Ambrosia pumila
(San Diego ambrosia)

5-Year Review:
Summary and Evaluation

Ambrosia pumila (San Diego ambrosia). Photo credit Ayoola Folarin (USFWS).

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

July 15, 2010

5-YEAR REVIEW
Ambrosia pumila (San Diego ambrosia)

I. GENERAL INFORMATION

Purpose of 5-Year Review:

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

Species Overview:

Ambrosia pumila (San Diego ambrosia) is a clonal herbaceous perennial plant occurring in southern California from northwestern Riverside County, south through western San Diego County, to northwestern Baja California, Mexico. The species is found primarily on upper terraces of rivers and drainages; however, several patches of the plant occur within the watershed of a large vernal (ephemeral) pool at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank in Riverside County. At listing, *A. pumila* was restricted to 15 occurrences in San Diego and Riverside counties. The primary threats at that time were urban development and highway and utility corridor construction and maintenance, inadequacy of regulatory mechanisms, nonnative plants, mowing or discing, and human encroachment.

Methodology Used to Complete This Review:

This review was conducted by Ayoola O. Folarin at the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. We used information in the 2002 listing rule, available literature, and reports and information in our files. We also relied upon information provided by experts familiar with the species, its habitat, and the associated processes. 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, since the last 5-year review, or since the last document containing a five-factor analysis. We focus on current threats to the

species that are attributable to any of 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 include a prioritized list of conservation actions recommended to be completed or initiated within the next 5 years. These actions are designed to alleviate persisting threats to the taxon.

Contact Information:

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

Lead Field Office: Ayoola O. Folarin and Bradd Baskerville-Bridges, Carlsbad Fish and Wildlife Office; (760) 431-9440.

Federal Register 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 was published in the Federal Register (FR) on March 25, 2009 (USFWS 2009a). No information was received during the open period relevant to the taxon being reviewed here.

Listing History:

Original Federal Listing
FR notice: 67 FR 44372-44382
Date listed: July 2, 2002
Entity listed: *Ambrosia pumila* (San Diego ambrosia), a plant species
Classification: Endangered

Associated Rulemakings:

Proposed Critical Habitat
FR Notice: 74 FR 44238-44267
Date of Proposed Critical Habitat: August 27, 2009

Review History:

No previous 5-year reviews have been completed for *Ambrosia pumila*.

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

The recovery priority number for *Ambrosia pumila* is 5C according to the 2009 Recovery Data Call for the CFWO. This number indicates that the taxon is a species that faces a high degree of threats, has a low potential for recovery, and has conflict with construction or other development projects or other forms of economic activity. This number is based

on a 1 to 18 ranking system that takes into account the degree of threat, the potential for recovery, and the taxonomic rank of the organism. According to this scale, 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983, p. 43104).

Recovery Plan (Draft or Final) or Recovery Outline:

No Recovery Plan has been completed for *Ambrosia pumila*.

II. REVIEW ANALYSIS

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

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as DPS to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable to the species' listing and is not addressed further in this review.

Information on the Species and its Status:

Species Description

Ambrosia pumila is a clonal herbaceous perennial plant. Individual stems are generally 5 to 30 centimeters (cm) (2 to 12 inches (in)) tall, but may grow to 50 cm (20 in), and are densely covered with short hairs. The leaves are two to four times pinnately divided into many small segments and are covered with short, soft, gray-white, appressed (lying flat on surface) hairs. The species has separate male and female flowers on the same plant (monoecious). Male flowers have no petals, are yellow to translucent, and are borne in clusters on terminal flower stalks. Female flowers have no petals, are yellowish-white, and occur in clusters in the axils of the leaves below the male flower clusters (Nuttall 1840, pp. 344–345; Gray 1882, p. 217; Munz 1935, p. 544; Keck 1959, p. 1103; Ferris 1960, p. 148; Munz 1974, p. 112; Beauchamp 1986, p. 94; Payne 1993, p. 194). Female flowers produce a dry, single-seeded fruit called an achene. References to seeds in this document refer to the single-seeded fruits.

Species Biology and Life History

Ambrosia pumila spreads vegetatively by means of slender, branched, underground root-like rhizomes from which new aboveground stems (aerial stems or ramets) arise each year (Nuttall 1840, p. 344; Munz 1974, p. 112; Payne 1993, p. 194). This growth pattern results in numerous aerial stems interconnected by a system of rhizomes. All aerial stems growing from the same root system are genetically identical and represent a single individual *A. pumila* plant (called a genet) (Harper 1977, p. 26). Growing rhizomes extend underground beyond the aboveground limit of the aerial stems into adjacent suitable habitat, thus rhizomes of adjacent individuals may intermingle. The

underground interconnections can break or disintegrate, resulting in aerial stems that are genetically identical, but physically separate (McGlaughlin and Friar 2007, p. 319).

Aerial stems of *Ambrosia pumila* sprout from their underground rhizomes in early spring after winter rains, and flower between May and October (Keck 1959, p. 1103). However, aerial stems have been observed sprouting under dry conditions in late fall (A. Folarin, USFWS, 2008, pers. obs.). The aerial stems senesce after the growing season, leaving the rhizome system in place from which new aerial stems may sprout when environmental conditions are appropriate (Keck 1959, p. 1103).

The reproductive biology of *Ambrosia pumila* has not been studied to the same extent as the more common *Ambrosia* species, such as *A. artemisiifolia* (common ragweed) and *A. trifida* (giant ragweed) (Dudek 2000, p. 16). Thus, little is known about its pollination system, seed production, seed dispersal, and germination (Dudek 2000, p. 16; Dudek 2003, p. P-331; McGlaughlin and Friars 2007, p. 320).

Ambrosia pumila is presumed to be wind-pollinated because most other species of *Ambrosia* are wind pollinated, and because biological pollinators have not been observed visiting *A. pumila* flowers (Johnson et al. 1999, p. 4; Dudek 2000, p. 16; Dudek 2003, p. P-331). Alternatively, pollinator(s) of *A. pumila* may have been extirpated (Dudek 2003, p. P-331). The species is presumed to be capable of self-pollination and of being self fertile (i.e., self-compatible, where pollen from an individual plant can fertilize an ovule on the same plant, resulting in production of viable seed), because other species of *Ambrosia* are capable of self-pollination (Payne 1976, pp. 171–172). The configuration of the male flowers in relation to the female flowers also implies opportunity for self-pollination (Dudek 2000, p. 16). However, studies are needed to determine whether viable seed is produced through self-pollination in this species (Johnson et al. 1999, p. 4; Dudek 2000, p. 16; Dudek 2003, p. P-332; McGlaughlin and Friars 2007, p. 329). The Service has recommended further study of sensitive aspects of the biology and life history of *A. pumila* as a result of this review (see Recommendations For Future Actions).

Ambrosia pumila is thought to have limited sexual reproductive output due to low production of viable seed (Johnson et al. 1999, pp. 1–5; Dudek 2000, pp. 16–17; Dudek 2003, pp. P-331–P-332). Low seed production in this species is inferred by the lack of fertile fruits on all but a few preserved *A. pumila* museum specimens (G. Wallace, USFWS, 1999, pers. obs.), and field observers have found seed production in *A. pumila* to be low (Dudek 2000, p. 17; Dudek 2003, p. P-332). Specific germination requirements of *A. pumila* seed are unknown. A 1998 germination study using 22 *A. pumila* seeds of unknown viability collected from three sites at Mission Trails Regional Park in San Diego did not result in any germination of seedlings (Dudek 2000, Appendix B). The lack of germination could have been due to the seeds being nonviable or inappropriate germination conditions. Regardless of what proportion of *A. pumila* seeds are viable, low seed production implies that little sexual reproduction is currently occurring in this species. This is not unusual in a clonal plant species (Sackville et al. 1987, p. 54). Reduced sexual reproduction may negatively impact the ability of the species to adapt to rapid environmental change or environmental change over the long term, which is

especially deleterious to a rare species with disjunct occurrences such as *A. pumila* (Dudek 2000, p. 17; Dudek 2003, p. P-332).

The dispersal strategy of *Ambrosia pumila* is unknown. *Ambrosia pumila* seeds lack structures that facilitate dispersal by wind or passing animals (Nuttall 1840, p. 344; Payne 1993, p. 194). The species may depend on periodic flooding of nearby waterways for dispersal of seeds and rhizomes that can produce new aerial stems (Dudek 2003, p. P-332). The longevity of individual plants is also unknown, although plants with clonal growth patterns tend to be long-lived (Watkinson and White 1985, pp. 44–45; Tanner 2001, p. 1980). Finally, the longevity of seeds and potential for buried seed banks to develop in the soil is unknown.

Spatial Distribution

Ambrosia pumila is distributed in southern California from northwestern Riverside County, south through western San Diego County, to northwestern Estado de Baja California, Mexico (CNDDB 2010). It is generally found at or below elevations of 487 meters (m) (1,600 feet (ft)) in Riverside County, and 183 m (600 ft) in San Diego County (CNDDB 2010). At listing, 15 native occurrences of *A. pumila* were considered extant in the United States: 3 in Riverside County and 12 in San Diego County (Figure 1, Appendix A) (USFWS 2002, pp. 44372–44382). The term "native" is used here to differentiate these from occurrences derived from plants translocated to another site. The term "occurrence" is defined as one or more *A. pumila* plants more than 0.40 kilometer (0.25 mile) from another individual or group of individuals (California Department of Fish and Game 2001, p. 1).

