Eryngium constancei
(Loch Lomond Coyote-thistle)

5-Year Review:
Summary and Evaluation

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

August 2009

5-YEAR REVIEW
Eryngium constancei (Loch Lomond Coyote-Thistle)

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), survey information from experts, and the California Natural Diversity Database (CNDDB 2007), which is maintained by the California Department of Fish and Game (CDFG). The Recovery Plan and personal communications with species 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), 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: 51 FR 45904
Date listed: December 23, 1986
Entity listed: Species (*Eryngium constancei*)
Classification: Endangered

I.C.3. Associated rulemakings:

August 1, 1985. Emergency listing of *Eryngium constancei* as endangered (50 FR 31187).

November 29, 1993. Proposal to downlist to threatened (58 FR 62629). This proposal was not finalized due to the Service-wide listing moratorium during part of the 1990s and higher priority listing and recovery actions. In addition, the few public comments received on the proposed rule did not support downlisting the species.

No critical habitat rules have been published for *Eryngium constancei*.

I.C.4. Review History

This is the first status review of *Eryngium constancei* since we proposed downlisting the species in 1993. The status review in the proposed downlisting rule no longer reflects the current status of this species because, at that time, its single known location was on land owned and protected by CDFG. Since then, although additional occurrences of the species have been located elsewhere, they are on private lands and unprotected from threats (see section III.C.2 below).

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

The recovery priority is 14 (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 is low, the recovery potential is high, and the taxonomic rank is a full 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

Eryngium constancei has slender, loosely branched stems 20 to 30 centimeters (7.9 to 11.8 inches) tall, which may be decumbent or upright. The entire plant is covered with downy hairs. The mature leaves are 11 to 16 centimeters (4.3 to 6.3 inches) long, with the petiole accounting for most of the length. The leaf blade is lance-shaped and may have a smooth, sharply toothed, or lobed margin. The bracts are narrow, spiny-margined, and shorter than the leaves. In this species, the rounded flower heads are only 3 to 5 millimeters (0.12 to 0.20 inch) in diameter; however, the stems supporting the flower heads may be as much as 8 centimeters (3.1 inches) long. Each flower head contains only five to seven tiny flowers. The petals are approximately 1 millimeter (0.04 inch) long and are white or tinged with purple. Fruits of this species are egg-shaped and approximately 2 millimeters (0.08 inch) long.

Eryngium constancei has been reported in Lake and Sonoma Counties in California. Three occurrences have been reported to CNDDB and we know of an additional locality in an unnamed pool near Cobb in Lake County. An occurrence as defined by the CNDDB is a location separated from other locations of the species by at least one-fourth mile that may contain populations, individuals, or colonies. We have used locality to refer to populations, individuals, or colonies that have not been reported to the CNDDB, and sites to refer to collections of occurrences and localities. Of the four sites all are presumed to be extant (CNDDB 2007). The majority of sites of *E. constancei* are not protected. One occurrence of this species is protected from the direct effects of development at Loch Lomond in Lake County.

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 (Act) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of 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 *Eryngium constancei* 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 *E. constancei* 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) participation and outreach.

The Recovery Plan provides recovery criteria that either directly or implicitly address the 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), and inadequacy of existing regulatory mechanisms (Factor D). 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 and delisting criteria for *Eryngium constancei* 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 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 located 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. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery.

In the Recovery Plan, the core areas that pertain to *Eryngium constancei* include Boggs Lake-Clear Lake, Diamond Mountain, and Dry Lake. These three core areas occur in the Lake-Napa Vernal Pool Region. The core areas generally encompass an area larger than just the location of location of *Eryngium constancei.* However, the Boggs Lake-Clear Lake core area does not encompass an area as large as the occurrence at the Loch Lomond Ecological Reserve. The Recovery Plan identifies specific percentages of suitable habitat to be protected in each of the three core areas. Core areas containing *E. constancei* are included as Zone 1 in the Recovery Plan, with no core areas ranked as Zone 2 or 3. In order to delist the species, the Recovery Plan recommends that 95 percent of the suitable *E. constancei* habitat in each of the Zone 1 core areas

[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) Inadqequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

be protected. Table 1 provides a summary of the zone designations for each of the three core areas.

Table 1: *Eryngium constancei* core recovery areas.

Lake-Napa Vernal Pool Region	
Core areas:	Boggs Lake- Clear Lake (Zone 1)
	Diamond Mountain (Zone 1)
	Dry Lake (Zone 1)

The Service does not yet have sufficient information to quantify either the acreage of suitable habitat within each core area. 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.

