Colusa Grass
(*Neostapfia colusana*)

5-Year Review:
Summary and Evaluation

Photo credit: Carol Witham

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California
June 2008

5-YEAR REVIEW
Colusa Grass (*Neostapfia colusana*)

I. GENERAL INFORMATION

I.A. Methodology used to complete the review:

This review was prepared by Sacramento Fish and Wildlife Office (SFWO) staff using information from the 2005 *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Recovery Plan) (Service 2005), and survey information from experts who have been monitoring various occurrences of this species. We interviewed recognized Colusa grass experts for their knowledge and suggestions for recommendations to assist in the recovery of the species. The Recovery Plan (Service 2005), the *CALFED At-risk Plant Species, Habitat Restoration, Final Conservation and Management Plan and Recovery, and Non-native Species Management* (ESA 2005), the *Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool Grasslands* (Vollmar 2002), and personal communications with experts were our primary sources of information used to update the species status and threats sections of this review.

I.B. Contacts

Lead Regional or Headquarters Office – Diane Elam, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, and Jenness McBride, Fish and Wildlife Biologist, Region 8 (California and Nevada), 916-414-6464

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I.C. Background

I.C.1. FR Notice citation announcing initiation of this review: 71 FR 14538, March 22, 2006; and 71 FR 16584, April 3, 2006. We received no information in response to these notices.

I.C.2. Listing history

Original Listing
FR notice: 62 FR 14338
Date listed: March 26, 1997
Entity listed: Colusa grass (*Neostapfia colusana*), a plant species
Classification: Threatened

I.C.3. Associated rulemakings:

Critical habitat for this species was proposed on September 24, 2002 (67 FR 60033). The final rule to designate critical habitat for the Colusa Grass was published on August 6, 2003 (68 FR

46684). A re-evaluation of non-economic exclusions from the August 2003 final designation was published on March 8, 2005 (70 FR 11140). An evaluation of economic exclusions from the August 2003 final designation was published on August 11, 2005 (70 FR 46924). Administrative revisions were published on February 10, 2006 (71 FR 7117).

I.C.6. Review History:

We have not conducted any previous 5-year reviews for this species.

I.C.7. 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-ranked recovery priority and 18 is the lowest), reflecting a high degree of threat, a high potential for recovery, and a taxonomic rank of full species.

I.C.8. 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 the Recovery Plan (Service 2005), Colusa grass is an annual plant in the grass family (Poaceae) and is in the Orcuttieae taxonomic tribe, which also includes species of the *Orcuttia* and *Tuctoria* genera. Grasses of the Orcuttieae tribe are endemic to California vernal pool habitat. Long-term inundation of approximately three months is required for seed germination, and it appears that deeper pools and stock ponds are most likely to provide the long inundation period required (Service 2005). Unlike terrestrial grasses, grasses in the Orcuttieae tribe have pith-filled stems, lack distinct leaf sheaths and ligules, and produce exudate. Population sizes of Colusa grass can vary widely from year to year. Colusa grass has the broadest ecological range among the Orcuttieae tribe, as it occurs on the rim of alkaline basins in the Sacramento and San Joaquin Valleys, on acidic soils of alluvial fans and stream terraces along the eastern margin of the San Joaquin Valley and into the adjacent foothills, as well as in Northern Claypan and Northern Hardpan vernal pool types. It has been found growing in pools ranging from 0.02 to 617.5 acres (Service 2005).

Currently, there are 43 presumed extant occurrences in Yolo, Solano, Merced, and Stanislaus Counties (Hogle 2002, CNDDB 2008). The vast majority of these occurrences are in Stanislaus County (15 occurrences) and Merced County (22 occurrences).

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

The Endangered Species 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. The 5 listing factors are (A) present or threatened destruction, modification, or curtailment of habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease and predation; (D) inadequacy of existing regulatory mechanisms; and (E) other natural or human-caused factors.

The Recovery Plan describes the geographic distribution of vernal pool taxa according to the vernal pool regions defined by the California Department of Fish and Game (CDFG) (Keeler-Wolf *et al.* 1998). Vernal pool regions are discrete geographic regions identified largely on the basis of endemic species, with soils and geomorphology as secondary elements. Within the vernal pool regions, the Recovery Plan identifies core areas that support high concentrations of federally listed vernal pool species, are representative of a given species' range, and are generally where recovery actions are focused. Core areas are distinct areas that provide the features, populations, and distinct geographic and/or genetic diversity necessary to the recovery of a species. More than one federally listed vernal pool species may be found within a single core area, and the core areas encompass areas larger that just the location of any single species.

