BROOD HABITAT FOR DUCKS AND AN IRRIGATION SYSTEM FOR FARMERS: A CALIFORNIA CASE STUDY

Marilyn Cundiff-Gee[1] Dave Smith[2]

ABSTRACT

We developed a project to restore 104 acres of wetlands and increase the economic viability and commercial flexibility associated with a wheat farm in the Sacramento Valley, California. Prior to the project, only 270 acres of the 910-acre farm could be irrigated; the remainder of the property was undeveloped land suitable only for dryland wheat and safflower production. A conjunctive use project was developed to restore wetlands and improve irrigation and farming capability. Seven wetland units were constructed on areas of the farm that produced low crop yields and were costly to maintain. A comprehensive irrigation system was developed that included two pumps, two wells, and numerous water control structures. A tailwater recovery system was completed that maximized water supply and flexibility for both agricultural and wetland purposes. In return for the capital improvements, a 25-year management agreement was developed requiring the landowners to annually (1) flood the restored wetlands from February through July, (2) grow 350 acres of wheat, and (3) delay wheat harvest until after the nesting season. While creating spring and summer wetland habitat for duck broods and a multitude of other avian species, the project provided irrigation capability for an additional 505 acres, bringing the total irrigated lands to 775 acres. A critical component of the project was the unique partnership developed between state and federal agencies, a nonprofit organization and private landowners. By pooling fiscal and technical resources and providing the landowner with incentives, the following benefits were realized: increased commercial farming opportunities, wetland restoration and long-term management, and most importantly, the creation of an environment wherein development and management of wetlands has become an asset, rather than a liability to the landowner.

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[1]Wetlands Program Manager, Wildlife Conservation Board, 801 K Street, Suite 806, Sacramento California 95814

[2]Wetland Habitat Biologist, California Waterfowl Association, 4630 Northgate Blvd., Suite 150, Sacramento, CA 95834 (Current Address: California Department of Fish and Game, 1416 Ninth Street, 12th Floor, Sacramento California 95814)

INTRODUCTION

The Central Valley of California is one of the most important wintering areas for waterfowl in North America (Bellrose 1980, Heitmeyer 1989a), supporting approximately 60 percent of the ducks and geese wintering in the Pacific Flyway (U.S. Fish and Wildlife Service [USFWS] 1978). However, nearly 95 percent of the Central Valley's historic wetlands have been lost (Gilmer et al. 1982). Of the remaining 300,000 acres (121,599 ha) of wetlands, two-thirds are privately owned and managed for the purposes of providing wintering waterfowl habitat and duck hunting opportunities (Heitmeyer 1989a). The remaining one-third consists of State wildlife areas and National Wildlife Refuges (Central Valley Habitat Joint Venture [CVHJV] 1990).

Significant wetland restoration has been conducted on private land since the CVHJV developed a plan to restore waterfowl populations to levels that existed in the mid-70s. Most restoration has resulted in the conversion of large blocks of agricultural land into wetland complexes through traditional processes such as the acquisition of fee and perpetual conservation easements. Although they are often referred to as the "crown jewels" of the Central Valley, wetlands do not provide enough food and nesting cover to support populations of waterfowl as proposed in the CVHJV Implementation Plan (Heitmeyer 1989b). If the goals of the CVHJV are to be achieved, incentives to foster a wildlife friendly approach to farming must be encouraged. While the importance of grain fields and cereal crops is recognized in the CVHJV Plan, relatively few attempts have been made to integrate wetlands into farming operations; even fewer projects have been initiated by wildlife agencies to conjunctively improve agronomic potential and wetland resources on private lands.

In this paper we present the methodology and processes used to develop a wetland restoration and agricultural enhancement project on a wheat farm in Glenn County, California. By accomplishing both agricultural and wildlife objectives, the project has been widely supported by wildlife interests, farmers and the local community.

THE TOOL BOX FOR INNOVATION

The Inland Wetlands Conservation Program was established within the California Wildlife Conservation Board (WCB) which recognized the importance of public/private partnerships as a tool to achieve the resource goals called for in the CVHJV Plan. Whereas most of California's previous wetland initiatives were national in origin or narrowly focused, WCB's program was structured with sufficient authority and flexibility to implement innovative habitat protection efforts that are locally driven and are based on the unique needs and opportunities that exist in the Central Valley.

