Occurrences and Habitat Suitability for Swainson's Hawk at the Cache Slough Mitigation Bank

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Introduction

Cache Slough Mitigation Bank, owned and operated by Westervelt Ecological Services (WES), is a 350-acre property in the Sacramento-San Joaquin Delta at the south end of the Little Egbert Tract in southeastern Solano County. Proposed management of the property, which has focused on livestock grazing and waterfowl habitat for at least 30 years, would create a tidal opening to Cache Slough/Sacramento River, which borders the property on the east and south, to restore tidal conditions and re-establish tidal freshwater marsh habitat onsite. Much of the site would be inundated daily during tidal exclusion and all of the interior of the site would be inundated during a 2-year flood. The only high ground would be a habitat berm that is constructed around the perimeter of the site. The rest of the Little Egbert Tract, an approximately 2,800-acre intensively-cultivated area extending northward to the southern terminus of the Yolo Bypass, is also proposed for restoration of tidal and subtidal habitats as described in the Little Egbert Tract Feasibility Study and Multi-Benefit Project (CBEC 2018).

Swainson's hawk (*Buteo swainsoni*), a state-listed Threatened species that requires trees for nesting and upland grasslands or agricultural lands for foraging, is known to nest in the vicinity of the mitigation bank property. An active nest was documented near the northern border of the property in 2022 and an active nest was documented within 0.3 miles on the neighboring property to the southwest in 2020. There are other nesting records throughout southern Solano, southwestern Sacramento, and southeastern Yolo Counties in the general vicinity of the property.

Location

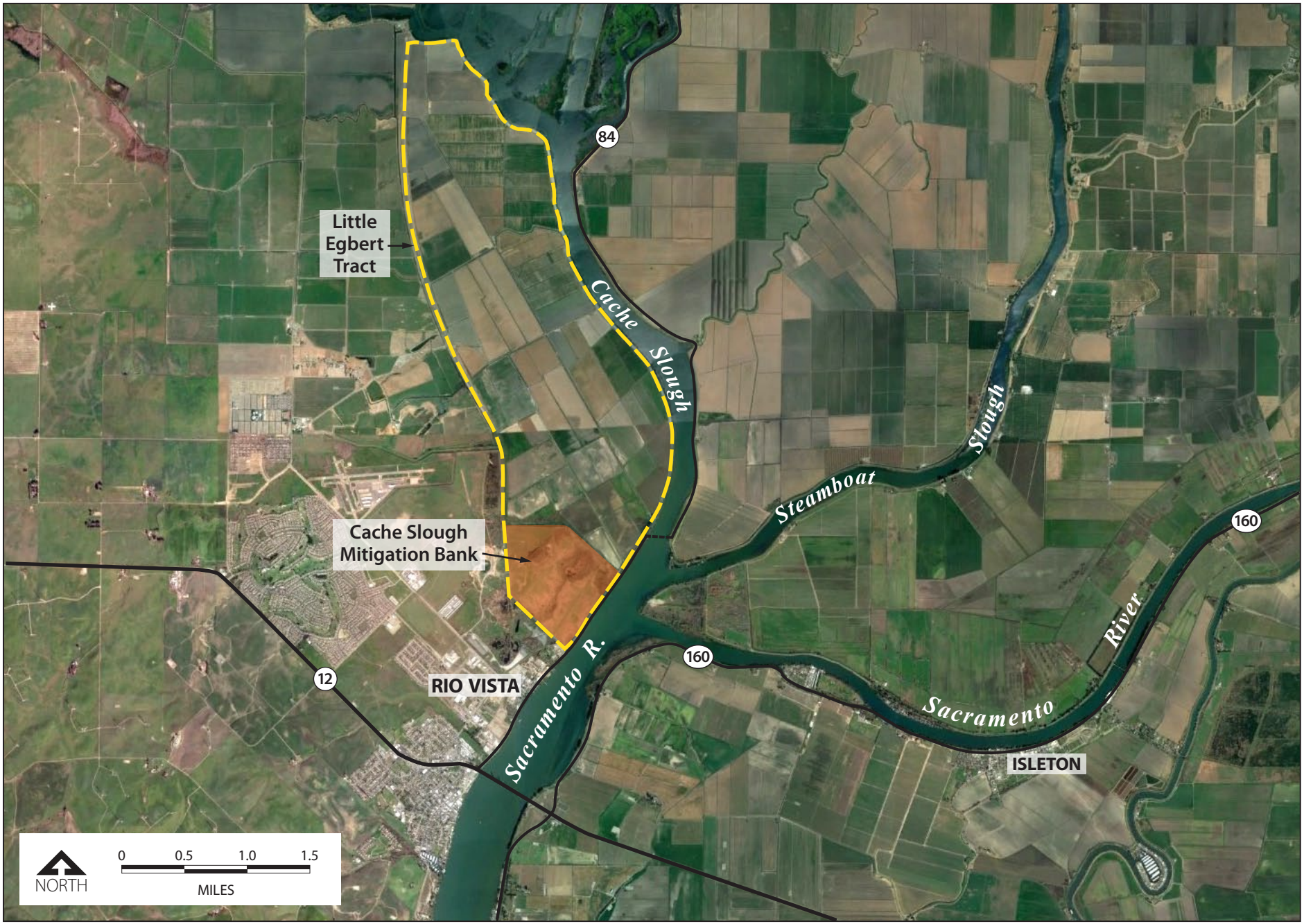
The Cache Slough Mitigation Bank is located in the Sacramento-San Joaquin River Delta at the southern end of the Little Egbert Tract, approximately 0.5 miles north and east of the City of Rio Vista, Solano County (Figure 1). The southeast boundary of the 350-acre property is bordered by State Route 84 and the Sacramento River, near the confluence of the Sacramento River, Cache Slough, and Steamboat Slough.

