Verbesina dissita
(Big-leaved crownbeard)

5-Year Review:
Summary and Evaluation

Photographs of *Verbesina dissita* (Big-leaved crownbeard).
Photo credit Mr. Fred M. Roberts Jr.

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

August 6, 2010

5-YEAR REVIEW

Verbesina dissita (Big-leaved crownbeard)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by Section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (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:

Verbesina dissita (Big-leaved crownbeard) is a semi-woody perennial shrub with bright yellow flowers in the Asteraceae (sunflower family). It is typically found on north-facing slopes of rugged coastal hillsides and steep canyons in dense southern maritime chaparral, but also exists as small pockets in coastal sage scrub and mixed chaparral. This species is found on San Onofre Breccia and derived gravelly soils with humus topsoil. In the United States, it is restricted to the Laguna Beach area of Orange County, California, though the greater portion of its historical range is in Baja California, Mexico. In Laguna Beach, it is known from two occurrences less than 0.8 kilometers (km) (0.5 mile (mi)) apart. Vegetative reproduction occurs by spreading rhizomes, underground stems that send out roots and shoots resulting in groups of aerial stems that represent a single genetic individual or multiple genetically identical individuals if the connecting rhizomes deteriorate. *Verbesina dissita* is known to respond favorably to fire and some level of clearing, likely as a result of its ability to persist through underground rhizomes for extended periods of time. Population density varies from a few scattered plants in dry exposed areas to dense stands in shaded understory situations.

Verbesina dissita was listed as threatened under the California Endangered Species Act (CESA) in 1990 and the Act in 1996.

Methodology Used to Complete This Review:

This review was conducted by Susan M. North at the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. We used information from the

1996 listing rule, available literature, survey information from experts who have been monitoring various localities of this species, reports and information in our files, and the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game (CDFG). We also relied upon information provided by experts familiar with the species, its habitat, and the associated processes. We received no information from the public in response to our Federal Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing. 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 provides 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 species.

Contact Information:

Lead Regional Office: Larry Rabin, Deputy Division Chief for Listing and Recovery, Region 8; (916) 414–6464.

Lead Field Office: Susan M. North and Bradd Baskerville-Bridges, Carlsbad Fish and Wildlife Office; (760) 431–9440.

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

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 25, 2009 (USFWS 2009, p. 12878). No responses specific to *Verbesina dissita* were received in response to the notice.

Listing History:

Original Listing
FR Notice: 61 FR 52370
Date of Final Listing Rule: October 7, 1996
Entity Listed: *Verbesina dissita* (Big-leaved crownbeard), a plant species
Classification: Threatened

State Listing
Verbesina dissita was listed by the State of California as threatened in 1990.

Associated Rulemakings: None

Review History:

No previous 5-year reviews or formal status reviews of this taxon have been conducted.

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

The recovery priority number for *Verbesina dissita* is *5C* according to the Service's 2009 Recovery Data Call for the CFWO, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983, p. 43098). This number indicates that the taxon is a species that faces a high degree of threat and has a low potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

Recovery Plan or Outline: No recovery plan or outline has been prepared for *Verbesina dissita*.

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 DPS of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. The species under review is a plant; therefore, the DPS policy is not applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

Information on the Species and its Status:

Verbesina dissita is a semi-woody perennial shrub of the Asteraceae (sunflower family). Plants grow as aerial stems that develop each year from underground rhizomes. The aerial stems die at the end of the growing season. Plants are 0.5 to 1 meter (m) tall (1.5 to 3 feet (ft)), branching, with short hairs, and rough to touch. Leaves are ovate, sessile, mostly opposite, and widely spaced on a stem. The yellow flowers are aggregated as disk and ray flowers in heads clustered at the end of a stalk. The dry, one-seeded fruits (i.e., achenes) are glabrous and broadly two-winged (Gray 1885, p. 299; CDFG 1990, p. 2). This species is distinguished from other members of the genus by its glabrous achenes and broad involucre (Munz 1974, p. 239). The flowering period is between May and July, although may be as early as February to as late as August (CDFG 1989, p. 2). *Verbesina dissita* may be differentiated from a frequent associate, *Encelia californica* (California brittlebush), by its intensely bright yellow disk flower, whereas the *E. californica* disk flowers are a buttery yellow color (Marsh *et al.* 1992, p. 38).

Species Biology and Life History

At the time of listing, information on the biology of *Verbesina dissita* was based entirely on field observations. It was thought that its winged seeds only allowed for short-distance dispersal from the understory but were not designed for long-distance travel (Marsh 1989, p. 3). Seeds were not known to be sticky, hooked, or buoyant, making them unlikely to attach to animals as they travel, or to float on the open ocean to nearby islands (Marsh 1989, p. 3). This reasoning suggested the species has limited dispersal capability that has resulted in its localized distribution in Laguna Beach, California.

Knowledge of *Verbesina dissita* reproductive biology is limited to observations of rhizomatous spreading, whereby multiple shoots are sent up from underground stems that represent a single genetic individual (genet) but have the appearance of multiple plants. The individual aerial stems are termed ramets. This growth mechanism makes it difficult to determine the abundance of *V. dissita* as it is challenging to observe where a genet begins and ends spatially. The rhizomatous nature of this species makes it less likely to be extirpated by fire. This possibility is supported by observations where in the years following a fire on Punta Banda near Ensenada, Baja California, Mexico, slopes were covered with *V. dissita* (Roberts 2009, p. 1). The positive response to fire is likely due to the rhizomatous nature of the species that allows rapid regeneration of aerial stems before competing shrubs recover. It is probable that if fires destroyed the aerial stems too frequently, the persisting rhizomes may not have stored enough reserves provided by the aerial stems to survive subsequent years. Observations over time indicate that if slopes are repeatedly cleared, *V. dissita* plants do not respond favorably and are sometimes extirpated (F. Roberts, Consulting Biologist, pers. comm. 2009). In 1984, a fuel break that cut through a population on Temple Hill may have resulted in a positive initial response from *V. dissita*; however, the plants began to decline after 4 years of repeated clearing (USFWS 1996, p. 52378).

Since listing, additional research was conducted on *Verbesina dissita* to investigate seed viability, germination, and propagation of seeds and vegetative matter. In 2003, Michael Wall (Seed Program Coordinator, Rancho Santa Ana Botanical Garden (RSABG)) performed laboratory tests of seed viability following storage in uncontrolled conditions (room temperature) that resulted in moldy seeds with very low germination rates. Fruits collected in 2003 were stored frozen and tested for their ability to germinate in 2005, 2007, and 2008. Germination success was high with vigorous root and cotelydon (seed leaves) development. More recent analysis of the winged fruits has revealed a strong dispersal potential; fruits are now thought to be dispersed up to 200 m (656 ft) from the plant (Wall, pers. comm. 2010). The fruits have two distinct prongs, known as awns, which may aid in dispersal through attachment to animals. Dispersal by water is unclear, although it appears seeds may be buoyant for an extended amount of time before they become saturated with water (Wall, pers. comm. 2010). Plants found on the Todos Santos Islands off Baja California, Mexico (Junak and Philbrick 1994, p. 417) may have traveled to the islands by long-distance dispersal by birds. Sexual reproduction, pollination requirements, longevity of adults, and genetics continue to be poorly understood.

Spatial Distribution and Abundance

Verbesina dissita was originally described by A. Gray in 1885 from a site in Todos Santos, Baja California, and subsequently collected by M.F. Bradshaw in 1903 from the Arch Beach area of Orange County, California (Gray 1885, p. 299; Hall 1907, p. 137). Its historical range is considered naturally disjunct as it has never been detected in the region between Orange County, California and Baja California, Mexico.

At the time of listing, *Verbesina dissita* was known to occur at two general locations in the United States known as Niguel Hill and Temple Hill, both in Laguna Beach, Orange County, California. Both locations were within about 3.2 km (2 mi) of each other and 2.5 km (1.5 mi) of the coast, supporting occurrences that occupied an approximate total area of 8 to 10 hectares (ha)

(20 to 25 acres (ac)) (CDFG 1989, p. iv; Marsh *et al.* 1992, p. 37) in a northwest to southeast distribution on steep, rocky, northwest-facing slopes.

Abundance estimates of *Verbesina dissita* cannot be accurately determined by counting aerial stems because the species is clonal and clumps may represent one to several genetically distinct individuals (Marsh *et al.* 1992, p. 38). Previous abundance data based on numbers of plants is now considered inaccurate until genetic analyses identify the extent of individual genets. Estimations of abundance based on percent cover are likely more useful for making trend assessments (Marsh *et al.* 1992, p. 38).

To aid in identifying rare species locations, tracking site changes, and establishing general abundance trends, the element occurrence (EO) tracking system was initiated by The Nature Conservancy. This system is now embodied in the CNDDB. Each EO is assigned a consecutive number based on the sequence in which data for a site was first reported to the CNDDB. CNDDB assigns different EO numbers to occurrences that are more than 400 m (0.25 mi) apart. This system is only applicable to occurrences within the United States. At the time of listing, the two occurrences representing the Temple Hill and Niguel Hill locations for *Verbesina dissita* were identified as EO 1 and EO 2, respectively (Figure 1).

At listing, EO 1 encompassed several subpopulations of *Verbesina dissita* based on area coverage estimations. These generally included the south flank of Temple Hill, Esslinger Ridge, Goff Ridge, Portafina Canyon, Arch Beach Heights, and Hobo Canyon. The Hobo Canyon region of EO 1 was reported as having the densest intact stand of *V. dissita* (Marsh *et al.* 1992, p. 38). This occurrence, as a whole, is well documented by herbarium records (Consortium of California Herbaria 2010). Most of these collections have precise location data, often associated with a specific address on a Temple Hill street called Nyes Place. On Niguel Hill, EO 2 occurred almost entirely in Ceonothus Canyon. The majority of Ceonothus Canyon is within the Aliso and Woods Canyon Wilderness Park (AWC Wilderness Park) in the Central/Coastal Reserve of Orange County (Reserve); this Reserve is the preservation component of the Orange County Central/Coastal Subregional Natural Community Conservation Plan/Habitat Conservation Plan (Central/Coastal NCCP/HCP). At listing, 10 to 20 percent of the total known distribution of *V. dissita* in the United States existed within the Reserve (USFWS 1996, p. 52380), while 80 to 90 percent of the total *V. dissita* distribution existed on property owned by either the City of Laguna Beach or private landowners. The area coverage estimation of 8 to 10 ha (20 to 25 ac) at the time of listing was based on identifications of *V. dissita* subpopulations made in 1992 (Marsh 1992). Approximately 69 ha (170 ac) were presumed to be occupied because habitat suitability was deemed high and some plants had been identified within that area (Marsh 1992, p. 11a, c; Service GIS Data, 2010). This estimate was taken into consideration in the listing rule; however, it was not considered to be precise since a specific representation of the area occupied was unidentified and survey effort at that time revealed a much smaller area actually occupied (i.e., 8 to 10 ha (20 to 25 ac).