Appendices A and B include information on all known occurrences of *Ambrosia pumila.* Not included in the Appendices and excluded from further discussion are occurrences found to be based on misidentified specimens (California Natural Diversity Database Element Occurrence Numbers (EO's) 17, 32, 33, 38, and 56) and occurrences that were combined with existing occurrences prior to listing (EO 5, 10, 23, 37, 46, 47, 49, and 51).

At listing, 15 known natural occurrences were extant. Since listing, 2 of the 15 occurrences (EO 35 and 49) were merged with existing extant occurrences, 2 occurrences thought to be extirpated were found to be extant (EO 14, 16), 2 occurrences considered extant at listing are now considered effectively extirpated (EO 3 and 42), and 4 occurrences were newly detected (EO's 54, 55, 57, and an unnumbered occurrence east of EO 43); EO 54 has since become extirpated. This brings the total number of extant native occurrences to 16 extant native EO's: (1, 12, 14, 16, 29, 34, 40, 43, 45, 48, east of EO 43, 22, 44, 55, 57, 58). Newly identified occurrences were likely in existence at the time of listing, representing a loss of four occurrences; additionally, a fifth occurrence (EO 44) has been much reduced by grading.

Due to the lack of information available regarding the biology and life history of *Ambrosia pumila*, we are unable to determine whether areas containing transplant occurrences sufficiently support the biology and life history of the species. Therefore,

translocated (transplanted) occurrences of *A. pumila* are not discussed in this review. Translocated occurrences may contribute to the conservation and recovery of *A. pumila* since they contain individuals that likely preserve the genetic diversity of the original occurrences, but until we know more about the biology of the species we cannot be sure these occurrences will be viable long term. Currently there are seven known instances in which *A. pumila* have been translocated from their place of origin to new areas, and one translocation planned for 2011 (see Table 1 and Appendix B).

Table 1. Translocated occurrences of *Ambrosia pumila*

CNDDB Elemental Occurrence Number	Former Location	Current Location
Former: 3 Current: N/A	Gillespie Field (airport in unincorporated San Diego County just north of the city of Santee)	North of the San Diego River, within Mission Trails Regional Park*
Former: 4 Current: N/A	Santee; north and south of Mission Gorge Road, between Fanita Drive and Carton Hills Blvd.	Santee; adjacent to Forrester Creek in open-space preserve; managed by City of Santee
Former: 23 Current: part of 12	State Route 52 corridor	Mission Trails Regional Park – small rectangular patch in occurrence 12
Former: unknown Current: 31	Gillespie Field	Gillespie Field, near north side of the airfield
N/A	State Route 76 corridor	Marron Mitigation site – just north of State Route 76 near East Vista Way
N/A	State Route 76 corridor	Along Pilgrim Creek (likely extirpated)
Former: 48 Current: N/A	San Diego National Wildlife Refuge Rancho San Diego (Jamacha); just south of Cottonwood Golf Course	San Diego National Wildlife Refuge near Steele Canyon Bridge; relatively small number of stems translocated for conservation purposes – EO 48 remains extant and intact
N/A	San Luis Rey River corridor	In a nursery awaiting transplantation

* Translocation planned for 2011

According to information used to develop the final listing rule (USFWS 2002, pp. 44372–44382), approximately 18 hectares (ha) (44 acres (ac)) of habitat in San Diego County was occupied by this species in 12 occurrences. This habitat estimate only includes areas where *Ambrosia pumila* stems were found in the 5 to 10 years prior to listing in 2002. Similar area estimate data were unavailable for the three occurrences in Riverside County.

The documented range of *Ambrosia pumila* in Mexico at the time of listing extended from Cabo Colonet south to Lake Chapala in north-central Baja California, Mexico (Burrascano and Hogan 1996, p. 8). Two of these three occurrences were confirmed by David Hogan, formerly with the Southwest Center for Biological Diversity (now Center for Biological Diversity), and Cindy Burrascano of California Native Plant Society, San

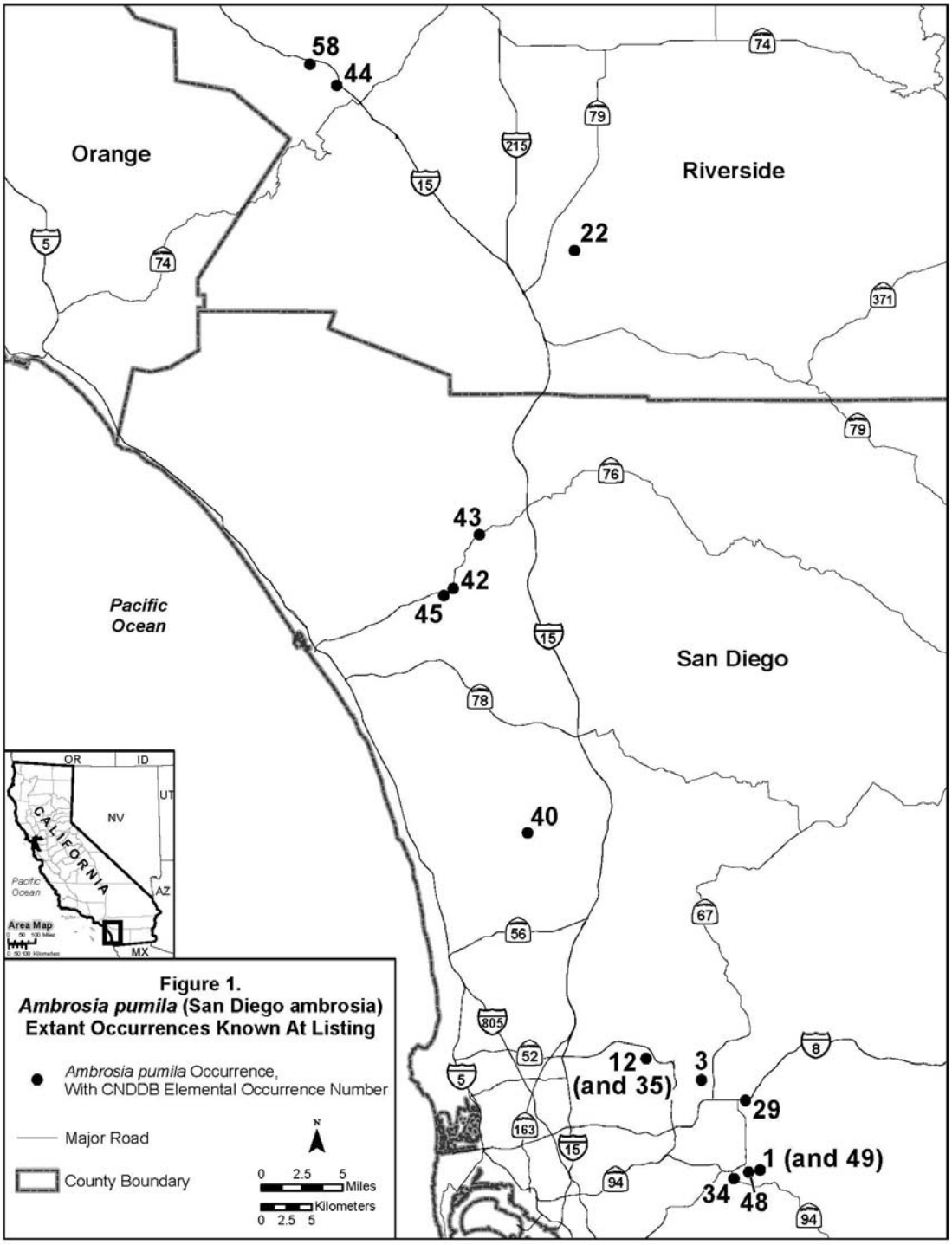

Figure 1: Distribution of extant *Ambrosia pumila* occurrences at listing.

