

Sidalcea keckii
(Keck's Checkermallow)

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



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

June 2012

5-YEAR REVIEW

Sidalcea keckii (Keck's checkermallow)

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:

Sidalcea keckii is an annual herb of the mallow family (Malvaceae) that can remain dormant as seeds for long periods. *S. keckii* is endemic to California and grows in relatively open areas on grassy slopes of the Sierra foothills. Botanists first collected *S. keckii* from a site near White River in Tulare County in the 1930s (Wiggins 1940; California Natural Diversity Database [CNDDDB] 2006). Historically, *S. keckii* was known from three occurrences, two from Tulare County and one from Fresno County. After having been collected in the 1930s, it was not collected or seen by botanists again for over 50 years. *S. keckii* was presumed extinct until it was rediscovered in 1992 at a site near Mine Hill in Tulare County (Mine Hill population) (Stebbins 1992). *Sidalcea keckii* is threatened by urban development, competition from non-native grasses, agricultural land conversion, and random events (Service 2000; S. Hill; pers. comm. 2002; C. Peck, *in litt.*, 2002).

Methodology Used to Complete This Review:

This review was prepared by the Sacramento Fish and Wildlife Office (SFWO), following the Region 8 guidance issued in March 2008. No final Recovery Plan has been approved for this species. We used survey information from experts who have been monitoring various localities of this species, Consortium of California Herbaria (CCH), and the CNDDDB maintained by the California Department of Fish and Game. Published peer-reviewed literature, field surveys, 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 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: Larry Rabin, Deputy Division Chief for Listing, and Environmental Contaminants, Pacific Southwest (916) 414-6464.

Lead Field Office: Josh Hull, Recovery Division Chief, Sacramento Fish and Wildlife Office; (916) 414-6600.

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 FR 30377-30382).

Listing History:

Original Listing

FR Notice: 65 FR 7757

Date of Final Listing Rule: February 16, 2000

Entity Listed: *Sidalcea keckii*, a plant species

Classification: Endangered

Review History: A 5-year review for this species was completed in December, 2007.

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

The recovery priority number for *Sidalcea keckii* is 8 according to the Service's 2010 Recovery Data Call for the Sacramento Field Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a full species with moderate threats and a high recovery potential.

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

Sidalcea keckii is an annual herb of the mallow family (Malvaceae). This plant may reach 6 to 13 inches in height, with slender, erect stems that are hairy along their entire length. Leaves toward the base of the plant have a roughly circular outline, and seven to nine shallow lobes arranged somewhat like the fingers of a hand (palmate). Leaves farther up the plant have fewer lobes which are more deeply divided. The plant flowers in April and early May, producing five petalled flowers that are either solid pink or pink with a maroon center. Petals are 1 to 2 cm (0.4 to 0.8 in) long, and are often shallowly notched at their outermost margins. Below the petals is a smaller calyx (cuplike structure) formed by five narrow green sepals (modified leaves). Each sepal is 0.3 to 0.4 inches long, and may have a maroon line running down the center. Below the calyx are bracts (modified leaf-like structures), which are much shorter than the sepals and are either undivided or divided into two threadlike lobes. *S. keckii* fruit consist of four to five wedge-shaped sections arranged in a disk. The sections measure 0.1 to 0.2 inches across, and each contains a single seed (Abrams 1951; Hill 1993; Cypher 1998). *S. keckii* exhibits several morphological features that bear a similarity to the more common *S. diploscypha*. However, *S. keckii* may be distinguished from *S. diploscypha* by their smaller undivided bracts and stipules (Hill 2009).

Seed sections mature and separate in May and most seeds are dispersed into the soil via gravity. However, other mechanisms of seed dispersal may occur but have not been identified (Cypher 1998). Conditions for germination, germination period, and seed viability in the soil seed bank are also unknown. Based on other Malvaceae species, and on recent observations of extreme yearly fluctuations in numbers of annual plants, it is likely that *Sidalcea keckii* seeds may remain viable for several years and form a persistent soil seed bank (S. Hill, pers. comm., 2002).

The primary pollinators of *Sidalcea keckii* are unknown, but two related California species of *Sidalcea* (*S. oregana* ssp. *spicata* and *S. malviflora* ssp. *malviflora*) are pollinated primarily by various species and families of solitary bees, bumble bees, and bee flies (Ashman and Stanton 1991; Graff 1999). Many bees of the solitary bee genus *Diadasia* specialize in collecting pollen solely from members of the Malvaceae family (Service 1998).

