

Section 6. Socioeconomic Implications

ANALYTICAL FRAMEWORK

This economic analysis focuses on evaluating two kinds of effects associated with establishing a riparian corridor along the Sacramento River: changes in regional economic activity and fiscal conditions, and changes in resource costs and benefits. Regional economic analysis measures changes in economic activity within a particular geographic region stemming from changes in within-region production of goods and services. This type of analysis, which focuses on changes in employment and personal income, typically includes the initial direct effect of a change in production plus the secondary indirect and induced multiplier effect (indirect impacts on input industries and induced impacts from household spending of labor income). The regions for the regional economic impact analyses are the counties where the direct impacts are expected to occur (Butte, Colusa, Glenn, and Tehama).

Habitat restoration would affect agricultural production and businesses that provide recreation services in each of the four counties. In addition, the restoration activities would affect businesses that provide landscape and agricultural services. The regional economic analysis focuses on how production changes in these sectors of the economy affect countywide economic activity and fiscal conditions. This analysis is depicted in Figure 6-1.

Analysis of resource costs and benefits measures the change in economic welfare or value to producers and consumers that would be affected by establishment of a riparian corridor. This type of analysis typically focuses on changes without consideration of where the effects occur. For this type of analysis, value to consumers is measured in terms of their willingness-to-pay for a change in resource conditions, whereas value to producers can be approximated by the change in net income or profits. Key resource cost and benefit topics for this assessment include the loss in net profits to farmers, the avoided flood control costs to farmers and government agencies, and the gain in benefits to recreationists.

In addition to changes in value to persons directly affected by the habitat restoration activities, some people can derive value from a change in resource conditions without ever using the resource. For example, individuals may be willing to pay to preserve their option to use a resource at some later date. This value is known as option value. Some individuals may be willing to pay money just to know that a resource such as the Grand Canyon exists, even if they have no intention of ever visiting it. This value is known as existence value. Lastly, some people may be willing to pay something to ensure that a unique resource is available for future generations to enjoy; this is referred to as bequest value.

Why analyze both resource costs and benefits and regional economic activity? Typically, it is important for federal agencies to conduct benefit-cost analyses in an attempt to maximize net benefits to society. An evaluation of societal net benefits (i.e., total benefits minus costs) of a proposed action is often used as a decision criterion. Regional analyses provide valuable information concerning the significance of changes in the regional economy or fiscal conditions. Decision makers need to know the impact of a project on a regional economy to avoid negative impacts for a region with a limited economic base.

Different analytical frameworks can be used to present results of the economic analyses. Deciding on the appropriate framework often depends in large part on the availability of data to conduct the analysis. Cost-effectiveness analysis can be used when a specific project outcome is predetermined and the analytical objective is to determine the least costly way to achieve the objective. A more comprehensive approach that involves equal consideration of economic costs and benefits is benefit-cost analysis. Benefits reflect the increased value of market goods and services and non-market goods and services (e.g., recreation, aesthetic, and cultural values). Benefit-cost analysis is commonly summarized in the form of a ratio, with a ratio of 1 or more indicating the positive economic outcome of an action.

A formal benefit-cost analysis of establishing a riparian corridor has not been conducted for several reasons. First, important components of costs and benefits, such as the value that the public places on changes in habitat conditions and the corresponding effects on the status of listed species, could not be estimated reliably on the basis of existing data and available resources. Moreover, the level of uncertainty regarding certain effects—such as the benefits of restoration to persons involved in recreation—is believed to be high. Lastly, there is considerable uncertainty regarding the scientific basis for predicting biological (and economic) effects over the long term.

Accordingly, a hybrid analysis that includes assessing changes in some of the key economic measures, such as potential loss in net income to farmers and changes in economic activity and fiscal conditions in the local/regional economy, has been conducted. This type of analysis is intended to provide decision makers with insight into the relative magnitude and trade-offs of predicted economic and fiscal changes associated with the habitat restoration. The analysis adopts a “snapshot” approach of annual effects at the end of a 30-year period; potential interim effects are discussed more qualitatively.

EFFECTS ON THE LOCAL ECONOMY AND FISCAL CONDITIONS

This section addresses the objectives and key assumptions, baseline conditions, and results of analyses conducted for agricultural resources, recreation, site monitoring, the regional economy, and fiscal conditions.

Agricultural Resources Effects

Objectives and Key Assumptions

The objective of the agricultural resources analysis is to address the following questions:

- How much farmland will be displaced?
- How will county crop production levels change?
- How will county crop production values change?

The analysis provides an estimate of the direct effect on agriculture in Butte, Colusa, Glenn, and Tehama Counties measured as acres of cropland converted and loss of production value. The change in agricultural production was used in part to estimate changes in employment, income, and property tax revenue (described elsewhere in Section 6). Appendix A provides a discussion of the methods and data sources used in this analysis.

Agricultural Production Rates and Values. Agricultural production rates were based on county averages as reported in the annual crop reports for Butte, Colusa, Glenn, and Tehama Counties from 1991 to 2000. The crop production rates used in the analysis reflect a 10-year average. No adjustments were made to crop production rates for lands within the study area. Interviews with farmers and review of soil surveys gave no clear indication that production rates should be adjusted upward or downward for crops grown within the riparian corridor.

Production values were also based on county averages as reported in the annual crop reports. The annual per unit production value for each crop was adjusted to 2000 dollars based on the Producer Price Index for farm products (U.S. Bureau of Labor Statistics 2002). After this adjustment, the production values for each crop type were averaged for the 1991 to 2000 period.

Land Use. Land use within the study area was based on California Department of Water Resources (DWR) land use maps for Butte, Colusa, Glenn, and Tehama Counties (California Department of Water Resources 1998, 1999) (see Figure 4-3). Although some land uses may have changed since the maps were published by DWR, the maps are considered the most up to date and accurate representation of the acreage and mix of crop types within the study area.

Baseline Conditions

Butte County. The total value of agricultural production in Butte County in 2000 was \$291.4 million; approximately 480,000 acres of cropland were harvested. Butte County's top five farm commodities, excluding timber, were rice, almonds, walnuts, prunes, and peaches. The combined value of these crops was approximately \$236.2 million.

Approximately 4,900 acres in the study area are under crop production (Table 6-1). Crops grown within the study area include deciduous fruits and nuts (e.g., prunes, almonds, and

walnuts), field crops (e.g., safflower, sugar beets, sunflower), grain and hay (e.g., oats, miscellaneous grains), and truck crops (e.g., beans and melons) (Figure 4-3). Approximately 4% of the deciduous fruits and nuts, 30% of the vegetable crops, and less than 1% of the field crops grown in Butte County are grown in the study area.

The estimated annual value of crops grown within the Butte County portion of study area is \$5.6 million (Table 6-1). This represents approximately 2 % of the total annual value of agricultural production for Butte County.

Colusa County. The total value of agricultural production in Colusa County in 2000 was \$345.9 million; approximately 480,000 acres of cropland were harvested. Colusa County's top five farm commodities were rice, tomatoes, almonds, onions for seed, and livestock. The combined value of these commodities was approximately \$256.2 million.

Approximately 1,700 acres in the Colusa County portion of the study area are under crop production (Table 6-2). Crops grown within the study area include deciduous fruits and nuts (e.g., prunes, almonds, walnuts), field crops (e.g., safflower, dry beans), grain and hay, and truck crops (e.g., melons, tomatoes) (Figure 4-3). Approximately 4% of the deciduous fruits and nuts, less than 1% of the vegetable crops, and less than 1% of the field crops grown in Colusa County are grown in the study area.

The estimated annual value of crops grown within the study area is \$2.2 million (Table 6-2). This represents less than 1% of the total annual value of agricultural production for Colusa County.

Glenn County. The total value of agricultural production in Glenn County in 2000 was \$286.7 million; approximately 460,000 acres of cropland were harvested. Glenn County's top five farm commodities were rice, dairy products, almonds, prunes, and livestock. The combined value of these commodities was approximately \$197.7 million.

Approximately 5,100 acres in the Glenn County portion of the study area are under crop production (Table 6-3). Crops grown within the study area include deciduous fruits and nuts (e.g., prunes, almonds, walnuts, miscellaneous), field crops (e.g., safflower, corn, dry beans, sunflower), grain and hay, and truck crops (e.g., melons) (Figure 4-3). Approximately 9% of the deciduous fruits and nuts, 2% of the vegetable crops, and less than 1% of the field crops grown in Glenn County are grown in the study area.

The estimated annual value of crops grown within the study area is \$6.8 million (Table 6-3). This represents approximately 2.5% of the total annual value of agricultural production for Glenn County.

Tehama County. The total value of agricultural production in Tehama County in 2000 was \$110.7 million; approximately 58,000 acres of cropland were harvested. Tehama County's top five farm commodities were fruits and nuts, livestock and poultry, pasture and range, field crops, and apiary products. The combined value of these commodities was approximately \$108.5 million.

Approximately 5,400 acres in the Tehama County portion of the study area are under crop production (Table 6-4). Crops grown within the study area include deciduous fruits and nuts (e.g., prunes, almonds, walnuts), field crops (e.g., safflower, corn, dry beans, sunflower), grain and hay, and truck crops (e.g., melons) (Figure 4-3). Approximately 28% of the deciduous fruits and nuts, all of the vegetable crops, and 5% of the field crops are grown in the study area; 2% of the pasturage occurs in the study area.

The estimated annual value of crops grown within the study area is \$6.8 million (Table 6-4). This represents approximately 6% of the total annual value of agricultural production for Tehama County.

Results of Analysis

The combined loss in annual agriculture production for Butte, Colusa, Glenn, and Tehama Counties attributable to establishment of the riparian corridor is approximately \$11.5 million. This represents approximately 1% of the combined value of agricultural production for the four counties. The combined loss in lands currently under agricultural production is approximately 9,390 acres. Approximately 6,505 acres (69%) of the agricultural land that will be converted as part of the restoration efforts are orchards (e.g., walnuts, almonds, prunes). The loss of production from these orchards represents nearly 90% of the combined loss in agricultural production attributable to the restoration project.

Butte. Agricultural production occurring on approximately 2,593 acres within Butte County would be displaced (Table 6-5). The corresponding loss in production value is approximately \$2.5 million. The loss in production represents less than 1% of the total value of agricultural production in Butte County in 2000.

Walnuts (\$1.5 million) followed by almonds (\$490,000) and unspecified grain and hay crops (\$232,000) are the crops expected to experience the greatest loss in production value. Unspecified grain and hay crops would experience the greatest loss in acreage (1,037) followed by walnuts (825 acres), and almonds (272 acres) (Table 6-5).

Colusa. Agricultural production occurring on approximately 948 acres within Colusa County would be displaced (Table 6-6). The corresponding loss in production value is approximately \$1.2 million. The loss in production represents less than 1% of the total value of agricultural production in Colusa County in 2000.

Walnuts (\$744,580) followed by prunes (\$351,964) and truck crops (\$51,062) are the crops expected to experience the greatest loss in production value. Walnuts would also experience the greatest loss in acreage (554), followed by prunes (253). No other loss of any specific crop type would exceed 50 acres. (Table 6-6).

Glenn. Agricultural production occurring on approximately 2,697 acres within Glenn County would be displaced (Table 6-7). The corresponding loss in production value is

approximately \$3.8 million. The loss in production represents approximately 1.4% of the total value of agricultural production in Glenn County in 2000.

Prunes (\$1,841,611) followed by walnuts (\$1,565,866) and almonds (\$286,171) are the crops expected to experience the greatest loss in production value. Walnuts would experience the greatest loss in acreage (1,262) followed by prunes (990) and almonds (210). No other loss of any specific crop type in Glenn County would exceed 100 acres. (Table 6-7).

