Santa Ana sucker
(*Catostomus santaanae*)

5-Year Review:
Summary and Evaluation

Santa Ana sucker habitat, Santa Ana River.
Photo credit Christine Medak (USFWS).

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, CA

March 10, 2011

5-YEAR REVIEW
Santa Ana sucker (*Catostomus santaanae*)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed. Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Santa Ana sucker (*Catostomus santaanae*) is a small, short-lived member of the sucker family (Catostomidae), named so primarily because of the downward orientation and anatomy of their mouth-parts, which allow them to suck up small invertebrates, algae, and other organic matter with fleshy, protrusible lips (Moyle 2002, p. 179). Santa Ana sucker is generally less than 6.3 inches (in) (16 centimeters (cm)) in length, is silvery-white ventrally and darker along the dorsal side, with irregular dorsal blotches on the sides and faint patterns of pigmentation arranged in lateral stripes, and the membranes connecting the rays of the caudal (tail) fin are pigmented (Moyle 2002, p. 182). The listed entity is found in three watersheds in southern California: (1) the Santa Ana River in San Bernardino, Riverside, and Orange Counties; (2) the San Gabriel River in Los Angeles County; and (3) Big Tujunga Creek, a tributary to the Los Angeles River, in Los Angeles County. The species is also found in the Santa Clara River watershed; however, it is not considered part of the listed entity because there is speculation that Santa Ana sucker was introduced into that system (USFWS 1999, p. 3916), and the current populations are hybridizing with the introduced Owens sucker (*Catostomus fumeiventris*) (Chabot *et al.* 2009, p. 1). For the purposes of this review we will only be discussing the listed entity of Santa Ana sucker that occur in the first three watersheds listed above. There are nine historical occurrences within these three watersheds, six of which are currently extant.

The Santa Ana sucker was federally-listed as threatened under the Act in 2000, and though not listed in California, is considered a species of special concern.

Methodology Used to Complete This Review:

This review was prepared by Carey Galst at the Carlsbad Fish and Wildlife Office, following the Region 8 guidance issued in March 2008. We used survey information from experts who have been monitoring known occurrences of Santa Ana sucker and the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game (CDFG). We received no information relative to Santa Ana sucker from the public in response to our Federal Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of information compared to that known at the time of listing. We focus on current threats to the species pursuant to the Act's five listing factors. This review synthesizes this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in performing the five-factor analysis, we herein recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Federal Register (FR) Notice Citation Announcing Initiation of This Review:

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the **Federal Register** on March 25, 2009 (USFWS 2009, p. 12878). No information relevant to the species being reviewed here was received during the open period.

Listing History:

Federal Listing
FR Notice: 65 FR 19686
Date of Final Listing Rule: April 12, 2000
Entity Listed: Santa Ana sucker (*Catostomus santaanae*), a fish species
Classification: Threatened

State Listing
None

Associated Rulemakings:

Final Critical Habitat
FR Notice: 69 FR 8839
Date of Final Critical Habitat Rule: February 26, 2004

<u>**Final Revised Critical Habitat**</u>
FR Notice: 70 FR 426
Date of Final Critical Habitat Rule: January 4, 2005

<u>**Proposed Revision to Critical Habitat**</u>
FR Notice: 74 FR 65056
Date of Proposed Revised Critical Habitat Rule: December 9, 2009

<u>**Final Revised Critical Habitat**</u>
FR Notice: 75 FR 77962
Date of Revised Critical Habitat Rule: December 14, 2010

Review History: None

Species' Recovery Priority Number at Start of 5-Year Review:

The recovery priority number for Santa Ana sucker is 5C according to the Service's 2010 Recovery Data Call for the Carlsbad Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983a, pp. 43098–43105; USFWS 1983b, p. 51985). This number indicates the species faces a high degree of threat, has a low potential for recovery, and has taxonomic status as a species. The high degree of threat is due to potential loss of water supply, pollution, the highly urbanized nature of the Santa Ana River, significant pressure placed on the population by recreational use and flood control restrictions, predation by introduced predators, and susceptibility of small populations to random catastrophic events. The low potential for recovery is due to the significant amount of effort needed to secure the required water supply, restore habitat, and secure funding for research and water quality standard revisions needed to protect the Santa Ana sucker from pollution. The "C" indicates conflict with construction or other development projects or other forms of economic activity, specifically water allocations/appropriations projects including water conservation infrastructure such as dams, diversions, and drop structures.

Recovery Plan or Outline: No recovery plan or recovery outline has been prepared for Santa Ana sucker.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy:

The Act defines "species" as including any subspecies of fish, or wildlife, or plants, and any distinct population segment (DPS) of any species of vertebrate. This definition of species under the Act limits listing as DPSs to species of vertebrate fish or wildlife. The 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Act (USFWS 1996, pp. 4722–4725) clarifies the interpretation of the phrase "distinct population segment" for the purposes of listing, delisting, and reclassifying species under the Act. Santa Ana sucker is not listed as a DPS, and it is an evolutionary significant unit that has been given species status recognized by the scientific community (see below). There is no relevant new information regarding the application of the DPS policy to Santa Ana sucker and is not addressed further in this review.

Information on the Species and its Status:

Species Biology and Life History

Figure 1: Juvenile Santa Ana sucker. Photo credit Christine Medak (USFWS).

Santa Ana sucker is a small, short-lived member of the sucker family of fishes (Catostomidae), named so primarily because of the downward orientation and anatomy of their mouth-parts which allow them to suck up small invertebrates, algae, and other organic matter with their fleshy, protrusible (or extendable) lips (Moyle 2002, p. 179) (Figure 1). Santa Ana sucker is generally less than 6.3 in (16 cm) in length; however, they have been collected at 8 in (20.3 cm) in length (Russell 2010, p. 3). Their jaws have cartilaginous scraping edges inside the lips. There are 21 to 28 gill rakers on the external row of the first arch and 27 to 36 on the internal row. The caudal peduncle (base of tail fin) is deep, measuring 8 to 11 percent of the standard length. Their color is silvery-white on the belly and dark gray on the sides and back, with irregular dorsal blotches on the sides and faint patterns of pigmentation arranged in lateral stripes. Membranes connecting the rays of the caudal (tail) fin are pigmented, but the anal and pelvic fins usually lack pigmentation (Moyle 2002, p. 182).

Santa Ana sucker use their subterminal mouth to scrape algae, diatoms, and detritus from cobbles and small boulders, which makes up approximately 98 percent of their diets as young fish (Greenfield *et al.* 1970, p. 174). As they grow in size, aquatic insects make up a greater proportion of their diet (Greenfield *et al.* 1970, p. 174; Moyle 2002, p. 183).

Spawning tubercles (raised growths on sexually mature fish), particularly at the beginning of the breeding season, are present on most parts of the body of breeding males and are heaviest on the anal fin, caudal fin, and lower half of the caudal peduncle. Female suckers grow tubercles on the caudal fin and caudal peduncle (Moyle 2002, pp. 182–183). Spawning may occur between mid-March to early-July, with peak activity usually in April (Moyle 2002, p. 183). For a small species of the sucker family, fecundity of Santa Ana suckers is high and increases linearly with body weight, ranging from 4,423 to 16,515 eggs in females measuring 3.1 to 6.2 in (78 to 158 millimeters (mm)) standard length, respectively (Greenfield *et al.* 1970, p. 170; Moyle 2002, pp. 183–184). Spawning takes place over gravelly-riffles where fertilized eggs adhere to the substrate and hatch within 360 hours (at 55 degrees Fahrenheit (ºF), 13 degrees Celsius (ºC)) (Greenfield *et al.* 1970, p. 169; Moyle 2002, p. 184). Larvae measure approximately 0.28 in (7 mm) at hatching, and the mouth becomes subterminal at approximately 0.63 in (16 mm) (Greenfield *et al.* 1970, p. 169). Greenfield *et al.* (1970, p. 170) found no gravid female Santa Ana suckers smaller than 1.9 in (49 mm) or 0.07 ounce (2.05 grams).

In many fish species, scales and otoliths (inner ear "bones") may be used to measure age and growth. Santa Ana suckers are difficult to age using their scales due to a lack of conspicuous annuli or rings that can generally be counted to determine age. Though scales are unreliable for age assessment, scale width provides an estimation of age (Greenfield *et al.* 1970, p. 172). Otolith examination is another method for aging fish, but is difficult with Santa Ana suckers because their otoliths are extremely small in size. Additionally, the otoliths become spherical in size as the fish grows, which can make it more difficult to estimate their age (Greenfield *et al.* 1970, p. 172); newer techniques that have proven successful for determining age and growth of other species with small or spherical otoliths have not yet been attempted for Santa Ana sucker. Santa Ana suckers generally mature during their second summer and die at the end of their third summer at 3 to 4.3 in (75 to 110 mm) standard length. However, some individuals have been observed to survive to a fourth summer reaching a size of 5.5 to 6.3 in (140 to 160 mm) standard length (Moyle 2002, p. 183). Maximum age also appears to vary among the watersheds, for unknown reasons, possibly due to the suitability of habitat and overall fish condition; however, studies indicate those in the San Gabriel River may survive into their fifth summer (Drake 1988, p. 56) and those in the Santa Clara River may reach only their third summer (Greenfield *et al.* 1970, p. 172). Males and females appear to grow at an equivalent rate (Greenfield *et al.* 1970, p. 174; Moyle 2002, p. 183).

<u>Spatial Distribution</u>

The Santa Ana sucker's historical range includes the rivers and larger streams emanating from the San Gabriel and San Bernardino Mountains in Ventura, Los Angeles, Orange, Riverside, and San Bernardino Counties, including the mainstems and tributaries from near the Pacific Ocean to the uplands of the Los Angeles and Santa Ana River systems (USFWS 2000, p. 19686). The species is currently known to occur in three watersheds: (1) The Santa Ana River (San Bernardino, Riverside, and Orange Counties), (2) the San Gabriel River (Los Angeles County), and (3) Big Tujunga Creek of the Los Angeles River (Los Angeles County) (USFWS 2009, p. 65058). However, information about the distribution of the Santa Ana sucker in many tributaries within its historical range is incomplete. Santa Ana suckers were recently found in San Dimas Creek, a tributary to the San Gabriel River that is isolated by development from the remaining occupied habitat in the San Gabriel River (Chambers Group 2008, pp. 1–3) and had no previous survey reports.

A population of the Santa Ana sucker is also found in the Santa Clara River. However, we determined at the time of listing that because of its presumed introduced status we did not include the Santa Clara River population in the listed entity of Santa Ana Sucker (USFWS 1999, p. 3916; USFWS 2009, p. 65058). We have no new information that clarifies the status of this species as native or nonnative to this river. A genetic analysis of the populations in all four watersheds (Santa Clara, Santa Ana, San Gabriel, and Los Angeles) would assist in determining the origin of the species in the Santa Clara River; however, this analysis has not been completed at this time.

The listing rule states that approximately 80 percent of Santa Ana sucker's historical range has been lost in the Los Angeles River watershed, 75 percent in the San Gabriel River watershed, and 70 percent in the Santa Ana River watershed (USFWS 2000, pp. 19687–19688). Rangewide surveys have not been conducted for this species; however, repeated surveys within portions of the historically occupied range indicate a decline in habitat availability and abundance (see discussion below in **Habitat or Ecosystem** section). Currently, the spatial distribution of Santa Ana sucker has been restricted within the range at listing due to habitat modifications mostly attributed to urbanization (see discussion of **Habitat or Ecosystem** and **Factor A** threats below).

We analyzed data reported through CNDDB, survey reports, expert information, and museum records to compile a list of historical occurrences for Santa Ana sucker, which is summarized in Appendix 1. For the purpose of this review, we compiled a list of historical occurrences that were divided into "occurrences" based on impassable barriers (see below). A total of 27 element occurrences (EOs) are reported in CNDDB (CNDDB 2010) for Santa Ana sucker. Of the 27 EOs, two report on the same geographic location and have been condensed in this analysis (EO 23 and 32, Appendix 1). Five additional EOs (EOs 6, 9, 12, 13, and 28) that were reported from the Santa Clara River watershed are not considered part of the listed entity and will not be discussed further in this review. In addition to the remaining 21 EOs, there are 10 reports presented in Appendix 1 (the Santa Ana River near Southern California Edison (SCE) Powerhouse 3, Warm Creek, Lytle Creek, and Chino Creek in the Santa Ana River watershed; Rio Hondo in the San Gabriel River watershed; and Haines Creek, Little Tujunga, Los Angeles River near Los Felizes Boulevard, Los Angeles River near Universal City, and Arroyo Seco, in the Los Angeles River watershed) from museum specimens that are not included in CNDDB and present unique occurrences for Santa Ana sucker (Best Best and Krieger 2010, p. 11; NHMLA 2010, p. 1; UMM 2010, p. 1; SU 2010, p. 1).

The current distribution of the Santa Ana sucker is delimited by dams or other impassable structures that preclude further upstream dispersal or migration of fish (Cogswell Reservoir on the West Fork of the San Gabriel River; the "Bridge-of-No-Return" on the North Fork of the San Gabriel River; San Gabriel Reservoir in the center of the San Gabriel River; Hansen Dam and Big Tujunga Dam on Big Tujunga Creek; and Prado Dam, La Cadena drop structure, and Seven Oaks Dam in the Santa Ana River). Therefore, we will discuss the above EOs and records as delimited by these impassable barriers. We determined that there are nine historical "occurrences" (areas delimited by impassable barriers) where Santa Ana suckers occurred throughout the three watersheds. Each of these areas may contain multiple EOs or location descriptions, but there are no barriers to dispersal within each occurrence (see Appendix 1 (occurrence table) and Appendix 2 (maps)). It is important to reiterate that the historical distribution of the Santa Ana sucker was likely more broad than the visual representation presented in Appendix 2 because Santa Ana suckers likely occupied the mainstems and tributaries within each of the watersheds from near the Pacific Ocean to the uplands of the Los Angeles and San Gabriel River systems (USFWS 2000, p. 19686); it is also likely their occupancy varied depending on suitability and access (water availability) to these different areas.

Three of the nine historical occurrences are currently considered extirpated and the remaining six are considered extant (see Appendix 1 and Appendix 2). These three occurrences were reported to be extirpated at listing and are represented by two EOs (EO 11 and 24) and seven of the museum records (Santa Ana River near SCE powerhouse 3, Warm Creek, Lytle Creek, Rio Hondo and San Jose Creek, Los Angeles River near Los Felizes Boulevard, Los Angeles River near Universal City, and Arroyo Seco). The nine occurrences are listed below for the three watersheds:

1) Santa Ana River Watershed
   - Extirpated: Upper Santa Ana River and Tributaries-Upstream of S. La Cadena Ave.
   - Extant: Middle Santa Ana River and Tributaries-S. La Cadena to Prado Dam
   - Extant: Lower Santa Ana River and Tributaries-Prado Dam to near California Highway 90

2) San Gabriel River Watershed
   - Extant: San Gabriel River-East Fork
   - Extant: San Gabriel River-West and North Forks
   - Extant: San Dimas Wash
   - Extirpated: Below San Gabriel Dam-San Gabriel River Watershed

3) Los Angeles River Watershed
   - Extant: Big Tujunga Creek
   - Extirpated: Los Angeles River

<u>Abundance</u>

Comprehensive surveys for the historically or currently occupied geographic area of Santa Ana sucker are lacking. Moyle and Yoshiyama (1992, p. 204) postulated in 1992 that both the Big Tujunga and Santa Ana populations are reduced to below 1,000 individuals per population and that only the San Gabriel population can be considered relatively viable and persisting. More recent survey reports indicate that locations may harbor tens (Drake 1988, p. 52; Baskin *et al.* 2005, p. 1; Swift 2009, p. 3; Ecorp Consulting 2010b, p. 9) to hundreds (Saiki 2000, pp. 11–12; Chambers Group 2004, p. 3; Ecorp Consulting 2007, p. 9) of adults, young-of-year, or larvae. Repeated monitoring has occurred in the Santa Ana River and the San Gabriel River, but has not been repeated in Big Tujunga Creek. In all watersheds inhabited by Santa Ana suckers, abundance is reduced because of the decrease in range (Moyle and Yoshiyama 1992, p. 204).

In the Santa Ana River, yearly monitoring has occurred since 2001 in the upper reach of the middle Santa Ana River (near the junction of the Santa Ana River with California Highway 60 and upstream to Riverside Avenue) (SMEA 2009, p. 1). Over the 10 year period surveyed, results indicate a decline in density and abundance of fish sampled at all locations surveyed (SMEA 2009, p. 2; SMEA 2010, p. 1). Additionally, at two of the sites sampled, for the last 5 to 6 years, there has been regularly low numbers of Santa Ana suckers in areas that historically had the highest abundances (SMEA 2010, pp. 1–2).

In the San Gabriel River, Santa Ana suckers appear to be more abundant in the East Fork of the river than the West or North Forks (Tennant 2006, p. 6); however, Santa Ana suckers are consistently observed throughout the San Gabriel River (Haglund and Baskin 1992, p. 31; Haglund and Baskin 2003, p. 72; Tennant 2004, p. 5; Tennant 2006, p. 5; Ecorp Consulting 2007, p. 9; Ecorp Consulting 2010b, p. 9). Most literature describes the San Gabriel River occurrences to be the most viable of the occurrences in the three watersheds; however, recent survey reports indicate a sharp decline in Santa Ana suckers and an increase in nonnative predators in the West Fork of the San Gabriel River possibly due to an increase in the reservoir's water level at the survey time (Ecorp Consulting 2007, p. 9; Ecorp Consulting 2010b, p. 9).

In Big Tujunga Creek, a systematic monitoring study for Santa Ana suckers has recently been established to assess operations of the Big Tujunga Dam following the dam rehabilitation project (Haglund and Baskin 2010, p. 1). The baseline fish surveys were completed in October and November 2009. Survey results yielded no more than 15 Santa Ana suckers per 25 meter (82 feet) sample area (Haglund and Baskin 2010, App. 1) and stated that Santa Ana suckers occur in very limited numbers and no large individuals were found in the study area (Haglund and Baskin 2010, p. 11). However, a subsequent report (post-breeding season) indicates that hundreds of second- and third-year Santa Ana suckers were present at a different survey area in Big Tujunga Creek (Ecorp Consulting 2010a, p. 5).

Frequent fluctuations between periods of low and high abundance may be characteristic of Santa Ana sucker populations due to the unpredictable fluvial systems they inhabit. Winter flood events may contribute to catastrophic decreases (Greenfield *et al.* 1970, pp. 174–175). Conversely, summer droughts may strand Santa Ana suckers in isolated pools where they may be exposed to unsuitable water quality conditions (Andresen 2001, p. 1). The combination of early sexual maturity, protracted spawning period, and high fecundity allows the Santa Ana sucker to quickly repopulate streams following extreme flooding or drought events that may decimate populations (Greenfield *et al.* 1970, p. 177; Moyle 2002, p. 183). However, data indicates that in the Santa Ana River watershed the available suitable habitat areas for successful breeding and feeding are in decline (see discussion below in **Habitat or Ecosystem**). The ability of the Santa Ana sucker to repopulate areas of suitable habitat are high, but as these areas become in short supply, their ability to repopulate areas decreases and the overall abundance of the species will decline.

Habitat or Ecosystem

Santa Ana suckers occur in the watersheds draining the San Gabriel and San Bernardino Mountains of southern California. Their historical distribution extended from upper watershed areas to the Pacific Ocean; hence, they are capable of occupying habitats as diverse as mountain streams and rivers in alluvial floodplains (Swift *et al.* 1993, pp. 119–121; Moyle 2002, p. 183). Sediment loads are high in the alluvial floodplains in the San Gabriel and San Bernardino Mountains (National Research Council 1996, pp. 29–35). The streams that Santa Ana sucker inhabits are generally perennial streams with water ranging in depth from a few inches to several feet and with currents ranging from slight to swift (Smith 1966, p. 57) (Figure 2). In-stream gradient is also important for Santa Ana sucker. We analyzed historical occurrence data and determined that there were no records of Santa Ana suckers above a 7 degree gradient (USFWS 2009, p. 65065). These stream environments are also naturally subject

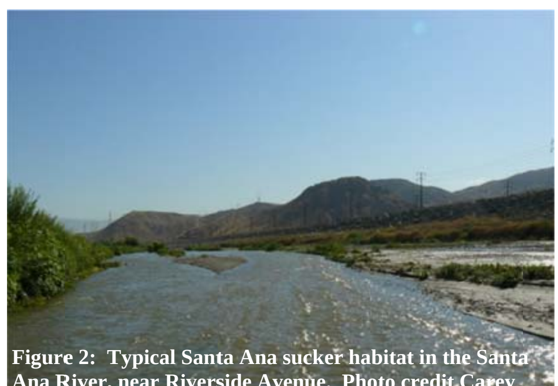


Figure 2: Typical Santa Ana sucker habitat in the Santa Ana River, near Riverside Avenue. Photo credit Carey Galst (USFWS).

to periodic, severe flooding (Moyle 2002, p. 183). Decades of groundwater extraction have lowered subsurface groundwater levels within the historical range of the Santa Ana sucker (California Regional Water Quality Control Board 1995, pp. 1-4–1-5 (CRWQCB)). In conjunction with periodic reductions in stream flows during extended periods of drought typical of southern California climate cycles, all streams that support the Santa Ana sucker experience less perennial flow (CRWQCB 1995, p. 1-4). Flows also fluctuate artificially in an unnatural manner as a result of dam operations and, in some areas, discharges from wastewater treatment plants.

Specific tolerance to water quality variable such as water temperature, dissolved oxygen, and turbidity, have not been determined for Santa Ana sucker; however, they are most abundant in unpolluted, clear water, at temperatures that are typically less than 72 ºF (22 ºC) (Moyle 2002, p. 183). Although elevated temperatures may be limiting fish populations and the growth of several fish species in the river, the continued presence of Santa Ana suckers in the Santa Ana River suggest that they are able to tolerate elevated temperatures and turbid conditions (Chadwick and Associates, Inc. 1992, p. 37; Saiki 2000, p. 25; Moyle 2002, p. 183). Santa Ana sucker utilize different substrate types as they develop through each life stage. The presence of coarse substrates, including gravel, cobble, and a mixture of gravel or cobble with sand and a combination of shallow riffle areas and deeper runs and pools provides optimal stream conditions (Haglund *et al.* 2001, p. 60; Haglund and Baskin 2003, p. 55). This species also prefers habitat containing in-stream or bank-side riparian vegetation that provides shade and cover especially for larvae and juveniles; however, vegetation becomes less important for adults when larger, deeper pools and riffles are present (Moyle and Yoshiyama 1992, p. 202; Moyle 2002, p. 183). Open stream reaches with shifting sandy substrates are typically less suitable for development of algae, an important food source (Saiki *et al.* 2007, p. 98) and hence, less suitable habitat for Santa Ana suckers. Therefore, a stream system that contains the appropriate quantity of coarse substrates with some larger cobbles or boulders to provide the space for reproductive development and growth of algae as a primary food source is important for a viable population of Santa Ana suckers.