Sidalcea keckii is endemic to California and grows in relatively open areas on grassy slopes at elevations ranging from 240 to 1,950 feet. It is strongly associated with serpentine soils, which are unusually low in nutrients and high in heavy metals (Kirkpatrick 1992; Cypher 1998).

Spatial Distribution

At the time of listing, the Mine Hill *Sidalcea keckii* population existed within a 0.73 acre area. The population occurred on a privately owned 700-acre parcel of land that was used for livestock

grazing. The occurrence of *S. keckii* at Mine Hill in Tulare County may have been extirpated when orange groves were planted on the property.

Surveys for *Sidalcea keckii* conducted in 2000 and 2001 by the Sierra Foothill Conservancy at the Piedra population found 500 to 1,000 plants in 8 separate patches within 205 acres. Additional surveys conducted, on adjacent properties extended the boundaries of the Piedra population within the designated critical habitat (J. Stebbins, pers. comm. 2004, 2006). Stebbins also documented an occurrence of about 60 *S. keckii* plants in 2008 on private property 0.5 mile east of Watts Valley Road north of Kings River directly under some power lines (CNDDDB 2011; J. Stebbins, pers. comm., 2011).

Additional *Sidalcea keckii* occurrences have been documented since 2007 in Merced, Yolo, El Dorado, Solano, Napa, and Colusa counties. However, the species identity of these plants has not been confirmed because they exhibit some physical characters that are not diagnostic of either *S. keckii* or *S. diploscypha* (S. Hill, pers. comm., 2002; B. Castro, pers. comm., 2011; K. Andreasen, pers. comm., 2011). Genetic studies, currently in progress, suggest that these plants may represent a previously undescribed taxon (B. Castro, pers. comm., 2011; K. Andreasen, pers. comm., 2011).

Plants that were initially identified as *S. keckii* plants were first observed at Yosemite Lake in Merced County in 1991, and then again in 2006 (CNDDDB 2011). The species identity of these plants has not been confirmed. Herbarium specimens collected from Yolo County in 1977 and 1983 were confirmed as *S. keckii*, based on morphological characteristics, by Dr. Steven Hill in 2008 (CCH 2011). However, Hill noted that these plants exhibited some characters of *S. diploscypha* (CCH 2011). All probable *S. keckii* specimens collected from Solano County between 1892 and 1981 were confirmed on the basis of morphological characters, but also exhibited some characters of *S. diploscypha* (CCH 2011). Several Herbarium specimens collected in Napa and Colusa Counties were also confirmed as *S. keckii* with some characters of *S. diploscypha* as well (CCH 2011). The presence of morphological characters of both *S. keckii* and *S. diploscypha* among these plants has raised concern that hybridization may be occurring between these two species. However, recent genetic studies suggest that these plants may represent a previously undescribed taxon (K. Andreasen, pers. comm., 2011). If genetic studies provide evidence that these plants are a new taxon, then the range of *S. keckii* will remain limited to Fresno and Tulare counties.

Abundance

At the time of listing in 2000, only two small isolated populations of *Sidalcea keckii* were in existence at Mine Hill in Tulare County (Mine Hill population) and Tivy Mountain near the community of Piedra, in southern Fresno County (Piedra population), (CNDDDB 1997; S. Carter *in litt.* 2001). The Mine Hill population had a total of 60 plants in 1992 (Woodward and Clyde Consultants 1992). The Piedra population was discovered on a mixture of private and public lands in Fresno County in 1998 and, at the time of listing, consisted of 216 plants (S. Carter, *in litt.* 2001).

A third population *Sidalcea keckii* at White River in Tulare County was documented in 1939 (Appendix A) (CNDDDB 2011). However, no *S. keckii* plants were observed during surveys conducted in 2002, 2003, or 2004 during the blooming season (J. Stebbins, pers. comm. 2004). Surveys also indicated that suitable habitat to support the existence of this species remains in this area (J. Stebbins, pers. comm. 2004). Other suitable habitat may exist within this area but has not yet been surveyed (J. Stebbins, pers. comm. 2006).

The occurrence of *Sidalcea keckii* at Mine Hill in Tulare County is currently considered to be extirpated and the habitat has been highly modified by the planting of an orange grove since the species was last seen there in the early 1990s (Appendix A) (Stebbins 2004). *S. keckii* was not observed during spring 2002, 2003, 2004 or 2005 field surveys for it at Mine Hill (Stebbins 2004; J. Stebbins, pers. comm. 2006; CNDDDB 2011).

