



Sacramento River Ranch

Integrating habitat conservation and
species banking in a working
agricultural landscape

Maria S. Bowman



SACRAMENTO RIVER RANCH

INTEGRATING HABITAT CONSERVATION AND SPECIES BANKING IN A WORKING AGRICULTURAL LANDSCAPE

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FARM OF THE FUTURE PROJECT

Case series editors: Ariela Summit, Louise E. Buck, Sara J. Scherr



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Table of Contents

Acknowledgments	3
Introduction	4
Agricultural, Ecological and Regulatory Context	4
Sacramento River Ranch Profile.....	7
Scaling Up: Challenges and Opportunities	18
References.....	21
Glossary.....	221

Figures

Figure 1. Aerial view of River Ranch.	5
Figure 2. Irrigated pasture farmed under a Swainson’s Hawk conservation easement.....	8
Figure 3. Walnut groves at River Ranch.....	9
Figure 4. Sheep grazing on River Ranch.....	10
Figure 5. Valley Elderberry Longhorn Beetle, <i>Desmocerus californicus dimorphus</i>	11
Figure 6. Timeline for the release for sale of River Ranch VELB Credits	12
Figure 7. The River Ranch Wetlands Bank	13
Figure 8. Timeline for release for sale of River Ranch Wetlands Bank credits.....	14
Figure 9. Swainson’s Hawk (<i>Buteo swainsoni</i>) in a sycamore tree at River Ranch.....	15
Figure 10. Young salmonids trapped in ditches along levees on River Ranch	15
Figure 11. Timeline for the release for sale of Fremont Landing Salmonid Conservation Bank Credits.....	15
Figure 12. Composition of revenue and profit at Sacramento River Ranch	18

Boxes

Box 1. Planning for the future in Yolo County, California	17
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Tables

Table 1. Number and type of species bank credits sold by year	16
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INTRODUCTION

The owners of Sacramento River Ranch are pioneering a unique model that integrates diversified agricultural production with credits for conservation banking. The Sacramento River Ranch property lies adjacent to the Sacramento River, which runs from Mount Shasta to the San Francisco Bay, in California. River Ranch practices conventional and organic agriculture, and engages in other activities that support its vision of integrated conservation and agricultural production in a managed landscape. Annual crops planted include wheat, grass hay, sunflowers, and corn; perennial crops planted are walnuts and alfalfa. River Ranch has converted 10 percent of land formerly in production to four types of conservation and mitigation activities which will be sold from the property: 1) species banks for the Valley Elderberry Longhorn Beetle (VELB), 2) the first federally approved conservation bank for Salmonids, 3) a conservation easement for Swainson's Hawk habitat, and 4) a federally-approved wetland bank. In addition to participating in these structured markets for habitat, River Ranch implements hedgerows and soil and water conservation techniques that support its vision of a working agricultural landscape that enhances—rather than competes with—biodiversity.

AGRICULTURAL, ECOLOGICAL, AND REGULATORY CONTEXT

The Sacramento River Ranch is located approximately 4 miles North of Highway 5, just outside of Sacramento, California. It lies along the west bank of the Sacramento River at the confluence of the Sacramento and Feather rivers, northwest of the Sacramento National Airport (see Figures 1 and 12) and just inside Yolo County. The immediate surrounding landscape is predominantly agricultural, and there is substantial urban and suburban development within the watershed. Driving north from the San Francisco Bay area and inland toward Sacramento, the landscape becomes a mosaic of orchards, pastures, and row crops interspersed with strip malls, office complexes, and suburban housing developments.

In spite of industrial and residential growth around Sacramento, the Yolo County is committed to maintaining a thriving agricultural landscape and fostering biodiversity. Agriculture is both economically and culturally important there. Extensive agriculture in the form of cattle ranching began in the area around 1850, and today intensive and extensive agriculture covers more than 50 percent of the landscape. Due to the Mediterranean-style climate with cold, wet winters and warm, dry summers, agriculture in the region relies heavily on surface and groundwater irrigation during the drier months. Approximately 6 percent of the land area in Yolo County is cultivated in deciduous fruits and nuts, 10 percent in field crops such as corn, safflower, and sunflowers, 10 percent in grain and hay crops, 10 percent

Figure 1. Aerial view of River Ranch



The view shows the farming landscape of Yolo and Sacramento counties. Feather River joins the Sacramento River on the left.

in pasture, 7 percent in rice, and 8 percent in vegetable and berry crops. Urban land uses make up only 6 percent of land use in the county (Yolo Natural Heritage Program, 2009). The value of agricultural production in Yolo County was approximately \$527 million in 2008, with the most valuable crop being processing tomatoes (approximately 20 percent by value), followed by alfalfa hay (14 percent), rice (11 percent), and wine grapes (8 percent). Almonds, walnuts, wheat, seed crops, and livestock are also important products, and organic production is growing in the region (increased by 12 percent between 2007 and 2008 and now accounting for approximately 4 percent of the value production) (Yolo County Department of Agriculture, 2008).