Tributaries, particularly those located near the confluence of occupied areas of the mainstem of the river, may also provide important habitat for Santa Ana suckers (Chadwick and Associates, Inc. 1992, p. 49; Chadwick Ecological Consultants, Inc. 1996, p. 16; Haglund *et al.* 2002, pp. 54–60), providing shallow-water refuge for larvae and fry from larger predatory fish and acting as refuge for juvenile and adult Santa Ana suckers during storms. Additionally, the species may be attracted to tributaries due to the relatively colder water temperatures that are typically found in these higher order streams (Swift 2001, p. 26).

The San Gabriel River (as compared to the Santa Ana River) supports Santa Ana suckers with higher body condition (length-weight relationship) and greater availability of various habitat types (Saiki *et al.* 2007, p. 98). The San Gabriel River generally contains a higher abundance of Santa Ana suckers and individuals are reported to reach a larger size, which may be attributed to more suitable habitat characters such as intermediate water velocities, and commonality of pools and riffles with coarser bottom substrates, all of which may contribute to a better functioning system and more suitable habitat for Santa Ana suckers (Saiki *et al.* 2007, pp. 99–100). In the San Gabriel River, there are some distinct differences between the three forks of the river (north, west, and east), which seem to correlate with both fish abundance and life stage occupancy (Tennant 2006, pp. 4–5, 9). Overall, the water quality (i.e., lower temperature, lower specific conductance, and lower turbidity) and better habitat availability in the San Gabriel River system appear to be primary reasons that Santa Ana suckers are more abundant and in better condition compared to those in the Santa Ana River. Other variables (i.e., stream width or depth) may also influence the species abundance and condition.

The unmodified and unpolluted nature of the habitat in the San Gabriel River support what survey and research indicate to be a healthier and more viable population of Santa Ana sucker. Habitat assessments conducted at 25-meter (82 feet) long stations throughout Big Tujunga Creek indicate that the habitat suitability is variable throughout the system, but does contain areas of contiguous good and excellent habitat that are suitable for all life stages (LACDPW 2009, Google Earth kmz file). The density of Santa Ana suckers in Big Tujunga Creek is often low, likely due to the variability in habitat suitability (Ecorp Consulting 2010a, p. 5; Haglund and Baskin 2010, pp. 5–6). Some of this variability in habitat suitability may be due to the periodic isolation of upper and lower reaches from a lack of perennial flow during dry summer months (Haglund and Baskin 2010, pp. 1–2).

Water Quantity and Quality

Water quantity and quality may also pose a significant threat to the Santa Ana sucker throughout urbanized areas. Not only is the presence of water vital to the Santa Ana sucker, the volume and flow rate are important in shaping the watershed and facilitate delivery of coarse substrates to occupied areas. In the Santa Ana River, there are significant pressures put on the hydrologic process through water diversions and impediments, which may impact the suitability of available habitat for Santa Ana sucker. Current and future water diversions for human uses have appropriated nearly all of the available water in the Santa Ana River watershed (CRWQB 2010, p. 2). In the Santa Ana River, the water that provides the habitat for Santa Ana sucker throughout most of the year and all of the water during dry summer months primarily originates from discharges of treated wastewater from publicly-owned treatment works (POTWs) (CRWQCB 2008, p. 1-11; USFWS 2008, pp. 2–3). There are approximately 17 different permitted POTWs in the Santa Ana River Basin that provide treated wastewater to the occupied reaches of the Santa Ana River. Of the 17 POTWs within the Santa Ana River Basin, 5 discharge 20.1 to 52.8 million gallons of treated wastewater per day (MGD) (76 to 200 million liters of treated wastewater per day, MLD), 6 discharge 10.1 to 20 MGD (38 to 75 MLD), and 6 more discharge 0 to 10 MGD (0 to 37.8 MLD) (CRWQCB 2008, p. 1-11). Five of the POTWs discharge treated wastewater 100 percent of the year and make up a majority of the water present in the mainstem of the Santa Ana River during the dry summer months (RIX (Regional Tertiary Treatment Rapid Infiltration and Extraction Facility), City of Rialto Municipal Waste Water Treatment Plant (WWTP), Western Riverside Co. Regional WWTP, Riverside Regional Water Quality Control Plant, City of Corona Municipal WWTP #1; see Appendix 2; D. Woelfel, CRWQCB, pers. comm. 2010).

The impacts of treated wastewater to Santa Ana sucker and hydrological processes within the watershed have yet to be fully understood; however, research is being conducted to specifically address the physiological impacts on Santa Ana suckers of residual chemicals present in treated wastewater of the Santa Ana River (see **Species-specific Research and/or Grant Related Activities** section below; USFWS 2008, pp. 2–3). The impact of POTWs on the hydrological function of the watershed has yet to be fully understood and the actual amount of water that reaches the mainstem of the Santa Ana River, which would provide habitat for Santa Ana sucker, has not been quantified. However, it is apparent the quantity of water available in the future is threatened by future water appropriations (CRWQCB 2010, pp. 2–3) and the proposed sale of treated wastewater (USFWS 2010b, pp. 2–3). The impact of additional water appropriations or sale within the Santa Ana River is expected to have a significant impact on the volume and flow of water available, which make up the habitat and shape the floodplain and watershed as a whole (USFWS 2010b, pp. 2–3). Additionally, any habitat quality impacts as a result of degraded water quality from water discharged from POTWs may be amplified because of the limited availability of cleaner, natural water to flush out or dilute residual chemicals. The extent that water quantity may threaten the Santa Ana sucker in the San Gabriel River or Big Tujunga Creek is not well known, but assumed to be lower than in the Santa Ana River.

Barriers

Urbanization continues to result in the loss of suitable habitat for Santa Ana suckers throughout its range. Impacts from dams, water diversions, roads, and construction of other impervious surface cover continue to impair the natural riverine processes that are important to the Santa Ana sucker. The ability for water to flow unregulated is impacted by urbanization such that rivers no longer meander through the floodplain to deliver coarse substrates and water to downstream occupied habitats (Kondolf 1997, pp. 535–540). Modification of the system has impacted the normal function of the watershed, including dispersal and stream processes. The channelization and impervious surface cover, such as roads and buildings, impacts runoff of stormwater that would normally percolate into the soil and recharge the stream through groundwater rising (CRWQCB 2008, p. 1-10). The modifications to stream processes also inhibit the transport of coarse substrates, which is essential for reproductive development of Santa Ana suckers and growth of algae as their primary food source.

Due to the modified hydrologic system in the Santa Ana River watershed, coarse sediment transport to downstream occupied areas has been diminished. The presence of coarse substrates (a proxy for habitat suitability) has been collected for a large section (18.6 miles (mi) (30 kilometers (km)) of the occupied area from 2006 to 2010 (Thompson *et al.* 2010, pp. 321–332). The information collected suggests that the suitability of habitat in the Santa Ana River is variable, but that it is also decreasing in quantity throughout a majority of the occupied area in the Santa Ana River (Thompson 2009, p. 10; Thompson *et al.* 2010, p. 328). Thompson (2009, p. 10) evaluated data reported by Camm Swift in 1999 and 2000 on the Santa Ana River and quantified the number of river miles of continuous suitable habitat available to Santa Ana suckers. Since 2006, there has been some variation in the amount of suitable habitat, but it appears available suitable habitat is declining (see Table 1 below developed from Thompson 2009, Thompson *et al.* 2010, and USFWS unpublished data 2010).

Table 1: Quantity of suitable habitat for the Santa Ana sucker along the Santa Ana River.

Year	Amount of Suitable Habitat in Santa Ana River (km)
1999/2000	~10.5
2006	4.2
2007	9.6
2008	5.1
2009	6.9
2010	4.2

Dams and other barriers to dispersal pose a significant threat to Santa Ana sucker through modifications to their habitat (see **Factor A** discussion below). Dams are generally structures that prevent water from naturally flowing downstream. Dams can be very sophisticated permanent structures used for flood control and water management, or may be temporary structures (such as rubber inflatable dams or earthen dams) that are created for recreation, flood control, or water management. The southern California region has grown 12.8 percent since the 1990 census and the Inland Empire continues to grow at the highest rate in the region and statewide (SCAG website; viewed July 27, 2010). As a result of the population growth in the Inland Empire, the necessity for flood control to protect urban development (CRWQCB 2008, p. 7-5) and accessibility to water rights has put increased pressure on water resources in southern California (CRWQCB 2008, pp. 1-14–1-15). The use of dams for water conservation (i.e., holding water behind dams for sale, diversion, or for recharge) has become a common practice that is coupled with dam operations. Dams used for flood control or water conservation pose a barrier to dispersal and may have significant impacts on habitat suitability and quality both above and below these structures (USFWS 2009, p. 65066).

Dam operations may require testing of gates to ensure functionality for flood control. Following a recent gate testing operation at Seven Oaks Dam on the Santa Ana River, fine sand and silt was transported downstream to occupied reaches of the Santa Ana River. The transport of this fine sediment may result in temporary impacts of an unknown magnitude and unknown duration. Figures 3 and 4 represent highly suitable habitat (majority cobble and gravel) from habitat surveys conducted in August 2007 and the immediate impacts to habitat as a result of the dam gate testing and the flushing of fine sand and silt to downstream occupied areas. Deposition of fine sand and silt on top of the coarse substrate in this reach appeared to be temporary because subsequent surveys indicate that the habitat has since returned to primarily coarse substrate. This type of impact would be typical of other flushing flow events that carry fine sediments downstream; however, the duration of the impact would be dependent on the water available to continue to move these fine sediments.

Figure 3: Looking upstream to Market St. Bridge August 15, 2007. Photo credit USFWS.

Figure 4: Looking upstream to Market St. Bridge July 14, 2010. Photo credit USFWS.

Barriers to dispersal pose a significant threat to Santa Ana sucker persistence and abundance by potentially fragmenting and isolating populations (see **Factor A** discussions below). Most fish tend to swim upstream as far as their abilities will allow, while others are better swimmers and therefore may be able to swim at a steeper gradient or higher flow velocity. In an attempt to estimate the maximum slope or gradient that a Santa Ana sucker is capable of passing, we used GIS to analyze the slope of occurrence polygons and known observation points in all three watersheds where Santa Ana suckers occur. Results from this analysis indicate that Santa Ana suckers do not occur above areas where the in-stream slope exceeds 7 degrees (USFWS 2009, p. 65061). Permanent dams used for flood control pose a permanent barrier to upstream movement, as do steep bridge drop structures; however, rubber dams, recreational dams, or Arizona crossings (road crossing that allows high flows to run over the road) may not pose permanent barriers but prevent dispersal at certain periods of time when flows are low. These barriers create fragments of habitat that are accessible if the fish are not washed downstream. If they are washed downstream, these barriers present a modification of the habitat that may confine Santa Ana suckers to less suitable areas.

Nonnative Plants

Nonnative vegetation, such as *Arundo donax* (giant reed), may be present in all three watersheds and may modify in-stream habitats (Zembal and Hoffman 2000, p. 69), leading to changes in fish assemblages. *Arundo donax* is very common in the Santa Ana River watershed (Zembal and Hoffman 2000, p. 69), may be present in the lower reach of Big Tujunga Creek, and to a lesser extent in the San Gabriel River. It is an aquatic plant in the genus of perennial reed-like grasses (Poaceae) and is often found growing along lakes, streams, and other wetted areas. Compared to other riparian vegetation, it uses excessive amounts of water to supply its exceptionally high growth rates (Bell 1997, p. 104) and may crowd out native riparian vegetation or possibly lower the water table (Zembal and Hoffman 2000, p. 66). Flows may become diminished and sandy pools may form in areas where *A. donax* is common. Slow moving flows and formation of pools are preferred habitat for nonnative predators such as largemouth bass (*Micropterus salmoides*) and green sunfish (*Lepomis cyanellus*), which have been suggested to prey heavily on Santa Ana suckers (Moyle 2002, p. 185; Saiki 2007 *et al.* p. 97). Additional study is needed to address the potential impacts of nonnatives on alteration of in-stream habitat and predators.

Wildfire

Santa Ana sucker habitat may be impacted by wildfires immediately following the event or through delayed impacts to the habitat. Immediate impacts include the direct loss of upland and riparian vegetation and creation of roads for fire-fighting that may allow greater access to streambeds that facilitate increased off-highway vehicle (OHV) use resulting in further habitat degradation (USGS 2009, p. 7). Delayed impacts include excessive debris flows and changes to water quality. As a result of the 2009 Station Fire (see **Factor A** threat of **Increased Fire Frequency** below), delayed impacts are anticipated to occur during seasonal rains over the next several years. Anticipated post-fire impacts to streams also include ash and debris deposition that may physically alter sediment composition of streambeds and pools, increase scouring of riparian and aquatic vegetation, and increase water temperature from the short-term loss of canopy shading (USFS 2009, p. 5). Changes to water quality (such as increased turbidity) are also anticipated from both post-fire impacts and from the release and mobilization of toxic chemicals, such as gas, oil, fire retardants, and building materials as a result of burned structures and their contents (USFS 2009, p. 6). The 2009 Station Fire burned 26 recreational residences in the Big Tujunga Creek watershed; it is unclear whether or not these residences will be rebuilt and whether new development projects would impact water quality and transport of water sediment into the river (L. Welch, USFS Wildlife Biologist, 2010, pers. comm.).

Changes in Taxonomic Classification or Nomenclature

The Santa Ana sucker was described in 1908 by Snyder as *Pantosteus santa-anae* from the Santa Ana River near Riverside, California (Snyder 1908, p. 33). Smith (1966, pp. 53–58) amended the specific name to eliminate the hyphen and relegated *Pantosteus* to a subgenus of *Catostomus*, which represented a new combination. Currently, the nomenclature or taxonomic classification of Santa Ana sucker is *Catostomus santaanae* and has not changed since it was listed.

Genetics

The Santa Clara River population was not included in the listed entity of Santa Ana suckers because there is insufficient evidence that this population was native to the River. This population is also in question because hybrids between the Santa Ana sucker and the Owens sucker have been documented in the Santa Clara River since the 1940s (Hubbs *et al.* 1943, p. 47). Hybrids have been observed in the lower Santa Clara River in the vicinity of the City of Fillmore and within Sespe Creek (Moyle 2002, p. 183). The Owens sucker is endemic to the Owens River watershed in southeastern California and was introduced to the Santa Clara River through transfers of Owens River water via the Owens Aqueduct (Bell 1978, p. 14). Recently, genetic introgression (backcrossing of hybrid offspring with one of its parent species) was detected in both Santa Ana and Owens suckers within the Santa Clara River (Chabot *et al.* 2009, p. 24); however, implications of this hybridization are yet to be determined.

Species-specific Research and/or Grant-supported Activities

Since listing, many entities have undertaken yearly surveys of the taxon throughout their range; however, there has not been a coordinated, consistent effort among the three watersheds.

Species-specific projects and activities have been conducted in each of the three watersheds where the Santa Ana sucker occurs. There have been studies exploring life history parameters, population dynamics and demographics, habitat assessments, environmental conditions, and possible restoration sites. These studies have been important for making decisions regarding the status of the species and the current conditions within each of the watersheds. Other activities have also been undertaken for the benefit of the Santa Ana sucker such as nonnative vegetation and nonnative predator removals.

Santa Ana Sucker Conservation Program (SAS Conservation Program)

The Santa Ana Sucker Conservation Program (SAS Conservation Program) has funded fish surveys since 2001 and habitat assessments since 2006 in the Santa Ana River, both of which are expected to continue indefinitely. The Orange County Water Control District (a participant in SAS Conservation Program) has regularly conducted predator removals, experimental habitat enhancements, and habitat surveys. The SAS Conservation Program has also supported and funded projects to better understand impacts to the Santa Ana sucker:

1) A comparative study on fish health and water quality within the Santa Ana and San Gabriel Rivers (Saiki *et al.* 2007, pp. 93–95);
2) a study of the Santa Ana sucker distribution, movement, spawning, and impacts from nonnative predators within the Santa Ana River (Swift 2001, pp. 23–36);
3) a study of wastewater treatment facility operational discharge regimes on the Santa Ana sucker (Allen 2003, pp. 10–11);
4) a draft video to educate staff and contractors working for participating agencies about the Santa Ana sucker and its conservation (Beehler 2010b, pers. comm.); and
5) a report detailing possible restoration sites within the middle and lower Santa Ana River watershed (SMEA 2010, pp. 1–12).

Riverside-Corona Resource Conservation District (Riverside-Corona RCD)

A native fish stream was constructed by the Riverside-Corona Resource Conservation District (Riverside-Corona RCD) in 2000 as a location to mimic natural habitat for native fishes and aid in recovery efforts (Russell 2008, p. 3). They have since built five research scale raceways or artificial streams where Santa Ana suckers are successfully housed and reared. The site continues to collect data and information on native fish augmentation success and reproduction. Since 2001, Santa Ana suckers were captured, tagged, and released into the Santa Ana River with intentions of studying demographics of captured fishes (K. Russell, Natural Resource Manager, Riverside-Corona RCD, pers. comm., 2010). In 2010, we determined the need for collection and release was not providing new information regarding species biology or life history; thus, this activity has been discontinued.

Santa Ana suckers have been successfully reared in captivity at the Riverside-Corona RCD site since 2009. The use of artificial streams has enabled researchers to learn more about the life history and basic biology of Santa Ana suckers, which will contribute to a better understanding of its biological needs in the wild. Rearing all life stages of Santa Ana suckers in captivity provides for the ability to conduct various research projects and allows researchers to work with specimens of known age and origin.

In October 2009, 290 juvenile Santa Ana suckers were salvaged from two locations in Big Tujunga Creek as a precautionary measure to secure a refugial population of Santa Ana suckers from Big Tujunga Creek in response to predictions of large scale flooding and debris flows as a result of the Station Fire in August 2009 (see **Factor A** discussion on **Increased Wildfire Frequency**; O'Brien and Maxwell 2010, p. 1). The salvaged fish were housed at the Riverside-Corona RCD site from October 2009 until August 2010, when there was confirmation of the presence of suitable habitat at Stoneyvale in Big Tujunga Creek (O'Brien, Biologist, CDFG, 2010, pers. comm.). The salvaged fish were released in two batches to the Stoneyvale area of Big Tujunga Creek: the first batch was released on August 2, 2010, and included approximately 128 fish; and the second batch was released on August 16, 2010, and included approximately 75 fish (S. Marquez, Recovery Permit Coordinator, U.S. Fish and Wildlife, pers. obs., 2010a and 2010b). Some mortality of the fish salvaged from Big Tujunga Creek was observed at the Riverside-Corona RCD facility: 9 died from disease, 6 from stress, 4 from old age, and 40 from unknown causes (Russell 2010, pp. 1–2). This salvage operation proved successful and indicates that the artificial raceways at Riverside-Corona RCD are capable of holding and rearing Santa Ana suckers, which may prove to be important for recovery of Santa Ana sucker in the future.

Service Funded Investigations – Environmental Contaminants

A research project investigating the contaminant sensitivity of Santa Ana sucker to pollutants is being conducted by the Service's Environmental Contaminants Program in coordination with the Riverside-Corona RCD and the U.S. Geological Survey's Columbia Environmental Research Center (USFWS 2008, p. 2). The main objective of the project is to provide management with information to help ensure that the water quality of streams currently occupied or potentially occupied by Santa Ana sucker are of sufficient quality to ensure this species' continued existence and recovery (USFWS 2008, p. 2). The impetus for this project was a study conducted on a co-occurring, surrogate fish species (western mosquitofish, *Gambusia affinis*) that indicated sensitivity to and impaired function from exposure to organic wastewater compounds and endocrine disrupting compounds that are regularly present in the waters of the Santa Ana River (Jenkins *et al.* 2009, p. 39). Of the chemicals that were tested by Jenkins *et al.* (2009), some of the chemical levels are regulated (pentachlorophenol, copper, ammonia) by the CRWQCB and U.S. Environmental Protection Agency (EPA) and others are unregulated (pharmaceuticals, personal care products). The study was conducted on a surrogate species (western mosquitofish) and does not provide the specificity necessary to make recommendations for contaminant sensitivity of Santa Ana sucker (USFWS 2008, p. 4). Therefore, the current project was designed to investigate the effects of both regulated and unregulated chemicals on Santa Ana suckers. Specifically, the study will investigate five standard chemicals used from previous studies (carbaryl, copper, 4-nonylphenol, pentachlorophenol, permethrin), two pharmaceuticals that are prevalent in wastewater influenced water bodies (ibuprofen and triclosan), and four substances typically considered for waste discharge permit requirements (chlorine, ammonia, nitrite, and sulfides). When completed, results of this study are expected to provide critical information regarding the sensitivity of the Santa Ana sucker relative to other commonly tested species used to derive water quality objectives (USFWS 2008, p. 4).

Los Angeles County Department of Public Works

In Big Tujunga Creek, the Los Angeles County Department of Public Works funded a survey of habitat suitability and monitoring of fish populations that is planned for 2 consecutive years (Haglund and Baskin 2010, p. 1). This work provides very detailed and fine-scale information on habitat suitability and availability in Big Tujunga Creek. Survey results were disseminated in a Google Earth format that is efficient for use and provides for easy updating/modifying when consecutive year's survey results become available (LACDPW 2009, Google Earth kmz file). This will facilitate use by stakeholders and provide a direct benefit to Santa Ana sucker by making its presence readily known in the watershed. This agency also conducts regular predator removals from the Big Tujunga Mitigation Bank in an effort to maintain suitable habitat for the Santa Ana sucker.

U.S. Forest Service (USFS)

USFS conducted native fish surveys for Santa Ana sucker on USFS lands (Tennant 2004; Tennant 2006; Ecorp Consulting 2010b) and has begun to implement nonnative plant removals in some areas where Santa Ana suckers will benefit from this activity. The removal of nonnative vegetation in riparian areas where Santa Ana sucker occurs will provide space for native vegetation to persist and natural processes to occur.

California Department of Fish and Game (CDFG)

CDFG has conducted Santa Ana sucker presence/absence surveys and habitat utilization study in the San Gabriel River (Ally 2003, pp. 1–22; Hernandez 1997, pp. 1–7) and Big Tujunga Creek (O'Brien and Stephens 2009, pp. 1–9). CDFG has also identified current threats within Big Tujunga Creek and continues to monitor the status of Santa Ana sucker throughout the watershed (O'Brien and Stephens 2009, pp. 1–9). The continued monitoring and identification of occupied areas throughout the Angeles National Forest in the San Gabriel River and Big Tujunga Creek provides important information on the Santa Ana sucker.

<u>Vulnerability Factors</u>

Species may be vulnerable to threats for a variety of reasons. Primack (2006, p. 159) outlined five categories of species considered most vulnerable to extinction as:

1) Species with very narrow geographical ranges;
2) species with only one or a few populations;
3) species in which population size is small (identified as one of the best predictors of species extinction rate);
4) species in which population size is declining; and
5) species that are hunted or harvested by people.