The purpose of this program is defined in statute, i.e., to carry out the objectives of the CVHJV. However, unlike many other habitat programs, the Inland Wetland Conservation Program was provided with the legislative authority to work with local stakeholders and issue grants and loans to nonprofit organizations, special districts, state and local entities and Resource Conservation Districts. This approach enables the WCB to utilize a variety of nontraditional methods of protecting valuable waterfowl habitat such as leasing property in need of restoration; purchasing restorable wetlands and then selling the wetlands back to the private sector; purchasing less than fee interests to protect, in perpetuity, critical agricultural lands, i.e., agricultural conservation easements; and purchasing water and water rights. Most importantly, the WCB is able to provide landowner incentives tailored to the specific landowner and conservation need.

INTEGRATING AGRICULTURE AND WETLAND OBJECTIVES

In California, wetland and agricultural interests have historically been polarized due to competing demands for water and other resources. Most of the State's historic wetlands were drained in the early 1900's for agricultural and reclamation projects (Frayer et al. 1989). Until recently, water supplies for the remaining wetlands were largely inadequate (U. S. Bureau of Reclamation [USBR] 1989). Lacking suitable fresh water supplies, wetland owners in the Grasslands area of the San Joaquin Valley used agricultural drainwater to flood their wetlands in the late 1970's and early 1980's. This alternative supply led to selenium contamination at the Kesterson National Wildlife Refuge, prompting ten years of costly cleanup and environmental mitigation. It was only with the passing of the Central Valley Project Improvement Act in 1992 that over 100,000 acres of Central Valley wetlands were finally guaranteed a firm supply of federal project water.

Recently, there has been a reversal in wetland trends in California. As a result of the efforts of progressive landowners and state and federal wildlife agencies, 42,508 acres (17,215 ha) have been converted from farmland back to wetlands since 1986 (CVHJV 1996). Most of the restored acreage was converted from farmland or pasture land to wetlands for the establishment of duck hunting clubs, wildlife areas and refuges. However, such restoration has not occurred without its critics.

California's Central Valley is the nation's most important agricultural area; eleven of its counties produce 250 different commodities with a market value of $13.3 billion (American Farmland Trust 1995). Citing adverse impacts to rural economies, some local governments in the Sacramento Valley have vigorously opposed fee-title land acquisitions for wetland restoration purposes. While numerous organizations, coalitions and commodity groups representing California agriculture have expressed their concern over the loss of farmland to a number of non-agricultural uses, primarily urban expansion (American Farmland Trust 1995), some commodity organizations have been particularly sensitive to wetland

protection and restoration efforts that eliminate agricultural uses on productive farmland. In recognition of these often strained relationships and the value of working together to integrate agricultural and wetland objectives, a unique project was developed with the intent of improving the wetland resources and agricultural values of a Sacramento Valley wheat farm.

LOW PRE-PROJECT AGRICULTURAL AND RESOURCE VALUES

The vast majority of the Sacramento Valley can be irrigated, and rice is the predominant commodity crop. Nonetheless, tracts of undeveloped land remain in existence. The 910-acre (369 ha) Beck Ranch is located in a portion of Glenn County that is characterized by level ricefields. The ranch is unique in that it features topographic relief representative of the historic Sacramento Valley landscape. Nearly all of the property's wetlands were eliminated as reclamation projects along the Sacramento River and its tributaries altered the region's natural hydrologic cycles. The low-lying areas of the Beck Ranch were farmed to dryland crops because they lacked their historic wetland hydrology. Prior to the project, only 270 acres (109 ha) of the farm could be irrigated and safflower and wheat were grown on the non-irrigated acres.

The landowners initiated a tailwater return project in the late 1980's to improve irrigation efficiency, but did not have the economic resources to complete the return system or drill two wells that would allow optimum use of abundant groundwater supplies that were available to the property. By 1993, the Beck Ranch had limited economic opportunities. Eucalyptus firewood propagation and a licensed pheasant club were used to supplement farm income. Concurrently, wildlife populations were at moderately low levels due to the lack of water during the late spring and summer. Although the wheat fields provided habitat for ground-nesting birds, haying was often done in mid-spring because irrigation water was not available to ensure a good grain crop. Haying is known to cause nest destruction and hen mortality (see review in Sargeant and Raveling 1992), and likely resulted in the mortality of nesting ducks on the Beck Ranch prior to the project as it did on other nearby hayfields (Loughman et al.1991).

