# coastal California gnatcatcher
# *(Polioptila californica californica)*

# 5-year Review:
# Summary and Evaluation

coastal California gnatcatcher (*Polioptila californica californica*) and habitat. Photo credit Marci Koski and Gjon Hazard (USFWS).

**U.S. Fish and Wildlife Service**
**Carlsbad Fish and Wildlife Office**
**Carlsbad, California**

**September 29, 2010**

# 5-YEAR REVIEW

coastal California gnatcatcher
(*Polioptila californica californica*)

## 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 of 1973, as amended (Act), to conduct a review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate the status of the species since it was listed or since the most recent 5-year review. Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species (delisted), be changed in status from endangered to threatened (downlisted), or be changed in status from threatened to endangered (uplisted). 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:

The coastal California gnatcatcher (*Polioptila californica californica*) (gnatcatcher) is thenominate and northernmost subspecies of California gnatcatcher (Atwood 1991, p. 118). It is a small, non-migratory songbird (passerine) that occurs along the Pacific coastal regions of southern California and northern Baja California, Mexico (Atwood 1991, p. 128). Coastal California gnatcatchers occur in or near coastal scrub vegetation communities (Woods 1921, p. 173; Atwood 1980, p. 67). Much of the species' current range within the United States is now or is anticipated to be covered by large, regional Habitat Conservation Plans (HCPs) permitted under section 10(a)(1)(B) of the Act and under the State of California's Natural Community Conservation Planning (NCCP) Act. These regional plans have made substantive contributions to the species' conservation.

### Methodology Used to Complete This Review:

This review was prepared by Gjon Hazard at the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. We used information from a wide range of sources including reports and published literature. A recovery plan has not been prepared for this species. We received one letter on March 6, 2008, responding to our request for information in the notice announcing initiation of the 5-year review of this taxon (USFWS 2008, 73 *FR* 11945). The letter was from the State of California Department of Justice recommending that we consider the potential impacts of global warming on the species.

This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all 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 the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

**Contact Information:**

**Lead Regional Office:** Larry Rabin, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, Region 8; (916) 414-6464.

**Lead Field Office:** Gjon Hazard, Fish and Wildlife Biologist, and Bradd Baskerville-Bridges, Recovery Branch Chief, Carlsbad Fish and Wildlife Office; (760) 431-9440.

**Cooperating Field Office:** Chris Dellith, Fish and Wildlife Biologist, Ventura Fish and Wildlife Office; (805) 644-1766.

***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 5, 2008 (USFWS 2008, 73 *FR* 11945). We received one letter in response from the State of California Department of Justice recommending that we consider the potential impacts of global warming on the species.

**Listing History:**

**Original Listing**
***FR* Notice:** 58 *FR* 16742 (USFWS 1993a)
**Date of Final Listing Rule:** March 30, 1993
**Entity Listed:** coastal California gnatcatcher (*Polioptila californica californica*), a bird subspecies
**Classification:** Threatened

**Associated Rulemakings:** Since the species was first included as a category 2 candidate species in 1982, the gnatcatcher has been the subject of no fewer than 28 *Federal Register* publications. Summaries of major events are presented in the 2000 and 2007 final rules designating critical habitat. A list of significant *Federal Register* publications follows:

- March 30, 1993—Proposed special rule concerning the take of the gnatcatcher pursuant to section 4(d) of the Act (USFWS 1993b, 58 *FR* 16758).

- December 10, 1993—Final special rule concerning the take of the gnatcatcher pursuant to section 4(d) of the Act (USFWS 1993c, 58 *FR* 63088).

- March 27, 1995— Notice of determination retaining the threatened status for the coastal California gnatcatcher in response to a court ruling (USFWS 1995, 60 *FR* 15693).

- February 8, 1999—Notice of determination reaffirming our earlier not prudent determination for the designation of critical habitat in response to a court ruling (USFWS 1999, 64 *FR* 5957).

- February 7, 2000—Proposed rule to designate critical habitat (USFWS 2000a, 65 *FR* 5946).

- October 24, 2000—Final rule designating critical habitat (USFWS 2000b, 65 *FR* 63680).

- April 24, 2003—Proposed rule to redesignate critical habitat and consideration of Distinct Population Segment (DPS) (USFWS 2003, 68 *FR* 20228).

- December 19, 2007—Final rule redesignating critical habitat (USFWS 2007a, 72 *FR* 72010).

**Review History:**

Since listing in 1993, no 5-year status review was conducted to assess whether the gnatcatcher should be delisted or reclassified. On April 24, 2003, we published a proposed rule to consider redefining it under the Act from a subspecies to a DPS (USFWS 2003, 68 *FR* 20228) (see below). The potential DPS was for the U.S. portion of the range only. As part of the DPS analysis in the proposed rule, we presented a five-factor analysis for the potential DPS (USFWS 2003, 68 *FR* 20232–20233), but we made no conclusion or determination of the listing status.

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

The recovery priority number for the coastal California gnatcatcher is 9C according to the Service's Fiscal Year 2009 Recovery Data Call for CFWO. The recovery priority number for the gnatcatcher was 3C at the start of the 5-year review, though in 2009 after initiation of the review, the number was changed to 9C. As defined in our Endangered and Threatened Species Listing and Recovery Priority Guidelines, the recovery priority number is based on a 1 to 18 ranking system where the lowest rank translates to the highest priority (USFWS 1983a, 48 *FR* 43098; as corrected, USFWS 1983b, 48 *FR* 51985). This number indicates that the taxon is a subspecies that faces a moderate degree of threat and has a high potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

**Recovery Plan or Outline:**

Neither a recovery plan nor a recovery outline has been prepared for this species.

## II. REVIEW ANALYSIS

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

We listed the gnatcatcher as a subspecies throughout its range in 1993. In 2003, in a proposed rule to redesignate critical habitat, we announced that we were considering changing its listing status under the Act from a subspecies to a DPS (USFWS 2003, 68 *FR* 20228). We considered a DPS because of perceived uncertainty in the subspecific taxonomy of the California gnatcatcher following the publication of a paper by Zink et al. (2000, pp. 1394–1405). Zink et al. (2000) examined the mitochondrial DNA (mtDNA) control region and three mtDNA genes for variation among samples. This research provided new information on the geographic structure of mtDNA haplotypes within California gnatcatcher populations throughout the entire species' range. Zink et al. (2000, p. 1399) did not support recognition of subspecies in the California gnatcatcher. This conclusion contradicted previously published taxonomic treatments of the gnatcatcher, all of which identified or acknowledged morphological distinctiveness to varying degrees within the greater California gnatcatcher taxon (Brewster 1881, p. 103; Brewster 1902, p. 210; Thayer and Bangs 1907, p. 138; Grinnell 1926, p. 496; Grinnell 1928, p. 227; van Rossem 1931, p. 35; Hellmayer 1934, p. 508; AOU 1957, p. 451; Miller et al. 1957, pp. 204–205; Paynter 1964, pp. 449–450; Atwood 1988, p. 61; Atwood 1991, p. 127; Phillips 1991, p. 25; Mellink and Rea 1994, p. 53; Howell and Web 1995, p. 578).

Upon analyzing all available information, including comments of the public and peer reviewers as well as the input of a Federal panel of scientists, we did not further pursue delineating a DPS of California gnatcatcher. While Zink et al (2000) was cited among other articles relating a general concern that subspecies defined by morphological variations may not reflect underlying genetic structure and phylogenies (Haig et al. 2006, p. 1586), Remsen (2005, pp. 403–413) criticized reliance on mtDNA data. Moreover, Edwards et al. (2005, p. 6552) asserted that "mtDNA should not have priority over nuclear genes in avian species delimitation." In this regard, Phillimore et al. (2008, p. 2850) found in a study comparing patterns of divergence of a small passerine bird, the Vanuatu white-eye (*Zosterops flavifrons*), that the species' populations may constitute from 2 to 13 conservation units depending on whether the approach employed mtDNA, nuclear DNA, or morphology. In light of the above, the available information led us to conclude that Zink et al (2000) alone did not constitute sufficient information to disregard the existing taxonomy and the information from multiple other scientific papers that found or acknowledged the distinctiveness of the California gnatcatcher. Authorities have recognized the gnatcatcher as a distinct taxon based on its physical appearance since it was first described, and the taxon has been recognized as a distinct subspecies by the American Ornithologists Union (AOU 1957, p. 451). Some doubt has been cast on analyses of morphological data by Atwood (1991, pp. 118–133) (e.g., Cronin 1997, p. 663), but problems with that analysis do not invalidate previous and subsequent morphological work (Grinnell 1926, pp. 493–500; van Rossem 1931, pp. 36–36; Phillips 1991, pp. 25–26; Mellink and Rea 1994, pp. 50–62). The

Service will consider any new scientific information, including published taxonomic revisions, relevant to this issue in future status reviews.

**Information on the Species and its Status:**

Overall Range

The range of the gnatcatcher is coastal southern California and northwestern Baja California, Mexico, from southern Ventura and San Bernardino Counties, California, south to approximately El Rosario, Mexico, at about 30 degrees north latitude (Grinnell 1926, p. 499; AOU 1957, p. 451; Miller et al. 1957, p. 204; Atwood 1991, p. 127; Phillips 1991, pp. 25–26; Atwood and Bontrager 2001, p. 3) (Figure 1). The range of the gnatcatcher closely follows that of coastal scrub. The northern and eastern limits of the coastal scrub vegetation communities used by the gnatcatcher are largely bound by mountainous areas, while the southern limit is defined by the transition to the Vizcaíno desert.

This overall range is roughly the same as it was at the time of listing. At the time of listing, the information available suggested the northernmost populations in southern Ventura and southwestern San Bernardino Counties were extirpated (extinct locally) (USFWS 1993a, 58 *FR* 16742), but observations since listing have shown that populations in those counties are extant (Davis et al. 1998, p. 361; USFWS 2009). Those discoveries, along with attributes of the species' life history, led us to conclude that those northern counties actually supported small populations at the time of listing (see USFWS 2007a, 72 *FR* 72036). Additionally, current data indicate gnatcatchers occur in the greater Santa Clarita Valley area (i.e., in the foothills along the upper Santa Clara River), which is farther north than the northern limit of the historical range (Grinnell and Miller 1944, p. 370). These occurrences, plus recent detections of multiple birds at the northwestern edge of the Santa Monica Mountains (south of Camarillo, Ventura County) (S. Hongola, Rincon Consultants, Inc., *in litt.* 2009; D. Pereksta, USFWS, *in litt.* 2009) caused us to reevaluate the northern limit to the species range because the Santa Monica Mountains were not known to support gnatcatchers at the time of listing (Atwood 1980, p. 72; Atwood 1993, pp. 155 and 158; Atwood and Bontrager 2001, p. 3). Historically, the range of the gnatcatcher extended farther east than it does today, in the vicinity the San Gorgonio Pass (Grinnell and Swarth 1913, p. 316; Grinnell and Miller 1944, pp. 369–370; Atwood 1988, p. 18; Unitt 2008).

Moreover, recent extralimital detections of individual birds (not mapped in Figure 1), such as one near Gorman, Los Angeles County (BonTerra Consulting 2006, p. 5), and one near Jacumba Peak in eastern San Diego County (Mock 2004, p. 431) warrant attention because they may indicate range expansions or, given that the gnatcatcher is generally considered a short-distance disperser, they may indicate data inadequacies from the intervening areas. Geographic outliers were reported historically, as well, including San Felipe Valley, San Diego County (Unitt 1984, p. 177; Mock 2004, p. 431) and Palm Springs (Grinnell 1904, p. 45; Phillips 1991, p. 25). The mapped range in Figure 1 shows the core range of the gnatcatcher based upon our assessment of sage scrub distribution, gnatcatcher occurrence data, and information from the literature. The range depicted in Figure 1 does not include gnatcatcher occurrences we consider to be outliers.


**Figure 1: Map depicting the current range of the coastal California gnatcatcher in California and Baja California, Mexico. We generalized the northern and eastern range limits from elevation data (610 meters (2,000 feet)) and, where available, gnatcatcher occurrence locations in our database. We used 610 meters (2,000 feet) elevation because it best summarized the gnatcatcher occurrences in our database, encompassing about 99 percent of them. To determine the northwestern limit, we used topography (roughly toe of slope) and occurrence locations. Per Atwood (1991, p. 129), we used 30 degrees north latitude as the southern limit.**

Range information in Baja California is not well defined. Unlike the United States, detailed survey data are not available. Nevertheless, the range of the gnatcatcher in Baja California, just as in the United States, follows that of sage scrub west of the mountains. The subspecies' southern range limit cannot be precisely defined because it intergrades with a different California gnatcatcher subspecies, but Atwood (1988, p. 11; 1991, p. 129) found morphological characters that differentiate the coastal California gnatcatcher from populations south of about 30 degrees north latitude (see also "Changes in Taxonomic Classification or Nomenclature" section, below).

Within this overall range, the historical and current distribution of the gnatcatcher is naturally patchy. That is, it may be locally common in some areas of apparently suitable habitat and scarce or absent in others (Grinnell 1898, p. 50; Grinnell and Miller 1944, p. 369; Atwood 1980, p. 68; Mellink and Rea 1994, p. 57). This distribution has been further fragmented by anthropogenic changes to the habitat (see "Five-Factor Analysis" section, below) (Atwood 1993, p. 155; Atwood and Bontrager 2001, pp. 2–3).

Abundance

Historically, Grinnell and Miller (1944, p. 369) noted gnatcatchers were "common locally" in the United States. However, they also noted that the amount of coastal scrub had already been reduced. Numbers of gnatcatchers continued to decline such that Pyle and Small (1961, p. 49) considered it to be "very rare." Atwood (1980, p. 76) also reported declining numbers and continued reduction in the amount of habitat, which was also noted by others at the time (Garrett and Dunn 1981, p. 292; Unitt 1984, p. 177).

In the 1980s and 1990s, a few qualitative estimates of the population size were made, but these estimates were not based on rigorous sampling. Atwood (1980, p. 76) speculated that 1,000 to 1,500 gnatcatcher pairs occurred in the United States, and later, using a different methodology, he estimated that the U.S. population was likely less than about 2,000 pairs (Atwood 1992, p. 4). These estimates were similar to the 1,645 to 1,880 pairs estimated by a Building Industry study (MBA 1991, p. 5). At the time of listing in 1993, we estimated about 2,562 pairs of gnatcatchers remained in the United States, and we reported about 2,800 pairs occurred in Baja California (USFWS 1993a, p. 16743). However, these estimates were not statistically valid because they were conducted using methods not supported by probability theory. Additionally, gnatcatcher population sizes are known to fluctuate from year to year (Atwood and Bontrager 2001, p. 20), which further complicates any trend assessment.

In a recent study using more rigorous sampling techniques, Winchell and Doherty (2008, p. 1324) estimated there were 1,324 (95 percent confidence interval: 976–1,673) gnatcatcher pairs over a 44,923-hectare (111,006-acre) area on public and quasi-public lands of Orange and San Diego Counties. Their sampling frame covered only a portion of the U.S. range, focusing on the coast, and was limited to one year. Although it is not valid to extrapolate beyond the sampling frame, especially in light of known differences in population densities across the range of the gnatcatcher (Atwood 1992, p. 2), it is likely there are more gnatcatchers in the U.S. portion of the range than was suggested by earlier estimates; Winchell and Doherty (2008, p. 1324) estimated nearly as many gnatcatchers in the portion of the U.S. range sampled in their study as was

originally estimated for the entire U.S. range. We are not aware of any recent estimates of gnatcatcher populations in Baja California.

Habitat

The "habitat" for many bird species, including the gnatcatcher, is best described by the plant community or communities that the bird species predominantly occupies. The range and distribution of the gnatcatcher is closely aligned with coastal scrub vegetation. This vegetation is typified by low (less than 1 meter (3 feet)), shrub and sub-shrub species that are often drought-deciduous (O'Leary 1990, p. 24; Holland and Keil 1995, p. 163; Rubinoff 2001, p. 1376). Starting at the United States–Mexico border and continuing southward, the gnatcatcher-associated plant communities increasingly include succulent species. As defined by Westman (1983, pp. 6 and 10), the *coastal scrub* plant communities that overlap the range of the gnatcatcher include Venturan, Diegan, and Riversidean coastal *sage* scrub communities, and Martirian and Vizcainan coastal *succulent* scrub communities. These different plant communities generally reflect the transition from a wetter, Mediterranean-type climate in the north to a dryer, tropical-desert climate in the south (Peinado et al. 1995, pp. 165–179). As detailed by Campbell et al. (1998, pp. 421–433), gnatcatchers may also occur in other nearby plant communities, especially during the non-breeding season, but gnatcatchers are closely tied to coastal scrub for reproduction (Atwood 1993, p. 151). Moreover, all coastal scrub is not equal with respect to gnatcatchers. Gnatcatchers are patchily distributed, and Winchell and Doherty (2008, p. 1325) found the density of gnatcatchers was highest in high-quality habitat and decreased as habitat quality decreased.

