

Camissonia benitensis
(San Benito evening-primrose)

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



Photo by David Pereksta, USFWS

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

August 2009

5-YEAR REVIEW

Camissonia benitensis (San Benito evening-primrose)

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:

As summarized from the recovery plan of this species (Service 2006), *Camissonia benitensis* (San Benito evening-primrose) is a small, yellow-flowered, annual herb in the evening-primrose family (Onagraceae). This species is restricted to serpentine-derived alluvial terraces and deposits near San Benito Mountain, within and adjacent to the Clear Creek Management Area (CCMA) in southern San Benito and western Fresno Counties, California (Taylor 1990).

It is important to note that on May 1, 2008, the Bureau of Land Management (Bureau) ordered a temporary emergency closure of 31,000 acres of the CCMA and portions of adjacent lands in southern San Benito County and western Fresno County. This closure was issued to protect public land users from health risks associated with exposure to airborne asbestos based upon a report issued by the Environmental Protection Agency. The closure will remain in effect until the Bureau completes a new CCMA Resource Management Plan to determine how visitor use can occur without excess health risks (Bureau 2008a). Although the closure minimizes some threats to *Camissonia benitensis*, it does so only temporarily. Therefore all known threats to the species will be addressed in this review in the event that the CCMA is reopened to the public.

Methodology Used to Complete This Review:

This review was prepared by the Ventura Fish and Wildlife Office (VFWO), following the Region 8 guidance issued in March 2008. We used information from the recovery plan, survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of

Fish and Game. The recovery plan and personal communications with experts were our primary sources of information used to update the species' status and threats. 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 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:

Lead Regional Office: Diane Elam, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, and John Robles, Fish and Wildlife Biologist, Region 8, Pacific Southwest; 916-414-6464.

Lead Field Office: Roger Root, Assistant Field Supervisor; Lena Chang, Biologist; and Connie Rutherford, Listing and Recovery Program Coordinator for Plants, Ventura Fish and Wildlife Office; 805-644-1766.

Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on February 14, 2007 (Service, 2007). No information was received as a result of this request.

Listing History:

Original Listing

FR Notice: 50 FR 5755

Date of Final Listing Rule: February 12, 1985

Entity Listed: Species (*Camissonia benitensis*)

Classification: Threatened

Associated Rulemakings: None.

Review History: The status of *Camissonia benitensis* was reviewed during preparation of the recovery plan for this species, which was approved in 2006. Otherwise, no 5-year review has been conducted.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Camissonia benitensis* is 5 according to the Service's 2008 Recovery Data Call for the VFWO, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Service 1983). This number indicates that the taxon is a species with a high degree of threat and has a low potential for recovery.

Recovery Plan or Outline

Name of Plan or Outline: Recovery Plan for *Camissonia benitensis* (San Benito evening-primrose)

Date Issued: September 21, 2006

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

Camissonia benitensis is autogamous (self-pollinating), and therefore does not require insects or other abiotic mechanisms for pollination. Germination occurs from February to March, flowering in mid-spring, and seed pods mature by early summer. An individual plant typically produces one capsule containing approximately 90-100 seeds. Black-colored seeds germinate more readily and comprise more than 95 percent of total seed production in comparison to blonde-colored seeds (Taylor 1990). Table 1 summarizes investigations by Taylor et al. (1989) of several characteristics of the seed from *Camissonia benitensis*.

Maintaining a seedbank in the soil is an important survival mechanism for many short-lived annual species in years of poor conditions (Baskin and Baskin 1978). *Camissonia benitensis* seedbank study samples collected from Clear Creek and San Carlos yielded 100 to 4,700 seeds per square meter (84 to 3,900 per square yard). These numbers were much larger than the observed numbers of above ground plants at those sites, suggesting that fluctuations in population size are a function of variation in rainfall and not necessarily dependent on the fecundity of plants from previous years (Taylor et al. 1989). Seeds that germinate in a given year may have been stored in the soil as a seedbank for a number of years. The vulnerability of populations to extirpation may be directly proportional to the depletion of seedbank reserves due to years of disturbance (Taylor et al. 1989). Seedling survivorship documented in Clear Creek and San Carlos suboccurrences showed that the majority of mortalities were attributable to drought. Less than a third of mortalities resulted from insect predation, and ten percent of the mortalities resulted from frost-heaving of the soil early in the growing season, damaging the roots (Taylor 1990). *Camissonia benitensis* may utilize both short-distance and long-distance seed dispersal mechanisms. The short stature of the plants when in fruit (5 to 10 centimeters or 2 to 4 inches) facilitates short-distance seed dispersal. Occurrences separated from each other by

perennial streams, documented shifts in the “footprint” of *Camissonia benitensis* suboccurrences (e.g., at suboccurrence 51100) (Bureau 1997b), and the distribution of occurrences over a large geographic area in a number of watersheds are evidence of long-distance seed dispersal (Service 2006).

Table 1. Seed characteristics of *Camissonia benitensis*

Seed Production	
Wild	Garden
<ul style="list-style-type: none"> • Annual seed production is highly variable, with less seed being produced in dry years. • Most individuals in the wild produce one capsule per plant. • Some individuals produce 2, 3, or as many as 10 capsules. • There is a positive correlation between capsule length and the number of ovules per capsule. • Mean capsule lengths of 3 occurrences range from 20 to 27 mm. • Ovules per capsule range from approximately 30 to 60 mm. 	<ul style="list-style-type: none"> • Seed from 2 of the 3 native occurrences produced plants with capsules reaching lengths of 36 mm. • Plants produced between 94 and 98 mean ovules per capsule. • 80 percent of the second-generation seed produced from these garden-grown plants were viable. • Most of the seed produced (96 percent) were the black, angular type. • Less than 4 percent of seeds were the smooth, blond type.
Germination	
<ul style="list-style-type: none"> • Black seeds germinated faster and more readily than blond seeds. • Both types of seed germinated more readily at 3 degrees Celsius (37.4 degrees Fahrenheit) than at 20 degrees Celsius (68 degrees Fahrenheit). • Germination of <i>Camissonia benitensis</i> seed requires some degree of cold stratification during the winter, rather than being triggered only by late fall rains. 	

In years that are favorable to growth and reproduction of *Camissonia benitensis*, more suboccurrences support plants, and the populations are typically larger in size (Rutherford 2003). In less favorable years, fewer suboccurrences are visible, and the visible suboccurrences are typically smaller in size.

Spatial Distribution

Camissonia benitensis is restricted to southeastern San Benito County and extreme western Fresno County in the Central Coast Range of California, within and adjacent to the CCMA. The known distribution of *Camissonia benitensis* comprises a total of 69 known populations, as summarized in Table 2 (R. O’Dell, Bureau, pers. comm. 2009d).

Table 2. Population distribution of *Camissonia benitensis*

Populations on BLM land within the CCMA	
52 natural populations	Presumed to have existed prior to European settlement and habitat impacts
5 reintroductions	Suboccurrences 41200, 51400, 51500, 161100, 281100
5 new introductions	Suboccurrences 21800, 51600, 91300, 241100, 241200
Populations on BLM land outside of the CCMA	
3 natural populations	Suboccurrences 191100, 161100, 161200
Private Land populations	
2 suboccurrences within the CCMA	Suboccurrences 181100, 201200
2 suboccurrences outside of the CCMA	Suboccurrences 221100, 151100
= 69 total known populations	

Abundance

Studies have estimated the number of plants needed to avoid extinction with a 95 percent probability of persistence for 100 years (Shaffer 1987, Menges 1991). For a long-lived perennial species, a population size of 1,000 individuals may be sufficient, but annual species may require larger populations (at least 100,000 to 1 million in climatically favorable years) to survive natural events that can eliminate occurrences and suitable habitat (Thomas 1990).