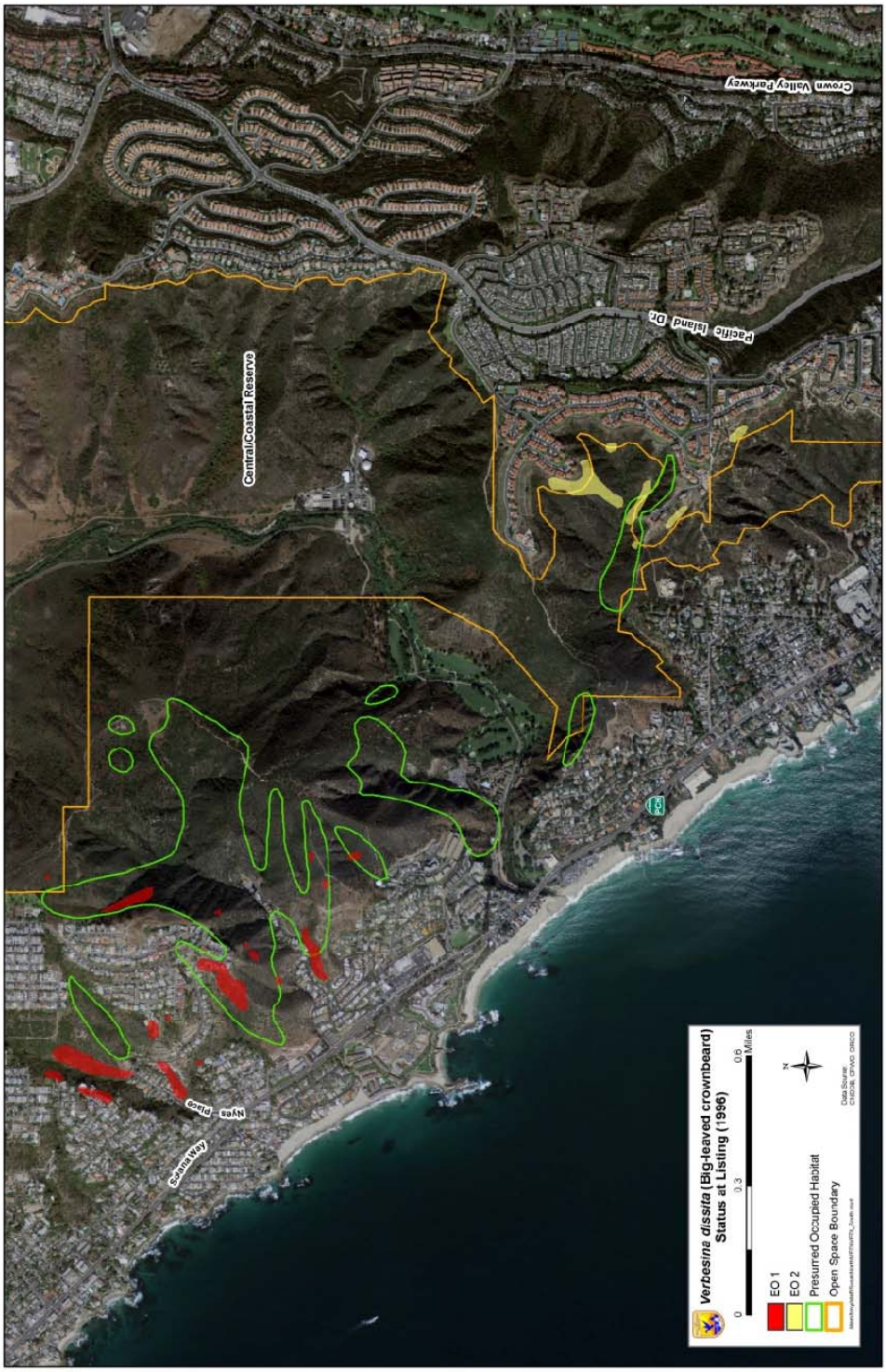

Figure 1: Distribution of *Verbesina dissita* (Big-leaved crownbeard) occurrences at listing. Element Occurrences (EO) based on Roberts (1988); Presumed Occupied Habitat based on Marsh (1992). Map prepared for 2010 5-year review.

In Mexico, the status of *Verbesina dissita* at the time of listing was based on historical data. This indicated a scattered distribution from Punta el Descanso south about 145 km (90 mi) to San Telmo near Cabo Colonet in Baja California, and as far inland as 25 km (15 mi). Over 20 historical populations were recorded (USFWS 1996, p. 52379). Populations of *V. dissita* were considered spotty in Mexico (R. Moran, California Academy of Sciences, pers. comm. 1992), but encompassed 85 percent of all known populations. Five of these 20 populations, or 25 percent, were extirpated by the time of listing, including the two northernmost, which may have adjusted the northern end of the distribution in Mexico south to La Salina. Therefore, at the time of listing, approximately 15 known populations remained in Mexico.

Since listing, two new occurrences for *Verbesina dissita* were reported in the United States. The first new occurrence was reported from the eastern side of Niguel Hill (EO 3); the inclusion of this location extends the range an additional half mile east from the coast, to roughly 3.2 km (2 mi) inland. The second new occurrence was reported from the Irvine Open Space Preserve (EO 4), about 16 km (10 mi) northeast of EO 1 and EO 2.

A recent review of *Verbesina dissita* for the CNDDB analyzed occurrence data from records kept by CNDDB, Calflora, and the Consortium of California Herbaria (CCH) (Roberts 2009). Reorganization of the occurrence data in the CNDDB will be finalized pending reconciliation of the data when the review is received by CDFG (R. Bittman, CDFG, pers. comm. 2010). An informal version of this review and the results were provided to the Service and indicate that a reorganization of the four EOs currently listed for *V. dissita* will likely take place. The review merges EO 1 and EO 2 due to the incorporation of a previously known but misrepresented report from 1992 (Marsh 1992). The review identifies EO 1 and EO 2 (from this point forward known as EO 1) as less than 400 m (0.25 mi) apart, following CNDDB protocol for occurrence delineation. In this 5-year review, the revised EO 1 may be discussed as either north or south of possible barriers to distribution across the occurrence, those barriers being Country Club Road, Village Lane, and the Aliso Creek Inn and Golf Course. The easterly occurrence reported from Niguel Hill will remain EO 3. The final occurrence, EO 4, was mistakenly reported due to inaccurate documentation of location coordinates and will now be disregarded (Roberts 2009, p. 6). Therefore, the current known occurrences of *V. dissita* are EO 1 and EO 3 (Appendix 1; Figure 2).

Since listing, the northernmost range of EO 1 has been reduced by development and fuel modification, particularly along Nyes Place, but also along other urban interface areas. Portions of Hobo Canyon have been cleared for fuel modification. A decline in abundance in the northernmost portion of EO 1 is evidenced by cleared private property areas and significantly thinned habitat on the flanks of Temple Hill and in Hobo Canyon; the Service estimates the loss of about 1.6 ha (4 ac) of habitat due to development in this area.

Additional surveys in EO 1 since listing have confirmed that *Verbesina dissita* occupies about 5 ha (12 ac) in multiple subpopulations on the northwest-facing slopes south of Hobo Canyon (PCR 2008, Figures 11a, b). These subpopulations are part of the larger area (69 ha (170 ac)) that was presumed to be occupied at the time of listing based on habitat suitability (Marsh 1992). Some areas remain to be surveyed within the EO 1 area. Abundance may appear to have increased since listing due to the newly detected subpopulations of *V. dissita* in EO 1; however,

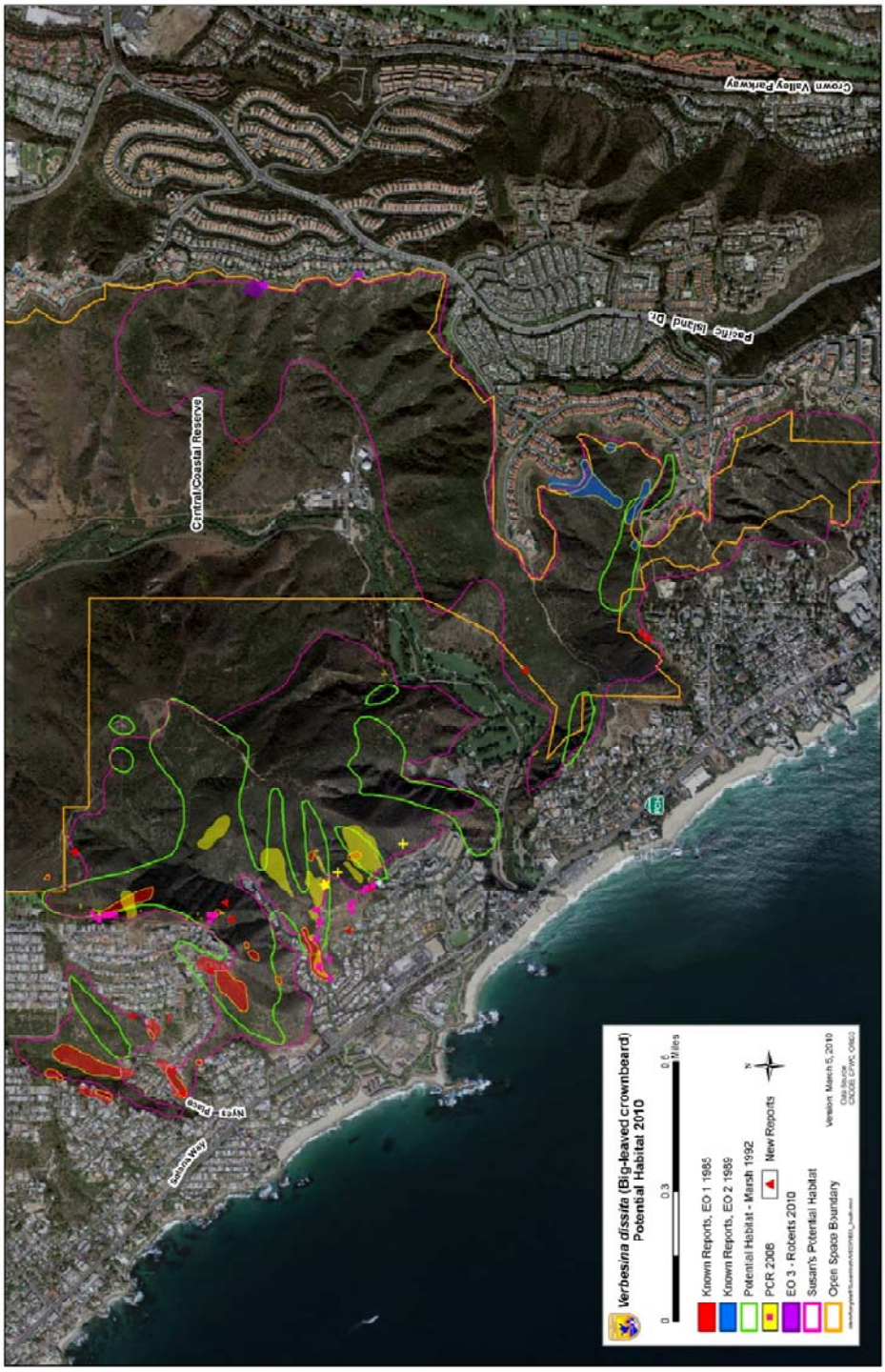

Figure 2: Current distribution of *Verbesina dissita* (Big-leaved crownbeard). Data from: Element Occurrences (EO) (Roberts 2009); PCR Services Corporation (2008); CNDDB (2010), CCH (2010), Calflora (2010); Presumed Occupied Habitat based on Marsh (1992). Map prepared for 2010 5-year review.

these subpopulations were likely present at the time of listing based on the biology of the species. Additionally, many miscellaneous reports of *V. dissita* have been made throughout the northern side of EO 1 since the year 2000 primarily at urban interface areas (CNDDB 2010; Calflora 2010; CCH 2010).