Consideration of these categories in conjunction with the life history traits can provide a vulnerability profile for Santa Ana sucker. Moyle (2002, p. 184) considers introduced species, few and small populations, and habitat modifications (including impacts as a result of dams, water diversion, development, and recreation) among the factors affecting the rarity and leading to declines of Santa Ana suckers. Santa Ana suckers exhibits several attributes that make them more vulnerable to extinction, including:

1) The fish are restricted to streams and rivers of only southern California;
2) they are currently found only in three distinct watersheds, and there are many permanent barriers that prohibit upstream dispersal or dispersal among watersheds;
3) populations sizes are unknown, however, many surveys indicate that densities can be low;
4) their habitat has been greatly modified and suitable habitat necessary for life cycle processes has become limited; and
5) they inhabit highly regulated watersheds creating unpredictable and adverse hydrologic conditions.

Life history, habitat specificity, and the impacts associated with human necessity of resource (water) likely comprise the most significant vulnerabilities of the Santa Ana sucker. The threats described below in the **Five-Factor Analysis** section likely have the greatest impacts on the traits above. Those threats in the listing rule are described below and addressed for occurrences in all three watersheds (Appendix 1).

Five-Factor Analysis

The final listing rule (USFWS 2000, pp. 19686–19698) identified the following threats to the Santa Ana sucker: habitat destruction, natural and human-induced changes in stream-flow, urban development, and related land-use practices, intensive recreation, introduction of nonnative competitors and predators, and demographics associated with small population size.

The following five-factor analysis describes and evaluates the current threats to the Santa Ana sucker relative to the five listing factors outlined in section 4(a)(1) of the Act. Due to the differences in threats by watershed (see Spatial Distribution section above), we will discuss the threats in the Santa Ana River, San Gabriel River, and Big Tujunga Creek under each factor below.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

At listing, the Santa Ana River watershed, the San Gabriel River watershed, and the Los Angeles River watershed all experienced threats associated with intensive urbanization. The following were listed as specifically impacting habitat: construction and operation of dams, such as isolation and fragmentation of habitat due to permanent barriers, changes in habitat suitability, changes in flow regimes including excessive flows and sections that are permanently dewatered; suction dredge mining (in San Gabriel); recreational activities; channelization; and degradation of water quality (USFWS 2000, pp. 19686–19694).

Currently, the threats to Santa Ana sucker habitat or range are primarily attributed to urbanization and the repercussions of human population growth in Los Angeles, Orange, Riverside, and San Bernardino Counties. Habitat loss has been the primary reason for the decline in Santa Ana sucker populations throughout its range and continues to be a significant threat to the recovery of the species. We categorized Factor A threats (all of which are attributable to urbanization) to Santa Ana sucker's habitat or range into the following categories that we describe in detail below: (1) Hydrological modifications, (2) water quality, (3) increased fire frequency, (4) OHV use, (5) mining activities, and (6) nonnative vegetation.

1. Hydrological Modifications

The hydrology of the watershed may be modified through human activities such as: (1) Construction and operation of dams or other barriers, and (2) water diversion and channelization of streambeds or construction of roads and other permanent impervious surface cover that modify stream processes. We address each of the threats and subsequent impacts to the habitat separately for which management actions could be taken to ameliorate the threats.

<u>1.1 Dams or Other Barriers</u>

Dams are prevalent structures throughout southern California. In the Santa Ana River, the two major dams (Seven Oaks and Prado) work in coordination regulating flows from the upper San Bernardino Mountains. In the lower Santa Ana River, there are a series of rubber inflatable dams near Weir Canyon Road and another series near California Highway 90 that regulate flood flows. In the San Gabriel River watershed, there are a series of dams that originate at the base of the San Gabriel Mountains, including Cogswell, San Gabriel, Morris, Santa Fe, and Whittier Narrows Dams. In the San Gabriel River watershed, and specifically the San Dimas River that is a tributary to the San Gabriel River, the San Dimas Dam exists at the base of the San Gabriel Mountains. In the Los Angeles River watershed, the Big Tujunga Dam and Hansen Dams surround the area that is currently occupied by Santa Ana suckers in Big Tujunga Creek. Other barriers throughout Santa Ana sucker's range that may modify its habitat are bridges, inflatable dams and drop structures, or other types of road crossings such as Arizona crossings.

The creation of dams or other barriers modifies Santa Ana sucker habitat by: (1) Interrupting long- and short-range dispersal, and (2) modifying habitat near the flood basin such that it is no longer suitable.

1.1.1 Interruption of Long- and Short-Range Dispersal

The Santa Ana River watershed is divided by three permanent barriers to upstream dispersal. The two major dams (Seven Oaks and Prado) work in coordination, regulating flows from the upper San Bernardino Mountains. Movement into the upper Santa Ana River and Bear Creek is blocked by the Seven Oaks Dam, which began operation in 1999. The middle Santa Ana River watershed is blocked to upstream movement by the drop structure under the South La Cadena Drive Bridge in San Bernardino County, California. This barrier continues to prevent access to historically occupied habitat upstream including Lytle Creek, Warm Creek, City Creek, and the Upper Santa Ana River. The lower Santa Ana River is blocked to upstream movement by Prado

Dam, which began operation in 1941. Additionally, in the lower Santa Ana River there are a series of rubber inflatable dams near Weir Canyon Road and another near California Highway 90. The creation and operation of these dams throughout the watershed has had substantial impacts on corridors. For example, the area in the mainstem of the Santa Ana River below Seven Oaks Dam down to the Rialto/RIX facilities is generally dry because of the prevention of flow that stems from water conservation behind Seven Oaks Dam. Historically, this corridor was connected by water flow that allowed Santa Ana suckers to move into City Creek and the upper area of the Santa Ana River (R. Rodriguez, Biologist, CDFG, 2006, pers. comm.; UMM 2010, #131753).

The San Gabriel River's flow is regulated by Cogswell Dam on the West Fork of the river and the San Gabriel Dam in the center of the river as it flows south into the City of Azusa. The West Fork water supply is regulated by releases from Cogswell Dam into the mainstem of the San Gabriel River. The San Gabriel Dam is downstream of the confluence of where the West and North Forks join the East Fork; the North and East Forks are unregulated at this time. Recreational dams also modify Santa Ana sucker habitat and may interrupt upstream dispersal. These temporary structures are generally created from rocks and other debris that are used by bathers or recreational miners to suction dredge (Ally 2003, p. 1). Reports indicate that there can be hundreds of recreational dams in a few mile stretch of the East Fork of the San Gabriel River attributed to bathers or recreational mining (Ally 2003, p. 1); however, in the North and West Forks of the San Gabriel River these types of recreational dams are primarily used for swimming or bathing (Ally 2003, p. 2). USFS discourages the creation of these dams and volunteers assist in the removal of dams that have been created and discourage the activity (Welch 2010, pers. comm.). Historically, Santa Ana suckers were present below the San Gabriel Dam and in Fish Canyon; however, recent survey reports indicate that this occurrence has been extirpated (Appendix 1; City of Azusa 2009, p. 4.3-13). Santa Ana suckers were recently recorded in the San Dimas Wash below the San Dimas Dam, which is part of the San Gabriel River watershed. This population is completely separated from the San Gabriel River population. In downstream historically occupied areas that have since been extirpated, additional barriers below the San Gabriel Dam include Morris Dam, Santa Fe Dam, Whittier Dam, and numerous other drop structures.

Big Tujunga Creek is regulated by dams on both the upstream (Big Tujunga Dam) and downstream (Hansen Dam) extremes; therefore, water supply is continually regulated throughout the remaining occupied area in the Los Angeles River watershed. There is flow from multiple tributaries into Big Tujunga Creek that provides surface flow in the lower and upper extremes. In between the two dams there are small barriers (road crossings on private land) that may prevent dispersal at certain periods of time when water flow is low (O'Brien and Stephens 2009, p. 2).

1.1.2 Modifying Habitat Near Flood Basins

Habitat behind dams is often modified from the natural conditions due to ponding and lack of downstream movement of water. When ponding occurs, a reduction in velocity causes increasing fine sediment to fall out of suspension, and thus dominate the substrate. The ponding and slow moving water modifies the habitat in a manner that is conducive to increased suitability of habitat to predators such as bass (Family Centrarchidae), carp (Family Cyprinidae) and catfish (Family Ictaluridae). Depending on the system and time of year, the flood basin may change in depth and size. Therefore, the suitability of the habitat for Santa Ana suckers may change. When the dams are holding large amounts of water, the flood basin fills and quickly modifies previously suitable habitat into unsuitable habitat (Ecorp Consulting 2010b, p. 15). The flood basins of Seven Oaks and Prado Dams are much larger than those within the San Gabriel or Big Tujunga Creek watersheds; therefore, the impact of flood basins and nonnative predators may be greater on the Santa Ana River, but data is lacking to accurately assess this impact.

All six of the extant Santa Ana sucker occurrences (Appendix 1) are threatened by the impact of dams and other impassable barriers. In the Santa Ana River, the operations of Prado Dam were analyzed and there is management in place to ameliorate and minimize impacts of the dam operations to Santa Ana suckers (USFWS 2001, pp. 39–42; Team 2009, pp. 4-21–4-24). Potential impacts to Santa Ana suckers by operations of the Seven Oaks Dam have not yet been analyzed. In the San Gabriel River, the "Long-Term Management Plan West Fork San Gabriel River" is in place; however, this plan does not specifically address the management needs of the Santa Ana sucker (USFS *et al.* 1989, pp. 1–22). Though there is no plan in place in Big Tujunga Creek, the Los Angeles County Department of Public Works is revising their dam operations and plans to address the management needs of the Santa Ana sucker (Haglund and Baskin 2010, p. 1). Although many of the permanent habitat modifications have not changed since the time of listing, the threat of hydrological modification has increased as a result of dam operations and other in-stream barriers that have severely impacted the habitat rangewide.

1.2 Modification of Stream Processes through Dams, Water Diversion, and Stream Channelization or Construction of Roads and Other Permanent Impervious Surface Cover

In all three watersheds, dams present barriers to water and sediment transport (as discussed in **1.1.1 Interruption of Long- and Short-Range Dispersal** section above), tributaries of the mainstem have been channelized for flood control, or there have been new diversions made that channel the water into spreading areas or basins for recharge. The process of damming, diverting, and channelizing rivers inhibits the normal movement and transport of water and sediment, prevents absorption of water back into groundwater, and fragments the available habitat for the Santa Ana sucker. Impacts from dams and other permanent impervious surface cover on (1) water transport and (2) sediment transport are discussed below.

1.2.1 Modifying Water Transport Downstream

Dams or other barriers present a substantial threat to the Santa Ana sucker because the flow of water from upstream areas is interrupted and necessary habitat (the water itself) becomes limited in downstream habitats. As a result of water retention practices, dams may eliminate flows during summer months when flows are naturally lower and the input of water from upstream becomes even more important to sustain the water depth and flow necessary to provide suitable habitat conditions for Santa Ana suckers. When flows are severely diminished, Santa Ana suckers may become stranded in pools that are then only maintained by springs, seeps, or other surfacing groundwater (Andresen 2001, p. 3).

Channelization and development of roads present substantial threats to Santa Ana suckers because flow of water may increase the amount of runoff and result in increased flashiness of the system (i.e., higher, more intense flows for shorter durations and lower baseflow), which makes the habitat less suitable throughout the year. Channelization, roads, and other development do not allow recharge or percolation of water as it would normally occur. Results of increased flashiness include (but are not limited to) reduced sinuosity that promotes habitat heterogeneity and increased channel depths. The resulting channel becomes linear and deeper with homogeneous substrates and is less suitable for Santa Ana sucker.

A search of water rights from the California Regional Water Quality Control Board (CRWQCB) website (CRWQCB 2010, website viewed August 2, 2010) resulted in 4,330 entries for Los Angeles, Orange, Riverside, and San Bernardino Counties. Of those, 977 occur in Los Angeles County, 91 in Orange County, 1,093 in Riverside County, and 2,163 in San Bernardino County. This information lists water rights dated from 1915 through present day. It is nearly impossible to determine how much water remains after all the diversions and usage along the rivers, but it is clear that the magnitude of usage in all of the watersheds is high. The removal of water from the system inevitably limits the quantity of habitat that is accessible and suitable for Santa Ana suckers.

A recent water rights petition (WW0059) for owners of wastewater treatment plants (SBMWD 2010) was submitted to CRWQCB that requested a change in the current discharge of tertiary treated water from the RIX water treatment plant. Currently, RIX discharges approximately 36 MGD (Wildermuth 2010, pp. 1-1–1-3) of tertiary treated water into the Santa Ana River. The petitioners request to decrease the amount of discharged water into the Santa Ana River from 36 MGD to 11.9 MGD (Wildermuth 2010, pp. 1-1–1-3). The petition submitted to the CRWQCB stated that they expected no adverse impacts to fish as a result of this petitioned action. On July 29, 2010, we submitted a letter in protest to CRWQCB specifically stating that Santa Ana sucker is dependent on discharges from the RIX facility to maintain suitable habitat for spawning and foraging and if there is Federal involvement in the proposed action, impacts to critical habitat and federally-listed species should be considered pursuant to section 7 of the Act (USFWS 2010b, p. 2). If the proposed petition is granted, a decrease, of this magnitude, in available water in the Santa Ana River would reduce the available habitat for Santa Ana suckers.

Water transport within the Santa Ana River is completely regulated by the coordinated efforts of Seven Oaks Dam in the upper Santa Ana River and Prado Dam in the lower reaches. Seven Oaks Dam has a gross reservoir capacity of 145,600 acre-feet (179,600,000 m^3) (OCPW 2010, website viewed July 29, 2010) and Prado Dam’s capacity is 196,000 acre-feet (242,500,000 m^3) (OCWD 2010, website viewed August 2, 2010). The upper watershed has not been impacted by urbanization and stream channelization to the same degree as the lower watershed. In the lower watershed most tributaries have been channelized. The extent of water diversion and channelization throughout the range of Santa Ana sucker inevitably impacts the availability and quality of water to occupied areas; however, quantifiable impacts are not known or fully understood. Of the currently occupied areas, the Santa Ana River watershed is most impacted by impervious surface cover. In the Santa Ana River watershed, the occupied waterway (middle and lower Santa Ana River) is located in the middle of the densely populated inland areas of San Bernardino and Riverside Counties. In the upper Santa Ana River watershed, City Creek and the upper Santa Ana River are relatively free from roads and other ground-covering development, but the Warm Creek location has been affected by modified water transport. As a result this habitat may no longer be suitable and may have contributed to the extirpation of Santa Ana sucker at this location.

In the San Gabriel River, Cogswell Dam has a capacity of 12,298 acre-feet (15,170,000 m^3) and regulates the flow in the West Fork of the river. The flow in the North and East Forks are unregulated, but flow into the San Gabriel Dam flood basin which has a capacity of 145,600 acre-feet (1,796,000,000 m^3). In Big Tujunga Creek, water flow is regulated on the upstream end by the Big Tujunga Dam that has a capacity of 5,960 acre-feet (7,352,000 m^3) (URS 2006, p. 1-1) and Hansen Dam that has a capacity of 106,000 acre-feet (124,100,000 m^3) on the downstream end near the Shadow Hills city limit. In Big Tujunga Creek and the San Gabriel River, the remaining areas that are occupied by the Santa Ana sucker are upstream of most of the urban area and are essentially the only reaches likely to be successfully inhabited under current watershed conditions. These reaches have not been heavily impacted by diversions or channelization upstream of the dams. As one travels downstream in both watersheds, the impacts associated with urbanization (entire area is essentially channelized through Los Angeles County) are evident; most of the water is captured behind dams or channelized into spreading grounds (recharge areas) or reservoirs.

1.2.2 Modifying Sediment Transport Downstream

The modification of a hydrological system by regulating and attenuating flows not only decreases the amount of water that is replenished to downstream areas, the diminished flows are less capable of carrying coarse sediments to downstream areas (Kondolf 1997, p. 535). Santa Ana suckers depend on the presence of gravel and cobble in the habitat for multiple reasons, including (but not limited to): (1) Gravel and cobbles serve as the substrate where the Santa Ana sucker’s primary food source (algae) grows; (2) this substrate is more easily scraped by the cartilaginous protrusions on the lips of Santa Ana suckers; and (3) gravel and cobble serve as a substrate where mature Santa Ana suckers lay their eggs. Sand does not provide enough surface area to allow algae to grow and therefore, does not provide high quality habitat. Interruption of water flows interrupts the transport of coarse sediments downstream, which is essential in riverine processes. In high elevations the coarse sediments are eroded and then transported downstream, as the flow energy dissipates with decreasing river gradient the sediments begin to deposit to the riverbed (Kondolf 1997, pp. 533–534). The creation of a dam interrupts the flow of water and sediments and creates a reservoir where this water and sediments are deposited. The transport capacity of the system to move sediment downstream becomes impaired, resulting in deposition of sediments behind the dam and degradation of coarse sediments of the habitat downstream (ACOE 1997, pp. 9-1–9-3). Downstream from a dam, there is an increasing abundance of fine sand and silt that settles out because these are the only sediments that pass through the dam and are able to be transported by the decreased magnitude of water flow (Kondolf 1997, p. 535). The presence of fine sand and silt creates a habitat that is not suitable for reproductive and feeding processes that are important for the Santa Ana sucker. The interruption and prevention of coarse sediment transport degrades habitat through time.

The impacts of a modified sediment transport system appear to be most affected in the Santa Ana River watershed (Saiki 2007, p. 96; Thompson *et al.* 2010, p. 322). Sediment transport has been modified in all of the watersheds due to the presence of dams and other barriers to water movement. The magnitude of impacts from dams on the transport of sediment is largely unknown for all three watersheds; however, recent data indicate that suitable habitat is distributed patchily and often isolated and rare (LACDPW 2009, Google Earth kmz file; Thompson *et al.* 2010, p. 321). Data collected from the Santa Ana River indicates that habitat suitability has decreased throughout the historically occupied area by approximately 60 percent since the time of listing (10.5 km at listing compared to 4.2 km currently; see Table 1 above developed from Thompson 2009, Thompson *et al.* 2010, and USFWS unpublished data 2010). The degraded habitat quality is likely due to the interruption in water and coarse sediment transport from higher elevation streams in the watershed. This modification of habitat in the occupied areas likely impacts the reproductive and feeding success of Santa Ana sucker throughout the occupied areas in the Santa Ana River. Moreover, the modification of hydrological processes may inhibit restoration efforts throughout the watershed through alteration of the hydrological processes. Restorative efforts may be repeatedly impacted because of the lack of natural processes that are necessary to maintain habitat suitability in the system.

Channelization and development of roads also present substantial threats to stream processes because the concrete-lined channels do not allow for the erosive processes that would normally occur in-stream in an unmodified channel. Additionally, roads and other development influence erosion along banks that must be reinforced with rip-rap or large boulders that do not provide the same coarse substrate transport that is necessary for essential life functions of Santa Ana suckers.

All six of the extant occurrences are threatened by the impact of modified stream processes. In the middle and a portion of the lower Santa Ana River, the Western Riverside County Multiple Species Habitat Conservation Plan (Western Riverside County MSHCP) and SAS Conservation Program afford some protection to the species, because there is some management in place to ameliorate and minimize impacts of routine maintenance and operation from flood control and other operations to Santa Ana sucker (USFWS 2001, pp. 39–42; Team 2009, pp. 4-21–4-24). However, there are no management protections afforded to the upper Santa Ana River where the water and coarse sediments originate. In the San Gabriel River, the Long Term Management Plan West Fork San Gabriel River is in place; however, management needs for the Santa Ana sucker is not specifically addressed (USFS *et al.* 1989, pp. 1–22). In Big Tujunga Creek, the Los Angeles County Department of Public Works is currently working on revising their dam operations and plan to address the management needs of the Santa Ana sucker; however, none are currently in place (Haglund and Baskin 2010, p. 1). Although many of the permanent habitat modifications have not changed since the time of listing, the threat of hydrological modification has increased because the impacts to habitat from dam operations, other in-stream barriers, water diversions and stream channelization, and roads and construction of other impervious surface cover have severely impacted the habitat rangewide.

2. Water Quality

As in-stream water quantity continues to diminish, water quality will become increasingly important to the continued survival and recovery of the Santa Ana sucker. Water quality may be degraded by point and non-point sources of pollution associated with urbanization. Pollutants may include oil, gas, other chemicals, metals, and anthropogenic chemicals and nutrients from human uses. Wastewater-dominated rivers, like the Santa Ana River, are subject to increased inputs of regulated contaminants including inorganics (e.g., chlorine, nitrates, ammonia, sulfides and metals), plasticizers, organochlorine insecticides, polynuclear aromatic hydrocarbons, solvents, and non-ionic detergent metabolites (Kolpin et al. 2002, pp. 1202–1211). Wastewater-dominated rivers are also subject to inputs of as yet unregulated "emerging" contaminants including new generation pesticides, steroids and hormones, personal care products, prescription and non-prescription drugs, antibiotics, household disinfectants, insect repellants, fire retardants and others (Kolpin *et al.* 2002, pp. 1202–1203). There are both point source and non-point source inputs in all three of the watersheds that may impact water quality. Additionally, chemicals that are released may be regulated or unregulated pollutants and some may have detrimental impacts on water (habitat) quality and sublethal or lethal impacts on Santa Ana suckers (see discussion in **Factor D - Clean Water Act** and **Factor E** below).

Point source discharges are easier to regulate and manage but non-point source impacts are significant in urbanized watersheds, often ongoing, and much more difficult to regulate or control. Changes in physical water quality variables (temperature, turbidity, conductivity, and nutrients) may modify the water (habitat) such that it is not suitable for Santa Ana sucker. Additionally, some of these same water quality impacts may have direct impacts on Santa Ana sucker. Urban run-off that discharges into the mainstem from a concrete channel may additionally increase the temperature of the water in the mainstem, thereby reducing the amount of dissolved oxygen in the water column due to an inverse affinity of water to hold oxygen at higher temperatures (Roa-Espinoza *et al.* 2003, p. 370). Though Santa Ana suckers are able to tolerate high water temperatures, fish are generally more stressed at the upper extremes of their range, which may affect growth and disease resistance (Barton *et al.* 2002, pp. 111–148). The combination of increased water temperature and introduced nutrients (such as nitrogen and phosphorous) may also increase algal growth (Dodds *et al.* 2002, p. 867) leading to eutrophication and consequently, increase the turbidity of the water. Excess algal growth in eutrophic waters due to higher oxygen demand from the respiration of excess algae at night can also significantly lower dissolved oxygen concentrations (Burkholder 2001, p. 105). Oxygen may be further depleted such that fish kills occur if large amounts of algae suddenly die, resulting in the breakdown of algae by bacteria (Burkholder 2001, pp. 103–121).