Purpose

The purpose of this assessment is to evaluate the current nesting and foraging habitat value of the proposed tidal restoration site for Swainson's hawk and assess the effect of conversion from grassland and seasonal wetland natural communities to tidal wetlands on the local and regional population. The assessment focuses on the mitigation bank property but also generally addresses the proposed restoration of the Little Egbert Tract in total.

Methods

A survey of the 350-acre mitigation bank was conducted on May 12 and June 8, 2023 to search for active Swainson's hawk nests, document foraging use, and evaluate nesting and foraging habitat conditions. The survey also included immediately adjacent properties and extended northward to include the 2,800-acre Little Egbert Multi-Benefit Project area. In addition, regional land cover was examined using aerial imagery from Google Earth and other online sources. Swainson's hawk nesting records gathered from CNDDB, e-bird, and recent surveys



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BASEMAP: Google Earth, 2022.

Figure 1
Location of Cache Slough Mitigation Bank

conducted by the Yolo Habitat Conservancy (Estep 2020) and other sources were examined to assess broader habitat availability and the regional density of the nesting population to assess the potential effect of the proposed land conversion on the regional nesting population.

Description of Swainson's Hawk Nesting and Foraging Habitat

Nesting

In the Central Valley, Swainson's hawk nests in large native trees such as valley oak (*Quercus lobata*), cottonwood (*Populus fremontia*), walnut (*Juglans californica*), and willow (*Salix* sp.), and increasingly in nonnative trees, such as eucalyptus (*Eucalyptus* sp.) and ornamental pine trees. Prior to agricultural conversion, Central Valley populations nested primarily in riparian woodlands and on the edges of oak woodlands. Today, in addition to these habitats, the species nests in roadside trees, trees along field borders, isolated trees, trees around farm houses and farmyards, and in urban areas that are adjacent to cultivated lands (England et al. 1995, Estep 2007, 2008, Bechard et al. 2010, Alsup 2012).

Nesting pairs are highly traditional in their use of nesting territories. Many monitored nesting territories in the state have been occupied annually since at least the early 1980s and banding studies conducted since 1986 confirm a high degree of territory and mate fidelity (Woodbridge 1991, Briggs 2007, Estep *in preparation*).

Foraging

Swainson's hawks are plains or open-country hunters, requiring large open landscapes for foraging. Historically, the species hunted the grasslands of the Central Valley and coastal valleys and the open desert scrub and shrublands in high desert regions. With the cultivation of virtually all of the Central Valley, and a portion of the high desert region, Swainson's hawk foraging has largely shifted onto agricultural lands that provide a dynamic, regularly manipulated landscape that maximizes prey populations and accessibility of rodent prey (Estep 1989, Woodbridge 1991, Babcock 1995).

Foraging habitat use, particularly agricultural foraging habitat, is largely a function of two primary variables: abundance of prey and amount of vegetative cover that affects access to prey (Bechard 1982, Estep 1989, 2009). Suitability is in part a function of changing vegetation structure throughout the growing season, which influences prey accessibility. Agricultural cover types that provide suitable foraging habitat conditions include hay, grain and row crops, fallow fields, and irrigated and dryland pasture. Foraging studies have revealed differences in use of different cultivated and uncultivated landscapes and individual crop types (Swolgaard 2008, Nur and Veloz 2019). For example, these and other studies have shown that the use of alfalfa and other hay fields is significantly greater than other crop types because of the low vegetative structure, relatively large prey populations, and because farming operations such as periodic mowing enhance prey accessibility. Other crop types may be more intermittently used, but provide an important pulse of available prey during the harvest season when vegetation is reduced and prey accessibility increases. A diverse cultivated landscape, such as that found throughout much of the Sacramento Valley and Delta region can create a dynamic foraging

landscape as temporal changes in vegetation results in changing foraging patterns and foraging ranges (Estep 1989, Babcock 1995, Fleishman et al. 2016). Uncultivated habitats, such as grasslands and seasonal wetlands, provide more stable, consistent habitat value, but may not provide the extent of available prey resources that would support the high breeding densities found in some cultivated habitats.

