BR-3 – GIANT GARTER SNAKE ASSESSMENT REPORT

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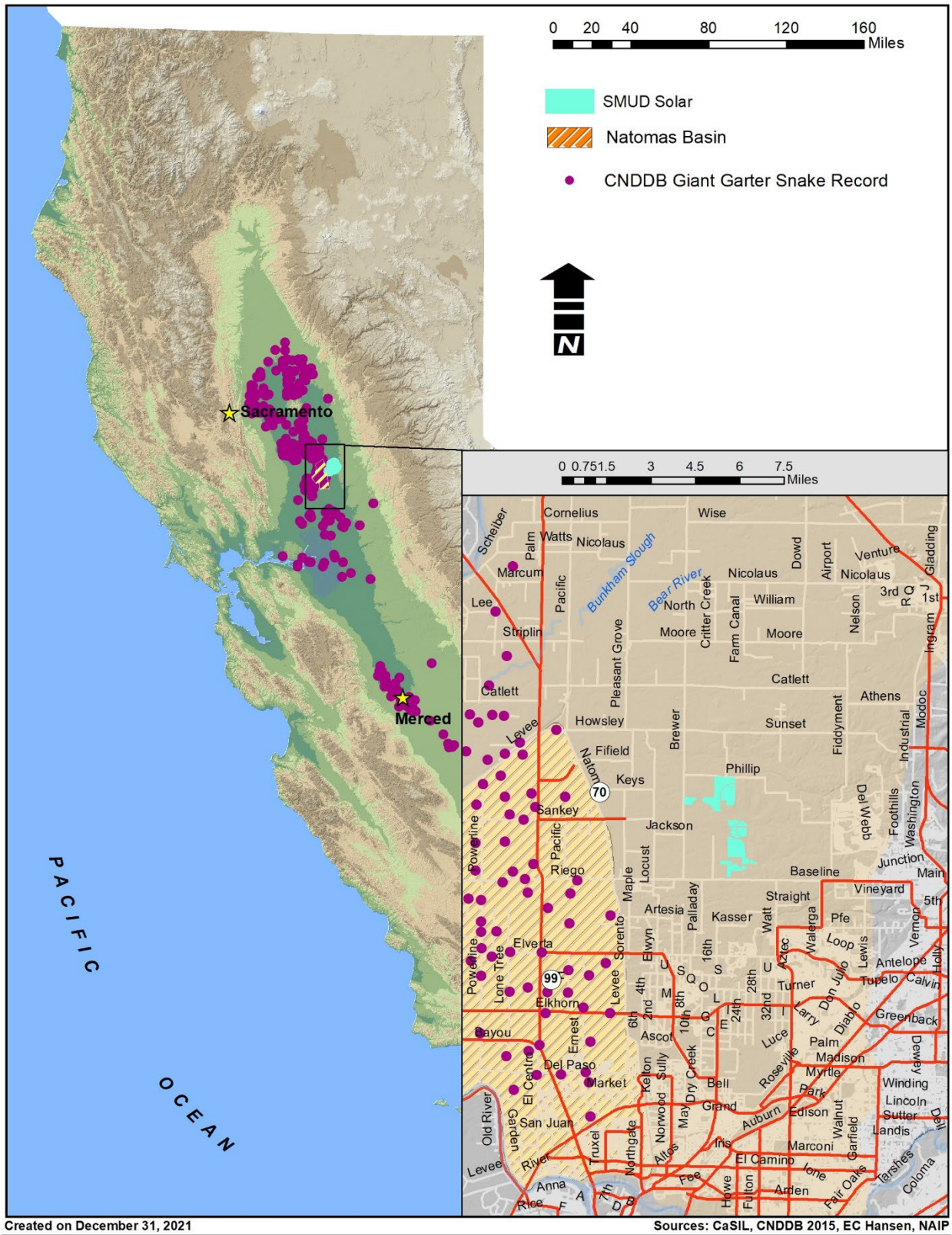
Re: Giant garter snake (*Thamnophis gigas*) Habitat Assessment on the SMUD Country Acres Solar Project, Placer County, California.

Date: 31 August 2022

Dear Ms. Fessler:

This memorandum provides the results of surveys conducted on 5 May 2021 and 8 August 2021 at the SMUD Country Acres Solar Project, Placer County, California Project Site (Project Site) in southwestern Placer County, California (Figure 1). These surveys were conducted to assess potential habitat for the giant garter snake (*Thamnophis gigas*) and were completed in reference to information provided by AECOM and information produced by multiple subcontractors associated with the larger project. Potential habitat was evaluated using a combination of ground-level surveys, National Agricultural Imagery Program (NAIP) and Google Earth™ aerial imagery, the California Natural Diversity Database (CNDDB), and Geographic Information System (GIS) program ArcGIS 10.8 to roughly quantify existing habitat, to assess the overall suitability of the site based on the prevailing character of the landscape, and to examine the site's location in regard to historical and recent giant garter snake occurrence records. This memorandum provides a thorough species background (Appendix 1), details the methodology used to assess habitat suitability (Appendix 2), includes a discussion of the site's suitability and impact potential for the giant garter snake, and provides a list of standard measures that, if implemented, would serve to avoid, and minimize project-related impacts to giant garter snakes in the unlikely event they may occur on site (Appendix 3).

Figure 1: Project Site Locator



The results of the assessment indicate that while rice agriculture and water conveyance infrastructure associated with giant garter snake habitat dominate the region, all potential habitats within the Project Site are of questionable value due to their location relative to the species' modeled range (e.g., CNDDB 2021, Hansen *et al*. 2017). Some features on the Project Site were deemed suitable due to the prevalence of rice agriculture observed on many, but not all properties. Although deemed suitable and therefore capable of supporting giant garter snakes under the broadest of definitions, it is highly unlikely that resident giant garter snakes occupy features within the Project Site due to the overall character of the potential habitat and the distance of the Project Site from habitats where giant garter snake presence has been verified. The Project Site also falls outside the range of giant garter snake occupancy (Hansen et al. 2017). Regardless of predicted suitability, all features occur outside the expected range of giant garter snake. Simply put, the project exists outside the species' known range (CNDDB 2021, Hansen *et al.* 2017).

The work described herein provides stand-alone results. However, results of prior occupancy analyses (Hansen et al. 2017) also have been incorporated to illustrate the broader probability of occupancy across the landscape encompassing the study area. Occupancy models use covariates for which there is data across a large portion of the species range (e.g., road density, canal density, or land cover type) to develop a map of occupancy probability across the landscape. Occupancy models are useful to land managers for a variety of reasons, including identifying locations for future surveys where giant garter snakes are most likely to occur and determining locations where maintaining habitat for giant garter snakes is most critical.

SURVEY AND ASSESSMENT METHODS

Though no formal protocol exists for assessing giant garter snake habitat, the methodology used for this assessment is like those developed for other species that depend upon aquatic habitat (e.g., California tiger salamander[1] and California red-legged frog[2]). Consistent with these protocols, this assessment provides a project description and details: 1) the project location with respect to the species' historic range; 2) known localities within proximity of the project site; and 3) supporting habitat upon and within proximity of the project site.