Within each core area, the Recovery Plan identifies specific percentages of suitable habitat that should be protected to achieve recovery for listed species. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery, with Zone 1 reflecting the highest priority areas. Protection of the majority of suitable habitat within Zone 1 core areas, and Zone 2 and 3 core areas where appropriate, is recommended to provide corridors and dispersal habitat, support metapopulation dynamics, provide for reintroduction or introduction sites, and to protect currently undiscovered populations.

In this review, most Colusa grass occurrences are those reported in the California Natural Diversity Database (CNDDB). The CNDDB defines occurrence as a location separated from other locations of the species by at least one-fourth mile that may contain populations, individuals, or colonies. For the purposes of this review, "element occurrence" or "occurrence" refers to a report contained in the CNDDB. Places where the subspecies is found but that are unreported to CNDDB are noted as "sites", "localities", etc., in order to differentiate them from occurrences as reported and defined in the CNDDB.

General recovery criteria for Colusa grass 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 Colusa grass 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. Of the 5 listing factors, factor B (overutilization) is not relevant to this species.

Delisting criteria for Colusa grass 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.

The Recovery Plan is designed to be implemented in a logical, progressive manner. Core areas are ranked as Zone 1, 2, or 3 in order of their overall priority for recovery. Core areas containing Colusa grass are included as both Zones 1 and 2 in the Recovery Plan. Protection of Zone 2 core areas will significantly contribute to recovery of Colusa grass, and if sufficient, might offset the need to protect some lands within the Zone 1 core areas. Further implementation of recovery actions in vernal pool habitat outside of the Zone 1 and 2 core areas described in the Recovery Plan could be recommended for Colusa grass if additional occurrences are found outside of Zone 1 and Zone 2 core areas. This criterion (1A-E) addresses listing factor A.

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

In the Recovery Plan, the core areas that pertain to Colusa grass are listed in Table 1 and include: (1) Grasslands Ecological Area; (2) Davis Communications Annex; (3) Jepson Prairie; (4) Farmington; (5) Madera; (6) Merced; (7) Turlock; and (8) Waterford. These eight core recovery

areas are distributed among three vernal pool regions: (1) San Joaquin Valley; (2) Solano-Colusa; and (3) Southern Sierra Foothills.

Table 1: Colusa grass core recovery areas, by vernal pool region.

San Joaquin Valley Vernal Pool Region
Core area: Grasslands Ecological Area (Zone 1).
Solano-Colusa Vernal Pool Region
Core areas: Davis Communications Annex (Zone 1) Jepson Prairie (Zone 1)
Southern Sierra Foothills Vernal Pool Region
Core areas: Farmington (Zone 2) Madera (Zone 1) Merced (Zone 1) Turlock (Zone 2) Waterford (Zone 2)

This criterion has not been met. The Recovery Plan specifies specific criteria for protection of suitable Colusa grass habitat within eight core recovery areas found within three vernal pool regions. For Colusa grass, the Recovery Plan recommends that 95 percent of Zone 1 core recovery areas and 85 percent of Zone 2 core recovery areas be protected. However, the Service does not yet have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected habitat that is suitable for Colusa grass. The amount of suitable habitat that exists range-wide has not yet been estimated; therefore, the percentage that has been protected range-wide is still unknown. In addition, the Recovery Plan recommends that 90 percent of occurrences of this species be protected. Currently, 5 out of 43 presumed extant occurrences are protected from the direct affects of development (see Table 2). However, one of the seven protected occurrences has not been detected in recent surveys for this species (surveys were conducted in 1989, 1991, 1992, 2000, and 2004) (C. Witham, *in litt.* 2006). The Service has only recently approved the Recovery Plan and does not yet have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected habitat that is suitable for Colusa grass.

Table 2. Colusa grass presence, ownership, and protection by vernal pool region and core area. Based primarily on CNDDB 2008.

Vernal Pool Region	Core Area	Occ. Num	Presence	Ownership	Type of Protection
San Joaquin Valley	Grasslands Ecological Area	39	Potentially Extirpated	Private	
	Grasslands Ecological Area	40	Potentially Extirpated	Private	
	Grasslands Ecological Area	51	Potentially Extirpated	Private-Sunrise Ranch	
	Grasslands Ecological Area	52	Extirpated	USFWS Merced NWR	Managed for Colusa grass [1]
		50	Presumed extant	Private	
Solano-Colusa	Davis Communication Annex	49	Presumed extant	DOD-McClellanAFB	Managed for the protection o Colusa grass, but not perman protected[2]
	Davis Communication Annex	58	Presumed extant	DOD-McClellanAFB	Managed for the protection o Colusa grass, but not perman protected[2]
	Jepson Prairie	19	Presumed extant	Solano Land Trust	Managed for the protection o Colusa grass[3]
	Jepson Prairie	48	Presumed extant	Private	Managed for the protection o Colusa grass[3]
	mostly not in a core area	13	Extirpated	Private	
Southern Sierra Foothills	Farmington	47	Presumed extant	Private	
	Madera	1	Presumed extant	Private, TNC	
	Madera	12	Potentially Extirpated	Private	
	Madera	14	Presumed extant	Private	
	Madera	15	Potentially Extirpated	Private	
	Madera	17	Presumed extant	Private	
	Madera	18	Presumed extant	Private	

