

Fremontodendron mexicanum
(Mexican flannelbush)

**5-Year Review:
Summary and Evaluation**



Fremontodendron mexicanum, Photo by J. Snapp-Cook, USFWS

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

August 14, 2009

5-YEAR REVIEW

Fremontodendron mexicanum (Mexican flannelbush)

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 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:

Fremontodendron mexicanum (Mexican flannelbush) is a small tree in the Malvaceae (mallow family) (in the Sterculiaceae (cacao family) when listed). Plants can grow to a height of 6 meters (19 feet) and have large orange to yellow flowers. *Fremontodendron mexicanum* is endemic to southern California and northwestern Baja California, Mexico, with native populations occurring in intermittent drainages with closed-cone coniferous forest and southern mixed chaparral habitats. *Fremontodendron* is thought to be a relic genus left over from a time period approximately 60 million years ago when California had a more tropical climate (Kelman 1991, p. 15). At the time of listing (1998), this species was known to occur in one canyon in the United States and one canyon in Baja California, Mexico. It is now known to occur in three canyons in the United States and one canyon in Baja California.

Methodology Used to Complete This Review:

This review has been prepared by the Carlsbad Fish and Wildlife Office (CFWO) using the Region 8 guidance issued in March 2008. The primary sources of information used to update the species' status and threats are survey data, data for *Fremontodendron mexicanum* in the California Natural Diversity Database (CNDDDB 2008, pp. 1–8, Element Occurrences (EO) 1, 2, 6, 7, 8, 12, 17, and 18) maintained by the California Department of Fish and Game, and personal communications with species and habitat experts. We also used information in the 2007 petition to list *F. mexicanum* as an endangered plant species under the Mexican equivalent of the Act (Norma Oficial Mexicana NOM-059). We received no information from the public in response to our Federal Register 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 the Act's five listing factors. In this review, we evaluate the listing status of the species and provide an assessment of this species' progress towards recovery. We also recommend a list of high priority conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Lead Field Office: Jonathan Snapp-Cook 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 species and the opening of a 60-day period to receive information from the public was published in the *Federal Register* on February 14, 2007 (Service 2007, pp. 7064-7068).

Listing History:

Original Listing

FR Notice: 63 FR 54956

Date of Final Listing Rule: October 13, 1998

Entity Listed: *Fremontodendron mexicanum* (Mexican flannelbush), a plant species

Classification: Endangered

State Listing

Fremontodendron mexicanum (Mexican flannelbush) was listed as rare by the State of California in July 1982.

Associated Rulemakings:

We designated approximately 228 acres (93 hectares) of Federal land as critical habitat for *Fremontodendron mexicanum* in San Diego County, California. The final rule designating critical habitat was published in the *Federal Register* on September 27, 2007 (Service 2007, pp. 54984-55010), and became effective October 29, 2007.

Review History: No previous reviews have been drafted for this species.

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

The recovery priority number for *Fremontodendron mexicanum* is 2 according to the Service's Fiscal Year 2008 Recovery Data Call for the Carlsbad Fish and Wildlife Office. This is based on a 1 to 18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Service 1983, pp. 43098–43105). This number indicates that the taxon is a species that faces a high degree of threat and has a high potential for recovery.

Recovery Plan or Outline: A recovery plan has not yet been drafted for this species.

II. REVIEW ANALYSIS

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

The Act defines “species” as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, 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:

Species Description

Fremontodendron mexicanum is a shrub or tree that ranges in height from 1.5 to 6 meters (5 to 19 feet) tall. The species has palmately (i.e., main sections of the leaf all radiating from one point) lobed leaflets 10 to 69 millimeters (0.4 to 2.7 inches) wide, and large bright yellow to orange flowers occasionally reddish toward the base (floral diameter is 45 to 79 millimeters (1.8 to 3.1 inches)). *Fremontodendron mexicanum* is differentiated from other members of its genus by the characteristics of its nectar pits and seeds. The nectar pits at the base of the sepals contrast with other members of this genus because they lack long silky hairs bordering the basal pits (Davidson 1917, p. 50). The seeds of *F. mexicanum* are shiny, black, and lack caruncles (i.e., waxy outgrowths on seeds) as opposed to those of *F. decumbens* and *F. californicum*, which are dull and brown with orange caruncles (Kelman 1991, p. 19). In the United States, *F. mexicanum* occurs partially in the Bureau of Land Management's (BLM) Otay Mountain Wilderness Area and partially on private land that is part of the historic Otay Ranch property.

Life History

Fremontodendron mexicanum is a perennial plant species that flowers from March to June (Munz 1974, p. 843); however, no studies on the longevity of this species have been conducted. Each year the plants flower and produce seed. The seeds are held on the plants in dry pods until the fall and winter months when the capsules open to release seeds. The showy nature of the flower and the presence of nectar pits at the base of the sepals suggest that pollen is transferred from flower to flower by insect pollinators, but a focused pollination study has not been conducted.

Response to Fire

A primary consideration in the biology of *Fremontodendron mexicanum* is its ability to survive fires. This species grows in chaparral habitat, a habitat type that is adapted to periodic fires, and *F. mexicanum* is associated with species such as *Callitropsis forbesii* (*Cupressus forbesii*, Tecate Cypress), that require fire as a part of their life cycle (Dunn 1987, p. 367). The final critical habitat rule discussed possible strategies that *F. mexicanum* may have adapted to survive periodic fires. One strategy is *F. mexicanum*'s ability to resprout from underground roots after a fire. Another strategy is the ability of its seeds to survive a fire and then sprout following the fire (Service 2007, p. 54992). At this time, we do not have data to show which of these two strategies is favored by this species, but we assume that both are important for its long-term survival.

Habitat

The information in the listing rule on the habitat of *Fremontodendron mexicanum* is accurate. The listing rule states that *F. mexicanum* grows in closed-cone coniferous forest and southern mixed chaparral, often in association with metavolcanic soils (Oberbauer 1991, pp. 1-9; Reiser 1996, pp. 92-92). *Fremontodendron mexicanum* grows on alluvial benches associated with ephemeral drainages and also on the associated canyon slopes. At the time of listing, the elevation range for this species was thought to range between 300 and 1000 meters (900 to 3,000 feet). Since, listing *F. mexicanum* has been found in Mexico near sea level. The elevation range of this species is now considered to range from sea level to 1,000 meters (3,000 feet).

