

# Caltrans District 3 Yolo 80 Corridor Improvement Project



## Giant Garter Snake Habitat Assessment

Sacramento, Yolo, and Solano Counties, California

04-SOL-80-PM 40.7/R44.7; 03-YOL-80-PM 0.00/R11.72; 03-YOL-50-PM 0.00/3.12;

03-SAC-50-PM 0.00/L0.617; 03-SAC-80-PM 0.00/M1.36

EA: 03-3H900 / EFIS: 0318000085

**August 2022**





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STATE OF CALIFORNIA  
Department of Transportation

Prepared By:  Date: 07/15/2022

Eric Britt, Research Associate  
(925) 455-8770  
4435 First Street, PMB 312  
Livermore, CA 94551

Recommended  
for Approval By:  Date: 8/29/2022

Michele Lukkarila  
Associate Environmental Planner/Natural Sciences  
(530) 720-5820  
District 3/North Region Environmental

Approved By:  Date: 8/29/2022

Kenneth Russo  
Environmental Branch Chief  
(916) 952-5304  
District 3/North Region Environmental



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## **LIST OF ABBREVIATED TERMS**

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CAS	California Academy of Sciences
CDFW	California Department of Fish and Wildlife
CNDDDB	California Natural Diversity Database
ESL	Environmental Study Limits
GGs	Giant Garter Snake
I-80	Interstate 80
SBI	Swaim Biological Incorporated
USFWS	US Fish and Wildlife Service



# Chapter 1. Introduction

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Swaim Biological Incorporated (SBI) conducted a habitat assessment for the federally and state-threatened giant garter snake (GGS) (*Thamnophis gigas*) for the California Department of Transportation (Caltrans) District 3 Yolo 80 Corridor Improvement Project (Project). This report assesses the suitability of GGS habitat in the study area of the Project along the Interstate 80 (I-80) and U.S. Highway 50 (US-50) corridor, located within the historic and current range of GGS and contains some areas of habitat suitable to support the species. The study area for this habitat assessment included habitats within and 200 feet beyond the Environmental Study Limits (ESL), which encompasses all currently proposed Project components and disturbance areas (e.g., road widening, paving, staging/laydown areas). Habitats were characterized, and their components were scored, to determine the suitability for the species based on recognized ecological requirements.



## **Chapter 2. Project Description**

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The California Department of Transportation (Caltrans) proposes to construct improvements consisting of managed lanes, pedestrian/bicycle facilities, and Intelligent Transportation System elements along Interstate 80 (I-80) and United States Route 50 (US-50) from Kidwell Road near the eastern Solano County boundary (near the City of Dixon), through Yolo County, and to West El Camino Avenue on I-80 and Interstate 5 on US-50 in Sacramento County (Appendix A, Figure 1). Caltrans is both the lead agency under the National Environmental Policy Act (as assigned by the Federal Highway Administration) and the California Environmental Quality Act for the Project. The purpose of this Project is to improve multimodal mobility on the I-80 and US-50 corridors in Solano, Yolo, and Sacramento Counties. The Project would decrease congestion through the corridor and the effects that congestion has on transit and freight. It would improve transit headway times, reliability, access, and viability through the corridor. The Project would also increase people throughput by increasing transit, bicycle and pedestrian, and carpool use. Furthermore, the Project would address non-recurrent congestion caused by incidents, including collisions, by improving incident detection, verification, response, and clearing.

### **2.1. Giant Garter Snake Overview**

The GGS is listed as a threatened species under California state- and federal endangered species legislation. Habitat loss and fragmentation is the leading threat to GGS throughout its range. Habitat loss has occurred from urban expansion, agricultural conversion, and flood control. Fragmentation limits dispersal and isolates populations of the GGS, increasing the likelihood of inbreeding, decreasing species fitness (i.e., reproductive success), and reducing genetic diversity. Some populations of GGS are subject to the cumulative effects of a number of other existing and potential threats, including roads and vehicular traffic, predation by non-native species, and climate change. Recovery priorities, objectives and criteria, and further conservation efforts have been outlined in a Recovery Plan by U.S. Fish and Wildlife Service (USFWS 2017).

The GGS is a highly aquatic species and is endemic to the California Central Valley. It requires low-gradient aquatic habitats with a hydro-period extending sufficiently long into the summer to support prey species such as fish and amphibians. It also requires adjacent upland areas with underground retreats and hibernacula which includes rodent burrows, riprap on canal banks, and soil crevices that are above the level of winter flooding (i.e., upland refugia). Historically, the GGS was found to inhabit freshwater tule marshes, streams, and wetlands throughout the length of the Sacramento and San Joaquin Valleys. Currently,

GGS are often found in modified habitats, including agricultural canals and ditches, often associated with rice farming and flooding. Perennial wetlands provide the highest quality habitat for the GGS, and ricelands with interconnected water conveyance structures serve as an alternative habitat in the absence of higher quality wetlands. These habitats need to have sufficient basking sites as well as vegetation to provide cover and to support the secretive behavior of GGS (USFWS 2017).

The GGS is active from early spring (April–May) through mid-fall (October–November), although this period of activity varies based on weather. During the winter season, GGS are much less active and rarely emerge from their upland refugia. When active they usually remain near aquatic habitat, although they can move up to 0.8 kilometer (i.e., about 0.5 mile) in a day (USFWS 1999) and have been observed in nearby uplands up to hundreds of meters distant from any water body (USFWS 2017). However, during most of the active season and for individuals found above ground, GGS were found within 10 meters (i.e., approximately 30 feet) of water during 95 percent of the observations (Halstead et al., 2015a). GGS may be capable of long-distance movements in search of suitable habitat, but less movement is observed when water remains in the aquatic habitat through the active season (Wylie et al., 2002).

Irrigated cropland adjoining rice or managed wetlands may provide suitable habitat since canals associated with irrigated cropland are often used by the species. Due to lack of habitat and emergent vegetative cover, GGS generally are not present in larger rivers with sand, rock, and gravel substrates (e.g., the Sacramento River, Putah Creek). Riparian woodlands are unlikely to provide suitable habitat due to excessive shade, lack of basking sites, and absence of prey populations (USFWS 2006).



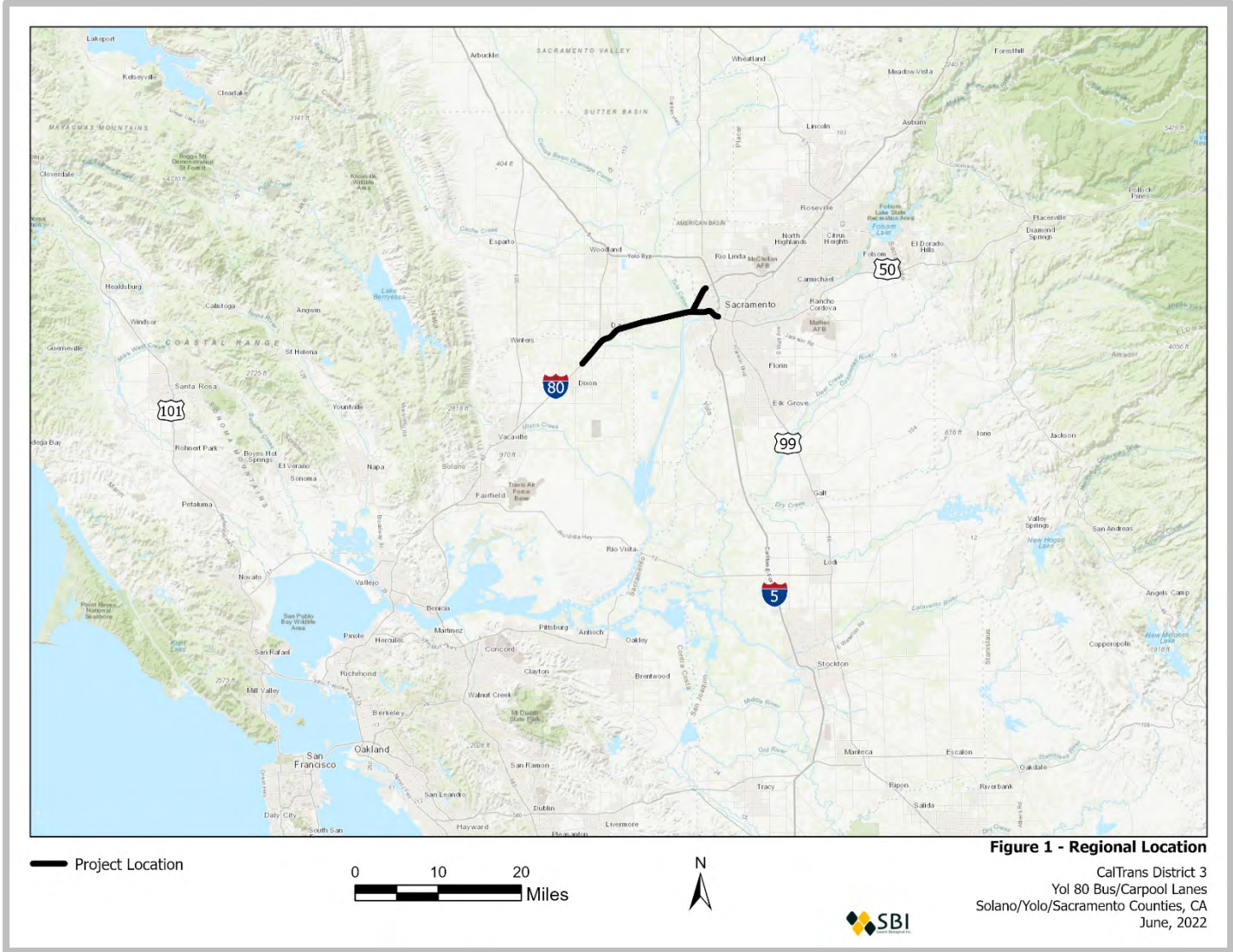


Figure 1. Project Location



# Chapter 3. Background Information

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## 3.1. Desktop Review

Information on the distribution of GGS in the vicinity of the Project was compiled from several sources prior to conducting field surveys. These included the following:

- California Natural Diversity Database (CNDDDB) occurrences within 4 miles of the study area (CDFW 2020a);
- California Department of Fish and Wildlife (CDFW) BIOS Viewer Giant Garter Snake Predicted Habitat Layer, based on California Wildlife Habitat Relationships (CDFW 2020b);
- The most recent U.S. Fish and Wildlife Service 5-Year review of the giant garter snake (USFWS 2006);
- Draft and Final Recovery Plans for the Giant Garter Snake published by the U.S. Fish and Wildlife Service (USFWS 1999; 2017);
- The California Academy of Sciences (CAS 2021) and University of California at Berkeley Museum of Vertebrate Zoology (MVZ 2021) online collection database records within 4 miles of the study area;
- Email communications with other wildlife managers and biologists with local species expertise; and
- Published accounts of surveys conducted in the area and literature reviews (Halstead et al., 2015b).

Habitat that could support GGS and geographic features that could facilitate or deter GGS movement were identified to the extent possible on topographic maps and aerial photographs (Google Earth Pro; ESRI basemap data). The most recent GGS occurrence records were mapped using geographical information system data obtained from the CNDDDB (Appendix C). The size of the GGS occurrence polygons reflects range accuracy and may include multiple snakes (California Natural Diversity Database [CNDDDB] and the California Academy of Sciences [CAS]). The CNDDDB is a voluntary database and is not a complete representation of expected species occurrences. Additionally, it does not track negative survey data (CDFW 2020). Areas identified as having potentially suitable aquatic habitat were identified using maps and aerial imagery, and areas dominated by industrial, commercial, or residential development were excluded from field surveys. Suitable upland habitat was defined as areas containing vegetative cover for protection from predators along with more permanent shelters, such as bankside crevices, holes, or small mammal burrows (Hansen 2003; Wylie et al. 2003) that were located within 200 feet of suitable aquatic habitat (Wylie et al. 1997; USFWS 1997).

## 3.2. Field Surveys

Field surveys of the study area were initially conducted between December 18 and 30, 2020, by SBI biologists Eric Britt, Cole Paris, and Elizabeth Armistead. After additional areas were added to the ESL in 2022, another survey was conducted on June 23, 2022, by SBI biologist Eric Britt. A total of 58 separate survey sites were identified in the study area (i.e., within and including 200 feet outside the ESL provided by Caltrans). Only one survey site (Pond 2; Location 53) was not directly accessible or visible from a public road or property. However, after review of surrounding area and aerial imagery, Pond 2 was determined to be marginal habitat for GGS. Assessed areas included aquatic and upland habitats, including interconnected ditches, drains, channels, rice fields, ponds and swales, within 200 feet of the Project ESL, a standard distance of upland from each bank side of aquatic habitat as suitable upland for GGS when assessing a project's disturbance area (USFWS 1997).

During the field surveys, criteria at each site were assigned a numerical score, and each site was classified as containing either unsuitable, marginal, or suitable GGS habitat according to its cumulative total. Habitat characteristics were recorded and assessed on a worksheet using a list of 15 variables associated with GGS habitat suitability adopted from the USFWS Draft Recovery Plan for GGS (USFWS 1999). Due to the large number of sites, some variables such as those associated with the presence of prey or introduced fish were estimated by the relative size and hydrological connectivity of the aquatic habitat. Habitat classification break points were identified based upon recognized habitat characteristics of GGS and their life history, distribution, and habitat requirements. Maps showing the habitat value for each survey site based on habitat variables within and around the study area are provided in Appendix A. Representative photographs of project habitat features are provided in Appendix B. The modified habitat assessment score sheet and guidelines for completing the form are included in Appendix E. Cumulative habitat scores for each site are provided in Appendix F.

Habitat was assessed using the following guidelines:

### *Suitable Habitat*

Locations that scored between 14 and 23 on the habitat evaluation form were considered to contain suitable GGS habitat. Suitable habitat contains an abundance of the water needed for GGS foraging throughout the active season, the aquatic vegetation required for cover, and bankside refugia needed for foraging and terrestrial movement. During the active and dormant seasons, GGS prefer sunny banks with vegetation refugia or riprap that is used for basking and underground seasonal aestivation. Large, slow-moving, and shallow aquatic habitats with gradually inclining banks are often preferable to deep, fast current channels that

lack the herbaceous emergent vegetation typically found in GGS foraging habitat. In the Sacramento Valley, suitable GGS habitat requirements can be summarized as follows (USFWS 2006):

- 1) Adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover;
- 2) Emergent herbaceous wetland vegetation for escape cover and foraging habitat during the active season;
- 3) Basking habitat of grassy banks and openings in waterside vegetation; and
- 4) Higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter.