Annual counts of *Camissonia benitensis* between 1983 and 2009 (a span of 26 years) reveal:

- 20 of these years contained numbers above 1,000 individuals;
 - 8 of the 20 years contained numbers over 10,000 individuals; and
 - 1 of the 20 years contained numbers above 100,000 as illustrated in Table 3 (O’Dell, pers. comm. 2009b).

Table 3. Annual count numbers of individuals of *Camissonia benitensis* from 1983 to 2009

Year	Number of Individuals	Year	Number of Individuals
1983	1,320	1997	1,606
1984	68	1998	12,455
1985	13,618	1999	625
1986	3,590	2000	16,760
1987	264	2001	1,849
1988	165,168	2002	5,560
1989	1,703	2003	16,485
1990	146	2004	607
1991	5,207	2005	41,543
1992	32,208	2006	284
1993	5,092	2007	1,188
1994	769	2008	6,090
1995	5,850	2009	2,791
1996	10,273		

Population numbers of *Camissonia benitensis* fluctuate from year to year, exhibiting a repetitive “boom-bust” population cycle occurring approximately every 2-3 years as described by O’Dell (2009b). In 1988, a record high number of 165,168 individuals of *Camissonia benitensis* were recorded. When population numbers from all sites were considered from 1983 to 2007, O’Dell (2009b) demonstrated that removal of this statistical outlier indicates that the population trend has slightly increased over time (Figures 1 and 2).

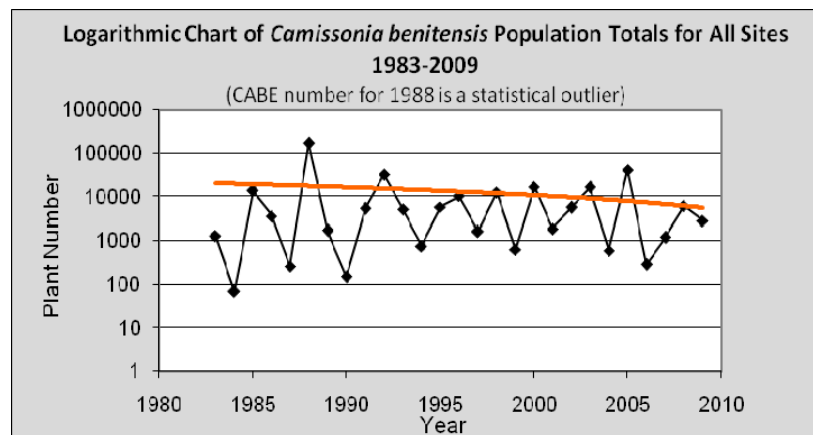


Figure 1. With the outlier, the population trend is a slight decrease over time (O’Dell, pers. comm. 2009b).

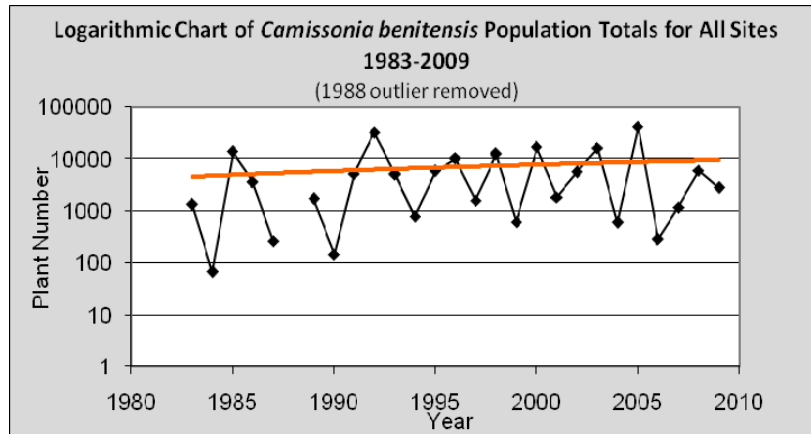


Figure 2. Without the outlier, the population trend is a slight increase over time (O'Dell, pers. comm. 2009b).

Whether these population patterns are cause for concern or confidence is difficult to determine at this time because population estimates for an annual species should include viable seeds in the soil, not just above-ground plants (Doak et al. 2002).

Habitat or Ecosystem

Climatic data are lacking for Clear Creek Canyon, where most of the occurrences of *Camissonia benitensis* exist. However, nearby weather stations permit inferences about the general climate at the CCMA. The Priest Valley weather station in Monterey County provides complete coverage of weather data from the past 20 years. Average annual rainfall is 40.4 centimeters (15.9 inches) in Idria (on the northern CCMA boundary) and 41.5 centimeters (16.3 inches) in Hernandez (on the western CCMA boundary) (Worldclimate 2007). Temperatures can range from a minimum of -6.7 to -1.1 degrees Celsius (20 to 30 degrees Fahrenheit) in the winter to 32.2 to 37.8 degrees Celsius (90 to 100 degrees Fahrenheit) in the summer (Taylor 1990). Precipitation is variable over the entire Clear Creek Management Area due to the large elevation difference between the lowest point (approximately 2,500 feet in Hernandez), and the highest point (approximately 5,000 feet at the top of San Benito Mountain). The Hernandez rain gauge represents the lowest elevation, while Santa Rita Peak represents the higher elevations (O'Dell, pers. comm. 2009c). Low annual rainfall and hot summer temperatures limit the growing season for plants.

Taylor (1990) describes suitable habitat for *Camissonia benitensis* as the following:

- a) Physical characteristics: alluvial terraces or areas adjacent to slopes (alluvial outwash) below an elevation of approximately 1,372 meters (4,500 feet). The habitat is flat to gently sloping (less than 3 degrees), on residual serpentine or serpentine alluvium, subject to frost heaving, and with minimal cover of surface gravel.
- b) Biotic characteristics: an association of annual plants, and no more than 25 percent of the terrace covered with chaparral.

- c) **Habitat stability:** the habitat is relatively stable with little soil erosion caused by natural processes (e.g., mass wasting), historical uses (e.g., mining activities), and current uses (e.g., recreational activities). The extent of stable habitat needs to include not only the current area occupied by *Camissonia benitensis*, but also sufficient surrounding habitat for maintaining stable soil and hydrologic processes, and for ensuring the species' ability to migrate within potentially suitable habitat at a site.

All of the known occurrences of *Camissonia benitensis* are on serpentine alluvial flats, terraces, and debris flows (alluvial outwash) terraces and deposits near San Benito Mountain in San Benito County, California, and in western Fresno County, California. The majority of the known *Camissonia benitensis* sites occur on the relatively more stabilized alluvial flats and terraces; however, some occurrences of the species are at the base of slopes where there is a greater potential for deposition of material moving from above (debris flows). There are currently less than 427 acres of suitable habitat for *Camissonia benitensis* known throughout its range (Bureau 2005a, 2005b). In any given year, the Bureau estimates that 10 to 15 percent (approximately 50 acres) of this suitable habitat is occupied by the species.

The San Benito serpentine body covers about 12,140 hectares (30,000 acres) on public land administered by the Bureau within the 30,687-hectare (75,829-acre) CCMA. Because soils developed from the San Benito serpentine body contain high levels of free asbestos fibers that pose human safety hazards, in 1984 the Bureau designated the 12,140 hectares (30,000 acres) of serpentine within the CCMA as an Area of Critical Environmental Concern. The U.S. Environmental Protection Agency has also designated this same area as a Hazardous Asbestos Area, and on May 1, 2008, the Bureau ordered a temporary emergency closure of 31,000 acres of the CCMA and portions of adjacent lands in southern San Benito County, and western Fresno County to protect public land users from health risks associated with exposure to airborne asbestos based upon a report issued by the Environmental Protection Agency.