Other introduced chemicals, such as vehicle oils or grease, may be discharged illegally into the watershed. For example, the CRWQCB issued a citation to the City of Los Angeles for unpermitted grading and construction activities and hydraulic fluid spill into the Big Tujunga Wash at the Foothill Boulevard Bridge Widening Project (CRWQCB 2010b, p. 4). This discharge may have or threatened to detrimentally impact the quality of the waters of the State and United States (CRWQCB 2010b, p. 4). The unauthorized or unpermitted operations may have impacted the water quality by filling a portion of occupied Santa Ana sucker habitat and the discharge of the hydraulic fluid may have contaminated the immediate and downstream occupied areas making the habitat unsuitable for Santa Ana sucker.

As stated above, the presence of dams in all three watersheds has increased the quantity of fine sediments (fine sand and silt) transported downstream, which may also impact the water quality of all watersheds. The construction phase of development results in further introduction of fine sediments into riverine systems. Sand and silt are also likely more prevalent due to increased bank erosion during flashier events resulting from increased impervious surface cover.

Water quality was compared between the Santa Ana River and the San Gabriel River and it is apparent that the quality of water is much better in the San Gabriel River watershed and may contribute to the higher density and condition of Santa Ana suckers in the San Gabriel River compared to the Santa Ana River (Saiki 2000 p. 45; Saiki *et al.* 2007, p. 93). Presumably, this is related to increased development in the Santa Ana River watershed. No comparisons exist for Big Tujunga Creek.

In the Santa Ana River, one reach (Reach 4 – from Mission Boulevard in Riverside to San Jacinto Fault in San Bernardino) the water quality is considered impaired (on the 303d list) by the California Regional Water Control Board due to pathogens (see **Factor D - Clean Water Act** section below). This area contains one of the few remaining suitable habitat areas for Santa Ana suckers and recent surveys indicate that this area, including the Riverside Narrows, is a very important location for the species persistence (SMEA 2009, pp. 1–4). Water quality is presumably better in Big Tujunga Creek and San Gabriel River, compared to the Santa Ana River and no reaches are included on the 303d list.

Decreasing water quality is a rangewide threat impacting all six of the extant occurrences. Increased sediment loads, elevated water temperature, and introduced chemicals threaten the Santa Ana sucker in all three watersheds. Though some protection is afforded by the Clean Water Act (CWA) and California Porter-Cologne Act (see **Factor D** discussion below), water quality continues to degrade, reducing the suitability of habitat for the Santa Ana sucker in all three watersheds where the species occurs. Urbanization has increased since the time of listing and continues to increase; the threat of degraded water quality is substantial and has potential to have rangewide impacts.

3. Increased Wildfire Frequency

Increased frequencies of wildfire may impact riparian vegetation throughout occupied and unoccupied reaches of all three watersheds. The loss of riparian vegetation may impact water transport, sediment transport, water quality, and flow regime. After recent fires in southern California, USFS investigated the potential impacts to streams on their lands (USGS 2009, p. 2) and determined that impacts may result in local extirpations of Santa Ana suckers (USFS 2009, p. 7).

In August 2009, a fire initiated within the San Gabriel Mountains (Station Fire) and eventually burned approximately 161,000 acres (ac) (64,975 ha) (USFS 2009, p. 4) that impacted the San Gabriel River watershed and Big Tujunga Creek watershed. The fire burned conifer forests, chaparral, and riparian vegetation in the stream corridors, including approximately 81 mi (130 km) of perennial channel and 572 mi (920 km) of intermittent streambeds (USFS 2009, p. 2). As a result of this fire, excessive debris flows and changes to water quality are anticipated to occur during seasonal rains over the next several years. The greatest potential for significant impacts resulting from elevated debris flows is anticipated in Big Tujunga Canyon, Pacoima Canyon, Arroyo Seco Canyon, the West Fork of the San Gabriel River, and Devil's Canyon (USFS 2009, p. 4). There is an estimated 81 to 100 percent probability that a 3-hour duration, 1-year-reoccurence thunderstorm will impact the area burned in the 2009 Station Fire in Big Tujunga Creek (USGS 2009, p. 9, Fig 3A). Anticipated post-fire impacts to streams within this area as a result of a thunderstorm of this magnitude include ash and debris deposition that may reduce available habitat by physically altering streambeds and pools, increasing scour of riparian and aquatic vegetation, and increasing water temperature from the short-term loss of canopy shading (USFS 2009, p. 5). Changes to water quality (such as increased turbidity) are also anticipated from both post-fire impacts and from the release and mobilization of toxic chemicals such as gas, oil, and building materials as a result of burned structures and their contents (USFS 2009, p. 6). The USFS determined that the future combined impacts attributed to the 2009 Station Fire may lead to a temporary loss or reduction of suitable stream habitat in this area and a localized risk of extirpation that may result in threatening the viability of the Santa Ana sucker (USFS 2009, p. 7). Additionally, the loss of vegetation and creation of roads for fire-fighting may allow greater access to streambeds and facilitate increased OHV use resulting in further habitat degradation (USGS 2009, p. 7).

There is no management plan in the San Gabriel Mountains that identifies management actions for potential impacts to Santa Ana suckers associated with wildfires. Information on impacts to Santa Ana suckers associated with wildfires is lacking for all three watersheds. Reports associated with the 2009 Station Fire did consider a portion of the San Gabriel River and Big Tujunga Creek watershed. Therefore, wildfire impacts were only analyzed for the area within the San Gabriel Mountains. However, wildfire impacts to the habitat would likely be similar in the upper Santa Ana River watershed and the San Gabriel River and Big Tujunga Creek watershed. The threat of wildfire is currently not considered a substantial threat but has the potential to have rangewide detrimental impacts.

4. Use of Off-Highway Vehicles (OHV)

OHVs impact both riparian and in-stream habitat that is important for Santa Ana suckers. Users of OHVs may drive along the banks of rivers, which can degrade bank stability and lead to erosion, and damage riparian plant communities that provide shade over the river and increase bank stability. OHVs may also drive through the river and disturb sediments, create increased turbidity, potentially crush Santa Ana suckers, and otherwise disturb substrates that Santa Ana suckers require for feeding and rearing young.

In the Santa Ana River in the Riverside Narrows near Riverside Avenue in San Bernardino County, unauthorized OHV activity is common. The banks of the river in this area have recently been cleared of the invasive plant, *Arundo donax*, which has allowed easy access to the river banks and bed. This easy access has promoted OHV activity that includes multiple observations of camps (tents and bonfires) and 10 to 20 vehicles driving through the river and along the banks (SAWPA 2010 pp. 1–10; Beehler, Environmental Project Manager, SAWPA, 2010a, pers. comm.).

OHV use also occurs in authorized areas such as the San Gabriel Canyon OHV which is approximately 153 ac (62 ha) and lies entirely within the designated critical habitat for

Santa Ana sucker. Our 2005 Biological Opinion determined an "unquantifiable number of Santa Ana suckers" would be taken as a result of OHV activity (USFWS 2005b, pp. 9–11). To minimize OHV impacts to habitat in the San Gabriel Canyon OHV area, USFS shall limit in-stream crossings to three locations, post signs for these crossings, conduct on-going annual monitoring, and form or fund partnerships to assess habitat linkage between the East and West Forks of the San Gabriel River (USFWS 2005b, pp. 9–11). Results from monitoring in the OHV area indicate that the quality and function of habitat is degraded (Ecorp Consulting 2010b, p. 8; Ecorp Consulting 2007, pp. 11–12). Furthermore, there was a drastic decline in numbers of Santa Ana suckers and increase of nonnative predators in 2009 surveys compared to 2007 surveys (Ecorp Consulting 2007, p. 9; Ecorp Consulting 2010b, p. 9). The cause of this change is unclear, although it may be the result of a more expansive flood basin behind the San Gabriel Dam that allowed nonnative predators to enter into the area where Santa Ana suckers usually occur. The Angeles National Forest is planning construction of a new OHV area in the San Gabriel Canyon that is anticipated to alleviate the amount of activity in the San Gabriel River (Welch 2010, pers. comm.).

OHV use in Big Tujunga Creek has not been documented, but a large portion of the creek is within USFS lands, which provide access that could potentially include unauthorized OHV use.

Three of the six extant occurrences may be threatened by the impacts of OHVs to Santa Ana suckers and their habitat. Management to control the impacts of OHV use to Santa Ana sucker or its habitat has been limited in scope and enforcement (i.e., some OHV activity continues to occur in the Santa Ana River). Management actions and enforcement specifically for the benefit of Santa Ana sucker is being planned by the SAS Conservation Program participants. In the San Gabriel Mountains, OHV use is allowed in one approved area (San Gabriel Canyon OHV area), which has management in place to ameliorate the impacts to Santa Ana suckers (USFWS 2005b, pp. 9–11). The threat of OHV use is currently not considered a substantial threat but has the potential to have rangewide impacts.

5. Mining Operations

Sand and gravel are used as construction aggregate for public works projects such as roads and highways and a multitude of other commercial uses (Kondolf 1997, p. 540). In-stream mining alters the channel geomorphology and bed elevation, and can require water diversion, clearing, and excavation (Kondolf 1997, p. 541). The practice of in-stream mining may induce channel incision and erosion, but more importantly for Santa Ana suckers, mining for gravel and sand removes necessary substrates from the watershed and discharges fine residual sediment back into the watershed. By removing sediment from the channel the sediment delivery and transport process is impeded and may result in an incised, straighter channel, which does not function as a normal river. The excavated pits slow water as it passes and may induce headcutting, where upstream of the excavation site the sediment becomes eroded because sediments fall out into the pit and then as they flow they need to pick up sediment on the downstream end. This process often creates incised channel banks and bed floor (Kondolf 1997, pp. 541–542). Under these circumstances the river is unable to maintain the diversity of successional stages of vegetation that occurs when a river is allowed to migrate and meander inside the floodplain (Kondolf 1997, p. 542). Additionally, because of the amount of sediment that is removed from mining activities, the scour that results downstream may have deleterious effects on bridges and other permanent in-stream structures (Kondolf 1997, p. 542). In-stream mining primarily occurs in the upper Santa Ana River and its tributaries, and in the middle Santa Ana River near River Road Bridge (USFWS 2002, p. 1); however, the mining near River Road Bridge is scheduled to be discontinued. We do not have any information indicating that sand and gravel mining is occurring in the San Gabriel River or Big Tujunga Creek.

Suction dredging to find precious minerals is generally a recreational activity that occurs most frequently on USFS lands. A vacuum is used by a worker (versus heavy equipment or vehicles) to suck up sediment and pass it through a screen or mesh with the intention of finding precious minerals such as gold. The 2000 listing rule states that in 1999 there were approximately 40 special use permits for suction dredging in the East Fork of the San Gabriel River. The current USFS policy does not permit suction dredging in the San Gabriel Canyon unless it is approved by a District Ranger (Welch 2010, pers. comm.). The number of permits being used in the San Gabriel River or Big Tujunga Creek is unknown because current regulation allows permits to be purchased for any location throughout the state (D. Maxwell, Senior Biologist, CDFG, 2010, pers. comm.). As of August 6, 2009, CDFG imposed a moratorium on in-stream suction dredging until the State of California completes a court-ordered environmental review, and adopts a permitting program (CDFG website viewed October 14, 2010). Sluicing and high banking, techniques also used to find precious minerals, are likely occurring in the San Gabriel River and to a lesser extent in Big Tujunga Creek (Welch 2010, pers. comm.).

Three of the six extant occurrences of Santa Ana sucker are threatened by impacts from mining operations. There are no management plans that specifically ameliorate the threat of mining to Santa Ana sucker or its habitat. The threat of impacts from mining operations is currently not considered a substantial threat but has the potential to have rangewide impacts.

6. Nonnative Vegetation

Arundo donax is an aquatic plant in the genus of perennial reed-like grasses (Poaceae). It is a nonnative giant reed species that is often found growing along lakes, streams, and other wetted areas. Compared to other riparian vegetation, it is known to use excessive amounts of water to supply its exceptionally high growth rates (Bell 1997, p. 104). This species is considered a primary threat to riparian corridors because of its ease of establishment and ability to alter the hydrology of the system. *Arundo donax* tends to form large, continuous, clonal root masses that stabilize the banks of the river or stream, which alters the flow regime of the system and prevents natural dynamic processes of stream meandering and deposition and scouring of sediments to occur (Bell 1997, p. 106). It has also been postulated that *A. donax* may crowd out native riparian vegetation or possibly lower the water table (Zembal and Hoffman 2000, p. 66). In areas where *A. donax* is common, flows may be diminished and sandy pool habitats created. Slow moving flows and formation of pools are preferred habitat for nonnative predators such as largemouth bass (*Micropterus salmoides*) and green sunfish (*Lepomis cyanellus*), which have been suggested to prey heavily on Santa Ana suckers (Baskin and Haglund 1999, pp. 17–18; Moyle 2002, p. 185; Ecorp Consulting 2010b, p. 15).

In the Santa Ana River, *Arundo donax* is predominant among the riparian vegetation. In the San Gabriel River, this nonnative plant is rarely found and the riparian vegetation consists primarily of native vegetation; nonnatives may be rare in these areas due to the steeper, mountainous terrain (Saiki 2000, pp. 18–19; Saiki 2007, p. 90). *Arundo donax* has also been reported in high abundance in the downstream portion of Big Tujunga Creek and may alter the in-stream habitat, which may provide habitat for nonnative predators (Saiki 2000, pp. 62–80; Chambers Group 2001, p. 4). However, impacts need to be evaluated within the context of potential threats to habitat occupied by Santa Ana sucker.

Habitat at four extant Santa Ana sucker occurrences may be threatened by the impacts of nonnative plant species, specifically *Arundo donax*. There are no management plans that ameliorate the threat of *A. donax* to the Santa Ana sucker or its habitat. In the Santa Ana River and Big Tujunga Creek, removal efforts are in place, but their success is unknown at this time. More information is needed to accurately determine what specific impacts this nonnative plant may have on the Santa Ana sucker. The threat of impacts from nonnative vegetation is currently not considered a substantial threat but has the potential to have rangewide impacts.

Summary of Factor A

At listing, the Santa Ana sucker's range was reduced by approximately 80 percent in the Los Angeles River, 75 percent in the San Gabriel River, and 70 percent in the Santa Ana River (USFWS 2000, pp. 19687–19688) and intensive urbanization impacted the Santa Ana sucker through the following threats: construction and operation of dams, such as isolation and fragmentation of habitat due to permanent barriers, changes in habitat suitability, changes in flow regimes including excessive flows and sections that are permanently dewatered; suction dredge mining (in San Gabriel); recreational activities; channelization; and degradation of water quality. Since listing, there are no additional barriers restricting dispersal or further fragmenting Santa Ana sucker populations; however, impacts to habitat have been amplified. As a result, Santa Ana suckers remain in a very small portion of their historical range. Furthermore, the areas where they occur are highly fragmented and isolated by impassable barriers or unsuitable habitat. The impacts attributed to loss of available habitat as a result of dams and other hydrological modifications combined with the threat of water quality degradation, overuse of habitat for recreation and economic gain, increased wildfire frequency, and potential effects of nonnative vegetation and predators have a cumulative effect on the Santa Ana sucker and its habitat. Threats at listing have not been ameliorated and the habitat has continued to be modified to varying levels in each of the watersheds. Impacts associated with increased urbanization are continuing to rise and new threats have been identified that impact Santa Ana sucker habitat. Although the Santa Ana sucker is a highly fecund species, the modifications of habitat have fragmented and limited the potential areas where important life-cycle processes occur and continue to inhibit the proliferation of the Santa Ana sucker. Though two of the six occurrences are addressed in management plans, the threat of habitat modification, fragmentation, and loss is considered substantial and has increased since listing.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The 2000 listing rule indicated that CDFG reported the illegal harvest of Santa Ana suckers with gill and throw nets in the Santa Ana River below Prado Dam (M. Maytorena, Lieutenant, CDFG, 1997, pers. comm.). Since listing, we received information that Santa Ana suckers may be a food source for people living in encampments along the Santa Ana River and there may be a correlation of this illegal activity to the observed decline in Santa Ana suckers with proximity to these camps (Russell 2007, p. 13). However, the relative impact of illegal harvesting of the species is unknown. We have no information indicating that overutilization of Santa Ana sucker in the San Gabriel or Big Tujunga Creek watersheds have historically or are currently a substantial threat to Santa Ana sucker.

Two of the six extant occurrences (Middle Santa Ana River and Lower Santa Ana River) may be impacted by overuse. There is a management plan in place in the Middle Santa Ana River that addresses this species; however, it does not specifically address the threat of overuse. We have no information indicating that overuse is a substantial threat to the continued existence of the Santa Ana sucker throughout most of its range.

FACTOR C: Disease or Predation

Disease

We have no information indicating that disease was historically or is currently a threat to the Santa Ana sucker in the Santa Ana River, San Gabriel River, or Big Tujunga Creek Watersheds (USFWS 2000, p. 19687). A previous study identified potential fish parasites that may impact survival of native fishes (Warburton *et al*. 2002, p. 4). This study reports Asian tapeworm, whitespot disease, and anchor worm as common parasites in the San Gabriel River and Big Tujunga watersheds. The impact of these parasites on Santa Ana sucker is unknown, although we do recognize that they can be susceptible to parasitism (Russell 2010, pp. 1–2).

We have no information indicating that disease is a substantial threat to the continued existence of the Santa Ana sucker throughout most of its range.

Predation

Information in our files indicates that the abundance of nonnative predators has risen dramatically throughout the currently occupied range of the Santa Ana sucker. In 1999, Saiki (2007, pp. 91–92) documented only 2 native species (Santa Ana sucker and speckled dace (*Rhinichthys osculus*)) and 12 nonnatives in the Santa Ana River. Not all of these nonnative species present a predation threat to Santa Ana sucker; however, this list includes voracious piscivorous (habitually feeding on fish) predators such as bass and sunfish (Centrarchidae), tilapia (Cichlidae), carp (Cyprinidae), and catfish (Ictaluridae). In years since 1999, many tilapia and hundreds of carp and yellow bullheads (catfish) have been reported in the Santa Ana River (Allen 2003, pp. 5–6; Russell 2006, p. 10). Moyle and Yoshiyama (1992, p. 205) state brown trout (*Salmo trutta*) may have caused the extirpation of Santa Ana suckers in the upper

Santa Ana River; however, data and survey efforts are lacking to provide evidence of this extirpation. Brown trout are still reported from the upper Santa Ana River (above Seven Oaks Dam), but they are mostly small in size and data indicate rainbow trout (*Oncorhynchus mykiss*) are more prevalent than brown trout, which do not present a significant predation risk to Santa Ana suckers because they feed on small macro-invertebrate larvae (McGinnis 1984, p. 126). The high abundance of *Arundo donax* throughout the Santa Ana River may provide preferred habitat conditions for these nonnative predators listed above (see discussion of nonnative vegetation under Factor A above). Near the Prado Dam Basin predator removals are regularly conducted in an attempt to maintain suitable habitat characters for the Santa Ana sucker.

Historically, nonnative predators were not abundant in the San Gabriel River (Hernandez 1997, p. 2). However, recent survey results indicate that in the West Fork there has been a dramatic increase in the number of nonnative predators (i.e., green sunfish, bluegill, and largemouth bass) (Ecorp Consulting 2010b, p. 9) and in the East Fork nonnative predators are also becoming more prominent (Morrissey 2009, p. 7). As discussed above, the abundance of nonnative predatory fishes may be enhanced by the presence of nonnative *Arundo donax* because it modifies the habitat to that preferred by nonnative predatory fishes.

Historical information indicated that in the Los Angeles River system, which includes Big Tujunga Creek, centrarchid (sunfish and bass) predators would aggregate in pools during droughts and presumably feed on native fishes, including Santa Ana suckers (USFWS 2000, p. 19694). More recent information indicates that sunfish and bullheads are common in Big Tujunga Creek (Chambers Group 2004, p. 6-3; Ecorp Consulting 2010a, p. 9). The cause of the increase in abundance of predators may be due to habitat changes such as diminished flows, pooling of water, or possibly the habitat provided by *Arundo donax*. Predator removals are regularly conducted in the Big Tujunga Mitigation Bank upstream of Hansen Dam in an attempt to maintain suitable habitat characters for Santa Ana sucker (Chambers Group Inc. 2004, p. 6-3–6-4; Chambers Group Inc. 2006, p. 5-2). During these removal efforts nonnative predators have been captured that expelled previously eaten Santa Ana suckers (CLADPW 2008, p. 2).

Although specific studies have not been conducted to determine the quantity of Santa Ana suckers consumed by nonnative predators, increase in abundance of nonnative predators indicates that Santa Ana sucker may be significantly impacted by predation pressures. There are management activities in place that have attempted to ameliorate this threat at three of the occurrences; however, the the abundance of nonnative predators continues to rise which likely poses an increase in predation pressure to all life-stages of the Santa Ana sucker. Predation throughout the three watersheds presents a substantial threat to the Santa Ana sucker throughout most of its range; however, data is lacking to describe the magnitude of this threat.

Summary of Factor C

Currently, we have no information indicating that disease is a prevalent threat impacting the continued existence of the Santa Ana sucker throughout its range; however, disease may impact the species and the magnitude of this threat should be further investigated. Data is lacking to quantify the magnitude of predation pressure on Santa Ana suckers throughout the three watersheds; however, the abundance of nonnative predators has increased since the time of listing and likely presents a substantial threat to the species throughout most of its range. While increases in abundance of nonnative predators are observed at all six extant occurrences, management is currently in place at three (Middle Santa Ana River, San Gabriel River – West Fork, and Big Tujunga Creek) of these occurrences to remove nonnative predatory fishes; however, only one of these occurrences (Middle Santa Ana River) has a management plan in place that is part of a Service-approved plan (Western Riverside County MSHCP).

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

In the listing rule, regulatory mechanisms thought to have some potential to protect the Santa Ana sucker included: (1) California Endangered Species Act (CESA) (where the Santa Ana sucker co-occurred with State-listed species), (2) California Environmental Quality Act (CEQA), (3) National Environmental Policy Act (NEPA), (4) CWA, (5) the Act (where Santa Ana sucker co-occurred with other federally-listed species), and (6) land management or conservation measures by Federal, State, or local agencies or by private groups and organizations (USFWS 2000, pp. 19686–19698). The listing rule provides an analysis of the potential level of protection provided by these regulatory mechanisms.

The status of regulatory mechanisms and their adequacy for protection of the Santa Ana sucker remains largely unchanged since listing; however, one habitat conservation plan has been signed and is currently being implemented for which the Santa Ana sucker is a covered species (i.e., the Western Riverside County MSHCP). Several State and Federal mechanisms provide a conservation benefit to the Santa Ana sucker, as described in the following paragraphs.

State Protections in California

The State's authority to conserve rare fish and wildlife is contained within three major statutes: CESA, CEQA, and the Natural Community Conservation Planning (NCCP) Act. The primary law in California for regulating water quality is the California Porter-Cologne Act of 1969. Another relevant program, the California Lake and Streambed Alteration Program, which is overseen by the CDFG concerns aquatic habitat conservation.