#### *Marginal Habitat*

Locations that received a habitat score of 5 to 13 were considered to be marginal GGS habitat. Marginal habitat may have contained only a minimal amount of the water, vegetation, and refugia that is required for the snake. In portions of the study area containing marginal habitat, permanent water courses may have been present nearby, but the surrounding area typically contained orchards, row crops or had other land uses not suitable to sustain GGS populations. Water channels in riparian areas with high canopies or concrete-lined canals, bankside woody and densely vegetated banks that limit the amount of sunny basking sites could be a deterrent to the GGS and were considered marginal habitat. Waterways with few or no shallow water areas that sustained herbaceous emergent vegetation typically found in GGS foraging habitat were considered marginal habitat. On its own, marginal habitat is considered incapable of supporting permanent populations of GGS and is typically ephemeral, providing no permanent source of prey. However, GGS may use areas of marginal habitat as connective corridors between areas of more suitable habitat.

#### *Unsuitable Habitat*

Locations that scored 4 or lower were considered to be unsuitable habitat for GGS. Unsuitable areas lacked summer aquatic habitat or bankside basking areas with emergent vegetation for cover and thermal regulation, or were located at a distance of over 200 ft. from suitable aquatic habitat. Uplands were usually absent, degraded, (e.g., row crop, orchard, overgrazed pasture, residential/developed), or lacked the refugia needed for extended periods of inactivity. Large rivers or fast-flowing canals with gravel or rock substrate, tall riparian shaded banks, or intermittent drainage ditches may also be considered unsuitable habitat. Large rivers and flood plains that lacked higher elevation upland habitat with limited opportunities for cover and refuge from flood waters during the snake's inactive season also would be considered unsuitable.



# **Chapter 4. Results**

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## **4.1. Distribution of GGS in the Project Region**

There are nine genetically and geographically separate populations of GGS in the Central Valley of California: Butte Basin, Colusa Basin, Sutter Basin, American Basin, Yolo Basin, Delta Basin, Cosumnes-Mokelumne Basin, San Joaquin Basin, and Tulare Basin. The study area is located partially within the Yolo Basin Recovery Unit, which extends from Cache Creek in the north to the Sacramento-San Joaquin Delta in the south. The easternmost portions of the study area, east of the Sacramento River, are in the American Basin Recovery Unit. These include an approximately 1.4-mile section of I-80 and 0.6 mile of US-50 in the City of Sacramento. The density of snakes observed within the Yolo Bypass Wildlife Area is thought to be equal to or greater than that of the American Basin, and snakes observed from the Yolo Bypass Wildlife Area population, which was discovered in 2005, include some of the largest, most robust individuals (Biologist Eric Hansen, cited in USFWS 2006).

## **4.2. Database Records Near the Study Area**

The CNDDDB and CAS online databases contain recorded observations of GGS near the study area. The CNDDDB contains five records of GGS within one mile of the study area: four occurrences in Yolo County and one in Solano County. Four GGS records are either located along the western edge of the Yolo Bypass Wildlife Area south of I-80 or are associated with the ponds and drainage canals of the Davis Wetlands Project located north of I-80. All five records within one mile are from GGS populations presumed to be extant, however, the nearest recorded GGS observation from the South Fork Putah Creek (CNDDDB Occurrence #20) was made in 1976, and the current status of the site is unknown (Hansen 1986).

There are 13 additional CNDDDB GGS records that occur within four miles of the study area, most of which are located either north or south of I-80 along the western edge of the Yolo Bypass Wildlife Area, near the Davis Wetlands Project, or are associated with GGS populations in the Willow Slough and Willow Slough Bypass. Most of the GGS occurrences within four miles of the study area are comprised of multiple individuals and were recorded during trapping studies that took place within the past 15 to 20 years. The CAS database contained three records of GGS within four miles of the study area: one record close to I-80 in the Yolo Bypass Wildlife Area (Appendix C). Outside of Yolo County, GGS records are found in the vicinity of Fisherman's Lake located at the southern end of the GGS Natomas Basin Management Unit of the American Basin Recovery Unit in Sacramento County (CNDDDB Occurrence #11). Nearby in the Natomas Basin Unit, a possibly extirpated GGS

population was recorded from 1986 in a drainage canal that is now fully developed (CNDDDB Occurrence #75). A table of all regional GGS CNDDDB and CAS occurrences are provided in Appendix C, and a map of the study area and nearby GGS occurrences contained in the CNDDDB is provided in Appendix D.

### 4.3. Suitable Habitat Within the Study Area

#### *Suitable Habitat in the Yolo Bypass Wildlife Area (Locations 13–19)*

Within the study area, suitable GGS habitat was concentrated around the area where I-80 spans the Yolo Bypass Wildlife Area. Ponds, freshwater marshes, rice fields, and uplands, which extend the full length of the bypass from the western levee at Chiles Road to Prospect Slough at the eastern boundary in the City of West Sacramento, provide suitable GGS habitat. Past observations suggest that GGS may be most prevalent along the western flank of the Yolo Bypass Wildlife Area where both permanent wetlands and higher elevation upland habitat are present. However, GGS access to upland habitat in the low-lying areas may be limited due to the flood control function. (In some years with heavy precipitation, the Yolo Bypass Wildlife Area is inundated across its width.) Along the eastern boundary of the Yolo Bypass Wildlife Area, Prospect Slough holds water all year and is bordered by a large levee (Tule Jack Road, City West Sacramento). This levee is stabilized with rock riprap that provides suitable basking habitat, and active and inactive season retreats.

According to the Yolo Bypass Wildlife Area Supervisor, “In general, GGS can be found throughout the Yolo Bypass Wildlife Area. What information that has been relayed to me in the past is that a survey done on a portion of the wildlife area that is outside of the (containment) levee had high densities. The reasoning was most likely because that area is not subject to regular flooding. We do see GGS throughout the area and need to be aware of the potential for them to be present whenever we do work.” (pers. com. Joe Hobbs, CDFW Supervisor, Yolo Bypass Wildlife Area).

Depending on conditions during the GGS active season, some portions of the study area along the north side of I-80 would be more than 200 feet from the high-water mark of aquatic habitat which reduces its likelihood of being used during the time of year when GGS are typically foraging in aquatic habitats. The upland habitat between the north side of I-80 and the Capitol Corridor railroad tracks contained fewer wetlands than south of the freeway and typically lease grazing rights to cattle ranchers which also somewhat reduces its suitability for GGS. Therefore, some areas on the north side of I-80 in the Yolo Bypass were classified as marginal habitat (See Appendix A, Maps 7–9).



### *Suitable Habitat in the City of West Sacramento (Locations 9, 11)*

As I-80 turns northeast in the City of West Sacramento, it crosses over the Capitol Corridor railroad tracks where both north and south sides of the tracks are lined with water canals (Location 9). The canals located on the north side of I-80 near the railroad overpass provide suitable aquatic habitat due to the presence of open, shallow water with emergent and bank-side vegetation and vegetated upland habitat. This location is surrounded by heavy-use industrial and urban development. However, the water canal's western reach is close to suitable habitat within Prospect Slough where Tule Jack Road crosses the Capitol Corridor railroad tracks.

Location 11 is a retention basin that holds water year-round and is hydrologically connected to a small drainage canal just south of the I-80 and US-50 interchange in the City of West Sacramento (Location 10). During field surveys, the small lake appeared shallow with both emergent and bankside vegetation with large patches of tules (*Schoenoplectus* spp.) and cattails (*Typha* spp.). This area is isolated from larger areas of suitable habitat present in the Yolo Bypass Wildlife Area with residential developments, commercial parking lots, and shopping strips. Based on its location in an urban area, it is unlikely to have a GGS population present, but habitat conditions were suitable for GGS, and the desktop review did not identify any studies conducted to detect GGS presence in this area.

### *Suitable Habitat Within and Near the City of Davis (Location 24)*

Approximately 0.5 mile west of the Yolo Bypass Wildlife Area on the south side of I-80, rice fields are present just south of Chiles Road outside of the City of Davis (Location 24). When the fields are flooded during the growing season, GGS may use the combination of ditches, drains, upland banks, and rice fields themselves. Although the rice fields are outside of the study area, upland habitat with grasses and shrubs adjacent to Chiles Road are included in the study area and may provide basking and retreat habitat for GGS during the active season and overwintering sites during the inactive season.

## 4.4. Marginal Habitat Within the Study Area

### *Marginal Habitat West of the Yolo Bypass Wildlife Area (Locations 20–21)*

West of the Yolo Bypass Wildlife Area and along the north side of the Capitol Corridor railroad track is the Swingle Canal, which at the time of this habitat survey was dry and appeared to have recently been drained. The canal extends from Mace Boulevard in the City of Davis to the western border levee of the Yolo Bypass Wildlife Area and provides irrigation water to fields containing row crops on the north side of the railroad tracks. While some areas of the canal provided suitable habitat with emergent and bankside vegetation and may contain water during growing seasons, other areas were lined with a tall canopy of trees that provide continuous shade, reducing their habitat value. The row crops on the north side of the water canal do not provide the same quality of habitat as rice fields, and GGS populations are unlikely to use them to the same extent. When water is present during the active season, Swingle Canal may provide for dispersal movements from the occupied GGS habitat to the north and northeast.

### *Marginal Habitat in West Sacramento (Locations 8, 10, 12)*

South of I-80 and the suitable GGS habitat described above at Location 9, the canal continues eastward along both sides of the Capitol Corridor railroad tracks, and habitat quality becomes marginal (Location 8). The drainage ditch along the south side of the railroad tracks was too narrow for high-quality GGS habitat and contained very little water and no evidence of retaining water during the active season. However, in close proximity along the north side of railroad tracks, the perennial water canal was wider and contained open water, emergent bank-side vegetation, and vegetated upland habitat. This location is also surrounded by heavy-use industrial and urban development, including parking lots associated with a shopping plaza. The vegetation on the banks and upland were dense and tall, which could decrease the ability of GGS to thermoregulate or bask during the active season.

East of the Yolo Bypass Wildlife Area, drainage canals provide aquatic habitat just south of and parallel to the I-80 and US-50 interchange in the City of West Sacramento (Location 10). During the field surveys, water and emergent vegetation were present, and an unknown species of turtle was observed in the canal. Although the canal banks are vegetated and the adjacent uplands provide open areas for basking and underground retreats, this marginal habitat area is relatively isolated and occurs as a thin strip of land bordered between the freeway on the north side and a business park including parking lots and buildings along Industrial Boulevard.

At the western end of the drainage basin in the City of West Sacramento, aquatic habitat is present just outside of the study area, south of I-80 (Location 12). In this area, open water is present just a few hundred feet east of the Yolo Bypass Wildlife Area, and there is some potential for GGS to cross the levee and enter this area. Heavy use of the trails surrounding the pond by pedestrians and sparse emergent and bankside vegetation, however, limit the suitability of the area for GGS. The uplands were composed of mixed-use trails, structures (pump house, water tank, parking lot), ornamental hedges, and short grass that appeared to be maintained along the margins of the trails. Taller vegetation was present on the freeway embankment, and small mammal burrows providing potential underground retreats were present in the adjacent uplands.

#### *Marginal Habitat in Sacramento (Locations 1, 4)*

At the eastern end of the study area just north of the westbound West El Camino Avenue off-ramp, a pond with open water was present during the field surveys. The pond was connected on two opposing sides to a drainage ditch that nearly followed the contours of I-80 and the off-ramp. The pond appeared to be a drainage basin lined with rock riprap but also had emergent and bankside herbaceous wetland vegetation. The adjacent upland was limited due to the freeway and a large, paved area composed of a gas station parking lot and truck stop buildings. Surrounding approximately half the pond were planted redwood (*Sequoiadendron giganteum*) and deciduous trees that shaded the ground underneath, and the other half was composed of dense herbaceous vegetation.

Another retention pond was present at the south end of El Centro Road that appeared to contain water from runoff from the freeway (Location 4). Only traces of water were observed in the very lowest portions of the pond, which was surrounded and filled in with herbaceous vegetation, including mature willows (*Salix* spp.) and blackberry (*Rubus* sp.). It is unlikely that this pond would retain sufficient water during the GGS active season to provide for foraging habitat, but it contained other habitat attributes such as vegetated banks and underground refugia that qualify as marginal habitat.

#### *Marginal Habitat in Davis, CA (Locations 36, 41, 42)*

Pond 3 (Location 36) is an approximately 2.8-acre pond located in the middle of the State Route 113 and I-80 interchange in the City of Davis. Although dry at the time of this survey, it appeared that water was present during a substantial portion of the rainy season, but the pond was unlikely to hold water during the summer and fall. A dense stand of large trees lined the eastern portion of the pond while less numerous and smaller trees lined the western and southern portions of the pond. Emergent herbaceous wetland vegetation was present in

the pond sufficient to be scored as marginal habitat. However, this site was isolated by heavily traveled roads and is unlikely to support GGS.

From Berryessa Reservoir (approximately 20 miles west of the Project), Putah Creek flows through a levee-controlled channel, crosses under I-80 southwest of the City of Davis, and terminates in the toe drain of the Yolo Bypass. Much of the south fork of Putah Creek is composed of riparian habitat with a tall canopy along the upper and lower banks and with dense patches of willows and blackberry near the I-80 overpass (Locations 41 and 42). During the field surveys, moderate flowing water was present in some narrow channels and low gradient, slow-moving pools of water were present in some areas where the channel widened. The creek bed was mostly sandy with some areas near the freeway bridge having gravel and rock, in contrast with the mud or silt substrates associated with GGS habitat. Because of the shallow and slow-moving aquatic habitat but overall riparian structure of this stretch of Putah Creek, it was classified as marginal GGS habitat.

#### *Marginal Habitat West of Davis, CA (Locations 45, 46, 50, 54, 34)*

The Kidwell Road overpass crosses I-80 between the City of Dixon and the City of Davis and connects with Sparling Lane which runs south of and parallel with I-80. Crossing underneath Sparling Lane and bisecting the orchards to the south of I-80 is an irrigation ditch (Location 45) that supplies water to the nearby orchards. This ditch did not have water at the time of this survey, but emergent herbaceous wetland vegetation was present, suggesting that water may be present during a substantial portion of the spring and summer. The irrigation ditch continues as a narrower channel that straddles the south side of Sparling Lane. North of Sparling Lane, however, the ditch turns into a shallow concrete-lined channel that crosses underneath I-80 and does not return to a more natural substrate until north of the Kidwell Road off-ramp on the north side of Route 80. Although the presence of emergent vegetation and the potential for irrigation water to last into the summer makes this area somewhat suitable, the roadways and concrete-lined channel associated with the aquatic features diminish the value of this area, and it was classified as only marginal GGS habitat.

