Verbena californica
(Red Hills Vervain)

5-Year Review:
Summary and Evaluation

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

June 2012

5-YEAR REVIEW
Verbena californica (Red Hills Vervain)

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: *Verbena californica* is an erect perennial herb belonging to the Verbenaceae (vervain family). It grows to 60 centimeters (23 inches) in height with opposite, bright green leaves without stems and tiny purplish-white flowers. *Verbena californica* grows on the margins of perennial streams and in other moist habitats in serpentine areas of the Red Hills (California Natural Diversity Database [CNDDB] 2011). *Verbena californica* was first discovered in 1938 in Tuolumne County, California and described in 1942 (Moldenke 1942). *Verbena californica* requires moist soil throughout the year, and thus the continued flow from perennial streams, springs, or seeps is a key biological need. Availability of pollinating insects is important for reproduction.

Methodology Used to Complete This Review:

This review was prepared by the Sacramento Fish and Wildlife Office following the Region 8 guidance issued in March 2008. We used information from the December 2007 5-year status review approved on January 10, 2008 (Service 2008), recent biological opinions, reports, and information in our files or obtained from interviews with individuals involved in surveys or research of this plant, survey information from experts who have been monitoring various localities of this species, and the CNDDB maintained by the California Department of Fish and Game. We received no information on *Verbena californica* 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 or since the last 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information

to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on May 25, 2011 (Service 2011). We received no information regarding this species.

Listing History:

Original Listing
FR Notice: 63 FR 49022 (Service 1998)
Date of Final Listing Rule: September 14, 1998
Entity Listed: *Verbena californica*, a plant species
Classification: threatened

State Listing: *Verbena californica* was listed by the State of California as threatened in 1994.

Review History: A 5-year review was conducted for *Verbena californica* dated December 2007 and approved on January 10, 2008 (Service 2008), at which time no change in the species status was recommended.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Verbena californica* is 14 according to the Service's 2011 Recovery Data Call for the Sacramento Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a species that has a low degree of threat and a high potential for recovery.

Recovery Plan or Outline: No recovery plan or outline has been completed for this species.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species 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 Biology and Life History. Much of the information on the life history of *Verbena californica* comes from a Master of Science thesis prepared by Anne Knox (1998). Her three study colonies included two in the Six-Bit Gulch watershed, and one in the Andrew Creek watershed, but did not encompass all populations within those occurrences. She also conducted indoor seed germination studies and attempted to grow the species in the greenhouse.

Although *Verbena californica* is a perennial, its average life span is not known. Wilken (1993) noted that the species may be biennial, meaning that plants would not flower until their second year, but would die after flowering, thus persisting for only 2 years.

Seeds apparently are the primary means of reproduction for *Verbena californica*. Formerly, the species was thought to also reproduce vegetatively through rhizomes, but Knox (1998) found no evidence of rhizomes when she dug up plants. In nature, seed germination has been observed as early as mid-October and probably continues throughout the winter (Knox 1998). The progress of seedling maturation has not been reported. Plants mature and can begin flowering by late May, with flowering continuing through September (Stone 1992; Tibor 2001). Flowering begins at the bottom of the flower cluster and progresses upward through the season (Stone 1992). Dates of seed formation in nature have not been reported, although transplants grown in an outdoor garden had mature seeds present in July (Knox 1998). Considering that each flower can produce as many as four seeds, Knox (1998) estimated that potential seed production at her three study sites ranged from 282 to 1,245 seeds per plant. The lowest estimate was at an atypical site in a meadow with compacted soils and severe competition (Knox 1998). Seed dispersal mechanisms are not known for *V. californica*.

The optimum conditions for seed germination in nature are uncertain. In her greenhouse study, Knox (1998) identified cold stratification (repeated cycles of 5 days under refrigeration followed by 2 days at room temperature) as the treatment most beneficial to seed germination. However, at least some seeds germinated without stratification and under each of three treatments (placed on moist cotton, soaked in water, scarified with sandpaper). Overall germination rates were poor, with only 76 out of 750 (10.1 percent) seeds germinating within 3 months in the greenhouse, although she observed scattered seedlings emerging as many as 10 months after they were first moistened. In the field, Knox (1998) found viable seeds remaining on plants 1 year

after their formation, and these seeds remained viable for at least 2 additional years in dry storage.