The Sacramento River, which borders the River Ranch property on the north and east, travels nearly 450 miles through the farmlands of the Central Valley and provides water to 5 million acres of farmland and 25 million people before emptying into the northern arm of the San Francisco Bay. In 2009, the Sacramento River Delta Region was declared by American Rivers to be the nation's most endangered waterway due to water shortages and water quality issues caused by overuse and aging flood control systems. In the early 1900s,

the Sacramento-San Joaquin Flood Control Project built more than 1600 miles of levees to control floods and improve navigation on the Sacramento and San Joaquin Rivers (American Rivers, 2009). When the river floods in the winter, water backs up behind a series of weirs, including the Fremont Weir, which adjoins the River Ranch property. If the water crests the weirs, it is diverted through the Yolo Bypass, a 59,000 acre, man-made floodplain designed to hold the water while keeping Sacramento safe from floods. The Northern Bypass runs from the Fremont Weir (immediately adjacent to the River Ranch property on the west side) to I-80, and is 14.2 miles in length. Land within the Bypass is farmed, but the county reserves the right to flood the land in the event that it is necessary for flood control.

While water management has been strategic for the expansion of Sacramento and the surrounding areas, it has wrecked havoc on natural floodplain and riparian ecosystems and on the more than 50 species of fish that inhabit them, including the Chinook (King) Salmon and Steelhead (American Rivers, 2009). These species rely on the combination of natural floodplains and high waters at an early stage in their life cycle to gain access to nutrients. Without special conservation measures such as fish ladders, they are often trapped behind weirs and levees (National Oceanic and Atmospheric Administration, 2005). Despite efforts by the government, conservation NGOs, and private landowners that include restoration of natural flood plains, wetlands, and riparian vegetation, the delta faces continued degradation. The Bay Delta Conservation Plan (BDCP), a coalition of stakeholders for management of the rivers, is working to develop a plan that can both restore the integrity of the ecosystem and provide for the diverse needs of the many users that rely on the water, ensuring a balance in water quantity between periods of scarcity and excess (Bay Delta Conservation Plan, 2009).

Maintaining and enhancing biodiversity on this mixed landscape of agriculture, urban development, managed waterways, and natural habitat is a complex task. Moreover, the legal framework that farmers and conservationists must navigate to participate in federal, state, or private conservation initiatives in the United States and in Yolo County, is a complicated one. For many years, protection of habitat has been regulated as part of several landmark pieces of legislation, which agencies at the local level have enforced. Most importantly for the context of this case study, these include the Federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), and the Clean Water Act (CWA).

The Endangered Species Act of 1973 dramatically changed the way in which urban and rural landowners, developers, and agencies make decisions about land use and development. Section 9 of the Act prohibits the “take” (broadly interpreted to mean killing or harming a listed species or destroying their habitat) of listed fish or wildlife species, and protects against

destruction of habitat that is critical to the survival and behavior patterns of these animals. The ESA has different implications for urban, agricultural, industrial, and residential land uses in the United States. Urban, suburban, and industrial expansion in areas with habitat critical for the survival of a species constitutes such a “take.” Under such expansion, actors destroying critical habitats are required to create or buy constructed habitat that will replace the destroyed habitat. Agriculture’s allowable activities and requirements tend to be based on historical land use provisions.

Similarly, Section 404 of the Clean Water Act requires 1:1 mitigation (i.e. construction of additional wetland that replaces the destroyed wetland) for development projects that result in destruction of freshwater marshes and riparian habitat. In the area surrounding the city of Sacramento, public and private-sector development projects abound during years of stable economic conditions. Because seasonal wetlands are common in the Sacramento River watershed, public and private development projects (e.g. construction of a new highway, channelization of a waterway, or the building of a new office complex) in areas that result in the destruction of wetlands require appropriate mitigation within the same watershed.

These regulations effectively gave rise to markets for a whole sector of environmental mitigation and species banking activities. In both cases, markets for mitigation usually involve an actor, who is developing or altering a landscape, paying a private party for a wetland or species habitat credit that ensures that additional habitat has been created and will be maintained in perpetuity.

SACRAMENTO RIVER RANCH PROFILE

Wildlands Inc., a co-owner of Sacramento River Ranch with headquarters in Rocklin, CA (just outside of Sacramento), has been managing land for conservation and mitigation goals for 20 years. Wildlands established the first wetlands mitigation bank west of the Mississippi in 1994, and is engaged in a myriad of banking activities including wetlands and species banks, agricultural mitigation and nutrient banks, and stream and habitat conservation banks in the southeast, the Pacific Northwest, and on the west coast.

Wildlands’ business model is unusual for land management in that it directly employs most of the expertise needed to develop its projects, and buys land to manage in perpetuity. The process of getting a species bank approved by Fish and Wildlife Service or the Army Corps of Engineers requires legal, planning, biological, engineering, and marketing expertise, and Wildlands has a team of lawyers, planners, biologists, engineers, and marketing personnel, on staff. Wildlands also has easier access to the financial capital for investment in new projects than many farmers might have, as well as experience in long-term financial planning. Careful

calculation of predicted rates of return on species or wetland banking projects helps Wildlands to succeed in making sound investment decisions, and to ensure that the projects are funded through all phases of implementation.

When Steve Morgan, the CEO and founder of Wildlands Inc., first saw the River Ranch property, he perceived more than just a farm dotted with Walnut groves. The property was unique in several ways. Most notably, the floodplain at the northernmost end of the property, known as Fremont Landing, is one of the few remaining natural floodplains along the Sacramento River. When the opportunity arose to acquire the River Ranch property, which had formerly been owned and operated by the Mormon Church as Deseret Farms, Steve saw it as an opportunity to expand Wildlands' management model. Wildlands partnered with Resource Land Holdings (RLH), a Colorado-based company, to acquire the property in 2003.

