Section 5.7 Agricultural Habitat Conservation Strategy

This section describes the conservation strategy developed to conserve habitat values and populations of covered species and other wildlife within nearly 350,000 acres of cultivated agricultural lands of Yolo County. Conservation of species that make extensive use of agricultural habitats offers unique opportunities while posing special challenges.

The Yolo NHP is one of few landscape level HCP/NCCP efforts to incorporate agricultural activities. This decision was based on multiple factors, including the social, cultural, and economic importance of agriculture to the County; the importance of these habitats to the County's wildlife, and a desire to ensure that agricultural operations are conducted in compliance with state and federal Endangered Species Acts. Cultivated agriculture makes up 56% of the land area in the County; maintaining a viable agricultural economy is a priority for the State of California, local governments, non-governmental organizations, and local farmers and ranchers.

5.7.1. Context and Issues for Conservation on Agricultural Lands

The Yolo NHP Steering and Advisory Committee's Agricultural Working Group identified several important issues related to the conservation of agricultural lands addressed in the NHP. These issues, briefly described below, provide context for development of the NHP's conservation strategy for agricultural lands.

Fallowing of Agricultural Land. Agricultural lands are fallowed for a variety of reasons, including maintaining soil fertility, water availability, market conditions, and in response to incentive programs such as those offered by the NRCS. Fallow lands provide substantial habitat value for some covered species but may reduce habitat value for others. It is important to understand the role of fallowing in agriculture, the factors that influence fallowing decisions, and the resulting habitat values created for covered wildlife in the context of the NHP.

Water Supply and Availability for Agriculture and Effects on Habitat. Many factors affect water supply for farm use including precipitation, allocations from storage facilities, conservation practices, groundwater availability, infrastructure availability and conditions, and government regulation (i.e., of water discharge from farmlands). Changes in water availability and management affect habitat values of agricultural lands for covered species through changes in the range of crops that are grown and irrigation methods and timing. Water availability and use also can affect the value of other habitats (e.g., effects of water efficiency and discharge restrictions on availability of water to support riparian and aquatic habitats).

Role of Government Constraints and Support (Incentives) for Agriculture in Shaping Habitat-friendly Agricultural Management Practices. Government restrictions and incentives can influence the willingness of farmers to maintain desirable agricultural practices and to modify practices to benefit covered species. For example, programs such as the Williamson Act, government Farm

Programs, Yolo County's Right to Farm Act, the Yolo County General Plan, and non-governmental efforts that reward and recognize the value of farming confer net benefits on producers and covered species. In contrast, certain constraints and regulations (such as tax assessment based on highest and best use; regulation of water use, energy, and waste management and disposal; diminishing local markets; and endangered species conflicts, including crop depredation by wildlife) often act as disincentives to continued agricultural operations, which in turn affect the willingness of landowners to engage in voluntary efforts to enhance species' habitat.

The Importance of Other Habitats Associated with Agriculture and Incentives for Creating Habitat on Farmland. A variety of habitat components including hedgerows, edges, sloughs and ditches, and tailwater ponds provide important habitat value and could be further integrated into agricultural lands to increase habitat value for covered species. These components can be encouraged in areas that are marginally productive or incorporated into farmed lands to provide broader public benefits beyond habitat enhancement. Areas of low production value such as field edges, fence lines, roadsides, ditches, field corners, tailwater and recirculating ponds, sediment traps, and areas of poor soils can be managed to reduce erosion, improve water quality, conserve water, and enhance aesthetic values. However, management of associated habitat lands for the benefit Covered Species has the potential to reduce crop production, increase management costs, and increase crop damage from depredation. Management plans that are written to recognize the needs of both farmers and species can reduce and sometimes eliminate these concerns. However, a combination of economic incentives (compensation, tax relief), technical assistance (i.e., support with design, installation, and maintenance), limited term contracts, and regulatory protection will likely be needed to encourage landowner participation.

5.7.2. Overview of Components Used in the Conservation Strategy Development

The agricultural conservation strategy responds to conditions that affect land use and activities in the mosaic of agricultural lands. These conditions include limitations on types of agricultural uses due to soil characteristics, water availability, previous investments, and location and distance to processing facilities. The strategy accommodates the need to rotate crop types and acreages (to maintain soil fertility and reduce pests) and to respond to local, regional, and worldwide economic markets.