The Service has been able to track and obtain details regarding one specific mitigation project whereby vegetative cuttings were collected from within EO 1. This has resulted in 30 propagated plants that are scheduled to be planted out on about 0.4 ha (1 ac) of land adjacent to a known subpopulation and not far from the source plants (L. Robb, PCR Services Corporation, pers. comm. 2010; V. Arvizu, RSABG, pers. comm. 2010).

The final occurrence, EO 3, is located on the eastern side of Niguel Hill, west of the Aliso Summit Trail. This record was based on a single herbarium collection made in 1997 (CCH 2010). This status review prompted an examination of the occurrence, which revealed not only that *Verbesina dissita* is extant here, but that it exists in two subpopulations (R. Reifner, Species expert, pers. comm. 2010; F. Roberts, pers. comm. 2010). The smaller of the two subpopulations contains about 23 clumps, presumably distinct plants. The larger subpopulation was found on a mostly shaded slope that supports about 250 square m (0.06 ac) of plants of varying density (CNDDB 2010). EO 3 is probably the eastern limit for *V. dissita* in the United States.

Based on the similarity of habitat to other portions of its distribution (e.g., soils and slope conditions), *Verbesina dissita* may occur on the steep rocky terrain between EO 1 and EO 3 that is inaccessible and has yet to be thoroughly surveyed, such as the north-facing slopes of Niguel Hill. Additional surveying of these areas is needed to increase information about abundance and potentially reveal connectivity between EO 1 and EO 3. A 1994 report of biological surveys for the South Laguna Beach Fuel Modification Zone noted that areas with a high potential for rare species were those steep unwalkable slopes with suitable micro-habitat for species already known to occur nearby, such as *V. dissita* (Marsh 1994, p. 18). The region between EO 1 and EO 3 was not directly identified because it was not a part of the proposed fuel modification zone, but those areas that were identified are similar in habitat suitability and are directly adjacent to this area. It is therefore reasonable to assume that this particularly difficult area to survey (which is entirely within the Reserve) has potential to support *V. dissita*. Many of the nearby areas characterized in the 1994 fuel modification report as having “high potential” to support *V. dissita* were cleared from the westernmost side of EO 1. Therefore, based on its current known distribution, habitat suitability characteristics, and a large area that has not been appropriately surveyed, the Service has identified 291 ha (718 ac) of potentially suitable habitat for *V. dissita* in the United States (Service GIS Data, 2010). With consideration for area lost and new subpopulations found, the actual known area occupied in the United States at this time is thought to be about 12 ha (30 ac).

The current distribution and abundance of *Verbesina dissita* in Mexico is highly speculative, and neither a specific assessment of abundance, nor of potentially suitable habitat has been determined with confidence. Based on aerial imagery of habitat loss alone, we estimate that as many as half of the approximately 15 populations known at listing have since been extirpated by development.

In summary, the known range and distribution of *Verbesina dissita* has changed since listing, but this is likely due to increased survey effort rather than establishment of new *V. dissita* populations. A few reasons that account for this include: the inclusion of a previously unincorporated record of *V. dissita* that caused EO 1 and EO 2 to be redesignated as a single EO (EO 1) based on the proximity of plants to one another; removal of habitat and plants along much of the northern and western sides of EO 1; additional surveys that confirm that plants occur in habitat previously presumed to be occupied; and identification of a new occurrence (EO 3) that contains two subpopulations of *V. dissita*. In the United States, area occupied by *V. dissita* is now known to be about 12 ha (30 ac), and the area believed to support suitable habitat for *V. dissita* is roughly 291 ha (718 ac). The Service estimates that approximately 7 of the 15 populations known to exist in Mexico at the time of listing have since been extirpated; however, the Service cannot specifically determine acreage associated with this loss, or the area of suitable habitat that remains in Mexico.

Habitat or Ecosystem

In the listing rule, *Verbesina dissita* was described as occurring predominantly in the southern maritime chaparral plant community, which historically covered about 121 ha (300 ac) in Orange County (USFWS 1996, p. 52371). At listing it was estimated that 60 ha (150 ac) of suitable habitat remained. This represents an estimated 50 percent decline in suitable habitat by the time of listing. The actual area occupied by *V. dissita* was estimated to be 8 to 10 ha (20 to 25 ac) by 1989 (CDFG 1989, p. iv; Marsh *et al.* 1992, p. 37). Southern maritime chaparral also occurs in San Diego County; however, as *V. dissita* has never been found in San Diego County, the habitat in this area is not considered further.

The southern maritime plant community has been reorganized into different vegetation series by multiple sources such as Holland (1986), Sawyer and Keeler-Wolf (1995), and Hogan *et al.* (1996). Here we describe the habitat as being composed of a fairly common association of species including: *Adenostoma fasciculatum* var. *obtusifolum* (Chamise), *Salvia mellifera* (black sage), *Ceonothus megacarpus* (big pod ceonothus), *Cneoridium dumosum* (bush rue), *Rhamnus crocea* (red berry), *Erigonum fasciculatum* (California buckwheat), and *Isomeris arborea* (bladderpod). Rare or restricted associates include *Quercus dumosa* (Nuttall's scrub oak), *Chorizanthe staticoides* subsp. *chrysacantha* (Turkish rugging), *Comarostaphylis diversifolia* subsp. *diversifolia* (summer holly), and *Dichondra occidentalis* (western ponysfoot). This association of plants can be found on weathered sandstone soils, some on more loamy soil alluvium (Hogan *et al.* 1996). Most sites are on San Onofre Breccia formation and derived gravelly soils with humus topsoil at elevations ranging from 50 to 230 m (165 to 750 ft) (CDFG 1989, p. v). The densest populations are found in the understory of other shrubs on shaded slopes.

Natural constraints may limit the range and distribution of *Verbesina dissita*. The unique substrate on which it most commonly occurs (i.e., San Onofre Breccia bedrock) is composed mostly on schist, developing acidic soils that are different from the alkaline or neutral substrates common in the cismontane area of Orange County. The breccia forms a polygon of bedrock centered over the Niguel Hill area of south Laguna Beach, extending north to the Arch Beach Heights area of Laguna Beach, and south to Dana Point (Marsh 1989, p. 1). Some area occupied

by *V. dissita* is also on Topanga formation (CDFG 1989, p. 2). Distribution may also be restricted to the area that occurs within the maritime fog belt, which has been noted in the United States as well as Mexico (Marsh 1989, p. 2; Junak and Philbrick 1994, p. 408).

The difference between our current assessment of the remaining suitable habitat for *Verbesina dissita* in the United States (291 ha (718 ac)), and that reported at the time of listing (60 ha (150 ac)) is attributed to an expansion of the known range of *V. dissita* due to the identification of an additional population (EO 3) since listing. The increase in suitable habitat is not attributed to the growth or restoration of southern maritime chaparral or associated species since listing. As much of the area across this range remains unsurveyed and the habitat characteristics are suitable, we have reevaluated our assessment of suitable habitat in the United States to 291 ha (718 ac) (Service GIS Data, 2010). We have no current figures representing acreage of southern maritime chaparral habitat loss in Orange County. Most habitat loss is currently attributed to vegetation thinning to reduce fire hazards along the urban-wildland interface, which is more difficult to quantify than cleared areas.

Details of habitat loss down the Baja California peninsula are also not well quantified, although the historical range of *Verbesina dissita* occurs in areas that have been increasingly developed since listing. Vegetation associations for *V. dissita* in Mexico are similar to those in the United States (Roberts 1988, p. 3).

In summary, neither our knowledge of habitat requirements nor the typically associated species with which *Verbesina dissita* is found have changed since listing. Our assessment of suitable habitat for *V. dissita* has increased solely due to the identification of an additional occurrence since listing. While habitat loss due to vegetation thinning for fire hazard reduction is occurring, the extent of this impact has not been well quantified.

Changes in Taxonomic Classification or Nomenclature

No changes in taxonomic classification or nomenclature have occurred since listing.

Genetics

In 1997, a chloroplast DNA restriction study identified the *Verbesina* genus as monophyletic, a member of the tribe *Heliantheae*, and sister taxa as primarily the Mexican genera *Podachaenium*, *Squamopappus*, and *Tetrachyron* (Panero and Jansen 1997, p. 1). The results of the research supported a North American origin for the genus *Verbesina*.

Species-specific Research and/or Grant-supported Activities

Rancho Santa Ana Botanical Garden (RSABG) Seed Collection and Propagation:

In 2003, *Verbesina dissita* fruits were collected from a site at Nyes Place prior to a home construction project, and housed at RSABG. Approximately 32,577 fruits were identified as being “from possibly 200 clonal individuals” (Wall 2003, p. 2). Germination tests have been conducted with varying results. Fruits stored in uncontrolled conditions experienced mold and

embryos became soft, while frozen fruits had a high germination rate, some with vigorous root and cotyledon development. All seedlings produced from initial viability tests were transferred to the nursery for continued growth, propagation, and observation. The results indicate that *V. dissita* is easy to propagate and grow. RSABG currently has eight *V. dissita* plants on the grounds from these original tests and nearly all fruits originally collected continue to be stored frozen (Wall, pers. comm. 2010).

Nature Reserve Orange County Monitoring Plan:

Dr. Kristine Preston (Science Program Coordinator, Nature Reserve Orange County) has participated in discussions with CFWO to include *Verbesina dissita* in a rare plant monitoring program in the Reserve under the Central/Coastal NCCP/HCP (Preston, pers. comm. 2010). This action, if implemented, will help to characterize the true current range of *V. dissita* within the Reserve, but will not address the portion of this species distribution that occurs outside the bounds of the Reserve.

Vulnerability Factors

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

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

Consideration of these categories and its life history traits can provide a vulnerability profile for *Verbesina dissita*. Fiedler and Ahouse (1992, p. 32) consider ecology, biotic competition, population dynamics, reproductive biology, and genetics among the factors affecting the rarity of a plant taxon which would be reflected in numbers 2 and 3 above; few and small populations. *Verbesina dissita* exhibits several attributes that are applicable to a list of causes of intrinsic rarity in plants prepared by Fiedler and Ahouse (1992, p. 33), including:

1) The plants are mostly restricted to San Onofre Breccia soils in the maritime fog belt;
2) Plants have a preference for dense shaded overstory habitat;
3) The species is limited to two EOs in the United States; and
4) Populations are small and declining.

