Noccaea fendleri ssp. *californica*
(Kneeland Prairie penny-cress)
5-Year Review:
Summary and Evaluation

Noccaea fendleri ssp. *californica*: Kneeland Prairie, California
Photograph utilized courtesy David Imper, Arcata FWO

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

September 2011

5-YEAR REVIEW
Noccaea fendleri ssp. *californica*
(Kneeland Prairie penny-cress)

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 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 Endangered Species 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 Endangered Species Act that includes public review and comment.

Species Overview:

Noccaea fendleri ssp. *californica (*Kneeland Prairie penny-cress) is an attractive perennial herbaceous member of the Brassicaceae (mustard family). This plant is characterized by white flowers and hairless leaves largely grouped in a basal rosette. Although the plant generally grows less than 6 inches tall, the white flowers are striking in March and April against the barren, serpentine rock slopes on which it occurs. The species is distinguished from its closest relative, *N. f.* ssp. *montanum*, by the orientation of the flower stalks, shape and notching of the fruit, and the length to width ratio of the fruit. *Noccaea f.* ssp. *californica* occurs in soils derived from ultramafic parent material, containing high levels of heavy metals and low levels of nutrients. This species was listed as endangered under the name *Thlaspi californicum.* In 2004, the scientific name was changed to reflect new genetic evidence. The species is currently known from one locality, in central Humboldt County, California (Figure 1). With the exception of a few plants on property owned by the State of California, the entire distribution occurs on private property.