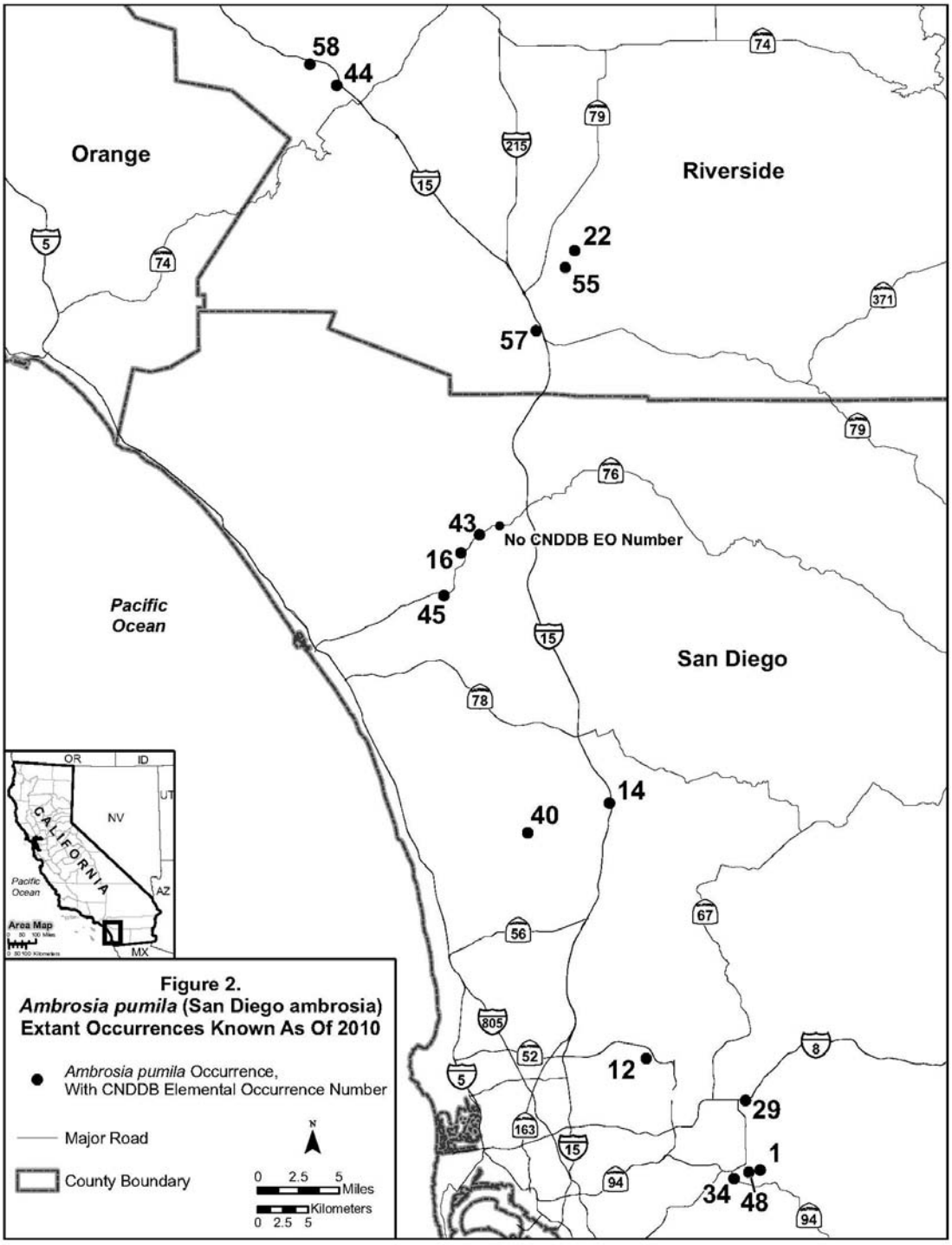

Figure 2: Current distribution of extant *Ambrosia pumila* occurrences as of 2010.

Diego Chapter (Burrascano and Hogan 1996, p. 8). Although additional occurrences may have existed in Baja California, the species was not considered to be widespread at listing due to the lack of suitable habitat and impacts from agriculture and urban development, especially near the coast (Burrascano and Hogan 1996, p. 8).

Abundance

Because of the clonal nature of *Ambrosia pumila*'s growth, it is not possible to directly determine the number of genetically distinct plants (genets) present in an area simply by counting stems (McGlaughlin and Friar 2007, p. 320). McGlaughlin and Friar's (2007, p. 323) analysis of clonality in *A. pumila* determined that the aerial stem-to-genet ratio is roughly 10-to-1 on average (about 1 genet for every 10 aerial stems counted in a patch (cluster of stems)). However, number of stems/patches visible each year may vary due to environmental factors (e.g., rainfall or temperature), and reliable, precise stem counts are not often available for occurrences. Therefore, population trends can only be determined indirectly by assessing changes in the amount of habitat occupied by the species over time.

At listing, there were an estimated 15 known extant, natural (non-transplant) occurrences of *Ambrosia pumila*. Since listing, 2 occurrences were combined with nearby occurrences, and an additional 7 new occurrences were identified bringing the total known extant occurrences to 20. Of these 20 occurrences, 4 have been effectively extirpated since listing (see Appendix A). Most of these losses are attributable to direct or indirect impacts of development discussed below. There are currently 16 known occurrences of *A. pumila*.

Habitat or Ecosystem

Ambrosia pumila occurs primarily on upper terraces of rivers and drainages (Beauchamp 1986, p. 94; Johnson et al. 1999, p. 1; McGlaughlin and Friar 2007, p. 321; CNDDB report for *A. pumila* 2008 (CNDDB 2010)); however, several patches of the plant occur within the watershed of a large vernal (ephemeral) pool at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank in Riverside County (Dudek 2003, p. P-326; CNDDB 2010). Within these areas, the species is found in open grassland of native and nonnative plant species, and openings in coastal sage scrub (Johnson et al. 1999, p. 1; Dudek 2000, p. 18; Dudek 2003, p. P-330; CNDDB 2010), and primarily on sandy loam or clay soils (Johnson et al. 1999, p. 1; Dudek 2000, p. 18; CNDDB 2010; USDA 2008). The species may also be found in ruderal habitat types (disturbed communities containing a mixture of native and nonnative grasses and forbs) such as fire fuel breaks and edges of dirt roadways (Beauchamp 1986, p. 94; Payne 1993, p. 194; CNDDB 2010). Nonnative grassland and ruderal habitat types provide adequate habitat for *A. pumila*; however, nonnative plants can out-compete *A. pumila* plants for resources in some situations. Associated native plants include *Distichlis spicata* (saltgrass), *Baccharis salicifolia* (mulefat), *Baccharis sarathroides* (broom baccharis), *Eriogonum fasciculatum* (California buckwheat), and *Eremocarpus setigerus* (turkey-mullein).

Ambrosia pumila consistently occurs in areas near waterways such as upper terraces of rivers or other water bodies. These areas do not necessarily provide high levels of soil moisture, and *A. pumila* is adapted to dry conditions (Keck 1959, p. 1103; Munz 1974, p. 112; Dudek 2000, Appendix A; CNLM 2008, p. 18). Additionally, Service biologists have observed green (not desiccated) aerial stem shoots of *A. pumila* after small amounts of precipitation and after other vegetation in the observed area had desiccated (Folarin, 2008, pers. obs.). So it is unclear why the species is only found in these areas. *Ambrosia pumila* may require periodic flooding for some segment of its life cycle. Additionally, areas subject to periodic flooding may be less amenable to competing nonnative and native plants.

Changes in Taxonomic Classification or Nomenclature

No changes in taxonomic classification or nomenclature have been made since the species was listed.

Genetics, Genetic Variation, or Trends in Genetic Variation in *Ambrosia pumila*

Little is known about genetic diversity or genetic distribution of *Ambrosia pumila* across its range. McGlaughlin and Friar (2007) conducted a genetic study of *A. pumila* to address conservation and management of the species. They found that each occurrence they examined contained multiple genetically distinct individuals, but that no individual was represented in more than one occurrence. Therefore, they concluded that in order to maintain a level of genetic diversity capable of responding to variable ecological conditions, conservation of the species should involve the protection and maintenance of as many populations of *A. pumila* as possible (McGlaughlin and Friar 2007, pp. 319 and 329).

Species-specific Research and/or Grant-supported Activities

The Center for Natural Lands Management (CNLM) performed a study examining the efficacy of various nonnative plant control methods and their affects on populations of *Ambrosia pumila* (CNLM 2008). Nonnative plant control methods investigated include: mowing, application of Fusilade© II Turfand Ornamental Herbicide (a grass-specific herbicide), and hand-pulling of nonnatives. The investigation was carried out at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank in unincorporated Riverside County, Mission Trails Regional Park in City of San Diego, and San Diego National Wildlife Refuge (SDNWR) in unincorporated San Diego County. Hand-pulling and application of Fusilade© produced the greatest decrease in nonnative cover, and the greatest increase in *A. pumila* cover.

McGlaughlin and Friar (2007) conducted an analysis of clonality in *Ambrosia pumila*. See "Genetics, Genetic Variation, or Trends in Genetic Variation in *Ambrosia pumila*" section above for study summary.

Five-Factor Analysis

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

At listing, in 2002, *Ambrosia pumila* was considered endangered in part because its habitat was damaged or destroyed by a variety of human-caused activities (USFWS 2002, p. 44376). It was estimated that 15 of the 40 occurrences remained extant and viable (USFWS 2002, p. 44373). The listing rule states that remaining occurrences were vulnerable to one or more of the following habitat disturbances: present or threatened destruction, fragmentation, and degradation of habitat primarily by construction and maintenance of highways, maintenance of utility easements, development of recreational facilities, and residential and commercial development. The current magnitude of these and other threats to *A. pumila* habitat throughout the range of the species are discussed below. Nonnative plants, if present in large enough numbers, may change the plant community in *A. pumila* habitat to the extent that *A. pumila* plants can no longer receive adequate sunlight and airflow. The threat of nonnative plants to *A. pumila* is discussed under Factor E.

Development – Habitat Loss

At listing, development was a significant threat to *Ambrosia pumila* throughout its range and nearly all of the 25 known natural occurrences lost prior to listing were extirpated by urban development and highway construction (USFWS 2002, p. 44373).