Life History

Several comprehensive overviews of the life history and ecology of the gnatcatcher have been prepared and are the basis for much of the discussion presented below (e.g., Atwood 1988, pp. 1–74; Atwood 1990, pp. 1–49; Atwood and Bontrager 2001, pp. 1–32). The gnatcatcher is non-migratory and defends breeding territories ranging in size from 1 to 6 hectares (2 to 14 acres). The home range size of the gnatcatcher varies seasonally and geographically, with winter season home ranges being larger than breeding season ranges (Bontrager 1991, pp. 12–13) and inland populations having larger home ranges than coastal (Atwood and Bontrager 2001, p. 11). The breeding season of the gnatcatcher generally extends from late February through July (sometimes later), with the peak of nest initiations (start-ups) occurring from mid-March through mid-May. Nests are composed of grasses, bark strips, small leaves, spider webs, down, and other materials and are often located in California sagebrush (*Artemisia californica*) plants about 1 meter (3 feet) above the ground. Nests are constructed over a 4 to 10 day period. Clutch size averages four eggs. The incubation and nestling periods encompass about 14 and 16 days, respectively. Both sexes participate in all phases of the nesting cycle. Although the gnatcatcher may occasionally produce two broods in one nesting season, the frequency of this behavior is not known; however, the species is known to rapidly and repeatedly renest following the loss of eggs or juveniles to predators. Juveniles are dependent upon or remain closely associated with their parents for up to several months following departure from the nest and dispersal from their natal (place of birth) territory.

Dispersal of juveniles generally requires a corridor of native vegetation that provides certain foraging and sheltering requisites and that connects to larger patches of appropriate sage scrub vegetation (Soulé 1991, p. 92). These dispersal corridors facilitate the exchange of genetic material and provide a path for recolonization of extirpated areas (Soulé 1991, p. 92; Galvin 1998, p. 323). Galvin (1998, p. 323) concluded that, "natal dispersal [through corridors] is therefore an important aspect of the biology of [a] . . . nonmigratory, territorial bird . . . [such as] the California gnatcatcher." The gnatcatcher generally disperses short distances through contiguous, undisturbed habitat, but juvenile gnatcatchers are capable of dispersing long distances (up to 22 kilometers) (14 miles) across fragmented and highly disturbed sage scrub habitat, such as that found along highway and utility corridors or remnant mosaics of habitat adjacent to developed lands (Bailey and Mock 1998, p. 359; Famolaro and Newman 1998, p. 449; Galvin 1998, p. 330).

Changes in Taxonomic Classification or Nomenclature

The California gnatcatcher, along with other gnatcatcher species, is a songbird (class Aves, order Passeriformes). At the time of listing, gnatcatchers as a group (tribe Polioptilini) were part of the Muscicapidae, a family encompassing many taxonomic groupings below the family level (AOU 1983, pp. xviii, 538). Since listing, the family Muscicapidae has been reorganized and split into several families. The gnatcatcher group is now a subfamily (Polioptilinae) in the family Sylviidae (AOU 1998, p. 489). However, recent evidence suggests that further reorganization of this family is needed (Sheldon and Gill 1996, pp. 473–495; Alström et al. 2006, pp. 381–397).

Prior to listing, the black-tailed gnatcatcher (*Polioptila melanura*) was split into two species, with coastal and Baja California peninsular forms becoming the California gnatcatcher and the interior forms remaining the black-tailed gnatcatcher (Atwood 1988, pp. 1–67; USFWS 1993a, 58 *FR* 16742). The coastal California gnatcatcher was then recognized as one of several subspecies of California gnatcatchers (Atwood 1991, pp. 118–133), but not without some controversy (USFWS 1993a, 58 *FR* 16742; USFWS 1995, 60 *FR* 15693; USFWS 2003, 68 *FR* 20228; see also DPS section, above).

Since listing, Mellink and Rea (1994, p. 55), proposed a new subspecies, *Polioptila californica atwoodi*, for the California gnatcatchers that occur in coastal northwestern Baja California from just south of the United States–Mexico border region to about El Rosario, Baja California—that is, from about 32 to 30 degrees north latitude. This analysis was based primarily on a qualitative assessment of the plumage characteristics of female gnatcatchers. New information using mtDNA showed little geographic structure of California gnatcatcher populations throughout the entire species' range (Zink et al. 2000, pp. 1394–1405).

Genetics

We are not aware of any nuclear DNA data from this species; however, as described above, mtDNA data indicate a lack of geographic structure of California gnatcatcher populations throughout the entire species' range (Zink et al. 2000, pp. 1394–1405). This finding suggested to Mock (2004, p. 433) that phenotypic characteristics that make the coastal California gnatcatcher

distinguishable "are being maintained by natural selection for plumage suitable to their local habitat rather than by restricted gene flow."

**Five-Factor Analysis**

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

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

For this factor we examined the present (current) or threatened (anticipated) destruction, modification, or curtailment of the habitat or range of the gnatcatcher. To provide historical context or to indicate trends in activities that provide information as to the magnitude or immediacy of the threat, we also note earlier (i.e., non-current or anticipated) habitat loses.

In the 1993 listing rule, we summarized the historical and, at the time, ongoing losses of coastal scrub habitat in the United States and Mexico. We stated that the "habitat and range of the gnatcatcher [had] been significantly reduced," further noting that coastal sage scrub was "one of the most depleted habitat types in the United States" (USFWS 1993a, 58 *FR* 16751). Overall, we reported 58 to 61 percent of coastal sage scrub habitat had been lost in the three counties that supported about 99 percent of the U.S. gnatcatcher population (USFWS 1993a, p. 16751). We identified urban and agricultural development as the primary causes for habitat destruction in the United States (USFWS 1993a, p. 16751). We also noted (natural and accidental) wildland fire as a temporary impact that could also lead to permanent habitat degradation. Fragmentation and nest parasitism were also mentioned as threats under this factor in the listing rule; however, because these stressors affect gnatcatcher populations or individuals, as opposed to habitat, we address them under Factor E (below) in the current analysis.

The 2000 proposed rule to designate critical habitat also included a five-factor analysis on the potential U.S. DPS. It identified similar threats as the listing rule, plus an additional threat listed under Factor E, "type conversion." Type conversion, or "habitat type conversion," is the modification of one habitat type to another through the affects of one or more stressors working individually or in combination—ultimately resulting in the destruction of the original habitat type. As such, we examine type conversion as a threat under Factor A, even though many of the individual stressors could be examined separately under Factor E.

Although the 2000 analysis only addressed the potential U.S. DPS, type conversion is also likely a threat to gnatcatcher habitat in Mexico, at least within the northwestern portion of Baja California where nonnative invasive plants are more prevalent (see below). In the listing rule for Mexico, we identified urban and agricultural development as threats under this factor, but also added grazing and intentional burning. However, the listing rule under Factor E identified grazing as a threat to gnatcatcher habitat throughout the species' range—a threat that was probably better addressed under Factor A. Therefore, below we examine whether the following four Factor A threats—(1) urban and agricultural development, (2) wildland fire, (3) grazing, and

(4) habitat type conversion—are currently affecting or are anticipated to affect gnatcatcher habitat throughout its range in the United States and Mexico.

Urban and Agricultural Development

Development for urban use involves clearing of existing vegetation. Larger urban developments also often involve earth moving activities resulting in topographical recontouring. Urban development not only results in buildings, roads, and other infrastructure, which are permanent, but also includes "temporary" impacts, such as pipeline installation or heavy equipment activity proximal to permanent urban development. Without active management in the form of habitat restoration, sites formerly supporting coastal sage scrub vegetation that have undergone severe disturbance (like heavy equipment and earth moving activities) take decades to recover (Stylinski and Allen 1999, p. 550). As such, in absence of restorative management, we consider these "temporary" activities to impact the species for the foreseeable future. Likewise, agricultural development involves clearing of existing vegetation, and sometimes recontouring. Even though agriculture does not result in the same level of physical infrastructure as urban development, it, like the "temporary" impacts of urban development, involves severe physical disturbance to the land. Moreover, it typically involves repeated disturbance (e.g., tillage). Clearing for fire abatement (e.g., fire breaks, fuel breaks) is done to protect urban and agricultural areas and similarly involves clearing and often tilling; thus, it can also be considered a threat under this factor. Therefore, urban and agricultural development in areas of coastal scrub within the range of the gnatcatcher results in destruction, modification, and curtailment of its habitat.

At the time of listing, we considered habitat destruction as a threat of high magnitude and immediacy. As mentioned above, we noted up to 61 percent of gnatcatcher habitat had been destroyed in the United States—primarily through urban and agricultural development—in Orange, Riverside, and San Diego Counties. We estimated these three counties supported 99 percent of the U.S. population of the gnatcatcher at that time (USFWS 1993a, p. 16751). We concluded from the evidence available at the time that the gnatcatcher had been extirpated (locally driven to extinction) in Ventura and San Bernardino Counties, and nearly so in Los Angeles County. Because of anticipated growth in the population of southern California, we expected urban development activities to continue to result in the loss of gnatcatcher habitat.

We also noted 36 percent of the remaining suitable habitat in Orange County had been preserved. Moreover, the State had initiated the NCCP Act for the coastal sage scrub region and multiple regional and local jurisdictions had committed to develop conservation plans under the NCCP and section 10 of the Act (see Factor D for additional information). Two major landowners committed to preserve large areas of gnatcatcher habitat. In all, we concluded that the combination of these conservation measures reduced the magnitude of the threat from habitat loss to a point where we listed the gnatcatcher as a threatened species rather than an endangered species, as we had originally proposed (USFWS 1993a, pp. 16755–16756).

Available evidence indicates modification, curtailment, and destruction of gnatcatcher habitat has been occurring over the recent past and we anticipate these actions to continue over the foreseeable future. In the United States, agricultural development and especially urban development have continued in southern California since the gnatcatcher was listed in 1993. We

do not have specific data on acreage of gnatcatcher habitat lost from development since listing, but using a simple GIS model, we estimated about 2,906 hectares (7,183 acres) of the 258,751 hectares (639,387 acres) of mapped sage scrub vegetation within the range of the gnatcatcher was destroyed by urban development between 2002 and 2006 (the years for which we had data). This represents about 1 percent of the mapped vegetation. However, the mapped vegetation is not necessarily representative of gnatcatcher habitat; as discussed above, not all areas of sage scrub vegetation support gnatcatchers. Additionally, these data only span a short time period. As such, these data indicate that gnatcatcher habitat is being destroyed by urban development (the threat has high immediacy), but the magnitude of this threat is unclear.

Additional evidence of habitat loss from urban development comes from the amount of human population growth (Figure 2) and the number of new houses (Table 1) in Orange, Riverside and San Diego Counties where the vast majority of gnatcatchers occur in the United States. Figure 2 shows that the population of these counties grew continuously from 1970 to 2009, including the period since listing. Additionally, State estimates showed a 13.4 percent increase in the number of new housing units between 2000 and 2008 in those same counties (Table 1). These data also suggest urban development has continued since listing, and despite the economic downturn that started in 2008, urban growth is likely to continue for the foreseeable future. However, because the extent to which these data are correlated with the area of gnatcatcher habitat impacted is not known, the magnitude of the threat remains unclear.

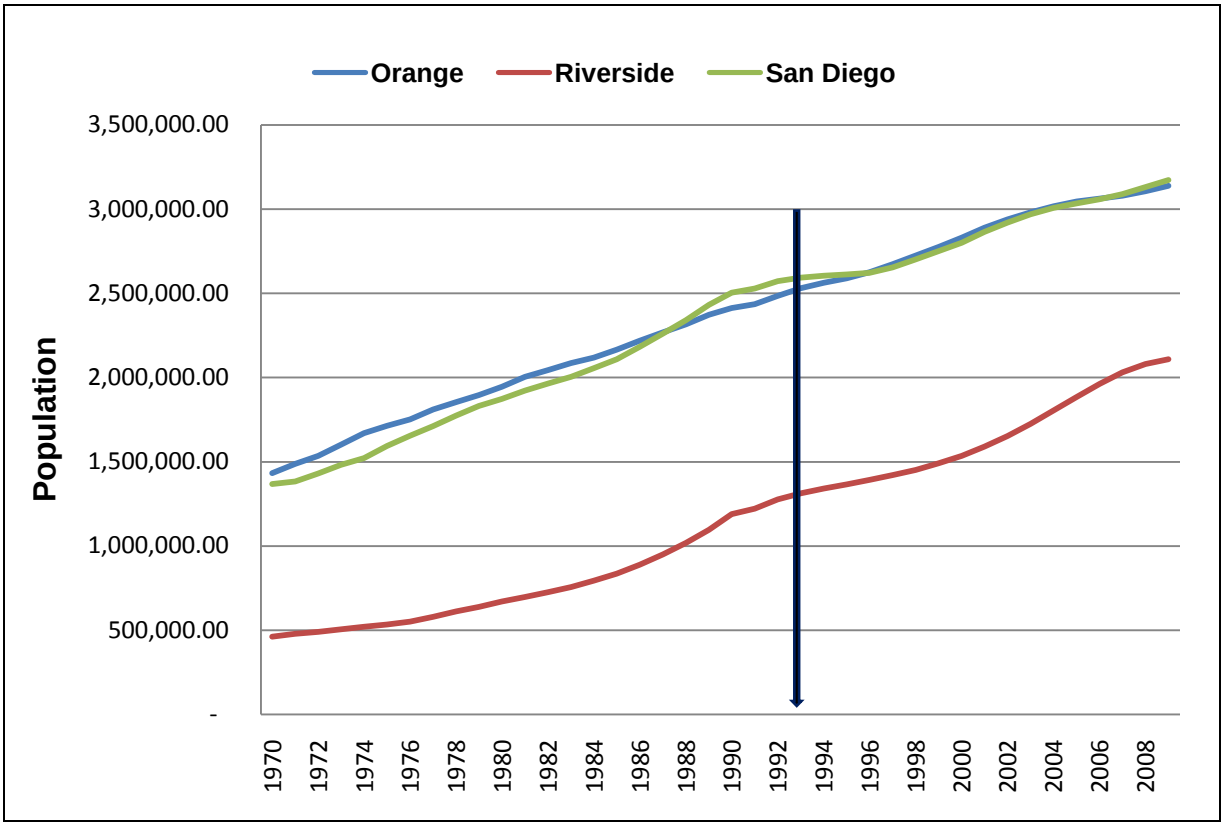


**Figure 2: Population of Orange, Riverside, and San Diego Counties between 1970 and 2009 as estimated by the State of California Department of Finance (*http://www.dof.ca.gov/research/demographic/reports/*). The vertical (black) arrow shows the 1993 date of listing of the coastal California gnatcatcher.**

**Table 1: Number of new houses built between 2000 and 2008 in the three counties that support the greatest number of coastal California gnatcatchers in the United States. (California Department of Finance data *http://www.dof.ca.gov/research/demographic/reports/estimates/e-5_2001-06/*)**

| County | 2000 | 2008 | Difference | Percent change |
|---|---|---|---|---|
| Orange | 969,484 | 1,030,289 | 60,805 | 6.27 |
| Riverside | 584,674 | 773,331 | 188,657 | 32.27 |
| San Diego | 1,040,149 | 1,138,857 | 98,708 | 9.49 |
| **Total** | 2,594,307 | 2,942,477 | 348,170 | 13.42 |

Regardless of the potential magnitude of the threat, the effects of agricultural and especially urban development resulting from population growth in the region have been tempered in recent years by implementation of regulatory mechanisms, especially the State's NCCP process and the Federal HCP process (described in detail in Factor D, below). Most of the range of the gnatcatcher within these three counties is covered by large-scale, multi-species, regional NCCP/HCPs. Five regional plans that cover the gnatcatcher are now in place, and three more are in development. Although these NCCP/HCP plans allow for incidental take of the gnatcatcher through destruction and curtailment of habitat, these plans also regulate and mitigate such actions. The methodologies employed by these plans to protect gnatcatcher habitat have been tailored to meet the needs of each permittee and thus vary from plan to plan. In general, they regulate the destruction of gnatcatcher habitat (e.g., through clearing and grubbing ordinances) and direct impacts toward certain areas and away from others, thereby providing for the establishment of habitat preserves consisting of large "core" areas of gnatcatcher habitat and connecting "linkage" areas. Thus, the implementation of these plans typically addresses not only urban development, but agricultural development too. Moreover, higher-valued habitat areas are preserved in a rough-step fashion as other lesser-valued areas are developed. Though these plans take many years to implement (permits range from 50 to 75 years), once fully implemented, the five currently finalized plans are anticipated to preserve in perpetuity over 74,048 hectares (182,976 acres) of gnatcatcher habitat (Table 2). Large Federal landholdings that support gnatcatcher habitat also contribute to core and linkage areas. Although the degree to which these Federal lands are managed to benefit gnatcatcher habitat varies, they are largely immune from the threat of agricultural and urban development. These lands include Marine Corps Base Camp Pendleton, Marine Corps Air Station Miramar, Cleveland National Forest, and San Diego National Wildlife Refuge. Therefore, in the United States, the threat of habitat destruction, modification, and curtailment continues, but the magnitude of this threat has been reduced since listing because of implementation of regulatory mechanisms, particularly the NCCP/HCP process.