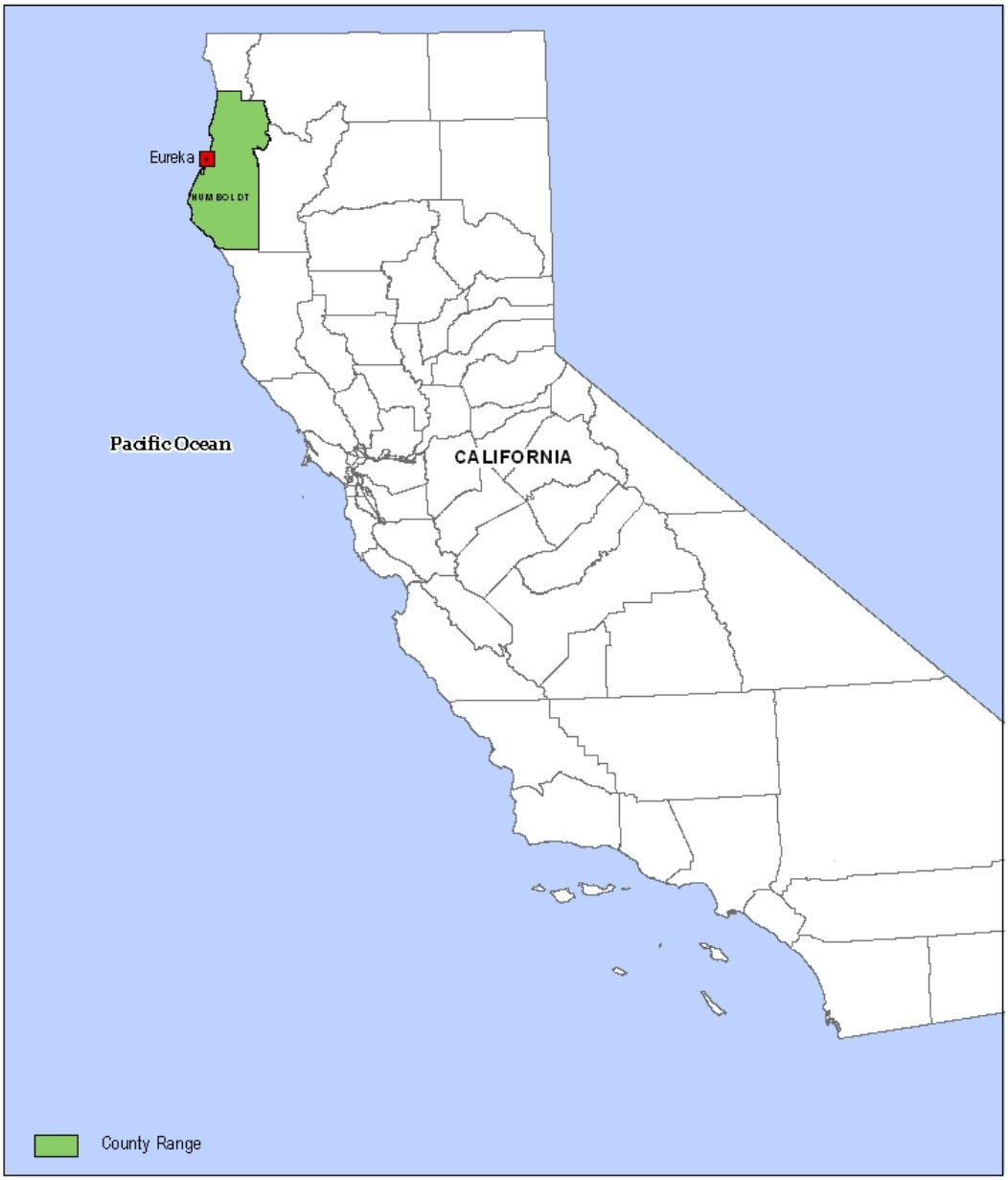
U.S. Fish & Wildlife Service

Arcata Fish and Wildlife Office

Humboldt County, California

Figure 1. ***Noccaea fendleri ssp. californica*** (Kneeland Prairie penny-cress) Range Map

Prepared for the 2011 5-Year Status Review



0 55 110 220 Miles

0 87.5 175 350 Kilometers

Produced in the Arcata Fish and Wildlife Office
Arcata, California
Map Date: 08/30/2011
File: KneelandPennycress_2011rangeMap.mxd

UTM ZONE 10
NAD 83

Methodology used to complete the review:

This review was conducted by the Arcata Fish and Wildlife Office (AFWO) following the Region 8 guidance issued in March 2008. We used information from the *Thlaspi californicum* recovery plan (Service 2003) and contained in our files, relevant information provided by other agencies, and the California Natural Diversity Database (CNDDB 2011) maintained by the California Department of Fish and Game (CDFG). The recovery plan, data in our files, and unpublished monitoring and research reports were our primary sources of information used to update the species' status and threats. 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 Endangered Species 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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Lead Field Office: David Imper, Arcata Fish and Wildlife Office (707)822-7201.

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 (76 Federal Register 101). No comments were received in response to the notice.

Listing history:

Species (Service 2000)
FR Notice: Federal Register 65(27):6332-6338
Date of Final Listing Rule: February 9, 2000
Entity Listed: Species - Kneeland Prairie penny-cress
Classification: Endangered

Critical Habitat (Service 2002)
FR Notice: Federal Register 67(196):62897-62910
Date of Final Listing Rule: October 9, 2002

Associated Rulemakings: None

Review History: The initial 5-year status review was approved June 20, 2006.

Species' Recovery Priority Number at Start of 5-Year Review:
The recovery priority number for *Noccaea fendleri ssp. californica* is 3C according to the Service's 2011 Recovery Data Call for the AFWO, 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 subspecies, which faces a high degree of threat, and has a high potential for recovery. The "C" indicates conflict construction or other development projects, or other forms of economic activity.

Recovery Plan or Outline:

> **Name of Plan or Outline:** Recovery Plan for Kneeland Prairie penny-cress (*Thlaspi californicum)*
> **Date Issued:** July 7, 2003

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 Endangered Species 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:

Life History
Noccaea fendleri ssp. *californica* is a perennial member of the mustard family (Brassicaceae) (Holmgren 1971; Hickman 1993). Mature *N. f.* ssp. *californica* individuals range from 2-6 inches tall, with a basal cluster of leaves. The plant normally begins blooming in March, with seed set in April or May and fruit dehiscence beginning in June. Monitoring has indicated anywhere from 60-100 percent of the individuals within the various colonies are reproductive in any year (Imper, unpublished data 2011). Seed appear to require a period of after-ripening, but do not require cold stratification (Kalt 2006). Besides germination requirements, little is known about the reproductive biology of the species.

Distribution
The known global distribution of *Noccaea fendleri* ssp. *californica* is restricted to three small patches of serpentine outcrop (total 2.8 acres) located between 200 and 500 feet from each other within Kneeland Prairie, approximately 15 miles east of the Pacific Ocean, Humboldt County, California (Figure 1). Past efforts failed to locate additional populations on suitable serpentine habitat farther south (Imper, unpublished data 2011) and on nearby Six Rivers National Forest to the east (Jennings 2001). The California Department of Fish and Game (CDFG) reported in 2005 that no new occurrences of *N. f.* ssp. *californica* have been discovered on timberlands in

general, and the two major timberland companies in the area have not identified any new, significant ultramafic substrate in the Kneeland area (B. Williams, CDFG, pers. comm. 2005). Review of the 2011 California Natural Diversity Database (CNDDB) indicated no new sites for the species since the last 5-year review (CDFG 2011). There is no evidence that the species ever extended beyond Kneeland Prairie, or even beyond the single ridge top (USFWS 2003).