Description of the Cache Slough Mitigation Bank

Site Conditions, Land Use, and Physiography

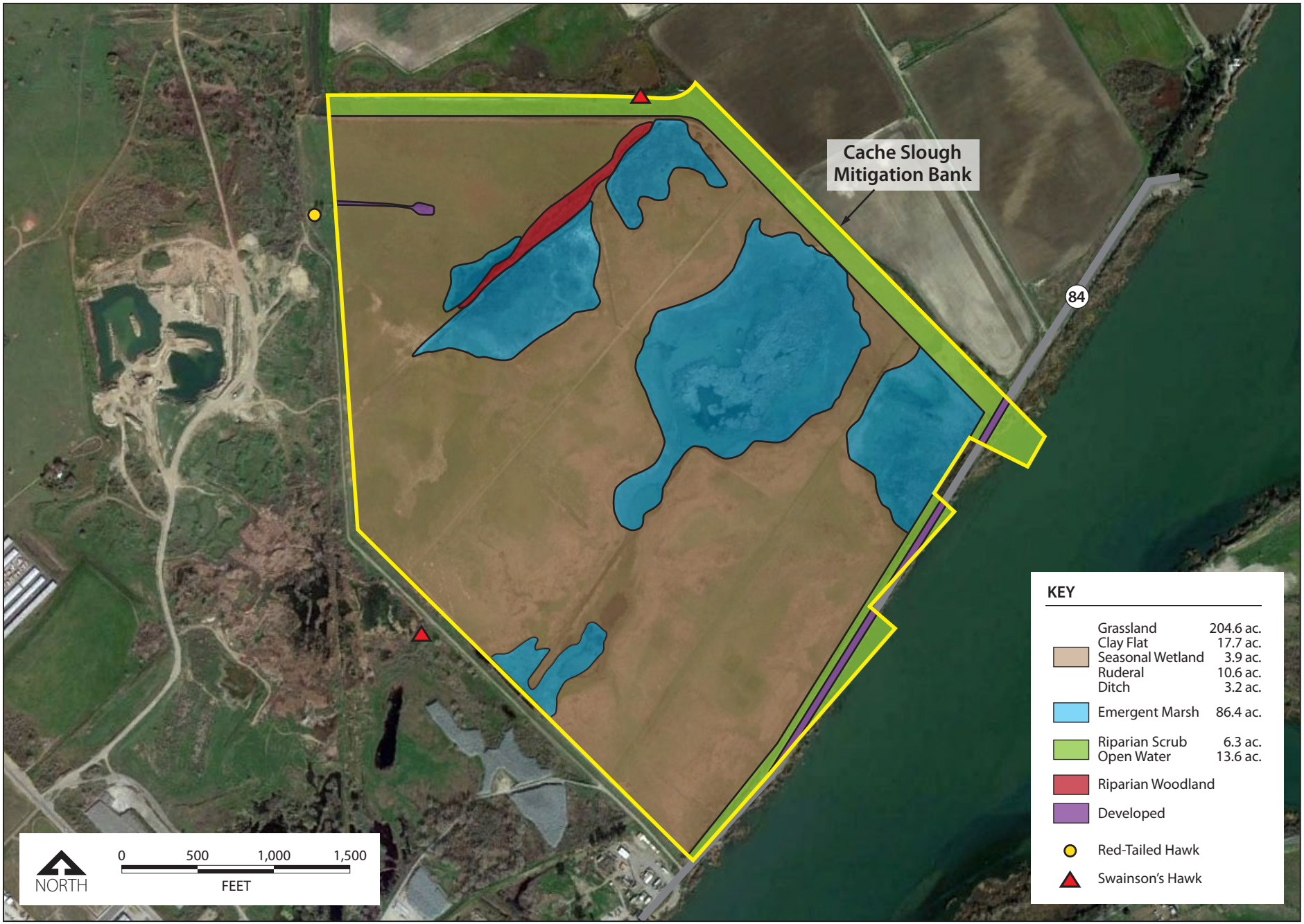
The mitigation bank is bordered on the north and northeast by the Watson Hallow Slough, a large permanent water conveyance canal supporting open water and riparian scrub habitats (Figure 2). Smaller drainage ditches also extend along the western border (although on the adjacent property), and along the southeastern border paralleling State Route 84. These also support a narrow band of riparian scrub. In several areas, the parcel line also crosses State Route 84 and includes riparian scrub and open water along the Sacramento River. Interior land cover can be characterized as a periodically inundated marsh/seasonal wetland-grassland complex. Helm Biological Consulting (2022) described the majority of the interior as grassland, emergent marsh, partially-vegetated clay flat, and seasonal wetland. Most of the interior appears to be periodically inundated and perhaps regularly inundated during the winter months, attracting wintering waterfowl and other waterbirds, and drying during the late spring and summer. Even much of the area mapped as emergent marsh by Helm Biological Consulting (2022) appears to dry out during the summer months.