Life history and habitat specificity traits create natural limitations for *Verbesina dissita*. The threats described below in the five-factor analysis exacerbate the vulnerabilities described above.

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

In the listing rule, destruction and modification of habitat by residential development, urbanization, and fuel modification activities were cited as threats to *Verbesina dissita* and its habitat, both in the United States and in Mexico (USFWS 1996, pp. 52377–52378). Agricultural development also contributed to the loss of populations in Mexico (USFWS 1996, p. 52379). Since listing, altered fire regimes have been identified as a threat to *V. dissita*.

Residential Development and Urbanization

Residential development and urbanization were considered the most immediate threats to plants and habitat of *Verbesina dissita* in the United States when the species was listed in 1996. Prior to Federal listing, but following state listing in 1990, at least four residences were built directly on habitat occupied by *V. dissita* in the vicinity of Nyes Place on Temple Hill (USFWS 1996, p. 52378). The location of most development appears to have been along the perimeter of the *V. dissita* range, but development has fragmented and interrupted the continuity of habitat. Such fragmentation has primarily occurred through the development of small scattered (0.2 ha (0.5 ac)) undeveloped lots within neighborhoods (Roberts 1989, p. 1). Much of this habitat loss and fragmentation has occurred in areas that were previously believed to be protected from development due to steepness of terrain.

Since listing, development does not appear to be an imminent threat to either *Verbesina dissita* occurrence (EO 1 or EO 3) and we do not anticipate additional large scale habitat loss from this potential threat because it appears that the steep slopes where *V. dissita* occurs have been developed to their full potential. However, *V. dissita* occurs almost entirely on private land, so we cannot be certain that development will not continue to curtail habitat, even due to the steepness of the terrain where it occurs. Future habitat loss from development is less of a threat to EO 3 since most of this area occurs within the Reserve. Although *V. dissita* is not a covered species under the Central/Coastal NCCP/HCP, it has potential to benefit from the conservation mandate under this plan that requires that impacts to sensitive and covered species be minimized from infrastructure and recreation facilities that are permitted within the Reserve area.

In Mexico, between 1987 and 1990, changes in land use transformed some relatively pristine areas supporting *Verbesina dissita* into cleared sites for condominium developments at three locations on Punta Banda just south of Ensenada (Roberts 1992, p. 1). Aerial imagery demonstrates that urbanization has increased in the last 15 years in many coastal areas along the Baja California peninsula. The expansion of urbanized areas has probably caused the loss of about 7 of the 15 populations known to be extant at the time of listing.

Fuel Modification

Fuel modification prescribes various levels of removal of vegetation from a site to reduce the likelihood of the area supporting a fire. At the time of listing, creation of fuel modification zones required by local ordinances was identified as a threat to *Verbesina dissita* plants and habitat (USFWS 1996, p. 52378). The City of Laguna Beach required the creation of a fuel modification zone up to 46 m (150 ft) from residences (R. Drewberry, Laguna Beach Fire Department, pers. comm. 1991). At that time, over 20 percent of known *V. dissita* plants were within the fuel modification zone. Compliance with these ordinances caused a significant loss of *V. dissita* and its habitat. Loss of habitat due to fuel modification primarily affected EO 1. Methods for fuel modification included thinning vegetation with goats or hand tools, fire breaks, disking, and mowing.

Currently, fuel modification as a fire prevention method is the most serious threat to *Verbesina dissita* plants and habitat and has been a consistent threat to the northern portion of EO 1. For example, the Hobo Canyon area previously supported the healthiest populations of *V. dissita* and was recommended for land acquisition and preservation by Marsh (1992, p. 38); Hobo Canyon has experienced substantial clearing and thinning since listing. According to the current Fuel Modification Guidelines for the City of Laguna Beach, development that is contiguous to or within 300 ft of an undeveloped vegetated area requires modification of natural vegetation at the urban interface. A typical landscape/fuel modification installation consists of an irrigated 20 ft setback zone (A), a 50 to 75 ft wide irrigated zone (B), and non-irrigated 125 to 300 ft vegetation thinning zones (C and D). The total minimum width of a fuel modification zone is 195 ft and the maximum width is 300 ft, with widths varying based on terrain and vegetation (Schwartz 2010, p. 4). Actions to comply with this guidance are mainly a threat in EO 1, which is directly adjacent to neighborhoods. Fuel modification is also a possible threat to EO 3 because one of the subpopulations in this occurrence occurs primarily within a fuel modification zone in the Reserve (CNDDB 2010). The Central/Coastal NCCP/HCP prescribes criteria for fuel modifications and precludes them within Reserve boundaries (NCCP 1996, p. II–338), but some exceptions within Laguna Beach have been granted where older residences that were constructed prior to fuel modification ordinances abut parklands. Maintenance of fuel modification areas has precluded re-establishment of the densely vegetated habitat that frequently supports *V. dissita*; some slopes are scantily occupied by *V. dissita* with few to no other shrubs. Currently this repeated clearing and thinning of habitat for fuel modification purposes is the greatest threat to *V. dissita* in the United States.

Thinning for fuel modification is accomplished by use of goats and by hand clearing with weed trimmers, hand-held loppers, and machetes (Schwartz 2010, p. 2). With the exception of two Laguna Beach Fuel Modification Zones (10 and 11), goats graze in all of the Fuel Modification Zones, including areas where *Verbesina dissita* occurs. Since 2007, the policy of the City of Laguna Beach Fire Department (LBFD) has been to coordinate fuel modification activities within Fuel Modification Zones 10 and 11 with the California Coastal Commission (CCC) and CDFG. LBFD flagged *V. dissita* plants in Fuel Modification Zones 10 and 11 during 2007 to 2008 fuel modification activities so goat managers could erect electric fencing around *V. dissita* to avoid any impacts to the plants from grazing activities. It is unclear whether electric fencing was subsequently placed. The same plants were flagged again (when needed) during the 2008 to

2009 fuel modification activities; however, hand crews were used to clear vegetation rather than goats during that year (Schwartz 2010, p. 4). Flags are maintained by consultant firms in some areas (L. Robb, pers. comm. 2010), although where and how frequently is not apparent. During a field visit to EO 1 by Service staff in November of 2009, we were unable to find any clearly flagged *V. dissita* plants (S. North, pers. obs. 2010). As the goat grazing program continues to impact the habitat within which *V. dissita* occurs, a lack of adequate flagging indicates that *V. dissita* plants are likely being grazed upon, or hand-trimmed due to misidentification. Furthermore, because flagging has not occurred in all Fuel Modification Zones in which *V. dissita* occurs, it is likely being grazed in these other areas.

Goat grazing that reduces fuel loads continues to impact *Verbesina dissita* habitat, not only by eliminating the dense overstory vegetation that it is commonly associated with and by potentially destabilizing the slopes on which it occurs, but also by directly eliminating *V. dissita* plants. The northern portion of EO 1 is most threatened by this type of habitat loss. The southern portion of EO 1 occurs almost entirely within the Reserve and is therefore more protected from habitat loss. EO 3 occurs within the Reserve and is presumed to be less threatened by fuel modification. This threat is discussed further under Factor C as it relates to predation impacts to the species.

Altered Fire Regimes

Habitat for *Verbesina dissita* is also threatened by altered fire regimes. A large fire has the potential to cause a type-conversion from the shrub habitat of chaparral and coastal scrub to grassland (Zouhar *et al.* 2008, p. 185). In the southwest bioregion, increased invasion rates by nonnative species and alteration of fire regimes by humans have occurred concurrently in such a way that has resulted in the type-conversion of native-dominated chaparral and coastal scrub into grasslands dominated by nonnative species (Keeley 2001; Zouhar *et al.* 2008, p. 185). The particular process for type-conversion of shrublands into grasslands is known as the grass/fire cycle and has been documented in many ecosystems worldwide (Zouhar *et al.* 2008, p. 185). As described under Habitat or Ecosystem, *V. dissita* is not known to occur in grassland habitats. In contrast, control of fire through modification of habitat in an urban interface area may inhibit a fire-adapted species over time.

The last large fire event in the relatively contiguous habitat of Laguna Beach occurred in 1993; however, there is no evidence that *Verbesina dissita* plants were burned. Should a large catastrophic wildfire occur in this region again, it has the potential to burn through all remaining populations of *V. dissita* simply due to this species' narrow distribution. If that were to occur, it is unlikely that this species would become extirpated as a result of fire alone. This is due to its evolved association with this natural event, which has possibly resulted in its ability to reproduce from rhizomes that persist underground for extended lengths of time. The fuel modification zone around the urban interface area of the City of Laguna Beach has allowed for settlement of invasive, nonnative grasses, providing a source for these species to establish themselves across a newly burned landscape. However, some invasive grasses will invade burned or unburned areas (Zouhar *et al.* 2008, p. 185). Impacts associated with nonnative plants will be discussed further under Factor E.

Agriculture

Impacts from agriculture were cited as a threat to Mexican populations in the listing rule, and while this likely continues to be true, we have no quantified information on the extent of its severity. Agricultural practices are not a threat to *Verbesina dissita* in the United States.

Summary of Factor A

The destruction and modification of habitat were the primary threats to *Verbesina dissita* at the time of listing. Because most locations with the proper topography for development have already been developed, residential development no longer appears to be a serious threat to the current known distribution of this species. However, fuel modification for fire hazard reduction still threatens habitat and individuals of *V. dissita*. The northern portion of EO 1 is the most threatened by this form of habitat alteration. The southern portion of EO 1 and EO 3 occur almost entirely within the Reserve, thus receiving greater protection from habitat loss. Agricultural practices continue to be a threat to *V. dissita* in Baja California, though we are not aware of the extent.

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

Overutilization for commercial purposes was not known to be a factor in the 1996 final listing rule (USFWS 1996, p. 52370). Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Disease and predation were not known to be threats to *Verbesina dissita* at the time of listing (USFWS 1996, p. 52370). Predation of *V. dissita* plants is a current threat associated with fuel modification activities because goat grazing is utilized to thin or remove vegetation along the steep urban wildland interface in Laguna Beach. Goats have potential to kill *V. dissita* by directly consuming plants and their reproductive structures, and from goats stripping bark from stems once more palatable vegetation has been consumed. The City of Laguna Beach's goat grazing program is implemented on an annual basis by the LBFD which hires goat herders to manage herds on a rotating basis throughout various areas along the urban-wildland interface. This program involves goat herders confining their goats to targeted areas where goats browse until a desired level of vegetation thinning is achieved, then moving the goats to another fuel modification zone. This threat is discussed further under Factor E.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms considered to potentially provide some protection for *Verbesina dissita* included: (1) the Native Plant Protection Act (NPPA); (2) the California Endangered Species Act (CESA); (3) the California Environmental Quality Act (CEQA); (4) implementation of conservation plans pursuant to the Natural Community Conservation Planning (NCCP) Act; (5) the Act in cases where *V. dissita* occurs in habitat occupied by a listed species;

and (6) land acquisition and management by Federal, State, local agencies, or by private groups and organizations (USFWS 1996, p. 52379–52381).

