State of California
Natural Resources Agency
Department of Fish and Game

REPORT TO THE FISH AND GAME COMMISSION

A STATUS REVIEW OF THE CALIFORNIA TIGER SALAMANDER (*Ambystoma californiense*)

Photograph by Greg Damron

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Report to the Fish and Game Commission:
A Status Review of the
California Tiger Salamander (*Ambystoma californiense*)

EXECUTIVE SUMMARY

Background

On July 6, 2001, the Fish and Game Commission (Commission) received a petition from the Center for Biological Diversity to emergency-list the California tiger salamander (CTS; *Ambystoma californiense*) as an endangered species under the California Endangered Species Act (CESA, Fish & Game Code (FGC), §2050 et seq.; see generally FGC §2073.5, subd. (a); California Code of Regulations, Title 14, §670.1, subd. (d)(1)). The Department of Fish and Game (Department) reviewed the petition and determined that petitioned action may be warranted and recommended to the Commission that the petition be accepted for a full status evaluation. At its December 7, 2001 meeting, the Commission rejected the petition, and subsequently published a Notice of Findings (March 1, 2002) which explained the Commission's reasons for rejection of the petition in detail. The findings indicated three main areas in which the Commission felt the petition was deficient: 1) population trend (petition arguments, which based solely on land use trend information without correlating CTS presence to the habitat loss, were unpersuasive), 2) population abundance (no population data were presented based on the petitioner's argument that CTS population numbers are difficult to estimate and amphibians naturally undergo large population fluctuations), and 3) degree and immediacy of threat (no demonstration of harm or threat based on loss of habitat). The Commission suggested that the petitioner correct the deficiencies of the petition and resubmit it for further consideration.

On February 13, 2004, the Commission received a second petition to list the CTS as an endangered species. The petition was submitted by the Center for Biological Diversity, Environmental Defense Center, Defenders of Wildlife, Sierra Club Sonoma Group, Citizens for a Sustainable Cotati, VernalPools.org, Citizens' Committee to Complete the Refuge, Butte Environmental Center, and Ohlone Audubon Society. The Department completed an evaluation of the petition and again determined that the petitioned action may be warranted. In October 2004, the Commission voted to reject the petition. The Commission's Notice of Findings, published December 24, 2004, explained its reasons for rejection of the petition in detail. The Commission found similar deficiencies in the 2004 petition as in the 2001 petition, i.e., regarding population trend, population abundance and degree and immediacy of threat.

The petitioners submitted a legal challenge to the Commission's decision, and in a written opinion issued December 14, 2006, the Sacramento Superior Court overturned the Commission's rejection of the petition. The Superior Court indicated that in making its findings, the Commission misstated or ignored substantial evidence in the administrative record and relied on conflicting information of doubtful scientific value. The Court ordered the Commission to accept the petition, declare CTS a candidate species, and proceed with the listing process. On February 26, 2007, the Commission filed an appeal to the ruling. On September 2, 2008, the Third District of the California Court of Appeal agreed that the Commission erred by rejecting the petition. The Appeals Court stated that the petition, when considered with the Department's petition evaluation report and comments received, clearly afforded sufficient information to indicate that some listing action may be warranted. The Commission subsequently accepted the petition for consideration at its February 5, 2009, meeting in Sacramento, and declared the CTS a candidate species. On February 20, 2009, the Commission formally notified the public and the Department of Fish and Game (Department) of the CTS's candidacy.

Pursuant to Fish and Game Code §2074.6, the Department provides this report to the Commission, based upon the best scientific information available, which indicates the petitioned action is warranted, includes preliminary identification of the habitat that may be essential to the continued existence of the species, and suggests management activities and other recovery actions.

Findings

The California tiger salamander (CTS) is a large, stocky amphibian that spends much of its life underground. It occurs only in California's Central Valley grasslands and the oak savannah plant communities of California's Central Valley, the Sierra Nevada and Coast ranges, and San Francisco Bay, below approximately 1,500 ft (457 m). CTS range is centered in the Central Valley from Tulare and San Luis Obispo counties in the south, to Sacramento and Solano counties in the north, with disjunct outlier populations in Santa Barbara and Sonoma counties. CTS require fishless, seasonal or semi-permanent wetlands to reproduce, with surrounding terrestrial migration and dispersal habitat that contains active ground squirrel or gopher burrows to serve as underground retreats. CTS begin breeding somewhere between two and five years of age, with approximately half of adults surviving to breed more than once, although the majority of females do not survive to breed a second time. An individual CTS can live for 10 or more years.

Except for a few populations intensively studied by researchers, the historical as well as the current knowledge of CTS abundance in California is limited. Data available suggest that most populations consist of relatively small numbers of breeding adults; breeding populations in the range of a few pairs up to a few dozen pairs are common, and numbers above 100 breeding individuals are rare. Because CTS spend most of their life underground and only a fraction of the population emerges during the breeding season, determination of population size range-wide is not possible. However, work on this and other pond-breeding amphibians demonstrates that population size is largely determined by both the size and density of breeding pools and particularly by the surrounding terrestrial habitat where CTS spend most of their lives. Both indirect molecular analysis and direct mark-release-recapture field study suggest that movement between adjacent breeding sites across intact terrestrial habitat is a key component of CTS population biology. Thus, aquatic and terrestrial habitat integrity are key elements for long-term CTS survival.

Habitat loss information and published literature indicate that CTS numbers have declined substantially. This information has been used here and elsewhere as a surrogate for the lack of range-wide population numbers. As demonstrated by the following milestones, the status of CTS has been a concern since the early 1970s:

1. In 1971, the Department suggested CTS be added to the existing list of seven protected amphibians.
2. CTS has been on the Department's Special Animal List since 1982 and has been a Species of Special Concern since the Department's "Amphibian and Reptile Species of Special Concern in California" was first published in 1994.
3. In 1985, CTS was on a USFWS list of Category 2 candidate for listing under the Endangered Species Act.
4. CTS was proposed for listing under the Federal Endangered Species Act in 1992.
5. The Department contracted for a distributional survey and status evaluation, completed in 1993.
6. In 1994, the USFWS found that listing of CTS was warranted but precluded by higher priority listing actions, and elevated CTS to Category 1 listing status.
7. In 2000, the USFWS listed the Santa Barbara County Distinct Population Segment (DPS) of the CTS as endangered.
8. In 2001, the California Fish and Game Commission was petitioned to list the CTS as endangered. The petition was rejected.
9. In 2003, the USFWS listed the Sonoma County Distinct Population Segment (DPS) as endangered.
10. In 2004, the USFWS listed the CTS range-wide as threatened, with a special rule exempting existing routine ranching activities.
11. In 2004, the California Fish and Game Commission was petitioned to list the CTS as endangered. The petition was rejected. Litigation ensued, and the CTS subsequently became a court-ordered candidate for listing in 2009.
12. In 2005, the USFWS range-wide listing of CTS as threatened was vacated by a judicial decision, and the Santa Barbara and Sonoma County populations were returned to endangered status. The Central California population remained classified as threatened.

Threats

This review describes the various threats and factors affecting CTS. Threats to CTS are primarily from continued and long-term habitat loss/conversion and fragmentation. CTS require both breeding and upland habitat in proximity such that the animals can move between the two. Consequently, impediments to movement such as roads or barriers, or loss of either habitat type is a threat to survival.

Additionally, hybridization with introduced non-native tiger salamanders has occurred over the past 60 years, thereby resulting in decreased population and distribution of “pure” CTS. CTS are also susceptible to increased predation by, and competition with, other non-native species- particularly fish and amphibians.

RECOMMENDATIONS

Petition Action

1. The Department recommends the Commission find that classification of California tiger salamander as Threatened is warranted.

2. The Commission should publish notice of its intent to amend Title 14 CCR §670.5 to list the California Tiger Salamander as Threatened.

Management Recommendations

The Department provides several actions described herein under management recommendations that it believes would have population-level benefits for California tiger salamanders:

Report to the Fish and Game Commission: A Status Review of the California Tiger Salamander (*Ambystoma californiense*)

INTRODUCTION

Petition History

On July 6, 2001, the Fish and Game Commission (Commission) received a petition from the Center for Biological Diversity to emergency-list the California tiger salamander (*Ambystoma californiense*) as an endangered species under the California Endangered Species Act (CESA; see generally Fish & Game Code, §2073.5, subd. (a); California Code of Regulations, Title 14, §670.1, subd. (d)(1).). The Department of Fish and Game (Department) reviewed the petition and determined that petitioned action might be warranted and recommended to the Commission that the petition be accepted for a full status evaluation. At its December 7, 2001 meeting, the Commission rejected the petition, and subsequently published a Notice of Findings (March 1, 2002) which explained the Commission's reasons for rejection of the petition in detail. The findings indicated three main areas in which the Commission felt the petition was deficient: 1) population trend (petition arguments were based solely on land use trend information without correlating CTS presence to the habitat loss were unpersuasive), 2) population abundance (no population data were presented based on the petitioner's argument that CTS population numbers are difficult to estimate and amphibians naturally undergo large population fluctuations), and 3) degree and immediacy of threat (no demonstration of harm or threat based on loss of habitat). The Commission suggested that the petitioner correct the deficiencies of the petition and resubmit it for further consideration.

On February 13, 2004, the Commission received a second petition to list the CTS as an Endangered species. The petition was submitted by the Center for Biological Diversity, Environmental Defense Center, Defenders of Wildlife, Sierra Club Sonoma Group, Citizens for a Sustainable Cotati, VernalPools.org, Citizens' Committee to Complete the Refuge, Butte Environmental Center, and Ohlone Audubon Society. The Department completed an evaluation of the petition and again determined that the petitioned action might be warranted. In October 2004, the Commission voted to reject the petition. The Commission's Notice of Findings, published December 24, 2004, explained its reasons for rejection of the petition in detail. The Commission found similar deficiencies in the 2004 petition as in the 2001 petition, i.e., population trend, population abundance and degree and immediacy of threat.

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Department Review

Pursuant to Fish and Game Code §2074.6, this report contains the results of the Department's review and recommendation to the Commission, based on the best scientific information available, as to whether the petitioned action is warranted. It also identifies habitat that may be essential to the continued existence of the species and suggests prudent management activities and other recovery actions.

The Department has contacted affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available, as required under §2074.4, Fish and Game Code (Appendix 1).

LIFE HISTORY

Description

Like other amphibians, the CTS has permeable skin and requires a moist environment. The CTS is a member of the family Ambystomatidae, or mole salamanders, so named because they spend most of their life underground or in similar moist refuges to prevent desiccation during dry weather or seasons. Mole salamanders occur only in North America, from southern Canada to Mexico. About half of the 32 recognized species of ambystomatid salamanders are members of the Tiger Salamander complex, including CTS. Adult CTS are large (3-6½ inches excluding the tail) (Stebbins 2003), stocky salamanders with big heads, small eyes and brown to blackish skin with numerous yellow to white spots (Figure 1). Larvae are fully aquatic, with external gills and a fin along the length of their back (Figure 2). At metamorphosis, the gills and fin disappear and lungs become fully developed (Figure 3).

Food habits

CTS are carnivorous, both as larvae and metamorphosed individuals. Smaller larvae feed on zooplankton, while older larvae consume aquatic invertebrates, snails and tadpoles. Post-metamorphic juveniles and adults feed primarily on terrestrial invertebrates (Anderson 1968).

Taxonomy

CTS was originally described as a full species, but was then considered to be a subspecies of the eastern tiger salamander *Ambystoma tigrinum*, the most widespread salamander species in North America (Lanoo and Phillips 2005). CTS are now recognized as the most deeply divergent species of the 15 in the Tiger Salamander complex, based on mtDNA sequence analyses (Shaffer and McKnight 1996) and multiple nuclear DNA sequence analyses (Weisrock et al. 2006). Allozyme data also support the deep divergence of CTS (Shaffer 1984) as does morphometric analysis of larval morphology (Irschick and Shaffer 1997). There has been discussion about whether the species actually consists of multiple cryptic species (genetically distinct but similar in outward appearance). Analysis of rangewide genetic samples is currently underway (Shaffer et al. 2004, H. B. Shaffer pers. comm.).

Range and Distribution
The CTS is found only in California. Although the historic range is not known in detail, current locality and genetic information imply a previous continuous distribution in the vernal pool/grassland habitat that formerly dominated much of the Central Valley (Shaffer and Trenham 2005) (see Figure 4 for depiction of historic Central Valley habitat). Currently, CTS primarily inhabit grasslands of the Central Valley and grassland/oak savannah plant communities of the Sierra Nevada and Coast Range, mostly below approximately 1,500 ft (Stebbins 1985, Barry and Shaffer 1994, Jennings and Hayes 1994, Shaffer et al. 2004; Shaffer and Trenham 2005, CNDDB 2009).

The CTS was a candidate for Federal listing for over 14 years, and a Department Species of Special Concern for most of that time. Consequently, the species has been the focus of many localized surveys to inform CEQA and NEPA analysis, with survey results usually reported to the Department's California Natural Diversity Data Base (CNDDB). A 1993 Department-funded status evaluation included a range-wide CTS survey (Shaffer et al. 1993). Figure 5 shows known CTS distribution based on the 1993 survey (including sites where CTS were not found), CNDDB locality data, and other data available to the Department.

The northernmost known extant CTS population occurs as an isolated population near Dunnigan in Yolo County, and the southernmost is in Santa Barbara County (Shaffer and Trenham 2005). Few populations are currently known from the Central Valley; most recent records are from surrounding hills to the east and west (CNDDB 2009). Of the 1,041 CTS occurrences in the CNDDB in July 2009, 114 are at an elevation of 1,500 ft (457 m) or greater and seven are at 3,000 ft (914 m) or more. Four of the seven occurrence records > 3,000 ft in elevation are from Ohlone Regional Wilderness (Alameda County), the highest of which is at 3,660 ft (1,097 m). Apparently CTS are capable of inhabiting relatively high-elevation localities in the Coast Range, but not in the extensive oak woodland of the Sierra Nevada foothills. The highest elevation data in the CNDDB for the foothills include an extirpated locality at an elevation of 1,724 ft (526 m), and two presumed extant localities, one in Tulare County at 1,543 ft (470 m), the other in Madera County at 1,371 ft (418 m). As of July 2009, 90 CNDDB occurrences were classified as extirpated or possibly extirpated, leaving 951 presumed extant locality records (Figure 6).

Genetics

Although sampling gaps made the determination of precise boundaries difficult, Shaffer et al. (2004) found six genetically and geographically coherent sets of CTS populations (Figure 7). CTS populations in Sonoma and Santa Barbara counties are geographically isolated and genetically distinct, and may constitute separate, recognizable species. The remaining four populations in central California abut and show limited genetic intermixing at their shared boundaries (Shaffer et al. 2004).

Population ecology

CTS have both aquatic and terrestrial life stages. Eggs laid during winter in the breeding pond develop into gilled aquatic larvae that feed on zooplankton, invertebrates and tadpoles until they metamorphose into small terrestrial juveniles resembling adult salamanders. Based on multi-year studies in Monterey and Solano counties, most breeding occurs in early January, and metamorphosis usually occurs from May to July, with a peak in June (Trenham et al. 2000). The larval stage usually lasts four to five months (Shaffer and Trenham 2005). Metamorphosing CTS have been detected as early as the beginning of May, but some larvae have been observed in ponds for approximately one year; no reported observations suggest that larvae remain in ponds for multiple years (Alvarez et al. 2004). After leaving the pond, newly-metamorphosed salamanders migrate to rodent burrows and crevices in terrestrial habitat where they remain underground, emerging only on a few rainy nights per year (Loredo et al. 1996). Until maturity, CTS live in terrestrial habitats exclusively, and upland trapping studies commonly capture these immature individuals, presumably as they migrate to different burrows (Trenham and Shaffer 2005, Searcy and Shaffer 2008, Trenham pers. comm.).

CTS have been observed to generally reach sexual maturity in two to five years (Loredo and Van Vuren 1996, Trenham et al. 2000,Trenham unpublished data). The size reported for breeding adults is variable, ranging from 3-4 in (75-130 mm) SVL (Trenham et al. 2000, Cook et al. 2006).

Adults migrate to and from breeding ponds during the rainy season (November-May), with greatest activity occurring December-February. During late or sparse rainfall years, larger proportions of adults, especially females, may forego migration to ponds and breeding (Loredo and Van Vuren 1996, Trenham et al. 2000, Shaffer and Trenham 2005). Rainfall pattern determines whether breeding occurs in one major episode or is spread over several months (Loredo and Van Vuren 1996, Trenham et al. 2000). Rainfall events are also strongly associated with breeding migrations (Loredo and Van Vuren 1996, Trenham et al. 2000, Cook et al. 2006), though CTS have been observed moving on rainless nights (Cook et al. 2006, Orloff 2007). Above-ground activity outside of the breeding season, following a summer rain event, was documented by Holland et al. (1990) and van Hattem (2004), although such movement is apparently uncommon.

Males arrive at the breeding pond before females and stay roughly four times longer. Based on a 2-yr (Loredo and Van Vuren 1996) and 7-yr (Trenham et al. 2000) study, mean observed time spent at the breeding pond was 37 days for males and 10 days for females (Loredo and Van Vuren 1996), and 44.7 days for males and 11.8 days for females (Trenham et al. 2000). Trenham (2001) reported that eleven adult CTS radio-tracked following breeding migrated an average final distance from the pond of 375 +/- 272 ft (114 +/- 83 m).

Mating and egg-laying occurs underwater in breeding ponds, which are usually vernal pools or human-constructed livestock watering ponds. One study found that each female CTS contained an average of 814 eggs (range 413-1,340) (Trenham et al. 2000). Females usually lay their eggs in small clutches, individually or in small clusters of 2-4 eggs, underwater and attached to wetland vegetation or detritus (Figure 8). Eggs are about 0.14 in (3.5 mm) in diameter and hatch 2-4 weeks after being laid (Storer 1925). A minimum of 10 weeks is required to complete metamorphosis from egg to juvenile (Trenham et al. 2000), although 4-5 months is usually required. Metamorphosis usually occurs during late-spring to summer.

Most metamorphs leave the breeding pond to settle in adjacent terrestrial habitat and breed for the first time in their pond of origin. Some disperse to new sites, however. Trenham et al. (2001) found that 31% of males and 26% of females marked at their natal pond were recaptured breeding for the first time at a second pond 1,902 ft (580 m) away.

Loredo and Van Vuren (1996) found that timing and mean size at metamorphosis showed substantial annual variation and that annual numbers of juveniles produced varied substantially, ranging from over 1000 metamorphs in 1992 to only three in 1994. Trenham et al. (2000) found that metamorphs have a 0.3 probability of surviving their first summer, and that all older age classes of CTS have a 0.63 probability of surviving to the next year. With an assumed CTS average age at maturity of 4 yr, he determined metamorphs had a 0.08 probability of reaching maturity, and juveniles had a 0.37 probability.

Amphibian breeding (and larval) populations naturally undergo large fluctuations in number, making them particularly sensitive to stochastic (random) events (Pechmann et al. 1991). Pond-breeding amphibians can experience significant natural population fluctuations due to chance events like drought. For example, a small, isolated wetland in South Carolina protected for over 30 years had annual reproductive failure rates of 42-56% for 13 species over a 16-year period (Semlitsch et al. 1996). Frequent reproductive failure in amphibian populations due to drought has been observed elsewhere, as well (Dodd 1993 and 1995 IN Semlitsch 2002). For CTS, there may be recent evidence of an increase in poor recruitment years, possibly associated with changing weather patterns (Searcy and Shaffer pers. comm.). At Olcott Lake, the main breeding site at Jepson Prairie Reserve, Solano County, metamorph production was 1,591 salamanders in 2005, 2,691 in 2006, but only 30 in 2007, three in 2008, and 152 in 2009. A similar decline was found at a second major breeding site at Jepson Prairie, Round Pond (Searcy and Shaffer unpublished results).

Trenham et al. (2000) estimated that individual CTS can live for 10 or more years, and reported that while many breed multiple times in their lives, the majority of females do not survive to breed a second time. The average female salamander at their study pond in Monterey County bred 1.4 times and produced 8.5 young that survived to metamorphosis per reproductive event, resulting in a lifetime total of approximately 12 offspring per female that survived to metamorphosis.

Ecological connectedness (i.e., an ecosystem's various habitat elements and transitional zones, and the ecological processes that link them) is essential to maintaining viable amphibian populations across large areas (Trenham et al. 2001, Semlitsch 2002). Pond isolation is a significant factor in sustaining populations within landscapes fragmented by dispersal barriers like roads, railroads, and croplands (Bishop et al. 2003). CTS recolonization potential, even in intact pond assemblages, may be less than that of other amphibians with a higher reproductive output. Wang et al. (2009) used microsatellite markers to study gene flow across 16 CTS breeding sites at Fort Ord, Monterey County. They found that 15 of 16 sites were distinct genetically, but that levels of gene flow were moderate-high, with 10.5-19.9% of individual salamanders moving between breeding sites. Wang et al. (2009) concluded that interruption of connectivity of breeding sites is a major threat to CTS populations.

HABITAT ESSENTIAL TO THE CONTINUED EXISTENCE OF THE CTS (HABITAT REQUIREMENTS)

Breeding habitat

The USFWS (2005) determined that one of the "primary constituent elements" of CTS critical habitat is standing bodies of fresh water (natural and artificial) including ponds, vernal pools, and other ephemeral or permanent water bodies that are typically inundated during winter rains and hold water for a minimum of 12 weeks during an average rainfall year. Historically, these water bodies were primarily vernal pools, but with the substantial loss of vernal pool habitat in the Central Valley (see "Habitat Loss and Fragmentation" section, below), livestock ponds are now used extensively for breeding, especially in foothill habitat where most remaining Central California CTS populations occur (Shaffer and Trenham 2005). In Monterey County, Trenham et al. (2001) found that breeding sites were vernal pools and stock ponds ranging in depth from 1 ft (30 cm) to > 6.6 ft (2 m) that contained water from 10-52 weeks.

Ponds with a hydroperiod (length of time the pond continuously holds water) of more than two years can accumulate a diverse array of aquatic predators, including invertebrates, aquatic salamanders, and fishes (Semlitsch 2002). Ponds containing non-native fishes or bullfrogs (*Rana catesbeiana*) appear to be unsuitable as breeding habitat (Fisher and Shaffer 1996, Semlitsch 2002, Shaffer and Trenham 2005). Pond "improvements" for livestock that reduce the probability of annual drying and therefore increase suitability for non-native fishes, crayfish and non-native tiger salamanders (*A. tigrinum*), decrease the biological value of the pond to CTS (Fitzpatrick and Shaffer 2004). In the Central Coast region where hybridization with non-native tiger salamanders is an issue, perennial ponds that hold water most years are much more likely to be highly genetically invaded by non-native genes than ponds that dry every year (Fitzpatrick and Shaffer 2004, 2007).

Upland habitat

To avoid the threat of desiccation when away from ponds, CTS spend nearly 100% of their life underground, in the burrows of California ground squirrels (*Spermophilus beecheyi*) or Botta's pocket gopher (*Thomomys bottae*) (Barry and Shaffer 1994, Trenham 2001, Pittman 2005, Cook et al. 2006). Though CTS are capable of excavating a plugged gopher mound (Jennings 1996), they have a strong commensal relationship with ground squirrels and gophers (e.g., Loredo et al. 1996). Trenham (2001) found that even though rocks, logs, culverts and other potential refugia were available, radiotracked CTS did not use them. Some movement and feeding activity occurs while CTS are underground (Trenham 2001, van Hattem 2004, Sweet in litt).

One radio tracking study found CTS most often in burrows located in open grassland or underneath large oaks (Trenham 2001). A burrow excavation study found adult CTS in pocket gopher burrows located in short annual grasslands, a boulder riprap mound with extensive gopher activity, and in gopher burrows under a large boulder (Pittman 2005). CTS have also utilized the burrows created by pocket gophers in artificial dirt mounds in an experimental habitat enhancement situation (Cook et al. 2006). Trenham (2001) found that several radiotracked CTS occupied burrows adjacent to creeks for some time, and although they crossed a creek at least once during emigration from the breeding pond, they did not appear to move along creeks or riparian vegetation. Using landscape genetics, Wang et al. (2009) found that chaparral may be an important dispersal habitat type for CTS, at least in coastal habitats, and that oak woodland was avoided for dispersal in some landscapes.

Tracking studies of CTS (Trenham 2001), and six other species of ambystomatid salamanders summarized by Semlitsch (1998), suggested that 95% of adult movement occurs within 820 ft (250 m) of the breeding pond. However, these are minimal estimates of movement. More recent work indicates that 50-95% of adult CTS disperse to within 492 ft (150 m) and 2,034 ft (620 m) of the breeding pond, respectively (Trenham and Shaffer 2005). For subadults, 95% are within 2,067 ft (630 m) of the pond, with 85% concentrated between 656 and 1,969 ft (200-600 m) of it (Trenham and Shaffer 2005). A 5 yr study recently found adult CTS movements potentially as far as 1.3 mi (2.2 km) to and from breeding ponds (Orloff 2007) Ongoing studies at Jepson Prairie (Searcy and Shaffer 2008, and unpublished results) show that adults and juveniles routinely move > 0.62 mi (1 km) from their breeding site).

ABUNDANCE TREND

Because CTS spend most of their life underground and only a fraction of the population emerges during the breeding season, an accurate determination of population size range-wide is not possible. Available information relating specifically to CTS population numbers mostly consists of a few detailed, site-specific studies, or pre-project presence/absence surveys required by the California Environmental Quality Act or Federal law. There is no standard protocol for determining CTS population size, and the difficulty of estimating CTS population size range-wide has been documented (Shaffer et al. 1993, Jennings and Hayes 1994).

Scientific data available on abundance of individual populations of CTS is limited to a few populations intensively studied by researchers (e.g., Barry and Shaffer 1994, Loredo et al. 1996, Trenham et al. 2000 and 2001, Cook et al. 2006, H. B. Shaffer unpublished results). These studies represent only snapshot-in-time data for single populations or ponds. Results, observations, and conclusions obtained at one site may not apply to other sites and should not be used to represent or predict long-term population trends. Counts of adults appearing at breeding ponds each year do not necessarily reflect true variation in actual adult population size of long-lived ambystomatid salamanders. These animals may skip breeding in unfavorable years or switch breeding sites regularly, thus the numbers of reproductively active adults may vary substantially from one year to the next, with less variable absolute adult population sizes (Bishop et al. 2003).