Due to periodic inundation, the structural similarities between the different types, and the transition to emergent marsh habitat throughout most of the area, much of the grassland, clay flat, and seasonal wetlands may also be generally classified as a seasonal wetland complex. As a result, for purposes of describing Swainson's hawk foraging habitat, these types of have been combined (See below). Five drainage ditches extend through the interior of the property, one of which supports a narrow band of ruderal vegetation along its edge and one that supports a band of riparian woodland. With the exception of several isolated trees around the perimeter, these trees represent the only suitable nesting habitat for Swainson's hawks on the mitigation bank. Topography throughout the entire property is generally flat with elevation ranging from -3 to 5 feet above mean sea level. The climate in the vicinity of the property is mild with average annual maximum temperature of 74.3 degrees Fahrenheit and average annual minimum temperature of 50.4 degrees Fahrenheit, with winter rains and dry summers, and an average annual rainfall of approximately 20 inches.

Natural Communities and Habitats

A detailed vegetation survey was conducted on the mitigation bank in 2022 (Helm Biological Consulting 2022). The survey conducted for this assessment verified those results. Natural communities used in this report follow those defined in Helm Biological Consulting (2022) and including the following (refer to Helm Biological Consulting for floristic descriptions):

- Grassland (204.6 acres)



BASEMAP: Google Earth, 2022.

Figure 2
Land Cover/Natural Communities and Swainson's Hawk Nests on the Cache Slough Mitigation Bank

- Emergent marsh (86.4 acres)
- Clay Flat (17.7 acres)
- Seasonal Wetland (3.9 acres)
- Riparian (8.3 acres)
- Ditch (3.2 acres)
- Ruderal (10.6 acres)
- Open Water (13.6 acres)
- Developed (1.83 acres)

Grassland. Grasslands, occupying nearly 60 percent of the land cover on the mitigation bank are low elevation areas that appear to be seasonally or periodically inundated, and likely requiring periodic recolonization by small rodents to provide suitable foraging conditions for Swainson's hawks and other raptors (Figure 2). Once recolonized, which can occur rapidly, these areas provide suitable prey accessibility and availability (Plate 1). The grasslands also appear to be floristically diverse throughout the property with varying vegetative density and plant associations. But as noted, although categorized as grasslands, they appear to function as seasonal wetlands with winter flooding and summer drying.

Plate 1. Grasslands on the Cache Slough Mitigation Bank. This land cover is considered suitable foraging habitat for Swainson's hawks.

Emergent Marsh. These areas are low-lying tule-dominated wetlands, occurring with other bullrushes, sedges, and a variety of non-native species (Plates 2 and 3) and integrating with seasonal wetland and grassland habitats (Figure 2). Some of these areas also dry during the summer months potentially providing suitable foraging habitat for Swainson's hawks once recolonized by small rodents. Emergent marsh occupies 25 percent of the mitigation bank.

Plate 2. Freshwater marsh complex near the east side of the mitigation bank. Patches of bullrush (*Schoenoplectus* sp.) within a larger marsh complex that includes smartweed (*Persicaria amphibia*) trefoil (*Lotus corniculatus*), and curley dock (*Rumex crispus*).