Pollination of *Verbena californica* has not been studied in great detail, but insects visiting the flowers, and possibly transferring pollen, include butterflies, flies, beetles (Stone 1992), and bees (Moldenke 1972). The most frequent visitors according to Stone (1992) were butterflies in the genus *Ochlodes* (woodland skippers; family Hesperiidae). However, Moldenke (1972) reported only bees visiting the flowers of *V. californica* in 1970 and 1971, including two species of leafcutting bees (family Megachilidae), *Anthidium edwardsii* and *Chalcidoma angelarum*, and two cuckoo bees (family Anthophoridae), *Anthophora urbana* and *Melissodes lupina*.

Only short term information is available regarding survival rates of this species in nature. In Knox's (1998) field study, only 25 to 50 percent of plants marked in one year remained alive the following year; even some large, well-established plants died between years. The primary cause of mortality was uprooting during a severe flood, particularly where insufficient vegetation was present upstream to protect plants from extreme flows (Knox 1998). In her greenhouse study, Knox (1998) found that none of the seedlings survived to maturity. The cause of death was damping off; however, this disease may not be a problem under natural drier conditions. Damping off is a common fungal disease in greenhouses. She also noted that *Verbena californica* can persist through droughts and that it survived transplanting. Her transplants flowered and set seed the following year, but she did not report their total life span. If *V. californica* is indeed a biennial, as reported by Wilken (1993), the plants would live only 2 years following germination. Longer term studies may be needed to provide further information about survival rates for this species.

Spatial Distribution. At the time of our 2008 5-year review, we stated that the entire range of *Verbena californica* is an area of about 62 square kilometers (24 square miles) or 9.7 kilometers (6 miles) by 6.4 kilometers (4 miles). Within this narrow range, the total area occupied by the populations is estimated to be 36 hectares (90 acres) (CNDDB 1997). *Verbena californica* grows at elevations between 259 and 351 meters (850 to 1,150 feet). Most of the sites are within the Red Hills Area of Critical Environmental Concern (ACEC) that consists of about 2,907 hectares (7,184 acres, slightly more than 11 square miles) of public land south of the historic town of Chinese Camp in Tuolumne County (Bureau of Land Management [BLM] 2007a).

Currently, the entire range of *Verbena californica* is presumed to be an area of about 77 square kilometers (30 square miles) or 12 kilometers (7.5 miles) by 6.4 kilometers (4 miles). Within this narrow range, the total area occupied by the populations is estimated to be 50 hectares (124 acres) (CNDDB 2011). *Verbena californica* grows at elevations between 255 and 400 meters (837 to 1,310 feet) (CNDDB 2011). Most of the sites are within the expanded Red Hills Area of Critical Environmental Concern (ACEC) that now consists of about 4,042 hectares (9,988 acres, about 15.6 square miles) of public land south of the historic town of Chinese Camp in Tuolumne County (BLM 2011).

An ACEC is a designated area on BLM lands where special management attention is required (1) to protect and prevent irreparable damage to fish and wildlife; important historic, cultural, or

scenic values; or other natural systems or processes or (2) to protect life and safety from natural hazards.

Abundance. Population trends in *Verbena californica* are not well known due to a lack of consistent monitoring. Even though this species is a biennial or perennial, population sizes may vary somewhat among years. Counts lumped all stems in tight clumps as single individuals, as they were thought to be clonal groups spread by rhizomes, which has now been seen to be not the case (Knox 1998).

An occurrence as defined by the CNDDB is a location separated from other locations of the species by at least one-fourth mile that may contain populations, individuals, or colonies. We have used locality to refer to populations, individuals, or colonies that have not been reported to the CNDDB and sites to refer to collections of occurrences and localities.

At the time of the last 5-year review we reported that there were 11 presumed extant sites included in CNDDB (CNDDB 2008). Six occurrences had information that was older than 20 years old, and five occurrences had information that was from 10 to 20 years old. Currently 15 sites are thought to exist (A. Franklin *in litt*. 2007; CNDDB 2011). Eleven of these are CNDDB occurrences. In addition to the CNDDB occurrences, there are BLM reports of the species at 4 localities. Five occurrences were verified in 2011; 4 localities and 1 occurrence were last verified in 2007; and 5 occurrences were last verified in the 1990s. Another occurrence is known only from a herbarium specimen collected in 1972 and no details on habitat, population size, or threats are available (CNDDB 2011); therefore, for the purposes of this 5-year review, we do not count this specimen as a presumed extant occurrence. See Appendix Table 1 for details.

