

Recovery Plan Revision for Large-flowered Fiddleneck (*Amsinckia grandiflora*)

Original Approved: September 29, 1997

Original Prepared by: Region 1, Pacific Region

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DRAFT AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for this species since the recovery plan was completed. In this recovery plan modification, we will reference the current criteria and document the proposed criteria amendments, information we considered in drafting proposed criteria amendments, and or other species specific information here about what else may be needed, if applicable. The proposed criteria amendments are shown as an appendix that supplements the recovery plan, superseding only pages 26 and 27 of the recovery plan.

**For
U.S. Fish and Wildlife Service
Region 8, Pacific Southwest
Sacramento, California**

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Approved: XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Regional Director, Pacific Southwest Region, Region 8
U.S. Fish and Wildlife Service

Date: XXXXXXXXXXXX

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

The original recovery plan did not include delisting criteria because there was insufficient information available to determine biologically sound delisting criteria to ensure the long-term self-maintenance of the species. The revised recovery criteria for the large-flowered fiddleneck (*Amsinckia grandiflora*) are based on new information, but may still require revision in the future as new information is collected. These criteria follow the five factors used to determine whether any species is an endangered species or a threatened species: the present or threatened destruction, modification, or curtailment of its habitat or range; the overutilization for commercial, recreational, scientific, or education purposes; disease or predation; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence. The recovery criteria also address the biodiversity principles of representation, resiliency, and redundancy as defined in the U.S. Fish and Wildlife Service (Service) Species Status Assessment Framework (Service 2016). Representation describes the ability of a species to adapt to changing environmental conditions over time. It is characterized by the breadth of genetic and environmental diversity within and among populations. Resiliency describes the ability of populations to withstand stochastic disturbance. Resiliency is positively related to population size and growth rate. Further, it might be influenced by connectivity among populations. Generally, populations need abundant individuals within habitat patches of adequate area and quality in order to survive and reproduce in spite of disturbance. Redundancy describes the ability of a species to withstand catastrophic events. Generally, species that have adequate individuals within multiple populations can better withstand potential loss from catastrophic events. Redundancy is high when multiple, resilient populations are distributed within the species' ecological settings and across the species' range. The amended criteria will be peer reviewed in accordance with the OMB Peer Review Bulletin following the publication of the Notice of Availability.

Emails were sent to species experts and the Recovery Implementation Team (RIT). While the RIT provided input, the shortened timeline for developing recovery criteria for the large-flowered fiddleneck limited the opportunity for collaboration in this effort. This review was not contracted out.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list." Legal challenges to recovery plans (see *Fund for Animals v. Babbitt*, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five delisting factors.

Recovery Criteria

See the previous version of the criteria in the original recovery plan on pages 26 and 27. [[Click here to view document](#)]

Synthesis

The large-flowered fiddleneck is an herbaceous annual plant in the borage family (Boraginaceae). This annual species has bright, red-orange, trumpet-shaped flowers arranged in a fiddleneck-shaped inflorescence. Its bright green foliage is covered with coarse, stiff hairs. Historically, the large-

flowered fiddleneck ranged from the San Joaquin River Delta in northern Contra Costa County, California, south to Corral Hollow and adjacent areas in San Joaquin County. As a heterostylous species, the large-flowered fiddleneck produces pin and thrum flower forms (morphs), where the female styles and stigmas have two distinct forms on different plants. Characteristic of the genus, each flower type has four ovaries at the base of the style, each of which matures into a seed. The fruit is known as a nutlet. For a status assessment of the large-flowered fiddleneck, see the 2009 5-year Review (Service 2009).

Abundance

At the time of listing, there was one known population in southwestern San Joaquin County, California, on U.S. Department of Energy land, at the Droptower site, with fewer than 50 plants. In 2017, there were no plants at either the Draney or natural Droptower sites, and 215 plants in two introduced populations also located on the Department of Energy land at Site 300 (Schweitzer, pers. comm. 2018). Additionally, there were 84 plants in the Carnegie Canyon population, and 2,559 plants in introduction sites in three counties in 2017 (Schweitzer, pers. comm. 2018).

Research on Management of Large-flowered Fiddleneck

Research indicates that the large-flowered fiddleneck produces more inflorescences in plots restored to low and medium densities of native perennial grasses compared to plots with low and medium densities of nonnative annual grasses, and that large-flowered fiddleneck produces more inflorescences at lower densities of both grass types compared to higher densities (Carlsen et al. 2000). There have been different ways to achieve this. Pavlik (1990, 1991, 1992, 1995) has examined the effectiveness of various management techniques for the control of nonnative species including hand manipulation, selective herbicides, and fire in the reintroduction of large-flowered fiddleneck to several sites. Grass-selective herbicide treatments were further used as a management tool for controlling nonnative annual grasses at the native Droptower population on the Lawrence Livermore National Laboratory. After each herbicide treatment, except for the treatment in 1998, large-flowered fiddleneck numbers increased dramatically (Carlsen et al. 2012). The use of herbicide was discontinued due to the large increase of bush lupine at the native Droptower site, and the lack of the response by the large-flowered fiddleneck in 1998 (Carlsen et al. 2012).