Steve's vision included diversifying farming on productive agricultural lands, as well as converting approximately 10 percent of marginal farmland (characterized by poorly-drained or alkaline soils) to species habitat and wetlands. The Wildlands team, which includes ecologists, legal and administrative support, land managers, and engineers, and the personnel at Sacramento River Ranch, has been committed to carrying out Steve's vision for the landscape.

Wildlands's experience in mitigation banking and land conservation, when combined with the financial backing and experience in agricultural property management of Resource Land Holdings, makes Sacramento River Ranch a project that draws upon years of diverse experience in navigating the political, logistical, and economic challenges of land management for the joint goals of agricultural production and conservation/mitigation banking. Today, the River Ranch landscape exemplifies the integration of traditional agricultural production with non-traditional management for species habitat and wetlands through payments for ecosystem services.

Figure 2. Irrigated pasture farmed under a Swainson's Hawk conservation easement



Agriculture on the ranch is diverse, and productive. River Ranch practices conventional and organic agriculture, and engages in other activities on the property that support its vision of integrated conservation and agricultural production on a managed landscape. The Ranch cultivates annual crops that include wheat, grass hay, sunflowers, and corn. If planted, sunflowers are sowed in April or May for harvest in July, and rotated with annual row crops, depending upon the market for each. They are irrigated once or twice in May or June. In a year when wheat is planted, approximately 100 acres are planted in November and harvested in June. Often, wheat is planted on a field following higher-input crops to take advantage of residual nutrients, or to “clean up” a field because of the variety of available herbicides, and is irrigated in March and/or April, depending on seasonal rains. Corn is grown in sandy loam soils and rotated with tomatoes, wheat, and other annual row crops. It is planted in early to mid April, and harvested in August; it requires approximately 3-4 acre-feet of water per year, which is applied using furrow irrigation during growth.

Annual and perennial varieties of grass hay are grown at River Ranch on both clay and silty/sandy soils and are rotated with row crops. The perennial varieties are irrigated monthly by flood irrigation during the dry season (May to September), with a total of approximately 4-5 acre-feet of water applied annually. Other cultivated perennials are walnuts and alfalfa. Irrigated alfalfa is rotated with grain crops that prosper on the nitrogen-rich soil left by the alfalfa rotation. Alfalfa is planted between September and February, and is harvested up to six times between April and October. Irrigation is done on a 30-day cycle, and is timed to follow each cut; In 2010, there were 870 acres of alfalfa planted at River Ranch.

River Ranch has several Walnut groves of varying ages. The walnut groves at River Ranch (see map) are located in higher areas with deep, well-drained soil on the eastern side of the ranch; some have sprinkler irrigation installed and the others are flood irrigated.

Figure 3. Walnut groves at River Ranch



Several groves were planted by the previous owner in the 1960s and 1970s. Improved pest and water management means that these groves continue to be productive.

River Ranch uses a mixture of pest and weed control techniques, including standard pesticide and herbicide application, and less conventional methods. The ranch contracts with a shepherd and allows sheep grazing on a portion of the property for weed control and supplemental income and is experimenting with pheromones to combat the Codling moth (the main pest for Walnuts). Organic hay crops are grown on a portion of the property which, in addition to providing a price premium, works well to ensure that the farm layout is in compliance with the requirement that there be pesticide/herbicide-free buffer zones of 200 feet around the VELB species bank. A focus on hay quality also means that River Ranch can sell a portion of its hay to area horse farmers, who pay, on average, a premium of \$100 per ton.

Figure 4. Sheep grazing on River Ranch



The Ranch hires a shepherd to graze the property, thereby controlling weed growth and creating supplemental income.

River Ranch has both agriculturally productive land and land that is clearly strategic for species and habitat banking due, in part, to its proximity to the Sacramento River. In addition to the large swath of natural floodplain, much of the northern portion of the property is ideally suited for riparian restoration. Irrigation water flows to a low point at the southernmost end of the property. Given these unique features of the property, the Wildlands team has initiated four types of conservation and mitigation activities: species banks for the Valley Elderberry Longhorn Beetle and Salmonids, a conservation easement for Swainson's Hawk habitat, and a federal wetlands bank at the low-lying, southern end of the property. The markets for these activities are driven by the ESA (VELB, Salmonids), the CESA (Swainson's Hawk), and Section 404 of the Clean Water Act (wetlands).

The northern part of the property is ideally suited as riparian habitat, and riparian Elderberry bushes are essential for the survival of the Valley Elderberry Longhorn Beetle (a federally listed threatened species), as it resides there for all stages of its life cycle. River Ranch is located near one of two zones designated as critical habitat for the Valley Elderberry Longhorn Beetle. Called the "Sacramento Zone," it is an area in the city of Sacramento enclosed on the north by Route 160 freeway, on the west and southwest by the Western Pacific railroad tracks, and on the east by Commerce Circle and its extension southward to

the railroad tracks. The River Ranch is thus a prime location for creation of a habitat bank for this species (Talley et al, 2006).

Species banking credits for VELB are sold to public or private actors who are destroying habitat. These include for example, business developers who are destroying elderberry bushes in the creation of an office complex and must therefore mitigate its activities under the ESA. Specifically, mitigation for destruction of Elderberry bushes is 1:1, meaning that if a bush is to be removed, it must be transplanted (or replaced by another bush) in an approved VELB species bank. There is a corresponding “service area”, or an area within which mitigation must occur, and River Ranch’s proximity to Sacramento means that developers in the area in and surrounding the city can offset their impacts by buying mitigation credits at the Ranch.

