

Few-flowered Navarretia
(Navarretia leucocephala ssp. pauciflora)

5-Year Review:
Summary and Evaluation

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

June 2008

5-YEAR REVIEW
Few-flowered Navarretia (*Navarretia leucocephala* ssp. *pauciflora*)

I. GENERAL INFORMATION

I.A. Methodology used to complete the review:

This review was prepared by the Sacramento Fish and Wildlife Office (SFWO) of the U.S. Fish and Wildlife Service (Service) using information from the 2005 *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) (Service 2005), the California Natural Diversity Database (CNDDDB 2007), and survey information from experts who have been monitoring various localities of this species. The Recovery Plan and personal communications with experts were our primary sources of information used to update the species status and threats sections of this review.

I.B. Contacts

Lead Regional or Headquarters Office –Diane Elam, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, and Amedee Brickey, Fish and Wildlife Biologist, Region 8, 916-414-6464

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I.C. Background

I.C.1. FR Notice citation announcing initiation of this review: 72 FR 7064, February 14, 2007. We received no information from the public in response to this notice.

I.C.2. Listing history

Original Listing

FR notice: 62 FR 33029

Date listed: June 18, 1997

Entity listed: Subspecies (*Navarretia leucocephala* ssp. *pauciflora*)

Classification: Endangered

I.C.3. Associated rulemakings:

No critical habitat rules have been published for the few-flowered navarretia.

I.C.4. Review History

We have not conducted any previous status reviews for this species. Updated information on its status and threats was included in the 2005 Recovery Plan.

I.C.5. Species' Recovery Priority Number at start of review:

The recovery priority is 3 (based on a 1-18 ranking system where 1 is the highest recovery priority and 18 is the lowest) because the degree of threat and recovery potential are high and the few-flowered navarretia has a taxonomic rank of sub-species.

I.C.6. Recovery Plan or Outline

Name of plan: Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon
Date issued: December 15, 2005

II. REVIEW ANALYSIS

Species Overview

As summarized in our Recovery Plan (Service 2005), navarretias are annual herbs of the phlox family (Polemoniaceae). These flowers are small, funnel-shaped, and are only 0.4 to 1.6 inches tall and approximately twice as wide due to branches originating near the base of the stem. The stems are white with purple streaks and approximately 0.02 inch in diameter. Each flower head is 0.16 to 0.39 inch-wide and contains between 2 and 20 pale blue or white flowers. The fruit of this species is a papery capsule that breaks open only when wet (Service 2005).

The few-flowered navarretia is extremely rare. This species is dependent on vernal pools for survival and its life history is closely linked to the hydrology of these wetlands. This species is found only on vernal pools on substrates of volcanic origin, specifically in Northern Basalt Flow and Northern Volcanic Ashflow Vernal Pools. Extant localities in Lake County are in "flats" of recent alluvium in mountainous areas; site specific details are not known for Napa County sites.

This species is found in Lake and Napa counties, in the Lake-Napa Vernal Pool Region. All occurrences are within an approximately 20-square mile area (CNDDDB 2007). The CNDDDB reports eight known occurrences of this species; six in Lake County and two in Napa County (CNDDDB 2007). However, it is difficult to determine the actual number of localities because of some plants exhibit characteristics that are intermediate between the few-flowered navarretia and many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*) as discussed below and because some occurrences historically reported have very vague location descriptions and these locations may represent known sites by different names (Bittman 1989).

Few-flowered navarretia was first given the Latin name *Navarretia pauciflora*. This taxon was subsequently reduced in rank and assigned the name *Navarretia leucocephala* ssp. *pauciflora* (Day 1993). Many-flowered navarretia, also federally-listed as endangered, was reduced in rank and assigned the name *Navarretia leucocephala* ssp. *plieantha*. Some populations of *Navarretia* consist of individuals intermediate in characteristics between two subspecies. According to Dr. Alva Day (*in litt.* 1997), these plants are not properly called hybrids nor "intercrosses," as the final listing rule (U.S. Fish and Wildlife Service 1997) described them. Dr. Day (*in litt.* 1997) has distinguished two types of intermediate specimens, which others have identified as either many-flowered navarretia or few-flowered navarretia. One group is intermediate between many-

flowered navarretia and few-flowered navarretia, and the other is intermediate between many-flowered navarretia and Baker's navarretia (*N. leucocephala* ssp. *bakeri*).

The Mead Ranch, in Napa County, is the only locality that is protected from development under a conservation easement (CNDDDB 2007) held by the Napa Valley land trust (Napa Valley Land Trust 2008). However, this easement allows for conversion of 30 additional acres to vineyards. It is unknown if the areas available for conversion are suitable for the few-flowered navarretia.