	Madera	26	Presumed extant	Private	
	Madera	27	Presumed extant	Private	
	Madera	29	Presumed extant	Private	
	Madera	32	Presumed extant	Private	
	Madera	34	Presumed extant	Private	
	Madera	36	Presumed extant	Private	
	Madera	37	Presumed extant	Private	
	Madera	38	Presumed extant	Private, TNC	
	Madera	42	Extirpated	Private	
	Madera	43	Presumed extant	Private	
	Madera	45	Presumed extant	Private	
	Madera	46	Presumed extant	Private	
	Madera	59	Presumed extant	Private	
	Madera	60	Presumed extant	Private	
	Madera	66	Presumed extant	Private	
	Madera	67	Presumed extant	Private	
	Madera	68	Presumed extant	Private	
	Madera	69	Presumed extant	Private	
	Madera	70	Presumed extant	Private	
	Merced	2	Presumed extant	Private	
	Merced	4	Presumed extant	Private	
	Merced	5	Presumed extant	Private	
	Merced	6	Potentially Extirpated	Private	
	Merced	7	Potentially Extirpated	Private	
	Merced	8	Presumed extant	Private	
	Merced	9	Extirpated	Unknown	
	Merced	20	Presumed extant	Private	
	Merced	24	Presumed extant	Private	

	Merced	28	Presumed extant	Private	
	Merced	35	Potentially Extirpated	Private	
	Merced	55	Presumed extant	Private	
	Merced	57	Presumed extant	Private	
	Merced	61	Extirpated	Private	
	Merced	62	Presumed extant	Private	
	Merced	71	Presumed extant	Unknown	
	Not in a core area	11	Presumed extant	Private	
	Not in a core area	22	Extirpated	Private	
	Not in a core area	41	Extirpated	Private, Stanislaus County	
	Not in a core area	54	Extirpated	Private	
	Not in a core area	63	Extirpated	Private	
	Turlock	23	Extirpated	Private	
	Waterford	56	Presumed extant	Private	
	Waterford	64	Presumed extant	Private	
	Waterford	65	Presumed extant	Private	

Occ. Num. = occurrence number

[1] D. Woolington, Service, personal communication, 2006.

[2] ESA 2005.

[3] C. Witham, *in litt.* 2006

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.

At least one occurrence remains in each of the vernal pool regions from which Colusa grass was known historically. The Recovery Plan recommends that 90 percent of this species' occurrences be protected. However, only 12 percent of the total 43 occurrences are currently protected; therefore, this criterion has not been met. Currently, there are 43 presumed extant occurrences (Hogle 2002; CNDDB 2008). Two extant occurrences are protected at the Jepson Prairie Preserve, in Solano County. However, one of these occurrences has not been detected in recent surveys for this species (surveys were conducted in 1989, 1991, 1992, 2000, and 2004) (C. Witham, *in litt.* 2006). One occurrence is protected at the Arena Plains Parcel of the Merced NWR. In addition, protection of distant edges of occurrences has not occurred at any of the known occurrences, except for the occurrence at Olcott Lake, in Jepson Prairie, Solano County.

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

The Recovery Plan recommends introduction to: (1) the Arena Plains parcel of the Merced NWR, in San Joaquin County; (2) appropriate sites in Colusa County, where the species is now apparently extirpated; and (3) appropriate sites in the Farmington Core Recovery Area. As of this review, introductions of Colusa grass have not occurred. Therefore, this recovery criterion has not been met.

1D. Additional occurrences identified through future site assessments, GIS and other analyses, and status surveys that are determined essential to recovery goals if the occurrences are permanently protected.

There is potential to locate additional occurrences of Colusa grass, particularly on Private lands in Merced and Stanislaus counties, where the majority of known extant occurrences are found. At this time, the Service is not aware of surveys of additional areas. Status surveys are currently occurring at three sites: the Davis Communications Annex site in Yolo County, the Jepson Prairie occurrence in Solano County, and the Arena Plains Unit of the Merced NWR, in Merced County. No GIS or other analyses to identify areas of potential occurrence are 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.

Monitoring of hydrology has not occurred at any of the known extant occurrences; therefore this recovery criterion has not been met.