At the time of our 2008 5-year review, there were 10 presumed extant sites in the Tuolumne River watershed that contained approximately two-thirds of all individuals of *Verbena californica*. The second-largest population of *V. californica* comprised approximately one-third of all plants was along Andrew Creek and its tributaries and was the sole occurrence in the Stanislaus River watershed (BLM 1996a; CNDDB 2006). Currently, there are 13 presumed extant sites in the Tuolumne River watershed and 2 presumed extant sites in the Stanislaus River watershed.

In summary, the abundance of *Verbena californica* is much the same today as it was when it was listed and 15 sites are presumed extant (A. Franklin *in litt*. 2007; CNDDB 2011). However, other sites may have been extirpated in the past without having been documented. We believe that current populations likely have been fragmented and reduced in size from those that existed historically.

Habitat or Ecosystem. *Verbena californica* is endemic to serpentine soils and grows on the margins of perennial streams and in other moist habitats in serpentine areas of the Red Hills (CNDDB 2011). A crucial factor for the persistence of *V. californica* is that the habitat remains moist throughout the summer and autumn (Rogers 1983; BioSystems Analysis, Inc. 1984; Stone 1992; BLM 1996a). Knox (1998) determined that soil moisture was the primary factor influencing the distribution and reproduction of this species. Underground springs were

responsible for maintaining summer water flow in the stream reaches she studied. Nine of the total 11 *V. californica* occurrences are along streams in *Pinus sabiniana* (foothill pine) woodlands. Two, including Andrew Creek, are in oak woodlands (California Department of Fish and Game 1992; California Department of Fish and Game 1993; Wilken 1993). According to Knox (1998), the Andrew Creek site also differs from the others in that *V. californica* is not confined to the stream channel, but grows in a moist habitat she described as a "meadow.

Rhamnus tomentella ssp. *tomentella* (hoary coffeeberry) is the primary shrub species in the canopy of *Verbena californica* habitat (Moldenke 1972; Stone 1992; BLM 1996a; Knox 1998). Although *Rhamnus tomentella* is much more widespread than *V. californica,* the former is a useful predictor of occurrence for *V. californica* because it indicates that the site remains moist year-round (A. Franklin, *in litt.* 2002). In general, *V. californica* grows where shrubs provide some shade, but Knox (1998) found that a completely closed canopy is detrimental to reproduction. Knox (1998) identified *Carex* species (sedges) and *Juncus* species (rushes) as the best indicators of suitable habitat for *V. californica*. She did not identify particular species in these genera, but others (BioSystems Analysis, Inc. 1984; BLM 1996a) have mentioned *Carex nudata* (torrent sedge) as a dominant associate of *V. californica*. *Juncus* and *Carex* species play an important role as associates because their well-developed root systems help to stabilize the soil and prevent the more shallowly-rooted *V. californica* from washing away during flood events (Knox 1998).

Placer gold mining in the 1850s and 1860s is suspected to have removed some of the *Verbena californica* substrate and buried colonies under rock debris, particularly in the Six-Bit Gulch watershed. Habitat destruction due to historical mining cannot be quantified because *V. californica* had not been discovered at the time of the mining. The effects have been inferred because existing occurrences end abruptly at tailings piles (Rogers 1983), and historical mining activities were documented in the habitat for the species in watersheds where *V. californica* currently occurs.

Changes in Taxonomic Classification or Nomenclature. There have been no species-level taxonomic or nomenclatural changes since the last 5-year review was published in 2008.

Genetics. There have been no genetic studies conducted for *Verbena californica*.

Species-specific Research and/or Grant-supported Activities. Seed banking of *Verbena californica* occurred for element occurrences on BLM property as part of the American Recovery and Reinvesting Act (ARRA). Seed was collected from Element Occurrence numbers 2. 4, 8, 11 and 12 on September 8, 2011, by University of California Botanical Garden staff (Holly Forbes, Curator, University of California Botanical Garden, *in litt*. 2011).