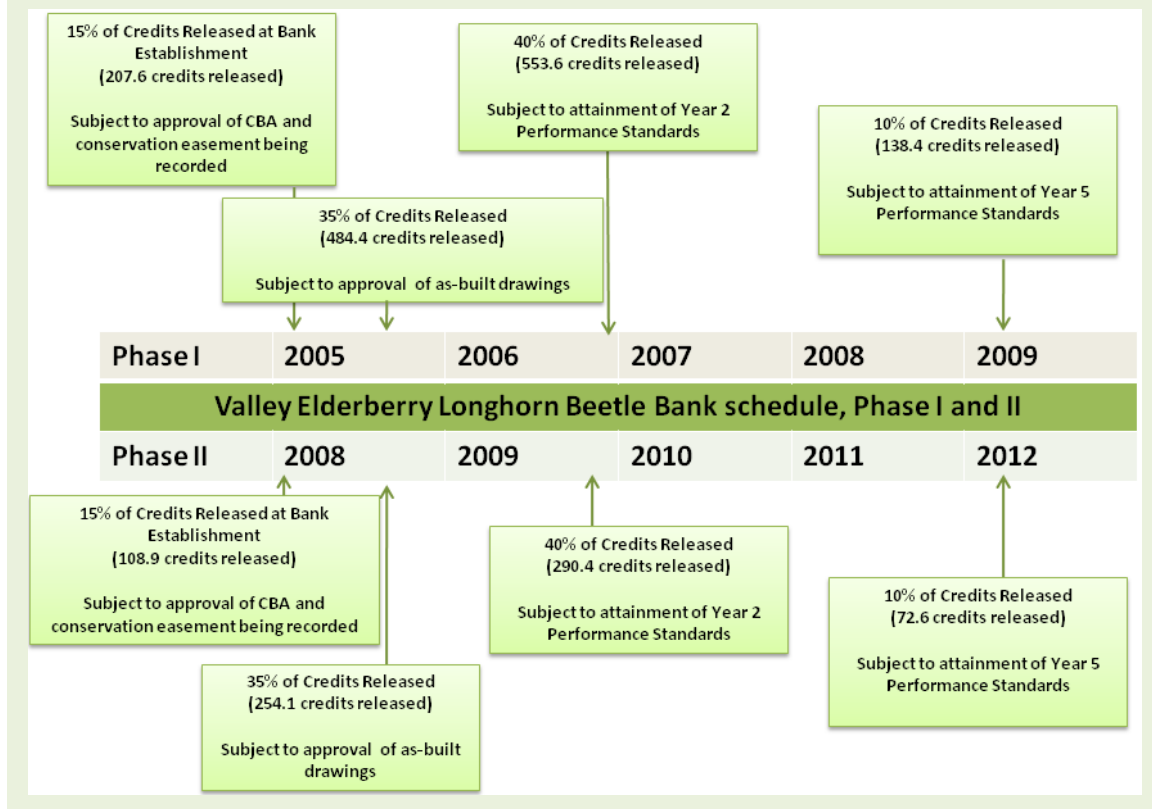
Figure 5. Valley Elderberry Longhorn Beetle, *Desmocerus californicus dimorphus*



The development of habitat for a VELB species bank at River Ranch has been elaborate. In each habitat unit (1800 ft²), River Ranch has planted 5 bushes (transplanted, if possible) and 5 associated plants (e.g. cottonwoods, willows and other shrubs) that would be found in the natural riparian habitat with Elderberry bushes. There are 24.2 habitat units per acre, and each unit has sold at approximately \$3,500 per unit (or \$85,000 an acre), with roughly 50 percent of sales to public agencies, and 50 percent of sales to private developers. Credits are sold *only once*, and the River Ranch must ensure that the habitat will be managed *in perpetuity*.

Construction and approval of VELB species banks on the River Ranch property was structured in three phases: the first phase in 2005 included 1384 credits (1 habitat unit=1 credit), the second phase in 2008 added 726 credits, and the third comprised 2432 credits. For the first phase, there were four months of processing time between the initiation of the approval process and the approval of the first credits for sale, and for the second phase the lag time was nine months. Credits in each phase are released for sale in intervals over a 5 year period, subject to performance standards; in this case, primarily plant survival rates. These timelines are shown in Figure 6, and figures for VELB credit sales over the last five years are shown in Table 1. River Ranch is currently clearing land for Phase 3 of planting for VELB species bank.

Figure 6. Timeline for the release for sale of River Ranch VELB Credits



Wetlands banking mitigation occurs at the watershed level, and any developer within the Sacramento River Watershed could buy a wetlands credit at River Ranch to offset his development activities. The River Ranch Wetlands Bank is an area of 119 acres at the southernmost end of the property (see Figure 12). This area is, on average, several inches lower than the surrounding farmland, and much of the irrigation water from the property drains toward this area; this made it a natural location to create a Wetlands bank. In order to “create” a suitable wetland, Wildlands’ engineers removed soil from the area and began planting additional wetland vegetation. Paperwork for the Bank was submitted to the USACE in September of 2007, and is nearing approval. Following approval, 11.7 freshwater marsh credits and 4.9 riparian habitat credits will be made available for sale and are expected to sell at around \$100,000 per acre. The remaining credits will be released at intervals (see Figure 8). Money must be placed in an endowment to ensure management of the wetland will continue, construction is completed as planned, and all performance standards are met. Credits are sold *only once*, and the River Ranch must ensure that the credited wetland will be managed *in perpetuity*.