Tehama. Agricultural production occurring on approximately 3,153 acres within Tehama County would be displaced (Table 6-8). The corresponding loss in production value is approximately \$4.0 million. This loss represents approximately 3.5% of the total value of agricultural production in Tehama County in 2000.

Walnuts (\$1,864,047) followed by prunes (\$1,162,196) and almonds (\$191,718) are the crops expected to experience the greatest loss in production value. Walnuts would also experience the greatest loss in acreage (1,357), followed by prunes (618) and alfalfa and alfalfa mixture pasture (433) (Table 6-8).

Recreation Effects

Objectives and Key Assumptions

With establishment of a riparian corridor, recreation activity in the study area is expected to increase as fish and wildlife resource conditions improve. The assessment of recreation effects focused on estimating potential changes in recreation use and spending levels in the study area associated with the habitat restoration. The objective of the recreation effects assessment is to answer the following questions:

- What are the effects on recreation activity levels?
- What changes in recreation-related spending can be expected?

In addition to addressing these two questions, the effects of changes in recreation spending on employment and income at the county level were evaluated. The results of this assessment are presented in *Regional Economic Effects* later in this section.

The assessment was based on first estimating current recreation use and spending levels associated with recreation resources potentially affected by the program. These resources include the Sacramento River between Red Bluff and Colusa as well as wildlife observation and waterfowl hunting activities at National Wildlife Refuges (NWRs) and Wildlife Management Areas (WMAs) adjacent to the study area: Sacramento NWR, Colusa NWR, Delevan NWR, and Gray Lodge WMA. Future (2030) use levels, both with and without establishment of a riparian corridor, were then projected. With-project conditions focused on the effect on fishing activity

that would result from doubling catch rates in the Sacramento River. The doubling of natural production of salmon and steelhead trout resources was identified as a state goal as early as 1988 in Senate Bill 2261, the Salmon, Steelhead Trout, and Anadromous Fisheries Program Act. This fisheries enhancement is also an underlying goal of riparian habitat restoration along the Sacramento River (Upper Sacramento River Fisheries and Riparian Habitat Advisory Council 1989).

The following key assumptions were made for the assessment of recreation effects:

- Between 1981 and 2000, use levels for activities other than fishing along the Sacramento River have increased at a rate consistent with statewide population changes.
- Future demand for recreation at potentially affected recreation areas in the study area will increase consistent with population growth rates.
- Access and recreation facilities within the study area will remain similar to current conditions and will not constrain future demand.
- Sportfishing opportunities associated with establishment of the riparian corridor will increase at a rate consistent with the doubling of catch rates observed between 1991 and 1994.

It is recognized that other programs and projects not associated with restoration of riparian habitat would contribute to achieving the goal of doubling catch rates on the Sacramento River. However, for purposes of this analysis, the effects of doubling catch rates are assigned to the establishment of riparian corridor.

Baseline Conditions

The section of the Sacramento River between Red Bluff and Colusa is about 100 miles in length. According to surveys conducted by DWR in 1980, the primary activities occurring along this stretch of the river are “just relaxing” and fishing. Other important activities include rafting/tubing, pleasure boating, picnicking, camping, and swimming/beach use. Key recreation facilities and access areas are identified in the 1982 DWR study (California Department of Water Resources 1982) and in a 1994 report prepared by California Department of Parks and Recreation (1994).

The reestablishment of a riparian corridor is expected to enhance fish and wildlife resources within the four-county study area. Recreation activities that would be expected to benefit directly from enhanced fish and wildlife resources include fishing, wildlife observation, and hunting. Table 6-9 shows estimates of current use levels for these and other recreation activities along the Sacramento River, and current use levels for wildlife observation and waterfowl hunting at the four NWRs and WMAs adjacent to the study area. As shown, an estimated 87,160 angler days occurred on the Sacramento River between Red Bluff and Colusa

in 2000. Of these, about 42% represented persons residing outside the study area. An estimated 738,530 other days of recreation activity occurred along the Sacramento River between Red Bluff and Colusa in 2000.

In addition to hunting at NWRs, considerable hunting activity occurs at private clubs near the study area. According to a DFG study (1992), an estimated 935,000 hunter days occurred throughout the Sacramento Valley in 1992. Some of this activity occurs at private clubs in the four-county area, particularly in Butte, Colusa and Glenn Counties.

Spending related to participation in recreation activities along the Sacramento River and at NWRs and WMAs is shown in Table 6-10. Tehama County accounts for the largest share of spending, primarily because significant recreation activity occurs directly upstream and downstream of the Red Bluff Diversion Dam. Nonresidents of the county generate most of the recreation-related spending in Tehama County. Considerable recreation activity also occurs near Colusa; this use contributes to recreation spending in the local economy as well as to use of the NWRs in the county.

Results of Analysis

The results of the recreation effects assessment are presented in Table 6-10. The change in estimated annual spending under future without-restoration conditions (2030) represents the effect of projected population growth and its corresponding effect on recreation activity and spending levels. Spending levels are projected to increase by about 48% over the 30-year period (2000–2030) as a result of population growth.

Restoration-related changes represent the effect on recreation activity and spending of doubling catch rates in the Sacramento River. The effect of doubling catch rates is greatest in Tehama County (\$438,500), followed by Colusa County (\$380,500), Butte County (\$118,900), and Glenn County (\$50,500). With the exception of spending changes in Butte County, non-residents of the counties account for most of the restoration-related change in spending.

In addition to increased angler activity and spending, the expansion of the riparian corridor is expected to improve wildlife habitat and result in enhanced populations of waterfowl and other species that use the riparian corridor. This effect would be expected to improve opportunities for hunting and other wildlife-related recreation activities in the study area. Although these opportunities can not be quantified in additional visitor days, recreation spending associated with wildlife-related activities can be expected to increase.

Site Monitoring Effects

Objectives and Key Assumptions

Habitat restoration activities are typically grouped into three categories: 1) site preparation and planting, 2) maintenance, and 3) monitoring. A key socioeconomic component of habitat restoration is the expenditures associated with these activities and the direct and indirect effects of these expenditures on the local economy. The objectives of the habitat restoration portion of this socioeconomic study are to address the following questions:

- How much is spent to establish and maintain habitat?
- How much is spent to monitor restored sites?

Of the three habitat restoration categories, site preparation is the most expensive. Site preparation and planting includes the costs of completing a site assessment and plan, clearing land, preparing the site, installing irrigation, purchasing and planting vegetation, and managing the project (site preparation does not include the costs of environmental documentation and permits). These one-time costs are estimated at \$2,400 per acre. After site preparation, the maintenance phase lasts 2–3 years. Maintenance can entail intensive management, such as weed control and irrigation, to help plants survive. Typical costs for this phase are \$500–\$750 per acre per year. The site-monitoring phase begins once the planting has been completed. This phase is typically limited to site visits and is estimated to cost \$20 per acre annually (Myers pers. comm.; based on 10 years of Sacramento River Project experience).

For this economic analysis, the only expenditures associated with the restoration process being considered are those related to site monitoring. Because the analysis focuses on conditions in 2030, and most of the restoration and maintenance activities are expected to occur in the first 20 years of the analysis time frame, establishing and maintaining habitat have not been considered an ongoing activity in 2030. Establishment and maintenance spending is addressed in the Interim Effects section.

Baseline Conditions

Baseline conditions for this analysis are described in *Agricultural Resources Effects* above. The lands subject to site monitoring in the future are currently in agricultural production. The number of acres to be converted (and therefore monitored) in each county are listed in Table 5-1.

Results of Analysis

At \$20 per acre, site-monitoring activities will result in \$187,800 in spending within the four-county area in 2030 (in year 2000 dollars). Table 6-11 shows the site monitoring expenditures that would occur in each of the four counties. These are direct benefits of site monitoring; they do not include indirect benefits, which are analyzed in the regional analysis described below. The direct benefits include the annual expenditures that will be made in each county.

Table 6-11. Site-Monitoring Expenditures

County	Acreage to be Restored	Site-Monitoring Expenditures for 2030 (year 2000 dollars)
Butte	2,593	\$ 51,860
Colusa	948	\$ 18,960
Glenn	2,696	\$ 53,920
Tehama	3,153	\$ 63,060
Total	9,390	\$187,800

Regional Economic Effects

Objectives and Key Assumptions

This section describes the regional economic effects of agricultural land conversion and development of a riparian corridor. Regional economic effects are divided into three categories: agriculture, recreation, and habitat restoration. Within each of these categories, the economic effects for Butte, Colusa, Glenn, and Tehama Counties are described. The objective of the regional analysis is to address the following questions:

- How will changes in crop production affect employment and income at the county level?
- How will changes in recreation activity and spending affect employment and income at the county level?
- How will habitat establishment, maintenance, and monitoring affect employment and income at the county level?

The IMPLAN model was used to evaluate regional economic effects. IMPLAN is a regional economic software model that describes flows from producers to intermediate and final consumers using a series of economic multipliers. The IMPLAN model describes, for each county, the transfers of money between all industries and institutions. This model of county-level economic interactions is used to predict, using input-output multipliers, total regional

activity based on a change in expenditures. A more detailed discussion of the IMPLAN model and the assumptions upon which it is based are included in Appendix B.

In addition to the direct loss in agricultural output, reduced expenditures occur from a drop in business-to-business purchases and in reduced household purchases. These are also known as indirect and induced economic effects and can be estimated using IMPLAN.

When creating a new project within IMPLAN, it is necessary to define the study area. For this analysis, the economic study area has been defined as the boundary of each of the four counties. The county-wide area was selected because agricultural land conversion and subsequent habitat restoration have economic effects throughout the county in which it occurs.

For this analysis, the following changes in expenditures were input into IMPLAN:

1. the increase in habitat restoration expenditures,
2. the decrease in agricultural expenditures, and
3. the increase in recreational expenditures.

Based on changes in expenditures, IMPLAN predicts the effects on several economic parameters. For this analysis, effects on employment and personal income within each county are described.

Table 6-12 shows existing economic conditions for the four-county area in terms of employment and personal income.

Table 6-12. Existing Economic Conditions in the Four County Area

County	Existing Conditions (2000)	
	Employment	Personal Income
Butte	101,367	\$4,549,105,000
Colusa	10,669	\$453,506,000
Glenn	11,851	\$508,841,000
Tehama	<u>23,453</u>	<u>\$1,089,470,000</u>
Total	147,340	\$6,600,922,000

Source: U.S. Department of Commerce 2002

Agriculture

Baseline Conditions. The agricultural analysis is based on the assumption that establishment of a riparian corridor will remove 9,390 acres of agricultural lands from production by 2030. The breakdown of that acreage by county is summarized in Table 5-1.

Agricultural impact IMPLAN runs were conducted for each of the four counties. The reduction in agricultural production (in year 2000 dollars) by crop type or category was entered into the model.

Results of Analysis. Table 6-13 shows the number of direct plus indirect and induced jobs that would be lost by removing agricultural lands from production within each county. The results shown are the incremental losses from existing (year 2000) conditions to 2030 conditions. (The agricultural analysis also represents the incremental economic impacts of 2030 conditions with and without the habitat restoration project; it assumes that, in the absence of the restoration, no changes would occur to the agricultural land between 2000 and 2030.) Removal of 9,390 acres of agricultural land from production would cause a permanent reduction of 228 jobs. Of these, the largest number would occur in Tehama County, where 71 direct and 25 indirect/induced jobs would be lost. Glenn County has the second highest direct job loss, the second highest total job loss, and the highest loss of indirect/induced jobs. The total agricultural job loss for the four-county area equals less than 0.15% of the existing jobs in these counties (see also Table 6-12).