The available data suggests that most populations consist of relatively small numbers of breeding adults; breeding populations in the range of a few pairs up to a few dozen pairs are common, and numbers above 100 breeding individuals are rare. However, work on this and other pond-breeding amphibians demonstrates that population size is largely determined by both the size and density of breeding pools and particularly by the surrounding terrestrial habitat where CTS spend most of their lives (Trenham et al. 2001, Trenham and Shaffer 2005). In general, the loss of a breeding site indicates a significant local decline in both the number of individuals, and in recovery potential (S. Sweet pers. comm.). Both simulations and field observations demonstrate that a key requirement for long-term population viability is large tracts of intact upland habitat surrounding breeding sites (Trenham and Shaffer 2005; Searcy and Shaffer 2008). In addition, both indirect molecular analysis (Wang et al. 2009) and direct mark-release-recapture field study (Trenham et al. 2001) suggest that movement between adjacent breeding sites across intact terrestrial habitat is a key component of CTS population biology. Thus, both aquatic and terrestrial habitat integrity are key elements for long-term CTS survival.

Information about past distribution of CTS can be gleaned from historical data (e.g., museum records) to assess patterns of change leading to present-day distribution (e.g., Shaffer et al. 1993). To reduce potential error when estimating decline and distributional change using resurveys based on limited past information, the level of detail of analysis can be traded off for robustness of conclusions by focusing on coarser levels of distribution within geographic units for which a number of historical records are known

(Skelly et al. 2003). The county-by-county analysis used by Fisher and Shaffer (1996) is an example of this trade-off, and was used to reduce their error when estimating the range-wide decline of CTS.

Jennings and Hayes (1994), as part of a statewide status assessment of amphibians and reptiles, examined historical and current CTS locality records to help determine the extent of CTS population losses. As of 1994, based on both verified museum records and verified sighting data, numerous populations of CTS had been extirpated (i.e., no longer existed in a specific location). Jennings and Hayes (1994) reported that the species was threatened due to declining population trend, unique habitat requirements, habitat loss and fragmentation, effects of introduced non-native species, and artificial migration barriers (e.g., roads).

In the absence of range-wide population numbers, the U.S. Fish and Wildlife Service (USFWS) listed all populations of CTS as threatened based on threats and the status of its habitat (USFWS 2004). The Central California CTS population is now listed as threatened under the Federal Endangered Species Act, and the populations in Sonoma and Santa Barbara counties are listed as endangered (see "Current Management" section, below, for more explanation).

POPULATION SIZE

As mentioned above under "Abundance Trend", the number of CTS range-wide is unknown. Estimating their numbers is difficult because CTS spend most of their life underground and are therefore hard to detect, and only a fraction of the total number of CTS migrates to breeding pools each year. In the absence of long-term monitoring data produced by a scientifically designed study, attempting to accurately estimate the total population size of CTS range-wide is not feasible.

FACTORS AFFECTING CALIFORNIA TIGER SALAMANDER ABUNDANCE

In discussing amphibian status globally, (Gascon et al. 2007) stated *"research has shown that modern amphibian declines and extinctions have no precedent in any animal class over the last few millennia (Stuart et al. 2004). About 32% of some 6000 amphibian species are threatened as compared to 12% of bird and 23% of mammal species. Up to 122 amphibian species may be extinct since 1980, and population size is declining in at least 43% of species. In the last decades of the 20th century the amphibian extinction rate exceeded the mean extinction rate of the last 350 million years by at least 200 times (Roelants et al. 2007)"*. More locally, *"even a conservative estimate leads to the conclusion that amphibian decline is a serious and important conservation issue in the western U.S."* (Corn 2003). Causes of amphibian declines are numerous, and probably the result of complex interactions among multiple factors (Blaustein and Kiesecker 2002). Ambystomatid salamanders are one of four amphibian families containing significantly more rapidly declining species than the average for all amphibians (Stuart et al. 2004).

Common causes of amphibian population declines include habitat destruction and alteration, global environmental change, disease, contaminants and introduced species (Sparling et al. 2003). For CTS in particular, declines are strongly associated with surrounding urban and agricultural habitat use (Davidson et al. 2002), strongly implicating upland habitat destruction as a major cause of decline among the four factors examined in that study. Any human threat that reduces the probability of larvae metamorphosing (e.g., draining ponds, fish introductions) and disrupts the natural dispersal process (e.g., habitat fragmentation, roads) will ultimately increase the probability of local declines and extinctions (Semlitsch 2002).

Habitat

Estimated occupied habitat

Similar to methodology of the USFWS (2004), we based our analysis of CTS status on the estimated current CTS distribution and habitat availability and assumed that the habitat is populated. We identified known CTS records (CNDDB and BIOS datasets) and, using a geographic information system (GIS), drew a 1.3 mi (2.1 km) boundary around each record. We used this number because it is the maximum distance a CTS has been documented from the nearest breeding pond. This approach may result in an overestimate of habitat, but is probably not a significant error since additional unsurveyed or unreported CTS breeding locations may exist within the 1.3 mi boundary. The polygons generated from the 1.3 mi boundary contained 1,279,048 acres (517,612 ha) (see Appendix 2 for explanation of GIS methodology).

Habitat loss and fragmentation

Wetland loss. Semlitsch (2002) stated *"Alteration and loss of wetlands reduces the total number or density of ponds where amphibians can reproduce and successfully recruit metamorphs into the breeding population. Reducing the number of wetlands reduces the total number of individual amphibians available to establish new population or reestablish extirpated populations."*

The Central Valley's early grassland landscape included significantly more wetlands, including vernal pools (Barry et al. 2006). Figure 4 illustrates the changes in the Central Valley landscape pre-1900 compared to 1995. Holland (1998) concluded that 80% (4 million acres; 16,187 km^2) of vernal pool habitat had been lost, and that at the current rate of loss, the remaining amount would shrink to 12% (480,000 acres; 1,943 km^2) of the historical total by 2044. In an updated analysis, Holland (pers comm) quantified the rate of vernal pool habitat loss between 1997 and 2005. His data indicate that during this time period, over 11,000 acres (4,451 ha) (>17 mi^2) per year of vernal pool habitat were converted to other uses, with 81% of this loss due to agricultural development.

Grassland loss. Based on approximate measurements on the Kuchler (1997) vegetation map, Shaffer et al. (1993) estimated that at least 75% of historical grassland habitat in the Central Valley used by CTS has been lost.

Human population growth and projected land use. Human population growth is a threat because CTS habitat destruction and fragmentation results from housing, business, agriculture and associated infrastructure (e.g., roads, airports, flood control structures and associated habitat modification or loss) that accommodates population growth. Given the high levels of migration between breeding sites at the local landscape level (Trenham et al. 2001, Wang et al. 2009), roads and other infrastructure associated with low-concentration urbanization in foothill habitats constitute an important threat to CTS.

To assess future human population growth effects on CTS and its habitat, we used Theobald (2005), who developed a landscape sprawl metric to project land-use changes to 2020 and 2030. He stated that it is critical for ecologists to examine and improve understanding of land-use changes beyond the urban fringe—also called "exurban sprawl" or rural residential development —because of the extensive and widespread changes that are occurring, and because they often are located near or adjacent to "protected" lands meant to conserve natural resources and biodiversity. He produced a fine-grained database of historical, current, and forecasted housing density, which enables these changes to be quantified as a foundation for inference of possible ecological effects. *"The developed footprint has grown from 10.1% to 13.3% (1980 to 2000), roughly at a rate of 1.60% per year. This rate of land development outpaced the population growth rate (1.18% per year) by 25%. Based on model forecasts, urban and suburban housing densities will expand to 2.2% by 2020, whereas exurban development will expand to 14.3%"* (Theobald 2005). Figure 9 illustrates CTS distribution in the context of estimated extent of urban/suburban and exurban growth in California by 2020 and 2030. We used GIS to estimate that 388,243 acres (1,571 km^2) of existing CTS habitat will be lost to development and fragmentation by 2020, with a total of 423,789 acres (1715 km^2) lost by 2030. Portions of the Bay Area, Central Coast and Sonoma CTS populations appear most likely to be affected by projected population growth.

A number of new reservoir sites are proposed in California (Figure 10), for which exact boundaries are not available. The proposed expansion of Los Vaqueros Reservoir does have boundaries delimited, however, and would eliminate a number of existing CTS localities, along with CTS mitigation sites for construction of the original reservoir (Figure 11).

Habitat fragmentation. Habitat fragmentation has been shown to negatively affect long term viability of animal populations, and can be defined as dissection of habitat into smaller portions that do not allow free movement of individuals (Westerman et al. 2003). Habitat fragmentation has two components, both of which cause extinctions: (1) reduction in total habitat area, and (2) redistribution of the remaining area into disjunct fragments (Wilcove et al. 1986). Isolation of habitats reduces or eliminates the ability of a single population to recover from a catastrophic extinction event by recolonization from a nearby population (Semlitsch and Bodie 1998, Bishop et al. 2003).

Green (2003) concluded that species with highly fluctuating populations and high frequencies of local extinctions, such as pond breeding amphibians, are likely to be affected rapidly and catastrophically by habitat fragmentation. Harper et al. (2008) ran matrix population models that included the spotted salamander (*Ambystoma maculatum*), an eastern U.S. relative of CTS. They modeled loss of terrestrial habitat as an initial reduction in population size and a permanent reduction in carrying capacity. With only a 5% reduction in terrestrial survival rates, extinction probabilities within 20 years went from 6% to 25%. When terrestrial survival rate was reduced to 25%, all salamanders were extinct within 20 years (Harper et al. 2008). An example of this local extinction process is the CTS population at a small preserve in Sonoma County (Southwest Community Park). This population is nearing extinction because the breeding pool is isolated and hydrologically impaired, with less than 10% of surrounding upland remaining due to residential and other development (Cook in litt. 2009). Trenham and Shaffer (2005) conducted a similar modeling exercise based on multi-year field studies for CTS in Solano and Monterey counties, and found that when the terrestrial buffer around a pond is less than 1,968 ft (600 m) the probability of long-term viability declines rapidly.

Habitat fragmentation can also impact gene flow among remaining interbreeding populations, putting the genetic vigor and therefore viability of the entire species ultimately at risk. For example, Reh and Seitz (1990) reported genetic changes in the common frog (*Rana temporaria*) resulting from roads or other linear barriers isolating previously connected populations. Reh and Seitz were able to detect reproductive isolation biochemically, even though they estimated only 10-12 generations had occurred since the barriers were installed. For CTS, increased habitat fragmentation and isolation means that there is decreasing opportunity for genetic mixing between populations and recolonization after a local extinction event.

<u>Public and conservation lands</u>
The Department used GIS analysis to determine that 231,679 acres (93,758 ha) or 18% of CTS habitat is on public and conservation lands, and 77,709 acres (31,448 ha) or 6% of CTS habitat occurs on military lands. Figure12 illustrates these lands, identified by ownership, relative to known CTS localities.

Public ownership helps somewhat to blunt the threat from habitat destruction, but many of these lands were not specifically designated for the conservation and management of CTS. Those that were, like Jepson Prairie Reserve in Solano County, can support healthy populations of CTS.

Protection currently afforded to CTS opportunistically on various existing public lands and reserves cannot be presumed to be adequate for overall conservation of the species. Military lands are not managed for the benefit of wildlife since the military mission supersedes other uses. For those lands where CTS are specifically protected and managed, it is important to note that protecting some CTS populations from habitat loss and fragmentation associated with urbanization and agriculture does not necessarily ensure populations can be sustained. For example, although their habitat had been protected for over 30 years, 13 species of amphibians experienced annual reproductive failure rates of 42-56% over a 16 year period, due to random events in their small, isolated wetland (Semlitsch et al. 1996). An example of this for CTS is the isolated population at the northern edge of Travis Air Force Base in Solano County. Although protected, this small habitat fragment is completely surrounded by recently-constructed military housing, reducing its value as CTS habitat. It is the only CTS breeding site on the base (H. B. Shaffer pers. comm.).

Private rangelands

"Rangelands represent one of the most threatened habitats throughout the western United States (Maestas et al. 2003; Theobald 2005). In addition to being threatened, these oak savanna and grassland habitats have relatively low levels of conservation management while maintaining high biodiversity values. Many grassland birds, native plants and threatened vernal pool species on this landscape benefit from responsible grazing practices (Marty 2005; Pyke and Marty 2005). Intact, privately-owned rangelands face threats from increased low density, rural residential housing development in the foothills and conversion to other uses. Out of this concern environmentalists, cattlemen and government agencies have come together to form a most unlikely conservation partnership, the California Rangeland Conservation Coalition." (TNC 2007).

The California Rangeland Conservation Coalition (Coalition) is based on a resolution signed by over 75 entities including agricultural organizations, environmental interest groups, and federal and state agencies (including the Department), documenting common ground for the conservation of the rangeland encircling the Central Valley, including the Sierra foothills and interior Coast Ranges (http://www.carangeland.org/about_us.html).

The Coalition works with willing private landowners to preserve ranches via conservation easements and conduct habitat enhancement projects for common and at-risk species. The Coalition has identified areas of privately-owned rangelands with high biodiversity value which require conservation action in the next 2-10 years (TNC 2007). While the Coalition's focus area methodology does not identify CTS as one of its species conservation targets, targets include ecological systems and communities that contain CTS habitat (TNC 2007). The Coalition's focus area methodology used the same model (Theobald 2005) to predict habitat loss as we did for our GIS calculations in the "Human population growth and projected land use" section, above.

Figure 13 depicts the Coalition's focus areas with respect to our estimated occupied CTS habitat. Of the Coalition's "Critical" focus areas, we used GIS methodology to determine that 658,580 acres (2665 km^2; 82%) are CTS habitat, and 170,713 acres (691 km^2; 87%) of the "Important" areas are CTS habitat. Overall, 83% of the Coalition's priority areas fall within our 1.3 mile buffered CTS habitat.

Hybridization with non-native tiger salamanders

Barred tiger salamanders (*A. tigrinum mavortium)* and Arizona tiger salamanders (*A. tigrinum nebulosum* (i.e., non-native tiger salamanders or NNTS), formerly imported into California for sale and use as fishing bait, have become established, via purposeful introductions and bait bucket releases, as wild populations in various locations (Riley et al. 2003, Fitzpatrick and Shaffer 2004, Fitzpatrick and Shaffer 2007a). As of December, 2000, it is illegal to use *A. tigrinum* (aka "waterdogs") as bait or possess any member of the genus *Ambystoma* in California without a special permit from the Department (CCR, Title 14, §4.00 and §671). This regulation change was made to protect CTS from hybridization with NNTS by further spread of the non-native species via deliberate or accidental release into state waters. Although possession and use for bait are now prohibited, a relict regulation still allows sale of waterdogs as bait (Title 14 §200.31(c). This oversight will be eliminated in the next appropriate Department regulation change cycle.

Hybridization between CTS and NNTS began 60 years ago when bait dealers introduced thousands of NNTS larvae into ponds already inhabited by CTS. Known hybrids now occupy approximately 20% of CTS range (Fitzpatrick and Shaffer 2007a, Ryan et al. 2009). Hybrid populations are mostly in the Salinas Valley, where NNTS were intentionally established in the wild, and are found on both public and private lands. Figure 14 illustrates the locations of currently known populations of pure and hybridized NNTS and CTS.

NNTS pose a serious threat because they are interbreeding with CTS in the wild and producing viable and fertile offspring. The hybrid offspring have higher survival rates (i.e., hybrid vigor) than either pure CTS or pure barred salamanders, which ultimately results in higher fitness, but reduced genetic purity (Fitzpatrick and Shaffer 2007b). Hybrids decrease pure CTS survival and impact growth rates through cannibalism and competition (Ryan et al. 2009). Decreased CTS growth rate results in smaller body size at metamorphosis, longer time to metamorphosis, and ultimately greatly reduced fitness of CTS compared to hybrids (Johnson et al. in review). In the CTS's dry upland habitat, reduced metamorph size may reduce survival via increased risk of desiccation and predation or reduced competitive ability (Ryan et al. 2009).

Pure CTS must metamorphose to reproduce, but pure NNTS and their hybrids can opportunistically forgo metamorphosis in perennial ponds and reproduce as sexually mature larvae (paedomorphs). Paedomorphs often reach sexual maturity earlier than metamorphs, produce larger clutches, and may breed earlier in a season, any of which may provide an advantage in perennial ponds (Fitzpatrick and Shaffer 2007a and b). Paedomorphs have been found in ponds on agricultural land in the Salinas Valley (H.B. Shaffer pers. comm.).

Tiger salamander hybrids also reduce survival, growth and developmental rate of other members of the ecological community, including California newt (*Taricha torosa*) and

Pacific chorus frog (*Pseudacris regilla*) larvae when they co-occur (Ryan et al. 2009). Tiger salamander larvae are voracious predators on amphibian larvae and aquatic invertebrates, thus impacts of hybridization may extend to other at-risk species that co-occur, including the threatened California red-legged frog (*Rana draytonii*), endangered Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), threatened vernal pool fairy shrimp (*Branchinecta lynchi*) and Western spadefoot toad (*Spea hammondii*) (Fitzpatrick and Shaffer 2007b, Ryan et al. 2009). Further exacerbating this problem is the recent experimental documentation that hybrids are better able to survive die-off events in agricultural landscapes than pure CTS (Ryan et al. in review), leading to an even more rapid take-over by hybrids in agricultural landscapes.

If an introduced species eats or displaces a native one, the introduced species can theoretically be removed, allowing the native taxon to recover. If the introduced species invades genetically, however, the pure native species may disappear unnoticed if the genotype is not easily visibly distinguished from the phenotype (Riley et al. 2003). Replacement of native species by hybrids has been characterized as a form of extinction (Rhymer and Simberloff 1996).

Fitzpatrick and Shaffer (2007a) determined that the distribution of introduced tiger salamander genes is largely confined to within 7.5 mi (12 km) of introduction sites, where the transition between hybrids and natives is abrupt. Examining the hybrid gene frequencies found among vernal pools, ephemeral cattle ponds and perennial ponds, Fitzpatrick and Shaffer (2007a) found that perennial ponds tended to have higher frequencies of non-native genes than either type of seasonal pond, even in cases where perennial and seasonal ponds were near each other. Fitzpatrick and Shaffer (2007a) suggested some level of hybrid management could be accomplished by private and public land managers converting perennial breeding ponds to more natural seasonal ponds. This would remove an ecological advantage for NNTS and hybrids, and help select for a "more native" tiger salamander.

Figure 15 portrays the varying degrees of hybridization in populations sampled to date and illustrates an unresolved conservation issue. It is unrealistic to expect that all tiger salamander populations in the state will be sampled for genetic integrity, so there will always be substantial uncertainty about which individuals and populations are pure CTS. Neither CESA nor FESA define the extent to which hybridization must occur for an individual or population to not warrant protection. The question of protection of hybrid species has not previously arisen under CESA. The original prohibition in FESA against listing hybrids has been removed and hybrid species are now considered on a case by case basis. The USFWS has not reached a decision yet on this issue regarding CTS.

Elimination of confirmed hybridized tiger salamander populations would likely be difficult due to their geographic extent and occurrence predominantly on private lands, their longevity, and habit of spending most of their lives in secluded underground retreats (Trenham et al. 2000, Riley et al. 2003, Shaffer and Trenham 2005). In addition, NNTS appear to be more suited than CTS to thrive in permanent, fishless ponds located on private ranchlands (Fitzpatrick and Shaffer 2007a), which now constitute much of remaining CTS breeding habitat. Elimination of hybrids may also be difficult due to human factors, including an ongoing interest in possessing the animals as pets or bait, exemplified by an April 2008 advertisement for NNTS for sale on the Santa Barbara area Craig'sList, (i.e., an on-line garage sale) (Bolster in litt. 2008).

A final complication is the recent observation that, with expanded genomic sampling, it appears that about 5% of the non-native genome (3/64 genes surveyed) is strongly selected for in hybrid populations (Fitzpatrick et al. 2009). Geographic survey work (Fitzpatrick et al. in review) demonstrates that these highly-selected genes have spread at least 58 mi (94 km) beyond the "standard" genetic invasion reported by Fitzpatrick and Shaffer (2007a). As Fitzpatrick et al. point out, elimination or containment of these highly fit genes will be extremely challenging, and this must be taken into consideration in management decisions. The authors state that slightly introgressed populations should not lose their protected status. Fitzpatrick et al. (in review) say *"We think these considerations make genetic purity an impractical conservation goal (not to mention the statistical challenge of evaluating "purity" (9)). The genetic influence of introduced Barred Tiger Salamanders beyond the Salinas Valley is negligible for most markers, such that there remains a sharp distinction between mostly pure native populations and the admixed populations of the Salinas Valley. We feel that this demarcation should be one guide for assigning legal protection. Further, assessment of the conservation value of introgressed California Tiger Salamanders should be based on the phenotypic and ecological consequences of introgression. An appropriate conservation goal might be to maximize ecological authenticity. That is, it would be better to protect individuals and populations that function like the native species, even if they are not genetically authentic, rather than to have no tiger salamanders present. This idea is appropriate only if introgressed individuals do not have negative impacts on other community members. Future research should investigate potential associations between introgressing alleles and traits of ecological significance."*

Predation and competition from non-native species
There is evidence that amphibians that did not evolve in the presence of predatory fishes are eliminated by the introduction of such fishes (e.g., Kats et al. 1988; see Kats and Ferrer 2003 for a general review of the impacts of non-native predators on amphibians). Semlitsch (2002) summarized information indicating that in situations where predatory fishes have been introduced to amphibian breeding habitat, especially ponds that exist for more than two years, the majority of amphibian species are eliminated.

Predation and competition from non-native fishes and amphibians, which are well-established throughout the range of the CTS, are considered important factors in the decline of CTS, particularly in the low elevation areas of the Central Valley (e.g., Shaffer et al. 1993, Jennings and Hayes 1994, Seymour and Westphal 1994, Fisher and Shaffer 1996, Cook and Northen 2004, Bobzien and Didonato 2007). Fisher and Shaffer (1996) reported that although native and introduced species do sometimes co-occur, the vast majority of ponds harboring native amphibians lack introduced species. They also reported that since these introduced exotic species occupied low-elevation sites, native species were relegated primarily to higher elevations. Stokes et al. (2007) found a similar pattern where vernal pools with fish never or seldom contained CTS larvae. Non-native predatory fishes include members of the sunfish family (Centrarchidae) popular with anglers, such as largemouth bass (*Micropterus salmoides*), redear sunfish (*Lepomis microlophus*), and bluegill (*Lepomis macrochirus*). Stocking of these three sunfishes and three species of non-native catfishes into private waters is currently allowable under a permit from the Department (CCR, Title 14, §238.5(d)), and many counties are currently exempted from the need for any stocking permit from the Department for a variety of non-native fish species. The private stocking program is currently under revision as part of the Department's Hatchery and Stocking Program Draft EIR/EIS (http://www.dfg.ca.gov/news/pubnotice/hatchery)

The non-native mosquitofish is widely introduced in California waters for mosquito control. The relationship between mosquitofish (*Gambusia affinis)* and CTS survival appears to be a negative one. Leyse (2005) found that at high densities, mosquitofish resulted in a 76% decrease in CTS larval survival and a substantial decrease in salamander size. Stocking of mosquitofish without a permit from the Department is authorized for all but five California counties (Inyo, Mono, San Bernardino, Riverside and Imperial) (CCR, Title 14, §238.5 (f)).

Road-crossing mortality

Roads present barriers to migration and thus contribute to habitat fragmentation and salamander mortality. Roads are a significant source of direct mortality to amphibians, including salamanders, traveling to and from breeding areas (see Andrews et al. 2008 for a literature review). Jackson (1996) stated that roads separating breeding and upland habitat can be the cause of significant population declines and even local extinctions for the spotted salamander (*Ambystoma maculatum*). Gibbs and Shriver (2005) found that population projections based on spotted salamander life tables imply road mortality can be a significant source of additive mortality for individual spotted salamanders in many parts of the species' range, and that an annual risk of road mortality for adults of >10% can lead to local population extirpation.

For CTS in particular, roads are a documented source of direct mortality. Significant numbers of CTS are killed by vehicular traffic while crossing roads (Hansen and Tremper 1993, S. Sweet in litt. 1993, J. Medeiros pers. comm. 1993; all cited in USFWS 2005). CTS road-kill mortality in the vicinity of breeding sites has been reported to be 25-72% of the observed salamanders crossing roads (Twitty 1941, S. Sweet in litt. 1993, Launer and Fee 1996). From 2001-2007, on one busy Sonoma County road that bisects a major CTS migration corridor, 58-87.5% of the CTS observed (range = 12-62 salamanders) were road kills (D. Cook in litt. 2007). Observations of 16 roadways in Sonoma County found 63% (164 of 261) road-killed CTS. The highest mortality concentration was one

1,200 ft (366 m) section of Stony Point Road where an estimated 5-20% of breeding adults are killed annually (Cook in litt. 2009). Stanford University constructed a tunnel system to help decrease road-kill mortality of migrating CTS on campus (http://news.stanford.edu/pr/03/wetlands910.html). The use of an amphibian tunnel system is being explored at the Stony Point Road site (Cook in litt. 2008).

Cook and Northen (2004) also noted CTS deaths from falling into underground storm drains along curbed roads during migration near a breeding pond in an urban area. Other impacts of roads include mortality from road construction, and effects from habitat fragmentation, predator attraction, animal behavior modification, home range shifts, altered movement patterns, altered reproductive success, invasive species (by serving as dispersal corridors), landscape pollution (via hydrological changes, increased sedimentation, vehicle by-products and compounds) and increased human use of an area (Trombulak and Frissel 2000, Andrews et al. 2008).

Agricultural practices (conversion to intensive agriculture, stock ponds, grazing, rodent control)

Conversion of open or grazing land to intensive agriculture results in habitat destruction and fragmentation detrimental to CTS (USFWS 2004). Predicting future loss of CTS habitat from conversion of grazing lands to intensive agriculture is difficult because conversion largely depends on the private landowner and is based on numerous factors that are hard to predict, including economic conditions and water availability (USFWS 2004). Some information about the trend of grazing land conversion to more intensive agriculture is available, however. According to figures from The Wine Institute, California acreage planted in wine grapes has grown steadily from 1988 (331,700 acres; 1,342 km^2) to the most recently reported year, 2008 (470,810 acres;1,905 km^2) (http://www.wineinstitute.org/resources/statistics/article88). Data reported by the U.S. Department of Agriculture's National Agricultural Statistics Service indicates a similar trend, with a percent change in wine grape acreage from 2006 to 2008 of +2% (http://www.nass.usda.gov/Statistics_by_State/California/Publications/Grape_Acreage/Reports/index.asp). According to The Wine Institute, demand for wine appears to be holding steady in spite of the current economic downturn (http://www.wineinstitute.org/resources/statistics/article122).