The habitat assessment includes aquatic and upland habitat within 200 feet of identified ditches, drains, channels, or swales. In its Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with

[1] October 2003 Interim Guidance on Site Assessment and Field Surveys for Determining Presence or Negative Findings for the California Tiger Salamander; prepared jointly by the U.S. Fish and Wildlife Service and California Department of Fish and Game

[2] April 4, 1997 Memorandum 1-1-97-TA-1093 Dissemination of Interim Guidance on Site Assessment and Field Surveys for California Red-Legged Frogs; August 2005 Revised Guidance on Site Assessment and Field Surveys for California Red-Legged Frogs

Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California (USFWS 1997, 2004), the USFWS incorporated a standard of 200 feet of upland on each bank side of linear habitat as suitable upland for giant garter snakes when assessing a project's disturbance area. The 200-foot upland buffer has become standard in subsequent Biological Opinions and impact analyses and is therefore used as a standard in this assessment.

To place the Project Site in relation to the known geographic distribution of giant garter snakes, locality records were obtained by conducting a computer search of the most recent version of the CNDDB (2021). Next, to place the Project Site in regional perspective, records falling within 5-kilometer radii of the project site were identified using the Geographic Information Systems (GIS) program ArcMap 10.8. GIS-generated maps are used to illustrate giant garter snake distribution relative to the Project Site. Finally, habitats within and surrounding the project site were identified using a combination of site plans, field surveys, and GIS analysis using digital orthographic quarter quadrangle (DOQQ) maps (digitized aerial maps) and digitized aquatic features from the National Hydrography Dataset (NHD), which were acquired through the United States Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) (http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai). Underlying soil types (Figure 4) were determined using the U.S. General Soil Map (STATSGO2) provided by U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS 2006) in conjunction with GIS program ArcMAP Version 10.8. The methodology used to evaluate scoring variable are provided in Appendix 2.

Classification values described in this assessment are based upon recognized habitat characteristics and personal experience and knowledge of giant garter snakes and their life history, distribution, and habitat requirements (Hansen and Brode 1980; Hansen 1988; USFWS 1999; Wylie *et al.* 2002, 2004; E. Hansen 2006, 2008).

Suitable habitat is characterized by all of the features required to support permanent populations of garter snakes, including: 1) sufficient water during the active summer season to supply cover and food such as small fish and amphibians; 2) emergent, herbaceous aquatic vegetation accompanied by vegetated banks to provide basking and foraging habitat; 3) bankside burrows, holes and crevices to provide short-term aestivation sites; 4) high ground or upland habitat above the annual high water mark to provide cover and refugia from floodwaters during the dormant winter season (Hansen 1988, Hansen and Brode 1980).

Marginal habitat is characterized by any combination of those features listed above needed to support transient giant garter snakes on a temporary basis, or to act as connective corridors between areas of more stable or desirable habitat.

This habitat need only possess the water, vegetation, and refugia required to provide minimal coverage for dispersing snakes. On its own, marginal habitat is considered incapable of supporting permanent populations of giant garter snakes and is typically ephemeral, providing no permanent source of prey.

Unsuitable habitat is devoid of the water, vegetation, and refugia necessary to support giant garter snakes for a meaningful time. Such habitat is generally composed of large rivers, lakes, gunite drains or temporary swales that possess no water during the active spring and summer seasons. As such, unsuitable habitat corridors are no more likely to support giant garter snakes than any non-aquatic environment, and if they do so, they do so only by chance. Transient features, such as shallow trenches and furrows intended only to direct winter runoff, typically do not persist through the remainder of the season, do not provide the aquatic habitat necessary to support giant garter snakes for a meaningful time, and should therefore be assigned to this category. However, because transient features still exhibit characteristics such as winter water, bank sun, and bank or upland vegetation, they can accumulate the number of points necessary to qualify as *marginal* habitat in this evaluation scheme. Wetted features lacking any supporting characteristics are also deemed unsuitable if the distance or connectivity to suitable habitat is likely to preclude their use as migration corridors.

PROJECT DESCRIPTION

Sacramento Municipal Utility District (SMUD), a local public agency, proposes to build and operate a photovoltaic (PV) solar power and battery storage renewable energy generation facility in southwestern Placer County. The Country Acres Solar Project includes construction and operation of a PV solar power and battery storage facility and interconnection facilities, including a generation substation, switch station, and interconnection lines, that would provide new power production capacity of up to 344 MW delivered at the point of interconnection with the grid managed by SMUD. The total project site would generally comprise PV solar modules, foundation piles, racking, direct current (DC) collection, alternative current (AC) collection, fencing, roads, inverters, medium voltage transformers, an interconnection line between the generation substation and switch station, battery storage equipment, and interconnection lines to the existing SMUD transmission system.

Construction of the project would take approximately eighteen months to two years and is proposed to begin as early as 2023 and conclude in 2024 or 2025. During construction, a temporary construction trailer/office complex and staging areas would be established. Setbacks would be established from the project boundary (footprint) to any wetlands. During operation, the proposed project would likely include an operations facility. At the end of the project's life (anticipated to be 30 to 35 years or more), the site would be decommissioned.

RESULTS AND DISCUSSION

Potential habitat for giant garter snake on the Project Site consists of the historic channel of Curry Creek, associated roadside drainage and irrigation channels, adjacent rice fields, and upland/ruderal habitats within 200-feet of these aquatic features (Figure 2 and Figure 3). The Project Site consists entirely of San Joaquin series soils (s825), which are commonly used for wheat, rice, pasture, and urban development. Sub soil layers associated with this series are brown loam (upper) and brown clay (lower) characterized by a cemented hardpan a few feet beneath the surface restricting roots and water percolation (ftp://ftp-fc.sc.egov.usda.gov/NSSC/StateSoil_Profiles/ca_soil.pdf). Except for rice, which is generally suitable after emergence, all these potential habitats (i.e., roadside drainages, irrigation channels, adjacent rice fields, and upland/ruderal habitats within 200-feet of these aquatic features) were deemed unsuitable based on the described criteria due to a lack of aquatic connectivity; no other features on the Project Site were deemed suitable due to the distance from perennial aquatic habitat. Rice fields that occur within the giant garter snake's range provide suitable habitat after the rice fields undergo leaf emergence and an increase in plant height. However, the rice fields on the Project Site are very unlikely to support giant garter snake because of the absence of aquatic connectivity, distance of the rice fields from perennial aquatic features, and lack of evidence for historical or current giant garter snake occupancy.

While this analysis identifies some potential habitats within the project margins as suitable (see Figure 2), giant garter snake presence at the Project Site is highly unlikely. While the overall character of the potential habitat on site is generally consistent with that of occupied sites, the Project Site lies east of the documented range of the species in Sacramento County (CNDDB 2021). Finally, recent, intensive trapping efforts have failed to identify giant garter snakes in any otherwise suitable features this far east within the American Basin. There are no known giant garter snake occurrence records falling within 5 kilometers of the Project Area (see Figure 1 and Figure 3).

