Navarretia leucocephala ssp. *plieantha*
(Many-flowered Navarretia)

5-Year Review:
Summary and Evaluation

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

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5-YEAR REVIEW
Navarretia leucocephala ssp. *plieantha* (Many-flowered Navarretia)

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 (CNDDB 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 Jenness McBride, Fish and Wildlife Biologist Region 8, California and Nevada Office, 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: *Navarretia leucocephala* ssp. *plieantha*, a plant subspecies
Classification: Endangered

I.C.3. Associated rulemakings:

No critical habitat rules have been published for *Navarretia leucocephala* ssp. *plieantha*

I.C.4. Review History

We have not conducted any status reviews for this species since listing. 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 to 18 ranking system where 1 is the highest recovery priority and 18 is the lowest) because the degree of threat and recovery potential is high and *Navarretia leucocephala* ssp. *plieantha* 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). *Navarretia leucocephala* ssp. *plieantha* forms mats 5 to 20 centimeters (2.0 to 7.9 inches) across and 1 to 3 centimeters (0.4 to 1.2 inches) high. The stems have a peeling, white surface and are highly branched. Stem thickness is 0.8 to 1.4 millimeters (0.03 to 0.06 inch) and is more or less uniform throughout its length. The leaves are 3 to 4 centimeters (1.2 to 1.6 inches) long and are either entire or have a few thread-like lobes. Flower heads are 1.5 to 2 centimeters (0.6 to 0.8 inch) across and contain between 10 and 60 pale blue flowers. Each flower in the head is 5 to 6 millimeters (0.20 to 0.24 inch) long. Each fruit may contain as many as three seeds (Mason 1946; Day 1993*b*). The fruit of this species is a papery capsule that breaks open only when wet (Service 2005). The chromosome number is unknown.

Navarretia leucocephala ssp. *plieantha* was first given the Latin name *Navarretia plieantha.* This taxon was subsequently reduced in rank and assigned the name *Navarretia leucocephala* ssp. *plieantha* (Day 1993). *Navarretia leucocephala* ssp. *pauciflora* (few-flowered navarretia), also federally-listed as endangered, was reduced in rank from *Navarretia pauciflora* and assigned the name *Navarretia leucocephala* ssp. *pauciflora*. Some populations of *Navarretia* consist of individuals intermediate in characteristics between these 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 *N. leucocephala* ssp. *plieantha* or *N. leucocephala* ssp. *pauciflora*. One group is intermediate between *N. leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *pauciflora,* and the other is intermediate between *N. leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *bakeri* (Baker's navarretia). For convenience, we refer to all of these as *N. leucocephala* ssp. *plieantha* throughout this review, but the population at the type locality is referred to as "typical" *N. leucocephala* ssp. *plieantha*.

Navarretia leucocephala ssp. *plieantha* is extremely rare. This species is found only on substrates of volcanic origin and is dependent on vernal pools, vernal lakes, and swales for survival. Its life history is closely linked to the hydrology of these wetlands. The California Natural Diversity Database (CNDDB) reports seven known occurrences of this species; five in

Lake County and two in Sonoma County (CNDDB 2007). Of the seven occurrences the CNDDB (2007) has catalogued as *N. leucocephala* ssp. *plieantha*, all are considered to be extant. Two localities for *N. leucocephala* ssp. *plieantha* are protected as reserves. The only typical population of *N. leucocephala* ssp. *plieantha* occurs at Boggs Lake Ecological Reserve that is co-owned and managed by California Department of Fish and Game and The Nature Conservancy. The California Department of Fish and Game manages the Loch Lomond Vernal Pool Ecological Reserve.

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

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

____ ***Yes***
_X_ ***No***

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA) 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?

_X_ ***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?

__X_ ***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)?

_X_ ***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 *Navarretia leucocephala* ssp. *plieantha* 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 *N. leucocephala* ssp. *plieantha* 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 that just the location of any single species. The Recovery Plan identifies specific percentages of suitable habitat that should be protected within core areas and percentages of all occurrences 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 *Navarretia leucocephala* ssp. *plieantha* include:

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

This criterion addresses Factor A[1].

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. Each region contains one or more of the vernal pool species covered in the Recovery 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. In the Recovery Plan, the core area that pertains to *Navarretia leucocephala* ssp. *plieantha* is Boggs Lake-Clear Lake which occurs within the Lake-Napa Vernal Pool Region. This core area encompasses an area larger than just the location of *N. leucocephala* ssp. *plieantha*.