North of the Kidwell Road/I-80 interchange are seasonal swales (Location 46) that were dry during the field surveys and that may only hold water during and after rain events. Mostly undisturbed and vegetated upland habitat on the margins of row crops was present, but the absence of a hydrological connection to known GGS populations, the intermittent availability of water during the active season, and adjacent land use of row crops and orchards diminishes the value of these waterways as suitable aquatic habitat. It is unlikely that GGS occur in these areas, and this area was classified as marginal GGS habitat.

An irrigation ditch along Sparling Lane between Pedrick Road and Kidwell Road (Location 50) and a small pond south of the Pedrick Road I-80 interchange (Pond 1; Location 54) provide only marginally suitable GGS habitat. Within the roadside ditch along Sparling Lane, water was present only in a small area that appeared to have recently been excavated (excavation marks were present on the canal bank). Pond 1 was dry at the time of the survey and appeared to receive water through an underground pipe via a headgate at the west end of the pond. The pond was filled in with dried herbaceous plants and may only occasionally hold water during times of irrigation for the surrounding row crops. Based on the habitat characteristics, these areas are likely to be occupied by GGS only temporarily or as dispersal habitat, if at all.

The UC Davis Arboretum (Location 34), a multipurpose public garden, contains a slow-flowing waterway/large pond that is dammed on both ends. The waterway sits in the channel that was formerly the North Fork Putah Creek, which flowed east toward the downtown area of the City of Davis. The UC Davis Campus manages the waterway as a retention pond for storm runoff. The water flows east to west, opposite the channel's original direction, to a weir, and when the water is high enough, it flows over the weir and into a pump that sends the water to the South Fork of Putah Creek. Potential GGS aquatic habitat was observed as the waterway widens, becomes more pond-like, and is surrounded with aquatic and bankside vegetation just outside the study area. However, the habitat at this location is isolated from other suitable habitat in the region and is surrounded by developed areas including the I-80 freeway, State Route 113, and the UC Davis Campus, and therefore was classified as marginal GGS habitat.

#### **4.5. Unsuitable Habitat Throughout the Study Area**

Unsuitable GGS habitat was common throughout the study area. In some instances, a waterway contained bankside or emergent vegetation that provided suitable cover and basking sites for thermal regulation, but lacked water during the snake's active season, or contained water only during intermittent irrigation use. Pond 4 (Location 4) was artificially constructed in a research agricultural field and holds water permanently but was lined with impermeable material that did not support bankside vegetation. Uplands surrounding unsuitable habitat were frequently developed or surrounded by heavily traveled roads. The Sacramento River near the two freeway bridges (I-80 in the north and US-50 in the south section of the Project) occurred in highly developed areas between the City of Sacramento and the City of West Sacramento. These areas contained tall riparian vegetation, shaded banks, and fast-flowing deep water, predatory fish, and are subject to flood waters during the snake's inactive season that inundate underground refugia along the riverbank.

West of the Richards Boulevard and I-80 interchange, the UC Davis Arboretum waterway turns south and crosses underneath the freeway (Location 29). Alongside the waterway, a busy bicycle trail connects the UC Davis Campus with the rest of the city south of I-80. At the time of the surveys, the waterway was dry, and no remaining pools of water were observed. The amount of upland and hydrologic connection to permanent water courses may attract GGS. However, this intermittent water feature is unlikely to hold sufficient enough water during the summer to provide suitable GGS aquatic habitat. Based on their habitat characteristics or on their isolated nature, these and other areas containing unsuitable habitat are not expected to be occupied by GGS.

## Chapter 5. Conclusions

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This assessment identified several locations within the study area where suitable GGS habitat is present and GGS have the potential to occur. In order from east to west, the sites with suitable GGS aquatic habitat included water canals that pass underneath the railroad overpass in the City of West Sacramento (Location 9), a water canal and drainage basin south of the I-80 and US-50 interchange in the City of West Sacramento (Location 11), the eastern boundary of the Yolo Bypass Wildlife Area including Prospect Slough and containment levee uplands (Locations 13 and 14), the western boundary area and middle sections of the Yolo Bypass Wildlife Area (Locations 15–19), and a rice field on the southern side of I-80 and west of the Yolo Bypass Wildlife Area (Location 24).

The most suitable habitat locations are within the Yolo Bypass Wildlife Area where nearly continuous wetlands stretch from west to east across the southern side of I-80, and mixed ephemeral and permanent wetlands with grazed upland occur on the north side of I-80. While GGS populations and records are relatively sparse adjacent to I-80 within the Yolo Bypass Wildlife Area, these localities are within dispersal distances of known locations of GGS. Given the proximity of I-80 in the Yolo Bypass Wildlife Area to known GGS sightings to the north and south and surrounding suitable habitat, its presence should be assumed in this area.

A total of 101.2 acres within the study area were classified as suitable GGS habitat. An additional 87.0 acres were classified as marginal habitat, and the remaining 277.5 acres were considered to be unsuitable (Table 1).

**Table 1. GGS Habitat Classifications and Number of Acres Identified Within the ESL**

<b>GGS Habitat Classification</b>	<b>Habitat Score Range</b>	<b>Number of acres within ESL</b>
Suitable	14 or greater	101.2
Marginal	5 to 13	87.0
Unsuitable	4 or lower	277.5

The main findings of this assessment are summarized as follows:

- The most suitable GGS habitat within the study area occurs throughout the Yolo Bypass Wildlife Area, a floodway within the historic Yolo Basin floodplain and bounded by constructed levees in eastern Yolo County. Although year-long upland habitat is somewhat limited, the mixed ephemeral and permanent wetlands along the south side of I-80 in this area provide highly suitable aquatic GGS habitat (Appendix A).
- Other suitable GGS habitat outside the Yolo Bypass Wildlife Area included a low-gradient water canal on the north side of the Union Pacific Railroad overpass near the southeastern terminus of Tule Jake Road in the City of West Sacramento (Location 9), a drainage canal and basin located north of Industrial Boulevard in West Sacramento (Location 11), and rice fields along Chiles Road east of the City of Davis (Location 24).
- Marginal GGS habitat was present in several other locations within the study area. These areas lack adequate water during the GGS active season to promote occupancy or had adequate water but lack either emergent, herbaceous aquatic vegetation, or vegetated banks that provide basking opportunities for GGS. Examples include portions of the ESL west of the Yolo Bypass, the area surrounding the South Fork Putah Creek south of the City of Davis, and some isolated wetlands in Solano County (Appendix A).
- In some instances, suitable GGS habitat occurred in isolated areas with very little or no hydrological connection to known GGS occurrences. Although these areas contained habitat characteristics associated with GGS presence, their lack of connectivity with larger areas of occupied habitat greatly reduced their potential to support GGS. Examples included a wetland located at the UC Davis Arboretum and a detention basin at the I-80/State Route 113 interchange south of the City of Davis (Appendix A).



## Chapter 6. References

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## **Appendix A** Overview of the study area and survey locations with giant garter snake habitat classifications

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- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- GGS Habitat Suitability Unsuitable
- Marginal

Base maps:  
Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

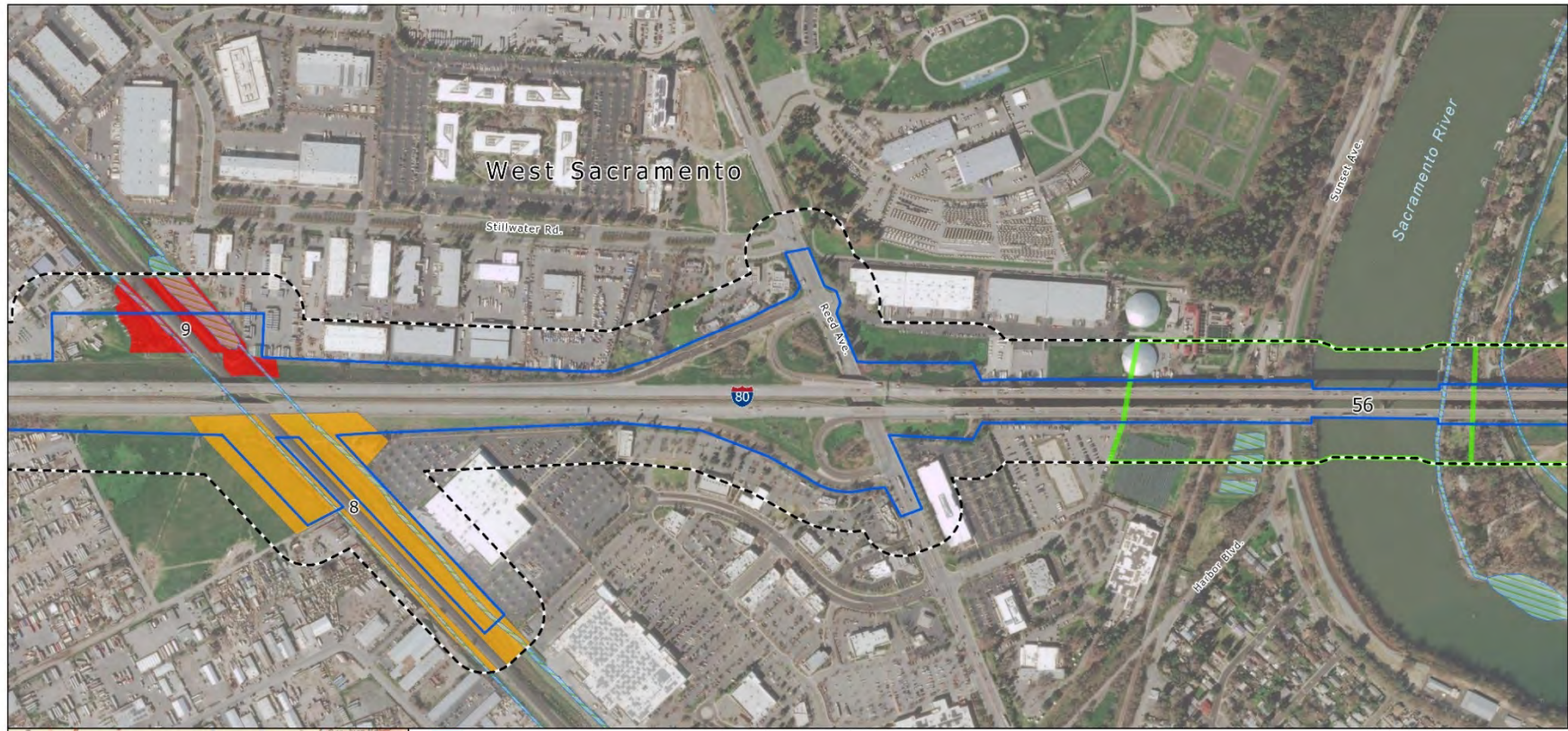


**GGG Habitat Suitability**  
**Map 1 of 16**

CalTrans District 3  
Yol 80 Bus/Carpool Lanes  
Solano/Yolo/Sacramento Counties, CA  
June, 2022







- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Marginal
- Suitable
- GGS Habitat Suitability: Unsuitable

Base maps:  
 County of Sacramento, Bureau of Land Management, Esri, HERE, Garmin, NGA, USGS, NPS, Maxar

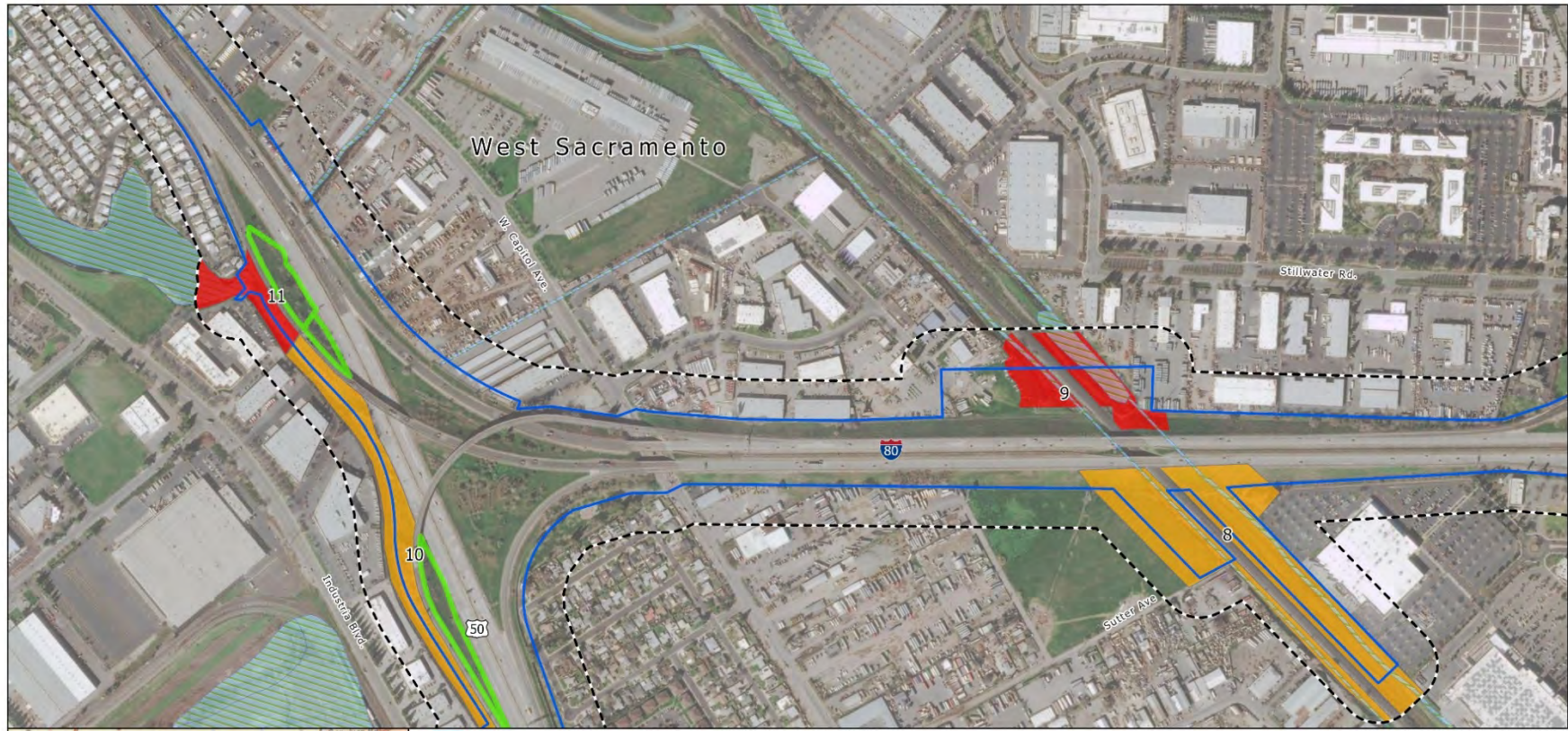


**GGG Habitat Suitability**  
**Map 2 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

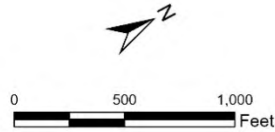






- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- GGS Habitat Suitability Unsuitable
- Marginal
- Suitable