The Recovery Plan incorrectly states that the locality near the town of Cobb, Lake County, is protected under a conservation easement. Instead, this locality is designated by Lake County as a "Natural Area" (T. Elliot, Lake County Planning, Building, and Development Department, pers. comm. 2007). The designation of "Natural Area" is used by Lake County to draw attention to parcels that have vernal pools or serpentine soils to make landowners aware of additional permits that may be necessary to obtain from State or Federal agencies if these sensitive resources will be impacted (T. Elliot, pers. comm. 2007). In the past, botanists have reported few-flowered navarretia at the California Department of Fish and Game's (CDFG) Loch Lomond Preserve. Currently, it is not known if few-flowered navarretia, many-flowered navarretia, or an intermediate species occurs at this site (A. Day, *in litt.* 1989, 1997; R. Bittman, CDFG, pers. comm. 2007). If few-flowered navarretia occurs at these preserves, then the species would be protected from habitat loss. All of the remaining sites are on private land and not protected.

II.A. Application of the 1996 Distinct Population Segment (DPS) policy

II.A.1. Is the species under review listed as a DPS?

Yes
 No

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species if vertebrate wildlife. This definition limits listing as distinct population segments (DPS) to vertebrate species of fish and wildlife. Because the species under review is a plant and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

II.B. Recovery Criteria

II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes
 No

II.B.2. Adequacy of recovery criteria.

II.B.2.a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

Yes
 No

II.B.2.b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

Yes
 No

II.B.3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

General recovery criteria for the few-flowered navarretia and 19 other listed plants and animals are described in the Recovery Plan (Service 2005). This Recovery Plan uses an ecosystem-level approach because many of the listed species and species of concern co-occur in the same natural ecosystem and share the same threats. The over-arching recovery strategy for few-flowered navarretia is habitat protection and management. The five key elements that comprise this ecosystem-level recovery and conservation strategy are: (1) habitat protection; (2) adaptive management, restoration, and monitoring; (3) status surveys; (4) research; and (5) public participation and outreach.

The Recovery Plan describes the geographic distribution of vernal pool taxa according to the vernal pool regions defined by the California Department of Fish and Game (CDFG) (Keeler-Wolf *et al.* 1998). Vernal pool regions are discrete geographic regions identified largely on the basis of endemic species, with soils and geomorphology as secondary elements. Within the vernal pool regions, the Recovery Plan identifies core areas that support high concentrations of federally listed vernal pool species, are representative of a given species' range, and are generally where recovery actions are focused. Core areas are distinct areas that provide the features, populations, and distinct geographic and/or genetic diversity necessary to the recovery of a species. More than one federally listed vernal pool species may be found within a single core area, and the core areas encompass areas larger than just the location of any single species. Within each core area, the Recovery Plan identifies specific percentages of suitable habitat that should be protected to achieve recovery for listed species. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery, with Zone 1 reflecting the highest priority areas. Protection of the majority of suitable habitat within Zone 1 core areas, and Zone 2 and 3 core areas where appropriate, is recommended to provide corridors and dispersal habitat, support

metapopulation dynamics, provide for reintroduction or introduction sites, and to protect currently undiscovered populations.

The Recovery Plan provides recovery criteria that either directly or implicitly address the four listing factors noted in the final rule to list the species: destruction, modification, or curtailment of habitat or range (Factor A), disease or predation (Factor C), inadequacy of existing regulatory mechanisms (Factor D), and other man-made or natural factors affecting its continued existence (Factor E). Factor B, overutilization for commercial, recreational, scientific, or education purposes, was not included as a threat in the listing rule and is not addressed in the Recovery Plan. Since the Recovery Plan has only recently begun to be implemented, species surveys and monitoring efforts that will provide data to evaluate progress towards recovery have yet to be implemented.

Downlisting/delisting criteria for the few-flowered navarretia include:

1. Habitat protection: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species.

This criterion addresses Factor A¹.

1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

Vernal pool regions used in the Recovery Plan are based largely on the presence of endemic species, with soils and geomorphology as secondary elements, and each region contains one or more of the vernal pool species covered in the plan. Core areas are distinct areas in each vernal pool region that support high concentrations of federally-listed vernal pool species and are representative of a given species range, and are generally where recovery actions are focused. Core areas represent viable populations, and possibly even source populations of vernal pool species for larger metapopulations, that will contribute to the connectivity of habitat and thus increase dispersal opportunities between populations. More than one federally-listed vernal pool species may be found within a single core area, and the core areas encompass an area larger than just the location of few-flowered navarretia. In the Recovery Plan, the core areas that pertain to few-flowered navarretia include: (1) Berryessa, (2) Boggs Lake-Clear Lake, (3) Dry Lake, and (4) Jordan Park. These four core areas occur in the Lake-Napa Vernal Pool Region.