2. Adaptive Habitat Management and Monitoring

This recovery criterion (2A-D) addresses listing factors A, C, 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. Jepson Prairie Preserve is managed under the December 29, 2006, Greater Jepson Prairie Ecosystem Regional Management Plan (B. Wallace, Solano Land Trust, personal communication, 2006). A management plan is currently being utilized to restore habitat and control non-native invasive plants (ESA 2005). In addition, Yolo County is developing a master plan for Grasslands Park (adjacent to the Davis Communications Annex Site. This master plan will include the Davis Communications Annex Site and will include a detailed management plan for conservation of the site's vernal pools and other natural resources (C. Alford, Yolo County, *in litt.* 2006).

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

This criterion has not been met. The occurrence of Colusa grass at Jepson Prairie is the only occurrence that has long-term funding for management in perpetuity. Long-term funding mechanisms exist for Jepson Prairie Preserve through an endowment, however the amount is not large for a preserve of this size and Solano Land Trust is currently attempting to increase the endowment amount (B. Wallace, personal communication, 2006). The Merced NWR is managed by the Service, and therefore funding depends on allocations of Federal monies. The Davis Communications Annex site is currently being monitored through a CALFED grant, but this is only for a limited number of years and is not in perpetuity.

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

This criterion has not been met. Monitoring of ecosystem function has occurred at Olcott Lake at the Jepson Prairie Preserve since the late 1980s and at the Davis Communications Annex site from 2003 to 2005. Monitoring of Colusa grass has occurred at the Arena Plains unit of Merced NWR since 1993, but ecosystem function has not been formally monitored.

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. The Recovery Plan recommends collection of seeds from each vernal pool region. Dr. Heather Davis, Department of Biology of Sonoma State University, will be primarily collecting Colusa grass seeds for population genetic studies in 2007. Seeds are

proposed to be collected throughout the range of Colusa grass (Sonoma State University 2006). Seeds or plants remaining at the end of the study will be deposited at an appropriate seed storage facility.

3. Status Surveys

This recovery criterion (3A-B) implicitly addresses all listing factors.

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. Of the 24 known occurrences visited by Hogle (2002), 11 appear to have been extirpated. Occurrences at the Davis Communications Annex monitored by ESA from 2003 to 2005 decreased in average density over the three years; the cause of this decline is unknown (ESA 2005). The occurrence of Colusa grass at the Merced NWR has decreased since monitoring began in 1993 (D. Woolington, personal communication, 2006). The occurrence at Olcott Lake in the Jepson Prairie Preserve is stable, with periodic fluctuations depending on climatic factors (C. Witham, California Native Plant Society, *in litt*., 2006). Monitoring has not occurred during a time period that meets the requirements specified in the 2005 Recovery Plan, but is ongoing at the three sites.

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

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

This criterion has not been met. Monitoring of known occurrences of Colusa grass has begun only recently, and at only three sites: Jepson Prairie Preserve, Merced NWR, and the Davis Communications Annex site. The majority of known extant occurrences have not been monitored. Hogle (2002) was able to assess the status of 24 known Colusa grass occurrences, where 13 of the 24 sites contained Colusa grass. At this time, there are no standardized site assessments. In addition, if monitored occurrences are deemed to be threatened, there are no habitat planning or rapid response measures planned. Many of the threats to this species described in the 1997 listing rule are still present, even at the three monitored sites.

4. Research

This recovery criterion (4A-C) implicitly addresses all 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.

This criterion has not been met. 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. 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. The majority of information needs discussed in the Recovery Plan are still outstanding. However, some research in these areas has been completed. Research on invasive non-native plant removal has been ongoing since 2003 at the Davis Communications Annex site (ESA 2005).

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. Dr. Heather Davis will be performing population genetic studies in 2007 (see 4B, below) (Sonoma State University 2006). Dr. Davis' research will assist in the implementation of the priority one and two tasks of the 2005 Recovery Plan by providing information on how to prevent extinctions by stabilizing and increasing currently declining Colusa grass occurrences. Specifically, this research will help determine how pollination ecology interacts with population genetics to control the species' reproductive success. This information will allow researchers to assess how an occurrence's density and individual plant proximity affect its ability to survive and grow, and to locate appropriate seed sources for use in restoration projects.

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

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

5. Participation and outreach

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

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

This criterion has not 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 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.

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

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

II.C. Updated Information and Current Species Status

II.C.1. Biology and Habitat

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

The majority of extant Colusa grass occurrences are in the Southern Sierra Foothills Vernal Pool Region, where they are concentrated northeast of the City of Merced in Merced County and east of Hickman in Stanislaus County. The majority of these known extant occurrences (42 percent) are at the Flying M Ranch, the Ichord Ranches, and the Virginia Smith Trust site (Vollmar 2002). One or two occurrences remain in central Merced County, which is part of the San Joaquin Valley Vernal Pool Region (Service 2005). Three occurrences are known to be extant in the Solano-Colusa Vernal Pool Region, and one occurrence is possibly extirpated. Two of the extant occurrences in this region are in southeastern Yolo County at the Davis Communications Annex site. One extant occurrence and a possibly extirpated occurrence are located within Jepson Prairie, in central Solano County (C. Witham, *in litt*., 2006; CNDDB 2008). This species has apparently been extirpated from Colusa County (Service 2005; CNDDB 2008).