On rangelands, given the widespread presence of non-native annual grasses, an appropriate level of grazing may be important for the maintenance of vernal pools (CDFG 1999). In the absence of vernal pools, many CTS populations use stock ponds created and maintained by ranchers that would not be in the landscape without grazing. For example, with the exception of a few vernal pools, CTS breed exclusively in seasonal and perennial stock ponds in the East Bay Regional Park District (Bobzien and DiDonato 2007). Management guidelines for stock ponds that support amphibian populations include limiting direct livestock access to the pond, limiting nitrogen inputs, and avoiding the introduction of fishes (Knutson et al. 2004).

In one study, low to moderate levels of cattle grazing did not appear to have a strong effect on the population dynamics of California ground squirrels, and indicated that grazing may be compatible with maintenance of ground squirrel populations (Fehmi et al. 2005). The commensal relationship between burrowing rodents (i.e., California ground squirrels and pocket gophers) and CTS is well documented (Barry and Shaffer 1994, Seymour and Westphal 1994, Loredo et al. 1996, Trenham 2001, Trenham et al. 2001), and has important conservation implications for CTS. Ground squirrels apparently maintain their burrows, since once abandoned, the burrow soon collapses (Loredo et al. 1996). Elimination or reduction in ground squirrel numbers to protect livestock can therefore eliminate or reduce subterranean habitat for CTS. Reduced burrow availability could also increase the risk of mortality to migrating salamanders by increasing the travel distance necessary to find a burrow (Loredo et al. 1996). According to the California Department of Food and Agriculture (CDFA), California ground squirrels are controlled (i.e., poisoned or otherwise killed) on approximately 300,000 total acres (1,214 km^2) (CDFA 2003). California ground squirrel control may be accomplished by use of poison bait, fumigants, trapping, shooting, burrow destruction, repellents/frightening, relocation, habitat modification/biological control, or burrow exploder. Of these methods, poison bait and fumigants have the highest efficacy and lowest cost. Poison bait is also used to control pocket gophers (UCANR 2008). Bait may be placed directly into burrows, bait stations, or broadcast on the surface.

EPA environmental risk assessment information for chlorphacinone, diphacinone and zinc phosphide (used in poison baits) does not mention amphibians, only birds and non-target mammals subject to secondary poisoning from ingestion of rodent carcasses (EPA 1998; http://www.epa.gov/oppsrrd1/REDs/2100red.pdf). No specific studies have been done to determine the direct effects of these poisons on CTS or similar species. In many California counties, the modification or elevation of bait stations to exclude kangaroo rats likely also exclude CTS. Bait stations are also relatively widely spaced, which would help minimize the probability that migrating CTS would actually encounter one. In the special rule exempting routine existing ranching activities, the USFWS (2004) discouraged placement of bait in burrows to avoid potential CTS dermal contact with the bait, but included the used of broadcast and confined bait stations. Bait stations encourage ground squirrels to transport much of the poisoned feed into their burrows where it can be consumed by the crickets, etc. that are a principal prey item for terrestrial CTS. It is not clear that bait compounds are toxic to the insects, but in any case there may be high potential for direct ingestion by CTS. Also, treated grain in burrows is likely to be hygroscopic, and may produce beaded moisture on its surface as dewpoint excursion occurs. In that case, CTS would come in direct skin contact with concentrated toxin (S. Sweet pers. comm.).

Fumigants (e.g., toxic or suffocating gasses including aluminum phosphide, carbon monoxide and methyl bromide) are injected directly into burrow complexes using cartridges or pumps. Fumigants are not target-specific, and all organisms inhabiting a treated burrow complex will likely be subject to the effects of the pesticide (i.e., toxicant exposure or oxygen depletion). Although specific data are not available on the effects of fumigants on CTS, the permeable skin of amphibians is likely to increase a salamander's susceptibility to any adverse effects from exposure to toxicants (Henry 2000 *In* USFWS 2004). To reduce the impact of fumigants on CTS in burrows, the USFWS (2004) prohibited use of fumigants within 0.7 mi (1.1 km) of any water body suitable for CTS breeding.

The USFWS (2004) recommended that discing and/or grading of rodent burrows be limited to areas where livestock congregate or move in large numbers, and that modification by deep-ripping be avoided within 0.7 mi (1.1 km) of known or potential CTS breeding ponds.

Mosquito abatement
See the discussion under "Predation and competition from non-native species" regarding the negative effects on CTS of using predatory mosquitofish for mosquito abatement.

Bacterial larvacides are target-specific so likely pose little risk to CTS. Methoprene, a commonly used chemical mosquito larvacide in California (CDPH 2008), could indirectly affect CTS by reducing the availability of aquatic invertebrate prey (Lawrenz 1984) and has a higher potential for direct impacts on higher order taxonomic groups due to its broader range of non-target effects (Ankley et al. 1998, Blumberg et al. 1998, Sparling 1998; all cited in USFWS 2004). In its special rule exempting routine ranching activities, the USFWS (2004) suggested that mosquito control in stock ponds should be unnecessary during much of the CTS breeding season, but included use of bacterial larvacides during the breeding season, and bacterial and chemical larvacides during the non-breeding season. The exemption did not include introduction of mosquitofish to CTS breeding sites.

Proximity to urban areas
Habitat loss, fragmentation, isolation and degradation due to urbanization threatens more than a third of the world's known amphibian species (Hamer and McDonnell 2008). In a study of two eastern U.S. ambystomatid salamanders, Rubbo and Kiesecker (2005) found that urbanization was associated with an increase in wetland permanency (hydroperiod) and the presence of fish predators, and urban wetlands had lower larval amphibian species richness than rural wetlands. Conservation of amphibians in urban and suburban landscapes should include actions to prevent further loss and degradation of both terrestrial and aquatic habitat, and to reconnect the landscape to facilitate dispersal and long-term regional presence of amphibian populations and communities (Hamer and McDonnell 2008).

Small preserves, especially those in proximity to housing or commercial developments, are increasingly common in urban areas and are particularly susceptible to human impacts. For example, Clark et al. (1998) reported fences around a small vernal pool preserve (Phoenix Park Vernal Pool Preserve in Sacramento County) in an urban setting were vandalized to allow unauthorized and destructive access (i.e., use of motorized vehicles) to the preserve. Clark et al. (1998) also mentioned several other management issues related to small preserves, including foot, horse and bicycle traffic, plant and animal collection, herbicide or pesticide oversprays, changes in hydrology, litter, invasive exotic plants, and feral and domestic animals. Cook and Northen (2004) observed several urban-related threats to a small reserve CTS population, including urban encroachment on all existing terrestrial habitat, road mortality from vehicle collisions and storm drains, probable increased predation from urban avian predators, and larval mortality from shortened pool hydroperiod caused by hydrological changes in the pool watershed. Native species like raccoons are often artificially abundant in association with human development; raccoons are highly effective predators on CTS both during migration and when in the breeding ponds (S. Sweet pers. comm.).

For long-term preservation of individual CTS populations, Trenham and Shaffer (2005) recommended breeding pond preserves be buffered by at least 2,066 ft (630 m) from incompatible upland uses. Trenham and Cook (2008) suggested that CTS populations may endure in complex and rapidly-developing urban landscapes if breeding pools and associated undeveloped grassland habitat are preserved, and if pools have at least 30% of contiguous shoreline abutting undeveloped uplands that extend at least several hundred meters from the pool. The contiguous shoreline helps minimize straying into unsuitable habitats.

Disease

Several infectious diseases have been implicated in amphibian population declines, including ranaviral disease of the Sonoran tiger salamander (*A. tigrinum stebbinsi*), a federally endangered subspecies in Arizona (Daszak et al. 1999). Viruses carried by fish may affect salamanders (Carey et al. 2003). Jancovich et al. (2001) suggested that one of the potential sources of the Sonoran tiger salamander viral infection was non-native salamanders introduced as bait. Picco et al. (2007) demonstrated that CTS are susceptible to *Ambystoma tigrinum* virus, a ranavirus present in the tiger salamander bait trade. Although use of tiger salamanders for bait in California is now prohibited, a risk to CTS remains from the illegal sale and movement of non-native species, as mentioned above under “Hybridization with non-native tiger salamanders”.

Chytrid fungus infection has resulted in significant die-offs of amphibian larvae worldwide. This fungus was previously detected in at least seven California amphibian species (Carey et al. 2003), and as of 2007, has been detected in 12 (CCADC 2007). Padgett-Flohr (2008) found that in the laboratory, CTS is susceptible to infection by chytrid fungus, but infection did not result in mortality or an overt disease state. Chytrid fungus has also been detected in field-collected endangered tiger salamanders (*A. t. stebbinsi*) in southern Arizona (Davidson et al. (2003)). Similar to Padgett-Florh’s (2008) results, the Davidson et al. (2003) field-collected salamanders transmitted the infection to captive ones, and both groups displayed extensive chytrid infections, but no tiger salamanders died from the infection after 60 days in the laboratory. To date, chytrid fungus has not been found to be responsible for CTS mortality in the laboratory or the field, but its potential to cause mortality cannot be ruled out.

Contaminants (pesticides, fumigants, fertilizers, etc.)

Little research has been done specifically on the effects of contaminants on CTS, so this section includes work on CTS, as well as close relatives and larvae of other pond-breeding amphibians. Contaminants that may adversely affect CTS include pesticides used in agricultural, landscaping, roadside maintenance, and rodent and mosquito control activities, as well as hydrocarbons and other pollutants in storm water runoff from urban and garden care and industrial facilities.

Direct effects

In an analysis of pesticide drift as a potential cause for the decline of eight species of California amphibians, Davidson et al. (2002) found that declines of four species were strongly associated with the amount of upwind agricultural land use, but that for CTS, the decline was strongly associated with habitat alteration and to a lesser extent agricultural land use. Ryan et al. (submitted) found that the pond-wide die-offs of invertebrates and vertebrates seen in several Salinas Valley ponds killed virtually all CTS but not hybrids that were housed in those ponds for experimental purposes. Those authors provide circumstantial evidence that pesticides are the cause of these massive die-off events. The two ponds that experienced no mass die-offs were both subject to about one tenth of the pesticide exposure of the others, and one was on an organic ranch, suggesting that pesticides may be a problem for CTS, and less so for hybrids.

The Department's Pesticide Investigations Laboratory (PIU) has one record of an incident involving CTS and carbofuran, an insecticide. A tiger salamander recovered dead in 1992 from a vineyard near King City, Monterey County, was determined to have died as a result of exposure to carbofuran. The vineyard had been treated with carbofuran immediately prior to the recovery of the animal. The salamander was not submitted for identification to determine if it was the California species, an eastern subspecies, or a hybrid (R. Hosea pers. comm.). Carbofuran is applied within the range of CTS (CDPR 2007; http://www.cdpr.ca.gov/docs/pur/pur07rep/07_pur.htm).

Indirect and sublethal effects

As mentioned above under "Mosquito abatement", use of the growth inhibitor methoprene for mosquito control may indirectly affect the invertebrate prey base of larval CTS. Indirect effects of pesticides used for rodent control are also discussed above, under "Agricultural practices".

Boone and James (2003) found that at expected environmental concentrations, the insecticide carbaryl virtually eliminated spotted salamanders (*Ambystoma maculatum*), an eastern species. This chemical is applied within the range of CTS (CDPR 2007; http://www.cdpr.ca.gov/docs/pur/pur07rep/07_pur.htm).

Based on results of a study examining nine pesticides (four herbicides, two fungicides, and three insecticides) used on cornfields in the midwestern United States, Hayes et al. (2006) cautioned that estimating ecological risk and the impact of pesticides on amphibians using studies that examine only single pesticides at high concentrations may lead to gross underestimations of the role of pesticides in amphibian declines. Similarly, Relyea et al. (2005) cautioned against the sole use of laboratory-based, single species studies. They looked at the combination of three tadpole species with naturally-occurring pond predators and two common pesticides (the insecticide malathion and herbicide Roundup) and found that both direct and indirect deleterious effects occur, based on community composition.

Lefcort et al. (1997) found that two relatives of the CTS from the eastern U.S., the marbled salamander (*Ambystoma opacum)* and Eastern tiger salamander (*A. tigrinum tigrinum*), were not deleteriously affected by direct exposure to used motor oil, even at concentrations of oil equivalent to service station runoff (100 mg/liter). However, salamanders appeared to be indirectly affected when their food chain included the contaminated algae exposed to oil - these salamanders showed significantly less growth than controls (i.e., salamanders whose food chain did not include contaminated algae). As stated by Rohr et al. (2008) *"… an emphasis on direct effects of pollution alone will not suffice. It is becoming clear that pollution is altering important species interactions, such as interactions between hosts and parasites, which might facilitate population declines (Relyea and Hoverman 2006, Rohr et al. 2006)"*. For instance, there is evidence that pesticides are compromising amphibian immunity and increasing ranavirus and chytridiomycosis infections, pathogens linked to amphibian declines (Forson and Storfer 2006, Davidson et al. 2007).

CLIMATE CHANGE

Climate change is predicted to increase temperatures and fluctuations in rainfall. For California, temperatures by the end of the 21st century are predicted to rise 1.5 – 4.5°C (Cayan et al. 2008). Corn (2005) discussed that any significant change in occurrence or hydroperiod of temporary ponds could have serious effects on amphibian diversity. Pounds et al.(2006) proposed that temperatures at many high elevation localities are shifting towards the growth optimum of chytrid fungus, thus encouraging disease outbreaks. Reaser and Blaustein (2005) indicated that amphibian populations and species most at risk due to global warming include those that depend on small, ephemeral wetlands and/or are bound by barriers to dispersal.

In Yellowstone National Park, one of the best protected ecosystems on the planet, climate monitoring over six decades, remote sensing and repeated surveys of 49 ponds indicate that decreasing annual precipitation and increasing temperatures during the warmest months of the year have significantly altered the landscape and local biological communities (McMenamin et al. 2008). The number of permanently dry ponds has increased four-fold, and of those that still hold water, the proportion supporting amphibians has declined significantly, as has the number of species found in each location. The number of populations of the blotched tiger salamander (*Ambystoma tigrinum melanostictum*) has fallen by almost half. Hydrologically active pond habitats have declined by 20%, and remaining ponds dry earlier and more rapidly, precluding metamorphosis and the adult return migration to upland habitat. Changes in hydroclimate within the terrestrial landscape may mediate increased terrestrial mortality and decreased migration and colonization (McMenamin et al. 2008). (The McMenamin et al. 2008 study is not without controversy – see Patla et al. 2009 and McMenamin et al. 2009.)

Climate change has also been implicated as a factor in amphibian disease outbreaks (e.g., Bosch et al. 2007, Reaser and Blaustein 2005) and species declines (e.g., Reaser and Blaustein 2005, Lacan et al. 2008, Wake 2007).

The discussion in Ryan et al. (2009) about how effects of hybrid salamanders on CTS may extend beyond reduced body size and increased time to metamorphosis may have implications for climate change. They mentioned that in the CTS' dry California upland habitat, reductions in metamorphic size may lead to differences in upland survival by increasing desiccation and predation risk or reducing competitive ability. They also mentioned that slowed growth rates may be costly during dry years (when ponds are more likely to dry before CTS reach minimum metamorphosis size) and are likely to increase exposure to cannibalism and other forms of predation in natural habitats.

Pyke and Marty (2005) evaluated the ecological implications of interactions between grazing and climate change for fairy shrimp and CTS in the Central Valley. Using a climate change scenario of +5.4°F (3°C) and an increase in winter precipitation of 30%, their model predicted that grazing played an important role in maintaining the suitability of vernal pool hydrological conditions for CTS reproduction in all but the southernmost portions of the Central Valley.

The distribution of CTS in California spans a considerable range in climatic conditions (including annual variation). Southern CTS populations may have adaptations that could become more relevant to populations father north, if decreased precipitation is a general consequence of climate change in the state. We do not know yet how the various subregions of the range of CTS might differ in their responses to climate change, and thus it is prudent to regard outlying populations as having potentially significant genetic diversity (S. Sweet pers. comm.). Climate change might also have the effect of eliminating populations in the southernmost portions of the range, where precipitation is currently lower than the rest of CTS range. Lower rainfall and higher temperatures might eliminate breeding pools or render them suitable less frequently, ultimately leading to extirpations.

NATURE AND DEGREE OF THREAT (BASED ON INFORMATION PRESENTED ABOVE)

CTS populations have been eliminated from much of their previous range due to habitat loss and fragmentation.

Due to projected population growth and continued habitat loss and fragmentation, along with the inadequacy of existing regulatory mechanisms, additional losses of CTS populations can reasonably be expected absent CESA listing (see “Existing Regulatory Setting and Management Efforts”, below).

There is evidence that introduced species, including bullfrogs and sunfishes, have a significant negative effect on CTS populations, particularly in the low elevation areas of the Central Valley.

Established populations of NNTS and of hybrid NNTS x CTS pose a considerable threat to CTS in the Central Coast and Bay Area populations, and a potentially major threat to the Central Valley, South San Joaquin population, and Santa Barbara populations.

EXISTING REGULATORY SETTING AND MANAGEMENT EFFORTS

Federal

Federal Endangered Species Act:

The CTS has a complex Federal Endangered Species Act (FESA) listing history. In summary, in 1985 the USFWS first published the Vertebrate Notice of Review (NOR) (50 FR 37958) in which CTS was a category 2 candidate species for possible future listing as threatened or endangered. (Category 2 candidates are no longer designated, but were those taxa for which USFWS file information indicated that listing may be appropriate but for which additional data were needed to support a listing proposal.) The CTS was petitioned for federal listing in February 1992. The Santa Barbara and Sonoma County CTS populations were listed as endangered in 2000 and 2003, respectively. The Central California CTS population was federally listed as a threatened species in 2004.

The 2004 Final Rule for the Central California population also contained a special rule, authorized under Section 4(d) of FESA. The special rule recognizes that the loss of natural vernal pools has resulted in livestock stock ponds serving as important alternative breeding sites for CTS. The rule allows certain traditional ranching activities that benefit CTS, including stock pond construction and maintenance, to continue without additional regulation.

There is no recovery plan for CTS. The USFWS is preparing a five year status review for the Santa Barbara County DPS (A. Adams pers. comm. 2009.

As mentioned above in the section “Hybridization with non-native tiger salamanders”, the legal status of hybrids is not clearly addressed by FESA.

Critical Habitat:

Critical habitat is a feature of FESA that allows for identification of geographic areas essential for the conservation and special management considerations for a threatened or endangered species. Designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area, nor does it allow government or public access to private lands. The USFWS did not designate critical habitat in all the areas where CTS are found, *"but instead focused on areas where there are high concentrations of known occurrences and the habitat is likely to persist in the future."* (USFWS 2005). Since critical habitat is based on what is known at the time of designation and both habitats and species may be dynamic, additional habitat outside the designation may still be important to recovery. Areas that support CTS populations but that are outside of the critical habitat designation are subject to conservation actions identified in Section 7 (a)(1), and protections afforded by Section 7 (a)(2), of FESA. Critical habitat designations *"do not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available to these planning efforts calls for a different outcome"* (USFWS 2005).

On September 22, 2005, the USFWS designated approximately 199,109 acres (80,576 ha) of critical habitat for the Central California CTS population. The critical habitat is located within 19 California counties (USFWS 2005) (Figure 16). *"The four geographic regions used for designation as critical habitat for the Central population of the CTS are designed to provide needed aquatic and upland refugia habitats for adult salamanders to maintain and sustain extant occurrences of CTS throughout their geographic and genetic ranges and provide those habitat components essential for the conservation of the species"* (USFWS 2005).

For the Santa Barbara population, approximately 11,180 acres (4,524 hectares) fall within the boundaries of the critical habitat designation. The critical habitat is located in northern Santa Barbara County, California (Figure 16). A total of 2,740 acres (1,109 hectares) of privately-owned lands were excluded from the designation (USFWS 2004).

In a December 2005 Final Rule, the USFWS designated but excluded approximately 17,418 acres (7,049 hectares) of critical habitat for the Sonoma County population, stating that interim conservation strategies and measures being implemented by local governing agencies with land use authority over the area, along with economic exclusions authorized under Section 4(b)(2) of FESA, would be greater than would be achieved through critical habitat (USFWS 2005). On May 6, 2009, the USFWS announced the settlement of a lawsuit that challenged its 2005 final decision on proposed critical habitat for the Sonoma County population. In the settlement, the Service agreed to re-propose as critical habitat the same 74,223 acres of the Santa Rosa Plain that it had originally proposed in August 2005. The designation of critical habitat was re-proposed in the Federal Register on August 18, 2009 (USFWS 2009).

Section 7 Consultations

Section 7 of FESA requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. A biological assessment (BA) for the purpose of analyzing the potential effects of the project on listed species and critical habitat in order to establish and justify an "effect determination". The federal agency reviews the BA and, if it concludes that the project may adversely affect a listed species or their habitat, it prepares a "biological opinion (BO)." The BO may recommend "reasonable and prudent alternatives (RPAs)" to the proposed action to avoid jeopardizing or adversely modifying habitat. RPAs carry significant weight with other federal agencies and are often treated as binding requirements. The opinion either authorizes take of habitat or species that may occur incidental to an otherwise legal activity, or deny the activity because, as proposed, it would put the continued existence of the species in jeopardy (known as a jeopardy finding).

Habitat Conservation Plans

HCPs are prepared under Section 10 of FESA, which is used when there is no federal nexus to trigger a Section 7 consultation. The HCP permitting timeframe and requirements are longer and more involved than those for Section 7 (which results in more Section 7 consultations than HCPs). A Habitat Conservation Plan (HCP) allows the USFWS to permit "taking" of endangered or threatened species incidental to otherwise lawful activities, when the taking is mitigated by conservation measures. "Take" is defined in FESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species or to attempt to engage in any such conduct. USFWS regulations (50 CFR 17.3) define “harm” to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. “Harassment” is defined as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Mitigation measures are actions that reduce or address potential adverse effects of a proposed activity upon species covered by an HCP. Mitigation measures may take many forms, such as: preservation (via acquisition or conservation easement) of existing habitat; enhancement or restoration of degraded or a former habitat; creation of new habitats; establishment of buffer areas around existing habitats; modifications of land use practices, and restrictions on access (http://www.fws.gov/endangered/factsheets/hcp.pdf). As of May 2009, the CTS is a covered species in six completed regional HCPs: East Contra Costa County HCP/NCCP; Kern Water Bank; Natomas Basin Revised HCP and Litigation Resolution – City of Sacramento, Sutter County, and Natomas Basin Conservancy; San Joaquin County Multi-Species Habitat Conservation and Open Space Plan; Sonoma County Office of Education LE HCP and Warmington Homes Assumption of the Bluffs HCP (K. Leyse pers. comm.). Figure 17 shows the location of existing and planned HCPs.

Safe Harbor Agreements

Safe Harbor Agreements are voluntary arrangements between the USFWS and cooperating non-federal landowners. This policy’s main purpose is to promote voluntary, beneficial management for listed species on non-federal property while giving assurances to participating landowners that no additional future regulatory restrictions will be imposed. The USFWS must determine net conservation benefits and how they contribute, directly or indirectly, to the recovery of the covered species (USFWS 2004).

In one of its first programmatic Safe Harbor Agreements, the USFWS worked with the Alameda County Resource Conservation District and the Natural Resources Conservation Service to help alleviate ranchers' concerns that restoring amphibian-friendly livestock ponds might increase their regulatory burden. The coordinated permit streamlining program for pond restorations allows ranchers "one-stop shopping" for permits and funding for ponds and other rangeland projects. The permit incorporates a wildlife-friendly pond design and management measures, as well as actions to reduce impacts to listed species during pond repair projects (USFWS 2006 http://www.fws.gov/sacramento/ea/news_releases/2006%20News%20Releases/Alameda_pSHA_NR.htm ; Environmental Defense Fund 2007 http://www.edf.org/article.cfm?contentID=5922&campaign=cci).

On June 2, 2009, East Bay Municipal Utility District and the USFWS signed the largest Safe Harbor Agreement awarded to a single landowner. The 30-year agreement covers 28,000 acres (11,331 ha) of San Joaquin, Amador and Calaveras counties, and includes the CTS (USFWS 2009 http://www.fws.gov/sacramento/ea/news_releases/2009_News_Releases/EBMUD_final_Safe_Harbor_Agreement.htm).

Recovery and Interstate Commerce Permits

For scientific research on a listed species or for activities to enhance a listed species propagation or survival, a Section 10 (a) (1) (A) permit from the USFWS is required by FESA.

Programmatic Biological Opinion for Santa Rosa Plain

A programmatic biological opinion for the Santa Rosa Plain (Sonoma County), developed by the USFWS and U.S. Army Corps of Engineers, can be used for most projects there since seasonal wetlands are usually present. The opinion simplifies the process of consulting with the USFWS and complying with FESA by using a template in many situations.
http://www.fws.gov/sacramento/es/consultations/Santa_Rosa_strategy_COE_programmatic_BO.htm

Conservation Banking

"*Conservation banks are permanently protected lands that contain natural resource values. These lands are conserved and permanently managed for species that are endangered, threatened, candidates for listing, or are species-at-risk. Conservation banks function to offset adverse impacts to these species that occurred elsewhere, sometimes referred to as off-site mitigation. In exchange for permanently protecting the land and managing it for these species, the U.S. Fish and Wildlife Service (FWS) approves a* *specified number of habitat or species credits that bank owners may sell. Developers or other project proponents who need to compensate for the adverse impacts their projects have on species may purchase the credits from conservation bank owners to mitigate their impacts. Conservation banking offers opportunities for a variety of landowners through preservation, enhancement, restoration and/or establishment of habitat for species.*

Lands used for ranching, farming, and timber operations or similar agricultural purposes can function as conservation banks if they are managed as habitat for species. Degraded habitat, such as retired croplands or orchards, may be restored. Linear areas or corridors, such as stretches of streams and their associated riparian habitat that link populations of species, may also qualify as conservation banks."
(http://www.fws.gov/endangered/factsheets/conservation_banking.pdf)

The USFWS is continuing to approve new conservation banks for small housing developments, additions to homes or other projects that are near a salamander breeding site. There are 19 FWS-approved conservation banks throughout the Central (12) and Sonoma (7) DPS regions, which equates to 6,076 acres (2,459 ha) of CTS habitat protected and managed in perpetuity (295 acres [119 ha] in Sonoma DPS, 5781 acres [2,340 ha] in Central DPS) (D. Russell pers. comm.) (see also http://www.fws.gov/sacramento/es/bank_list.htm).