Certain terraces that are currently not suitable for *Camissonia benitensis* could be rendered suitable through restoration efforts. Continued research in soil amendment and revegetation, along with efforts by the Bureau to sign closed routes and barrens and enforce the restrictions identified in the 2006 Record of Decision regarding off highway vehicle (OHV) use may reduce the rate of soil erosion and soil surface disturbance, allow extant occurrences to expand, and could make other sites available for natural expansion and reintroduction efforts. In addition, terrace sites that feature otherwise suitable *Camissonia benitensis* habitat, but have more than 25 percent chaparral coverage that reduces habitat availability, may have the greatest potential for providing new suitable habitat for *Camissonia benitensis* (Taylor 1990). Resource managers may be able to reduce chaparral cover in these areas through controlled burning or manual brush removal.

Species-specific Research and/or Grant-supported Activities

An ex-situ study conducted from January to April 2009, examined the affects of rising levels of soil amendment from organic matter sources. The study also examined the response and competitive interaction of red brome, a common invasive annual grass along roadsides in close proximity to *Camissonia benitensis* habitat. The results of this study indicated that organic matter (particularly compost or peat) greatly increased the survival and productivity of *Camissonia benitensis*, and that organic amendment of serpentine substrate in disturbed habitat is essential in increasing the survival and productivity of this species. However, the amended substrate has a higher likelihood of invasion by red brome and possibly other invasive species. Similar soil amendment properties were tested in the field on both small and large scales. Results demonstrated that soil amendment and planting methods (seeding of shallow, cross-ripped, composted trenches) were successful in establishing revegetation on serpentine barrens. Compost and peat moss amendment resulted in the highest establishment and productivity of *Camissonia benitensis* (O'Dell, pers. comm. 2009a). Some data collections from these soil amendment studies are still in progress, and revegetation research is ongoing.

In the winter of 2008, revegetation trials were conducted within the San Benito Mountain Research Area as part of a two-year collaborative research project between the Bureau and the University of California, Davis. These trials included soil amendment treatments (including deep tillage, compost amendment, and wood chip mulch), with planting of the locally collected, serpentine tolerant species *Achillea millefolium* (yarrow) and *Elymus elymoides* (squirrel tail). Preliminary results demonstrated that water availability may be a key factor in plant establishment and productivity on serpentine barrens. Now that the plants are well established, the next growing season is expected to reveal further differences between treatments (Bureau 2008b).

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

The final rule listing *Camissonia benitensis* as a threatened species (Service 1985) summarized the following factors affecting it: habitat and colonies were adversely affected by off-road vehicle (ORV) activities; surveys at the time reflected a low number of approximately 1,000 individuals; camping and recreation areas and trails made protection of the species difficult; active gravel removal near the entrance to Clear Creek Canyon threatened to destroy an entire colony of *Camissonia benitensis*; and an inadequacy of regulatory mechanisms did not offer the species aid in conservation through interagency cooperation under section 7 of the Endangered Species Act. Current threats to *Camissonia benitensis* are discussed in the following sections.

Off-highway Vehicle Recreation

OHV use has been a substantial threat to *Camissonia benitensis* and its habitat (Bureau 1970, 1981, 1982, 1984, 1986, 1993, 1995, 2005a, and 2005c; Losos et al. 1993; Taylor 1990, 1991, 1993, and 1995). The CCMA attracts OHV recreationists in large numbers because its serpentine areas offer open slopes (barrens) for riding (Bureau 2005c), and visitor use in the CCMA has increased over the past decade. In 2004, the Bureau invested in new visitor use counting devices. As a result, and combined with actual onsite counts, visitation figures have been refined. The Bureau reports the level of use (prior to the temporary closure) was approximately 50,000 visitor-use days per year (Bureau 2005c). Appendix A illustrates *Camissonia benitensis* distribution in the CCMA and the temporary closure area (Bureau 2008c).

The silt-clay crust that forms on serpentine soils protects open, undisturbed slopes from erosion. When the crust is disturbed, sheet erosion, rilling, and gullying occur (Kruckeberg 1984). OHV recreation at the CCMA has caused disturbance of soil integrity, soil loss, compaction of soil, and destruction of plants (Bureau 2005c). In addition, recreation (e.g., camping, vehicle traffic, and OHV use) has disturbed alluvial terraces in Clear Creek Canyon (Bureau 2005c, Bureau 2006a). Appendix B summarizes past and current effects of various activities, by type of use, at the CCMA; we use the terminology employed by the Bureau's compliance monitoring program (Dynamac Corporation 1998).

In response to increased visitor use and associated resource concerns, the Bureau initiated management actions to address recreational impacts. In the 1995 Clear Creek Management Plan Amendment and Final Environmental Impact Statement, the Bureau proposed to undertake numerous actions to protect *Camissonia benitensis* and other sensitive species in the CCMA (Bureau 1995).

Prior to 2006, management of routes and barrens was based on the Clear Creek Management Plan and Decision Record (Bureau 1995, 1999) that designated the CCMA as a limited use area and closed use in the existing 800-hectare (2,000-acre) San Benito Mountain Natural Area except for the county and ridge route roads. However, the route system was to be managed to encourage use on designated numbered and/or signed routes, and to allow use on all other routes that were not physically and/or signed closed, until completion of the route designations in a subsequent environmental analysis. The 2006 amendment to the Clear Creek Management Plan resulted in a large reduction in the amount and extent of open routes and barrens in the CCMA; 389 kilometers (242 miles) of routes and 193 hectares (478 acres) of barrens were designated as open.

The Bureau has erected many miles of fence to protect habitats and riparian corridors at the CCMA, and a law enforcement officer is assigned to the area. Other measures have been implemented to protect sensitive habitat while maintaining OHV recreational opportunities, particularly along the Clear Creek riparian corridor. However, prohibited activities such as cutting through fences and removing signs that have been erected to protect sensitive areas still occur. These activities result in costly ongoing monitoring, repair and replacement of barriers and signs, enforcement actions, and occasional rerouting to avoid sensitive areas.

Soil Loss and Elevated Erosion Rates

Erosion on both barren and vegetated slopes causes soil loss and other physical and chemical changes. These changes negatively affect the soil's texture, composition, and chemistry. They also can reduce the soil's water infiltration capacity and productivity, which in turn affects the ability of plants to grow in these soils.

Several attempts have been made to quantify the extent of natural and human-caused soil erosion occurring within the CCMA. One study estimated the mean background, undisturbed soil loss in the Clear Creek watershed at 10.0 metric tons (11 tons) per acre per year (PTI Environmental Services 1993; B. Ellis in litt. 1994, 1996). Sediment yield to the mouth of Clear Creek from undisturbed soil conditions is estimated to be approximately 2.7 metric tons (3 tons) per acre per year. In comparison, soil loss from OHV hillclimb play areas is estimated to be approximately 14.5 metric tons (16 tons) per acre per year, with a sediment yield of approximately 4.5 metric tons (5 tons) per acre. The erosion rate from roads alone averages 72.6 metric tons (80 tons) per acre of road surface per year, and the estimated sediment yield from roads to the mouth of Clear Creek is nearly 4,536 metric tons (5,000 tons) per year. The CCMA plan amendment (Bureau 2005c) includes measures that are expected to reduce the current sediment loss from the CCMA by reducing human-caused contributions to the total, and the Bureau will implement an erosion monitoring program to determine and analyze sediment erosion and deposition affecting occupied and surrounding potential habitat within the CCMA.