Habitat loss associated with development is the result of destruction and modification of *Ambrosia pumila* habitat (associated soils and plant community) due to filling, grading, discing, construction, landscaping, and other activities. Urban development has displaced habitat supporting one occurrence of *A. pumila* since the species was listed in 2002, and will soon displace habitat supporting another. EO 4 formerly located in the City of Santee was converted to urban development in 2009 (A. Himes-Cornell, USFWS, 2009, pers. obs.). Some of *A. pumila* plants in this occurrence were salvaged and transplanted to a conserved area southeast of the original occurrence, adjacent to Forrester Creek. Also, the habitat supporting EO 3 located at Gillespie Field airport will be converted to development in the near future by an airport expansion project (USFWS 2009b). *Ambrosia pumila* plants in this occurrence will be transplanted to a predetermined area in Mission Trails Regional Park.

Ambrosia pumila occurrences are protected from habitat loss if they are on lands that are conserved – lands on which development activities and other man-made disturbances are legally precluded. At the time of listing, EO's 22 (Barry Jones (Skunk Hollow) Wetland Mitigation Bank), 35 and 12 (Mission Trails; these two occurrences have been combined since listing), and 48 (SDNWR) were conserved and EO 34 (SDNWR) was partially conserved. Currently, in addition to those conserved at listing, EO's 16 (Olive Hill Road), and 58 (Alberhill Conservation Area (Lake Street)) are conserved, and EO 40

(Crosby Estates) is partially conserved. Of the 16 currently known extant occurrences of *A. pumila*, 7 are conserved or partially conserved. The remaining 9 of 16 occurrences are not conserved and are more vulnerable to habitat loss from urban development. However, 5 of the 9 extant occurrences not conserved, and the unprotected portions of the 2 partially conserved occurrences are covered under multi-species Habitat Conservation Plans (HCPs) and thus are afforded protection under the HCPs.

The Western Riverside County Multiple Species Habitat Conservation Plan (Western Riverside County MSHCP) affords protection to two conserved occurrences (EO's 22 and 58) and three occurrences that are not conserved under the plan (EO's 44, 55, and 57). EO's 44 and 57 occur within the Western Riverside County MSHCP Criteria Area. Because these occurrences are within the Criteria Area, any development projects in these areas are required to be implemented through the Joint Project Review process to ensure that the requirements of the Western Riverside County MSHCP permit and the Implementing Agreement are properly met (Western Riverside County MSHCP, Volume 1, section 6.6.2 in Dudek 2003, p. 6–82). EO 44 is also within the Western Riverside County MSHCP Narrow Endemic Plant Species survey area. On properties within the Narrow Endemic Plant Species survey area with positive survey results for *Ambrosia pumila*, impacts to 90 percent of portions of the property that provide long-term conservation value for the species will be avoided until it is demonstrated that the conservation objectives for the species have been met, at which time avoidance will no longer be required (see Protection of Narrow Endemic Plant Species; Western Riverside County MSHCP, Volume 1, section 6.1.3, in Dudek 2003). Protections provided the species in these areas are discussed further under Factor D.

The City of San Diego Subarea Plan under the Multiple Species Conservation Program (MSCP) affords protection to one conserved occurrence (EO 12). EO 14 is not within the MSCP Multi-Habitat Planning Area, but is provided protection under the MSCP narrow endemic species policy, i.e., the species will receive protection from development as appropriate via management, enhancement (for example, removing nonnative species), restoration, or transplantation to areas identified for preservation (City of San Diego 1997, pp. 105–106; Service 1997, p. 15). Protections provided the species under the City of San Diego MSCP Subarea Plan are discussed below under Factor D.

The County of San Diego Subarea Plan under the MSCP provides protection to one conserved occurrence (EO 48) and two partially conserved occurrences (EO's 34 and 40). EO 1 is also provided some protection from development under the County of San Diego MSCP Subarea Plan by impact avoidance measures required under the County's Biological Mitigation Ordinance. Narrow endemic plants, including *A. pumila*, are conserved under the Biological Mitigation Ordinance using a process that: (1) requires avoidance to the maximum extent feasible; (2) allows for a maximum 20 percent encroachment into a population not already conserved if total avoidance is not feasible; and (3) requires in-kind mitigation at 1-to-1 to 3-to-1 ratios for impacts if avoidance and minimization of impacts would preclude reasonable use of the property (County of San Diego 1997, p. 11; USFWS 1998, p. 12). Protections provided the species under the County of San Diego MSCP Subarea Plan are discussed below under Factor D.

Protection under the draft North County MSCP is proposed for one conserved occurrence (EO 16) and three occurrences that are not conserved (EO 43 and the occurrence east of EO 43). EO 45 is proposed to be covered under the draft Northwestern San Diego County Multiple Habitat Conservation Plan.

Habitat loss from development is still a threat impacting *A. pumila* occurrences. See the discussion under Factor D for more detail regarding HCPs.

Summary of Factor A

The loss and modification of *Ambrosia pumila* habitat continues to be a threat to the species. Of the 16 currently known extant occurrences of *A. pumila*, 7 are conserved or partially conserved; 9 of the 16 remaining occurrences are not conserved and are vulnerable to habitat loss via urban development. However, multi-species HCPs afford protection to 5 of the 9 occurrences that are not conserved. We cannot be certain that we know all of the specific threats to *A. pumila* habitat, because of the limited data available regarding the life history of *A. pumila*.

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

In the listing rule we did not consider any threats attributable to this factor to apply (USFWS 2002, p. 44377). We believe that this assessment remains valid.

FACTOR C: Disease or Predation.

In the listing rule, we did not consider disease to impact *Ambrosia pumila* and we believe that this assessment is still valid (USFWS 2002, p. 44377).

Grazing was discussed as a threat to *Ambrosia pumila* under Factor E in the listing rule (USFWS 2002, p. 44378), but is treated in Factor C in this 5-year review. The listing rule stated that one occurrence at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank (EO 22) in Riverside County was grazed by sheep that could threaten the plant's ability to persist by reducing the vegetative portions of the plants (USFWS 2002, p. 44378). Grazing no longer occurs in this area, and is thus no longer a threat to *A. pumila*.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms.

At the time *Ambrosia pumila* was listed as endangered under the Act, it was not protected by any other regulatory mechanisms. In the listing rule (USFWS 2002, p. 44372), inference was made to potential protections under the California Endangered Species Act

(CESA) enacted in 1984, the Native Plant Protection Act (NPPA) enacted in 1977, and the California Environmental Quality Act (CEQA) enacted in 1970.

The following discussion describes State and Federal laws and regulations that are relevant to conservation of *Ambrosia pumila* and contribute to its conservation. These measures, most enacted in the past 30 to 40 years, have greatly reduced or eliminated the threat of habitat destruction for this plant.

State Protections

State laws potentially providing protection to *Ambrosia pumila* include CESA, NPPA, CEQA, and the Natural Communities Conservation Planning (NCCP) Act enacted in 1991. *Ambrosia pumila* was not a State-listed species at the time it was federally-listed, nor is it State-listed at this time.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA)

Both the NPPA and CESA include prohibitions forbidding the "take" of State-listed species (Chapter 10, Section 1908 and Chapter 1.5, Section 2080, CFG code). With regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners are notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify California Department of Fish and Game (CDFG) 10 days in advance of changing land use in order to allow salvage of listed plants. Sections 2081(b) and (c) of CESA allow CDFG to issue incidental take permits for State-listed threatened and endangered species if:

1) The authorized take is incidental to an otherwise lawful activity;
2) the impacts of the authorized take are minimized and fully mitigated;
3) the measures required to minimize and fully mitigate the impacts of the authorized take are roughly proportional in extent to the impact of the taking of the species, maintain the applicant's objectives to the greatest extent possible, and are capable of successful implementation;
4) adequate funding is provided to implement the required minimization and mitigation measures and to monitor compliance with and the effectiveness of the measures; and
5) issuance of the permit will not jeopardize the continued existence of a State-listed species.

Although *Ambrosia pumila* is not listed under CESA, it can co-occur with other listed State species and, therefore, may receive indirect protection under CESA and NPPA.

The Natural Community Conservation Planning (NCCP) Act

The 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. An NCCP

identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. The program began in 1991 under the State's NCCP Act (CFG Code 2800-2835). 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 depend. Many NCCPs are developed in conjunction with HCPs prepared pursuant to the Act. The Western Riverside County MSHCP, City of San Diego Subarea Plan under MSCP, and County of San Diego Subarea Plan under the MSCP are discussed below under the Act.

California Environmental Quality Act (CEQA)

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

Federal Protections

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Clean Water Act

Under section 404, the U.S. Army Corps of Engineers (Corps) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters,

headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term "wetland" refers to areas meeting the Corps' criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any action with the potential to impact waters of the United States must be reviewed under the Clean Water Act, NEPA, and the Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts. Most occupied habitat for *Ambrosia pumila* is found outside of the Waters of the United States, thus most of the impacts to the taxon would not fall under Corps' jurisdiction.