Table 6-13. Direct Plus Indirect/Induced Job Losses Resulting from Reduced Agricultural Expenditures

County	Jobs		Total Jobs
	Direct	Indirect + Induced	
Butte	(23)	(26)	(49)
Colusa	(10)	(9)	(19)
Glenn	(30)	(36)	(66)
Tehama	(71)	(25)	(96)
Total	(133)	(95)	(228)

Table 6-14 shows the reduction in personal income that would be associated with the lost agricultural jobs. The loss of 228 jobs would reduce total personal income in the four-county area by \$7,501,080 in 2030 (in year 2000 dollars). The largest drop in personal income would occur in Tehama County, followed by Butte and Glenn Counties. The total reduction in personal income would equal 0.09% of existing (year 2000) total personal income in the four counties.

Table 6-14. Direct Plus Indirect/Induced Reduction in Personal Income Resulting from Reduced Agricultural Expenditures

County	Personal Income		Total Impacts
	Direct	Indirect + Induced	
Butte	(1,059,742)	(598,238)	(1,657,980)
Colusa	(405,951)	(179,785)	(585,736)
Glenn	(1,487,947)	(583,990)	(2,071,937)
Tehama	(2,623,491)	(561,936)	(3,185,427)
Total	(5,577,131)	(1,923,949)	(7,501,080)

A closer look at the economic impacts shows that within each county, several industries would be most affected by the indirect and induced impacts of reduced expenditures. Those industries include the agricultural service industry, agricultural equipment supply, agricultural equipment maintenance and repair, motor freight transport and warehousing, general merchandise stores, food stores, eating and drinking establishments, banking, miscellaneous retail, real estate, insurance, computer and data processing equipment, doctors and dentists, hospitals, legal services, and accounting services.

Recreation

Baseline Conditions. IMPLAN was also used to evaluate the economic effects of changes in recreational spending in 2030 with and without the proposed habitat restoration program. Recreational expenditures associated with existing conditions (2000), future expenditures without restoration (2030), and future expenditures with restoration (2030) were entered into IMPLAN.

Results of Analysis. Table 6-15 shows the number of direct plus indirect and induced jobs that would be gained by the improvement in recreational opportunities associated with habitat restoration. The results shown are the incremental impacts when comparing future (year 2030) conditions without restoration to future (year 2030) conditions with restoration. Improving recreational opportunities in the study area would result in an increase of 29 jobs in 2030. The largest increase would occur in Tehama County where 14 jobs would be gained, followed by Butte County with 12 jobs, and Glenn and Colusa County with one job each.

Table 6-15. Direct Plus Indirect/Induced Job Gains Resulting from Increased Recreational Expenditures

County	Jobs		Total Job Increase
	Direct	Indirect + Induced	
Butte	1	0	1
Colusa	11	2	13
Glenn	1	0	1
Tehama	11	2	13
Total	24	4	28

Table 6-16 shows the increase in personal income associated with the 2030 recreational improvements. The gain of 28 jobs would increase total personal income in the four-county area by \$503,246 in 2030 (in year 2000 dollars). The largest increases in personal income would occur in Tehama and Colusa Counties.

Table 6-16. Direct Plus Indirect/Induced Increase in Personal Income Resulting from Increased Recreational Expenditures

	Personal Income		Total Impacts
	Direct	Indirect + Induced	
Butte	19,868	9,908	\$ 29,776
Colusa	172,755	38,870	\$ 211,625
Glenn	19,580	4,114	\$ 23,694
Tehama	183,430	54,721	\$ 238,151
Total	395,633	107,613	\$ 503,246

A closer look at the economic benefits shows that within each county, several industries would benefit substantially from the increased recreational expenditures. These include food stores, automotive dealers and service stations, eating and drinking establishments, miscellaneous retail, and hotels and lodging places.

Site Monitoring

Baseline Conditions. The site monitoring analysis is based on the assumption that 9,390 acres of agricultural land would be restored by 2030. The breakdown of that acreage by county is summarized in Table 6-11. Table 6-11 also summarizes the costs of site monitoring for each of the four counties. Site-monitoring IMPLAN runs were conducted for each county. Year 2030 site-monitoring expenditures (in year 2000 dollars) were the impacts entered into the model.

Results of Analysis. Table 6-17 shows the direct plus indirect and induced jobs that would result from site monitoring expenditures within each county. The results shown are the incremental impacts when comparing existing (year 2000) conditions to future (year 2030) conditions. (The site monitoring expenditures analysis also represents the incremental economic impacts of year 2030 conditions with and without habitat restoration; the analysis assumes that, in the absence of the restoration, no changes would occur to the agricultural land between 2000 and 2030.) Site monitoring would generate eight new jobs in the four-county region.

Table 6-17. Direct Plus Indirect/Induced Jobs Resulting from Site Monitoring

County	Jobs		Total Job Increase
	Direct	Indirect/Induced	
Butte	2	1	3
Colusa	1	0	1
Glenn	2	0	2
Tehama	2	0	2
Total	7	1	8

Table 6-18 shows the changes in personal income that would be associated with those eight jobs. The eight monitoring jobs would increase total personal income in the four-county area by \$128,302 (in year 2000 dollars). Those sectors that would benefit most from this increase in personal income include many of the retail sectors. However, the total economic impacts from site monitoring expenditures are minor relative to the total employment and personal income in each county. Additional new jobs may be generated by the restoration activities, but these have not been estimated. The restored riparian corridor may require periodic patrolling and maintenance as public use increases. Refuge land along the river may require periodic vegetation and water management. The number of jobs these activities might generate have not been determined because land management plans have not been completed.

Table 6-18. Direct Plus Indirect/Induced Personal Income from Site Monitoring

County	Personal Income		
	Direct	Indirect/Induced	Total Impacts
Butte	\$27,911	\$11,483	\$39,394
Colusa	\$10,214	\$1,929	\$12,143
Glenn	\$29,013	\$4,908	\$33,921
Tehama	\$33,972	\$8,872	\$42,844
Total	\$101,110	\$27,192	\$128,302

Fiscal Effects

Objectives and Key Assumptions

The acquisition and restoration of private lands within the study area would cause fiscal impacts on the governments of Butte, Colusa, Glenn, and Tehama Counties. These impacts would occur primarily because of the transfer of private properties to public ownership, resulting in the loss of property tax revenue for each county. Many of the parcels within the study area also generate state payments (called “subvention payments”) to the respective counties as compensation for reduced property tax payments under the state Williamson Act program. These payments to counties would end for parcels transferred to public ownership. Additionally, restoration of lands could result in losses of sales tax revenues caused by reduced taxable purchases by farm operators.

To some extent, reductions in property tax revenues and subvention payments for counties would be offset by state and federal payments in lieu of taxes for lands eventually transferred to state and federal ownership. Losses of sales tax revenues would also be offset to some extent by local taxable purchases by persons visiting the study area for recreation and by purchases for habitat-related activities.

The objective of the fiscal effects analysis was to answer the following questions:

- How will acquisition and restoration affect property tax revenues and Williamson Act subvention payments?
- How will farming displacement and habitat restoration affect sales tax revenues?
- Will state and federal payments in lieu of taxes offset property tax revenue losses?
- What will be the net fiscal impact on counties?

The fiscal impact analysis made the following key assumptions, which are discussed in more detail in Appendix C.

- Long-term inflation rate: 3% (Adams and Gallo 1999).
- Average Proposition 13 annual adjustment factor: 2%.
- Real (in excess of inflation) long-term land market appreciation rate: 0.95% (Adams and Gallo 1999).
- Current average farmland market values (per acre): almonds – \$6,500; walnuts – \$6,750; prunes – \$6,000; vegetable crops – \$3,500; irrigated field crops – \$2,400; other (range, riparian, native) – \$300. (Based on 2001 Butte County Administrative Office report on land acquisitions, modified based on information provided by other local sources as noted in Appendix C.)
- Average private property turnover rate: once every 20 years (Adams and Gallo 1999).
- All private properties acquired in fee title for restoration are transferred to state or federal ownership during the first 10 years of the study period.
- State in-lieu payment rate: 100% of state obligation.
- Federal revenue-sharing payment rate: 70.2% of authorized amount (based on actual 10-year average).
- Williamson Act subvention payment rates per acre for prime and non-prime lands remain constant over time.
- Counties and special districts receive the percentages of property tax revenues, state in-lieu payments, and federal revenue-sharing payments shown in Table 6-19 (based on county sources).

Table 6-19. Average Distribution of Affected Revenues Among County Funds, Schools Funds, and Special Districts

County/Revenue Recipient	Property Tax Revenue	Federal Revenue-sharing Payments	State Payments In Lieu of Taxes	Williamson Act Subvention Payments
Butte County:				
County funds	26%	100%	26%	100%
School funds	69%	0%	69%	0%
Special districts	5%	0%	5%	0%
Colusa County:				
County funds	25%	43%	43%	100%
School funds	59%	45%	45%	0%
Special districts	16%	12%	12%	0%
Glenn County:				
County funds	29%	29%	100%	100%
School funds	67%	67%	0%	0%
Special districts	4%	4%	0%	0%
Tehama County:				
County funds	26%	26%	26%	100%
School funds	70%	70%	70%	0%
Special districts	4%	4%	4%	0%

Sources: Rene, Garner, Haynes, Jones pers. comms.

Baseline Conditions

The existing fiscal environments of the four counties affected by establishment of the riparian corridor provided the baseline for projecting future revenues under with- and without-habitat restoration conditions (i.e., with corridor and without corridor conditions). Relevant fiscal indicators include the existing tax base and the contribution of study area properties to this tax base. Other key background information concerns the in-lieu-of-tax payment programs operated by the state and federal governments.

The following description of total county acreages differs from those contained in the description of baseline conditions and post-restoration conditions in Section 4 and 5, as well as from acreages presented in the land-based analyses earlier in this section (agricultural production). Water surface acreages were excluded in the earlier sections because the analyses were focused on conversion of land; water acres would not be affected. However, to assess the effect of property transfer and restoration on county revenues, the acres of water-surface within the study area must be included. These acres are included in each county's tax base and would be transferred along with dry land acres in land sales.

The description of land ownership in the fiscal analysis also differs from that presented earlier. TNC-owned lands were combined with public lands in the description of land conversion presented in Section 5; this was done to distinguish the agricultural lands already destined for conversion from those that are held by farmers for long-term agricultural production.

However, TNC is a non-profit entity and is considered a private owner for purposes of tax roles and assessing property taxes. Therefore, the fiscal analysis includes TNC land in the private ownership category. While these changes in designation make it difficult to compare acreage numbers between the agricultural and fiscal analyses, they provide a more accurate picture of the effects in the different analyses.

Existing County Fiscal Environment

Butte County. The portion of the study area located in Butte County comprises approximately 12,240 acres (with water surface), including 3,970 acres in public ownership. Anchored by a diverse combination of agricultural and urban properties, Butte County's property tax base exceeded \$10.3 billion in 2001 (Holland pers. comm.). Approximately 54% of the county's assessed valuation is located within incorporated areas (State Controller's Office 2001). Property tax revenue generated by properties within the study area are distributed among several county, school, and special district funds. As shown by Table 6-19, approximately 26% of property tax revenue generated by private properties within the study area is currently allocated to Butte County, including the county's general, welfare, and library funds. The County of Butte's general fund received secured property tax revenue totaling nearly \$7.0 million during fiscal year (FY) 2000-01 (Jones pers. comm.).

Based on county assessor's parcel data collected for parcels fully or partially within the study area, the average current assessed value of private land and improvements within the study area is approximately \$2,400 per acre, resulting in an estimated total assessed value of approximately \$19.9 million. This valuation annually generates an estimated \$54,200 for the county's general, welfare, and library funds based on current tax rates and revenue allocations. This amount represents approximately 0.8% of the county's FY 2000-01 general fund secured property tax revenue.