Riparian habitats (and the streamside terraces upon which *Camissonia benitensis* occurs) can be adversely affected by accelerated sediment deposition from wet-season use of the road system in the CCMA. Sediment delivery is reduced by providing proper road maintenance. Recent changes in maintenance practices at the CCMA, such as the installation of water bars, are designed to further reduce sedimentation of streams.

The Bureau implements wet season closure procedures at the CCMA after the annual total precipitation exceeds 20.3 centimeters (8 inches). The Bureau temporarily closes certain routes, areas, or all of the CCMA to OHV use during the wet season. These closures reduce damage to road drainage structures, reduce delivery of excess sediment to streams, and lessen the degree to which *Camissonia benitensis* habitat or seed banks may be covered by sediment deposition. Closures are usually in effect for 3 to 10 days after the storm event. The Bureau posts signs alerting the public of the closures on all arterial routes leading to closed areas. Closure notices are also included on the recorded CCMA information hotline. Once part or all of the CCMA has been closed, the Bureau completes a field inspection to determine the suitability of road conditions prior to reopening.

Facilities Construction and Maintenance

The Bureau established an administrative site in 1988 that lies to the north of the CCMA. Its purpose is to support ranger and law enforcement services and to facilitate asbestos (chrysotile) decontamination. The Bureau inadvertently constructed a residence within a *Camissonia benitensis* suboccurrence (suboccurrence 19110) at the administrative site, resulting in the direct loss of plants and habitat. The administrative site is currently in the process of being relocated

onto a site of non-serpentine soils that is not regarded as potential habitat for the species. The Bureau plans to remove the old administrative site and restore the habitat for *Camissonia benitensis*. Maintenance and other minor construction activities at the administrative site continue to present a threat due to disturbance of habitat (O'Dell, pers. comm. 2009a).

Mining Activities

Mining activity in the CCMA has decreased since the early 1900s, and the last commercial mining operation ceased its activities in 2002. Residual soil erosion problems from historic mines and their access roads may affect certain occurrences of *Camissonia benitensis*. The 2006 CCMA plan amendment (Bureau 2006a) states that all routes through closed mine areas will be corridor-fenced by 2008. The short- and long-term effects to occupied and suitable habitat resulting from reclamation efforts required by the State of California's Division of Mines, such as recontouring or consolidating waste materials, will depend on site-specific activities and conditions.

The primary mining activity in the CCMA now consists of rock hounding for gems and minerals. In 1994, the Bureau estimated that 5 percent of the visitor use was comprised of rock hounders. We believe the impact of this activity on *Camissonia benitensis* and its habitat is minimal.

The Bureau acquired the surface, but not the mineral, rights of 208 hectares (520 acres) along the lower reaches of Clear Creek up to and including the confluence with the San Benito River. The acquisitions placed seven additional suboccurrences of *Camissonia benitensis* under Bureau management. Gravel mining in the area has ceased and will not occur again due to State prohibitions. While the Bureau does not own the mineral rights, and therefore cannot provide absolute protection to the three suboccurrences within or adjacent to an historic mining operation, we believe that the potential for substantial mineral exploitation in this area is negligible.

Habitat Alteration due to Invasive Species

Several non-native plant species, including *Centaurea solstitialis* (yellow star-thistle) and *Taeniatherum caput-medusae* (medusahead) have been found in the Clear Creek watershed. Once established, these weeds are difficult to eradicate and therefore pose a potential threat to *Camissonia benitensis* habitat in certain areas. *Centaurea solstitialis* and non-native annual grasses occur on the Franciscan soils throughout the Clear Creek watershed where several *Camissonia benitensis* suboccurrences occur at the interfaces between Franciscan and serpentine soils (J.A. Delgado, pers. comm. 2002). The Bureau's 2006 CCMA plan amendment (Bureau 2006a) includes the development and implementation of an invasive weed management program.

Feral pigs (*Sus scrofa*) are also present in the Clear Creek watershed. As pigs root for bulbs and tubers, they churn the soil. Churning of the soil not only disrupts the existing native vegetation, but also facilitates establishment of non-native plant species. In spring 2002, feral pig damage was extensive throughout Clear Creek Canyon on partially vegetated alluvial terraces. Pigs affected several *Camissonia benitensis* suboccurrences after germination had occurred.

Resulting seedling mortality contributed to an overall reduction in *Camissonia benitensis* survivorship that year. Feral pig activity continues at the CCMA.

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

At the time of listing, overutilization was not considered a threat to *Camissonia benitensis*, and is not considered a threat now.

FACTOR C: Disease or Predation

At the time of listing, disease or predation were not considered threats to *Camissonia benitensis*, and are not considered threats to the taxon now.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

County Protections

There are currently no Fresno or San Benito County protections in place that explicitly address *Camissonia benitensis* or its habitat.

State Protections

Camissonia benitensis is not a State-listed taxon under the California Endangered Species Act; however, the California Environmental Quality Act (chapter 2, section 21050 et seq. of the California Public Resources Code) affords some protection to the species under State law via mitigation requirements. This is because there are Federal protections in place for the species and it is listed as a 1B(1) species (seriously endangered in California) by the California Native Plant Society (California Native Plant Society 2007).

The State of California requires mining plans of operation to include reclamation activities for all mine sites over 1 acre or over 1,000 cubic yards in volume. Reclamation is intended to prevent or minimize the negative impacts of surface mining to public health, property, and the environment (pursuant to the Surface Mining and Reclamation Act) (California Division of Mines and Geology 1975). This requirement applies to mines on Federal, State, and private lands. Therefore, the long-term effects of mining on *Camissonia benitensis* and its habitat (e.g., erosion, sedimentation, etc.) may be minimized through this process in areas where the species occurs adjacent to such operations. Local lead agencies administer reclamation activities. The County of San Benito is the lead agency for mining operations in the CCMA.

In cooperation with the U.S. Forest Service and the California Department of Parks and Recreation's (CDPR) Off-Highway Motor Vehicle Recreation Division, the Bureau assisted in developing and publishing guidelines for soil conservation for OHV recreation management (CDPR 1991). The State Public Resources Code requires that the guidelines be applied to OHV recreation areas managed or funded by the State. The guidelines document the significance of soil resource losses due to OHV recreation, and establish standards for restoration efforts.

The State Water Resources Control Board (SWRCB) is the designated State agency that implements the Federal Water Pollution Control Act (33 U.S.C. 1251, et seq.). As of January 1, 2004, the Bureau is obligated to monitor water quality in areas that exceed total maximum daily loads (TMDL) of certain pollutants, as per section 303 (d) of the Federal Water Pollution Control Act. The SWRCB is responsible for determining, in the case of excessive TMDL, if land use restrictions may be necessary for the protection of public health, safety, or the environment. As of 2001, the CDPR requires a Wildlife Habitat Protection Plan (WHPP) as a component of any grant application submitted to the Green Sticker fund (a funding program administered by the Off-highway Motor Vehicle Division of the CDPR using funds generated from registration of OHVs). The WHPP is required to comply with the provisions of the California Environmental Quality Act and the California Endangered Species Act to guarantee that recipients do not jeopardize the continued existence of state-listed species with projects using State of California funds. The WHPP summarizes the protection and management of all Federal and State endangered, threatened, and special status plant and animal species that occur within the project area. The first WHPP for the CCMA was developed in 2003; updates are now made annually (Bureau 2006a).

Federal Protections

Because the Bureau is required to consult with the Service on any activities it funds, authorizes, or carries out that may affect *Camissonia benitensis*, occurrences of the species are subject to the consultation requirements of section 7(a)(2) of the Act. There are no Federal prohibitions under the Act for negatively impacting listed plants on non-Federal lands, unless a person damages or destroys federally listed plants while in violation of a State law or a criminal trespass law. Where the species occurs on private lands, protections afforded by section 7(a)(2) of the Act are triggered only if there is a Federal nexus (i.e., an action funded, permitted, or carried out by a Federal agency).