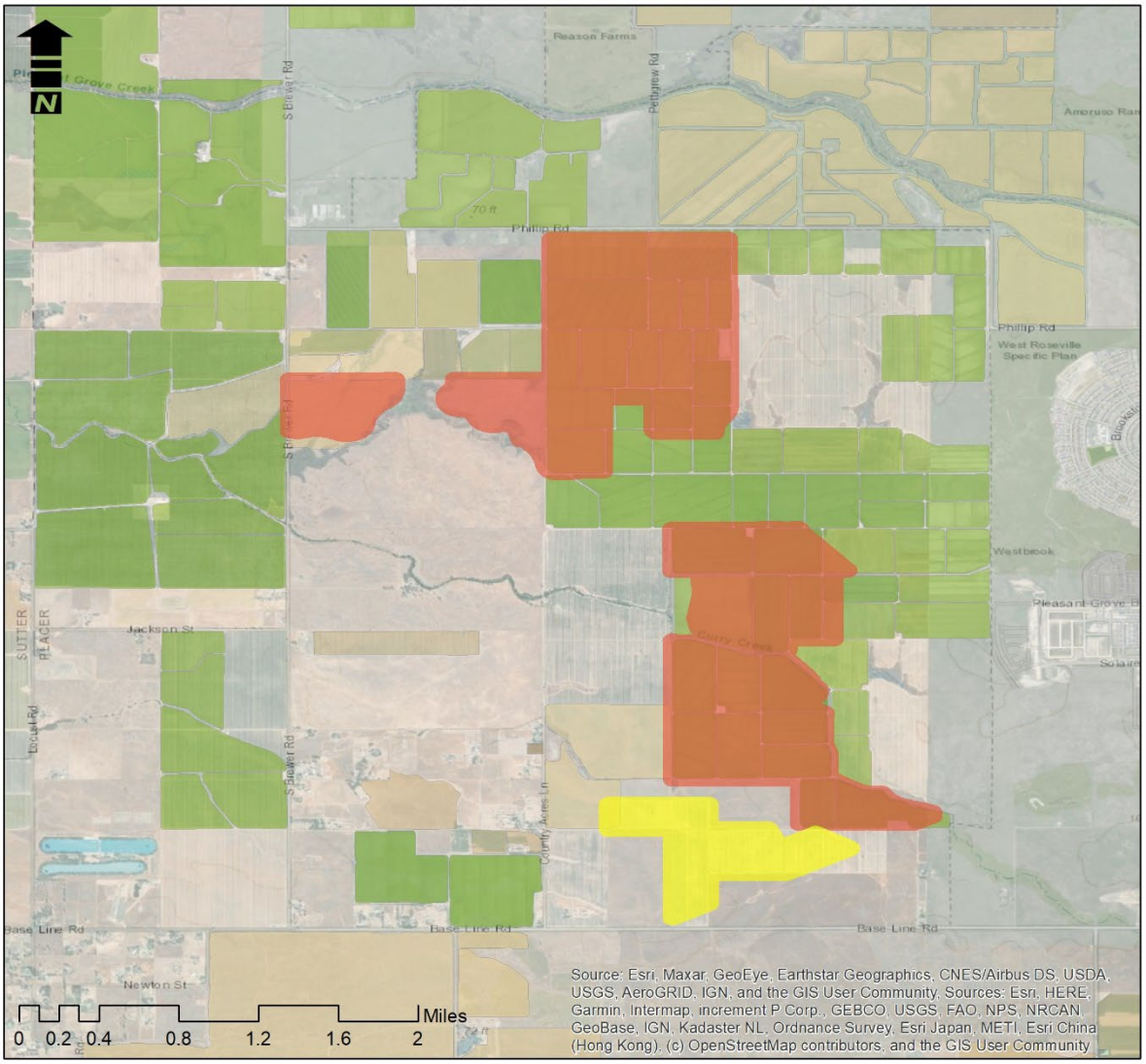
While the current (October 2021) commercial version of the CNDDB was consulted during this analysis to ensure that no new records were omitted, the CNDDB is limited in that it does not account for sites that have been sampled without detecting the species of interest -- i.e., it does not address potential species absence. To address this to the extent that data are available, personal records were consulted to place regional survey efforts in perspective (Figure 4). Although recent trapping and/or visual encounter surveys are not known of on the site, giant garter snakes have never been documented here, and extensive trapping efforts conducted since 2001 have failed to detect any giant garter snakes east of the Natomas East Main Drainage Canal (NEMDC) (Hansen 2001, 2003, 2004, 2005a, 2005b, 2006, 2007; Hansen, unpublished data), suggesting that the site lies at or beyond the easterly limit of the species' range. Trapping

conducted by Eric Hansen from 2001 through 2012 are shown alongside of known giant garter snake distribution records in Figure 5 and include several years of trapping surveys conducted within the NEMDC (Steelhead Creek) (Hansen 2004, 2005a, 2006), which is the most likely source from which giant garter snakes could access the Project Site.

Lastly, it is important to note that while elementary habitat characteristics are present on site, the location of the Project Area suggests that it is outside of the species' modeled range (Hansen et al. 2017). Occupancy models identify covariates that are associated with the probability of occupancy (i.e., presence) at a location and are completed using multiple covariates modeled across the landscape as opposed to isolating individual features in the way that an isolated assessment does. Such models and resulting maps can be useful to resource managers for a variety of reasons, including: 1) increased ability to efficiently plan and prioritize maintenance work, particularly in relation to potential mitigation; 2) ability to prepare an avoidance and implementation strategy that is compatible with relevant operations and maintenance activities and can be leveraged into permits; and 3) ability to document increases in populations/distribution and hence the efficacy of avoidance and minimization measures. Contributing to this analysis, the presented occupancy model (Figure 5) illustrates that the study area has a lower probability of giant garter snake occupancy in the identified features than elsewhere in the America Basin, and that the Project Site lies east of the species' predicted range. These results align clearly with known patterns of distribution of both historic and current records. The occupancy model did not include historic records, but rather used multi-year trapping and capture data derived throughout the Sacramento Valley, including multiple sites in the Natomas Basin and is therefore based on records of demonstrated occurrence.

The comparison of known locality records, the published occupancy data, and site-level assessment presented here strongly suggest that the probability of giant garter snake or habitat impacts within the project vicinity is low. While this survey concludes that giant garter snakes are not likely to occur on the Project Site, the project would present a risk of mortality or species take if the species did occur. Steps can be taken to reduce the risk and/or minimize the impacts of species take where feasible when giant garter snakes are present. A list of standard measures is included as Appendix 3; however, appropriate, and specific measures should be determined following the selection of a final project schedule, the development of a formal project description, and in consultation with U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and local environmental agencies.