The County of Butte also receives revenue from state subvention payments made by the State of California for lands enrolled in the state Williamson Act program. Under the Williamson Act, properties enrolled in the program are taxed at their agricultural value, which is based on an income capitalization approach specified by the state that incorporates 10-year long bond yield rates, land rents, and production expenses, rather than at their market value. Assessed values of Williamson Act properties are generally substantially lower than assessed or market values of similar properties not enrolled under the Williamson Act. As opposed to non-Williamson Act properties, which are re-appraised for tax purposes only when sold or substantially improved, Williamson Act properties are re-appraised every year using the state income capitalization formula. To compensate for the revenue reduction caused by the lower assessments, counties are paid by the state at a rate of \$5 per acre for prime agricultural land and \$1 per acre for non-prime agricultural land enrolled in the program. Based on assessor's parcel data collected for parcels within or bisected by the study area boundary, approximately 42% of privately held lands in the study area are enrolled in the state Williamson Act program, generating an estimated \$10,700 in annual state Williamson Act payments to Butte County. All subvention payment revenue is assigned to the county general fund (Jones pers. comm.).

During FY 2000–01, Butte County’s general fund received approximately \$3,812,800 in sales and use tax revenue. The purchase of taxable goods and services by the study area’s agricultural operators and their employees contributes to this revenue, with 1% of the value of taxable purchases within Butte County accruing to the county general fund. Taxable purchases made within Butte County by the study area’s agricultural operators and employees, by recreationists visiting the study area, and by businesses and their employees indirectly affected by agricultural and recreational activities in the study area, currently generate an estimated \$8,300 in sales tax revenue for the county. This represents 0.3% of the county general fund’s sales and use tax revenue.

Colusa County. The portion of the study area located in Colusa County comprises approximately 6,000 acres (with water surface), including 1,000 acres in public ownership. Colusa County’s property tax base exceeded \$1.7 billion in FY 1999–00, with approximately 81% of the assessed valuation located within the unincorporated area of the county (State Controller’s Office 2001). Property tax revenue generated by the county’s tax base is shared among the County of Colusa, school districts, and numerous special districts (Table 6-19). Approximately 24% of property tax revenue generated by properties within the study area are currently allocated to the county’s general fund, with an additional 0.5% of the revenue allocated to the county’s bridge fund. The County of Colusa’s general fund received secured property tax revenue totaling approximately \$3.6 million during FY 2000–01. (Colusa County 2001.)

Based on county assessor’s parcel data collected for parcels fully or partially within the study area, the average current assessed value of private land and improvements within the study area is approximately \$2,250 per acre, resulting in an estimated total assessed value of \$11.3 million. This valuation generates an estimated \$29,500 for the county’s general fund based on current tax rates and revenue allocations. This amount represents approximately 0.8% of the county’s FY 2000–01 general fund secured property tax revenue.

The County of Colusa also receives revenue from state subvention payments made by the State of California for lands enrolled in the state Williamson Act program. Based on assessor’s parcel data collected for parcels within or bisected by the study area boundary, approximately 23% of the private acreage within the study area is enrolled in the state Williamson Act program, generating an estimated \$2,400 in state Williamson Act payments to Colusa County annually. All subvention payment revenue is assigned to the county general fund (René pers. comm.).

During FY 2000–01, Colusa County’s general fund received approximately \$818,200 in sales and use tax revenue. The purchase of taxable goods and services by the study area’s agricultural operators and their employees contributes to this revenue, with 1% of the value of taxable purchases within Colusa County accruing to the county general fund. Taxable purchases made within Colusa County by the study area’s agricultural operators and employees, by recreationists visiting the study area, and by businesses and their employees indirectly affected by agricultural and recreational activities in the study area, currently generate an estimated \$18,800 in sales tax revenue for the county. This represents 2.3% of the county general fund’s sales and use tax revenue.

Glenn County. The portion of the study area located in Glenn County totals approximately 14,400 acres (with water surface), including 5,700 acres in public ownership. Glenn County's property tax base exceeded \$1.5 billion in FY 2000–01, with approximately 77% of the assessed valuation located within the unincorporated area of the county (State Controller's Office 2001). Property tax revenue generated by the county's tax base is shared among the County of Glenn, school districts, and numerous special districts (Table 6-19). Approximately 29% of property tax revenue generated by properties within the study area are currently allocated to the county general fund (Haynes pers. comm.). The County of Glenn's general fund received property tax revenue totaling approximately \$3.1 million during fiscal year (FY) 2000-01 (Wadsworth pers. comm.).

Based on county assessor's parcel data collected for parcels within the study area, the average current assessed value of private land and improvements fully or partially within the study area is approximately \$2,900 per acre, resulting in an estimated total assessed value of \$25.2 million. This valuation generates an estimated \$73,200 for the county's general fund based on current tax rates and revenue allocations. This amount represents approximately 2.4% of the county's FY 2000–01 general fund secured property tax revenue.

The County of Glenn also receives revenue from state subvention payments made by the State of California for lands enrolled in the state Williamson Act program. Based on assessor's parcel data collected for parcels within or bisected by the study area boundary, approximately 29% of the private acreage within the study area is enrolled in the state Williamson Act program, generating an estimated \$5,000 in state Williamson Act payments to Glenn County annually. All subvention payment revenue is assigned to the county general fund (Haynes pers. comm.).

During FY 2000–01, Glenn County's general fund received approximately \$1.1 million in sales and use tax revenue (Wadsworth pers. comm.). The purchase of taxable goods and services by the study area's agricultural operators and their employees contributes to this revenue, with 1% of the value of taxable purchases within Glenn County accruing to the county general fund. Taxable purchases made within Glenn County by the study area's agricultural operators and employees, by recreationists visiting the study area, and by businesses and their employees indirectly affected by agricultural and recreational activities in the study area, currently generate an estimated \$13,000 in sales tax revenue for the county. This represents 1.2% of the county general fund's sales and use tax revenue.

Tehama County. Approximately 16,560 (with water surface) acres of the study area are located in Tehama County, including 4,130 acres in public ownership. The county is largely rural, with much of its tax base centered around its agricultural economy. The county's property tax base exceeded \$2.6 billion in FY 1999–00, with approximately 75% of the assessed valuation located within the unincorporated area of the county (State Controller's Office 2001). Property tax revenue generated by the county's tax base is shared among the County of Tehama, school districts, and numerous special districts (Table 6-19). Approximately 26% of total property tax revenue generated by private properties within the study area is currently allocated to Tehama County, including the general fund (20%) and the county's fire fund (6%). The County of

Tehama's general fund received property tax revenue totaling approximately \$5.2 million during FY 2000–01. (Garner pers. comm.)

Based on county assessor's parcel data collected for parcels fully or partially within the study area, the average current assessed value of private land and improvements within the study area is approximately \$2,300 per acre, resulting in an estimated total assessed value of \$28.6 million. This valuation generates an estimated \$74,300 for the county's general fund and fire fund based on current tax rates and revenue allocations. This amount represents approximately 1.4% of the county's FY 2000–01 general fund secured property tax revenue.

The County of Tehama also receives revenue from state subvention payments made by the State of California for lands enrolled in the state Williamson Act program. Based on assessor's parcel data collected for parcels within or bisected by the study area boundary, approximately 77% of the private acreage within the study area is enrolled in the state Williamson Act program. Of the land enrolled in the Williamson Act, 54% of the acreage is considered prime agricultural land, with the remainder designated as non-prime land. The Williamson Act acreage generates an estimated \$22,200 in state Williamson Act payments to Tehama County annually. All subvention payment revenue is assigned to the county general fund (Garner pers. comm.).

During FY 2000–01, Tehama County's general fund received approximately \$938,100 in sales and use tax revenue. The purchase of taxable goods and services by the study area's agricultural operators and their employees contributes to this revenue, with 1% of the value of taxable purchases within Tehama County accruing to the county general fund. Taxable purchases made within Tehama County by the study area's agricultural operators and employees, by recreationists visiting the study area, and by businesses and their employees indirectly affected by agricultural and recreational activities in the study area, currently generate an estimated \$18,500 in sales tax revenue for the county. This represents 2.0% of the county general fund's sales and use tax revenue.

In-Lieu State and Federal Tax Payment Programs

Lands acquired in fee simple purchase by state and federal agencies are removed from the county property tax rolls. Properties acquired by TNC are removed from the tax rolls only when a welfare exemption is taken. TNC's policy is to request a welfare exemption from property tax payments only when the acquired property is not productive and is considered a completely natural area. For example, in Butte County only one property owned by TNC has such a designation (Butte County Administrative Office 2001). While agricultural land under TNC ownership is likely to remain subject to property taxation in the future, lands acquired by TNC and various public entities within the study area are anticipated to be eventually transferred to state and federal ownership following the completion of restoration activities. Once transferred, properties would no longer generate property tax revenues. Lands purchased by federal/state agencies for purposes of restoration are immediately removed from the tax roles. However, assuming the private lands are purchased by or transferred to USFWS and DFG, the properties

would be eligible to generate state and federal payments in lieu of property tax payments to local governments.

California Department of Fish and Game In-Lieu Payments. Section 1504 of the California Fish and Game Code requires DFG to pay annually to counties in which wildlife areas are located fees in lieu of taxes equal to the amount of property taxes levied upon the property at the time of acquisition by the state. If the property purchased in fee is not located within a designated wildlife area, no in-lieu fees are paid. The designation of land as a wildlife area rather than a different designation such as an ecological preserve is made by the California Fish and Game Commission. (Butte County Administrative Office 2001)

Funds to cover the payments in lieu of taxes are appropriated each year to DFG by the State Legislature, which has not always provided sufficient funding for DFG's in-lieu payment obligations. In years when inadequate funds are appropriated, DFG has utilized a process by which the counties with the lowest populations are paid first, at times resulting in no or late payments to certain counties. In most cases, payments are eventually made; however, the full obligation is not always met in a timely manner. In Butte County, for example, a review of the past 10 years of claims and payments conducted by the Butte County Auditor's Office revealed that DFG payments were late or partial in 5 of the 10 years and covered approximately 94% of the county's claims over that period (Butte County Administrative Office 2001). Based on recent payment history, the state may eventually pay 100% of past outstanding claims.

The in-lieu tax claims submitted by counties to the state are based on the assessed values in effect at the time properties are acquired and the applicable tax rate for the acquired properties. Values are not adjusted over time for changes in market conditions or inflation. Thus, state in-lieu payments made on a specific parcel remain constant over time, but decrease in real value terms as inflation erodes the real value of the payments. As Table 6-19 shows, the internal allocation of state in-lieu payments received by counties differs from county to county. For example, in Glenn County state payments are assigned entirely to the county general fund, whereas in Butte, Colusa, and Tehama Counties payments are only partially allocated to the county general fund, with the remainder allocated to various school and special district agencies and funds.

During FY 2000–01, DFG made payments in lieu of taxes on properties in designated wildlife areas as follows: Butte County – \$96,400 for 21,056 acres; Colusa County – \$3,090 for 782 acres; Glenn County – \$57,410 for 6,322 acres; and Tehama County – \$21,210 for 3,715 acres (California Department of Fish and Game 2000).

U.S. Fish and Wildlife Service Revenue-sharing Payments. Like lands owned by state, county, and city governments, properties owned by the federal government are not subject to local property taxes. The federal government makes revenue-sharing payments to counties in which USFWS-administered lands are located, however, to offset property tax revenue lost as a result of federal acquisition. Counties are responsible for distributing funds to sub-units of local government that incur losses of tax revenues by reason of USFWS ownership of lands. As Table 6-19 shows, distributions to county governments ranged from 26% in Tehama County to 100%

in Butte County. Under the federal Revenue Sharing Act (Public Law 95-469), the U.S. Secretary of the Interior is authorized to pay counties in which land has been acquired in fee title the greatest of one of the following annual amounts:

- \$0.75 per acre of land acquired by USFWS in each county,
- 0.75% of the fair market value of land acquired in each county, or
- 25% of the net receipts collected by the federal government in connection with refuge operation and management in each county during each fiscal year.