Clean Water Act (CWA)
Per USFWS (2004), "*[w]hile the Clean Water Act provides a means for the Corps of Engineers (Corps) to regulate the discharge of dredged or fill material into waters and wetlands of the United States, it does not provide complete protection. Nationwide the Corps denies less than one percent of all applications to discharge dredged or fill material into waters or wetlands on an annual basis. While many applicants are required to provide compensation for wetlands losses (i.e., no net loss), many smaller impact projects remain largely unmitigated unless specifically required by other environmental laws such as the Endangered Species Act. Recent court cases limit the Corps' ability to utilize the CWA to regulate the discharge of fill or dredged material into the aquatic environment within the current range of the California tiger salamander* …." The USFWS (2004) concluded that regulation of wetlands filling by the Corps under Section 404 of the CWA is inadequate to completely protect CTS from further decline. Section 404 does not protect most isolated wetlands, such as stock ponds and vernal pools, without a direct connection to a navigable waterway). Section 404 also does not maintain connectivity among wetlands, and does not regulate the continuing losses of terrestrial habitat (USFWS 2004, Harper et al. 2008).

Listed Species Research and Habitat Acquisition
Under Section 6 of FESA, the USFWS disburses funds annually to state wildlife agencies for research essential to the conservation and recovery of listed (and candidate) species. The USFWS also provides funding to the Department for acquisition of listed species

habitat. For example, the Rangeland Conservation Trust holds a Section 6-funded conservation easement for CTS protection on about 1,000 acres in Santa Barbara County.

State
In 1971, the Department identified the CTS as a species needing protection (Bury 1972).

Species of Special Concern (http://www.dfg.ca.gov/wildlife/nongame/ssc/index.html)
The CTS has been on the Department's Special Animal List since 1982 and has been a Species of Special Concern (SSC) the Department's "Amphibian and Reptile Species of Special Concern in California" was first published in 1994. This designation is administrative and carries no formal legal status. The intent of designating SSCs is to:

- focus attention on animals at conservation risk by the Department, other State, local and Federal governmental entities, regulators, land managers, planners, consulting biologists, and others;
- stimulate research on poorly known species;
- achieve conservation and recovery of these animals before they meet California Endangered Species Act criteria for listing as threatened or endangered.

California Environmental Quality Act
SSCs may be considered during the environmental review process. The California Environmental Quality Act (CEQA; California Public Resources Code §§21000-21177) requires State agencies, local governments, and special districts to evaluate and disclose impacts from "projects". Sections 15065 and 15380 of the CEQA Guidelines, which address how an impact is identified as significant, are particularly relevant to SSCs. Section 15065 (Mandatory Findings of Significance) controls not only the decision of whether to prepare an EIR, but also the identification of effects to be analyzed, and the requirement to make detailed findings on the feasibility of alternatives or mitigation measures. Section 15380 (Endangered, Rare or Threatened Species) indicates that SSCs should be included in an analysis of project impacts if they can be shown to meet the criteria of sensitivity outlined therein. In practice, however, inclusion of a unlisted taxon under the auspices of sections 15065 and 15380 is at the discretion of the lead agency.

Project-level impacts to listed species (rare, threatened, or endangered) are generally considered significant, and if mitigation measures are not proposed that would lessen the impacts to less than significant levels, lead agencies should prepare an Environmental Impact Report (EIR) to fully analyze and evaluate the potential project related impacts. In assigning "impact significance" to populations of non-listed species, analysts usually consider factors such as population-level effects, proportion of the taxon's range affected by a project, regional effects, and impacts to habitat features. However, the adeqacy of impact assessments and associated mitigation measures within CEQA documents varies widely depending on the CEQA Lead Agency, and because impacts to non-listed species are often cursorily addressed.   In addition, due to under-compliance with public notification procedures, the Department is denied the opportunity to review some pertinent CEQA project documents.

The Yosemite Lakes development project in Merced County is an example of impacts to CTS habitats and populations that have occurred in spite of Federal listing and the CEQA process. Although surrounded by nearby lands containing wetlands, including vernal pools, this development appears not to have been surveyed for CTS (Figure 18).

There is no entitity specifically charged with CEQA compliance – enforcement is generally via lawsuit against the CEQA Lead Agency.

Conservation and Mitigation Banking

A conservation or mitigation bank is privately or publicly owned land managed for its natural resource values. In exchange for permanently protecting the land, the bank operator is allowed to sell habitat credits to developers who need to satisfy legal requirements for compensating environmental impacts of development projects. A conservation bank generally protects threatened and endangered species habitat. Credits are established for the specific sensitive species that occur on the site. Conservation banks must be approved by the wildlife agencies, such as the Department of Fish and Game and the U.S. Fish and Wildlife Service. Mitigation banking is the same concept as conservation banking, but is specifically for wetland restoration, creation, and enhancement undertaken to compensate for unavoidable wetland losses. Use of mitigation bank credits must occur in advance of development, when the compensation cannot be achieved at the development site or would not be as environmentally beneficial. Mitigation banking helps to consolidate small, fragmented wetland mitigation projects into large contiguous sites which will have much higher wildlife habitat values. Mitigation banks are generally approved by the wildlife agencies and the U.S. Army Corps of Engineers. http://www.dfg.ca.gov/habcon/conplan/mitbank. Acquisition of CTS habitat is available for a number of conservation and mitigation banks approved by the Department (http://www.dfg.ca.gov/habcon/conplan/mitbank/catalogue/catalogue.html), as well as additional banks that have been independently approved by other agencies

Natural Community Conservation Plans

http://www.dfg.ca.gov/habcon/nccp/status.html

Conservation planning in California is often initiated to comply with the state and federal endangered species acts. Under FESA, an HCP must be prepared. Under California law, the following permitting mechanisms apply to project-related take of State listed species: FGC Section 2080.1 (Taking Endangered Species With Federal Incidental Take Statement), 2081(b) permit, and FGC §2835 (take of species covered in a Natural Community Conservation Plan, NCCP) . A recent court decision (*Environmental Council of Sacramento v. City of Sacramento et al.* 2006) precludes unlisted species being included in a CESA 2081 take permit, whereas unlisted species can be a covered species in an NCCP. CESA permits can be issued for individual developments or applied to large regional areas. CESA requires that impacts to listed species be fully mitigated. NCCPs can only be initiated for large landscape areas, must address ecosystem integrity and function, and must provide for conservation of the covered species. An NCCP must mitigate for impacts and make an additional contribution to recovery of the covered species.

To date, the East Contra Costa County NCCP is the only approved plan in which CTS is a covered species (i.e., included as part of the permit). Figure 17 shows the location of existing and planned NCCPs.

California State Safe Harbor Program

Senate Bill 448, a Safe Harbor Program to be administered by the Department, was signed by the Governor on October 11, 2009. The program is designed to encourage landowners to voluntarily manage their lands to benefit listed and candidate species without being subject to additional regulatory restrictions as a result of their conservation efforts. The program includes a host of species dependent upon rangeland within the Central Valley and Interior Coast Ranges and was endorsed by over 37 entities of the California Rangeland Coalition.

Lake and Streambed Alteration (LSA) Agreements

FGC §1602 requires an entity to notify the Department of any proposed activity that will: substantially divert or obstruct the natural flow of any river, stream or lake; substantially change or use any material from the bed, channel, or bank of, any river, stream or lake; or deposit or dispose or debris, waste, or other material containing crumbled, flaked or ground pavement where it may pass into any river, stream, or lake. If the Department determines that the activity described in a LSA notification may substantially adversely affect an existing fish or wildlife resource, the Department and the entity enter into a LSA agreement that includes reasonable measures necessary to protect the resource. If mutual agreement cannot be reached, the entity may request a panel of arbitrators to resolve the disagreement.

The LSA notification requirement applies to work undertaken in or near any river, stream, or lake that flows at least intermittently. Relevant to CTS, this can include instream ponds, and ponds that are hydrologically connected to streams, some of which support CTS. In practice, however, what the Department considers "jurisdictional" and what is used by CTS as breeding habitat only rarely overlap.

Scientific Collecting Permits

Take or possession of marine plants, live or dead birds, mammals, fishes, amphibians, or reptiles for scientific, educational, or propagation purposes requires a Scientific Collecting Permit (SCP) (Public Resources Code, Title 14 §650). The SCP approval process for take of CTS requires that the applicant provide a copy of their federal threatened and endangered species permit and requires compliance with conditions in the federal permit. The Department may condition SCPs more restrictively than federal permits or with additional requirements, if desired.

Other State Regulations
It is unlawful to import, transport, or possess alive all members of the genus *Ambystoma* per California Code of Regulations, Title 14 §671. No species of salamander may be used as fishing bait per Public Resources Code, Title 14 §4. As mentioned above under the subheading "Hybridization with non-native tiger salamanders", an old regulation still allows sale of larval NNTS (waterdogs) as bait, but will be eliminated in the next appropriate Department regulation change cycle.

California Department of Pesticide Regulation
The Endangered Species Program at the California Department of Pesticide Regulation (CDPR) has a County Bulletin Program which outlines use recommendations for application of pesticides that may pose a threat to federally listed species http://www.cdpr.ca.gov/docs/endspec/index.htm. However, CTS information on the website is limited to Federal Register Notices regarding listing and critical habitat, and one County Pesticides Interim Measures Bulletin (March 2000) that includes Santa Barbara County CTS. All of the website training materials for pesticide applicators are dated August 1997, and therefore predate the federal listing of CTS. The only other CTS information is on a page listing Federal Register notices by species.

Cooperative Efforts
In 2003, the USFWS and the Department developed a joint survey protocol to accurately assess the likelihood of CTS presence in the vicinity of a project site. "Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander" can be found at http://www.fws.gov/ventura/speciesinfo/protocols%5Fguidelines/.

Guidelines for the relocation of CTS (Shaffer et al. 2008) resulted from funding from multiple agencies and the cooperation of academia and agency personnel.

Santa Rosa Plain Santa Rosa Plain Conservation Strategy
http://www.fws.gov/sacramento/es/santa_rosa_conservation_strategy.htm
The Santa Rosa Plain in Sonoma County, about 20 miles long and six miles wide, contains federally listed species, including CTS. Completed in 2005, the Sonoma County Conservation Strategy is a long-term program to mitigate adverse impacts on protected species in a way that the local community felt was least injurious. Beyond that, the ultimate goal is to aid in recovery of the species.

Although the Strategy was finished in 2005, local governmental agencies have not yet completed the implementing ordinances nor acquired necessary funding. The Adaptive Management Team described in the Strategy has not been established.

Santa Barbara Regional Conservation Strategy
http://longrange.sbcountyplanning.org/programs/regionalconservationstrategy/reg_cons_strategy.php
A Regional Conservation Strategy within the CTS range in northern Santa Barbara County was initiated by the County Board of Supervisors on March 28, 2006. Implementation of the strategy was intended to protect stakeholder (public and private) land use interests, provide predictability and streamline processes in land use permitting, and provide long-term protection for covered species and their habitat.

Although the USFWS contributed $277,000 toward the effort, the Board of Supervisors voted on March 25, 2008 to discontinue this project due to financial constraints and the significant cost required to prepare and implement a regional conservation strategy.

CONCLUSIONS

The California tiger salamander is unique to grasslands and vernal pool communities of the Central Valley, Sierra Nevada and Coast Range, generally below approximately 1,500 ft (457 m). This long-lived species spends most of its life underground in ground squirrel or gopher burrows, migrating during the winter rainy season to breed in fish-free vernal pools and stock ponds. The Department has been concerned about the CTS for over 30 years. The USFWS listed the species throughout its range as three distinct population segments, designated as either threatened or endangered.

Although it is not currently feasible to accurately determine CTS abundance, the Department's evaluation of factors affecting CTS abundance substantiates range-wide habitat loss and fragmentation, along with other threats, including hybridization with invasive non-native tiger salamanders, predation and competition from other non-native species, and road-kill mortality. Other factors likely related to suspected CTS declines, supported by evidence from studies on CTS or similar species, include certain agricultural and mosquito abatement practices, contaminants, disease and climate change.

The Department believes that the California tiger salamander is likely to become an endangered species in the foreseeable future. Based on the best scientific information available (FGC §2074.6), the Department finds the petitioned action to list the California tiger salamander as threatened is warranted.

RECOMMENDATIONS

Petitioned Action

The Department recommends the Commission find that classification of California tiger salamander as Threatened is warranted. With such a finding, the Commission should publish notice of its intent to amend Title CCR §670.5 to list the California tiger salamander as Threatened.

Management and Recovery Measures
The Department's objective is the protection of a sufficient number of genetically pure California tiger salamander populations to make their long-term survival and recovery in their native habitat and range a certainty.

Because there is not yet a quantitative basis for estimating the benefits of any given action(s), attempting to sustain and improve California tiger salamander populations during the foreseeable future will involve implementing management measures and evaluating their success empirically.

The Department believes the following actions, which are not listed in priority order and are not all under the Department's authority, would have population-level benefits for California tiger salamanders:

-- In cooperation with the USFWS, determine what level of CTS x NNTS hybridization warrants management actions such as eradication or control. Eradicate or reduce the impact of known non-native tiger salamander (NNTS) and CTS x NNTS hybrid populations. Retain habitat for re-establishment of CTS populations.

--In management and conservation plans, identify both aquatic and terrestrial CTS habitats. Emphasize managing and protecting groups of ponds (landscape level conservation) rather than single water bodies. Where possible, retain dispersal corridors of suitable habitat among ponds. Assign high priority to ponds or groups of ponds that support large subpopulations of CTS.

--Correct the discrepancy in existing regulations which makes it illegal to possess NNTS (Title 14 §671(c)(3)(C)) or use them as bait (Title 14 §4.00), but legal for bait shops to sell them (Title 14 §200.31(c)).

--Actively manage CTS habitats, including maintenance of appropriate vegetation condition as appropriate, and removal and/or control of non-native predators.

--Where CTS ponds are adjacent to NNTS or hybrid zones, manage pond hydrology (particularly in stock ponds and other human-made/manipulated water bodies) to favor seasonal rather than perennial wetlands.

-- Protect occupied CTS breeding and upland habitat. Prioritize protection of centrally located land that lies near a number of breeding sites, i.e., based on the density distribution of reproductive value (per Searcy and Shaffer 2008).

--Restore or create ephemeral ponds to enhance existing CTS populations.

--Restore degraded upland habitats adjacent to known or restored breeding sites.

--Maintain upland habitat connectivity for interpond dispersal (see Wang et al. 2009).

--Retain broad, contiguous sections of undeveloped shoreline (>30% of total perimeter) around CTS breeding sites to minimize straying of migrating individuals into unsuitable habitats (per Trenham and Cook 2008).

--Encourage additional emphasis on CTS habitats in California Rangeland Coalition Conservation Focus Areas.

--Translocate/relocate CTS to establish new populations, remediate for lost or compromised habitat, and/or prevent further loss of individuals, following the guidelines authored by Shaffer et al. (2008).

--Restore or create ephemeral ponds to enhance existing CTS populations.

--Discontinue Department private stocking permits for non-native fishes where they may negatively affect CTS.

--Encourage public and private stock pond management practices consistent with CTS conservation as described in the Special Rule Exempting Routine Ranching Activities USFWS (2004).

--Issue Scientific Collecting Permits as necessary for research essential to the conservation and recovery of CTS.

-Investigate use and effectiveness of wildlife crossing structures and/or tunnels designed for CTS in circumstances where road-kill mortality due to migration to/from breeding ponds is significant.

--Develop guidelines for placement and design of CTS-specific crossing structures for new projects within CTS habitat, particularly those that will result in significant new road construction between upland and breeding sites (to avoid the need for remedial structures or tunnels described above).

--Control rodents and mosquitoes on grazing lands in accordance with the Special Rule Exempting Routine Ranching Activities in USFWS (2004). On non-grazing lands, avoid introductions of mosquitofish into CTS breeding ponds.

-- Within the CTS Distinct Population Segments (DPSs) identified by the USFWS, consider establishment of CTS target population and mitigation goals.

PROTECTION AFFORDED BY LISTING

CESA defines "take" to mean "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." (FGC, §86). If the CTS is listed as threatened or endangered under CESA, take of CTS would be unlawful absent take authorization from the Department (FGC §§2080 et seq. and 2835). Take can be authorized by the Department pursuant to FGC §§2081.1, 2081, 2086, 2087 and 2835 (NCCP).

FGC §2080.1 allows an applicant who has obtained a federal incidental take statement pursuant to a federal Section 7 consultation or a federal Section 10(a) incidental take permit to notify the Department in writing that the applicant has been issued an incidental take statement or an incidental take permit pursuant to the FESA. The applicant must submit the federal opinion incidental take statement or permit to the Department for a determination as to whether the federal document is "consistent" with CESA. Receipt of the application by the Department starts a 30-day clock for processing the Consistency Determination. To issue a Consistency Determination, the Department must determine that the conditions specified in the federal incidental take statement or the federal incidental take permit are consistent with CESA. If the Department determines that the federal statement/permit is not consistent with CESA, the applicant must apply for a State Incidental Take Permit under FGC §2081(b).

The exception provided in FGC §2080.1 to CESA's take prohibition can be used only for species that are listed under both FESA and CESA, and cannot be applied to species that are listed by the State but not federally listed.

FGC §2081(b) permits are usually preferable to 2080.1 Consistency Determinations for the reasons listed below. Under a Consistency Determination:

- the Department cannot add any conditions to the federal incidental take statement/permit or biological opinion to meet the full mitigation standard, and must accept it as is, if we determine it to be consistent,
- Often the biological opinion does not contain enough details in decribing mitigation measures,
- If pertinent section of FESA changes, the Consistency Determination could become invalid, and the Department would have to issue 2081(b) permits for those projects
- If a Federal Biological Opinion/Incidental Take Permit is amended, the Consistency Determination is invalidated and either a new Consistency Determination or 2081(b) permit is needed
- If there are compliance problems with a biological opinion, the Department's only remedy is to rely on USFWS ability to enforce the terms of their permit, or in the case of direct take,involve Department enforcement, i.e., the Department does not have a permit to enforce, suspend, or revoke.

§2081(b) permits may be issued if certain conditions are met, including:

- The impacts of the take are minimized and fully mitigated
- The measures are capable of successful implementation
- The applicant ensures adequate funding to implement and monitor the effectiveness of the measures

- The measures are roughly proportional in extent to the impact
- Where various measures are available, the measures shall maintain the applicant's objectives to the greatest extent possible
- Issuance of the permit will not jeopardize the continued existence of a species.

Take under FGC §2081 (a) is authorized by DFG via permits or memorandums of understanding for individuals, public agencies, universities, zoological gardens, and scientific or educational institutions, to import, export, take, or possess any endangered species, threatened species, or candidate species for scientific, educational, or management purposes.

FGC §2086 authorizes locally designed voluntary programs for routine and ongoing agricultural activities on farms or ranches that encourage habitat for candidate, threatened, and endangered species, and wildlife generally. Agricultural commissioners, extension agents, farmers, ranchers, or other agricultural experts, in cooperation with conservation groups, may propose such programs to the Department. Take of candidate, threatened, or endangered species, incidental to routine and ongoing agricultural activities that occurs consistent with the management practices identified in the code section, is authorized.

FGC §2087 authorizes accidental take of candidate, threatened, or endangered species resulting from acts that occur on a farm or a ranch in the course of otherwise lawful routine and ongoing agricultural activities.

Although CTS sometimes, depending on CEQA Lead Agency, currently receives consideration under CEQA §§15380 (Endangered, Rare or Threatened Species) and 15065 (Mandatory Findings of Significance), avoidance, minimization and mitigation measures that benefit CTS nevertheless tend to result in locally fragmented CTS landscapes and a trend of cumulative habitat loss and fragmentation range-wide. CEQA-imposed mitigation measures do not necessarily result in compensation habitat being secured or the completion of other actions that benefit the species. As a CESA-listed species, CTS would be more likely to be included in Natural Community Conservation Plans (FGC §2800 *et seq*.) and benefit from large-scale planning. Further, the full mitigation standard and funding assurances required by CESA would result in mitigation for the species that in general does not usually occur under CEQA.

Actions subject to CESA may result in an improvement of available information about CTS. For example, one result of the Federal listing of CTS in Santa Barbara County was an increase in the number of known CTS localities over the first one to three years post-listing, as new properties became accessible to scientists and biological consultants for survey work (Figure 19).

Though the CTS is federally listed, mitigation under FESA Section 7 is voluntary. Where USFWS field offices routinely apply this standard, large projects causing significant take of CTS do not necessarily result in compensatory habitat acquisition, and a net loss of breeding and upland habitat can occur. For example, a proposed project in San Benito County will impact 13% of the CTS critical habitat in that area, but mitigation is regarded as voluntary. Absent CESA protection, CTS can lose significant amounts of habitat because of this Section 7 interpretation.

ECONOMIC CONSIDERATION

The Department is not required to prepare an analysis of economic impacts (FGC §2074.6).

PUBLIC RESPONSE

Comments were invited in response to the current petition in a Press Release dated June 15, 2009. Comments received are included in Appendix III.

PEER REVIEW

The draft final version of this document was reviewed by several scientists familiar with CTS or herpetology in general (Appendix IV).

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Figure 1. Adult California tiger salamander (*Ambystoma californiense*) (photo by Chuck Brown).

Figure 2. Larval California tiger salamander (*Ambystoma californiense*) (photo by Chuck Brown).

Figure 3. California tiger salamander (*Ambystoma californiense*) metamorph (photo by Michael Van Hattem).

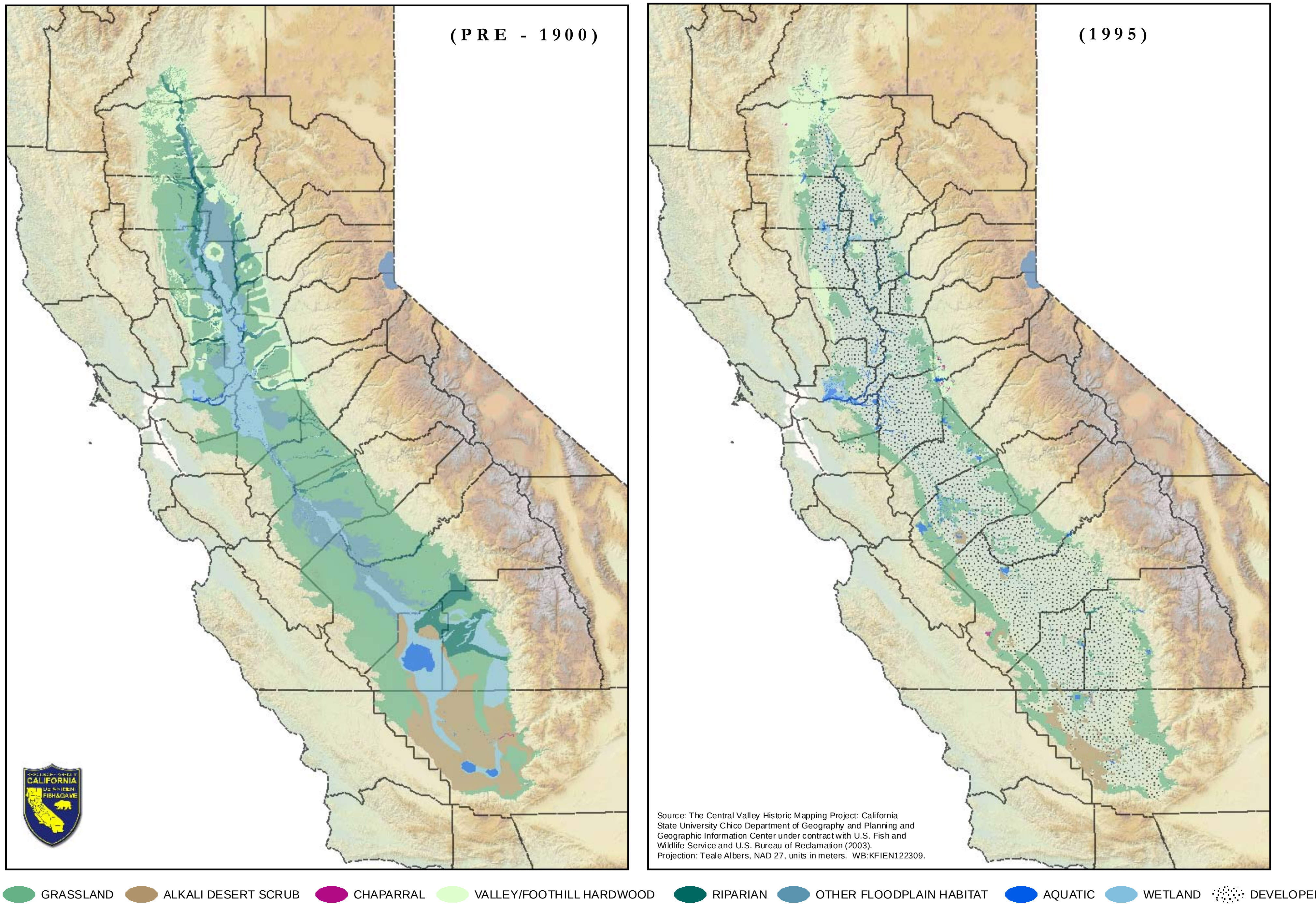

Figure 4. Central Valley Landscape Changes Pre 1900 versus 1995.