The critical habitat rule for *Fremontodendron mexicanum* analyzed the habitat factors that support this species. These factors are summarized in the Primary Constituent Elements section of the rule and add specificity to the habitat description in the listing rule (Service 2007, p. 54993). The primary constituent elements for *F. mexicanum*, as described in the critical habitat rule, are:

- (1) Alluvial terraces, benches, and associated slopes within 152 meters (500 feet) of streams, creeks, and ephemeral drainages where water flows primarily after peak seasonal rains with a gradient ranging from 3 to 7 percent; and stabilized north to east facing slopes associated with steep (9 to 70 percent) slopes and canyons that provide space for growth and reproduction.
- (2) Silty loam soils derived from metavolcanic and metabasic bedrock, mapped as San Miguel—Exchequer Association soil series, that provides the nutrients and substrate with adequate drainage to support seedling establishment and growth.
- (3) Open *Callitropsis forbesii* and *Platanus racemosa* (western sycamore) stands at elevations of 274 meters (900 feet) to 914 meters (3,000 feet) within a matrix of chaparral that includes species such as *Dendromecon rigida* ssp. *rigida* (bush poppy) and *Malosma laurina* (laurel sumac), and riparian vegetation that provides adequate space for growth and reproduction.

Spatial Distribution and Abundance

At the time this species was listed, we only knew of one occurrence containing fewer than 100 plants in the United States, and one occurrence in Mexico with no information on the number of plants. Since listing, two additional occurrences have been discovered in the United States (both within 2 miles of the known occurrence), and one additional occurrence has been located in Mexico.

The Service and our partners have made an effort to better document the range of *Fremontodendron mexicanum* in the United States. Surveys were conducted from 2005 to 2007 by biologists from the Service, BLM, San Diego State University, County of San Diego, the Center for Reproduction of Endangered Species, and Southern California Botanists in the northwest portion of Otay Mountain in areas that were identified as potential habitat. Figure 1 depicts the areas that were surveyed on Otay Mountain and the areas where native occurrences of *F. mexicanum* were found. The occupied area in Figure 1 represents occurrences of *F. mexicanum* in Cedar Canyon (2,500 plants), Little Cedar Canyon (31 plants), and an unnamed canyon on Otay Mountain (3,500 plants) (we believe this unnamed canyon was referred to as “Woodwardia Canyon” by Harbison, Gander, and Wolf in the 1930s). Table 1 lists our current assessment of the distribution and abundance of this species.

Table 1. Occurrences of *Fremontodendron mexicanum* that were extant at the time of listing or are currently extant (see Appendix 1 for a detailed account of all occurrence records).

<i>Occurrence Location</i>	<i>Number of individuals (estimates made from 2005-2008 plant counts)</i>	<i>Size</i>	<i>Year discovered</i>	<i>Threats</i>
Otay Mountain, San Diego County, USA				
Cedar Canyon	2,000 – 2,500	100 ac	1955	Fire Frequency
Little Cedar Canyon	31	50 ac	2006	Fire Frequency
Woodwardia Canyon (unnamed canyon on topographical maps)	3,500	200 ac	1935 (rediscovered 2006)	Fire Frequency
Baja California, Mexico				
Arroyo Seco	Not relocated	--	19xx	
Arroyo Hediondo	20	5 ac	2000	Altered Hydrology

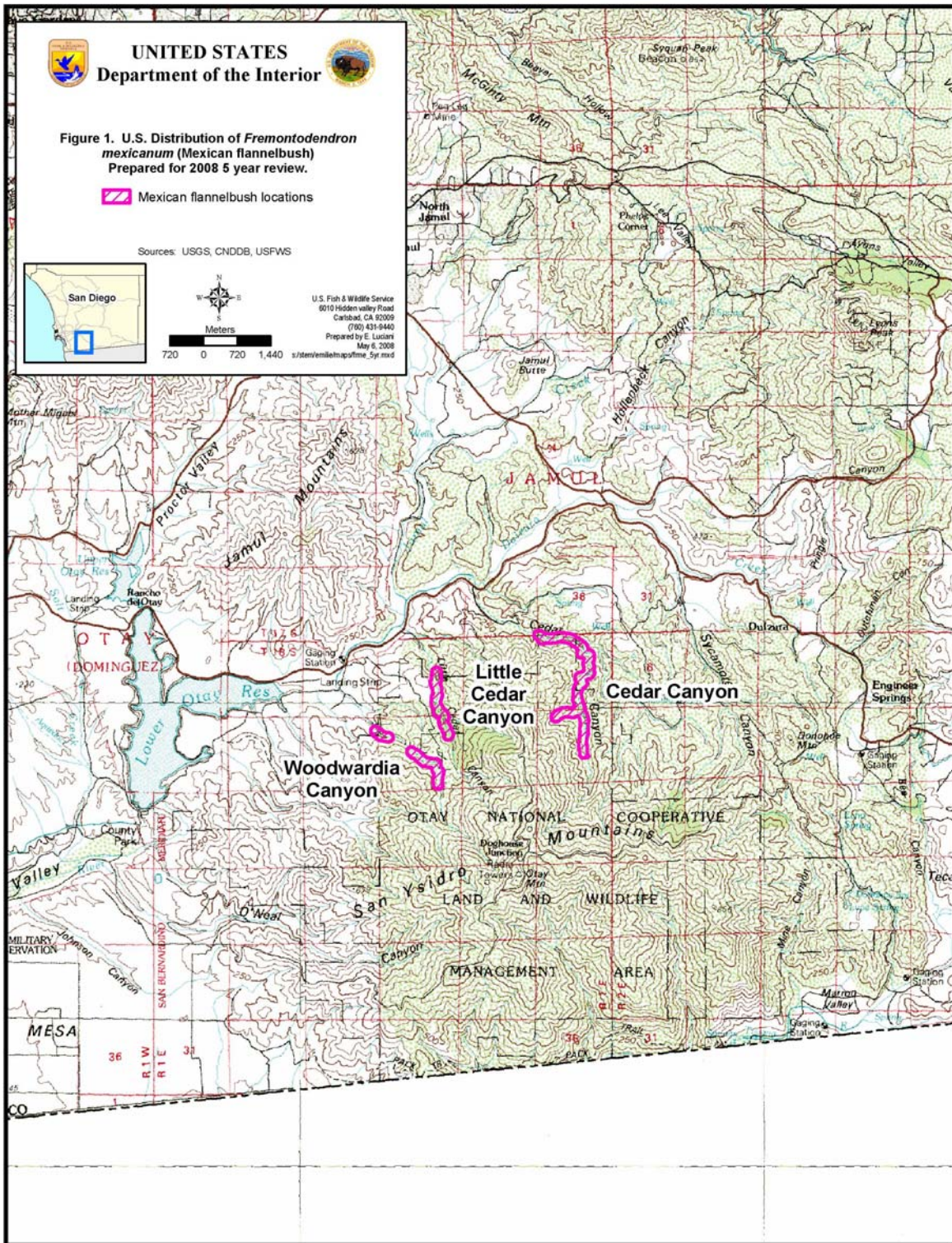


Figure 1: Distribution of known *Fremontodendron mexicanum* occurrences in the United States.