Given market values for acquired lands in California, the second formula (i.e., 0.75% of the fair market value of acquired lands) is usually used to determine federal revenue-sharing payments in California. The fair market value of an acquired property is initially set at the property's purchase price. Federal regulations specify that the fair market value of fee-title lands are to be reassessed by USFWS every 5 years. Appraisals are based on current highest and best use in accordance with current zoning assuming a property is held in private ownership (Coster pers. comm.).

In most years, federal payments to counties have been less than the full amount authorized by the Revenue Sharing Act because congressional appropriations typically fall short of the maximum authorized amount. As Table 6-20 shows, revenue-sharing payments for the 1991–2000 decade ranged from a low of 50.8% in 2000 to a high of 89.6% in 1991. Over this period, revenue-sharing payments averaged 70.2%.

Table 6-20. Percent of Authorized Federal Revenue-sharing Rate Paid to Local Jurisdictions, 1991–2000 (Butte, Colusa, Glenn and Tehama Counties)

Year	Percent ^a
1991	89.6
1992	81.7
1993	77.9
1994	77.1
1995	65.7
1996	72.5
1997	66.2
1998	62.2
1999	58.0
<u>2000</u>	<u>50.8</u>
Average	70.2

^a Represents the percent of the authorized 0.75% of fair market value actually approved by Congress and paid by the U.S. Fish and Wildlife Service to counties in lieu of property taxes.

Source: U.S. Fish and Wildlife Service 2001a.

During 2000, the federal government made the following revenue-sharing payments for qualifying properties under USFWS management: Butte County – \$45,000 on 3,481 acres;

Colusa County – \$117,710 on 12,605 acres; Glenn County – \$110,250 on 11,590 acres; and Tehama County – \$52,630 on 4,080 acres (U.S. Fish and Wildlife Service 2001b). These payments represented 58.0% of the total amounts due to individual counties based on 1999 entitlements.

Results of Analysis

The fiscal assessment focused on estimating how public revenues generated by land uses within the study area would change over the 2000–2030 period with establishment of the riparian corridor. Revenues evaluated as part of the assessment included property tax revenues generated by private properties, in-lieu tax payments generated by state-owned lands, revenue-sharing payments generated by federally owned properties, state subvention payments generated by private properties under Williamson Act contracts, and sales tax revenues generated by agricultural, recreational, and habitat monitoring activities within the study area.

Revenues for individual counties were estimated for three conditions and two time periods: pre-restoration (i.e., year 2000) conditions; future (i.e., year 2030) without-restoration conditions; and future with-restoration conditions. Impacts were determined by comparing future with-restoration revenues to future without-restoration revenues for the year 2030. Unlike county-level impacts, impacts on special districts were not estimated for each potentially affected district. Instead, special district impacts were totaled across all affected districts within each county. Interim effects of the restoration were not quantified but are qualitatively discussed in *Interim Effects*, which appears later in this section. The analysis was conducted using the data sources and methods described in Appendix C.

Because the analysis focused on revenue effects, public costs potentially generated by the restoration activity were not evaluated as part of the analysis. Changes in public costs would be primarily related to the increased demand for law enforcement and emergency services generated by increased recreational use of the Sacramento River. As discussed in *Recreation Effects* above, the habitat restoration is expected to generate more recreational use of the study area, resulting in more law enforcement and emergency calls which, in turn, will increase costs for law enforcement and emergency services providers. The sheriff's departments of each county are responsible for providing law enforcement services on the Sacramento River.

In the draft version of this report, it was stated that the costs incurred by the departments to provide law enforcement services on the river are reimbursed by the California Department of Boating and Waterways, which would probably defray much of the public cost increase generated by the habitat restoration. Information provided by the County of Butte Chief Administrative Office in a letter of comment on the draft report indicates that the costs are not totally offset. The California Department of Boating and Waterways does pay for a majority of the law enforcement costs incurred on the County's lakes and rivers, but the state payments are subject to annual approval by the state legislature and are not guaranteed. Also, the County must provide a local funding match. The County estimated that its local general fund match would increase from \$41,000 in 2002 to \$56,000 in 2030 based only on County population increases.

With the additional fishing activity predicted in this report, the total would increase to \$58,000 (McIntosh pers. comm.). This analysis suggests that the County would incur an additional \$2,000 in law enforcement cost increases associated solely with the added fishing activity. A small increase in law enforcement costs also could be expected in the other three counties in this study.

The analysis of revenues generated by land uses in the study area resulted in the findings discussed in the following sections concerning how public revenues are predicted to change under with-restoration conditions for each of the four affected counties and for special districts within the counties. Fiscal impacts on counties are summarized in Table 6-21; special district impacts are summarized in Table 6-22. The following points should be remembered when considering the results of the analysis.

- All values, including future values, are presented in constant 2000 dollars, so the dollar values for future (i.e., 2030) conditions reflect the corrosive effects of inflation as well as the positive effects of real (i.e., in excess of inflation) market appreciation for farmland over time.
- On a per-acre basis, current state in-lieu payments decrease in real value between 2000 and 2030 because state in-lieu payments are based on assessed values in place at the time properties are acquired. Unlike federal properties, which are re-appraised every 5 years and therefore increase in value over time because of real market appreciation, the values of state properties are never adjusted for changes in inflation and market conditions, and are fixed at their assessed value when acquired. Therefore, the value of properties currently under state ownership decline in real dollar terms because of inflation, resulting in lower payments in the future. Similarly, Williamson Act payments, which are assumed to remain constant on a per-acre basis over time, will also decrease in value.
- As discussed in the following sections for individual counties, Butte County comes out slightly ahead in land use-related revenues under 2030 with-restoration conditions compared to without-restoration conditions, while Colusa, Glenn, and Tehama Counties are projected to experience deficits following restoration. There are many factors responsible for this outcome, but the primary factors are the relative mixes of croplands (and associated property values) within the counties, which provide the basis for estimating revenues, and the way the counties distribute state and federal in-lieu payments (see Table 6-19). For example, according to county sources, Butte County keeps all of its federal revenue-sharing payments while other counties share them to varying degrees with other agencies (i.e., schools and special districts). Similarly, Glenn County retains all of its state in-lieu payments. Colusa County retains a greater share of federal and state payments than it does general property tax revenues. Only Tehama County distributes its federal and state monies in the same way that it distributes its property tax revenues; this is the primary reason Tehama County loses more than a minor amount of revenue under with-restoration conditions, while the other counties virtually break even. These relationships are discussed in more detail in Appendix C.

- Table 6-21 relates only to revenue changes from land use modifications associated with restoration. The counties are likely to experience a small cost associated with increased demand for law enforcement on the river as fishing activity increases. The size of the cost increase was not investigated in this study; however, based on information provided by Butte County, the annual increase could be several thousands of dollars.

Butte County. As Table 6-21 shows, Butte County currently receives an estimated \$106,300 in revenues generated by properties within the study area, including \$54,200 in property tax revenue and \$32,500 in federal revenue-sharing payments. Without the restoration activity, study area revenues would rise to an estimated \$128,100 (in 2000 dollars) by 2030, reflecting real (in excess of inflation) increases in property tax revenues, federal revenue-sharing payments, and sales tax revenues. Conversely, the real value of current state in-lieu payments and Williamson Act subvention payments would decline by 2030 because these payments, which are held constant over time on a per-acre basis, would be eroded by inflation.

With implementation of the habitat restoration activity, total revenues generated by study area properties are projected to rise to \$133,800 by 2030, resulting in an annual net increase of \$5,700 over revenues projected for without-restoration conditions. With the restoration, some revenues would fall and some would rise compared to without-restoration revenues, as shown by Table 6-21. Specifically, property tax revenues would fall by \$23,900 as a result of the acquisition and transfer of 1,983 acres of private property to federal and state ownership over the 30-year period (the private property acreage includes land owned by TNC). This loss, as well as minor losses of Williamson Act subvention payments and sales tax revenue, would be more than offset by a projected \$28,400 increase in federal revenue-sharing payments and \$3,800 increase in state in-lieu payments.

The projected \$5,700 surplus to Butte County under with-restoration conditions is largely attributable to the way in which Butte County allocates its federal revenue-sharing payments. As Table 6-19 shows, Butte County allocates 100% of its federal revenue-sharing payments to county funds, compared to 26% of its property tax revenues.

For special districts, the restoration activity is expected to result in a total annual loss of \$3,900 by 2030 for all districts affected in Butte County. As Table 6-22 shows, the loss of \$4,600 in property tax revenue would only be partially offset by a projected \$700 increase in state in-lieu revenues allocated to special districts. In Butte County, special districts receive no allocation of funds from federal revenue-sharing payments received by the county.

Colusa County. As Table 6-21 shows, Colusa County currently receives an estimated \$52,300 in revenues generated by properties within the study area, including \$29,500 in property tax revenue and \$18,800 in sales tax revenue. Without the habitat restoration, study area revenues would rise to an estimated \$65,700 (in 2000 dollars) by 2030, reflecting real (in excess of inflation) increases in property tax revenue and sales tax revenue. Conversely, the real value of current state in-lieu payments and Williamson Act subvention payments would decline by 2030 because these payments, which are held constant over time on a per-acre basis, would be eroded by inflation.

With implementation of the restoration activity, total revenues generated by study area properties are projected to fall slightly to \$63,300 by 2030, resulting in an annual net decrease of \$2,400 from revenues projected for without-restoration conditions. With the restoration, some revenues would fall and some would rise compared to without-restoration revenues, as shown by Table 6-21. Specifically, property tax revenues would fall by \$15,500 as a result of the acquisition and transfer of 858 acres of private property to federal and state ownership over the 30-year period. This loss, as well as minor losses of Williamson Act subvention payments, would be largely offset by projected increases of \$8,700 in federal revenue-sharing payments, \$4,500 in state in-lieu payments, and \$100 in sales tax revenue.

The revenue projections indicate that Colusa County would virtually break even under with-restoration conditions; this fact is largely attributable to the way in which Colusa County allocates its federal revenue-sharing payments and state in-lieu payments. As Table 6-19 shows, Colusa County allocates 43% of its federal revenue-sharing payments and state in-lieu payments to county funds, compared to 25% of its property tax revenues.

For special districts, the restoration activity is expected to result in a total annual loss of \$6,300 by 2030 for all districts affected in Colusa County. As Table 6-22 shows, the loss of \$9,900 in property tax revenue would only be partially offset by projected revenue increases of \$2,400 from federal revenue-sharing payments and \$1,200 from state in-lieu payments.

Glenn County. Glenn County currently receives an estimated \$120,000 in revenues generated by properties within the study area, including \$73,200 in property tax revenue, \$20,400 in state in-lieu payments, and \$8,400 in federal revenue-sharing payments (Table 6-21). Without habitat restoration, study area revenues would rise to an estimated \$124,300 (in 2000 dollars) by 2030, reflecting increases in the value of property tax revenues, federal revenue-sharing payments, and sales taxes, and decreases in the real value of current state in-lieu payments and Williamson Act subvention payments, which are held constant over time on a per-acre basis and would be eroded by inflation.