Figure 2: Project Site Detail and Assessed Habitat Suitability



DWR 2014 Crop Layers

Crop2014

- Alfalfa and Alfalfa Mixtures
- Almonds
- Citrus
- Corn, Sorghum and Sudan
- Flowers, Nursery and Christmas Tree Farms
- Grapes
- Idle
- Kiwis
- Managed Wetland
- Miscellaneous Deciduous
- Miscellaneous Grasses
- Miscellaneous Truck Crops
- Mixed Pasture
- Olives
- Peaches/Nectarines
- Pistachios
- Plums, Prunes and Apricots
- Pomegranates
- Rice
- Strawberries
- Urban
- Walnuts
- Young Perennials

GGS Habitat Suitability

- Suitable
- Marginal
- Unsuitable

Figure 3: GGS occurrence records relative to the Project Site

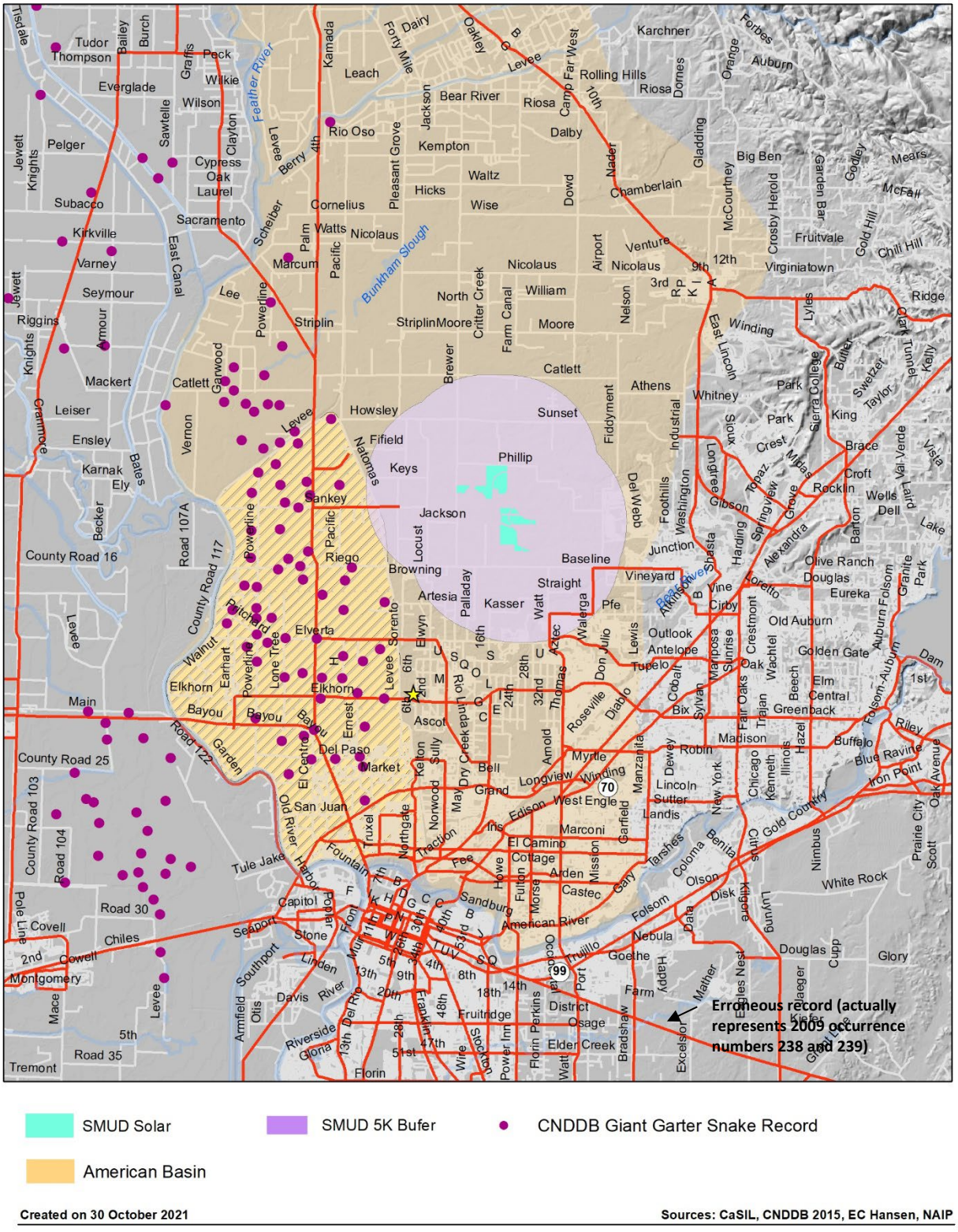


Figure 4: GGS occurrence records relative to mapped soil categories

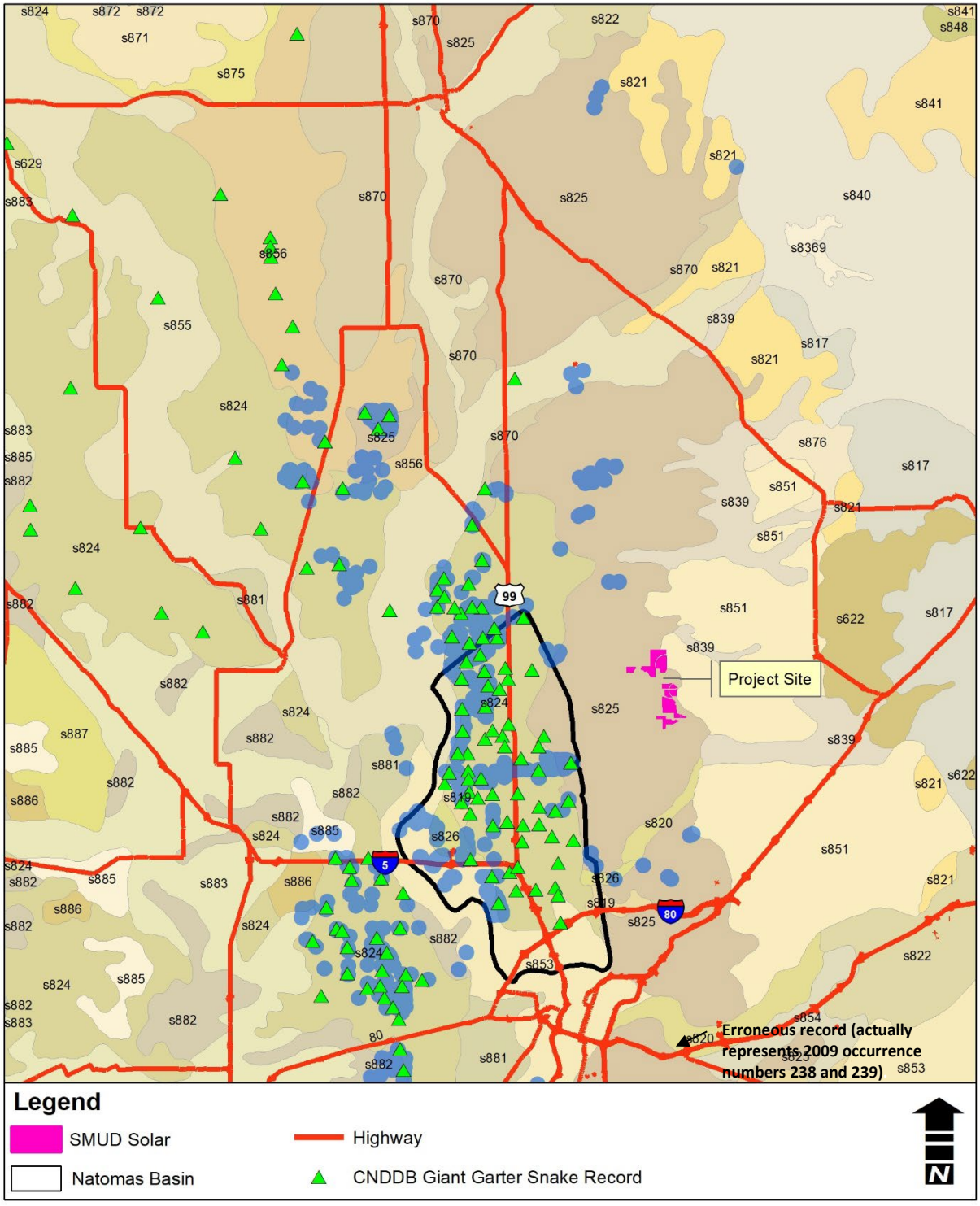


Figure 5: Summary of Regional Trapping Effort (E. Hansen, personal records)