1B. Species occurrences 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 criterion has not yet been met. Most sites of *Eryngium constancei* are on private land that is not protected. It is presumed that there is genetic variation providing a range of adaptability between the occurrences found in different parts of the geographic range. It is for this reason that the Recovery Plan recommends conservation of occurrences and suitable habitat in all core habitat areas where the species is found.

1C. Reintroductions must be carried out and meet success criteria established in the recovery plan.

The Recovery Plan states that additional populations in Lake and Sonoma Counties must be discovered or established in order to delist. No new populations have been discovered or established since the Recovery Plan was published. This criterion has not yet been met.

1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery are protected. Any newly found occurrences may count towards recovery goals if the occurrences are permanently protected as described in the recovery plan.

Future surveys may locate additional occurrences of this species, particularly on private lands that support suitable habitat and soil types that have not yet been surveyed. At this time, we are aware of three additional sites that have been discovered since the species was listed in 1987. These additional sites include one in Sonoma County and two in Lake County, and were included as essential to recovery in the Recovery Plan. No GIS or other analyses to identify areas of potential occurrences have been conductedare known. This recovery criterion has not been met.

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 sites; therefore we are unable to determine whether the hydrology at extant locations has supported viable populations through a variety of hydrologic conditions.

2. <u>Adaptive Habitat Management and Monitoring</u>

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 *Draft Management Plan for Loch Lomond Vernal Pool Ecological Reserve* was written for the CDFG's Loch Lomond Ecological Preserve (CDFG 1994). This management plan indicates that periodic monitoring of listed plant species is planned (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 occurrence (G. Cooley, pers. comm. 2007). The Service does not have information regarding whether a management or monitoring plan has been developed for the locality near Cobb, Lake County.

Therefore, work to meet this criterion is proceeding, but it has not currently 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. Most of the sites are on private lands that have no known management in perpetuity or long-term monitoring. The Loch Lomond Ecological Preserve is dependent on funding from CDFG.

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.

The Loch Lomond Ecological Reserve occurrence has occasionally been censused; however, continuous monitoring of ecosystem function has not occurred during a time period that meets the requirements specified in the Recovery Plan (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 extant locations that has

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.

The Recovery Plan recommends collection of seeds from each population. Seed was collected from Loch Lomond in 1988, and accessioned in the U.S. Department of Agriculture facility now located at Fort Collins (H. Forbes, University of California, Berkeley, pers. comm. 2008). Additionally, seed was collected and accessioned at the Rancho Santa Ana Botanic Gardens from Lake County in 1994. This criterion has not been met because seed has been collected from only one occurrence.

3. <u>Status Surveys</u>:

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.

This criterion has not been met. Although one occurrence has been censused, status surveys and monitoring have not occurred over a time period that meets the requirements specified in the 2005 Recovery Plan (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 for all habitat protected in 1A-E). Vernal pool regional 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.

Standardized site assessments have not been conducted at any of the known localities of *Eryngium constancei* during or since the listing process. This criterion has not been met.

4. <u>Research</u>:

Research implicitly addresses all relevant 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 (U.S. Fish and Wildlife Service 2005, pages IV-53 to IV-63). The Recovery Plan recommends research on genetics, 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. The majority of information needs discussed in the Recovery Plan are still outstanding. Currently, this criterion has not been met.

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. This criterion has not been met. No genetic studies have been completed for this species.

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. No such research has been completed for this species.

5. <u>Participation and outreach</u>:

Public participation and outreach implicitly address all relevant listing factors.

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

This criterion has not yet been met. 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 has selected the implementation team which started meeting in June 2009. The implementation team will select the members of the regional working groups with assistance from the Service.

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

regional recovery efforts.

See 5A, above. This criterion has not been met. Working groups have not been formed.

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

This criterion has not been met. Participation plans have 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 action has not been initiated. Working groups have not been formed.

II.C. Updated Information and Current Species Status

II. C.1. Biology and Habitat –

II.C.1.a. Abundance and population trends:

At the time of listing in 1986, the species was known from one population with an unknown number of plants at a vernal lake called Loch Lomond, near the town of Loch Lomond in Lake County, California. Since that time, two additional occurrences have been located and reported to the CNDDB, one from Dry Lake in Lake County and the other from Diamond Mountain in Sonoma County. We also know of an additional locality that has not been reported to CNDDB located near the town of Cobb in Lake County.