Agricultural activities also support species diversity on the ranch; field and row crops provide primary and secondary foraging habitat for raptors including the Swainson's Hawk, which is listed as a threatened species under the California Endangered Species Act (CESA) (Estep Environmental Consulting, 2008). As part of the legal requirements of the CESA, development projects in the region are evaluated for impacts on foraging and nesting habitat. Because the Swainson's

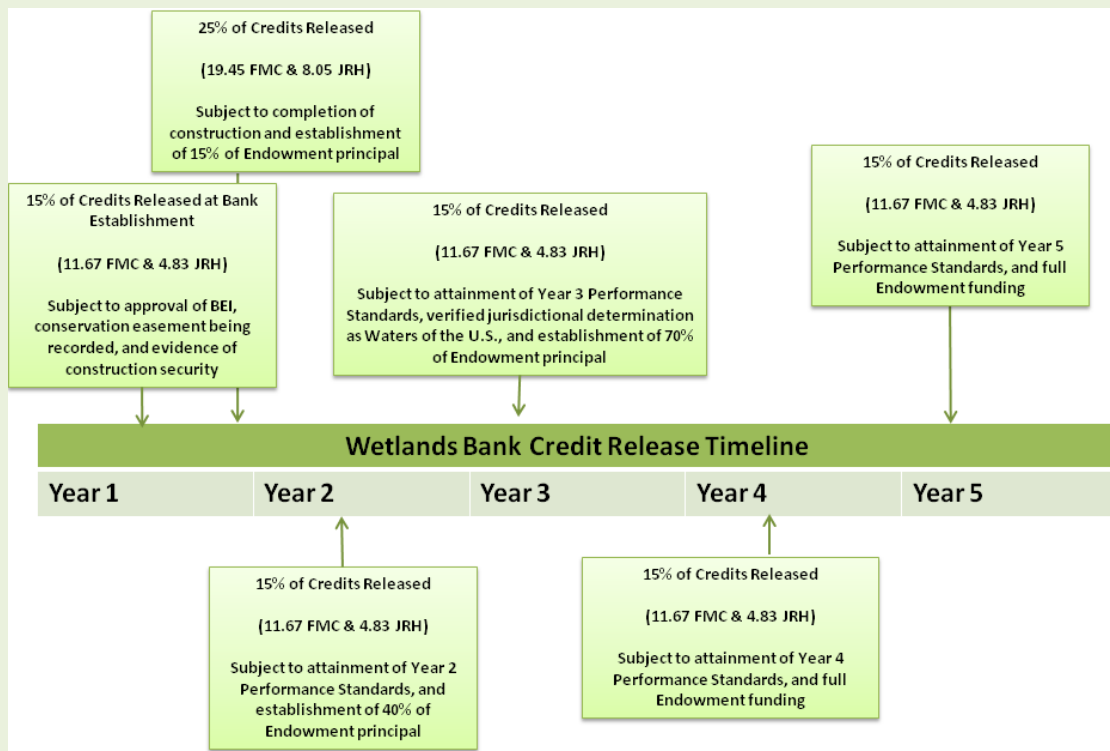
Hawk forages in large, open fields, foraging habitat is often compromised when agricultural land is subdivided into smaller parcels. Developers pay a fee that is assessed based upon the amount of acreage impacted, and these fees are directed toward the acquisition of land that is held as habitat or paid to farmers to maintain Swainson's Hawk foraging habitat (Department of Environmental Review and Assessment, 2009). A commitment to grow certain varieties of field and row crops that support foraging for the Hawk, can qualify for these payments. In this case River Ranch has placed a conservation easement on 838 acres of Swainson's Hawk (soon to be expanded by an additional 497 acres), qualifying for state payments. Under the easement, the Ranch must commit to growing only crops which support foraging by the hawk (irrigated pasture) in perpetuity. The payment to River Ranch for the easement is made when the easement is established, which was done in 2010 for \$7,500 per acre.

Figure 7. The River Ranch Wetlands Bank



Wildlands was aware when they bought the River Ranch property that the nearly two mile stretch of natural floodplain at the northern end of the property held unique habitat potential. Watching juvenile Chinook salmon get stranded high-and-dry in the drainage ditches and trapped along the earthen levees of the property motivated the process of creating the first federally approved conservation bank for endangered and threatened salmon and steelhead. Actors at River Ranch realized that with some modifications, including planting vegetation on which the salmon feed and removing ditches where the salmon get trapped when waters recede, the area would be prime habitat for young salmon which are endangered under the ESA during their winter run on the Sacramento River.

Figure 8. Timeline for release for sale of River Ranch Wetlands Bank credits



FMC are Freshwater Marsh Credits, and JRH are Jurisdictional Riparian Habitat Credits.

While the process for approval was a long one (nearly two years), the bank was approved in 2006. The ranch experienced difficulties and delays in negotiating construction with the US Army Corps of Engineers (USACE) due to a requirement that the area be kept clear for access to levees and to ensure structural integrity. However, River Ranch expects to continue as planned in constructing and maintaining riparian forest floodplain habitat for which they will be allowed to sell 42 preservation and 58 restoration credits (see Figure 11). The anticipated market for these credits is public and private offsets for development projects from Redding to Turlock, CA including mitigation by the county for water projects or by the USACE for levee strengthening. The credit price has been, on average, \$100,000 per credit. Credit sales to date are shown in Table 1.