One introduced population at Site 300 is a long-term research population established to investigate the effects of fire on large-flowered fiddleneck and the associated plant community. Fire seems to have negative effects on the large-flowered fiddleneck, including increasing the rate of granivory on large-flowered fiddleneck nutlets (Espeland et al. 2005, Paterson et al. 2010, Carlsen et al. 2017). Pavlik (1996) believed that granivores caused the extirpation of the Connolly Ranch population.

All *Amsinckia* plants are poisonous to grazing animals (Ditomaso et al. 2013; Panter et al. 2017), but the presence of these animals has caused the decline of populations by trampling (Pavlik 1992; Vollmar 2016). However, cattle seem to avoid large densities of fiddleneck as cattle don't eat the plant.

Introduction of Large-flowered Fiddleneck

Several attempts have been made to introduce populations of large-flowered fiddleneck. As part of recovery efforts, seven introductions have been established from seed throughout the large-flowered

fiddleneck's historical range (Pavlik 1990, Pavlik et al. 1993). Only two of these populations (at Lougher Ridge on East Bay Regional Park District land, and at Site 300 near the Droptower natural population), appear to have initially been successful. Presently, the Lougher Ridge population is extirpated and the Site 300 population has been maintained through periodic seeding and plantings. In October 2002, the U.S. Bureau of Reclamation entered into an Interagency Agreement with the Lawrence Livermore National Laboratory and the U.S. Department of Energy to provide funding to the Lawrence Livermore National Laboratory for rapid seed bank enhancement at the Lougher Ridge and Droptower sites (Paterson et al. 2005). Demographic monitoring has been conducted on the various natural and reintroduced sites. The U.S. Bureau of Reclamation is currently funding introduction efforts in Alameda, Contra Costa, and San Joaquin Counties (Vollmar 2016).

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the large-flowered fiddleneck may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants (Lists). Downlisting is the reclassification of a species from endangered to threatened. The term "endangered species" means any species (species, sub-species, or distinct population segment) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, to state agencies, and to other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Lists, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

We provide both downlisting and delisting criteria for the large-flowered fiddleneck, which will supersede those included in the Large-flowered Fiddleneck Recovery Plan, as follows:

Downlisting Recovery Criteria

Revisions to the original criteria are shown in italics. The large-flowered fiddleneck may be downlisted to threatened status when:

- 1) A minimum of six management areas¹ are secured and protected from the threats that caused listing initially, including urbanization, agricultural conversion, competition with invasive vegetation, and livestock *overgrazing*².
- 2) Sufficient information has been obtained to ensure the perpetuation of *suitable habitat*³, and appropriate management, based on this information, is being implemented at each management area¹ *in perpetuity*⁴.
- 3) Each management area has *an average of 3,000 individuals*⁵ *over two precipitation cycles*⁶ *or 10 years, whichever is longer*⁷, with sufficient acreage of suitable habitat³ to support an expanded population⁸ and provide an appropriate buffer (see task 42).
- 4) The six management areas¹ concurrently demonstrate self-maintenance without intensive management intervention (e.g. hand-pollination, seed collection, off-site propagation) needed to prevent population decline for *two precipitation cycles*⁶ *or 10 years, whichever is longer*^{7,9}.

Delisting Recovery Criteria

All delisting criteria are new. The large-flowered fiddleneck will be considered for delisting when:

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

To delist the large-flowered fiddleneck, threats to the species and its habitat must be reduced. This reduction will be accomplished when the following has occurred:

- A/1** A minimum of 12 management areas¹ that encompass sufficient acreage with suitable habitat characteristics³ and an appropriate buffer area to conduct site specific management actions¹⁰ have been protected in perpetuity. Twelve areas will provide sufficient redundancy for the species to withstand potential catastrophic events.

¹ A management area is land consisting of one or more populations of large-flowered fiddleneck and its associated community that is protected adequately to maintain ecosystem and evolutionary processes.

² The phrase “including at least two natural populations,” has been removed. Livestock overgrazing is differentiated from grazing as a threat, as the plants seem to need some level of grazing to control its associated plant community and provide more open space for the fiddleneck.

³ Suitable habitat characteristics include soil quality, slope, and amount of solar radiation; a negligible amount of edge effects; and appropriate levels of grass cover and/or a grazing regime.

⁴ The RIT wanted this criterion to be more flexible as more research is being conducted on what the species habitat requirements are.

⁵ The largest population size at the Droptower site (1,949 individuals) was not large enough to prevent the collapse of the population (Carlsen et al. 2012). The RIT decided to change this criterion from 1,500 individuals to 3,000, which reflects current introduction efforts.

⁶ A precipitation cycle is a series of years that encompass average, above-average, and below-average rainfall conditions, starting and ending with average precipitation. The populations must demonstrate the ability to survive both precipitation extremes.

⁷ A time constraint has been added to ensure populations meet the criteria after a certain amount of time should all precipitation cycles last the smallest amount of time.

⁸ A population is a group of individuals in a small geographic area.

⁹ The phrase “at or above this level,” has been removed.