With implementation of habitat restoration, total revenues generated by study area properties are projected to decline to \$117,700 by 2030, resulting in an annual net decrease of \$6,600 for revenues projected for without-restoration conditions. With the restoration, some revenues would fall and some would rise compared to without-restoration revenues, as shown in Table 6-21. Specifically, property tax revenues would fall by \$28,300 as a result of the acquisition and transfer of 1,428 acres of private property to federal and state ownership over the 30-year period. This loss, as well as minor losses of Williamson Act subvention payments and sales tax revenue, would only be partially offset by projected increases of \$16,600 in state in-lieu payments and \$9,600 in federal revenue-sharing payments.

Table 6-22. Summary of Revenue Impacts on Special Districts within the Study Area

County: Revenue Source	Estimated Revenues Generated by Properties Within the Study Area			Change in 2030 With Restoration
	Current 2000	Future (2030) Without Restoration	Future (2030) With Restoration	
Butte County special districts:				
Property tax revenue	\$10,400	\$14,100	\$9,500	-\$4,600
State in-lieu payments	\$100	\$100	\$800	\$700
Federal revenue-sharing payments	\$0	\$0	\$0	\$0
Total	\$10,500	\$14,200	\$10,300	-\$3,900
Colusa County special districts:				
Property tax revenue	\$18,900	\$23,800	\$13,900	-\$9,900
State in-lieu payments	\$400	\$200	\$1,400	\$1,200
Federal revenue-sharing payments	\$0	\$0	\$2,400	\$2,400
Total	\$19,300	\$24,000	\$17,700	-\$6,300
Glenn County special districts:				
Property tax revenue	\$10,100	\$12,200	\$8,300	-\$3,900
State in-lieu payments	\$0	\$0	\$0	\$0
Federal revenue-sharing payments	\$1,200	\$1,400	\$2,700	\$1,300
Total	\$11,300	\$13,600	\$11,000	-\$2,600
Tehama County special districts:				
Property tax revenue	\$11,400	\$13,700	\$7,700	-\$6,000
State in-lieu payments	\$100	\$100	\$1,000	\$900
Federal revenue-sharing payments	\$1,500	\$1,800	\$3,900	\$2,100
Total	\$13,000	\$15,600	\$12,600	-\$3,000

Note: Table includes revenues allocated to special districts only. Values do not include revenues distributed to school funds and counties. Future values are expressed in constant 2000 dollars.

Source: Revenues were estimated by the study team based on various data sources, including assessor's parcel data; county, state, and federal sources; and other published sources. See Appendix C for a discussion of data sources and estimation methods.

The projected \$6,600 deficit for Glenn County under with-restoration conditions is largely attributable to the corrosive effects of inflation on state in-lieu payments over time. As Table 6-19 shows, Glenn County allocates 100% of its state in-lieu payments to county funds, suggesting that the failure of state in-lieu payments to maintain their value over the study period has a particularly detrimental effect on the ability of state and federal payments to offset property tax losses in Glenn County under with-restoration conditions.

For special districts, the restoration activity is expected to result in a total annual loss of \$2,600 by 2030 for all districts affected in Glenn County. As Table 6-22 shows, the loss of \$3,900 in property tax revenue would only be partially offset by a projected \$1,300 increase in federal revenue-sharing payments allocated to special districts. In Glenn County, special districts receive no allocation of funds from state in-lieu payments received by the county.

Tehama County. As Table 6-21 shows, Tehama County currently receives an estimated \$125,600 in revenues generated by properties within the study area, including \$74,300 in property tax revenue, \$22,200 in Williamson Act subvention payments, and \$18,500 in sales tax revenue. Federal revenue-sharing payments and state in-lieu payments for properties in the study area currently generate an estimated \$9,900 and \$700, respectively, for the county. Without the restoration activity, study area revenues would rise to an estimated \$136,200 (in 2000 dollars) by the year 2030, reflecting increases in the real value of property tax revenues, federal revenue-sharing payments, and sales tax revenue.

With implementation of the restoration activity, total revenues generated by study area properties are projected to fall to \$113,100 by 2030, resulting in an annual net decrease of \$23,100 from revenues projected under without-restoration conditions. With restoration, some revenues would fall and some would rise compared to without-restoration revenues, as shown in Table 6-21. Specifically, property tax revenues would fall by \$39,300 as a result of the acquisition and transfer of 2,637 acres of private property to federal and state ownership over the 30-year period. This loss, as well as minor losses of Williamson Act subvention payments and sales tax revenue, would only be partially offset by projected increases of \$13,200 in federal revenue-sharing payments and \$6,800 in state in-lieu payments.

The projected \$23,100 deficit for Tehama County under with-restoration conditions is largely attributable to the way in which Tehama County allocates its federal revenue-sharing and state in-lieu payments. Unlike the other three counties, which allocate greater shares of these revenues than property tax revenues to county funds, Tehama County allocates the same percentage of federal and state payments to county funds as it does property tax revenues (Table 6-19). As a result, government payments, including state in-lieu payments, which erode in value over time due to inflation, fail to fully offset the losses of property tax revenues.

For special districts, the restoration activity is expected to result in a total annual loss of \$3,000 by 2030 for all districts affected in Tehama County. As Table 6-22 shows, the loss of \$6,000 in property tax revenue would only be partially offset by a projected \$900 increase in state in-lieu payments and \$2,100 in federal revenue-sharing payments allocated to special districts.

CHANGES IN SOCIAL COSTS AND BENEFITS

This section of the report describes social costs and benefits of establishing a riparian corridor along the Sacramento River. As described in *Analytical Framework* above, these effects represent changes in the economic welfare of parties affected by habitat restoration. The key components for study are:

- potential loss of agricultural benefits,
- flood control costs and benefits,

- recreation benefits, and
- ecosystem protection benefits.

Potential Loss of Agricultural Benefits (Producer's Surplus)

Objectives and Key Assumptions

With establishment of the riparian corridor, farmlands in the study area would be displaced as lands are acquired and restored, resulting in the loss of benefits currently accruing to agricultural producers. These benefits, also known as agricultural producer's surplus, are represented by the profits earned by farmers producing food and fiber products.

The assessment of reduced farming surplus focused on estimating changes in producer surplus in the study area associated with development of the riparian corridor. The objective of the agricultural benefits assessment was to answer the following questions.

- What are the losses in net benefits (i.e., profits) to farmers?
- How do net profits vary from year to year?

The assessment was based on a review of farming cost and income data provided by University of California Cooperative Extension crop budgets (1998–2002b) prepared for specific crops in the Sacramento Valley and elsewhere. Information gathered through interviews with several farmers within the study area was also used (Hammond and Van Wyck 2001). This information was supplemented by proprietary income data for crops within study area counties provided by the IMPLAN model database (Minnesota IMPLAN Group 1997). (Refer to *Regional Economic Effects* earlier in this section for a description of the IMPLAN model.) The data from these three sources were used to develop average pretax profit margins for crops grown in the study area. These margins, expressed as percentages of gross production value, are presented in Table 6-23. The percentages were applied to the estimated changes in agricultural production value under with-restoration conditions (see *Agricultural Resource Effects*) to derive estimates of changes in producer surplus for each county in 2030.

In addition to the assumptions incorporated into the assessment of agricultural production impacts, which are described in *Agricultural Resource Effects* earlier in this section, the following assumptions were made for the assessment of producer surplus effects.

- Long-term profit margins for study area crops are similar to those depicted in Table 6-23.
- Farmers displaced by the purchase of land for habitat restoration do not start up new farming operations elsewhere in the county. To the extent that farmers shift their production from the study area to sites elsewhere in the county, the impacts reported in this section would be reduced. (TNC information regarding specific past sales in

the area indicate that at least some of the revenues from land sales are being reinvested in agricultural operations elsewhere in the four-county region.)

Results of Analysis

The results of the producer surplus assessment are presented in Table 6-23. The estimated changes in 2030 under with-restoration conditions represent expected average long-term changes in producer surplus in the study area. When evaluating these results, it should be noted that in some years farmers experience losses due to factors such as low crop prices, high input costs, poor yields, or a combination of these.

Variation in agricultural production value and producer surplus can be substantial from year to year. A review of 10 years of crop price data for study area counties conducted for the agricultural resources assessment found that prices for the major tree crops grown in the study area have risen and fallen sharply over this time period. Additionally, other factors can affect farm economics for crops in the study area. According to Hammond and Van Wyck (2001), the general factors considered to be most influential for all types of farming operations include labor cost and availability, crop prices, and the effects of regulations. Interviews conducted by Hammond and Van Wyck identified the following additional factors necessary for maintaining high production levels, gross income, and profits for tree crops grown throughout the study area.

- Walnuts: prime soil with good fertility and unrestricted drainage; availability of relatively large amounts of high-quality water; and maintenance of a timely spring spraying program.
- Prunes: high-quality soils (not as critical as for walnuts); a good relationship with a prune marketer; reasonable energy costs; and protection of crops from wildlife (particularly deer and blackbirds).
- Almonds: high-quality soils (not as critical as for walnuts); excellent drainage; good bloom weather in the spring (e.g., the absence of rain, frost, or wind at bloom); financial strength to adapt to wide swings in almond prices from year to year; and protection of crops from wildlife (particularly crows, squirrels, and other rodents).

As these factors suggest, farming profits from year to year are subject to a wide variety of market and natural conditions. Because of normal fluctuations in these factors, agricultural production and producer surplus levels in the study area are highly variable, suggesting that the effects described below and in Table 6-23 should be viewed as estimated changes in long-term average returns to the farmer following habitat restoration.

Butte County. The conversion of farmland in Butte County is estimated to result in the annual loss of an estimated \$1,060,300 in producer surplus (in 2000 dollars) in 2030. Much of this loss (77%) would be attributable to the conversion of walnut acreage in the study area. According to the data reviewed for this assessment, walnuts, on average, have the largest profit margin of any of the crops grown in the study area.

Colusa County. Under with-restoration conditions, producer surplus in Colusa County is estimated to fall by \$485,000 in 2030. The conversion of two crops, walnuts and prunes, account for nearly all (96%) of the reduction in producer surplus in the study area.

Glenn County. Producer surplus in the Glenn County portion of the study area is estimated to be reduced by \$1,230,600 in 2030 with implementation of the habitat restoration. As in Colusa and Tehama Counties, the conversion of two crops, walnuts and prunes, account for most (93%) of this reduction.

Tehama County. Producer surplus in Tehama County is estimated to be reduced by \$1,343,100 in 2030 as a result of farmland conversion. The conversion of walnut acreage would account for 77% of this reduction. The loss of prune production in the study area would account for an additional 12% of the loss.

Flood Control Benefits and Costs

Objectives and Key Assumptions

The assessment of flood control benefits and costs focused on estimating changes in benefits and costs to local, state, and federal agencies associated with conversion of farmland to establish a riparian corridor. The objective of the assessment is to address the following questions:

- What are the costs of protecting stream banks?
- How are these costs expected to change over the study time frame?
- What are the costs to landowners and the government from periodic flooding?

The following key assumptions were made for the assessment of flood control-related effects.

- Agricultural production would continue on all orchard lands with remaining useful life acquired by TNC or public entities.
- Bank protection in the study area would not be abandoned if flooding risk would increase for private downstream properties.
- Future flood damage would be similar to damage over the past 10 years.
- Future flood damage would be reimbursed by state/federal agencies as has occurred over the past 10 years.
- Cost savings from abandoning public bank protection and from avoiding flood damages is estimated on the basis of historical (1991–000) information from the counties.

Results of Analysis

The focus of the analysis was on identifying flood control costs to counties and landowners and potential savings associated with acquiring and restoring lands over the next 30 years within the riparian corridor along the Sacramento River.

The study objectives include consideration of the costs (and potential savings) of both private and public bank protection within the study area. To address the costs of maintaining private stream banks, a study was conducted by Ayres Associates to inventory the condition of private bank protection structures within the study area and to estimate the costs of maintaining these structures over the 30-year study period. The results of this study, which are presented in a final report prepared in June 2002 (Ayres Associates 2002), indicate that 36 of the 73 sites within the study area would require substantial maintenance or repairs over the 30-year study period. The total cost for these repairs would be an estimated \$1.4 million.