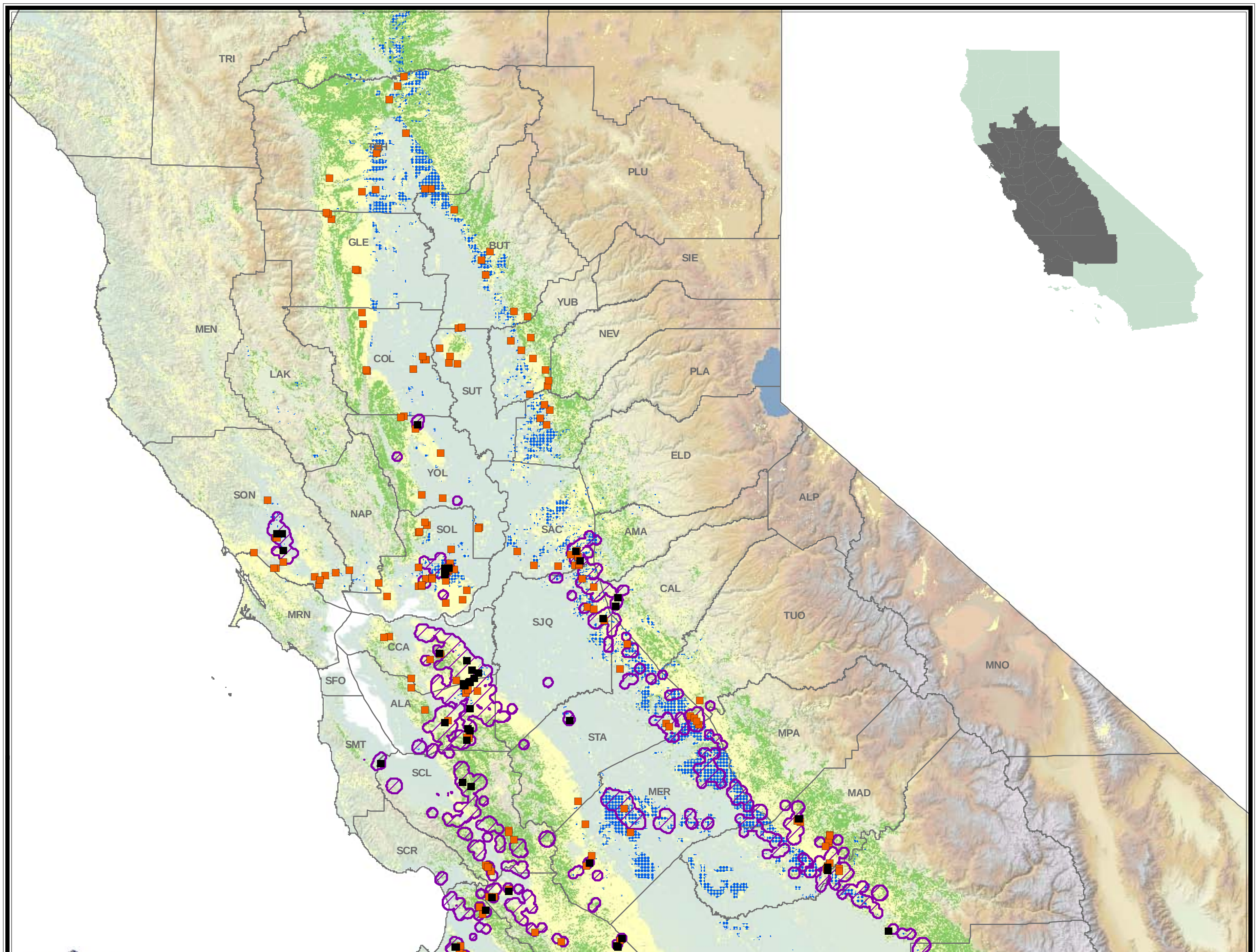

Figure 5. Known distribution of California tiger salamander *(Ambystoma californiense)*, remaining potential habitat and Shaffer et al. 1993 survey locations.

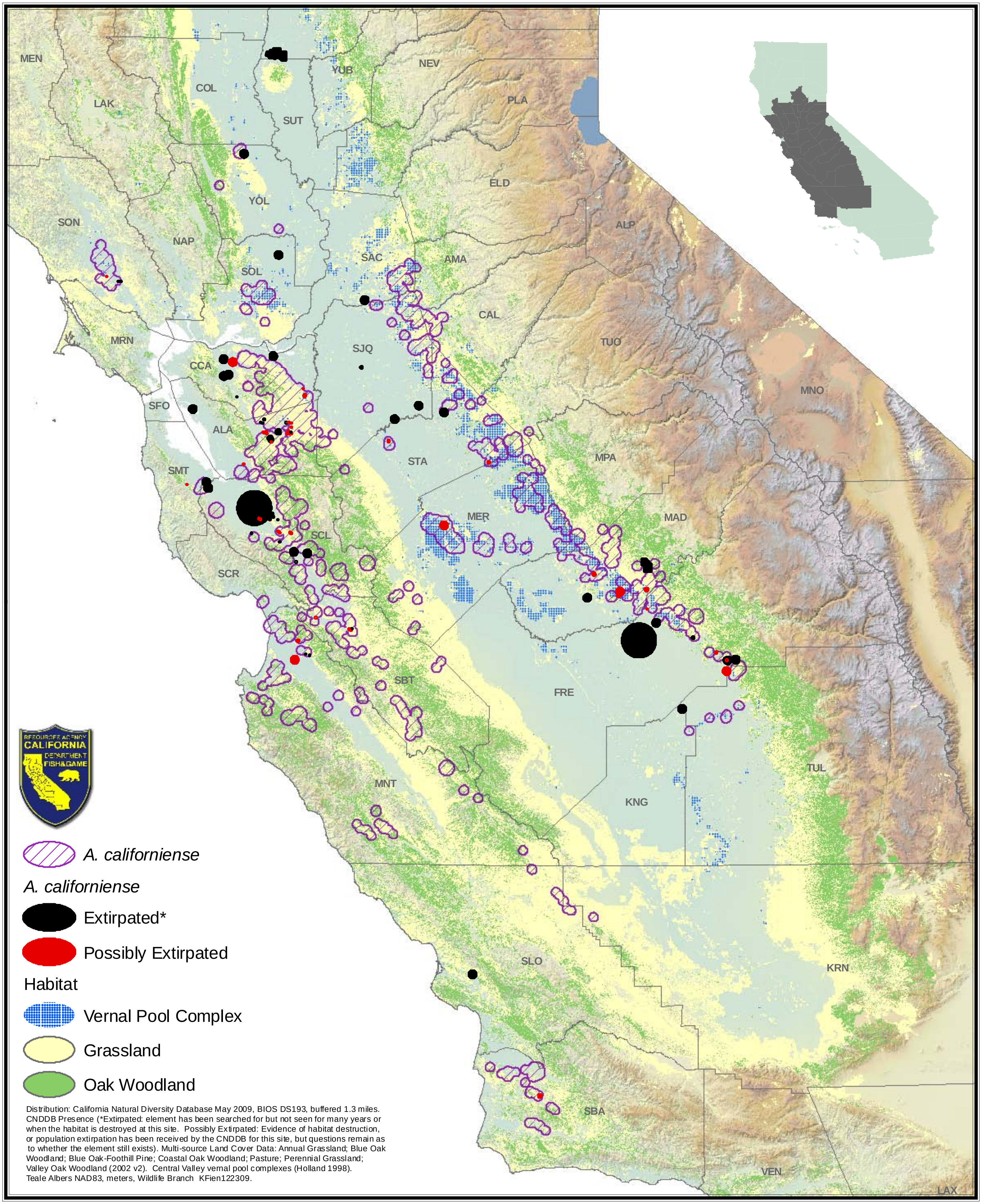

Figure 6. Extirpated populations of California tiger salamander *(Ambystoma californiense)* with known distribution and remaining potential habitat.

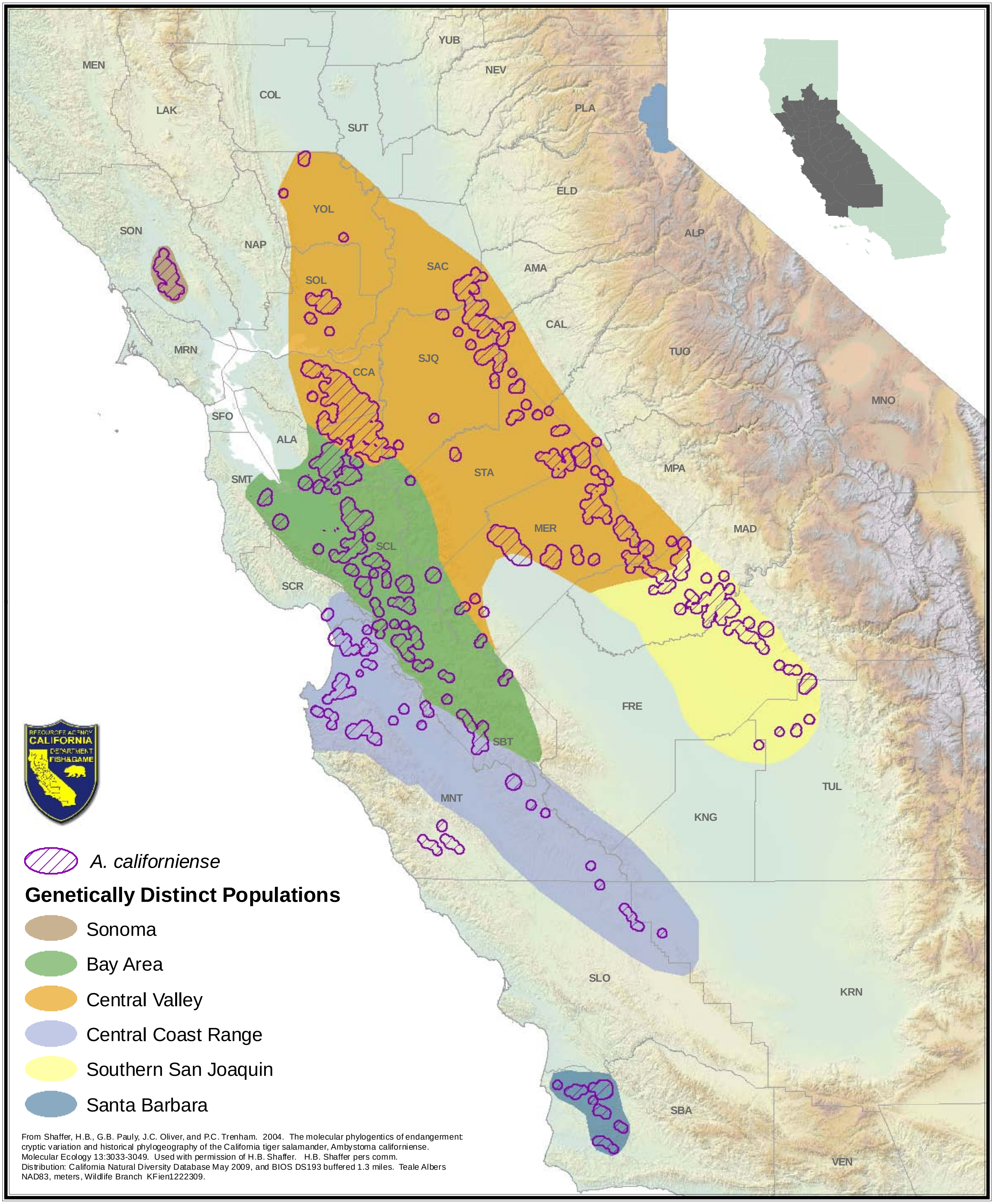

Figure 7. Genetically distinct California tiger salamanders *(Ambystoma californiense)* populations.

Figure 8. California tiger salamander (*Ambystoma californiense*) eggs (photo by Michael Van Hattem).

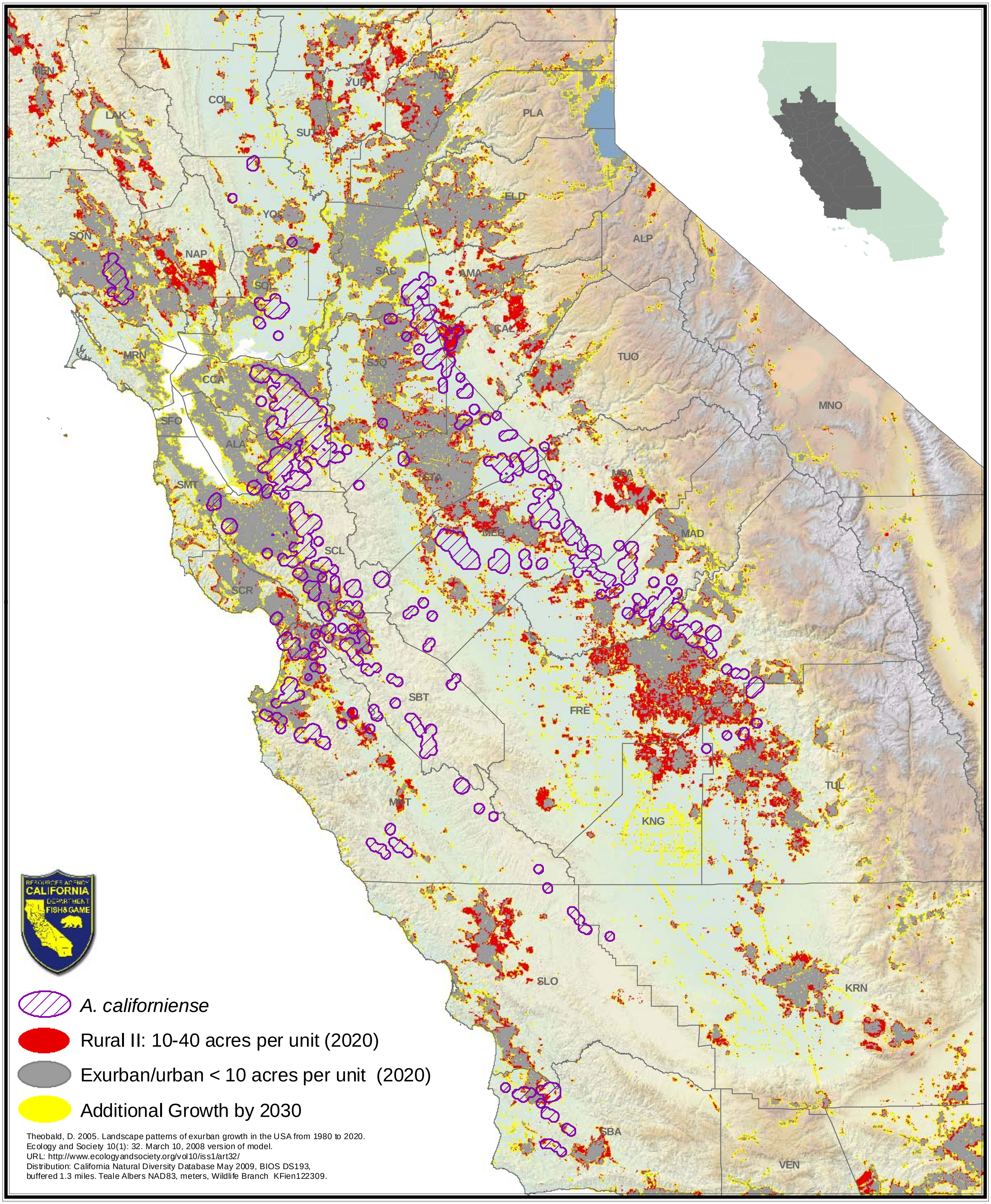

Figure 9. Known distribution of California tiger salamander *(Ambystoma californiense)* and estimated extent of urban/exurban growth by 2020 and 2030.

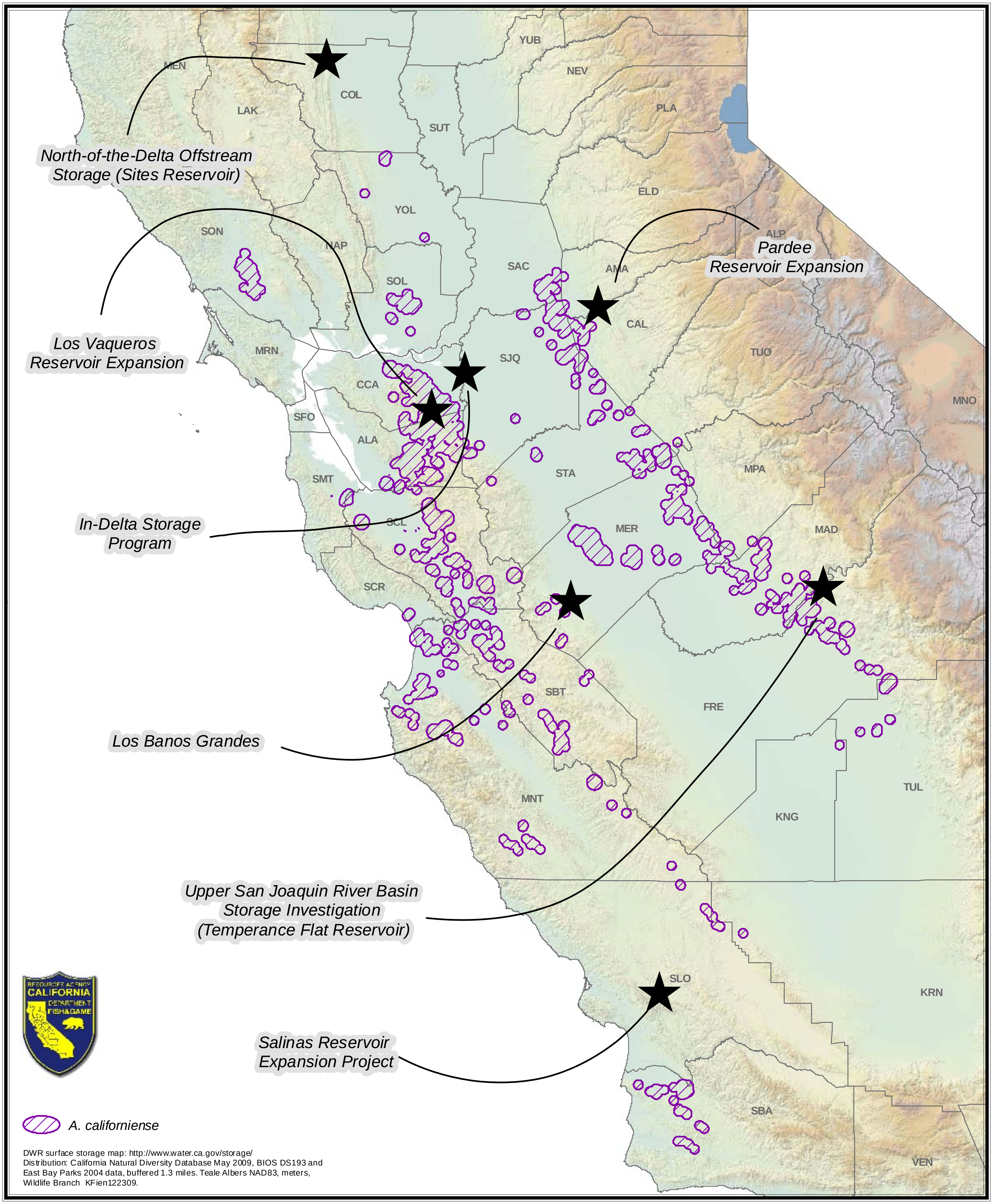

Figure 10. Proposed water storage projects relative to the known distribution of California tiger salamander ***(Ambystoma californiense)*****.**

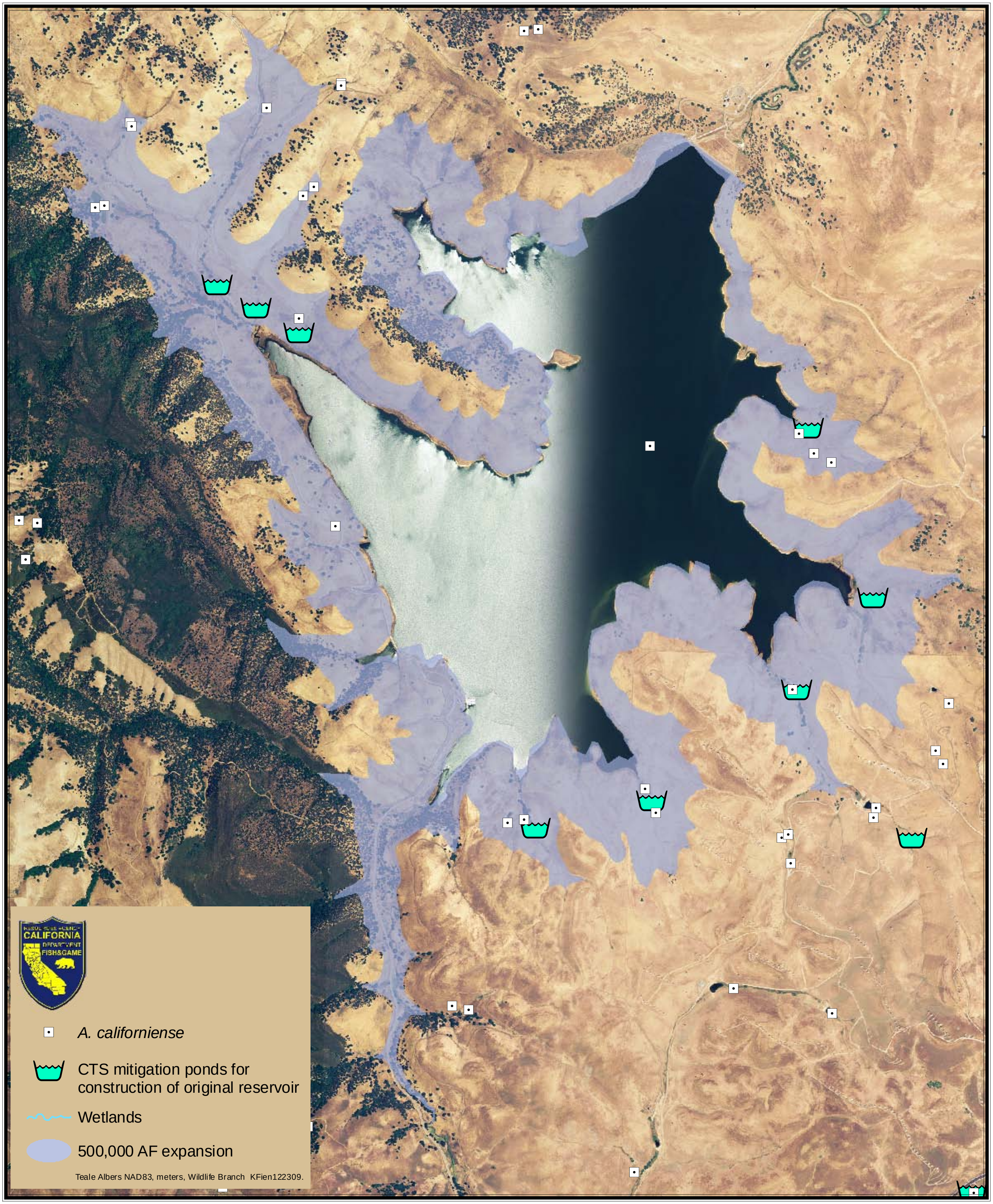

Figure 11. Locations of California tiger salamanders ***(Ambystoma californiense)*** **and mitigation ponds relative to proposed expansion of Los Vaqueros Reservoir.**

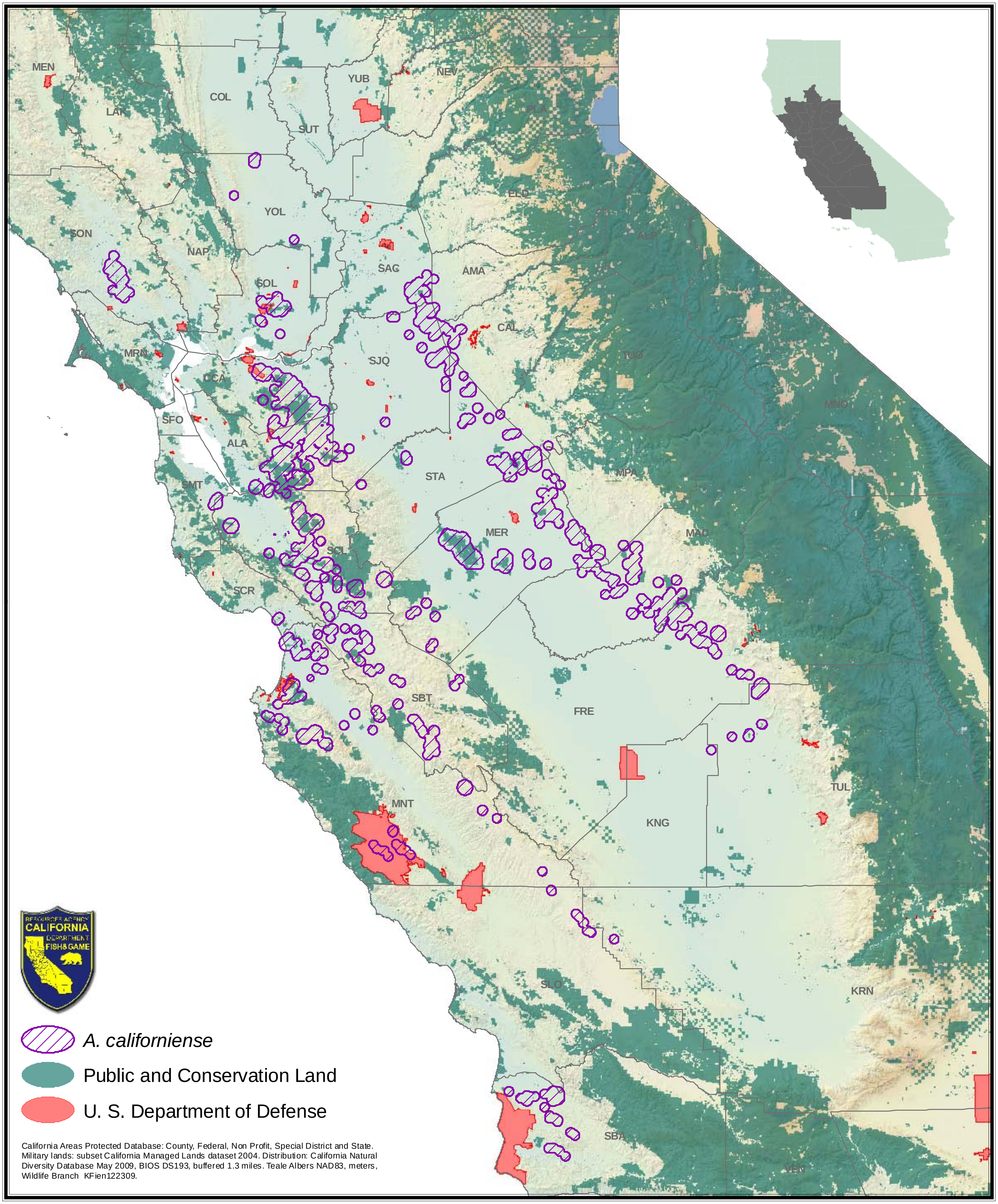

Figure 12. Known distribution of California tiger salamander *(Ambystoma californiense)* relative to public and conservation lands.