In Mexico, urban and agricultural development continues as a threat to gnatcatcher habitat in certain areas. For example, much of the coastline north of Ensenada has been developed, and agricultural and tourism development along the San Quintin coastal plain has affected a large portion of the coastal scrub habitat there (Minnich and Franco-Vizcaíno 2005, p. 383). Our interpretation of a vegetation and land-use map of northwestern Baja California (CBI 2004, p. 9) indicates much of the area of gnatcatcher habitat ("coastal sage scrub" and "maritime succulent scrub") has been converted to urban and agricultural areas, especially around the greater Tijuana area and the immediate coast. Land use is not as heavily regulated in Mexico as it is in the United States. Privately owned land in northwestern Baja California is often managed in ways that are not consistent with preservation of natural resources (CBI 2004, p. 31), but conservation

efforts in the region along the United States–Mexico border (CBI 2004, pp. 1–43) may reduce the threat of agricultural and urban destruction of gnatcatcher habitat in Mexico.

**Table 2: Area of coastal California gnatcatcher habitat anticipated to be conserved by full implementation of the five approved regional NCCP/HCP plans in the U.S. range of the gnatcatcher. Acreage values, including estimated or modeled values, are as evaluated in plan documents. See Factor D for additional information on the NCCP/HCP process.**

| Regional NCCP/HCP | Habitat area at plan start | | Habitat area to be preserved by plan | | Percent |
|---|---|---|---|---|---|
| | hectares | (acres) | hectares | (acres) | |
| Orange Co. Central–Coastal | 13,918 | (34,392) | 7,290 | (18,015) | 52 |
| Orange Co. Southern* | 8,384 | (20,716) | 5,842 | (14,437) | 70 |
| San Diego Co. MHCP | 3,703 | (9,152) | 2,258 | (5,580) | 61 |
| San Diego Co. MSCP South | 45,223 | (111,748) | 29,848 | (73,756) | 66 |
| Western Riverside Co. MSHCP | 54,148 | (133,801) | 28,809 | (71,188) | 53 |
| **Total** | 125,376 | (309,809) | 74,048 | (182,976) | 59 |

* Approved as an HCP, but not approved by the State as an NCCP at the time of this review.

Wildland Fire

Fire in coastal scrub, regardless of ignition source, burns all or most of the above-ground portions of the plants, thereby reducing the habitat value of the area to the gnatcatcher. In the absence of other influences, we would expect this loss of habitat to be temporary. This conclusion is based on the ability of coastal scrub plants to sprout from their crown, germinate from (unburned) seeds buried in the soil, or both (Malanson and O'Leary 1982, pp. 355–358). Thus, in broad terms, coastal scrub (i.e., gnatcatcher habitat) recovers from fire and, over time, returns as suitable habitat for the gnatcatcher. However, frequent fire can exacerbate habitat type conversion, generally consisting of the conversion of coastal scrub to grassland dominated by nonnative grasses and forbs. Type conversion is discussed in a separate section under this factor (see below). Although wildland fire can result in the direct death or injury of individual gnatcatchers, this section focuses on the direct effects of fire on coastal scrub.

Areas denuded by fire do not support gnatcatchers (Beyers and Peña 1995, p. 153). As plants return to areas that have burned, gnatcatchers initially return to use these areas as foraging habitat (with adjacent unburned areas providing nesting habitat) (Wirtz et al. 1997, p. 95). Burned areas with rapid plant re-growth may be suitable as both nesting and foraging habitat for the gnatcatcher within 3 years, but areas with slower re-growth take longer (e.g., 5 to 10 years) (Wirtz et al. 1997, pp. 95–96). As such, wildland fire serves as a temporary threat to gnatcatcher habitat. To determine the magnitude of this threat, we examine the spatial and temporal scales of wildland fires.

To assess the spatial scale, we developed a simple GIS model of gnatcatcher habitat that burned from 2003 to 2007 (inclusive) (Figure 3). The modeled gnatcatcher habitat consisted of "sage scrub" vegetation within the U.S. portion of the range of the gnatcatcher (see Figure 1). Over the 5-year span, 95,193 hectares (235,226 acres) of the 258,751 hectares (639,387 acres) (37 percent) of modeled gnatcatcher habitat were within mapped burn perimeters and had likely

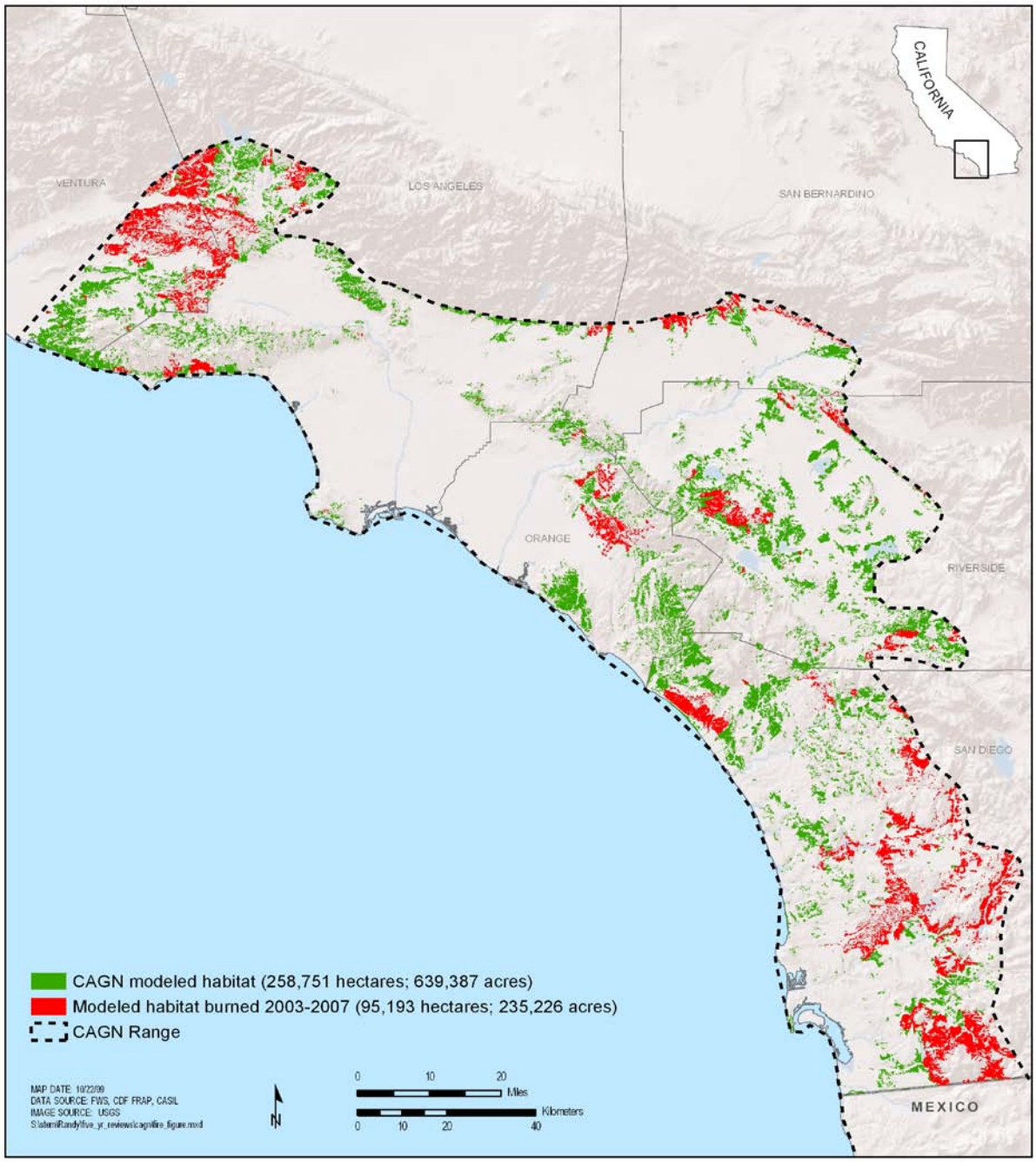


**Figure 3: An estimate of burned (red) and unburned (green) modeled coastal California gnatcatcher habitat within the U.S. range of the gnatcatcher. Over one-third of the modeled habitat "burned" in the interval spanning 2003 to 2007. We assumed that areas within mapped wildland fire perimeters that occurred between 2003 and 2007 (inclusive) burned, but it is likely that some habitat areas within fire perimeters did not burn. However, additional areas have burned since 2007 (GIS data for more recent fires were not available at the time of this review).**

burned (Figure 3). Moreover, gnatcatcher densities depend on the quality of the habitat (Winchell and Doherty 2008, p. 1325). In San Diego County where habitat quality has been mapped by different habitat-quality classes (TAIC 2002), about 90 percent of the overall number of gnatcatchers occur in the two highest habitat-quality classes (C. Winchell, USFWS, unpubl. data 2009), and of those two highest habitat-quality classes, nearly half burned between 2003 and 2007 (C. Winchell, unpubl. data, 2009). Additional wildland fires have occurred in gnatcatcher habitat in southern California since 2007 (not mapped in Figure 3). Although interpretations of historical and current wildland fire patterns in Mexico and the United States differ (e.g., Keeley and Fotheringham 2001, pp. 1536–1548; Minnich 2001, pp. 1549–1553), rates of ignition likely increased as the urban–wildland interface increased in both countries. Moreover, in Baja California, deliberate burning is still practiced by vaqueros and farmers (Minnich and Franco-Vizcaíno 2005, p. 370). In all, the magnitude of the threat of wildland fire on a spatial scale depends on the amount of habitat that was burned in the previous 3 to 5 years.

To assess the temporal scale, we reviewed the scientific literature on fire frequency in coastal scrub plant community. Wildland fire has long been a component of the coastal scrub, to the point that it is often characterized as being "fire adapted" (Keeley 2005, p. 97), but fire frequencies have increased dramatically in recent times as human population levels have increased in the region (Figure 4) (Keeley et al. 1999, p. 1829; Keeley and Fotheringham 2001, p. 1543). This increased fire frequency is especially true in wildland areas adjacent to urban development, resulting from an associated increase in fire ignition sources (Syphard et al. 2007, p. 1388). Additionally, military training on Marine Corps Base Camp Pendleton has led to an increase in fire frequency within that portion of the range of the gnatcatcher (USMC 2007, pp. 3–9, 4-76–4-84).

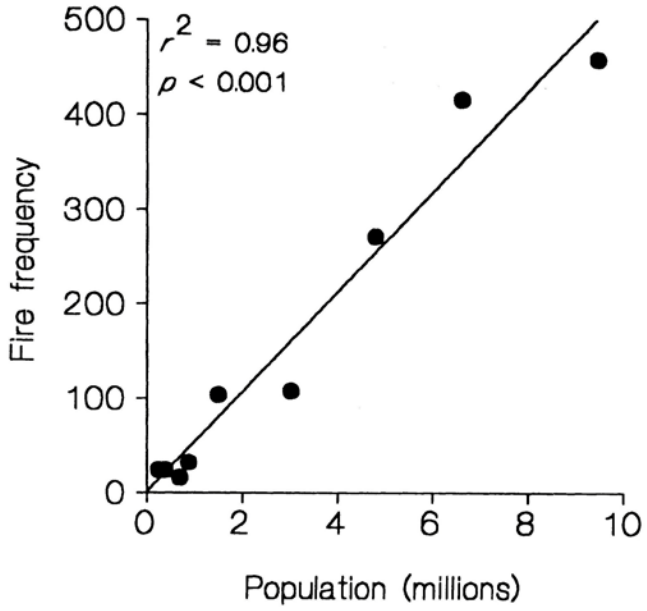


**Figure 4: Fire frequency each decade since 1910 versus human population density at the beginning of each decade for Riverside and Los Angeles Counties in southern California. (Reproduced from Keeley and Fotheringham 2001, p. 1543, as published by Blackwell Science, Inc., in association with the Society for Conservation Biology).**

In summary, the threat of wildland fire depends on how much gnatcatcher habitat has burned. Data indicate that more than one-third of the habitat within the U.S. portion of the range of the gnatcatcher has burned since 2003 and the overall fire frequency has been increasing over time. Therefore, the magnitude of the threat from wildland fire is high and we anticipate it to stay high

for the foreseeable future. Moreover, high fire frequencies contribute to habitat type conversion (see below).

Grazing

As noted above, grazing was identified as a threat to gnatcatcher habitat in the 1993 listing rule. Grazing animals, such as cattle, sheep, and goats, eat and trample coastal scrub plants, destroying and modifying gnatcatcher habitat. Areas of native sage scrub vegetation that have been disturbed by livestock appear to be more susceptible to invasion by nonnative plants and, thus, habitat type conversion (see below). Historically, grazing was prevalent in many areas of coastal scrub habitat within the range of the gnatcatcher (Westman 1987, p. 138; Minnich and Dezzani 1998, p. 384).

In the United States, the amount of grazing in coastal sage scrub since listing has declined as urbanization has spread. For example, grazing is a "covered activity" under the Orange County Central-Coastal plan, but despite this, it is not now practiced. Another example is Rancho Mission Viejo in southern Orange County. The Rancho used to have several thousand head of cattle but now only has about 500 head of cattle grazing on a large amount of land (about 7,730 hectares (19,100 acres)) (USFWS 2007b, p. 30). Additionally, several local jurisdictions regulate grazing and several NCCP/HCPs address grazing by limiting its practice and mitigating its effects through habitat management. As part of the Chula Vista Subarea Plan under the southern San Diego County MSCP, the City of Chula Vista enacted a local ordinance that includes restrictions on the location and timing of grazing. Thus, the magnitude of grazing as a threat in the United States is small. In Mexico, where seasonal movement of livestock still occurs (referred to as transhumance grazing in Minnich and Franco-Vizcaíno 2005, p. 379), we are not aware of any restrictions on grazing activities. The magnitude of this threat in Mexico is not clear, but because livestock are seasonally moved, it does not severely impact gnatcatcher habitat. In sum, grazing and associated trampling by livestock continues, but since listing, the magnitude of this threat has decreased to minimal levels in the United States. The magnitude of this threat in Mexico, though larger than in the United States, is likely low. However, grazing is thought to contribute to habitat type conversion (see below).

Habitat Type Conversion

As mentioned above, the 1993 listing rule did not identify "habitat type conversion" *per se* as a threat to gnatcatcher habitat. However, the rule did list under Factors A and E some of the processes (stressors) that contribute to coastal scrub type conversion and degradation. The 2003 proposed rule to designate critical habitat explicitly identified type conversion as a threat for the potential U.S. DPS under Factor E. It noted the habitat areas in the inland portions of the range of the gnatcatcher in particular were suffering from type conversion (USFWS 2003, 68 *FR* 20233). Additionally, we identified type conversion as a threat to gnatcatcher habitat as part of our 2007 designation of critical habitat (USFWS 2007a, 72 *FR* 72035).
Because the processes that drive type conversion occur over various temporal and spatial scales, habitat types are not necessarily converted evenly or discretely over the landscape. Habitats that have not completely converted are considered "degraded"; type conversion may be considered the extreme end of the habitat degradation process.

