

# Recovery Plan

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for the Pedate Checkermallow

(*Sidalcea pedata*)

and Slender-Petaled Mustard

(*Thelypodium stenopetalum*)



*Thelypodium stenopetalum*

*Sidalcea pedata*

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and the

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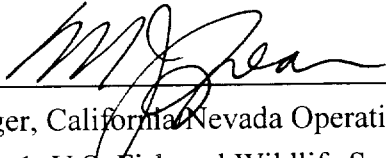
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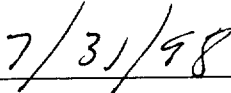
U.S. Fish and Wildlife Service

Portland, Oregon

Approved: \_\_\_\_\_

  
Manager, California Nevada Operations Office  
Region 1, U.S. Fish and Wildlife Service

Date: \_\_\_\_\_



## DISCLAIMER PAGE

Recovery plans delineate actions required to recover and protect listed species. Plans are published by the U.S. Fish and Wildlife Service, sometimes prepared with the assistance of recovery teams, contractors, State agencies, and other affected and interested parties. Recovery teams serve as independent advisors to the Fish and Wildlife Service. Plans are reviewed by the public and submitted to additional peer review before they are adopted by the Fish and Wildlife Service. Objectives of the plan will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well the need to address other priorities. Recovery plans do not obligate other parties to undertake specific tasks and may not represent the views nor the official positions or approval of any individuals or agencies involved in the plan formulation, other than the Fish and Wildlife Service. They represent the official position of the Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

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## EXECUTIVE SUMMARY

Current Status: The pedate checkermallow (*Sidalcea pedata*) and the slender-petaled mustard (*Thelypodium stenopetalum*) are both listed as endangered and occur in Big Bear and Holcomb Valleys, San Bernardino County, California, in wet to moist montane meadow habitat. Current occupied habitat for the pedate checkermallow is estimated to be fewer than 8.1 hectares (20.0 acres) at 17 recorded sites. Current occupied habitat for the slender-petaled mustard is estimated at approximately 8.5 hectares (21.0 acres) divided among the six recently-occupied locales. Occupied habitat is secure at one fully protected site for each species. The checkermallow is partially protected at five additional sites and the mustard is partially protected at four additional sites. Restorable habitat for both species can be found in the vicinity of Big Bear Lake and Baldwin Lake. An estimated 24.3 hectares (60.0 acres) of occupied or restorable habitat are available for these endangered species.

Habitat Requirements and Limiting Factors: The pedate checkermallow and the slender-petaled mustard are restricted (endemic) to the Big Bear and Holcomb Valley areas in the San Bernardino Mountains of southern California. These species occupy similar wet to moist meadow habitat associated with swales and shallow drainages and are primarily located on the perimeters of Big Bear Lake and Baldwin Lake. Although the species frequently cooccur, pedate checkermallow is more widely distributed than slender-petaled mustard. Commercial and residential development, changes in surface hydrology, recreational activities, and livestock grazing have reduced and fragmented pedate checkermallow and slender-petaled mustard habitat. Protection and management of occupied habitat, restoration of degraded habitat, fencing of occupied habitat, and elimination of other threats are necessary to affect recovery of these species.

Recovery Priority:

Pedate checkermallow: 2c

Slender-petaled mustard: 5c

Recovery Objective: This plan was devised to bring the species to a point where they may be reclassified from endangered to threatened. The conditions required for delisting have not yet been fully established, but tentative delisting criteria are included.

Recovery Criteria: The pedate checkermallow and the slender-petaled mustard can be considered for reclassification to threatened status by 2007 (and possibly as early as 2001) if and when:

1. Thirteen populations of *Sidalcea pedata* and six populations of *Thelypodium stenopetalum* and adjacent suitable habitat for each species are fully protected through land management agreements, land ownership by a resource agency or conservation organization, conservation easement, or other permanent means of protection.
2. Populations are stable or increasing with allowances for natural fluctuations.

Tentatively, delisting of each species might be considered when, in addition to the reclassification criteria, the following criteria have been met:

1. Any necessary protection, restoration and enhancement recommended as a result of prescribed research or management contingency plans are successfully completed.
2. Current and potential threats to populations of both *Sidalcea pedata* and *Thelypodium stenopetalum* at all sites with high or moderate protection priorities (Appendix B) have been eliminated.
3. Natural populations of *Sidalcea pedata* and *Thelypodium stenopetalum* at all protected sites show positive trends for establishment and recruitment for a minimum of five consecutive generations (at least 15 consecutive years for *Sidalcea pedata* and 10 consecutive years for *Thelypodium stenopetalum*).

4. Populations of *Sidalcea pedata* and *Thelypodium stenopetalum* are representative of the current genetic and geographical range of each species and occur in habitats that collectively represent the full range of parameters observed during prescribed research and monitoring efforts.

Actions Needed:

1. Protecting , enhancing, and conserving extant populations of *Sidalcea pedata* and *Thelypodium stenopetalum* and adjacent suitable habitat for each species.
2. Developing and effectively implementing a cooperative management plan (or plans) to guide and ensure the monitoring, maintenance, and conservation of all populations of these species.
3. Restoring or enhancing lands suitable for by *Sidalcea pedata* and *Thelypodium stenopetalum* to provide sufficient, suitable habitat for both species.
4. Conducting research on the population dynamics, ecology, and physiology of these species that will enable the a) adaptive management of existing populations and habitat, b) establishment of additional populations, and c) restoration, enhancement, and development of supplementary habitat.
5. Educating the public through educational outreach programs designed to heighten public awareness of the need for the protection and recovery of these rare species as a step toward maintaining biodiversity.

Costs (in \$1000s) for reclassification of the pedate checkermallow and the slender-petaled mustard:

<u>Year</u>	<u>Need 1</u>	<u>Need 2</u>	<u>Need 3</u>	<u>Need 4</u>	<u>Need 5</u>	<u>Total</u>
1998	29	27	12	10	3	81
1999	21	24	12	10	3	70
2000	13	21	16	5	2	57
2001	13	16	16	5	2	52
2002	12	15	16	0	2	45
2003	12	15	8	0	2	37
2004	12	13	6	0	2	33
2005	12	13	6	0	2	33
2006	12	12	6	0	2	32
2007	12	12	6	0	2	32

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Total Estimated Cost to Reclassification = \$ 472,000 (additional recovery costs beyond the year 2007 have yet to be determined)

The above costs do not include land acquisition costs and additional costs related to the ownership and operation of these lands. Land acquisition may not be necessary, but if acquisition is needed to secure habitat, the costs will be determined at a later date.

Dates of Reclassification: Reclassification likely will occur by 2007, assuming full implementation of this plan. Research and other tasks prescribed by this plan are necessary to determine the potential for complete recoveries and delistings.

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## I. INTRODUCTION

### Species Overview

The pedate checkermallow *Sidalcea pedata* (*S. pedata*) and the slender-petaled mustard *Thelypodium stenopetalum* (*T. stenopetalum*) are restricted (endemic) to moist mountain meadow habitat in the Big Bear and Holcomb Valley areas in the San Bernardino Mountains of southern California. As a result of their increasingly restricted distribution and threats to their native habitat, both species were listed as endangered by the U.S. Fish and Wildlife Service on August 31, 1984 (49 FR 34500). *Sidalcea pedata* has a Fish and Wildlife Service recovery priority of 2c indicating that it is a species facing a high degree of threat but with a high potential for recovery (the “c” indicates a potential conflict with construction or other development projects). *Thelypodium stenopetalum* has a priority of 5c, indicating a species with a high degree of threat and with a low potential for recovery. In 1989, each species was also listed as endangered by the State of California (California Department of Fish and Game 1989). Further, the species have been placed on the sensitive species list by the U.S. Forest Service, Big Bear Ranger District as a result of their designated Federal status.

*Sidalcea pedata*, originally documented at 23 sites, now exists at 17 locales with occupied habitat estimated to be fewer than 8.1 hectares (20 acres). Of the original sites, only 1 is fully protected, 15 have either been altered by or are threatened by development, and a minimum of 5 have been extirpated.

*Thelypodium stenopetalum* exists at six locales with an estimated 8.5 hectares (21 acres) of occupied habitat. Populations at two additional locales have been extirpated, and an additional two populations likely have been extirpated.

### Taxonomy

*Sidalcea pedata* A. Gray

The genus *Sidalcea*, of the mallow (Malvaceae) family, comprises approximately 22 species located throughout western North America, mostly Oregon and California. A thorough description of the perennial members of this genus can be found in Hitchcock (1957). The perennial herb of interest, *Sidalcea pedata* A.

Gray, was first described by Asa Gray (1887) based on a 1886 collection made by Samuel B. Parish from "Bear Valley in the San Bernardino Mountains, S. California" (Parish 1917). Jepson (1925) relegated the taxon to the variation *Sidalcea spicata* var. *pedata*. However, C. L. Hitchcock (1957) returned the taxon to full species status as *Sidalcea pedata* in his revision of the perennial species of the genus *Sidalcea*. *Sidalcea pedata* is distinguished from other sister species by its smooth carpels, mostly leafless stem, and the three- to five-lobed leaves that are then dissected into short, linear segments. Additional species of *Sidalcea* that occur in the San Bernardino Mountains include *S. malvaeflora* ssp. *dolosa* (distinguished by the presence of additional stem leaves, few-flowered racemes, and net-veined carpels), *S. hickmanii* ssp. *parishii* (shallowly-lobed leaves and coarse, gray pubescence), and *S. neomexicana* (fleshy leaves and net-veined carpels). Colloquial names commonly used for this species are pedate checkermallow, bird-footed checkerbloom, bird-footed checkermallow, and Bear Valley checkermallow. Voucher specimens of *Sidalcea pedata* are held at the University of California, Riverside Herbarium; Jepson Herbarium at the University of California, Berkeley; Pomona College Herbarium; and in the Dudley Stanford collection of the California Academy of Sciences.

*Thelypodium stenopetalum* S. Wats.

*Thelypodium*, a genus in the mustard family (Brassicaceae), contains approximately 20 species located throughout western North America, with 8 species occurring in California (Rollins 1993). The biennial *Thelypodium stenopetalum* S. Wats., was first described in 1887 by Sereno Watson from a collection made by Samuel B. Parish the same year from Bear Valley, San Bernardino Mountains, California (Watson 1887). Schulz (1933) transferred the taxon into the genus *Thelypodopsis*, subsequently changing the name to *Thelypodopsis stenopetala*. *Thelypodium stenopetalum* is distinguished from other members of the genus by the sessile (attached directly to the stem), clasping leaves, paired filaments that are free, and the linear petals. No other species of *Thelypodium* occur within the range of *Thelypodium stenopetalum*. The geographically closest sister species, *Thelypodium integrifolium* occurs from the western Mojave Desert and Antelope Valley to the northern San Bernardino

Mountains below 2,500 meters in elevation. The most widely-used colloquial name for *Thelypodium stenopetalum* is slender-petaled mustard.

Voucher specimens of *Thelypodium stenopetalum* are housed at the University of California, Riverside Herbarium; Jepson Herbarium at the University of California, Berkeley; and in the Dudley Stanford collection of the California Academy of Sciences. Specimens are also held at the Big Bear Ranger Station, U.S. Forest Service, San Bernardino National Forest.

### **Description**

#### *Sidalcea pedata*

*Sidalcea pedata* is a several-stemmed perennial 2 to 4 decimeters (8 to 16 inches) tall. Individual plants have a fleshy, nonrhizomatous taproot. The erect stems range from slightly hirsute (hairy) to "long-bristly" and are typically reddish, especially in young plants. The predominantly basal leaves are palmately five- to seven-parted into narrow, three-lobed divisions, which are further dissected into linear to oblong segments. The few stem leaves are small and divided into three segments that are also dissected into linear segments. The five-parted flowers, which occur in many-flowered, loose, spike-like terminal racemes, may vary in color from pink to magenta with darker veins; petals are 9 to 12 millimeters (0.4 to 0.5 inch) long. The five to six rounded carpels are smooth, a distinguishing character of this species, and mostly beakless. The taxon flowers from May to August.

#### *Thelypodium stenopetalum*

The slender-petaled mustard, *Thelypodium stenopetalum*, is a glabrous or hairless, glaucous biennial with simple stems, 3 to 8 decimeters (12 to 31 inches) tall, with one to many branches per plant. The lavender to whitish flowers occur in an open, many-flowered inflorescence. The linear petals are 10 to 14 millimeters (0.4 to 0.6 inch) in length and are crinkled at the base. The calyx has a purplish tinge that gives the inflorescence a purple hue. The oblanceolate leaves (2 to 15 centimeters; 1.6 to 5.9 inches) are thickish, purple tinged, arranged in a basal

rosette, and wither soon after blooming. The 2- to 5-centimeter (1.6- to 2.0-inch) long cauline (stem) leaves are sessile, sagittate (arrowhead shaped) or auriculate-clasping (with lobes clasping the stem) at the base. Leaves are variably entire to few-toothed or shallowly lobed. The fruit is a straight to slightly curved silique (pod) that is cylindrical and slightly narrowed between seeds. Plants of this species flower from June to July.

### **Historic Range and Population Status**

#### *Sidalcea pedata*

The historical distribution of *Sidalcea pedata* was much more extensive prior to the construction of the Big Bear Dam in the Big Bear Valley in the 1890's. Early botanists, notably Samuel Parish (1838-1928), reported that the lower parts of Big Bear Valley were a green subalpine meadow, suggesting that suitable habitat for the pedate checkermallow existed throughout the area. Additionally, Parish (1917), indicated the pedate checkermallow to be "frequent in the meadows of Bear Valley." It may well be that this species was common in what is now the bottom of Big Bear Lake. Furthermore, the current distribution of *Sidalcea pedata* along the margins of Big Bear Lake suggest that, prior to development around its shores, the plant was widespread in the moist meadow habitat that surrounded the lake.

There are 17 historic occurrences of *Sidalcea pedata* recorded in the California Natural Diversity Data Base (CNDDB, 1997); an additional five occurrences are reported in this plan (Table 1). Although some of these latter occurrences are immediately adjacent to other locales mentioned in the California Natural Diversity Data Base, they are listed in this recovery plan separately where different landowners are involved.