Endangered Species Act of 1973, as amended (Act)

Since listing, the Act is the primary Federal law that may provide protection for *Ambrosia pumila*. The Service's responsibilities include administering the Act, including sections 7, 9, and 10. Section 7(a)(2) of the Act requires Federal agencies, including the Service to ensure that actions they fund, authorize, or carry out do not "jeopardize" a listed species or result in the "destruction or adverse modification" of habitat in areas designated by the Service to be "critical." Critical habitat has been proposed for this taxon (74 FR 44238; August 27, 2009). A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 C.F.R. § 402.02).

Under Section 9(a)(2) of the Act, with respect to endangered plant taxa, it is unlawful to remove and reduce to possession (i.e., collect) any such taxon from areas under Federal jurisdiction; maliciously damage or destroy any such taxon on any such area; or remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law. As noted above, *Ambrosia pumila* is not listed by the State of California, and most occurrences of *A. pumila* are on non-Federal lands (CNDDB 2010).

Under Section 10(a)(1)(A) of the Act, there are provisions for collection of plants or plant parts for scientific purposes or to enhance the propagation and survival of the species. Under section 10(a)(1)(B) of the Act, the Service may issue "incidental take" (take is defined in section 3(18) of the Act) permits for listed animal species to non-Federal applicants. Take and therefore incidental take protections are not extended to plants. "Incidental take" refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved HCP that details measures to [avoid] minimize and mitigate the project's adverse impacts to listed species including listed plants. Issuance of an incidental take permit by the Service is subject to section 7 of the Act; thus, the Service is required to ensure that the actions proposed in the HCP are not likely to jeopardize the animal or plant species or result in the destruction or adverse modification of critical habitat. Therefore, HCPs may provide an additional layer of regulatory protection to animals as well as plants. Although Section 10(a)(1)(B) allows for

exemptions to take prohibitions under section 9 for animals, it does not allow for similar exemptions for plants. Many NCCPs are developed in conjunction with HCPs prepared pursuant to the Act. The Western Riverside County MSHCP, City of San Diego MSCP Subarea Plan, and County of San Diego MSCP Subarea Plan are discussed below.

Western Riverside County MSHCP:

At the time of listing, *Ambrosia pumila* was proposed for coverage under the Western Riverside County MSHCP. At that time, only one occurrence of *A. pumila* in Riverside County (Barry Jones (Skunk Hollow) Wetland Mitigation Bank; EO 22) had been conserved; the other two known occurrences (Nichols Road (EO 44) and Lake Street (EO 58)) were afforded no protection.

The Western Riverside County MSHCP was finalized in 2004 and *Ambrosia pumila* is a covered species under the plan. Specific conservation objectives stated in the Western Riverside County MSHCP for *A. pumila* include conserving at least 8,822 ha (21,800 ac) of occupied or suitable habitat for the species. Specific areas identified for conservation include the occurrences at the Barry Jones (Skunk Hollow) Wetland Mitigation Bank (EO 22), and the occurrence near Temescal Creek at Nichols Road (EO 44). Additionally, the permittees of the Western Riverside County MSHCP anticipated conservation of an occurrence near Temescal Creek east of Lake Street (EO 58), in accordance with its Narrow Endemics Policy (Dudek 2003, pp. P-327–P-328). The Skunk Hollow and Lake Street occurrences have been conserved. The Nichols Road occurrence has not been conserved yet, and though this occurrence has been significantly impacted by human activities (discing and grading), conservation of *A. pumila* in Subunit 1B is expected to occur as anticipated under the Western Riverside County MSHCP. The remainder of the 8,822 ha (21,800 ac) to be conserved is to be attained through acquisition or other dedications of lands within the Criteria Area (lands identified for potential inclusion in the Western Riverside County MSHCP's Conservation Area) and through coordinated management of existing Public/Quasi-Public lands (pre-existing natural and open space areas including those under Federal ownership, primarily managed by the U.S. Forest Service and U.S. Bureau of Land Management (BLM), and also permittee-owned or controlled open-space areas, primarily managed by the State and Riverside County).

Additionally, the Western Riverside County MSHCP requires surveys for *Ambrosia pumila* as part of the project review process for public and private project proposals where suitable habitat is present within a defined Narrow Endemic Plant Species survey area (see Narrow Endemic Plant Species survey area Map, Figure 6–1 of the Western Riverside County MSHCP, Volume I *in* Dudek 2003). For locations with positive survey results, 90 percent of those portions of the property that provide long-term conservation value for the species will be avoided until it is demonstrated that the conservation objectives for the species are met (see Additional Survey Needs and Procedures; Western Riverside County MSHCP, Volume 1, section 6.3.2 *in* Dudek 2003). Surveys required in the Narrow Endemic Plant Species survey area are expected to lead to the discovery and protection of additional occurrences of *A. pumila*. For example, the occurrence near Santa Gertrudis Creek (EO 55) was identified during surveys for a proposed project, and

the project proponents subsequently protected the occurrence by avoiding stems during development and maintenance activities. The Western Riverside County MSHCP offers no protection for the *A. pumila* occurrence found both outside of the Narrow Endemic Species Survey Area and outside of the Criteria Area (such as the occurrence near Santa Gertrudis Creek (EO 55)), however in this case the HCP has lead to identification and some protections for an occurrence outside of these areas. A fifth occurrence of *A. pumila*, near Murrieta Creek in the City of Temecula (EO 57), is not conserved, but falls within the Criteria Area, therefore, projects proposed in this area will be reviewed through the Joint Project Review Process to ensure the requirements of the HCP permit and the Implementing Agreement are properly met (Western Riverside County MSHCP, Volume 1, section 6.6.2 in Dudek 2003, p. 6–82). Subunit 3B is not within the Narrow Endemic Plant Species Survey Area..

San Diego Multiple Species Conservation Program (MSCP):

Ambrosia pumila is a covered species under the MSCP (MSCP 1998, Table 3-5). To protect *A. pumila* habitat, the City and County of San Diego MSCP Subarea Plans require that development be configured in a manner that minimizes impacts to sensitive biological resources and species covered by those plans (USFWS 1997, p. 10; USFWS 1998, p. 7). The City of San Diego's preserve and two segments (Lake Hodges and South County) of the County's preserve are delineated by mapped preserve boundaries referred to as "hardline" boundaries (the Multi-Habitat Planning Area). The remainder of the County of San Diego preserve areas does not have "hardline" boundaries, but the County's subarea plan identifies areas where mitigation activities should be focused to assemble its preserve areas (the Pre-Approved Mitigation Areas).

Known occurrences of *Ambrosia pumila* located within the City of San Diego MSCP Subarea Plan area include the element occurrence in Mission Trails Regional Park (EO 12) and the occurrence east of Lake Hodges (EO 14). The City of San Diego MSCP Subarea Plan requires preservation of over 90 percent of the what remains of the occurrence of *A. pumila* in Mission Trails Regional Park, additional impact avoidance and other measures as required under the MSCP Plan for narrow endemic species, and area specific management directives designed to maintain long-term survival in the planning area (USFWS 1997, pp. 104–105). Under the City of San Diego MSCP Subarea Plan, impacts to narrow endemic plants, including *A. pumila*, inside the Multi-Habitat Planning Area will be avoided, and outside the Multi-Habitat Planning Area will be protected as appropriate by: (1) avoidance of impacts; (2) management; (3) enhancement; or (4) transplantation to areas identified for preservation (City of San Diego 1997, pp. 105–106; USFWS 1997, p. 15).

Known occurrences of *Ambrosia pumila* located within the County of San Diego MSCP Subarea Plan area include the element occurrence near the intersection of Jamul Road and Steele Canyon Road (EO 1), the occurrence near Steele Canyon Bridge (EO 34), the occurrence west of Lake Hodges (EO 40), and the occurrence on SDNWR (EO 48). The County of San Diego MSCP Subarea Plan provides two levels of protection for *A. pumila*. First, area-specific management directives must be designed for *A. pumila* to

maintain long-term survival in the planning area (USFWS 1998, pp. 60–61). Second, the County of San Diego MSCP Subarea Plan dictates that on category 3 lands (lands for which the County Plan has not delineated preserve and development boundaries), any newly discovered occurrences of *A. pumila* will be protected by impact avoidance measures required under the County's Biological Mitigation Ordinance. Narrow endemic plants, including *A. pumila*, are conserved under the Biological Mitigation Ordinance using a process that: (1) requires avoidance to the maximum extent feasible; (2) allows for a maximum 20 percent encroachment into a population not already conserved if total avoidance is not feasible; and (3) requires in-kind mitigation at 1-to-1 to 3-to-1 ratios for impacts if avoidance and minimization of impacts would preclude reasonable use of the property (County of San Diego 1997, p. 11; USFWS 1998, p. 12).

