

4.1 Background

The NBHCP and its Implementing Agreement require that an annual survey of nesting Swainson's hawks be conducted throughout the Basin (Chapter VI, Section E [2][a][1] of the 2003 NBHCP). In compliance with the conditions described in the NBHCP, this chapter summarizes the results of surveys for Swainson's hawk in the NBHCP Area from 1999 to 2004.

It should be noted that the study area in the context of this species differs slightly from the study area used in all other surveys. For the purposes of conducting the Swainson's hawk monitoring effort, the study area was expanded to include the far side of the peripheral water bodies (i.e., the Sacramento River, Steelhead Creek, and the Natomas Cross Canal) because these areas support nesting habitat for birds that forage within the Basin. Moreover, individual pairs may use alternate nest sites within given territories that span these water bodies.

4.2 Goals and Objectives

Monitoring efforts for Swainson's hawk are designed to assess the progress of the NBHCP toward meeting the Plan's goals and objectives for Swanson's hawk populations and the habitats they use. The Swainson's hawk monitoring surveys are designed to achieve the following specific objectives.

- Document the numbers, distribution, density, and reproductive success of the Swainson's hawk population in the Basin.
- Conduct surveys in a systematic and repeatable manner that will ensure detection of all active Swainson's hawk nests in the Basin from year to year.
- Document changes in land use and availability of foraging habitats throughout the Basin over time.

4.3 Life History

4.3.1 Status and Range

Swainson's hawk (Figure 4-1) inhabits grassland plains and agricultural regions of western North America during the breeding season and winters in grassland and agricultural regions from Central Mexico to southern South America (England et al. 1997; Bradbury et al. in preparation). Early accounts described Swainson's hawk as one of the most common raptors in the state, occurring throughout much of lowland California (Sharp 1902). Since the mid-1800s, the native habitats that supported the species have undergone a gradual conversion to agricultural uses. Today, native grassland habitats are virtually nonexistent in the state, and only remnants of the once vast riparian forests and oak woodlands still exist (Katibah 1983). This habitat loss has caused a substantial reduction in the breeding range and in the size of the breeding population in California (Bloom 1980; England et al. 1997). Swainson's hawks are also sensitive to habitat fragmentation and avoid low-density development (e.g., parcels with improvements subdivided to less than 4 hectares [10 acres]) even though suitable prey conditions may exist (Estep and Teresa 1992). However, Swainson's hawks are also known to re-inhabit dense urban areas to nest if suitable nesting trees are present and suitable foraging habitat exists within 3.2 kilometers (2 miles) of the nest (England et al. 1995). The state currently supports between 700 and 1,000 Swainson's hawk breeding pairs (Swainson's Hawk Technical Advisory Committee file data), which is less than 10% of the historic population (Bloom 1980).

The Central Valley population (between 600 and 900 breeding pairs) extends from Tehama County south to Tulare and Kings Counties. The optimum foraging and nesting habitat conditions in portions of Yolo, Sacramento, and San Joaquin Counties support the bulk of this Central Valley population (Estep 1989, in preparation) (Figure 4-2). The Central Valley is surrounded by mountains—the Sierra Nevada on the east and the Cascade Range on the north—that geographically isolate it from the rest of the species' range. Extensive banding (Estep 1989, unpublished data; Anderson unpublished data; Bloom unpublished data; Woodbridge unpublished data) suggests that no movement occurs between the Central Valley breeding population and other populations. Results of satellite radiotelemetry studies of migratory patterns further indicate little to no interaction between the Central Valley population and other populations of Swainson's hawks (Bradbury et al. in preparation).

Despite the loss of native habitats in the Central Valley, Swainson's hawks appear to have adapted relatively well to certain types of agricultural patterns in areas where suitable nesting habitat remains (Figure 4-3). However, nesting habitat for Swainson's hawks continues to decline in the Central Valley because of flood control projects, agricultural practices, and urban expansion.

4.3.2 Habitat Use

Swainson's hawks usually nest in large native trees such as valley oak (*Quercus lobata*), cottonwood (*Populus fremontia*), walnut (*Juglans juglans*), and willow (*Salix* spp.), and occasionally in nonnative trees, such as eucalyptus (*Eucalyptus* spp.). Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Stringers of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (Estep 1984; Schlorff and Bloom 1984; England et al. 1997). However, this is a function of nest tree availability rather than dependence on riparian forest. Nests are usually constructed as high as possible in the tree, providing protection to the nest as well as visibility from it (Figure 4-3).

Nesting pairs are highly traditional in their use of nesting territories and nesting trees. Many nest sites in the Central Valley have been occupied annually since 1979 (Estep unpublished data), and banding studies conducted since 1986 confirm a high degree of nest and mate fidelity (Estep in preparation).

