			369	Butte
Willow Creek Ranch Water Distribution Improvements	22-May-14	Colusa, Glenn	$657,000.00			1,045	Colusa
Agricultural Sub-Total			**$972,000.00**			**1,414**	
GRAND TOTALS			**$11,097,000.00**			**9,703**	