<u>California Endangered Species Act (CESA)</u>

The State of California considers the Santa Ana sucker a ‘‘species of special concern.” However, Santa Ana sucker is not listed as endangered or threatened by the State, and “species of special concern” are afforded no protection under CESA (CDFG Code, section 2080 *et seq*.). When a project has no Federal nexus, Santa Ana suckers may potentially receive some indirect protection under CESA when occurring in close proximity to other species that are listed under CESA. These protections are similar to protection afforded by the Act and may include consultation and project planning to avoid potential impacts. State-listed species known to occur within 328 feet (100 meters) of stream/river reaches occupied by populations of Santa Ana sucker include *Eriastrum densifolium sanctorum* (the Santa Ana River woolly star), *Dodecahema leptoceras* (slender-horned spineflower), southwestern willow flycatcher (*Empidonax traillii* *extimus*), least Bell's vireo (*Vireo bellii pusillus*), and yellow billed cuckoo (*Coccyzus americanus*).

California Environmental Quality Act (CEQA)

As a federally-listed species, the Santa Ana sucker must be considered as a rare species under CEQA (Section 15380, Public Resources Code), which is the principal statute mandating environmental assessment of projects in California. The purpose of CEQA is to evaluate whether a proposed project may have an adverse effect on the environment and, if so, to determine whether that effect can be reduced or eliminated by pursuing an alternative course of action or through mitigation. CEQA applies to projects proposed to be undertaken or requiring approval by State and local public agencies (*http://www.ceres.ca.gov/topic/env_law/ceqa/summary.html*). CEQA requires disclosure of potential environmental impacts and a determination of "significant" if a project has the potential to reduce the number or restrict the range of a rare or endangered plant or animal; however, projects may move forward if there is a statement of overriding consideration. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

Natural Community Conservation Planning (NCCP) Act

In 1991, the State of California passed the NCCP Act to address the conservation needs of natural ecosystems throughout the State (CFG 28002835). The NCCP program is a cooperative effort involving the State of California and numerous private and public partners to protect regional habitats and species. The primary objective of NCCPs is to conserve natural communities at the ecosystem scale while accommodating compatible land uses. NCCPs help identify, and provide for, the regional- or area-wide protection of plants, animals, and their habitats while allowing compatible and appropriate economic activity. Many NCCPs are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Act. Regional NCCPs may provide protection to federally-listed species by conserving native habitats upon which the species depend. The plan that currently provides the most significant protection to Santa Ana sucker is the Western Riverside County MSHCP. Although the Santa Ana sucker is discussed in the Orange County Central/Coastal NCCP it is not addressed in the plan and no specific measures afford protection to the species under this plan. The Western Riverside County MSHCP is discussed further under the Federal Protections section below.

The California Porter-Cologne Act of 1969

The primary law regulating water quality in California is the California Porter-Cologne Act of 1969 (Section 13000 *et seq.*, California Water Code). This Act designates authority over surface water and groundwater quality to the State Water Resources Control Board and the nine RWQCBs and applies to surface waters, wetlands, and groundwater and to both point and nonpoint sources of pollution. Under the Porter-Cologne Water Quality Control Act (California Water Code, Division 7, Chapter 2 §13050), 23 beneficial uses and water quality objectives are established for all waters of the State, both surface and subsurface (groundwater). Of these 23 beneficial uses, several definitions may be relevant to Santa Ana sucker conservation, including (but not limited to): warm freshwater habitat; cold freshwater habitat; rare, threatened, and endangered species waters; and spawning, reproduction, and development waters (CRWQCB 2008, pp. 3-3–3-4). Three of the four definitions exist within occupied reaches of the Santa Ana River (warm freshwater habitat; rare, threatened, and endangered species waters; and spawning, reproduction, and development waters) (CRWQCB 2008, p. 3-25). The regulations allow more than one beneficial use to be identified for a given water body, although the most sensitive use must be protected. The Regional Board, however, has the final say in resolving conflicts among beneficial uses based on the facts in a given case (CRWQCB 2008, p. 3-4).

<u>California Lake and Streambed Alteration Program</u>

The Lake and Streambed Alteration Program (CDFG Code sections 1600-1616) may promote the recovery of listed species in some cases. This program provides a permitting process to reduce impacts to fish and wildlife from projects affecting important water resources of the State, including lakes, streams, and rivers. This program also recognizes the importance of riparian habitats to sustaining California's fish and wildlife resources, including listed species, and helps prevent the loss and degradation of riparian habitats. Therefore, potential projects that may substantially modify a river, stream, or lake would be evaluated and must comply with CEQA. However, since the Santa Ana sucker is not State-listed it would be only indirectly protected.

Federal Protections

<u>Rivers and Harbors Act</u>

The Rivers and Harbors Act of 1899 is the oldest environmental law in the United States. Section 9 regulates the construction of bridge, dam, dike, or causeway over or in navigable waterways of the United States without Congressional approval. Section 10 regulates the obstruction or alteration of any navigable water of the United States, such as building of any wharf, pier, jetty, or other structure without Congressional approval. The U.S. Coast Guard and Army Corps of Engineers (ACOE) authorize such actions, respectively. This Federal regulation prohibits the use of Federal funds for activities, which may have an adverse effect on those characters which cause a river to be classified as wild, scenic, or recreational. The Santa Ana sucker may benefit indirectly from this regulation because portions of its occupied range (within the San Gabriel River watershed) are considered wild and scenic.

<u>National Environmental Policy Act (NEPA)</u>

NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of actions with a Federal nexus, NEPA requires the agency to analyze the action for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public. This disclosure to the public, including other Federal agencies, provides an opportunity to submit comments on the particular project and propose other conservation measures that may directly benefit listed species, such as the Santa Ana sucker.

Clean Water Act

The Clean Water Act (CWA) is the primary mechanism in the United States for surface water quality protection. It establishes the basic structure for regulating discharges of pollutants into waters of the United States. It employs a variety of regulatory and non-regulatory tools to reduce direct water quality impacts, finance water treatment facilities, and manage polluted run-off. The CWA made it unlawful to discharge any pollutant from a point source into navigable water unless a permit was obtained. The EPA's National Pollutant Discharges Eliminations System permit program controls discharges. The EPA determines water quality standards for each state and the CWA requires states to either adopt this level or determine another with documentation (EPA 2000, p. 31682). In California, the State Water Resources Control Boards regulate and enforce surface water quality standards (see discussion above on **The California Porter-Cologne Act of 1969**). The chemicals or pollutants included on the State Water Resources Control Board’s list are considered regulated pollutants. Any chemicals not on this list of regulated pollutants are therefore unregulated, and no standards or limits apply.

Section 303 of the CWA defines water quality standards consisting of both the uses of the surface (or navigable) waters involved and the water quality criteria which are applied to those uses. Therefore, the State Water Resources Control Board is required to determine what beneficial uses and water quality objectives are to be established for surface water bodies. They must define beneficial uses and determine which water bodies may be impaired (and place them on the 303d list) and create a plan to remove this water body from the impaired list (303d). No occupied areas in the San Gabriel River or Big Tujunga Creek are included in the list of impaired waters. In the occupied range of Santa Ana sucker, one reach of the Santa Ana River is considered impaired due to pathogens (Reach 4 – from Mission Boulevard in Riverside to San Jacinto Fault in San Bernardino). In the Santa Ana River, all but one of the occupied areas by the Santa Ana sucker have been identified as supporting habitat necessary for rare, threatened, or endangered species (RARE designation (CRWQCB 2008, p. 3-25)). The area not included is also Reach 4. This area does contain Santa Ana suckers and recent surveys indicate that this area, which includes the Riverside Narrows, is a very important location for the species persistence (SMEA 2009, pp. 1–4). The reaches upstream, including upstream to Seven Oaks Dam was historically occupied and is very important to maintaining the processes necessary for suitable habitat conditions within the currently occupied range; however, these reaches are not currently designated as RARE (CRWQCB 2008, p. 3-25). Designation by CRWQCB of these areas as RARE would ensure that water quality at these areas is of sufficient quality to support Santa Ana suckers.

Under section 404, the ACOE regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). Any action with the potential to impact waters of the United States must be reviewed under provisions of the CWA, NEPA, and the Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts.

National Forest Management Act (NFMA)

The National Forest Management Act (36 C.F.R. 219.20(b)(i)) (NFMA) requires the USFS to incorporate standards and guidelines into Land and Resource Management Plans, including provisions to support and manage plant and animal communities for diversity and for the long-term, rangewide viability of native species. On January 5, 2005, USFS revised National Forest land management planning under NFMA (USFS 2005). The new planning rule changed the nature of Land Management Plans so that plans generally would be strategic in nature and could be categorically excluded from NEPA analysis, and thus not subject to public review. Under this new planning rule, the primary means of sustaining ecological systems, including listed species, would be through guidance for ecosystem diversity. If needed, additional provisions for threatened and endangered species could be provided within the overall multiple-use objectives required by NFMA. The final rule did not include a requirement to provide for viable populations of plant and animal species, which had previously been included in both the 1982 and 2000 planning rules. However, on March 30, 2007, the United States District Court in *Citizens for Better Forestry et al.* v. *USDA* (N.D. Calif.) enjoined the United States from implementing and utilizing the 2005 rule until it complies with the court's opinion regarding the Administrative Procedure Act, the Act, and NEPA. On May 14, 2007, USFS published a Notice of Intent to prepare an environmental impact statement to analyze and disclose potential environmental consequences associated with a National Forest System land management planning rule. On April 28, 2008, USFS replaced previous National Forest System land management planning rules after completing a Final Environmental Impact Statement. However, on June 30, 2009, the United States District Court in *Citizens for Better Forestry et al.* v. *USDA* (N.D. Calif.) enjoined USFS from implementing and utilizing the 2008 rule due to violations of NEPA and the Act. Because of the uncertainty regarding the future of regulations under the NFMA, the impact of any revisions of this rule to listed species is unknown at this time.

Since listing of Santa Ana sucker, USFS has adopted additional guidance and proposals to protect this species. The revised Land Management Plans for the four southern California National Forests (USFWS 2005c) included strategic direction in the form of land use zoning and standards. The land use zoning and standards indicated that for projects on USFS lands under the Land Management Plans, potential impacts should be minimized due to dispersed recreation activities, and expansion of existing facilities or new facilities will focus recreational use away from Santa Ana suckers. Future projects will be implemented to promote the recovery of Santa Ana sucker with the potential exception of fire abatement activities (fuel treatments) in wildland-urban interface areas (USFWS 2005c, p. 45). USFS standards indicate that the operation of dams and water extraction operations occur, such that habitat conditions are maintained and enhanced for Santa Ana sucker, as determined by site-specific section 7 consultations and analysis (USFWS 2005c, p. 45). Although actions could still occur outside the parameters of the revised Land Management Plans, we anticipate implementation of the management outlined in these documents will reduce threats to the Santa Ana sucker.

Endangered Species Act of 1973, as amended (Act)

The Act is the primary Federal law providing protection for Santa Ana sucker. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2) of the Act, which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy determination generally requires reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project. Critical habitat was designated for Santa Ana sucker in 2005, was subject to litigation in 2008, and was revised in 2010 (USFWS 2010c, pp. 77962–78027). The Service has analyzed the potential effects of Federal actions under section 7(a)(2) of the Act, which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect the species or may destroy or adversely modify areas designated as critical habitat.

Section 9 of the Act prohibits the taking of any federally-listed endangered or threatened species. Section 3(18) defines “take” to mean “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Service 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 by the Service 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. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that result from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B) of the Act. To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved HCP that details measures to minimize and mitigate the project’s adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and many of these HCPs are coordinated with California’s related NCCP program. The Western Riverside County MSHCP is the only HCP within the current range of Santa Ana sucker and is discussed below.

Federal projects (evaluated under section 7 of the Act), other projects (evaluated under section 10(a)(1)(B) of the Act), or recovery actions (evaluated under section 10(a)(1)(A) of the Act) may result in incidental take of the Santa Ana sucker. Since the time of listing, we conducted 17 formal and 12 informal consultations under section 7 of the Act that resulted in incidental take of the Santa Ana suckers and impacts to habitat or the riparian area that is currently designated as critical habitat for the Santa Ana sucker. These formal and informal consultations addressed project impacts to Santa Ana sucker or designated critical habitat as a result of: dam operations or construction; flood control activities such as levee installation or repair, bridge repair, replacement or modification, sediment removal, and bank stabilization; wastewater treatment releases; and nonnative vegetation removals. None of the biological opinions that were issued as a result of the above consultations determined an adverse modification of critical habitat. Incidental take was issued for 372 fish within the impacted areas, of which at least 266 were confirmed to have died. A total of 1,329 fish were translocated from the impacted areas, although survival and long-term success of these fish in their new habitats is difficult to assess and relatively unknown at this time. A total of 13 ac (5 ha) of in-stream habitat and 750 ac (304 ha) of riparian habitat were impacted as a result of the formal consultations.

Western Riverside County Multiple Species Habitat Conservation Plan (Western Riverside County MSHCP):

The Western Riverside County MSHCP was permitted on June 22, 2004 and is a regional, multijurisdictional HCP encompassing about 1.26 million ac (510,000 ha) in western Riverside County, which covers the Middle Santa Ana River occurrence of Santa Ana suckers. This Western Riverside County MSHCP addresses 146 listed and unlisted ‘‘covered species,’’ including the Santa Ana sucker, and was designed to establish a multi-species conservation program that minimizes and mitigates the effects of expected habitat loss and associated incidental take of covered species. The Western Riverside County MSHCP will establish approximately 153,000 ac (61,917 ha) of new conservation lands to complement the approximately 347,000 ac (140,426 ha) of pre-existing natural and open space areas to form the overall Western Riverside County MSHCP Conservation Area over the 75-year permit period (USFWS 2004, p. 2).

The Western Riverside County MSHCP is intended to reduce the threats to Santa Ana sucker and the physical and biological features essential to its conservation as the plan is implemented by placing large blocks of habitat into preservation throughout the Conservation Area. Core Areas have been identified to be set aside and preserved (USFWS 2004, p. 258; Dudek and Associates, Inc. 2003, p. F-20). The Western Riverside County MSHCP identifies five conservation objectives that will be implemented to provide long-term conservation of the Santa Ana sucker (Dudek and Associates, Inc. 2003, pp. F-19–20; USFWS 2004, p. 258). Additionally, the Western Riverside County MSHCP requires avoidance and minimization of impacts to riparian and riverine habitats, if feasible. Unavoidable impacts will be mitigated such that the lost habitat functions and values related to covered species will be replaced (Dudek and Associates, Inc. 2003, pp. 6–24). Lands are to be managed in a manner that contributes to the conservation of the covered species. Should a permittee elect to alter lands such that they would not contribute to the conservation of covered species, lands would need to be replaced at a minimum 1:1 ratio. As outlined in the Western Riverside County MSHCP, the goal is to conserve 3,480 ac (1,408 ha) of habitat for the Santa Ana sucker (USFWS 2004, p. 258). This goal relies primarily on coordinated management between multiple landowners of existing lands, and to a lesser extent on acquisition or other dedications of land assembled from within the Criteria Area.

Many permittees of the Western Riverside County MSHCP are also participants in the SAS Conservation Program. This program was intended by the Western Riverside County MSHCP permittees to cover activities not covered by the Western Riverside County MSHCP. Although not formally an HCP, the SAS Conservation Program was developed over a 10-year period, and is the result of a multiagency partnership of Federal, State, and local governmental agencies and the private sector that encourages a riverwide approach to conservation of the Santa Ana sucker and its habitat. The Program encompasses the Santa Ana River and the lower reaches of its tributaries extending generally from Tippecanoe Avenue in San Bernardino County to Chapman Avenue in Orange County; a distance of approximately 31 mi (48.3 km) (Santa Ana Watershed Project Authority 2008, pp. 13–18). The CWA section 404 application submitted by the agencies participating in the SAS Conservation Program for operation and maintenance activities proposed in the Santa Ana River and for implementation of the SAS Conservation Program is under review by the ACOE. Implementation of the SAS Conservation Program is intended to remove and reduce threats to this species and the features essential to its conservation by reducing project impacts to the Santa Ana sucker, establishing vehicle crossings, ensuring that wastewater treatment facilities maintain flows for the Santa Ana sucker, and conducting habitat restoration and predator removal. The program also funds various research and monitoring activities for the Santa Ana sucker.

The Western Riverside County MSHCP permittees are required to implement management and monitoring activities. For the Santa Ana sucker, the Western Riverside County MSHCP specifically identifies conservation objectives to: (1) provide long-term conservation for the species, (2) develop a management and monitoring plan for the species, and (3) mitigate for impacts to Santa Ana sucker habitat that are associated with permittee activities (Dudek and Associates, Inc. 2003, pp. 6-24, F-19–F-20; USFWS 2004a, p. 258). Baseline surveys must be conducted at known occupied locations within the first 5 years of the plan and additional surveys need to be conducted every 8 years to verify occupancy at a minimum of 75 percent of the Conservation Areas. Additionally, permittees and Reserve Managers must work cooperatively with Federal, State, and local agencies on conservation measures for the Santa Ana sucker (USFWS 2004, p. 259; Dudek and Associates, Inc. 2003, pp. F-23–F-25). The Western Riverside County MSHCP incorporates several processes that allow for Service oversight and participation in program implementation.

Although conservation measures are detailed in the plan and subsequent biological opinion, information indicates that the implementation of these actions has not been completed. Baseline surveys of Santa Ana sucker have yet to be completed and no Additional Reserve Lands have been acquired since permitting that would benefit Santa Ana sucker. We recognize that although these conservation measures have yet to be implemented they are anticipated through the implementation of the Western Riverside County MSHCP and should be fully realized within the 75-year permit period. We were informed that there are potential projects within the Santa Ana River that are not included as “covered activities” in the Western Riverside County MSHCP (RCFCD 2010, p. 1) nor within the list of routine maintenance and other activities in the Biological Assessment submitted to the Service by the SAS Conservation Program for the section 7 consultation between the Service and ACOE on the program. These potential projects include rehabilitation and future flood control projects. The projects and their potential effects have not been included in or analyzed as part of the Western Riverside County MSHCP or the SAS Conservation Program.

Summary of Factor D

In summary, the Act is the primary Federal law that provides protection for this species since its listing as threatened in 2000. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. One of the six extant Santa Ana sucker occurrences (Middle Santa Ana River and Tributaries – S. La Cadena Ave. to Prado Dam) has a management plan in place that directly affords protections for impacts to the species and its habitat. Therefore, in absence of the Act, other laws and regulations have limited ability to protect the species. Inadequacies in provisions or implementation of regulatory mechanisms are not considered a threat to the species, although inadequacies may permit or precipitate actual threats that are attributable to and described under Factors A, B, C, and E.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

The 2000 listing rule identified periodic wildfires and stochastic (unexpected) risks to small populations as threats under Factor E (USFWS 2000, p. 19695). In this status review, the threat of wildfire and the repercussions attributed to habitat modifications or unsuitability is discussed under Factor A. Since listing, two new Factor E threats were identified: impacts to water quality and global climate change. An assessment of the Factor E threats currently impacting the Santa Ana sucker is provided below.

<u>Small Population Size</u>

The listing rule discussed the vulnerabilities associated with few occurrences of small population sizes for the Santa Ana sucker as a result of the fragmented and isolated remaining populations. These vulnerabilities included susceptibility to stochastic or unexpected events such as flood, fire, drought, earthquakes, or chemical spills and inbreeding depression (USFWS 2000, p. 19695).

Small population size may be the result of several conditions, including local extirpations or ongoing natural or artificial factors limiting establishment and survival of the taxon. Stochastic events represent a significant threat to small occurrences. In the case of Santa Ana suckers, consecutive survey data indicate that fish density is decreasing in areas in the Santa Ana River and San Gabriel River that previously had significant densities of fish (SMEA 2009, p. 1; Ecorp Consulting 2010b, p. 14) and fish abundance tends to be variable in Big Tujunga Creek (Ecorp Consulting 2010a, p. 5; Haglund and Baskin 2010, Appendix 1). Stochastic events that could destroy these smaller occurrences include flood, fire, or drought. Given the impact these events could have on the any of the three watersheds where Santa Ana suckers exist, they represent a potential threat to the species as a whole.

Inbreeding depression may also impact Santa Ana sucker populations by reducing fitness as a result of breeding between related individuals. This occurs most often in small populations by highlighting deleterious genetic traits. Therefore, to avoid inbreeding depression it is important to maintain genetic diversity, especially for rare alleles (different forms of a gene). The likelihood of maintaining this diversity decreases in smaller populations (Barrett and Kohn 1991, pp. 9, 10, and 13). Moreover, the loss of genetic variability through random genetic drift (random gene frequency changes in small populations due to chance) reduces the ability of populations to respond successfully to environmental stresses. Though this potential threat is not immediate, it does increase concern for small, isolated populations of Santa Ana suckers.

Water Quality

As described above (see **Factor A**), water quality may be impacted by a number of processes involved with urbanization or other natural or anthropogenic processes, including introduction of chemicals and nutrients from human uses or changes due to warming global climates that may modify habitat such that it is no longer suitable or may have direct impacts on Santa Ana suckers.

Water quality varies widely among the three watersheds, but appears to be better in Big Tujunga Creek and San Gabriel River, compared to the Santa Ana River (Mendez 2005, p. 7; Saiki *et al.* 2007, p. 93). Santa Ana suckers are present in each watershed, although not in equal densities. Therefore, we can assume that the tolerance of the Santa Ana suckers to water quality may be fairly wide. Big Tujunga Creek and the San Gabriel River are located outside the highly populated zones of Los Angeles and San Bernardino Counties and are therefore, exposed to a lesser extent to water quality impacts associated with urbanization.

A newly identified threat that may have severe impacts to Santa Ana suckers in the Santa Ana River is the presence of released wastewater and urban run-off into the watershed. There are multiple wastewater treatment plants along the Santa Ana River that discharge treated (generally tertiary treated) water directly into the river. Though discharged water may contain chemicals that are harmful to fish, Santa Ana suckers are dependent on this as a source of water during the dry months of the year. A recent study conducted by Jenkins *et al.* (2009, p. 1) indicates that endocrine disrupting compounds and organic wastewater components may impair reproductive and endocrine function in western mosquitofish (*Gambusia affinis*). These results have led to a subsequent study using Santa Ana suckers and will investigate their tolerance to many commonly found chemicals in wastewater and related to urban run-off ; tolerance levels will also be compared to other species normally tested and used to develop water quality criteria and objectives (USFWS 2008, p. 4).

Other potential impacts to Santa Ana suckers based on water quality included (but are not limited to): elevated temperatures attributed to global climate change, low oxygen levels attributed to increased nutrients causing algal blooms, or increased ammonia levels that are toxic to fish. Each of these scenarios may result in the degradation of water quality in the habitat that may result in elevated stress of the fish, lower reproductive input, or death. Additionally, elevated levels of chemicals may result in disease or direct damage to their anatomy (i.e., gills, endocrine disruption). Note, while many chemicals are regulated, there are many that are unregulated (see **Factor D – Clean Water Act** discussion above). More information is needed to adequately assess the impact of chemical pollutants on the Santa Ana sucker; however, this threat has the potential to impact the species rangewide.