Abundance

The population estimates provided below are subject to error caused by the rhizomatous growth pattern of the species, which limits the ability to distinguish one individual from another. For past sampling efforts, rosettes separated by less than about 4 inches were generally assumed to be the same individual. In the recovery plan, we identify the need for research on the rhizomatous growth pattern of the species. Clarification is needed on the degree of clonal growth with the colonies, and a standardized protocol for identifying individuals for the purpose of population estimation should be developed.

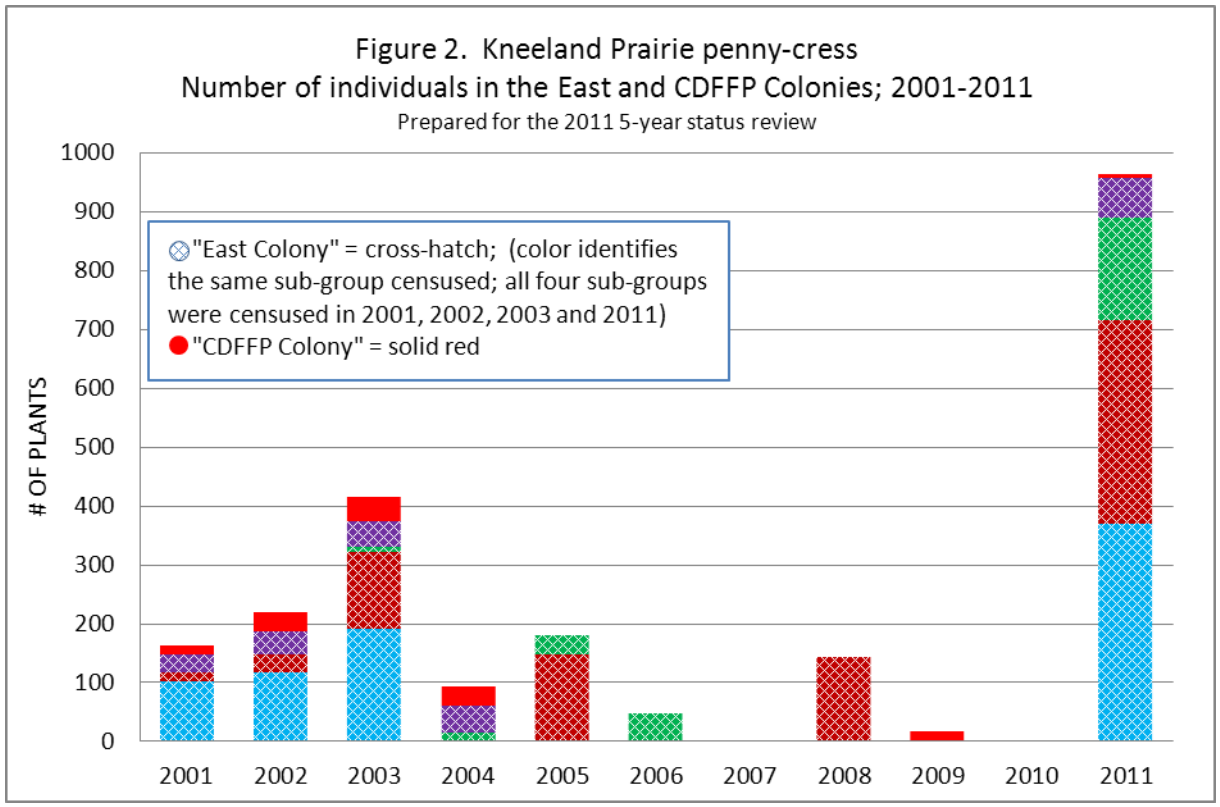
As of 2002, the largest colony (referred to as the "West colony") occupied approximately 19,000 square feet, or 0.44 acre of the 1.23-acre outcrop located on the west side of Mountain View Road. This colony contained an estimated 9,920 plants in 1997 (95 percent confidence interval [CI] = 7,980-11,860; SHN Consulting Engineers & Geologists 2001); an estimated 5,140 plants in 2001 (95 percent CI = 3,880-6,400; SHN Consulting Engineers & Geologists 2001); and an estimated 8,850 plants in 2002 (95 percent CI = 6,820-10,880; Imper, unpublished data 2011). The total in 2002 amounted to over 95 percent of the species at that time. The landowner has denied access to this colony since 2003.