In the Central Valley, Swainson's hawks feed primarily on small rodents, usually in large fields that support low vegetative cover (to provide access to the ground) and high densities of prey (Bechard 1982; Estep 1989). These habitats include hay fields, grain crops, certain row crops, and lightly grazed pasturelands. Fields lacking adequate prey populations (e.g., flooded rice fields) or those that are inaccessible to foraging birds (e.g., vineyards and orchards) are rarely used (Estep 1989; Babcock 1995). Urban expansion and conversion to unsuitable crop types (e.g., vineyards and orchards) are responsible for a continuing reduction of available Swainson's hawk foraging habitat in the Central Valley.

4.3.3 Breeding Season Phenology

Swainson's hawks arrive onto the breeding grounds from early March to early April. Breeding pairs immediately begin constructing new nests or repairing old ones. Eggs are usually laid in mid- to late April, and incubation continues until mid-May when young begin to hatch. The brooding period typically continues through early to mid-July when young begin to fledge (England et al. 1997). Studies conducted in the Sacramento Valley indicate that one or two—and occasionally three—young typically fledge from successful nests, with an average of 1.4–1.8 young per successful nest (Estep in preparation) (Figure 4-4). After fledging, young remain near the nest and are dependent on the adults for about 4 weeks, after which they permanently leave the breeding territory (Anderson et al. in progress). By mid-August, breeding territories are no longer defended and Swainson's hawks begin to form communal groups. These groups begin their fall migration from late August to mid-September. Unlike the rest of the species, which migrates to southern Argentina for the winter, the Central Valley population winters primarily in Central Mexico and, to a lesser extent,

throughout portions of Central and South America (Bradbury et al. in preparation).

4.4 Assessment of Populations

4.4.1 Methods

Surveys were conducted by systematically driving all available roads within the NBHCP survey area. The survey area is defined as the NBHCP area and both sides of all peripheral drainages: the Sacramento River, Natomas Cross Canal, and Steelhead Creek. Where roads were not available to drive (e.g., the levee road along the Cross Canal), or where there were no roads to access potential nest trees, the surveys were conducted on foot. All potential nesting trees were searched for nests and adult Swainson's hawks using binoculars and/or a spotting scope.

Surveys were conducted in three phases. Phase one surveys were conducted early in the breeding season (late March to mid-April) to detect Swainson's hawk activity at previously known nest sites and in all other suitable nesting habitat. All suitable nesting habitat was checked for the presence of adult Swainson's hawks and to note all nesting activity and behavior (e.g., nest construction, courtship flights, defensive behavior). Activity was noted and mapped on field maps; locations of active nests were documented using a GPS unit.

Phase two surveys were conducted in mid-May through June to determine if breeding pairs detected during phase one surveys were actively nesting and to resurvey all previously unoccupied potential nesting habitat for active nests.

Phase three surveys were conducted in July to determine nesting success and record the number of fledged young per nest.

An active territory is defined as a nest site that was occupied in 2004 by a breeding pair of Swainson's hawks, regardless of the reproductive outcome. A successful nest is defined as a nest that produced fledged young. A failed nest is defined as one that did not produce fledged young.

Incidental observations, such as foraging, roosting, and other sightings of adult Swainson's hawks, were also noted.

4.4.2 Results

Figure 4-5 illustrates the distribution of nesting Swainson's hawks in the Basin in 2004. Nest sites occur primarily in the southern portion and along the far western and northern edges of the Basin. These areas support both suitable nesting and foraging habitat. Crop patterns include a mixture of hay, row, and

grain crops. Suitable nesting trees occur along roadsides, in remnant riparian and oak woodlands, and as isolated trees. Most of the Basin north of Elkhorn Boulevard and east of Powerline Road is unsuitable or only marginally suitable for nesting or foraging Swainson's hawks, and thus most of the area does not support nesting pairs. The agricultural land in this area is dominated by rice production, which provides limited foraging value to Swainson's hawks; moreover, very few trees exist in the region, limiting potential nesting sites.

A total of 89 Swainson's hawk nesting territories were monitored in 2004 (Table 4-1). Among these are three new territories in the interior of the Basin (NB-80, NB-81, and NB-82), one new territory along the Cross Canal (NB-83), and six new territories along the Sacramento River (NB-84 through NB-89).