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

At the time of listing, the primary threat to the species was the potential loss of habitat to the two largest occurrences of *Verbena californica* by development projects, and the loss of habitat by other human activities (Service 1998). Currently *V. californica* is still threatened by recreational gold mining and also now is threatened by hydrological changes from adjacent development. Although the *V. californica* population is no longer threatened directly by residential development, runoff from the proposed houses and golf course on the table land above the drainage may affect the riparian area. Lowering of the water table that feeds springs in the riparian area is also a concern.

The Red Hills have mostly been used for recreation. Until 1991, the main recreational uses were target-shooting, off-road vehicle driving, camping, hunting, hiking, horseback riding, nature study, wildflower viewing, and hobby prospecting. In 1991, to protect the fragile biological resources of the area, target shooting and off-road vehicle use were prohibited on public land in the Red Hills (BLM 2009). Presently the main recreational activity in the Red Hills is equestrian use. Hiking, mountain biking and spring wildflower viewing are other popular activities (BLM 2007b). Overnight camping is no longer allowed within the Red Hills ACEC (BLM 2008).

The *Sierra Resource Management Plan and Record of Decision* (BLM 2008) limits equestrian and mountain bike use to designated trails. There has been a problem with a proliferation of trails in the Red Hills, as some riders choose to travel cross country, and others follow the tracks that these riders create. Routes for designated trails are laid out to avoid listed species habitat, but defacto trails have no such safeguards. The provision limiting riders to designated trails should help reduce impacts to the listed plant species in the Red Hills, especially from horse hoof trampling (BLM 2007a).

Placer gold mining, which includes panning and dredging along streams, is a potential threat to occurrences of *Verbena californica* on lands administered by the BLM (J. Willoughby, BLM, in litt. 1990; California Department of Fish and Game 1993; A. Franklin, in litt. 2007). In the course of gold panning, the plants themselves can be trampled or dislodged and soil can be compacted. Currently, the California Department of Fish and Game is prohibited by court order from issuing suction dredge permits. Panning of gold along streams is still allowed.

Today, almost all of the extant occurrences are located on public land, where their habitat is protected from the direct effects of development. In Tuolumne County, in 2008, Richard Sinclair put forward the Sinclair Ranch project which proposed to develop 230 acres of the Chinese Camp area into 242 lots, 250 additional multi-family units, and 225 senior housing units. There was no public water or wastewater available, and the project has not moved forward yet. The landowner is still trying to acquire water (Tuolumne Utilities District 2012).

A proposed project that would involve the construction of approximately 50 single-family homes, 300 vacation ownership condominiums, a 120 room hotel, 20 affordable housing units, a 557.4 square meter (6,000 square foot) visitors' center, 6 kilometers (3.7 miles) of recreational trails, and an 18-hole championship golf course could adversely impact suitable habitat for

Verbena californica. The proposed project also includes 101 hectares (249 acres) of preserved open space. Proposed open space is interspersed throughout the project site, primarily in steeper areas and along drainages. Currently, Tuolumne County is working toward drafting an Environmental Impact Report for this project.

Hydrological changes remain a threat to the Andrew Creek occurrence. Although the *Verbena californica* population is no longer threatened directly by residential development, runoff from the proposed houses and golf course on the table land above the drainage may affect the riparian area. Lowering of the water table that feeds springs in the riparian area is also a concern (California Department of Fish and Game 2005).

The direct threat from housing development has decreased since listing. The *Verbena californica* habitat that was formerly on private land within the Andrew Creek drainage became public land in 2000. The acquisition was a cooperative effort among the BLM, the Tuolumne County Land Trust, the Trust for Public Lands, the California Wildlife Conservation Board, the Packard Foundation, and the California Department of Transportation (A. Franklin, *in litt.* 2002). In 2004, the Tuolumne County Land Trust acquired part of the Big Creek population with funding from the California Department of Transportation (E. Cypher, California Department of Fish and Game, pers. comm. 2006, 2007).