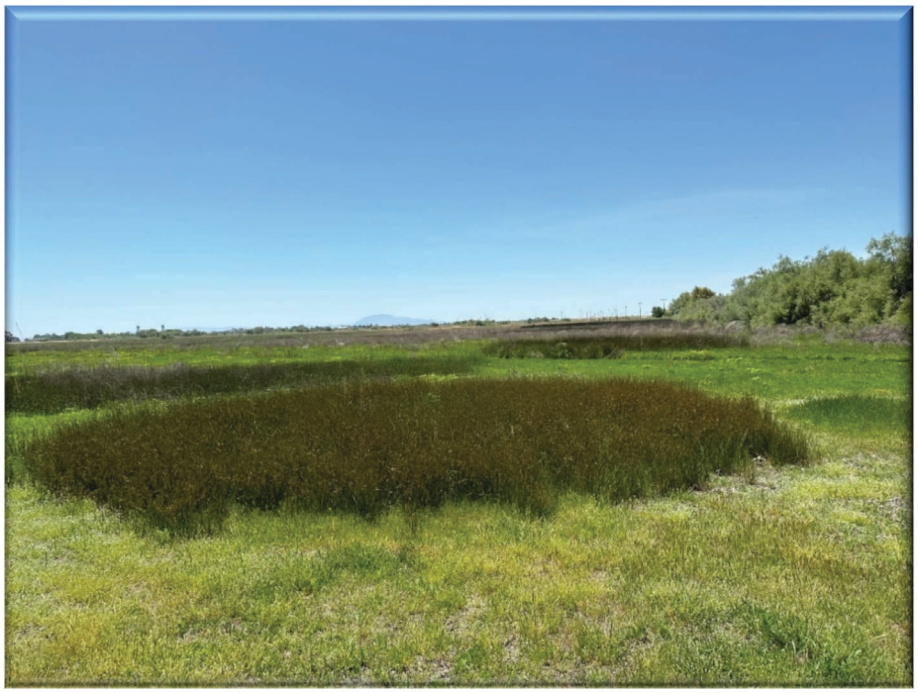


Plate 3. Freshwater marsh complex just south of the riparian woodland corridor showing the variation in vegetation type and structure. When dry, and following rodent colonization, suitable foraging conditions may occur where prey is accessible.

Clay Flat. These areas, totaling 17.7 acres of the mitigation bank, include barren ground to partially vegetated ground (Plate 4). Soil composition and inundation frequency determine the extent of vegetative cover. Where devoid of vegetation, they provide limited to no suitable foraging habitat for Swainson's hawks; however, on the mitigation bank they integrate with grasslands and seasonal wetlands and are considered part of the broader seasonal wetland complex.

Plate 4. Clay flat on the west side of the mitigation bank showing unvegetated and sparsely vegetated areas.

Seasonal Wetland. Seasonal wetland, as defined and mapped by Helm Biological Consulting (2022) encompasses only 3.9 acres of the mitigation bank land cover. These areas may remain inundated longer that the adjacent grasslands and support a more diverse vegetation composition but also maintain a relatively low-lying vegetative structure. Once dry and recolonized by prey, they can provide suitable foraging habitat for Swainson's hawks.

Riparian. Narrow patches of mostly herbaceous riparian scrub with occasional willow trees, occur along the northern, southern, and eastern borders of the mitigation bank (Plates 5 through 8). A narrow band of willow-dominated riparian woodland, approximately 2 acres of the 8.28 acres of riparian described by Helm Biological Consulting (2022), extends along an interior ditch in the northern portion of the mitigation bank (Figure 2, Plate 9).

Ditch, Ruderal, Open Water, and Developed. Ditches include the larger permanent or semi-permanent water conveyance channels around the perimeter of the property and several small internal channels. Nearly all of the ruderal habitats occur along the edge of ditches (Plates 5 and 6). Developed areas include State Route 84 where it intersects with the parcel, and a small structure and access road in the northwest corner. Open water occurs in the water conveyance channels along the northern and eastern borders (Figure 2, Plates 2, 6, and 7).

Plate 5. Looking northwest along the southwest border of the mitigation bank showing open water within the ditch and a small group of riparian trees (willow) further northwest along the ditch.

Plate 6. Looking southeast along the Watson Hallow Slough, a permanent water conveyance channel along the northern and northeastern borders of the mitigation bank. Vegetation is entirely herbaceous riparian scrub and ruderal, with the exception of several widely-spaced willow trees.

Plate 7. Looking northwest along Watson Hallow Slough from State Route 84. Riparian scrub occurs along the edge of the slough - most vegetation is herbaceous with several small willow trees. The cottonwood trees on the right are just off the mitigation bank property.

Plate 8. Looking southwest along State Route 84 showing the narrow band of riparian vegetation along the internal roadside ditch on the right and the Sacramento River on the left. Small willow, valley oak, walnut, and Oregon ash (*Fraxinus latifolia*) occur along both sides of the road.

Plate 9. Looking west along the south side of the riparian corridor in the interior of the property. This woody riparian area is comprised entirely of willow trees.

Habitat Suitability for Swainson's Hawks

Figure 2 illustrates the natural community types on the mitigation bank based on suitable nesting and foraging habitat for Swainson's hawk by consolidating some of the natural communities described by Helm Biological Consulting (2022).

Nesting. Suitable nesting habitat on the mitigation bank is limited to the approximately 2-acre patch of willow-dominated riparian woodland extending along a narrow corridor from the northeast corner of the property southwestward for approximately 1,600 feet, and several willow trees within the riparian scrub around the perimeter of the mitigation bank (Figure 2).

Foraging. Suitable foraging habitat combines the grassland, clay flat, and seasonal wetland habitats. It also incorporations ruderal habitats and ditches that occur as linear features within these types and may also provide suitable foraging habitat or rodent prey refugia. Combining these types, suitable foraging habitat on the mitigation bank totals 240 acres. Emergent marsh, totaling 86.4 acres and considered unsuitable foraging habitat, occurs in several blocks within the otherwise suitable foraging landscape (Figure 2). Note, however that suitability is in part a function of prey accessibility. When the mitigation bank is flooded and the grassland habitats are inundated, they do not provide suitable foraging conditions. It is only after the property has dried and rodent populations have recolonized that the area functions as suitable foraging habitat. Also, as noted above, some areas within the emergent marsh complex may also be suitable following late spring drying and rodent recolonization.