As noted above, population trends for this species appear to be declining. When the species was listed in 1997 (62 FR 14338), there were 40 known extant occurrences; currently, there are 43 presumed extant occurrences. Colusa grass continues to be threatened by loss of habitat, primarily from urbanization and conversion to agriculture. Fragmentation of habitat also

threatens this species. These threats have resulted in a decreasing trend in overall population numbers since this species initial discovery in 1898. During the 1980s, many new occurrences of Colusa grass were located during extensive surveys. As of 1989, 40 occurrences were extant and 11 had been extirpated (Stone *et al*. 1988). In 2002, there were 48 occurrences believed to be extant (Vollmar 2002, Service 2002). Currently there are 43 extant occurrences reported in the CNDDB (2008). This total does not include an occurrence (occurrence 48 as described in CNDDB 2008) that is possibly extirpated. This site, located in Solano County at the Jepson Prairie Preserve, has not been detected during surveys over the past 18 years (C. Witham, in litt., 2006). Occurrences of Colusa grass have also declined at the Davis Communications Annex (ESA 2005), as well as at the Arena Plains site at the Merced NWR (D. Woolington, personal communication, 2006).

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 determined that habitat loss and degradation due to urbanization , agricultural land conversion, livestock grazing, off-highway vehicle use, altered hydrology, and competition from weedy non-native plants imperiled the continued existence of this species (62 FR 14338). Habitat loss and degradation is still the primary threat to Colusa grass. Eighty-five percent of known Colusa grass occurrences are on Private land and are not protected (CNDDB 2008). The largest continuing threat to this species is agricultural conversion, especially in Stanislaus County, where 14 extant occurrences are known to occur (33 percent of the total extant occurrences) (CNDDB 2008). Urbanization is the second greatest threat, especially at the proposed University of California campus and associated community development in eastern Merced County. Four occurrences in the vicinity of the proposed campus are expected be developed within the next 15 years and two others are within the general "planning area" (EIP Associates 1999). Proposed construction of a new prison and a landfill also threaten other specific occurrences in Merced County (Service 1997). Recent inundation by poultry manure is a threat to the occurrence at the Arena Plains parcel within the Merced NWR (D. Woolington, Service, personal communication, 2006).

San Joaquin Valley Vernal Pool Region

Grasslands Ecological Area, Merced County

One occurrence of Colusa grass is found on the Arena Plains parcel of the Merced NWR and the vernal pool complex where it occurs is managed for the preservation of this species (D. Woolington, Service, personal communication, 2006).

Solano-Colusa Vernal Pool Region

Davis Communications Annex, Yolo County

There are two occurrences of Colusa grass at the Davis Communications Annex site. Ownership of this site is currently being transferred from McClellan Air Force Base to Yolo County (ESA 2005). The two occurrences are managed for the protection of Colusa grass, but are not permanently protected (ESA 2005). At this time, it is unknown if this site will be preserved, but the Yolo County Natural Communities Conservation Plan/Habitat Conservation Plan (NCCP/HCP) process has recommended that the Davis Communications Annex site be preserved (ESA 2005; M. Wong, Yolo County HCP/NCCP Joint Powers Agency (JPA), *in litt.*, 2006). If the Davis Communications Annex site is preserved then 95 percent of suitable habitat within this core recovery area will be protected from the direct affects of development.

Jepson Prairie, Solano County

The Nature Conservancy's 1,566-acre Jepson Prairie Preserve is protected and managed for the benefit of vernal pool species. Two occurrences of Colusa grass are known to occur within the Preserve. However, one of these occurrences has not been detected in recent surveys for this species (surveys were conducted in 1989, 1991, 1992, 2000, and 2004) (C. Witham, *in literature* 2006).

Southern Sierra Foothills Vernal Pool Region

Farmington, Stanislaus County

The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species.

Madera, Merced County

The majority of lands within this core recovery zone are privately owned and not protected or managed for the benefit of vernal pool species. The 254-acre Drayer Ranch Conservation Bank is protected under a conservation easement and managed for the benefit of vernal pool species. Colusa grass is not known to occur within the bank, and the amount of suitable habitat for Colusa grass within this conservation bank is unknown.