The Recovery Plan identifies specific percentages of suitable habitat to be protected in each of the four core areas. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery. Core areas containing few-flowered navarretia are included as Zones 1, 2, and 3 in the Recovery Plan. For the few-flowered navarretia, the Recovery Plan recommends that 95 percent

¹A) Present or threatened destruction, modification or curtailment of its habitat or range;
B) Overutilization for commercial, recreational, scientific, or educational purposes;
C) Disease or predation;
D) Inadequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

of Zone 1 and Zone 2 core recovery areas be protected. Jordan Park is a Zone 3 core area (Zone 3 represents currently unoccupied, historical habitat, which has not been identified for this species) and the Recovery Plan states that presence of this species should be determined in this area and percentage of the area to be protected will be determined at a future date. Table 1 provides a summary of the zone designations for each of the four core areas.

Table 1: Few-flowered navarretia core recovery areas.

Lake-Napa Vernal Pool Region Core areas: Berryessa (Zone 2) Boggs Lake-Clear Lake (Zone 1) Dry Lake (Zone 1) Jordan Park (Zone 3)
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To downlist the few-flowered navarretia, the Recovery Plan recommends that 95 percent of Zone 1 and Zone 2 core recovery areas be protected. In addition, the Recovery Plan recommends that 100 percent of known localities be protected. Neither of these criteria has been met. To delist this species, the Recovery Plan recommends that 100 percent of all reintroduced/newly discovered populations be protected. The Recovery Plan states that presence of this species at Jordan Park should be determined, and if detected, the locality should be protected. At this time, new populations have not been discovered or reintroduced. Therefore, this criterion has not been met.

The Service does not yet have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected habitat that is suitable for this species. The amount of suitable habitat that exists range wide has not yet been estimated; therefore, the percent that has been protected range wide is still unknown. However, the majority of localities of this species are on private land and are not protected. The only protected locality of this species includes the Mead Ranch site, in Napa County (CNDDDB 2007). The Loch Lomond Ecological Preserve, in Lake County, may also have protected localities of few-flowered navarretia, although this is not certain.

1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

This recovery criterion has not been met. Known localities of this species' range have not changed from what was known historically. If few-flowered navarretia occurs at the Boggs Lake Preserve and/or the Loch Lomond Preserve, then these localities would have extreme edges protected. However, we do not have recent information that indicates whether these areas are currently occupied by few-flowered navarretia.

1C. Reintroduction and introductions must be carried out and meet success criteria.

This recovery criterion has not been met. The Recovery Plan recommends that the presence of the species be determined at Jordan Park, in Lake County. If surveys do not indicate that this species is present here, then the species should be reintroduced there. The status of few-flowered navarretia at Jordon Park has not been determined yet.

1D. Additional localities that are detected (and determined essential to recovery goals) are permanently protected.

At this time, additional localities have not been detected.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

This criterion has not been met. Monitoring of hydrology has not occurred at any of the known extant populations; therefore the Service is unable to determine whether the hydrology at extant locations has supported viable populations through a variety of hydrologic conditions.

2. Adaptive Habitat Management and Monitoring

This criterion implicitly addresses Factors A, D, and E.

2A. Habitat management and monitoring plans that facilitate maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected, as previously discussed in sections 1A-E.

The CDFG have prepared a Draft Management Plan for Loch Lomond Vernal Ecological Reserve (CDFG 1994). This management plan indicates that periodic monitoring of listed plant species is planned; however, monitoring of few-flowered navarretia has not occurred to date (G. Cooley, CDFG, *in litt.* 2007). Management at the Loch Lomond Ecological Preserve is minimal and consists primarily of ensuring that fencing is maintained to ensure that off-road vehicles do not enter the site (G. Cooley, *in litt.* 2007). The Nature Conservancy's Boggs Lake Preserve does not have a management or monitoring plan in place at this time (L. Lozier, The Nature Conservancy, pers. comm. 2007). The Service does not have information regarding whether a management or monitoring plan has been developed for the Natural Area near Cobb, Lake County. This criterion has not been met.

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of 1A-E, as previously discussed (funding, personnel, etc).

This criterion has not been met. The Loch Lomond Ecological Preserve is managed by the CDFG and relies on annual funding requests through the State of California. Over the last ten

years this site has received no funding at all (P. Hoffman, CDFG, pers. comm. 2008). The Boggs Lake Preserve is managed by the Nature Conservancy. The Preserve does not have dedicated funds for management and monitoring of potential few-flowered navarretia. Funding is dependent on annual funding requests to The Nature Conservancy (L. Lozier, pers. comm. 2007).