The Recovery Plan identifies specific percentages of suitable habitat to be protected in the core area. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery. The single core area containing *Navarretia leucocephala* ssp. *plieantha* is Zone 1 in the Recovery Plan.

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 (five of seven) of the localities of this species are not protected. The only protected populations of this species include occurrences at: (1) Boggs Lake Preserve, Lake County; and (2) Loch Lomond Vernal Pool Ecological Reserve, Lake County. The Boggs Lake locality represents the typical form of the species. To downlist *Navarretia leucocephala* ssp. *plieantha*, the Recovery Plan recommends that 100 percent of known localities and 95 percent of Zone 1 core recovery area be protected. To delist this species, the Recovery Plan recommends that 100 percent of all reintroduced populations be protected. None of these criteria has been met.

1B. Species localities distributed across the species geographic range and genetic range are

[1].A) 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.

protected. Protection of extreme edges of populations protects the genetic differences that occur there.

Navarretia leucocephala ssp. *plieantha* has been known historically and currently to occur only in Sonoma and Lake Counties. This criterion has not been met because the southern most occurrences in Sonoma County have not yet been protected.

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

This recovery criterion has not been met. The Recovery Plan recommends reintroduction to vernal pool regions and soil types from which status surveys indicates the species has been extirpated. No reintroductions or introductions have occurred to date.

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

No additional localities for this species have been identified.

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 Pool Ecological Reserve* (CDFG 1994). This management plan indicates that periodic monitoring of listed plant species is planned; however, monitoring of *Navarretia leucocephala* ssp. *plieantha* has not occurred to date (G. Cooley, CDFG, pers. comm. 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, pers. comm. 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). 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 dependent on funding from CDFG and over the last ten years has received no funding at all (P. Hoffman, CDFG, pers. comm. 2008). The Nature Conservancy's Boggs Lake Preserve does not have a funding mechanism to provide for management and monitoring of *Navarretia leucocephala* ssp. *plieantha* found there and funding is dependent on available funding from 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.

This criterion has not been met. 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 during a time period that meets the requirements specified in the Recovery Plan; therefore, this criterion has not 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 range-wide (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.

This criterion has not been met. Systematic habitat monitoring has not occurred at any of the known localities of *Navarretia leucocephala* ssp. *plieantha* during or since the listing process. However, informal status surveys have occurred periodically in the 1980s and 1990s (CNDDB 2007). When *Navarretia leucocephala* ssp. *plieantha* was listed in 1997, the threats to its survival and recovery were activities that resulted in the direct destruction of the plants and their habitat or hydrologic change in its vernal pool habitat. Such activities included wetland drainage, off-highway vehicle use, effects from road maintenance activities, residential development, and competition from invasive weedy plant species. Small numbers of localities and threats of localized stochastic extirpation also potentially threatened this 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, and 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 relevant listing factors.

5A. Recovery Implementation Team is established and functioning to oversee range-wide 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 their interest in joining 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 have occurred at all of the known localities for this species (CNDDB 2007). However, status surveys are infrequent and monitoring has not been sufficient to quantify abundance and identify trends.

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.):

Navarretia leucocephala ssp. *plieantha* is known from only a small number of widely separated populations. This species is currently found in volcanic ash substrate, clay pan vernal pools in chaparral, grassland, or mixed coniferous forest in southern Lake and Sonoma Counties. The subspecies occurs over a 390 square-mile area at elevations of 110 to 2,800 feet (CNDDB 2007).

II.C.1.c. Extant Localities

At the time of listing in 1997, we reported that *Navarretia leucocephala* ssp. *plieantha* was historically known from eight locations in Lake and Sonoma Counties. Two historical populations in Sonoma County were considered potentially extirpated and were possibly hybrids between *N. leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *bakeri*. All five extant populations were found in Lake County (62 FR 33029). The CDFG reported that historically there were about eight sites known: two are protected, four are on private land, and two are extirpated (CDFG 2005).

Table 1 summarizes the intermediacy, trend, ownership, date last surveyed, and protection of *Navarretia leucocephala* ssp. *plieantha.* Following the table is a discussion of known occurrences for the taxon.