In the United States, *Fremontodendron mexicanum* is found only on the northwest side of Otay Mountain in southern San Diego County, California. Rather than being limited to a single canyon on Otay Mountain as was known at the time of listing, *F. mexicanum* is currently found in three adjacent canyons, though the distribution of *F. mexicanum* in the United States is still extremely localized. All of the currently known extant natural occurrences of this species occur on a single mountain, in an area approximately 4.8 kilometers (3.0 miles) from north to south and 5.6 kilometers (3.5 miles) from east to west. At this time, we estimate that there are approximately 6,000 *F. mexicanum* plants on Otay Mountain.

At the time of listing, we only knew of one population of *Fremontodendron mexicanum* in Mexico. This population was referred to by Wiggins (1980, pp. 814–815) as Arroyo Seco. Botanists have searched for this population since the time of listing without finding any individuals; therefore, the population in Arroyo Seco is considered to be extirpated (Harper 2007, p. 5). In 2000, a single population of *F. mexicanum* was discovered in Arroyo Hediondo, Baja California, Mexico (Harper 2007, pp. 6–7). Figure 2 shows the distribution of *F. mexicanum* in the United States and Mexico. Currently, the distribution of *F. mexicanum* is extremely localized in Mexico. We currently know of a single population in northwestern Baja California, Mexico, which we estimate has fewer than 20 *F. mexicanum* plants.

Changes in Taxonomic Classification or Nomenclature

Since listing, there have been no changes in the nomenclature of *Fremontodendron mexicanum*. However, until recently, *F. mexicanum* was considered a member of the Sterculiaceae (cacao family). Recent work indicates that this species should be considered a member of the Malvaceae (mallow family) (Judd and Manchester 1997, pp. 384–405; Bayer et al. 1999, pp. 267–303; Baum et al. 2004, pp. 1863–1871).

Historically, the genus *Fremontodendron* has primarily been included in the family Sterculiaceae. Systematic treatments have generally grouped Sterculiaceae with Malvaceae, Tiliaceae, and Bombacaceae (three other tropical plant families) due to similar and overlapping characteristics; however, the delineation between these families has been a problem for many years. Sometimes, comparisons among plants from different parts of the world were not undertaken, resulting in regional differences in classifications. The advent of cladistic and molecular systematics (i.e., recent advances in the field of genetics) has allowed clarification of the relationships among the members of this aggregate of families. Research results indicate that most of the members of these families are best treated as members of a single family, the Malvaceae. These results are based on: (1) a preliminary cladistic analysis of the morphological, anatomical, and chemical characters (Judd and Manchester 1997, pp. 384–405); (2) analysis of plastid DNA sequences (Baum et al. 2004, pp. 1863–1871); and (3) a combined analysis of plastid *atpB* and *rbcL* (Bayer et al. 1999, pp. 267–303). All of the cited references above include the genus *Fremontodendron* in the revised Malvaceae *s.l.* Therefore, we now recognize *Fremontodendron* as a member of the Malvaceae (mallow family). We will present this information for inclusion in the next iteration of the List of Endangered Wildlife and Plants (50 CFR, Part 17, Subpart B, section 17.12 Endangered and Threatened Plants).

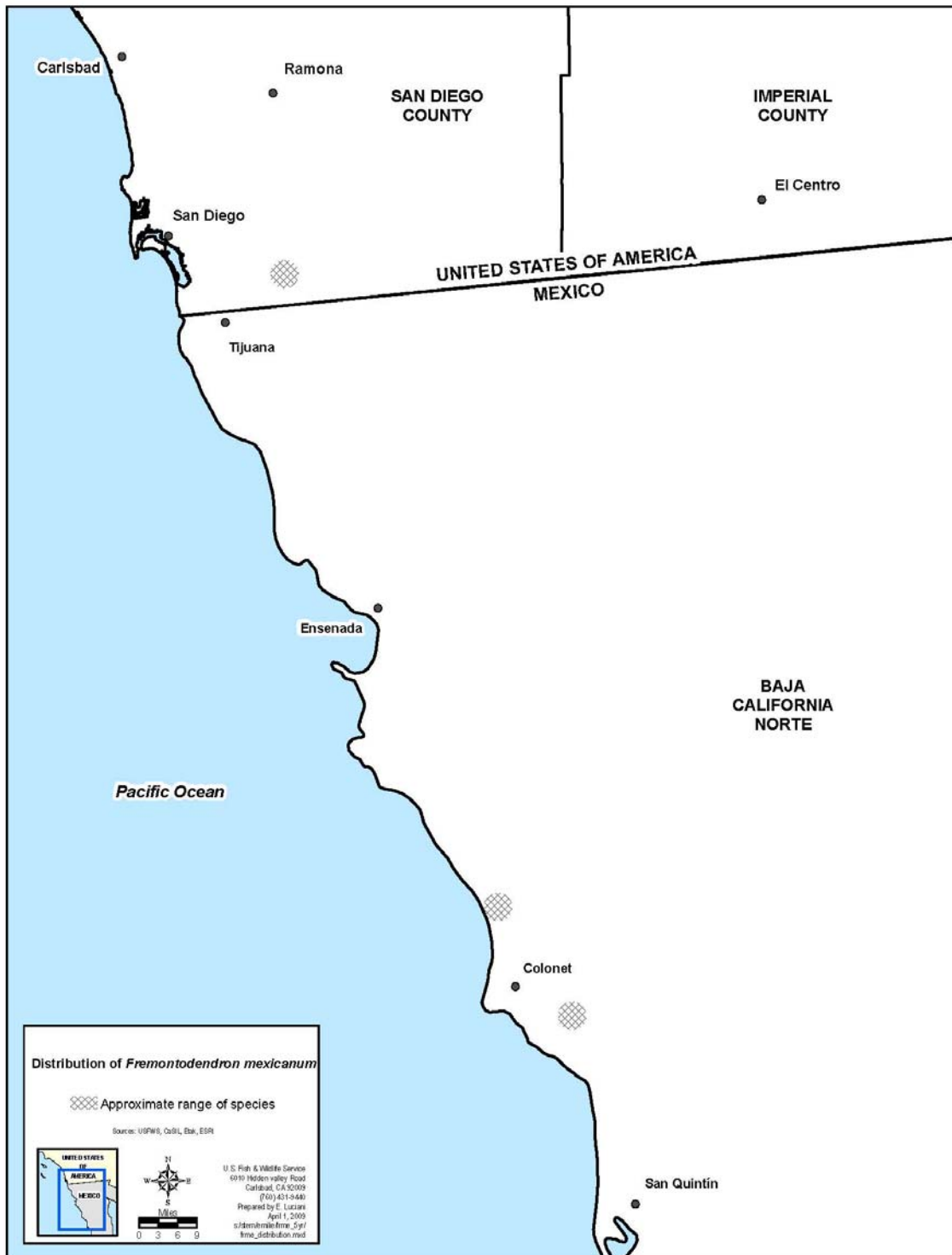


Figure 2. Distribution of *Fremontodendron mexicanum* occurrences in the United States and Baja California, Mexico.