Base maps:  
 County of Sacramento, Bureau of Land Management, Esri, HERE, Garmin, NGA, USGS, NPS, Maxar

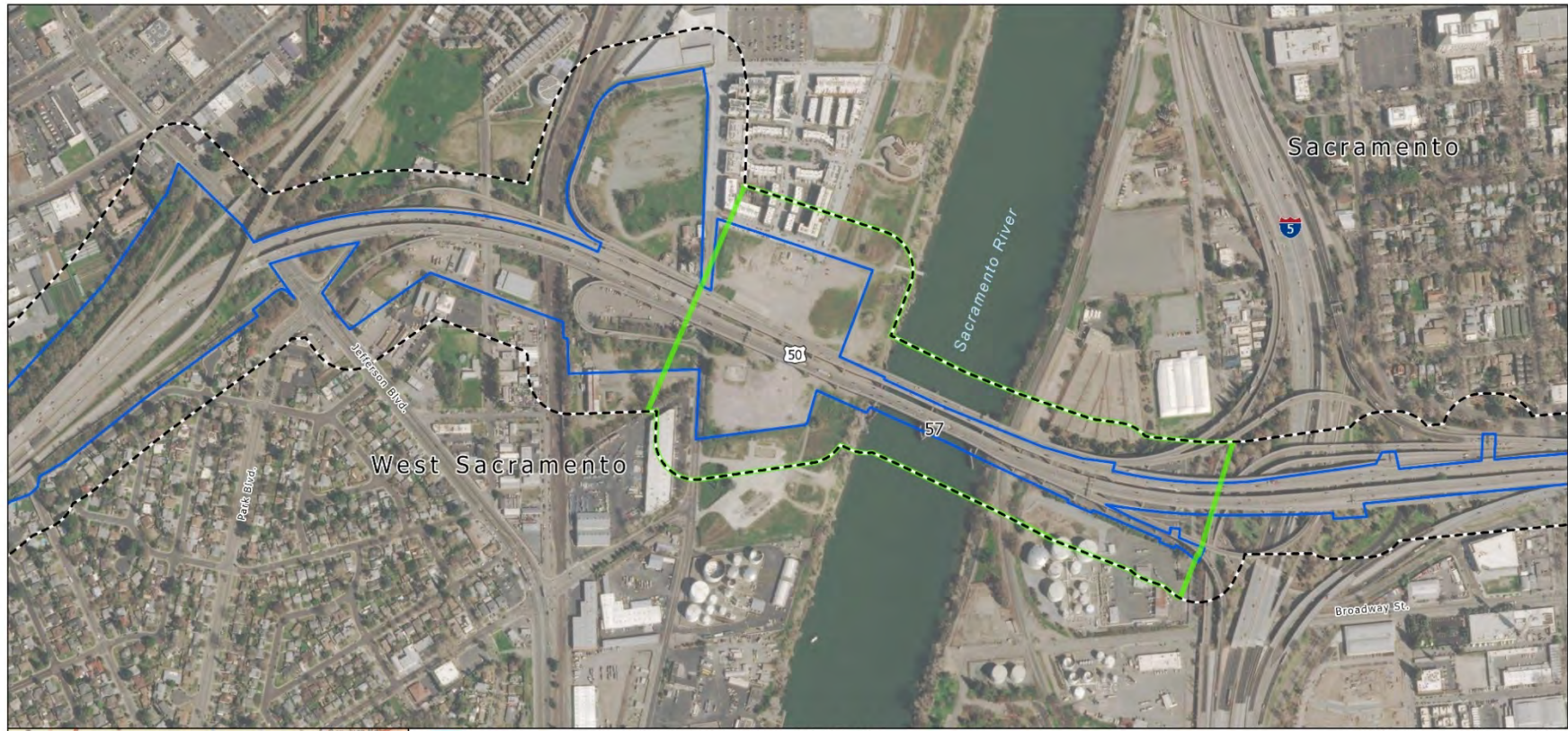


**GGG Habitat Suitability**  
**Map 3 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022





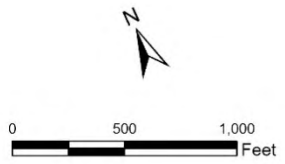


Environmental Study Limit  
 ESL 200' Buffer  
 GGS Habitat Suitability  
 Unsuitable

**GGG Habitat Suitability  
Map 4 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

Base maps:  
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 NP

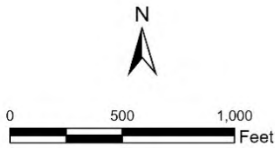






- Environmental Study Limit
- ESL 200' Buffer
- Streams (USGS - NHD)
- Marginal
- GGS Habitat Suitability

Base maps:  
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 NP

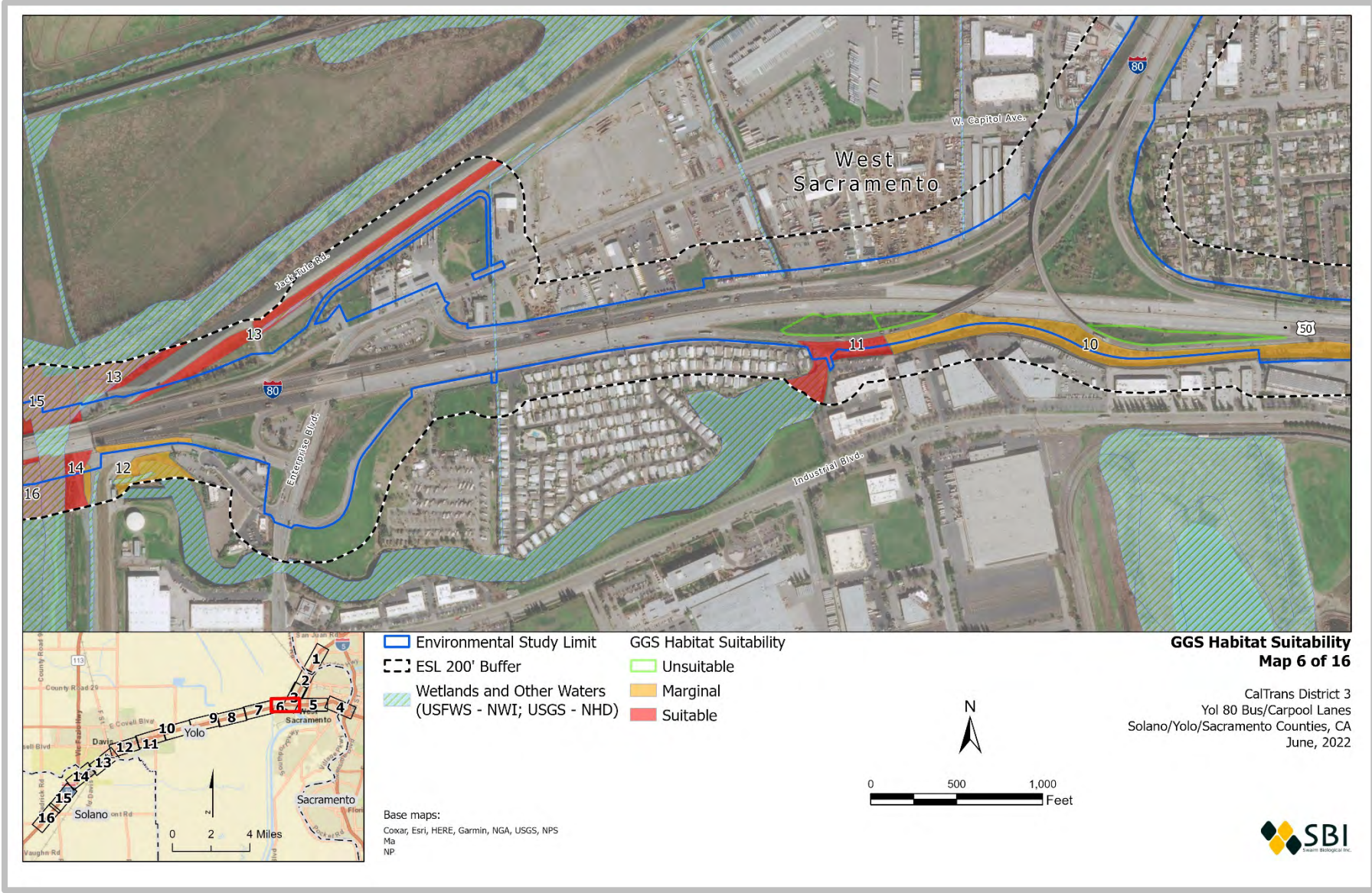


**GGS Habitat Suitability  
 Map 5 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

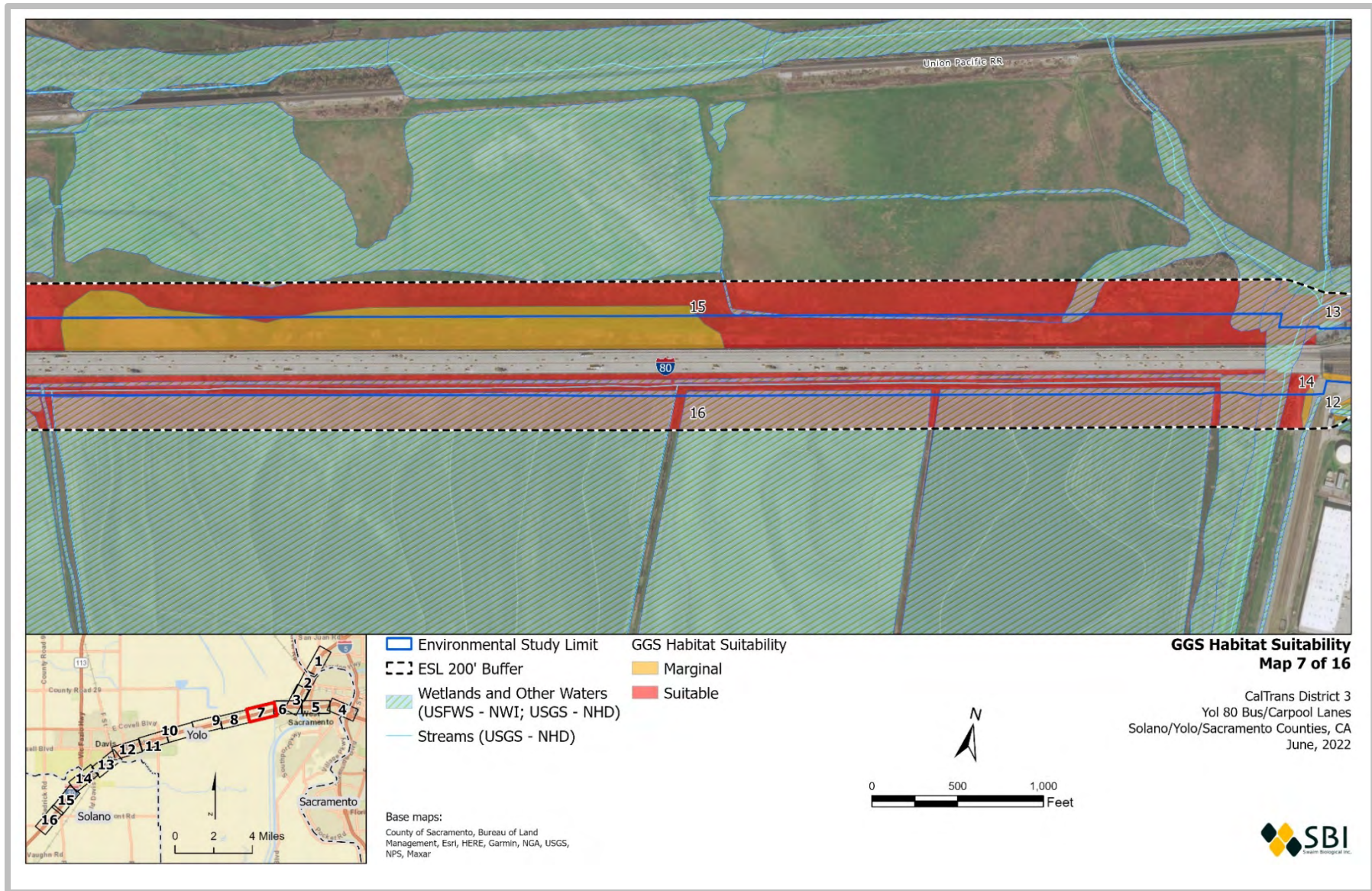






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03-3H900 Yolo 80 Corridor Improvement Project



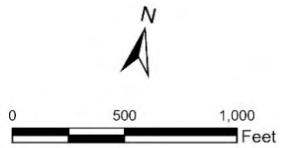






- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Streams (USGS - NHD)
- GGS Habitat Suitability**
- Marginal
- Suitable

Base maps:  
 Maunty of Sacramento, Bureau of Land  
 nagement, Esri, HERE, Garmin, NGA, USGS,  
 S, Maxar



**GGS Habitat Suitability  
 Map 8 of 16**

CalTrans District 3  
 Yol 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

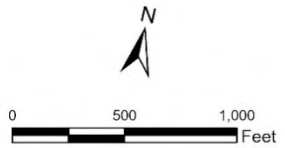






- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Streams (USGS - NHD)
- GGS Habitat Suitability
- Unsuitable
- Marginal
- Suitable

Base maps:  
 County of Sacramento, Bureau of Land Management, Esri, HERE, Garmin, NGA, USGS, NPS, Maxar



**GGS Habitat Suitability**  
**Map 9 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

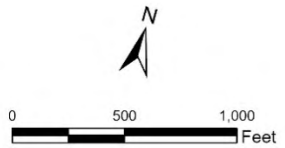






- ▬ Environmental Study Limit
- ESL 200' Buffer
- ▬ Streams (USGS - NHD)
- ▬ GGS Habitat Suitability
- ▬ Unsuitable
- ▬ Marginal