Two of the six extant Santa Ana sucker occurrences may be threatened by degraded water quality impacts. Management is in place to monitor water quality in one of these occurrences; however, there is uncertainty in the types of response and chemicals introduced in the system that are not addressed by the management currently afforded to the species. The threat of decreased water quality may present a substantial threat to the Santa Ana sucker rangewide; however, specific data is lacking to make this determination. As water quantity becomes more limited, water quality will become increasingly more important for the continued survival and recovery of the Santa Ana sucker.

<u>Global Climate Change</u>

Since listing, it has become apparent that potential threats exist to biota of the United States from ongoing, accelerated climate change (IPCC 2007). Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying are predicted by the year 2100 (Field *et al.* 1999, p. 1; Cayan *et al.* 2005, pp. 7–8; IPCC 2007, pp. 8–9).

Climate modeling for California indicates similar outcomes in temperature and precipitation. Recent assessments have been carried out running low and medium emission scenarios through the six models used in the 2007 International Panel on Climate Change assessment. The results predict a 1 to 3^{o}C (1.8 to 5.4^{o}F) increase in average temperature by the year 2050 (Cayan *et al.* 2009, p. 16). Over the same period, a 12 to 35 percent decrease in precipitation is indicated (Cayan *et al.* 2009, p. 17).

Significant temperature increases create a stressor for endemic species. This stressor enhances pressures from competitors, nonnative species, habitat change, low water supply, and disease. The species must somehow adapt to these pressures *in situ* (in place) or shift their geographic range (Cayan *et al.* 2009, p. 45). Such a shift in range for narrow endemic species such as the Santa Ana sucker could exceed the tolerance of the species. Recently we received a report of Santa Ana sucker deaths during survey efforts when temperatures reached 31°C (88°F) in the Santa Ana River. Dead Santa Ana suckers were found floating into block-nets upstream of the survey area and then floated into the block-nets (C. Medak, USFWS, pers. obs. 2010). The precise reason for these observed deaths are unknown, but could be attributed to the elevated water temperature, electroshocking methods, or other factors such as stress from presence of nearby surveyors.

There is a great deal of uncertainty in determining what the temperature limit of Santa Ana sucker may be; more information on this subject would be necessary to determine the possible impacts from global climate change. Santa Ana suckers are capable of withstanding temporal changes to water quality (Saiki *et al.* 2007, pp. 98–99), but they cannot adapt or move to other areas because their habitat (water) has been removed or barriers to movement are present as a result of human uses; therefore, the possibility of Santa Ana suckers shifting their range is not feasible because the water is not available to connect the watersheds or a barrier to movement is present. Furthermore, the current separation of watersheds may be exacerbated by the predicted decreases in annual precipitation. All life stages of Santa Ana suckers require cool water (Saiki *et al.* 2007, pp. 99–100). Increasing air temperatures and decreasing precipitation levels attributed to global climate change are likely to impact the availability of suitable cooler water habitat.

The pressures to water availability associated with urbanization may become amplified by global climate change. As flows decline because of human use needs increasing, the ability of rivers to tolerate pollutant loads will become reduced (Schindler 2001, p. 171). As temperatures increase as a result of global climate change, water will also be in short supply. The cumulative effect of the increased temperatures, decreased ability of a river to tolerate pollutants, and the decrease in available water may have significant effects on the watershed function as a whole and therefore, may significantly impact the Santa Ana sucker.

There is still a great deal of uncertainty associated with predictions relative to the timing, location, and magnitude of future global climate change. Global climate change could potentially pose a significant rangewide threat to the species. In streams and rivers with temperatures approaching the upper limit of allowable water temperatures, Santa Ana suckers may not be able to adapt to or avoid the effects of global climate change. As its distribution contracts, suitable habitat size decreases and connectivity is truncated. Santa Ana sucker populations that may be currently connected may face increasing isolation, which could accelerate the rate of local extirpation beyond that resulting from changes in stream temperature alone. Due to variations in land form and geographic location across the range of the Santa Ana sucker, it appears that some populations face higher risks than others. Santa Ana suckers in areas with currently degraded water temperatures or at the southern edge of its range may already be at risk of adverse impacts from current as well as future global climate change.

Summary of Factor E

Threats associated with small population size affect the Santa Ana sucker rangewide. Threats associated with degraded water quality affect this species primarily in the Santa Ana River, but may increase with added recreational use and continued development in the other watersheds. Though difficult to quantify, change in global climate may impact all occurrences of Santa Ana sucker and poses a significant threat to this species in the future. Due to the threat of vulnerability of small populations from stochastic processes, degraded water quality, and potential impacts from global climate change, factor E threats continue to threaten the Santa Ana sucker.

III. RECOVERY CRITERIA

No recovery plan or recovery outline has been prepared for the Santa Ana sucker.

IV. SYNTHESIS

At listing, Santa Ana suckers occurred at six extant occurrences among three watersheds (two in the Santa Ana River, three in the San Gabriel River, and one in the Los Angeles River). These occurrences were threatened by habitat destruction, natural and human-induced changes in stream flows, urban development and land-use practices, intensive recreation, introduction of nonnative predators, and risks associated with small population size. Santa Ana suckers have persisted at the same six occurrences, but are confined within a smaller portion of their historical range. The number of individuals within these areas has also declined and their remaining habitat is highly fragmented and degraded. Since listing, threats have continued to increase in magnitude and impacts to the habitat have been amplified rangewide, increasing the potential extirpation in two of the three watersheds (Santa Ana River and Los Angeles River).

All Santa Ana sucker occurrences are isolated by impassable barriers or unsuitable habitat and are increasingly threatened throughout its range by modification, fragmentation, and loss of habitat. The impacts attributed to loss of available habitat (i.e., dams, changes in water allocations, and other hydrological modifications) combined with increasing threats (water quality degradation, impacts to habitat from recreation, loss of habitat from economic development, increased wildfire frequency, and potential effects of nonnative vegetation and predators) have a cumulative effect on the Santa Ana sucker and its habitat, thereby increasing the potential extirpation of the fish in all watersheds. The two occurrences in the Santa Ana River watershed are particularly at risk and have become dependent on discharges of tertiary treated wastewater throughout the year because in-stream flows have been reduced or lost to water diversions for human use. This also renders the Santa Ana sucker in this watershed more susceptible to spills, illegal discharges (e.g. violations of discharge limitations), or combined pollutants in permitted wastewater discharges. As water demands for municipal use continue to rise, the amount of suitable habitat (water) available to the Santa Ana sucker becomes severely depleted because water is generally removed from the system upstream of occupied areas. Though not predominant threats at this time, Santa Ana sucker habitat is impacted by fire, OHVs, mining operations, and nonnative plants. Impacts from nonnative predators is also increasing at all six occurrences where Santa Ana suckers occur, though the magnitude remains uncertain. Fragmented and isolated habitat within each of the three watersheds make the Santa Ana suckers susceptible to limited gene flow among occurrences, thus increasing the vulnerability of small populations to a range of environmental and genetic stochastic factors.

The Santa Ana sucker faces a high degree of threat with a low recovery potential and proactive efforts are needed to aid in the continued survival and recovery of this threatened species. One of the six extant occurrences (Middle Santa Ana River and Tributaries – S. La Cadena Ave. to Prado Dam) is expected to receive some conservation benefit through habitat conservation planning efforts under the Western Riverside County MSHCP. The remaining five occurrences remain at risk of further fragmentation and impacts attributed to current threats. Threats have not been abated and have continued to increase, thereby making the Santa Ana sucker more vulnerable to extinction. The increasing pressure for water conservation (storage) for human use through dams and water diversions, urbanization, recreation, degraded and fragmented habitat, degraded water quality, the vulnerability of small populations, and global climate change indicate that the Santa Ana sucker faces increased threats throughout much of its range. However, the Santa Ana sucker is not in imminent danger of catastrophic threat within all three watersheds where it occurs. Therefore, based on this status review, we conclude the Santa Ana sucker continues to meet the definition of a threatened species and no status change is recommended at this time.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
  ____ *Extinction*
  ____ *Recovery*
  ____ *Original data for classification in error*
__X__ No Change

New Recovery Priority Number and Brief Rationale: No Change.

We recommend no change in the recovery priority number of 5C at this time. The taxon is a species that faces a high degree of threat, a low recovery potential, and is in conflict with development.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1) Assess and evaluate water allocations rangewide to determine habitat limitations and implement management actions to ensure sufficient water is available.

2) Assess and evaluate sediment transport rangewide to determine habitat limitations and implement management actions to ensure suitable habitat (coarse substrate) is available.

3) Conduct rangewide studies and implement a monitoring protocol leading to a better understanding of life history strategies such as patterns of migration, reproduction, and recruitment.

4) Evaluate the effects of nonnative predators and nonnative riparian vegetation that impact Santa Ana suckers, and initiate management actions to ameliorate potential impacts.

5) Assess the sensitivity of the Santa Ana sucker relative to standard test organisms used to determine water quality standards. This may include investigation of impacts from chemicals such as compounds traditionally found in treated wastewater and unregulated "emerging" contaminants including new generation pesticides, steroids and hormones, personal care products, prescription and non-prescription drugs, antibiotics, household disinfectants, insect repellants, and fire retardants.

6) Determine if genetic distinctness exists among the three watersheds where the listed entity occurs and determine the status of the Santa Clara River occurrence.

7) Work with partners, such as the Service's Partners for Fish and Wildlife Program to identify opportunities for conservation or preservation of the Santa Ana sucker. Restore

or maintain important tributaries or areas of the floodplain (i.e., abandoned golf courses) that have been disconnected from the mainstem (i.e., Sunnyslope Creek) or are currently urban outfalls that have been channelized (i.e., Day Creek, Evans Drain).

8) Implement management actions to minimize impacts from recreational activities associated with OHV use, rock dams, recreational residences, and recreational mining (or dredging) for precious metals.

9) Assess areas outside the currently occupied range of the species but within the historical range that may serve as suitable reintroduction sites.

VII. REFERENCES CITED

Allen, B.C. 2003. Evaluation of Santa Ana sucker (*Catostomus santaanae*) spawning success in the Santa Ana River and the potential effects of temporary shutdowns at the rapid infiltration and extraction plant (RIX). Unpublished report prepared for the San Bernardino Municipal Water Department. 19 pp.

Ally, J.R.R. 2003. Survey of recreational rock dams in the East Fork San Gabriel River, from fire camp 19 to Cattle Canyon. Unpublished report prepared by the California Department of Fish and Game, South Coast Region. 7 pp.

Andresen, V. 2001. Lower Big Tujunga stream pool location survey. Angeles National Forest. Summer 2001. Date August 6, 2001. Unpublished report. 13 pp.

[ACOE] U.S. Army Corps of Engineers. 1997. Engineering and design hydrologic engineering requirements for reservoirs. Manual No. 1110-2-1420. 115 pp.

Barrett, S.C.H. and J.R. Kohn. 1991. Genetic and evolutionary consequences of small population size in plants: implications for conservation. Pages 1–30, in Falk, D.A. and K.E. Holsinger (editors), Genetics and conservation of rare plants. Oxford University Press, New York, New York.

Barton, B., J. Morgan, M. Vijayan. 2002. Physiological and condition-related indicators of environmental stress in fish, in Biological indicators of aquatic ecosystem stress. Ed. S. Adams.

Baskin, J.N. and T. Haglund. 1999. Conservation Program for the Santa Ana Sucker in the Santa Ana River, Southern California. Unpublished report prepared for the Santa Ana Watershed Project Authority. 35 pp.

Baskin, J.N., T. Haglund, S. Bryant. 2005. Sucker research progress report. Unpublished report prepared for the Santa Ana Sucker Conservation Team. 2 pp.

Baskin, J. N. and T. R. Haglund. 1999. Conservation program for the Santa Ana sucker in the Santa Ana River, southern California. Unpublished report prepared for Santa Ana Watershed Project Authority. December 1999. 36 pp.

Bell, M.A. 1978. Fishes of the Santa Clara system, southern California. Contributions in Science, Natural History Museum of Los Angeles County, No. 295, 20 pp.

Bell, G.P. 1997. Ecology and management of Arundo donax, and approaches to riparian habitat restoration in southern California. In Brock, J. H., Wade, M., Pysek, P., and Green, D. (Eds.): Plant Invasions: Studies from North America and Europe. Blackhuys Publishers, Leiden, The Netherlands, pp. 103–113.

Best Best & Krieger LLP. 2010. Evaluation of the proposed rule to designate revised critical habitat for the Santa Ana sucker. February 3, 2010. Prepared by PBS&J for Best Best & Krieger. Submitted with public comment on proposed revised critical habitat rule 74 FR 65056.

Burkholder, J.M. 2001. Beyond algal blooms, oxygen deficits and fish kills: chronic. Long-term impacts of nutrient pollution in aquatic ecosystems; in Waters in peril. Eds. Bendell-Young, L. and P. Gallaugher. 2001. Kluwer Academic Publishers. 249 pp.

[CNDDB] California Department of Fish and Game, Natural Diversity Data Base. 2010a. Element Occurrence Reports for Santa Ana sucker. Unpublished cumulative data current to June 11, 2010.

[CDFG] California Department of Fish and Game. Suction dredge permit holders and potential applicants. Website viewed August 3, 2010. *http://www.dfg.ca.gov/licensing/specialpermits/suctiondredge/*

[CRWQCB] California Regional Water Quality Control Board. 1995. Water Quality Control Plan, Santa Ana River Basin (8). Unpublished report prepared by the California Regional Water Quality Control Board, Santa Ana Region. 76 pp.

[CRWQCB] California Regional Water Quality Control Board. 2008. Water Quality Control Plan, Santa Ana River Basin (8). Unpublished report prepared by the California Regional Water Quality Control Board, Santa Ana Region. 1995 version updated February 2008.

[CRWQCB] California Regional Water Quality Control Board. 2010a. Electronic Water Rights Information Management System (eWRIMS). Website (*http://www.swrcb.ca.gov/ewrims/*) viewed and information downloaded on August 2, 2010.

[CRWQCB] California Regional Water Quality Control Board. 2010b. Complaint No. R4-2010-0112 for administrative civil liability against the city of Los Angeles, Bureau of Engineering, Bridge Improvement Program, Foothill Boulevard bridge widening project at Big Tujunga Wash, Sunland, California (File No. 06-208). Submitted to Gary Lee Moore, City of Los Angeles Engineer and Jim Coppini, MCM Construction, Inc. Dated July 29, 2010.

Cayan, D., M. Dettinger, I. Stewart, and N. Knowles. 2005. Recent changes towards earlier springs: early signs of climate warming in western North America. U.S. Geological Survey, Scripps Institution of Oceanography, La Jolla, California.

Cayan, D., M. Tyree, M. Dettinger, H. Hidlago, T. Das, E. Maurer, P. Bromirski, N. Graham, R. Flick. 2009. Climate change scenarios and sea level rise estimates for the California 2008 climate change scenarios assessment. California Climate Change Center, Sacramento, California.

Chabot, C., D. Buth, C.C. Swift, J. Sim, T. Dowling, L. Allen. 2009. Introgression of mitochondrial DNA between *Catostomus fumiventris* and *Catostomus santaanae* (Cypriniformes: Catostomidae) in the Santa Clara Drainage. Abstract presented at the Southern California Academy of Sciences Annual Meeting, May 29–30, 2009.

Chadwick and Associates. 1992. Santa Ana River Use-Attainability Analysis, Volume 2: Aquatic Biology, Habitat & Toxicity Analysis. Report prepared for the Santa Ana Watershed Project Authority, Riverside, California.

Chadwick Ecological Consultants, Inc. 1996. Current status of the Santa Ana sucker in the Santa Ana River, California. Report prepared for the Santa Ana River Dischargers Association, California.

Chambers Group, Inc. 2001. Memo from S. Chiang, S. to CAC Members on Big Tujunga Wash Mitigation Bank. Dated September 27, 2001. 7 pp.

Chambers Group, Inc. 2004. Big Tujunga Wash semi-annual mitigation bank report, January – June 2003. Unpublished report prepared for the Los Angeles County Department of Public Works, Alhambra, California.

Chambers Group, Inc. 2006. Big Tujunga Wash mitigation bank final annual report - 2005. Unpublished report prepared for the Los Angeles County Department of Public Works, Alhambra, California.

Chambers Group, Inc. 2008. Letter from Paul Morrissey, Chambers Group, Irvine, California, to Ken Corey, Carlsbad Fish and Wildlife Office, Carlsbad, California; August 17, 2008. Subject: Update for the Santa Ana sucker located in the San Dimas Canyon East Fork, Los Angeles County, California. 2 pp.

City of Azusa. 2009. Azusa Rock Quarry. Draft environmental impact report. Modification to C-89-20, Development agreement and revised reclamation plan SCH No. 200951057. Volume 1. Dated December 2009. 45 pp.

[CLADPW] County of Los Angeles Department of Public Works. 2008. Big T Wash Line. Unpublished newsletter on the Big Tujunga Mitigation Bank. Newsletter submitted May 2008. 4 pp.

Dodds, W., V. Smith, and K. Lohman. 2002. Nitrogen and phosphorus relationships to benthis algal biomass in temperate streams. Canadian Journal of Fisheries and Aquatic Sciences 59(5): 865–874.

Drake, P.D. 1988. 1984 through 1986 fisheries field study report for the West Fork San Gabriel River, Los Angeles County. Unpublished report prepared by the California Department of Fish and Game, Region 5. 60 pp.

Dudek and Associates, Inc. 2003. Western Riverside County Final Multiple Species Habitat Conservation Plan, Volumes I -V. Dudek and Associates, Inc., Encinitas, California.

[EPA] U.S. Environmental Protection Agency. 2000. 65 FR 31682. Water quality standards: establishment of numeric criteria for priority toxic pollutants for the State of California. May 18, 2000. 65 FR 31682–31719.

Ecorp Consulting, Inc. 2007. Fish population and habitat surveys San Gabriel Canyon OHV area, 2007 report. Unpublished report prepared for U.S. Forest Service, Angeles National Forest. December 2007. 18 pp.

Ecorp Consulting, Inc. 2010a. Report for the Santa Ana sucker (*Catostomus santaanae*) survey and relocation effort in the Big Tujunga Wash at Oro Vista Avenue (W.O. E1907366). Report submitted to the City of Los Angeles. 15 pp.

Ecorp Consulting, Inc. 2010b. Santa Ana sucker population and habitat monitoring surveys in the U.S. Forest Service San Gabriel Canyon OHV area, West Fork of the San Gabriel River 2009 report. Unpublished report prepared for U.S. Forest Service, Angeles National Forest. May 2010. 44 pp.

Field, C.B., G.C. Daily, F.W. Davis, S. Gaines, P.A. Matson, J. Melack, and N.L. Miller. 1999. Confronting climate change in California: ecological impacts on the golden state. A report of the Union of Concerned Scientists, Cambridge, Massachusetts, and the Ecological Society of America, Washington, DC.

Greenfield, D.W., S.T. Ross, and G.D. Deckert. 1970. Some aspects of the life history of the Santa Ana sucker, *Catostomus* (Pantosteus) *santaanae* (Snyder). California Fish and Game 56:166–179.

Haglund, T.R. and J.N. Baskin. 1992. Distribution of Native Fishes and Southwestern Pond Turtles in the Upper San Gabriel River Drainage. Report submitted to Los Angeles Department of Public Works. San Marino Environmental Associates, San Marino, California.

Haglund, T.R. and J.N. Baskin. 2003. Habitat and resources utilization by the Santa Ana sucker (*Catostomus santaanae*) and the Santa Ana speckled dace (*Rhinichtys osculus* ssp) in the East Fork of the San Gabriel River. Unpublished report prepared for the California Department of Fish and Game, Contract No. P9985307. 75 pp.

Haglund, T.R. and J.N. Baskin. 2010. Santa Ana sucker (*Catostomus santaanae*) and macroinvertebrate baseline survey 2009. Big Tujunga Creek, Los Angeles County, California. Unpublished report prepared for Los Angeles County Department of Public Works. March 2010. 62 pp.

Haglund, T.R., J.N. Baskin, and C.C. Swift. 2001. Results of the Year 1 Implementation of the Santa Ana Sucker Conservation Program for the Santa Ana River. Unpublished report for Santa Ana Watershed Project Authority. 66 pp.

Haglund, T.R., J.N. Baskin, and C.C. Swift. 2002. Results of the Year 2 Implementation of the Santa Ana Sucker Conservation Program for the Santa Ana River. Unpublished report for the Santa Ana Sucker Conservation Team. 105 pp.

Hernandez, J.J. 1997. Fish survey on the East Fork of the San Gabriel River (EFSGR) and Cattle Creek. Unpublished report submitted by memorandum to Dr. Dwayne Maxwell, California Department of Fish and Game. Date August 20, 1997. 11 pp.

Hubbs, C.L., Hubbs, L.C., and R.E. Johnson. 1943. Hybridization in nature between species of catostomid fishes. Contributions from the laboratory of vertebrate biology, University of Michigan, number 22. 76 pp.

[IPCC] Intergovernmental Panel on Climate Change. 2007. Climate change 2007: the physical science basis. Summary for policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC Secretariat, World Meteorological Organization and United Nations Environment Programme, Geneva, Switzerland.

Jenkins, J.A., S.L. Goodbred, S.A. Sobiech, H.M. Olivier, R.O. Draugelis-Dale, and D.A. Alvarez, 2009. Effects of wastewater discharges on endocrine and reproductive function of western mosquitofish (*Gambusia* spp.) and implications for the threatened Santa Ana sucker (*Catostomus santaanae*). Unpublished report prepared by the U.S. Geological Survey. Open-File Report 2009–1097. 46 pp. (Revised May 2009).

Kolpin, D.W., E.T. Furlong, M.T. Meyer, E.M. Thurman, S.D. Zaugg, L.B. Barber and H.T. Buxton. 2002. Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance. *Env. Sci. Technol.* 36(6):1202–1211.

Kondolf, G.M. 1997. Hungry water: Effects of dams and gravel mining on river channels. Environmental Management 21(4): 533–551.

[LACDPW] Los Angeles County Department of Public Works. 2009. Big Tujunga Creek. Los Angeles County, California. Santa Ana sucker (*Catostomus santaanae*) habitat suitability 2007–2008 and Santa Ana sucker (*Catostomus santaanae*) and macroinvertebrate baseline survey 2009. Google Earth kmz file. Prepared by AECOM and San Marino Environmental Associates.

McGinnis, S.M. 1984. Freshwater fishes of California. University of California Press, Berkeley, California. 316 pp.

Mendez, G.O. 2005. Evaluation of two low-flow releases from Big Tujunga Reservoir, Los Angeles County, California, 2003. Unpublished report prepared by the U.S. Geological Survey. Report 2005-5003. 15 pp.

Morrissey, P. 2009. Santa Ana sucker (*Catostomus santaanae*) fish survey in support of the 2008 San Gabriel reservoir sediment removal project, Los Angeles County, California. Unpublished report submitted to Sandy Marquez, U.S. Fish and Wildlife Biologist. Date February 2009. 23 pp.