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

At the time of issuance of the most recent 5-year review (Service 2008), we determined this factor was not applicable to *Verbena californica*. We are not aware of any new information that would indicate overutilization for commercial, recreational, scientific, or educational purposes threaten *V. californica.*

FACTOR C: Disease or Predation

In the final listing rule, we stated that virtually all the information that we received or located regarding beneficial and adverse livestock grazing effects on the species was anecdotal. However, repeated observations over time coupled with knowledge of historical land uses have validity even though that information was not scientifically collected. We further concluded that heavy grazing and trampling threatened *Verbena californica* (Service 1998)

Currently, grazing on the BLM lands in the Red Hills occurs within two leases, one of which has *Verbena californica*. This lease is for 72 animal unit months over 1,178 acres within the Red Hills ACEC. Monitoring of *V. californica*, which began in 1998, uses a comparison of 2 grazed and 2 ungrazed (fenced) plots to evaluate grazing effects (BLM 2007b). No clear pattern of grazing effects has emerged from monitoring, i.e., it is not clear that the grazed or ungrazed plots are resulting in greater viability (BLM 2007b). However, grazing clearly does impact plants of *V. californica*. Clipped stems of *V. californica* have been observed both in the experimental plots and in other areas subjected to grazing. Trampling damage has been observed especially for the wet ground where *V. californica* occurs. Because the phenology of *V. californica* is relatively late, the grazing period was moved forward and now ends on April 15. We

determined that the grazing program may adversely affect *V. californica*. No new grazing leases will be authorized in the Red Hills (BLM 2007b; Service 2007); however, the existing leases still remain (Peggy Cranston, Wildlife Biologist, Mother Lode Field Office, BLM, pers. comm. 2012).

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

State Laws and Regulations

The State's authority to conserve rare wildlife and plants is comprised of four major pieces of legislation: the California Endangered Species Act, the Native Plant Protection Act, the California Environmental Quality Act, and the Natural Community Conservation Planning Act.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed rare 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. *Verbena californica* is State listed as threatened.

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. Salvage of *Verbena californica* is unlikely to be successful.

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 Federal Endangered Species Act.

Federal Laws and Regulations

Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(18) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species which results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). 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. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and many of these HCPs are coordinated with California's related Natural Community Conservation Planning program.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*) may afford some protection to populations affected by Federal activities. The NEPA requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of Federal actions and management decisions affecting the human environment, but NEPA does not require or guide mitigation for impacts.

Bureau of Land Management policy includes special status plant management (BLM Manual Handbook 6840-1) (BLM1996b) and land use plans written for each resource area. Because prominent land transfers of occupied habitat to BLM-administration had not occurred when the species was listed in 1998, the final listing rule did not mention regulatory mechanisms protecting *Verbena californica* occurrences on BLM lands (Service 1998). Today, almost all of the occurrences of *V. californica* occur in the Red Hills in Tuolumne County, on BLM property (A. Franklin, BLM, pers. comm. 2007; CNDDB 2011). Occurrences of *V. californica* on BLM lands derive protection from land use plans that establish allowable resource uses, resource condition goals and objectives to be attained, program constraints and general management practices needed to attain the goals and objectives, general implementation sequences, and intervals and standards for monitoring and evaluating the plan to determine its effectiveness and the need for amendment or revision (43 CFR 1601.0-5(k)).

In 1985, the BLM designated the southern 1,821 hectares (4,500 acres) of the Red Hills as an Area of Critical Environmental Concern (ACEC). In 1993, the BLM expanded the ACEC to the entire 2,873 hectares (7,100 acres) that was then public land in the Red Hills (Hastey 1993). The purpose of the designation is to protect the rare plant species found there, the unusual serpentine soils that provide habitat for unique flora of the area, habitat for the rare minnow known as the Red Hills roach (*Lavinia symmetricus*), and to protect wintering habitat for the bald eagle (*Haliaeetus leucocephalus*) (BLM 2009). Currently, the Red Hills ACEC consists of about 4,042 hectares (9,988 acres, about 15.6 square miles) of public land south of the historic town of Chinese Camp in Tuolumne County (BLM 2011).

The BLM's Sierra Resource Management Plan and Final Environmental Impact Statement includes actions for the Red Hills ACEC (BLM 2007a). The preferred alternative authorized the addition of 1,143 hectares (2,824 acres) to the current Red Hills ACEC that has 2,907 hectares (7,184 acres), the withdrawal of mineral entry within the enlarged ACEC (including Andrew Creek), and the development of a new Red Hills ACEC Plan (BLM 2008). Withdrawal from entry to mining stops exploration for "locatable" minerals, as defined in mining law, such as gold still in the original rock matrix.