A second colony (referred to as the "East colony") was discovered in 1990 approximately 500 feet east of the West colony. The East colony currently includes four semi-isolated sub-groups of plants. The number of individuals in this colony increased from 150 scattered across about 4,600 square feet of habitat in 2001 to nearly 1,000 spread over 10,700 square feet (0.25 acre of the approximately 1.5-acre outcrop) in 2011 (Figure 2; Imper unpublished data 2011). That growth represents a 700 percent increase in number of plants and 130 percent increase in occupied habitat. The boundary expansion rate for three of the four sub-groups in the East colony was roughly 5 feet per year for the 10-year period, primarily in a north-northeasterly direction from the initially established plants, regardless of whether it was uphill or not. The predominant wind direction in late spring and summer is northwest to northeast, when seed dispersal occurs. These results suggest future efforts to augment or introduce new colonies could be designed to effectively use natural dispersal patterns.

A third colony (referred to as the "CDFFP colony") was discovered across Mountain View Road on California Department of Forestry and Fire Protection (CDFFP) property in 1999. Sixteen plants were scattered over 600 square feet of habitat in 2001. The CDFFP colony peaked at 41 plants in 2003, but has since declined to 8 plants in 2011 (Imper unpublished data 2011).

The rapid increase in population and occupied habitat at the East colony over the past 10 years indicates that, at least in some cases, the species is capable of very high recruitment rates after a site is initially colonized. Climate data for Eureka (National Weather Service 2011) indicated the years in which the largest increase in number of plants were observed (2003, 2005, 2011;

Figure 2) coincided with above average March-April precipitation. Slower growth rates or declines recorded in 2004 and 2008 coincided with below average rainfall for the same period. In contrast, population fluctuations in the CDFFP colony (Figure 2) did not seem to correlate with rainfall, suggesting other factors may be responsible for the ongoing decline there. The monitoring record for this species is too short to allow for more than preliminary assessment of trends and relationships between population fluctuations and climate conditions.



Habitat or Ecosystem

The entire distribution of *Noccaea fendleri* ssp. *californica* occurs between 2,700 and 2,800 feet elevation. It is restricted to shallow, rocky, serpentine soils, generally rich in magnesium, iron, and silicates, and poor in calcium, nitrogen, potassium, and phosphorus (Kruckeberg 1984). An investigation of serpentine soils along the ridge occupied by *N. f.* ssp. *californica* found little difference between occupied and unoccupied soils in the immediate vicinity (SHN Consulting Engineers and Geologists 2001). A total of about 5 acres of serpentine soils occur within Kneeland Prairie, scattered among 18 semi-isolated outcrops ranging in size from 0.04 to 1.45 acres in size. Soils sampled within habitat occupied by *N. f.* ssp. *californica* consistently contained higher levels of NO_3-N (1.1 to 1.4 parts per million), and there was a strong relationship between occurrence of the species and cooler soil temperatures during the growing season. In general, *N. f.* ssp. *californica* appeared to grow best in soils intermediate in fertility, and free of exotic plants compared to the surrounding prairie. Possible factors include: 1) lower calcium/magnesium ratio; 2) a slightly higher pH; and 3) generally lower levels of

macronutrients and less competitive stress. The results also indicated high arsenic levels may be a factor limiting exotic species.

Vegetation on these outcrops is entirely herbaceous, in contrast to serpentine outcrops only a few miles farther south and east, that often exhibit a developed shrub layer. Climate in Kneeland Prairie is maritime-influenced, with frequent summer fog. Average annual precipitation recorded approximately 5 miles south of the prairie was 59 inches for the period 1939 to 1969 (California Department of Water Resources 1975). *Noccaea fendleri* ssp. *californica* occurs on most aspects, on slopes ranging from 0 to 70 percent.

Changes in Taxonomic Classification or Nomenclature

Since the last 5-year status review, most North American representatives of genus *Thlaspi* were reassigned to the genus *Noccaea*, based both on genetic affinity to Eurasian representatives of that genus, and differences from the European representatives of genus *Thlaspi* (Koch and Al-Shehbaz 2004). *Thlaspi californicum* was formerly classified a subspecies of *T. montanum*, a relatively widespread taxon in the western U.S. that is now recognized as *N. fendleri*. *Thlaspi californicum* was returned to subspecific status within that group, and is recognized as *N. f.* ssp. *californica*. The forthcoming 2nd edition of the Jepson Manual for California will recognize that nomenclature (University of California Jepson Herbarium 2011).