Genetics

At the time of listing, there was no genetic information on *Fremontodendron mexicanum* or any members of this genus. Since the listing, a genetic analysis was conducted on the related *F. decumbens* (Pine Hill flannelbush) (Kelman et al. 2006, pp. 380–387). This study supported the genetic, morphological, and ecological distinction of *F. decumbens* from *F. mexicanum* and *F. californicum* (Kelman et al. 2006, pp. 383–386). This study focused on *F. decumbens* and did not provide additional information on *F. mexicanum*. The methodology and framework presented in Kelman *et al.* (2006) could be used to conduct a similar genetic analysis of *F. mexicanum*.

Species-specific Research and/or Grant-supported Activities

(1) United States Fish and Wildlife Service Preventing Extinction Grant: In 2006, a grant under the Preventing Extinction Program was awarded to the San Diego National Wildlife Refuge (Refuge) to fund a project entitled “Distributional Enhancement of Mexican flannelbush”. The purpose of this grant is to decrease the vulnerability of *Fremontodendron mexicanum* by collecting seeds from the native populations and creating new populations in unoccupied habitat. As part of the grant, five potential areas for introduction of *F. mexicanum* were identified on San Diego National Wildlife Refuge and BLM lands in the Jamul Mountains and on Mount McGinty (both areas are north of Otay Mountain). Refuge staff collected seeds from the Cedar Canyon population in 2007 and planted 19 *F. mexicanum* plants grown from the collected seed at a site on the Refuge in 2009. The main point of contact for this project is John Martin, Wildlife Biologist, San Diego National Wildlife Refuge.

(2) Bureau of Land Management Challenge Cost Share Project: In 2007, the BLM began work on a Cost Share Project with researchers from San Diego State University to conduct a habitat site assessment for *Fremontodendron mexicanum* based on the 2007 critical habitat designation. The proposal for this project indicates that researchers will: (1) Assess the known occurrences of *F. mexicanum* on Otay Mountain and verify the presence of the Primary Constituent Elements identified in the 2007 critical habitat designation for *F. mexicanum*; (2) identify and characterize potential *F. mexicanum* habitat on Otay Mountain; and (3) search the potential habitat identified on BLM administered lands for new occurrences of *F. mexicanum*. This research will enable BLM to develop appropriate management and monitoring programs in the areas that have occurrences of *F. mexicanum* or potential habitat for *F. mexicanum*. The principle investigator for this project is Kathy Williams, Ph.D., Associate Professor of Biology, San Diego State University.

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. Although we believe that all three known occurrences were likely occupied at the time of listing, at listing we only knew of the Cedar Canyon occurrence. The listing rule analyzed threats based on the single occurrence in Cedar Canyon. In the discussion below, we have not differentiated between the three known

occurrences in the United States, because they are located in close proximity and are affected by the same threats.

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

Threats identified under Factor A in the listing rule for *Fremontodendron mexicanum* include: adverse genetic effects because of the low number of individuals in the Cedar Canyon occurrence, and altered fire regimes—fires that occur at shorter or longer intervals than the natural cycle or fires that may occur during reproductive seasons. Since listing, we have identified two additional threats to *F. mexicanum*'s habitat. Specifically, there is the threat of adverse effects to *F. mexicanum* habitat from nonnative, invasive plants, including *Tamarix* spp. (tamarisk or salt cedar). There is also the potential for impacts to this species' habitat from border patrol activities conducted by the Department of Homeland Security (DHS). In this review we have moved the entire discussion on threats related to fire and small population size to Factor E. In the listing rule aspects of these two threats were discussed under Factor A and Factor E. These threats more directly affect *F. mexicanum* plants, rather than the habitat. The following threats to *F. mexicanum* are discussed below: (1) Adverse effects related to the development of adjacent areas; (2) adverse effects to *F. mexicanum* from nonnative, invasive species; and (3) potential adverse effects associated with border control activities.

Adverse effects to *F. mexicanum* from nonnative invasive plants

At the time of listing, threats associated with nonnative invasive species were not discussed. Following the 2003 fires that burned through all known occurrences of *Fremontodendron mexicanum*, the nonnative invasive shrub *Tamarix* spp. (tamarisk) was found in the canyons that support *F. mexicanum* (J. Snapp-Cook, Service, pers. obs. 2006, pp. 1–3; Gasser 2007, p. 201). Following the 2007 fire on Otay Mountain, hundreds of seedling and sapling tamarisk plants were found growing throughout Cedar Canyon (Gasser 2007, p. 201). Goodwin and Sheley (2001, p. 15) noted that as a result of fire, open areas containing high levels of nutrients in full sun, favor the invasion and spread of weedy nonnative species. Additionally, *Tamarix* spp. has been shown to decrease the water available to native plants in riparian habitats (DeLoach et al. 2000, pp. 835–844). The Interagency Burned Area Emergency Response Team recommended that the tamarisk be removed.

We consider invasion of tamarisk to be a range-wide concern with a moderate degree of threat. At this time, the infestation of tamarisk is in its initial phase and can be controlled in the canyons where *Fremontodendron mexicanum* grows. This threat could increase in magnitude if left unchecked. Without proactive management to eliminate tamarisk, the magnitude of this threat could increase. In 1999, the Federal land where *F. mexicanum* occurs was designated as the Otay Mountain Wilderness Area. This designation allows the BLM to use the Wilderness Act of 1964 to guide the management of the BLM lands where *F. mexicanum* occurs. This also introduces some unique management issues because this designation prohibits the use of motorized vehicles and tools in the Wilderness Area. Controlling nonnative invasive plants becomes more difficult, because all tools must be carried into areas; also it slows survey work in the potential habitat because vehicles cannot be used to reach remote areas.

Potential adverse effects associated with border control activities

At the time of listing border patrol activities were not discussed as a possible threat to *Fremontodendron mexicanum*. The area where *F. mexicanum* occurs (i.e., Otay Mountain Wilderness Area) is heavily patrolled by DHS. Although the Otay Mountain Wilderness Area is off-limits to most road construction and vehicle use, the DHS is allowed to conduct operations for border control. *Fremontodendron mexicanum* could be impacted by road construction and vehicle use. We are currently unaware of any direct threat to *F. mexicanum* from DHS activities because most of the DHS activities take place along existing roads and trails where negative impacts to the species are not expected. However, possible impacts associated with DHS activities could alter the habitat for *F. mexicanum*. We are concerned about impacts from the following activities: (1) The use of all-terrain vehicles in canyon bottoms; (2) construction of roads in canyon bottoms; and (3) cut and fill work associated with road construction. The potential threats associated with DHS activities are represent a low degree of threat because the DHS currently works regularly with the Service and BLM minimize their impacts in the Otay Mountain Wilderness Area.