Description of Landscape and Habitat Conditions on Neighboring Lands and in the Region

Land cover on adjacent lands to the west and northwest include a large wetland complex intermixed with willow-dominated riparian, irrigated pasture, and urbanization from the City of Rio Vista. To the east and southeast, across the Sacramento River and Cache Slough, land use is entirely agricultural. Little Egbert Tract extends northward and northeastward from the mitigation bank. This approximately 2,800-acre area is also entirely under cultivation. During the survey, wheat and alfalfa were the primary crop types noted, with smaller areas that were unplanted row crop fields and idle fields (Figure 3).

While suitable foraging habitat is abundant on neighboring land and throughout the Delta region, nesting habitat is limited. Several suitable willow trees are present on the adjacent property to the west and southwest, but there is no nesting habitat on the Little Egbert Tract north of the mitigation bank with the exception of several cottonwood trees along the northeast side of Watson Hallow Slough near State Route 84 and a grove of eucalyptus trees just north of the State Route 84 ferry crossing along Cache Slough. Throughout the Delta region and the area west of Little Egbert Tract in Solano County, the majority of potential nest trees are willow trees along water courses and eucalyptus trees near farmsteads.

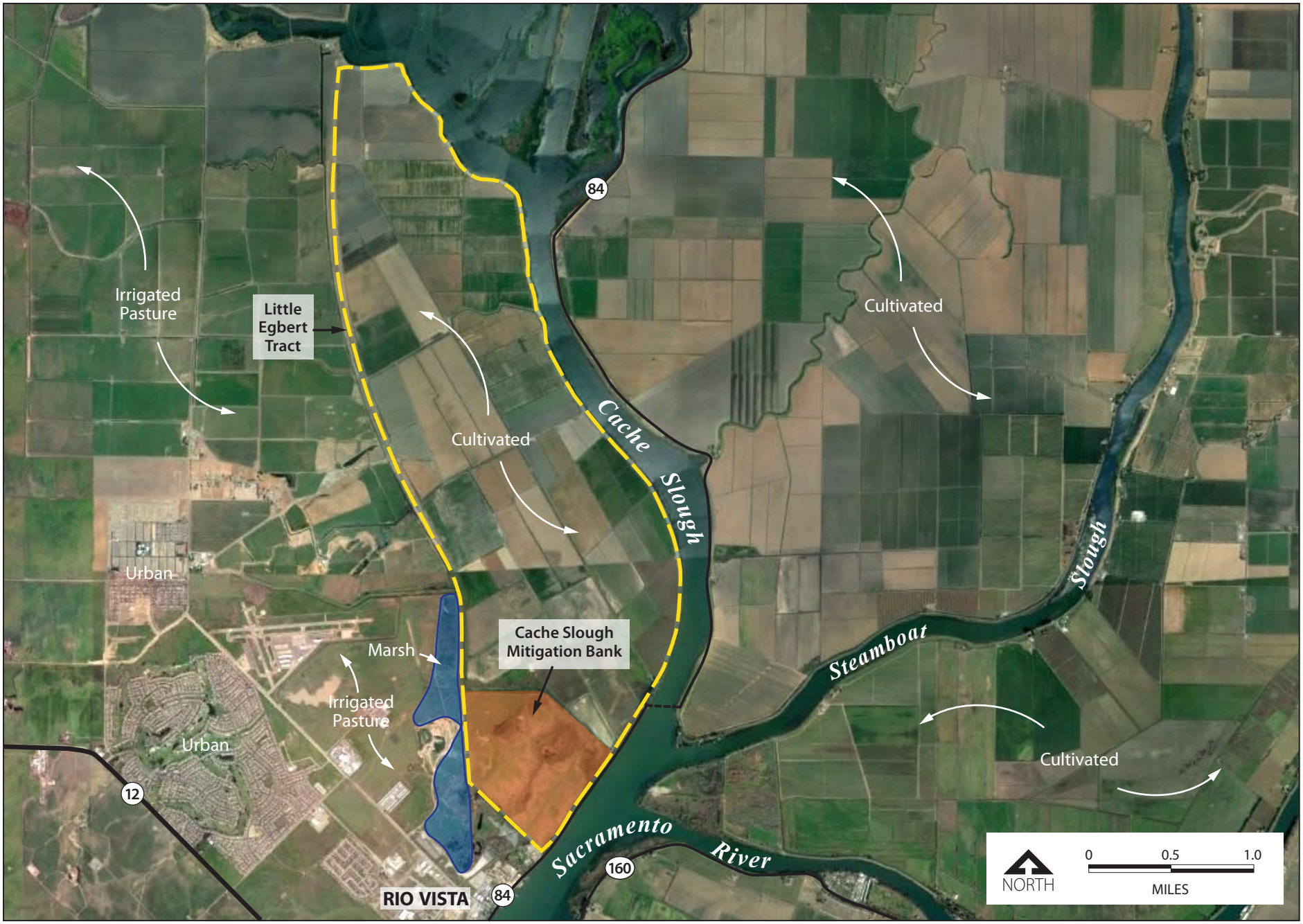
Nesting and Foraging Occurrences

A Swainson's hawk nest was located on the mitigation bank in 2022. The nest is located in a willow tree along the northern water conveyance canal near the northeast corner of the property (Figure 2, Plate 10). During this survey, the adult Swainson's hawks occupied the site and the nest was intact. However, as of the follow-up survey date (June 9, 2023), the pair had not nested, but continued to occupy the territory. This has been a common occurrence during the 2023 breeding season across the species' range in the Sacramento Valley, likely due to the particularly severe weather conditions during the spring and its effect on arrival dates, rodent prey populations, and the breeding cycle.