Figure 9. Swainson's Hawk (*Buteo swainsoni*) in a sycamore tree at River Ranch

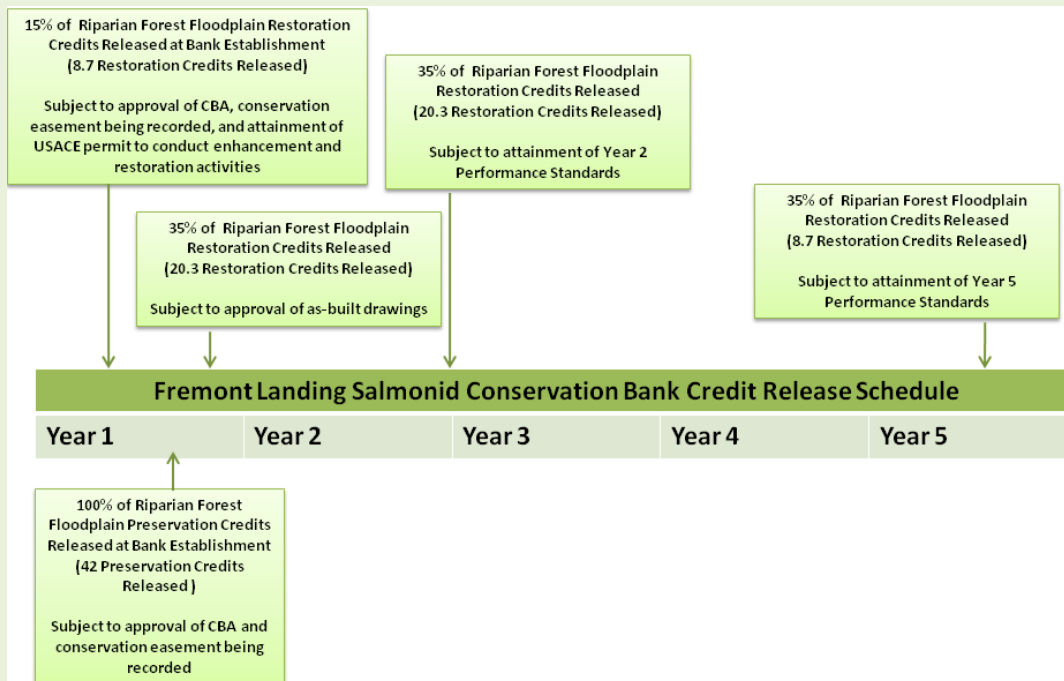


Figure 10. Young salmonids in ditches along levees on River Ranch



Before the creation of the Fremont Landing Salmonid Conservation Bank, the first federally-approved conservation bank for Salmonids, the young often got trapped in ditches along the northern part of the River Ranch property.

Figure 11. Timeline for the release for sale of Fremont Landing Salmonid Conservation Bank Credits



The most tangible, direct benefit to River Ranch from creating and maintaining species and wetlands banks on the property is an economic one. While demand for mitigation credits fluctuates dramatically and is correlated with economic growth in the region, in a good year (see, for example, 2008 in Figure 12), mitigation activities account for more than half of the profit stream from the ranch.

During the economic downturn, sales dropped significantly, largely as a result of a loss of private mitigation clients. Mitigation continued to be responsible, however, for more than 50 percent of the Ranch's profits. In general, mitigation payments help to support the farming activities on the ranch by providing financial capital for investment in tractors, irrigation systems, and other farm investments with high fixed costs. Perhaps most importantly, they are an extension of the historical practice of diversification of activities to minimize risk; while demand for mitigation fluctuates, the prices of credits tend to be stable and high. In a year where a particular agricultural market is weak (such as the dairy market in 2010 which caused a subsequent drop in hay prices), mitigation activities provide a significant amount of supplementary revenue and make the ranch as a whole less vulnerable to economic fluctuations than more traditional farms.

The primary ecological benefits that have resulted from adopting PES schemes on River Ranch have been increased species diversity and improvements in water management and water quality. A visit to River Ranch is a visit to a truly integrated landscape. Above and beyond the benefits to the targeted species, many other species benefit from the landscape; hawks fly overhead, jackrabbits scurry around beneath elderberry bushes, and sheep graze in

Table 1. Number and type of species bank credits sold by year

Year	VELB Credits Sold	Fremont Landing Salmonid Conservation Bank Credits Sold
2005	172.40	
2006	190	
2007	230.73	1.352
2008	747.90	8.865
2009	263.60	0.242
2010		0.10