California gnatcatcher habitat is typified by coastal scrub vegetation and many authors have noted that type conversion or degradation has been occurring in coastal scrub for many years (e.g., Zedler et al. 1983, p. 809; Westman 1987, p. 138; Freudenberger et al. 1987, p. 25; Giessow and Zedler 1996, p. 3; Minnich and Dezzani 1998, p. 375; Stylinski and Allen 1999, p. 550; Allen et al. 2000, p. 254; Keeley et al. 2005a, p. 2109; Talluto and Suding 2008, p. 811). These authors identified native coastal scrub converting to plant communities dominated by nonnative species, in particular, annual grasses. While other processes may subsequently influence the conversion to a nonnative community, the presence of nonnative plants (or their seeds) is the fundamental precursor condition to the type conversion in gnatcatcher habitat.

Invasive, nonnative plants—especially annual grasses—have far-reaching impacts on native species (see D'Antonio and Vitousek 1992, pp. 63–87). Within the range of the gnatcatcher, the introduction of many nonnative plant species is linked to historical grazing activities (Minnich and Dezzani 1998, p. 380). Now, nonnative plant species are widely established in coastal scrub in southern California (Freudenberger et al. 1987, p. 23; Minnich and Dezzani 1998, p. 380; Talluto and Suding 2008, p. 811) and northwestern Baja California (Minnich and Franco-Vizcaíno 2005, p. 372). However, the presence of invasive, nonnative plant species does not necessarily, by itself, cause coastal scrub to type covert. Often, other stressors give the invading species a competitive advantage over the established natives. For example, severe physical disturbance (e.g., clearing by heavy machinery) has allowed areas formerly covered with coastal scrub species to become dominated by nonnative species (Stylinski and Allen 1999, p. 544). Also, livestock activity (grazing, trampling, transporting seeds), much of which occurred historically, has contributed to the invasion of coastal scrub areas by nonnative plants in the United States and Mexico (Minnich and Dezzani 1998, p. 384; Minnich and Franco-Vizcaíno 2005, p. 380).

Also, wildland fire—and how often it occurs at a given site (fire frequency)—is a major stressor acting on coastal scrub (Minnich and Dezzani 1998, p. 382; Keeley 2001, p. 83; Keeley 2005, p. 97; Keeley et al. 2005a, p. 2122). Nonnative plant species typically are short-lived annuals that produce seeds and die. Upon dying, individual plants cure (dry) and often persist as a layer of fine, dry fuel that readily ignites and carries fire. In contrast, native forbs when cured do not provide much fuel for fire (Minnich and Franco-Vizcaíno 2005, p. 381). Areas with dead nonnative grasses are more likely to burn than areas of re-growing native sage scrub without nonnative annuals (Cione et al. 2002, p. 382). Additionally, the presence of dead, nonnative annual plants can also extend the fire season by allowing fires to burn earlier (Keeley et al. 2005a, p. 2123). This results in a positive feedback loop allowing the time between fires at a given site to decrease (i.e., an increased fire frequency) (Zedler et al. 1983, pp. 809–818; Keeley et al. 2005a, p. 2123). Anthropogenic ignition sources have also been increasing, further contributing to an increased fire (see "Wildland Fire" section, above). Moreover, year to year variation in weather can further influence fire patterns within coastal scrub (Keeley 2004, p. 173), which may be further exacerbated by global climate change (Karl et al. 2009, p. 131). After a fire, coastal scrub plants re-grow by crown-sprouting and from seeds (Malanson and O'Leary 1982, p. 355), but nonnative annual grasses can out-compete native coastal scrub seedlings (Eliason and Allen 1997, p. 253). Past a certain fire frequency, the level of resiliency of the native coastal scrub plants is exceeded and nonnative plants dominate the system

(Westman and O'Leary 1986, pp. 179–189; O'Leary and Westman 1988, p. 775; Keeley 2005, p. 97; Keeley et al. 2005a, p. 2122, Keeley et al. 2005b, p. 1505). For coastal scrub, this threshold frequency may be as short as 3 to 5 years near the coast but is likely longer at inland habitat areas (Keeley 2005, p. 97, Keeley et al. 2005b, p. 1505)—that is, it takes short intervals between fires (more frequent fires) to convert coastal sites, but inland coastal scrub sites may type convert even with longer intervals between fires (less frequent fires).

Stressors can also contribute to the degradation of coastal scrub even without obvious external perturbations. Anthropogenic atmospheric pollutants can directly harm coastal scrub plants or place them at a competitive disadvantage compared to nonnative plants. For example, the input of nitrogen-based compounds (nitrification) increases the mortality rate of coastal scrub plants (Allen et al. 1998, p. 138) and causes shifts in mycorrhizal communities that favor nonnative plant species (Egerton-Warburton and Allen 2000, p. 484). Also, atmospheric sulfur dioxide and ozone were implicated in a significant reduction of foliage and root growth in coastal scrub (Westman 1985, p. 39). In contrast, *Bromus madritensis* subsp. *rubens*, a nonnative annual grass, has inherited a tolerance to sulfur dioxide and ozone in southern California (Preston 1993, p. 141). Through these mechanisms, atmospheric pollutants may also promote nonnative plant growth after wildland fire, further compounding the deleterious effects of fire on coastal scrub plants (O'Leary and Westman 1988, p. 784). Moreover, atmospheric pollutants affect coastal scrub habitat areas over large portions of the range of the gnatcatcher within the United States, especially inland areas (Allen et al. 1998, p. 131–139), and likely also affect habitat areas near the urbanized portions of Baja California. In all, the presence of invasive, nonnative plants, in combination with one or more stressors, causes the ecological balance to shift away from native plants towards nonnative plants, resulting in degradation and, ultimately, type conversion of gnatcatcher habitat. Depending on the stressors, such degradation occurs over various temporal and spatial scales. In particular, the nonnative annual plant–wildland fire feedback loop can cause large areas of habitat to type convert over a short period of time. Atmospheric pollutants affect even larger areas, but over longer periods of time. Therefore, the threat represented by the habitat degradation and type conversion continuum is ongoing and is of high magnitude.

We anticipate management benefitting gnatcatcher habitat in most NCCP/HCP preserve areas will help to offset the effects of type conversion (USFWS 1996, p. 45; USFWS 1997, p. 69; USFWS 1998, pp. 26 and 56; USFWS 2003, p. 101; USFWS 2004a, p. 204; USFWS 2004b, pp. 204 and 206; USFWS 2007b, p. 86). As such, we anticipate this threat will be reduced through time as preserves associated with NCCP/HCPs are established and management is implemented. As of this 5-year review, only a few NCCP/HCPs have significant portions of their preserves established, and fewer have yet to fully implement their habitat management programs. Moreover, other portions of the range of the gnatcatcher in the United States are still developing NCCP/HCP plans. Therefore, additional time is needed to see how effective these NCCP/HCPs will be on reducing the magnitude of this threat within these areas. Additionally, portions of the range of the gnatcatcher are not likely to be managed within the foreseeable future, including large portions of Los Angeles County (not including the Palos Verdes Peninsula), Ventura County, San Bernardino County, and most if not all of the range in Baja California.

**Summary of Factor A**

Urban and agricultural development has destroyed and modified the habitat of the gnatcatcher, coastal scrub. While conversion of land to agriculture has largely stopped, urban development continues throughout the range of the gnatcatcher. However, the implementation of NCCP/HCP plans in southern California has directed that growth into certain areas, while establishing other areas as habitat preserves, thereby reducing the magnitude of this threat since listing in the United States. In Mexico, where fewer regulatory mechanisms exist, urban and agricultural development likely continues as high magnitude threats in many areas. The threats associated with livestock grazing have diminished in the United States because grazing activities have declined in the face of increased urbanization and increased regulation of grazing. Grazing in Mexico continues, but it is not likely a threat of high magnitude there. Additionally, wildland fire destroys the coastal scrub plants that the gnatcatcher uses for foraging, breeding, and sheltering. Absent other perturbations, coastal scrub vegetation re-grows in approximately 3 to 5 years; as such, wildland fire is an infrequent impact. However, the number of fires has increased dramatically as urbanization has extended farther into wildland areas, resulting in a decrease in the amount of habitat available to the gnatcatcher. As such, the magnitude of the threat posed by wildland fire is high and increasing. Moreover, wildland fire, and how often it reoccurs in an area, is a major contributor to habitat type conversion, another major threat to gnatcatcher habitat. Wildland fire, along with several other stressors, promotes the growth of nonnative plant species allowing them to out-compete native plant species. This results in the modification and, ultimately, the destruction of coastal scrub habitat. Dead, nonnative annual plants persist as a flammable layer, further fueling the wildland fire–type conversion feedback loop. Habitat type conversion can affect all areas of habitat, even those areas otherwise considered preserved. Because of the continued presence of one or more stressors, particularly the increasing occurrence of wildland fire, habitat type conversion is a threat of high magnitude. However, the NCCP/HCP process generally includes measures for managing coastal scrub habitat. Therefore, we anticipate the magnitude of this threat will eventually be reduced over most of the U.S. range of the gnatcatcher as management actions are enacted through the implementation of individual NCCP/HCP plans.

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

Overutilization for any purpose was not known to be a factor in the 1993 final listing rule (USFWS 1993a, 58 *FR* 16751) or for the potential U.S. DPS analyzed in the 2003 proposed rule to designate critical habitat (USFWS 2003, 68 *FR* 20232). Overutilization for any purpose does not appear to be a threat at this time, nor is it anticipated within the foreseeable future.

**FACTOR C: Disease or Predation**

Disease was not identified as a threat to the gnatcatcher at the time of listing in 1993; however, the 2003 analysis for the potential U.S. DPS acknowledged a possible threat from West Nile virus and Newcastle disease. Predation was identified as a threat in both 1993 and 2003, but neither document clearly described the magnitude of this threat. Below, we examine how

disease and predation impact the gnatcatcher and the current and anticipated status of these threats.

Disease

Wildlife diseases have the potential to affect host populations. No specific diseases have been identified as a threat to the gnatcatcher; however, West Nile virus, a novel disease to North America, has had variable impacts on bird species with substantial impacts to certain species (McLean 2006, pp. 44–64; LaDeau et al. 2007, pp. 710–714). West Nile virus was first detected in New York in 1999 (Steele et al. 2000, p. 208) and quickly spread throughout North America (Peterson et al. 2003, pp. 27–37). In 2003, West Nile virus invaded southern California, successfully overwintered, and amplified to epidemic levels (Hays et al. 2005, p. 1167; Reisen et al. 2006, p. 344). West Nile virus is a mosquito-borne disease that causes high rates of mortality in certain bird species and not in others (McLean 2006, p. 52). Given the overlap of range of the disease and the gnatcatcher, we expect the gnatcatcher likely has been exposed to the West Nile virus. We do not know how virulent the disease is to the gnatcatcher, but we have no evidence suggesting that gnatcatcher populations have been substantially affected by the disease. Therefore, we do not consider disease a significant threat at this time.

Additionally, exotic Newcastle disease was identified as a potential threat to the potential U.S. DPS in 2003. According to the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), exotic Newcastle disease is a contagious and fatal viral disease affecting the respiratory, nervous, and digestive systems of birds, including poultry (APHIS 2003a, 68 *FR* 1516). At the time of the DPS analysis in 2003, APHIS had quarantined much of southern California because Newcastle disease had been detected in poultry stocks (APHIS 2002, 67 *FR* 70674; APHIS 2003a, 68 *FR* 1515). By August 2003, the quarantine had been lifted from southern California (APHIS 2003b, 68 *FR* 54797). We have no evidence suggesting that gnatcatcher populations have been substantially affected by the outbreak of exotic Newcastle disease. We do not consider exotic Newcastle disease a threat to the species at this time.

Predation

Adult gnatcatchers undoubtedly fall prey to certain predators, but depredation of adult gnatcatchers has not been identified as a threat affecting the species' status and we do not consider the magnitude of this threat to be significant. However, both the 1993 listing rule and the 2003 proposed rule analyzing the potential U.S. DPS included nest predation as a potential threat, but neither identified the magnitude of the threat. Nest predation occurs when eggs or nestlings are consumed or otherwise killed (e.g., knocked from the nest) by a predator or potential predator.

It is difficult to directly link nest predation rates to the status of a species because other natural and anthropogenic events and processes also affect the species at the same time. In a given year, a gnatcatcher pair may lose the contents of one or more nests to predation, yet that pair may still be successful at raising a brood. Gnatcatcher pairs often renest after nest predation events, so nest predation rates would need to be high enough to prevent the growth of gnatcatcher populations to pose a threat to the species. Using a variety of methodologies, researchers have

found the nest predation rates for the coastal California gnatcatcher to range from 26.1 to 68.1 percent (Table 3). The gnatcatcher is an open-nesting passerine. Martin and Clobert (1996, p. 1039) found the average nest predation rate for a wide range of North American open-nesting passerines from a number of nesting habitats to be about 41 percent. The differing methodologies used in the gnatcatcher studies presented in Table 3 prevent combining data to get an overall rate, but a visual comparison of the rates in Table 3 suggests the predation rate for gnatcatchers is higher than for typical open-nesting passerines.

A number of species of reptiles, birds, and mammals are considered potential gnatcatcher nest predators (Atwood 1990, pp. 18–19; Bontrager 1991, p. 16; Braden and Powell 1994, p. 17; Galvin 1998, p. 326). In particular, snakes and western scrub-jays (*Aphelocoma californica*) have been singled out as known or likely nest predators of gnatcatchers and other shrub-nesting birds in coastal sage scrub vegetation communities (Braden 1992, p. 7; Bontrager et al. 1995, p. 25; Grishaver et al. 1998, p. 310; Braden 1999, p. 991; Patten and Bolger 2003, p. 484; Preston and Rotenberry 2006, p. 833). Additionally, Argentine ants (*Linepithema humilis*) are known to have infested gnatcatcher nests, resulting in death of the nestlings (Sockman 1997, p. 327; Atwood and Bontrager 2001, p. 13). This nonnative ant species was not identified in the 1993 listing rule or the 2003 potential DPS analysis as a nest predator. Overall, Braden (1999, p. 991) noted that nest predators were abundant and varied in his study site, prompting him to conclude that gnatcatchers nest in a "predator-rich" environment. This means that any anti-predator defenses gnatcatchers may employ against one type of nest predator are likely thwarted by a different type of predator using a different hunting strategy.

**Table 3: Percentage of coastal California gnatcatcher nests from which eggs or nestling were depredated (predation rate), number of nests monitored, county in which population was monitored, and citation.**

| Predation Rate (%) | Number of Nests | County | Citation |
|---|---|---|---|
| 59.4 | 64 | San Diego | Mock and Bolger 1992, p. A-26 |
| 39.4 and 58.2 | 40 and 111 | Riverside | Braden and Powell 1994, p. 31 |
| about 50 | 154 | Orange | Bontrager et al. 1995, p. 24 |
| 54.2 | 168 | Riverside | Braden et al. 1997, p. 861 |
| 68.1 | 107 | San Diego | Sockman 1997, p. 328 |
| 26.1 | 46 | Orange | Galvin 1998, p. 326 |
| 43.3 | 134 | San Diego | Grishaver et al. 1998, p. 316 |
| 47.3 | 91 | Orange | Miner et al. 1998, p. 441 |
| 52.9 | 384 | Riverside | Braden 1999, p. 987 |

The brown-headed cowbird (*Molothrus ater*) may also contribute to gnatcatcher nest failure. Rather than destroying the host's nest or its contents, cowbirds, as part of the species' brood parasitism reproduction strategy, often remove a host's egg shortly before or after laying one of its own (Friedmann 1963, p. 20). Gnatcatchers are almost three times as likely to abandon parasitized nests, compared to non-parasitized nests (Braden et al. 1997, p. 861); however, parasitized nests are not any more likely to be depredated than non-parasitized nests (Braden et al. 1997, p. 861). We do not consider the nest-predation aspects of cowbird activities to be a

threat of significant magnitude; however, we discuss the effects of brood parasitism on the gnatcatcher under Factor E.

The nest predation rate for gnatcatchers appears higher than expected for most open-nesting passerines; therefore, this threat has a high immediacy. However, the gnatcatcher is known for its ability to repeatedly renest, suggesting the species' life-history trait may have evolved to counteract higher nest predation rates. Therefore, the evidence suggests the magnitude of nest predation as a threat to the gnatcatcher is low.

**Summary of Factor C**

Two diseases have been identified as potential threats to the gnatcatcher, West Nile virus and Newcastle disease. Because of the geographic overlap of known West Nile virus cases and the range of the gnatcatcher, the gnatcatcher has likely been exposed to West Nile virus. However, we have no evidence that this disease has caused any decline in gnatcatcher populations. Additionally, Newcastle disease does not appear to have affected gnatcatchers. Therefore, disease does not appear to be a significant threat at this time.