Summary of Factor A

The most significant threat to *Fremontodendron mexicanum* under Factor A is the invasion of the canyon bottoms by the nonnative invasive shrub tamarisk. Edge effects associated with DHS activities (e.g., road building, off-highway vehicle use), have not caused noticeable damage to *F. mexicanum* habitat and are considered to be a low level of current concern.

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

The listing rule stated that *Fremontodendron mexicanum* is sold as a landscaping plant in the commercial nursery trade. At that time, we stated that seeds and cuttings of *F. mexicanum* used in the nursery trade were derived from plants in cultivation and not taken from native occurrences. We believe that this is still the case. In 2006, seed was collected from the Cedar Canyon occurrence for use in establishing new occurrences of *F. mexicanum* on the Refuge as part of a grant awarded through the Service's "Preventing Extinction" grant program. Approximately 3,000 seeds were collected from approximately 100 parent plants, under the CFWO's subpermit under section 10(A)(1)(a) of the Act. We do not believe that activities relating to Factor B are a threat to the survival of *F. mexicanum*. The use of this species in the nursery trade does not impact wild occurrences of this species and collections (seeds and voucher specimens) from wild occurrences have been conducted in an orderly manner for recovery purposes.

FACTOR C: Disease or Predation

The listing rule did not identify any threats attributable to Factor C. We do not have any new information directly related to disease or predation for *Fremontodendron mexicanum*.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Fremontodendron mexicanum* included: (1) Federal laws and regulations, including the National Environmental Policy Act (NEPA), the Endangered Species Act, in those cases where these species occur in habitat occupied by other listed species, and section 404 of the Federal Clean Water Act; (2) State laws, including the Native Plant Protection Act (NPPA), the California Endangered Species Act (CESA), the California Environmental Quality Act (CEQA), and section 1603 of the California Fish and Game Code; (3) regional planning efforts pursuant to the California Natural Community Conservation Planning Program (NCCCP); (4) land acquisition and management by Federal, State, or local agencies, or by private groups and organizations; and (5) local land use processes and ordinances. The listing rule (Service 1998a, pp. 54963–54964) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. In this 5-year review we provide an updated summary of the state and federal protection as well as regional planning efforts that benefit *F. mexicanum*.

State Protections

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): *Fremontodendron mexicanum* was listed as a rare species by the State of California in 1982 and is afforded protections under the CESA. The CESA (California Fish and Game Code, section 2080 *et seq.*) prohibits the unauthorized take of State-listed threatened or endangered species. NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game 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. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities.

Furthermore, with regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants.

California Environmental Quality Act (CEQA): The CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

Natural Community Conservation Planning Act: The Natural Community Conservation Program is a cooperative effort to protect regional habitats and species. The program helps identify and provide for area wide protection of plants, animals, and their habitats while allowing compatible

and appropriate economic activity. Many Natural Community Conservation Plans (NCCPs) are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Act. The San Diego Multiple Species Conservation Program (MSCP) is discussed below.

San Diego Multiple Species Conservation Plan (MSCP): *Fremontodendron mexicanum* is not a covered species under the San Diego Multiple Species Conservation Program (MSCP) (City of San Diego 1998, Table 3-5). However, *F. mexicanum* was evaluated in the biological opinion for the MSCP, and we found that implementation of the plan would not jeopardize this species (Service 1998b, p. 24).

The Otay Ranch Plan: The private land on Otay Mountain where *Fremontodendron mexicanum* is known to occur is part of Otay Ranch. This land is zoned as Open Space and part of the preserve for the San Diego Multiple Species Conservation Plan (MSCP). This land is also covered by the Otay Ranch Phase 2 Resource Management Plan (Otay Ranch 2002). This plan was originally written in June of 1996 and in August of 2002 it was revised by the County of San Diego's Board of Supervisors. This plan provides for the phased conservation and development of lands in southern San Diego County. The development and associated conservation of these lands is currently taking place in a phased approach. A large portion of land is proposed for conservation purposes, but this land is not technically dedicated for conservation until the associated development occurs. The area where *F. mexicanum* occurs on private land is part of the eastern section of Otay Ranch and because it is the furthest from existing development it will be one of the last phases completed. The Otay Ranch Phase 2 Management Plan includes provisions to manage areas occupied by *F. mexicanum* on private land in a way that will benefit this species (Otay Ranch 2002, pp. 52–53, 112–130, 141–145).

At this time, the private land where *Fremontodendron mexicanum* occurs is protected from impacts by existing management. The private land is fenced and has locked gates at access points. This measure excludes any unauthorized off-road vehicle activity from the area. The excluded area is also entirely within the area zoned by the County of San Diego as open space.

The draft Otay Ranch Phase 2 Resource Management Plan describes the following monitoring and management activities, which will benefit *Fremontodendron mexicanum* within the Otay Ranch Preserve:

- a. Focused surveys and population estimates specifically for *F. mexicanum* (Otay Ranch 2002, pp. 141, 144);
- b. maintenance of existing, high-quality resources through the prevention of disturbance, including controlling access to the preserve, prohibiting off-road traffic, enforcing no trespassing rules, and curtailing activities that degrade resources such as grazing, shooting, and illegal dumping (Otay Ranch 2002, p. 52);
- c. monitoring of resources to identify changes in the quality and quantity of sensitive resources and habitat (Otay Ranch 2002, p. 52);
- d. implementation and monitoring of restoration activities as appropriate (Otay Ranch 2002, p. 53);

- e. trail maintenance (Otay Ranch 2002, p. 53); and
- f. removal and control of exotic species including nonnative plants (Otay Ranch 2002, p. 53).

As the Otay Ranch Plan is implemented it will provide substantial protection for *F. mexicanum* and will reduce the threats to this species.

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 Federal 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 mitigation alternatives that would offset those effects (40 C.F.R. 1502.14(f)). These mitigations can provide some level of protection for listed species. However, NEPA does not require that environmental impacts be avoided, only that effects be assessed and the analysis disclosed to the public.

Clean Water Act: Under section 404, the U.S. Army Corps of Engineers (Corps or USACE) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term “wetland” refers to areas meeting the Corps’s criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any action with the potential to impact waters of the United States must be reviewed under the Clean Water Act, NEPA, and the Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts.