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under 1A-D for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

Monitoring of ecosystem function has not occurred for any of the known populations of this species; therefore, the Service is unable to determine if the ecosystem function has been maintained at locations that have supported viable populations through a variety of hydrologic conditions.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

This criterion has not been met. Seed banking actions have not been implemented, and the Service is not aware of any plans for seed banking actions for this species.

3. Status Surveys

This criterion implicitly addresses Factors A, D, and E.

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

Monitoring has not occurred for a duration that meets the requirements specified in the Recovery Plan; therefore, the Service is unable to determine if this criterion has been met at this time. The Service is not aware of any standardized monitoring for this species. Occasionally individual localities have been visited by botanists; however, many of the sites have not been visited for over ten years. For these sites, biologists have noted the number of plants observed when out in the field, but no standardized site assessments exist for any of the sites. The Recovery Plan states that standardized status surveys should establish parameters that evaluate population sizes to determine overall trends in species status rangewide (e.g., evidence of reproduction and recruitment). Specific monitoring parameters have not yet been identified for this species.

Vernal pool region working groups will be important for tracking the progress of recovery efforts, including monitoring the status of populations of this species, particularly on private lands that are not currently monitored.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

Systematic habitat monitoring has not occurred at any of the known localities of few-flowered navarretia since the listing of this species. However, status surveys were conducted in the mid-1980s (McCarten 1985; Bittman 1989). When few-flowered navarretia was listed in 1997, the primary threats to its survival and recovery were alterations to hydrology, conversion of habitat to agriculture, effects from road maintenance activities, and competition from non-native weed species. We have no new information to suggest that these threats to the species have substantially changed since the time of listing in 1997.

4. Research

Research implicitly addresses all five listing factors.

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

The Recovery Plan discusses a variety of research that would be beneficial to help refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (pages IV-53 to IV-63). The Recovery Plan recommends research on genetics, taxonomy, biology of vernal pool species, the effects of habitat management practices on vernal pool species and their habitat, and threats to vernal pool species and ecosystems.

Currently, this criterion has not been met. The majority of information needs discussed in the Recovery Plan are still outstanding. Leigh Johnson, from Brigham Young University, is currently conducting research on the genetics of the *Navarretia leucocephala* group by utilizing microsatellite markers (L. Johnson, Brigham Young University, *in litt.* 2007).

4B. Research on genetic structure has been completed (for species where necessary – for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in sections 1A-E.

See 4A, above. Results are preliminary and therefore have not been incorporated into any habitat protection plans. This criterion has not been met.

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

See 4A, above. This criterion has not been met.

5. Participation and outreach

Public participation and outreach implicitly address all five listing factors.

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

The Recovery Plan discusses a variety of participation programs to achieve the goal of recovery of the listed species in the plan. An essential component of this collaborative approach is the formation of a single recovery implementation team overseeing the formation and function of multiple working groups formed at the vernal pool region level. The Service is currently in the preliminary stages of organizing both a recovery implementation team and multiple working groups. Service employees have met with various stakeholders to determine interest of stakeholders to be involved in working groups and/or the recovery implementation team. This criterion has not been met.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

See 5A, above. This criterion has not been met.

5C. Participation plans for each vernal pool region have been completed and implemented.

This criterion has not been met, as it has not been initiated.

5D. Vernal pool region working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

This criterion has not been met, as it has not been initiated.

II.C. Updated Information and Current Species Status

II. C.1. Biology and Habitat

II.C.1.a. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Informal status surveys were conducted at all of the known localities for this species in the mid-1980s (McCarten 1985; Bittman 1989). This information can be found in the 1997 listing rule for this species (62 FR 33029). No other information on abundance and population trends has been collected for this species. In addition, the taxonomic confusion surrounding this species makes it difficult to determine whether the species actually occurs at some sites, including Loch Lomond and Boggs's Lake. According to Alva Day, the Boggs's Lake location is *Navarretia leucocephala* ssp. *plieantha* and the specimens from Loch Lomond are intermediate between *Navarretia leucocephala* ssp. *plieantha* and *Navarretia leucocephala* ssp. *pauciflora*.

II.C.1. b. Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historical range (e.g., corrections to the historical range, change in distribution of the species within its historical range, etc.):

Few-flowered navarretia is known from only a small number of populations within a 20-square-mile area. This species is currently found in volcanic ash substrate, clay pan vernal pools in chaparral, grassland, or mixed coniferous forest in southern Lake and Napa Counties. The subspecies occurs at elevations of 1,400 to 2,800 feet. We have no new information that indicates a change in the distribution of this species within its current range.