Base maps:  
Maxar, Esri, HERE, Garmin, NGA, USGS, NPS

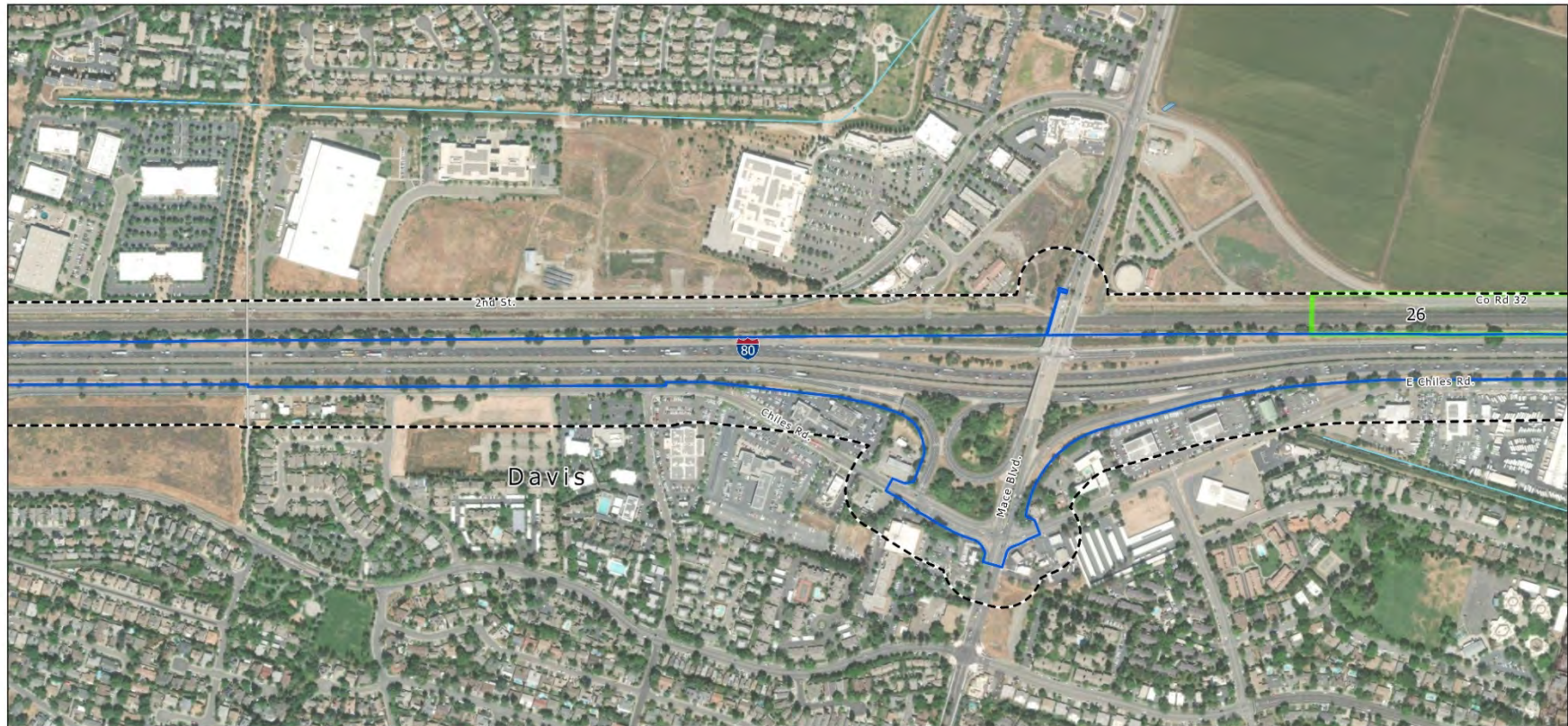


**GGG Habitat Suitability  
Map 10 of 16**

CalTrans District 3  
Yolo 80 Bus/Carpool Lanes  
Solano/Yolo/Sacramento Counties, CA  
June, 2022



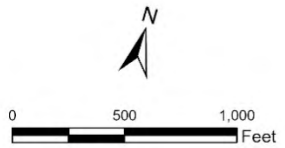




- Environmental Study Limit
- ESL 200' Buffer
- Streams (USGS - NHD)
- GGS Habitat Suitability
- Unsuitable

**GGS Habitat Suitability  
Map 11 of 16**

CalTrans District 3  
Yolo 80 Bus/Carpool Lanes  
Solano/Yolo/Sacramento Counties, CA  
June, 2022



Base maps:  
County of Sacramento, Bureau of Land Management, Esri, HERE, Garmin, NGA, USGS, S, Maxar



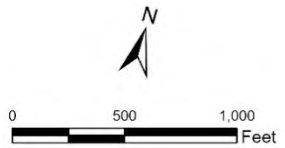




— Environmental Study Limit  
 ESL 200' Buffer  
— GGS Habitat Suitability  
 Unsuitable

**GGG Habitat Suitability  
Map 12 of 16**

CalTrans District 3  
 Yol 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022



Base maps:  
 County of Sacramento, Bureau of Land  
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 NPS, Maxar

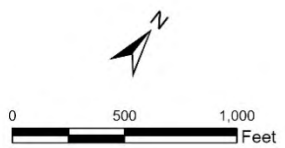






- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Streams (USGS - NHD)
- GGS Habitat Suitability
- Unsuitable

Base maps:  
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 i, HERE, Garmin, NGA, USGS, NPS, Maxar

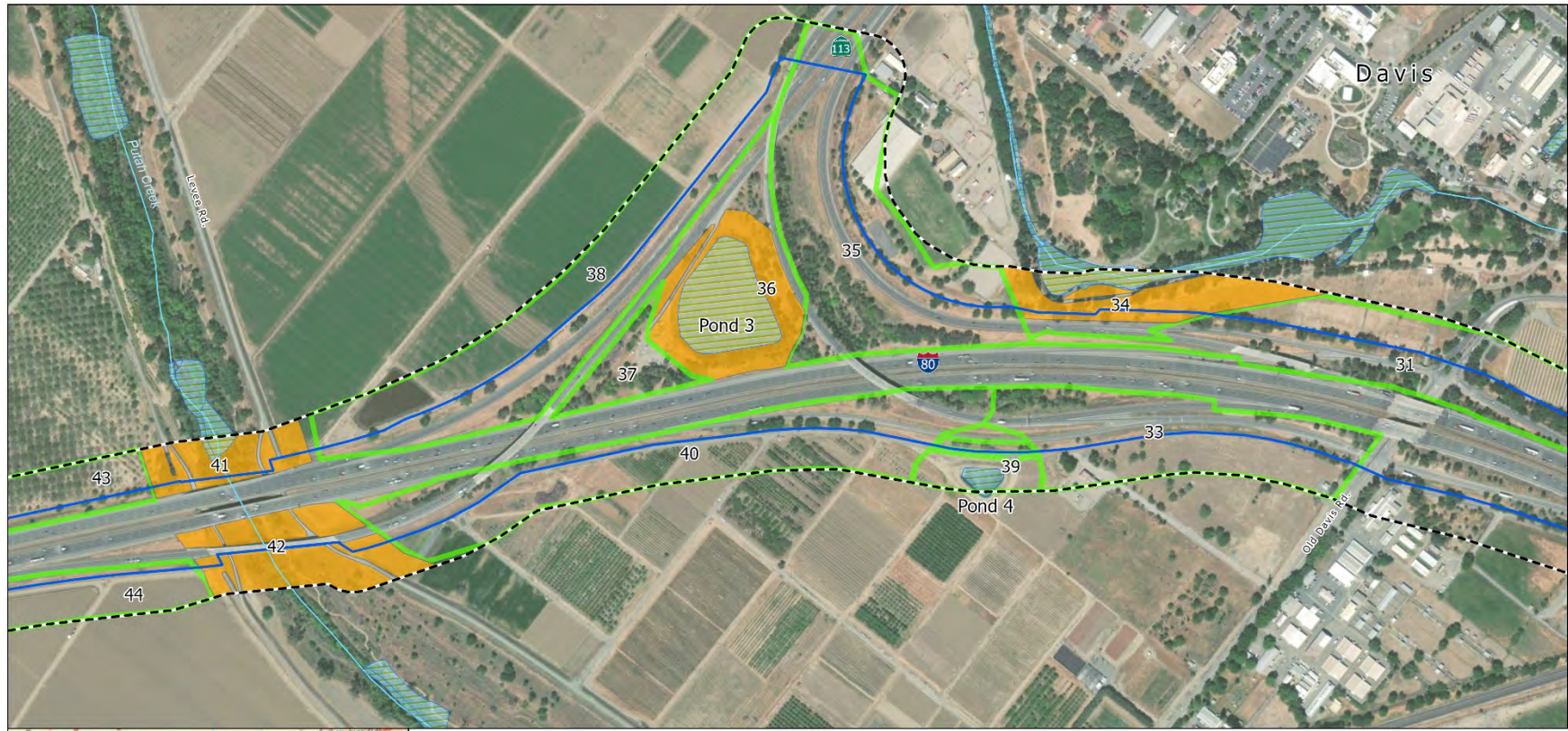


**GGS Habitat Suitability  
 Map 13 of 16**

CalTrans District 3  
 Yol 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

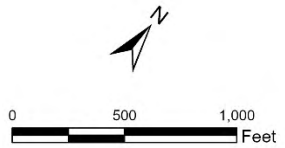






- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Streams (USGS - NHD)
- Marginal
- GGS Habitat Suitability Unsuitable

Base maps:  
 County of Sacramento, Bureau of Land Management,  
 Esri, HERE, Garmin, NGA, USGS, NPS, Maxar

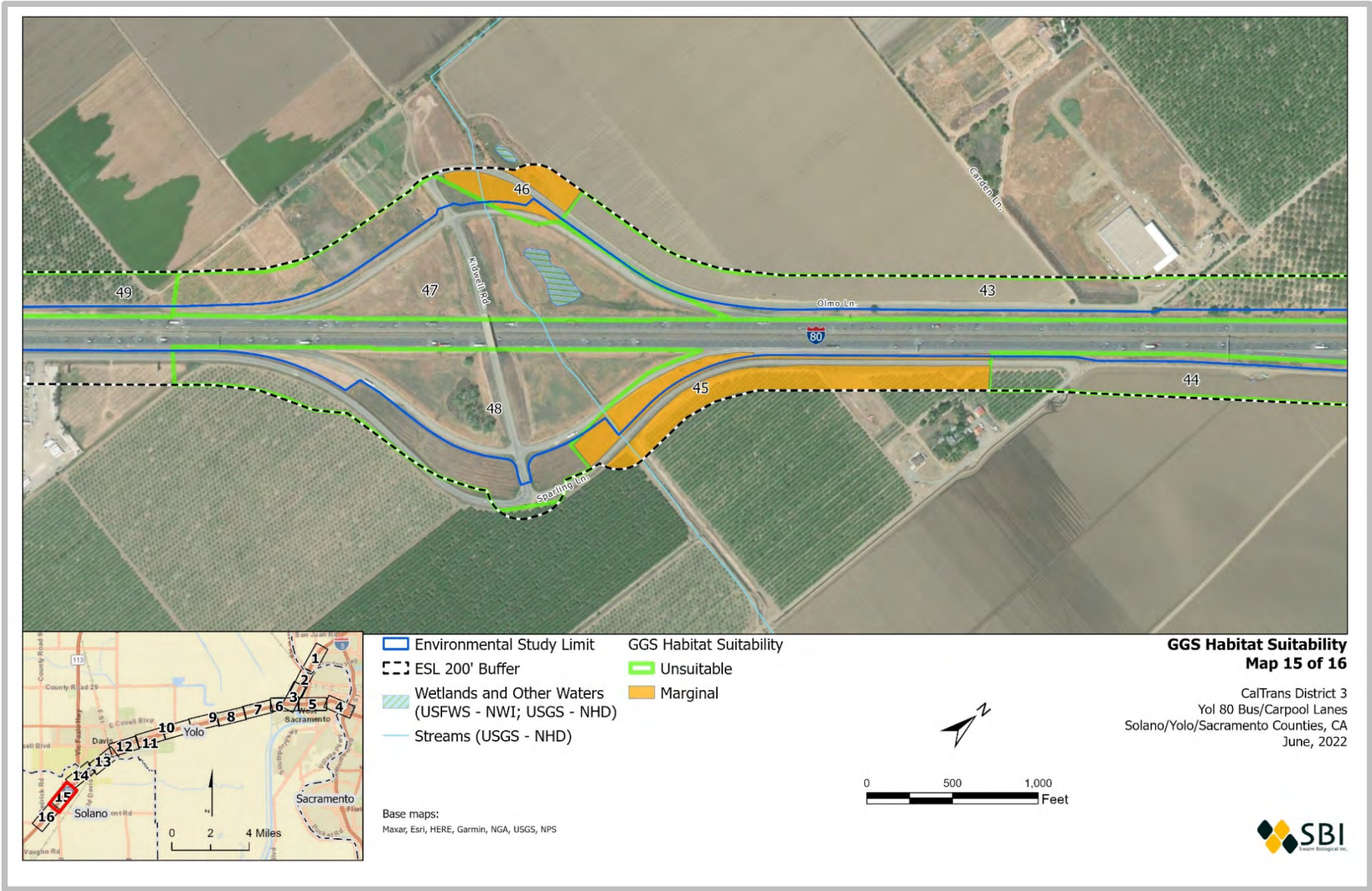


**GGG Habitat Suitability**  
**Map 14 of 16**

CalTrans District 3  
 Yolo 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022