Federal Land Policy and Management Act of 1976 (FLPMA): The Bureau of Land Management is required to incorporate Federal, State, and local input into their management decisions through Federal law. The FLPMA (Public Law 94–579, 43 U.S.C. 1701) was written “to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development and enhancement of the public lands; and for other purposes”. Section 102(f) of the FLPMA states that “the Secretary [of the Interior] shall allow an opportunity for public involvement and by regulation shall establish procedures ... to give Federal, State, and local governments and the public, adequate notice and opportunity to comment upon and participate in the formulation of plans and programs relating to the management of the public lands”. Therefore, through management plans, the Bureau of Land Management is responsible for including input from Federal, State, and local governments and the public. Additionally, Section 102(c) of the FLPMA states that the Secretary shall “give priority to the designation and protection of areas of critical environmental concern” in the development of plans for public lands. Although the Bureau of Land Management has a multiple-use mandate under the FLPMA which allows for grazing, mining, and off-road vehicle use, the Bureau of Land Management

also has the ability under the FLPMA to establish and implement special management areas such as Areas of Critical Environmental Concern, wilderness, research areas, etc., that can reduce or eliminate actions that adversely affect species of concern (including listed species).

Otay Mountain Wilderness Act of 1999, P.L. 106–145, H.R. 15: At the time of listing, Cedar Canyon was designated by the BLM as an Area of Critical Environmental Concern (ACEC) and a Research Natural Area (RNA). These designations were in place to allow the area to be managed in a way that would sustain the population of *Fremontodendron mexicanum* (BLM 1994). In 1999, BLM managed land on Otay Mountain, including the known *F. mexicanum* habitat, was designated as the Otay Mountain Wilderness Area (Otay Mountain Wilderness Act of 1999, P.L. 106–145, H.R. 15). This designation applies the regulations and restrictions outlined in the Wilderness Act of 1964 (P.L. 88–577) to the area on Federal land where *F. mexicanum* occurs. This designation limits the use of motorized vehicles and motorized tools in this area and limits the use of certain fire fighting techniques.

Endangered Species Act of 1973, as amended (Act): Since listing, the Act is the primary Federal law that provides protection for this species. The Service’s responsibilities include administering the Act, including sections 7, 9, and 10. Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out do not “jeopardize” a listed species or result in the “destruction or adverse modification” of habitat in areas designated by the Service to be “critical.” 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. Critical habitat was designated by the Service in 2007 in Cedar Canyon and Little Cedar Canyon on Otay Mountain in San Diego, California (Service 2007, pp. 54995–54996, Table 1).

Under section 9(a)(2) of the Act, it is unlawful to remove and reduce to possession (i.e. collect), and maliciously damage or destroy any listed plants from lands under Federal jurisdiction. In addition, it is unlawful to remove, cut, dig up, or damage or destroy listed plants on non-Federal lands in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law. As mentioned above, *Fremontodendron mexicanum* is listed under CESA as rare in the State of California. Therefore, *F. mexicanum* is afforded protections under section 9 of the Act on non-Federal lands. Any impacts to this species require consultation with the California Department of Fish and Game.

Section 10(a) of the Act allows for exceptions to section 9 prohibitions. 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” permits for listed animal species to non-Federal applicants. Section 3(18) defines “take” to mean “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”. “Incidental take” refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). However, the take prohibitions do not apply to plants. To qualify for an incidental take permit, applicants must

develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. As mentioned above, HCPs in southern California are often developed in association with the State's NCCP process. The *Fremontodendron mexicanum* occurrences on Otay Mountain are within the San Diego MSCP, but it is not a "covered species" under this plan. Nevertheless, the MSCP may provide an additional layer of regulatory protection for *F. mexicanum*.

Summary of Factor D

The protections afforded to this species through existing regulations have improved over those that were in place at the time of listing. The fact that all of the Federal land where *Fremontodendron mexicanum* is now designated as the Otay Mountain Wilderness Area and that the Otay Ranch Plan is being implemented as planned provides greater assurances of conservation and management than were in place at the time the plant was listed under the Act. However, these regulations do not necessarily provide species specific protections that would substitute the type of regulation provided by the Act.

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

Factor E threats to *Fremontodendron mexicanum* identified in the listing rule include adverse genetic effects because of the low number of individuals in the Cedar Canyon occurrence and altered fire regimes. These two threats continue to be a concern for the survival of *F. mexicanum*. In addition to these continuing threats there is the potential threat of climate change to *F. mexicanum*. The Factor E threats to *F. mexicanum* are discussed below under the following headings: (1) Adverse effects related to small population size and low number of populations; (2) adverse effects of an altered fire regime and increased ignition sources; and (3) potential impacts associated with climate change.

Adverse effects related to small population size and low number of populations

The listing rule indicates that *Fremontodendron mexicanum* is susceptible to adverse genetic effects because of the low number of individuals in the population, which at listing was estimated to be below 100 individuals (Service 1998a, p. 54962). The listing rule cited Barret and Kohn (1991) as background on this threat. We now know that *F. mexicanum* occurs in three canyons on the northwestern slope of Otay Mountain and that there are approximately 6,000 plants in these three canyons. At this time, we are less concerned that *F. mexicanum* will be subject to adverse genetic effects because there are approximately 6,000 plants rather than 100 plants. However, we need to understand the genetic structure of the population and the breeding system before we can rule out this threat. Even though we believe the population size is larger, we do not know that all of these individuals represent genetically unique individuals or what the effective population size (i.e., the number of individuals in a population that are actually participating in the sexual reproduction and genetic recombination in a population) that is for this species (Barrett and Kohn 1991, pp. 7–8). *Fremontodendron mexicanum* reproduces, at least partially, by the regrowth from underground roots and runners. Resprouting is a type of asexual reproduction and because some of these plants may be clones, we do not know if all three occurrences are part of a single population or if each occurrence represents a single population.

In addition to the genetic concerns associated with small population size, we are concerned that a single catastrophic event could threaten this species. Generally populations of a plant species occur at several locations. If a fire, flood, disease outbreak, or insect infestation eliminates a population at one location other, more distant populations, may not be impacted. Over time the site where the population was eliminated may be recolonized from the surviving populations. *Fremontodendron mexicanum* occurs in single location (three canyons on northwestern Otay Mountain) in the United States. The three occurrences that we know of are all in close proximity and lack the geographic separation that could provide protection from catastrophic events. As seen in 2003 and 2007, when this area experienced fire, all three of the known occurrences were impacted to some degree. Other events, such as disease or insect infestation, might easily impact all three of these occurrences.