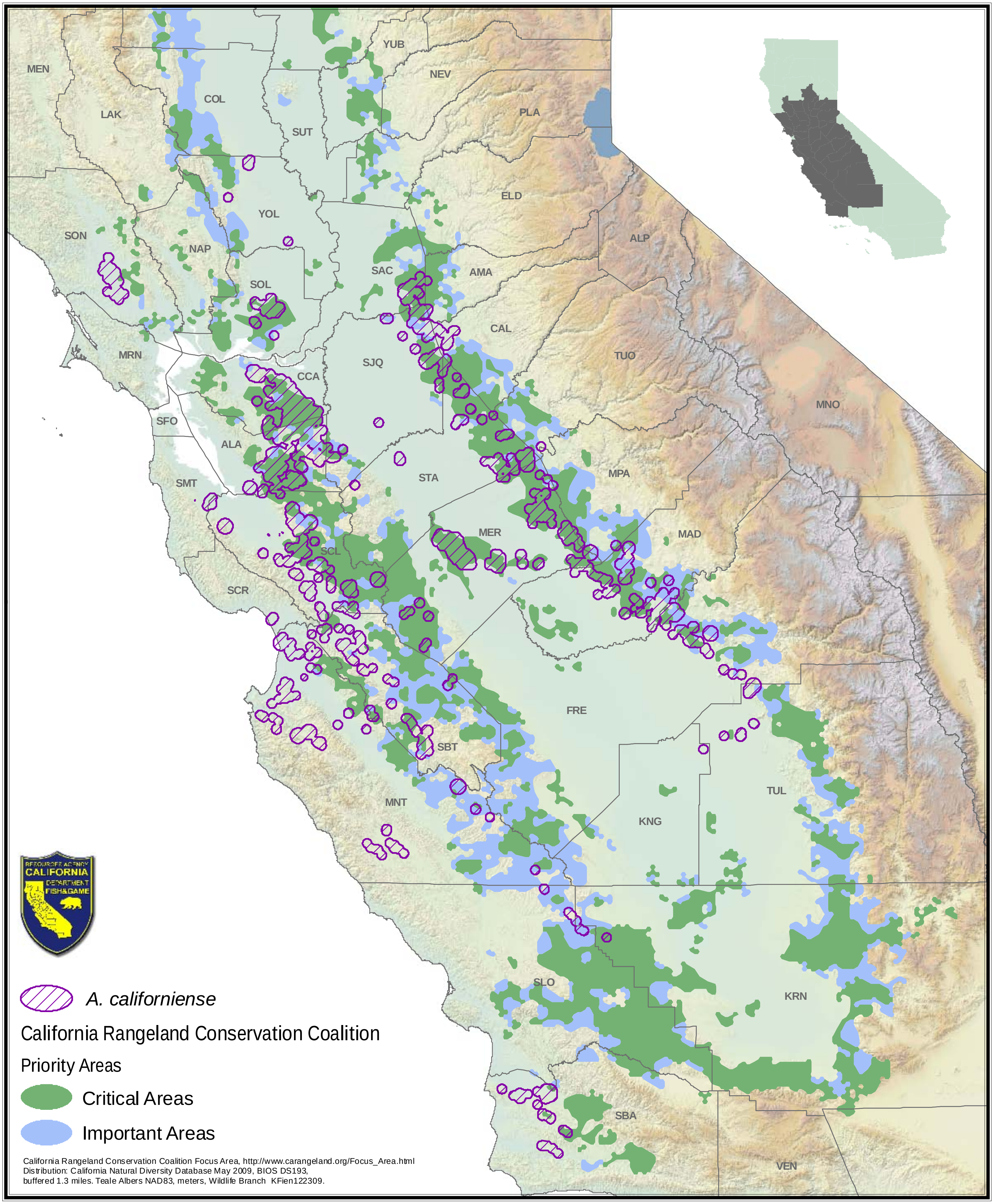

Figure 13. Known distribution of California tiger salamander *(Ambystoma californiense)* and California Rangeland Conservation Coalition Focus Areas.

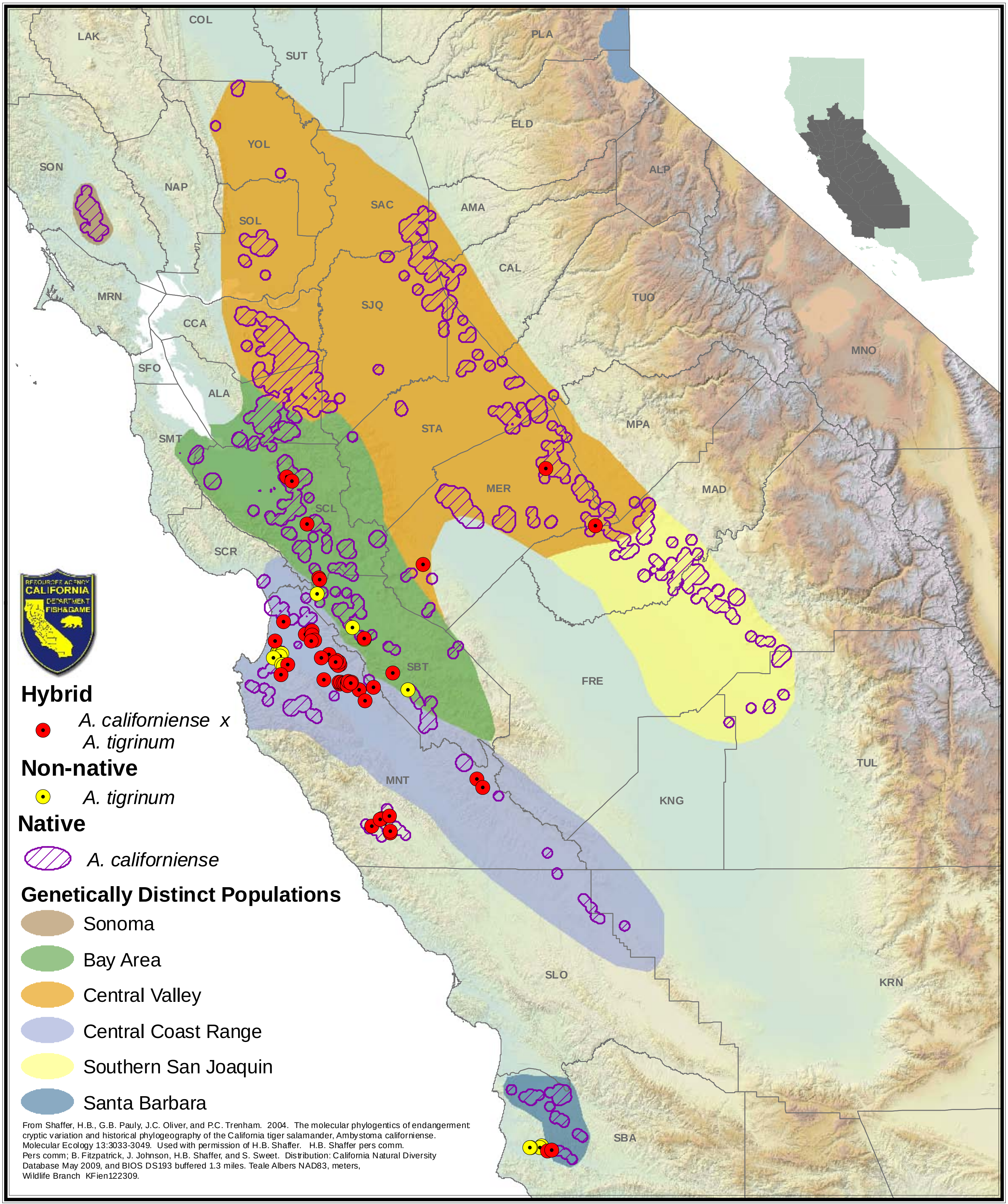

Figure 14. Locations of California tiger salamanders *(Ambystoma californiense)* (CTS), non-native, hybrid salamanders *(A. californiense x A. tigrinum)*, and genetically distinct CTS populations.

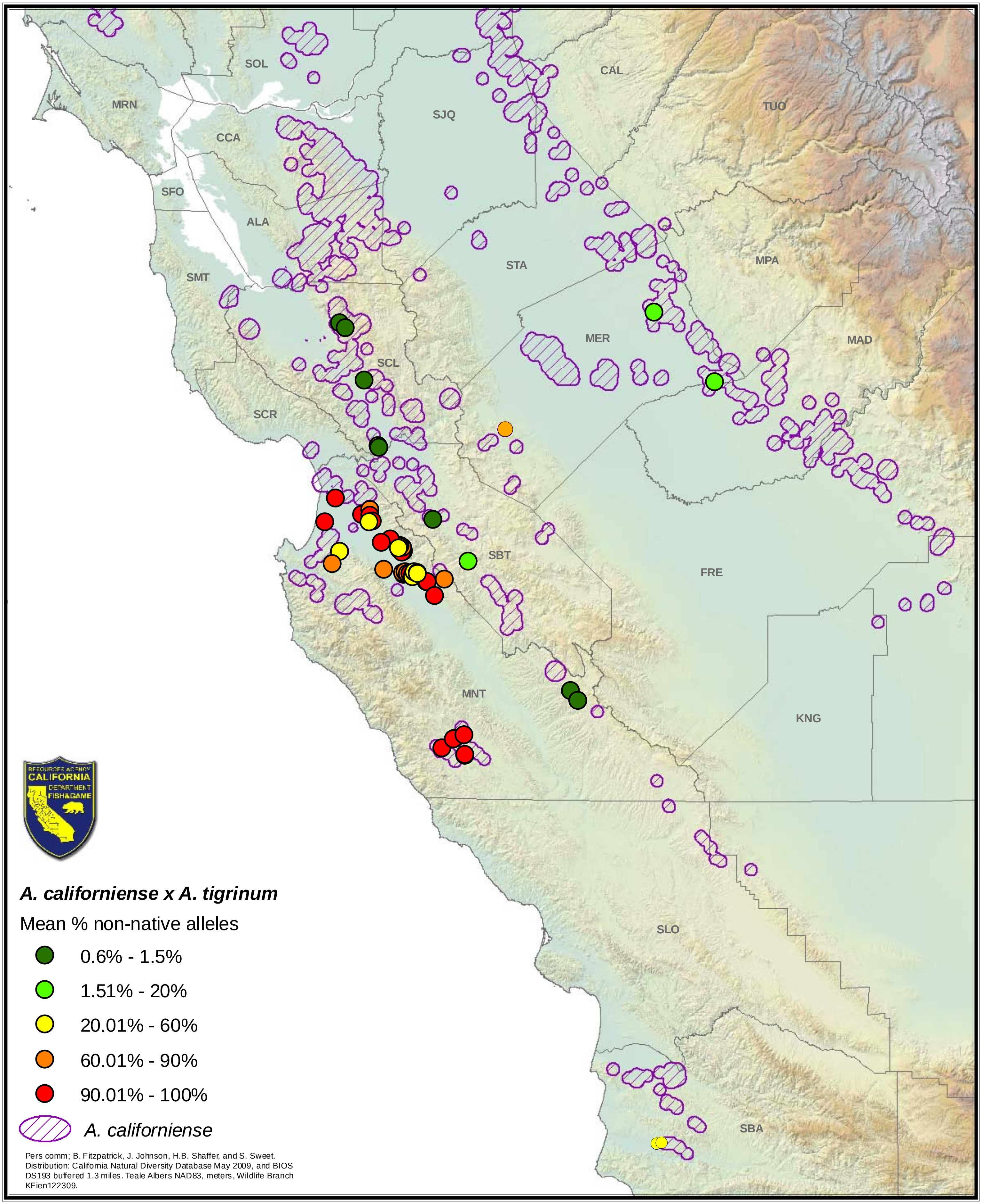

Figure 15. Locations of California tiger salamanders *(Ambystoma californiense)* and percent hybridization with *(A. californiense X A. tigrinum)*.

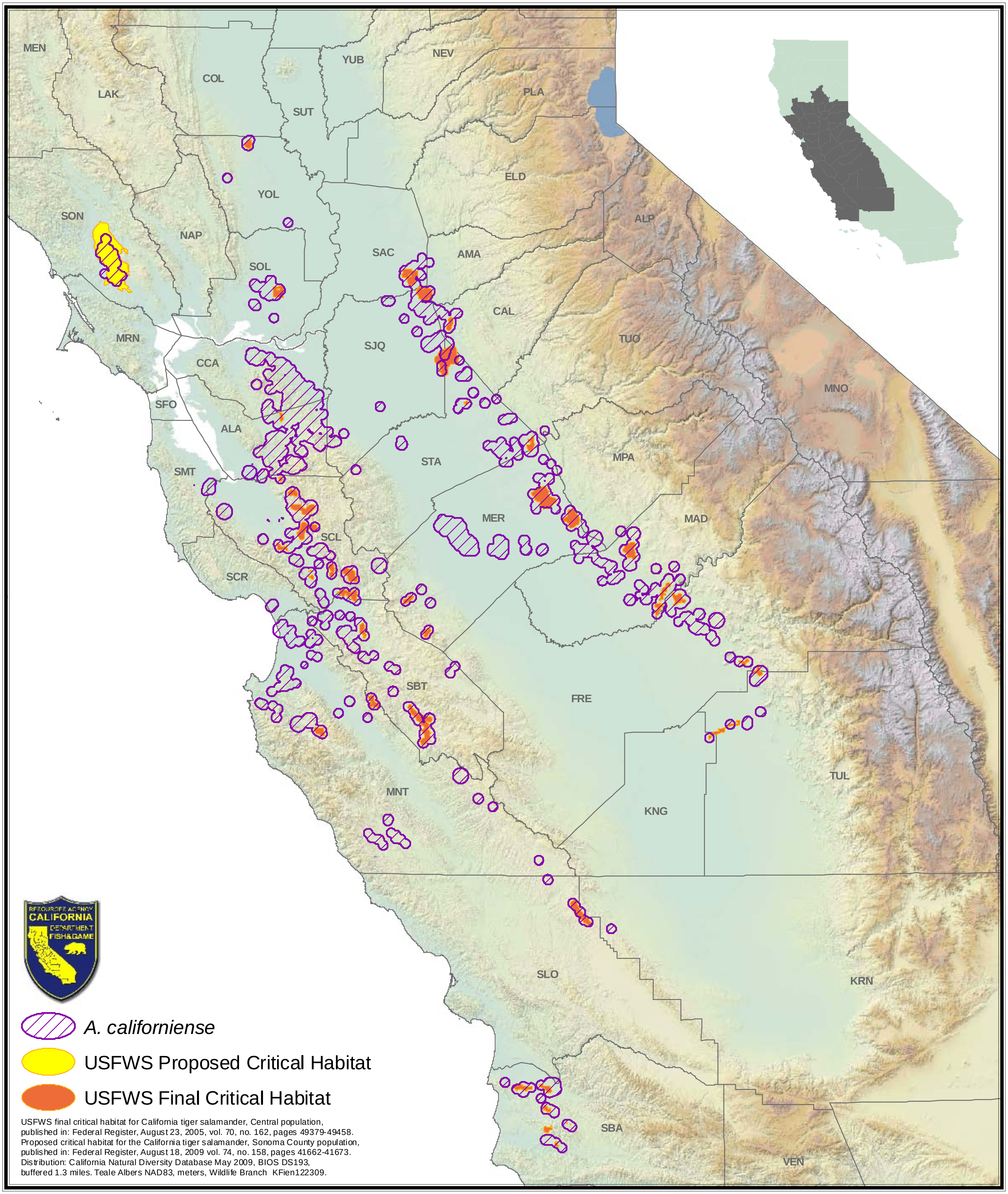

Figure 16. Known distribution of California tiger salamander *(Ambystoma californiense)* and U.S. Fish and Wildlife Service designated Critical Habitat (74,223 acres of critical habitat in Sonoma County proposed in August 2009).

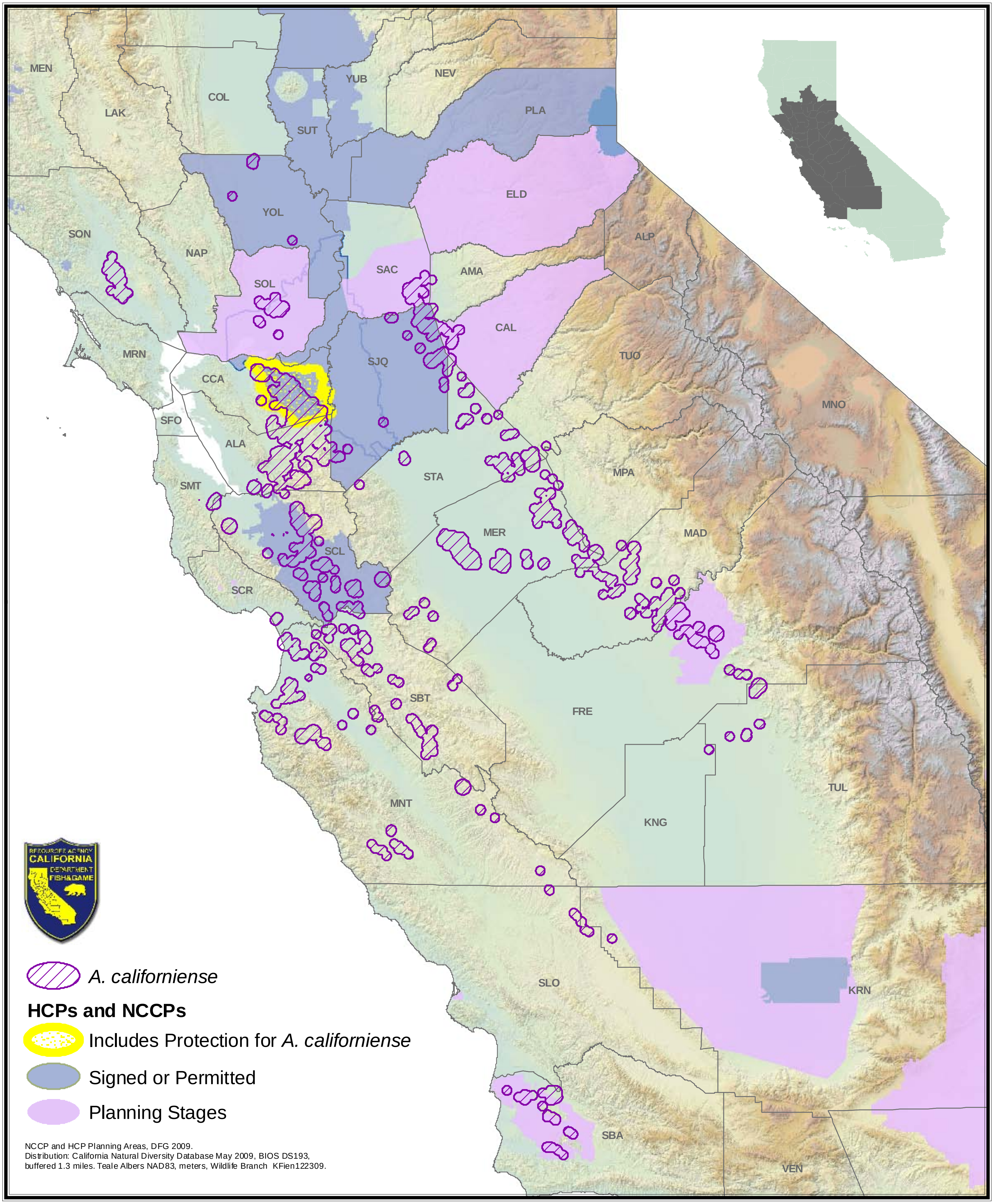

Figure 17. Known distribution of California tiger salamander *(Ambystoma californiense)* and Natural Community Conservation Plan and Habitat Conservation Plan coverage areas.

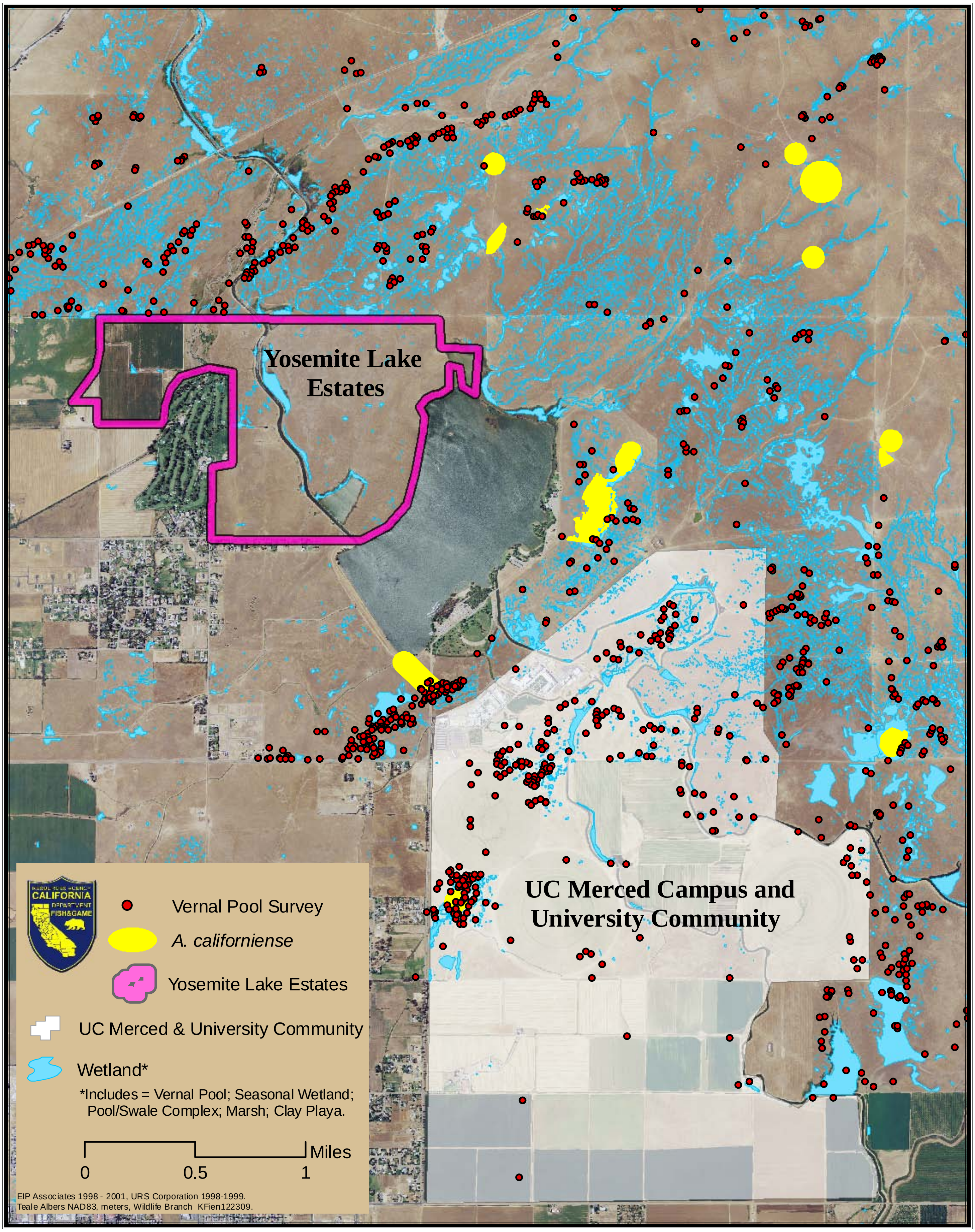

Figure 18. Example of an apparently unsurveyed development project likely containing California tiger salamander *(Ambystoma californiense)* habitat (Merced County).

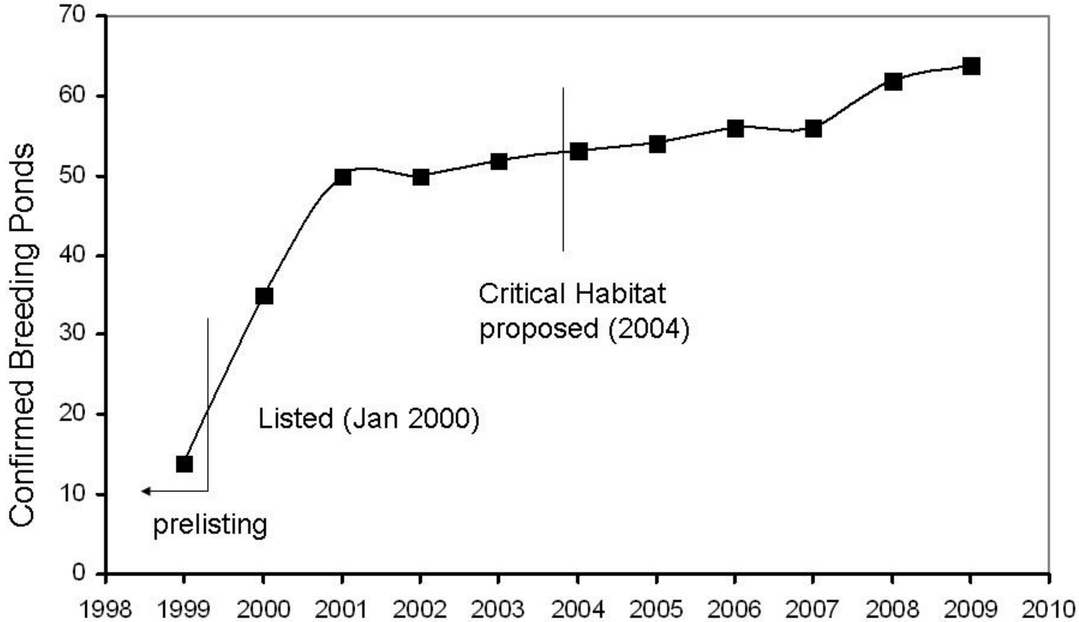

Figure 19. Number of known California tiger salamander localities pre- and post-Federal listing in Santa Barbara County (courtesy S. Sweet).

Appendix 1. Press Release for California Tiger Salamander Status Evaluation.

From: DFG News
To: DFG News
Date:
Subject: DFG Seeking Public Comment Regarding Proposed Listing of the California Tiger Salamander

Department of Fish and Game

NEWS RELEASE FOR IMMEDIATE RELEASE May 18, 2009

Contact: Betsy Bolster, Wildlife Branch, bbolster@dfg.ca.gov
Jordan Traverso, Office of Communications, (916) 654-9937

DFG Seeking Public Comment Regarding Proposed Listing of the California Tiger Salamander

The California Department of Fish and Game (Department) is seeking public comment on a proposal to add the California tiger salamander (*Ambystoma californiense*) to California's endangered species list. A listing petition was submitted to the Fish and Game Commission (Commission) by the Center for Biological Diversity, Environmental Defense Center, Defenders of Wildlife, Sierra Club Sonoma Group, Citizens for a Sustainable Cotati, VernalPools.org, Citizens' Committee to Complete the Refuge, Butte Environmental Center, and Ohlone Audubon Society.