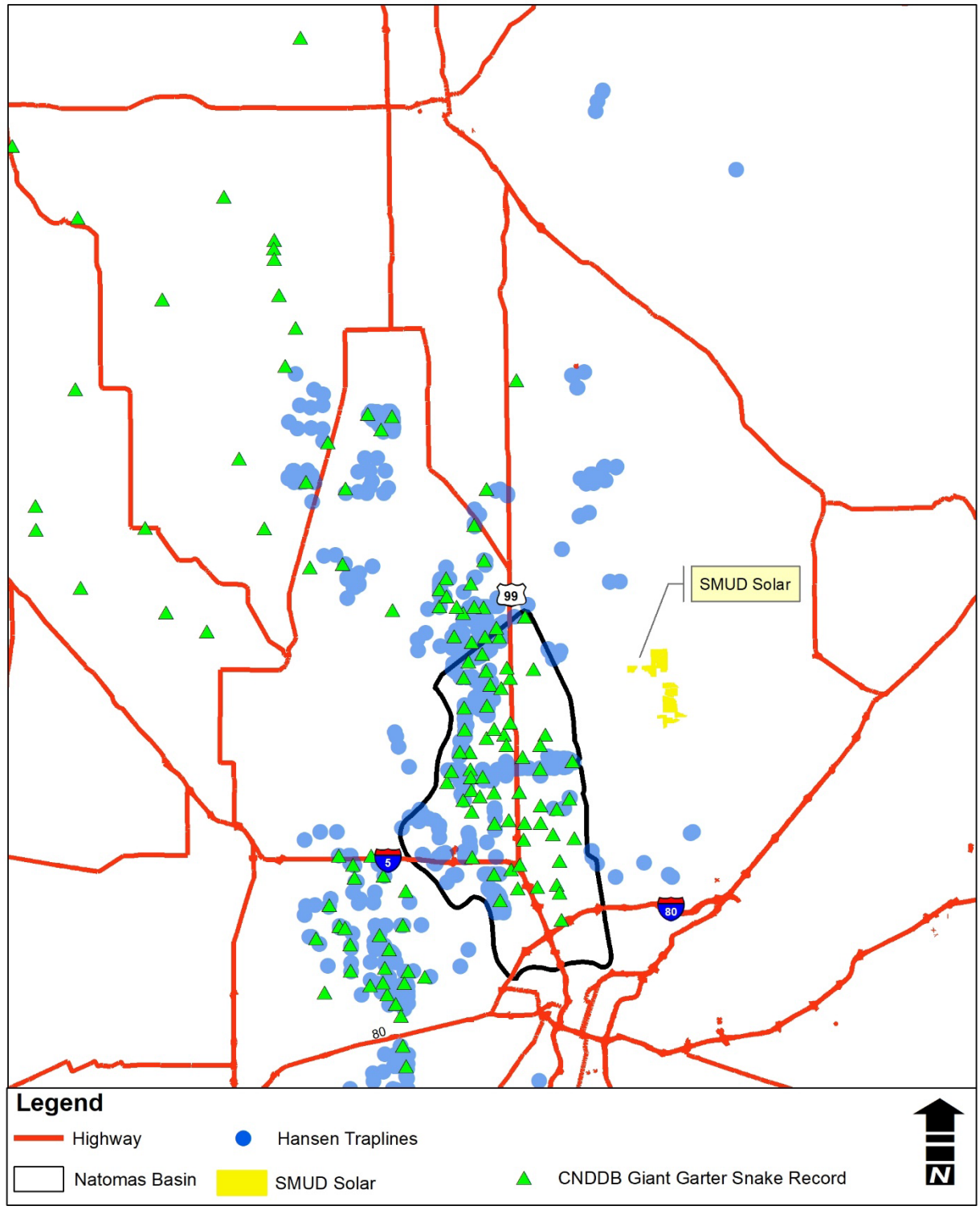
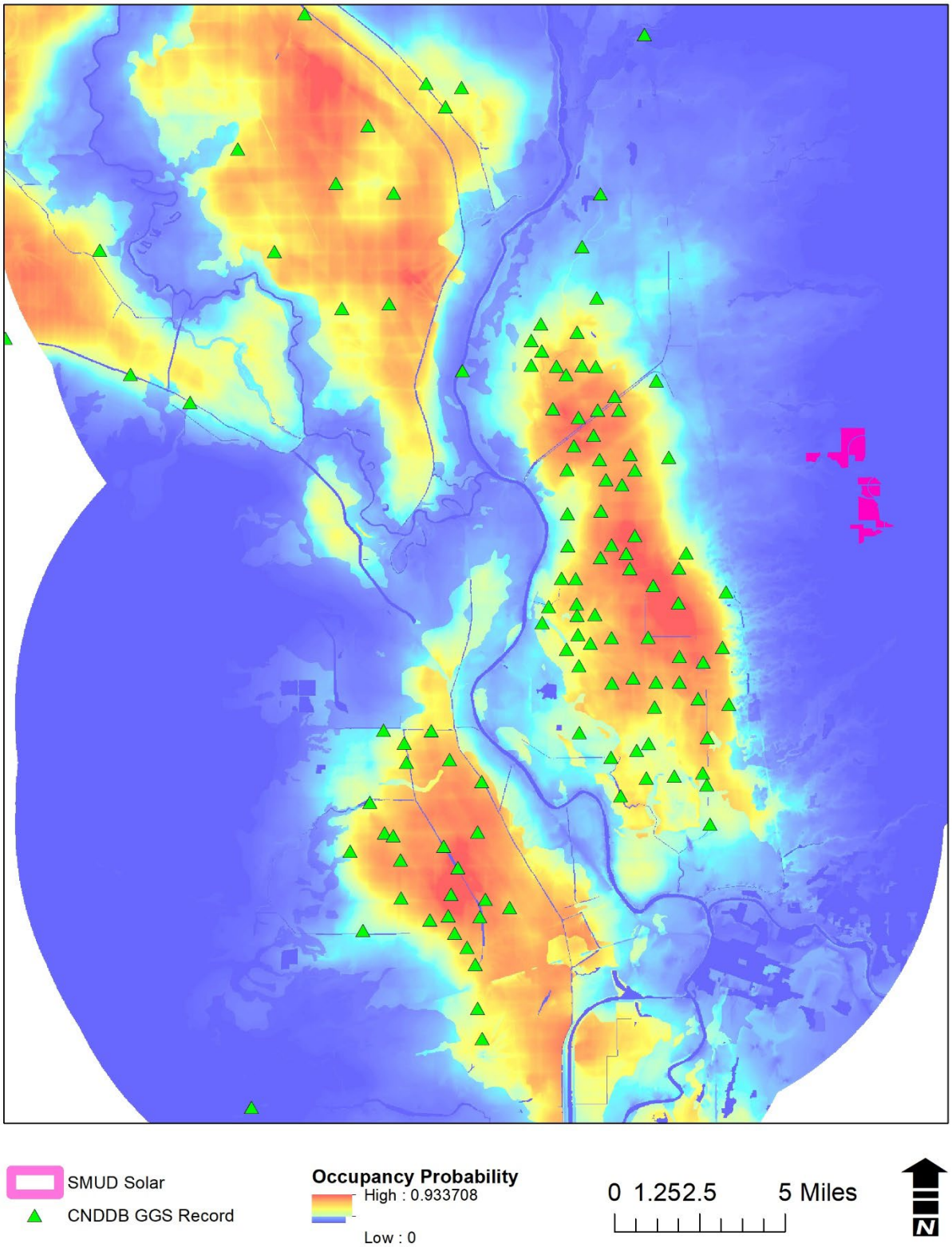


