Parvisedum leiocarpum (= *Sedella leiocarpa*) (Lake County Stonecrop)

5-Year Review: Summary and Evaluation

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

June 2009

5-YEAR REVIEW
Parvisedum leiocarpum (= *Sedella leiocarpa*) (Lake County Stonecrop)

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, Pacific Southwest Region, 916-414-6464

Lead Field Office – Kirsten Tarp, Recovery Branch, Sacramento Fish and Wildlife Office, 916-414-6600

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: *Parvisedum leiocarpum* (= *Sedella leiocarpa*), a plant species
Classification: Endangered

I.C.3. Associated rulemakings:

No critical habitat rules have been published for *Sedella leiocarpa.*

I.C.4. Review History

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

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

The recovery priority is 2C (based on a 1 to 18 ranking system where 1 is the highest recovery priority and 18 is the lowest). This number reflects a high degree of threat and recovery potential and a taxonomic rank of a full species. The "C" reflects conflict with development, construction, or other economic activity.

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), *Sedella leiocarpa* is a low, erect to spreading annual in the stonecrop family (*Crassulaceae*) with reddish stems 3 to 5 centimeters (1 to 2 inches) tall. The fleshy, oblong leaves are 4 to 5 millimeters (0.16 to 0.20 inch) long and fall off the stem by flowering time. The inflorescence is a cyme (flat-topped of convex flower cluster) of campanulate (bell-shaped) yellow flowers that are crowded on curving stems in two rows. The five petals are 3 to 3.5 millimeters (0.12 to 0.14 inch) long with large, club-shaped, red nectaries. The five carpels have smooth surfaces. *Sedella leiocarpa* flowers in April and May (CDFG 2005).

Sedella leiocarpa was described from an area 10.4 kilometers (6.5 miles) north of Lower Lake, Lake County, California. Two similar taxa occur within the range of *S. leiocarpa*. *Sedella pentandra* (Central California stonecrop) differs in having shorter petals, top-shaped flowers, and carpels with glandular bumps on the surfaces. *Crassula connata* (sand pygmyweed) differs in having only one to a few, four-petaled flowers above each leaf base not arranged in definite cymes.

Sedella leiocarpa occurs on more or less level sites in shallow depressions that retain water sesasonally. Its life history is closely linked to the hydrology of these wetlands. *Sedella leiocarpa* is extremely rare. The historical range of the species encompasses six collection localities within a 16-kilometer (10-mile) radius from Siegler Springs near Lower Lake, Lake County, California (CDFG 2005). Elevations of occurrences range from 395 to 790 meters (1,300 to 2,600 feet) (CDFG 2005). The extant occurrences of *S. leiocarpa* collectively cover a total area of less than 1.2 hectares (3 acres). All occurrences are located on private lands (CNDDB 2007). 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.

I.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 (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 *Sedella leiocarpa* and 19 other listed plants and animals are described in the Recovery Plan (Service 2005). The 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 *S. leiocarpa* 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 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), 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, and Factor C, disease and predation were not included as a threat in the listing rule and therefore not addressed in the Recovery Plan. Species surveys and monitoring efforts that will provide data to evaluate progress towards recovery have yet to be implemented.

Downlisting/delisting criteria for *Sedella leiocarpa* 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 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, only one core area was identified as having *Sedella leiocarpa* (Boggs Lake-Clear Lake). However, one of the extant occurrences may actually occur within the Dry Lake core area. Both of these core areas occur in the Lake-Napa Vernal Pool Region, but currently the downlisting criteria pertain only to the BoggsLake-Clear Lake core area. The Boggs Lake-Clear Lake core area is within Zone 1 and encompasses an area larger than just the occupied habitat of *S. leiocarpa*. To downlist *S. leiocarpa*, the Recovery Plan recommends that 95 percent of Zone 1 and 100 percent of all occurrences be protected. To delist this species, the

[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.