Other provisions of the Act may also apply:

- Section 5 of the Act authorizes the Department of the Interior to acquire habitat essential to preserving listed species.
- Section 6 directs the Service to cooperate with states to maintain adequate programs for the conservation of listed species.
- Section 7(a) of the Act (and its implementing regulations) require Federal agencies to use their authorities to carry out programs for the conservation of listed species and to consult with the Service whenever they may affect listed species through their actions.
- Section 9 of the Act provides for protection of listed species. On Federal lands or lands under Federal jurisdiction, it is a violation to remove or reduce to possession threatened or endangered plants, or to maliciously damage or destroy them. On other lands, listed plants may not be removed, cut, dug up, or damaged in knowing violation of any State law or regulation. Listed plants also cannot be sold, shipped, or received in interstate or foreign commerce.
- Section 10 of the Act permits exceptions to the protections granted under section 9 in the form of recovery and incidental take permits.

The Bureau has regulations and policies that guide the management of natural resources on the public lands they manage. In particular, the U.S. Congress passed the Federal Land Policy and Management Act of 1976 to provide policy for “the management, protection, development, and enhancement” of public lands managed by the Bureau. This law directs the Bureau to “take any action necessary to prevent unnecessary or undue degradation of the lands” during mining operations (43 U.S.C. 1732 (b)). Mining operations that exceed 5 acres, and certain other defined operations, require a plan of operations approved by the Bureau (43 CFR 3809.1-4, 1-6). However, before approving the plan, the Bureau must comply with section 7(a)(2) of the Act for any species that: a) is proposed or listed as endangered or threatened; or b) has proposed or designated critical habitat.

The Code of Federal Regulations found in Title 43, Volume 2, Parts 8340 and 8364, gives the Bureau the ability to enact special rules to protect soil, vegetation, wildlife, threatened or endangered species, wilderness suitability, and other resources by immediately closing affected areas to off-road vehicles that are causing resource damage until the adverse effects are eliminated and measures are implemented to prevent recurrence.

Two Executive Orders (EO) apply specifically to off-road vehicles on public lands:

- EO 11644 directs agencies to designate zones of off-road use that are based on protecting natural resources, the safety of all users, and minimizing conflicts among various land uses. The Bureau and other agencies are to locate such areas and trails to minimize damage to soil, watershed, vegetation, or other resources, and to minimize disruption to wildlife and their habitats. Areas may be located in designated park and refuge areas or natural areas only if the head of the agency determines that off-road use will not adversely affect the natural, aesthetic, or scenic values of the locations. The respective agencies are to ensure adequate opportunity for public participation in the designation of areas and trails.
- EO 11989 amends the previous order by adding the following stipulations: a) whenever the agency determines that the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources of particular areas or trails on public lands, it is to immediately close the areas or trails to the type of off-road vehicle causing the effects until it determines that the adverse effects have ceased and that measures are in place to prevent future recurrence; and b) each agency is to close portions of public lands within its jurisdiction to off-road vehicles except areas or trails designated as suitable and open to off-road vehicle use.

In 2001, the Bureau published the National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands. The purpose of this guiding document is to ensure consistent and positive management of environmentally responsible motorized OHV use on public lands.

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

Succession to Woody Shrub Community

Woody plants have been encroaching on a number of alluvial terraces and may be reducing the amount of habitat available for *Camissonia benitensis* (Taylor 1990). Taylor (1990) speculated that seed of *Camissonia benitensis* is not likely to remain viable through an entire cycle of woody vegetation encroachment into occupied habitat. Whether woody vegetation encroachment and resultant shading would eliminate this species from an area depends on how long the seed bank remains viable and the interval for a stand-replacing fire to occur. While at least three fires have occurred within the CCMA since the 1950s, none has gone through occupied or potential habitat.

Prescribed fire could potentially be employed to reverse encroachment of woody vegetation into terrace sites. However, prescribed burning appears impracticable because of the potential health hazard associated with the asbestos-bearing soils in the San Benito serpentine area. The asbestos hazard prevents participation in fire suppression by the California Department of Forestry and Fire Protection and the California Department of Corrections, which otherwise cooperate with the Bureau to implement prescribed fire on Bureau lands.

Stochastic Events

Randomly-occurring events, such as prolonged drought, wildfire, flooding, and catastrophic erosion and sedimentation, have the potential to affect the continued existence of this species, but to an unknown extent. While these natural catastrophic events are difficult or impractical to manage at the time they occur, improved resource management to address human-caused impacts over a long period of time can reduce the severity of their effects on the species. The probability of extinction for *Camissonia benitensis* from random events can be reduced by allowing for the persistence of widely dispersed occurrences and potential habitat so that species survival does not depend only on a few occurrences, and by maintaining healthy watersheds with intact edaphic (soil function) and hydrologic regimes.

The threat from randomly-occurring natural events is now considered less than was thought at the time of listing, because the species is now known from 27 occurrences and 67 suboccurrences compared to 9 occurrences at the time of listing. Also, the species' distribution is now known to extend downstream along the San Benito River and into additional watersheds (Lorenzo Vasquez Creek, Laguna Creek, White Creek, upper reaches of Clear Creek, Larios Creek, Sawmill Creek, Picacho Meadow, San Benito River, and an unnamed tributary to the San Benito River downstream of the confluence with Lorenzo Vasquez).

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). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. While it appears reasonable to assume that both plant and animal species may be affected, we lack sufficient certainty on knowing how and how

soon climate change will affect species, the extent of average temperature increases in California, or potential changes to the level of threat posed by drought or fire. 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 particular species at this time.

III. RECOVERY CRITERIA

The final recovery plan for this species, Recovery Plan for *Camissonia benitensis* (San Benito evening-primrose), was issued on September 21, 2006. Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

The short-term recovery objective for *Camissonia benitensis* is to eliminate or reduce current threats to all existing populations and potential habitat so that the species retains threatened status and does not have to be reclassified as endangered. The long-term recovery objective for *Camissonia benitensis* is removal from the Service's list of threatened and endangered species. At the time the recovery plan was written in 2006, Listing Factors A, D, and E were identified as potential threats to the persistence of this species. Listing Factors B and C were not found to pose threats to the species at the time the species was listed in 1985, and are still not considered relevant to the species.

Recovery Criterion 1: Research has been completed and delisting criteria 2 through 4 have been refined as appropriate based on research findings. Factors that should be studied include: (a) Potential for restoration of serpentine terrace habitat and natural rate of habitat replacement (excluding human-caused activities); (b) Ecology of *Camissonia benitensis* seed banks; and (c) Population viability modeling and estimation of habitat area and population levels necessary for dispersal, seed bank viability, and long-term persistence of the species.

For reference, Delisting Criteria 2 through 4 in the recovery plan are synonymous with Recovery Criteria 2 through 4, and are:

2. Known occurrences and sufficient additional suitable habitat, within each watershed unit throughout its range, are protected from direct effects from OHV use and other recreational activities. Appropriate levels of compliance with use regulations by recreationists have prevented adverse impacts to *Camissonia benitensis* suboccurrences and habitat.
3. Currently occupied and suitable habitat for the species has been restored and maintained over an appropriate period of time, as informed by monitoring and research. Given current knowledge, we expect that the “appropriate period of time” will be no less than 20 years. Because the number of individuals in a suboccurrence fluctuates widely from year to year, more emphasis should be placed on maintaining the habitat that supports known suboccurrences. Disturbance and erosion rates should not be substantially elevated above natural levels, and *Camissonia benitensis* should persist in suitable habitat.
4. Population sizes have been maintained over a 20-year period during a normal rainfall cycle (i.e., includes periods of drought and wet years).