Box 1. Planning for the future in Yolo County, California

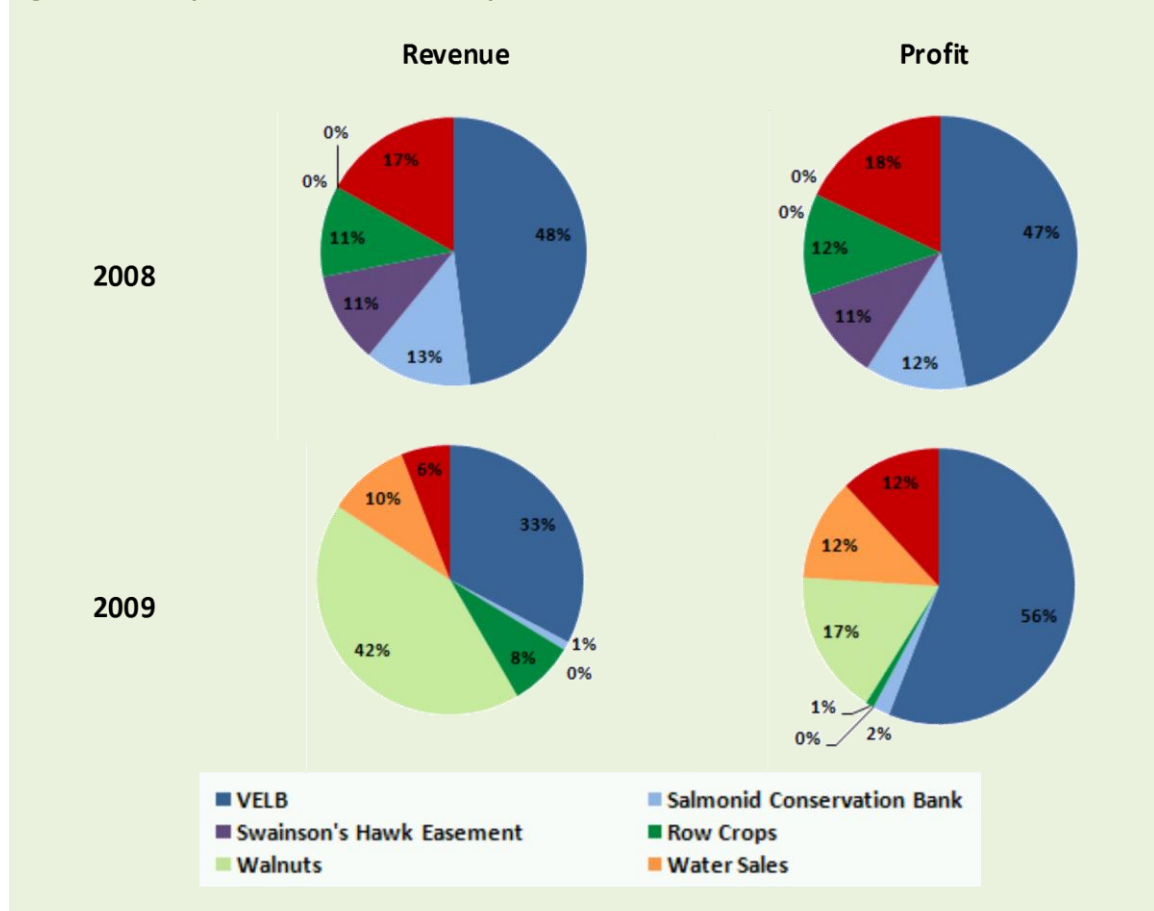
In order to integrate planning for compliance with federal and state regulations as Yolo County continues to develop over the next several decades, they have pioneered the development of a county-wide Habitat Conservation Plan (HCP) which will satisfy regulatory requirements under the ESA, CESA, and California Natural Community Conservation Planning Act (NCCPA) (LSA Associates, Inc., 2009). In the year 2000, the United States Fish and Wildlife Service adopted a new policy that helps landowners and governments develop a Habitat Conservation Plan (HCP) that will meet Section 10 requirements for an “incidental take” permit. In order to achieve compliance under Section 10 of the ESA and Section 2835 of the NCCPA, Yolo County is developing an HCP that details how they will implement and monitor conservation goals for threatened and endangered species.

Upon approval, this 50-year plan will allow for the incidental take of endangered species if the plan provides for the habitat protection, conservation measures, and mitigation of adverse effects, and the monitoring, funding, and implementation of activities that are proposed. The joint production of habitat and agricultural crops (i.e. Swainson’s Hawk using crops as foraging habitat) is central to the argument that Yolo County landscapes will continue to satisfy habitat requirements for threatened and endangered species. As such, a Habitat Conservation Plan that convincingly argues that agricultural landscapes satisfy these requirements will provide for county-level compliance. It will also provide an even clearer legal link between agricultural production and the conservation of habitat, as the county will be required to implement policies and create incentives for farmers and developers alike that satisfy the requirements of the HCP. This could occur through local ordinances and subsidies for management of agricultural land to support threatened species, through technical extension education that better prepares farmers to manage their land for habitat benefits, and through additional opportunities for private mitigation in the region.

hayfields. Bird diversity, in particular, benefits from hedgerows, and the vegetation associated with the Wetlands bank, the VELB species bank, and the Salmonid bank areas.

River Ranch is continually improving upon its land management model. In addition to species and conservation banking, the Ranch is creating wildlife corridors and hedgerows to improve overall biodiversity on the ranch. Together with riparian zones and wetlands, hedgerows around irrigation ditches will likely decrease the amount of soil erosion, as well as increasing the infiltration time and lowering the volume of pesticides, herbicides and nutrients leaving the property. These are important co-benefits to the ranch of implementing banking projects, particularly at a time with increasing constraints on water quality and quantity, and additional conservation measures are expected.

Figure 12. Composition of revenue and profit at Sacramento River Ranch, 2008-2009



As a conservation-minded, for-profit business with a great deal of experience in combining land management with species and ecosystem banking, Wildlands has learned many lessons through undertaking projects in distinct locations and on many different scales. River Ranch is a prime example of how environmental markets can be coordinated to complement agricultural production. In this respect, there is a role for River Ranch in the transfer of knowledge about the business of banking to farms in the area that might be well suited to develop such projects.

SCALING UP: CHALLENGES AND OPPORTUNITIES

There are several noteworthy challenges to involving area farmers in payment for ecosystem service schemes. Even in a county that is well aware of the need to integrate conservation initiatives with agriculture and is working to develop a plan to take these actions to the county level, the barriers to entry and implementation that go along with the majority of PES activities undertaken at River Ranch are significant. Most require, first and foremost, the existence of a market for an ecosystem service that coincides with property characteristics.