The following discussion describes State and Federal regulatory mechanisms that currently may offer some level of protection to *Verbesina dissita* and its habitat. These mechanisms have remained largely unchanged since listing.

State Protections

At the time *Verbesina dissita* was listed as threatened under the Act, it was thought to be protected by the following State laws: NPPA enacted in 1977, CESA enacted in 1984, CEQA enacted in 1970, and the NCCP Act enacted in 1991.

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

In 1990, the California Fish and Game Commission listed *Verbesina dissita* as threatened under the NPPA (Division 2, Chapter 10, Section 1900 *et seq.* of the California Fish and Game Code) and CESA (Division 3, Chapter 1.5, Section 2050 *et seq.* of the CFG). Both the NPPA and CESA include prohibitions forbidding the unauthorized "take" of State-listed threatened or endangered plant species (Chapter 10, Section 1908 and Chapter 1.5, Section 2080, California Fish and Game Code). CESA requires State agencies to consult with CDFG on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. However, 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) Impacts of the authorized take are minimized and fully mitigated;
3) Measures required to minimize and fully mitigate the impacts of the authorized take are roughly proportional in extent to the impact of the taking on 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.

NPPA, which is referenced as an exception to take prohibitions of CESA, exempts a number of activities from regulation including: clearing of land for agricultural practices or fire control measures; removal of endangered or rare plants when done in association with an approved timber harvesting plan, or mining work performed pursuant to Federal or State mining laws, or by a public utility providing service to the public; and/or when a landowner proceeds with changing the use on their land in a manner that could result in take, provided the landowner notifies CDFG at least 10 days in advance of the change. These exemptions indicate that CESA and NPPA may be inadequate to protect *Verbesina dissita* and its habitat from a range of

activities such as development and fuel modification.

Recent queries to CDFG requesting documentation of incidental take permits granted under Section 2081(b) and (c) for *Verbesina dissita* since listing reveal that take permits are not monitored by species (G. de La Rosa, pers. comm. 2010; M. Osborne, pers. comm. 2010). This means it is not possible to track the effects of granting incidental take throughout the species range. Instead, tracking of incidental take is accomplished by establishing the location at which an impact has occurred or will occur, and subsequently reviewing the applicant's Environmental Impact Report to become informed as to which species were or are present. Hence, this system is not designed for tracking cumulative impacts to species, but rather for tracking impacts expected due to a project at a specific location. CDFG has issued only one incidental take permit for *V. dissita*, and that impact is currently in the process of being mitigated by the attempted translocation of plants grown from seed and vegetative collections (Osborne, pers. comm. 2010). The size of the mitigation is proportionate to the impact; however, risks associated with translocation, discussed under Factor E, may hinder survivorship of plants and fail to offset the loss caused by the primary impact.

Additionally, as noted in the listing rule, some projects do not comply with the regulations of NPPA and CESA. After Federal listing, CDFG was notified that *Verbesina dissita* plants were again being removed without the State's knowledge (Osborne, pers. comm. 2010). Upon learning this, CDFG worked in cooperation with the City of Laguna Beach to notify all landowner's with the potential for *V. dissita* to occur on their property that they must consult with CDFG prior to impacting potential *V. dissita* habitat areas. Additional illegal take of *V. dissita* has occurred since listing, prompting law enforcement by CDFG and CCC, which has resulted in additional mitigation measures that are currently being implemented (Osborne, pers. comm. 2010). All illegal take of *V. dissita* under NPPA or CESA has been associated with property development or fuel modification activities.

The Natural Community Conservation Planning (NCCP) Act

The NCCP program, established in 1991 under the State's NCCP Act (CDFG Code 2800–2835), 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 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 State and federally-listed species as well as unlisted species by conserving native habitats upon which those species depend. Species for which the habitat conservation is aimed and that benefit from an NCCP are typically identified as "Covered Species" or "Identified Species," meaning that specific activities within the planning area that may impact such species do not require further mitigation beyond that identified in the NCCP, because the conservation needs of the Identified Species have been adequately addressed by provisions of the NCCP. Many NCCPs are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Act.

The Central/Coastal NCCP/HCP, adopted in July of 1996 prior to the listing, is one such plan for which the planning region encompasses the entire United States distribution of *Verbesina dissita*. The Central/Coastal NCCP/HCP identified *V. dissita* as a "Special Interest Species" indicating that this species is eligible to receive regulatory coverage in the future under the NCCP/HCP (i.e., be included as an "Identified Species") should field surveys reveal that the conservation afforded *V. dissita* is consistent with the conservation guidelines of the NCCP and the regulatory requirements of CESA and the Act. Targeted field surveys for *V. dissita* have not yet been implemented under the Central/Coastal NCCP/HCP; thus, its status as a Special Interest Species remains unchanged. Additional discussion of the Central/Coastal NCCP/HCP is provided below under Federal Protections.

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. Potential impacts to *Verbesina dissita* due to mitigation are discussed under Factor E below, as they relate to small population size and transplantation.

California Coastal Act (CCA)

This regulatory mechanism was not discussed at the time of listing. The California Coastal Commission (CCC) considers the presence of listed species in determining environmentally sensitive habitat lands subject to Section 30240 of the CCA of 1976, which requires their protection. Certain local jurisdictions have developed their own Local Coastal Programs or Land Use Plans that have been approved by the CCC. Some of the major accomplishments of this act include reduction in overall development, the acquisition of prime habitat along the coast, restoration of coastal streams and rivers, and a reduction in the rate of wetland loss. The CCC has successfully pursued law enforcement action as a result of illegal take (according to CESA) of *Verbesina dissita* since the time of listing. Such law enforcement has required reseeding, planting, and monitoring of *V. dissita* plants for a period of 5 years.

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. Therefore, this regulatory mechanism may not be adequate to fully protect species.

Endangered Species Act of 1973, as amended (Act)

Since listing, the Act is the primary Federal law that may provide protection for *Verbesina dissita*. The Service's responsibilities include administering the Act, including Sections 7, 9, and 10. Section 7(a)(1) of the Act requires all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species. 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 not been proposed for this taxon. 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). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project. Thus, listing *V. dissita* provided a variety of protections, including the prohibitions against removing or destroying plants within areas under Federal jurisdiction and the conservation mandates of Section 7 for all Federal agencies.

Under Section 9(a)(2) of the Act, with respect to threatened plant taxa, it is unlawful to remove and reduce to possession (i.e., collect) any such taxon from areas under Federal jurisdiction. Regulations adopted for threatened plant species (50 CFR 17.71) refer to the regulations adopted for endangered plant species (50 CFR 17.61). However, the endangered plant species regulations identify a narrower set of prohibitions for endangered plant species than are listed in the Act itself. The exception to the prohibitions for endangered plants that applies to threatened plants is that seeds of cultivated specimens of species treated as threatened are exempt from all the provisions of 50 CFR 17.61, provided that a statement that the seeds are of "cultivated origin" accompanies them during the course of any activity otherwise subject to regulation.

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), 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 fish and wildlife 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 fish and wildlife species. 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 any 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 plants when the listed plant co-occurs with listed fish or wildlife species addressed by an HCP. Although Section 10(a)(1)(B) allows for exemptions to take prohibitions under Section 9 for animals, it does not govern impacts to plants on private land when they do not co-occur with listed animal taxa since incidental take is not defined and does not apply to plant taxa.

Orange County Central/Coastal Subregion NCCP/HCP (Central/Coastal NCCP/HCP):

A portion of the known range of *Verbesina dissita* occurs within AWC Wilderness Park, which is a component of the natural reserve system of the Reserve, established under the Central/Coastal NCCP/HCP. As mentioned above, *V. dissita* was not listed at the time of adoption of the Central/Coastal NCCP/HCP and was not addressed as an Identified Species. Based on the current understanding of the species distribution, it does not appear to co-occur with other Identified Species. Impacts to *V. dissita* resulting from implementation of the Central/Coastal NCCP/HCP were not contemplated or authorized by the Central/Coastal NCCP/HCP. Therefore, impacts to *V. dissita* remain subject to existing regulatory mechanisms.

Despite the fact that the Central/Coastal NCCP/HCP does not specifically address conservation of *Verbesina dissita*, this species may benefit from implementation of a Fire Management Plan that is a component of this NCCP/HCP. With a few exceptions, the Fire Management Plan excludes fuel modification zones at the urban-wildland interface from inclusion in the Reserve, and identifies strategies that should be implemented to reduce the risk of fire and fire management measures on natural resources and adjoining developed areas.

Implementation of the Central/Coastal NCCP/HCP adaptive management program may also benefit *Verbesina dissita* in the future through monitoring and management efforts. For instance, establishment and implementation of a rare plant monitoring program may help to better delineate the distribution of *V. dissita* within the Reserve. Such delineation will help park planners avoid and minimize impacts to this species from new recreation or erosion control facilities and may help to target management measures that are beneficial to its habitat (such as nonnative plant species control). Future monitoring within the Reserve may also provide justification to include *V. dissita* as an Identified Species under the Central/Coastal NCCP/HCP, which would extend regulatory coverage to it under Section 10 of the Act and Section 2835 of the California Fish and Game Code.

Mexican Law

The Service is not aware of any existing regulatory mechanisms that protect *Verbesina dissita* or its habitat where it occurs in northwestern Baja California, Mexico. The species is not listed under the Mexican equivalent of the Act (Norma Official Mexicana NOM–059).

Summary of Factor D

Most of the regulatory mechanisms discussed above have provided a significant degree of recognition by State, Federal, and local agencies and private landowners, but have not greatly reduced the likelihood of destruction and alteration of habitat or direct removal of *Verbesina dissita* plants. The Act provides protection to the species by offering a mechanism for education, protection, and management through its threatened listing status. In conjunction with other regulatory mechanisms, the Act has allowed for some conservation through seed collection, propagation, and restoration. The decline of *V. dissita* may have slowed after becoming federally listed; however, local policies guiding fire prevention and development on private land continue to reflect inadequate protection for this plant species. The Central/Coastal NCCP/HCP Reserve, which does not have a required monitoring component for *V. dissita* because it is not a covered species, still offers the greatest protection to the species for two reasons: (1) *V. dissita* is protected by default within the Reserve because it occurs within a reserve system designed to benefit other sensitive and listed species; and (2) the Reserve benefits from implementation of an adaptive management program through the Central/Coastal NCCP/HCP that helps to safeguard habitat values by managing fire and monitoring and managing sensitive species and habitats within the Reserve.

State regulatory mechanisms that are in place to provide protection to *Verbesina dissita* appear largely ineffective, as evidenced by the substantial amount of illegal take that occurred prior to and since listing under CESA. State incidental take permits are not tracked in such a way that allows for an assessment of cumulative impacts on the species. The inadequacy of State regulatory mechanisms is significant to a plant taxon known to occur only on non-Federal lands.

The Act is the primary Federal law that provides protection for *Verbesina dissita* since its listing as a threatened species in 1996. Other Federal and State regulatory mechanisms provide discretionary protections, but do not exclusively guarantee protection for *V. dissita*. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Act.