The population at the Loch Lomond Ecological Reserve was reported to have millions of individuals in 1991 (CNDDB 2007). The Diamond Mountain population was estimated to have at least 50,000 plants in 1996, and 25,000 plants were estimated at the Dry Lake population in 1997 (CNDDB 2007). No population estimate is reported from the Cobb site (CNDDB 2007). The population information that is currently available is at least 10 years old, and is inadequate to determine trends within individual populations due to the lack of monitoring.

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.):

See II.C.1.a.

II.C.1.c. Known Occurrences

The following is a discussion of known occurrences or localities of this species by county and core recovery area by county (from north to south).

In the Recovery Plan, the core areas that support *Eryngium constancei* are included within the

Lake–Napa Vernal Pool Region. Descriptions of the protected habitat, by core recovery areas, within the single vernal pool region are described below.

Lake County

Dry Lake – This occurrence is located in the vicinity of Highway 29 South of Clear Lake on private land and was discovered in 1997.

Loch Lomond – This occurrence is located near Loch Lomond, in the vicinity of State Route 29. This site is currently owned by CDFG as an ecological reserve. The site is not monitored by CDFG (G. Cooley, pers. comm. 2007; T. Nosal, CDFG, pers. comm. 2008).

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 CNDDB (2007).

Sonoma County

Diamond Mountain – This occurrence is in the vicinity of Calistoga in Sonoma County and was discovered in 1996. The ownership is private. Two pools on Diamond Mountain comprise this occurrence (CNDDB 2007).

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

At the time of listing, the habitat or ecosystem conditions for the single occurrence for *Eryngium constancei* was described as occurring in a meadow-like bed of Loch Lomond Lake at an elevation of 2,800 feet (853 meters). Cabins and a paved road (State Route 175) largely encircle the southern and eastern sides of the lake bed. A forest of ponderosa pine (*Pinus ponderosa*) and California black oak (*Quercus kelloggii*) surrounds the periphery of the lake. Plants associated with *E. constancei* in the vernal pool lake bed include *Cuscuta howelliana* (Boggs Lake dodder), *Eleocharis* spp. (spikerush), *Downingia* spp., (downingia), *Gratiola ebracteata* (hedge hyssop), *Lilaea scilloides* (flowering quillwort), *Mimulus tricolor* (three-colored monkeyflower), *Plagiobothrys* (allocarya), and two Federal candidate species that have since been listed, which were identified at that time as *Navarretia pauciflora* [= *Navarretia leucocephala* ssp. *pauciflora* (few-flowered navarretia)] and *Navarretia plieantha*[= *Navarretia leucocephala* ssp. *plieantha* (many-flowered navarretia)]. The soil of the lake bed consists of a fine, powdery, volcanic, silty clay. The terrain around the lake to the south and west generally faces the northeast and attains an elevation of 3,300 feet (990 meters).

Currently, habitat information is available for the three occurrences catalogued by CNDDB (2007). Loch Lomond is a small, intermittent lake with a surface area of about 3.2 hectares (7 acres) at maximum inundation (U.S. Fish and Wildlife Service 1985). This wetland is classified as a Northern Volcanic Ashflow Vernal Pool (Sawyer and Keeler-Wolf 1995; CNDDB 2007) and is on Collayomi-Aiken-Whispering complex soils. The surrounding area is mountainous and supports a mixed forest dominated by *Pinus ponderosa* (ponderosa pine), *Quercus kelloggii* (black oak), *Pseudotsuga menziesii* (Douglas fir), and understory of *Arctostaphylos* spp.

(manzanita) and *Ceanothus* spp. (California lilac) (CDFG 1994; K. Aasen *in litt.* 1995; CNDDB 2007). *Eryngium constancei* occurred throughout the lakebed in 1994, but grew most densely towards the center, where it was one of the most abundant species. Other plants that were abundant in Loch Lomond that year included *Perideridia gairdneri* ssp. *gairdneri* (Gairdner's yampah), *Cuscuta howelliana* (Boggs Lake dodder), *Mentha pulegium* (pennyroyal), *Plagiobothrys stipitatus* (stalked popcornflower), *Plagiobothrys tener* (slender popcorn flower), and a species of navarretia (CDFG 1994) that has been identified as an intergrade between *Navarretia leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *pauciflora* (A. Day *in litt.* 1997). *Eryngium aristulatum* (Jepson's button-celery), a close relative of *E. constancei*, also co-occurred in the lakebed (CDFG 1994).