While mitigation markets have boomed in the Sacramento area during years of strong economic growth, the last few years have shown weak markets for mitigation as a result of the economic downturn.

Second, area farmers may lack experience in ecosystem service management and may not have enough market information to evaluate the potential for banking projects. Most projects require a team of lawyers, ecologists, and planners to navigate the process of submitting to a bank for approval, and the financial investment required to assemble this team is prohibitive for most farmers. In addition to high transaction and personnel costs, the fixed costs associated with constructing a bank or fine-tuning the landscape for the species/service being targeted can be overwhelming. Finally, the monitoring and performance standards, which include the mandatory establishment of an ongoing management endowment, are stringent.

In addition to these formidable barriers, the traditional farming business model in the area may make these projects slow to catch on. One important characteristic of most of the banking adopted by River Ranch is that the land is committed to perpetual management as a wetland or species bank. Despite banking being a diversification of activities, River Ranch is giving up the future option value of doing anything else with this land once it is committed to banking. This type of commitment to manage land in perpetuity for conservation, which Wildlands prides itself on, could be a hard sell to farmers who might want to retain the option of selling a parcel of land for development, building a shed, or continued cultivation in response to market signals.

Of the activities on the River Ranch property, the one that holds the most potential for adoption by other area farmers, and indeed has been adopted by some, is the Swainson's Hawk Conservation Easement. This project has the fewest barriers to entry and could be most easily adopted, as it is merely a commitment to crop a combination of already widely cultivated field and row crops. It does not require establishing specialty habitat and meeting stringent performance standards.

The River Ranch example sheds light on the types of policies that will be necessary to encourage adoption of payments for ecosystem service schemes around the country. First, farmers will need knowledge and guidance. Second, farmers will need access to finance to help cover the high fixed costs associated with establishing these types of schemes. One important barrier, at present, is that federal money cannot be directed toward establishment of private PES schemes, which means that most farmers are on their own financially. The alignment of federal and county-level legal, educational, and financial incentives will be the

most important tool to aid in helping farmers to diversify to conservation and banking activities. The task at hand is to make adoption of elements of the River Ranch model more feasible for a willing farmer without 20 years of experience in habitat banking and conservation. The River Ranch example shows clearly how crucial Wildlands' experience and knowledge is to the success of River Ranch, and suggests that there may be a role, at least in the case of species banking, for investment in extension or government assistance in helping farmers evaluate and bring potential projects to fruition.

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GLOSSARY

404 Wetlands Bank		A wetland that has been restored, established, enhanced, or preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 of the Clean Water Act
BDCP	Bay Delta Conservation Plan	A plan that will identify a set of water flow and habitat restoration actions to contribute to the recovery of endangered and sensitive species and their habitats in California's Sacramento-San Joaquin Delta that is being prepared through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties. The goal of the BDCP is to provide for both species/habitat protection and improved reliability of water supplies.
CBA	Conservation Bank Agreement	An agreement whereby a landowner contracts with the USFWS to protect and manage their land for one or more species.
CESA	California Endangered Species Act	States that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved. CESA also allows for take incidental to otherwise lawful development projects, and emphasizes avoidance of potential impacts to rare, endangered, and threatened species and development of appropriate mitigation planning to offset impacts on listed species.
Conservation Easement		A conservation easement is a legally-binding land preservation agreement between a private landowner and a government agency or a land trust. It restricts the types of activities that can occur on the land, even though it remains the private property of the landowner.
CWA	Clean Water Act (1972)	Targets pollution of waterways and specifies how wastewater and polluted runoff should be managed. The broader scope includes restoration and maintenance of the quality of waterways so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

ESA	Endangered Species Act (1973)	Protects and provides for the recovery of species listed as threatened or endangered and the habitat upon which they depend. Administered by the USFWS and the National Marine Fisheries Service (NMFS).
HCP	Habitat Conservation Plan	Approval of an HCP allows for a landowner or other entity to receive a permit to “take” species listed as threatened or endangered under the ESA as long as the activities that cause the “take” are otherwise legal. HCPs include an assessment of the likely impacts on the species from the proposed action, the steps that the permit holder will take to minimize and mitigate the impacts, and the funding available to carry out the steps.
“Incidental take”		The “take” of a threatened or endangered species under the ESA that occurs as a result of private, non-federal entities undertaking otherwise lawful projects. A permit under Section 10 is necessary to engage in “incidental take,”
NCCPA	Natural Community Conservation Planning Act	A California state Act which authorizes the Natural Community Conservation Plan program, and allows communities to use an ecosystem approach to conserve natural communities at the ecosystem scale while accommodating compatible land use (e.g. development, agriculture).
PES	Payments for Ecosystem Services	Any scheme whereby landholders receive an incentive in exchange for the provision of a benefit provided by nature.
Species Bank		Species banks maintain and manage a certain amount of habitat for one or more species, and are usually created to provide endangered species mitigation credits for internal use or for sale to outside parties.
“Take”		“To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect (a species listed as threatened or endangered under the ESA) or attempt to engage in any such conduct.” (cite)
USACE	US Army Corps of Engineers	The federal agency responsible for, among other things, flood control; the construction of dams, canals, and weirs; and Section 404 of the CWA that regulates wetland habitat.

USFWS	United States Fish and Wildlife Service	Federal agency that is responsible for implementing the ESA for terrestrial and freshwater species
Weir		A low dam used to control or divert the flow of a stream or river