Species-specific Research and/or Grant-supported Activities

A partial list of activities focused on *Noccaea fendleri* ssp. *californica* since the species was listed, along with funding source, includes:

Inventory:

- Jennings, G., 2001: Focused surveys for the species on Six Rivers National Forest; funded by Arcata Fish and Wildlife Office, Arcata, California.

Research:

- Imper, D.K., 1990: Botanical inspection of Kneeland CDFFP Helitack Base, and historical review of Kneeland Prairie penny-cress; funded by Humboldt County Department of Public Works, Eureka, California.
- Kalt, J., 2006: Seed germination trials; funded by Arcata Fish and Wildlife Office, Arcata, California.
- SHN Consulting Engineers & Geologists, 1997: Biological surveys and assessment of the Kneeland pennycress habitat, Kneeland Airport, and surveys of potential serpentine habitat elsewhere; funded by Humboldt County Department of Public Works, Eureka, California.
- SHN Consulting Engineers & Geologists, 2001: Population and environmental monitoring and soils characterization for Kneeland Prairie penny-cress habitat; funded by Arcata Fish and Wildlife Office, Arcata, California.

Five Factor Analysis:

The following analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Endangered Species Act.

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

There has been no significant change in the imminence of this threat factor. As noted in the final rule listing the species as endangered, the habitat occupied by *Noccaea fendleri* ssp. *californica* was reduced by 50 percent or more since the mid-1960's, through relocation of a county road, and construction of an airport and helitack port (USFWS 2002). Its distribution continues to be threatened with habitat destruction as a result of potential improvements to the airport.

The Kneeland Airport serves as the primary backup airport when weather conditions preclude landing at other Eureka area airports (Humboldt County 2005). The final listing rule discussed proposed upgrades and slope stabilization efforts related to the Kneeland Airport, and possible realignment of Mountain View Road to accommodate the airport upgrade. Those improvements are yet to be initiated. Since the last 5-year review, Humboldt County completed an update to the airport master plan, which summarized past and future expected use, and reviewed design, safety, environmental and other issues related to operating the airport (Humboldt County 2005). The Master Plan predicts use of the airport to increase perhaps 15 percent by the year 2021, over 2001 levels. Three primary constraints were identified for expansion of the airport to meet future growth demand: *Noccaea fendleri* ssp. *californica*; the steep topography; and the helitack base.

Expanding runway length and width, runway safety areas and aircraft parking, and creating obstacle free zones were all judged to either have significant impacts on *N. f.* ssp. *californica*, the critical habitat designated for the species, or be excessively expensive. As a result, the Master Plan recommends: maintenance and stabilization of the existing runway configuration, continuation of existing nonstandard setbacks, such as obstacle free zones; and foregoing expansion of some facilities, such as aircraft parking. Under these recommendations, realignment of Mountain View Road would not be necessary.

However, Humboldt County has recently sought funding to implement a Phase 1 Runway Safety Area Improvement Study, which would reassess options for bringing the airport into compliance with FAA standards (H. Seeman, Humboldt County Environmental Services Manager, pers. comm. 2011). Subsequent phases of work would include environmental assessment, design, and implementation. No schedule for implementation of the work phases was available.

The Service to date has not received any specific design proposals, nor issued a formal opinion regarding the impacts of any specific proposal on *N. f.* ssp. *californica* and its designated critical habitat.

Noccaea fendleri ssp. *californica* habitat is also vulnerable to destruction as a result of its unobstructed, close proximity to the county road. Observations made from the county road

overlooking the West colony in May 2011, indicated a substantial amount of large rock had been removed and displaced within the upper portion of the habitat (Imper unpublished data 2011). Large rocks are a key feature of the habitat for *N. f.* ssp. *californica*, undoubtedly influencing moisture and temperature regimes at the scale of the plant, and perhaps other factors important to the species. Due to an inability to access the property, the impact of the rock removal could not be quantified. In addition, the landowner has not indicated an interest in discussing habitat protection measures for the species. Therefore, the species remains vulnerable to habitat destruction and modification.

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

Overutilization has not been, and currently is not known to be a threat for this plant.