Moyle, P.B. 2002. Inland Fishes of California: Revised and Expanded. University of California Press, Berkeley, California.

Moyle, P.B. and R.M. Yoshiyama. 1992. Fishes, aquatic diversity management areas, and endangered species: Plan to protect California's native aquatic biota. The California Policy Seminar, University of California.

National Research Council. 1996. Alluvial fan flooding. National Academy Press. Washington D.C.

[NHMLA] Natural History Museum of Los Angeles County – Santa Ana sucker records as of July 26, 2010. 125 records. Received from Rick Feeney, Collection Manager, Ichthyology.

Primack, R.B. 2006. Essentials of Conservation Biology. Sinauer Assoc., Inc.; Sunderland, Massachusetts. 585 pp.

O'Brien, J. and D. Maxwell. 2010. Proposal for the maintenance and release of a captive refugia population of Santa Ana sucker, *Catostomus santaanae*, from Big Tujunga Creek, Los Angeles County, California. Unpublished proposal submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 20 pp.

O'Brien, J. and M. Stephens. 2009. Data summary of the 2009 fish surveys in the Big Tujunga Creek Basin, Los Angeles County, California. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 12 pp.

[OCPW] Orange County Public Works. 2010. Orange County Flood: Santa Ana River project Seven Oaks Dam. Website viewed July 29, 2010.

[OCWD] Orange County Water District. 2010. Prado Wetlands. Website viewed August 2, 2010.

[RCFCD] Riverside County Flood Control District. 2010. Public comment submitted for the proposed revised critical habitat for Santa Ana sucker. February 4, 2010. 15 pp.

Roa-Espinosa, A., T. Wilson, J. Norman, K. Johnson. 2003. Predicting the impact of urban development on stream temperature using a thermal urban model (TURM). A National

Conference, Urban Storm Water: Enhancing programs at the local level, Chicago, Illinois, Proceedings, Environmental Protection Agency.

Russell, K. 2006. Santa Ana sucker research and population augmentation project, 2007 annual report. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 20 pp.

Russell, K. 2007. Santa Ana sucker research and population augmentation project, 2007 annual report. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 21 pp.

Russell, K. 2008. Santa Ana sucker research and population augmentation project, 2007 annual report. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 22 pp.

Russell, K. 2010. Field report to native fish relocation for ACOE Reach 9 channel diversion. March 2010. Unpublished report submitted to CFWO. 8 pp.

Russell, K. 2010. Tujunga Mortality Data for October 13, 2009 to July 10, 2010. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California, on Santa Ana sucker salvage effort and fish housed at Riverside County Resource Conservation District facility.

Saiki, M.K. 2000. Water quality and other environmental variables associated with variation in population densities of the Santa Ana sucker. Unpublished report prepared for the National Fish and Wildlife Foundation, San Francisco, California. 117 pp.

Saiki, M.K., B.A. Martin, G.W. Knowles, and P.W. Tennant. 2007. Life history and ecological characteristics of the Santa Ana sucker, *Catostomus santaanae*. California Fish and Game 93(2):87–101.

Santa Ana Watershed Project Authority. 2008. Santa Ana sucker conservation team and Santa Ana River regional maintenance and conservation plan for the threatened Santa Ana sucker Initial Study/Mitigated Negative Declaration. Unpublished report prepared by the Santa Ana Watershed Project Authority, Riverside, California. 102 pp.

[SAWPA] Santa Ana Water Protection Authority. 2010. Not so beneficial uses of off road vehicle use upper Santa Ana River Wash. Unpublished report submitted to Carlsbad Fish and Wildlife Office, Carlsbad, California. 10 pp.

[SBMWD] City of San Bernardino Municipal Water District. 2010. Petition for change (WW0059, water code 1211) to California State Water Resources Control Board – Division of Water Rights. WW-CHG-PET (3-01). 19 pp.

[SMEA] San Marino Environmental Associates. 2009. Santa Ana sucker Research progress report: October 2009. Santa Ana sucker population monitoring 2001–2009. 5 pp.

[SMEA] San Marino Environmental Associates. 2010. SAWPA Santa Ana sucker population monitoring 2001–2010. 2 pp.

Schindler, D.M. 2001. The cumulative effects ofclimate warming and other human stresses on Canadian freshwaters in the new millenium; in Waters in peril. Eds. Bendell-Young, L. and P. Gallaugher. 2001. Kluwer Academic Publishers. 249 pp.

Smith, G.R. 1966. Distribution and evolution of the North American catostomid fishes of the subgenus *Pantosteus*, Genus *Catostomus*. Number 129, Miscellaneous Publications, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

Snyder, J.O. 1908. Description of *Pantosteus santa-anae*, a new species of fish from the Santa Ana River, California. Proceedings of United States National Museum. 59: 23–28.

[SCAG] Southern California Association Governments. 2010. Census data. Website; viewed July 27, 2010.

[SU] Stanford University. 2010. Museum records of Santa Ana sucker reported by California Academy of Sciences as of October 15, 2010. Museum specimen # 37042, collected in 1939.

Swift, C.C. 2001. The Santa Ana sucker in the Santa Ana River: distribution, relative abundance, spawning areas, and impact of exotic predators. Unpublished report prepared for the Santa Ana Water Project Authority, Riverside, California. 94 pp.

Swift, C.C. 2009. Memorandum report of Santa Ana sucker fish rescue for the River Road Bridge construction and sand mining project located in the Santa Ana River, at River Road Bridge, City of Norco, California, occurring on May 18 and 19, 2009. Unpublished report prepared for AMEC Earth and Environment, Inc., Riverside, California. 7 pp.

Swift, C.C., T.R. Haglund, M. Ruiz, and R.N. Fisher. 1993. The status and distribution of the freshwater fishes of southern California. Bulletin of the Southern California Academy of Sciences, 92:1–67.

[Team] Santa Ana Sucker Conservation Team. 2009. Biological assessment United States Army Corps of Engineers regional general permit authorizing routine maintenance activities along the Santa Ana River. October 2009.

Tennant, P. 2004. Results of surveys on the West Fork of the San Gabriel River (January 27, 2004). Unpublished Report submitted to the Carlsbad Fish and Wildlife Office, Carlsbad, California. 9 pp.

Tennant, P. 2006. Forty-five day survey report on surveys for the Santa Ana sucker (*Catostomus santaanae*) on the San Gabriel River. Unpublished Report submitted to the Carlsbad Fish and Wildlife Office, Carlsbad, California. 12 pp.

Thompson, A., J. Baskin, C.C. Swift, T. Haglund, and R. Nagel. 2009. Influence of substrate dynamics on the distribution and abundance of the federally threatened Santa Ana sucker, *Catostomus santaanae*, in the Santa Ana River. Draft manuscript submitted to Environmental Biology of Fishes. 25 pp.

[UMM] University of Michigan Museum. Santa Ana sucker records as of July 23, 2010. 39 records. *http://141.213.176.15/ummz/form.php?function=show_search_form&table_name=ummz*

URS. 2006. Big Tujunga Dam seismis upgrade initial study and mitigated negative declaration. Unpublished report prepared for Los Angeles County Department of Public Works. Date January 5, 2006. pp. 111.

[USFS] U.S. Forest Service, Los Angeles County Department of Public Works, California Department of Fish and Game, California Trout, Inc., Main San Gabriel Basin Watermaster, San Gabriel Valley Protective Association, San Gabriel River Water Committee. 1989. Long-term management plan West Fork San Gabriel River. May 8, 1989. 22 pp.

[USFS] U.S. Forest Service. 2005. National Forest System Land Management Planning. **Federal Register** 70:1023–1061.

[USFS] U.S. Forest Service. 2009. Station Fire Burned-Area Report (BAER). September 23, 2009. 22 pp.

[USFWS] U.S. Fish and Wildlife Service. 1983a. 48 FR 43098. Endangered and Threatened Species Listing and Priority Guidelines. **Federal Register** 48: 43098–43105.

[USFWS] U.S. Fish and Wildlife Service. 1983b. 48 FR 51985. Endangered and Threatened Species Listing and Priority Guidelines. **Federal Register** 48: FR 51985.

[USFWS] U.S. Fish and Wildlife Service. 1996. 61 FR 4722. Policy regarding the recognition of distinct vertebrate population segments under the Endangered Species Act. **Federal Register** 61: 4722–4725.

[USFWS] U.S. Fish and Wildlife Service. 1999. 64 FR 3915. Endangered and threatened wildlife and plants; proposed threatened status for the Santa Ana sucker. **Federal Register** 64: 3915–3922.

[USFWS] U.S. Fish and Wildlife Service. 2000. 65 FR 19686. Endangered and threatened wildlife and plants; threatened status for the Santa Ana sucker. **Federal Register** 65: 19686–19698.

[USFWS] U.S. Fish and Wildlife Service. 2001. Biological opinion on the Prado mainstem and Santa Ana River reach 9 flood control projects and Norco Bluffs stabilization project, Orange, Riverside, and San Bernardino Counties, California (FWS-SB-909.6). December 5, 2001.

[USFWS] U.S. Fish and Wildlife Service. 2002. Amendment to the Emergency Biological Opinion for the River Road bridge sand mining operation, Riverside, California. 2 pp.

[USFWS] U.S. Fish and Wildlife Service. 2004. Intra-Service formal section 7 consultation/conference for issuance of an Endangered Species Act section 10(a)(1)(B) permit (TE-088609-0) for the Western Riverside County Multiple Species Habitat Conservation Plan, Riverside County, California. 1203 pp.

[USFWS] U.S. Fish and Wildlife Service. 2004. 69 FR 8839. Endangered and threatened wildlife and plants; final rule to designate critical habitat for the Santa Ana sucker (*Catostomus santaanae*). **Federal Register** 69: 8839–8861.

[USFWS] U.S. Fish and Wildlife Service. 2005a. 70 FR 426. Endangered and threatened wildlife and plants; final rule to designate critical habitat for the Santa Ana sucker (*Catostomus santaanae*). **Federal Register** 70: 426–458.

[USFWS] U.S. Fish and Wildlife Service. 2005b. Formal section 7 consultation on the San Gabriel Canyon Off-Highway Vehicle Area on the Angeles National Forest, Los Angeles County, California (1-6-05-F-3480.4). April 7, 2005. 14 pp.

[USFWS] U.S. Fish and Wildlife Service. 2005c. Biological and conference opinions on the Revised Land and Resource Management Plans for the Four Southern California National Forests, California (1-6-05-F-773.9). September 15, 2005. 339 pp.

[USFWS] U.S. Fish and Wildlife Service. 2008. Susceptibility of the Santa Ana sucker (*Catostomus santaanae*) to endocrine disrupting compounds, wastewater compounds, and other contaminants. Proposal submitted April 30, 2008. 24 pp.

[USFWS] U.S. Fish and Wildlife Service. 2009. 74 FR 12878. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 58 species in California, Nevada, Arizona, and Utah; availability of completed 5-year reviews in California and Nevada. **Federal Register** 74: 12878–12883.

[USFWS] U.S. Fish and Wildlife Service. 2009. 74 FR 65056. Endangered and threatened wildlife and plants; revised critical habitat for the Santa Ana sucker (*Catostomus santaanae*); proposed rule. **Federal Register** 74: 65056–65087.

[USFWS] U.S. Fish and Wildlife Service. 2010a. 75 FR 38441. Endangered and threatened wildlife and plants; revised critical habitat for the Santa Ana sucker (*Catostomus santaanae*); proposed rule; reopening of comment period. **Federal Register** 75: 38441–38451.

[USFWS] U.S. Fish and Wildlife Service. 2010b. Protest of revised wastewater change petition WW0059, City of San Bernardino Municipal Water Department, City of San Bernardino, San Bernardino County, California. Date July 29, 2010. 7 pp.

[USFWS] U.S. Fish and Wildlife Service. 2010c. 75 FR 77962. Endangered and threatened wildlife and plants; revised critical habitat for Santa Ana sucker (*Catostomus santaanae*); final rule. **Federal Register** 75: 77962–78027.

[USGS] U.S. Geological Survey. 2009. Emergency assessment of postfire debris-flow hazards for the 2009 Station Fire, San Gabriel Mountains, southern California. Open-File Report 2009-1227. Unpublished report by the USGS. Revised 2010. 30 pp.

Warburton, M., B. Kuperman, V. Matey, R. Fisher. 2002. Parasite analysis of native and non-native fish in the Angeles National Forest – 2001 Final report. Unpublished report by USGS prepared for U.S. Forest Service, Angeles National Forest.

Wildermuth Environmental, Inc. 2010. Recycled water planning investigation report – Draft Final. Unpublished report prepared for San Bernardino Municipal Water Department. November 2010. 321 pp.

Zembal, R. and S. Hoffman. 2006. Environmental assessment of the Santa Ana watershed program 2000–2002. Unpublished report prepared for U.S. Environmental Protection Agency, Orange County Water District, and Santa Ana Watershed Association of Resource Conservation Districts. Dated December 2000. 108 pp.

Personal Communications

Beehler, J. 2010a. Environmental Project Manager, Santa Ana Watershed Project Authority. Email correspondence to Christine Medak, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated June 18, 2010. Subject: photos detailing the OHV use in the Santa Ana River near Riverside Avenue, San Bernardino County, California.

Beehler, J. 2010b. Environmental Project Manager, Santa Ana Watershed Project Authority. Telephone conversation with Carey Galst, Fish and Wildlife Biologist, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated September 28, 2010. Subject: video created to educate consultants and other employees that my work in areas where Santa Ana sucker occurs in the Santa Ana River.

Lovan, H.J. 2010. U.S. Army Corps of Engineers. Email correspondence to Christine Medak, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated March 12, 2010. Subject: capture of one 8 inch Santa Ana sucker at the diversion of Green River Golf Club downstream of Prado Dam.

Marquez, S. 2010a. Recovery Permit Coordinator, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Email correspondence to John O'Brien, Biologist, California

Department of Fish and Game. Dated July 28, 2010. Subject: the release of Santa Ana suckers at Stoneyvale, Big Tujunga Creek.

Marquez, S. 2010b. Recovery Permit Coordinator, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Email correspondence to John O'Brien, Biologist, California Department of Fish and Game. Dated August 6, 2010. Subject: the release of Santa Ana suckers at Stoneyvale, Big Tujunga Creek.

Maxwell, D. 2010. Biologist, California Department of Fish and Game. Email correspondence to Carey Galst, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Date September 20, 2010. Subject: describing suction dredge permits in California that are issued by California Department of Fish and Game.

Maytorena, M. 1997. Lieutenant, California Department of Fish and Game. Telephone conversation between M. Maytorena and Paul Barrett. Dated January 6, 1997. Subject: describing illegally placed gill nets with Santa Ana suckers in the Santa Ana River below Prado Dam.

Medak, C. 2010. Fish and Wildlife Biologist, USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. Email to Carey Galst, Fish and Wildlife Biologist, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated August 30, 2010. Subject: results of surveys for Santa Ana sucker in the Santa Ana River.

O'Brien, J. 2010. Biologist, California Department of Fish and Game. Email correspondence to Bradd Bridges, Recovery Branch Chief, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated August 3, 2010. Subject: the first release of Santa Ana suckers back into the Big Tujunga Creek and plans to release the remainder in August.

Rodriguez, R. 2006. Biologist, California Department of Fish and Game. Email correspondence to Christine Medak, Fish and Wildlife Biologist, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated March 27, 2006. Subject: memo that details a 1982 survey of City Creek in which Santa Ana suckers were observed with a healthy population of brown trout.

Russell, K. 2010. Natural Resources Manager, Riverside-Corona Resource Conservation District. Email correspondence to Carey Galst, Fish and Wildlife Biologist, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated September 14, 2010. Subject: the artificial streams at Riverside-Corona RCD facility and the first time Santa Ana suckers were housed and reared at the facility.

Welch, L. 2010. Wildlife Biologist, Angeles National Forest. Email correspondence and attachment to Carey Galst, Fish and Wildlife Biologist, Carlsbad Fish and Wildlife Office, Carlsbad, California. Dated September 17, 2010. Subject: impacts to Santa Ana suckers and their habitat within Angeles National Forest.

Appendix 1: Occurrences of Santa Ana sucker (*Catostomus santaanae*); prepared for FY 2011 5-year review.

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Santa Ana River Watershed							
Upper Santa Ana River and Tributaries – Upstream of S. La Cadena Ave.	Santa Ana River – near SCE Powerhouse 3		Extirpated - 8/25/1940; University of Michigan museum specimen, Catalogue # 131753	Extirpated		BLM, Private	
	City Creek – west fork north of Highland Ave. – 0.5 mi upstream of Forest Service Rd. crossing	24	Extirpated - 1982-08	Extirpated - CNDDB reports Presumed Extant, OCWD 2009 not occupied		Private, USFS	
	Warm Creek		Extirpated- 8/25/1940; University of Michigan museum specimen, Catalogue # 131756	Extirpated			
	Lytle Creek		Extirpated - 1939; Standford University museum specimen, Catalogue #37042	Extirpated		Private	

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Middle Santa Ana River and Tributaries – S. La Cadena Ave. to Prado Dam	Santa Ana River – upstream of Riverside Ave.	27	Extant - 8/6/1998	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River – Rialto to Mission Blvd	17	Extant - 1991	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River - North of Hwy 91 and Hwy 60 – above and below Riverside Ave	31	Extant - 9/20/2000	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River – Mission Blvd. Bridge	25	Extant - 9/22/2004	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Evans Outlet Drain – Santa Ana River upstream of Tequesito Arroyo Confluence	18	Extant - 1991	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Middle Santa Ana River and Tributaries – S. La Cadena Ave. to Prado Dam	Tequesito Arroyo upstream from Santa Ana River	19	Extant - 1991	Extant	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River – Sunnyslope Channel, and Tequesquito Arroyo	21	Extant - 7/27/2001	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	County and City of Riverside Parks and Recreation, CDFG	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River – Hamner Bridge	22	Extant - 9/25/2001	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	Western Riverside County MSHCP, SAS Conservation Program
	Santa Ana River – near Archibald Ave. (turns into River Rd.)	30	Extant - 9/25/2001	Extant **	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	County and City of Riverside Parks and Recreation, CDFG	Western Riverside County MSHCP, SAS Conservation Program
	Chino Creek		Extant - 03/1939; University of Michigan museum specimen, Catalogue #132944	Extant	A: Hydrological modifications, Water quality, OHV Use, Mining, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private, Army Corps of Engineers	

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Lower Santa Ana River and Tributaries – Prado Dam to near Hwy 90	Santa Ana River – near interchange of Hwys 91 and 71	29	Extant - 7/14/2000	Extant **	A: Hydrological modifications, Water quality, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	CDFG, Private	
	Santa Ana River – upstream (east) of Imperial Highway (90) bridge	23, 32	Extant - 8/19/1996	Extant **	A: Hydrological modifications, Water quality, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	
	Santa Ana River – Featherly Regional Park	26	Extant - 8/22/1996	Extant **	A: Hydrological modifications, Water quality, Nonnative vegetation B: Overuse C: Predation E: Small population; Water quality; Global climate change	Private	
	Santa Ana River – near Taylor St. Bridge, Yorba Linda	33	Extant - 9/14/1987	Extirpated **		Private	
	Walnut Canyon Reservoir – Santa Ana River system	14	Extant - 1991	Extirpated		Private	Orange County NCCP/HCP ****

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
San Gabriel River Watershed							
San Gabriel River – East Fork	East Fork San Gabriel River, Cattle Canyon Creek	2	Extant - 08/2006	Extant **	A: Hydrological modifications, Water quality, OHV use, Mining C: Predation E: Small population, Global climate change	USFS, Private	
San Gabriel River – West and North Forks	West Fork San Gabriel River, North For San Gabriel River, Bear Creek	3	Extant - 08/2006	Extant **	A: Hydrological modifications, Water quality, Wildfires, OHV use, Mining C: Predation E: Small population, Global climate change	USFS, Private	Long-Term Management Plan West Fork San Gabriel River ****
San Dimas Wash	Puddingstone Diversion Dam - San Dimas Wash – 1 mi NNE of Hwy 30 and 66 interchange	34	Extant - 8/22/2008	Extant	A: Hydrological modifications, Water quality C: Predation E: Small population, Global climate change	Private	
	San Dimas Wash – west of San Dimas Canyon Rd. – 2 mi NNE of Hwy 30 and 66 interchange	35	Extant - 8/22/2008	Extant	A: Hydrological modifications, Water quality C: Predation E: Small population, Global climate change	Private	

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Below San Gabriel Dam – San Gabriel River Watershed	San Gabriel River through Fish Canyon/Fern Canyon	11	Extirpated - 1975, City of Azusa 2009 none observed	Extirpated		Private, USFS	
	Rio Hondo and San Jose Creek near Montebello and Whittier		Extirpated - 1939; University of Michigan specimen, Catalogue #s 132992, 133162, 132948	Extirpated		Private	
Los Angeles River Watershed							
Big Tujunga Creek	Big Tujunga Creek	7	Extant - 5/8/2002	Extant **	A: Hydrological modifications, Water quality, Wildfires, Nonnative vegetation C: Predation E: Small population, Global climate change	USFS, Private	
	Haines Creek		Extant - 6/4/2003; Natural History Museum of Los Angeles, Collection #56375.001	Extant **	A: Hydrological modifications, Water quality, Wildfires, Nonnative vegetation C: Predation E: Small population, Global climate change	Private	
	Little Tujunga Creek		Extant - 5/31/1973; Natural History Museum of Los Angeles, Collection #36207.001	Extant - Swift 2006 pers. comm.	A: Hydrological modifications, Water quality, Wildfires C: Predation E: Small population, Global climate change	Private	

Occurrence*	Location Description	EO	Status at Listing and Documentation	Current Status	Threat ***	Ownership	Management Plan
Los Angeles River	Los Angeles River near Los Feliz Blvd.		Extirpated - 10/16/1942; University of Michigan museum specimen, Catalogue #136288	Extirpated		City of LA, Private	
	Los Angeles River near Universal City		Extirpated - 11/7/1939; University of Michigan museum specimen, Catalogue #133858	Extirpated		City of LA, Private	
	Arroyo Seco		Extirpated - Chicago Field Museum of Natural History specimen, Catalogue #9157	Extirpated		Private	

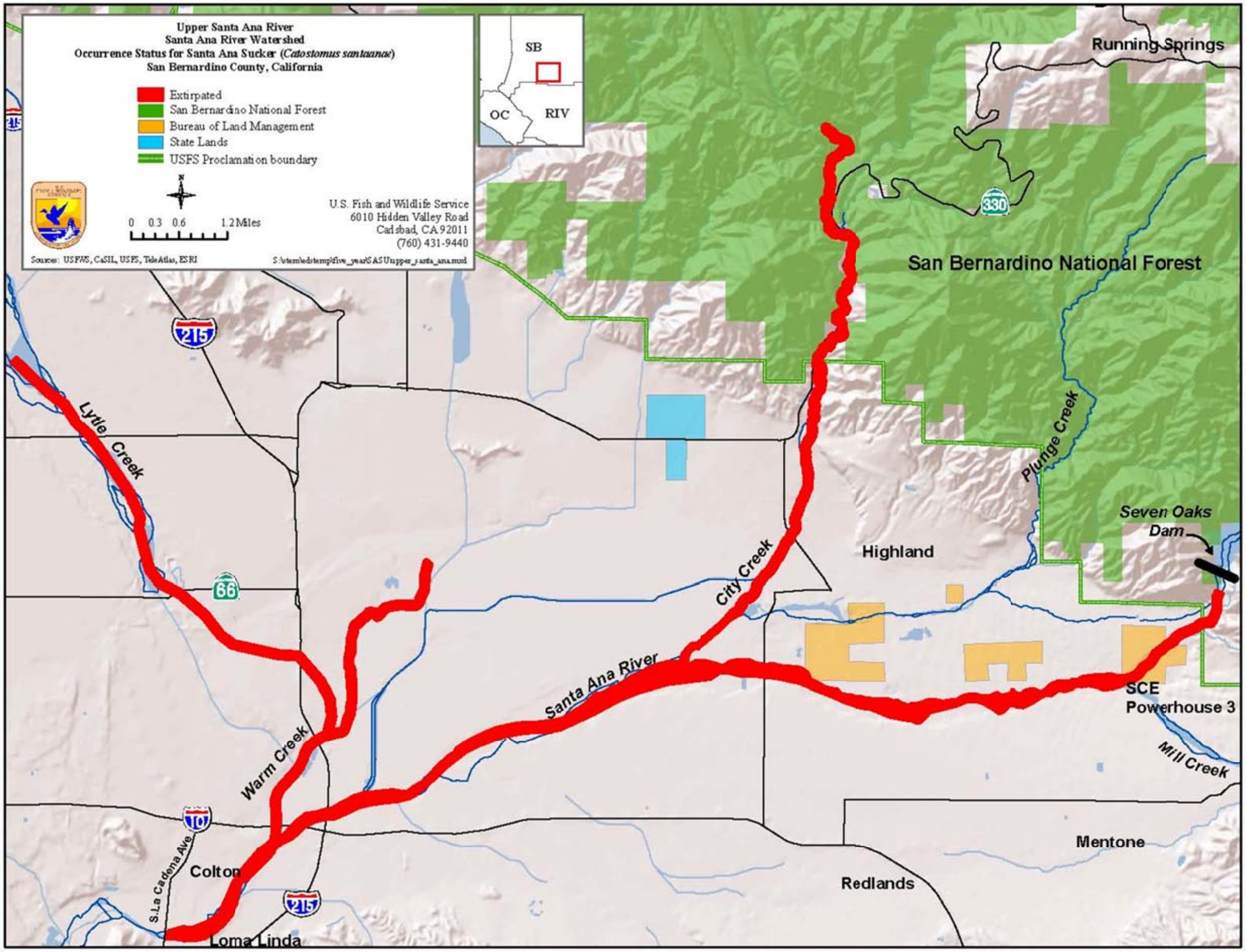
* For the purpose of this review, using reports from CNDDB, survey reports, expert information, and museum records we compiled a list of historical occurrences which were then divided into “occurrences” based on impassable barriers.