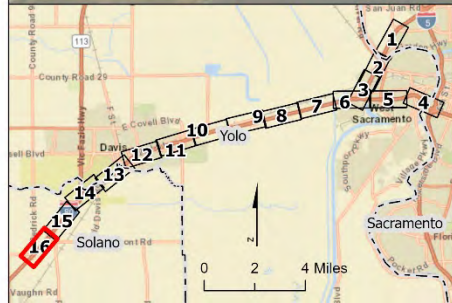
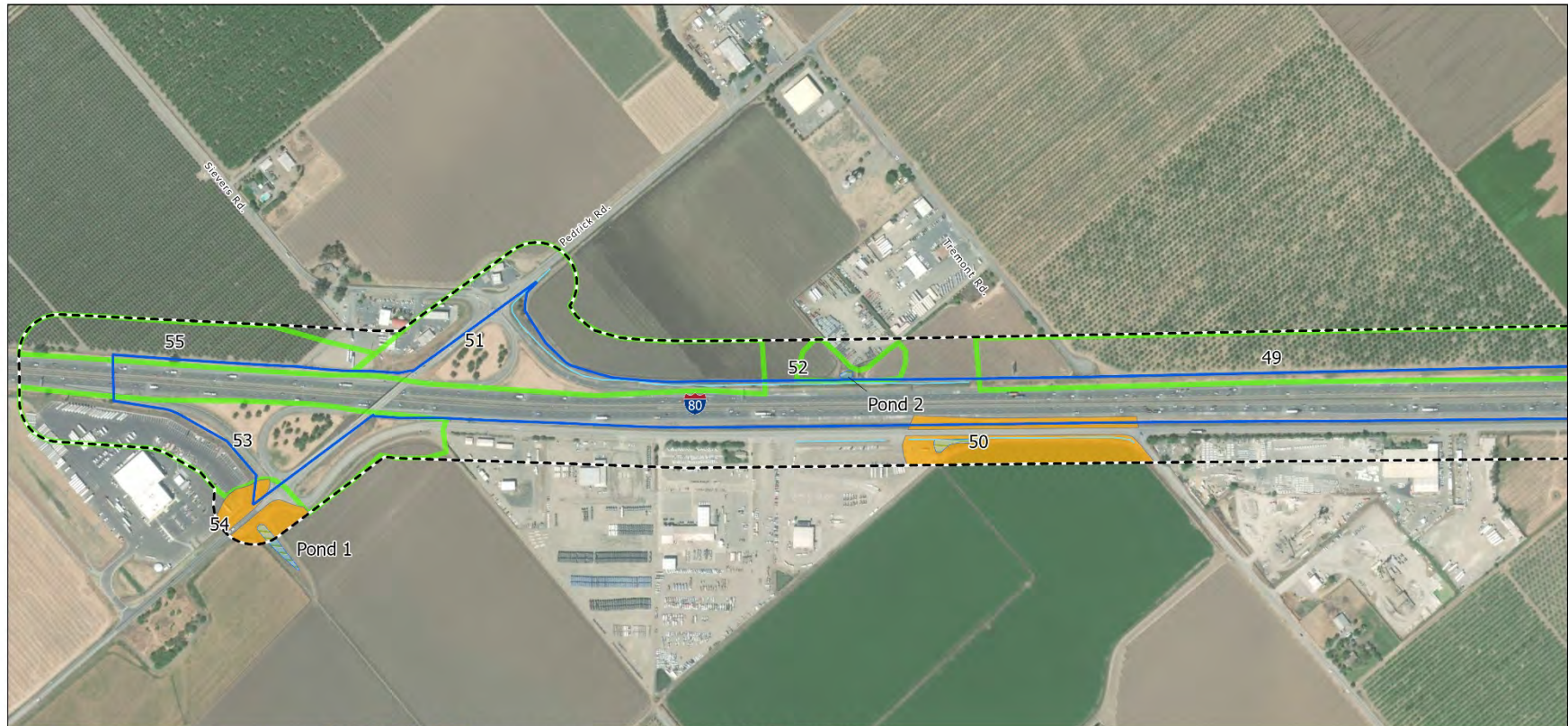






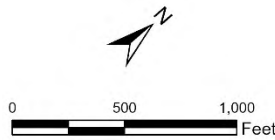
Giant Garter Snake Habitat Assessment  
 03-3H900 Yolo 80 Corridor Improvement Project





- Environmental Study Limit
- ESL 200' Buffer
- Wetlands and Other Waters (USFWS - NWI; USGS - NHD)
- Streams (USGS - NHD)
- GGS Habitat Suitability
- Unsuitable
- Marginal

Base maps:  
 County of Sacramento, Bureau of Land Management,  
 Esri, HERE, Garmin, NGA, USGS, NPS, Maxar



**GGG Habitat Suitability  
 Map 16 of 16**

CalTrans District 3  
 Yol 80 Bus/Carpool Lanes  
 Solano/Yolo/Sacramento Counties, CA  
 June, 2022



## **Appendix B** Representative Site Photos

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**Photo 1.** Suitable GGS habitat in the Yolo Bypass Wildlife Area (Location 18).



**Photo 2.** Suitable GGS habitat in the Yolo Bypass Wildlife Area (Location 17).



**Photo 3.** Suitable GGS habitat in the Yolo Bypass Wildlife Area (Location 19).



**Photo 4.** Suitable GGS habitat in Prospect Slough south of Route 80 (Location 14).



**Photo 5.** Suitable GGS habitat in low gradient water canal near railroad overpass in West Sacramento (Location 9).



**Photo 6.** Suitable GGS habitat in drainage basin and water canal in West Sacramento (Location 11).



**Photo 8.** Marginal GGS habitat in the UC Davis Arboretum (Location 34).



**Photo 9.** Marginal GGS habitat in seasonal water canal and railroad track embankment (Location 20).



**Photo 10.** Marginal GGS habitat in water canal near Route 80 railroad crossing in West Sacramento (Location 8).



**Photo 11.** Marginal GGS habitat in water canal just south of Route 80 and Route 50 interchange in West Sacramento (Location 10).



**Photo 12.** Marginal GGS habitat in drainage basin south of Route 80 in West Sacramento (Location 12).



**Photo 13.** Marginal GGS habitat in Putah Creek, Davis, CA. (Location 42).





**Photo 14.** Marginal GGS habitat in seasonal pond within Route 80 and 113 interchange, Davis, CA. (Location 36; Pond 3).



**Photo 16.** Marginal GGS habitat in a drainage pond north of W. El Camino and Route 80 interchange (Location 1).



**Photo 17.** Unsuitable GGS habitat near County Road 32 A off-ramp just north of Route 80 (Location 22).



**Photo 18.** Unsuitable GGS habitat at the Route 80 and 113 interchange in Davis, CA. (Location 35).



**Photo 19.** Unsuitable GGS habitat near along Olmo Ln. (Location 43).



**Photo 20.** Unsuitable GGS habitat just east of Route 80 bridge over Sacramento River (Location 7).



**Appendix C** California Natural Diversity Database (CNDDDB) and California Academy of Sciences (CAS) Giant Garter Snake Regional Occurrence Records (January 2021) in Order of Proximity to Project Location

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Occurrence Number	Site Date	County	Location	Distance to Project (miles)
CAS-178594	1983	Yolo	FRONTAGE ROAD OF CAUSEWAY	0
CNDDDB-20	1976	Solano	SOUTH FORK PUTAH CREEK AT OLD DAVIS RD, DAVIS.	0.62
CNDDDB-185	2014	Yolo	DRAINAGE CANALS, WITH STEEP BANKS (>1:1), DENSELY VEGETATED WITH GRASSES, RUDERALS, CATTAILS, BULRUSH, AND WILLOWS AND MANAGED WETLANDS WITH GRADUALLY SLOPED BANKS (<1:1), OPEN WATER, DENSE CATTAILS, BULRUSH & WATER PRIMROSE.	0.72
CNDDDB-268	2007	Yolo	DRAINAGE CANAL WITH STEEP BANKSIDE SLOPES; BANKS AND MARGINS DENSELY VEGETATED WITH GRASSES & RUDERALS.	0.72
CNDDDB-311	2012	Yolo	NEAREST WETTED CANAL APPROXIMATELY 800 METERS WEST. SNAKES HAVE BEEN CAPTURED IN THIS CANAL IN PREVIOUS YEARS (OCC. #269). LOCATION IS PART OF A FLOOD CONTROL BASIN ALSO USED FOR RICE FIELDS AND WATERFOWL HUNTING.	0.91
CNDDDB-267	2012	Yolo	MANAGED WETLAND RECEIVING STORMWATER FROM THE CITY AND ADVANCED SECONDARY-LEVEL TREATED WASTEWATER. BANKS ARE DENSELY VEGETATED WITH GRASSES & RUDERALS; WATER MARGINS VEGETATED WITH CATTAILS & BULRUSH. DRAINAGE CANAL ABOUT 10-11M WIDE.	1
CNDDDB-266	2007	Yolo	DRAINAGE CANAL, WITH STEEP BANKS (GREATER THAN 1:1), MODERATELY VEGETATED WITH GRASS, RUDERALS, CATTAILS, BULRUSH, AND INTERMITTENT WATER PRIMROSE. SURROUNDING AREA IS RICE FIELDS.	1.64
CNDDDB-75	1986	Sac	1986: 30 FT WIDE SLOW-MOVING E DRAINAGE CANAL W/STEEP BANKS & CATTAIL/TULE AT WATER EDGE; BLACKBERRIES, MILK THISTLE, MUSTARD, STAR THISTLE ON BANKS. SMALLER DITCH IS SIMILAR W/A FEW COTTONWOODS & WILLOWS WHICH SURVIVED CLEARING 2 YRS AGO.	1.89
CNDDDB-292	2009	Yolo	DRAINAGE CANAL, ~10 M WIDE WIHT MUD/SILT SUBSTRATE; STEEP SLOPES (>1:1), BANKS DENSELY VEGETATED WITH GRASSES & WEEDS; CHANNEL PROPER MOSTLY OPEN WATER; BANK MARGINS MODERATELY TO DENSLY VEGETATED WITH SMARTWEED AND WATER PRIMROSE.	2.15
CNDDDB-294	2009	Yolo	IRRIGATION CANAL, ABOUT 6 M WIDE, MUD/SILT SUBSTRATE, WITH STEEP SLOPES (>1:1), BANKS DENSELY VEGETATED WITH GRASSES & WEEDS; CHANNEL PROPER MOSTLY OPEN WATER; BANK MARGINS MODERATELY TO DENSELY VEGETATED WITH CATTAILS.	2.21
CNDDDB-295	2012	Yolo	IRRIGATION CANAL, ABOUT 7 M WIDE, MUD/SILT SUBSTRATE, WITH STEEP SLOPES (>1:1), BANKS MODERATELY VEGETATED WITH GRASSES & WEEDS; CHANNEL PROPER AND BANK MARGINS MODERATELY TO DENSELY VEGETATED WITH CATTAILS & BULRUSH.	2.26
CAS-262676	2016	Yolo	YOLO BYPASS STATE WILDLIFE AREA	2.35
CNDDDB-314	2012	Yolo	DRAINAGE CANAL WITH CULTIVATED RICE FIELDS IMMEDIATELY TO THE NORTHEAST AND SOUTHWEST. SURROUNDING AREA PREDOMINANTLY RICE AGRICULTURE (INCLUDING YOLO BYPASS TO THE EAST).	2.37
CNDDDB-11	2016	Sacramento	FISHERMANS LAKE IS A WIDE, SHALLOW PONDED PORTION OF WEST DRAINAGE CANAL, WHICH SUPPORTS TULE/CATTAIL MARSH & RIPARIAN WOODLAND OF COTTONWOOD, WILLOW, POISON OAK & BLACKBERRY. ADJACENT AGRICULTURE WAS RICE.	2.39
CAS-262666	2014	Yolo	YOLO BYPASS STATE WILDLIFE AREA	2.4

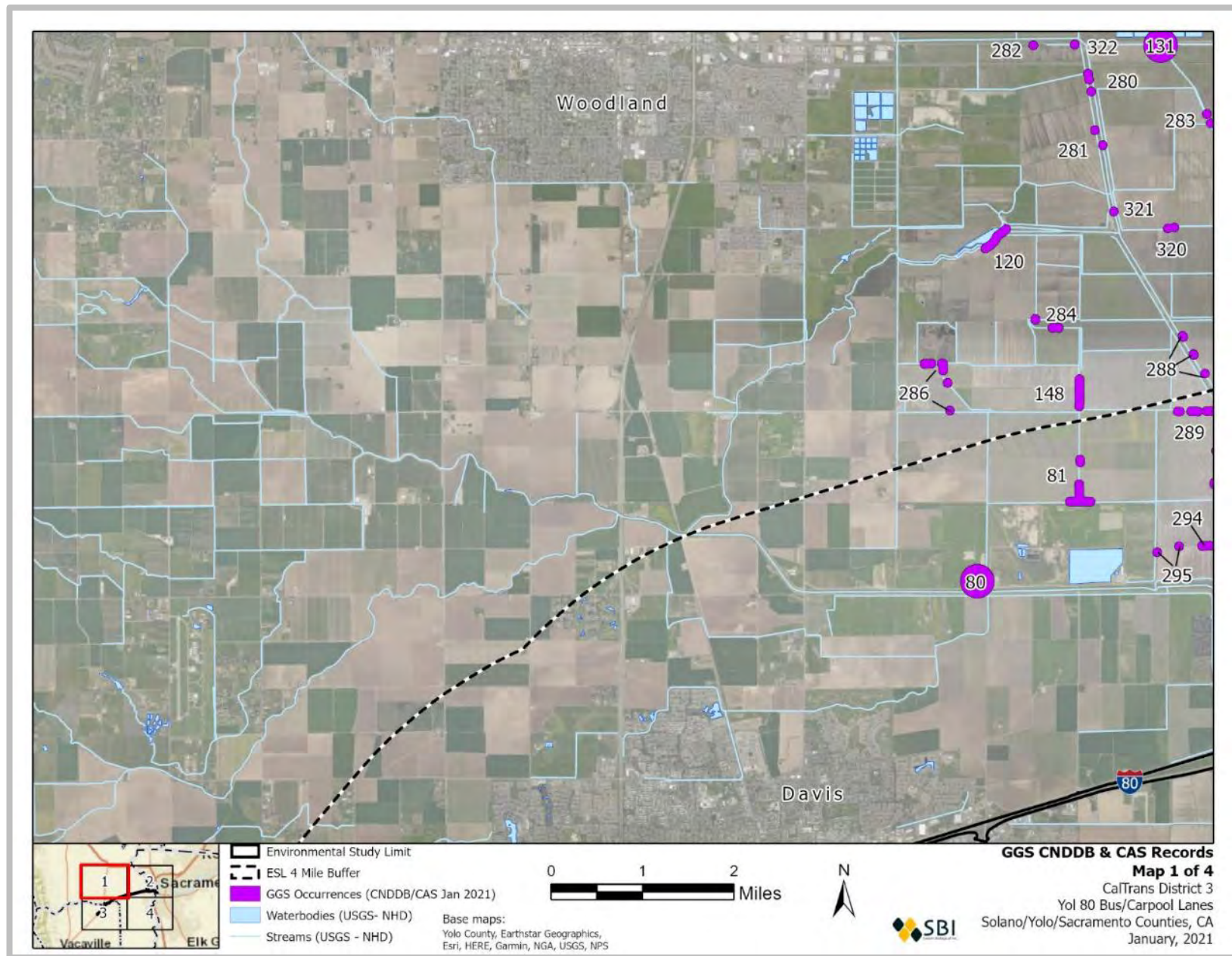
CNDDB-80	1987	Yolo	IRRIGATION DITCH WITH CATTAILS & TULE.	2.43
CNDDB-291	2009	Yolo	IRRIGATION CANAL, ~3 M WIDE, CHARACTERIZED BY MUD/SILT SUBSTRATE; STEEP SLOPES (>1:1); BANKS DENSELY VEGETATED WITH GRASSES & WEEDS; CHANNEL PROPER MOSTLY OPEN WATER; BANK MARGINS DENSELY VEGETATED WITH CATTAILS AND SOME BULRUSH.	2.55
CNDDB-290	2009	Yolo	IRRIGATION CANAL, ~10 M WIDE, WITH STEEP SLOPES (>1:1), BANKS DENSELY VEGETATED WITH GRASSES & WEEDS; CHANNEL PROPER AND BANK MARGINS MODERATELY TO DENSELY VEGETATED WITH CATTAILS.	2.79
CNDDB-313	2011	Yolo	MAJOR IRRIGATION/DRAINAGE CANAL WITH YOLO BYPASS (CONSISTING OF CULTIVATED RICE FIELDS) IMMEDIATELY TO THE EAST; WESTERN BYPASS LEVEE AND MIX OF CULTIVATED AND FALLOW RICE FIELDS IMMEDIATELY TO THE WEST. SURROUNDING LAND PREDOMINANTLY AG.	2.97
CNDDB-81	2011	Yolo	SMALL IRRIGATION/DRAINAGE CANALS (~7 M WIDE), ADJ TO RICE FIELDS, WITH SALTGRASS BANKS & OCCASIONAL STANDS OF CATTAILS. MUSTARD, MILK THISTLE ON UPPER BANK EDGE. 2009: BANKS VEG BY GRASSES/WEEDS. CHANNEL PROPER VEG BY CATTAILS & BULRUSH.	3.1
CNDDB-312	2011	Yolo	IRRIGATION CANAL WITH CULTIVATED RICE FIELDS IMMEDIATELY TO THE EAST AND WEST. SURROUNDING AREA PREDOMINANTLY RICE AGRICULTURE.	3.21