In summary, we are less concerned about the negative effects of a small population size than we were at the time of listing. The threat related to adverse genetic effects can be managed and reduced by a better understanding of this species' breeding system and genetic structure. However, research needs to be conducted to better understand the significance of the threat associated with small population size. The restricted distribution of this species amplifies other threats to this species because threats that might be localized for a more common species threaten this species' entire range. The threat caused by the restricted distribution of this species can be managed and reduced by through the maintenance of an *ex situ* seed collection and through the establishment of introduced populations in appropriate locations. Given that *Fremontodendron mexicanum* is already successfully propagated in the commercial nursery trade, there may be a greater chance of successful introductions into appropriate habitats than we might experience with other endangered plant species that have not been cultivated successfully.

Adverse effects of an altered fire regime and increased ignition sources

The listing rule indicates that the Cedar Canyon population is threatened by altered fire regimes as a result of human caused fires (Service 1998a, p. 54962). The listing rule states:

“A single catastrophic fire could potentially eliminate all or most of [the *Fremontodendron mexicanum*] population. A fire can occur too soon after an earlier fire resulting in the killing of young plants prior to their producing seeds. A fire can also occur at a time when litter and biomass accumulation has reduced or eliminated seedling establishment and kill all of the mature plants. Either of these types of fire occurrences could drastically reduce or eliminate the seed bank for this species and kill mature plants that might otherwise survive less severe fires. In the extreme circumstance an uncontrolled fire of sufficient intensity could potentially drive the species to extinction (Service 1998a, p. 54962).”

Fremontodendron mexicanum grows in mixed chaparral and closed-cone coniferous forest dominated by *Callitropsis forbesii*. Both of these vegetation types are susceptible and naturally adapted to naturally occurring fires. These habitat types show evidence of time-dependent, self-regulating fire cycles under natural conditions (Minnich 2001, p. 1549). Fires that occur at longer or shorter intervals than the natural cycle or during the reproductive seasons may imperil fire-adapted species in these ecosystems. Plant species have evolved survival responses to fire

either through stump-sprouting after a fire or by germination of fire resistant seeds (obligate seeders) (Keeley 1986, pp. 96–97). A change in the frequency of the natural fire regime can impact the effectiveness of these adaptations to fire. The listing rule indicates that increases in human activity in a fire prone area are generally accompanied by an increased incidence of local accidental fires, but less frequent natural fires. These conditions can be detrimental to the persistence of those species that evolved under natural fire cycle regimes (Zedler et al. 1983, pp. 815–817; Keeley 1986, pp. 95–110; Dunn 1987, pp. 367–376).

Fremontodendron mexicanum has adapted two strategies to persist in a fire prone environment. It regenerates after a fire through sprouts from underground roots and shoots that were not killed during the fire and new plants emerge from seeds that germinate following the fire. Prior to the 2003 fire, which burned all *F. mexicanum* habitat on Otay Mountain we did not know how this species would respond to a large fire. We were concerned that if the entire population of 100 plants burned that they would have difficulty recovering.

Fremontodendron mexicanum recovered without any of these negative scenarios and much more vigorously than we had predicted. Within two years several *F. mexicanum* plants were larger than 4 meters (12 feet) (J. Snapp-Cook, Service, pers. obs. 2006a, p. 1–3). *Fremontodendron mexicanum* plants grew in areas of Cedar Canyon where they had not previously been recorded (J. Digregoria, Service, pers. obs. 2004, p. 2–3). We were also able to survey other canyons on Otay Mountain because the fire reduced the amount of vegetation and made these areas accessible. In these post fire surveys we found two additional canyons where *F. mexicanum* occurred. Currently, we are noting that on Otay Mountain and throughout southern California wildfires are becoming more frequent and, in some cases, more intense. The area occupied by *F. mexicanum* on Otay Mountain has experienced five fires in the past 30 years (see Table 2).

Other species in the ecosystem with *Fremontodendron mexicanum* may have resources depleted before *F. mexicanum*. *Callitropsis forbesii*, for example, will not produce seedlings without a fire and this species needs 35 to 40 years to produce enough cones to have sufficient seed to replace a population (Dunn 1987, p. 371). The dry hillsides adjacent to the occurrences of *F. mexicanum* may also be more vulnerable to frequent fires. Other chaparral ecosystems that have experienced higher than natural fire frequencies have been converted into nonnative grasslands. These changes in the species composition and ecosystems that *F. mexicanum* occurs in could have unforeseen impacts on this species.

Table 2. Burn history of areas on Otay Mountain occupied by *Fremontodendron mexicanum* from records back to 1910.

Year Burned	Burn Area	Portion of the Canyon Burned
1979	Cedar Canyon, Little Cedar Canyon	Northern Portion
1980	Little Cedar Canyon	Northern Portion
1996	Woodwardia Canyon	Southern Portion
2003	Cedar Canyon, Little Cedar Canyon, Woodwardia Canyon	Entire Canyon
2007	Cedar Canyon, Little Cedar Canyon, Woodwardia Canyon	Patchy Burn

Summary of Fire

Fremontodendron mexicanum was able to survive the 2003 Otay fire; however, an altered fire frequency may still be a threat to this species. The 2007 fire burned through the habitat with relatively low intensity, the damage to *F. mexicanum* could have been much worse. If the fire had burned with the same intensity as the 2003 fires it is likely that the effect would have been much more detrimental and could have pushed this species close to extinction. This threat is highly significant because regardless of mode of regeneration this threat could directly impact this species. This area has experienced five fires in the past 30 years. If *F. mexicanum* relies on seed to regenerate such frequent fires may not allow time for a substantial seed bank to collect. If *F. mexicanum* reproduces mostly by resprouting, then repeated fires at a short interval may be limiting the ability of the population to adapt and react to environmental changes (Keeley 1986, pp. 95–112).

Climate Change

Impacts to the species under predicted future climate change are unclear. 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; Cayan et al. 2005; IPCC 2007). A trend of warming in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, and reduce summer stream flows, and increased summer heat may increase the frequency and intensity of wildfires (IPCC 2007). 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 5–6° F (Morse et al. 1995, p. 393). Whether or not this would include *Fremontodendron mexicanum* is unknown.

While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to *F. mexicanum* at this time.

Summary of Factor E

The most significant threat under Factor E to *Fremontodendron mexicanum* is altered fire frequency. We lack sufficient information to determine if this species faces possible extinction due to genetic related circumstances. Climate change has not yet caused noticeable changes to the habitat.

III. RECOVERY CRITERIA

A recovery plan has not been drafted for this species.

IV. SYNTHESIS

Fremontodendron mexicanum was listed as endangered in 1998 primarily due to its small population size and the risk to this species' survival from an altered fire regime. Additional threats since listing include nonnative invasive species and impacts from border control activities. These threats can be managed and represent a moderate degree of threat. At listing, there was only a single occurrence known to exist in the United States and a single occurrence known to exist in Mexico. The occurrence in the United States is partially on BLM land and partially on private land. At the time of listing, we lacked any specific information about the occurrence in Mexico. In Mexico, botanists have not been able to relocate the population that we knew of at the time of listing, and we assume the population has been extirpated. Another population has been located in coastal northwestern Baja California, Mexico, but that population supports fewer than 20 individual plants.