Predation undoubtedly occurs among all ages of gnatcatchers, but only nest predation has been previously identified as a threat. Nest predation rates for the gnatcatcher are higher than most open-nesting passerines. This may be because the gnatcatcher lives in a predator-rich environment. The life history strategy of the gnatcatcher allows it to repeatedly renest, allowing the bird to compensate for higher losses. Therefore, nest predation does not appear to be a significant threat.

**FACTOR D: Inadequacy of Existing Regulatory Mechanisms**

The 1993 final listing rule noted that no regulatory mechanisms were in effect that adequately protected the gnatcatcher or its habitat throughout the species' range (USFWS 1993a, p. 16752). However, we did acknowledge that the State's NCCP Act (see below), then in its early stages of implementation, showed considerable promise (USFWS 1993a, p. 16755). Additionally, in December 1993, we further acknowledged the "significant conservation planning efforts" undertaken by the State and several local jurisdictions pursuant to the State's NCCP Act (USFWS 1993c, 58 *FR* 65088).

**State Protections**

The gnatcatcher is not listed under the California Endangered Species Act.

<u>California Environmental Quality Act (CEQA)</u>

The California Environmental Quality Act (CEQA) (chapter 2, section 21050 et seq. of the California Public Resources Code) requires State and local government agencies to consider and disclose environmental impacts of projects and to avoid or mitigate them where possible. Under CEQA, public agencies must prepare environmental documents to disclose environmental impacts of a project and to identify conservation measures and project alternatives. However,

CEQA itself does not guarantee that conservation measures will be implemented; the lead agency may either require mitigation through changes to a project, or determine that overriding considerations make mitigation infeasible (CEQA Sec. 21002). Therefore, protection of specific species depends on the determination of the lead agency involved. Prior to listing of the gnatcatcher under the Act, we reported that CEQA did not adequately address potential impacts to the coastal California gnatcatcher and its habitat, if such impacts were considered at all (USFWS 1993a, p. 16753). Therefore, CEQA is not an adequate regulatory mechanism to conserve the species.

Natural Community Conservation Planning (NCCP) Act

The Natural Community Conservation Planning (NCCP) program is a cooperative effort between the State of California and numerous private and public partners with the goal of protecting habitats and species. The NCCP identifies and provides for the regional or area-wide protection for plants, animals, and their habitats, while allowing compatible and appropriate economic activity. The program began in 1991, and as noted above, the State's Natural Community Conservation Planning (NCCP) Act, as amended (California Fish and Game Code, sections 2800–2835), was in the early stages of implementation when the gnatcatcher was listed. The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land uses (http://www.dfg.ca.gov/nccp/). Regional NCCPs provide protection to federally listed species by conserving native habitats upon which the species depends.

The NCCP program has been implemented in tandem with the Federal Habitat Conservation Planning (HCP) program and associated incidental take permit under section 10(a)(1)(B) of the Act. Implementation of these two laws is a collaborative process between the California Department of Fish and Game (CDFG), the Service, and the permittees (local jurisdictions and agencies), resulting in NCCP/HCP plans. Implementation of these plans has made substantial contributions towards the conservation of the gnatcatcher. Because these two laws have been implemented jointly and because they have made significant contributions to the conservation of the U.S. population of the gnatcatcher, we address these two laws together in detail.

The NCCP Act addresses certain habitat areas or "regions." The first NCCP region is important to this discussion because it focused on the coastal sage scrub plant community (Figure 5). Implementation of the NCCP/HCP process resulted in the development of NCCP/HCP plans that addressed impacts to numerous species including the gnatcatcher and it habitat throughout much of its U.S. range (Table 4). Regional NCCP/HCP plans include funding mechanisms to provide for habitat acquisition, species monitoring, and adaptive management. In contrast to the voluntary actions outlined in recovery plans, NCCP/HCP plans, which are prepared in collaboration with the permittees, include mandatory permit requirements. As such, the NCCP/HCP plans and associated permits provide greater assurances that measures specifically contributing to the recovery of the gnatcatcher will be implemented.

Of the 11 Subregions identified in Figure 5, one—the area identified as "Camp Pendleton"—is actually an area with two, large military installations (see below). Neither is addressed explicitly by the NCCP/HCP process; instead, actions in this area that adversely affect listed species,

including the gnatcatcher, are addressed under section 7 of the Act, plus also the Sikes Act (see sections below). Of the remaining 10 Subregions, 5 have finalized Subregional Plans (although with differing levels of implementation), 3 are in development, and current indications suggest that 2 will not likely be pursued. Each NCCP/HCP plan is unique and has its own evaluation and implementation system, yet the end result will be a network of core and linkage preserved areas that will be managed in perpetuity to benefit the gnatcatcher and other species. Camp Pendleton and the eight active Subregions listed in Table 4 address the gnatcatcher as follows:

- *Camp Pendleton "Subregion"*—Marine Corps Base Camp Pendleton (Camp Pendleton) occupies over 50,588 hectares (125,000 acres) of land in the northwest corner of San Diego County, including the 809 hectares (2,000 acres) at San Onofre State Beach, the San Onofre Nuclear Generating Station, and other non-military "overlays." Naval Weapons Station Seal Beach, Detachment Fallbrook (Detachment Fallbrook) occupies approximately 3,582 hectares (8,852 acres) next to Camp Pendleton. Both installations have Integrated Natural Resource Management Plans (INRMPs) that provide benefits to the gnatcatcher (USFWS 2007a, 72 *FR* 72043). These areas make important contributions toward the overall core-and-linkage configuration of sage scrub habitat preserved under neighboring NCCP/HCPs.

- *Orange County, Central and Coastal Subregion NCCP/HCP*—The Central–Coastal NCCP/HCP covers about 84,178 hectares (208,000 acres) in eight local jurisdictions (Cities of Anaheim, Costa Mesa, Irvine, Laguna Beach, Newport Beach, Orange, San Juan Capistrano, plus unincorporated areas of Orange County) (USFWS 1996, p. 23). Approximately 7,291 hectares (18,015 acres) of the estimated 13,918 hectares (34,392 acres) of gnatcatcher habitat (not including the former Marine Corps Air Station El Torro, but including that National Audubon Society's Starr Ranch) is anticipated to be preserved in a core-and-linkage configuration and managed in perpetuity (USFWS 1996, p. 43). The plan's two Subarea reserves (Central and Coastal) are not directly connected, but the plan provides for linkages (USFWS 1996, p. 46). The plan's adaptive management program is intended to address adverse edge effects to the gnatcatcher and its coastal sage scrub habitat through its biological monitoring and habitat enhancement activities, which include pest/invasive species control efforts (USFWS 1996, p. 48).

- *Palos Verdes Peninsula NCCP/HCP*—This Subregional Plan is in development and is nearing completion.

- *Eastern San Diego County Multiple Species Conservation Program (MSCP East)*—This Subregional Plan is in development.

- *[Southern] San Diego Multiple Species Conservation Program (MSCP)*—This "umbrella" NCCP/HCP "Subregional Plan" covers about 235,535 hectares (582,000 acres) in 12 participating jurisdictions in southwestern San Diego County. Each jurisdiction, or "Subarea", prepares a "Subarea Plan" that implements the MSCP within that jurisdiction under a 50-year permit. Approximately 29,849 hectares (73,756 acres) of the estimated 45,224 hectares (111,748 acres) of gnatcatcher habitat is anticipated to be preserved in a core-and-linkage configuration and managed in perpetuity (USFWS 1997, pp. 66–67).


**Figure 5: Map depicting the "southern California coastal sage scrub region" as defined under the California Natural Community Conservation Planning Act, including 11 separate NCCP "Subregions" anticipated to address coastal California gnatcatcher conservation. (Source: CDFG 2008).**

**Table 4: Status of NCCP Subregional Planning Areas depicted in Figure 5.**

| Title in Figure 5 | Current Title | Plan Status (Reference) |
|---|---|---|
| Camp Pendleton Resource Management Plan | Integrated Natural Resource Management Plans for Marine Corps Base Camp Pendleton and Naval Weapons Station Seal Beach, Detachment Fallbrook [1] | Both finalized (USMC 2007, Navy 2006) |
| Coastal/Central Orange County NCCP | Orange County, Central and Coastal Subregion NCCP/HCP | Finalized (County of Orange 1996) |
| Northern Orange County Subregion | — | Not participating |
| Palos Verdes Peninsula NCCP | Palos Verdes Peninsula NCCP/HCP | In development |
| San Bernardino Valley-wide Multi-species Habitat Conservation Plan | — | Not participating |
| San Diego Multiple Habitat Conservation and Open Space Program (MHCOSP) | Eastern San Diego County Multiple Species Conservation Program (MSCP) | In development |
| San Diego Multiple Species Conservation Program (MSCP) | [Southern] San Diego Multiple Species Conservation Program (MSCP) | Plan finalized (County of San Diego 1998), implementation in progress including 5 finalized, 1 in development, and 6 not initiated/not anticipated (due to little need of take authorization) |
| San Diego Multiple Habitat Conservation Program (MHCP) | San Diego Multiple Habitat Conservation Program (MHCP) | Plan finalized (SANDAG 2003); partially implemented: 1 of 7 jurisdictions finalized |
| San Diego Northern MSCP Subarea | Northern San Diego County Multiple Species Conservation Program (MSCP) | In development |
| Southern Orange County NCCP | Southern Orange County NCCP/MSAA/HCP | Plan finalized, implementation in progress (County of Orange 2006; USFWS 2007b) |
| Western Riverside County Multiple Species Habitat Conservation Plan | Western Riverside County Multiple Species Habitat Conservation Plan | Plan finalized, 1 permit with 22 permittees; implementation in progress (County of Riverside 2003; USFWS 2004a) |

[1] Two major military facilities are within the area depicted in Figure 5 as Camp Pendleton: (1) Marine Corps Base Camp Pendleton; and (2) Naval Weapons Station Seal Beach, Detachment Fallbrook. None of these Federal installations have plans under the NCCP or section 10(a)(1)(B); instead, each has prepared an Integrated Natural Resource Management Plan per the Sikes Act. Additionally, the geographically smaller Marine Corps Air Station Mira Mar also falls within the area depicted, but it does not have any coastal California gnatcatcher habitat.

Five of the 12 jurisdictions are permitted and cover the gnatcatcher: City of Poway (July 19, 1996); City of San Diego (July 18, 1997); County of San Diego (March 17, 1998); City of La Mesa (January 31, 2000); and City of Chula Vista (January 12, 2005). Additionally, the Service and CDFG committed to manage, maintain, and monitor State Ecological Reserves and San Diego National Wildlife Refuge lands they contribute to the MSCP consistent with the MSCP. Also within this geographic region (not mapped in Figure 5) is the 9,314-hectare (23,015-acre) Marine Corps Airs Station Miramar, which has an approved INRMP that provides a benefit to the gnatcatcher (USFWS 2007a, 72 *FR* 72043).

- *San Diego Multiple Habitat Conservation Program (MHCP)*—This "umbrella" NCCP/HCP "Subregional Plan" covers about 45,326 hectares (112,000 acres) in seven participating jurisdictions (including Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista) in northwestern San Diego County. Each jurisdiction, or "Subarea," prepares a "Subarea Plan" that implements the MHCP within that jurisdiction under a 50-year permit. Approximately 2,258 hectares (5,580 acres) of the 3,704 hectares (9,152 acres) of sage scrub habitat within the MHCP area is anticipated to be preserved in a core-and-linkage configuration and managed in perpetuity (USFWS 2004b, pp. 197 and 206). The City of Carlsbad, permitted on November 12, 2004, is the only jurisdiction with an approved Subarea Plan at this time; therefore, this plan is in the early stages of implementation.

- *Northern San Diego County Multiple Species Conservation Program (MSCP North)*—This Subregional Plan is in development.

- *Southern Orange County NCCP/MSAA/HCP (Southern Subregion HCP)*—The Southern Subregion Plan (approved as an HCP but not yet as an NCCP) covers about 34,835 hectares (86,076 acres) within areas owned or operated by three participating entities (County of Orange, Rancho Mission Viejo, and the Santa Margarita Water District). About 5,843 hectares (14,437 acres) of the 8,384 hectares (20,716 acres) of sage scrub are anticipated to be preserved in a core-and-linkage configuration and managed in perpetuity (USFWS 2007b, p. 93). The Southern Subregion HCP includes provisions to avoid and minimize impacts to sage scrub habitat through implementation of a grazing plan and habitat in the preserve areas will be monitored and managed per a management plan. This 50-year plan was permitted in 2006 and therefore this plan is in the early stages of implementation.
- *Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP)*—The MSHCP covers about 509,900 hectares (1.26 million acres) overseen by 22 permittees in western Riverside County. About 28,810 hectares (71,188 acres) of the 54,149 hectares (133,801 acres) of gnatcatcher habitat (as modeled in our analysis of the plan) is anticipated to be preserved in a core-and-linkage configuration and managed in perpetuity (USFWS 2004a, pp. 198 and 204). This 75-year plan was permitted in 2004 and therefore this plan is in the early stages of implementation.

Thus, the State's NCCP Act is an important regulatory mechanism that has promoted region-wide planning and has made substantial contributions toward conservation of the gnatcatcher in the United States.

**Federal Protections**

The Federal Endangered Species Act

The Endangered Species Act of 1973, as amended (Act), is the primary Federal law that provides protection to the gnatcatcher since its listing as a threatened species in 1993. In addition to section 10(a)(1)(B) permits and associated HCPs described above, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed species. Since 1993, the Service has addressed urban development and other projects not addressed under NCCP/HCP plans through the section 7 process and individual HCPs (as opposed to those issued for regional planning efforts associated with the NCCP). The projects have included residential developments, highway-widening projects, and pipeline projects, among others. Section 7 consultations were primarily with the U.S. Army Corps of Engineers for Clean Water Act permit applications, but we have also consulted with other Federal agencies on specific actions. In addition to "projects," we have consulted with the Marine Corps, including a large-scale programmatic consultation that is in development, to address potential impacts to the gnatcatcher and its habitat from military training activities on Camp Pendleton and Miramar, and we have consulted with the Navy on actions related to the management of Detachment Fallbrook. The Act is the primary Federal regulatory mechanism that has contributed toward the conservation of the gnatcatcher.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of major Federal actions and management decisions that have significant effects on the human environment (including natural resources), but NEPA does not require that mitigation alternatives be implemented. Additionally, NEPA applies only to actions by Federal agencies, so private landowners are not required to comply with NEPA unless a Federal agency is involved through provision of Federal funding or a Federal permit. Although NEPA requires disclosure of the effects of proposed Federal actions, it does not necessarily afford direct protection to the gnatcatcher. Thus, NEPA is inadequate as a regulatory mechanism to conserve the gnatcatcher.

Sikes Act

In 1997, section 101 of the Sikes Act (16 U.S.C. 670a (a)) was revised by the Sikes Act Improvement Act to authorize the Secretary of Defense to implement a program to provide for the conservation and rehabilitation of natural resources on military installations. To do so, the Department of Defense was required to work with Federal and State fish and wildlife agencies to prepare an INRMP for each facility with significant natural resources. The INRMPs provide a planning tool for future improvements, provide for sustainable multipurpose use of the resources (including activities such as hunting, fishing, trapping, and non-consumptive uses), and allow some public access to military installations to facilitate their use. The implementation of these plans is subject to funding availability. On Department of Defense lands, including Camp Pendleton, Detachment Fallbrook, and Miramar, gnatcatcher habitat is generally not subjected to threats associated with large-scale development. However, the primary purpose for military

lands, including most gnatcatcher habitat areas, is to provide for military support and training. At these installations, INRMPs provide direction for project development and for the management, conservation, and rehabilitation of natural resources, including gnatcatchers and gnatcatcher habitat. Despite these benefits, in total, the Sikes Act, as amended, is an inadequate regulatory mechanism to conserve the gnatcatcher.

**Mexico Laws**

Mexico's Federal government listed the *atwoodi* subspecies of the California gnatcatcher in the Official Mexican Norm NOM–059–ECOL–2001, Mexico's threatened species law (SEMARNAT 2002). The coastal California gnatcatcher, as listed under the Act in the United States, includes the *atwoodi* subspecies (see Mellink and Rea 1994, pp. 50–62). The Mexican law may be implemented to modify development projects or support creation of Natural Protected Areas, but successful implementation often falls upon individuals or groups outside of the Mexican government (O. Hinojosa, Pronatura Noroeste, pers. comm., 2008). Although this law may contribute to the conservation of the gnatcatcher in northwestern Baja California, it is an inadequate regulatory mechanism to recover the gnatcatcher in Mexico.