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

At listing, nonnative plant competition was considered a threat to this species but was discussed under Factor A (USFWS 1996, p. 52378). Since listing, additional threats attributable to Factor E have been identified. Desiccation, drought, climate change, and stochastic events are rangewide threats and may affect more aspects of the species' life history than currently known. Competition with nonnative plants, fuel modification, small population size, transplantation, and susceptibility to fire are also rangewide threats but may be more significant in the northernmost portion of the range.

Competition with Nonnative Plants

At the time of listing, the establishment of nonnative plants used in landscaping (such as *Atriplex semibaccata* (Australian saltbush)) was noted as a current and future threat to the species.

Verbesina dissita directly competes for space and shade with landscaping materials such as *A. semibaccata*, *Nicotiana glauca* (Tree tobacco), various *Acacia spp.*, and other nonnative plants. This threat is best documented along the northernmost portion of EO 1 at urban interface areas where development and fuel modification have aided in the spread of nonnative plants since *V. dissita* was listed. The expansion of landscape plantings (such as *Acacia spp*.) from nearby residential areas is also a threat to EO 3. The LBFD Landscape/Fuel Modification Guidelines and Maintenance Program (Fuel Modification Guidelines) (LBFD 2010) require that any new plantings within the designated fuel modification zones be "replanted" using appropriate plants not listed on the Undesirable Plant Species List of the City of Laguna Beach (Schwartz 2010, p. 2), which includes all of the nonnative species listed above in addition to 57 other taxa.

As noted under the "Species Biology and Life History" section of this review, fire at natural frequencies may favor the rhizomatous *Verbesina dissita.* However, an increase of nonnative grasses and forbs may alter the natural fire frequency to the detriment of *V. dissita.* Recurrent fires can destroy annual aerial stems too frequently, thus precluding the replacement of food supplies in the rhizomes that allow rhizomes to persist and produce a new cohort of aerial stems each year. Fuel modification activities that possibly serve as vectors of transport for invasive species' seeds, fruits, and vegetatively viable parts include goat grazing, fuel break construction, and heavy equipment and vehicle use (Giessow and Zedler 1996; Stylinski and Allen 1999). In a study of 24 fuel breaks from throughout the southwest coastal bioregion, Merriam *et al.* (2006) found that along fuel breaks, nonnative plant cover was 200 percent greater than in adjacent wildland areas and decreased rapidly with distance from the fuel breaks (Zouhar *et al.* 2008, p. 187). Relative cover of nonnative plants was 21 percent higher on breaks constructed with heavy equipment than on those constructed with hand tools.

Many nonnative grasses and forbs invade chaparral and coastal sage scrub. Those already present in fuel modification zone areas previously occupied or sporadically occupied by *Verbesina dissita* include *Avena barbata* (slender oat) ,*Avena fatua* (wild oat), *Bromus diandrus* (rigput brome), *Bromus rubens* (red brome), *Brassica nigra* (black mustard), *Hirschfeldia incana* (summer mustard), *Cortaderia selloana* (Uruguayan pampas), and *Pennisetum setaceum* (fountain grass). The latter two, along with *Cortaderia jubata* (pampas grass), are highly invasive in coastal sage scrub, and there is speculation that they contribute to stands becoming more susceptible to fire ignition (DiTomaso 2000a, b). *Cortaderia selloana* and *Echium candicans* have both escaped into the canyons on Niguel Hill and will likely continue to be a problem for *V. dissita* in the future. Other nonnative, invasive grasses and forbs that are present in the Laguna Beach area though are not yet known to be problematic for *V. dissita* include *Bromus tectorum* (cheatgrass), *Hordeum geniculatum* (Mediterranean barley), *Hordeum vulgare* (common barley), *Lolium multiflorum* (Italian ryegrass), *Vulpia myuros* (foxtail fescue), *Centaurea solstitialis* (yellow-star thistle), *Erodium botrys* (longbeak stork's bill), *Erodium cicutarium* (cutleaf filaree), *Medicago polymorpha* (burclover), and various species of mustards. Fuel breaks should be maintained so that dense populations of nonnative plants do not continue to become established along them.

Drought and Climate Change

Although drought was not identified as a threat in the listing rule, it is likely that cyclical drought

reduces local populations over the long term. 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, p. 1; Cayan *et al.* 2005, pp. 1, 7–8; IPCC 2007, pp. 8–9). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. One study has predicted that 5 to 10 percent of California's native plant species would no longer find suitable habitat within the state, and thus be vulnerable to extinction, if average temperatures warmed 3° Celsius (5 to 6° Fahrenheit) (Morse *et al.* 1995, p. 393). Whether or not this would include *Verbesina dissita* is unknown.

Small Population Size

The conservation biology literature commonly notes the vulnerability of species known from one or very few locations, or from small populations (e.g., Shaffer 1981, 1987; Primack 2006; Dunning *et al.* 2006). In particular, small population size and the likely low levels of genetic interchange among them make small populations potentially vulnerable to inbreeding depression and loss of genetic variability due to random fixation (e.g., genetic drift). Low genetic variation may influence the ability of populations to adjust to novel or fluctuating environments, survive stochastic events, or to maintain high levels of reproductive performance (Huenneke 1991). Small, fragmented populations may be visited by fewer pollinators and thus have reduced pollination and seed set, merely because the small number of available flowers attracts fewer pollinators (i.e., "Allee effect"; Groom 1998, pp. 487–496; Lennartsson 2002, p. 3068).

In the United States, *Verbesina dissita* is known from only two occurrences within 0.8 km (0.5 mi) of each other, occupying an area of approximately 12 ha (30 ac). The western occurrence (EO 1) is divided by major barriers to distribution between the north and south, making genetic interchange across this boundary unlikely to occur in the future. Risks posed by a small population size may be more significant for *V. dissita* than currently understood due to the misleading appearance of the species, which has aerial stems that can appear to be multiple genets aboveground while actually representing several genetically identical stems supported by connected underground rhizomes. This may provide an inflated representation of the number of genetic individuals representing the population size. Additionally, interconnected groups of aerial stems may become separated if intervening rhizomes deteriorate. Therefore, the threats from small population size may be more significant if occurrences are actually composed of only a few genetically distinct types. Research on clonal diversity and breeding system for *V. dissita* should address this concern.

Transplantation

Small populations can be especially vulnerable to negative effects from transplantation efforts that are otherwise meant to benefit the species. Seeds and vegetative material *of Verbesina dissita* have been collected and propagated for mitigation measures when *V. dissita* plants were removed from EO 1 (Osborne, pers. comm. 2010; L. Robb, pers. comm. 2010). Preserving plants and genotypes is a positive step for the conservation of *V. dissita*; however, there may be a number of potentially negative impacts. These impacts include mixing genotypes, risking long

term survivability of genotypes, damaging plants during the translocation process, and increasing the frequency of outcrossing if *V. dissita* is normally an inbreeder. Alternately, if *V. dissita* is an outbreeder, mixing genotypes could be beneficial. "Weedy" individuals of a species may be more generalist in their habitat requirements and thus may survive the translocation process. These individuals may have higher survivability but lower genetic diversity, which means that translocation may effectively decrease the gene pool for the species. Lowered optimization of transplantation can result from a number of factors including lack of knowledge about habitat requirements, lack of appropriate preparation or funding, poorly timed or hasty transplanting, poor choice of transplantation site, lack of maintenance throughout the establishment period, and lack of monitoring (Hall 1987, p. 418). Data from a review of 15 transplantation projects for other rare plant species in Southern California indicate that maintenance and monitoring are the most frequently neglected variables contributing to the failure of transplantation projects (Hall 1987, p. 418).

Mitigation sites that are not adequately monitored or maintained may put the displaced genetic source at risk of die-off in the long term. Conversely, mitigation sites that are over-maintained may misrepresent the success of transplantation, while also putting the genetic source at risk of die-off when the maintenance period is complete. Multiple genets of *Verbesina dissita* may be replaced by successfully transplanted genets with a smaller representative gene pool. This threat highlights the need for genetic research on *V. dissita* including identification of the extent and location of genetic variability and clonality within the small populations in the United States and between the United States and Mexico.

Stochastic Events

The limited number of populations in a restricted geographic range, in addition to the small size of some of the remaining populations, makes *Verbesina dissita* susceptible to random catastrophic events, the most likely of which is fire. Fire has important evolutionary and ecological influences on chaparral and coastal scrub vegetation (Axelrod 1989; Rundel and Vankat 1989). Woody chaparral species often exhibit adaptations that enhance their ability to both survive fire and reproduce in postfire landscapes (Schwilk 2003; Zedler and Zammit 1989). These include resprouting from persisting root crowns, seeds that germinate after fire or have a fire-resistant seed coat, and heavy postfire seed production (Keeley 1987; Keeley and Fotheringham 1998; Keeley and Keeley 1981; Keeley and Zedler 1978). Herbaceous species that occur in chaparral communities may also have dormant, fire resistant seeds in a persistent seed bank that germinate after burning (Keeley and Fotheringham 1998). The only adaptation to fire evidenced by *V. dissita* is the presence of rhizomes noted above. We are not aware of any fruit/seed adaptations to fire or the presence of a seed bank for the species. The latter seems unlikely in light of the observations by Michael Wall as discussed above under the "Species Biology and Life History" section of this review, because plants require regeneration periods between fires.

In summary, the primary threat associated with a catastrophic fire is unlikely to be extirpation due to incineration. Rather, the foreseeable threat appears to be type-conversion and displacement of *Verbesina dissita* and other native plants by nonnative plants.

Summary of Factor E

In summary, threats affecting the continued existence of *Verbesina dissita* have changed since listing. Impacts from nonnative plant competition have increased as development and fuel modification clearings have made recruitment of nonnatives possible and persistent. *Verbesina dissita* competes with nonnatives for space and shaded sites, and is potentially impacted by altered fire frequency associated with increased prevalence of nonnative plants. While we recognize that drought and climate change are important issues with potential impacts on listed species and their habitats, we lack adequate information to make accurate predictions regarding the effects on *V. dissita* at this time. The genetic effects associated with small population size should be explored more thoroughly and the long term effects of transplanted genets should be monitored. Fuel modification practices required by the City of Laguna Beach are reducing the dense overstory habitat where *V. dissita* is found in the urban interface area outside of the Reserve. The goat grazing program managed by the LGFD is also impacting *V. dissita* and its habitat, though the direct effect on *V. dissita* plants has been difficult to establish. This species is susceptible to risk from catastrophic events such as wildfires. Furthermore, its habitat is susceptible to continued invasion by nonnative species, with the potential for a type-conversion shift from shrubland to grassland.

III. RECOVERY CRITERIA

There is no final approved recovery plan for *Verbesina dissita*.