II.C.1.c. Extant Localities

Following is a discussion of known localities of this species:

Napa County localities

Milliken Canyon – This locality occurs off Atlas Road, near Milliken Creek. Jake Ruygt surveyed this site in 1987 (CNDDDB 2007). The Service does not have any information regarding more recent surveys of this site. This locality corresponds with occurrence number 7, as reported in the CNDDDB (CNDDDB 2007).

Mead Ranch – This locality occurs off of Atlas Road, near Monticello Road. Jake Ruygt surveyed this locality in 2000 and detected 10,000 plants (CNDDDB 2007). According to the CNDDDB (2007), this site is protected by a conservation easement; however, the Service does not have any information regarding this easement. This locality corresponds with CNDDDB occurrence number 8 (CNDDDB 2007).

Lake County localities

Manning Flat – This locality occurs at Manning Flat, adjacent to State Route 29. This site is threatened by erosion. A ditch was dug in the early 1900s to drain the vernal pool in Manning Flat and several large gullies have formed in the middle of the flat. Roxanne Bittman surveyed this site in 1990. Surveys at Manning Flat were conducted in 1999 and few-flowered navarretia was detected in road side ditches on both sides of SR 29 (D. Taylor, Jepson Herbarium, University of California, *in litt.* 2007). The California Department of Transportation (Caltrans) performed plant surveys for the proposed State Route 29 road widening project. Few-flowered

navarretia was detected at Manning Flat in several areas during these surveys (Caltrans 2007). This locality corresponds with CNDDDB occurrence number 4 (CNDDDB 2007).

Ely Flat – This locality occurs at Ely Flat, west of Soda Bay Road (CNDDDB 2007). This site was surveyed in 1989 and the Service does not have any additional information regarding surveys of this site. This locality corresponds with CNDDDB occurrence number 9 (CNDDDB 2007).

Hesse Flat – This locality occurs at Hesse Flat, north of Lower Lake Road. This locality was surveyed in 1990 by Roxanne Bittman (CNDDDB 2007). The Service is not aware if more recent surveys of this site have occurred. This locality corresponds with CNDDDB occurrence number 5 (CNDDDB 2007).

Cobb area – There is one locality in the vicinity of the town of Cobb (A. Howald, CDFG, *in litt.* 1995). This site is not reported in the CNDDDB (2007).

Loch Lomond - This locality is located near Loch Lomond, in the vicinity of SR 29. This site is currently owned by CDFG as an ecological reserve. The site is not monitored by CDFG (G. Cooley, pers. comm. 2007). The taxonomic status of this species is not certain at this site, as this site may contain either intermediates of the *N. leucocephala* group (A. Day, *in litt.* 1989), or possibly few-flowered navarretia (R. Bittman, pers. comm. 2007). According to the CNDDDB (2007), the last survey of this site occurred in 1985 (McCarten 1985), and few-flowered navarretia was not found. This locality corresponds with CNDDDB occurrence number 1 (CNDDDB 2007).

Boggs Lake – This locality is located within or possibly adjacent to the Nature Conservancy's Boggs Lake Preserve (Bittman 1987). The species has been reported to occur at Boggs Lake (Howald 1998; R. Bittman, pers. comm. 2007). An intermediate was known in the past, but hasn't been observed since the 1950s (Bittman 1989). Currently, only many-flowered navarretia is known to occur in the Boggs Lake area (McCarten 1985; Bittman 1989; Howald 1998). Surveys were last conducted in 1998 and few-flowered navarretia was not detected, although many-flowered navarretia was detected (Howald 1998). Future surveys are necessary to determine whether few-flowered navarretia is present at this site. This site is not reported in the CNDDDB (2007).

In addition to the localities discussed above, there are historical records of other localities that have never been relocated, which include: (1) Lower Lake (CNDDDB occurrence 3), (2) Jordan Park (CNDDDB occurrence 10); and Breems Lake (not reported in the CNDDDB). These historical records have extremely vague locality descriptions and may represent other already known sites by different names (Bittman 1989). It is also possible that the few-flowered navarretia have been extirpated from these sites.

II.C.1.d. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.); taxonomic classification or changes in nomenclature:

There has been no new information on genetics or taxonomy since listing of this species in 1997. The preliminary stages of genetic research are underway by Leigh Johnson (*in litt.* 2007) (See section 4A).

II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

II.C.2.a. Present or threatened destruction, modification or curtailment of its habitat or range:

The 1997 listing rule states that the primary threats to this species are alteration of hydrology, effects from road maintenance activities, agriculture land conversion, construction of a stock pond, off-road vehicle use, inappropriate grazing regimes, and competition from invasive weedy plant species. Current information on this species is limited, and the Service has limited new information regarding whether these threats have decreased or increased since this species was listed. However, it is likely that in most cases these threats continue at similar levels. A discussion of these threats is provided below, with the exception of invasive weedy plant species, which is discussed in section II.C.2.e., below.