FACTOR C: Disease or Predation

No current threats to *Noccaea fendleri* ssp. *californica* from disease are known at this time. With the exception of the CDFFP colony, the entire distribution of *N. f.* ssp. *californica* is open to livestock grazing. At the time of listing there was no evidence that grazing was impacting the population. However, monitoring data collected intermittently since 2001 throughout the occupied habitat suggest that even the current low intensity cattle grazing, or perhaps wildlife herbivory, may be depressing the reproductive output of the population through ingestion of inflorescences prior to seed dispersal, and perhaps through foliar ingestion.

Population monitoring conducted since 2005 has indicated, as high as 40 percent of the flowering plants in some areas were negatively affected by grazing. Plants located closer to cattle trails, the serpentine/pasture interface, or on moderate slopes were more likely to be grazed (Imper unpublished data 2011). Although these impacts may be important, we do not know at this time if the impacts of grazing are affecting the rate of population mortality or recruitment, or limiting recovery of the population in any way.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

There has been no change in the imminence of this threat factor. *Noccaea fendleri* ssp. *californica* is not listed by the State of California. Therefore, protections under the California Endangered Species Act and Native Plant Protection Act do not apply. The California Environmental Quality Act (CEQA) (chapter 2, section 21050 *et seq.* of the California Public Resources Code) affords the primary protection for the species under state law. 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 deciding 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. With the exception of eight plants located on the CDFFP site in 2011, the entire distribution of *Noccaea fendleri* ssp. *californica* is currently located on privately owned grazing land. CEQA does not regulate grazing or many other activities on private land that could negatively affect the species.

The primary protections under Federal law are afforded by the Endangered Species Act of 1973 (Act), as amended. Since all habitat occupied by *Noccaea fendleri* ssp. *californica* is either private or State-owned, the prohibitions on take afforded under Section 9 of the Act do not apply to otherwise legal activities. However, under Section 7(a)(2) of the Act, Federal agencies must consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. This section would apply to any project funded by the Federal Aviation Administration (FAA) that potentially could affect the species, or its occupied habitat. In addition, the airport occurs within the designated critical habitat for the species. Any airport project funded by the FAA that affects any portion of designated critical habitat is covered under Section 7 of the Act.

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

With the exception of global climate change, which may constitute a new threat for the species, there has been no significant change in the imminence of this threat factor. Although habitat occupied by *Noccaea fendleri* ssp. *californica* appears to have expanded since the last 5-year review, it continues to occupy less than 0.7 acre of over 5 acres of serpentine habitat within Kneeland Prairie. As discussed in the final listing rule, because it is highly restricted, *N. f.* ssp. *californica* is vulnerable to destruction of all or a significant portion of its range as a result of random events, such as contaminant, herbicide, or pesticide spills emanating from the airport, helitack base, and Mountain View Road; soil erosion; drought; fire and fire protection efforts; and exotic species encroachment (Shaffer 1981 and 1987; Primack 1993; Meffe and Carroll 1994).

Habitat for *Noccaea fendleri* ssp. *californica* has become progressively fragmented since construction of the original Mountain View Road, the helitack base, and the airport. As a result, what probably was one large population spread across Ashfield Ridge is now fragmented into three relatively small and disjunct colonies, which probably function independently. In general, smaller serpentine outcrops support a higher number of alien species (Harrison 1999). Smaller outcrops may also be more vulnerable to recreational impacts, trampling, and modification of the unique serpentine soil chemistry as a result of enrichment from cattle grazing or the surrounding meadow system (SHN Consulting Engineers & Geologists 2001). Increased cattle grazing could increase impacts from erosion and soil compaction. In general, habitat fragmentation increases external threats by bringing sources of disturbance closer to plants, and increasing the amount of habitat near edges. Conserving several small, disjunct habitat fragments presents greater biological and operational difficulties than a single large habitat area (Erlich and Murphy 1987).

Climate Change

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. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. The available data suggests *Noccaea fendleri* ssp. *californica* may prefer relatively cool soil temperatures during the growing season, at least

compared to conditions typical of the outcrops located near the airport (SHN Consulting Engineers and Geologists 2001). Therefore, if a warming trend is associated with climate change, the limited range in elevation and aspect available to *N. f.* ssp. *californica* nearby could hinder the ability of the species to escape detrimental changes in climate.

III. RECOVERY CRITERIA

The recovery plan for *Noccaea fendleri* ssp. *californica* was approved July 7, 2003. 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 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.