The Piedra population of *Sidalcea keckii* is the only population known to be extant. Most of this population occurs within the Sierra Foothill Conservancy's Tivy Mountain Preserve (Service 2003), on several small portions of land administered by the U.S. Bureau of Reclamation (Bureau) (Cypher 1998; R. Faubion, pers. comm. 2001) and on private land (Cypher 1998; J. Stebbins, pers. comm. 2001). Subsequent surveys for *Sidalcea keckii* conducted in 2000 and 2001 by the Sierra Foothill Conservancy at the Piedra population found 500 to 1,000 plants. (Appendix A) (J. Stebbins, pers. comm. 2004 and 2006). Field reconnaissance surveys conducted since 2007 indicate that this population is stable and may be increasing (Appendix A) (J. Stebbins, pers. comm. 2011).

Another small population of about 60 *Sidalcea keckii* plants located approximately 6 miles northwest of the Piedra population was discovered in 2008 near the end of the flowering season (Appendix A) (J. Stebbins, pers. comm. 2011). Grazing was occurring on the property and it was a very dry year (J. Stebbins, pers. comm. 2011). It is likely that this population could be more extensive and should be surveyed again during a year with average or above average precipitation (J. Stebbins, pers. comm. 2011).

Habitat or Ecosystem

Sidalcea keckii is associated with serpentine and other soils that tend to restrict competing vegetation (Kirkpatrick 1992; Cypher 1998; Service 2003). Serpentine soils are unusually low in primary plant nutrients, nitrogen, phosphorus, and potassium; and high in heavy metals. The lack of nutrients in serpentine soils may restrict the growth of many competing plants (Brooks 1987). However, as with many serpentine species, *S. keckii* appears to compete poorly with densely growing non-native annual grasses (Stebbins 1992; Weiss 1999).

This plant occurs at elevations ranging from 750 feet to 1,400 feet in Fresno and Tulare counties. The occurrence in Merced County was located at 280 feet elevation (Appendix A). Plants identified in Yolo County occurred at a lower elevation as well (240 feet) (Appendix A). Occurrences of *S. keckii* in Napa, Colusa, and El Dorado counties ranged from 900 to 1,950 feet in elevation (Appendix A).

At the Piedra population, *Sidalcea keckii* grows on both Fancher and Cibo soils (Cypher 1998; C. Peck, *in litt.*, 2002; Service 2003). Associated plants at this site include *Bromus hordeaceus* (soft chess), *Dichelostemma capitatum* (blue dicks), *Gilia tricolor* (bird's eye gilia), *Triteleia ixioides* (pretty face), *Triteleia laxa* (Ithuriel's spear), *Asclepias* sp. (milkweed), and *Madia* sp. (tarweed) (Cypher 1998; C. Peck, pers. comm., 2002).

The population of 60 plants discovered near Watts Valley Road in 2008 occurred along an east-facing slope within grazed annual grasslands in association with *Holocarpa heermannii* (Heerman's tatweed), *Achyrrachaena mollis* (blow-wives), *Brodiaea (Tritelia) hyacinthina* (white brodiaea), and *Avena fatua* (wild oat) (CNDDDB 2011, J. Stebbins, pers. comm., 2011). The soil at this site appeared to be a heavy reddish clay of possible ultramafic origin (CNDDDB 2011, J. Stebbins, pers. comm., 2011).

The Mine Hill population occurred on 20 to 40 percent slopes of red and white-colored clay soils in sparsely-vegetated annual grasslands (CCH 2011; CNDDDB 2011). Associated plants included *Bromus rubens* (red brome), *Lepidium nitidum* (shining pepperweed), *Plantago hookeriana* (California plantain), *Senecio vulgaris* (old-man-in-the-spring or common groundsel), and *Silene gallica* (common catchfly) (CCH 2011; CNDDDB 2011). The clay soils at this site may have been derived from serpentine parent materials high in magnesium, low in calcium, and laden with heavy metals.