Five of the historic occurrences of *Sidalcea pedata* have been extirpated. The extirpated occurrences were near Arrowbear (2)<sup>1</sup>, Bear Valley Golf Course (4),

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<sup>1</sup> Throughout this plan occurrence numbers shown in parentheses refer to those used in Tables 1 and 2 and on Figures 1 and 2.

Big Bear Lake near Trout Lake (10), Fawnskin Meadow at Grout Bay (11), which was inundated in 1929, and a locale near the Big Bear City Airport (13). Several extirpations resulted from inundation following the construction of Big Bear Dam. A portion of occurrence (5A) near the Stansfield Cutoff at Big Bear Lake was destroyed in 1991 as a result of commercial development.

### *Thelypodium stenopetalum*

The historical distribution of *Thelypodium stenopetalum* is not well known. As was the case with respect to *Sidalcea pedata*, *Thelypodium stenopetalum* was once more common around Big Bear Valley in habitat eliminated by the construction and operation of Big Bear Dam in the 1890's and subsequent residential and commercial development. The California Natural Diversity Data Base (1997) lists 10 historic occurrences of *Thelypodium stenopetalum*. Two of these occurrences (9) and (11) have been be extirpated. Two additional populations, at the southwest end of Erwin Lake (5) and at the southeast end of Big Bear Lake (8), have not been documented recently and may have been extirpated. Reconnaissance surveys to the Erwin Lake locale have not been conducted since 1991 to conclusively determine the presence or absence of this population. *Thelypodium stenopetalum* was not observed during field surveys to the locale at the southeast end of Big Bear Lake in 1989 or 1990. No current information is available concerning this population.

### **Current Range and Population Status**

#### *Sidalcea pedata*

A total of 23 populations of *Sidalcea pedata* have been documented at Bluff Lake Meadow, the margins of Baldwin Lake, or various sites around Big Bear Lake in the San Bernardino Mountains, San Bernardino County, California. Table 1 provides a summary of the current status of these 23 occurrences. The location and distribution of these populations are shown on Figure 1. Occupied habitat at specific locales vary in size from 1.35 hectares (3.3 acres) at Bluff Lake to 0.04 hectare (0.1 acre) at Ski Beach. The current range of *Sidalcea pedata* is defined

by the locations of populations in moist meadow habitat surrounding Big Bear Lake Baldwin Lake and Bluff lake.

Of the 17 sites where *Sidalcea pedata* is presumed to exist, only one is fully protected, the N. Baldwin Lake (1) site. There are 5 sites that have some form of partial protection (Bluff Lake (6), Eagle Point (19), Pan Hot Springs (12), Metcalf Bay (17), and Ski Beach (20)), and 11 are unprotected, degraded or threatened (Table 1).

Data on population size and density have not been compiled for all known occurrences of *Sidalcea pedata*. In 1989, an attempt was made to determine the size and density of six populations on protected or semiprotected sites in the Big Bear Valley; these sites include Bluff Lake (6), Eagle Point (19), Baldwin Lake Ecological Reserve (1), Pan Hot Springs (12), Ski Beach (20), and Metcalf Bay (17). The estimated extents of occupied habitat reported by Stephenson (1989) ranged from 1.4 hectares (3.3 acres) at Bluff Lake to 0.04 hectare (0.1 acre) at Ski Beach. The number of plants estimated to occur at each site in 1989 ranged from 568 (Metcalf Bay) to 37,750 (Bluff Lake). Density estimates ranged from 0.14 plants per square meter (Metcalf Bay) to 23.2 plants per square meter (Bluff Lake). The total number of plants combined for all sites was estimated to be 68,337. Although this estimate was generated from censuses of only half of the occurrences, data from the largest and most undisturbed occurrences were available and analyzed. Note that this population estimate was made in 1989, a drought year in the San Bernardino Mountains. Because moisture may be a limiting factor affecting population densities and distributions, these parameters should be higher in nondrought years.

Table 1. Current and Historical Occurrences of *Sidalcea pedata*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
1 (1)	Baldwin Lake Ecological Reserve.	Northwest end of Baldwin Lake. Significant population, mostly on southeast side of Highway 18, within fenced boundary of reserve. Monitored annually.	California Department of Fish and Game owns 50 hectares (125 acres) Reserve; adjacent land is Forest Service and private.
2 (2)	Deer Lick, Deep Creek Valley; near Arrowbear.	Extirpated (1906).	
3 (*)	Metcalf Creek, east side, on either side of Delamar Road., 1/4 mi north of Highway 18.	Approximately 400 plants (in 1991) on disturbed moist meadow between Highway 18 and lake shore. Vacated dirt section of Delamar Road. bisects site.	Privately owned.
4 (4)	Bear Valley Golf Course.	Extirpated (1939).	
5 (5)	Big Bear Lake margin from 0.5 mi. west of Stansfield cut-off to Eagle Point (China Garden).	Scattered plants, including concentration of plants in the China Gardens area. Habitat is west of Sandalwood Drive and Rathbun Creek. No current development proposal.	Private ownership.
5A (5)	Big Bear Lake margin from west of Stansfield Cut-off to Eagle Point.	Extirpated in 1991. South of Fox Farm Drive on what is now developed property.	Private ownership.
6 (6)	Bluff Lake Meadow.	Approximately 1.4 hectares (3.4 acres) of occupied habitat on land managed as a camp. Owner has agreed to protect habitat; use has been diverted from habitat.	Private owner has voluntary landowner protection agreement with The Nature Conservancy. Possible Forest Service acquisition.
7 (7)	Big Bear Lake, Metcalf Meadow Vicinity of Lakeview Drive.	Scattered plants on undeveloped lots in residential area. Surveyed in June 1993; plants found on some parcels. <sup>3</sup>	Various private owners.



Table 1. Current and Historical Occurrences of *Sidalcea pedata*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
8 (8)	South end of Baldwin Lake near Shay Road and Big Bear Community Services District waste water treatment plant.	Scattered plants in undeveloped lots along south end of Baldwin Lake. Small number of plants occur on fenced property owned by Natural Heritage Foundation east of Shay Road. Additional plants identified near the sewage plant on Palomino Road in 1995.	Various private owners; Natural Heritage Foundation owns portion.
9 (9)	East margin of Baldwin Lake.	Scattered plants on undeveloped property along eastern margin of lake. Not protected.	Various private owners.
10 (10)	Big Bear Lake near Trout Lake.	Extirpated.	
11 (11)	Fawnskin Meadow near Grout Bay.	Extirpated (1929).	
8 12 (12)	Southwest end of Baldwin Lake near Pan Hot Springs.	Relatively undisturbed site with 20 hectares (50 acres) of wetland and sensitive plant habitat. Four hectares (10 acres) is protected through deed restriction by Big Bear Community Services District.	Big Bear Community Services District.
13 (13)	Near Big Bear City Airport.	Presumed extirpated. Potential habitat exists in swales adjacent to runways	
14 (14)	Big Bear Lake City, just south of Mallard Lagoon.	Presumed extant but decreasing in residential neighborhoods.	Privately owned.
15 (*)	City of Big Bear Lake between Metcalf and Boulder Bays.	Small scattered groups of plants in empty lots and residential yards at corner of Chipmunk Drive. and Willow Landing Drive and along Willow Landing <sup>3</sup> .	Various private owners.

Table 1. Current and Historical Occurrences of *Sidalcea pedata*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
16 (*)	South of Metcalf Bay, near old drive-in theater east of Cienega Road.	At least 500 scattered <i>Sidalcea</i> clusters in 1992. Grading of one cluster in 1992 resulted in settlement agreement with California Department of Fish and Game <sup>2</sup> .	Private ownership.
17 (17)	South of Metcalf Bay, on Presbyterian Conference along Prairie lane, north of Big Bear Boulevard.	Occupied lands are partially registered in The Nature Conservancy's Landowner Notification Program under voluntary agreement to protect rare plant habitat on approximately 0.8 hectares (2 acres).	Private ownership.
18 (18)	Jay Bird Lane, City of Big Bear Lake, Metcalf Meadow area.	Wet meadow area at intersection of Tulip Lane in residential area on south side of Highway 18. Plants also reported in 1993 on southeast and southwest corners of Tulip Lane and Big Bear Boulevard <sup>2</sup> .	Various private owners.
19 (19)	Near Eagle Point, City of Big Bear Lake, east of Oriole Drive.	Approximately 5.7 hectares (14 acres) moist meadow with large <i>Sidalcea</i> population (other rare species also). Set aside as rare plant preserve as mitigation for Eagle Point development. Includes approximately 0.4 hectare (1 acre) owned by The Nature Conservancy (corner of Fox Farm Road and Garstin Drive) used as transplanted site.	Fee ownership by private parties with deed restriction to City of Big Bear Lake; 0.4 hectare (1 acre) owned by The Nature Conservancy.
20 (20)	Ski Beach at Kidd Cove, southwest end of Big Bear Lake.	Small (approximately 0.4 hectare; 1 acre) population in wet meadow at west end of lake is entirely fenced by the Forest Service. Small portion of population has extended beyond fenced limits and is subject to disturbance from recreational use.	Forest Service.
21 (*)	Eureka and Park Drives, near Eagle Point.	Small populations on empty lots in residential neighborhood; 5 lots with 2,000+ plants in 1992. <sup>3</sup>	Various private owners.

Table 1. Current and Historical Occurrences of *Sidalcea pedata*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
22 (*)	City of Big Bear Lake Civic Center site on south side of Highway 18 to Iris Lane.	Dense population (approx. 600 plants in 1993) from Iris Lane west along Big Bear Boulevard. (Highway 18) on city property and in CALTRANS (California State Highway Department) right of way <sup>3</sup> . Site was fenced in 1996.	City of Big Bear Lake; CALTRANS

LEGEND

- <sup>1</sup> = Occurrences are numbered consecutively in this table. Numbers given in parentheses are the element occurrence numbers (EO) assigned by the California Natural Diversity Data Base (CNDDB). In cases where an occurrence was not listed by the California Natural Diversity Data Base, an asterisk (\*) is shown. Plants found in two separate ownerships at EO #5 are reported separately as 5 and 5A. Site 5A retains potential as a mitigation site.
- <sup>2</sup> = Abbreviations are as follows: BBCSD = Big Bear Community Services District; CDFG = California Department of Fish and Game; SBNF = San Bernardino National Forest, Big Bear Ranger District; TNC = The Nature Conservancy.
- <sup>3</sup> = A detailed account of the occurrence of *Sidalcea pedata* in scattered parcels in the City of Big Bear Lake was prepared by Mary Meyer, Regional Plant Ecologist, California Department of Fish and Game based on surveys in June 1993. This information was included in a memo sent to City of Big Bear Lake by the California Department of Fish and Game in December 1993 (CDFG 1993).

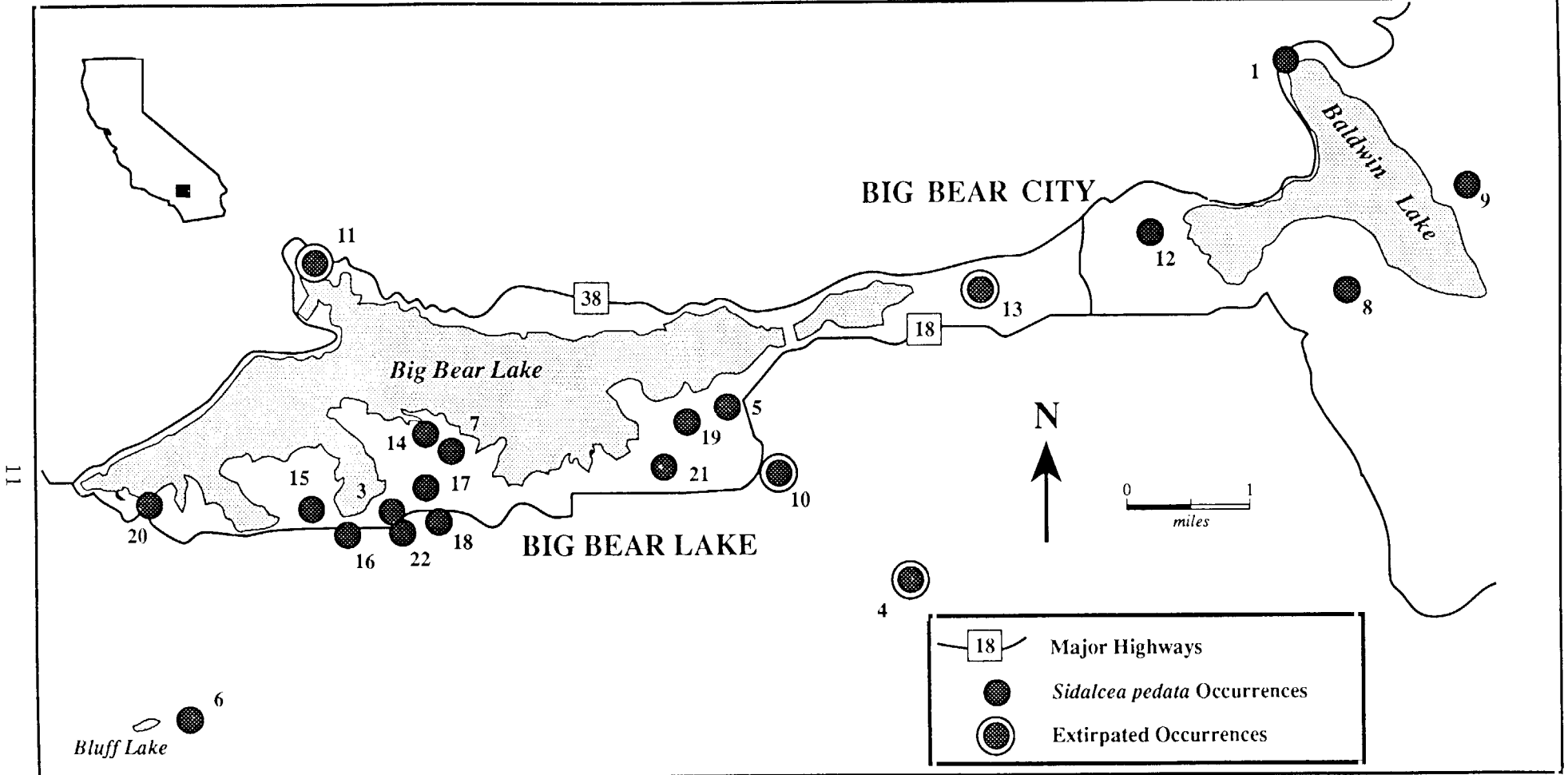


Figure 1. Location of Known Occurrences of *Sidalcea pedata* in the Big Bear Valley, San Bernardino County, California. Numbers used to designate each site are the California Native Diversity Data Base (CNDDDB) element occurrence numbers, with the addition of several sites not listed by the CNDDDB (refer to Table 1). Sites where *S. pedata* have been extirpated are denoted by double circles. Occurrence number 2 is an extirpated occurrence at Arrowbear. This locale is off the map to the west.