Recovery Plan recommends that 100 percent of all reintroduced or newly discovered populations be protected. Additionally, new populations must be discovered or established. At this time, new populations have not been discovered or reintroduced. Therefore, this criterion has not been met.

The Service does not yet have sufficient information to quantify the acreage of suitable habitat within the Boggs Lake-Clear Lake 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. However, all known localities of this species are on private land and are not currently protected.

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

This criterion has not been met. As stated in 1A above, all of the localities for this species are on private land and no conservation measures have been implemented by any of the land owners to ensure protection.

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

This recovery criterion has not been met. The Recovery Plan recommends that reintroductions should occur on soil types from which status surveys indicate 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.

At this time, additional localities have not been detected.

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

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

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.

This criterion has not been met. As stated in 1A above, none of the localities for this species are currently protected.

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. As stated in 1A above, none of the localities for this species are protected and no conservation measures have been implemented by any of the land owners.

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

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

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. The California Department of Fish and Game has acquired funding to conduct seed banking for State-listed endangered plants in 2008. However, as all occurrences are on private land, seed banking for *Sedella leiocarpa* will require landowner approval (M.A. Showers, CDFG, pers. comm. 2007). The seed-banking has not occurred yet.

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.

This criterion has not been met. Monitoring has not occurred for a duration that meets the requirements specified in the Recovery Plan. We are not aware of any standardized monitoring for this species. The most recent surveys for this species were conducted in 2006 to 2007. The

California Department of Transportation (CalTrans) conducted surveys of historic populations in the CNDDB database and also at sites that could harbor new populations (E. Schwab, CalTrans, pers. comm. 2008, 2009). See section II.C.1.c. below for results of these surveys. The Recovery Plan states that standardized status surveys should establish parameters that evaluate population sizes to determine overall trends in species status rangewide (e.g., evidence of reproduction and recruitment). Specific monitoring parameters have not yet been identified for this species.

Regional vernal pool working groups will play an important role in tracking the progress of recovery efforts, including monitoring the status of populations of this species.

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.

The primary threat to this species is habitat modification and loss. Currently there are no protections in place for this species that would ameliorate or eliminate the threats to this species. Therefore, this criterion has not been met.

4. Research

This recovery criterion (4A-C) 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 in refining 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. Habitat management of controlling the erosion at Manning Flat is particularly relevant for this species.

Currently, this criterion has not been met. The majority of information needs discussed in the Recovery Plan are still outstanding.

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.

This criterion has not been met. No genetic studies have been completed. See 4A, above.

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

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

5. Participation and outreach

This recovery criterion (5A-D) implicitly addresses all listing factors.

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

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

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

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

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 regional 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:

A formal status survey for this species was completed in 1986 (Patterson 1986). More recently, surveys have been conducted on all occurrences listed in the CNDDB database (E. Schwab, pers. comm. 2008). However, 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.):

Sedella leiocarpa is known from only a small number of populations within a 10-square-mile area. This species occurs on more or less level sites in shallow depressions that retain water seasonally. Known microhabitats include Northern Basalt Flow and Northern Volcanic Ashflow vernal pools (Sawyer and Keeler-Wolf 1995), low areas in meadows and gravelly flats, and hollows in exposed rocks. A few plants were found on a man-made berm within a flat area that supported a large population. Substrates on which *S. leiocarpa* occur frequently are of volcanic origin and often are gravelly (Patterson 1986). The species occurs at elevations of 518 to 793 meters (1,700 to 2,600 feet).

II.C.1.c. Known Occurrences

When *Sedella leiocarpa* was listed as endangered in 1997, three extant populations were known.

All of the known occurrences of this species occur in Lake County. Occurrences are listed by the element occurrence number associated with the CNDDB (2007):

Element Occurrence No. 1 – This locality occurs 6.9 kilometers (4.3 miles) south of Adams Springs Junction on the road to Middletown (Highway 29). Specimens were collected from this area in 1940. The area was searched in 1978 and 1986, however plants were not relocated. Due to the poor location description, the exact location of the historical population in unknown. An attempt to re-locate this population was made in 2006 and 2007 with negative results (E. Schwab, pers. comm. 2008).