The Department is seeking scientific data or comments about the California tiger salamander in the following areas: taxonomic status, ecology, biology, life history, management recommendations, distribution, abundance, threats and habitat that may be essential for the species, or other factors related to the status of the species.

All comments or other information must be submitted in writing by **July 1, 2009** to the following addresses:

Wildlife Branch – Nongame Wildlife Program
California Department of Fish and Game
Attn: Betsy Bolster
1812 9th Street
Sacramento, CA 95811

Responses received by the due date will be considered and the results included in the Department's status evaluation report to the Commission. The Department's report will make a recommendation to the Commission whether or not to list the California tiger salamander as an endangered or threatened species under the California Endangered Species Act. Following receipt of the Department's report, the Commission will allow a 30-day public comment period prior to taking any action on the Department's recommendation. The Department's status evaluation must be received by the FGC for consideration at or before the February 2010 Commission meeting.

All populations of the California tiger salamander are currently listed under the Federal Endangered Species Act. Populations of CTS Santa Barbara and Sonoma counties are listed as endangered, and the Central California population is listed as threatened. A special rule, exempting existing routine ranching activities, accompanies the Federal listing. The U.S. Fish and Wildlife Service cites past habitat loss, alteration, and degradation, along with projected future losses and further degradation, as the primary factor for listing the salamander. A number of non-native species also adversely affect the presence or abundance of California tiger salamander, especially bullfrogs, mosquitofish, and other non-native fishes. The larvae (gilled aquatic stage) of non-native tiger salamanders, formerly imported for use as fishing bait, were illegally established in ponds and are now hybridizing with their California cousins. It is now illegal to use salamanders as bait in California, and transport or possession of any salamander in the genus *Ambystoma* is illegal without a special permit from the Department.

The Department's evaluation will include current threats to this species and the effectiveness of present regulatory actions in place.

###

Appendix 2. GIS data processing summary for California tiger salamander (November 2009, K. Fien)

DISTRIBUTION:
Known distribution consists of California tiger salamander data documented in the California Natural Diversity Database, CNDDB (June 10, 2009), and BIOS dataset 193: Tuolumne Aquatic Resources Relational Inventory (TARRI) from the Biogeographic Information and Observation System, BIOS. Locality data were buffered 1.3 miles to create an area of known distribution.

Total area **1, 813, 231 acres**

HABITAT:
Two different datasets were used to calculate habitat. Multi-source Land Cover Data: fveg (2002 v2) from California Department of Forestry and Fire Protection was the primary data source. California Department of Water Resources Land Use data were used to identify orchard and vineyard lands that were simplified into agriculture lands under the fveg dataset.

Fveg is a raster dataset 100m grid, while DWR data are in vector or polygon format.

FVEG total acreage of habitat 1, 279,048 acres

Type	Considered Habitat	Acreage
Annual Grassland	YES	982,868
Blue Oak Woodland	YES	100,994
Blue Oak-Foothill Pine	YES	27,330
Coastal Oak Woodland	YES	104,360
Coastal Scrub	YES	33,236
Freshwater Emergent Wetland	YES	12,200
Lacustrine	YES	675
Pasture	YES	801
Perennial Grassland	YES	259
Ponderosa Pine	YES	22
Valley Oak Woodland	YES	16,304
	Total	**1,279,048**
Urban as fveg defines	NO	125,057
Agriculture	NO	284,385
Alkali Desert Scrub	NO	5
Barren	NO	2,259
Chamise-Redshank Chaparral	NO	23,534
Closed-Cone Pine-Cypress	NO	128
Desert Wash	NO	7
Estuarine	NO	49
Eucalyptus	NO	956
Marine	NO	5
Mixed Chaparral	NO	11,634
Montane Hardwood	NO	16,378
Montane Hardwood-Conifer	NO	2,330
Montane Riparian	NO	158
Redwood	NO	1,030
Riverine	NO	146

Saline Emergent Wetland	NO	2,352
Unknown Conifer Type	NO	6,741
Unknown Shrub Type	NO	32,094
Valley Foothill Riparian	NO	5,241
Water	NO	23,354
Wet Meadow	NO	47
	Total	**537,892**

DWR
Data collected by county most recent version available was used: Alameda 2006, Stanislaus 2004, Merced 2002, San Benito 2002, Madera 2001, Calaveras 2000, Fresno 2000, Sacramento 2000, Sonoma 1999, Tulare 1999, Monterey 1997, Yolo 1997, San Joaquin 1996, San Luis Obispo 1996, and Santa Barbara 1996.

Total acreage calculated within CTS known distribution:

Orchard	59,990
Vineyard	28,733
Total	**88,723 acres**

GROWTH:
Theobald, D. 2005. Landscape patterns of exurban growth in the USA from 1980 to 2020. *Ecology and Society* **10**(1): 32. [online] URL: http://www.ecologyandsociety.org/vol10/iss1/art32/

Dataset description:
Category Code Description

Rural I (data not considered)		Exurban/urban	
0	Undeveloped private	7	1.7-10 acres per unit
1	1 >80 acres / unit	8	0.6-1.7 acres per unit
2	50-80 acres per unit	9	<0.6 acres per unit
3	40-50 acres per unit	Urban/built-up	
Rural II		10	(commercial / Industrial / transportation -- but few to no housing units!)
4	30-40 acres per unit		
5	20-30 acres per unit		
6	10-20 acres per unit		

GROWTH	YEAR	STATEWIDE NUMBERS	WITHIN CTS DISTRIBUTION
Rural II, Exurban/urban and Urban/built-up	2010	**11,843,504**	**342,905**
Rural II	2010	4,039,962	125,386
Exurban/urban	2010	7,035,652	196,241
Urban/built-up	2010	767,890	21,278
Rural II, Exurban/urban and Urban/built-up	2020	**13,187,120**	**388,243**
Rural II	2020	3,203,137	91,201
Exurban/urban	2020	9,217,064	275,811
Urban/built-up	2020	766,919	21,231
Rural II, Exurban/urban and Urban/built-up	2030	**14,167,391**	**423,789**
Rural II	2030	2,363,600	65,268
Exurban/urban	2030	11,035,996	337,298
Urban/built-up	2030	767,796	21,224

USFWS CRITICAL HABITAT:
Includes, Central Valley, Sonoma and Santa Barbara critical habitat areas that are within the CTS known distribution
Calculated **371, 631 acres**

RANGELAND COALITION PRIORITY AREAS:
TNC Ranchland Coalition Project
http://www.carangeland.org/Files%20to%20Link/Focus%20Area/Rangeland%20Coalition%20Focus%20Area.pdf

Calculated area within the CTS known distribution located within the Critical and Important Areas.

	Priority areas within known distribution (acres)	Priority areas within known distribution and considered CTS habitat (acres)	Percentage of Priority Area considered CTS habitat
Critical Areas (Priority 1)	799,212	658,580	82%
Important Areas (Priority 2)	196,368	170,713	87%
Total	995,580	829,293	83%

PUBLIC LAND:
Green Info Dataset, Public and Conservation lands: Categories State, Special District, Non Profit, Joint, Federal and County categories included: Selected by location with CTS known distribution, and then clipped selected records by known distribution.

Military Lands DOD owned: (areas within CTS known distribution: CAMP PARKS MILITARY RESERVATION, CONCORD NAVAL WEAPONS STATION, FORT ORD MILITARY RESERVATION, HUNTER LIGGETT MILITARY RESERVATION, and TRAVIS AIR FORCE BASE.

Public Land	231, 678.67 acres
Military	77,708.61acres
Total Public	309, 387acres

Appendix 3. Public Comments on California Tiger Salamander Status Evaluation.

Wildlife Branch - Nongame Wildlife Program
California Department of Fish and Game
Attn: Betsy Bolster
1812 9th Street
Sacramento, CA 95811

David Cook - Herpetologist
3003 Magowan Drive
Santa Rosa, CA 95405
salamanderdave@sbcglobal.net

Comments on the Proposed Rule to List the California Tiger Salamander Under CESA

This letter is in regards to a proposal to add the California tiger salamander (CTS; *Ambystoma californiense*) to California's endangered species list under the California Endangered Species Act (CESA). Public comments are due by July 1, 2009. I have been conducting research for several years on the conservation and population ecology of CTS, mainly in Sonoma County. Hence, I will focus my comments on the isolated Sonoma County population. Research documents referenced in this letter have been previously emailed to Betsy Bolster.

Overall, I support the listing of CTS state-wide to prevent extinction. The magnitude and intensity of the endangerment to CTS are very severe and protection was warranted over a decade ago. My research indicates that agricultural and urban development continues to endanger the salamander in Sonoma County due to habitat loss and alteration, although the recent economic downturn has slowed the loss of habitat. Also, all of the threats discussed in the federal ESA listing rule in 2003 still persist for CTS indicating that endangered status is necessary. Below are summaries of conservation concerns and declines of this species.

CTS Range in Sonoma County

The historic range of CTS included the Santa Rosa Plain and Petaluma lowlands, an area of approximately 100,000 acres. The current range appears restricted to approximately 18,000-20,000 acres in the areas of west Santa Rosa, west Rohnert Park, west and south Cotati, and north Petaluma. This estimate is based on the range shown on Figure 1, which is from the 2001 federal listing petition and more recent observations. Based on my observations, only a fraction of the current CTS range contains suitable habitat.

Although the potential range of CTS includes the Santa Rosa Plain from Windsor south to the Petaluma lowlands (based on USFWS potential range map), little has changed in the known range of CTS breeding sites since the federal petition to list the species in 2001. Except for small changes, the 2001 range remains an accurate depiction of the current distribution of known CTS breeding sites. Since 2001, breeding pools have been found on the border of the range at the north end of Duer Road (west Santa Rosa). Also, breeding pools have been found near Roblar Road southwest of the known range of CTS, and near Hunter Lane southeast of Santa Rosa. The later is based on a verified photograph of a salamander and has been submitted to the CNDDB.

Local Declines
The distribution of CTS appears to have decreased primarily in two areas since recent times. Salamander observations in the Santa Rosa Air Center area (southwest Santa Rosa) have decreased since surveys conducted in the early 1990s (Chuck Brown pers. com.). This area has been the stronghold for CTS. Also, CTS have declined significantly in the south Cotati area where they were once commonly observed in the late 1980s to early 1990s (CNDDB; D. Cook unpublished data; John O'Keefe pers. com.; Al Wolf pers. com.; and Jon Seifer pers. com.).

Threats
There are several threats that are particularly severe to Sonoma County CTS that contribute to their endangerment. CTS are restricted to a small area located next to the primary urban center for the county, which is rapidly expanding. Livestock grazing is, in general, compatible with CTS habitat. However, much of the rangeland on the Santa Rosa Plain is under threat from vineyard conversion, which eliminates CTS breeding and terrestrial habitat. Ditch maintenance along rural roads threaten breeding habitat, which in some areas are the only known breeding sites. Rural road improvements that include curbs and storm drains obstruct salamander migration and cause mortality. The large increase in traffic from rapid urbanization in the historic range of CTS has likely increased mortalities from vehicle collisions (see below).

Population Ecology Studies
I have conducted CTS larval surveys for 10 years at approximately 100 vernal pools located on over 8 preserves on the Santa Rosa Plain (Stokes et al. 2007. Sonoma California Tiger Salamander Population and Ecology and Preserve Management: An Eight-Year Study. FWS Agreement No.: 814206J158; Cook unpublished data). Salamander activity and numbers appear to naturally fluctuate due to annual weather conditions. However, no preserve independently supports a viable population of CTS. These preserves are all too small and lack adequate buffer zones around most breeding pools, several preserves are increasingly isolated by surrounding development, several have had recent ground disturbance that degrades habitat, and exotic predators occur at most preserves. The Southwest Park CTS breeding pool is isolated, has been hydrologically impaired, and less than 10% of the surrounding uplands remain due to residential and other development. Although annual breeding does persist, larval survival and recruitment is very low. This breeding population is nearing extinction.

Road Mortality
I have been conducting evening road surveys for migrating CTS since 1999 and have documented CTS road mortality annually during the winter migration season. Mortality has likely increased in recent years due to increased commuter traffic from urbanization of the county. CTS have been found on over 16 roadways located from Santa Rosa to northern Petaluma. A total of 261 CTS have been found on roads, in which 164 (63%) were found dead by vehicle collisions. The highest mortality concentration is along a 1200-foot-length of Stony Point Road. From 2000-2007 at total of 125 dead CTS have been found on Stony Point Road out of 197 observations. Obviously, this mortality severely impacts the adult breeders, which are essential to maintain a viable population. I estimate that about 5-20% of the breeding adults are killed at this site annually. Many road mortalities likely go undocumented.

Thank you for the opportunity to comment. This letter was submitted by email to tsalamanderdata@dfg.ca.gov.

Sincerely,

David Cook

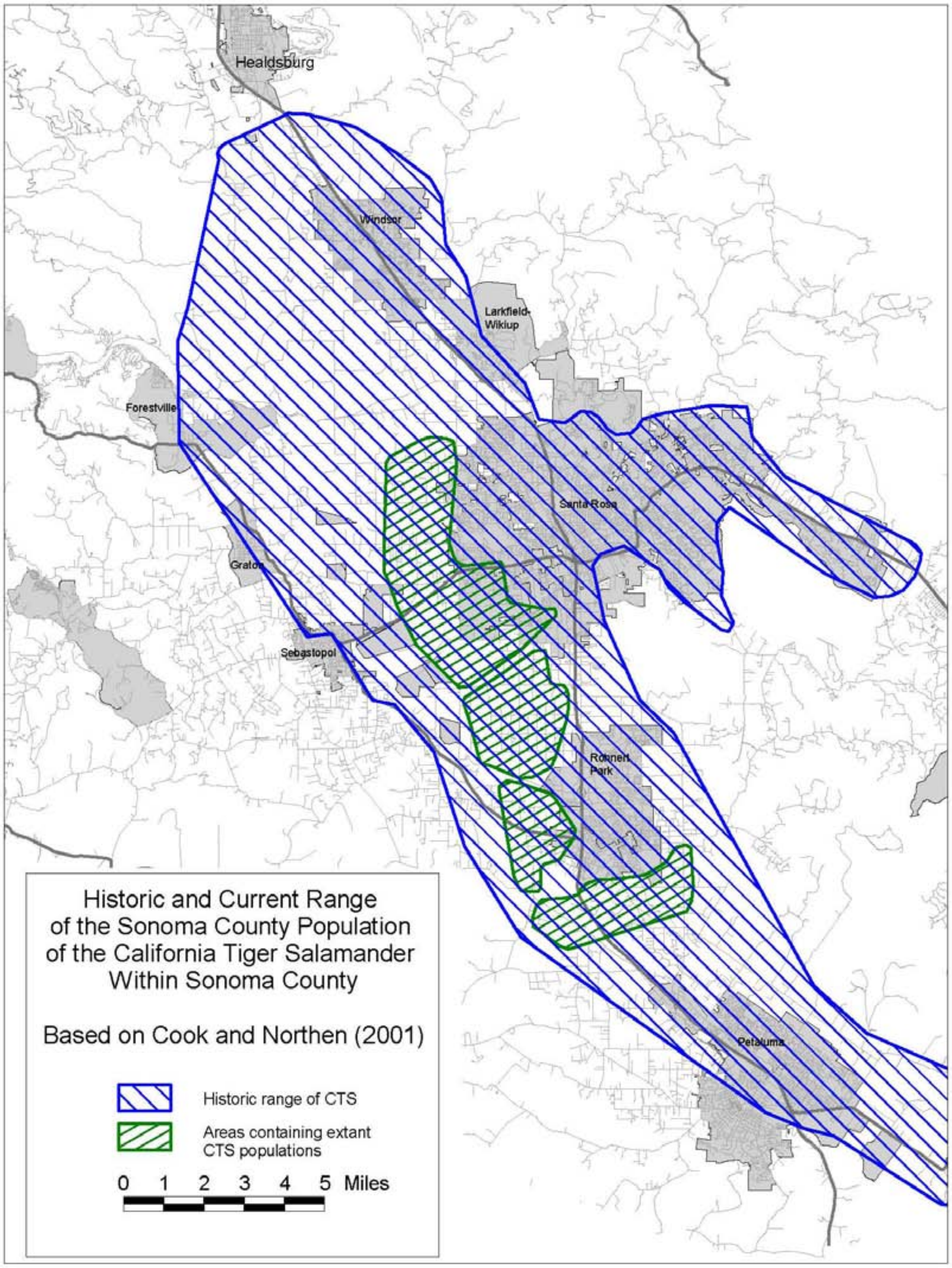

Figure 1: Historic and current range of CTS in Sonoma County based on 2001 data.

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July 1, 2009

VIA EMAIL TO TSALAMANDERDATA@DFG.CA.GOV

Wildlife Branch – Nongame Wildlife Program
California Department of Fish and Game
Attn: Betsy Bolster
1812 9th Street
Sacramento, CA 95811

RE: Public Comment on Proposal to Add the California Tiger Salamander to California's Endangered Species List – California Tiger Salamander in Santa Barbara County

Dear Ms. Bolster:

This letter responds to your Department's proposal to list the California Tiger Salamander ("CTS") as endangered under the California Endangered Species Act. We are writing on behalf of farmers, ranchers and other landowners directly affected by this proposed listing. The landowners that we represent, long diligent stewards of the habitat upon which the CTS rely, oppose the proposed listing.

The Proposed Listing Is Premature and Should Not Be Considered until after the U.S. Fish & Wildlife Service Has Updated Its CTS Habitat Data Base and Map

The proposal is premature because the U.S. Fish & Wildlife Service ("Service") is in the process of gathering updated information from permit holders authorized by the Service to study and survey CTS. That information is expected to culminate in an updated map of known and potential breeding pools in or about August 2009. This updated information is vital to any determination of listing status for CTS.

CTS and Agriculture Have Co-existed in Santa Barbara County for Generations and Modern Farmers and Ranchers Provide CTS-Friendly Habitat

The CTS is a large, stocky, terrestrial salamander that inhabits vernal pools, seasonal ponds, slow moving waters and associated uplands. No one knows for certain what types of upland habitat provides potential habitat for the CTS. This issue continues to be studied.

In Santa Barbara County, the CTS breeding pools studied to date occur almost entirely on private land. It is unknown whether CTS also occur on the thousands of acres of publicly owned lands in Santa Barbara County because no one has conducted a comprehensive survey to make such a determination. The reservoirs, vernal pools and slow moving waters identified to date as breeding ponds for CTS are surrounded by prime agricultural land, which supports farming and ranching. Santa Barbara County is primarily an agricultural community with more than 90% of the private land in the

County zoned for agriculture. The total value of the County's agricultural products exceed $625 million dollars a year. Farmers and ranchers in Santa Barbara County are dedicated to protecting agricultural land from conversion and urbanization. Many landowners have voluntarily entered Williamson Act contracts, whereby land use practices are restricted to agricultural activities. Agriculture is the lifeblood of this community and anything that disrupts the daily operations of farms and ranches affects the County as a whole.

In the first half of the 1900's, many of the lands identified as providing CTS habitat (including those with breeding ponds) were much more intensively farmed than they have been since. In fact, some of the lands identified by biologists as having been recently converted from grazing to cultivation, or threatened with such conversion, were tilled with annual crops during the first half of the twentieth century. Notwithstanding this fact, biologists contend that the CTS survived and co-existed with this historic intensive farming and supposedly began their decline during the period that the less intensive operations of livestock grazing gradually supplanted the farming operations. This, of course, makes no logical sense and casts significant doubt upon the assumption that the CTS, at least in Santa Barbara County, is or has been in decline.

Grazing operations involve little or no earth disturbance, provide hundreds of thousands of acres of rodent burrows utilized by CTS, and often include seasonal stock ponds created and/or maintained by the cattle operator for watering the livestock. These same ponds, because they are filled by rain water runoff and gradually dry up, replicating natural vernal pools, provide CTS breeding habitat not otherwise available in the absence of the cattle operator's maintenance activities. Earthen dams or berms would be breached if not routinely maintained.

Prior to the past fifty (50) years, most lands in the Santa Rita Valley, Santa Maria Valley, and Los Alamos Valley were dry farmed or used for grazing and dry farming. Few had reservoirs because of the unavailability of power to extract the ground water and store it on the surface. Recent farming and grazing practices have expanded the number of reservoirs and stock ponds that provide potential breeding habitat for CTS. In short, the proposal to permanently list the CTS as Endangered in Santa Barbara County lacks foundation because there is no substantial evidence that the species and its habitat is declining from historic levels. Instead, the surveys that have occurred since the CTS was listed as Threatened under the Federal Endangered Species Act reveal over eight (8) times as many known breeding locations as were identified at the time of that listing.

Except for a brief period of vineyard plantings that occurred during the late 1990's, conversion of grazing land to cultivated agriculture in Santa Barbara County has been minor. Where CTS breeding pools are known to exist on land proposed for cultivation, conversion either has not occurred or the owners have worked with the Service to establish mitigation measures and these habitat areas have been preserved. No one has conducted a comprehensive study of the impact of vineyards upon CTS habitat once the vineyards have been planted. Santa Barbara County vintners, for the most part, use cultivation practices that are compatible with CTS. They use natural predators such as owls and hawks for their gopher and ground squirrel populations so these rodent populations remain stable with plenty of burrows suitable for CTS use. Ground cover has replaced the old method of tilling between rows for weed control. Where known or potential CTS ponds are located near a vineyard, the vineyard blocks are set back from the ponds and runoff water is directed away from the ponds. In short, Santa Barbara County vineyard operators are conscious of the need to preserve CTS should they live in or adjacent to their vineyards.

We submit that the assumption of population and/or habitat decline upon which the listing proposal is based is faulty and unsubstantiated in the agricultural lands of Santa Barbara County.

The Assumptions Regarding Frequency of Breeding by Adult Females Lack Substantial Basis

The Department Evaluation concludes that adult females breed only once every five years and perhaps only once in a lifetime. This conclusion is based upon limited data, gathered from one study of one pond. Because California has been suffering from a prolonged drought and, even before the drought, had years of moderate rainfall, it should be recognized that weather has affected the study results. Observers of CTS in Santa Barbara County, particularly the landowners who host CTS breeding pools, notice that CTS breed heavily, year after year, in their pools during periods of high rainfall, particularly El Nino events. Because California experiences wet and dry cycles, CTS breeding studies that do not extend through several wet and dry cycles are fundamentally flawed, simply because they do not include enough data gathered during wet cycles. The females that don't breed during the drought (for obvious reasons given their dependence upon vernal pools that hold water long enough for the young to metamorphose) likely breed year after year during an El Nino period when the ponds are filled and stay full for many months. CTS has evolved in an environment where short rainfall years historically occur consecutively. It would be wasteful and risky for breeding adults to emerge from their protective burrows, migrate to a distant pond while dodging predators, then breed in a pond that has little water and little chance of the young surviving long enough to metamorphose.

In short, a listing decision should not be based upon incomplete data that doesn't include ample study of CTS breeding behavior during wet cycles.

Before Making a Decision on the Proposed Listing, We Propose that Your Department First Should Contact the Property Owners Whose Private Lands Host the Known and Potential CTS Breeding Locations and Upland Habitat about Voluntary Preservation Measures

Conservation easements have become an increasingly popular method in Santa Barbara County for preserving the long-term viability of agricultural land, particularly grazing lands. As present owners age, they look for ways to ensure that their heirs will be able to retain their lands in agriculture after the parents' deaths. Income tax benefits from the donation or partial sale/partial donation of conservation easements further entice owners to participate in creating these easements. Other property owners, not yet educated about the benefits of conservation easements simply may require an outreach program whereby they are contacted and encouraged to take advantage of the many benefits offered by conservation easements. For the most part, these are people who take pride in their long-time stewardship of the land, including the natural environment. They love their land and the natural resources that their grazing operations preserve. Let's be realistic -- who would continue to eke out a living from livestock grazing if they didn't love being out on the land, watching the wildlife, listening to the birds, and otherwise enjoying the natural environment on a daily basis as they work long days and nights to birth calves and foals, doctor large, stubborn cows, bulls and horses, chase down and rotate ornery bulls, gather and truck cattle to market for declining returns, travel to auctions to purchase new stock, and the thousand other tasks required at all hours of the day and night in all kinds of weather?

These are the people who, for the most part, own CTS habitat. Before concluding that these long-time caretakers of this resource will cease to do their job (or already have ceased to do so), we propose that the Department contact these landowners to determine their intentions regarding the future of this habitat. We do not propose **requiring** these folks to dedicate conservation easements, but we urge the Department to offer to provide information to these folks about the benefits of conservation easements and how easy the California Rangeland Trust can make it to create a conservation easement. This would seem to be a far more productive use of Department resources than attempting to regulate agricultural lands through a listing under the California Endangered Species Act. As set forth below, many landowners are likely to become more resistant to working with the Department if the CTS is listed as Endangered by the State.

We further submit that, by not first contacting and offering to work with affected property owners through a voluntary conservation program or a conservation easement, the Department is not consulting the best sources of information about the presence of CTS and the condition of their habitat.

The Department appears to have relied upon a limited number of "sources" to arrive at their conclusion that CTS and their habitat are declining the Santa Barbara County. Those sources are not the owners of the agricultural lands where the CTS are most likely to occur, yet these land owners are the best sources of information as to the presence or absence of CTS, the state of their habitat, and the frequency of water remaining for a sufficient period of time in potential breeding pools. Instead of assuming that property owners intend to convert potential CTS habitat to more intensive cultivation or urban development why hasn't the Department contacted individual property owners to ascertain their actual plans?

Unfortunately, by proposing this listing, the Department has heightened the level of mistrust in the agricultural community. A listing will cause these landowners to close ranks and provides an incentive for some to either cease to maintain existing breeding pools or to introduce fish into the pools. For example, one known breeding pool recently experienced a breach in the dam that held the water in the pool for the period required by CTS metamorphosis. Why should the landowner repair the breach if doing so submits his land to restrictions due to the presence of CTS? Other pools have been known to have fish in them from time to time. If encouraged to keep fish out of the pond, rather than being threatened with the repercussions to their land from a listing, most landowners will opt to keep fish out of their ponds. An education outreach program, together with the offering of the benefits of a conservation easement, will be far more beneficial to CTS than the proposed listing.