On Diamond Mountain, the pools where *Eryngium constancei* grows are shallow and spring-fed (CNDDB 2007); they are classified as Northern Basalt Flow Vernal Pools (Sawyer and Keeler-Wolf 1995; CNDDB 2007). The surface area of the occupied pools and the soil type have not yet been determined. The surrounding plant community consists of *Quercus garryana* (Oregon oak), *Q. lobata* (valley oak), and *Pseudotsuga menziesii* (Hrusa and Buckmann 2000). The elevation of the site has been variously reported as 628 meters (2,060 feet) (CNDDB 2007) or 685 meters (2,247 feet) (Hrusa and Buckmann 2000). *Eryngium constancei* was dominant in both pools in 1996 (B. Hunter *in litt.* 1996). Associated plant species that year included *Pogogyne douglasii* (Douglas' pogogyne), *Perideridia kelloggii* (Kellogg's yampah), *Perideridia howellii* (Howell's yampah), *Eleocharis* spp. (spikerush), *Madia elegans* ssp. *densifolia* (leafy common madia), and *Clarkia purpurea* (winecup clarkia) (CNDDB 2007).

Less information is known about the Cobb and Dry Lake occurrences. The surface area of the Cobb pool is approximately 2 hectares (5 acres) (J. Diaz-Haworth pers. comm. 2001), but its elevation and soil type are not known. The endangered plant *Navarretia leucocephala* ssp. *pauciflora* is the only associate that has been reported at the Cobb pool (A. Howald *in litt.* 1995). The Dry Lake pool is at an elevation of 463 meters (1,520 feet) and is surrounded by *Quercus douglasii* (blue oak) woodland. In 1997, *Eryngium constancei* was the dominant species and was associated with unidentified *Juncus* spp. (rushes) CNDDB 2007). Soils underlying Dry Lake are in the Sobrante-Guenoc-Hambright complex.

II.C.1.e. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No information regarding genetics was mentioned in the final listing rule, and there has been no information on genetics or taxonomy since listing of this species in 1986.

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:

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When *Eryngium constancei* was listed in 1986, the threats to its survival and recovery in the single location where it was then known were physical alterations of the lake bed at Loch Lomond, off-road vehicle (ORV) use, trash dumping, routine highway maintenance, and

trampling of the lake bed by hikers (51 FR 45904). After the species was listed, the California Department of Fish and Game purchased the habitat for the Loch Lomond Vernal Pool Ecological Reserve and constructed a fence around the lake. This was the reason we proposed downlisting the species to threatened in 1993. Currently, routine highway maintenance, trash dumping and, to a smaller degree, occasional fence vandalism, vehicle trespass, and trampling still threaten *E. constancei* at this site. Additionally, *E. constancei* is threatened by larger-scale hydrological changes.

Since listing in 1986 and proposed downlisting in 1993, three additional occurrences of *Eryngium constancei* were found. Specific threats to two of the four extant populations are that at least one of the occupied pools at Diamond Mountain may be converted to a vineyard, and the owner of Dry Lake has proposed excavating the pool for a reservoir (CNDDB 2007). Changes in hydrology threaten three of the four occurrences. In addition, runoff from adjacent roads and swimming pools creates excess water flow, whereas drainage ditches, culverts, and diversion of a natural spring are reducing the flow of water to *E. constancei* habitat (Hrusa and Buckmann 2000; CNDDB 2007). Existing and potential sources of changes to the hydrology at two sites include adjacent roads, drainage ditches in and adjacent to Loch Lomond, development south of the lake (CNDDB 2007), and a culvert alongside one of the Diamond Mountain pools.

Larger-scale hydrological alterations, including commercial development and timber harvesting, are also occurring in all the watersheds where *Eryngium constancei* grows, thus posing added hydrological threats (U.S. Fish and Wildlife Service 1986, 1993; CDFG 1994; K. Aasen *in litt.* 1995; B. Hunter *in litt.* 1996; CNDDB 2007). Not only does removal of trees and construction of logging roads alter the flow of water, but it also causes erosion, which can bury the plants and affect the hydrology (U.S. Fish and Wildlife Service 1985, U.S. Fish and Wildlife Service 1986, U.S. Fish and Wildlife Service 1993; California Department of Fish and Game 1994; Aasen *in litt*. 1995; B. Hunter *in litt.* 1996). The Loch Lomond and Diamond Mountain occurrences are threatened by hydrological alterations within their watersheds. By affecting the amount of runoff entering the pools or the rate at which the pools dry, the depth and duration of inundation can increase or decrease, creating conditions unsuitable for the survival of Loch Lomond coyote-thistle.