IV. SYNTHESIS

At the time of listing in 1996, *Verbesina dissita* was known to occur in two disjunct occurrences in Laguna Beach, California. Those two occurrences are now considered one because intervening plants have been found that place these subpopulations closer than the 400 m (1,312 ft) distance used to distinguish distinct occurrences. Increased survey efforts have also detected an additional 5 ha (12 ac) area that is occupied by *V. dissita* at this occurrence; however, it is thought that these plants likely existed at listing. Overall, the northernmost portion of the range has decreased since listing by approximately 1.6 ha (4 ac) due to habitat modification from development and fuel modification (indicated by clearings). Habitat suitability and plant distribution has diminished at this location due to fuel modification, which is the most serious threat to the species and its habitat at this time; although we have no data to precisely quantify the extent of loss of *V. dissita* due to fuel modification. An additional 0.4 ha (1 ac) of occupied habitat discovered just after listing (EO 3) has been confirmed as extant, representing the eastern extent of the range. The total known area occupied is now considered to be about 12 ha (30 ac). While it is possible that an additional 291 ha (718 ac) of habitat is suitable for *V. dissita* in the United States, focused surveys are needed to identify if additional plants are found within this area.

At listing, the most serious threat to *Verbesina dissita* was urban development. Currently, the most serious threat is fuel modification, which clears or thins the dense vegetation where *V. dissita* is found. Such alteration likely alters the amount of incident sunlight, reduces soil moisture, and may increase competition with plants (such as nonnatives) that colonize habitat openings. Thus, it is likely that maintenance of thinned vegetation for fuel modification

degrades habitat quality for *V. dissita*. Fuel modification practices required by the LGFD include the thinning of vegetation by goats and by hand. This is likely to be directly affecting *V. dissita* and its habitat along the northern perimeter of its range.

According to State laws, illegal take of *Verbesina dissita* is also a significant threat. Almost all illegal take has occurred as a result of either fuel modification or development without the knowledge of CDFG.

Invasive nonnative plants, drought, climate change, small population size, transplantation, and impacts associated with fire are additional threats to *Verbesina dissita* throughout its range; however, we lack data to adequately assess their impacts or potential impacts. Life history and habitat specificity traits have created natural limitations for *V. dissita* that have been compounded by threats described in the five-factor analysis. Current research indicates that *V. dissita* is very easy to grow and maintain in controlled circumstances, which suggests that threats in the environment are causing its decline. Much of the southwest portion of the *V. dissita* distribution in EO 1 exists within the AWC Wilderness Park in the Reserve under the Central/Coastal NCCP/HCP, where it is mostly protected from the threat of development but may still be vulnerable to new recreation trails, erosion control facilities, and fire management measures.

In Mexico, 20 historical populations of *Verbesina dissita* were thought to represent about 85 percent of the total known abundance in the United States and Mexico combined (USFWS 1996, p. 52379). At the time of listing, as many as 5 populations in Mexico were extirpated and 15 remained extant. Since the time of listing, about half of those 15 populations have likely become extirpated as well. There is no indication that *V. dissita* is receiving any protection in Mexico similar to that afforded by the Act in the United States, as it is not a listed species in Mexico (Norma Official Mexicana NOM–059). This magnifies the value of conserving the remaining populations in the United States.

While threats to *Verbesina dissita* have increased since listing, so too has the recognition that much suitable habitat remains unsurveyed and is potentially occupied in the United States. Additionally, more data is needed to assess impacts from new threats. Therefore, we recommend that this species remain listed as threatened and that comprehensive survey efforts be undertaken in the next 5 years to better understand the population size and distribution of *V. dissita*.

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 *Verbesina dissita* from 5C to 11C. We do not anticipate additional large scale losses of habitat occupied by *V. dissita* because residential development and urbanization are no longer predominant threats. Though fuel modification has become the most serious threat, the southern portion of EO 1 and all of EO 3 occur within the Reserve and are presumed to be less impacted by this threat. *Verbesina dissita* has also been shown to respond well following a fire, demonstrating that it is capable of persisting through such stochastic events. *Verbesina dissita* has persisted at each location since listing and is not likely to go extinct within the foreseeable future throughout all or a significant portion of its range. Therefore, we recommend the recovery priority number be changed to 11C to reflect a moderate degree of threat, a low recovery potential, and a conflict with development.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1) Work with partners and programs (such as the Partners for Fish and Wildlife Program) to organize surveys of the historical occurrences, extant occurrences, and likely suitable habitat, especially in isolated steep canyon areas during the flowering season, to detect presence and distribution of plants.

2) Work with the LBFD to identify the distribution of *Verbesina dissita* in fuel hazard reduction zones and identify ways to minimize fuel modification impacts by identifying alternatives to thinning or clearing of habitat and introduction of nonnatives.

3) Perform a clonal structure analysis from multiple sources across the range of the species, including Mexico. If large clumps are found to be single genetic individuals, conservation measures may need to be more aggressive to address the threats of a smaller population size. Patterns in genetic variability should be studied to understand the breeding system of *Verbesina dissita* and to address potential threats compounded by a small population size.

4) Prepare site specific and species monitoring protocols to determine fine-scale habitat requirements and species fidelity to those requirements. This will allow us to

discriminate between lack of seed dispersal and unsuitable habitat as explanations for discontinuities in plant distributions.

5) Write a recovery plan with action items for *Verbesina dissita* and other rare associates that includes a restoration program to restore habitat required for healthy stands of *V. dissita*.

VII. REFERENCES CITED

Axelrod, D.I. 1989. Age and origin of chaparral. In Keeley, S.C., ed. The California chaparral: paradigms reexamined. Los Angeles, CA: Natural History Museum of Los Angeles County: 7–20.

Calflora: Information on California plants for education, research and conservation. [web application]. 2010. Berkeley, California: The Calflora Database [a non-profit organization]. Available: http://www.calflora.org. Accessed on July 15, 2010.

[CDFG] California Department of Fish and Game. 1989. Report to the Fish and Game Commission on the Status of Big-leaved Crown-beard (*Verbesina dissita*). State of California, Natural Heritage Division, The Resource Agency.

[CDFG] California Department of Fish and Game, Endangered Plant Program. 1990. California Native Plant Status Report for *Verbesina dissita*. Natural Diversity Data Base and California Native Plant Society. State of California, The Resource Agency.

[CDFG] California Department of Fish and Game. 2009. Natural Diversity Data Base, Natural Heritage Program, Sacramento, CA. Element Occurrence Report for *Verbesina dissita*.

[CDFG] California Department of Fish and Game. 2010. Natural Diversity Data Base, Natural Heritage Program, Sacramento, CA. Element Occurrence Report for *Verbesina dissita*.

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

City of Laguna Beach, California. 2010. Brush clearance for wildland fires. *http://www.lagunabeachcity.net/cityhall/fire/disaster/brush.asp*. Accessed on March 9, 2010.

[CCH] Consortium of California Herbaria. 2010. Data provided by the participants of the Consortium of California Herbaria. *http://ucjeps.berkeley.edu/consortium*. Accessed on July 15, 2010.

[CNDDB] California Department of Fish and Game, Natural Diversity Data Base. 2010. Element Occurrence Reports for *Verbesina dissita*. Unpublished cumulative data to current. Accessed on July 15, 2010.

DiTomaso, J.M. 2000a. Cortaderia jubata. In: Bossard. C.C., Randall, J.M., Hoshovsky, M.C., eds. Invasive plants of California's wildlands. Berkeley, CA: University of California Press: 124–128.

DiTomaso, J.M. 2000b. Cortaderia selloana. In: Bossard. C.C., Randal, J.M., Hoshovsky, M.C., eds. Invasive plants of California's wildlands. Berkeley, CA: University of California Press: 128–133.

Dunning, J.B., M.J. Groom, and H.R. Pulliam. 2006. Species and landscape approaches to conservation. Pages 419-465 in M.J. Groom, G.K. Meffe, and C.R. Carroll (editors). Principles of conservation biology, third edition. Sinauer Associates, Inc., Sunderland, MA.

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

Fielder, P.L. and J.J. Ahouse. 1992. Hierarchies of cause: Toward an understanding of rarity in vascular plant species. Pp. 23-47. *In* Fielder, P.L. and S.K. Jain, eds. Conservation Biology. The Theory and Practive of Nature Conservation, Preservation, and Management. Chapman and Hall; New York, NY.

Giessow, J. and Zedler, P. 1996. Effects of fire frequency and firebreaks on the abundance and species richness of exotic plant species in coastal sage scrub. San Diego, CA: San Diego State University. 76 p. Thesis.

Gray, A. 1885. Notes of various Compositae. Proceedings of the American Academy of Arts and Sciences 20: 299.

Groom, M. 1998. Allee effects limit population viability of an annual plant. Amer. Naturalist 151(6): 487–496.

Hall, H.M. 1907. Compositae of Southern California. University of California Publications in Botany 3: 136–139.

Hall, L.A. 1987. Transplantation of sensitive plants as mitigation for environmental impacts. In: Conservation and Management of Rare and Endangered Plants by T. Elias (ed.). California Native Plant Society.

Halvorson, W.L. and G.J. Maender. 1994. Santa Barbara Museum of Natural History, Santa Barbara, CA.

Hogan, D.C., J.O. Sawyer, and C. Saunders. 1996. Southern Maritime Chaparral. Fremontia 24(4): 3–7.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, the Resource Agency, Department of Fish and Game.

Huenneke, L.F. 1991. Ecological implications of genetic variation in plant populations. In: Genetics and Conservation of Rare Plants, D.A. Falk and K.E. Holsinger, eds. Center for Plant Conservation. Oxford Univ. Press, NY.

[IPCC] Intergovernmental Panel of Climate Change. 2007. Climate Change 2007: the physical science basis: Summary for policymakers. Contribution of the Working Group I to the Fouth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC Secretariat, World Meteorological Organization and United Nations Environment Programme, Geneva, Switzerland. Available online at *www.ipcc.ch.*

Junak S.A. and R. Philbrick. 1994. The vascular plants of Todos Santos Island, Baja California, Mexico. In The Fourth California Symposium: Update on the Status of Resources. Edited by W.L. Halvorson and G.J. Maender. 1994. Santa Barbara Museum of Natural History, Santa Barbara, CA.

Keeley, J.E. 1987. Role of fire in the germination of woody taxa in California chaparral. Ecology 68: 434–443.

Keeley, J.E. 2001. Fire and invasive species in Mediterranean-climate ecosystems in California. Pp. 81–94. In: Galley, K.E.M., T.P. Wilson, eds. Proceedings of the invasive species workshop: The role of fire in the control and spread of invasive species; Fire conference 2000: the first national congress on fire ecology, prevention, and management. 2000 San Diego, CA. Misc. Publ. No. 11. Tallahassee, FL: Tall Timbers Research Station.

Keeley, J.E., and C.J. Fotheringham. 1998. Mechanism of smoke-induced seed germination in a post-fire chaparral annual. Journal of Ecology 86: 27–36.

Keeley, J.E. and S.C. Keeley. 1981. Post-fire regeneration of southern California chaparral. American Journal of Botany 68(4): 524–530.

Keeley, J.E. and P.H. Zedler. 1978. Reproduction of chaparral shrubs after fire: a comparison of sprouting and seeding strategies. The American Midland Naturalist 99: 142–161.

Keil, D.J. 1993. *Verbesina* p. 356. In: The Jepson Manual, Higher Plants of California, J. C. Hickman, ed. p. 356. University of California Press, Berkeley and Los Angeles, CA.