Element Occurrence No. 2 – Four miles west of Lower Lake. Specimens were collected from this area in 1941. The area was searched in 1989, however plants were not relocated. No vernal pool habitat or plants were found in 2007 (CNDDB 2007; E. Schwab pers. comm. 2008).

Element Occurrence No. 3 – Manning Flat, about five miles west of Lower Lake on the road to Kelseyville (Highway 29). This occurrence was surveyed in 1986 and three populations totaling 3,300 plants were located. The three colonies remain extant however the northern-most colony is being negatively effected by extreme erosion from landowner efforts to drain the vernal pool area. Current individual numbers range in the thousands (E. Schwab pers. comm. 2008).

Element Occurrence No. 4 – This occurrence is found on a large grassy flat area between Hesse and Manning Flats, opposite Thurston Creek Road. This site was said to be in good condition in 1986, however the CNDDB does not list number of individuals located. A survey of the area in 2006 and 2007 revealed that the area had been converted to a vineyard. A small vernal pool area remains however it appears that it is being affected by runoff from the vineyard. No individuals were located (E. Schwab pers. comm. 2008).

Element Occurrence No. 5 – This occurrence is on the west side of Little High Valley about five air miles southeast of Manning Flat. This occurrence was discovered in 1985. It was surveyed again in 1986 and two colonies totaling 800 plants were located. Caltrans surveyors were not allowed access to the land. The status of the *Sedella leiocarpa* occurrence is unknown (E. Schwab pers. comm. 2009).

Element Occurrence No. 6 – This occurrence is located a quarter of a mile west of Snows Lake. According to the CNDDB (2007) plants at this location were locally common in 1995, however, it notes that the occurrence may be extirpated and that fieldwork was needed. This population was re-located in 2006 and 2007 with populations totaling over 500 individuals (E. Schwab pers. comm. 2008). This occurrence is on vineyard land. It is unknown if any management is occurring for the species. This occurrence may actually be within the Dry Lake core area.

In summary, two occurrences (element occurrences1 and 2) have not been seen since the 1940s; although habitat still remains in the area; one occurrence (element occurrences 4) has been converted to vineyards and attempts to relocate *Sedella leiocarpa* in 2006 and 2007 was unsuccessful; one occurrence is unknown; two occurrences (element occurrences 3 and 6) were seen in 2006 and 2007.

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

Sedella leiocarpa occurs on more or less level sites in shallow depressions that retain water seasonally. Known microhabitats include Northern Basalt Flow and Northern Volcanic Ashflow vernal pools (Sawyer and Keeler-Wolf 1995), low areas in meadows and gravelly flats, and hollows in exposed rocks. Occurrence 3 occurs on both sides of Highway 29, five miles west of Lower Lake, California (CNDDB 2007).

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:

Sedella leiocarpa is in the stonecrop family (Crassulaceae) and is one of three (Moran 1997) or four (Clausen 1946; Denton 1993) species in the genus *Sedella*, The original scientific name for Lake County stonecrop was *Sedella leiocarpa*. The type locality was cited as "6.5 miles north of Lower Lake, Lake County, California" (Sharsmith 1940). Clausen (1946) changed the name of this species to *Parvisedum leiocarpum* because the genus name *Sedella* already had been applied to another group of plants. However, Moran (1997) returned to using the name *Sedella leiocarpa* for Lake County stonecrop, after another taxonomist determined that the genus name

Sedella had been used improperly for the other group of plants. We originally listed the species as endangered under the name *Parvisedum leiocarpum* (U.S. Fish and Wildlife Service 1997). However, to remain up-to-date with current nomenclature, we will recommend that an amendment be submitted to change the listing to *Sedella leiocarpa* in the Recommendations for Future Actions section at the end of this document.