**Summary of Factor D**

Together, the ongoing and anticipated implementation of the State's NCCP process and the Federal HCP process (pursuant to section 10 of the Act) are making substantial contributions to the conservation of the gnatcatcher by creating a network of managed, core-and-linkage preserves within the areas of the range of the gnatcatcher in the United States with the largest populations of gnatcatchers. Implementation of section 7 of the Act has also been effective in reducing the amount of incidental take on the gnatcatcher. Other State, U.S. Federal laws, and Mexican Federal laws make contributions toward the conservation of the gnatcatcher, but are inadequate regulatory mechanisms by themselves.

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

The 1993 listing rule identified grazing, air pollution, and increased anthropogenic wildland fires associated with urbanization and fragmentation as threats to the species and its habitat. The listing rule did not clearly articulate how these threats affected the gnatcatcher, though through an example it implied that the magnitude of the wildland fire threat was high. Grazing, air pollution, and increased wildland fires all impact gnatcatcher *habitat*; as such, we address these topics under Factor A (above). Similarly, the 2003 five-factor analysis evaluating the potential U.S. DPS identified type conversion as a threat under Factor E. Type conversion also affects gnatcatcher habitat, and therefore, this topic is likewise addressed under Factor A. In contrast, the 1993 listing rule identified habitat fragmentation and brood parasitism (also referred to as nest parasitism) by brown-headed cowbirds as threats under Factor A. Because these threats affect the species rather than its habitat, these topics are better addressed under Factor E. Additionally, anthropogenic climate change was not previously identified as a threat, but its effects have increasingly become apparent on a global scale. Therefore, below, we evaluate if and how the following three natural or manmade factors affect the continued existence of the gnatcatcher: (1) habitat fragmentation, (2) brood parasitism, and (3) climate change.

Fragmentation

Habitat fragmentation occurs "when a large expanse of habitat is transformed into a number of smaller patches of smaller total area, isolated from each other by a matrix of habitats unlike the original" (Wilcove et al. 1986, p. 237). Thus, the process of habitat fragmentation inextricably involves habitat loss (Fahrig 1999, p. 87). Moreover, isolated habitat patches are subject to "secondary fragmentation," resulting from altered disturbance regimes that allows increased incursion of invasive nonnative plant species, ultimately resulting in habitat loss through type conversion (Soulé et al. 1992, p. 43). The effects of habitat loss (including habitat degradation and type conversion) are addressed under Factor A (above), but such losses in areas of gnatcatcher habitat result in the remaining habitat becoming fragmented (Atwood and Bontrager 2001, p. 3).

The response to habitat fragmentation by the gnatcatcher and other bird species has been studied in coastal scrub habitat fragments, though the *mechanisms* affecting these populations are not well understood (Bolger 2002, p. 154). As summarized by Bolger (2002, p. 144), habitat fragmentation may affect a species because it is sensitive to effects associated with one or more of the following: edge (proximity to the fragment's edge), distance (proximity to other habitat areas), area (change in habitat size as a result of fragmentation), or age (time elapsed since insularization of the fragment).

The gnatcatcher does not appear to be particularly sensitive to edge effects (Bolger 2002, pp. 148, 149; Kristan et al. 2003, p. 38), and it is unclear if the gnatcatcher is sensitive to distance effects. However, individual gnatcatchers do appear able to disperse and recolonize habitat fragments (Lovio 1996, p. 56; Baily and Mock 1998, p. 359), even within an urban matrix (Crooks et al. 2001, p. 163; Surtain and Alberts 2008, p. 90). This suggests the gnatcatcher is not especially sensitive to distance effects. Studies from coastal southern California where habitats have been highly fragmented by urbanization have shown the gnatcatcher is both area and age sensitive (Soulé et al. 1988, p. 85; Bolger 2002, p. 144). Crooks et al. (2001, p. 163) and Surtain and Alberts (2008, p. 88) found gnatcatchers generally occupied the larger habitat fragments only. Atwood et al. (1998, p. 345) also noted gnatcatchers were more persistent in larger habitat patches. Further, Crooks et al. (2001, p. 164) developed a basic model that estimated that a fragment needed to be about 118 hectares (291 acres) for the gnatcatcher to have a 95 percent probability of occurrence after 100 years of isolation. In contrast, Winchell and Doherty (2008, pp. 1325–1326), using a larger sampling area including sites outside the urban matrix, found patch size was a poor predictor of gnatcatcher occupancy. Although this study was not designed to examine the effects of fragmentation, it does illustrate that the gnatcatcher is not likely responding to changes in fragment size alone.

For much of the range of the gnatcatcher in the United States, the NCCP/HCP process has established preserved areas in a core-and-linkage configuration. The core areas are large, unfragmented areas, while linkage areas are intended to provide continuous or "stepping stone" corridors for gnatcatcher movement and dispersal. As a result, these areas help to ameliorate the effects associated with habitat fragmentation. Therefore, the magnitude of the threat posed by habitat fragmentation has been reduced since listing.

Brood Parasitism

Historically, brown-headed cowbirds did not occur within the range of the gnatcatcher, but have since spread rapidly from populations farther east, mostly during the early twentieth century (Laymon 1987, pp. 63–70). Rothstein (1994, p. 309) postulated that the rapid increase in cowbird populations throughout western North America was driven by anthropogenic changes in the landscape. By the time the gnatcatcher was listed in 1993, cowbirds had become common throughout most of southern California (Garrett and Dunn 1981, p. 368). Brown-headed cowbirds are also known to occur and breed in northwestern Baja California (Howell 2001, p. 21; Howell et al. 2001, p. 189).

Brown-headed cowbirds are obligate brood parasites; that is, they do not raise their own young and instead lay their eggs in the nests of other birds to be raised by them, the hosts. Brown-headed cowbirds are host generalists (Friedmann and Kiff 1985, p. 227), laying their eggs in the nests of a wide range of host species. Brood parasitism of gnatcatchers by cowbirds has been recognized for many years (e.g., Woods 1930, p. 126; Friedmann 1934, p. 33; Hanna 1934, p. 89). Parasitized gnatcatcher nests typically do not fledge gnatcatcher young and only rarely fledge cowbird young (e.g., Braden et al. 1997, p. 861). Moreover, parasitized nests are abandoned significantly more often than non-parasitized nests (Braden et al. 1997, p. 861). However, a successful parasitism event is prolonged and may occupy hosts for much of the breeding season, as opposed to nest predation events or other nest failures that are sudden and often allow time for the hosts to renest (Griffith and Griffith 2000, p. 345).

Fragmentation has increased cowbird access in forested habitat (Lowther 1993, p. 13), but cowbirds do not appear to have responded similarly to fragmentation in coastal scrub habitats (Bolger 2002, p. 153). Nevertheless, the rate of parasitism of gnatcatcher nests by cowbirds does appear to vary with surrounding land use. Gnatcatcher populations in areas near agriculture or livestock may be more susceptible to brood parasitism (Braden 1992, p. 15; Atwood and Bontrager 2001, p. 18), while other areas have low rates of parasitism (Hanna 1934, p. 89; Braden 1992, p. 15). Given that cowbirds are not native to the region and likely spread due to anthropogenic changes, any rate of parasitism exceeds natural (historical) rate. However, because cowbirds do not appear to have responded to coastal scrub habitat fragmentation as they have in other habitats, the magnitude of this threat is not as great.

Management of cowbird populations by trapping has proven to be effective at limiting the number of gnatcatcher broods parasitized, even in areas that had marked rates of parasitism prior to trapping (Bontrager et al. 1995, p. 23). The State's NCCP Conservation Guidelines, the basis for the regional NCCP/HCP plans in southern California, includes measures for "exotic species control," including cowbirds. Thus, management of NCCP/HCPs can include controlling cowbird populations if monitoring finds them to be a threat. Cowbird control is sometimes included as conservation measures as part of consultations under section 7 of the Act. Moreover, cowbird control in neighboring habitats (e.g., in riparian areas to benefit the listed least Bell's vireos (*Vireo bellii pusillus*) may also benefit gnatcatcher populations (Griffith and Griffith 2000, p. 353).

In summary, the magnitude of the threat posed by brood parasitism by cowbirds is variable over the range of the gnatcatcher, depending in large part on neighboring land use. Management activities, especially cowbird removal programs, have and are likely to continue to reduce this threat in specific areas.

Climate Change

Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, pp. 1–63; Cayan et al. 2006, pp, 1–47; Meehl et al. 2007, pp. 747–843). Changes in rainfall quantity, timing, and frequency may affect coastal scrub vegetation. Assessments for California include predicted increases in the size and frequency of wildland fires, and possibly severity (Westerling et al. 2009, pp. 23–24). This may include promoting habitat type conversion (see Factor A). Indeed, Westerling et al. (2009, p. 24) anticipates such changes as part of their model. Yet, predictions of climatic conditions and other physical forces are uncertain. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to the gnatcatcher at this time. Therefore, the magnitude of this threat is unknown at this time.

**Summary of Factor E**

In summary, the gnatcatcher appears susceptible to threats associated with reduced habitat fragment size and length of time the fragment has been isolated, but the mechanisms causing this are not clear. Ongoing and anticipated implementation of NCCP/HCP plans is expected to create a network of core-and-linkage habitat areas, thereby preventing or reducing the effects of future habitat fragmentation. Rates of brood parasitism by invasive, nonnative brown-headed cowbirds appear to vary throughout the range of the gnatcatcher, depending upon nearby land uses (i.e., higher rates near livestock and agriculture). Although any rate of brood parasitism exceeds the historical rate of parasitism, the life history trait of the gnatcatcher of being able to rapidly and repeatedly renest helps to reduce the magnitude of this threat. Cowbird trapping is an effective tool that could be employed as part of management, either NCCP/HCP-based or otherwise, to further reduce this threat. The effects associated with anthropogenic climate change are largely unknown at this time, but may include changes in habitat because of alterations in rainfall (quantity or timing) and overall dryer conditions that may affect the species directly or through changes in fire frequencies.

## III. RECOVERY CRITERIA

Neither a recovery plan nor a recovery outline has been prepared for this species.

## IV. SYNTHESIS

The coastal California gnatcatcher is closely tied to its habitat—coastal scrub vegetation. This includes coastal sage scrub in the northern portion of its range and coastal succulent scrub in the southern portion. At the time of listing, coastal scrub vegetation was rapidly being destroyed by urban and agricultural development, but we noted the State's recently enacted NCCP Act showed promise in being able alleviate these threats, at least within most of the U.S. portion of the range. Since listing, implementation of NCCP/HCP plans has greatly reduced the magnitude of this threat by directing development toward certain areas, while preserving core and linkage habitat areas.

In the listing rule, we noted the gnatcatcher is affected by habitat degradation and fragmentation, but we did not clearly articulate these threats. Since then, additional information is now available in the scientific literature on these processes in general, and how they are affecting coastal scrub habitats and gnatcatchers specifically. In terms of habitat, fragmentation promotes habitat degradation, which is a process that ends in habitat type conversion. Several stressors, including livestock grazing, anthropogenic atmospheric pollutants, and wildland fire promote habitat type conversion within the range of the gnatcatcher. Wildland fire in particular is a major contributor because it promotes a feedback loop. That is, wildland fire allows nonnative grasses to outcompete re-growing native shrubs, which leads to an increase in nonnative grasses, which makes the area more susceptible to wildland fire, which allows the process to repeat—but with successively fewer native shrubs with each iteration. The number of wildland fires has increased dramatically as urbanization (with its multitude of ignition sources) has come into greater contact with wildland areas. Thus, the threat of habitat type conversion has increased throughout the range of the gnatcatcher since listing. Although we anticipate an increasing amount of habitat will receive beneficial management as NCCP/HCP plans are implemented over time, these plans are mostly in the early stages of implementation or are still in development. Therefore, the magnitude of the threat posed by habitat type conversion remains high at this time. Anthropogenic global climate change has the potential to further exacerbate the threat by promoting one or more stressors that contribute to habitat type conversion, but it is not clear to what extent or whether NCCP/HCP management will be able to counteract this threat.

Another threat includes the immediate effects of wildland fire (i.e., the temporary destruction of the plants upon which the gnatcatcher depends for foraging, sheltering, and nesting), the magnitude of which has increased as the number of wildland fires has increased. Additional lower magnitude threats include grazing, nest predation, brood parasitism by brown-headed cowbirds, and the population effects of habitat fragmentation. As mentioned, implementation of the NCCP/HCP process is reducing these threats, so is implementation of the Act in general, but other regulatory mechanisms are inadequate to conserve the species.

Although implementation of NCCP/HCPs is in the process of reducing the threats identified above for most of the U.S. population of gnatcatchers, habitat type conversion is an increasing threat that is only beginning to be addressed through the implementation of the NCCP/HCP habitat management process. Therefore, the coastal California gnatcatcher continues to meet the definition of threatened with no change in listing status being warranted, 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.

The recovery priority number for the coastal California gnatcatcher is 9C, indicating that this subspecies has a moderate degree of threat, a high potential for recovery, and is the subject of conflict. The recovery priority number was 3C at the start of the 5-year review, though in 2009 after initiation of the review, the number was changed to 9C.

## VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. Habitat Restoration

   Wildland fires burnt approximately one-third of the habitat of the gnatcatcher in southern California between 2003 and 2007. These areas are at risk of habitat type conversion. We should work with partners, including those associated with NCCP/HCP plans to restore burnt habitat areas most at risk from habitat type conversion.

2. Validate NCCP/HCP Reserve Design

   The core-and-linkage reserve design spanning multiple NCCP/HCP areas should be validated with a study that examines the amount of gene flow across gnatcatcher populations within the system of preserves.

## VII. REFERENCES CITED

Allen, E.B., P.E. Padgett, A. Bytnerowicz, and R. Minnich. 1998. Nitrogen deposition effects on coastal sage vegetation of Southern California. Pp. 131–139 *in* Bytnerowicz, A., M.J. Arbaugh, and S.L. Schilling (technical coordinators). Proceedings of the international symposium on air pollution and climate change effects on forest ecosystems; February 5–9, 1996, Riverside, CA. General Technical Report PSW-GTR-166. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA.

Allen, E.B., S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the limits to restoration of coastal sage scrub in southern California? Pp. 253–262 *in* Keeley, J.E., M. Baer-Keeley, and C.J. Fotheringham (eds.). 2nd Interface Between Ecology and Land Development in California. U.S. Geological Survey Open-File Report 00-62.

Alström, P., P.G.P. Ericson, U. Olsson, P. Sundberg. 2006. Phylogeny and classification of the avian superfamily Sylvioidea. Molecular Phylogenetics and Evolution 38: 381–397.

[AOU] American Ornithologists' Union. 1957. Check-list of North American birds. Fifth edition. The American Ornithologists' Union. Baltimore, Maryland. *xiii* + 691 pp.

[AOU] American Ornithologists' Union. 1983. Check-list of North American birds. Sixth edition. *xxix* + 827 pp.

[AOU] American Ornithologists' Union. 1998. Check-list of North American birds. Seventh edition. The American Ornithologists' Union, Washington, DC. *liv* + 829 pp.

[APHIS] Animal and Plant Health Inspection Service. 2002. Exotic Newcastle Disease; designation of quarantined area. November 26, 2002. Interim rule. Federal Register 67: 70674–70675.

[APHIS] Animal and Plant Health Inspection Service. 2003a. Exotic Newcastle Disease; additions to quarantined area and applicability of regulations. January 13, 2003. Interim rule. Federal Register 68: 1515–1517.

[APHIS] Animal and Plant Health Inspection Service. 2003b. Exotic Newcastle Disease; removal of areas from quarantine. September 19, 2003. Interim rule. Federal Register 68: 54797–54800.

Atwood, J.L. 1980. The United States distribution of the California black-tailed gnatcatcher. Western Birds 11: 65–78.

Atwood, J.L. 1988. Speciation and geographic variation in black-tailed gnatcatchers. Ornithological Monographs, No. 42. American Ornithologists' Union. Washington, DC. *viii* + 74 pp.

Atwood, J.L. 1990. Status review of the California gnatcatcher (*Polioptila californica*). Unpublished technical report. Manomet Bird Observatory, Manomet, MA. 49 pp.