The actual area of the *Sidalcea pedata* occurrences is quite limited due to the range and extent of remaining habitat. The largest site in terms of area is the Bluff Lake Meadow (6), with approximately 1.4 hectares (3.3 acres) of occupied habitat; the entire Bluff Lake Meadow (6) comprises approximately 49 hectares (120 acres). The occupied habitat at Baldwin Lake Ecological Reserve (1) consists of approximately 1 hectare (3 acres). The other sites that contain 0.8 hectare (2 acres) or more of occupied habitat are Eagle Point (19) (1.0 hectare, 2.4 acres), “Drive-In Theater” (16) (0.8 hectare, 2.0 acres), east of Mill Creek (3) (0.8 hectare, 2.0 acres), and Pan Hot Springs (12) (0.8 hectare, 2.0 acres). The total area of occupied habitat in protected or partially protected localities is approximately 3.0 hectares (7.3 acres) of occupied habitat; the total area of these unprotected parcels, including the occupied habitat, is probably 14 hectares (35 acres) or more.

#### *Thelypodium stenopetalum*

*Thelypodium stenopetalum* and *Sidalcea pedata*, often cooccur, with the latter species found at four of the locales described for *Thelypodium stenopetalum*. These cooccurrence sites are the north end of Baldwin Lake (1), Eagle Point (2), the south end of Baldwin Lake near Shay Road (6), and Pan Hot Springs (7) (see Table 2 and Figure 2).

Populations of *Thelypodium stenopetalum* are extant at six (and possibly eight) locations ranging from the margins of Baldwin Lake and Erwin Lake to Eagle Point at the eastern end of Big Bear Lake in the San Bernardino Mountains, San Bernardino County, California. Table 2 provides a summary of the current status of these occurrences. The locations of the presumed extant populations and extirpated populations are shown in Figure 2. The current distribution of *Thelypodium stenopetalum* is defined by populations in moist meadow habitat surrounding Baldwin Lake, Erwin Lake and the eastern portion of Big Bear Lake.

The species occurs at only one fully protected site, the north end of Baldwin Lake (1), which is on land owned by the California Department of Fish and Game. The Eagle Point (2) population is on privately owned, deed restricted lands governed by the City of Big Bear Lake and receives only partial protection. The Upper Holcomb Valley/Belleville population occurs on Federal land managed by the

Table 2. Current and Historical Occurrences of *Thelypodium stenopetalum*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
1 (1)	North shore of Baldwin Lake, Baldwin Lake Ecological Reserve.	Northwest end of Baldwin Lake. Significant population, mostly on southeast side of Highway 18, within fenced boundary of reserve. Monitored annually.	California Department of Fish and Game owns 50 hectares (125 acres) within Reserve; adjacent land is U.S. Forest Service and private.
<u>2</u> (2)	East of Eagle Point, south shore of Bear Lake, east of Oriole Dr.	Large population in approx. 5.7 hectares (14 acres) moist meadow associated with other rare species, including <i>Sidalcea pedata</i> . Set aside as rare plant preserve as mitigation for Eagle Point development.	Fee ownership by private party with conservation easement to City of Big Bear Lake.
13 3 (3)	East end of Erwin Lake.	Scattered small populations of plants along the north and east ends of this dry lake bed. Area was once pristine; habitat now reduced.	Privately owned; formerly the Hamilton Ranch; Development plan approved in 1993.
4 (4)	Interlakken Shopping Center.	Extirpated	
5 (5)	South west of Erwin Lake to southeast of Woodlands.	Along southwest shore of Erwin Lake. Area subject to possible development. <i>Thelypodium</i> may not be extant.	Private ownership.
6 (6)	South Shore of Baldwin Lake, near Shay Road and the Big Bear Community Services District wastewater treatment plant.	Approximately 1.2 hectares (3 acres) of occupied habitat in sagebrush scrub east of Shay Road. Property is fenced and protected by the Natural Heritage Foundation. Additional plants identified near the sewage plant on Palomino Road in 1995.	Owned by Natural Heritage Foundation.

Table 2. Current and Historical Occurrences of *Thelypodium stenopetalum*

Number <sup>1</sup>	Occurrence Name	Description	Ownership Status
7(7)	Southwest end of Baldwin Lake, east of Big Bear City, south of Pan Hot Springs.	Undisturbed site with approx. 20 hectares (50 acres) of wetland and sensitive plant habitat with large <i>Thelypodium</i> population. Previously undescribed habitat south of fence was detected in 1994. Four hectares (10 acres) is protected through deed restriction by Big Bear Community Services District.	Owned by Big Bear City Community Services District.
8 (8)	Margin of Big Bear Lake at east end on south side, west of Big Bear City.	Described as margin of Big Bear Lake, (from forest to lake) in California Natural Diversity Data Base report. Area is relatively disturbed. <i>Thelypodium</i> has not been confirmed at this location since 1979.	Privately owned.
9 (9)	Near Big Bear Post Office and mouth of Pine Knot drainage.	Extirpated.	
10 (10)	Upper Holcomb Valley/ Belleville.	Large meadow located at site of historical town of Belleville. Significant population along Caribou Creek. Annual monitoring since 1988. A 1997 estimate of 25,000 plants. Potential threat from mining claim activity.	Managed by the Forest Service.
11 (11)	Bear Valley Golf Course and Moonridge Meadows.	Extirpated in 1939.	

LEGEND

<sup>1</sup> = Occurrences are numbered consecutively in this table. Numbers given in parentheses are the element occurrence numbers assigned by the California Natural Diversity Data Base (CNDDDB).

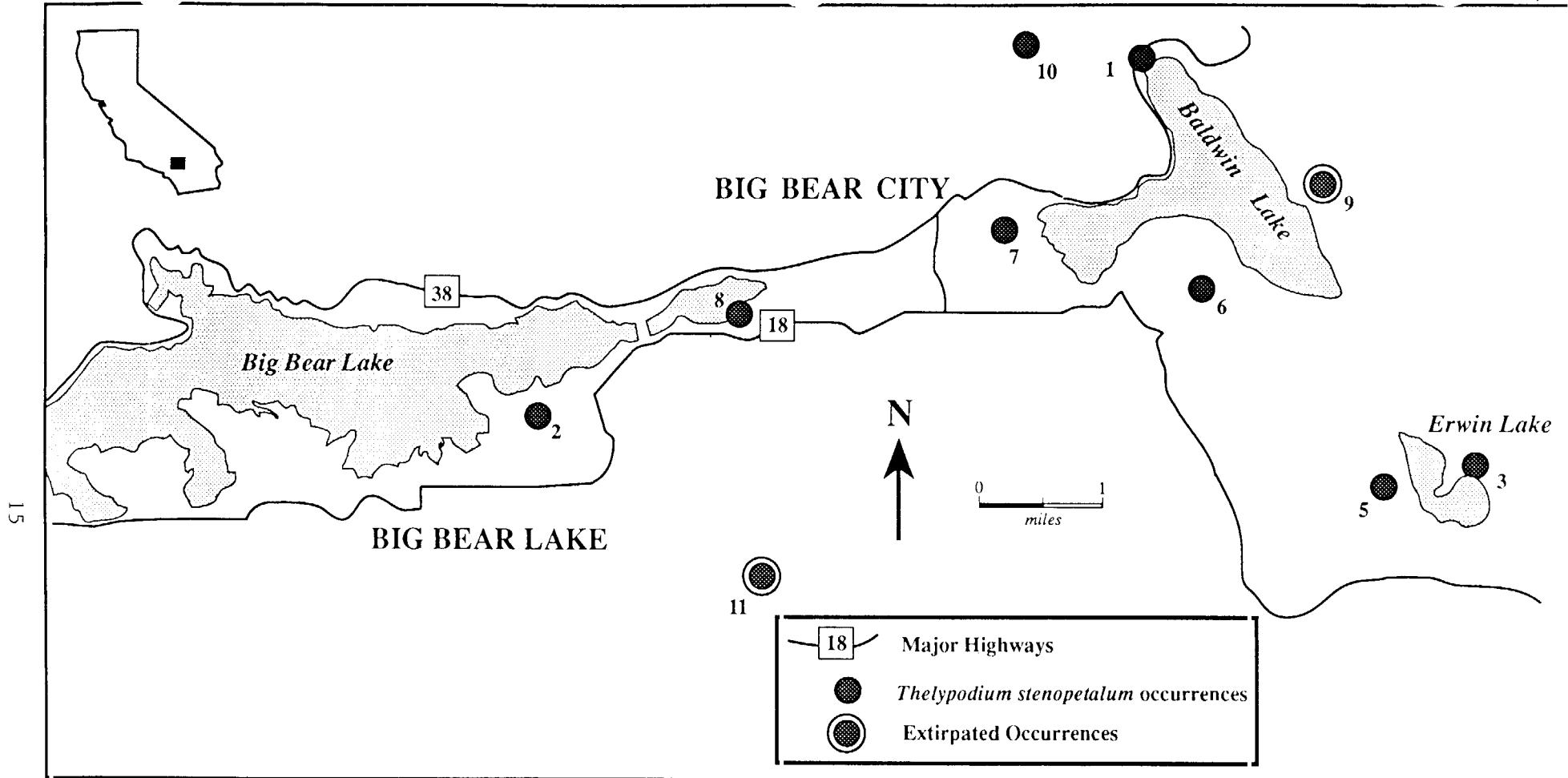


Figure 2. Location of Known Occurrences of *Thelypodium stenopetalum* in the Big Bear Valley, San Bernardino County, California. Numbers used to designate each site are the California Native Diversity Data Base (CNDDDB) element occurrence numbers, as given in Table 2. No occurrence number 4 is indicated in the CNDDDB. Sites where *T. stenopetalum* have been extirpated are denoted by double circles.



U.S. Forest Service. This site is currently fenced, but is considered to be only partially protected due to vandalism, mining claims, and recreational uses in the vicinity. The Pan Hot Springs population (7), on lands owned by the City of Big Bear City Community Services, and the population at the south end of Baldwin Lake near Shay Road (6), on lands owned by the City of Big Bear City Community Services, also receive only partial protection. The Erwin Lake (3) population occurs on privately owned lands. The locales where populations of *Thelypodium stenopetalum* are either extirpated or presumed extirpated do not have any protection from development or impacts.

The extant occurrences of *Thelypodium stenopetalum* vary in size from approximately 3.2 hectares (8.0 acres) of occupied habitat at Eagle Point (2) to approximately 0.4 hectare (1.0 acres) of occupied habitat at the south end of Baldwin Lake (6). In 1989, an attempt was made to complete a population estimate of individual *Thelypodium stenopetalum* plants in six populations in the Big Bear Valley. These sites include Eagle Point (2), Baldwin Lake Ecological Reserve (1), Pan Hot Springs (7), Upper Holcomb Valley/Belleville (10), the south end of Baldwin Lake (6), and Erwin Lake (3). The population estimates reported by Stephenson (1989) were generated in a year when plants apparently were low in abundance or absent from several sites due to 1989 being a drought year in the San Bernardino Mountains. The number of *Thelypodium stenopetalum* plants estimated to occur at each site ranged from 375 flowering plants at Eagle Point (2) to 12 flowering plants at Erwin Lake (3). The total number of plants for all sites was estimated to be 439 flowering individuals, with an additional 106 nonflowering plants. Populations of *T. stenopetalum* have fluctuated considerably relative to soil moisture and precipitation levels over recent years at Upper Holcomb Valley/Belleville (10) site (Zimmerman 1997). For example, during the drought years from 1989 through 1991 the *T. stenopetalum* population was sparse, while during 1995 and 1996, wetter years, population levels were more dense (approximately 25,000-27,000 flowering plants).

Information gathered from more recent field surveys reveals that the actual extent of each population of *Thelypodium stenopetalum* at the six locales is limited. For example, at Eagle Point where 5.7 hectares (14.0 acres) of sensitive plant habitat

are set aside, approximately 2.8 hectares (7.0 acres) of habitat are occupied. At Pan Hot Springs, *Thelypodium stenopetalum* occurs on only 0.9 hectares (2.1 acres) of the 20 hectares (50 acres) of sensitive meadow and wetland habitat owned by the Big Bear City Community Services District. Other sites that contain 0.8 hectare (2.0 acres) or more of occupied habitat include Upper Holcomb Valley/Belleville (2.8 hectares, 6.9 acres) and Erwin Lake (0.8 hectare, 2.0 acres). The total area of occupied habitat in a protected or partially protected status is approximately 7.5 hectares (18 acres). The remainder of the unprotected occurrences comprise approximately 1.0 hectare (2.5 acres) of occupied habitat. The area of unprotected suitable habitat, including occupied habitat, is estimated to be 6.0 hectares (15.0 acres) or more.

### **Life History and Ecology**

#### *Sidalcea pedata*

Specific studies on the life history of *Sidalcea pedata* have not been done. However, since 1989, limited biological monitoring of this species has been conducted through the cooperative efforts of the Forest Service; The Nature Conservancy; and the California Department of Fish and Game.

*Sidalcea pedata* is a herbaceous perennial that grows from a nonrhizomatous rootstock, and has a generational turnover of approximately 3-5 years. Pollination studies have not been done. Flowers are relatively large and conspicuous with flowers reaching full bloom from May to July. The seeds are small and dispersal appears to be limited to the area surrounding the parent plant. However, no specific information on seed dispersal is available. Monitoring studies that included censuses of first-year seedlings were conducted in 1990, 1991, and 1992 at Eagle Point (19), Baldwin Lake (1), and Ski Beach (20). Additional studies conducted at the Baldwin Lake Ecological Reserve (1) in 1992 and 1993 revealed that the number of first-year seedlings was 120 percent and 38 percent, respectively, of the total number of adult plants.