<u>Lake County localities</u>

Boggs Lake – This locality occurs at Boggs Lake; on the east side, along the north side, and west of the lake. This site was last surveyed on May 5, 1986 by R. York (CNDDB 2007). The Service does not have any information regarding more recent surveys of this site. This locality corresponds with occurrence number 1, as reported in the CNDDB (CNDDB 2007). Additionally, this is the type locality of the species and is protected through The Nature Conservancy and CDFG.

Table 1: *Navarretia leucocephala* ssp. *plieantha* core recovery area and occurrences.

Core Area Name (# of Occurrences)	Occurrence Name	Intermediacy	Trend	Last Surveyed	Owner-ship Type	Protection Type
Bogg's Lake-Clear Lake	Bogg's Lake	Typical *plieantha*	Increasing	May 5, 1986	CDFG TNC	Ecological Reserve
	Loch Lomond	Intermediate A*	Unknown	May 25, 1986	CDFG	Ecological Reserve
	Sieglers Springs	Intermediate A*	Unknown	May 6, 1986	Private	None
	Steinhart Lakes	Not seen by Alva Day	Unknown	April 29, 1989	Private	None
	Mt Hannah Lodge	Intermediate A*	Unknown	July 2, 1987	Private	None
Outside of Recovery Plan	Sander's Road	Intermediate B*	Unknown	May 5, 1998	Private	None
	Shiloh Ranch	Intermediate B*	Unknown	June 1, 1985	Private	None

* Intermediate A taxa are intermediate between *Navarretia leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *pauciflora,* another federally listed endangered species. Intermediate B taxa are intermediate between *N. leucocephala* ssp. *plieantha and N. leucocephala ssp. bakeri.* The intermediates are not believed to be hybrids (A. Day *in litt.* 1997). The two occurrences from outside the recovery area are in Sonoma County and were considered potentially extirpated in the final listing rule.

Loch Lomond – This locality occurs off of State Highway 29 on the southeast slope of Mt. Hannah according to the CNDDB (2007). This site was last surveyed on May 15, 1986 by R. York (CNDDB 2007). According to the CNDDB (2007), this site is protected as a California Department of Fish and Game Vernal Pool Ecological Reserve. This locality corresponds with CNDDB occurrence number 4 (CNDDB 2007).

Seiglers Springs – This locality is located 1.8 miles east of Loch Lomond, on the road to Seiglers Springs. This site was last surveyed on May 6, 1985 by N. McCarten (CNDDB 2007). This locality corresponds with CNDDB occurrence number 5 (CNDDB 2007) and is privately owned.

Steinhart Lakes – This locality is located at the northernmost lake of Steinhart Lakes, east of Spruce Grove Road, seven air-miles northeast of Middletown. The site was last surveyed by R. Bittman and N. McCarten on April 29, 1989 (CNDDB 2007). At that time, this site was primarily undisturbed save for a small cattle pond at one end of the occurrence (CNDDB 2007). This locality corresponds with CNDDB occurrence number 11 (CNDDB 2007) and is privately owned.

Mt. Hannah Lodge – This locality is located east of State Highway 175 and Mt. Hannah Lodge, south of Clear Lake. The site was last surveyed on July 2, 1987 by R. Bittman and R. Holland

(CNDDB 2007). This locality corresponds with CNDDB occurrence number 12 (CNDDB 2007) and is privately owned.

Sonoma County localities

Saunders Road – This locality occurs approximately two miles south of Windsor, south of Saunders Road. Four colonies are mapped as two polygons in CNDDB. Two colonies occur just south of Saunders Road along either side of a unnamed street; a third colony occurs about 0.4 miles southeast of the end of Saunders Road; and a northwest colony was found in 1998 by a crew surveying for *Lasthenia burkei* (Burke's goldfields) (CNDDB 2007). This site was last surveyed for *Navarretia leucocephala* ssp. *plieantha* on May 23, 1986 by J. Guggolz (CNDDB 2007). This locality corresponds with CNDDB occurrence number 9 (CNDDB 2007) and occurs on private land.

Shiloh Ranch – This locality occurs at Shiloh Ranch, 0.6 mile west-southwest on Mark West Springs on private land. This site was last surveyed on June 1, 1985 by D. Stone (CNDDB 2007). This locality corresponds with CNDDB occurrence number 10 (CNDDB 2007).