Atwood, J.L. 1991. Subspecies limits and geographic patterns of morphological variation in California gnatcatchers (*Polioptila californica*). Bulletin of the Southern California Academy of Science 90: 118–133.

Atwood, J.L. 1992. A maximum estimate of the California gnatcatcher's population size in the United States. Western Birds 23: 1–9.

Atwood, J.L. 1993. California gnatcatchers and coastal sage scrub: The biological basis for endangered species listing. Pp. 149–169 *in* Keeley, J.E. (ed.). Interface Between Ecology and Land Development in California. Proceedings of the symposium convened. May 1–2, 1992, at Occidental College in Los Angeles. Southern California Academy of Sciences.

Atwood, J.L., and D.R. Bontrager. 2001. California gnatcatcher (*Polioptila californica*). *In* Poole, A., and F. Gill (eds.). The birds of North America, No. 574. 32 pp.

Atwood, J.L., S.H. Tsai, C.A. Reynolds, and M.R. Fugagli. 1998. Distribution and population size of California gnatcatchers on the Palos Verdes Peninsula, 1993–1997. Western Birds 29: 340–350.

Baily, E.B., and P.J. Mock. 1998. Dispersal capability of the California gnatcatcher: a landscape analysis of distribution data. Western Birds 29: 351–360.

Beyers, J.L. and G.C. Peña. 1995. Characteristics of coastal sage scrub in relation to fire history and use by California gnatcatchers. Pp. 153–154 *in* Weise, D.R., and R.E. Martin (technical coordinators). The Biswell symposium: fire issues and solutions in urban interface and wildland ecosystems; February 15–17, 1994. Walnut Creek, California. General Technical Report PSW-GTR-158. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. 199 pp.

Bolger, D.T. 2002. Habitat fragmentation effects on birds in southern California: contrast to the "top-down" paradigm. Studies in Avian Biology, No. 25: 141–157.

BonTerra Consulting. 2006. Results of focused surveys for the southwestern willow flycatcher and least Bell's vireo on the Cordoba Village Project Site, Los Angeles County, California. November 17, 2006. Unpublished report to the U.S. Fish and Wildlife Service, Ventura, CA.

Bontrager, D.R. 1991. Habitat requirements, home range and breeding biology of the California gnatcatcher (*Polioptila californica*) in south Orange County, California. Unpublished technical report prepared for the Santa Margarita Company, Rancho Santa Margarita, CA. 19 pp.

Bontrager, D.R., A.L. Gorospe, and D.K. Kamada. 1995. Breeding biology of California gnatcatchers in the San Joaquin Hills 1995, studies for coastal sage scrub management. Unpublished technical report prepared for the U.S. Fish and Wildlife Service. 36 pp.

Braden, G. 1992. California gnatcatchers (*Polioptila californica*) at three sites in western Riverside County. Unpublished draft technical report prepared for the Metropolitan Water District by the U.S. Fish and Wildlife Service. 24 pp. + appendix.

Braden, G. and S. Powell. 1994. Nesting biology of the coastal California gnatcatcher (*Polioptila californica californica*) in western Riverside County. Unpublished draft technical report prepared for the Southwestern Riverside County Multi-species Reserve Management Committee and the Metropolitan Water District by the U.S. Fish and Wildlife Service. 35 pp.

Braden, G.T. 1999. Does nest placement affect the fate or productivity of California gnatcatcher nests? Auk 116: 984–993.

Braden, G.T., R.L. McKernan, and S.M. Powell. 1997. Effects of nest parasitism by the brown-headed cowbird on nesting success of the California gnatcatcher. Condor 99: 858–865.

Brewster, W. 1881. On the affinities of certain *Polioptilæ* with a description of a new species. Bulletin of the Nuttall Ornithological Club 6: 101–107.

Brewster, W. 1902. Birds of the cape region of Lower California. Bulletin of the Museum of Comparative Zoology 41: 1–272.

California Department of Finance. Multiple data sources available on the internet at *http://www.dof.ca.gov/research/demographic/reports/*. Accessed October 23, 2009.

California Department of Finance. 2008. Data from "E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2008, with 2000 Benchmark. Sacramento, California, May 2008". Data available on the internet at *http://www.dof.ca.gov/research/demographic/ reports/estimates/e-5_2001-06/*. Accessed January 13, 2009.

Campbell, K.F., R.E. Erickson, W.E. Haas, and M.A. Patten. 1998. California gnatcatcher use of habitats other than coastal sage scrub: conservation and management implications. Western Birds 29: 421–433.

Cayan, D., A.L. Luers, M. Hanemann, G. Franco, and B. Croes. 2006. Scenarios of climate change in California: an overview. Unpublished white paper report from the California Climate Change Center. CEC-500-2005-186-SF, February 2006. *v* + 47 pp.

[CBI] Conservation Biology Institute. 2004. Las Californias binational conservation initiative, a vision for habitat conservation in the Border Region of California and Baja California. Unpublished report. *iv* + 43 pp.

[CDFG] California Department of Fish and Game. Map depicting original NCCP planning area. http://www.dfg.ca.gov/habcon/nccp/images/region.gif. Accessed August 2008.

Cione, N.K., P.E. Padgett, and E.B. Allen. 2002. Restoration of native shrubland impacted by exotic grasses, frequent fire, and nitrogen deposition in southern California. Restoration Ecology 10: 376–384.

County of Orange. 1996. Natural community conservation plan and habitat conservation plan, County of Orange, Central and Coastal Subregion, Parts 1 & 2. July 17, 1996. Prepared by R.J. Meade Consulting, Inc., La Jolla, CA.

County of Orange. 2006. Southern Subregion NCCP/HCP Plan. Available on the internet at <http://www.ocplanning.net/ssnccp/nccp_hcp.aspx>. Accessed August 21, 2008.

County of Riverside. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Volume 1. Prepared by Dudek and Associates, Inc., Encinitas, CA.

County of San Diego. 1998. Multiple species conservation program, MSCP [subregional] plan. August 1998.

Crooks, K.R., A.V. Suarez, D.T. Bolger, M.E. Soulé. 2001. Extinction and colonization of birds on habitat islands. Conservation Biology 15: 159–172.

Cronin, M.A. 1997. Systematics, taxonomy, and the Endangered Species Act: the example of the California gnatcatcher. Wildlife Society Bulletin 25: 661–666.

D'Antonio, C.M., and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23: 63–87.

Davis, L.H., R.L. McKernan, and J.S. Burns. 1998. History and status of the California gnatcatcher in San Bernardino County, California. Western Birds 29: 361–365.

Edwards, S.V., S.B. Klingan, J.D. Calkins, C.N. Balakrishnan, W.B. Jennings, W.J. Swanson, and M.D. Sorenson. 2005. Speciation in birds: Genes, geography, and sexual selection. Proceedings of the National Academy of Sciences 102: 6550-6557.

Egerton-Warburton, L.M., and E.B. Allen. 2000. Shifts in arbuscular mycorrhizal communities along an anthropogenic Nitrogen Deposition Gradient. Ecological Applications 10: 484–496.

Eliason, S.A., and E.B. Allen. 1997. Exotic grass competition in suppressing native shrubland re-establishment. Restoration Ecology 5: 245–255.

Fahrig, L. 1999. Forest loss and fragmentation: Which has the greater effect on persistence of forest-dwelling animals? Pp. 87–95 *in* Rochelle, J.A., L.A. Lehmann, and J. Wisniewski (eds.). Forest fragmentation, wildlife and management implications. Brill, Leiden, The Netherlands.

Famolaro, P., and J. Newman. 1998. Occurrence and management considerations of California gnatcatchers along San Diego County highways. Western Birds 29: 447–452.

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. Union of Concerned Scientists, Cambridge, MA; Ecological Society of America, Washington, DC.

Freudenberger, D.O., B.E. Fish, and J.E. Keeley. 1987. Distribution and stability of grasslands in the Los Angeles Basin. Bulletin of the Southern California Academy of Science 86: 13–26.

Friedmann, H. 1934. Further additions to the list of birds victimized by the cowbird. Wilson Bulletin 46: 25–36.

Friedmann, H. 1963. Host relations of the parasitic cowbirds. Smithsonian Institution, Washington, DC.

Friedmann, H., and L.F. Kiff. 1985. The parasitic cowbirds and their hosts. Proceedings of the Western Foundation of Vertebrate Zoology 2: 226–302.

Galvin, J.P. 1998. Breeding and dispersal biology of the California gnatcatcher in central Orange County. Western Birds 29: 323–332.

Garrett, K., and J. Dunn. 1981. Birds of Southern California: status and distribution. Los Angeles Audubon Society. Artisan Press, Los Angeles, California.

Giessow, J., and P. Zedler. 1996. The effects of fire frequency and firebreaks on the abundance and species richness of exotic plant species in coastal sage scrub. Pp. [86–94] *in* J.E. Lovich, J. Randall, and M.D. Kelly (eds.). Proceedings of the California Exotic Pest Plant Council Symposium. Vol. 2, 1996.

Griffith, J.T., and J.C. Griffith. 2000. Cowbird control and the endangered least Bell's vireo: a management success story. Pp. 342–356 *in* Smith, J.N.M., T.L. Cook, S.I. Rothstein, S.K. Robinson, and S.G. Sealy (eds.). Ecology and management of cowbirds and their hosts. University of Texas Press, Austin.

Grinnell, J. 1898. Birds of the Pacific slope of Los Angeles County, a list with brief notes. Pasadena Academy of Sciences, publication No. 2.

Grinnell, J. 1904. Midwinter birds at Palm Springs, California. Condor 6: 40–45.

Grinnell, J. 1926. A critical inspection of the gnatcatchers of the Californias. Proceedings of the California Academy of Sciences 15: 493–500.

Grinnell, J. 1928. A distributional summation of the ornithology of Lower California. University of California Publications in Zoology 32: 1–300.

Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna, No. 27. Cooper Ornithological Club, Berkeley, CA.

Grinnell, J., and H.S. Swarth. 1913. An account of the birds and mammals of the San Jacinto area of southern California. University of California Publications in Zoology 10: 197–406.

Grishaver, M.A., P.J. Mock, and K.L. Preston. 1998. Breeding behavior of the California gnatcatcher in southwestern San Diego County, California. Western Birds 29: 299–322.

Haig, S.M., E.A. Beever, S.M. Chambers, H.M. Draheim, B.D. Dugger, S. Dunham, E. Elliott-Smith, J.B. Fontaine, D.C. Kesler, B.J. Knause, I.F. Lopes, P. Loschl, T.D. Mullins, and L.M. Sheffield. 2006. Taxonomic considerations in listing subspecies under the U.S. Endangered Species Act. Conservation Biology 20: 1584-1594.

Hanna, W.C. 1934. The black-tailed gnatcatcher and the dwarf cowbird. Condor 36: 89.

Hays, E.B., N. Komar, R.S. Nasci, S.P. Montgomery, D.R. O'Leary, and G.L. Campbell. 2005. Epidemiology and transmission dynamics of West Nile virus disease. Emerging Infectious Diseases 11: 1167–1173.

Hellmayer, C.E. 1934. Catalogue of birds of the Americas and the adjacent islands in Field Museum of Natural History. Field Museum of Natural History, Publication 330, Zoological Series 13, part 7.

Holland, V.L., and D.J. Keil. 1995. California vegetation. Kendall/Hunt Publishing Company.

Howell, S.N.G. 2001. Regional distribution of the breeding avifauna of the Baja California Peninsula. Pp. 10–22 *in* Erickson, R.E., and S.N.G. Howell (eds.). Birds of the Baja California peninsula: status, distribution, and taxonomy. Monographs in Field Ornithology, No. 3. American Birding Association.

Howell, S.N.G., and S. Web. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, NY.

Howell, S.N.G., R.A. Erickson, R.A. Hamilton, and M.A. Patten. 2001. An annotated checklist of the birds of Baja California and Baja California Sur. Pp. 171–203 *in* Erickson, R.E., and S.N.G. Howell (eds.). Birds of the Baja California Peninsula: status, distribution, and taxonomy. Monographs in Field Ornithology, No. 3. American Birding Association.

Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). 2009. Global Climate Change Impacts in the United States. Cambridge University Press.

Keeley, J.E. 2001. Fire and invasive species in Mediterranean-climate ecosystems of California. Pages 81–94 *in* Galley, K.E.M. and T.P. Wilson (eds.). Proceedings of the invasive species workshop: the role of fire in the control and spread of invasive species. Miscellaneous publication 11. Tall Timbers Research Station, Tallahassee, FL.

Keeley, J.E. 2004. Impact of antecedent climate on fire regimes in coastal California. International Journal of Wildland Fire 13: 173–182.

Keeley, J.E. 2005. Fire as a threat to biodiversity in fire-type shrublands. Pp. 97–106 *in* Kus, B.E., and J.L. Beyers (technical coordinators). Planning for Biodiversity: Bringing Research and Management Together. General Technical Report PSW-GTR-195. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, CA. 274 pp.

Keeley, J.E., and C.J. Fotheringham. 2001. Historic fire regime in southern California shrublands. Conservation Biology 15: 1536–1548.

Keeley, J.E., C.J. Fotheringham, and M. Morais. 1999. Reexamining fire suppression impacts on brushland fire regimes. Science 284: 1829–1832.

Keeley, J.E., M. Baer-Keeley, and C.J. Fotheringham. 2005a. Alien plant dynamics following fire in Mediterranean-climate California shrublands. Ecological Applications 15: 2109–2125.

Keeley, J.E., C.J. Fotheringham, and M. Baer-Keeley. 2005b. Determinants of postfire recovery and succession in Mediterranean-climate shrublands of California. Ecological Applications 15: 1515–1534.

Kristan, W.B. III, A.J. Lynam, M.V. Price, and J.T. Rotenberry. 2003. Alternative causes of edge-abundance relationships in birds and small mammals of California coastal sage scrub. Ecography 26: 29–44.

LaDeau, S.L., A.M. Kilpatrick, and P.P. Marra. 2007. West Nile virus emergence and large-scale declines of North American bird populations. Nature 447: 710–714, plus supplementary information.

Laymon, S.A. 1987. Brown-headed cowbirds in California: historical perspectives and management opportunities in riparian habitats. Western Birds 18: 63–70.

Lovio, J.C. 1996. The effects of habitat fragmentation on the breeding-bird assemblage in California coastal sage scrub. Master's thesis. San Diego State University. 93 pp.

Lowther, P.E. 1993. Brown-headed cowbird (*Molothrus ater*). *In* Poole, A., and F. Gill (Eds.). The Birds of North America, No. 47. The Academy of Natural Sciences, Philadelphia, PA; The American Ornithologists' Union, Washington, DC.

Malanson, G.P., and J.F. O'Leary. 1982. Post-fire regeneration strategies of Californian coastal sage shrubs. Oecologia 53: 355–358.

Martin, T.E., and J. Clobert. 1996. Nest predation and avian life-history evolution in Europe versus North America: a possible role of humans? The American Naturalist 147: 1028–1046.

[MBA] Michael Brandman Associates. 1991. A rangewide assessment of the California gnatcatcher (*Polioptila californica*). Unpublished report prepared for Building Industry Association of Southern California, Santa Ana, CA. 21 pp. + appendix.

McLean, R.G. 2006. West Nile virus in North American birds. Ornithological Monographs, No. 60: 44–64.

Meehl, G.A., T.F. Stocker, W.D. Collins, P. Friedlingstein, A.T. Gaye, J.M. Gregory, A. Kitoh, R. Knutti, J.M. Murphy, A. Noda, S.C.B. Raper, I.G. Watterson, A.J. Weaver, and Z.-C. Zhao. 2007. Global climate projections. Pp. 747–843 *in* Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.). Climate change 2007: The physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom, and New York, NY.

Mellink, E. and A.M. Rea. 1994. Taxonomic status of the California gnatcatchers of northwestern Baja California, Mexico. Western Birds 25: 50–62.

Miller, A.H., H. Friedmann, L. Griscom, and R.T. Moore (eds.). 1957. Distributional check-list of the birds of Mexico, Part II. Pacific Coast Avifauna, No. 33. 436 pp.

Miner, K.L., A. Wolf, and R. Hirsch. 1998. Use of restored coastal sage scrub habitat by California gnatcatchers in a park setting. Western Birds 29: 439–446.

Minnich, R.A. 2001. An integrated model of two fire regimes. Conservation Biology 15: 1549–1553.

Minnich, R.A., and R.J. Dezzani. 1998. Historical decline of coastal sage scrub in the Riverside–Perris plain, California. Western Birds 29: 366–391.