It is quite unlikely for a mineral deposit to prove commercially viable (profitable under the "prudent man rule") in the Red Hills because of the local geology. Existing laws, however, allow individuals or companies to patent mining claims on public lands (i.e., take ownership of public land), so long as it remains "open to entry" for mining. Such laws supersede designations such as the Area of Critical Environmental Concern, which applies only to discretionary uses (Farve 1987). Withdrawal of lands from potential mining claims is possible only if action is taken by BLM administrators in Washington, D.C., and approved by the Department of Interior; it is beyond the authority of the Mother Lode Field Office, which oversees the ACEC (A. Franklin, BLM, pers. comm. 2001; A. Franklin, *in litt.* 2002). The request to have an area

withdrawn from open entry for mining can be initiated at the Mother Lode Field Office, which has no record of such a request ever being made. The BLM does have oversight over any mechanized mining operations on public lands within an Area of Critical Environmental Concern. Before conducting such activities, a plan of operations must be filed for any mechanized mining in the Red Hills ACEC (Hastey 1993), and the plan could be rejected if it adversely affected federally-listed or sensitive species.

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' 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, National Environmental Policy Act, and Endangered Species Act. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts.

The Corps interprets "the waters of the United States" expansively to include not only traditional navigable waters and wetlands, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. However, recent Supreme Court rulings have called into question this definition. On June 19, 2006, the U.S. Supreme Court vacated two district court judgments that upheld this interpretation as it applied to two cases involving "isolated" wetlands. Currently, Corps regulatory oversight of such wetlands (e.g., vernal pools) is in doubt because of their "isolated" nature. In response to the Supreme Court decision, the Corps and the U.S. Environmental Protection Agency (USEPA) have recently released a memorandum providing guidelines for determining jurisdiction under the Clean Water Act. The guidelines provide for a case-by-case determination of a "significant nexus" standard that may protect some, but not all, isolated wetland habitat (USEPA and USACE 2007). The overall effect of the new permit guidelines on loss of isolated wetlands, such as intermittent streams, is not known at this time.

At the time of the last 5-year review in 2008, we stated that Nationwide permit No. 26, under section 404 of the Clean Water Act, was established by the U.S. Army Corps of Engineers (Corps) to facilitate issuance of permits for discharge of fill into wetlands. Under the regulations at the time of listing, these nationwide permits could be issued for fill of up to 1.2 hectare (3 acres) of wetlands. Additionally we stated that in 2000, Nationwide permit No. 26 expired and new replacement Nationwide Permits were issued. Nationwide permit No. 29 covered residential developments and Nationwide permit No. 39 covered commercial and institutional developments (USACE 2008).

In 2012, the Corps reissued 48 permits including Nationwide permits (NWP) No. 29 and 39 (USACE 2012a, 2012 b). Nationwide permit No. 29 still covers residential developments and Nationwide permit No. 39 still covers commercial and institutional developments. Nationwide permits No. 29 and No. 39 cover discharge that must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the

300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. These Nationwide permits do not authorize discharges into non-tidal wetlands adjacent to tidal waters (USACE 2012a, 2012b).

In summary, the Endangered Species Act is the primary Federal law that provides protection for this species since its listing as threatened in 1998. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of listing under the Endangered Species Act.

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

At the time issuance of the last 5-year review, we noted that *Verbena californica* was still threatened by susceptibility of populations to extirpation from random demographic, environmental or genetic events. In addition, competition from nonnative plants was a new threat not included in the original listing. To our knowledge, there has been little change in these threats. We have identified global climate change as additional threat to *Verbena californica* since the last 5-year review.

We have little information to indicate that imminence or magnitude of the threat of extirpation from random demographic, environmental, stochastic, or genetic events has changed since listing. As discussed in the final listing rule, small population size increases the susceptibility of a population to extirpation from random demographic, environmental and/or genetic events (Shaffer 1981, 1987; Lande 1988; Groom et al. 2006). In this 5-year review, populations of 200 growing plants or less (not counting ungerminated seeds) are considered to be small, in keeping with Menges' (1992) calculation that populations of this size are especially vulnerable to even moderate levels of environmental uncertainty. *Verbena californica* has population sizes of less than 200 plants for 2 of the recently-observed occurrences. Additionally, several of the smaller occurrences have not been visited recently and we do not know their status (see Appendix for Table 1).