Of the 89 known nesting territories in the survey area, 59 were active (i.e., at least one adult was present on the nesting territory) and 30 were inactive (i.e., neither adult was observed on the nesting territory) in 2004. Of the 59 active sites, 39 were occupied by breeding pairs that successfully nested (i.e., reared young to fledging), producing a total of 54 fledglings (Table 4-2). Sixteen of the remaining 20 active sites were occupied by pairs that did not successfully reproduce, and the reproductive outcome at four sites was undetermined. Twelve of the sixteen unsuccessful pairs nested but failed to rear young to fledging; four territories were occupied, but the adult breeding pair did not attempt nesting.

4.4.3 Discussion

Based on the number of active territories and reproductive performance, the nesting population in the Basin continues to remain generally healthy (Table 4-2). Data from 2004 indicate a relatively significant increase in the number of active territories (five more than in 2003) and the number of successful nests (five more than in 2003). In addition, 10 new territories were identified in 2004, most of these along the Sacramento River and Natomas Cross Canal; however, the data suggest the possibility of known breeding pairs using alternate nest sites, as well as the local movement of displaced pairs (e.g., breeding pairs whose nest trees were removed). Because very few individuals in this population have been marked (i.e., color banded), local movements of individuals or nesting pairs cannot usually be confirmed; accordingly, newly discovered nest sites are often considered new territories.

Of the new territories identified in 2004, the most significant is NB-81 on the BKS Reserve. This successful nest represents the first Swainson's hawk nest on a TNBC reserve. This site is also one of the few that has been detected on the eastern side of the Basin, and suggests that management of the BKS reserve has been successful in providing nesting and foraging habitat for this species.

Overall reproductive performance (i.e., number of young per occupied nest and number of young per successful nest) has also remained relatively stable (Table 4-2). The number of young per successful nest continues to decline slightly each year; however, overall reproductive performance has remained relatively stable

between 1999 and 2004, and is generally consistent with the Sacramento Valley population as a whole since the mid-1980s (Estep in preparation).

Although these data have not been subjected to statistical analysis, no significant trend in the Basin population has been detected thus far since 1999. While several nesting sites have been removed as a result of ongoing development or other activities, this has not yet resulted in a detectable decline in the overall population; however, removal of nest trees and loss of foraging habitat has contributed to a reduction in the number of active territories in the southern interior portion of the Basin. As planned development continues, additional nesting pairs will likely be displaced and foraging habitat will continue to be reduced in the Basin. Conservation efforts (i.e., maintaining and creating new upland foraging habitat on reserves) can help to offset losses and counter possible future population declines. This year's establishment of a Swainson's hawk nest on the BKS Reserve is an example of how reserve management efforts can help offset losses elsewhere in the Basin.

A total of seven Swainson's hawk nest sites have been removed since the implementation of the NBHCP (Figure 4-5). Three of these, NB-3, NB-17, and NB-76, were removed as a result of development permitted under the NBHCP. One site, NB-7, was permitted for removal under the Metro Air Park HCP. Three additional sites, NB-15, NB-26, and NB-20, were removed during maintenance activities by the Sacramento International Airport staff; these sites were not permitted for removal. While there continues to be an increase in the total number of active territories in the study area (Table 4-2), the majority of the new sites that have been identified in the last several years, with few exceptions, are along the peripheral drainages (e.g., the Sacramento River) or the edges of the Basin. As expected, active nest sites in the southern interior portion of the Basin have declined as a result of nest site removal and development activities.

4.5 Distribution of Foraging Habitats in the Basin

4.5.1 Methods

The distribution and abundance of habitat types was analyzed using the comprehensive GIS vegetation map (see Chapter 2, *Vegetation Mapping, Floristic Inventory, and Noxious Weed Monitoring*). Cover types considered to be suitable Swainson's hawk foraging habitat were identified and mapped, and acreages were compiled. These data were then used to describe the types and distribution of suitable Swainson's hawk foraging habitat throughout the Basin.

4.5.2 Results

Table 4-3 lists the habitat types in the Basin that provide suitable Swainson's hawk foraging habitat. Suitable habitat types include both cultivated and

uncultivated lands. Suitable cultivated habitats comprise alfalfa and row, grain, and other hay crops (row, grain, and other hay crops have been combined because of seasonal and annual rotations). Suitable uncultivated habitats include irrigated and nonirrigated grasslands and pastures. The relative foraging habitat value of the different types depends on prey density and availability, but all have foraging value; collectively, these habitat types provide an important diversity of foraging habitats in portions of the Basin.