BREEDING DUCKS AND WHEAT FIELDS

The Central Valley is widely recognized for its value to wintering waterfowl (see reviews in USFWS 1978, Gilmer et al 1982, Heitmeyer 1989a). Less well known is the fact that the Central Valley supports a substantial population of breeding ducks, primarily mallards (McLandress et al. 1996). Previous breeding estimates (119,000 mallards; Munro and Kimball 1982) were low due to survey methodology, but CDFG recently revised its waterfowl surveys to conform to standardized procedures used in the cooperative breeding ground survey (USFWS and Canadian

Wildlife Service [CWS] 1987). The revised surveys now indicate a breeding population of at least 350,000 mallards in California (Zezulak et al. 1991, CWS and USFWS 1996).

Investigations of mallard nesting biology throughout the Central Valley indicate that, at least in surveyed areas, nest densities and success are extremely high (McLandress et al. 1996). During three years of nest searching on state and federal wildlife refuges in the Sacramento Valley, (McLandress et al. 1996) found an average of over 0.4 mallard nests/acre. Overall mallard nest success (Mayfield method) was 32.3% for the five-year statewide study (McLandress et al. 1996).

Duck nesting is also prevalent in agricultural areas of the Sacramento Valley, especially wheat fields and fallow "set-aside" ricefields. Yarris and Loughman (1990) and Loughman et al. (1991) found approximately 0.75 nests/acre in set-aside fields and over 2.0 nests/acre in Sacramento Valley wheatfields, respectively. Central Valley wheat fields differ markedly from those in northern regions of North America in that plant growth coincides with duck nesting chronology. Due to the long growing season, the wheat is typically tall (>16 inches [40cm]) and provides dense nesting cover by early April. Mallards nest earlier in California than in northern breeding grounds (cf. Hammond and Johnson 1984, Lokemoen et al. 1990, McLandress et al. 1996); the peak of nesting in the Sacramento Valley occurs in April and May.

BROOD HABITAT - THE LIMITING FACTOR

Although mallard nest densities and success are typically very high in the rice-growing region of the Sacramento Valley, brood survival appears to be limited by habitat availability during the spring (Yarris 1995). Rice culture involves ground preparation and planting from March through May. The fields are flooded in late April and May, but do not provide cover for the duck broods until about mid-June (Yarris 1995). With only ditches available as early season brood habitat during his study in 1993 and 1994, Yarris (1995) found duckling survival to be very poor. However, survival increased 4-fold in late season. This temporal increase in survival probability was attributed to the increased suitability of ricefields as brood habitat once the rice plants matured sufficiently to provide protection from predators (Yarris 1995). Based on these findings and several years of previous anecdotal evidence, it was determined that although duck nesting effort was relatively high on the Beck Ranch, additional spring-summer wetlands were needed to maximize duck production.

Palustrine emergent wetlands flooded continuously from early March until late July are rare in the Sacramento Valley. Most Central Valley seasonal wetlands are drained in March or April and are not re-flooded until September or October (Heitmeyer 1989a); however, as is the case in other key wintering areas, short

duration (1-2 week) summer irrigations are sometimes used to increase moist-soil seed production (Smith et al. 1994, Fredrickson and Taylor 1982). In addition to local ducks, spring-summer wetlands are extremely important to a host of wetland dependent wildlife including great egrets, (*Casmerodius albus*), snowy egrets (*Egretta thula*), black-crowned night herons (*Nycticorax nycticorax*), virginia rails (*Rallis limicola*), American avocets (*Recurvostra americana*), black-necked stilts (*Himamtopus mexicanus*), white-faced ibis (*Plegadis chili*), ring-necked pheasants (*Phasianus colchicus*) and the state listed Giant garter snake (*Thamnophis couchii gigas*).

DEVELOPMENT OF AN AGRICULTURE/WETLAND SOLUTION

Many programs that provide assistance to private landowners are structured such that only certain activities and types of projects are eligible for cost-sharing assistance. In California, there are a multitude of federal, state and private programs available to assist landowners with habitat restoration projects. However, because of restrictive eligibility requirements and/or program criteria, many worthy projects do not qualify for cost-sharing assistance.