Monitoring studies have also yielded measurements of marked individuals on permanent plots at Baldwin Lake Ecological Reserve (1). Survivorship of seedlings has been high throughout the 4 years of monitoring. Only 2 of 66 marked individual plants died in the period from 1990 to 1993 (Greene 1993).

### *Thelypodium stenopetalum*

Although life history studies of *Thelypodium stenopetalum* have not been done, information on this species can be gleaned from data obtained during the recent biological monitoring program. This monitoring was initiated in 1989 through the cooperative efforts of the California Department of Fish and Game, The Nature Conservancy, and the Forest Service, Big Bear Ranger District.

*Thelypodium stenopetalum* is a herbaceous biennial species that reaches maturity in its second year. Pollination studies have not been done on this species. Mature plants produce an inconspicuous flower stalk with flowers arranged in an open raceme in May or June; flowers may be present on the stalk through July. No studies have been completed on seed dispersal, but it appears that the small seeds do not disperse very far from the parent plant (Barrows, personal observation). Monitoring data from Baldwin Lake Ecological Reserve, including counts of flowering and nonflowering individuals in marked transects, were obtained from 1990 through 1993. During these 4 years, the number of nonflowering rosettes were 46, 67, 65, and 73 percent, respectively, of the number of flowering plants. These data suggest that recruitment of new individuals is occurring at a relatively high level. However, additional data from the monitoring study indicate that many plants do not reach adult (flowering) status.

### **Habitat Description and Ecological Relationships**

#### *Sidalcea pedata*

The habitat for *Sidalcea pedata* is restricted to vernal moist meadows and sparsely vegetated drier meadows at elevations from 1,600 to 2,500 meters (5,250 to 8,200 feet) in Big Bear Valley, San Bernardino Mountains of California. *Sidalcea pedata* is one of the indicator species used to define and delimit wet

meadow habitats and is further considered to be an obligate wetlands indicator (U.S. Fish and Wildlife Service 1988). Although the areas occupied by *Sidalcea pedata* and other rare species have traditionally been referred to as wet meadows, they might be more accurately described as moist meadows. Within wet meadow habitats, *Sidalcea pedata* tends to occupy relatively drier portions of the landscape. Individual plants generally are not found in the dense rush and sedge thickets typically found in the wettest portions of drainages, swales and meadow areas.

The primary limiting factor for *Sidalcea pedata* appears to be the maintenance of appropriate hydrological conditions within the moist meadow habitat. A gradient mosaic of moisture conditions can be observed at various *Sidalcea pedata* occurrences from Bluff Lake to the north end of Baldwin Lake. At Bluff Lake, *Sidalcea pedata* is found in the moist to drier parts of the meadow and is associated with other rare species such as *Poa atropurpurea*, *Perideridia parishii* ssp. *parishii*, and *Taraxacum californicum*. Other associated species include *Potentilla glandulosa* and *Aster occidentalis*. At a number of the *Sidalcea pedata* sites, including the locale at the north end of Baldwin Lake, the species occurs in moist swales and is associated with *Agropyron pubescens*, *Agropyron desertorum*, *Horkelia bolanderi*, and species of *Poa*, *Eleocharis*, and *Juncus*. In drier, more elevated portions of these meadows, *Sidalcea pedata* is interspersed with *Artemisia tridentata* and *Artemisia nova*. This pattern of association with *Artemisia* spp. is apparent at Pan Hot Springs, Eagle Point, and at the east end of Big Bear Lake.

The moist to wet, open meadow association, where *Sidalcea pedata* is found, is often interspersed within pebble plains, another sensitive plant community in the Big Bear Valley area. In these wet meadow habitat mosaic, this species often occurs in association with other species considered to be rare, including *Linanthus killipii*, *Mimulus exiguus*, *M. purpureus*, *Castilleja lasiorhyncha*, *Poa atropurpurea*, *Pyrrocoma uniflora* var. *gossypina*, *Senecio bernardinus*, *Taraxacum californicum*, and *Thelypodium stenopetalum*.

No comprehensive study of soil conditions within *Sidalcea pedata* habitat has been conducted. Geologically, the basins that form the present day Baldwin Lake

and Big Bear Valley are both the result of deposition of lake-bottom and alluvial debris (Stout 1976). The geological history of the area as a Pleistocene lake bed has resulted in a high clay component in the soil, which, in turn, has contributed to the formation of wet meadow habitat. This wet meadow habitat occurs where clay lenses in the soil are intercepted by shallow drainages or springs. The clay forms a barrier to percolation of surface water and creates appropriate conditions for moist to wet meadow species.

For example, preliminary soil surveys done at the Baldwin Lake Ecological Reserve in conjunction with an unarmored three-spine stickleback (*Gasterosteus aculeatus* ssp. *williamsoni*) habitat project (Heule 1991) suggest that clays occur in layers, or lenses, in soils that are characteristically gravelly to sandy. An associated study of groundwater availability suggests that groundwater may not provide significant moisture to the vegetation, which may rely instead on surface moisture from precipitation and snow melt runoff. Artesian wells are present in the Baldwin Lake Ecological Reserve, though not immediately adjacent to *Sidalcea pedata* habitat.

#### *Thelypodium stenopetalum*

Similar to *Sidalcea pedata*, *Thelypodium stenopetalum* occurs in vernal moist meadows and sparsely vegetated drier meadows at elevations from 1,600 to 2,500 meters (5,250 to 8,200 feet) in the Big Bear Valley, San Bernardino Mountains of California. The two species are often associated. As discussed above for *Sidalcea pedata*, the habitat for this mustard might more accurately be described as moist meadows. The habitat for the species is described by Rollins (1993) as alkaline flats and lake shores. *Thelypodium stenopetalum* does tend to occupy the drier portions of wet meadows or sparsely vegetated "dry" meadows. The habitat where the species is documented is generally dominated by open sagebrush scrub vegetation. Individual *Thelypodium stenopetalum* plants often seen growing up through sagebrush (*Artemisia tridentata*) shrubs may be as much as 1 meter (3.3 feet) tall. Sagebrush scrub habitat is closely associated with wet areas along the margins of drainages or low areas where water collects in the spring. Associated

species include *Artemisia tridentata*, *Gutierrezia sarothrae*, *Iris missouriensis*, *Castilleja cinerea*, *Distichlis spicata*, *Oenothera californica*, and *Linum lewisii*.

Although the limiting factors that influence the distribution of *Thelypodium stenopetalum* are not well understood, soil moisture appears to be important (Barrows, personal observation). A mosaic of moisture gradients can be observed at various *Thelypodium stenopetalum* locales from Eagle Point to Erwin Lake. At the north end of Baldwin Lake, this species occurs along the margins of a relatively moist swale. At Erwin Lake, the species has been observed in what appears to be relatively dry, alkaline flats around the margins of the dry lake bed (Barrows, personal observation). Although no quantitative data are available regarding the specific soil characteristics associated with this species, soil alkalinity and clay content may be important. The relative significance of the groundwater versus surface moisture hypothesis discussed above with respect to *Sidalcea pedata* also appears to be relevant with respect to *Thelypodium stenopetalum*.

*Thelypodium stenopetalum* also occurs in moist meadow-pebble plain associations. Within these wet meadow areas, this species often occurs in association with other wet to moist meadow species that are considered to be rare, including *Linanthus killipii*, *Mimulus exiguus*, *Mimulus purpureus*, *Castilleja lasiorhyncha*, *Poa atropurpurea*, *Pyrrocoma uniflora* var. *gossypina*, *Senecio bernardinus*, *Taraxacum californicum*, and *Sidalcea pedata*.

One unique aspect of the ecological relationship of *Thelypodium stenopetalum* to faunal species is the use of its flowering stalks by the caterpillar of the rare Andrew's marble butterfly (*Euchloe hyantis andrewsii*). The Andrew's marble is endemic to the San Bernardino Mountains, where the species feeds on native mustard species, including *Thelypodium stenopetalum*. The adult butterfly lays one to several eggs on the tip of the flower stalk. Larvae emerge after several days to feed on the blossoms and fruits. They typically feed on the upper fruit stalks, leaving the lower fruits untouched. The caterpillars pupate and may remain in their cocoons for up to 5 years (Krantz 1990). Insect damage to individual *Thelypodium stenopetalum* plants was recorded on as many as 20 percent of the plants monitored at the locale at the north end of Baldwin Lake.

The extent to which Andrew's marble butterfly contributes to this damage is presently unknown (see Barrows 1991 and Greene 1993).

### **Reasons for Listing: Decline and Current Threats**

The decline in the populations of both *Sidalcea pedata* and *Thelypodium stenopetalum* in the Big Bear Valley can be attributed to several factors related to human disturbance of habitat appropriate for the species as indicated in the Final Listing Rule for both species (Fed. Reg. Vol 49, No. 171, 1984). The inundation of the Big Bear Valley to create the Big Bear Lake reservoir undoubtedly extirpated a significant number of populations of each species and eliminated suitable habitat. Since that event in the 1890's, it is presumed that populations of both species have continued to decline, with drought in the early 1990's considered to have been a factor in the decline of these species.

The conversion of native wet to moist meadow habitat to residential and commercial development around the margins of Big Bear, Baldwin, and Erwin Lakes is the primary disturbances factor resulting in decline of both species. Other impacts that apparently have contributed to the declines of the species include grazing by horses and burros, alterations of the hydrologic drainages that supply wet meadow habitats, soil compaction resulting in alterations of infiltration rates and surface hydrology, and recreational activities, especially where activities involve the creation or use of trails within habitat areas (CDFG 1989; Krantz 1983).

The following paragraphs briefly describe the extent and relative significance of these threats.

**Development Activities:** Residential and commercial development has been a factor in the degradation of 11 of the extant *Sidalcea pedata* occurrences and 4 of the occurrences of *Thelypodium stenopetalum*. More significantly, four of the historic occurrences of *Sidalcea pedata* and two historic occurrences of *Thelypodium stenopetalum* were eliminated as a result of residential or commercial development (CNDDDB 1997), e.g., the grading of habitat for parking lots and the destruction or fragmentation of habitat.

In the vicinity of Eagle Point, both species occur in empty lots associated with existing homesites in a residential neighborhood. These plants are almost certainly remnants of a once much larger population. Occurrences of *Sidalcea pedata* in the Metcalf Bay (15) area are surrounded by homes, motels, commercial buildings, and unprotected parcels. Moreover, at least two *Thelypodium stenopetalum* occurrences there apparently have been degraded by development. With the exception of the habitat supporting the species' occurrence at the north end of Baldwin Lake, all remaining habitat has been fragmented by development.

Grazing by Horses and Burros: Horse grazing can result in significant degradation of habitat for both species. Grazing related impacts include trampling, soil compaction, and actual consumption of the plants. Currently, impacts to populations of both species from grazing by horses is not a significant threat. However, horse grazing and pasturing activities have adversely affected portions of several species occurrences. These sites include Pan Hot Springs (12) at the southwest end of Baldwin Lake, Metcalf Bay (15), and Bluff Lake (6); the latter two sites contain *Sidalcea pedata* only. In each case, voluntary agreements with the landowners have resulted in the relocation of equestrian activities away from rare plant habitat. In areas where grazing has been removed as a threat, the species have been able to recover from the impacts of horse activity (Barrows, personal observations at Bluff Lake and Pan Hot Springs).

Similarly, burros do not appear to be a significant threat to the populations of either species at the present time (Barrows 1989). In early 1997, a population of wild burros, estimated to be 117 animals, inhabited the Big Bear Valley and Baldwin Lakes area. During 1997, 77 of the burros were removed from this population and additional animals may be removed in the future (Zimmerman 1997). These animals roam freely over the area, grazing in residential areas and natural habitats. Past trampling of rare plant habitat by burros on reserve lands has been subsequently prevented by fencing and the rerouting of trails (Barrows 1989). Although it is reasonable to assume that some burro grazing of *Sidalcea pedata* and *Thelypodium stenopetalum* continues to occur in adjacent areas, the impacts do not appear to be significant at the present. Additionally, impacts to populations of these species on the Baldwin Lake Ecological Reserve (Barrows



1989), initially attributed to burros, may have resulted from small mammal (rabbit) activity.

Alteration of Hydrology: Both species are susceptible to changes to the natural surface hydrological conditions within their habitat due to their apparent dependence on soil moisture. Alteration of drainages and swales, depletion of groundwater, and conversion of drainages to flood control channels all have the potential to significantly impact populations of these species. Alteration of soil hydrology or existing drainage patterns may have impacted several *Sidalcea pedata* occurrences, including Metcalf Bay (7), Eagle Point (19), and the Baldwin Lake Ecological Reserve (1). Populations of *Thelypodium stenopetalum* appear to have been affected at the latter two locations. In each of these cases, however, recent efforts have been made to prevent hydrology-related impacts to the habitat and subsequently, the species. For instance, purchase of private lands containing the watershed for the Baldwin Lake Ecological Reserve (1) by the California Department of Fish and Game in 1992 has since helped to reduce this potential threat to both species on the Reserve.

Recreational Activities: Recreational activities represent a threat at sites where public or private facilities occur adjacent to rare plant habitat occupied by one or both species. For example, recreational activities at Bluff Lake have resulted in trampling and degradation of the rare plant habitat containing *Sidalcea pedata* (see Krantz 1983). Similar activities have posed a threat in the past to the *Sidalcea pedata* occurrence at Metcalf Bay (15). Moreover, recreational activity could pose a threat to *Sidalcea pedata* plants located at Ski Beach (20), and to both species at Eagle Point (19) and the Baldwin Lake Ecological Reserve (1). Given the close proximity of many occurrences of both species to residential development, along lake shores, or recreational facilities, protection of these species from recreation-induced impacts will require careful planning and management.