The agricultural strategy is developed around an economically based model that:

- predicts future potential for changes in agricultural conditions (i.e., changes in locations and amounts of various crops)
- incorporates habitat suitability models that quantify the amount and quality of habitat provided for covered species over time,
- incorporates conservation goals and objectives for covered species,
- calculates the resulting likelihood that species conservation goals will be achieved under future agricultural conditions, and
- in cases where goals are not predicted to be met, provides a basis for the selective use of economic incentives to ensure that goals and objectives are achieved.

The following sections describe the major components of the agricultural strategy.

5.7.3. Agricultural Land Use Information.

Baseline agricultural conditions were mapped in the project's GIS system as part of development of the overall land cover and habitat mapping systems for the NHP. Baseline data on agricultural land use is required for general characterization of existing plan conditions and for use in modeling the potential for changes in agricultural use patterns (See *Agricultural Forecasting Model* below). Baseline agricultural data on crop use was derived from several sources, including the California Department of Water Resources' (DWR's) detailed crop mapping program (see DWR 1999; and Appendix __, *Yolo County Land Cover Map: Methods for Development of the Data Layer*). Crop groups and individual crop types recognized in the land cover database are described in *Chapter 2, Section 2.3.1. Community and Habitat Classification and Description).*

Acreages of various crop types will be tracked over the life of the plan to evaluate the habitat conditions for covered species. In addition to this tracking, however, an agricultural forecasting model has been developed, and will be used to regularly evaluate the potential for future changes in crops types and acreages across the existing agricultural mosaic. Variability in the location and amount of crop types is a critical variable in predicting how the pattern of agriculture will change over space and time (See *Agricultural Forecasting Model* below). Therefore, for initial use in plan development, updates of information on crop type locations and extent were acquired from DWR in 2008 and from 2005, 2006, 2008, and 2009 pesticide use reports from the Yolo County Agricultural Commissioner (see *Agricultural Forecast Model*).

5.7.4. Valuation of Agricultural Habitat for Covered Species

Conservation of Covered Species that use agricultural habitats requires an understanding of their habitat relationships, including the relative importance of various crops to each species for foraging and nesting. Evaluating differences in the habitat quality of particular crops is important in understanding how crop variability affects the habitat suitability of different species, some of which specialize in a small subset of crops. Valuation of agricultural habitats for covered species therefore incorporates both quality of habitat and quantity (acreage).

Agricultural Habitat Valuation. The habitat suitability models have been developed to predict occurrence of covered species within all natural and anthropogenic communities and habitats within the Yolo NHP area. The model was further refined for agricultural habitats to include a set of suitability models that evaluated not just predicted presence or absence, but the relative importance of different agricultural crops for those covered species to which agricultural lands are important.

Ten (29%) of the 34 NHP covered species use agricultural lands extensively for foraging, cover, reproduction, or dispersal (Table 5.7-1). All of the species that use agricultural lands are terrestrial vertebrates; none of the covered plants or invertebrates occurs on cultivated croplands.

An additional 10 (32%) of 31 NHP species of local concern also make extensive use of agricultural lands (Table 5.7-1). Conservation and management of species that use agricultural lands requires an understanding of the habitat values of different agricultural crop types to these species.

Table 5-7-1. Covered Species and Species of Local Concern that Extensively Use Agricultural Lands in Yolo County

COVERED SPECIES		
Giant garter snake	Swainson's hawk	Loggerhead shrike
Northwestern pond turtle	Western burrowing owl	Tricolored blackbird
Northern harrier	Black tern	Townsend's big-eared bat
White-tailed kite		
SPECIES OF LOCAL CONCERN		
Bald eagle	Short-eared owl	Yellow-headed blackbird
Golden eagle	Mountain plover	Western red bat
Prairie falcon	Yellow-billed magpie	Pallid bat
Long-eared owl		

Species that use agricultural habitat are attracted to certain agricultural crop types that meet their foraging, cover, reproduction, or dispersal needs. The regular changes in the locations and abundances of various crop types within the County present challenges in quantifying and tracking habitat values for these species. The agricultural habitat value rating process provides a method to quantify the relative habitat values of agricultural lands, which can be combined with habitat quantity to characterize total habitat value for species at a landscape level.

The NHP assembled a group of biologists knowledgeable about the habitat use patterns of the 10 covered species that use cultivated lands in Yolo County and elsewhere in the Central Valley to design and apply a system to assign numerical crop type habitat values (see Appendix A and Appendix B for a summary of qualifications of the biologists who rated agricultural values for species). Crops were rated relative to the value of the highest value local habitat (generally a natural habitat type) for each species. Crop habitat values for each species were assigned one of five numerical ratings from 0.0 to 1.0 (Table 5.7-2).