Five plants identified as possible *Sidalcea keckii* in Merced County were growing on a low ridge just north of Yosemite Lake within a vernal pool complex and grazed grassland dominated by non-natives (CCH 2011; CNDDDB 2011). The soil at this site was considered to be either Hopeton gravelly clay loam or Redding gravelly clay loam (CCH 2011; CNDDDB 2011). The occurrence of putative *S. keckii* plants documented in Yolo county were growing within open, low-elevation, foothills woodland (CCH 2011; CNDDDB 2011). Putative *S. keckii* plants documented in Solano County were found in the Montezuma Hills, Walker Canyon, and in a field with *Pectocarya (Boraginaceae)* (CCH 2011; CNDDDB 2011). Plants preliminarily identified as *S. keckii* in Napa and Colusa counties were found among a range of habitats such as serpentine outcrops, serpentine chaparral, roadsides, blue oak-dominated (*Quercus douglasii*) woodland, south-facing slopes, and grasslands within oak-digger pine woodland (CCH 2011; CNDDDB 2011).

Changes in Taxonomic Classification or Nomenclature

There have been no changes in taxonomic status or nomenclature since *Sidalcea keckii* was listed.

Genetics

Genetic analyses have confirmed that *Sidalcea keckii* is a distinct taxon (Andreasen and Baldwin 2001, 2003; Andreasen 2005). The analysis of results from nuclear DNA studies concluded that *S. keckii* is most closely related to *S. diploscypha* and that *S. keckii* has a significant number of unique mutations (Andreasen and Baldwin 2001, 2003; Andreasen 2005).

Samples from herbarium specimens collected in Napa and Colusa Counties were recently submitted for genetic studies to confirm their identity as *Sidalcea keckii* (Appendix A). Plant samples from Solano, Yolo, El Dorado, and Merced counties have not been analyzed. Preliminary results of these studies suggest that these plants are neither *S. keckii* nor *Sidalcea diploscypha* (K. Andreasen, pers. comm., 2011). Rather, the Napa and Colusa County plant samples tested appear to be a previously undescribed species that is most closely related to *S. diploscypha*. *S. keckii* appears to be the next closest genetic relative to the Napa and Colusa County plant samples and *S. diploscypha* (K. Andreasen, pers. comm., 2011). Therefore, it is likely that the genetic lineage observed among samples tested from Napa and Colusa counties may actually represent a previously undescribed taxon (K. Andreasen, pers. comm., 2011). Additional genetic studies, currently in progress, should confirm the species identity of the plants from these counties. However, based on the results of these genetic analyses, the Service will only consider plants from counties from Fresno and Tulare counties that have been confirmed as *S. keckii* through further genetic studies and identification of diagnostic morphological features.

Species-specific Research and/or Grant-supported Activities

Genetic studies of probable *Sidalcea keckii* plants collected in Napa and Colusa counties are currently in progress at University of California Berkeley (B. Castro, pers. comm., 2011; K. Andreasen, pers. comm., 2011; B. Baldwin pers. comm., 2011). The results of these studies will be used to confirm the identity of plants collected from these counties and provide insight into their genetic relationship with other closely related *Sidalcea* species.

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. The five-factor analysis will be restricted to the currently recognized range of *Sidalcea keckii* in Fresno and Tulare counties.

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

At the time of listing, the primary threats to the species were urban development, agricultural land conversion, and grazing (65 FR 7757). Currently, *Sidalcea keckii* remains threatened by agricultural conversion and potential development.

Critical Habitat Unit KECK-1 includes 205 acres of land protected by the Sierra Foothill Conservancy, federally managed lands, and some private land. There is a single unprotected parcel within the Piedra population that could potentially be developed (Stebbins 2004). However, there are no imminent plans for development at this time. The Service is not aware of any activities that would have caused destruction or modification habitat within Critical Habitat Unit KECK-1 since the last 5-Year Review in 2007.

The Mine Hill location where *Sidalcea keckii* was found in 1992, which is located in Critical Habitat Unit KECK-2, has been altered significantly during the last several years. A citrus orchard was planted and a reservoir was constructed on a portion of habitat that previously

supported the species (CNDDDB 2011). In addition, a gravel quarry was constructed immediately south of the 1992 population site. A small portion of the original habitat from the 1992 population site remains unaltered. However, habitat quality has been degraded and the species has not been observed despite intensive field surveys conducted by qualified researchers (Stebbins 2004; J. Stebbins, pers. comm. 2006). This occurrence is now considered extirpated due the destruction and modification of habitat (Stebbins 2004; CNDDDB 2011).