Merced, Merced County

The majority of lands within this core recovery zone are privately owned and not protected or managed for the benefit of vernal pool species. During the Endangered Species Act section 7 consultation process for the U.C. Merced campus, U.C. Merced and Merced County committed to preservation of the Virginia Smith Trust and Campus Natural Reserve parcels, where Colusa grass is known to occur. These parcels are adjacent to the U.C. Merced Campus. At this time, however, none of these sites have been protected (J. Vollmar, Vollmar Consulting, personal communication, 2006).

Turlock, Merced County

The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species.

Waterford, Stanislaus County

The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species.

Summary of Factor A

Five of the 43 extant occurrences are now partially or completely protected, and include: (1) one occurrence at the Merced National Wildlife Area (NWR), in Merced County; (2) one occurrence on Private lands protected by a conservation easement adjacent to the Merced NWR; (3) one occurrence at Jepson Prairie Preserve, in Solano County; and (4) two occurrences at the Davis Communications Annex, in Yolo County.

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

Overutilization was not known to be a factor for this species when it was listed in 1997. The listing rule does state that uncontrolled visits by groups or individuals to vernal pool areas could result in possible trampling of vernal pool plants (62 FR 14338). Overutilization does not appear to be a threat at this time, and no new instances of overutilization are known.

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

The 1997 listing rule states that disease was not a factor, and that grazing was not a factor when moderate grazing regimes on dry pasture are utilized (62 FR 14338). In regard to predation, the 1997 final rule states that livestock grazing and associated trampling may or may not adversely affect vernal pool plants depending on, among other things, the kind of livestock, stocking level, season of use, and grazing duration. One or two sites containing Colusa grass have been reported as threatened by foraging by grasshopper outbreaks (Stone *et al*. 1988). The magnitude of this threat is unknown at this time. The Service is not aware of any new information regarding disease or predation since the listing of Colusa grass in 1997.

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

When this species was listed, we found that many existing regulatory mechanisms were not sufficient to protect plants. Regulatory mechanisms analyzed in the listing rule included the section 404 of the Clean Water Act, the California Environmental Quality Act, and the Endangered Species Act (62 FR 14338). In the absence of the Endangered Species Act, we still find that other regulatory mechanisms are insufficient to protect Colusa grass.

Federal Protections

Endangered Species Act: The Endangered Species Act of 1973, as amended (Act), is the primary Federal law that provides protection for Colusa grass. Section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife, however, the take prohibition does not apply to plants. Instead, plants are protected 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, or in the course of any violation of a state criminal trespass law. Section 9 also makes illegal the international and interstate transport, import export and sale or offer for sale of endangered plants and animals. The protection of Section 9 afforded to endangered species is extended to threatened wildlife and plants by regulation. Federally listed plants may be incidentally protected in areas where they co-occur with federally-listed wildlife species. In some cases, federally listed plants are included as covered species in habitat conservation plans (HCPs) prepared by non-Federal applicants as part of the terms and conditions for issuance of an incidental take permit for federally listed wildlife under section 10(a)(1)(B).

Clean Water Act: The Section 404 of the Clean Water Act may afford some protection to Colusa grass. The U.S. Army Corps of Engineers (USACE or Corps) issues permits for the discharge of dredged or fill material into navigable waters of the United States. The Corps interprets "the waters of the United States" expansively to include not only traditional navigable waters, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. Before issuing a 404 permit to a project applicant that may affect federally listed species, the Corps is required under section 7 of the Endangered Species Act to consult with the Service.

However, recent Supreme Court rulings have called into question the Corps' definition of Waters of the U.S. On June 19, 2006, the U.S. Supreme Court vacated two district court judgments that upheld this interpretation as it applied to two cases involving "isolated" wetlands. Currently, the Corps regulatory oversight of vernal pools is in doubt because of their "isolated" nature. In response to the Supreme Court decision, the Corps and the U.S. Environmental Protection Agency (USEPA) have recently released a memorandum providing guidelines for determining jurisdiction under the Clean Water Act. The guidelines provide for a case-by-case determination of a "significant nexus" standard that may protect some, but not all, vernal pool habitat (USEPA and USACE 2007). The overall effect of the new permit guidelines on loss of vernal pool habitat is not known at this time. If the Corps loses its regulatory authority over vernal pools, unmitigated destruction of potential habitat for Colusa grass may increase over the range of the species.

California State Laws

The State's authority to conserve plants is comprised of four pieces of legislation: The California Endangered Species Act (CESA), the Native Plant Protection Act (NPPA), the

California Environmental Quality Act (CEQA), and the Natural Community Conservation Planning Act (NCCPA).