#### Conservation Efforts: Research

Research on the life history and ecology of both *Sidalcea pedata* and *Thelypodium stenopetalum* has been limited. However, an extensive survey of the distribution

and status of both species was completed in 1978 by botanist Tim Krantz in unpublished reports to the San Bernardino National Forest, U.S. Forest Service ("Forest Service"). Biological monitoring of both species has been conducted since 1989 at Ski Beach (20) (1989-present; *Sidalcea* only), Baldwin Lake Ecological Reserve (1) (1989-present), Eagle Point (19) (1989-1991), Pan Hot Springs (12) (1989-1991), Bluff Lake (6) (1989-1990; *Sidalcea* only), and Upper Holcom/Bellville (10) (1989-present; *Thelypodium* only). This monitoring has generated baseline data on some population characteristics and on relative measures of plant vigor including height; leaf growth; and numbers of flowers, fruits, and buds. The monitoring has been accomplished through the cooperative efforts of the Forest Service, California Department of Fish and Game, and The Nature Conservancy. Quantitative analyses of the habitat and life histories of these species have not been completed.

Limited information exists on the success of transplantation of *Sidalcea pedata* plants based on experimental projects in the Big Bear Valley. In the early 1980's, 12 *Sidalcea pedata* plants were transplanted from the site of an impending development to the Belleville site in Upper Holcomb Valley on Forest Service land. This experimental population is currently presumed to be extirpated.

A second experimental transplant project occurred as partial mitigation for a development in Big Bear City. In 1988 and 1990, 13 mature and 4 seedling *Sidalcea pedata* plants were transplanted from a private property parcel to The Nature Conservancy's property on Garstin Drive (Krantz 1988, 1990). Six of the mature transplanted plants were observed during a 1991 survey of the transplant site (Barrows 1991). However, none of the seedlings apparently survived. In a subsequent survey during 1993, only three of the original transplanted adult plants were found, and the transplanted population did not appear to be self-perpetuating. Competition with introduced weeds may have reduced the success of the transplanted *Sidalcea pedata*. Thus far, transplantation has not been confirmed as a successful method of restoring, mitigating, or enhancing *Sidalcea pedata* populations. Further research into the efficacy of transplantation methodologies is necessary. Transplantation of *Thelypodium stenopetalum* has not been attempted.

The Forest Service also retains ownership of one locale of *Thelypodium stenopetalum* at Upper Holcomb Valley/Belleville. This site has also been monitored on an annual basis since 1989. The Forest Service has attempted to negotiate an exchange of lands to acquire rare plant habitat adjacent to existing Forest Service lands surrounding the Bluff Lake meadow. The Forest Service also participated in the development of a cooperative management plan for the Baldwin Lake Ecological Reserve and contributed significantly to the planning and implementation process for protection and interpretation activities at this site.

Most recently, the City of Big Bear Lake has initiated the preparation of a Coordinated Resource Management Plan (CRMP) for rare species in the Big Bear Valley area. This comprehensive Coordinated Resource Management Plan, recently renamed into a planning program called Big Bear 2000, is a cooperative effort involving representatives from Federal and State agencies, and local city and county planning agencies.

U.S. Army Corps of Engineers: Because suitable habitat for these species is associated with jurisdictional wetlands or waters of the United States, the Corps of Engineers regulates virtually all projects that would impact *Sidalcea pedata* and *Thelypodium stenopetalum* or their habitat. Pursuant to various provisions of section 404 of the Clean Water Act, the Corps of Engineers regulates and issues permits for the discharge of fill into wetlands and waters of the United States. The Corps of Engineers is required to consult with the Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act and the implementing regulations pertaining thereto if their discretionary authority to issue permits "may affect" federally-listed species, including *Sidalcea pedata* and *Thelypodium stenopetalum*. Avoidance or compensation measures are generally integrated into projects that may affect listed species. The Corps of Engineers apparently will have jurisdiction over projects proposed for Metcalf Bay (15), Pan Hot Springs (12), China Gardens (5), and Eagle Point (19).

#### State Actions

California Department of Fish and Game (CDFG): Both *Sidalcea pedata* and *Thelypodium stenopetalum* are State-listed endangered species proving them

protection from “take” under the California Endangered Species Act (CESA) unless otherwise permitted through a 2081 permit issued by the California Department of Fish and Game. The California Native Plant Society lists these two species as 1B, 3-3-3 (plants that are endemic to California, are endangered throughout their range, and are restricted to one to only several occurrence or are in such small numbers that they are seldom reported) providing further protection under the California Native Plant Protection Act of 1977. Moreover, the California Environmental Quality Act (CEQA), enacted in 1970, provides for the potential mitigation of project impacts to State-designated rare and listed plants through the California Environmental Quality Act environmental review process.

Given these various authorities and mandates, the California Department of Fish and Game is charged with working with local agencies and project proponents to reduce or prevent impacts of projects to rare and listed species. For example, the California Department of Fish and Game was actively involved in the development of mitigation plans for two private projects in Big Bear Valley. In 1991, a mitigation agreement developed by the California Department of Fish and Game and a private developer resulted in the establishment of a \$25,000 fund for the protection and management of *Sidalcea pedata*. This fund is administered by the California Department of Fish and Game and is still available for appropriate projects to protect this species.

California Department of Fish and Game currently owns and conserves 56 hectares (138 acres) containing sensitive habitats on the north shore of Baldwin Lake. Most of this property, which is now designated as the Baldwin Lake Ecological Reserve, was purchased by The Nature Conservancy and transferred to the California Department of Fish and Game in 1986. This reserve includes approximately 2.8 hectares (7.0 acres) of wet meadow habitat with large populations of *Sidalcea pedata* and *Thelypodium stenopetalum*. A management plan and "Operations and Maintenance Schedule" for the reserve and adjacent lands were completed in August 1989 pursuant to a cooperative endeavor involving the California Department of Fish and Game, The Nature Conservancy, and the Forest Service. This plan included a recommendation to acquire 5.7 hectares (14 acres) of lands known collectively as the "Cemetery Parcel". This parcel was acquired by the California Department of Fish and Game in 1992. The

recommended rerouting of trails away from the rare plant habitat was completed in 1990. A biological monitoring plan was implemented to track *Sidalcea pedata* and *Thelypodium stenopetalum* populations from 1989 through 1993. Funding has not been available for monitoring since 1994.

The California Department of Fish and Game is also responsible for enforcing various codes, including section 2080 of the California Endangered Species Act, established to protect native California plants and animals. In this capacity, the California Department of Fish and Game has issued multiple citations for the taking of *Sidalcea pedata* where there has been a violation of section 2080 of the California Endangered Species Act.

### Local Agencies

a) City of Big Bear Lake: Eleven of the extant populations of *Sidalcea pedata* occur within the boundaries of the city of Big Bear Lake: Metcalf Bay (15), east of Mill Creek (3), Ski Beach (20), "Drive-In Theater" (16), Eureka and Park Drives (21), Eagle Point (19), China Gardens (5), Lakeview Drive (7), Mallard Lagoon (14), Chipmunk Drive (15), and Jay Bird Lane (Civic Center site) (18). The Eagle Point site also includes habitat for *Thelypodium stenopetalum*. The city General Plan, completed in 1983, includes a Conservation Element that recognizes the significance of rare plant populations within the city boundaries. Populations of both species are designated on a "Rare Plant Habitat Map" within the Conservation Element. However, this map, prepared in 1982, is considered to be out-of-date, including only three of the *Sidalcea pedata* occurrences: the "Drive-In Theater" locale (16), Metcalf Bay (15), and Eagle Point (19).

The City has recently received a conservation easement for 2.8 hectares (7.0 acres) of rare plant habitat at Eagle Point. This parcel contains significant populations of both species. The conservation easement on this property, which is still owned by the developers of an adjacent housing development, was granted to the City of Big Bear Lake as mitigation for project impacts. A cooperative management approach involving the landowner, the City of Big Bear Lake, the Forest Service, the Fish and Wildlife Service, and the California Department of Fish and Game hopefully will be developed for this significant site.

b) Big Bear City Community Services District: A single population of each *Sidalcea pedata* and *Thelypodium stenopetalum* is on property at Pan Hot Springs owned by the Big Bear Community Services District. This parcel includes 20 hectares (50 acres) of sensitive meadow and wetland habitat. Approximately 4 hectares (10 acres) of the property have been set aside as a rare plant preserve. This area is covered by a Big Bear Community Services District deed restriction that requires protection of the rare plant populations and habitat. This protection agreement was designed in consultation with Fish and Wildlife Service, Corps of Engineers, and Nature Conservancy personnel. Prior to this agreement, the wet meadow habitat at Pan Hot Springs had been degraded by horse grazing and trampling. A horse corral within the rare plant habitat was removed in 1987. The wet meadow habitat, at the southwest end of Baldwin Lake, is fenced and receives relatively little disturbance at the present time. Annual monitoring of *Sidalcea pedata* and *Thelypodium stenopetalum* at this location was coordinated by The Nature Conservancy and the Forest Service from 1989 through 1991.

In June 1994, a California Department of Fish and Game botanist located additional habitat for *Sidalcea pedata* and *Thelypodium stenopetalum* south of the existing, fenced rare plant reserve. At the request of the Big Bear Community Services District, which was considering leasing the 25.6 hectares (63.4 acres) parcel for livestock grazing, the California Department of Fish and Game surveyed the area. Significant populations of both species were located during this survey (Meyer 1994). In a letter to the Big Bear Community Services District, the California Department of Fish and Game requested that limited livestock grazing be restricted to the period after August 1 to avoid the flowering and fruiting period for the rare plant species and that monitoring be conducted to determine if grazing practices were compatible with the management of these populations.

#### Other Organizations

a) The Nature Conservancy: The Nature Conservancy became involved in rare plant protection in the Big Bear Valley area with the purchase of 50 hectares (125 acres) of habitat. This property, which subsequently was transferred to the

California Department of Fish and Game, is now the core of the Baldwin Lake Ecological Reserve. The Nature Conservancy also retains ownership of a 0.4 hectare (1 acre) parcel ("Lot A") in the City of Big Bear Lake. This parcel was dedicated to The Nature Conservancy in April 1986 by the developers of the adjacent housing tract. This small parcel was designated by the City as a rare plant preserve and 17 *Sidalcea pedata* plants were transplanted there in 1989 and 1990 as mitigation for a separate development approximately 0.9 kilometers (0.5 mile) away.

The Nature Conservancy is also involved, per their Landowner Protection Program, in protection of *Sidalcea pedata* populations at Bluff Lake and Metcalf Bay. Two landowners have entered into a voluntary agreement with The Nature Conservancy to take steps to protect the *Sidalcea pedata* populations on their respective properties. They have also agreed to notify The Nature Conservancy prior to any significant changes in their land use practices. At Bluff Lake, the landowner has removed a horse pasture and diverted recreational use away from the rare plant habitat. At Metcalf Bay, the landowner has removed recreational activities from the rare plant area and permitted monitoring of the population on an annual basis from 1988 to 1991. An additional wet meadow area on this property was fenced through the cooperative efforts of the landowner, Friends of the Big Bear Valley Preserve, and The Nature Conservancy. As a result of the above protective measures and implementation of the landowner protection agreement, the *Sidalcea pedata* population at this site has begun to recover. Thirty *Sidalcea pedata* plants were observed in 1989 on land previously used as a parking lot (Barrows, personal observation, 1992).

Through 1990, The Nature Conservancy had a preserve manager working on conservation of rare plant habitat, including *Sidalcea pedata* and *Thelypodium stenopetalum* sites. This staff person was involved with monitoring and protection projects for both species. However, due to limited resources, the Nature Conservancy no longer has staff in the Big Bear Valley and has significantly reduced its role in the area. The Nature Conservancy is interested in transferring its current local land ownership, the parcel on Garstin Drive, to another organization or agency, potentially the Natural Heritage Foundation.

b) Friends of the Forest (Friends of the Big Bear Valley Preserve): In the spring of 1992, the Friends of the Big Bear Valley Preserve merged with the Friends of the Forest, which now is the official interpretive association of the Big Bear Ranger District, San Bernardino National Forest. The nonprofit, volunteer organization was originally formed in 1985 to support the efforts of Forest Service, The Nature Conservancy, and the California Department of Fish and Game to protect the unique natural heritage of the Big Bear area, including rare plant habitats. The group erected fencing at Baldwin Lake, Metcalf Bay, The Nature Conservancy/Garstin Drive site, and Eagle Point; produced interpretive displays and materials; and conducted walks to inform the public about the endangered plant populations and the need to protect them. The group additionally reconstructed an abandoned building on the Baldwin Lake Ecological Reserve for use as a visitor center. The Friends of the Forest continues to actively support the protection of both endangered and other rare plant species.

c) Natural Heritage Foundation: The objective of this nonprofit local organization is to protect and preserve rare, threatened, and endangered species and their habitats. The Natural Heritage Foundation has purchased approximately 60 hectares (150 acres) along the south shore of Baldwin Lake, near Shay Road. This property contains a small population of *Sidalcea pedata* and a significant *Thelypodium stenopetalum* population.

### **Recovery Strategy**

Conservation efforts to protect habitat for *Sidalcea pedata* and *Thelypodium stenopetalum* have been underway since 1978 and have involved State, Federal, and local agencies; private organizations; and individuals. However, only one of the extant occurrences of each *Sidalcea pedata* and *Thelypodium stenopetalum* is protected by fee ownership or other permanent means of protection. Thus, the recovery of these species depends on:

1. Protecting, enhancing, and conserving extant populations of *Sidalcea pedata* and *Thelypodium stenopetalum* and adjacent suitable habitat for each species.



2. Developing and effectively implementing a cooperative management plan (or plans) to guide and ensure the monitoring, maintenance, and conservation of all populations of these species.
3. Restoring or enhancing lands suitable for occupation by *Sidalcea pedata* and *Thelypodium stenopetalum* to provide sufficient, suitable habitat for both species.
4. Conducting research on the population dynamics, ecology and physiology of these species that will enable the a) adaptive management of existing populations and habitat, b) establishment of additional populations, and c) the restoration, enhancement, and development of supplementary habitat.
5. Educating the public through educational outreach programs designed to heighten public awareness of the need for the protection and recovery of these rare species as a step toward maintaining biodiversity.

## II. RECOVERY

### A. Objectives and Delisting Criteria

The primary objective of this recovery plan is to enable the reclassification of *Sidalcea pedata* and *Thelypodium stenopetalum* to threatened and ultimately delist these two species by providing written guidance on protecting and maintaining sufficient populations and habitat. The delisting criteria below are tentative and subject to revision as the species approach the reclassification stage.