Approximately 20 percent of Critical Habitat Unit KECK-2, which includes the Mine Hill site, has been destroyed. Nearly 40 percent of the critical habitat in this unit was surveyed for *Sidalcea keckii* during 2002 to 2006 (J. Stebbins pers. comm. 2006). Although the highest quality habitat was destroyed, potential habitat within the Critical Habitat Unit KECK-2 (Mine Hill) still exists, which has not been surveyed due to restricted access (J. Stebbins pers. comm. 2006). It is possible that plants or a seed bank of this species could occur within the unsurveyed portion of Critical Habitat Unit KECK-2. Any undocumented plants or seed bank within this unit may be subject to the same threats that contributed to the extirpation of the known standing population of *S. keckii*, as discussed above.

No *Sidalcea keckii* plants have been observed in Critical Habitat Unit KECK-3 since 1939. However, surveys for this species have indicated that suitable habitat to support this species remains in this area. The Service is not aware of any activities that would have caused destruction or modification habitat within Critical Habitat Unit KECK-3 since the last 5-Year Review in 2007.

All other occurrences of possible *Sidalcea keckii* plants occur outside of designated critical habitat on both public and private lands. Habitat and plants on land managed by public agencies may be more protected than those that occur on private land.

Summary of Factor A: Urbanization, residential development, public works projects, and agricultural activities may result in the loss of existing populations and modification of currently occupied habitat. Suitable unoccupied habitat may also be threatened by modification and destruction. Cumulative loss and modification of occupied and available suitable habitat may threaten the survival and recovery of *Sidalcea keckii*.

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

Overutilization for commercial purposes was not known to be a factor in the 2000 final listing rule (65 FR 7757) (Service 2000).

Sidalcea keckii is an attractive, showy plant, and the genus is prized as a source of horticultural plants. The listing of a species may precipitate commercial or scientific interest, both legal and illegal, which can threaten the species through unauthorized and uncontrolled collection. Unrestricted collecting for scientific or horticultural purposes and impacts from excessive visits by individuals interested in seeing rare plants could result in a reduction of plant numbers and seed production. To date there is no evidence of negative effects from any of these activities to the persistence of this species.

Summary of Factor B: Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Diseases were not considered as threats in the 2000 final listing rule (65 FR 7757) (Service 2000). Since the time of listing, no fungal, viral, or bacterial diseases have been documented as a significant source of mortality for *Sidalcea keckii*. At the time of listing, cattle (*Bos taurus*) grazing was discussed as a potential threat to the species; there has been no known change since the final listing. Cattle grazing may limit encroachment of non-native grasses (C. Peck, *in litt.*, 2002; Weiss 1999). However, cattle have been observed to cause damage to *S. keckii* by eating or trampling it, although the damage was barely noticeable a week later (Cypher 1998). Increased grazing during months of flowering, seed-set, or seed maturation could potentially reduce local population viability and negatively affect long-term conservation of this species.

Summary of Factor C: Diseases do not appear to be a threat at this time. Overgrazing by cattle may threaten the long-term conservation of this species.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

Factor D regulatory mechanisms known at the time of listing

At the time of listing, regulatory mechanisms thought to have some potential to protect *Sidalcea keckii* included: (1) listing under the California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA); (2) the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA); and (3) the Federal Endangered Species Act. The listing rule (65 FR 7757) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. This analysis appears to remain valid. There are several State and Federal laws and regulations that are pertinent to federally listed species, each of which may contribute in varying degrees to the conservation of federally listed and non-listed species. These laws, most of which have been enacted in the past 30 to 40 years, have greatly reduced or eliminated the threat of wholesale habitat destruction.

Factor D regulatory mechanisms currently known:

No substantial changes have been made to the above regulations. No additional legal protections are afforded to the species.

The following list includes a brief summary of laws and regulations that were evaluated for this 5-year review.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 et seq.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with CDFG on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is

unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. *Sidalcea keckii* is not currently listed under CESA at this time.

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

National Environmental Policy Act (NEPA): NEPA (42 U.S.C. 4371 *et seq.*) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 CFR 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

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

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(19) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section

10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and many of these HCPs are coordinated with California's related Natural Community Conservation Planning program. With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibits the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

Natural Community Conservation Planning Act: The Natural Community Conservation Program is a cooperative effort to protect regional habitats and species. The program helps identify and provide for area wide protection of plants, animals, and their habitats while allowing compatible and appropriate economic activity. Many Natural Community Conservation Plans (NCCPs) are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Federal Endangered Species Act.