This study assumes that agricultural production would continue for some period on lands with tree crops acquired by public entities. The study also assumes that bank protection would not be abandoned if flooding risk would increase for private downstream properties. Therefore, there would be no cost savings related to private bank protection that could be considered a benefit of the restoration activities. The only way that the avoided cost of bank protection could be considered a benefit is if agricultural production continued on the newly acquired lands. However, with the exception of lands supporting permanent crops such as almonds, walnuts and prunes, agricultural production would not continue. For permanent crops, the costs of bank protection would continue until the useful life of these orchards ends. At that time, the lands would be allowed to return to habitat and bank protection would no longer be necessary as long as adjacent private property would not likely be affected.

The same chain of logic applies to potential savings from flood damages on private property. It has been assumed that there would be no change in the risk of flooding associated with development of the riparian corridor. Properties that would be sold to public entities and converted to habitat would no longer have a cost associated with silt and debris removal or reduced production due to flooding, but these cost savings do not accrue to anyone because the properties are no longer being used for agricultural production. In essence, the cost to remove silt and debris (as with bank protection) is a cost of production that is no longer relevant once the property is taken out of agricultural production.

For these reasons, this assessment of flood control costs and benefits focuses on public costs for bank protection and flooding. Ultimately, the public acquisition and restoration programs could involve gradual abandonment of certain private levees and bank protection measures as participating farmlands along the river are converted to habitat. Once this occurs, it may prove beneficial to counties to discontinue maintenance of public infrastructure that exclusively serves participating properties within the study area. In addition, flood damage costs to infrastructure would be avoided. In an effort to assess these potential effects, the public works departments of the four affected counties were contacted and asked for assistance with identifying public infrastructure that may be abandoned following conversion of agricultural land

to habitat. They were also asked to help assess the resulting maintenance and repair savings to the counties.

As shown in Table 6-24, Butte County incurred a total of \$1,326,700 in flood damages to county infrastructure within the study area during the 1991–2000 period. The county was eventually reimbursed for all flood-related damages by the Federal Emergency Management Agency (FEMA) and USACE (Edell pers. comm.). Under with-restoration conditions, the Butte County Public Works Department has determined that the county would not abandon any county-maintained infrastructure within the study area. As a result, no flood control benefits would accrue to Butte County as a result of flood control–related changes associated with habitat restoration along the river.

According to the Colusa County Department of Public Works, no county-maintained infrastructure would be abandoned in Colusa County as a result of establishment of the riparian corridor (Wrynski pers. comm.). Consequently, no flood control benefits would accrue to Colusa County as a result of flood control–related changes associated with the habitat restoration effort.

Glenn County experienced damages to public infrastructure in the study area totaling \$1,075,000 from flooding over the 1991–2000 period. These costs were associated with damage to roads in the study area. Approximately 98% of these costs were either paid for or reimbursed by FEMA and the state Office of Emergency Services. The portion of the flood damages ultimately absorbed by Glenn County totaled an estimated \$24,500. According to the Glenn County Public Works Department, the county could potentially abandon the following county roadway segments under certain conditions with the riparian corridor in place: Roads 23 and 29 east of State Route 45, and Roads 19 and XX east of the Sacramento River to the levee. (Johnson pers. comm.) Abandonment of these roadway segments could, on average, save Glenn County \$2,450 annually in flood damage repairs, with savings totaling an estimated \$73,500 over the 30-year study period. Additionally, abandoning these roads would allow Glenn County to avoid future maintenance costs for these facilities. Based on current average annual maintenance costs of \$2,900 for the affected roads (Johnson pers. comm.), road maintenance savings could total \$87,000 over the 30-year study time frame.

In Tehama County, repairs to public infrastructure in the study area necessitated by flood damage over the 1991–2000 period exceeded \$300,000. These costs have primarily been attributable to repairs to Sacramento River bank protection sites maintained by the county. County costs for these repairs were ultimately reimbursed by FEMA. (Ohlin pers. comm.)

Under with-restoration conditions, no roads or bridges in the study area would be abandoned by the county due to the need to maintain access for the public and for fire and emergency service providers. However, up to 12 of the 20 rock-revetment bank protection sites maintained by the county could be abandoned, depending upon site-specific conditions. The county currently budgets \$10,000 per fiscal year for maintenance of these bank protection sites. (Ohlin pers. comm.) Assuming the county is able to abandon 12 of the 20 sites following

development of the riparian corridor, potential maintenance savings to Tehama County could total \$6,000 per year, or \$180,000 over the 30-year study time frame.

In summary, Glenn and Tehama Counties could save an estimated \$8,900 annually in bank protection costs if the riparian corridor is fully established. In addition, flood damage costs in Glenn County would be reduced by an average of about \$2,500 per year. State and federal agencies that reimburse the counties for flood-related damages would experience an average savings of about \$270,000 per year.

Recreation Benefits

Objectives and Key Assumptions

With establishment of a riparian corridor along the Sacramento River, fish and wildlife resource conditions in the study area are expected to improve, resulting in enhanced opportunities for angling, wildlife observation, and hunting. The assessment of recreation benefits focused on estimating the magnitude of potential changes in recreation benefits, as measured by recreationists' willingness to pay for enhanced fish and wildlife resource conditions. The objective of the assessment was to answer the following question:

- How will the development of a riparian corridor contribute to recreation benefits?

The assessment focused on estimating the benefits to anglers of doubling catch rates in the Sacramento River. As previously indicated, the doubling of natural production of salmon and steelhead trout resources was identified as a goal of legislation passed in 1988 by the California legislature (Senate Bill 2261; Salmon, Steelhead Trout, and Anadromous Fisheries Program Act) to enhance fishery resources of the Sacramento River. This fishery enhancement is also an underlying goal of riparian habitat restoration efforts along the Sacramento River (Upper Sacramento River Fisheries and Riparian Habitat Advisory Council 1989). Other recreation benefits, such as the increased value of wildlife observation and hunting opportunities, could not be quantified because the effects of riparian restoration and other related programs on wildlife conditions is not known.

The following key assumptions were made for the assessment of recreation benefits.

- Sportfishing opportunities associated with riparian habitat restoration will increase at a rate consistent with the doubling of catch rates observed between 1991 and 1994.
- Benefits of habitat restoration would accrue to anglers that fish on the Sacramento River between Redding and Colusa.

Other programs and projects being pursued by state, federal, and local entities would contribute to achieving the goal of doubling catch rates on the Sacramento River. However, for

purposes of this analysis, the effects of doubling catch rates have been assigned to establishment of a riparian corridor.

Results of Analysis

Angler benefits associated with sport fishing on the Sacramento River between Redding and Colusa are estimated to have averaged \$1.98 million annually between 1991 and 1995 (Roach and Loomis 1996). This benefit represents the additional amount that anglers would have been willing to pay (over and above what they actually did pay) to participate in sportfishing on the affected reach of the Sacramento River. The effect of doubling catch rates would be to increase angler benefits to \$2.62 million, an increase of \$641,000 annually. Fishing for rainbow trout and salmon would account for almost 80% of the increase in angler benefits.

In addition to angler benefits, the restoration effort is expected to improve wildlife habitat and result in enhanced populations of waterfowl and other riparian species. This effect would be expected to improve the quality of hunting and other recreation activities enhanced by wildlife populations. These effects cannot be put in monetary terms because potential impacts on biological resources are unknown; however, as discussed in *Recreation Effects* earlier in this section, wildlife-dependent recreation activity within the study area is considerable and enhanced wildlife populations would add value to these recreation experiences.

Ecosystem Protection Benefits

Objectives and Key Assumptions

With an expansion of riparian habitat, aquatic and riverine environments in the Sacramento River riparian corridor would be improved. This restoration is expected to result in enhanced conditions for fish and wildlife resources. The assessment of ecosystem protection benefits focused on evaluating potential benefits to society of this restoration. The objective of the assessment was to answer the following question:

- What kinds of benefits will accrue to society from habitat restoration?

Ecosystem protection benefits can be generally classified as use and nonuse values. Use values include the economic and social benefits to resource users who depend, either directly or indirectly, on the affected resources. Nonuse values, which are often referred to as passive use values, are benefits not related to people's use of the resource, but to just knowing that the resource is being protected. The kinds of use and non-use values that could result from restoring and protecting the ecosystem are discussed below.

Use Values

- Delisting of species currently listed under the federal and state Endangered Species Acts (ESAs)
- Easing of fishery and wildlife harvest restrictions
- Value associated with improving the quality of recreation experiences
- Avoided administrative costs for regulation

Nonuse Values

- Existence value (public's willingness to pay to know that a resource exists)
- Bequest value (public's willingness to pay to know that future generations will be able to enjoy a resource)
- Option value (public's willingness to pay to know that they will have the option to use a resource in the future)

The assessment of these values focused on a literature review of other restoration efforts to identify the kinds and relative magnitudes of monetary benefits to society. For use values, the benefits are often measured in terms of avoided regulatory costs to resource users and government agencies or increased productivity in the use of affected resources. For non-use values, benefits are typically measured by society's willingness to pay to restore and protect the affected resources, as elicited typically through public surveys.

As previously indicated, an underlying goal of the restoration programs along the Sacramento River is to contribute to the doubling of natural production of salmon and steelhead trout resources. This goal was identified in legislation passed in 1988 (Senate Bill 2261: Salmon, Steelhead Trout, and Anadromous Fisheries Program Act) to enhance fishery resources of the Sacramento River. An additional goal of the habitat restoration efforts is to improve aquatic and riverine habitat, thereby contributing to the future delisting of species in the study area that are currently listed (or proposed for listing) as threatened or endangered under the state or federal ESAs. Success toward achieving these two goals provides a framework for assessing the kinds of benefits that would accrue to society from habitat restoration.

Results of Analysis

A wide range of users depend on the Sacramento River and its ecosystem. The Sacramento River system is the most productive salmon fishery in California, supporting sportfishing and commercial fishing activities throughout the Sacramento Valley and along the Pacific coast. The Sacramento River also flows into the Sacramento–San Joaquin River Delta, which is part of the Bay/Delta Estuary, the largest estuary along the western coast of the United States (U.S. Environmental Protection Agency 1994). The Sacramento River and its tributaries are the source of agricultural and urban water supplies for large regions of California.

Ecosystem protection would result in benefits to both users and nonusers of the resource. The magnitude of these benefits, however, is difficult to estimate because of the uncertainty about how resource conditions would change. It is clear, however, that the listing of species under the ESAs resulting from degraded habitat imposes costs on economic activities that utilize ecosystem resources. One recent study (Jones & Stokes 2001) of the proposed 4(d) rule (federal ESA) to limit “take” of Central Valley spring-run Chinook salmon estimated that the administrative and compliance costs for implementing the proposed rule for limiting take would be about \$2.6 million in the first year and about \$2.0 million each year thereafter. These costs, which would be incurred by fishery management agencies, hatchery operators, and researchers, could be avoided if the need for regulatory action was eliminated by ecosystem protection.

A study of the economic benefits of restoring salmon populations on the Trinity River in northern California (U.S. Fish and Wildlife Service 1999) found that easing ocean restrictions on salmon harvest (as a result of delisting) would generate an additional \$7.7 million in ex-vessel value to commercial fisheries in California and Oregon. Of this value, only \$630,000 was directly attributable to harvesting additional Trinity River stocks of naturally produced fish, with the remaining \$7.1 million of value attributable to the easing of harvest restrictions on other stocks. Most of the increased value was estimated for harvest management regions north and south of the Klamath Management Zone. The study also found that easing harvest restrictions would generate about \$6.1 million in additional benefits to recreational anglers in California and Oregon.