# **Appendix D Regional Giant Garter Snake Occurrence Maps**

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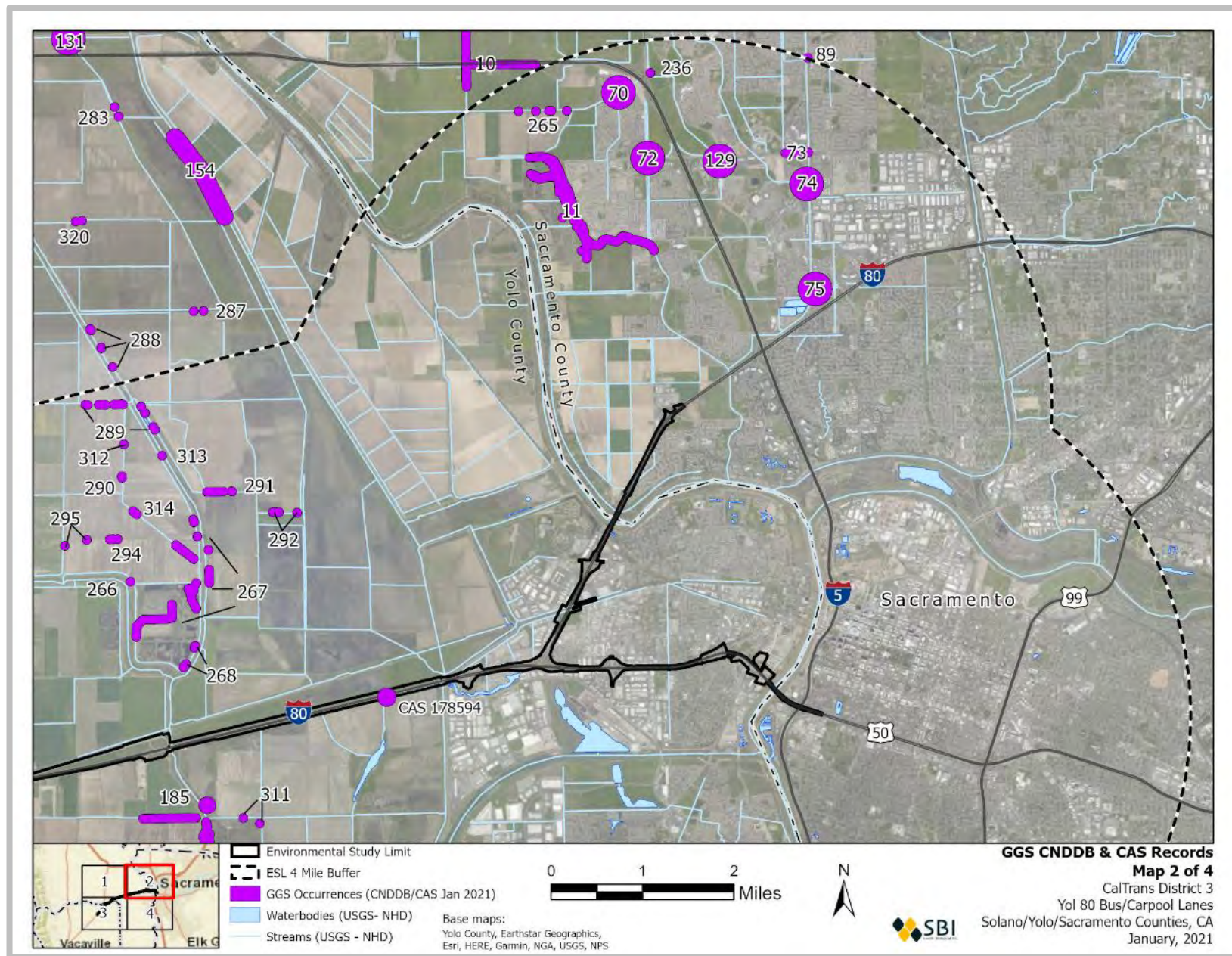






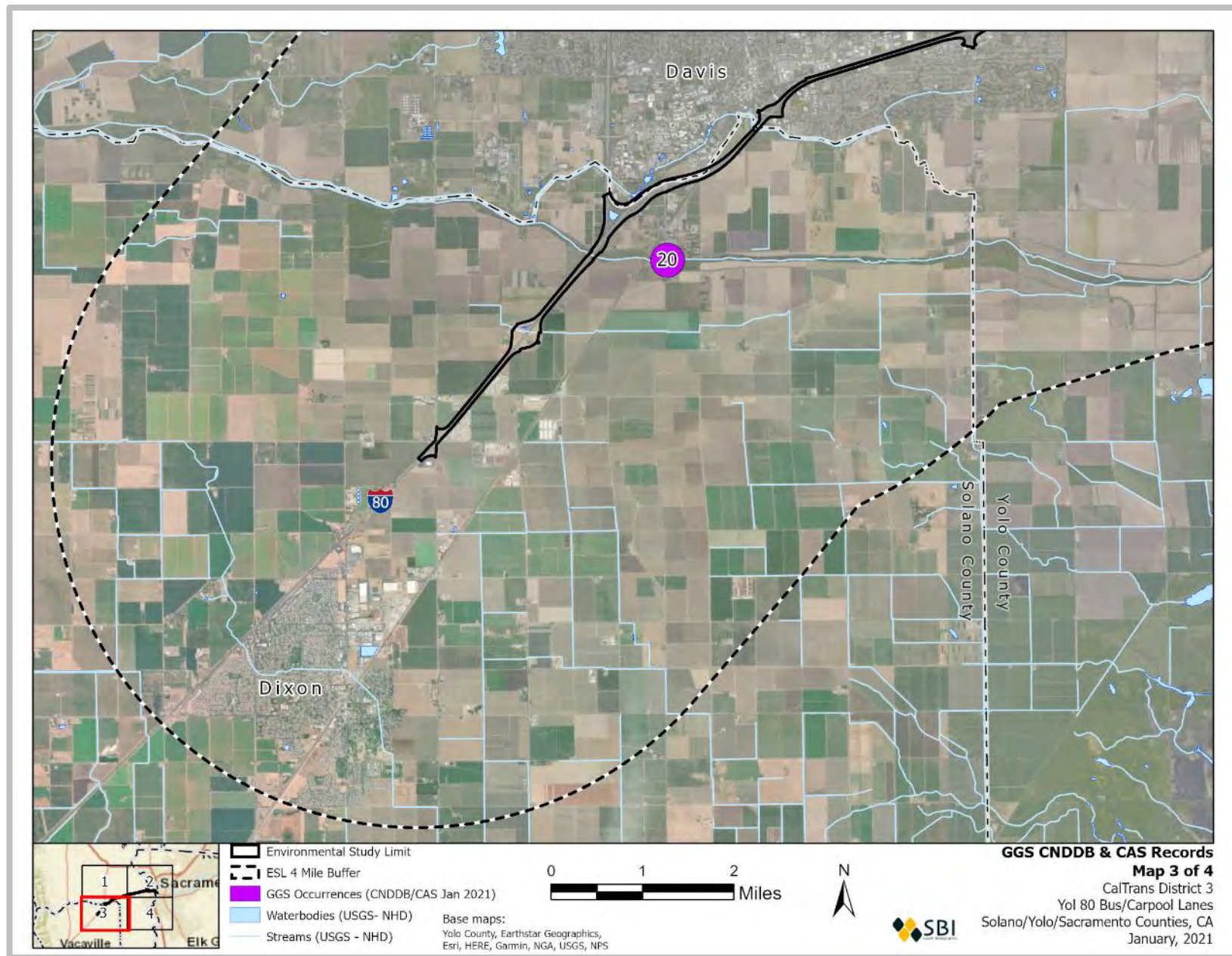
Giant Garter Snake Habitat Assessment  
 03-3H900 Yolo 80 Corridor Improvement Project





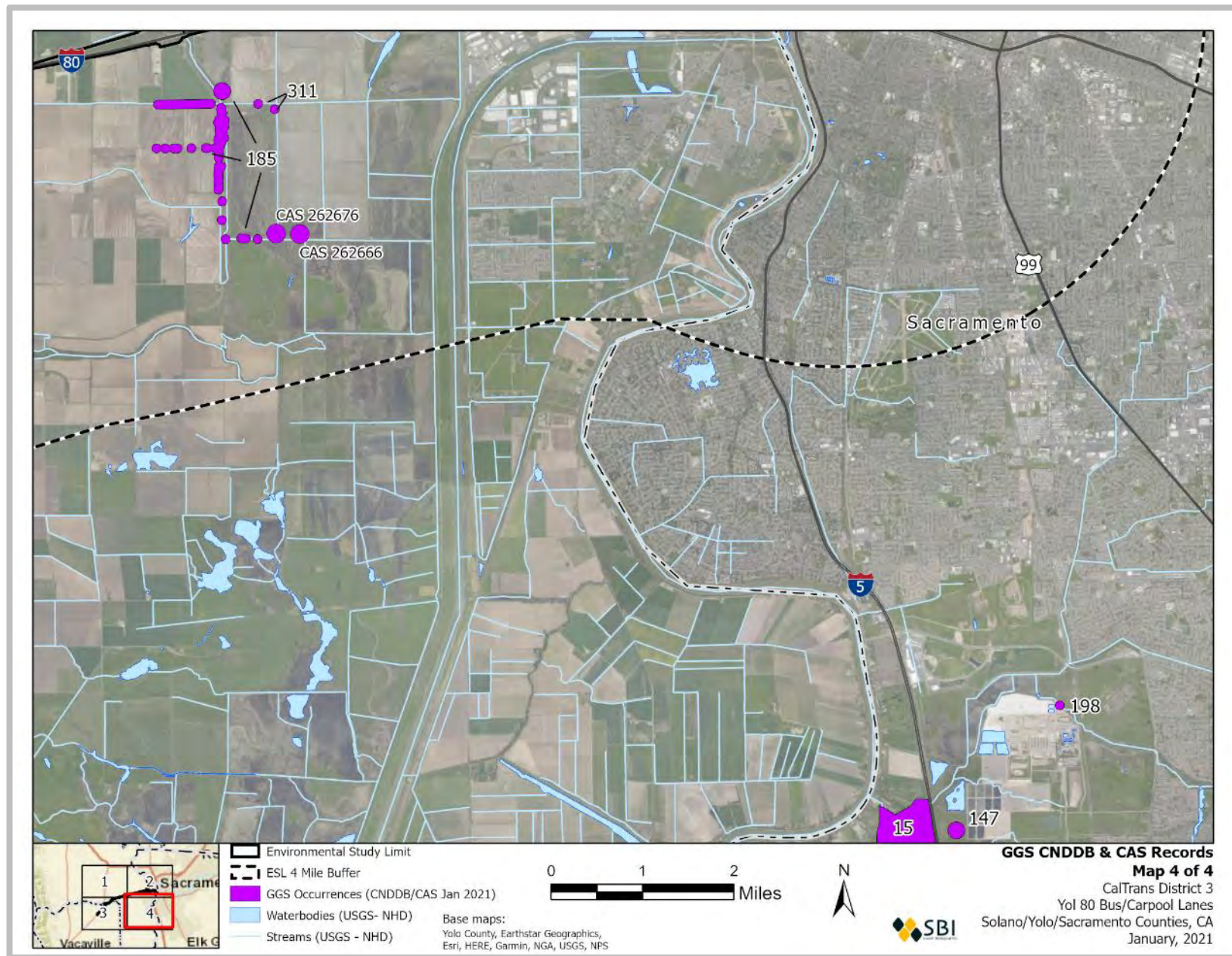
Giant Garter Snake Habitat Assessment  
 03-3H900 Yolo 80 Corridor Improvement Project





Giant Garter Snake Habitat Assessment  
 03-3H900 Yolo 80 Corridor Improvement Project





Giant Garter Snake Habitat Assessment  
 03-3H900 Yolo 80 Corridor Improvement Project

# **Appendix E Habitat Evaluation and Scoring Form**

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Site Name: \_\_\_\_\_ Site ID: \_\_\_\_\_

General Characteristic: \_\_\_\_\_

USGS 7.5' Topo Quad \_\_\_\_\_ Township \_\_\_\_\_ Range \_\_\_\_\_

Surveyor/Affiliation: \_\_\_\_\_ Date(s): \_\_\_\_\_

Scores: 0=absent/none      1=present/low (0-25%)      2=moderate (25-75%)      3=high (75-100%)

Factor Score

<b>1. Still or slow-flowing water over silt substrate</b>	*( ) +
<b>2. Flowing water over sand, gravel, rock or cement substrate</b>	*( ) --
<b>3. Water available†</b>	
<b>a) Winter only (runoff) or sporadic availability</b>	*( ) +
<b>b) April through October only (e.g. irrigation)</b>	*( ) +
<b>c) All year (e.g. perennial marsh or channel)</b>	*( ) +
<b>4. Banks are sunny</b>	( ) +
<b>5. Banks shaded by overstory vegetation</b>	( ) --
<b>6. Aquatic or emergent vegetation present</b>	( ) +
<b>7. Terrestrial vegetation present</b>	
<b>a) On banks</b>	( ) +
<b>b) In adjacent uplands</b>	( ) +
<b>8. Subterranean retreats present†</b>	
<b>a) In banks</b>	*( ) +
<b>b) In adjacent uplands</b>	*( ) +
<b>9. Prey fish present</b>	*( ) +
<b>10. Introduced gamefish present</b>	*( ) --
<b>11. Prey amphibians present</b>	*( ) +
<b>12. Site subject to severe seasonal or tidal flooding</b>	*( ) --
<b>13. Adjacent land use†</b>	
<b>a) Rice, marsh, or wetland</b>	*( ) +
<b>b) Upland</b>	*( ) +
<b>c) Row Crop</b>	*( ) --
<b>d) Urban</b>	*( ) --
<b>14. Disturbance due to human recreational or maintenance activities</b>	*( ) --
<b>15. Connectivity to known populations of GGS</b>	*( ) +