Alteration of Hydrology

Many of the known localities of this species have been threatened by changes in hydrology. The Manning Flat occurrence is the most threatened by changes to hydrology as gullies have formed from attempts to drain Manning Flat in the early 1900s. The gullies continue to increase in size. If the erosion is not stopped the few-flowered navarretia habitat at this site will be lost because the vernal pool holds less water every year (McCarten 1985; Bittman 1989). Caltrans currently plans to widen State Route 29 and is currently in informal consultation with the Service to analyze potential effects to the few-flowered navarretia that occurs within Manning Flat. It is not known at this time if the highway-widening project will result in impacts to this species. Hydrology has also been altered at Ely Flat and Hesse Flat in attempts to drain the vernal pools at these sites (CNDDDB 2007; Bittman 1989). The locality near the town of Cobb, Lake County, occurs in a vernal pool that is encroached by development (J. Diaz, *in litt.* 2007), which may alter the hydrology by limiting the amount of surface and sub-surface flow that enters the vernal pool.

Effects from Road Maintenance Activities

The Service has no new information regarding road maintenance activities since the species was listed in 1997. Caltrans has proposed to widen SR 29 through Manning Flat, which contains a known locality of few-flowered navarretia. It is not known at this time if the widening of Manning Flat would indirectly affect this species. There is potential for Caltrans to design the proposed road widening project to prevent further erosion in Manning Flat, which would be a beneficial effect to this species.

Conversion to Agriculture

This continues to be a primary threat to this species. The Ely Flat locality has been reported to be threatened by agriculture development (Bittman 1989; CNPS 1990). The majority of few-flowered navarretia localities are threatened by conversion to agriculture or adjacent agriculture practices to some degree (CNDDDB 2007). Currently, only the Mead Ranch locality, in Napa County, is protected from habitat modification by conservation easements (Service 2005; CNDDDB 2007). It is possible that this species occurs at the Nature Conservancy's Boggs Lake Preserve and the CDFG's Loch Lomond Ecological Preserve, in which case these localities would be protected from habitat loss as well. However, it is currently unclear if few-flowered navarretia occurs at these sites or if only many-flowered navarretia or an intermediate species occurs at these sites instead.

Construction of a Stock Pond

The 1997 listing rule stated that this species was threatened by the construction of a stock pond at Ely Flat. This stock pond was constructed prior to the listing of this species at an unknown time. The Service has no new information to determine if the stock pond has had an adverse effect on this species.

Off-road Vehicle Use

Off-road vehicle use has threatened the locality at Manning Flat in the past (CNPS 1977; Bittman 1989). However, the Service has no recent information regarding off-road vehicle use at Manning Flat. The Loch Lomond site has been threatened by off-road vehicle use in the past (Bittman 1989); and is still threatened currently by occasional fence vandalism and vehicle trespass (S. Zalusky, pers. comm. 2008).

Inappropriate Grazing Regimes

The Milliken Canyon locality in Napa County may be threatened by sheep grazing (CNDDDB 2007). The Mead Ranch locality has been reported as being threatened by horse grazing (CNDDDB 2007). There have been reports in the past that livestock grazing may also potentially threaten the locality at Hesse Flat (CNPS 1990). The Service does not have any additional information regarding grazing at these sites and it is not known if grazing is a threat at this time.

II.C.2.b. Overutilization for commercial, recreational, scientific, or educational purposes:

Overutilization was not known to be a threat at the time of listing and still does not appear to be a threat at this time.

II.C.2.c. Disease or predation:

Disease and predation were not known to be a threat to this species at the time of listing, and these factors are still not known to be threats at this time.

II.C.2.d. Inadequacy of existing regulatory mechanisms:

In the final rule we identified the inadequacies of the Federal Clean Water Act and the California Environmental Quality Act.

Federal Laws

The Endangered Species Act of 1973, as amended (Act), is the primary Federal law that provides protection for few-flowered navarretia. Section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the “take” of federally-endangered wildlife, however, plants are not protected against take. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e. collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation. The protection of Section 9 afforded to endangered species is extended to threatened wildlife and plants by regulation. The Act affords protection to federally-listed plants if they co-occur with federally-listed wildlife species.

Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement. Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act and the implementing regulations prohibit the removal and reduction to possession of federally-listed threatened or endangered plants or the malicious damage of endangered plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas when in violation of state law or regulation or in the course of any violation of a State criminal trespass law.