Reclassification of the two species from endangered to threatened will be possible if and when:

1. Thirteen populations of *Sidalcea pedata* and six populations of *Thelypodium stenopetalum* and adjacent suitable habitat for each species are fully protected through land management agreements, land ownership by a resource agency or conservation organization, conservation easement, or other permanent means of protection.
2. Populations are stable or increasing with allowances for natural fluctuations.

Tentatively, delisting of each species might be considered when, in addition to the reclassification criteria, the following criteria have been met:

1. Any necessary protection, restoration and enhancement recommended as a result of prescribed research or management contingency plans are successfully completed.
2. Current and potential threats to populations of both *Sidalcea pedata* and *Thelypodium stenopetalum* at all sites with high or moderate protection priorities (Appendix B) have been eliminated.
3. Natural populations of *Sidalcea pedata* and *Thelypodium stenopetalum* at all protected sites show positive trends for establishment and recruitment

for a minimum of five consecutive generations (at least 15 consecutive years for *Sidalcea pedata* and 10 consecutive years for *Thelypodium stenopetalum*).

4. Populations of *Sidalcea pedata* and *Thelypodium stenopetalum* are representative of the current genetic and geographical range of each species and occur in habitats that collectively represent the full range of parameters observed during prescribed research and monitoring efforts.

## **B. Recovery Tasks**

1. Protect and conserve existing, currently unprotected populations of *Sidalcea pedata* and *Thelypodium stenopetalum* and suitable habitat for each species.

An immediate recovery need and priority is the protection and conservation of currently unprotected populations of *Sidalcea pedata* and *Thelypodium stenopetalum* and their suitable habitat. The prospects for the permanent protection of additional *Sidalcea pedata* and *Thelypodium stenopetalum* occurrences will depend heavily on the cooperative efforts of the Fish and Wildlife Service, Forest Service, California Department of Fish and Game, local jurisdictions, and landowners, and on adequate funding for necessary protective infrastructure and management efforts. Protection is necessary to prevent both species from declining irreversibly in the near future.

11. Identify and protect priority habitats and sites.

Because so few of the occurrences of *Sidalcea pedata* and *Thelypodium stenopetalum* (one each) are fully protected, identifying and securing additional habitat protection by purchase, conservation easement, or other means is essential to the recovery of these species. At the present time, adequate information on the location and relative status of *Sidalcea pedata* and *Thelypodium stenopetalum* locales as provided by California Natural Diversity

Data Base and other sources apparently is nearly complete. By contrast, little is known concerning the population dynamics, ecology, and physiology of these species. Thus, the selection and ultimate conservation of priority habitats and locales will be dictated in part by existing and acquired empirical data, and the relative willingness of private and public landowners to participate in the recovery process.

A prioritized list of *Sidalcea pedata* and *Thelypodium stenopetalum* locales is presented in Appendix B. This prioritization list contains rankings of locales with significant and relatively undisturbed populations of one or both species as well as sites with high apparent potentials for habitat restoration. Sites with relatively "low" priority ratings (those that are small, isolated, or highly disturbed) are not included in the table. These sites may be important, however, as sources for seeds or plants for restoration efforts elsewhere. Relative priorities for any and all sites may be changed in the future on the basis of additional experimental and survey data.

12. Develop and implement protection alternatives or mitigation strategies for unprotected sites.

In the past, measures designed to reduce or mitigate project-related impacts to *Sidalcea pedata* and *Thelypodium stenopetalum* occasionally were unsuccessful in achieving the desired result. In some instances, suitable protection alternatives were not identified, pursued, or universally endorsed by regulatory agencies.

121. Identify and evaluate protection alternatives.

A variety of protection programs are now in place for *Sidalcea pedata* and *Thelypodium stenopetalum* populations. Protection options include fee ownership, voluntary landowner protection plans, conservation banks,

and deed restrictions. The adequacy of some of these protection alternatives, such as voluntary agreements, should be evaluated with respect to long-term status of the *Sidalcea pedata* and *Thelypodium stenopetalum* populations at these sites. Future protection should focus on a defined list of acceptable conservation alternatives that have been established by State, Federal, and local agencies to achieve permanent protection.

Currently, multiple agencies and organizations retain responsibility for protection of *Sidalcea pedata* and *Thelypodium stenopetalum* habitat and sites. However, not all of these agency landowners or land managers are presently able or authorized to accept additional parcels or to manage sensitive resources in perpetuity. The Forest Service may accept and manage additional lands if they are adjacent to their existing ownership. In the past, this agency has taken a lead role in monitoring and management of local rare plant species. Subject to budgetary considerations, the California Department of Fish and Game may be in a position to accept mitigation lands and conservation easements for both species.

By contrast, The Nature Conservancy has dramatically reduced its involvement in the Big Bear area. The Fish and Wildlife Service, Forest Service, and California Department of Fish and Game should cooperatively identify the roles and responsibilities of all involved organizations and parties in implementing recovery goals for both species. A creative approach, potentially involving local volunteer organizations, could provide suitable protection and management solutions.

Many of the unprotected *Sidalcea pedata* and *Thelypodium stenopetalum* sites occur on private lands within the

boundaries of the cities of Big Bear Lake and Big Bear City. Therefore, the support and involvement of local cities is highly desirable. City and county planning departments should be provided with current maps and occurrence information. In addition, suggested mitigation guidelines and protection alternatives should be provided to these jurisdictions. This action could be part of the Coordinated Resource Management Plan process.

122. Solicit cooperation of private owners of *Sidalcea pedata* and *Thelypodium stenopetalum* occurrences.

Currently unprotected plant populations on private lands occur on relatively large, undeveloped parcels; small, relatively fragmented lands and habitats; and an array of intermediate conditions. Continuing or future landowner cooperation may provide for the protection or restoration of most, if not all, extant populations or suitable habitat. Even if eventually developed, the smallest sites may be extremely important in enabling predevelopment research relating to minimum viable population sizes, habitat restoration, or plant transplantation methodologies.

To accomplish protection of *Sidalcea pedata* and *Thelypodium stenopetalum* populations on private lands, outreach programs must be continued that effectively encourage and, if possible, reward landowners for conserving listed plants and sensitive habitats on their property. Although Federal agencies are specifically required to utilize their resources to further the purposes of the Endangered Species Act, successful endeavors to secure the permanent protection of populations of *Sidalcea pedata* and *Thelypodium stenopetalum* will require the continuing cooperative efforts of local and State agencies; the

interested public; and, most importantly, the owners of lands with these plant populations or habitats.

123. Develop and implement mitigation strategies.

Mitigation and protection guidelines should be provided to local jurisdictions, landowners, and project proponents to encourage coordinated planning efforts for the protection of *Sidalcea pedata* and *Thelypodium stenopetalum* habitats. Appropriate mitigation strategies could include a) habitat protection through acquisition or conservation easements; b) fencing of rare plant populations; c) contributions to a management endowment fund for protection and restoration projects; or d) development of a mitigation land bank where project proponents could purchase a portion of, or contribute to, an endowment that would allow for the purchase of a priority site targeted for protection. One such management and protection fund for *Sidalcea pedata* and associated rare plants was established by the California Department of Fish and Game with a \$25,000 contribution from a private land developer.

2. Establish cooperative and adaptive management and monitoring programs.

At protected sites throughout the Big Bear Valley, the maintenance and conservation of *Sidalcea pedata* and *Thelypodium stenopetalum* populations depends on adequate management at these sites. Given the relative degradation and fragmentation of habitats at several currently unprotected sites and a current shortage of funds to manage all sites, developing an efficient, coordinated management program is necessary for the recovery of these two plant species. Before a management plan can be developed, detailed studies of the life history and ecology of *Sidalcea pedata* and *Thelypodium stenopetalum* are needed. The combination of prescribed research, and continued species monitoring, and analyses of applied management efforts should provide this information.

21. Prepare a comprehensive adaptive management plan.

Currently, a Coordinated Resource Management Plan for rare species in the Big Bear Valley is being developed through a multi-agency effort involving the Forest Service, the Fish and Wildlife Service, the California Department of Fish and Game, the Corps of Engineers, County of San Bernardino, City of Big Bear Lake, and Big Bear City Community Services District. The ultimate goal is to develop a plan for all rare plant species on public and private lands in the Big Bear Valley. Given the contemplated participation of several Federal, State, and local agencies; landowners; public and private organizations; and other potentially interested parties; the completion of a Coordinated Resource Management Plan as a first step is the preferred approach to providing effective management of these listed species. The Coordinated Resource Management Plan should eventually incorporate and adopt the mitigation strategies, conservation alternatives, management methodologies, and management objectives cooperatively developed as a result of tasks prescribed by this recovery plan.

To facilitate a cooperative approach to the management of *Sidalcea pedata* and *Thelypodium stenopetalum* populations and other endangered and sensitive species, a recovery implementation team composed of agency representatives, species experts, and citizens could meet on an ongoing basis to discuss management of these species and update the management plan. Given the number of sensitive species present in the Big Bear Valley, a recovery implementation team could provide a forum for the development of consistent mitigation strategies and cooperative management projects involving regulatory agencies, landowners, and local conservation groups. The Coordinated Resource Management Plan section specifically devoted to *Sidalcea pedata* and *Thelypodium stenopetalum* would provide the framework, but not necessarily the only basis, for the cooperative management of those two species.



Ideally, this team should include representatives of the Forest Service, the California Department of Fish and Game, the Fish and Wildlife Service, the City of Big Bear Lake, Big Bear City, the Big Bear City Community Services District, The Nature Conservancy, the Friends of the Forest, the Natural Heritage Foundation, landowners, and species experts including local university research ecologists, botanists and naturalists.

22. Manage plant populations and habitat.

Management measures should be developed and then implemented to the extent feasible on an area-wide basis for all *Sidalcea pedata* and *Thelypodium stenopetalum* populations. Management actions that are already underway at some sites should be continued and management efforts should begin at currently unmanaged sites according to the protocols that have been (and will be) developed.

221. Maintain optimum hydrological conditions of habitat.

The maintenance of suitable habitat for *Sidalcea pedata* and *Thelypodium stenopetalum* requires the presence of adequate soil moisture. *Sidalcea pedata* requires wet to moist soil conditions, often related to the presence of a shallow swale or small creek drainage; *Thelypodium stenopetalum* occupies the drier portions of these same areas.

Many of the larger *Sidalcea pedata* and *Thelypodium stenopetalum* occurrences are associated with swales, shallow creeks, or ephemeral run-off, which apparently individually or collectively create or sustain the moist to wet conditions preferred by these species. Maintenance of necessary hydrological conditions requires that natural watercourses be protected, enhanced, and restored as part of the total habitat area.

222. Restrict grazing in wet meadow areas.

Although apparently none of the *Sidalcea pedata* or *Thelypodium stenopetalum* populations are currently affected by grazing, there is some potential for renewed grazing on at least one site. Several plant populations, including those at Pan Hot Springs and Bluff Lake, have been subjected to horse and burro grazing in the past. Livestock grazing may not be compatible with protection of *Sidalcea pedata* or recovery of *Thelypodium stenopetalum* populations. Grazing results in the destruction of plants, trampling of the habitat, and may change the dynamics of exotic invasion. Ideally, grazing should be limited in habitats supporting *Sidalcea pedata* and *Thelypodium stenopetalum* until research can be conducted to identify the effects of grazing on populations and habitats of these species.

223. Limit recreational use in sensitive habitat.

Because a number of the protected populations are close to residential areas, private camps, or other facilities, recreational activity occurs in proximity to *Sidalcea pedata* and *Thelypodium stenopetalum* habitat. Specifically, recreational activities of various types presently occur or are expected to occur in or near *Sidalcea pedata* or *Thelypodium stenopetalum* habitat at Eagle Point, North Baldwin Lake, Upper Holcomb Valley, Metcalf Bay and Ski Beach.

A coordinated effort should be made to continue encouraging landowners to divert recreational activities away from habitat occupied by the listed species. One previous request by The Nature Conservancy led to the

removal of recreation activities from sensitive *Sidalcea pedata* habitat at Bluff Lake.

Although limited recreation may be allowed in the vicinity of rare plant habitat, careful planning is necessary to avoid impacts to these species and the wet meadow interface ecotone in which they occur. The development and implementation of a Recreation Management Plan or less formal guidelines would assist agencies, landowners, and interested citizens to meet this goal.

224. Establish interpretative trails outside essential habitat.

Trails in areas containing *Sidalcea pedata* and *Thelypodium stenopetalum* habitat offer opportunities for interpretation and appreciation of rare and endangered species. However, these trails should be restricted to the perimeter of occupied habitat, with view stops that overlook the plants' habitat. Trails that may impact rare plant habitat currently exist at Upper Holcomb Valley, Eagle Point, and Bluff Lake.

225. Restrict the timing of weed abatement activities in sensitive habitat.

Weed abatement has occurred in *Sidalcea pedata* habitat, particularly where it occurs on or adjacent to private lands. These weed abatement activities, including mowing and clearing, should be restricted to the period from August 1 to March 1 to avoid impacts to flowering and fruiting *Sidalcea pedata* plants. The California Department of Fish and Game has been working with the City of Big Bear Lake to develop a weed abatement agreement for *Sidalcea pedata* and *Thelypodium stenopetalum* (CDFG 1993).

Some *Sidalcea pedata* occurrences are located on the perimeter of residential areas or along road easements. These landowners should be notified of the presence of *Sidalcea pedata* populations and asked to avoid, to the extent possible, impacts to the listed species. In some cases, it may be possible to minimize impacts to *Sidalcea pedata* by simply moving the location of firebreaks.

226. Prevent introduction of exotic plants.

At the present time, exotic plants are not known to represent a significant threat to *Sidalcea pedata* and *Thelypodium stenopetalum* populations in the Big Bear area. Exotic species, primarily grasses and weedy annuals, do occur within the wet meadow habitat, but do not appear to pose a threat to these species. However, because several populations occur adjacent to residential or private recreational facilities, the potential for the introduction of exotic species exists. For example, nonnative trees were planted recently for landscaping purposes within *Sidalcea pedata* habitat on private property. Left in place, these trees would have shaded the plants and eliminated the habitat. Fortunately, negotiations involving the site manager and The Nature Conservancy resulted in the removal of the trees.