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 are alteration of hydrology, effects from road maintenance/widening activities, agriculture land conversion, off-highway vehicle use, and trampling by cattle. Land conversion for housing and agriculture, highway widening, and road maintenance continue as specific threats to *Sedella leiocarpa* habitat at all of the historical localities (Patterson 1986; CNDDB 2007; E. Schwab pers. comm. 2008).

We have limited new information regarding whether these threats have decreased or increased since this species was listed. However, it is likely that in most cases these threats continue at similar levels.

Caltrans issued a Draft Environmental Impact Report/Environmental Assessment (DEIR/EA) for the Lake 29 Improvement Project in Lake County, California (Caltrans 2007) Caltrans has proposed to widen approximately 8 miles of State Highway 29 between the communities of Kelseyville and Lower Lake from the existing two lane highway to a four-lane expressway with a median. The DEIR/EA states that Alternative D (the Caltrans preferred alternative) has been designed to avoid all direct and indirect effects to *Sedella leiocarpa*. California Department of Fish and Game and the Service are concerned that the loss or disruption of hydrological connectivity and function, habitat fragmentation, direct modification or destruction of vernal pools, loss of upland habitat, and seed bank losses could negatively impact *S. leiocarpa* and other listed or rare plant species (Service 2007).

When we finalized the listing rule we included occurrence 3, 4 and 5, as being extant. For example, occurrence 5 (CNDDB 2007) was discovered in 1985 and surveys conducted in 1986 yielded two populations with 800 plants. Surveys conducted in 2006 and 2007 discovered the area had been converted to agricultural land and attempts to re-locate the plants were unsuccessful (E. Schwab pers. comm. 2008). Occurrence 4 (CNDDB) was said to be in good condition in 1986, however surveys conducted in 2006 and 2007 discovered the area had been converted to a vineyard. Populations at occurrence 3 (CNDDB) are being negatively affected by erosion (E. Schwab pers. comm. 2008). Off-highway vehicle (OHV) use threatens a number of occurrences as these vehicles are used extensively in private land management.

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

Due to the limited distribution of *Sedella leiocarpa*, indiscriminate collection of plants could seriously affect this species. However, overutilization was not known to be a threat at the time of listing and 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.

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

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

Federal Laws

Endangered Species Act: The ESA is the primary Federal law that provides protection for *Sedella leiocarpa*. 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 ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the "take" of federally-endangered wildlife, however, plants are not protected against take. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e. collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation. The protection of Section 9 afforded to endangered species is extended to threatened wildlife and plants by regulation. The ESA affords protection to federally-listed plants if they co-occur with federally-listed wildlife species.

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

Habitat Conservation Plans (HCP) that are developed as part of an application for incidental take coverage under section 10 of the ESA have the potential to provide some level of protection for listed plants. However, there are no completed HCPs that cover areas occupied by *Sedella leiocarpa*.

National Environmental Policy Act: 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.

Clean Water Act: The Section 404 of the Clean Water Act (CWA) may afford some protection to *Sedella leiocarpa*. The U.S. Army Corps of Engineers (Corps) issues permits for the discharge of dredged or fill material into navigable waters of the U.S. The Corps interprets "the waters of the United States" expansively to include not only traditional navigable waters, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. Before issuing a 404 permit for a project that may affect federally-listed species, the Corps is required under section 7 of the ESA to consult with the Service. The ESA is the primary Federal law that provides protection for *S. leiocarpa* since its Federal listing as an endangered species in 1997.

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. If the Corps loses their regulatory authority over vernal pools, unmitigated destruction of potential habitat for *Sedella leiocarpa* may increase over the range of the species.

California State Laws: The State's authority to conserve wildlife is comprised of the California Endangered Species Act (CESA) and the California Environmental Quality Act (CEQA). *Sedella leiocarpa* was listed as endangered under CESA in 1990. CEQA (chapter 2, section 21050 *et seq.* of the California Public Resources Code) requires government agencies to consider and disclose environmental impacts of projects and to avoid or mitigate them where possible. Under CEQA, public agencies must prepare environmental documents to disclose environmental impacts of a project and to identify conservation measures and project alternatives. Through this process, the public can review proposed project plans and influence the process through public comment. If a project may impact known populations of *S. leiocarpa*, these impacts would be disclosed to the Service and allow the Service an opportunity to comment on the proposed project's effects to this species. Typically, project proponents proposed conservation measures to offset or minimize adverse effects to listed species. However, CEQA does not guarantee that such conservation measures will be implemented.