II.C.1.d. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Navarretia leucocephala ssp. *plieantha* is found in pools that form on volcanic substrate, specifically in Northern Basalt Flow and Northern Volcanic Ashflow Vernal Pools. Typical *N. leucocephala* ssp. *plieantha* is found only at Boggs Lake. The lake itself is classified as a Northern Volcanic Ashflow Vernal Pool which consists of a clay layer that is impervious to water and is buried under a layer of volcanic ash. Elsewhere, *N. leucocephala* ssp. *plieantha* occurs in vernal pools, vernal lakes, and swales.

II.C.1.e. 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. Factor 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 were activities that result in the direct destruction of the plants and their habitat or hydrologic change in its vernal pool habitat. Such activities included wetland drainage, off-highway vehicle use, effects from road maintenance activities, residential development, and competition from invasive weedy plant species Current information on this species is limited, and the Service has little information

regarding whether these threats have decreased or increased since this species was listed. However, it is likely that these threats continue at similar levels to when the species was listed. 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.

The following is a list of each known location and the threats associated with that location:

Boggs Lake – The primary threat to *Navarretia leucocephala* ssp. *plieantha* at this site is infestation by invasive species including *Cirsium* spp. (thistle), *Centaurea* spp. (knapweed), and *Typha* spp. (cattail) (CNDDB 2007) as discussed in Factor E.

Loch Lomond - The primary threat to *Navarretia leucocephala* ssp. *plieantha* at this site is off-highway vehicles (OHV's) and California Department of Transportation activities next to the preserve (CNDDB 2007). The occurrence is adjacent to State Route 175, where road maintenance activities could still result in the loss of plants. Occasional fence vandalism and vehicle trespass still occur at Loch Lomond (S. Zalusky, Northwest Biosurvey, pers. comm. 2008).

Seiglers Springs - Plants at this location are threatened by urban land use (CNDDB 2007).

Mt. Hannah Lodge – In addition to competition from invasive plant species discussed below, there have been attempts to drain the pool (CNDDB 2007).

Saunders Road - Threats to this location include cattle grazing, wastewater irrigation, and potential urban development. Additionally, grazing has eliminated many native species (CNDDB 2007).

Shiloh Ranch - Threats to this population include grazing, trampling, and urban development (CNDDB 2007).

Invasive Plant Species: Competition from invasive plant species continues to pose a threat to this species. The localities at Mt. Hannah Lodge and Boggs Lake have been reported to be threatened by invasive plant species (CNDDB 2007) including infestation by invasive *Centaurea solstitialis* (star thistle) and *Taeniatherum caput-medusae* (medusahead). Although site specific information regarding adverse effects from invasive plant species is not available, we believe it is likely that many of the localities of *Navarretia leucocephala* ssp. *plieantha* are currently threatened by invasive plants to some degree.

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

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

II.C.2.c. Factor 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. Factor D, Inadequacy of existing regulatory mechanisms:

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In the final rule we identified the inadequacies of the Federal Clean Water Act, California Endangered Species Act, California Environmental Quality Act, and California Native Plant Protection Act.

Federal Laws

Endangered Species Act: The Endangered Species Act of 1973, as amended (Act), is the primary Federal law that provides protection for *Navarretia leucocephala* ssp. *plieantha* since its listing in 1997. 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, the take prohibition does not apply to plants. Instead, plants are protected in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e. collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation, or in the course of any violation of a state criminal trespass law. Section 9 also makes illegal the international and interstate transport, import export and sale or offer for sale of endangered plants and animals. The protection of Section 9 afforded to endangered species is extended to threatened wildlife and plants by regulation. Federally listed plants may be incidentally protected in areas where they co-occur with federally listed wildlife species. In some cases, federally listed plants are included as covered species in habitat conservation plans prepared by non-Federal applicants as part of the terms and conditions for issuance of an incidental take permit for federally listed wildlife under section 10(a)(1)(B).

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 *Navarretia leucocephala* ssp. *plieantha*. The U.S. Army Corps of Engineers (Corps) issues permits for the discharge of dredged or fill material into navigable waters of the United States. 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 to a project applicant that may affect federally listed species, the Corps is required under section 7 of the Endangered Species Act to consult with the Service.

However, 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. In response to the Supreme Court decision, the Corps and the U.S. Environmental Protection Agency (USEPA) have recently released a memorandum providing guidelines for determining jurisdiction under the Clean Water Act. The guidelines provide for a case-by-case determination of a "significant nexus" standard that may protect some, but not all, vernal pool habitat (USEPA and USACE 2007). The overall effect of the new permit guidelines on loss of vernal pool habitat is not known at this time. If the Corps loses its regulatory authority over vernal pools, unmitigated destruction of known localities or potential habitat for *Navarretia leucocephala* ssp. *plieantha* may increase over the range of the species.