Figure 6: Results of regional giant gartersnake occupancy modeling (Hansen et al. 2017)



If you have questions regarding this evaluation, the methodologies, or any of the subsequent comments, please do not hesitate to contact me. I will gladly expand on any of these topics upon request.

Sincerely,

Eric C. Hansen
Consulting Environmental Biologist

Appendices:

1. Species Background
2. Scoring Methods
3. Sample of Standard Avoidance Measures for the Giant Garter Snake
4. References

APPENDIX 1. SPECIES BACKGROUND

Overview - The giant garter snake is a federal- and state-listed species precinctive to California's Great Central Valley. Described as among California's most aquatic garter snakes (Fitch 1940), giant garter snakes are associated with low-gradient streams and the wetlands and marshes of the valley floor. The conversion of Central Valley wetlands for agriculture and urban uses has resulted in the loss of as much as 95% of historical habitat for the giant garter snake (Wylie et al. 1997). In some instances where wetlands have been reclaimed, giant garter snakes have adapted successfully to rice agriculture and the irrigation infrastructure supporting its practice (G. Hansen and Brode 1993; G. Hansen 1998; USFWS 1999; Wylie et al. 1997). Giant garter snakes once ranged from Buena Vista Lake near Bakersfield, Kern County, north toward the vicinity of Chico in Glenn and Colusa Counties (G. Hansen and Brode 1980). Due mainly to loss or degradation of aquatic habitat resulting from agricultural and urban development, the giant garter snake has been either extirpated or else suffered serious declines throughout much of its former range.

Distribution - The current known distribution of giant garter snakes is patchy, extending from near Chico, Butte County, south to Mendota Wildlife Area, Fresno County. Giant garter snakes are not known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Sacramento-San Joaquin River Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (G. Hansen and Brode 1980, USFWS 1993). The resulting gap of approximately 100 kilometers (62.3 miles) separates the southern and northern populations, with no giant garter snakes known from the lowland regions of Stanislaus County (CNDDB 2011, G. Hansen and Brode 1980). Scattered records suggest that giant garter snakes may have occupied the Sacramento-San Joaquin River Delta at one time, but longstanding reclamation of wetlands for intense agricultural applications has eliminated most suitable habitat (CNDDB 2011, G. Hansen 1986). Recent sightings within the Sacramento-San Joaquin Delta are haphazard, and repeated surveys have failed to identify any extant population clusters west of the eastern inland fringe (G. Hansen 1986, Patterson and E. Hansen 2004, Swaim 2004). Current locality records indicate that within this range, giant garter snakes are distributed in as many as 13 unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley (R. Hansen 1980, Brode and G. Hansen 1992, USFWS 1993, USFWS 1999). These populations are isolated, without protected dispersal corridors to adjacent populations, and are threatened by land use practices and other human activities, including development of wetland and suitable agricultural habitats.

Habitat Requirements - Habitats occupied by giant garter snakes contain permanent or seasonal water, mud bottoms, and vegetated dirt banks (Fitch 1940, G. Hansen and Brode 1980). Prior to reclamation, these wetlands probably consisted of freshwater marshes and low gradient streams. Giant garter snake habitat includes all of the following four characteristics: 1) sufficient water during the snake's active season (typically early spring through mid-fall) to

supply cover and food such as small fish and amphibians; 2) emergent, herbaceous wetland vegetation, such as cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* [=*Scirpus*] spp.), accompanied by vegetated banks to provide basking and foraging habitat and escape cover during the active season; 3) upland habitat (e.g., bankside burrows, holes, and crevices) to provide short-term refuge areas during the active season; and 4) high ground or upland habitat above the annual high water mark to provide cover and refuge from flood waters during the dormant winter period (G. Hansen and Brode 1980, G. Hansen 1998).

This species appears to be absent from most permanent waters that support established populations of predatory game fishes, from streams and wetlands with sand, gravel, or rock substrates, and from riparian woodlands lacking suitable basking sites, prey populations, and cover vegetation (G. Hansen and Brode 1980, Rossman and Stewart 1987, Brode 1988, USFWS 1999). The species also appears to be absent from natural or artificial waterways that undergo routine mechanical or chemical weed control or compaction of bank soils (G. Hansen 1988, G. Hansen and Brode 1993).

Reproduction - Upon emerging from overwintering sites, male giant garter snakes immediately disperse in search of mates and will continue breeding from March into early May. Female giant garter snakes brood young internally, giving birth to live young from late July through early September (R. Hansen and G. Hansen 1990). Young immediately disperse and seek shelter to absorb their yolk sacs, after which they molt and begin feeding on their own. Brood size ranges from 10 to 46 young, with a mean of 23.1 (n=19) (R. Hansen and G. Hansen 1990). Averaging 3-5 grams with a snout-to-vent length averaging 8.1 inches (20.6 cm), young giant garter snakes will double their size within their first year (R. Hansen and G. Hansen 1990, USFWS 1999). Sexual maturity probably averages 3 years in males and 5 years in females (G. Hansen personal communication, USFWS 1999).

Longevity - Survivorship and longevity of giant garter snakes is unknown, with few quantitative studies of survivorship available for the genus as a whole. The best proxy comes from data on individual survival rates for a population of valley garter snakes (*Thamnophis sirtalis fitchi*) at a mountain lake in northern California. Snakes from this population exhibited first year survivorship among neonates ranging from 28.7 to 43.0 percent, with a second year neonate survivorship of 16.4 percent. Survival of yearling snakes was greater than that of juveniles at 50.8 percent, while that of snakes 2 years and older decreased to 32.7 percent (Jayne and Bennett 1990).