Reclassification to threatened status will be evaluated when:

Downlisting Criterion 1 (Addresses Listing Factors A, C, D and E)
The population as a whole, and all presently extant colonies, are protected and stable. Protected sites are defined as either 1) sites owned and/or managed by a government agency or private conservation organization that identifies maintenance of the species as the primary management objective for the site, or 2) sites protected by a permanent conservation easement or covenant that commits present and future landowners to the conservation of the species. To be deemed stable, the present largest population must maintain a running average population size (mean of annual mean population estimates) of at least 7,000 individuals, and the two other presently extant colonies must maintain a running average population size of at least 500 individuals each. Running averages will be determined over the most recent 10 years, or an appropriate period justified on the basis of population research.

There has been no change in the protection status of the three colonies since the recovery plan was completed. Both the West colony (over 95 percent of the species in 2002) and the East colony remain unprotected on private property. Because access has been denied to the West colony since 2003, monitoring was last conducted in 2002. The third colony is located on CDFFP property. Following listing of the species, the CDFFP prepared a draft policy in 2001

that outlined various measures to protect *Noccaea fendleri* ssp. *californica* on its property (CDFFP 2001). Although the policy has generally been implemented, it is yet to be finalized. The number of individuals in the East colony has increased since the last 5-year review, and as of 2011 exceeded 500 total plants (see Section C below); the CDFFP colony has declined somewhat. This criterion has not been achieved.

Downlisting Criterion 2 (In part, addresses Listing Factors A, C and E):
Reliable seed germination and propagation techniques for the species are understood and demonstrated.

An investigation of the germination requirements of this species was completed by Kalt (2006). Seed treatments included storage at room temperature and cold stratification. Both treatments achieved 75 percent or greater germination rate. However, high mortality occurred relatively soon after germination, indicating further research is needed on ways to increase early survival rates. This criterion has only been partially achieved.

Downlisting Criterion 3 (In part, addresses Listing Factors A, C, and E):
Genetic material, in the form of seeds adequately representing the genetic diversity within the species, is stored in a facility approved by the Center for Plant Conservation.

Due to the inability to access the primary population, and therefore collect samples representing the genetic diversity within the species, no progress has been made on this criterion.

The species may be considered for delisting when, in addition to the criteria for downlisting, all of the following conditions have been met:

Delisting Criterion 1 (In part, addresses Listing Factors A, C and E):
The running average for the entire population is 10,000 or more individuals over a period of 10 years, or an appropriate period justified on the basis of population research.

Access has been denied to the largest colony (West colony) since 2003. Therefore, we cannot assess any progress made toward achievement of this criterion.

Delisting Criterion 2 (In part, addresses Listing Factors A, C, D and E)
At least five protected and stable colonies (populations on distinct serpentine outcrops) are distributed throughout the current and historic range of the species. For a site to be considered protected, it must be either owned by a government agency or private conservation organization that identifies maintenance of the species as the primary management objective for the site, or the site must be protected by a permanent conservation easement or covenant that commits present and future landowners to the conservation of the species. To be deemed stable, the largest presently extant colony must maintain a running average population size of at least 7,000 individuals, and colonies on 4 additional outcrops must be shown to be naturally reproducing and maintain a running average population size of at least 500 individuals each for a period of 10 years, or an appropriate period justified on the basis of population research.

There has been no change in the protection status of the three extant colonies, or nearby suitable habitat since the recovery plan was completed. The two largest colonies (West and East colonies) are not protected. The CDFFP colony is covered under a draft protective policy implemented by the CDFFP.

Access has been denied to monitor the West colony since 2003. Therefore, the information necessary to assess the stability of that colony is not being collected. Two other historical (and extant) occurrences are known, both of which have naturally reproduced since completion of the recovery plan. However, only the East colony exceeds the numerical threshold set in this criterion as of 2011 (see Section C below). The CDFFP colony has declined, and is on the verge of extirpation. As a result, this criterion has not been achieved.

Delisting Criterion 3 (In part, addresses Listing Factors A, C and E):
Monitoring of population size, trends, other pertinent characteristics, and habitat quality has begun and will continue for the post-delisting monitoring period.

Population-based monitoring of the two smaller colonies has been conducted since 2001. However, the large West colony has not been monitored since 2002 because due to an inability to access the property. This criterion has been partially achieved.