227. Fence plant populations and habitats.

Fencing has been established through the efforts of volunteers, particularly the Friends of the Big Bear Valley Preserves and Friends of the Forest, at many of the *Sidalcea pedata* and *Thelypodium stenopetalum* locations to protect rare plant habitat. Fences have been erected at Baldwin Lake Ecological Reserve, South Baldwin Lake (Natural Heritage Foundation), Pan Hot Springs (partial), Eagle

Point (private property), Eagle Point (The Nature Conservancy; 0.4 hectare (1 acre), Metcalf Bay (private property), and Ski Beach. Sites where additional fencing may need to be installed include Bluff Lake, Eagle Point, and Metcalf Bay.

Some of the fenced locations have established fence maintenance programs. Fence maintenance programs at all protected sites are essential and should be funded in perpetuity if, in fact, landowners or volunteer organizations are not able or willing to continue necessary maintenance.

The Baldwin Lake Ecological Reserve has an existing barbed-wire fence along both sides of Highway 18. This fence protects the rare plant habitat, including populations of *Sidalcea pedata* and *Thelypodium stenopetalum*, which occurs immediately inside the fence. Vandalism of the perimeter fence is a persistent problem. In April, 1995, the California Department of Fish and Game sponsored a fence repair day at the reserve. Maintenance of this fence should continue to be a high priority. A comprehensive fence maintenance and monitoring program, ideally involving volunteers, should be established where needed.

23. Monitor population trends and identify potential threats and management needs.

A monitoring program should be initiated that includes, at a minimum, all protected sites. Although the most significant threats to both species appear to be habitat destruction, fragmentation, and changes to natural hydrologic conditions, other potential threats should be monitored on a continuing basis. The results of monitoring carried out at various sites since 1989 suggest that some populations of *Sidalcea pedata* and *Thelypodium stenopetalum* fluctuate in numbers during climatic conditions

ranging from drought to above-average precipitation, but remain viable and potentially stable. If this trend continues, recovery will be both facilitated and expedited. If this trend does not continue or if potential future threats are identified, appropriate corrective measures should be identified and implemented.

Accordingly, biological monitoring will provide essential baseline data to evaluate the stability of the populations monitored. Substantial baseline data pertaining to population status of *Sidalcea pedata* and *Thelypodium stenopetalum* were obtained during the exceptionally wet years of 1992 and 1993 at Baldwin Lake. Additional data pertaining to the latter species were obtained at Upper Holcomb Valley in 1993 (Neel 1993). Populations of *Thelypodium stenopetalum* at Baldwin Lake increased 74 percent in 1992 and 83 percent in 1993.

231. Continue biological monitoring program.

A biological monitoring program conducted annually since 1989 at Ski Beach (20), Upper Holcomb Valley/Belleville (10), and Baldwin Lake Ecological Reserve (1) included the study of permanent plots or transects for both species. Annual monitoring was conducted in 1989 and 1990 at Bluff Lake and from 1989 through 1991 at Pan Hot Springs, Metcalf Bay (private property) and Eagle Point. This monitoring was accomplished through 1991 as a cooperative effort between the Forest Service, The Nature Conservancy, and the California Department of Fish and Game, using standardized methodology. The current monitoring protocol is described in Barrows (1990, 1991), Greene (1993), and Neel (1991, 1992, 1993).

With 4 years of monitoring data now available for both species at several sites, recommendations have been made to modify monitoring methods, particularly for

*Thelypodium stenopetalum* (Greene 1993, Neel 1993). If modifications are made, the changes should be implemented at all sites where monitoring continues. An appropriate interval should also be determined for subsequent monitoring. Yearly monitoring may not be necessary at all sites.

232. Identify and monitor current and potential threats.

Monitors must be able to recognize and accurately characterize real and potential threats to populations of *Sidalcea pedata* and *Thelypodium stenopetalum*. These threats include, but are not limited to, habitat destruction; exotic species infestations; depredation; disease; recreational activities; and changes in hydrology, habitat parameters, or soil conditions. These potential threats should be monitored on a quantitative basis whenever possible to facilitate the anticipation of existing or developing impacts and the timely adjustment of management plans and priorities.

Observations and analyses generated as a result of past monitoring of the species at the Baldwin Lake Ecological Reserve and various other sites suggest that protected subpopulations will remain stable in the face of "normal" environmental variation. However, these data presently are insufficient to address or predict the species' tolerance of extreme random events engendered by the individual or combined effects expressed by an array of environmental variables and parameters. Therefore, some basic criteria for evaluating population viability should be developed. These criteria should establish whether or not a) a population has demonstrated a net increase over a period of at least 10 years, b) the net amount of occupied habitat has increased over the same time frame, and c) observed population

fluctuations fall within the "normal" range. Fluctuations in population numbers are entirely expected and result, at least in part, from the expressed effects of abiotic and biotic variables, including annual rainfall or available soil moisture. It is assumed that viable and stable populations may nonetheless periodically decrease in geographic extent and numbers during adverse conditions.

233. Report findings with recommendations.

Consistent with past practice, annual reports on monitoring should be prepared for each site and submitted to a recovery implementation team and the appropriate regulatory agencies (e.g., the Fish and Wildlife Service, California Department of Fish and Game, Forest Service Big Bear Ranger District). These reports should contain clear descriptions of the methods employed, the results of the monitoring or management effort, and recommendations for future changes in management strategies and priorities.

Once the required reports are submitted, a recovery implementation team and responsible agencies should review the results and recommendations to determine what changes in the management plan or overall or recovery strategy may be needed. Subject to the availability of funds and regulatory agencies' purviews, identified, threats to species populations will be addressed by means of appropriate management actions.

3. Restore or enhance habitat occupied by *Sidalcea pedata* and *Thelypodium stenopetalum* and increase the amount of secure, occupied habitat for both species.



After the tasks outlined in previous sections of the plan have been completed, any necessary restoration or enhancement of *Sidalcea pedata* and *Thelypodium stenopetalum* populations should be undertaken expeditiously. The restoration of additional habitat could be accomplished through additional land acquisition or protection, followed by restoration of former habitat areas or existing degraded habitat. One apparent candidate for enhancement is an area of degraded habitat for *Sidalcea pedata* in the vicinity of the Metcalf Creek. Even though the population has been impacted by grading, mowing, and roads, the extent of suitable habitat at this locale could be significantly increased if habitat protection and restoration (e.g., replanting) measures are implemented. Restoration efforts are, of course, subject to the cooperation and indulgence of the appropriate landowners or land management agencies.

31. Research and implement effective restoration techniques.

Limited information is available pertaining to the effectiveness of the various techniques that might be employed to restore *Sidalcea pedata* or *Thelypodium stenopetalum* populations and habitat. Supplemental research efforts should be designed to identify economical and efficient restoration techniques and determine the relative importance of such parameters as site preparation, irrigation and hydrology, seedbank reserves, and weeding in producing desired increases in plant populations and habitat.

The propagation of *Sidalcea pedata* and *Thelypodium stenopetalum* from seeds has not been attempted. And, although three experimental plant transplantation projects have been attempted and partial success was achieved, the development of a definitive technique for relocating plants has not yet been developed or adequately field tested.

The germination of *Sidalcea pedata* and *Thelypodium stenopetalum* specimens from seeds is one possible means of procuring plants for restoration efforts. Although there are

substantial data and information pertaining to the propagation of other plant species, there have been no attempts to grow *Sidalcea pedata* and *Thelypodium stenopetalum* from seed.

Prior to the initiation of an intensive transplantation program, the viability of this option should be researched and tested. Assuming that propagation from seed is feasible, seed gathering (and planting) done during annual monitoring could ultimately reduce management costs and facilitate restoration efforts. If prudent or necessary, approximately 5 percent of available seeds could be collected and stored at Rancho Santa Ana Botanic Garden or a similar facility (see Greene 1993). If found to be economical and otherwise practical, the propagation of plants from seed should be tested in the laboratory and in the field.

Transplantation experiments with the listed species should be undertaken with due caution. To date, three transplantation experiments involving limited numbers of plants have been conducted. In two cases, plants were transplanted from a development site to a 0.4-hectare (1-acre) lot on Garstin Road. The survival rate of transplanted plants after 3 years has been approximately 25 percent. In the third experiment, twelve plants were transplanted to the Upper Holcomb/Bellville site. This transplanted population is presumed to be extirpated.

Some of the small, isolated or highly degraded occurrences of *Sidalcea pedata* and the few corresponding occurrences of *Thelypodium stenopetalum* may not be suitable for protected status. However, these areas might serve as sources for plants for transplantations to restoration and enhancement areas. If *Sidalcea pedata* or *Thelypodium stenopetalum* plants become available as a result of salvage operations at nonessential sites, the efficacies of various transplantation techniques should be evaluated and implemented.

32. Evaluate restoration options at existing, optimum sites.

Protected sites with a relative abundance of optimum, undisturbed habitat may contain areas where the restoration of nonoptimum habitat within the site may be biologically prudent. Several sites, including Eagle Point and Bluff Lake, have existing trails through *Sidalcea pedata* and *Thelypodium stenopetalum* habitat. The feasibility of removing these trails and restoring habitat should be evaluated. At Eagle Point, the contouring of soil surfaces in trail areas could be done to restore natural hydrological conditions and, thus, promote the reestablishment of habitat.

33. Select and prioritize plant reintroduction and habitat restoration sites.

If the reintroduction of plants or habitat restoration are not feasible or no longer possible in protected optimum sites, alternate sites should be selected and priority-ranked. High priority sites should contain topographical features, soil factors, and hydrological parameters that compare favorably with the corresponding attributes of existing, functional habitat. To the extent possible, reintroductions and habitat restorations should be done in areas known to have been previously occupied by *Sidalcea pedata* and *Thelypodium stenopetalum*.

34. Restore sufficient habitat and plants to achieve recovery.

Once necessary research has been done and conservation alternatives have been selected and implemented, any and all plant and habitat restoration efforts dictated by relevant research should be undertaken. Previously developed and proven plant reintroduction and habitat restoration techniques should be employed and continuously evaluated and refined.

As discussed in Task 123, habitat protection through title acquisition or conservation easements is an option. Actual acquisition may not be needed if there is sufficient voluntary commitment by landowners.

All restoration actions, progress, and results should be fully monitored and documented. A recovery implementation team, all regulatory agencies, and other interested parties will be notified of the progress of restoration efforts in yearly reports.

35. Establish criteria to evaluate restoration programs.

Criteria to assess the success of the various restoration efforts should be developed. These criteria should include the population and habitat parameters evaluated and the bases for determinations that restoration objectives have been met or that satisfactory progress has been made in that regard.

Deficiencies in the restoration efforts should be identified, reported, reexamined, and corrected. The Recovery Management Team shall recommend appropriate corrective measures if restoration efforts do not produce results consistent with objectives and needs identified by relevant research. Monitoring and restoration efforts beyond the year 2006 may be necessary if difficulties are encountered in establishing viable, restored habitats. Restoration efforts should be continued until essential restorations are fully successful and prescribed research has established that *Sidalcea pedata* and *Thelypodium stenopetalum* are fully recovered (i.e., no longer threatened with extinction and endangerment).

4. Conduct necessary research on the population dynamics, ecology, and physiology of *Sidalcea pedata* and *Thelypodium stenopetalum*.

Given a composite of the existing data base relating to *Sidalcea pedata* and *Thelypodium stenopetalum*, it is evident that additional research is

necessary to enable, expedite and ensure the recovery of the listed species. Specifically, additional research is needed to elucidate the genetic variability, population dynamics, life histories, ecological requirements, transplantation tolerances, and minimum viable population sizes of the two listed species.

Sites given high priority for protection and management should contain (or be capable of containing) minimum viable populations of the two plant species. The tenets of the minimum viable population (MVP) theory are based on the assumption that larger populations are better able than smaller ones to counter stochastic or random events that threaten populations with extinction (Menges 1991). However, population viability analysis, including determination of a minimum viable population size, requires substantial empirical data on factors including environmental variables, genetics, and population characteristics (Menges 1991). Data derived from studies of both species suggest that significant annual fluctuations in population numbers may occur as a result of random environmental events, including drought.

Information derived from relevant research is necessary to create statistical models that predict with accuracy the likelihood of the persistence of the species over time. Necessary research may be recommended by a recovery implementation team and conducted by appropriate agencies, or their agents. In the present absence of more definitive, species-specific information, Menges' (1991) conclusions relating to minimum viable population size of plant populations are germane and should be cautiously considered in evaluating conservation alternatives.

5. Develop an educational outreach program for the purpose of enhancing public awareness of the need for the protection and recovery of *Sidalcea pedata* and *Thelypodium stenopetalum*.

Public awareness of restoration and other recovery efforts may help create a positive image of these efforts and, thus, reduce impacts to protected populations. Interpretive programs and materials are already available

through the efforts of the Forest Service, Big Bear Ranger District and the Friends of the Forest. The Forest Service provides information at their visitor center in Fawnskin.

Interpretive exhibits and trails should be established adjacent to rare plant habitat containing *Sidalcea pedata* and *Thelypodium stenopetalum* populations. Outreach and education efforts will almost certainly enhance the public's understanding and appreciation of these rare plants, and thereby reduce accidental impacts to the species. Interpretive facilities are appropriate at several public or very accessible locations, such as at Baldwin Lake Ecological Reserve, Eagle Point, Metcalf Bay, and Upper Holcomb Valley. Interpretive signs and exhibits placed at these locations should describe and depict sensitive local resources and the involvement and contributions of volunteers; announce the availability of published materials and information; and advertise the locations and times of interpretive walks and programs.

### III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines the specified actions and estimated costs for the recovery of *Sidalcea pedata* and *Thelypodium stenopetalum*. It is a guide for meeting the objectives discussed in the Recovery section of this plan and depicts task numbers, descriptions, priorities, and durations, responsible agencies, and estimated costs. The implementation schedule utilizes the numbering system from the Recovery section of this document to identify recovery tasks. These actions, when accomplished, should bring about the recovery of *Sidalcea pedata* and *Thelypodium stenopetalum* and the protection of their habitat. Because the monetary needs for all parties involved in recovery are identified, this schedule reflects the total estimated financial requirements to reach the reclassification objective for these species. All costs related to recovery efforts except perpetual maintenance of optimum habitat hydrology, possible regulatory costs beyond the year 2007, possible land acquisition, possible perpetual maintenance activities, and possible monitoring of restored sites beyond the 2007 are estimated and included in the schedule. These additional costs, to be determined (TBD), are noted in the comments section of the implementation schedule.