\* indicates presence/absence only

† factors within these fields are scored cumulatively

**Total:**





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## **Appendix F Habitat Evaluation Scores**

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Habitat Evaluation and Scoring Results (See Appendix D for headings)

Location	Map No.	North/South of Freeway	Landmark	Habitat Characteristics	1	2	3a	3b	3c	4	5	6	7a	7b	8a	8b	9	10	11	12	13a	13b	13c	13d	14	15	GGS Habitat Total Score	GGS Habitat Suitability
1	1	N	El Camino WB off-ramp	Drainage pond with open water and ditch with emergent vegetation, rock riprap. Limited upland with tall trees, parking lot and roadways.	1	0	1	1	1	1	2	3	3	2	1	0	0	0	1	0	0	0	1	1	1	0	10	Marginal
2	1	S	El Camino EB on/off-ramp	No potential habitat	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1	Unsuitable
3	1	S	El Camino EB off-ramp	No potential habitat	0	0	0	0	0	2	2	0	2	1	0	0	0	0	0	0	0	0	0	1	1	0	1	Unsuitable
4	1	N	Pond at south end of El Centro Rd.	Retention pond with traces of water, surrounded by herbaceous vegetation, paved surfaces, row crops.	0	0	1	0	0	1	2	3	3	1	1	0	0	0	0	1	0	0	1	1	1	0	4	Marginal
5	1	N	Ditch at S end of El Centro	No potential habitat	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	Unsuitable
6	1	N	Ditch N of Sand Cove	No potential habitat	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	Unsuitable
7	2	S	Sand Cove Park Beach	No potential habitat	0	0	0	0	0	1	3	0	2	1	0	0	0	0	0	1	0	0	1	1	1	0	-3	Unsuitable
8	3	S	Railroad canal West Sacramento	Narrow and intermittent ditch S. side of RR tracks. Wider, permanent water canal on N. side of RR tracks. Tall emergent and bankside vegetation. Upland composed of RR track/freeway embankments	1	0	1	1	1	3	1	3	3	1	1	0	1	0	1	1	0	0	0	1	1	0	13	Marginal

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9	3	N	Railroad canal West Sacramento	Two open and shallow water canals on N and S side of RR tracks with emergent and bankside vegetation. Upland composed of RR/freeway embankment, parking lots. Open connection to water canals and Bypass to the west.	1	0	1	1	1	3	1	3	3	1	1	1	1	0	1	0	0	0	0	1	1	0	15	Suitable	
10	5	S	Canal north Industrial Blvd.	Water canal, slow-moving water with emergent and bankside vegetation. Limited upland bordered by parking lots and freeway.	1	0	1	1	1	2	1	3	3	1	1	0	1	0	1	0	0	0	0	1	1	0	13	Marginal	
11	6	S	Lake+canal north of Industrial Blvd.	East end of large lake used for city drainage. Residential development lining north side of lake. Emergent and bankside vegetation with shallow and silted bottom.	1	0	1	1	1	2	1	3	3	3	1	1	1	1	1	1	0	1	1	0	1	1	0	17	Suitable
12	6	S	Lake at end of Lake Rd. W. Sac	West end of lake, shallow water but less emergent and bankside vegetation. Pedestrian use on trails in upland. Just	1	0	1	1	1	3	0	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	13	Marginal

13	6	N	Roland hensley Bike Park	on east side of Yolo Bypass levee. W. end of W. Capitol Ave.	0	0	0	0	0	2	3	0	1	1	1	1	0	0	0	0	0	0	1	1	1	2	Unsuitable	
13	6	N	Tule Jack Rd. east side of Yolo Bypass	Permanent wetland of Prospect Slough, emergent and bankside vegetation, large levee with rock riprap.	1	0	1	1	1	3	1	3	3	3	1	1	1	1	1	1	1	0	0	0	1	20	Suitable	
14	6	S	Tule Jack Rd. east side of Yolo Bypass	Permanent wetland of Prospect Slough, emergent and bankside vegetation, large levee with rock riprap.	1	0	1	1	1	3	1	3	3	3	1	1	1	1	1	1	1	1	0	0	0	1	20	Suitable
15	7	N	Yolo Bypass Wildlife Area	Permanent and ephemeral wetlands. Upland composed of grazed pasture and ruderal fields. May be exposed to winter flooding.	1	0	1	1	1	3	0	1	1	2	0	1	1	0	1	1	1	1	0	0	1	1	15	Suitable
16	7	S	Yolo Bypass Wildlife Area	Ricefields and wetlands, dirt roads. May be exposed to winter flooding.	1	0	1	1	1	3	0	3	3	3	1	1	1	0	1	1	1	1	0	0	1	1	21	Suitable
17	8	N	Yolo Bypass Wildlife Area	Permanent and ephemeral wetlands. Upland composed of grazed pasture and ruderal fields. May be exposed to winter flooding.	1	0	1	1	1	3	0	1	1	2	0	1	1	0	1	1	1	1	0	0	1	1	15	Suitable

18	8	S	Yolo Bypass Wildlife Area	Mixed permanent and ephemeral wetlands with emergent and bankside vegetation. May be exposed to winter flooding.	1	0	1	1	1	3	0	3	3	3	1	1	1	0	1	1	1	1	0	0	1	1	21	Suitable
19	9	N	Yolo Bypass Wildlife Area	Mixed permanent and ephemeral wetlands with emergent and bankside vegetation. May be exposed to winter flooding.	1	0	1	0	1	1	1	3	3	3	1	1	1	0	1	1	1	1	0	0	0	1	18	Suitable
19	9	S	Yolo Bypass Wildlife Area	Mixed permanent and ephemeral wetlands with emergent and bankside vegetation. May be exposed to winter flooding.	1	0	1	0	1	1	2	3	3	3	1	1	1	0	1	1	1	1	0	0	1	1	16	Suitable
20	9	N	Rd 32A/North side Railroad ditch+Swingle Canal	Irrigation canal with emergent and bankside vegetation. Upland composed of vegetated banks and row crops, RR track embankment.	0	0	0	1	0	1	2	1	3	2	1	1	0	0	1	0	0	1	1	0	1	1	9	Marginal
20	10	N	Swingle canal	Irrigation canal with emergent and bankside vegetation. Upland composed of vegetated banks and row crops, RR track embankment.	1	0	0	1	0	1	2	3	3	3	1	1	0	0	1	0	0	1	1	0	1	0	12	Marginal



20	9	N	Co Rd 32 east of Co Rd 105 roadside ditch	Irrigation canal with emergent and bankside vegetation. Upland composed of vegetated banks and row crops, RR track embankment.	0	0	0	1	0	2	1	2	2	2	1	1	0	0	1	0	0	1	1	0	0	0	11	Marginal		
21	9	N	Rd 32A/ South side Railroad ditch	Roadside ditch with emergent vegetation, water only sporadically available. Upland composed of ruderal fields, RR track embankment and roadway.	0	0	1	0	0	3	0	2	1	1	1	1	0	0	0	0	1	1	1	0	1	1	11	Marginal		
22	9	N	Rd 32B EB on/off-ramp area	No potential habitat	0	0	1	0	0	2	1	0	1	1	0	0	0	0	0	1	0	1	0	0	1	1	4	Unsuitable		
23	9	S	Rd 32B EB on-ramp area+field	No potential habitat	0	0	1	0	0	2	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	1	3	Unsuitable		
24	9	S	Chiles Rd rice field	Active rice fields along the south side of Chiles Rd. with irrigation ditch. Thin strip of upland ruderal vegetation north side of Chiles Rd.	1	0	0	1	0	3	0	2	1	1	1	1	0	0	1	0	1	1	0	0	1	1	14	Suitable		
25	10	S	Co Rd 105D roadside ditches	No potential habitat	0	1	0	0	0	2	2	0	1	0	0	1	0	0	0	0	0	0	0	1	1	1	0	-2	Unsuitable	
26	10	N	Co Rd 32 west of Co Rd 105 roadside ditch	No potential habitat	0	0	0	0	0	3	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	Unsuitable	
27	13	N	Richards Blvd WB off/on-ramps	No potential habitat	0	0	0	0	0	1	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	-1	Unsuitable
28	13	S	Richards Blvd staging areas	No potential habitat	0	0	0	0	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	-2	Unsuitable	
29	13	N	UCD bikepath	Seasonal riparian creek, large upland	0	0	1	0	0	1	3	0	2	2	1	1	0	0	0	0	0	0	1	0	1	1	0	4	Unsuitable	

30	13	S	UCD bikepath	of undisturbed ruderal field. No potential habitat	0	0	0	0	0	0	3	0	3	2	1	1	0	0	0	0	0	0	1	1	1	1	0	2	Unsuitable	
31	14	N	Old Davis Rd. WB on ramp	No potential habitat	0	0	0	0	0	0	3	0	3	2	0	0	0	0	0	0	0	0	1	0	1	1	0	1	Unsuitable	
31	13	N	Old Davis Rd. WB off-ramp	No potential habitat	0	0	0	0	0	1	3	0	1	0	1	0	0	0	0	0	0	0	0	1	1	1	0	-3	Unsuitable	
32	13	S	North end of Equine Ln	No potential habitat	0	0	1	0	0	1	1	0	2	1	0	1	0	0	0	0	0	0	0	1	1	1	0	2	Unsuitable	
33	14	S	Pond 4 rd. side ditches	No potential habitat	0	1	1	0	0	2	1	0	1	1	1	0	0	0	0	1	0	0	0	1	1	1	0	0	Unsuitable	
34	14	N	UC Davis Arboretum	Permanent wetland and water canal. Mixed silted bottom and concrete lined banks. Emergent and bankside vegetation. Heavy used trails in upland, horse stables.	1	1	1	1	1	1	2	2	3	3	1	1	1	0	1	0	0	1	0	1	1	1	0	13	Marginal	
35	14	N	Hwy 113 interchange staging area - east	No potential habitat	0	0	0	0	0	1	3	0	2	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	Unsuitable	
36	14	N	Pond 3	Seasonal pond with emergent and bankside vegetation. Surrounded by roadways, isolated. Limited water is summer.	0	0	1	0	0	1	2	3	3	1	0	1	0	0	1	1	0	0	0	0	0	1	1	0	6	Marginal
37	14	N	Hwy 113 interchange staging area - middle	No potential habitat	0	0	0	0	0	1	3	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	-1	Unsuitable	
38	14	N	Hwy 113 interchange staging area - west	No potential habitat	0	0	0	0	0	1	3	0	2	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	-2	Unsuitable
39	14	S	Pond 4	Irrigation pond, plastic lined, no emergent vegetation, isolated.	0	1	1	1	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	3	Unsuitable
40	14	S	Hwy 113 EB on-ramp	No potential habitat	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	1	1	1	0	-3	Unsuitable	

41	14	N	Putah Creek	Riparian, slow-moving stream, open water with emergent and bankside vegetation, gravel/sand bottom.	1	1	1	1	1	0	3	3	3	3	1	1	1	1	1	1	0	1	1	0	1	0	10	Marginal		
42	14	S	Putah Creek	Riparian, slow-moving stream, open water with emergent and bankside vegetation, mixed silt/sand bottom, willow shrubs in upland.	1	0	1	1	1	1	3	2	3	3	1	1	1	1	1	1	0	1	1	0	1	0	11	Marginal		
43	15	N	Olmo Ln. roadside ditches	No potential habitat	0	0	0	0	0	3	1	0	1	0	1	0	0	0	0	1	0	0	1	1	1	0	0	Unsuitable		
44	15	S	Sparling Ln. ditch east of Kidwell on-ramp	No potential habitat	0	0	0	0	0	2	2	3	2	0	1	0	0	0	0	0	0	0	0	1	1	1	0	3	Unsuitable	
45	15	S	Sparling Ln. south of Kidwell Rd.	Irrigation canal with emergent and bankside vegetation. Some parts with concrete lined bottom.	0	0	0	1	0	2	1	3	2	0	1	0	0	0	0	0	0	0	0	1	1	1	0	5	Marginal	
46	15	N	N. of Kidwell Rd. WB off-ramp	Seasonal swale with emergent and bankside vegetation, upland of row crops and ruderal field. Limited water in summer.	0	0	1	0	0	2	1	1	2	1	1	1	0	0	0	0	1	0	1	1	1	1	0	5	Marginal	
47	15	N	Kidwell Rd. WB on/off-ramp	No potential habitat	0	1	1	0	0	2	1	0	1	1	1	0	0	0	0	1	0	0	0	1	1	1	0	0	Unsuitable	
48	15	S	Kidwell Rd. EB on/off-ramp	No potential habitat	0	1	0	0	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	-3	Unsuitable
49	16	N	Tremont Rd. culdesac	No potential habitat	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	-2	Unsuitable	
50	16	S	Sparling Ln. to Tremont Rd. ditch	Road side ditch with water and	1	0	0	1	1	2	1	0	1	0	1	0	0	0	1	0	0	0	1	1	1	0	4	Marginal		

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51	16	N	Tremont Rd. I-5 ditch to Pond 2	vegetation. Limited upland of row crops and roadway. No potential habitat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	-2	Unsuitable		
51	16	N	Pedrick Rd. WB on/off-ramp	No potential habitat	0	0	0	0	0	2	1	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	Unsuitable
52	16	S	Pedrick Rd. EB off-ramp	No potential habitat	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	1	1	0	-4	Unsuitable	
52	16	S	Pedrick Rd. EB on-ramp	No potential habitat	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	1	1	0	-4	Unsuitable	
53	16	N	Pond 2	Small pond with bankside wetland vegetation, surrounded by row crops and industrial yard. No access through private property.																						Marginal	
54	16	S	Pond 1	Small isolated pond with wetland vegetation. Upland composed of row crops and roadway.	0	0	1	0	0	2	1	2	1	1	1	0	0	0	0	0	0	1	1	1	0	4	Marginal
55	16	N	West of Pedrick Rd.	No potential habitat	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	1	1	0	-4	Unsuitable	
56	2	N/S	I-80 Bridge, Sacramento River	No potential habitat	0	1	0	0	1	2	2	0	1	1	0	0	1	0	1	0	0	1	1	0	-2	Unsuitable	
57	4	N/S	US-50 Bridge, Sacramento River	No potential habitat	0	1	0	0	1	2	1	0	1	1	0	0	1	0	1	0	0	1	1	0	-1	Unsuitable	