Currently, all downlisting and delisting criteria are considered adequate and appropriate with respect to recovery of the species. The conservation strategy outlined by these criteria addresses all the currently known threats to the species. Components of the conservation strategy and criteria include habitat protection and management secured by appropriate agreements (such as conservation easements, covenants) to address listing factors A (habitat loss or modification, etc.); C (possible threat of predation); D (inadequate regulatory mechanisms); and E (other natural or manmade factors – specifically manmade random events, such as contaminant spills associated with the airport, that can be prevented or contained by appropriate management). Population sizes and number of protected populations included in the criteria in part address the threat of stochastic events under listing factor E. Seed banking also addresses the threat of stochastic events under listing factor E by ensuring that genetic material is available to reestablish any populations that become extirpated due to stochastic events.

IV. SYNTHESIS

We have no new information to suggest that threats to *Noccaea fendleri* ssp. *californica* have substantially changed since the time of listing. The primary threats continue to be potential destruction and modification of habitat and the threat from catastrophic events. The update to the Airport Master Plan, and its recommendations to forego expansion of the facilities has for the time being reduced the immediate threat from airport expansion and stabilization efforts. However, none of the species' habitat has been protected since the last 5-year review, and currently none of the three extant colonies occur on lands managed strictly for the protection of *N. f.* ssp. *californica*. The only colony in any way protected is on CDFFP property (eight plants in 2011) which is covered under a draft protection policy for the agency. No progress has been made with respect to establishment of new colonies to reduce the threat of random catastrophic events.

Research and population monitoring indicate a high germination rate under controlled conditions, and a high rate of natural recruitment, at least in some parts of its habitat, are both possible. However, the CDFFP colony appeared to be expanding at the time of the last 5-year review is now on the verge of extirpation, and the status of the large West colony is unknown, due to the fact the landowner has not allowed access to conduct the monitoring since 2003. The West colony included over 95 percent of the species at the time of the 2002 survey. The primary landowner has also not been willing to explore any measures that ensure the future protection of the population and its habitat. Without access to the majority of the population, we have been unable to document any population trends sufficient to be considered representative of the species. Similarly, without access to this site, we have been unable to characterize the degree of threats posed by cattle grazing, either direct, or indirect impacts, through nutrient enrichment of its habitat. We also were not able to assess the impact of recent rock removal from its habitat at the West colony (Imper unpublished data 2011).

Climate change may be a long-term threat for the species, perhaps limiting growth of the plant on the southern aspects. Establishing as many colonies as possible on different outcrops and aspects, may be the best way to offset the effects of climate change, without resorting to establishment of the species outside of Kneeland Prairie.

In summary, due to past and threatened destruction or modification of its habitat; the possible threat of predation; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence, we conclude that *Noccaea fendleri* ssp. *californica* continues to meet the definition of endangered.

V. RESULTS

Recommended Listing Action:

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

New Recovery Priority Number and Brief Rationale: No change.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

The following recommendations are listed in order of their priority, from highest to lowest:

Virtually all habitat occupied by *Noccaea fendleri* ssp. *californica,* or suitable for the species within Kneeland Prairie occurs on private property owned by a single landowner. Therefore, recovery of the species is almost entirely dependent on being permitted to access the population,

and to implement protective measures and management on private lands. The highest priority action for this species is to continue efforts to secure a working relationship with the landowner.

Continued periodic monitoring of the portion of the population for which access is authorized is also crucial in order to: measure progress toward meeting the numerical recovery criteria; provide an early warning of threats to the population; provide further evidence of the importance of climate to the health of the population; and enable at least a gross assessment of habitat in the area for which access is not authorized.

Since the recovery criteria for *Noccaea fendleri* ssp. *californica* contain specific goals with respect to the number of individuals, research is needed to determine the degree of clonal growth within the population and develop a method to standardize identification of individuals for the purpose of population estimation.

Lastly, future efforts by Humboldt County to expand or maintain the airport may present opportunities for experimental restoration of serpentine substrate buried during past construction, or exposed where it is (naturally) situated near the ground surface. Those efforts, while not assured of success, are worth pursuing in order to expand the overall distribution of the species.

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

***Noccaea fendleri* ssp. *californica* (Kneeland Prairie penny-cress)**

Current Classification: __Endangered____

Recommendation Resulting from the 5-Year Review:

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

Review Conducted By: __David Imper, Ecologist_____

FIELD OFFICE APPROVAL:

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

Approve _____ Date 10-19-11

REGIONAL OFFICE APPROVAL:

Lead Assistant Regional Director, U.S. Fish and Wildlife Service, Region 8

Approve _____ Date _____

Cooperating Regional Director, Fish and Wildlife Service

_____Concur _____ Do Not Concur

Signature_____ Date_____