** Indicates that the area is included in the prCH 2009 designation for Santa Ana sucker (74 FR 65056)

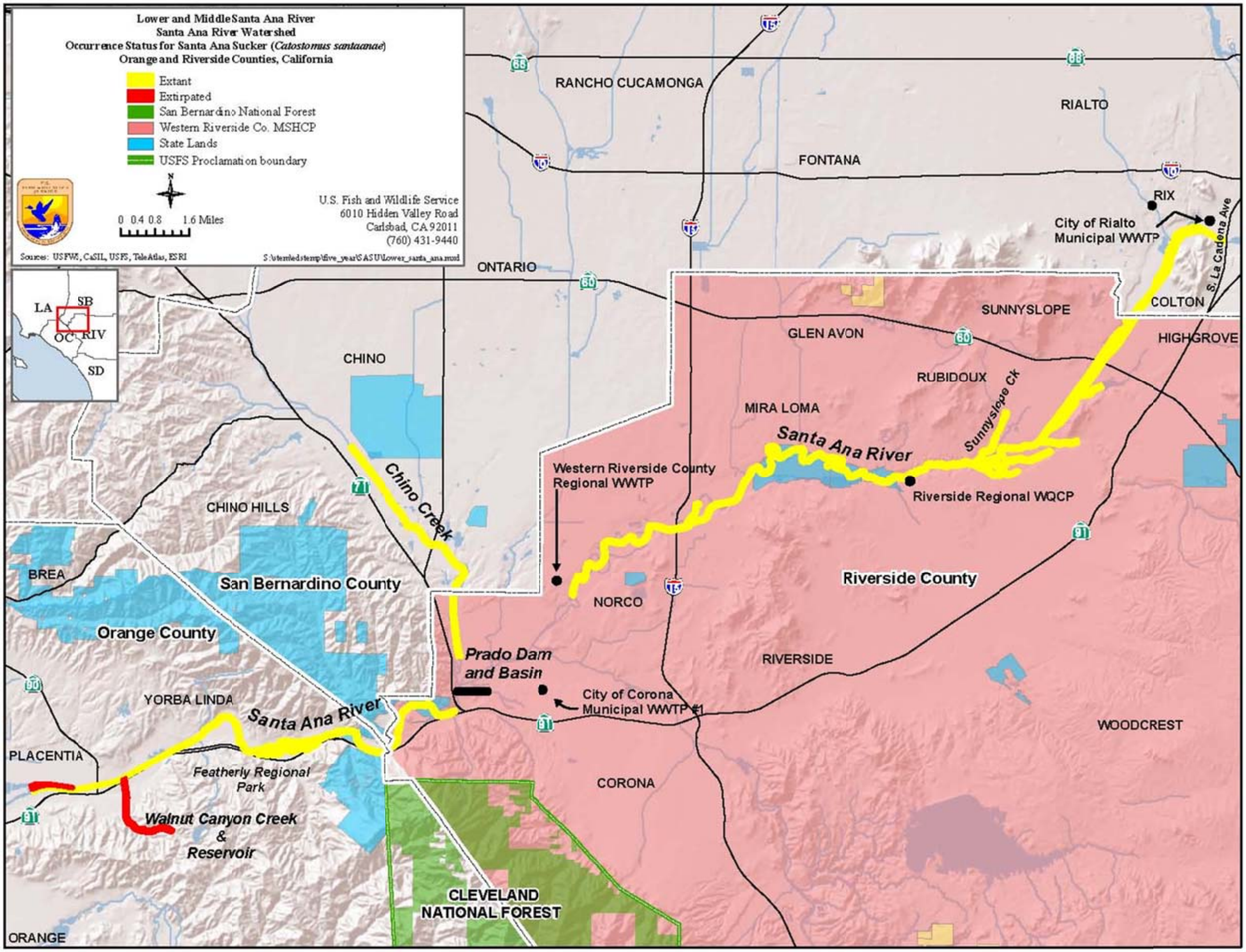
*** Uses heading from Five Factor Analysis

**** NOT a Covered species

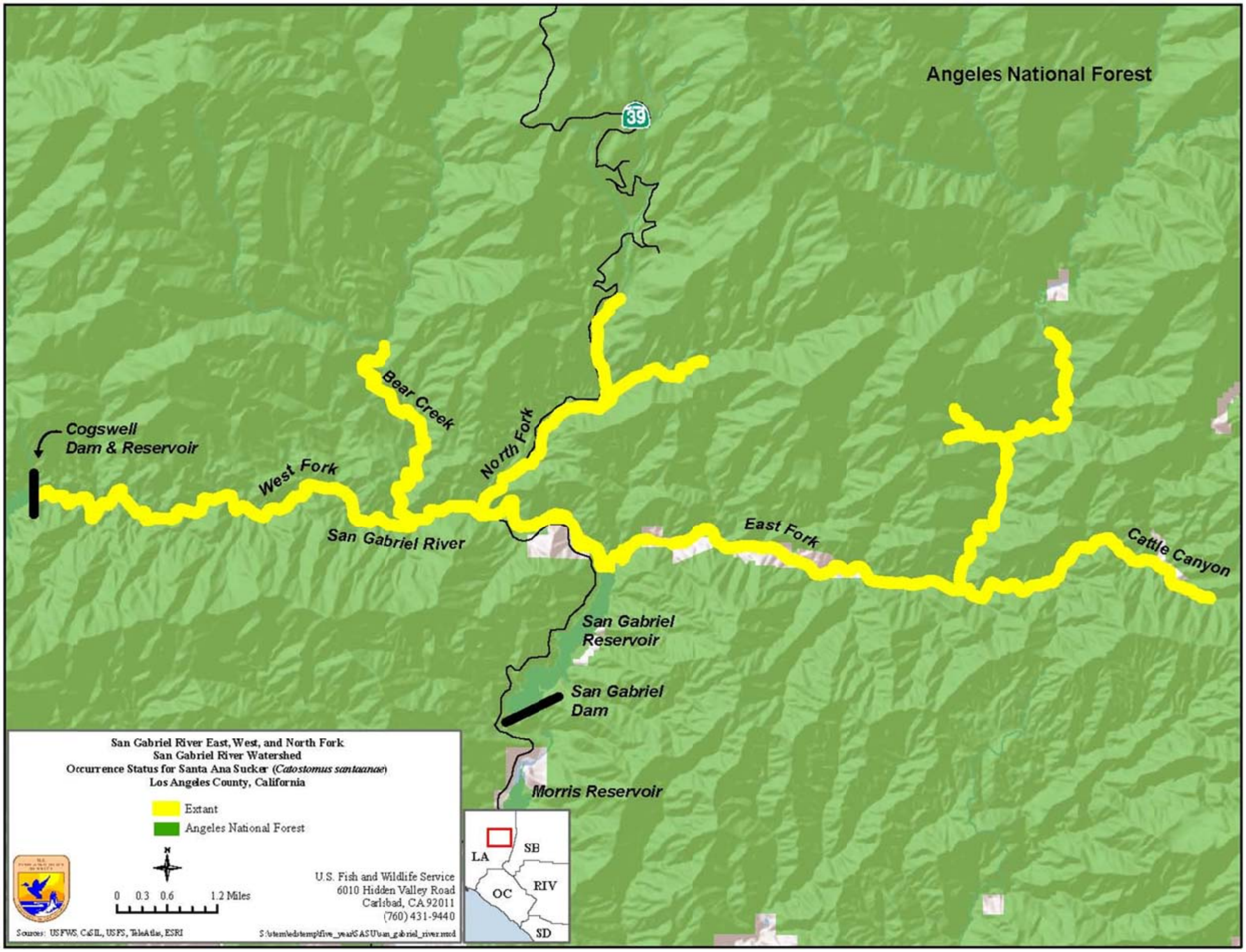
Appendix 2: Distribution of Santa Ana sucker (*Catostomus santaanae*) occurrences; Prepared for FY2011 5-yr review.



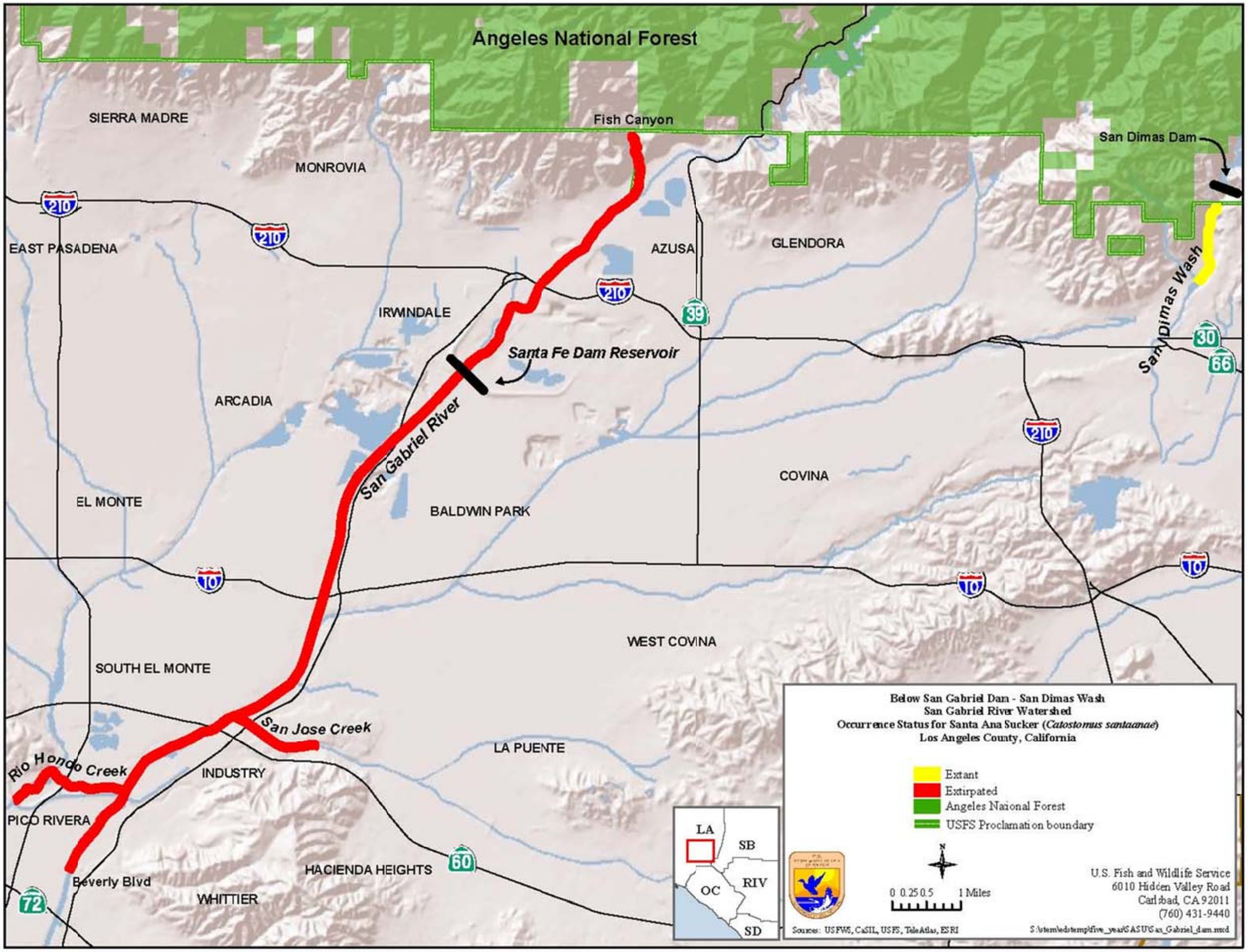
Distribution of the Santa Ana sucker in the Upper Santa Ana River Occurrence.



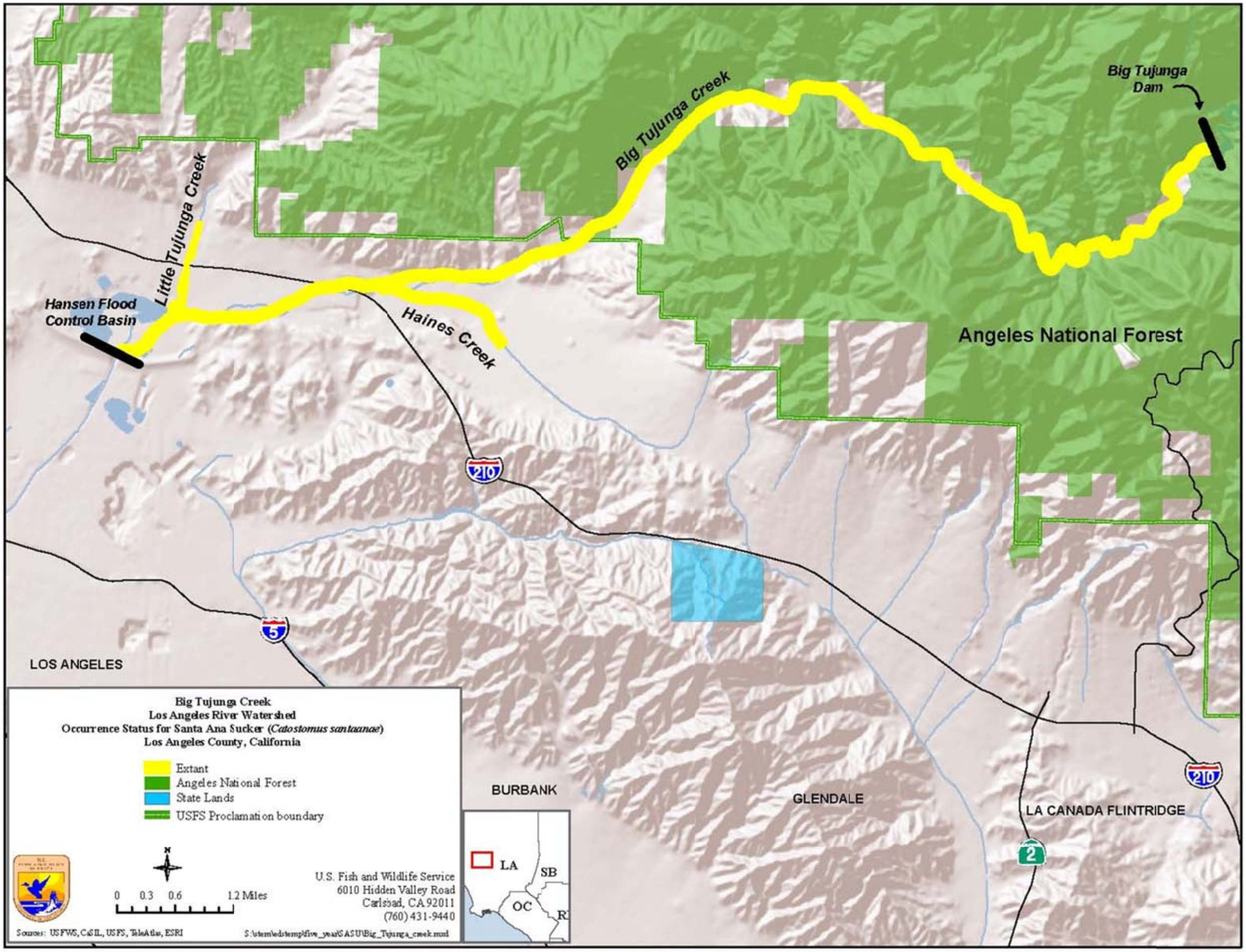
Distribution of the Santa Ana sucker in the Lower and Middle Santa Ana Rivers Occurrences.



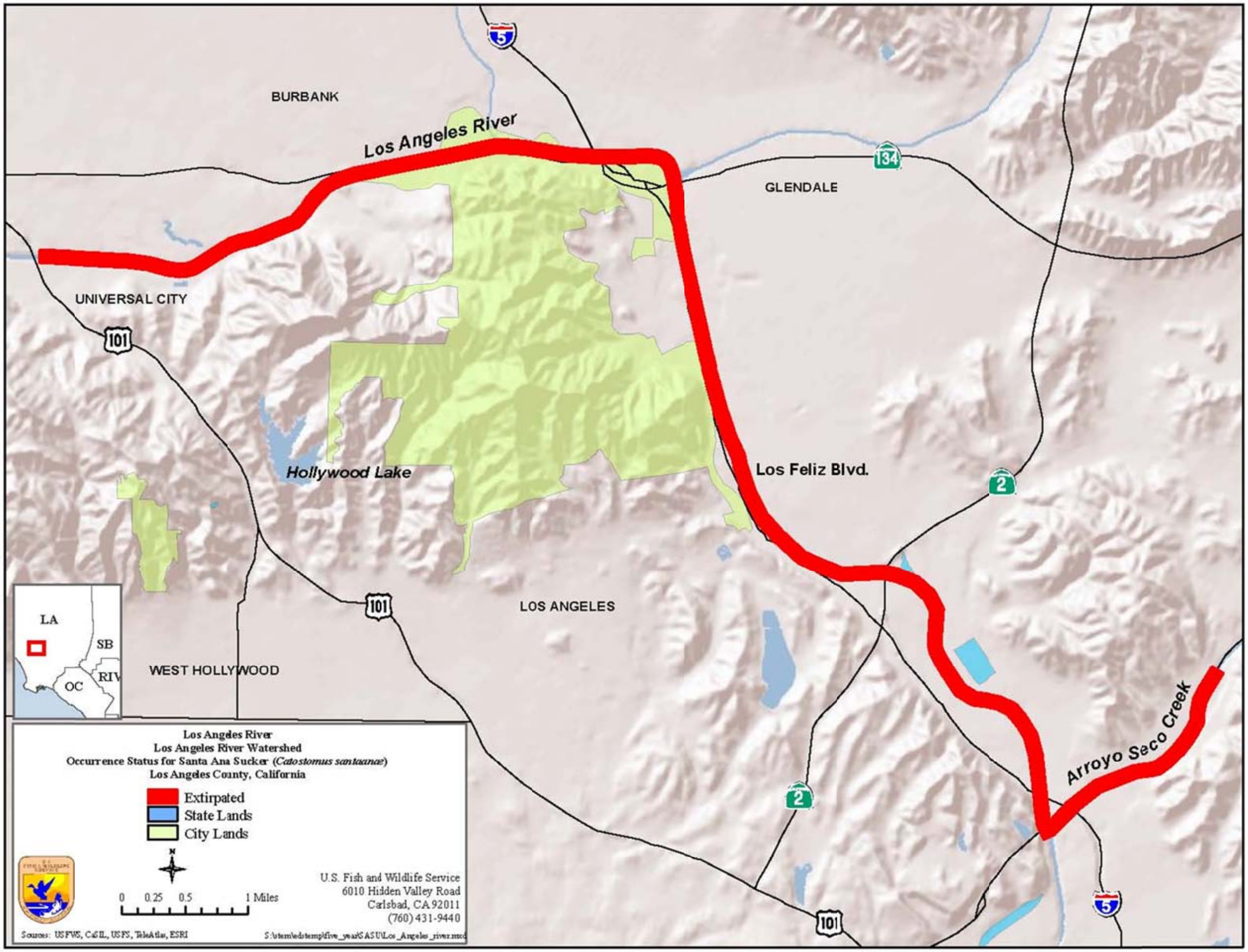
Distribution of the Santa Ana sucker in the San Gabriel River – East Fork, West Fork, and North Fork Occurrences.



Distribution of the Santa Ana sucker in the San Gabriel River - Below San Gabriel Dam and the San Dimas Wash Occurrences.



Distribution of the Santa Ana sucker in the Big Tujunga Creek Occurrence.



Distribution of the Santa Ana sucker in the Los Angeles River Occurrence.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Santa Ana sucker
(*Catostomus santaanae*)

Current Classification: Threatened

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X_ No change needed

Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

ACTING **Lead Field Supervisor, U.S. Fish and Wildlife Service**

Approve ______________________ Date MAR 10 2011

Scott A. Sobiech