The Dry Lake occurrence is threatened by trash dumping and erosion into the pool; the surrounding slopes have been stripped of vegetation and are eroding (CNDDB 2007). The Loch Lomond occurrence is also threatened by occasional fence vandalism and vehicle trespass (S. Zalusky, pers. comm. 2008).

Currently, only one of the four known sites of *Eryngium constancei* is protected from the direct affects of development at the CDFG Loch Lomond Vernal Pool Ecological Reserve. The management of the Reserve does not include the preservation of hydrology necessary for the species' long-term survival.

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

Overutilization of this species for commercial or other purposes was not known to be a threat at the time of the 1986 final rule or the 1993 downlisting proposal, and is not thought to be a threat currently.

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

At the time of listing *Eryngium constancei* in 1986, it was unknown whether grazing by livestock occurred within the lake bed, and at the time of the 1993 downlisting proposal livestock grazing was prevented at the single occurrence then known. Currently, the occurrence at Dry Lake is heavily impacted by horse padocking (S. Zalusky, pers. comm. 2008).

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

In the final listing rule we mentioned that the State of California had not yet listed *Eryngium constancei*; however, it was State-listed in 1987 as endangered.

Federal Laws

The Endangered Species Act of 1973, as amended (Act), is the primary Federal law that provides protection for *Eryngium constancei*. Section 7(a)(2) requires Federal agencies to consult with the Service to insure 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. 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.

For non-Federal projects that would likely result in incidental take of listed wildlife species, the Service may issue incidental take permits under section 10 of the Act. To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Although the Act's take prohibitions generally do not apply to plants, many HCPs include listed plants as covered species. Such HCPs thus incidentally provide an additional layer of regulatory protection for covered plant species. Many regional HCPs also are coordinated with the State of California's related Natural Community Conservation Planning program. However, currently there are no completed regional or county-wide HCPs authorized

under section 10 of the Act, or Natural Community Conservation Plans authorized under the California Natural Community Conservation Plan Act, in Lake or Sonoma Counties, thereby leaving populations on private land without protection under these programs.

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. However, none of the extant occurrences of *Eryngium constancei* are located on Federal lands or are likely to be affected by Federal activities; therefore, NEPA affords little protection to this species.

The Section 404 of the Clean Water Act (CWA) may afford some protection to *Eryngium constancei*. 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 for a project 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 CWA. 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 their regulatory authority over vernal pools, unmitigated destruction of potential habitat for *Eryngium constancei* may increase over the range of the species.

California State Laws

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State listed endangered or rare plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. *Eryngium constancei* was State-listed as endangered in 1987.

Furthermore, with regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants. It is unknown whether salvage of *Eryngium constancei* is likely to be successful.

California Environmental Quality Act (CEQA): The 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 feasible. However, CEQA does not guarantee that such conservation measures will be implemented. Section 15065 of the CEQA Guidelines requires a finding of significance if a project has the potential to "reduce the number or restrict the range of an endangered, rare, or threatened species." Under CEQA, species that are eligible for listing as rare, threatened, or endangered but are not so listed are given the same protection as those species that are federally or State-listed. Once significant effects are identified, the lead agency has the option to require mitigation for effects through changes in the project or to decide that overriding considerations make mitigation infeasible. In the latter case, projects may be approved that cause significant environmental damage. Protection of even listed species through CEQA is dependent upon the discretion of the agency involved. Moreover, CEQA does not regulate many activities on private land which might negatively affect the species such as ministerial projects or grazing. The CEQA guidelines section 15369, defines ministerial as describing "a governmental decision involving little or no personal judgment by the public official as to the wisdom or manner of carrying out the project …. A ministerial decision involves only the use of fixed standards or objective measures, and the official cannot use personal, subjective judgment in deciding whether of how the project should be carried out."

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

At the time of the original listing we did not identify any natural or manmade factors affecting its continued existence. In our 1993 downlisting proposal, we noted that the single occurrence then known was at risk of extirpation from castastrophic events such as fire, flood, severe drought, or pest/disease outbreaks. Currently, *Eryngium constancei* continues to be threatened by its restricted range; and by drought and climate change.

Small Numbers of Localities/Stochastic Extinction: The extremely restricted distribution of *Eryngium constancei* is a threat to its long-term viability. Although the individual populations are sufficiently large that intrinsic problems such as genetic drift are not a concern, other random events could cause the species to go extinct. Catastrophic weather events, climate change, or other unforeseen circumstances potentially could eliminate all of the populations. 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 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 *E. constancei* has several consecutive years of poor rainfall, or changes in hydrology from adjacent development, it is possible that all individuals within 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).