This recovery criterion addresses Listing Factors A and E. This criterion specifically calls for research to refine the delisting criteria presented in the recovery plan. This is critical for this species, because individual occurrences of the species are relatively isolated, a finite amount of suitable habitat is available, and the specific habitat requirements of the species (e.g., appropriate buffer sizes, population viability thresholds, and annual precipitation requirements) are not well understood.

Delisting criteria cited (2 through 4) have not been refined since approval of the recovery plan, and as mentioned in the species-specific research section of this review, research is still in progress. Therefore, we believe that this criterion has been partially, though not fully met. We believe that this criterion is adequate and appropriate to the recovery of this species.

Recovery Criterion 2: Known occurrences and sufficient additional suitable habitat within each watershed unit throughout its range are protected from direct effects from OHV use and other recreational activities. Appropriate levels of compliance with use regulations by recreationists have prevented adverse impacts to *Camissonia benitensis* suboccurrences and habitat.

This recovery criterion addresses Listing Factor A. Direct and indirect impacts from OHV use has been a substantial threat to *Camissonia benitensis* and its habitat. In 2006, the Bureau approved an amendment to the CCMA Resource Management Plan. The 2006 Record of Decision (Bureau 2006a) adopted criteria for determining whether routes and barrens should be open or closed to OHV use, and specifically designated where OHV use is permitted within the CCMA, including 389 kilometers (242 miles) of routes and 193 hectares (478 acres) of barrens.

Prior to the temporary closure, all routes and barrens at CCMA that were not designated as open or limited use were closed to OHV use pursuant to the 2006 Record of Decision.

The Bureau implemented route closures by placing signs at designated open or limited-access routes; closed routes were signed on a priority basis if compliance problems occurred. Closed routes providing access to *Camissonia benitensis* habitat were signed, fenced, and barricaded by the Bureau. In addition, the Bureau enlarged *Camissonia benitensis* exclosures to encompass the boundaries of the suitable habitat polygon. These amendments to the CCMA Resource Management Plan were designed to contribute to the reduction of threats from OHV use and erosion. Since the CCMA is currently under a temporary emergency closure, OHV improvement projects pursuant to the 2006 Record of Decision have been suspended until completion of a new CCMA Resource Management Plan reveals whether the CCMA will be reopened to the public (Bureau 2009).

As a result of efforts by the Bureau to sign closed routes and barrens and to enforce the restrictions identified in the 2006 Record of Decision, incidents of non-compliance by OHV recreationists (e.g., cut or compromised exclosure fences, vehicle tracks in closed areas, etc.) have declined in potential and occupied *Camissonia benitensis* habitat at the CCMA. Monitoring actions performed by the Bureau are outlined in Table 4.

Table 4. OHV compliance monitoring schedule

Occurrence/Suboccurrence Priority Level for <i>Camissonia benitensis</i>	OHV Compliance Monitoring by Bureau
High	<ul style="list-style-type: none"> • 2 visits per month during use season • Monthly visits during rest of the year
Medium	<ul style="list-style-type: none"> • 1 visit per month, year-round
Low	<ul style="list-style-type: none"> • 1 visit every 2 months, year-round

While OHV user compliance has improved with respect to minimizing impacts to *Camissonia benitensis* at the CCMA, the California Native Plant Society expressed concerns to the Bureau and the Service that compliance monitoring methods and reporting should be refined and standardized to ensure that incidents of non-compliance are documented and reported with a high degree of accuracy.

Based on the increase in OHV user compliance with respect to closed *Camissonia benitensis* habitat areas, and the Bureau's protection of occupied and potential *Camissonia benitensis* habitat at the CCMA, we consider that this criterion has been partially, though not fully, met. The temporary closure of the CCMA greatly reduces OHV disturbance; however, the status of the closure is yet to be determined, and some OHV non-compliance still occurs. To accurately determine that this criterion is met in

the future, this recovery criterion should be refined as appropriate based on research findings.

Recovery Criterion 3: Currently occupied and suitable habitat for the species has been restored and maintained over an appropriate period of time, as informed by monitoring and research. Given current knowledge, we expect that the “appropriate period of time” will be no less than 20 years.

This recovery criterion addresses Listing Factors A and E. As discussed in Recovery Criterion 2 above, the Bureau has taken considerable strides toward protection of *Camissonia benitensis* habitat from the direct and indirect impacts of OHV use. In an effort to minimize erosion and sedimentation of *Camissonia benitensis* habitat, the Bureau has re-contoured approximately 18 miles of roads and trails since issuing the 2006 Record of Decision in January 2006 (Bureau 2007). In addition, the Bureau began restoring (re-contouring and revegetating) barrens and trails in summer of 2007 and has collaborated with the University of California, Davis, conducting revegetation trials within the San Benito Mountain Research Area, as mentioned in the species-specific research section of this review. The Bureau will also be restoring habitat where a residence was inadvertently constructed within a *Camissonia benitensis* suboccurrence (19110). The time frame for rehabilitation of this site is currently unknown (O’Dell, pers. comm. 2009a).

The long-term persistence and vigor of *Camissonia benitensis* occurrences depends primarily on the conservation and availability of suitable habitat; however, the Bureau has not yet developed a program to track the creation or loss (due to natural or anthropogenic causes) of *Camissonia benitensis* habitat over time for comparative purposes. As a result, we consider that this criterion has not been met. To accurately determine that this criterion is met in the future, this recovery criterion should be refined as appropriate based on research findings.

Recovery Criterion 4: Population sizes have been maintained over a monitoring period that includes multiple rainfall cycles (successive periods of drought and wet years). The trend in overall population size during non-drought years (greater than 15 inches precipitation from October through April at the Priest Valley station) should be stable or increasing.

This recovery criterion addresses Listing Factors A and E. Table 8 of the recovery plan (Service 2006) identifies target numbers of *Camissonia benitensis* individuals (per watershed or geographic unit) that should be maintained under favorable environmental conditions to meet this recovery criterion. According to recent population count data, only one of these populations has maintained individuals above target numbers since 2006 (O’Dell, pers. comm. 2009b). Annual germination rates of *Camissonia benitensis* are dependent upon a number of factors, yet these factors are still not completely understood.

Annual rainfall has been considered one of the most important factors for annual germination rates; however, when taking into account 15 core sites for which there are

continuous population data since 1989, no correlation of population increase or decline with local precipitation over time is shown. The population trend for these core sites show a slight increase over time (O'Dell, pers. comm. 2009b) (Figure 3).

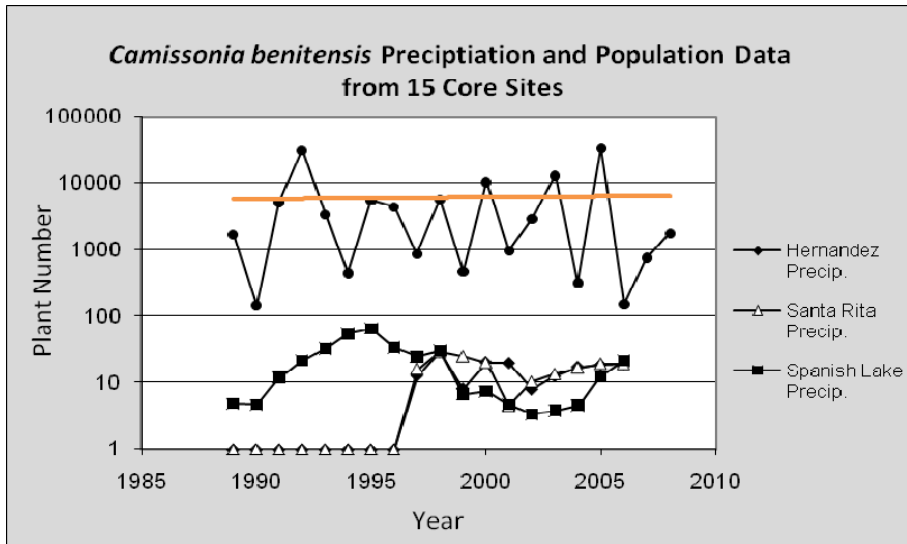


Figure 3. Population and precipitation data from 15 core sites

Camissonia benitensis exhibits a repetitive “boom-bust” population cycle occurring every 2 to 3 years, and appears to be independent of local climate conditions. A prolonged (greater than 3 years) “bust” should be considered a disruption in the natural boom-bust cycle and an indication that the species as a whole is declining (O’Dell, pers. comm. 2009b).