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

At the time of listing, *Sedella leiocarpa* was threatened by having a restricted range and few populations. Additionally; erosion was occurring at one of the population sites. Currently, in addition to these threats, climate change is now a concern.

Likelihood of Stochastic Extinction As discussed in the final listing rule, the combination of its restricted range, few populations, and highly specific and vulnerable habitat makes *Sedella*

leiocarpa vulnerable to destruction of all, or a significant part, of any population from random, natural events such as floods or droughts. These populations are highly vulnerable to elimination from random fluctuations in environmental conditions, natural catastrophes, and genetic bottlenecks (Menges 1991). In addition, the restricted range of the species means that a regional catastrophe could drive the entire species to extinction. We have no new information to suggest that this threat to the species have diminished since the time of listing in 1997.

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 severe erosion, which threatens one of the three remaining populations of *S. leiocarpa*, changes in hydrology, adjacent development, drought, or other unknown factors. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Goodman 1987; Gilpin and Soule 1988). If a locality of *Sedella leiocarpa* has several consecutive years of poor rainfall, or changes in hydrology from adjacent development, it is possible that the locality will become extirpated.

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). 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 *Sedella leiocarpa* through decreased inundation periods that do not allow the species sufficient time to complete its life cycle. In contrast, warmer conditions could increase inundation periods, which would not necessarily be a negative effect because increased inundation periods would increase available habitat for *S. leiocarpa.* 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; Pyke and Fischer 2005), including *S. leiocarpa.*

II.D. Synthesis

When *Sedella leiocarpa* was listed as endangered in 1997, three extant populations were known. The primary threats to its survival and recovery were alterations to hydrology, conversion of habitat to agriculture, effects from road maintenance or widening activities, effects from off-road vehicle use, trampling by cattle, and random natural events. Currently, two occurrences of *S. leiocarpa*, have not been seen since the 1940s and habitat no longer remains, one occurrence has been converted to vineyards and attempts to relocate *Sedella leiocarpa* in 2006 and 2007 were unsuccessful; one occurrence's status is unknown, and two occurrences were observed in 2006 and 2007.

The threats to the species have not diminished since the time of listing in 1997. In addition, other factors, such as climate change may also threaten this species. All occurrences of this species are located on private lands and do not have management plans or monitoring programs

to ensure that these localities are sustainable in perpetuity. 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. Criteria discussed within the Recovery Plan have not been met, and in most instances, not initiated, including research, monitoring, management, seed banking, and public participation and outreach. Based on the continuing threat of altered hydrology, habitat loss resulting from conversion to agriculture and development, risk of localized stochastic extirpation, we conclude that *Sedella leiocarpa* still meets the ESA definition of endangered. No status change is recommended at this time.

III. RESULTS

III.A. Recommended Classification:

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

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

We recommend that the recovery priority number remain 2C.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

The following recommendations for future actions are from the 2005 Recovery Plan:

1. Protect habitat. Currently none of the known localities of this species are protected. Preservation of Zone 1 core area should be pursued to preserve known localities.

2. Control erosion. Erosion at Manning Flat should be controlled because the soil loss is making the habitat unsuitable.

3 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 improve 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 if it is affected by breeding system limitations such as low reproductive rate, inbreeding depression or loss of genetic diversity.

4. Collect seeds for future introduction and/or reintroductions into suitable habitat..

5. Formally change the name in the Code of Federal Regulations from *Parvisedum leiocarpum* to *Sedella leiocarpa.*

6. Correct the downlisting criteria, if necessary, to also apply to the Dry Lake core area.

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

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 15 June 2009