Drought and Climate Change: *Eryngium constancei* is an obligate wetland species found only in vernal pools, typically on Northern Volcanic Ashflow vernal pools; thereforeore, maintenance of the natural hydrology of the pools is necessary for the survival and recovery of this species. Drought or flood conditions will place additional strains on the vernal pool ecosystem supporting *E. constancei* occurrences, some of which are already fragmented or reduced by habitat conversion to wineries and development. Where occurrences persist on only marginal habitat, the addition of extreme drought conditions is likely to result in higher rates of mortality in the short term with the effects of low reproductive output and survivorship persisting after the drought has ceased. It is unknown how quickly *E. constancei* occurrences may rebound after severe climatic conditions.

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. Court-ordered environmental flows (water left in steams to support aquatic life) compete with agricultural or urban uses (Field *et al*. 1999), but may not be available if climate change reduces water supply for human uses. Although the specific effects of climate change on *Eryngium constancei* are unknown, the effects of increased winter flooding and drought conditions in the spring and summer have the potential to adversely affect this species.

II.D. Synthesis:

When *Eryngium constancei* was listed as endangered in 1986 only a single occurrence was known. The threats to its survival and recovery were the original landowner's plan to dredge and fill Loch Lomond, ORV use, trash dumping, routine highway maintenance, and trampling of the lake bed by hikers. At that site, the threat from dredging and filling Loch Lomond has been eliminated by the CDFG's purchase of the site (Loch Lomond Vernal Pool Ecological Reserve). The threat from ORV use and trampling of the lake by hikers has been minimized by the construction of a fence around the lake. However, since listing in 1986 and proposed downlisting in 1993, additional unprotected occurrences have been discovered in other locations, and the original Loch Lomond occurrence remains at risk from adjacent watershed effects.

Currently, *Eryngium constancei* occurs at four sites. Three sites remain unprotected on private lands. The primary remaining threats include development and timber harvesting in the watersheds of all four occurrences, as well as landowner plans to convert two occurrences to vineyard or reservoir. In addition, other factors, such as horse padocking, climate change, small numbers of localities, threats of localized stochastic extirpation, occasional fence vandalism, vehicle trespass, and trampling may also threaten this species. The majority of known localities for this species do not have conservation management plans, monitoring programs, or adequate funding to ensure that these localities are sustainable in perpetuity. The CDFG's Loch Lomond reserve 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 that has partially been met at one occurrence, other criteria discussed within the Recovery Plan have not been met, and in some instances, not initiated. Based on the continuing threat of larger-scale hydrological changes, potential habitat loss resulting from conversion to agriculture (vineyards), development, timber harvesting, lack of trend data at any occurrence, and small number of localities and risk of localized stochastic extirpation for all four extant occurrences, we conclude that *Eryngium constancei* still meets the Act's 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:

We recommend the recovery priority number be changed to 8C because the species has a moderate degree of threat and a high potential for recovery, and now has potential conflict with development projects or other ground-disturbing activity.
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IV. RECOMMENDATIONS FOR FUTURE ACTIONS -

The following recommendations for future actions are from the Recovery Plan and the results of discussions on the status of the species and the species' needs with recognized *Eryngium constancei* experts:

1. Protect vernal pool habitat from being destroyed or modified by development, agriculture, or other activities. Acquire conservation easements or fee title to habitat lands to help guarantee protection of the species in perpetuity.

2. Develop and implement standardized population trend survey protocols to complete updated status surveys at all four occurrences.

3 Create and convene regional vernal pool working groups in the Lake-Napa Region where *Eryngium constancei* occurs. Regional vernal pool working groups will be important for the tracking the progress of recovery efforts, including the amount of suitable habitat protected for each of the species in the core areas.

4. Collect seeds from populations from which it has not yet been collected following the Center for Plant Conservation Guidelines (1991). Seed collections should be stored in at least two sites, including the National Center for Genetic Resources in Fort Collins, Colorado, and a facility certified by the Center for Plant Conservation.

5. Withdraw the proposal to reclassify *Eryngium constancei* from endangered to threatened.

6. Consider modifying the Boggs Lake-Clear Lake core area to incorporate the entire Loch Lomond Vernal Pool Ecological Reserve and adjacent watershed.

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

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

Approve _____ Date 8.11.09

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Fish and Wildlife Service

Approve _____ Date 8/17/09