Small populations may also be subject to increased genetic drift and inbreeding (Menges 1991; Ellstrand and Elam 1993). Populations that are continually small in size are particularly susceptible to genetic changes due to drift. However, drift may also cause genetic changes with populations that occasionally fluctuate to small sizes (e.g., undergo population bottlenecks). Increased homozygosity (reduced genetic variation) resulting from genetic drift and inbreeding may lead to a loss of fitness (ability of individuals to survive and reproduce) in small populations. In addition, reduced genetic variation in small populations may make any species less able to successfully adapt to future environmental changes (Ellstrand and Elam 1993).

The conservation biology literature commonly notes the vulnerability of taxa known from one or very few locations (e.g., Shaffer 1981, 1987; Primack 1998; Groom *et al*. 2006). The combination of few populations, small range, and restricted habitat still renders *V. californica* susceptible to extirpation due to random events, such as scouring from storm events, drought, disease, or other factors (Shaffer 1981, 1987; Groom et al. 2006.)

Competition from nonnative *Cynodon dactylon* (Bermuda grass) and *Panicum* species (panic grass) is a concern at Andrew Creek and at two other occurrences (Knox 1998; BLM 1998; CNDDB 2011). The nonnative *Centaurea solstitialis* (star thistle) has become established near two *Verbena californica* occurrences in the Six-Bit Gulch watershed, although the differing habitat requirements of the two species may prevent any competition between them (A. Franklin, *in litt.* 2002). Nonnative plants are also a concern at the newly discovered occurrence (CNDDB 2011).

Global Climate Change. The global average temperature has risen by approximately 0.6 degrees Celsius (1 degree Fahrenheit) during the 20th Century (IPCC 2001, 2007; Adger et al. 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IPCC 2001, 2007; Adger et al. 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger et al. 2007). Ongoing climate change (Inkley et al. 2004; Kerr 2007; Adger et al. 2007; Kanter 2007) likely imperils *Verbena californica* and the resources necessary for its survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of its habitat and/or increased numbers of its predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat, or in the case of plants the inability to disperse to newly suitable habitat at a rate equal to advance of newly unsuitable habitat caused by the change in environmental conditions.

III. RECOVERY CRITERIA

No draft or final recovery plan has been published for this species.

IV. SYNTHESIS

At the time of the last 5-year review we reported that there were 11 presumed extant sites included in CNDDB (CNDDB 2008). Six occurrences had information that was older than 20 years old, and 5 occurrences had information that was from 10 to 20 years old. Currently 15 sites are thought to exist (A. Franklin *in litt*. 2007; CNDDB 2011). Eleven of these are CNDDB occurrences. In addition to the CNDDB occurrences, there are BLM reports of the species at 4 localities. Five occurrences were verified in 2011; 4 localities and 1 occurrence were last verified in 2007; and 5 occurrences were last verified in the 1990s.

Although almost all the presumed extant occurrences of *Verbena californica* are now on public land, hydrological changes due to impacts from adjacent development, recreational mining, grazing, trampling from livestock, competition from nonnative plants, the risk of extirpation from random demographic, environmental, or genetic events, and global climate change still threaten the species. Almost all of the occurrences are now located on public land, where their habitat is protected from the direct effects of development. Therefore, based on continuing habitat threats and risks associated with small population size, we consider that *Verbena californica* still meets the definition of threatened and recommend no change in its ESA listing status at this time.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (*Indicate reasons for delisting per 50 CFR 424.11):*
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X_ No change

New Recovery Priority Number and Brief Rationale: No change needed.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS-

■ Work with the BLM to revise the Red Hills ACEC management plan to include new data, new listings of species under the Endangered Species Act, newly acquired lands, and other lands added to the ACEC because of newly developed resource information.

■ Encourage the BLM to withdraw habitat from mining patents.

■ Establish reliable baseline data for monitoring plant occurrences. Monitor the status and trend of *Verbena californica* in order to track any threats, and to estimate current population sizes, the number and distribution of populations, and whether the species is stable, increasing, or declining.