During the survey, a second active nest was located on the adjacent property immediately west of the mitigation bank (Figure 2). The nest is in a willow tree, approximately 200-feet west of the mitigation bank border. This nest was active during the survey with the female on the nest in an incubating position.

A red-tailed hawk nest was also documented during the survey on the adjacent property to the west within approximately 60-feet of the mitigation bank boundary (Figure 2, Plate 11).

Several foraging occurrences were also noted during the survey. Four individual Swainson's hawks were observed hunting on the mitigation bank: the two adults from the aforementioned onsite active territory, an individual from the offsite territory just west of the mitigation bank boundary, and an individual that hunted on the mitigation bank and then flew across the Sacramento River presumably to a territory east of the Sacramento River. At the time of the survey, the land had sufficiently dried after having been inundated during the winter and early spring months. Observed foraging activity indicates the ongoing recolonization by rodent prey.



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BASEMAP: Google Earth, 2022.

Figure 3
Land Use in the Vicinity of the Cache Slough Mitigation Bank

Plate 10. Swainson's hawk nest tree along the Watson Hallow Slough near the northeast corner of the mitigation bank. The nest is visible in the center of the tree.

Plate 11. Red-tailed hawk nest tree just west of the northwest corner of the mitigation bank.

Regional Swainson's Hawk Distribution

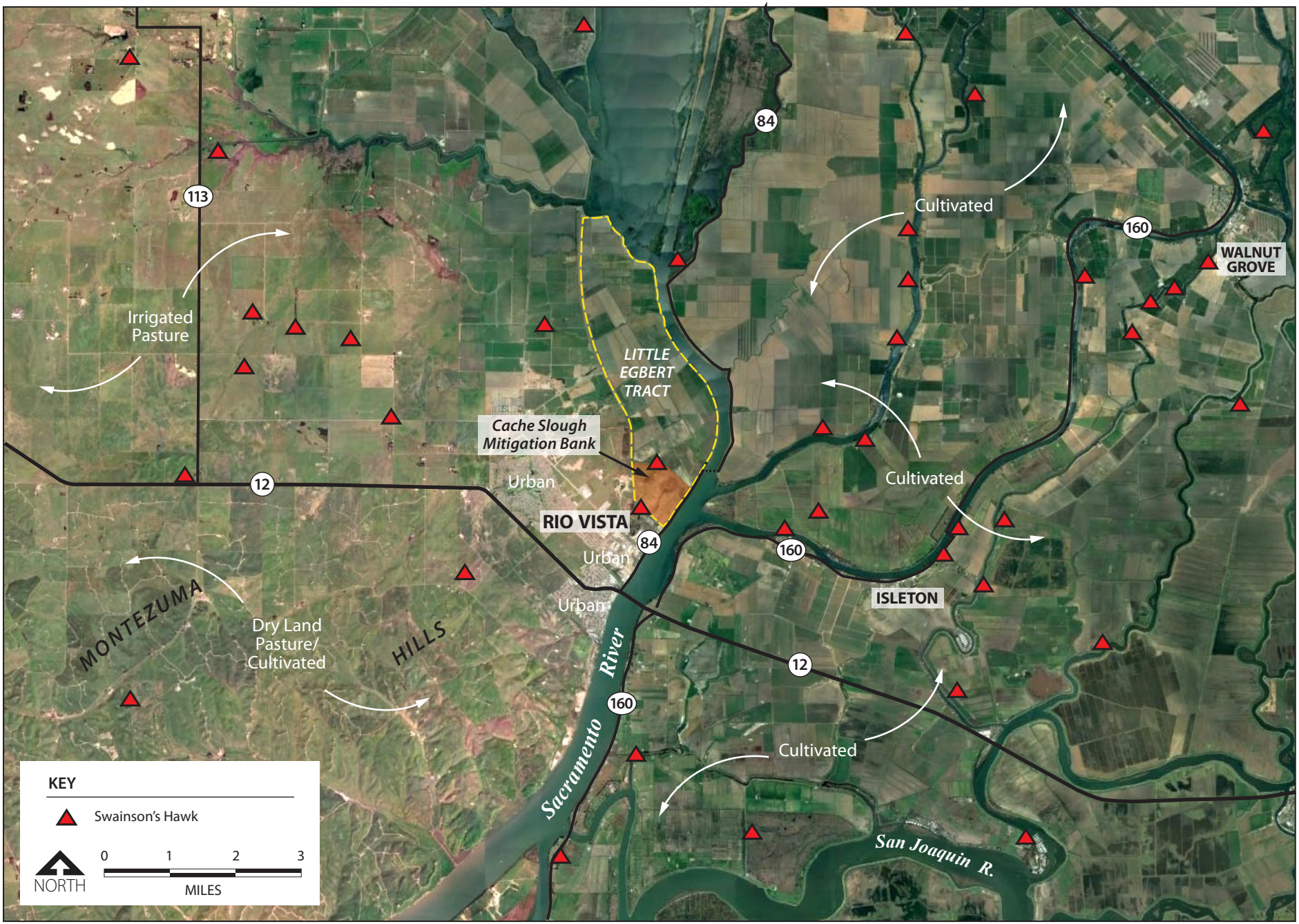
As a result of the limited nesting opportunities, the Swainson's hawk breeding density in the vicinity of the mitigation bank and throughout much of the central Delta region, is relatively low compared with other cultivated areas outside of the central Delta. Figure 4 illustrates the distribution of nesting Swainson's hawks within about 9 miles of the mitigation bank. There are 16 confirmed reported nest sites within 5 miles of the mitigation bank (Estep 2007, 2018, ebird 2023). A review of eBird data also reveals numerous additional sightings of Swainson's hawks within this area indicating the importance of this agricultural landscape for foraging.