Table 5.7-2. Relative Agriculture Habitat Value Rating System

Value of Agricultural Type to Species	Frequency of Use (Observed Association)	Value
Very High Value	Species uses the crop at a level equal to the highest value habitat (very strongly associated with the crop)	1.00
High Value	Species uses crop frequently but not as often as the highest value habitat (strongly associated with the crop)	0.75
Moderate Value	Species uses crop often but not as often in natural habitat (regularly uses the crop, but at a lower level than other habitats)	0.50
Low Value	Species uses crop infrequently (only infrequently found in association with the crop)	0.25
Very Low Value	Species uses crop rarely or incidentally (only rarely found in association with the crop)	0.10
No Value	Species rarely or never uses crop	0.00

The ratings were assigned based on descriptions in the scientific literature of agricultural use by species and the knowledge of biological experts (as summarized in the Yolo NHP Species Accounts). The relative values of crop type were considered separately for each species when habitat values differed between uses (i.e., foraging breeding, wintering).

Calculation of Habitat Units as a Measure of Habitat Value. Initially, each biologist completed a form for each of the 10 species that identified the rationale for assigning values to crop habitats. The rationale for each species included:

- the component of the species habitat use (breeding, foraging, wintering) that was rated;
- a description of the habitats that were used as a reference (i.e., those rated with a value of 1.00) for assigning agricultural ratings;
- a description of the characteristics of reference habitat;
- the habitat characteristics that determined the relative suitability of the agriculture for that species; and
- the relative habitat value rating for each crop type.

The biologists collectively reviewed the draft assigned values and rationales collaboratively to discuss and revise, as appropriate, the habitat value assignments in the agriculture habitat value matrix. A summary of habitat values assigned for covered species to major agricultural crops and crop groups is shown in Table 5.7-3.

Table 5.7-3. Generalized summary of habitat value ratings assigned to various crops and crop groups for the Yolo NHP covered species

Species	Crop Type or Group								
	Alfalfa	Native Pasture	Other Pasture	Grains	Field crops	Truck Crops	Idle	Rice	Orchard/ Vineyard
Giant garter snake								0.75	
Western pond turtle								0.5	
Swainson's hawk	1.0	0.75	0.75	0.1	0.25	0.25			
White-tailed kite	1.0	0.75	0.75	0.1	0.25	0.1		0.25	
Northern harrier	1	0.75	0.5	0.5			0.5		
Black tern								1.0	
Burrowing owl	0.25	0.75	0.25	0.1	0.1	0.1	0.5		
Loggerhead shrike	0.75	0.75	0.75	0.25	0.25	0.25	0.25		
Tricolored blackbird	1.0	1.0	0.8	0.8			0.5	1.0	
Townsend's big-eared bat	0.5	0.5	0.5	0.25			0.25		0.25
# Species	**7**	**7**	**7**	**7**	**4**	**4**	**5**	**5**	**1**
Average Habitat Value	**0.55**	**0.53**	**0.43**	**0.21**	**0.14**	**0.07**	**0.20**	**0.35**	**0.03**

5.7.5. Biological Goals and Objectives for Agricultural Lands

All of the Yolo NHP covered species and species of local concern that use agricultural habitat also make use of non-agricultural habitats. Many species use agricultural habitats for foraging in ways that are similar to how they use upland grasslands, or for nesting as they do in riparian, woodland, or wetland habitats. This range of habitat use offers flexibility in determining an appropriate mix of agricultural and non-agricultural habitats that will meet species conservation goals under the range of environmental conditions that apply within the Plan Area over the term of the NHP.

Note to reviewers: As noted in Section 5.2.1, species habitat goals and objectives are defined as aggregate habitat values measures over the entire landscape of Yolo County. The objectives can be achieved through conservation of different amounts of habitat from the range of available and suitable lands. Disaggregation of the species objectives to different major landscape units (Hill and Ridge, Valley Lowland) and Natural Communities (Grassland, Woodland, Chaparral, Riparian, Herbaceous Wetland, and Agriculture), will be determined

iteratively as individual strategies for each landscape unit and community emerge based on a variety of factors, including existing level of habitat protection, certainty of achieving conservation goals, costs for implementation and monitoring, potential conflicts with other lands uses, and other factors. Ultimately, the proportion of species total objectives that are assigned to agricultural lands will be based on this overall examination of conservation needs, opportunities, and tradeoffs.