The City of San Diego has a management plan in place for the *Ambrosia pumila* occurrence in Mission Trails Regional Park (Dudek 2000), ongoing monitoring (City of San Diego 2000, 2001, 2003, 2006, and 2008), and ongoing maintenance of the Mission Trails Regional Park occurrence, including building and maintaining fencing, and rerouting or closing trails to protect plants (Dudek 2000, pp. 29–30). The Crosby at Rancho Santa Fe Habitat Management Plan provides for the management and monitoring of the *A. pumila* occurrence in The Crosby at Rancho Santa Fe Open Space areas (EO 40). Management/monitoring activities have included annual surveys of the occurrence, nonnative plant removal, and signage to reduce trampling impacts from hikers using a trail adjacent to the occurrence (Rincon Consultants, Inc. 2009, p. 17 and Appendix B). On other non-Federal lands covered by the City or County of San Diego Subarea Plans, management plans, management, and monitoring are not yet in place.

Summary of Factor D

Loss of *Ambrosia pumila* habitat has continued to occur since listing, however, the above laws and regulations have reduced the likelihood of destruction of *A. pumila* occurrences and alteration of occupied habitat. Protections afforded under regional HCPs have decreased major habitat loss and alteration and currently afford protection to 11 of the 16 extant occurrences; 4 additional occurrences are expected to receive protections under HCPs that are currently in draft form. However, existing regulatory mechanisms are still insufficient to ameliorate impacts to *A. pumila* from current threats rangewide.

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

At the time of listing, negative impacts from nonnative plants, mowing and discing for fuel modification, and trampling by horses, humans, and vehicles were believed to be significant threats to *Ambrosia pumila* plants (USFWS 2002, pp. 44378–44379). These threats continue to impact *A. pumila* plants throughout the range of the species. Grazing was also mentioned in the rule under Factor E, but discussion of this has been moved to Factor C of this 5-year review. New threats since listing include fragmentation and climate change.

Impacts from all current threats are discussed below under the following headings: Competition from Nonnative Plants, Fuel Modification, Fragmentation, Altered Hydrology, and Climate Change.

Competition from Nonnative Plants

At the time *Ambrosia pumila* was listed as endangered, nonnative plants were known to pose a serious threat to the species. The following discussion of this threat is taken from the listing rule:

> "Non-native plants are considered a threat to virtually all of the extant occurrences of *Ambrosia pumila* (CNDDB 1999; J. Vanderwier, in litt. 1998). Non-native species of grasses and forbs have invaded many of southern California's plant communities. Their presence and abundance are often an indirect result of persistent and repeated habitat disturbance from development, discing, mowing, alteration of local hydrology, and the presence and maintenance of highways and trails. Overgrowth and competition by nonnative plants likely affect the reproductive potential of this low growing, wind-pollinated species (CNDDB 1999). Non-native plants found with *A. pumila* include *Brassica* spp. (mustard), *Vulpia* spp. (annual fescue), *Erodium* spp. (crane's-bill), *Bromus* spp. (brome grass), and *Foeniculum vulgare* (sweet fennel). While scientific studies on the effects of non-native plants on *A. pumila* have not been undertaken, the presence of these and other non-native plants is likely to affect (1) pollen and fruit dispersal by impeding flow of wind-blown pollen and local dispersal of seeds; (2) fire patterns by increasing the fuel loads due to the influx of nonnative plants; (3) hydrological conditions by decreasing the amount of water available for *A. pumila*; and (4) the cumulative effects by reducing the vegetative productivity and the apparently low seed production for this species."

Nonnative plants continue to encroach upon *Ambrosia pumila* populations and pose a significant threat to the species throughout its range (CNDDB 2010; CNLM 2009, p. 3; Folarin, 2008, 2009, pers. obs.). Since listing, no research has been done to clarify the specific effects of nonnative plants on *A. pumila*. A recent study by CNLM demonstrated that reduction of nonnatives increases percent cover of *A. pumila* (CNLM 2008, p. 5; 2009, pp. 8 - 9). Though it is unknown by what mechanism nonnative plants inhibit the growth of *A. pumila* stems, we do know that nonnative plants have a negative effect on the species.

Fuel Modification

Weed abatement, fire suppression, and landscaping practices (including mowing, discing, and plowing) are fuel modification activities that were recognized as a threat to several occurrences of *Ambrosia pumila* in the listing rule. Mowing *A. pumila* plants, if done in midsummer to early fall, can remove flowering portions of the aerial stems, thus decreasing or preventing seed output. Mowing stems at other times may reduce the

vegetative vigor of the plants. Mowing is known to occur regularly in two occurrences: EO 43 (in unincorporated northern San Diego County, adjacent to State Route 76 near Calle de la Vuelta) and EO 29 (near 3rd Street and Oakdale Avenue, south of Interstate Highway 8, in the City of El Cajon) (CNDDB 2010, pp. 26 and 38).

Mowing has been shown to be effective in controlling nonnative plant populations in areas where *Ambrosia pumila* occurs, and, if done at appropriate times of the year, may be a valuable management tool. For example, EO 31, an occurrence subjected to periodic mowing (transplant occurrence on north end of Gillespie Field airport), has a higher density of *A. pumila* stems than EO 3 (natural occurrence in southeastern portion of Gillespie Field), which is a nearby occurrence that was not mowed periodically (Folarin, 2009, pers. obs.).

Discing, grading, or plowing occupied areas can break apart stems and rhizomes and leave rhizomes vulnerable to desiccation, potentially killing plants. Grading can also remove stems and rhizomes from a site completely. Discing is thought to be responsible for the apparent extirpation of an occurrence identified in 2005 near Steele Peak in Riverside County (EO 54) (Folarin, 2009, pers. obs.). Discing or grading has also significantly reduced an occurrence near Nichols Road in Riverside County (EO 44) (Boyd, 2007, pers. comm.).

Mowing, discing, grading, and plowing could pose a significant threat to the nine occurrences that are not conserved or managed. HCPs should provide some protection from this threat to five of the nine occurrences that are not conserved. Draft HCPs, when they are finalized, may provide protection to another three of the nine occurrences that are not conserved.

Trampling

Human encroachment into *Ambrosia pumila* habitat on foot, bicycles, or horses can result in trampling of *A. pumila* stems along often-used trails (Dudek 2000, p. 20). Trampling and soil compaction were identified in the listing rule as a significant threat to *A. pumila*, affecting the species through direct destruction of stems and affecting its habitat by reducing percolation of water into the soil. The effects of soil compaction on *A. pumila* are not known. It was noted in the listing rule and has been widely observed that aerial stems of the species are generally absent from often-used trails through patches otherwise densely occupied by *A. pumila* stems (Dudek 2000, p. 20; Martin 2005, p. 3; Folarin, 2008, 2009, pers. obs.); however, in areas where trail use has been curtailed, *A. pumila* stems have proliferated within disused trails (Folarin, 2008, 2009, pers. obs.). This implies that soils compacted by trampling may be suitable for *A. pumila* once the trampling threat is removed. Thus, destruction of *A. pumila* stems by trampling is likely the more significant threat.

Efforts have been made to restrict human encroachment to trails impacting the occurrences in Mission Trails Regional Park and SDNWR (EO's 12 and 48 respectively) (Dudek 2000, p. 21; J. Martin, USFWS, 2008, pers. comm.). Fencing and signage has

much reduced use of trails through areas occupied by *A. pumila* at Mission Trails Regional Park. *Ambrosia pumila* continues to be impacted or vulnerable to impacts by human encroachment in all occupied areas other than the occurrences at Mission Trails Regional Park, the Barry Jones (Skunk Hollow) Wetland Mitigation Bank, and Lake Street (Alberhill) (EO's 22 and 58 respectively), which are fenced and managed to minimize human encroachment (CNDDB 2010; Folarin, 2008, 2009, pers. obs.).

Fragmentation

Most occurrences of *Ambrosia pumila* are patchy in nature, composed of a few to numerous smaller groups of aerial stems (McGlaughlin and Friars 2007, p. 319). While some of this patchiness may be inherent to the growth habit of the species, many occurrences are also fragmented by development activities, competition by nonnative plants, and human encroachment (CNDDB 2010). The creation and continued use of paths through occurrences of *A. pumila* has been a major source of fragmentation (e.g., EO's 48 (SDNWR) (Martin 2005, p. 3; CNDDB 2010), 12 (Mission Trails Regional Park) (Dudek 2000, p. 20; CNDDB 2010), 14 (northeast of Lake Hodges) (CNDDB 2010), 16 (near Olive Hill Road and State Route 76) (CNDDB 2010)), and 44 (near Nichols Road in Riverside County).

The City of San Diego and the Service have taken measures to reduce the number of paths fragmenting the occurrences at Mission Trails Regional Park and SDNWR respectively (Dudek 2000, p. 21; Martin, 2008, pers. comm.). At Mission Trails Regional Park, fencing and signage has largely eliminated use of trails formerly cutting through a major portion of the occurrence there (Dudek 2000, p. 21). Efforts to reduce use of side trails impacting the occurrence of *Ambrosia pumila* at SDNWR via signage are ongoing (Martin, 2008, pers. comm.). The occurrence near the intersection of Olive Hill Road and State Route 76 has been fenced and signed by CalTrans.