In a study of the benefits of salmon recovery on the Columbia River, Huppert and Fluharty (1995) estimated that annual use values to commercial and recreational fisheries could range between \$0 and \$20 million, with the most likely value (in the authors’ judgment) about \$3.1 million. In addition to increased use values to commercial and recreational fisheries, the institutional (i.e., agency coordination and monitoring) costs for the program to restore salmon on the Columbia River are estimated at about \$12.2 million annually.

Based on several recent studies, nonuse values associated with ecosystem protection are likely significant. One study of Columbia River salmon resources (Olsen, Richards, and Scott 1991) estimated that residents of Pacific Northwest households with no probability of using these resources in the future were willing to pay an average of about \$26.50 annually (1991 dollars) for a doubling of Columbia River salmon runs. Extrapolating these values to nonusers in the entire region results in an annual willingness-to-pay of about \$42.4 million. Huppert and Fluharty (1995) indicated that existence values for restoring Snake River salmon runs would be at least several million dollars per year, based on the results from other economic studies of salmon recovery. Other examples of the economic and social value that society places on ecosystem protection include recent legislation such as the Central Valley Project Improvement Act and the CALFED Bay-Delta Program, and the passing of several parks and water propositions in California (Propositions 12, 13 and 40).

In summary, estimating the benefits of ecosystem protection is difficult because of uncertainty about how the resource would change. Assuming that habitat restoration leads to improved conditions for fish and wildlife resources, users of these resources can be expected to benefit by obtaining greater value in resource use. Improved fisheries and wildlife conditions

would be expected to have benefits that extend far beyond the study area because many of the affected fish and wildlife resources are migratory. Based on results of other studies, the non-use benefits, as measured by society's willingness to pay for habitat restoration and ecosystem protection programs, also appears to be substantial.

INTERIM EFFECTS

Background

As indicated in Section 3 (*Overview of Assessment Scope and Methods*), the analysis in this report focuses on the social and economic effects anticipated at the end of the estimated 30-year land conversion process (i.e., 2030). It does not include a comprehensive quantitative or qualitative evaluation of conditions predicted for intervening years. Nonetheless, some insights regarding intervening years have been gained in the process of conducting the analysis. These insights are discussed below.

Agricultural Effects

The analysis of the direct effects of habitat restoration on agricultural production identifies the total acreage of cropland converted and the associated loss in production value (see *Agricultural Resources Effects*). However, the total loss would not accrue in a single year; rather, the conversion process is expected to extend over a 30-year period ending in 2030. Consequently, in the intervening years, the annual loss would be something less than reported for the entire program (year 2030 annual loss reported in Tables 6-5 through 6-8). While these intervening years have not been described individually, it has been estimated that 90% of the conversion would occur by the end of a 20-year period.

The analysis of effects on agricultural production estimated the types of cropland that would be affected by the program. Generally, the lands in the study either produce annual crops (e.g., field crops, pasture, vegetable crops) or are planted to orchards. It is likely that lands planted to annual crops would be converted to habitat first. Although orchards and lands supporting annual crops may be purchased at the same time, orchards would most likely remain in production up to the time that trees mature and production rates begin to decline. Accordingly, the economic effects on sectors raising, harvesting, and processing annual crops would occur earlier than similar effects associated with removing the orchards from production. Depending on the age of the orchards when purchased for restoration, some production from these lands could extend to near the end of the study's 30-year time frame. Therefore, because the orchard crops generally have the higher production values, the larger losses of production value would likely be delayed into the later years of the restoration efforts.

Recreation Effects

The predicted recreation effects over the 30-year study period include increases in recreation activity and spending resulting from both population growth and improvements in habitat conditions. Population growth is expected to increase recreation activity and related spending by an estimated 48% over the 30-year period. The habitat restoration programs, together with other fishery enhancement efforts, are expected to result in an estimated 26% increase in angling activity on the Sacramento River. The predicted increases in recreation activity would primarily benefit Tehama and Colusa Counties.

The predicted increase in restoration-related angling activity and spending can be expected to occur incrementally over the 30-year period as fishery resource conditions stabilize and improve. Fishery conditions for key target species such as salmon, steelhead, and rainbow trout are generally recognized to be improving, but population sustainability goals are considerably higher than current conditions. Year-to-year variability in angling activity and spending will occur, as recently evidenced by an estimated 25% reduction in fishing activity between 1999 and 2000 (California Department of Fish and Game 2001).

Restoration-related changes in recreation activity and spending focused on estimating potential increases in fishing activity. Fishing on the Sacramento River between Red Bluff and Colusa, however, accounts only for an estimated 10–20% of total recreation activity along the river. Although no changes in access and recreation facilities were assumed for this analysis, it is generally recognized that there is great potential for enhancing and developing additional recreational opportunities along the upper Sacramento River by improving public access and facilities (California Department of Parks and Recreation 1994). Moreover, wildlife enhancements resulting from riparian habitat expansion can be expected to generate additional recreation activity and spending in the study area. The timing of these additional contributions to the local recreation economy will depend on how rapidly state, federal, and local entities can increase access to the river and improve infrastructure and facilities that support recreation activities.

Restoration and Site Monitoring Effects

Because the economic analysis in this report focuses on conditions that are projected to exist after 30 years of agricultural conversion and habitat restoration, it does not provide a detailed accounting of economic effects occurring in intervening years. However, the intervening years would show significant activity associated with clearing land and planting riparian vegetation, maintaining that vegetation for a 2–3 year period, and monitoring the condition of the habitat. Using estimates of restoration, maintenance, and monitoring costs developed by the Chico office of TNC (Myers pers. comm.), it is possible to predict annual spending associated with these activities. Table 6-25 illustrates the annual and cumulative spending anticipated for the first 20 years of the study time frame (2000–2019), assuming that

90% of the restoration will occur in the first 20 years and that the rate of conversion will be constant during that 20-year period.

The estimates in Table 6-25 are based on spending as follows:

- \$2,400 per acre for site preparation and planting (a one-time expenditure)
- \$625 per acre for habitat maintenance (2 years of maintenance at each site)
- \$20 per acre for site monitoring (occurring every year following installation)

These expenditures include wages and salaries, equipment operation, and purchase of materials and supplies. It is anticipated that the majority of this spending would occur within the four counties included in this study (Butte, Colusa, Glenn, and Tehama). The table addresses only the first 20 years of the study time frame.

With the assumed constant rate of conversion and restoration activity, the regional economy would benefit from annual activity ranging from slightly more than \$ 1.2 million to more than \$1.4 million. Over the 20-year period illustrated in Table 6-25, the spending would exceed \$27 million.

Regional Economic Effects

The interim effects of establishing a riparian corridor on the regional economy are the incremental total of the direct and indirect/induced effects resulting from agricultural production loss, reduced taxes, increases in environmental restoration expenditures, and increased recreational spending associated with improvements in recreational opportunities. The effects during intervening years of the study time frame will depend largely on the rate at which agricultural land is purchased and restored to riparian habitat, and the rate that access and recreational infrastructure is improved along the river. If land conversion proceeds as assumed in this report, the effects of lost agricultural production and related losses in jobs and personal income will build gradually over the first 20 years of the program. By 2020, the majority of the losses to the regional economy will have occurred. The rate of increases in offsetting recreation spending may lag because it will be influenced by the rate at which habitat matures and fishery and other resources rebound. The real benefits to the recreation economy may occur late in the study time frame.

Over the 30-year period as properties were sold, there would be small positive economic effects associated with the real estate transactions. Each transaction would require appraisals, boundary surveys, hazardous waste site evaluations, title fees and escrow insurance. These benefits would accrue to the community in which the sale took place.

Fiscal Effects

The fiscal effects of land conversion and habitat development result from a combination of countervailing changes in revenues associated with shifts in land ownership and land use patterns in the study area that occur over time. Over the study period, affected revenues, including property tax revenues, state in-lieu payments, federal revenue-sharing payments, Williamson Act subvention payments, and sales tax revenues, will change as portions of the study area shift from private ownership to state and federal ownership. Additionally, revenues will change as land use in portions of the study area shift from agricultural production to restored habitat and as recreational use of the study area increases.

During the first 10 years of the 30-year study period, fiscal effects on counties and special districts may be subtle if land ownership patterns shift from private to TNC or other nonprofit organization ownership. This shift would likely result in increased property tax revenues for counties and special districts because acquired properties would remain on the county tax roles and would be reappraised for tax purposes at their purchase prices, which would be higher than current assessed values. This increase in the value of the tax base of each county would result in higher property tax revenues during this interim period. As TNC or other private entities restore these acquired lands, counties would experience losses in sales tax revenues due to reduced taxable purchases by displaced agricultural operations and their employees. However, these losses would be offset to some extent by taxable purchases made by TNC or others for habitat restoration and monitoring purposes.

By the end of the first 10 years of the study period, revenues sensitive to land ownership would change again as ownership shifts to state and federal agencies. This shift would result in lands being removed from public tax roles and in Williamson Act contracts being terminated for acquired properties in the study area. Property tax revenues and Williamson Act subvention payments would incrementally decline for both counties and special districts as this shift occurs. To some extent, this reduction in revenue would be offset by state in-lieu payments and federal revenue-sharing payments to counties. These payments would begin once ownership of acquired properties is transferred to state and federal agencies (assuming the agencies are DFG and USFWS). Initially, revenues from in-lieu payments generated by properties transferred to state ownership would be similar to property tax revenues generated under pre-transfer conditions. Over time, however, the value of these payments, which are frozen in place at their acquisition levels, would decrease as inflation erodes their value. Conversely, federal revenue-sharing payments on federally owned properties would rise over time because these properties would be re-appraised, bringing them up to current market values, every 5 years.

The fiscal analysis conducted for this study indicates that state and federal payments would likely offset property tax revenue losses caused by land conversion during the early years of the study period, although deficits may occur in certain years in certain counties, especially for special districts serving the study area, due to the periodic nature of federal property reappraisals and annual fluctuations in federal revenue-sharing payment rates. Over time, these deficits may occur more often as the value of state in-lieu payments is eroded by inflation. This conclusion is supported by the results of a study conducted by Adams and Gallo (1999) that

examined the impacts on Glenn County revenues of past federal and state land acquisitions along the Sacramento River. This study found that in the near and medium term, federal and state payments more than offset property tax reductions caused by land acquisitions, but that over the long term these surpluses may disappear and become deficits.

Finally, during interim years, revenues generated by possessory interest taxes and property transfer taxes may soften any adverse fiscal impacts of restoration as lands are shifted from private ownership to state and federal ownership. The possessory taxes are paid to counties when publicly acquired properties are leased back to private individuals for farming. To the extent that unrestored lands are transferred from TNC or other entities to state and federal ownership, possessory interest taxes may be generated if agencies lease lands to farmers prior to the restoration of these lands. Property transfer taxes are paid to counties at the time of property sale. Eventually, revenues from possessory interest and property transfer taxes would decline and end as all lands acquired and transferred to public ownership are restored.

Social Costs and Benefits

Changes in social costs and benefits include losses in agricultural benefits, avoided costs of flood control, increases in recreation benefits, and ecosystem protection benefits. Agricultural benefits, as expressed by farmer producer surplus, over the 30-year study period would mirror the changes expected in agricultural production and production value in the study area under with-restoration conditions. The timing of avoided flood control costs would include annual benefits associated with avoiding investments for bank protection as well as periodic benefits of avoiding the costs of flooding, which are primarily borne by state and federal agencies. Recreation and ecosystem protection benefits would gradually increase over the 30-year study period as the riparian habitat restoration programs and other enhancement programs are expected to improve fish and wildlife conditions.