5.7.6. Agricultural Forecasting Model

Understanding how and why cropping patterns change over time is important for the NHP because different crops provide different habitat values for covered species. A detailed database was developed to describe crop choice by farmers at the field level, coupled with an agricultural forecasting model to explain changes in land allocated to various crops. An econometric forecasting model (i.e., a model that specifies the statistical relationships between various economic quantities) was then developed to predict what crops will be grown in the county in what locations and amounts, to allow assessment of the potential for the Plan to meet its habitat goals for covered species (see Appendix __ for a description of the model). The predictions of future crop habitat conditions can be used to identify where conservation action (e.g., enactment of market incentives and easements) may be needed in advance to ensure that covered species goals are achieved.

Model Development and Operation. The agricultural forecasting model was developed based on detailed characterization of farmers' past crop choices in Yolo County, on the theory that the best way to understand future land allocation is to study why and where cropping patterns have changed in the past. The land use model was developed at the level of the individual field, providing a very high degree of spatial disaggregation. The model recognizes that crop choice is largely an economic decision made by farmers to maximize profit under land capability constraints, market prices, and environmental conditions.

The forecasting model was developed for use in preparing the NHP, but will also be used over the term of the NHP to track ongoing crop type acreages and associated habitat values, and to predict future changes in crop acreages, and identify the need for active measures to ensure that community and covered species' habitat goals and objectives for agricultural lands are met.

Predictions of Future Crop Conditions. The output of the econometric forecasting model is a set of probabilities that describe the likelihood of observing different crops in individual fields, given a range of explanatory variables that may vary by location or from year to year. Explanatory variables that predict the probability of various crops being grown include factors that influence the profitability of given crops at given locations, such as site conditions (e.g., soil type, water availability, floodplain status), prior crops grown (e.g. crop rotation), market conditions, weather conditions, and transportation costs. The resulting probabilities of growing various crops are then used to calculate the expected composition and amount of agricultural habitat in the future. Ongoing monitoring of crop type acreages over the life of the plan will provide a stronger baseline data set for use in making model predictions, and

a basis for evaluating the accuracy of the agricultural forecasting model and improving its predictive performance.

Targeting of Incentives. The predicted crop composition is combined with the covered species habitat suitability models to determine the likelihood that species habitat objectives will be met over future specified time periods (e.g., 5 year forecasts). If the model predicts that there is a high probability that objectives will be met over the forecast period, then no active intervention would occur. If objectives are not met, however, the model can show the extent of the predicted habitat shortfall and can identify specific areas on which to focus conservation mechanisms to achieve habitat targets, including acquisition of conservation easements or market-based incentive payments to induce farmers to maintain or switch to desired crops (See *Conservation Measure 5.7-2* below). The econometric model also can be used to estimate the payment amounts required to achieve conservation needs.

5.7.7. Agricultural Community Goals and Objectives

The conservation strategy component for agricultural lands is designed to implement a program that will conserve the associated covered species in a manner that is compatible and complementary with maintaining Yolo County's agricultural economy. The agricultural lands conservation strategy will meet the following goals.

- Identify mixtures of agricultural uses that are beneficial to covered species and other native species, taking into account the dynamic nature of the agricultural landscape.

- Ensure that the future mixture of agricultural uses supports covered species and other native species and a vibrant agricultural economy.

- Create incentives for the agricultural community to manage their lands in a manner that benefits covered species and other native species

Objectives of the agricultural strategy for covered species are:

- Maintain and apply a system for tracking and predicting future acreages of various agricultural crops and the resulting habitat values provided for covered species.

- Maintain the conservation values for covered species (measured in habitat units) allocated to agricultural lands, shown in Table 5.7-4 *[Note to reviewers – Table to come showing allocations of targets to landscape units and natural communities]*

5.7.8. Conservation Strategy for Agricultural Lands

The conservation strategy for agricultural lands consists of several conservation measures that mitigate for permanent losses of agricultural lands and that maintain targeted levels of

habitat value for covered species through monitoring and enactment of conservation incentives when needed.

Conservation Measure 5.7-1. Mitigate for Effects of Habitat Loss Resulting from Permanent Loss of Agricultural Lands. The Implementing Entity will implement a mitigation program for those covered activities that cause a permanent loss of agricultural lands by permanently protecting and enhancing agricultural lands. Protection will be achieved either through the acquisition of conservation easements or through fee title acquisition and dedication to conservation management by qualified conservation landowners (i.e., within Category 1 conservation lands).