Summary of Factor D: In summary, the Endangered Species Act is the primary Federal law that has provided protection for this species since the dates of its listing as endangered in 2000. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent their status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Endangered Species Act.

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

Other natural or manmade threats cited in the 2000 final listing rule include small population size, extirpation due to random events including fire, inbreeding depression, and loss of genetic variability. Competition from invasive non-native grasses was also considered a threat to *Sidalcea keckii*.

Small population size increases the susceptibility of a population to extirpation from random demographic, environmental, and/or genetic events, affecting survival and reproduction of individuals (Shaffer 1981, 1987; Lande 1988; Groom *et al.* 2006). Small populations of annual species, such as *Sidalcea keckii*, may be more vulnerable to random environmental events such as extreme weather, disease, fire, or insect infestations (Shaffer 1981, 1987; Menges 1991; Groom *et al.* 2006). For example, if a fire should occur before plants bloom or during the blooming season, the fire could destroy the individual plants as well as deplete the seed bank. The threat from random natural events has increased since *S. keckii* was listed because the plant now is found only at one location.

The isolation of the single known extant of population of *Sidalcea keckii* exacerbates these vulnerabilities by reducing the likelihood of recolonization of extirpated populations. Inbreeding depression and loss of genetic variability may also be causes for concern in such small isolated populations (Ellstrand and Elam 1993).

The absence of *Sidalcea keckii* from dense grasslands, even those on serpentine clay soils, suggests that it is a poor competitor (Stebbins 1992; J. Stebbins, pers. comm. 2001). Thus, aggressive, nonnative grasses such as *Bromus madritensis* ssp. *rubens*, and *Bromus hordeaceus* could potentially outcompete *S. keckii* if conditions changed to favor these grasses. For example, soil disturbances, increased availability of soil nutrients (e.g., nitrogen deposition) from cattle feces and other sources, and absence of fire may provide ideal conditions that would allow these nonnative grasses to outcompete *S. keckii*. Non-native grasses may generate increased fuel sources that could increase intensity of fires above the normal range of variability in serpentine grasslands that support *S. keckii* (E. Cypher, California Department of Fish and Game, pers. comm. 2006). However, an appropriate fire regime may reduce the presence of nonnative grasses and benefit serpentine endemic species such as *S. keckii* (Harrison et al. 2003).

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. 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

Summary of Factor E: Synergistic effects of altered fire regime, small population size, limited recruitment, habitat fragmentation, and genetic isolation of populations may pose a serious threat to the genetic viability long-term persistence of *Sidalcea keckii*.

III. RECOVERY CRITERIA

There is no approved final or draft recovery plan for the species.

IV. SYNTHESIS

The primary threats to *Sidalcea keckii* at the time of listing of the species such as destruction and modification of habitat, and catastrophic events continue to threaten the existence of this species. The single known population of *S. keckii* within Critical Habitat Unit Keck 2 has been extirpated and approximately 20 percent of the critical habitat at this site has been destroyed. No *S. keckii* plants have been observed in Critical Habitat Unit Keck 3 since 1939. However, suitable habitat to support this species still exists in that area. The Piedra population (700-900 plants in 1998 (CNDDDB 2011)) is located on lands managed with grazing, although the unprotected parcel within the Piedra population could be subject to threats from either inappropriate grazing, agriculture, or development.

Due to past and threatened destruction or modification of its habitat, the inadequacy of existing regulatory mechanisms, small population size, loss and fragmentation of habitat, isolation of populations, and other natural or manmade factors affecting its continued existence, we conclude that *Sidalcea keckii* 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*
- No Change

New Recovery Priority Number and Brief Rationale: The Service has determined that the new priority number for *Sidalcea keckii* should be upgraded from 8 to 5C, which indicates a high degree of threat, including threats from development and agricultural activities, and a low potential for recovery. Since the time of listing, threats to the survival and recovery of this endangered plant species have steadily increased. Only a single confirmed population of *S. keckii* currently exists on 205 acres of land protected by the Sierra Foothill Conservancy within Critical Habitat Unit Keck 1 (Fresno County), which is also known as the Tivy Mountain and Piedra Area. The small population in Critical Habitat Unit Keck 2 was extirpated in 2002 by the planting of an orange grove. The population in Critical Habitat Unit Keck 3 also appears to be extirpated. All other populations consist of plants that have ambiguous species identities that must be confirmed through genetic analyses. Preliminary studies suggest these plants may represent a previously unidentified taxon closely related to *S. keckii*. This plant does not have protection as a state listed species under CESA which increases the vulnerability of populations that occur on privately owned land.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. Continue to protect property with suitable habitat for *Sidalcea keckii*. Acquisition of additional habitat through fee title or conservation easements is needed for the recovery of the species.
2. Survey additional serpentine and gabbro soil areas in Tulare and Fresno Counties to discover additional populations of *Sidalcea keckii*.
3. If additional populations of *Sidalcea keckii* are not discovered through systematic surveys, the species should be reintroduced into protected land within critical habitat units.