California State Laws

The State's authority to conserve plants is comprised of four pieces of legislation: the California Endangered Species Act (CESA), the Native Plant Protection Act (NPPA), the California Environmental Quality Act (CEQA), and the Natural Community Conservation Planning Act (NCCPA) (California Native Plant Society 2001).

Navarretia leucocephala ssp. *plieantha* was State-listed as endangered in 1979. CESA (California Fish and Game Code, section 2080 *et seq*.) and NPPA (Division 2, Chapter 10, section 1908) prohibit the unauthorized take of State-listed threatened or endangered plant species. Unlike the take prohibition in the Federal Endangered Species Act, the State prohibition includes plants; however, landowners are exempt from this prohibition for plants taken via habitat modification. As noted in the 1997 Federal rule to list *N. leucocephala* ssp. *plieantha*, the landowner is required to notify the CDFG 10 days in advance of changing land use in order to allow salvage of listed plants (NPPA Division 2, Chapter 10, section 1913).

The California Environmental Quality Act (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. However, CEQA does not guarantee that such conservation measures will be implemented.

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

The 1997 listing rule states that the combination of restricted range, few populations, and highly specific and vulnerable habitat makes *Navarretia leucocephala* ssp. *plieantha* vulnerable to destruction of all or a significant part of any population from random natural events. Additionally, low population numbers and sizes were thought to make this taxon vulnerable to changes in gene frequency, inbreeding, and genetic drift. Current threats include vulnerability to extinction or extirpation from random natural events as discussed in the 1997 final rule, as well as climate change threaten this taxon.

The threats of invasive plant species, climate change, small population size, and risk of localized stochastic extirpations remain for all localities of *Navarretia leucocephala* ssp. *plieantha* whether they are on protected lands or not. Threats to this species are not likely being managed to any extent 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 *N. leucocephala* ssp. *plieantha*; however, without these components, potential threats may not be identified and eliminated.

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; (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)]; and, (3) increased competition among urban, agricultural, and natural ecosystem uses due to decreased precipitation.

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 *Navarretia leucocephala* ssp. *plieantha* 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 *N. leucocephala* ssp. *plieantha*. 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 *N. leucocephala* ssp. *plieantha*.

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 events or additional environmental disturbance (Goodman 1987; Gilpin and Soule 1988). If a locality of *Navarretia leucocephala* ssp. *plieantha* 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.

II.D. Synthesis

When *Navarretia leucocephala* ssp. *plieantha* was listed as endangered in 1997, five extant occurrences were known from Lake County and two historical occurrences from Sonoma County were thought to be potentially extirpated. The threats to this species' survival and recovery were activities that resulted in the direct destruction of the plants and their habitat or hydrologic change in its vernal pool habitat. Such activities included wetland drainage, off-highway vehicle use, effects from road maintenance activities, residential development, and competition from invasive weedy plant species. Small numbers of localities and threats of localized stochastic extirpation may also threaten this species. Currently, there are approximately five extant occurrences in Lake County and two potentially extirpated occurrences from Sonoma County.

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, potentially threaten this taxon. 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. 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 wetland drainage, off-highway vehicle use, effects from road maintenance activities, residential development, competition from invasive weedy plant species, and small numbers of localities/ risk of localized stochastic extirpation, we conclude that *Navarretia leucocephala* ssp. *plieantha* still meets the Endangered Species Act 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*
_X_ **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 *Navarretia leucocephala* ssp. *plieantha* experts:

1. The majority of known localities of this species are on private land and not protected. Preservation of Zone 1 core areas should be pursued to preserve known localities that are currently not protected.

2. 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.

3. Once additional sites are protected, management plans should be prepared. Results from standardized monitoring discussed in item 3, 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. Regional vernal pool working groups should be created in regions where *Navarretia leucocephala* ssp. *plieantha* is known to occur to aid with monitoring and management efforts.

5. Potential habitat should be surveyed for new populations and if located, those populations should be protected.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF *NAVARRETIA LEUCOCEPHALA* SSP. *PLIEANTHA*

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

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
_X_ **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

ACTING

Approve _____ Date 10/17/08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 2-4-09