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

Federal Clean Water Act: The Section 404 of the Clean Water Act (CWA) may afford some protection to few-flowered navarretia. The U.S. Army Corps of Engineers (Corps) issues permits for the discharge of dredged or fill material into navigable waters of the U.S. The Corps interprets “the waters of the United States” expansively to include not only traditional navigable waters, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. Before issuing a 404 permit for a project that may affect federally-listed species, the Corps is required under Section 7 of the Act to consult with the Service. The Act is the primary Federal law that provides protection for few-flowered navarretia since its Federal

listing as an endangered species in 1997. Without the provisions of the Act, protection of these sites would not likely have occurred.

Recent Supreme Court rulings have called into question the Corps' definition of Waters of the U.S. On June 19, 2006, the U.S. Supreme Court vacated two district court judgments that upheld this interpretation as it applied to two cases involving "isolated" wetlands. Currently, the Corps regulatory oversight of vernal pools is in doubt because of their "isolated" nature. If the Corps loses their regulatory authority over vernal pools, unmitigated destruction of potential habitat for few-flowered navarretia may increase over the range of the species.

California State Laws: The State's authority to conserve wildlife is comprised of the California Endangered Species Act (CESA) and the California Environmental Quality Act (CEQA). Few-flowered navarretia was listed as threatened under CESA in 1990. As stated earlier, the Federal Act does not authorize take for the destruction of endangered plants on non-Federal areas in violation of State law. Therefore, the CESA would offer protection at the State level if few-flowered navarretia was not federally-endangered. CEQA (chapter 2, section 21050 *et seq.* of the California Public Resources Code) requires government agencies to consider and disclose environmental impacts of projects and to avoid or mitigate them where possible. Under CEQA, public agencies must prepare environmental documents to disclose environmental impacts of a project and to identify conservation measures and project alternatives. Through this process, the public can review proposed project plans and influence the process through public comment. If a project may impact known populations of few-flowered navarretia, these impacts would be disclosed to the Service and allow the Service an opportunity to comment on the proposed project's effects to this species. Typically, project proponents proposed conservation measures to offset or minimize adverse effects to listed species. However, CEQA does not guarantee that such conservation measures will be implemented.

II.C.2.e. Other natural or manmade factors affecting its continued existence:

The 1997 listing rule states that non-native invasive plant species are threats to few-flowered navarretia. Current threats include those discussed in the 1997 final rule, as well as climate change, small number of localities, and risk of localized stochastic extirpations.

The threats of invasive plant species, climate change, small numbers of localities, and risk of localized stochastic extirpations exist for all localities of few-flowered navarretia whether they are on protected lands or not. Threats to this species are not likely being managed at any of the known localities. The Service is not aware of any known localities that have management plans or monitoring programs to ensure that potential threats are managed and controlled. In addition, funding is not sufficient at any of the protected localities for systematic surveys to be conducted to determine if potential threats are present. The lack of management, monitoring, and funding are not, in themselves, threats to few-flowered navarretia; however, without these components, potential threats may not be identified and eliminated.

Invasive Plant Species: Competition from invasive plant species continues to pose a threat to this species. The localities at Hesse Flat and Manning Flat have been reported to be threatened by invasive plant species such as yellow star thistle (*Centaurea solstitialis*) (CNPS 1990).

Although specific information regarding adverse effects from invasive plant species is not available for all sites, we believe it is likely that many of the localities of few-flowered navarretia are currently threatened by invasive plants to some degree. Further research and monitoring are necessary to determine the degree that this species is threatened by non-native invasive plant species.

Climate Change: Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Pyke 2005). However, climatic conditions for smaller sub-regions such as California remain uncertain (Pyke 2005).

Climate is predicted to change in California during the 21st century (Field *et al.* 1999; Cayan *et al.* 2005). Even modest changes in warming could result in a reduction of the spring snowpack, earlier snowmelt, and more runoff in winter with less runoff in spring and summer, more winter flooding, and drier summer soils (Field *et al.* 1999; Cayan *et al.* 2005). The predicted impacts on California's ecosystems projected with a high certainty include (1) higher sea level; and (2) decreased suitable habitat for many terrestrial species as climate change intensifies human impacts [for example isolated patches of vernal pools can be so poorly connected with other patches that migrations required by climate change may be difficult or impossible without human intervention (Field *et al.* 1999)].

It is unknown at this time if climate change in California will result in a localized, relatively small cooling and drying trend, or a warmer trend with higher precipitation events (Pyke 2005). However, it is possible that either scenario would result in negative effects to vernal pool species (Pyke 2004; Pyke and Marty 2005). Cooling and drying trends could adversely affect few-flowered navarretia through decreased inundation periods that do not allow the species sufficient time to complete its life cycle. In contrast, warmer conditions with higher precipitation could increase the area of vernal pools, which would not necessarily be a negative effect because increased vernal pool area could increase available habitat for few-flowered navarretia. There could also be increased competition from nonnative plants. Monitoring of vernal pool ecosystems to determine effects from climate change is necessary to determine what adaptive land management practices would be the most appropriate to ensure the sustainability of vernal pool species (Pyke and Marty 2005), including few-flowered navarretia.