4. Continue monitoring the status and trend of *Sidalcea keckii* to determine whether this species is stable, increasing, or declining.
5. Continue genetic studies to confirm the species identity of plants preliminarily identified as *Sidalcea keckii* so that we can more accurately determine the actual number of populations, the geographic range, and types of habitats that support this species.

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

Sidalcea keckii (Keck's Checkermallow)

Current Classification:

Recommendation Resulting from the 5-Year Review:

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

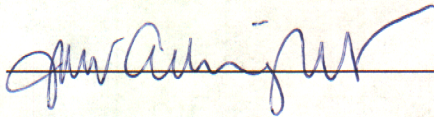
Appropriate Listing/Reclassification Priority Number:

Review Conducted By: Florence M. Gardipee, Sacramento Fish and Wildlife Office

FIELD OFFICE APPROVAL:

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

Approve



Date

20 June 2012

Appendix A: Known occurrences of *Sidalcea keckii*; prepared for 5-year review, 2011

Date(s) of records	County	CNDDDB Occurrence #	CCH Occurrence #	CSHC Occurrence #	Elevation (feet)	Population estimate		Species ID confirmed?	
						2007	2011	Morphology	Genetic
1939	Tulare	2	UC6655405, CAS298658, DS266077, NY222063, RSA28130		1400	None observed - may be extirpated	None observed - may be extirpated	Yes	Yes
2002	Tulare	5			750	None observed - extirpated	None observed - extirpated	Yes	Yes
1907	Tulare		UC147952			UNK	UNK	Yes	Yes
1907	Tulare		UC148003			UNK	UNK	Yes	Yes
1939, 1998, 2000, 2008	Fresno	4	UC763981		800	500-1,000	500-1,000	Yes	Yes
2007	Fresno	7			912	UNK	60	No	No
2005	Merced	6			280	UNK	5	No	No
1943	Solano	8	UC703223			UNK	UNK	Yes*	No
1892	Solano	9	JEPS50073, UC18880			UNK	UNK	Yes*	No
1981	Solano		UC18876			UNK	UNK	Yes*	No
1892	Solano		JEPS50074, UC18877			UNK	UNK	Yes*	No
1977	Yolo	10	JEPS84737		240	UNK	UNK	Yes*	No
1893	Yolo		UC187416			UNK	UNK	Yes*	No
1999	Napa	11	JEPS100817		1950	UNK	UNK	Yes*	No
1989	Napa	12	UC1585877, JEPS50076, RSA537732, SD133948		1000	UNK	UNK	Yes*	No
1998	Napa	13			900	UNK	UNK	No	No
2002	Napa	14	CHSC83385	83385	1650	UNK	UNK	No	No
1957	Napa		RSA292974			UNK	UNK	No	No
1932	Colusa	15	JEPS50071			UNK	UNK	Yes*	No
2000	Colusa	16	CHSC79771	79771	1300	UNK	UNK	No	No
1984	Colusa	17	CHSC45331	45331	1200	UNK	UNK	No	No
2004	Colusa	18	JEPS105737			UNK	UNK	Yes*	No**
1935	Colusa		UC584175			UNK	UNK	Yes*	No
2008	Colusa		RSA756334			UNK	UNK	No	No**
1982	El Dorado		UCD20683		1350	UNK	UNK	No	No

CNDDDB = California Natural Diversity Database; CCH = Consortium of California Herbaria; CSHC = California State University Chico Herbarium; UNK = Unknown, no recorded surveys

* Herbarium specimens identified by S.R. Hill in 2008 as *Sidalcea keckii*, but it was noted that some morphological characters of *S. diploscypha* were present.

** Preliminary genetic analyses suggest this plant is neither *S. keckii* nor *S. diploscypha* and may represent a previously unidentified taxon.