The variation in above-ground expression of *Camissonia benitensis* between years of disparate climatic conditions was dramatically illustrated over the 2-year period from 2004 through 2005. Over this period, the total number of *Camissonia benitensis* individuals observed during annual population counts was 607 in 2004 and 41,543 in 2005. Recorded population numbers reached an all-time high in 1988, when 165,168 individuals were recorded. Since the first recorded population counts of *Camissonia benitensis* took place in 1979, the number of known occurrences of the species has increased as well. Despite the increased number of known occurrences, the size of total population counts has been extremely variable during years with favorable growing conditions for the species. Total counts of *Camissonia benitensis* individuals during such favorable climatic years (i.e., greater than 15 inches precipitation from October through April at the Priest Valley station) are shown in Figure 4.

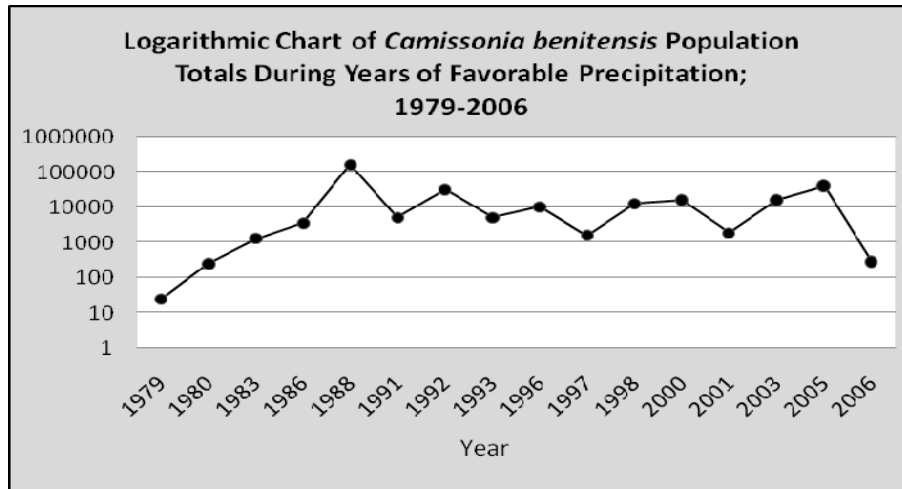


Figure 4. Population totals during years of favorable precipitation

The significance of the apparent increase in observed population numbers between 1979 and the late 1980's, as well as the two apparent “peaks” in population numbers in 1988 and 2005, is tempered by the fact that the known number of *Camissonia benitensis* occurrences increased considerably over this period, from 8 occurrences in 1979 to 27 occurrences from 2005 through the present. Trends appear to be showing a slight increase in population numbers, though these refer only to above ground plants and do not consider viable seeds in the soil. Additionally, the factors causing fluctuations in documented numbers of *Camissonia benitensis* individuals are still not completely understood. Based on these reasons, we consider that this criterion has not been met. Although it is difficult to accurately detect population trends from counting individuals of annual plant species, we believe that as our understanding of the factors affecting *Camissonia benitensis* occurrences are refined, this will be a useful tool for comparison. Therefore, this recovery criterion should be refined as appropriate based on research findings.

IV. SYNTHESIS

As discussed previously, several studies have estimated the viable population size of plant species (Shaffer 1987, Menges 1991). Annual species may require larger populations (at least 100,000 to 1 million in climatically favorable years) to survive natural perturbation events (Thomas 1990). To date, 13 *Camissonia benitensis* populations have consisted of more than 1,000 individuals in any single year, and in many years no populations reached this number (O'Dell, pers. comm. 2009b). Although information is lacking to determine whether these population patterns are cause for immediate concern, it appears that annual population counts of *Camissonia benitensis* are erratic and influenced by a variety of environmental and anthropogenic factors (e.g., amount and timing of precipitation, temperature, vegetation community succession, disturbance, etc.).

In addition, there are currently less than 427 acres of suitable habitat for *Camissonia benitensis* known throughout its range (Bureau 2005a, 2005b). In any given year, the Bureau estimates that 10 to 15 percent (approximately 50 acres) of this suitable habitat is occupied by the species.

When suitable habitat is available and environmental conditions are conducive for germination, certain *Camissonia benitensis* sites can be productive; however, other sites may not manifest any germination that year (Bureau 2004). Because the long-term persistence of *Camissonia benitensis* depends on the existence of intact suitable habitat, we believe it is appropriate to base recovery criteria on factors relating to the abundance and quality of habitat, and the level of human threats to that habitat, particularly threats arising from recreational activities and other anthropogenic causes (Service 2006).

Therefore, the recovery strategy identifies the short-term objective for the recovery of this species as eliminating or reducing current threats so that the species can retain threatened status and we do not have to consider proposing to list the species as endangered (Service 2006). The long-term objective is to delist the species; however, we cannot refine the recovery criteria until we have a better understanding of the natural rate of habitat replacement (erosion and creation). Therefore, the recovery strategy recommends: (1) conducting research on the dynamics of erosion and creation of suitable habitat, seed bank ecology, population modeling, and genetic diversity between occurrences; (2) developing a seed collection for potential reintroduction efforts and insurance against extinction; and (3) exploring public outreach opportunities (Service 2006).

Camissonia benitensis remains vulnerable to ongoing regulated and unregulated threats (e.g., mechanized recreation, erosion, invasive species, and vegetation community succession) in the limited area where the taxon occurs. Most of the threats that were known at the time of the species' listing are still considered threats, and research that would enable refinement of the delisting criteria in the recovery plan has either yet to be initiated or is still in progress. Protections in place for the species have improved considerably due to the Bureau's adoption and implementation of the 2006 Record of Decision (Bureau 2006a); specifically, the Bureau has closed routes and barrens, and incidents of non-compliance by OHV recreationists at the CCMA have declined. The closure of the CCMA also temporarily reduces OHV and recreational disturbance to the species. Therefore, the species is not currently in danger of extinction throughout all or a significant portion of its range. However, for the reasons outlined above, we conclude that *Camissonia benitensis* remains likely to become an endangered species within the foreseeable future. As a result, the threatened designation under the Act is appropriate for this species.