Small Numbers of Localities/Stochastic Extinction: The conservation biology literature commonly notes the vulnerability of taxa known from one or very few locations (e.g., Shaffer 1981, 1987; Primack 1998; Groom *et al.* 2006). In particular, small numbers of localities makes it difficult for this species to persist while sustaining the impacts from competition from non-native plant species, intensive grazing, changes in hydrology, adjacent development, drought, or other unknown factors. Such populations may be highly susceptible to extirpation due to chance environmental disturbances (Goodman 1987; Gilpin and Soule 1988). If a locality of few-flowered navarretia has several consecutive years of poor rainfall, intensive grazing, changes in hydrology from adjacent development, or intense competition from other plant species, it is possible that the locality will become extirpated. Populations that decline to zero may not always be capable of rebounding from the soil seed bank and the population is likely to become extirpated (Service 2005).

II.D. Synthesis

When few-flowered navarretia was listed in 1997, the primary threats to its survival and recovery were alterations to hydrology, conversion of habitat to agriculture, effects from road maintenance activities, effects from off-road vehicle use, inappropriate grazing regimes, and competition from non-native weed species. We have no new information to suggest that these threats to the species have substantially changed since the time of listing in 1997. In addition, other factors, such as climate change, small numbers of localities, and threats of localized stochastic extirpation may also threaten this species. The majority of known localities for this species do not have management plans, monitoring programs, or adequate funding to ensure that these localities are sustainable in perpetuity. The CDFG's Loch Lomond Preserve is the only locality that has a draft management plan, but it is not known at this time if few-flowered navarretia actually occurs at this site. Lack of management, monitoring, and funding are not, in themselves, threats to this species; however, without these components, the potential threats described above may not be identified and eliminated. Other than habitat preservation, other criteria discussed within the Recovery Plan have not been met, and in some instances, not initiated, including research, monitoring, management, seed banking, and public participation and outreach. Based on the continuing threat of altered hydrology, habitat loss resulting from conversion to agriculture and development, small numbers of localities/ risk of localized stochastic extirpation, and the lack of progress in meeting recovery criteria, we conclude that few-flowered navarretia still meets the ESA definition of endangered. No status change is recommended at this time.

III. RESULTS

III.A. Recommended Classification:

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

III.B. New Recovery Priority Number: N/A

We recommend that the recovery priority number remain 3.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

The following recommendations for future actions are from the 2005 Recovery Plan and the results of discussions on the status of the species and the species' needs with several recognized few-flowered navarretia experts:

1. Erosion control measures should be implemented at Manning Flat to prevent further erosion of this site and to prevent the destruction of the few-flowered navarretia locality found here.
2. The majority of known localities of this species are on private land and not protected. Preservation of Zone 1 and 2 core areas should be pursued to preserve known localities that are currently not protected.
3. Once additional sites are protected, management plans should be prepared for the protected sites. Results from standardized monitoring discussed in item 4, below, should be included in the management plans for these protected sites. Grazing management and invasive weed control should be primary components of these management plans.
4. Conduct research at as many of the extant localities as possible to incorporate research recommendations outlined in the 2005 Recovery Plan. The following research should be prioritized over the next five years:
 - a. Develop a standardized monitoring method to monitor species status and population trends at all known locations. This will better our understanding of potential threats to the species, and will aid in the development of methods to ameliorate these threats.
 - b. Conduct research on the genetic structure of the species to determine the taxonomic status of the *Navarretia leucocephala* group.
5. Regional vernal pool working groups should be created in regions where few-flowered navarretia is known to occur to aid with monitoring and management efforts.

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF FEW-FLOWERED NAVARRETIA**

Current Classification: Endangered
Recommendation resulting from the 5-Year Review

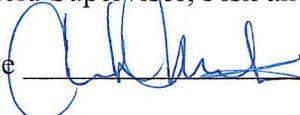
- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number, if applicable N/A

Review Conducted By Sacramento Fish and Wildlife Office Staff

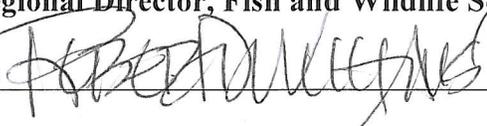
FIELD OFFICE APPROVAL:

 **Lead Field Supervisor, Fish and Wildlife Service**

Approve  Date 12/21/07

REGIONAL OFFICE APPROVAL:

 **Lead Regional Director, Fish and Wildlife Service**

Approve  Date 2/10/08