Priority numbers given in Column 1 of the implementation schedule are defined as follows:

Priority 1: An action that must be taken to prevent extinction or the species from declining irreversibly.

Priority 2: An action that must be taken to prevent a significant decline in population numbers or habitat quality of these two species, or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery of these species.

Responsible or Involved Agencies (acronyms used in parentheses): Big Bear City; Big Bear Community Services District; City of Big Bear Lake; California Department of Fish and Game (CDFG); U.S. Army Corps of Engineers (COE); U.S. Fish and Wildlife Service (FWS); U.S. Forest Service (FS).

**IMPLEMENTATION SCHEDULE FOR *SIDALCEA PEDATA* AND *THELYPODIUM STENOPETALUM* RECOVERY**

Priority Number	Task Number	Task Description	Task Duration (Years)	Responsible Agencies	Total Estimated Cost (\$1000's) thru 2007	Costs (\$1000s)										Comments
						FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	
1	11	Identify and protect priority habitats and sites.	10	FWS FS COE CDFG	10	1	1	1	1	1	1	1	1	1	1	Support from area cities would assist CDFG and FWS; additional possible costs TBD
1	121	Identify and evaluate protection alternatives.	10*	FWS FS CDFG	65	15	10	5	5	5	5	5	5	5	5	Outreach to landowners vital  *Volunteer support may be available; costs after 2007 TBD
1	122	Solicit cooperation of private landowners.	10	ALL	20	5	5	2	2	1	1	1	1	1	1	
2	123	Develop and implement mitigation strategies.	10*	ALL	53	8	5	5	5	5	5	5	5	5	5	*Precise costs and task duration will be determined by land acquisition costs (if any) and results of prescribed research.
2	21	Prepare a comprehensive adaptive management plan.	2	ALL	5	3	2									
2	221	Maintain optimum hydrological conditions of habitat.	10	FWS FS CDFG COE	27	5	4	3	3	2	2	2	2	2	2	



**IMPLEMENTATION SCHEDULE FOR *SIDALCEA PEDATA* AND *THELYPODIUM STENOPETALUM* RECOVERY**

Priority Number	Task Number	Task Description	Task Duration (Years)	Responsible Agencies	Total Estimated Cost (\$1000's) thru 2007	Costs (\$1000s)										Comments
						FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	
2	222	Restrict grazing in meadow habitats.	10	ALL	10	1	1	1	1	1	1	1	1	1	1	
2	223	Limit recreational use in sensitive habitat.	10	ALL	10	1	1	1	1	1	1	1	1	1	1	
2	224	Establish interpretative trails outside essential habitat.	3	ALL	3	1	1	1								
2	225	Restrict the timing of weed abatement activities in sensitive habitat.	3	ALL	3	1	1	1								
2	226	Prevent introduction of exotic plants.	10*	FWS CDFG FS	20	2	2	2	2	2	2	2	2	2	2	*Precise cost determined by extent of problem
2	227	Fence plant populations and habitat.	10	ALL	50	9	8	8	5	5	5	3	3	2	2	Particularly needed at Bluff Lake, Ski Beach, Eagle Point; public outreach and volunteer assistance essential
2	231	Continue biological monitoring program.	10	ALL	20	2	2	2	2	2	2	2	2	2	2	Requires coordination with local jurisdictions, State agencies, and landowners

**IMPLEMENTATION SCHEDULE FOR *SIDALCEA PEDATA* AND *THELYPODIUM STENOPETALUM* RECOVERY**

Priority Number	Task Number	Task Description	Task Duration (Years)	Responsible Agencies	Total Estimated Cost (\$1000's) thru 2007	Costs (\$1000s)										Comments
						FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	
2	232	Identify and monitor current and potential threats.	10	ALL	10	1	1	1	1	1	1	1	1	1	1	Requires coordination with local land planners
2	233	Report findings with recommendations.	10	ALL	10	1	1	1	1	1	1	1	1	1	1	
2	31	Research and implement effective restoration techniques.	7	ALL	22	3	3	2	2	2	2	2	2	2	2	
2	32	Evaluate restoration options at existing, optimum sites.	5	ALL	10	2	2	2	2	2						
2	33	Select and prioritize plant reintroduction and habitat restoration sites.	10	ALL	15	2	2	2	2	2	1	1	1	1	1	
2	34	Restore sufficient habitat and plants to achieve recovery.	8*	FWS CDFG FS	32			5	5	5	5	3	3	3	3	*Precise costs and task duration will be determined by land acquisition costs (if any) and results of prescribed research.
3	35	Establish criteria to evaluate restoration programs.	5	ALL	25	5	5	5	5	5						

**IMPLEMENTATION SCHEDULE FOR *SIDALCEA PEDATA* AND *THELYPODIUM STENOPETALUM* RECOVERY**

Priority Number	Task Number	Task Description	Task Duration (Years)	Responsible Agencies	Total Estimated Cost (\$1000's) thru 2007	Costs (\$1000s)										Comments
						FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	
3	4	Conduct necessary research on the population dynamics, ecology and physiology of the two plant species.	3	FWS CDFG FS	30	10	10	5	5							
3	5	Develop an educational outreach program.	10	FWS CDFG FS	22	3	3	2	2	2	2	2	2	2	2	Volunteer assistance likely will be available.
<b>TOTAL</b>					472	81	70	57	52	45	37	33	33	32	32	

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**APPENDIX A.        Individuals and Agencies Contacted To Provide Input  
To Recovery Plan**

Big Bear City Community Services District, Big Bear Blvd, Big Bear City, CA. (909) 585-2565. Re: Pan Hot Springs. Contacts: Cheryl Bardowell (General Manager) and Gary Sissell.

Big Bear Lake, City of. 39707 Big Bear Blvd., P.O. Box 2800, Big Bear Lake, CA 92315. (909) 866-7831. Contact: Janice Etter, Senior Planner.

California Department of Fish and Game, Natural Heritage, Region 5. 1429 Foothill Rd., Ojai, CA 93203. (805) 640-8019. Contact: Mary Meyer, Plant Ecologist.

California Department of Fish and Game, Region 5. 330 Golden Shore, Suite 50, Long Beach, CA 90802. (310) 590-5113. Contact: Patricia Wolfe, Regional Manager.

California Department of Fish and Game. Big Bear area Warden Rick Coelho. P.O. Box 47, Big Bear City, CA 92314.

Forest Properties, Inc. Big Bear Lake, CA. (909) 866-9270. Contact: Steve Foulkes. Re: Eagle Point occurrence and rare plant mitigation site.

Kegarice, Lisa. Regarding China Gardens occurrence (formerly worked for U.S. Army Corps of Engineers and has surveyed *Sidalcea pedata* at this site). (213) 838-6437.

Natural Heritage Foundation, P.O. Box 656, Big Bear Lake, CA 92315. (909) 584-2248. Contact: Terrence Martin, Robert Linblad.

Nature Conservancy, The. 785 Market Street, San Francisco, CA, 94105. (415) 777-0487. Contact: Lynn Lozier, Director of Landowner Protection Program.

Sanders, Andy. University of California Riverside, Herbarium. (909) 787-3601. Regarding *S. pedata* collections.

United States Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 2730 Loker Ave., Carlsbad, CA. 92008. (700) 431-9440. Contacts: Nancy Gilbert, Fred Roberts, Pete Sorensen, John Hanlon, Loren Hays.

United States Fish and Wildlife Service, Ventura Fish and Wildlife Office, 2493 Portola, Suite B, Ventura, CA 93003, (805) 644-1766. Contact: Constance Rutherford, Botanist.

United States Forest Service, San Bernardino National Forest, Big Bear Ranger District, P.O. Box 290, Fawnskin, CA 92333. (909) 866-3437. Contact, Maile Neel, District Botanist.

## Appendix B. Priority For Increased Protection of *Sidalcea pedata* and *Thelypodium stenopetalum* Sites.

<u>Number<sup>1</sup></u>	<u>Occurrence Name</u>	<u>Description</u>	<u>Protection Alternatives</u>
<b>High</b>	<b>Significance</b>		
6	Bluff Lake Meadow	Forest Service previously involved in negotiations with the landowner for the purchase or exchange of this property.	If purchase or land exchange cannot be obtained, determine potential for conservation easement.
19	Eagle Point	Property only partially fenced, and protected by conservation easement.	Secure occupied and potential habitat by fencing and enforce conservation easements.
12	Southwest end of Baldwin Lake	Relatively undisturbed site with approximately 20 hectares (50 acres) of wetland and sensitive plant habitat, including large populations of <i>Sidalcea pedata</i> and <i>Thelypodium stenopetalum</i> (occurrence 7). Four hectares (10 acres) is protected through 1990 deed restriction by the Big Bear Community Services District. Previously undescribed portion of population south of fence was detected in 1994; area is unprotected.	Owned by Big Bear City Community Services District of Pan Hot Springs. Secure primary hydrology and protect unprotected populations.
17	Metcalf Bay	Two areas of occupied <i>Sidalcea</i> habitat occur on this site total approx. 0.8 hectares (2 acres). One area was degraded and is recovering; the second area was disturbed by prior managers.	Conservation easement for long-term protection, possible fencing of habitat on western margin of property.
3	Metcalf Creek	A degraded site, which includes approximately 0.8 hectare (2 acres) of habitat near the Big Bear Lake margin. Site was recommended as mitigation area for proposed "Metcalf Bay Improvement Project - Marina and Channel" in 1988-1989.	Conservation easement or voluntary agreement with landowner; possible fencing to protect plants. Some enhancement may be appropriate.



## Appendix B. Priority For Increased Protection of *Sidalcea pedata* and *Thelypodium stenopetalum* Sites.

<u>Number<sup>1</sup></u>	<u>Occurrence Name</u>	<u>Description</u>	<u>Protection Alternatives</u>
16	"Drive-In Theater" Site	Site with degraded habitat west of Metcalf Creek. Approximately 200 scattered plants on property in 1991.	Possible purchase of site (through mitigation bank program); possible conservation easement to California Department of Fish and Game.
<b>High</b>	<b>Significance</b>		
5	China Garden/Big Bear Lake	Portion of site degraded by grading/filling; overall has relatively undisturbed habitat.	Mitigation for future development to include on-site protection or contribution to mitigation bank.
18	Jay Bird Lane, Metcalf Meadow	Small, wet meadow on south side of Highway 18 east of Tulip Lane. Few plants are present; enhancement may be necessary.	
<b>Moderate</b>	<b>Significance</b>		
8	S. Baldwin Lake	Scattered plants on undeveloped, privately-owned lots and small number of plants on Natural Heritage Foundation property on Shay Road. Relatively undisturbed area at the present time; density of <i>Sidalcea</i> unknown.	Conservation easement or voluntary agreement with landowner. Possible mitigation bank site.
21	Eureka and Park Drives near Eagle Point	High density of <i>Sidalcea</i> on scattered residential lots in neighborhood area.	Voluntary protection or possible off-site mitigation. Possible enhancement/restoration research.
15	Between Metcalf and Boulder Bays	Scattered in empty lots and front yards of residential area; corner of Chipmunk Dr. and along Willow Landing Dr.	Possible off-site mitigation or use for restoration research.

## Appendix B. Priority For Increased Protection of *Sidalcea pedata* and *Thelypodium stenopetalum* Sites.

<u>Number</u> <sup>1</sup>	<u>Occurrence Name</u>	<u>Description</u>	<u>Protection Alternatives</u>
22	Highway 18, from City of Big Bear Lake Civic Center to Iris Lane	Partially in CALTRANS right-of-way, disturbed by weed abatement, clearing; highly degraded.	Site fenced in 1996. High potential for restoration.
<b>Low</b>	<b>Significance</b>		
9	E. Baldwin Lake	No current data on occurrence; plants on undeveloped lots along lake's eastern margin. Easternmost occurrence of species.	Off-site mitigation/mitigation bank; voluntary protection.
7	Metcalf Meadow along Lakeview Dr.	Scattered plants in residential lots; none observed during 1993 cursory survey. Access to private lands necessary for adequate survey.	Off-site mitigation or use at site for enhancement/restoration research.

<sup>1</sup> = These sites are largely located in developed areas and in most cases contain small, isolated patches of habitat that supports *Sidalcea pedata*. Sites are listed in ranked (descending) order according to the number of plants (not total area) contained.

**Appendix C: Summary of Agency and Public Comments on the Draft Recovery Plan for *Sidalcea pedata* and *Thelypodium stenopetalum***

On August 21, 1997, the U. S. Fish and Wildlife Service released the Draft Recovery Plan for *Sidalcea pedata* and *Thelypodium stenopetalum* for a 60-day comment period that ended October 20, 1997, for Federal agencies, State and local governments, and members of the public (62 **Federal Register** 44484).

The Fish and Wildlife Service sent letters to three people considered to be experts with *Sidalcea pedata* and *Thelypodium stenopetalum* to solicit comment on the Draft Recovery Plan. Responses were received from all three experts. An additional three comment letters were received. Therefore, the number of letters received by affiliation are as follows:

Federal agencies	2 letters (1 peer reviewer)
State government	1 letter
Academia	2 letters (both peer reviewers)
Environmental/conservation organizations	1 letter

The peer reviewers were:

Derby, Jeanine. Forest Supervisor. Cibola National Forest. 7501

Elderwood Dr. NW. Albuquerque, New Mexico. 87120

Krantz, Tim. Department of Environmental Studies. University of

Redlands. 1200 E. Colton Avenue. Redlands, California. 92373-0999

Wilson, Ruth. P.O. Box 158. Alta Loma, California. 91701

### **Summary of Significant Comments and Fish and Wildlife Service Responses**

The Fish and Wildlife Service reviewed all of the comments received during the comment period. Comments received were generally positive, providing recommendations for research/conservation strategies and correcting and updating specific locality descriptions and information. All applicable comments have been addressed in, or incorporated into, the body of the Final Recovery Plan.

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**July 1998**