The Potential Effect of the Proposed Tidal Restoration on the Swainson's Hawk Nesting Population

The proposed restoration of tidal wetland habitat on the Cache Slough Mitigation Bank is expected to result in more consistent and longer duration inundation compared with current conditions. Because much of this grassland-marshland complex represents suitable foraging habitat for the Swainson's hawk, the conversion from a periodically inundated grassland/marshland complex to a tidal wetland could effectively remove 240 acres of Swainson's hawk foraging habitat or otherwise influence the use of the area. However, although foraging use of the mitigation bank may be reduced, because suitable agricultural foraging habitat is abundant throughout the region and nesting density is relatively low, the conversion to a restored tidal wetland would not be expected to affect the abundance or nesting distribution of Swainson's hawks in the Delta region. Reestablishing the tidal wetland natural community on the property would add substantial value to the restoration of natural processes within the Sacramento-San Joaquin River Delta, including value to numerous native plants and wildlife.

Potential effects to nesting habitat is limited to trees along the interior riparian corridor. The nest tree along the Watson Hallow Slough is not expected to be affected because it's on the north side of the slough. The several other willow trees around the perimeter of the property are also not expected to be affected by restoration activities since they are associated with management of the water conveyance channels that are unlikely to be substantially altered as a result of restoration. Removal of the riparian woodland within the interior of the mitigation bank would represent a loss of suitable Swainson's hawk nesting habitat. Currently 8 to 10 of the willow trees within the 2-acre riparian stand are considered suitable as nest trees and could be removed or otherwise affected by proposed restoration. However, these trees are not currently occupied by nesting Swainson's hawks and none have been previously reported, so direct impacts on active or historic nests are not expected. Because nesting habitat is limited in the Delta region, removal of the trees further reduces available nest trees and would remove the potential for future nesting at that location. Still, removal of these few riparian trees to allow for restoration of tidal wetlands is not expected to affect the abundance or nesting distribution of Swainson's hawks in the Delta region.

The proposed similar restoration of tidal wetlands on the Little Egbert Tract north of the mitigation bank may result in a more substantial reduction of available foraging habitat and may potentially result in the removal of several additional willow trees and several mature cottonwood trees along the Watson Hallow Slough – depending on the need to modify the



BASEMAP: Google Earth, 2022.

Figure 4

Regional Land Use and Swainson's Hawk Nests in the Vicinity of the Cache Slough Mitigation Bank

configuration of the slough. This may also affect the future status of the active territory and nest tree along the slough. But because of the relatively few nesting occurrences in the area (none on the entirety of Little Egbert Tract other than the site along Watson Hallow Slough) and the abundance of available foraging habitat that occurs on neighboring lands and throughout the region, even this conversion of approximately 2,800 acres of suitable agricultural foraging habitat to tidal wetland and possible removal of 8 to 10 suitable nest trees may not substantially influence the current distribution and abundance of Swainson's hawks in the region. It could, however, contribute to a continued overall regional loss of agricultural foraging habitat from a variety of sources, including urbanization and conversion to perennial crops (e.g., orchards, vineyards) that could impede expansion of the local or regional population or nesting distribution.

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