Colusa grass was state-listed as endangered in 1979. CESA (California Fish and Game Code, section 2080 *et seq*.) and NPPA (Division 2, Chapter 10, section 1908) prohibit the unauthorized take of State-listed threatened or endangered plant species. Unlike the take prohibition in the Federal Endangered Species Act, the State prohibition includes plants; however, landowners are exempt from this prohibition for plants taken via habitat modification. As noted in the 1997 Federal rule to list Colusa grass, the landowner is 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 (NPPA Division 2, Chapter 10, section 1913). However, salvaging is unlikely to be beneficial for Colusa grass, an annual species, as no evidence exists that the species would survive transplantation.

The California Environmental Quality Act (CEQA) (chapter 2, section 21050 *et seq.* of the California Public Resources Code) requires government agencies to consider and disclose environmental impacts of projects and to avoid or mitigate them where possible. Under CEQA, public agencies must prepare environmental documents to disclose environmental impacts of a project and to identify conservation measures and project alternatives. Through this process, the public can review proposed project plans and influence the process through public comment. However, CEQA does not guarantee that such conservation measures will be implemented.

Currently there are no completed regional or county-wide Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) in Sacramento County, thereby leaving occurrences on Private land without protection pursuant to the Endangered Species Act of 1973, as amended (Act) or the Natural Community Conservation Planning Act.

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

Competition from non-native plants and herbicide run-off are potential threats analyzed in the Service's 1997 listing rule (62 FR 14338). Other natural or manmade threats cited in the 1997 final rule include damage from off-highway vehicles, deleterious substances from adjacent properties, and increases in human population growth. No new information is available on these threats at this time. Current threats include those discussed in the 1997 final rule, and in addition include drought and climate change.

Drought and Climate Change. Colusa grass is dependent upon vernal pool wetlands, which signifies the importance of water availability on the survival and recovery for this species. Drought conditions will place additional strains on vernal pool ecosystems. Where occurrences persist on only marginal habitat, the addition of drought conditions is likely to result in high 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 Colusa grass occurrences may rebound after severe climatic conditions.

Climate is predicted to change in California within the 21st century (Cayan *et al*. 2005, Field *et al*. 1999). Even modest changes in warming could result in a reduction of the spring snowpack,

earlier snowmelt, more runoff in winter with less runoff in spring and summer, more winter flooding, and drier summer soils (Cayan *et al.* 2005, Field *et al*. 1999). Although the specific effects of climate change on the Colusa grass are unknown, the effects of increased winter flooding and drought conditions in the spring and summer have the potential to adversely affect this species.

Small, Isolated Populations. Occurrences of this species can vary greatly from year to year, with some extant occurrences not appearing during certain years based on climatic conditions (Service 2005). Habitat for Colusa grass continues to be highly fragmented throughout its range due to conversion of natural habitat for urban and agricultural uses. This fragmentation results in small isolated occurrences of this species. Such occurrences may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1988; Goodman 1987). If an extirpation event occurs in a occurrence that has been fragmented, the opportunities for recolonization will be greatly reduced due to physical isolation from other source occurrences.

II.D. Synthesis

When Colusa grass was listed as threatened in 1997, there were 40 known extant occurrences. Currently, there are 43 presumed extant occurrences of this species. Five of the 43 total extant occurrences are now partially or completely protected; however, the remaining occurrences remain threatened by land conversion to urban development and to irrigated cropland, impacts from surrounding land use, competition with non-native plant species, potential changes to hydrology, and other human activities. The overall trend of this species is unclear due to lack of systematic surveys. Many occurrences occupy a small area, indicating that extirpation is still a threat even on protected sites.

We have no new information to suggest that threats to the species have substantially changed since the time of listing in 1997. Some threats, such as habitat loss and fragmentation, have increased since 1997. The primary threats to the species continue to be potential destruction and modification of habitat and the threat from fragmentation of habitat. In addition to habitat preservation, other criteria discussed within the Recovery Plan have not been met, and in some instances, not initiated. These include research, monitoring, management, and participation and outreach. Based on the primary continued threats of habitat loss and degradation, nonnative invasive plants, and small population size, we conclude that Colusa grass still meets the Act's definition of threatened, and 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: 2C (no change)

We recommend that the recovery priority number remain 2C because the species continues to have a high degree of threat but also a high potential for recovery. The "C" indicates that some degree of conflict exists with construction or other development projects or other forms of economic activity.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

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

1. Once compiled, results from research on non-native invasive species control and population genetic studies should be incorporated into existing and future management plans for protected Colusa grass occurrences.

2. A standardized monitoring method should be developed to monitor species status and population trends throughout the species range. Monitoring species status should be continued at the Jepson Prairie Preserve occurrence in Solano County, the Davis Communications Annex site in Yolo County, and the Arena Plains site, within the Merced NWR, in Merced County. Additional research should be conducted at these sites to incorporate research recommendations outlined in the Recovery Plan. Results from monitoring and research should be included in the management plans for these three areas. Sites also should be monitored within Merced and Stanislaus Counties, where the majority of extant occurrences are known. Currently, the Merced NWR's Arena Plains parcel is the only monitored occurrence within these two counties. Many occurrences reported in the CNDDB (2008) have not been visited in over a decade.