Sources of Mortality - Giant garter snakes are subject to mortality through the loss or degradation of habitat, predation of juvenile giant garter snakes by introduced predators, elimination of giant garter snakes or prey species by pesticides and other toxins, road mortality, maintenance and modification of

agricultural ditches and drains and flood control systems, and flooding (G. Hansen 1986, USFWS 1999).

Behavior **-** Giant garter snakes typically emerge from winter retreats from late March to early April after spending the cool winter months in dormancy or periods of reduced activity. They remain active through October, with the timing of annual activity subject to varying seasonal weather conditions. Daily activity consists of: 1) emergence of burrows after sunrise, 2) basking to increase body temperatures, 3) foraging or courting for the remainder of the day (G. Hansen and Brode 1993). Activity generally peaks during spring emergence and courtship from April into June, whereupon observations of giant garter snakes diminish significantly until a second peak is observed after females give birth during late July into August (G. Hansen and Brode 1993, Wylie et al. 1997, USFWS 1999, E. Hansen 2004). Giant garter snakes then remain active foraging and occasionally courting until the onset of cooler fall temperatures.

Movement **–** Giant garter snakes are strongly associated with aquatic habitats, typically over-wintering in burrows and crevices near to their active-season foraging habitat (E. Hansen 2003a,b). Individuals have been noted using burrows as far as 164 feet (50 meters) from marsh edges during the active season, and retreating as far as 820 feet (250 meters) from the edge of wetland habitats while overwintering, presumably to reach hibernacula that are located above the annual high water mark (G. Hansen 1986, Wylie et al. 1997, USFWS 1999).

Changing agricultural regimes, development, and other shifts in land use create an ever-changing mosaic of available habitat. Giant garter snakes move around in response to these changes in order to find suitable sources of food, cover, and prey. Connectivity between regions is therefore extremely important for providing access to available habitat and for genetic interchange. In an agricultural setting, giant garter snakes rely largely upon the interconnected network of canals and ditches that provide irrigation and drainage to provide this connectivity.

Data based on radiotelemetry studies show that home range varies by location, with median home range estimates varying between 23 acres (9.2 hectares) (range 10.3 to 203 acres [4.2 to 82 hectares], n=8) in a semi-native perennial marsh system and 131 acres (53.2 hectares) (range 3.2 to 2,792 acres [1.3 to 1,330 hectares], n=29) in a managed refuge (USFWS 1999). Differential dispersal and home range patterns between males and larger females who spend the majority of the active season gestating young are not reported. Lifetime dispersal patterns of both neonates and adults of this species are unknown.

Ecological Relationships **-** Giant garter snakes feed on small fishes, tadpoles, and small frogs (Fitch 1940, G. Hansen and Brode 1980, USFWS 1999), specializing in ambushing prey underwater (Brode 1988). Historically, giant

garter snakes probably preyed on native species such as the thick-tailed chub (*Gila crassicauda*) and California red-legged frog (*Rana aurora draytonii*) which have been extirpated from the snake's current range, as well as the Pacific chorus frog (*Pseudacris* [=*Hyla*] *regilla*) and Sacramento blackfish (*Orthodox microlepidus*) (Cunningham 1959, Rossman et al. 1996, USFWS 1999). Giant garter snakes now prey upon introduced species, such as small bullfrogs (*Rana catesbeiana*) and their larvae, carp (*Cyprinus carpio*), and mosquitofish (*Gambusia affinis*). While juveniles probably consume insects and other small invertebrates, giant garter snakes are not known to consume larger terrestrial prey such as small mammals or birds.

Large vertebrates, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), red foxes (*Vulpes vulpes*), gray foxes (*Urocyon cinereoagentius*), river otters (*Lontra* [=*Lutra*] *canadensis*), opossums (*Didelphis virginiana*), northern harriers (*Circus cyaneus*), hawks (*Buteo* spp.), herons (*Ardea herodius, Nycticorax nycticorax*), egrets (*Ardea alba*, *Egretta thula*), and American bitterns (*Botaurus lentiginosus*) prey on giant garter snakes (USFWS 1999). In areas near urban development, giant garter snakes may also fall prey to domestic or feral housecats (G. Hansen personal communication). In permanent waterways, introduced predatory game fishes such as black and striped bass (*Micropterus* spp.), sunfish (*Lepomis* spp.), and catfish (*Ictalurus* spp.) probably prey on giant garter snakes and compete with them for smaller prey (G. Hansen 1988, USFWS 1993).

Giant garter snakes coexist with the valley garter snake and, in limited instances, both may be found together with the mountain garter snake (*Thamnophis elegans elegans*), a western terrestrial garter snake subspecies, where this species' range extends to the Central Valley floor. The extent of competition among these species is unknown, but it is likely that differences in habitat use and foraging behavior allow their coexistence (Brode 1988, USFWS 1999).

INSTRUCTIONS FOR COMPLETING THE HABITAT EVALUATION AND SCORING FORM FOR GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Giant Garter Snake (*Thamnophis gigas*)

1. Still or slow-flowing water over silt substrate

This category is checked if bank habitat adjacent to water is composed of soil, silt, or mud in flows no greater than 3 mph. Water in this category will often be dark or murky rather than clear, of the type observed in marshes, sloughs, or irrigation canals. This category is determined by presence or absence only and receives a positive score.

2. Flowing water over sand, gravel, rock or cement substrate

This category is checked if channel or bank habitat is composed of an impermeable substrate of the type listed above defining this category, and may include the presence of bank side cinders or fine concrete riprap placed for erosion control. Water in this category will often be clear, associated with flows exceeding 3 mph, of the type typically observed in flowing streams or rivers where silt or sediment will not persist. This category is determined by presence or absence only and receives a negative score.

3. Water available:

a) Winter only (runoff) or sporadic availability
b) April through October only (e.g. irrigation)

c) All year (e.g. perennial marsh or channel)

Factors in this category are based upon the persistence of all water within 200 feet of observed habitat. Factors in this category are cumulative, are determined by presence or absence only, and receive positive scores.

4. Banks are sunny

This category is checked if bank habitat adjacent to water receives direct sunlight. Availability of sunlight is determined by the ability of GGS to access sun for basking, and does not include areas where vegetation or topography prevents such access. This category receives positive scores

determined by percentage of sunlight present. Percentage classes and corresponding point values are included on the Habitat Evaluation and Scoring Form.

5. Banks shaded by overstory vegetation

This category is checked if bank habitat adjacent to water receives shade obstructing direct sunlight. This category is designed to complement and weight category 4, and receives negative scores determined by percentage of shade present. Percentage classes and corresponding point values are included on the Habitat Evaluation and Scoring Form.

6. Aquatic or emergent vegetation present

This category is checked if bank side aquatic habitat is characterized by aquatic vegetation which persists above the water level (*e.g.* cattails, bulrushes, primrose or hyacinth). This category receives positive scores determined by the percentage of aquatic vegetation present. Percentage classes and corresponding point values are included on the Habitat Evaluation and Scoring Form.