Fragmentation of *Ambrosia pumila* occurrences could diminish the efficacy of wind pollination or biological pollinators by increasing the between-population distances. It has been presumed by many that *A. pumila* is wind pollinated (Johnson et al. 1999, p. 4; Dudek 2000, p. 16; Dudek 2003, p. P-331), but it is not implausible that the species could be pollinated by biological agents (Dudek 2003, p. P-331). However, we do not know if fragmentation is a significant threat because we do not know to what degree *A. pumila* depends on seeds for reproduction (Dudek 2000, p. 16; Dudek 2003, p. P-331; McGlaughlin and Friars 2007, p. 320). There is no doubt that the loss of plants that leads to fragmentation is a significant problem, but whether the spaces created between groups of plants when patches of *A. pumila* are subdivided (e.g., by soil compacting activities, competition from nonnative plants, grading/discing) create new issues for the resulting subgroups is unknown. The smaller patches resulting from fragmentation may also be less resilient when faced with stochastic phenomena such as fire or drought; however, we do not know how significant these threats are to the species.

Altered Hydrology

Ambrosia pumila occurrences are almost always found on the upper terraces of rivers/streams or near the margins of vernal pools, where under natural conditions they would likely be subjected to inundation during large-scale flooding events (McGlaughlin and Friars 2007, p. 320). If *A. pumila* is dependent on these periodic flooding events for some aspect of its life history (e.g., seed germination, dispersal) or control of competing plants, altering the flooding regimes of associated waterways or vernal pools could have a significant impact on the species. However, since we are unsure if or to what degree *A. pumila* is dependent upon periodic flooding or other aspects of its proximity to waterways, we cannot say with certainty to what degree altering the hydrology of adjacent waterways would impact the species.

Climate Change

Since listing, it has become apparent that there is potential for threats to biota from ongoing accelerated climate change (IPCC 2007). The impacts of local climatic shifts on populations of native and nonnative plants that compete with *Ambrosia pumila* and the interaction of these shifts with other ongoing threats are as yet unmeasured. Habitat conditions altered as a result of climate change impacts could favor invasive nonnative plants, which could then out-compete *A. pumila* for resources. Climatic change could also impact hydrological systems on which the species may depend. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information at this time to make accurate predictions regarding its effects to particular species and habitats, including *A. pumila*.

Summary of Factor E

Threats to *Ambrosia pumila* from nonnative plants and fuel modification were considered significant at listing and continue to impact the species range-wide. Nonnative plants are likely present in every occurrence of the species, and are known to be pervasive in most, posing a significant threat to the species. Management of occupied *A. pumila* habitat is needed to address this issue. As discussed above in the "Species-specific Research and/or Grant-supported Activities" section, CNLM recently examined the effectiveness of various nonnative plant control methods and their affects on *A. pumila*. Results of this study have yet to be applied to occurrences of the species. Fuel modification activities have also continued to impact the species in more isolated instances, although since listing it has been noted that mowing at appropriate times of the year can be an effective tool for management of nonnative plants. Trampling of *A. pumila* stems continues to impact the species in all occupied areas that are not fenced and managed to minimize human encroachment. The significance of other threats such as fragmentation, alteration of the hydrology of associated waterways, and climate change is as yet unclear. Overall, *A. pumila* continues to be impacted throughout its range and may be affected by other threats relative to its life history and habitat that are not currently understood.

IV. SYNTHESIS

Impacts from development continue to affect *Ambrosia pumila* and have resulted in the extirpation of four occurrences since listing. Most of these losses are due to direct (habitat loss) or indirect (soil compaction) impacts of development. Currently, 7 of the 16 remaining occurrences are conserved or partially conserved, and thus are protected from development. *Ambrosia pumila* is not listed as endangered by the State of California and most occurrences of *A. pumila* are located on non-Federal lands. Though not fully conserved, the Western Riverside County MSHCP, City of San Diego MSCP Subarea Plan, and County of San Diego MSCP Subarea Plan afford protection to 11 of the 16 occurrences.

Ambrosia pumila continues to be impacted throughout its range by additional threats, including nonnative plants and fuel modification activities. We do not know enough about the life history and biology of *A. pumila* to assess the significance of other potential threats such as fragmentation, altered hydrology, and climate change. Because of the ongoing threats to *A. pumila* and the need for further protection and management of the few remaining occurrences, we recommend no change be made to the status of *A. pumila* as endangered 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: 11C.

We recommend a change in the recovery priority number for *Ambrosia pumila* from 5C to 11C. The threat of habitat loss has been reduced through implementation of multi-species HCPs. Nearly half of the occurrences are currently conserved by regional plans, which afford at least some protection to 11 of the 16 extant occurrences; 4 more occurrences should receive protection in the future. Additional threats impacting *A. pumila* include nonnative plants and fuel modification and there is a limited amount of data available regarding the life history of this species. Therefore, *A. pumila* is a species that faces a moderate degree of threat, has a low recovery potential, and is in conflict with development.

VI. RECOMMENDATIONS FOR FUTURE ACTIONS

1) Identify opportunities through the Service's Partners for Fish and Wildlife Program to seek habitat restoration and enhancement opportunities.

2) Work with partners to implement nonnative plant control methods such as those demonstrated effective by CNLM's 2008 study.

3) Work within the Service and with outside researchers to design studies aimed at gaining insight into sensitive aspects of the biology and life history of *Ambrosia pumila*.

4) Conduct field surveys to verify persistence of occurrences that are in question and accurately map extant occurrences.

5) Determine whether a program to propagate *Ambrosia pumila* in greenhouses and outplant the resulting plants in unoccupied areas would be biologically sound and feasible.

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Appendix A. *Ambrosia pumila* occurrences extant at listing or identified since listing

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
		San Diego County		
Currently Extant				
1	Southeast of El Cajon near Cottonwood Golf Course at and near junction of Jamul Road and Steele Canyon Road Includes former EO 49 which was discussed as a separate occurrence in listing rule	At listing: extant	In listing rule: Factor A - nonnative plants, trampling during SDG&E utility tower maintenance and other human encroachment Factor E - nonnative plants, vehicle parking, discing, periodic mowing	At listing: Ownership – private HCP coverage – within County of San Diego MSCP Subarea Plan area; outside of pre-approved mitigation area Conservation Status – not conserved or managed
		Current: extant	Current: same	Current: same
12	Mission Trails Regional Park, just south of SR 52 and west of Santee in City of San Diego Includes former EO35 which was discussed as a separate occurrence in listing rule.	At listing: extant	In listing rule: Factor A - nonnative plants, trampling Factor E - nonnative plants	At listing: Ownership – City of San Diego HCP coverage – Within City of San Diego MSCP Subarea Plan; within Multi-Habitat Planning Area Conservation Status – conserved and managed by City of San Diego
		Current: extant	Current: same	Current: same
14	Near Lake Hodges, just southwest of the intersection of I-15 and Felicita Road	At listing: considered extirpated	In listing rule: N/A	At listing: N/A
		Current: extant	Current: Factor A - development, nonnative plants, trampling Factor E - nonnative plants	Current: Ownership – City of San Diego HCP coverage – Within City of San Diego MSCP Subarea Plan; outside of Multi-Habitat Planning Area Conservation Status – not conserved or managed
16	On the north and south sides of Olive Hill Road, west of Mission Road, in San Luis	At listing: considered extirpated	In listing rule: N/A	At listing: N/A

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
	Rey River valley	Current: portion on north side extirpated; portion on south side extant	Current: nonnative plants	Current: Ownership – California Department of Transportation HCP coverage – Not covered under any finalized HCP Conservation Status – conserved and managed by CalTrans as part of the Groves Open Space Preserve
29	3rd Street and Oakdale Ave., south of I-8, in El Cajon	At listing: extant	In listing rule: Factor A - development, nonnative plants, Factor E - nonnative plants, mowing	At listing: Ownership – California Department of Transportation HCP coverage – Within Regional MSCP plan area; not covered under a MSCP subarea plan Conservation Status – not conserved or managed except for mowing which might reduce nonnatives
		Current: extant	Current: Factor A - development, indirect impacts of urbanization	Current: same
34	Near Steele Canyon Bridge, east side of State Route 94, in and just above a concrete lined ditch and further up slope Also a small fenced patch south of Steele Canyon Bridge and west of SR-94 on Federal lands	At listing: extant	In listing rule: Factor A - nonnative plants, trampling (pedestrians, road maintenance) Factor E - nonnative	At listing: Ownership – private, California Department of Transportation, Federal HCP coverage – Within County of San Diego MSCP Subarea Plan and pre-approved mitigation area Conservation Status – portions of occurrence on Federal land conserved and managed by Service (Refuges)
		Current: extant	Current: Factor A - nonnative plants, trampling Factor E - nonnative plants	Current: same
40	Del Dios Highway, 1-2 miles west of Lake Hodges	At listing: extant	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – Within County of San Diego MSCP Subarea Plan and Multi-Habitat Planning Area Conservation Status – not conserved