Minnich, R.A., and E. Franco-Vizcaíno. 2005. Baja California's enduring mediterranean vegetation: early accounts, human impacts, and conservation status. Pp. 370–386 *in* Cartron, J.E., G. Ceballos, and R.S. Felger (eds.). Biodiversity, ecosystems, and conservation in northern Mexico. Oxford University Press, New York, NY.

Mock, P.J. and D. Bolger. 1992. Ecology of the California gnatcatcher for Rancho San Diego. Unpublished technical report prepared by Ogden Environmental and Energy Services Co. for Home Capital Development Corporation (included as an appendix in the Draft Habitat Conservation Plan for Ranch San Diego). 54 + 4 pp.

Mock, P.J. 2004. California gnatcatcher *Polioptila californica*. Pp. 430–433 *in* Unitt, P. San Diego County bird atlas. Proceeding of the San Diego Society of Natural History, No. 39. San Diego Natural History Museum, San Diego, CA.

[Navy] U.S. Department of the Navy. 2006. Naval Weapons Station Seal Beach Detachment Fallbrook Integrated Natural Resources Management Plan (January 2006, v2). Prepared by Tierra Data, Inc.

O'Leary, J.F. 1990. Californian coastal sage scrub: General characteristics and considerations for biological conservation. Pp. 24–31 *in* Schoenherr, A.A. (ed.). Endangered plant communities of southern California. Southern California Botanists Special Publication No. 3.

O'Leary, J.F. and W.E. Westman. 1988. Regional disturbance effects on herb succession patterns in coastal sage scrub. Journal of Biogeography 15: 775–786.

Patten, M.A., and D.T. Bolger. 2003. Variation in top-down control of avian reproductive success across a fragment gradient. Oikos 101: 479–488.

Paynter, R.A. Jr. 1964. Subfamily Polioptilinae. Pp. 443–455 *in* Mayr, E. and R.A. Paynter, Jr. (eds.). Check-list of birds of the world, Volume X. Museum of Comparative Zoology, Cambridge, MA.

Peterson, A.T., D.A. Vieglais, and J.K. Andreasen. 2003. Migratory birds modeled as critical transport agents for West Nile virus in North America. Vector-borne and Zoonotic Diseases 3: 27–37.

Peinado, M., F. Alcaraz, J.L. Aquirre, J. Delgadillo, and I. Aguado. 1995. Shrubland formations and associations in mediterranean–desert transitional zones of northwestern Baja California. Vegetatio 117: 165–179.

Phillimore, A.B., I .P.F. Owens, R. A. Black, J. Chittock, T. Burke, and S . M. Clegg. 2008. Complex patterns of genetic and phenotypic divergence in an island bird and the consequences for delimiting conservation units. Molecular Ecology 17: 2839-2853.

Phillips, A.R. 1991. The known birds of North and Middle America, part 2. Published by the author, Denver, CO. 249 pp.

Preston, K.P. 1993. Selection for sulfur dioxide and ozone tolerance in *Bromus rubens* along the south central coast of California. Annals of the Association of American Geographers 83: 141–155.

Preston, K.L. and J.T. Rotenberry. 2006. The role of food, nest predation, and climate in timing of wrentit reproductive activities. Condor 108: 832–841.

Pyle, R.L., and A. Small. 1961. Annotated field list, birds of Southern California [revised]. Published by Otis Wade for the Los Angeles Audubon Society, Los Angeles, CA.

Reisen, W.K., Y. Fang, H.D. Lothrop, V.M. Martinez, J. Wilson, P. O'Connor, R. Carney, B. Cahoon-Young, M. Shafii, and A.C. Brault. 2006. Overwintering of West Nile virus in Southern California. Journal of Medical Entomology 43: 344–355.

Remsen, J.V., Jr. 2005. Pattern, process, and rigor meet classification. The Auk 122: 403-413.

Rothstein, S.I. 1994. The cowbird's invasion of the far West: history, causes and consequences experienced by host species. Pp. 301–315 *in* A Century of Avifaunal Change in western North America. Jehl, J.R., and N.K. Johnson (eds.). Studies in Avian Biology, No. 15. Cooper Ornithological Society.

Rubinoff, D. 2001. Evaluating the California gnatcatcher as an umbrella species for conservation of southern California coastal sage scrub. Conservation Biology 15: 1374–1383.

[SANDAG] San Diego Association of Governments. 2003. Multiple habitat conservation program. March 2003. Prepared by AMEC Earth and Environmental, Inc., Conservation Biology Institute.

[SEMARNAT] Secretaría de Medio Ambiente y Recursos Naturales. 2002. Norma Oficial Mexicana NOM-059-ECOL-2001. Protección ambiental—Especies nativas de México de flora y fauna silvestres—Categoría de riesgo y especificaciones para su inclusión, exclusión o cambio—Lista de especies de riesgo. Diario Oficial de la Federación, marzo 6 de 2002, tomo DLXXXII, 4: 1–80.

Sheldon, F.H., and F.B. Gill. 1996. A reconsideration of songbird phylogeny, with emphasis on the evolution of titmice and their sylvioid relatives. Systematic Biology 45: 473–495.

Sockman, K.W. 1997. Variation in life-history traits and nest-site selection affects risk of nest predation in the California gnatcatcher. Auk 114: 324–332.

Soulé, M.E. 1991. Theory and Strategy. Pp. 91–104 *in* Hudson, W.E. (ed.). Landscape Linkages and Biodiversity. Island Press, Washington, DC.

Soulé, M.E., A.C. Alberts, and D.T. Bolger. 1992. The effects of habitat fragmentation on chaparral plants and vertebrates. Oikos 63: 39–47.

Soulé, M.E., D.T. Bolger, A.C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conservation Biology 2: 75–92.

Steele, K.E., M.J. Linn, R.J. Schoepp, N. Komar, T.W. Geisbert, R.M. Manduca, P.P. Calle, B.L. Raphael, T.L. Clippinger, T. Larsen, J. Smith, R.S. Lanciotti, N.A. Panella, and T.S. McNamara. 2000. Pathology of fatal West Nile virus infections in native and exotic birds during the 1999 outbreak in New York City, New York. Veterinary Pathology 37: 208–224.

Stylinski, C.D., and E.B. Allen. 1999. Lack of native species recovery following severe exotic disturbance in Southern Californian shrublands. The Journal of Applied Ecology 36: 544–554.

Surtain, A.R., and A.C. Alberts. 2008. Habitat fragmentation and scrub-specialist birds: San Diego fragments revisited. Western Birds: 39: 82–93.

Syphard, A.D., V.C. Radeloff, J.E. Keeley, T.J. Hawbaker, M.K. Clayton, S.I. Stewart, and R.B. Hammer. 2007. Human influence on California fire regimes. Ecological Applications 17: 1388–1402.

[TAIC] Technology Associates International Corporation. 2002. California gnatcatcher habitat evaluation model for USFWS. Digital data. U.S. Fish and Wildlife Service Office, Carlsbad, California.

Talluto, M.V. and K.N. Suding. 2008. Historical change in coastal sage scrub in southern California, USA in relation to fire frequency and air pollution. Landscape Ecology 23: 803–815.

Thayer, J.E. and O. Bangs. 1907. Catalog of birds collected by W. W. Brown, Jr., in middle Lower California. Condor 9: 135–140.

Unitt, P. 1984. The birds of San Diego County. Memoir 13, San Diego Society of Natural History, San Diego, CA. *xxii* + 276 pp.

Unitt, P. 2008. San Jacinto centennial resurvey project data. Available on the internet at <http://www.sdnhm.org/research/sanjacinto/index.php>. Accessed August 18, 2009.

[USFWS] U.S. Fish and Wildlife Service. 1983a. Endangered and threatened species listing and recovery priority guidelines. September 21, 1983. Notice. Federal Register 48: 43098–43105.

[USFWS] U.S. Fish and Wildlife Service. 1983b. Endangered and threatened species listing and recovery priority guidelines. November 15, 1983. Correction. Federal Register 48: 51985.

[USFWS] U.S. Fish and Wildlife Service. 1993a. Endangered and threatened wildlife and plants; determination of threatened status for the coastal California gnatcatcher. March 30, 1993. Final rule. Federal Register 58: 16742–16757.

[USFWS] U.S. Fish and Wildlife Service. 1993b. Endangered and threatened wildlife and plants; proposed special rule to allow take of the threatened coastal California gnatcatcher. March 30, 1993. Proposed special rule. Federal Register 58: 16758–16759.

[USFWS] U.S. Fish and Wildlife Service. 1993c. Endangered and threatened wildlife and plants; special rule concerning take of the threatened coastal California gnatcatcher. December 10, 1993. Final rule. Federal Register 58 FR 63088–65096.

[USFWS] U.S. Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; notice of determination to retain the threatened status for the coastal California gnatcatcher under the Endangered Species Act. March 27, 1995. Notice of determination. Federal Register 60: 15693–15699.

[USFWS] U.S. Fish and Wildlife Service. 1996. Biological and conference opinions for the Central and Coastal Subregion Natural Community Conservation Plan and Habitat Conservation Plan, County of Orange, California. May 24, 1996. Carlsbad Fish and Wildlife Office, Carlsbad, CA. 87 pp. + attachment.

[USFWS] U.S. Fish and Wildlife Service. 1997. Biological and conference opinions on issuance of an incidental take permit to the City of San Diego pursuant to the Multiple Species Conservation Program (1-6-97-FW-47). June 6, 1997. Carlsbad Fish and Wildlife Office, Carlsbad, CA. 121 pp.

[USFWS] U.S. Fish and Wildlife Service. 1998. Biological and Conference Opinions on Issuance of an Incidental Take Permit to the County of San Diego under the Multiple Species Conservation Program for their Subarea Plan (1-6-98-FW-03). March 12, 1998. Carlsbad Fish and Wildlife Office, Carlsbad, CA. 70 pp.

[USFWS] U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; determination of whether designation of critical habitat for the coastal California gnatcatcher is prudent. February 8, 1999. Notice of determination. Federal Register 64: 5957–5963.

[USFWS] U.S. Fish and Wildlife Service. 2000a. Endangered and threatened wildlife and plants; proposed determination of critical habitat for the coastal California gnatcatcher. February 7, 2000. Proposed rule. Federal Register 65: 5946–5976.

[USFWS] U.S. Fish and Wildlife Service. 2000b. Endangered and threatened wildlife and plants; final determination of critical habitat for the coastal California gnatcatcher. October 24, 2000. Final rule. Federal Register 65: 63680–63743.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for the coastal California gnatcatcher (P*olioptila californica californica*) and determination of distinct vertebrate population segment for the California gnatcatcher (*Polioptila californica*). April 24, 2003. Proposed rule. Federal Register 68:20228–20312.

[USFWS] U.S. Fish and Wildlife Service. 2004a. Intra-Service Formal Section 7 Consultation/Conference for Issuance of an Endangered Species Act Section l0(a)(l)(B) Permit (TE-088609-0) for the Western Riverside County Multiple Species Habitat Conservation Plan, Riverside County, California. FWS-WRIV-870.19. June 22, 2004. Carlsbad Fish and Wildlife Office, Carlsbad, CA. *xii* + 1125 pp. + 8 appendices.

[USFWS] U.S. Fish and Wildlife Service. 2004b. [Biological and conference opinions on the] Subregional Multiple Habitat Conservation Plan and the City of Carlsbad Subarea Plan/Habitat Management Plan, San Diego County, California (1-6-00-F 847.4). FWS-SDG-847.4. November 9, 2004. Carlsbad Fish and Wildlife Office, Carlsbad, CA. 495 pp.

[USFWS] U.S. Fish and Wildlife Service. 2007a. Endangered and threatened wildlife and plants; revised designation of critical habitat for the coastal California gnatcatcher (*Polioptila californica californica*). December 19, 2007. Final rule. Federal Register 72: 72010–72213.

[USFWS] U.S. Fish and Wildlife Service. 2007b. Intra-Service Formal Section 7 Consultation/Conference for Issuance of an Endangered Species Act Section 10(a)(l)(B) Permit (TE1441 13-0, TEI44140-0, and TEI44105-0) for the Southern Orange Natural Community Conservation Plan/Master Streambed Alteration Agreement/Habitat Conservation Plan, Orange County, California (l-6-07-F-812.8). January 10, 2007. Carlsbad Fish and Wildlife Office, Carlsbad, CA.

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; initiation of 5-Year Reviews of 58 species in California and Nevada; availability of completed 5-Year Reviews in California, Nevada and Southern Oregon. March 5, 2008. Notice. Federal Register 73: 11945–11950.

[USFWS] U.S. Fish and Wildlife Service. 2009. GIS analysis of coastal California gnatcatcher distribution. Unpublished analysis. Carlsbad Fish and Wildlife Office, Carlsbad, California.

[USMC] U.S. Marine Corps. 2007. Integrated Natural Resources Management Plan. Marine Corps Base Camp Pendleton. March 2007.

van Rossem, A.J. 1931. Concerning some western races of *Polioptila melanura*. Condor 33: 35–36.

Westerling, A.L., B.P. Bryant, H.K. Preisler, H.G. Hidalgo, T. Das, and S.R. Shrestha. 2009. Climate change, growth, and California wildfire. Draft paper from the California Climate Change Center. CEC-500-2009-046-D; March 2009. California Energy Commission and California Environmental Protection Agency. 28 pp. + appendix.

Westman, W.E. 1983. Xeric Mediterranean-type shrubland associations of Alta and Baja California and the community/continuum debate. Vegetatio 52: 3–19.

Westman, W.E. 1985. Air pollution injury to coastal sage scrub in the Santa Monica Mountains, southern California. Water, Air, and Soil Pollution 26: 19–41.

Westman, W.E. 1987. Implications of ecological theory for rare plant conservation in coastal sage scrub. Pp. 133–140 *in* Elias, T.S. (ed.). Conservation and management of rare and endangered plants, proceedings of a California conference on the conservation and management of rare and endangered plants. California Native Plant Society, Sacramento, CA.

Westman, W.E., and J.F. O'Leary. 1986. Measures of resilience: the response of coastal sage scrub to fire. Vegetatio 65: 179–189.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Pp. 237–256 *in* Soulé, M.E. (ed.). Conservation biology, the science of scarcity and diversity. Sinauer Associated, Inc., Sunderland, MA.

Winchell, C.S., and P.F. Doherty. 2008. Using California gnatcatcher to test underlying models of habitat conservation plans. Journal of Wildlife Management 72: 1322–1327.

Wirtz, W.O., II, A.L. Mayer, M.M. Raney, and J.L. Beyers. 1997. Effects of fire on the ecology of the California gnatcatcher, *Polioptila californica*, in California coastal sage scrub. Pp. 91–96 *in* Greenlee, J.M., ed. Proceedings, 1st conference on fire effects on rare and endangered species and habitats; November 13–16, 1995, Coeur d'Alene, ID. International Association of Wildland Fire, Fairfield, WA.

Woods, R.S. 1921. Home life of the black-tailed gnatcatcher. Condor 23: 173–178.

Woods, R.S. 1930. Two more victims of the cowbird. Condor 32: 126.

Zedler, P.H., C.R. Gautier, and G.S. McMaster. 1983. Vegetation change in response to extreme events: the effect of a short interval between fires in California chaparral and coastal scrub. Ecology 64: 809–818.

Zink, R.M., G.F. Barrowclough, J.L. Atwood, and R.C. Blackwell-Rago. 2000. Genetics, taxonomy, and conservation of the threatened California gnatcatcher. Conservation Biology 14: 1394–1405.

**Personal communications and *in litteris* references:**

Hinojosa, Osvel. 2008. Pronatura Noroeste, San Luis Río Colorado, Sonora. México. Email to Gjon Hazard, U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, dated August 17, 2008.

Hongola, Steve. 2009. Rincon Consultants, Inc., Ventura, CA. California Natural Diversity Database form reporting coastal California gnatcatcher observation on July 6, 2009.

Pereksta, David. 2009. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, CA. California Natural Diversity Database form reporting coastal California gnatcatcher observation on August 16, 2009.

Winchell, Clark. 2009. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad California. Information of occupancy and effect of 2003–2007 wildland fires on gnatcatcher habitat in San Diego County, California.

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

**coastal California gnatcatcher**
***(Polioptila californica californica)***

**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:**

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

Approve _____ Date 9/16/10

**Cooperating Field Supervisor, U.S. Fish and Wildlife Service**

Approve _____ Date 9/2/10

**REGIONAL OFFICE CONCURRENCE:**

**Lead Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, Region 8**

Approve _____ Date 9/29/10