7. Terrestrial vegetation present

a) On banks
b) In adjacent uplands

This category is checked if bank habitat or adjacent uplands within 200 feet of aquatic habitat are characterized by vegetation (*e.g.* grasses, brush, low shrubs or Himalayan blackberry). This category receives positive scores determined by the percentage of terrestrial vegetation present. Percentage classes and corresponding point values are included on the Habitat Evaluation and Scoring Form.

8. Subterranean retreats present

a) In banks
b) In adjacent uplands

This category is checked if bank habitat or adjacent uplands within 200 feet of aquatic habitat are characterized by burrows, holes, or cracks either in the soil or under debris. Factors within this category are cumulative, are determined by presence or absence only, and receive positive scores.

9. Prey fish present

This category is checked if small aquatic prey fish (*e.g.* carp, mosquitofish, or blackfish) are present within aquatic habitat. This category is determined by presence or absence only and receives a positive score.

10. Introduced gamefish present

This category is checked if large, predatory gamefish (*e.g*. black bass, striped bass, channel catfish) are present within aquatic habitat. This category is determined by presence or absence only and receives a negative score.

11. Prey amphibians present

This category is checked if amphibians (e.g. bullfrog, treefrog, red-legged frog) are present within or near aquatic habitat. Note that toads do not constitute preferred prey for the giant garter snake and are not included when scoring this category. This category is determined by presence or absence only and receives a positive score.

12. Site subject to severe seasonal or tidal flooding

This category is checked if habitat is subject to prolonged inundation of upland terrestrial habitat by seasonal floodwaters or persistent tidal flows. This category is determined by presence or absence only and receives a negative score.

13. Adjacent land use

a) Rice, marsh, or wetland

b) Upland
c) Row Crop or horticultural
d) Urban or developed public area

Factors in this category are based upon dominant land use within 200 feet of observed habitat. Factors in this category are cumulative, are determined by presence or absence only and receive positive or negative scores indicated on the Habitat Evaluation and Scoring Form.

14. Disturbance due to human recreational or maintenance activities

This category is checked if habitat is subject to prolonged or regular intense disturbance by human recreational or maintenance activities (*e.g.* fishing, boating, walking, or farming, mowing, burning, or scraping of bankside vegetation). Activities are considered regular if they occur more than 50% of the time between March and November. This category is determined by presence or absence only and receives a negative score.

15. Connectivity to known populations of GGS

This category is ranked by distance, with occurrence records falling within 10, 5, and 1 mile(s) of the observed habitat receiving scores of 1, 2, and 3 points, respectively. The date of the last recorded observation associated with the record is not considered.

APPENDIX 3. SAMPLE OF STANDARD MINIMIZATION AND AVOIDANCE MEASURES FOR THE GIANT GARTER SNAKE

Definition of Take (Federal Definition)

Section 9 of the Endangered Species Act and Federal Regulation pursuant to section 4(d) of the Endangered Species Act prohibit the take of threatened or endangered species, respectively, without special exemption. Take is defined as harass, harm pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Minimization of Take (Reasonable and Prudent Measures)[3]

1. All construction activity within giant garter snake habitat (aquatic habitat and adjacent upland habitat within 200 feet of aquatic habitat) shall be conducted between May 1 and October 1. This is considered the active season of the giant garter snake and direct impacts are lessened because snakes may actively avoid danger if adequately warmed. However, even active snakes may remain immobile in response to threats when vegetative cover is available in a likely attempt to rely on their cryptic coloring to avoid detection; this scenario necessitates intervention by a biological monitor (see Measure 3). Danger is posed to giant garter snakes during their inactive over-wintering period because cool temperatures impair rapid movement and resulting escape. Between October 1 and May 1, giant garter snakes typically utilize underground burrows or crevices where they have a greater susceptibility to harm resulting from ground disturbance or excavation. If the project proponent determines that it will not be able to complete the proposed project prior to October 1, the resource agencies should be contacted no later than September 1 to determine actions necessary to minimize the potential for adverse effects.

2. Construction personnel shall participate in a worker environmental awareness program. Under this program, workers shall be informed about the potential presence of giant garter snakes and habitat associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the

[3] This list is provided for guidance only. Appropriate and specific measures should be determined following the selection of a final project schedule, the development of a formal project description, and in consultation with U.S. Fish and Wildlife Service, California Department of Fish and Game, and local environmental resource agencies.

state or federal Endangered Species Acts. Prior to construction activities, a qualified biologist approved by the resource agencies shall instruct all construction personnel about: (I) the life history of the snake; (2) the importance of irrigation canals, marshes and wetlands, and seasonally flooded areas to the snake; and (3) the terms and conditions of environmental permitting. As needed, training shall be conducted in Spanish for Spanish language speakers.

3. Within 24-hours prior to commencement of construction activities, the site shall be inspected by a qualified biologist who is approved by the resource agencies. The biologist will provide the agencies with a field report form documenting the monitoring efforts within 24-hours of commencement of construction activities. The monitoring biologist shall be present during construction for the duration of the project. If a snake is encountered during construction activities, the monitoring biologist shall have the authority to stop construction activities until appropriate corrective measures have been completed or it is determined that the snake will not be harmed. Of particular concern is the risk of the snake to entanglement with any of the erosion control materials. Any silt curtains, silt fencing, and erosion control wattles shall be regularly inspected-for entanglement or entrapment of the snake. Giant garter snakes encountered entering the project area shall be allowed, if they are able, to move away from construction activities and the action area on their own. Capture and relocation of trapped or injured individuals shall be attempted only by personnel or individuals with the necessary state and federal permits. The project biologist shall be required to report any incidental take to the resource agencies immediately. The project area shall be re-inspected whenever a lapse in construction activity of three days or greater has occurred.

4. Clearing of wetland vegetation will be confined to the minimal area necessary to excavate toe of bank for riprap or fill placement. Excavation of channel for removal of accumulated sediments will be accomplished by equipment located on and operated from the top of the bank, with the least interference practical for aquatic vegetation and terrestrial retreats.

5. Movement of heavy equipment to and from the project site shall be restricted to established roadways to minimize habitat disturbance.

6. Snake habitat shall be designated as Environmentally Sensitive Areas and shall be flagged by a qualified biologist approved by the Service and avoided by all construction personnel. Should installation of an exclusion fence occur, the fence shall be inspected before the start of each work day and maintained by the contractor until completion of the project. The fence may be removed only when the construction of the project is completed.

7. During construction operations, the number of access routes, number and size of staging areas, and the total area of the proposed project activity will be limited to the minimum necessary. Routes and boundaries will be clearly

demarcated. Movement of heavy equipment to and from the project area will be restricted to established roadways to minimize habitat disturbance.

8. After completion of construction activities, any temporary fill and construction debris will be removed and, wherever feasible, disturbed areas will be restored to pre-project conditions. Restoration work may include replanting native emergent vegetation.

9. During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas which will be greater than 200 feet from the edge of the snake aquatic habitat.

10. The applicant will include a copy of all environmental permits within its construction documents making the primary contractor responsible for implementing all requirements and obligations included within the permits and to educate and inform all other contractors involved in the project as to the requirements of the permits.

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