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
		Current: extant	Current: Factor A - nonnative plants and golf course maintenance Factor E - nonnative plants	Current: Ownership – private HCP coverage – Within County of San Diego MSCP Subarea Plan and Multi-Habitat Planning Area Conservation Status – conserved, managed, and monitored
43	North and south sides of Pala Road (SR-76), east and west of junction with Calle del Vuelta	At listing: extant	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – not covered under any finalized HCP Conservation Status – not conserved or managed; site mowed periodically
		Current: extant	Current: Factor A - nonnative plants, development, indirect effects of urbanization Factor E - nonnative plants	Current: same
45	About 0.7 mile west of Bonsall Bridge, adjacent to SR-76 (Jeffries Ranch)	At listing: extant	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – within planning area for draft City of Oceanside Subarea Plan Conservation Status – not conserved or managed
		Current: extant	Current: Factor A - nonnative plants, development, indirect effects of urbanization, trampling, road expansion/ maintenance Factor E - nonnative plants	Current: same
48	In the San Diego National Wildlife Refuge, Rancho San Diego (Jamacha); just south of Cottonwood Golf Course	At listing: extant	In listing rule: Factor A - nonnative plants, trampling (hikers, horses, vehicles) Factor E - nonnative plants, fuel modification (mowing/ discing),	At listing: Ownership – Federal HCP coverage – within County of San Diego Subarea Plan pre-approved mitigation area Conservation Status – conserved and managed by the Service (Refuges)

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
		Current: extant	Current: Factor A - nonnative plants, trampling (hikers, horses, bicycles) Factor E - nonnative plants	Current: same; *Ambrosia pumila* flagged prior to fuel modification activities; Efforts made disuse some trails;
N/A	very small occurrence along SR-76 east of EO43	At listing: not known	In listing rule: N/A	At listing: N/A
		Current: extant	Current: Factor A - nonnative plants, indirect impacts of urbanization, development, highway maintenance Factor E - nonnative plants	Current: Ownership – private HCP coverage – not covered under any finalized HCP Conservation Status – not conserved or managed
Extirpated Since Listing				
3	Gillespie Field (airport in unincorporated San Diego County just north of the city of Santee) near south side of the airfield	At listing: extant	In listing rule: unknown	At listing: Ownership – private HCP coverage – not covered under any finalized HCP Conservation Status – not conserved
		Current: effectively extirpated: population to be transplanted to an area north of the San Diego River, within Mission Trails Regional Park in accordance with conservation measures outlined in USFWS (2009)	Current: N/A	Current: N/A
42	Bonsall Bridge, at Mission Road and Vista Ave.	At listing: extant	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – not covered under any finalized HCP Conservation Status – not conserved or managed
		Current: likely extirpated; visited site in 2009, no plants found	Current: N/A	Current: N/A
Riverside County				

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
22	Barry Jones (Skunk Hollow) Wetland Mitigation Bank	At listing: extant	In listing rule: Factor A - nonnative plants, indirect impacts of urbanization Factor C - grazing	At listing: Ownership – private HCP coverage – Within draft Western Riverside County MSHCP preserve area Conservation Status – conserved and managed by Center for Natural Lands Management
		Current: extant	Current: Factor A - nonnative plants, indirect impacts of urbanization Factor E - nonnative plants	Current: Ownership – same HCP coverage – Within finalized Western Riverside County MSHCP preserve area Conservation Status – same
44	North of Lake Elsinore, on the north and south sides of Nichols Road, just west of Durant Road	At listing: extant	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – Within draft Western Riverside County MSHCP area Conservation Status – not conserved or managed
		Current: extant	Current: Factor A - nonnative plants, development, indirect effects of urbanization, trampling, road expansion/ maintenance Factor E - nonnative plants, grading (occurrence has been largely destroyed by grading since listing)	Current: Ownership – same HCP coverage – Within finalized Western Riverside County MSHCP area Conservation Status – same; was to be conserved in accordance with the Western Riverside MSHCP, but to date has not been conserved
55	Southeast of Murrieta Hot Springs, along San Diego Aqueduct and powerline route,	At listing: not known	In listing rule: N/A	At listing: N/A

CNDDB Element Occurrence Number	Location	Status	Threats*	Ownership, HCP coverage, and Conservation Status
	south of intersection of Chandler and Suzi Roads	Current: extant	Current: Factor A - nonnative plants, trampling (utility maintenance; utility company policy is to mark and avoid patches during maintenance activities), indirect impacts of urbanization Factor E - nonnative plants	Current: Ownership – private HCP coverage – Within finalized Western Riverside County MSHCP area Conservation Status – not conserved or managed
57	Western end of Santiago Road, just west of Murrieta Creek, Temecula	At listing: not known	In listing rule: N/A	At listing: N/A
		Current: extant	Current: Factor A - nonnative plants, development, indirect impacts of urbanization Factor E - nonnative plants	Current: Ownership – private HCP coverage – Within finalized Western Riverside County MSHCP area Conservation Status – not conserved or managed
58	About 0.3 air mile south-southeast of the I-15 overpass over Lake Street, in Alberhill Conservation Area, Lake Elsinore	At listing: extant, not conserved	In listing rule: Factor A - nonnative plants, development Factor E - nonnative plants	At listing: Ownership – private HCP coverage – Within draft Western Riverside County MSHCP area Conservation Status – not conserved or managed
		Current: extant	Current: Factor A, E - nonnative plants	Current: Ownership – County of Riverside HCP coverage – Within finalized Western Riverside County MSHCP area Conservation Status – conserved and managed by the Western Riverside County Regional Conservation Authority
Extirpated Since Listing				
54	Exact location unknown. 0.5 mile southeast of Steele Peak, 4 miles southwest of Perris, and 6 miles north-northeast of Lake Elsinore, northwest of SR-74	At listing: not known	N/A	N/A
		Current: extirpated	N/A	On BLM lands. Identified in 2005. Voucher specimen verified. Site visited in 2009; *Ambrosia pumila* not found. Area had been disced – this may have killed plants.

*Threats may be discussed under different threat factor in listing rule

Appendix B. *Ambrosia pumila* occurrences extirpated or deemed not viable prior to listing

CNDDB Elemental Occurrence Number	Location	Status	Notes
San Diego County	←[merge cells later]→		
2	Spring Valley, about 1.5 miles northwest of Sweetwater Dam.	extirpated	
4	Santee; north and south of Mission Gorge Road, between Fanita Drive and Carton Hills Blvd.	extirpated	Western portion of occurrence partially destroyed by development, remainder transplanted to site in Santee adjacent to Forrester Creek in 2009 (see Table 1). Eastern portion presumed extirpated.
6	East of the intersection of Broadway and State Route 67, El Cajon	extirpated	
7	Approximately 0.5 mile north of Santee	extirpated	
8	Junction of Bostonia cutoff and Lake Side Road	extirpated	
9	Kennedy Park, near Granite Hills High School (4th Street and Granite Hills Drive) in El Cajon	extirpated	
11	Near intersection of Highland Avenue and 12th Avenue, and 13th Street and D Street in National City	presumed extant, but not viable	Northeast portion: growing in sidewalk cracks and in areas adjacent to sidewalk on north side of street; only one stem observed in 1996. Southwest: growing in soil of parking lot. Neither portions are conserved or managed; no plants observed in 2006. Both areas subjected to intensive trampling
13	Mission Valley in the City of San Diego; probably the current site of Qualcomm stadium	extirpated	
15	About 0.75 mile east of Mission San Luis Rey, in San Luis Rey River valley	extirpated	
18	Rice Canyon, 0.4 air miles northwest of Halecrest School	extirpated	
19	City of Chula Vista; approximately one air mile south-southeast of Allen School	extirpated	
25	Near junction of Sweetwater Road and Jamacha Road	extirpated	
26	Along Quarry Road, southwest of Sweetwater Reservoir	extirpated	
27	Between Jamacha Blvd. and Jamacha Road, Sweetwater	extirpated	

CNDDB Elemental Occurrence Number	Location	Status	Notes
28	Lincoln Acres School, on Lanoitan Ave. (corner of 24th Ave)	extirpated	
30	Along Washington Street between Mollison Ave. and Jamacha Road in El Cajon	extirpated	
36	Big Rock Park, western Santee. About 0.6 mile south of Mission Gorge Road	extirpated	
39	Black Mountain Road at Penasquitos Creek.	extirpated	
41	Just southwest of junction El Camino Real and Mission Avenue in Oceanside.	extirpated	
52	Exact location unknown. Most likely somewhere along Sweetwater Springs Boulevard in Spring Valley	unknown; presumed extirpated	
53	Exact location unknown; west end of Otay Mesa, east of San Ysidro, head of Dillon Canyon	extirpated or possibly misidentified	Attempted to locate occurrence in 2009; only found *Ambrosia confertiflora*
Riverside County			
50	Along Arlington Avenue, La Sierra Heights, Riverside	extirpated	

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

Ambrosia pumila
(San Diego ambrosia)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

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

New Recovery Priority Number and Brief Rationale: 11C.

We recommend a change in the recovery priority number for *Ambrosia pumila* from 5C to 11C. The threat of habitat loss has been reduced through implementation of multi-species HCPs. Nearly half of the occurrences are currently conserved by regional plans, which afford at least some protection to 11 of the 16 extant occurrences; 4 more occurrences should receive protection in the future. Additional threats impacting *A. pumila* include nonnative plants and fuel modification and there is a limited amount of data available regarding the life history of this species. Therefore, *A. pumila* is a species that faces a moderate degree of threat, has a low recovery potential, and is in conflict with development.

Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

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

Approve _____ Date JUL 15 2010

Scott A. Sobiech