Table 4-3. Habitat Types in the NBHCP Area in 2004 that Provide Suitable Swainson's Hawk Foraging Habitat

Cover Type	Acres
Alfalfa	610
Row, grain, and other hay crops	7,258
Nonnative annual grasslands	6,488
Irrigated grasslands/pasture	750
Created grasslands on reserves	42
Total	15,157

Cover types that provide suitable Swainson's hawk foraging habitat total 6,814 hectares (16,840 acres), or approximately 31% of the entire Basin (Table 4-3). The distribution of suitable foraging habitat in the Basin is depicted in Figure 4-6. The majority of the area that is considered suitable foraging habitat occurs in the Basin's southwest corner and on its western edge along the Sacramento River. While there are pockets of suitable habitat in other areas, the majority of the northern and central Basin are traditionally under rice production, a crop type that is considered unsuitable for Swainson's hawk foraging. Most of the southeast corner of the Basin has been or is currently being developed and is largely unsuitable for Swainson's hawk foraging. Reserve acquisition and management activities have retained and created some Swainson's hawk foraging habitat, offsetting a portion of the habitat loss resulting from development.

4.6 Effectiveness

Biological effectiveness as it pertains to Swainson's hawk is measured on the basis of acquisition and land management activities that meet the goals for Swainson's hawk habitat, as well as the population's response to these actions. It is also measured on the basis of successful implementation of management recommendations designed to further benefit Swainson's hawk through targeted acquisition or specific land management activities.

4.6.1 Population Status

As discussed in Section 2.4.3, the status of the Swainson's hawk population in the Basin remains stable. While it is too early to reach conclusions regarding the overall effectiveness of the acquisitions and reserve management with respect to population stability, to date there have been no significant changes in the Basin-wide population beyond the expected loss of habitat and nesting pairs within development areas.

4.6.2 Habitat Suitability and Availability on Reserves

To date, TNBC has acquired sufficient habitat in the Basin, relative to lands permitted for development, to meet the overall compensation goals of the NBHCP. Swainson's hawk habitat goals also continue to be met through establishment of suitable upland habitats on reserves.

Site-specific management activities have been undertaken for purposes of maximizing habitat potential for Swainson's hawk. For example, the Brennan Reserve is managed primarily for Swainson's hawk habitat by maintaining the entire reserve as suitable foraging habitat and establishing a long-term crop/fallow program to maximize rodent prey production (see the Brennan Reserve SSMP for details).

4.6.3 Targeted Acquisitions

Swainson's hawk habitat has been a key consideration in reserve acquisition. Several of the acquisitions are consistent with recommendations that have been summarized in the Swainson's hawk annual report for the last several years, as well as in this report (see Section 4.7 below).

Acquiring reserve lands within 1 mile of the Sacramento River is desirable because a large segment of the nesting population occurs along the river and because the value of foraging habitat along the river is greater than that in the Basin interior. Several of the reserves are within the 1-mile zone: Alleghany 50, Cummings, Souza, Natomas Farms, Atkinson, Huffman West, Huffman East, and Bennett South. All these reserves, with the exception of Huffman East, include an upland component that provides suitable foraging habitat for Swainson's hawk.

Acquiring contiguous properties or properties with a high probability of being contiguous in the future is also desirable because larger contiguous reserves enhances the suitability of Swainson's hawk foraging habitat. Contiguity has been and continues to be a key component in the decision-making process regarding reserve acquisition. In addition, TNBC has been strategizing

opportunities to trade properties (e.g., Ayala) for other properties that are either currently contiguous or have a high likelihood of becoming contiguous through additional acquisitions.

4.7 Recommendations

- Rely on survey results to strategize acquisition efforts with the goal of sustaining the existing Swainson's hawk population. Many of the pairs are in or near areas that will be affected by current or planned development. Consequently, a net loss of suitable nesting and foraging habitat—and breeding pairs—is expected. To sustain the population in the Basin and to offset this loss, efforts should be made to create new nesting and foraging habitat in protected areas.
- Focus acquisition efforts within 1.6 kilometers (1 mile) of the Sacramento River. This is the area that is currently most critical to sustaining the existing population because it provides the highest value nesting and foraging habitat and supports the majority of breeding pairs that use the Basin. Enhancement efforts (i.e., converting unsuitable habitat to suitable habitat) within this area will help to offset the loss described in item 1.
- Focus acquisition and restoration efforts on upland habitats. While seasonal wetlands can provide some foraging value to Swainson's hawks, permanent uplands provide the highest value foraging habitat. Permanent uplands include non-rice agricultural fields, grasslands, and pastures.
- Develop a Basin-wide strategy for acquisition and management of Swainson's hawk habitat. Identify areas throughout the Basin that could contribute to sustaining and/or expanding the Swainson's hawk population through management, enhancement, or creation of suitable habitat.
- Carefully select and give preference to conservation sites that provide potential for additional acquisition of neighboring properties.
- Give preference to utilizing simple management techniques and existing farm resources for the Swainson's hawk components of the reserve lands. Efforts should be made to integrate surrounding farmlands with reserve lands.

4.8 References

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