The Perceived Threats to the Santa Barbara CTS Population Are Unfounded

Your Department's Evaluation of Petition: Request of the Center for Biological Diversity Et. Al. (2004) to List California Tiger Salamander As Endangered ("Department Evaluation") states that "information about past distribution of CTS can be gleaned from historical data (e.g., museum records), however, to assess patterns of change leading to present-day distribution." (Page 11) The Department Evaluation further states that "Given the lack of both historical and current data about CTS abundance range-wide, the fact that the species spends most of its life underground, and the fact that only a fraction of individuals migrates to breed every year, existing trend studies must be used to assess the species' status.." (Page 12) The Department Evaluation also states that the USFWS determined that CTS populations and habitats have declined. (Page 13) The following pages describe population and infrastructure growth, general destruction of prairie and vernal pool habitat, habitat conversion through urbanization and intensive agriculture, and habitat fragmentation. These descriptions are inaccurate and outdated when applied to Santa Barbara County. First, population growth in Santa Barbara County has been minimal overall, with a spurt of growth in the localized Santa Maria area where the known CTS habitat is owned largely by a public agency that is both cognizant of and sensitive to the need to preserve CTS habitat. Because urban growth has been so limited in the County, there have been very few new roads, particularly in CTS locales. Except for the brief period of vineyard conversions described above, the threat of land conversion is inaccurately portrayed in the Department Evaluation. For the most part, the known CTS range in Santa Barbara County is located in rural agricultural lands largely devoted to cattle grazing.

Finally, the citation to the Service's information is many years out of date. The distribution and range of the Santa Barbara County CTS population has been greatly underestimated.

Prior to approximately 1970, biologists did not consider Santa Barbara County to be within the CTS range. It wasn't until a local rancher, Jeanette Sainz, carried a live CTS from her ranch to the local Museum of Natural History that anyone (other than the agricultural community) was even aware of the presence of this species in Santa Barbara County. After 1970, a biologist from the Department visited the Sainz Ranch on a periodic basis to observe the breeding activity in the Sainz vernal pools. After several years of observing the same conditions, the biologist stopped coming. The Sainz family continues to maintain the vernal pools and their upland habitat in the same condition that it was before 1970. In some years, their pools are teeming with CTS. In others, few or no individuals appear for breeding.

In 1993, the Service records include descriptions of 15 known breeding ponds in Santa Barbara County. In 1998, the number was down to 14 known breeding locations. In 1999, Department records indicated a decline to less than 10 known populations in Santa Barbara County. In the Service's 2000 emergency listing of CTS, it noted that there were 13 known breeding locations with only 6 or 7 still being viable populations. When the Service published its proposed rule to list the Central California DPS in 2003, the Service listed 8 known breeding ponds in Santa Barbara County. By the end of 2004, the Service's number had risen to 46 known breeding pools for CTS in the County. In 2007, the County of Santa Barbara and the Service published an updated map of known and potential CTS breeding pools based upon information from local biologists. The map shows **51** known breeding locations and **106** potential breeding pools. At the end of 2007, the eastern half of Laguna Seca, one of the mapped pools, was incorporated into a conservation easement deeded to the California Rangeland Trust, an easement that included approximately 594 acres of agricultural land. In short, few known breeding pools had been identified between 1993 and 2003. This time period encompasses the data period upon which the "existing trend studies" referenced in the Department Evaluation and the petition are based. They are grossly out of date.

The information gathered in Santa Barbara County supports the statement, included on Page 7 of the Department Evaluation and attributed to Uram et al. 2004, that "the more one looks for the CTS, the more one finds extant localities." That is precisely what has occurred in Santa Barbara County. Either that, or one would have to concede that CTS had an amazing increase in populations and breeding pools in just seven years – increasing from a mere 6 or 7 viable breeding locations to 51, with another 106 potential breeding locations. Something is very wrong with the data analysis in the Department Evaluation.

The Proposed Listing Overlooks the Vigorous County Regulation of the Santa Barbara County CTS

Santa Barbara County requires a permit for any grading that will result in a "significant environmental impact." Such regulated impacts include disturbance of vernal pools and habitat of species of special concern, which includes CTS. The County's role in preserving CTS habitat cannot be overlooked. The County rigorously observes the requirements of the California Environmental Quality Act (CEQA), the Federal Endangered Species Act, and the California Fish and Game Code. For any project requiring a discretionary permit (including projects that otherwise would be ministerial were it not for their unique impacts upon protected species), the County staff contacts both the Service and your Department for input on the project. These existing measures amply protect CTS and its habitat.

The vast majority of land upon which known and potential CTS breeding pools and upland habitat exist is zoned for agriculture. The County of Santa Barbara has a long history of resisting changes of zone from agricultural to urban or suburban (ranchette) uses.

Most of the agriculturally zoned acreage in the County is enrolled in the Williamson Act program, which restricts the land uses of contracted property to agricultural. In exchange for agreeing to these restrictions under a 10-year contract that automatically renews annually (thereby creating a potentially perpetual contract term), the property owner enjoys a tax break. The largest tax break is for grazing lands. The result is that most CTS habitat is in no foreseeable danger of being converted to non-agricultural purposes or fragmented by urban land uses and infrastructure. Agricultural land in Santa Barbara County is stable with very few changes. The citizens of the County, including the agricultural community, are vigilant in preserving this valuable natural resource.

Conclusion

The stated grounds for the proposed listing, as applied to Santa Barbara County, are not supported by current and accurate information. We request that you take into consideration the information set forth in this letter. If you require further details or citations, please advise me. I can identify the biologists who conducted the studies upon which the breeding location information referenced in this letter, gathered over the past 16 years, was based.

Sincerely,

Susan F. Petrovich

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July 8, 2009

Our File Number: 22BG-149292

VIA FEDEX AND E-MAIL

Betsy Bolster
Wildlife Branch - Nongame Wildlife Program
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Sacramento, CA 95811
E-Mail: tsalamanderdata@dfg.ca.gov

Re: Proposal to add the California tiger salamander to California's endangered species list

Dear Ms. Bolster:

This firm represents the Wine Institute. We submit these comments in response to the request of the Department of Fish and Game ("Department") for comments, data, and other information related to the proposal to list the California tiger salamander ("CTS"). We are encouraging the Department to provide stakeholders with the opportunity to further participate in the evaluation process and to have the process be one that is open and transparent.

Issues To Be Addressed In The Department's Report

Once the Fish and Game Commission has accepted a petition, the California Endangered Species Act ("CESA") provides that "the [D]epartment shall provide a written report, based upon the best scientific information available to the [D]epartment, which indicates whether the petitioned action is warranted, which includes a preliminary identification of the habitat that may be essential to the continued existence of the species, and which recommends management activities and other recommendations for recovery of the species." Cal. Fish & Game Code § 2074.6. The Department has stated in its request for public comment that its report will address current threats to the species and the effectiveness of present regulatory actions in place, and will include a recommendation as to whether to list the CTS.

Under CESA, the Department is also required to discuss population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, the availability and sources of information, information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other relevant factors. We especially emphasize the importance of identifying the population of the species and any trends in the population.

In addition, we recommend that the Department identify objective standards for evaluating the threat to the species. If the Department determines that the species is threatened with extinction, it should identify the time period in which the species may become extinct, the probability of extinction with and without the listing under CESA. If the Department is not familiar with the IUCN Red List of Endangered Species, we recommend this as an example of quantitative criteria: www.iucnredlist.org/static/categories_criteria_3_1. The Red List also contains helpful discussions of how to evaluate a species including a set of definitions the Red List uses for consistency. We do not endorse those specific criteria or suggest that placement of a species on the Red List is sufficient for listing under CESA, but they at least provide an objective method of evaluation.

The Red List places the CTS in the category of Vulnerable A2c based on a 2004 evaluation: www.iucnredlist.org/details/1098/0. The basis for the finding under the Red List is decline in area of occupancy, extent of occurrence and/or quality of habitat. The category of Vulnerable A2c is for species which have an observed, estimated, inferred or suspected population size reduction of ≥ 30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, according to certain specified criteria. The Red list defines a CTS generation as being 8 years and states that the number of mature individuals certainly exceeds 10,000. While this finding is not directly relevant to listing under CESA, applying this criteria based on 2009 data may very well result in the conclusion that CTS is NOT vulnerable.

In considering current threats to the species and the effectiveness of present regulatory regimes, the Department needs to consider changes to the status of the species since the Commission initially took action on the petition. For example, in its initial review of the petition in 2004, the Department concluded that the petitioned action may be warranted due in part to the continued loss and fragmentation of natural aquatic breeding and non-breeding terrestrial habitat due to urbanization and, to a lesser extent, conversion of grazing land to more intensive agricultural uses such as row crops and vineyards. *See* Department of Fish and Game, Evaluation of Petition: Request of the Center for Biological Diversity *et al.* (2004) to List California Tiger Salamander (*Ambystoma californiense*) as Endangered (August 2004), at 14. The rate of habitat loss from urbanization has been dramatically reduced since the time of the Department's evaluation due to economic factors, and the passage of SB 375 and an increased emphasis on infill development in an effort to address climate change concerns suggests that the 2004 data may overestimate the threat to the species habitat loss due to urbanization. Similarly, the projected loss of habitat from agricultural conversions may be overstated due to probable reductions in the availability of water due to the ongoing drought, federal restrictions on drawing water from the Delta, and potential effects of climate change. The Department's evaluation should carefully re-examine the threat to the species due to loss and fragmentation of habitat due to urbanization and agricultural conversion in light of these factors.

The Department also previously concluded that the existing regulatory mechanisms in place at the time were inadequate. *Id.* at 23. Specifically, the Department found that federal listing of the CTS and other species did not provide adequate protections to CTS upland habitat. But when this finding was made, the CTS had only just been listed throughout its range by the U.S. Fish and Wildlife Service ("Service") and no critical habitat had been designated to protect both the species aquatic and upland aestivation and dispersal habitat.

We have now had almost five years of federal protection, and the Department's evaluation of existing regulatory measures should be based on an on-the-ground review of the effectiveness of the federal listing and designation of critical habitat in protecting the species. It should identify specific examples of where the federal measures provided inadequate protections and explain how listing under CESA would provide additional benefits for the species.

The Department's prior evaluation of the petition also concluded that CEQA had been inadequate to ensure consideration and mitigation of CTS impacts. *Id.* at 23-24. Even if this were correct, the federal listing triggered mandatory findings of significance for impacts to CTS. *See* CEQA Guidelines § 15065(a)(1). The Department should in its current evaluation examine the extent to which CTS impacts have been deemed significant and mitigated under CEQA in the past five years.

Additionally, the Department has been actively working with the Service, local governments, and interested stakeholders on the implementation of a conservation strategy in the Santa Rosa plain to protect the Sonoma population of the CTS, and has been requiring mitigation for CTS in many of its streambed alteration agreements. In its upcoming report, the Department should evaluate the effectiveness of these measures at protecting the CTS and explain, if appropriate, why they do not provide adequate protection for the species. Particularly in light of California's budget situation, is there a need for state action?

The Department should also update its analysis to explain whether changes since its prior evaluation have increased or diminished the other threats to the species, including threats from hybridization and the presence of pure non-native tiger salamanders; predation and competition from non-native predatory species in artificial breeding habitat; and limited protection of populations on existing public lands and reserves. What degree of introgression with non native salamanders qualifies a specimen as being a hybrid? To what extent has hybridization spread since 2004 and what threat does this present to the species? Are more populations protected on public lands and preserves? Have five years of federal listing resulting in an increase in protected lands that are specifically or beneficially managed for the conservation of the CTS? How many acres of protected lands are sufficient for the CTS not to be listed under CESA?

Request For An Open and Transparent Process

The Wine Institute has previously submitted comments on the petition to list the California tiger salamander. Our goal in making these comments is to alert the Department to issues that we think it should cover in its report. We believe that the evaluation process should provide stakeholders with the opportunity to further participate in the evaluation process and to have the process be one that is open and transparent. We plan to ask the Department establish a process that will accomplish these objectives.

Very truly yours,

Robert J. Uram/sef

Robert J. Uram

for SHEPPARD, MULLIN, RICHTER & HAMPTON LLP

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cc: Tim Schmelzer, Wine Institute
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Comments on the Proposed Rule to List the California Tiger Salamander Under CESA

This letter is in regards to the proposal to add the California tiger salamander (CTS; *Ambystoma californiense*) to California's endangered species list under the California Endangered Species Act (CESA). I am a Professor in the Department of Evolution and Ecology at the University of California at Davis, where I have been on the faculty since 1987. I have worked on the Tiger salamander complex, including the CTS continuously since 1977, and today about half of my lab works on issues related to CTS. During that time, I have published over 30 scholarly papers in the top journals in ecology, evolution, and conservtion biology on the CTS, and have several more papers currently under review. Because of our research and that of other groups, the CTS is now one of the best understood endangered amphibians on earth. I am a member of the Conservation Committee of the American Society of Ichthyologists and Herpetologist, and I frequently consult, on a pro bono basis, with the USFWS and CDFG on issues related to the conservation biology of amphibians and reptiles, particularly in California. I recently convened a workshop and wrote a white paper defining best practices for CTS translocation procedures for the USFWS, and within the limits of my job as a professor, I try to make myself available to all interested parties to consult on issues relevant to CTS biology and conservation. **I would like to emphasize that I have never accepted any direct payment for these services. I have received competitive grants and contracts to conduct research, but that has never resulted in any direct compensation to me.**

I fully support the state listing of the CTS, as I have in the past. The American Association of Ichthyologists and Herpetologists, the leading herpetological society in the world, has also recently supported this action, and I fully concur with this group of experts. The species is an exceedingly problematic one to manage, given its large terrerstrial habitat requirements, and its range continues to be splintered, subdivided, and rendered uninhabitable by both agricultural and urban activities throughout its range. David Cook has done an admirable job of summarizing the plight of the salamander in the extremely fragile Sonoma county Distinct Population Segment, and I will only comment on it briefly. In general, as we conduct research on the species, several factors continue to come into focus that emphasize the plight of the species and the need for CESA listing. I briefly discuss a few of these below.

Terrestrial habitat needs. As our research at Jepson Prairie (Solano county), Hasting Reservation (Monterey county), Ft. Ord (Monterey county), and at several sites in eastern Merced county continue to illuminate, CTS require large blocks of upland habitat surrounding their breeding sites. Our current best estimate, based on calculations presented in Searcy and Shaffer (2008) and Trenham and Shaffer (2005) (for all citations, see the DFG Proposed Rule), is that it takes about 1200 acres of upland habitat to successfully cover the area occupied by 95% of the CTS that breed in one vernal pool at our study site at Jepson Prairie. Other studies, based on either direct mark-recapture data (Trenham et al. 2001) or molecular genetic data (Wang et al. 2009) indicate that between-pond movements of breeding adults are frequent and often a kilometer or more in length. At Jepson, we have records of both newly metamorphosed babies and adults moving one kilometer (2/3 of a mile, the longest distance in less than two weeks. Given that the animals are documented to live up to 11 years in the wild and move throughout this time, it is clear that they require large, intact tracts of upland habitat with multiple breeding sites. Such habitat is being lost, subdivided by roads, and fractured by agriculture throughout the range of the species. The proposed expansion of the Los Vaqueros Reservoir, the enormous windmill farms that now cover most of the Potrero Hills in Solano county, and the fragmentation of old Ft. Ord with the loss of the former military base are just three examples, and there are many, many more. **State listing under CESA would provide additional impetus to ensure that projects minimize their impact on the species while still allowing the successful completion of important, revenue-generating projects for California.**

Aquatic habitat needs. Although simpler in some ways, it is important to recognize that the *prime* aquatic habitat for CTS is large vernal pools, and these have all but disappeared in the face of Central Valley development. This has pushed more and more populations of CTS into artificial stock ponds. Although this is a viable short-term solution, it also presents an appearance of stability that is more apparent than real. According to the vernal pool hydrology expert who participated in the Santa Barbara recovery plan (never completed, to my knowledge), natural vernal pools may last **10's to 100's of thousands of years**, whereas the average stock pond lasts for less than 30 years. I have witnessed the demise of many stock ponds due to natural erosional processess, including Blomquist pond at Hastings (site of our 9 year study of CTS) and Triangle pond (on the adjacent Oak Ridge ranch, and also part of our long term study). **State listing under CESA could provide impetus to maintain stock ponds in a stable, fish-free condition, and would allow the state to further protect our remaining vernal pool complexes.**

Hybrids. As our work continues to expand both geographically and genetically, it is becoming clear that hybridization with non-native tiger salamanders is an important challenge for CTS management. Although I agree that we need to have a defensible strategy for what to do, and how to consider hybrids from a management perspective, the ever-expanding range of hybrids is a critical threat that further imperils remaining pure populations of CTS. **State listing will allow the Department to help set priority goals for hybrid salamanders, allowing them to work with other state agencies to manage both pure and hybrid populations to ensure maximal protection**. The USFWS has not yet produced such a policy, and would have limited jurisdiction over many state lands and projects that would undoubtedly be more responsive if the CTS is CESA listed.

Additional threats. Other important threats to CTS, as described in the Department's Proposed Rule, include predatory fishes (including mosquitofish and warm-water invasive game fishes), pesticides, and other polutants. Many of these are regulated, and even distributed, at the state level. **By recognizing the endangerment of the CTS with CESA listing, it will enable the intellegent, prudent regulation of these threats by relevant state agencies**. For example, it should be easier to rationalize the regulation of sunfish releases into sensitive areas for CTS when our own Department of Fish and Game recognizes that CTS is endangered. Leaving this to the federal agencies, and not listing CTS at the state level when it is clearly justified, would seem to hinder, rather than empower, the Department's ability to enforce changes in the distribution of these threats to CTS.

Responses to comments by David Cook (Sonoma County), Robert Uram (on behalf of the Wine Institute), and Susan Petrovich (Santa Barbara County). I was provided copies of the comments by all three of these individuals, each of whom speak on behalf of either specific regions, special interest groups, or both. I comment briefly on each below.

David Cook (Sonoma County) letter: David Cook is a herpetologist and the leading authority on CTS in Sonoma County. His tireless efforts have resulted in major insights into the biology of the species, and he has documented in great detail the population trends of a single population (Southwest Community Park) and of populations across the Santa Rosa plain. I concur, absolutely, with his assessment of the Southwest Community Park population. In the 1980s, when I first visited that site, it was a large, robust population with open space in all directions. Now, it is a tiny fragment, surrounding by housing developments, that Cook has watched decline to near-extinction. It will be gone soon. The same is true for populations at the old county airport, and Mr. Cook's assessment of its decline jibes with my own observations. His assessment of road mortality is shocking, particularly given how vulnerable the CTS is in Sonoma County. I fully concur with David Cook's assessment of the plight of CTS in Sonoma County, and the need to list the species under CESA.

Robert Uram (Wine Institute) letter: Robert Uram's letter asks that a number of issues, ranging from 'transparency' to the need to determine population trends, be addressed. I disagree strongly with several of Mr. Uram's statements, and can only say that they appear to reflect a lack of biological expertise with the actual salamander, perhaps combined with an understandable desire to cast this listing in a favorable light for his employer, the Wine Institute.

Mr Uram "emphasize(s) the importance of identifying the population of the species and any trends in the population", and seems to imply that this has not been done adequately. The Department went to great lengths to summarize the population data which are available for CTS, and these published studies invariably indicate that these study populations are declining. Our currently unpublished data for Jepson Prairie also supports this view: in 2005 and 2006 thre were 1591 and 2621 baby salamanders recorded at this protected site, but in 2007, 2008 and 2009 there were 30, 3, and 152, respectively. Crashes have been documented in the literature at all sites where the animals have been studied, including in Sonoma County and Monterey County. Given the incredible difficulty in obtaining these data, and the fact that the best available science strongly indicates that habitat loss can stand as a strong proxy for actual population data, habitat loss further provides the data at a rangewide level that Mr Uram requests. Our group has published genetic data showing that individual breeding ponds are sufficiently differentiated to be considered populations (see in particular Figure 3 inWang et al. 2009, and Shaffer et al. 2004). Our detailed field ecological studies have demonstrated the extent of terrestrial habitat needed to support these populations (see in particular Searcy and Shaffer 2008) and the population consequences of losing this habitat (Trenham and Shaffer 2005). As discussed in detail by the Department, is simply not possible to study every population in this kind of detail given the secretive biology of the species, but they provide ample evidence of habitat loss trends with their superb geographical analysis at the rangewide level. Thus, Mr Uram's request for adequate data has been fulfilled, and it strongly indicates that listing under CESA is appropriate.

Mr Uram's emphasis on the IUCN Red List is interesting. In the context of global animal declines, the IUCN rated the CTS as Vulnerable, a sub-category within its Threatened designation. The IUCN website (http://www.iucnredlist.org/apps/redlist/static/categories_criteria_3_1) defines Vulnerable as:

> "A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), **and it is therefore considered to be facing a high risk of extinction in the wild**."

This certainly agrees with the Department's evaluation that CTS is in deep trouble in the wild. Mr. Uram goes on to say, for reasons that he does not explain, that "applying this criteria based on 2009 data may very well result in the conclusion that CTS is NOT vulnerable.", apparently suggesting that the situation has improved for CTS in the last five years since the IUCN assessment. However, in that time the human population in California has increased steadily (by roughly 1% per year, or a million people every three years, based on freely available data), available habitat has declined steadily, and the large blocks of land needed by the salamander have been subdivided and marginalized. I agree with the IUCN listing; CTS is indeed "facing a high risk of extinction in the wild". The Department has demonstrated that the situation has deteriorated for the species, and Mr. Uram provides no evidence that things are improving for the salamander. Mr. Uram's own words attest to this, when he says that "the *rate* of habitat loss from urbanization has been dramatically reduced". Although he provides no *evidence* for this, even if true, it suggests that habitat is still being lost, just not as quickly as previously. That still translates to a worsening outlook for the salamander since the IUCN listing, and a greater need for protection under CESA.

Finally, Mr. Uram requests that the Department evaluate the efficacy of conservation programs that have been in effect since the Federal listing of CTS. They do so in their report, and state clearly that they feel that the salamander is still losing ground, and therefore requires State protection under CESA. I agree.

Susan Petrovich (Santa Barbara County) letter: Ms Petrovich is an environmental lawyer in Santa Barbara County, representing "farmers, ranchers, and other landowners" in Santa Barbara. She does not list which farmers, ranchers and other landowners. In her letter, Ms Petrovich misrepresents many aspects of our biological knowledge of CTS. She claims that "no one knows for certain what types of upland habitat provides potential habitat for CTS.", with no reference to the numerous, sometimes decade-long studies that have addressed exactly this question. Her casting of agricultural conversion of grazing land to vineyards in Santa Barbara County as "minor" is disturbing and inaccurate; according to the web, the Santa Maria valley has over 19,000 acres in vineyards, out of ~80,000 acres reported (Wikipedia, 2009). Ms Petrovich's assertion that "Santa Barbara vintners, for the most part, use cultivation practices that are compatible wit CTS" is completely unfounded, and has absolutely no scientific or factual basis to my knowledge. No where else in the range of the species have CTS and vineyards been found to be compatible land uses, and there is certainly no published information supporting this claim in the scientific literature.

Ms Petrovich goes on to question the assertion that CTS breed only once every five years (which was never actually asserted by the Department or in the literature), and often only once in a lifetime (which is in the literature). She claims, with no factual support, that the nearly decade-long study on which this was based was flawed because, she claims, the study occurred in low rainfall years. First of all, that is simply untrue: 1992-93 was a huge rainfall year (727 mm), as was 1994-95 (895 mm) and 1997-98 (1033 mm). The long-term study at Hastings on which this statement was based covered years from 1992-1998, with rainfalls ranging from 381-1033 mm- a three-fold range from extreme El Nino to extreme La Nina years. Over this full range of rainfall years, the population plummeted. Studies at Jepson Prairie have been conducted from 2002-2009, covering rainfall years of 233 to 566 mm. Again, the population shows signs of significant declines. Finally, and most importantly, **Ms Petrovich claims that the best available science should not be trusted, yet offers no alternative, published, scientific evidence to the contrary**. The mandate of the Department, and the Commission, is to use the best available science, and it indicates clearly that CTS are extremely infrequent breeders.

Ms Petrovich goes on to say that landowners should be contacted to "determine their intentions" with respect to their land before a listing at the state level is appropriate. I have searched the CESA documentation available to me, and have yet to find anywhere stating that this should be a part of the listing process. I agree that if, as Ms Petrovich claims, the landowners have no plans to develop or otherwise infringe upon the salamander's habitat, then the risk of future, additional loss is reduced. However, this would also imply that these same landowners should not object to the listing, since it does not affect them in any way. Yet Ms Petrovich says that her clients DO object to the listing. This is confusing, and implies that future plans to add housing, row crops and other land uses that are incompatible with CTS may be looming in the future. Ms Petrovich goes on to say that the perceived threats to CTS in Santa Barbara County are unfounded. She claims that the known range of the species is greatly underestimated, yet to my knowledge, no substantial expansion of the known range limits has occurred over the last decade or more. **What is known is that now non-native tiger salamanders are hybridizing with the Santa Barbara population; this new threat is on top of the grave concerns over and above restricted range, urbanization, agricultural expansion and other threats that led the USFWS to list the Santa Barbara population of CTS as Endangered**. Remember that Endangered is a more severe listing than the Threatened status in the Central portion of the CTS range, and it indicates the extremely vulnerable nature of the species in Santa Barbara County. Add to that the fact that the Santa Barbara population will almost certainly be described as a distinct species in the near future, and it seems clear that it requires listing under CESA. To claim that the species does not even deserve listing in Santa Barbara County, in the face of the USFWS's position and the new threat from invasives, demands very serious new data, new analyses, new publications, and new, strong science. Ms Petrovich provides none of these in her letter.

Thank you very much for the ability to respond to the Department's proposed rule. I feel that the California Department of Fish and Game has done an excellent job in summarizing the best available science, and they have provided a detailed, critical account of the biology of, and threats to, the CTS. I hope that their recommendations are followed by the Commission, and that the CTS is fully listed under CESA rangewide.

Sincerely,

H. Bradley Shaffer
Professor

Appendix 4. Scientists Who Peer-Reviewed the California Tiger Salamander Status Evaluation.

D. G. Cook, Senior Environmental Specialist (Wildlife), Sonoma County Water Agency, Santa Rosa, CA

K. E. Leyse, Ph.D. Listing Branch Chief, Sacramento Fish and Wildlife Service Recovery Office, U.S. Fish and Wildlife Service, Sacramento, CA

P. T. Northen, Ph.D. Professor, Department of Biology, Sonoma State University, Sonoma, CA

H. B. Shaffer, Ph.D. Professor, Department of Evolution and Ecology, University of California, Davis, CA

G. R. Stewart, Ph.D. Professor Emeritus, Biological Sciences Department, California State Polytechnic University, Pomona, Pomona, CA

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