Two additional occurrences of *Fremontodendron mexicanum* in the United States were found after listing, both of which are on Otay Mountain very near the Cedar Canyon occurrence. The fire in 2003 burned the all three of the occurrences in the United States and no above ground plants survived the fire. However, plants in these occurrences successfully resprouted and continue to persist. Currently, there are approximately 6,000 *F. mexicanum* plants on Otay Mountain among the three occurrences, compared to fewer than 100 plants known at listing. However, infrequent surveys and the lack of any study of its population dynamics (e.g., seed production, seedling establishment and survival and response to fire) do not allow us to conclude that these factors do not pose a risk to *F. mexicanum*. Therefore, we recommend that the status of *F. mexicanum* as endangered remain unchanged at this time.

V. RESULTS

Recommended Listing Action:

We recommend no change in the listing status of *Fremontodendron mexicanum* at this time.

- 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*
- No Change

New Recovery Priority Number and Brief Rationale: Change to an 8. This number indicates the taxon is a species that faces a moderate degree of threat and has a high potential for recovery.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

Resurvey historical occurrences and survey potential habitat to determine if there are any other native occurrences of *Fremontodendron mexicanum* that are extant.

Determine the breeding system and pollinators for the taxon. This will assist us in determining what, if any, bottlenecks in reproductive output are due to these factors.

Determine the distribution of genetic diversity at the various occurrences. This will assist us in identifying higher priority occurrences for potential translocation source materials. This will help us to better understand how this species will be able to adapt to future environmental changes and how this species will withstand possible catastrophic events.

Establish site and species monitoring protocols to identify how this species is impacted by future fires and how the occurrences regenerate following fire. This will help us understand the species' responses to the change in fire frequency and what management actions are appropriate.

Support and provide assistance to the San Diego National Wildlife Refuge in their efforts to introduce new populations of *Fremontodendron mexicanum* to suitable unoccupied habitat. These efforts are described in the "United States Fish and Wildlife Service Preventing Extinction Grant" discussion above.

Establish a working group that will coordinate conservation efforts for this species. This group should focus on coordination between Federal agencies (e.g., Service, BLM, DHS), MSCP staff (e.g., County of San Diego), Otay Ranch, and Mexico.

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

***Fremontodendron mexicanum* (Mexican flannelbush)**

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

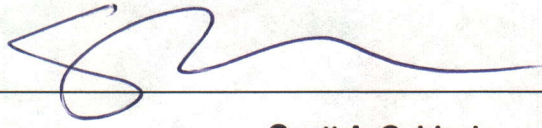
Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

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

ACTING

Approve _____



Scott A. Sobiech

Date _____

AUG 14 2009

Appendix 1. *Fremontodendron mexicanum* documented collections compiled for the 2008 5-year review.Table 1. Native occurrences of *Fremontodendron mexicanum*.

<i>Location</i>	<i>Source</i>	<i>Year first recorded</i>	<i>Last year recorded</i>	<i>Maximum abundance (Year)</i>	<i>Extant, extirpated or unknown</i>
San Diego County					
Point Loma	EO: 12 Herbarium: UCSB-Hout #18	1961	1961	No data	Extirpated
2.25 miles north of Jamul Valley	EO: 6	1981	1981	No data	Unknown
Jamul	Herbarium: SD7223	1878	1878	No data	Extirpated
Jamul Valley	EO: 2 Herbarium: Mearns 3825 DS	1894	1894	No data	Extirpated
Cedar Canyon, Otay Mountain	EO: 1, 3, 13, 16 Herbarium: SD114517, SD104533, SD106108, UCR51930, RSA485413	1955	2008	2,500 (2006)	Extant
Little Cedar Canyon, Otay Mountain	Snapp-Cook 2006 (personal observation)	2006	2007	31 (2006)	Extant
Woodwardia Canyon, Otay Mountain	EO: 3 Herbarium: SD13017, SD14765, SD14766, RSA17237, RSA427004, SDSU17597, SD182541, SD182542	1935	2008	3,500 (2008)	Extant
Unnamed canyon on the west flank of Otay Mountain	EO: 7	1981	1981	No data	Unknown
Border Field Monument	EO: 8 Herbarium: SD7222	1875	1875	No data	Extirpated
15 miles from San Diego	Herbarium: CAS3234	1917	1917	No data	Unknown

Table 1 (continued). Native occurrences of *Fremontodendron mexicanum*.

<i>Location</i>	<i>Source</i>	<i>Year first recorded</i>	<i>Last year recorded</i>	<i>Maximum abundance</i>	<i>Extant, extirpated or unknown</i>
Baja California (North), Mexico					
Cariso Creek	Herbarium: UC108843	1983	1893	No data	Extirpated
Los Malcriados	Herbarium: RSA346053	1985	1985	No data	Extirpated
San Antonio Canyon; Johnson Ranch; Canyon of San Antonio Del Mar	Herbarium: POM99108, POM117307, POM265045	1925	1931	No data	Extirpated
Arroyo Seco	Wiggins 1980			No data	Extirpated
Arroyo Hediondo	O'Brien 2003 (personal observation), Snapp-Cook 2006 (personal observation)	2000	2006	14 (2003)	Extant

Table 2. Documented *Fremontodendron mexicanum* collections that are likely from cultivated sources.

<i>Location</i>	<i>Source</i>	<i>Year(s) recorded</i>
San Diego County		
Agua Tibia Creek	Herbarium: SD136123	1984
Presidio Hills Park	Herbarium: SD35568	1945
Florida Canyon	EO: 18 Herbarium: SDSU11262	1989
Mission Trails Park	Herbarium: SDSU11261	1991
Bonita	Herbarium: SD32168	1944
Alpine	Herbarium: SD135330	1991
North of Barret Lake	EO: 17 Herbarium: UCR130662, RSA628848	1999
Orange County		
Tucker Wildlife Sanctuary	Herbarium: RSA659637	1991
Los Angeles County		
Via Del Monte, Palos Verde	EO: 11 Herbarium: UCSB18828	1963
Whittier	Herbarium: SDSU11270	No date
San Gabriel Canyon	Herbarium: RSA427003	1936
Altadena, dry mesa	Herbarium: POM308321	1937
Claremont Creek	Herbarium: SD93035	1953
Pomona College	Herbarium: RSA162693	1958
Monterey County		
Junipero Serra Peak	EO: 14 Herbarium: JEPS48693	1940
Santa Clara County		
Embarcadero Road & El Camino Real	Herbarium: SJSU2500	1950