3. Colusa grass should be reintroduced to vernal pool regions and soil types from which status surveys indicate the species has been extirpated. The Recovery Plan recommends introduction of Colusa Grass to Colusa County, the Arena Plains

parcel of the Merced NWR, and the Farmington core area. Genetic studies proposed by Sonoma State may help to identify appropriate seed sources for use in introduction/reintroduction project.

4. The Service should work cooperatively with landowners to preserve known occurrences of Colusa grass on properties adjacent to and within the proximity of the U.C. Merced Campus. The majority of known extant occurrences (42 percent) are at the Flying M Ranch, the Ichord Ranches, and the Virginia Smith Trust site (Vollmar 2002), all of which are within the vicinity of the U.C. Merced campus. These occurrences are likely to be lost as a result of development if they are not preserved in the near future. Although some portions of the Flying M Ranch in Merced County are currently protected by conservation easements, the known occurrences of Colusa grass within the ranch are not currently protected.

5. It is possible that occurrences of Colusa grass exist on private lands that have not yet been surveyed, particularly in Merced and Stanislaus counties, where the majority of known occurrences are found. Surveys should be performed in suitable habitat for Colusa grass on private lands throughout the species' range to determine if more occurrences exist.

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Appendix 1. Protection of Occurrences Narrative.

San Joaquin Valley Vernal Pool Region

Grasslands Ecological Area, Merced County

The Grasslands Ecological Core Recovery Area is a Zone 1 core recovery area. The amount of suitable Colusa grass habitat that is protected within this core recovery area has not been quantified at this time. One occurrence of Colusa grass is found on the Arena Plains parcel of the Merced National Wildlife Refuge (NWR). The Merced NWR currently manages the vernal pool complex where the Colusa grass occurs for the preservation of this species (D. Woolington, Service, personal communication, 2006).

Solano-Colusa Vernal Pool Region

Davis Communications Annex, Yolo County

The Davis Communications Annex Core Recovery Area is a Zone 1 core area. There are two occurrences of Colusa grass at the Davis Communications Annex site. This site is affiliated with McClellan Air Force Base (AFB), which was closed in 1999. Ownership of this site is currently being transferred to Yolo County (ESA 2005). The two occurrences within the Davis Communications Annex site are managed for the protection of Colusa grass, but are not permanently protected (ESA 2005).

Jepson Prairie, Solano County

The Jepson Prairie Core Recovery Area is a Zone 1 core area. The amount of suitable Colusa grass habitat that is protected within this core recovery area has not been quantified at this time. The Nature Conservancy's 1,566-acre Jepson Prairie Preserve is within this core area. This preserve is protected and managed for the benefit of vernal pool species. Two occurrences of Colusa grass are known to occur within the Preserve. However, one of these occurrences has not been detected in recent surveys for this species (surveys were conducted in 1989, 1991, 1992, 2000, and 2004) (C. Witham, *in litt.* 2006).

Southern Sierra Foothills Vernal Pool Region

Farmington, Stanislaus County

The Farmington Core Recovery Area is a Zone 2 core area. The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species. There is not yet sufficient information to determine the amount of suitable Colusa grass habitat that is protected within this core area.

Madera, Madera County

The Madera Core Recovery Area is a Zone 1 core area. The amount of suitable Colusa grass

habitat that is protected within this core recovery area has not been quantified at this time. The majority of lands within this core recovery zone are privately owned and not protected or managed for the benefit of vernal pool species.

Merced, Merced County

The Merced Core Recovery Area is a Zone 1 core area. The amount of suitable Colusa grass habitat that is protected within this core area has not been quantified at this time. The majority of lands within this core recovery zone are privately owned and not protected or managed for the benefit of vernal pool species.

Turlock, Merced County

The Turlock Core Recovery Area is a Zone 2 core area. The amount of suitable Colusa grass habitat that is protected within this core recovery area has not been quantified at this time. The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species.

Waterford, Stanislaus County

The Waterford Core Recovery Area is a Zone 2 core area. The amount of suitable Colusa grass habitat that is protected within this core recovery area has not been quantified at this time. The majority of lands within this core area are privately owned and not protected or managed for the benefit of vernal pool species.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF COLUSA GRASS

Current Classification: Threatened
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 __NA__

Review Conducted By ___Sacramento Fish and Wildlife Office Staff_

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 7 July 2008

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Acting

Approve _____ Date 7/10/08