Conserved land acquired for mitigation for agricultural habitat loss will emphasize those crop types with higher value for covered species (alfalfa, other pasture, grain and hay, rice) with ratios set for general groups of crops that are lost (Table 5.7-5). The ratios of conservation land to be acquired per acre of lost agricultural lands (i.e., mitigation ratios) will be determined based on the quality of habitat lost and the value of habitat conserved, with any required enhancement. Lands selected to mitigate for agricultural habitat loss will be located in areas with specific characteristics that increase their value as habitat. These elements will include adjacent high value natural communities (riparian, oak woodland, wetlands) and herbaceous and shrub habitat areas within field edges, ditches, fence lines, roadsides, and other areas. Alternatively, these habitat elements may be created to enhance habitat value on mitigation lands. As a result, these enhanced mitigation lands will produce higher per-acre habitat values (as expressed in habitat units) to offset habitat losses and contribute toward achievement of covered species habitat goals.

Table 5.7-5. <u>DRAFT</u> Proposed mitigation ratios to be achieved to replace habitat values resulting from agricultural land loss to covered activities *[<u>Note to Reviewers:</u> Shown for illustration only – ratios to be refined through evaluation of crop type suitability ratings for covered species]*

Affected Habitat by Crop Group	Habitat Value Mitigation Ratio by Crop Type Conserved and Enhanced (Category 1a lands)			
	Alfalfa	Pasture	Grain/Hay/ Field/Truck	Rice
Alfalfa	1.5	2.0	n/a	n/a
Pasture	1.0	1.5	n/a	n/a
Grain/Hay/Field/Truck Crops	0.75	1.0	1.5	n/a
Vineyard/Orchard/	0.1	0.2	0.3	n/a
Rice	n/a	n/a	n/a	2.0

Conserved agricultural lands acquired as mitigation will have a specified range of agricultural uses that support the mitigation habitat value targets while also allowing for long-term management flexibility to accommodate needs for periodic crop rotation or adjustment of individual crops within groups, to respond to long-term effects of markets, climate, and other relevant factors.

Conservation Measure 5.7-2. Monitor Agricultural Habitat Values for Covered Species and Implement Actions as Needed to Meet Conservation Objectives

The agricultural lands conservation strategy is designed to meet species goals. The Implementing Entity will evaluate goals achievement through monitoring of observed agricultural habitat conditions for covered species and predicted changes in future conditions. Agricultural forecasting provides the basis for evaluating likely future agricultural conditions expressed in acres of habitat, habitat units for covered species, and probabilities of achieving species goals for agricultural landscapes.

The ongoing system for monitoring and predicting habitat acres and habitat units, and the calculating probabilities of achieving goals and objectives in the future, will provide a basis for judging the need for conservation action to ensure that goals are achieved in the future. Crop acreage will be monitored using the DWR crop mapping program, which is conducted approximately every 10 years, through the use of annual crop pesticides reporting conducted by the County Agricultural Commissioner, and supplemental field surveys where necessary.

If the trends in habitat values observed and predicted through forecasting suggest the potential for a future decline in covered species habitat value below the species habitat objective for agricultural lands, conservation actions will be taken to maintain habitat values above objectives by ensuring that appropriate crops are grown and/or that agricultural habitats are enhanced to increase their habitat value. Actions to maintain habitat value may include incentives to increase the acreage of desirable crops that otherwise would not be grown at levels necessary to achieve conservation goals. Alternatively, incentives may be provided to increase agricultural habitat values by enhancement actions (e.g., planting of cover strips, pollinator habitats, etc.). The form of these incentives could include acquisition of short-term or permanent easements, incentive payments, property tax reductions, government assistance grants, or other mechanisms. [***Note to Reviewers:*** *additional detail regarding incentives will be added to this measure as NHP planning progresses.]*

Conservation Measure 5.7-3. Coordinate with Ongoing Efforts to Enhance Agricultural Lands as Habitat. The Implementing Entity will support, through coordinated public outreach and funding of specified actions, ongoing agricultural habitat enhancement programs implemented by NRCS, local agencies and tribes, private conservation organizations, and other applicable entities. Habitat enhancements under this measure are directed at portions of agricultural lands that are not actively farmed and will include actions such as maintenance and creation of herbaceous, shrub, and tree species within field edges, ditches, fence lines, roadsides, and other areas within and adjacent to agricultural lands. Support for agricultural enhancements will contribute towards achieving covered species objectives by increasing the per-acre habitat value of agricultural lands, and thereby reducing the amount of agricultural land that must be maintained to achieve the conservation targets.