In the case of the Beck Ranch, the landowners did not have the resources to improve the farm by establishing additional irrigation capability. Moreover, a wetland conservation easement was not feasible because the property could not easily be converted into a high quality duck hunting club due to its rolling topography and lack of surface water rights. Economically speaking, most Sacramento Valley landowners can only convert farmland into wetlands by selling conservation easements and then establishing duck clubs. The Central Valley's natural hydrology has been altered so drastically that most wetlands must now be artificially flooded, often at a significant annual cost to the landowner, and duck club memberships are usually needed to generate such revenue. Small-scale habitat improvements were not an option for these landowners because they needed to increase the agronomic value of the farm that was on the brink of economic failure. Thus, traditional wetland programs were not applicable.

Capitalizing on WCB's programmatic flexibility, we tailored a project to fit the Beck Ranch by first recognizing the needs of the landowners. Once it was determined that an expanded irrigation system was their highest and most urgent priority, and essentially their only means of improving the agronomic value of the farm, a team of wildlife professionals developed a list of habitat restoration and management actions that would be needed to achieve desired wildlife objectives, commensurate with the funding provided for the capital improvement.

To protect the State's investment and assure the long-term viability of the project, WCB, the landowners, and the California Waterfowl Association (CWA) developed a binding three-way, 25-year agreement. As the grantee, CWA supervised the

development and construction of all capital improvements, and by working cooperatively with the landowner and all of the stakeholders associated with the project, developed a management plan for the property. The management plan required the landowners to (1) restore 104 acres (42 ha) of wetlands in low-lying, unproductive agricultural areas, (2) flood the restored wetlands from February through July each year, (3) annually grow 350 (142 ha) acres of wheat, and (4) delay wheat harvest until after the duck nesting season.

In return for this commitment by the landowners, WCB provided the $200,000 necessary to restore the wetlands and install a comprehensive irrigation system including two wells, a network of ditches, two lift pumps, three inverted siphons, and numerous water control structures. An important feature of the project is a complex tailwater return system that allows maximum recirculation and water use efficiency. The wetlands are an integral part of the system because they will serve as shallow irrigation reservoirs at certain times of the year. Additional water necessary to meet the wetland flooding requirements must be pumped from the new wells at the landowner's expense.

In 1996 its first year of operation, the project has already provided significant agricultural and wetland benefits. Foremost, irrigated acreage has been increased by 505 acres (205 ha), with 775 acres (314 ha) of the farm now under irrigation. By irrigating the wheat, yields are certain to increase and mid-spring haying will no longer be necessary even after the 25-year agreement expires. Further, crop diversification is underway and irrigated crops such as sugar beets, squash, and cucumbers can now be grown on the property.

Wetland values have also increased dramatically. Over 5,000 waterfowl were recorded during March 1996, thus it appears that the ponds will be of significant value to spring staging waterfowl. Mallards and other duck species are utilizing the Beck Ranch for brood-rearing; early indications are that brood survival will be reasonably good in 1996. Resource values will increase in future years as wetland vegetation matures and additional cover is provided. Local biodiversity has been improved substantially due to the presence of highly productive spring-summer wetlands.

DEPOLARIZE AGRICULTURAL AND CONSERVATION INTERESTS

The trade-off between increased agricultural production and preserving a diversity of wildlife habitat on private lands oftentimes becomes a choice based upon economic factors. In many cases, as agricultural production increases, the diversity of wildlife habitat decreases. This happens because lands that are more fertile, in other words those that are best suited for agricultural production, are cultivated first and, as such, end up with a lower degree of natural biodiversity. However, as agricultural technologies increase and cultivation moves into less fertile areas of the

ecosystem, (which have a higher degree of biodiversity because they were not initially cultivated) the trade-off between increased agricultural production and preserving wildlife habitat becomes greater. In areas of marginal farmland, gains in agricultural acreage are often not justified by the resulting crop yields. Yet, such agricultural conversion results in large decreases in biodiversity (Howitt 1995, Huston 1993, Weitzman 1992).

Herein lies the conflict faced by many private landowners concerned with maintaining an abundance of diverse wildlife habitat yet dependent upon higher yields and greater crop diversity. For wildlife managers and organizations, the challenge becomes one of providing sufficient incentives to the private landowner to encourage the preservation of less fertile land for wildlife purposes and limiting agricultural production to quality farmland.