[LBFD] City of Laguna Beach Fire Department. Landscape/Fuel Modification Guidelines and Maintenance Program. 2010. Unpublished report.

Lennartsson, T. 2002. Extinction thresholds and disrupted plant-pollinator interactions in fragmented plant populations. Ecology 83(1): 3060–3072.

Marsh, K.G. 1989. A recommendation to the State of California Fish and Game Commission: a petition to list Big-leaved Crown-beard (*Verbesina dissita*). Unpublished.

Marsh, K.G. 1992. South Laguna Biological Resources Inventory. Prepared for the City of Laguna Beach, CA.

Marsh, K.G., F.M. Roberts Jr., D. Bramlet, G. Marsh, and R. Reifner. 1992. South Laguna biological resource inventory. Report prepared for City of Laguna Beach, CA. Unpublished.

Marsh, K.G. 1994. Biological surveys for the South Laguna Fuel Modification Zone, Laguna Beach, Orange County, CA. Unpublished report submitted to City of Laguna Beach by Chambers Group, Inc.

Merriam, K.E., J. E. Keeley, J.L. Beyers. 2006. Fuel breaks affect nonnative species abundance in Californian plant communities. Ecological Applications 16(2): 515–527.

Morse L.E., L.S. Kutner, J.T. Kartesz. 1995. Potential impacts of climate change on North American flora. Pages 392–395 in La Roe, E.T. LaRoe, G.S Farris, C.E. Puckett, P.D. Doran, and M.J. Mac, eds. 1995. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. Department of the Interior, National Biological Service, Washington, DC. 530 pp.

Munz, P.A. 1974. A Flora of Southern California. University of California Press. Berkeley, CA.

[NCCP] County of Orange, Central/Coastal Subregion, Natural Community Conservation Plan & Habitat Conservation Plan, Parts I & II. 1996.

[NOM] Norma Official Mexicana. 2001. Seguna Seccion: Secretaria de Medio Ambiente Y Recursos Naturales. Diario Official. NOM-059-ECOL-2001. Accessed from *www.conbio.gob.mx/conocimiento/ise/doctos/NOM-059-ECOL-2001.pdf* on 02/23/2010.

Panero, J.L. and R.K. Jansen. 1997. Chloroplast DNA restriction site study of *Verbesina* (Asteraceae: Heliantheae). American Journal of Botany 84(3): 382–392.

PCR Services Corporation. 2008. Aliso Creek Area Redevelopment Plan. Prepared for the Athens Group.

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

Roberts, F.M., Jr. 1988. A Recommendation to the State of California Fish and Game Commission: a petition to list Big-leaved Crown-Beard (*Verbesina dissita*). Unpublished.

Roberts, F.M., Jr. 1989. Letter to Chris Kreyman of California Coastal Commission regarding residential construction permits.

Roberts, F.M., Jr. 1992. Memo to USFWS file: The Status of *Verbesina dissita* on Punta Banda, Estado de Baja California, Mexico.

Roberts, F.M., Jr. 2009. A preliminary review of *Verbesina dissita* records in Orange County, California. Unpublished.

Rundel, P.W. and J.L. Vankat. 1989. Chaparral communities and ecosystems. In: Keeley, S.C., ed. The California chaparral: paradigms reexamined. Los Angeles, CA: Natural History Museum of Los Angeles County: 127–139.

Sawyer J.O. and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society.

Shaffer, M.L. 1981. Minimum population sizes for species conservation. Bioscience 31:131–134.

Shaffer, M.L. 1987. Minimum viable populations: coping with uncertainty. Pages 69–86 in M.E. Soulé (editor), Viable populations for conservation. Cambridge University Press, New York, NY.

Schwartz, P. 2010. Laguna Beach Fuel Modification: Response to questions from U.S. Fish and Wildlife Service regarding Laguna Beach Fuel Modification Activities and Big-leaved Crownbeard (*Verbesina dissita*). Unpublished report provided by Glenn Lukos Associates. April 1, 2010.

Schwilk, D.W. 2003. Flammability is a niche construction trait; canopy architecture affects fire intensity. American Naturalist 162: 725–733.

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

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

[USFWS] U.S. Fish and Wildlife Service. 1996. Determination of endangered or threatened status for four southern maritime chaparral plant taxa from coastal southern California and northwestern Baja California, Mexico. Federal Register 61: 52370–52384.

[USFWS] U.S. Fish and Wildlife Service. 2009. Initiation of 5-Year Reviews of 58 Species in California, Nevada, Arizona, and Utah; Availability of Competed 5-Year Reviews in California and Nevada. Federal Register 74: 12878–12883.

[USFWS] U.S. Fish and Wildlife Service. 2010. GIS Data provided by Carlsbad Fish and Wildlife Office GIS Specialist Tony McKinney, on June 15, 2010.

Wall, M. 2003. Summary of seed collection and initial viability test for *Verbesina dissita*. Rancho Santa Ana Botanical Garden. Pp. 1–2.

Zedler, P.H. and C.A. Zammit. 1989. A population-based critique of concepts of change in the chaparral. In Keeley, S.C., ed. The California chaparral: paradigms reexamined. Los Angeles, CA: Natural History Museum of Los Angeles: 73–83.

Zouhar, K., J.K. Smith, S. Sutherland, M.L. Brooks. 2008. Wildland fire in ecosystems: fire and nonnative invasive plants. Gen. Tech. Rep. RMRS–GTR–42-vol. 6. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 355 p.

Personal Communications:

Arvizu, V. 2010. Rancho Santa Ana Botanical Garden. Record of telephone conversation with Mr. Arvizu. Subject: Mitigation project for *Verbesina dissita,* on February 22, 2010.

Berg, K. 1992. Coordinator of California Department of Fish and Game Endangered Plant Program. Record of conversation with Mr. Berg. Subject: Impacts to State listed plants.

Bittman, R. 2010. Lead Botanist for the California Natural Diversity Database, California Department of Fish and Game. Record of telephone conversation with Ms. Bittman. Subject: Verbesina dissita occurrences status, on July 14, 2010.

Christopher, T. 2010. Fuel modification expert, City of Laguna Beach Fire Department. Record of telephone conversation on February 11, 2010. Subject: Fuel modification practices related to *Verbesina dissita*.

De la Rosa. 2010. California Department of Fish and Game (CDFG). Record of telephone conversation on March 3, 2010. Subject: Data search for incidental take permits through CDFG.

Drewberry, R. 1991. Laguna Beach Fire Department Chief. Record of conversations and meetings with Fred Roberts of USFWS from 1991 to 1993. Subject: Fuel modification and rare plants.

Moran, R. 1992. Botanist, California Academy of Sciences. Record of conversation with Dr. Moran. Subject: Plant distributions in Baja California, on June 27, 1992.

North, S. 2010. Carlsbad Fish and Wildlife Office Biologist. Record of personal observations during field visit to *Verbesina dissita* occurrences in Laguna Beach, CA in November, 2009.

Osborne, M. 2010. California Department of Fish and Game. Record of conversation with Ms. Osborne, South Coast Region Five Associate Biologist (Botany). Subject: Incidental take permitting, history of take and mitigation for *Verbesina dissita* on June 10, 2010.

Preston, K. 2010. Nature Reserve Orange County (NROC). Record of conversation on January 12, 2010. Subject: NROC rare plant monitoring program.

Reifner, R. 2010. Species expert. Email to Susan North dated February 10, 2010. Subject: Crownbeard found.

Robb, L. 2010. Consulting Biologist, PCR Services Corporation. Record of telephone conversation, dated February 22, 2010. Subject: Mitigation site for *Verbesina dissita*.

Roberts, F.M., Jr. 2009. Consulting Biologist, Oceanside, California. Record of conversation while on site visit to *Verbesina dissita* occurrences on November 20, 2009. Subject: *Verbesina dissita*.

Roberts, F.M., Jr. 2010. Consulting Biologist, Oceanside, California. Email to Susan North with attached CNDDB form describing Verbesina dissita Element Occurrence EO 3 on March 1, 2010.

Wall, M. 2010. Seed Conservation Program Manager. Rancho Santa Ana Botanical Garden. Record of telephone conversation on February 23, 2010. Subject: Seed biology and dispersal methods.

Appendix 1. Occurrences of *Verbesina dissita* in the United States; prepared for 5-year review, 2010; CNDDB element occurrence number (EO) (CNDDB 2010).

Occurrence	Known at Listing	Threats at Listing	Current Threats	Current Conservation
Temple Hill, Goff ridge, Portafina Canyon, Arch Beach Heights, Hobo Canyon, western side of Niguel Hill, Ceonothus Canyon **EO 1**	Temple Hill and Niguel Hill, two separate occurrences at listing, have since been joined due to an occurrence report connecting the two (Marsh *et al.* 1992) .	**Factor A:** Urban development, fuel modification activities. **Factor D:** CESA, NPPA, and CEQA are ineffective. Orange County Central/Coastal NCCP/HCP does not include *V. dissita*, and local fire management laws and regulations are detrimental. **Factor E:** Competition with invasive nonnative plants.	**Factor A:** Fuel modification activities, urban development, and altered fire regimes. **Factor C:** Grazing. **Factor D:** CESA, NPPA, and CEQA are ineffective. Orange County Central/Coastal NCCP/HCP does not cover *V. dissita*, and local fire management laws and regulations are detrimental. **Factor E:** Competition with invasive nonnative plants, small population size, transplantation, and stochastic events.	Ten to twenty percent occurs within Central/Coastal Reserve of Orange County. This alleviates most threats associated with development, fuel modification, and grazing.
Eastern side of Niguel Hill, west of Aliso Summit Trail. **EO 3**	Unknown at listing.	None identified.	**Factor A:** Possibly future fuel modification activities, and altered fire regimes. **Factor C:** Possibly some grazing. **Factor D:** CESA, NPPA and CEQA are ineffective. Orange County NCCP does not cover *V. dissita*. **Factor E:** Competition with nonnatives, small population size, transplantation, and stochastic events.	Occurs entirely within Central/Coastal Reserve of Orange County.

U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW

***Verbesina dissita* (Big-leaved crownbeard)**

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_____

New Recovery Priority Number and Brief Rationale: 11C

We recommend a change in the recovery priority number for *Verbesina dissita* from 5C to 11C. We do not anticipate additional large scale losses of habitat occupied by *V. dissita* because residential development and urbanization are no longer predominant threats. Though fuel modification has become the most serious threat, the southern portion of EO 1 and all of EO 3 occur within the Reserve and are presumed to be less impacted by this threat. *Verbesina dissita* has also been shown to respond well following a fire, demonstrating that it is capable of persisting through such stochastic events. *Verbesina dissita* has persisted at each location since listing and is not likely to go extinct within the foreseeable future throughout all or a significant portion of its range. Therefore, we recommend the recovery priority number be changed to 11C to reflect a moderate degree of threat, a low recovery potential, and a conflict with development.

FIELD OFFICE APPROVAL:

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

AUG 0 6 2010

Approve _____ Date _____

Scott A. Sobiech