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APPENDIX Table 1. *Verbena californica* crosswalk

Row	Location Name	CNDDB EO Number	BLM Locality Map #	BLM colony numbers	Last Verified	Comments/status	Highest number of plants prelisting	Highest number of plants post listing
1	Andrew Creek	12		25, 26, 27, 28, 29, 30, 31, 32, 33	2011 in part	Seeds collected from this occurrence on 9/08/2011. Entire site complex was not surveyed. Total number of individuals greater than 1000, no visible disturbances, overall site quality excellent.	several thousand	>1000
	W of Highway 108		1		2007	Per Al Franklin e-mail dated 8/10/2007: BLM portion is 30 square meters in size (11.5 meters long averaging 2.6 meters in width). A long standing water diversion siphons off some water for livestock that may have some impact on the population downstream of the present population.	?	BLM portion is 30 square meters
2	Chinese Camp, Non-Specific	14		–	1972	We are not considering this occurrence to be presumed extant. Large non-specific polygon not seen since 1972.	?	———
3	Horton Creek, Upper Six-Bit Gulch	2 (includes former EO 3)		7, 8, 1, 2	2011	Seeds collected from this occurrence on 9/08/2011. Greater than 1000 individuals. Surrounding land use -grazing. No visible disturbances. Potential scouring by storm events. Overall site condition excellent.	440	>1000 (2011) 4% cover (2005)

Row	Location Name	CNDDB EO Number	BLM Locality Map #	BLM colony numbers	Last Verified	Comments/status	Highest number of plants prelisting	Highest number of plants post listing
4	Amber Creek, Upper Six-Bit Gulch	4		11, 10, 4	2011	Seeds collected from this occurrence on 09/08/2011. There are about 110 individuals. Overall site/occurrence quality is fair. Threats: potential scouring by storm events. Comments: Stream dry in places (not flowing above ground everywhere). Plants found only in areas of standing or running water. Population probably continues upstream on private land (water appeared more abundant upstream--seen through fence).	169	110
5		13		34	1995	Unknown status	100	?
			3	3	2007?	Unknown status. Per Al Franklin 8/10/2007 e-mail: The subdivision of the land along Red Hills Road in the vicinity of BLM occurrence #3 is likely to affect that population. It has been heavily grazed in the past. A reduction of grazing could produce beneficial effects. All the other potential effects of development (e.g., grading. different grazing, herbicides, fertilizers) are also possibilities. Four 40-acre lots are being sold, all of them along Six Bit Gulch. They may cause effects to water quality, which could impact the small occurrences downstream, BLM# 23 and #24.	?	?

Row	Location Name	CNDDB EO Number	BLM Locality Map #	BLM colony numbers	Last Verified	Comments/status	Highest number of plants prelisting	Highest number of plants post listing
			2	5	2007	Unknown status	?	?
6		9		19	1994	Unknown status	70	?
7		10		20	1999	Unknown status	55	?
8		1		23	1990s	Unknown status	200	?
9	Poor Man's Gulch	8		18	2011	Seeds collected from this occurrence on 09/08/2011. Greater than 1000 individuals. Immediate and surrounding land use is grazing. Visible disturbances: apparent small homeless encampment. Threats: potential scouring by storm events. Excellent overall site/occurrence quality.	6	>1000
	Three Springs population		4		2007?	Per Al Franklin 08/10/2007 e-mail: The Three Springs population is grazed. Historically this area has been observed overgrazed with riparian shrubs heavily browsed and *Verbena californica* trampled. However, in 2007 the habitat was in very good condition. Grazing as conducted in 2007 at Three Springs Gulch seems to be compatible with the species.	?	Habitat in very good condition
10		11		21, 22	2011	Seeds collected from this occurrence on 09/08/2011. Greater than 1000 individuals. Overall site/occurrence quality is fair. Visible disturbances: apparent pig rooting all along stream area, but not within area immediately occupied by *Verbena californica*.	several thousand	>1000

Row	Location Name	CNDDB EO Number	BLM Locality Map #	BLM colony numbers	Last Verified	Comments/status	Highest number of plants prelisting	Highest number of plants post listing
10 Cont.						Threats: potential scouring by storm events. Comments: stream dry in lower reach (not flowing above ground everywhere). Plants found only in areas of standing or running water.		
11		5		6, 12, 13, 14, 15, 16, 17	1990s	Unknown status	>310	?
12		15			2007	About 10 plants seen by E. Buxton in 2007. Threats to the occurrence included proposed golf course and residential development; non-native species. On private land.	____	10

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

***Verbena californica* (Red Hill Vervain)**

Current Classification: Threatened

Recommendation resulting from the 5-Year Review:

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

Review Conducted By: Kirsten Tarp, Sacramento Fish and Wildlife Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 20 June 2012