To preserve the agricultural integrity and productivity of the Beck Ranch, the brood ponds were restored on areas of the farm that were expensive to cultivate. These areas had poor soils and were difficult to farm. While the cost per acre to maintain the farming operation has been reduced, the value of the farm to nesting ducks and their broods has increased substantially. More importantly, crop diversity and crop yields were increased without sacrificing any critical wildlife habitat.

Another important aspect of the project is the relationship between the incentive provided to the landowner, i.e., the capability to irrigate 775 acres of farmland, and the diversity of wildlife benefits that will be obtained from the private landowner. In return for the $200,000 incentive, important habitat will be maintained by the landowner for 25 years. Thus, managing the brood ponds has become an asset to the landowner and not a liability. Further, the property remains on the local property tax roles, the local community is benefitting financially by having a successful farm operation and nesting ducks are benefitting from the quality habitat.

From the perspective of a public agency, the cost/ benefits associated with this project further demonstrate the need for incentives designed to meet the needs of the landowner and the unique habitat located on the private land. For example, if traditional means of preserving the habitat were utilized and a wetland conservation easement was purchased by a public entity, this same project would have cost the taxpayers approximately $675,000 (WCB 1996). Alternatively, if this property was owned-in-fee by a public entity, it is estimated that the same management effort would cost $1.125 million over the 25-year life of the project. This price tag however, does not include the economic losses to the agricultural industry, nor does it include the economic loss to the local community with respect to reduced property taxes or the third party economic losses associated with the total conversion of agricultural land to wildlife habitat.

The monetary incentive to the landowner was not the only factor that contributed to the success of this project. This project reflects a unique partnership between the

agricultural industry and the conservation community. Early in the design of this project, we recognized that this particular piece of farmland provided a tremendous opportunity to increase the population of locally breeding ducks. However, inherent within this recognition was the understanding by the conservation community that maintaining a productive agricultural operation was equally important to the local and state economy. As such, efforts were made to understand the unique needs of the landowner and, by working together, we identified mutually beneficial ways by which the property could be developed to meet the financial and agricultural needs of the landowner and the needs of the waterfowl.

The two needs were not mutually exclusive. The successes of the wildlife aspects of the project were dependent upon the success of the agricultural operation. If the landowner incentive was not sufficient to provide the economic means by which the agricultural operations could become successful and profitable to the landowner, habitat for the breeding ducks would not have been created.

The incentives tailored to meet the needs of the Beck Ranch and those of the conservation community have resulted in habitat restoration and management by the landowner. This project promotes voluntary land stewardship rather than regulating land management practices for the exclusive benefit of wildlife. Current controversies over private property rights have shown that a non-regulatory approach to preserving wildlife habitat may be more successful than regulating and mandating specific land management practices. Understanding the importance of integrating wildlife habitat into commercial farming operations is sometimes a difficult transition for many within the conservation and agricultural communities. However, by identifying mutual areas of interest, coupled with the knowledge and expertise of stakeholders within the agricultural industry and conservation community, conjunctive use efforts, such as those demonstrated by this project are possible.

CONCLUSION

Although still in its infancy, the project has accomplished the two major objectives it was designed to achieve. It increased irrigation capability by 505 acres (205 ha) and restored 104 (42 ha) of spring-summer wetlands. The importance of this project however, goes beyond simply increasing the irrigation capability and providing habitat for ducks. The project exemplifies accomplishments that can be achieved when the agricultural industry and the conservation community in the Central Valley work together to mutually benefit agriculture and conservation interests. To the extent that incentives or cost-share assistance can be tailored to meet the unique needs of private landowners, the dichotomy between agricultural production and diversity of wildlife habitat should be reduced.

With increasing fiscal demands placed upon governmental entities, coupled with declining revenue sources, it is becoming more and more difficult for federal and state resource agencies to address critical issues facing our fish and wildlife resources. Developing projects designed to integrate the needs of agriculture and wildlife provides one avenue whereby a cost effective, win-win opportunity can be implemented, benefitting the private landowner and the wildlife species dependent upon the privately-owned land. While the techniques used to develop this project may not be the panacea to all of our resource problems, this approach could provide a cost-effective answer to increasing both biodiversity on farmland and cooperation between the agricultural industry and the conservation community. In the Central Valley of California, where 11 counties contribute $13.3 billion in agricultural revenue to the State economy and where 60% of the Pacific Flyway waterfowl population winters, efforts designed to integrate agricultural production and the needs of wintering and breeding ducks is imperative.

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