V. RESULTS

Recommended Listing Action:

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
 - Extinction*
 - Recovery*
 - Original data for classification in error*
- No Change

New Recovery Priority Number and Brief Rationale: No change to the recovery priority number is recommended at this time

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. The Service, the Bureau, and the County of San Benito (County) should coordinate to reroute Clear Creek Road out of Clear Creek Canyon. Even if the Bureau's efforts to reduce the adverse effects of authorized OHV use and eliminate unauthorized OHV use are fully successful, the presence of staging areas and Clear Creek Road will likely result in sediment movement into Clear Creek that would exceed natural levels.
2. The Service should work with the Bureau to develop and implement an active program to determine the type of vegetation management that would promote the conservation of *Camissonia benitensis*. These measures could include reducing the amount of non-native weeds at various times of the year through mechanical or other means.
3. The Service should work with the Bureau to develop and implement methods to monitor the abundance and other characteristics of the seed bank of *Camissonia benitensis* occurrences at the CCMA. Information from seed bank studies could be used along with information on the life history of this species and the requirements for suitable habitat to develop population models. Population modeling could allow us to compare the risk of extinction under natural rates of habitat replacement (terrace erosion and formation) with the risk of extinction under a range of rates of soil loss resulting from different scenarios of habitat management. This information would assist us and the Bureau in making and adjusting management decisions that will promote the long-term conservation of *Camissonia benitensis*.
4. The Service, the Bureau, and the County should coordinate to develop and implement a program for applying dust suppressant to heavily-used routes which are under County jurisdiction. Under some conditions, encroachment by woody vegetation onto terraces that are otherwise suitable for *Camissonia benitensis* may reduce its ability to persist or preclude its establishment. If dust can be effectively suppressed, thereby reducing the hazards of asbestos contamination to firefighters, the Bureau may be more able to use prescribed fire as a management tool to maintain terraces in a condition that could potentially support *Camissonia benitensis*.

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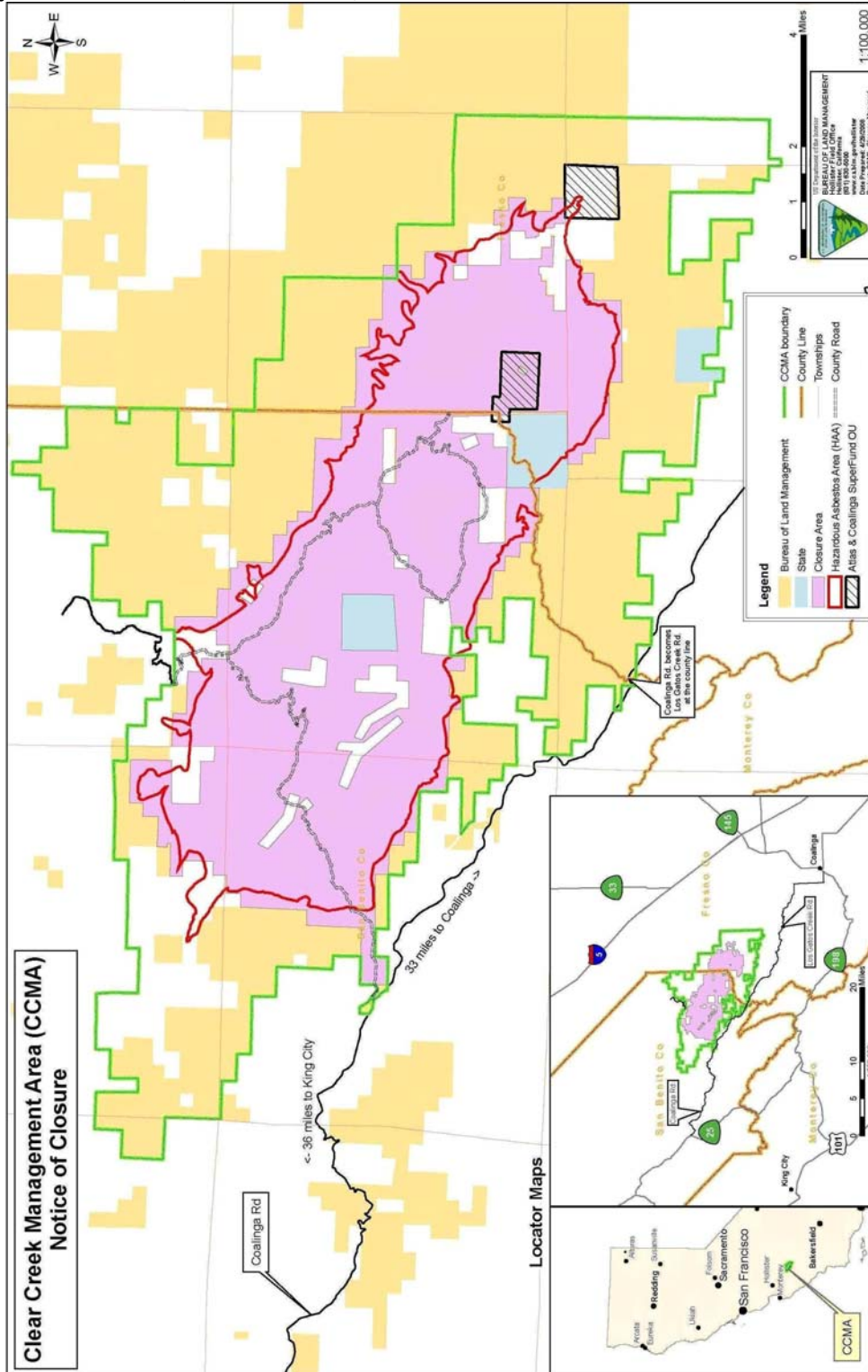
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VIII. APPENDICES

APPENDIX A. Map of *Camissonia benitensis* in the Clear Creek Management Area and temporary closure area (Bureau 2008c).



APPENDIX B. Impacts associated with activities in the CCMA (Service 2006)

Activity	Estimated Actual Extent of Activity within CCMA	Authorized Use Prior to 2006	Authorized Use in 2006 Record of Decision on Amendment	Type of Impacts	Intensity / Duration
Camping	Throughout CCMA except in San Benito Mountain Natural Area and certain terraces in Clear Creek Canyon	authorized	not changed in Amendment	compaction of alluvial terrace soils, loss of habitat due to deposition of human wastes and trash	low/ winter season
OHV riding - main trails	Estimate 700 – 1,000 miles of open and unauthorized trails	440 miles of designated open routes	242 miles of designated open routes	increased soil erosion	high/ winter season; moderate/ year round
OHV riding - roads	Paved/improved roads throughout	29 miles paved/improved roads, included in total above	29 miles paved/improved roads, included in total above	minor contribution to soil erosion	low-moderate/ year round
OHV riding - open areas on “barrens”	Estimated 2,876 acres, out of 3,841 acres of barrens on BLM land (BLM 1993)	2,311 acres of designated open play areas on BLM land	478 acres of designated open play areas on BLM land	mortality of plants, increase in soil erosion, increase in deposition on terraces, soil compaction, removal of soil crust in serpentine areas	low to high/ winter season
OHV riding - special events	200-400 visitors per event 3 events per year	Special use authorizations	not changed in Amendment	mortality of plants, increase in erosion, increase in deposition on terraces, soil compaction	low to high/ short term
4WD - special events	50 visitors per event 1 event per year	Special use authorizations	not changed in Amendment	minor contribution to soil erosion, soil compaction	low/ short duration
Rock and gem collecting	5 percent of visitors per year	authorized	not changed in Amendment	possible mortality of plants, minor contribution to soil erosion	low/ continuous
Nature hiking	<5 percent of visitors per year	authorized	not changed in Amendment	possible mortality of plants, minor contribution to soil erosion, soil compaction	low/ continuous
Hunting	5 percent of visitors per year	authorized	not changed in Amendment	possible mortality of plants, minor contribution to soil erosion, soil compaction	low/ seasonal (August)
Grazing	5-10 trespass cattle / year	no	not changed in Amendment	trampling of habitat, minor contribution to soil erosion, soil compaction	low/ seasonal

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

Camissonia benitensis (San Benito evening-primrose)

Current Classification:

Recommendation Resulting from the 5-Year Review:

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

Review Conducted By: Roger Root and Lena Chang

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve Diane K. Vade Date 8/17/09