¹⁰ The RIT decided that there shouldn’t be a minimum size for each management area due to various land owners and management regimes. Instead, the size of the management areas will be site specific, and will contain suitable habitat characteristics and a land buffer to protect populations from indirect threats. The Service decided that there should be at least 12 management areas, which is double the number of management areas in Downlisting Criteria 1.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The overutilization for commercial, recreational, scientific, or educational purposes is not known to threaten the large-flowered fiddleneck at this time. Therefore, no recovery criteria have been developed for this factor.

Factor C: Disease or Predation

Predation by granivores and the effects associated with grazing (e.g. trampling) are known to threaten the large-flowered fiddleneck. To delist the large-flowered fiddleneck, the threats of predation must be controlled or eliminated. This control will be accomplished when the following has occurred:

- C/1 Predation pressure by granivores and herbivores is at a level that does not result in a declining population trend for any of the management areas¹ over four precipitation cycles⁶ or 20 years, whichever is longer^{7, 11}.

Factor D: Inadequacy of Existing Regulatory Mechanisms

The inadequacy of existing regulatory mechanisms is not known to threaten the large-flowered fiddleneck at this time. Therefore, no recovery criteria have been developed for this factor.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

Other natural or anthropogenic factors believed to affect the continued existence of the large-flowered fiddleneck: changes in environmental conditions resulting from climate change, altered fire regime, wildfire fuel reduction treatments, natural succession, non-native invasive species, loss of genetic diversity, stochastic (chance) events, and small population size. To delist the large-flowered fiddleneck, these threats must be reduced. This reduction will have been accomplished when the following have occurred:

- E/1 Each management area¹ has an average of 16,000 individuals over four precipitation cycles⁶ or 20 years, whichever is longer^{7, 12}.
- E/2 The twelve management areas¹ concurrently demonstrate self-maintenance without intensive management intervention (e.g. hand-pollination, seed collection, off-site propagation) needed to prevent population decline for four precipitation cycles⁶ or 20 years, whichever is longer^{7, 13}.

Rationale for Recovery Criteria

Although our understanding of the threats to and recovery needs of the large-flowered fiddleneck

¹¹ This criterion will ensure each population has enough time to recover from unpredictable increases in the number of granivores and to develop an adequate seed bank.

¹² Traill et al. (2007) recommends using the upper 95% confidence limit from his meta-analysis of minimum viable population (MVP) for species without a known MVP; a value of 15,992 for plants. This number was rounded to 16,000. The RIT agreed that this number is a good target for delisting.

¹³ This criterion ensures populations are large enough to survive without intensive management.

have not changed since the original recovery plan was written, the knowledge base for other aspects of the species ecology has significantly increased. Through the RIT, we have been able to learn more about the potential habitat requirements. However, there are still data gaps that could impede recovery progress, such as the relationship between grazing and the large-flowered fiddleneck, the relationship between fire and the large-flowered fiddleneck, and the relationship between climate change and the large-flowered fiddleneck.

The new delisting criteria mitigate threats according to Listing Factors A (present or threatened destruction, modification or curtailment of the species habitat or range), C (disease or predation), and E (other natural or manmade factors).

Threats identified under Factor A include habitat loss from the expansion of the San Francisco Bay Area, the change in management regimes, and the conversion of the plant community (Service 1997). Delisting Criteria A/1 addresses Factor A by ensuring 12 management areas are protected with sufficient number of acreage to protect the populations from threats. The management areas will be distributed throughout Alameda, Contra Costa, and San Joaquin Counties where suitable habitat exists. The distribution of the management areas will ensure redundancy and resiliency of the species. Recovery Task 4 and its subsequent tasks are still applicable.

Threats identified under Factor C include the impacts of herbivores and granivores (Service 1997; Service 2009). Delisting Criteria C/1 addresses Factor C by ensuring the average population in each management area is not decreasing over four precipitation cycles, thereby demonstrating resiliency.

Threats identified under Factor E include small populations, stochastic events, and climate change (Service 1997; Service 2009). The updated Downlisting Criteria 3 and Delisting Criterion E/1 will help ensure the species is able to adapt as environmental conditions change. A long-term population viability analysis is needed to determine the actual MVP for this species, as stated under Recovery Task 83. Delisting Criteria E/2 ensures populations are large enough to require little outside help to sustain population levels. As stated in the Recovery Plan, the Service recognizes that limited management, possibly including fencing, periodic burning, and periodic grazing, may continue to be necessary, even following downlisting and delisting, until the species' habitat is restored on a large-scale (Service 1997). Such management will help ensure the populations are resilient and there is sufficient representation to adapt to environmental changes. These recovery criteria do not address the threat of climate change.

The recovery strategy and the recovery tasks for this species ultimately still reflect the needs of the large-flowered fiddleneck, but they need to be updated in future revisions.

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Personal Communications

Schweitzer, Jake. 2018. Senior Ecologist and Geographic Information Science Specialist, Vollmar Natural Lands Consulting. Email conversation from Jake Schweitzer to Jeb Bjerke, California Department of Fish and Wildlife, and Rosemary Stefani, U.S. Bureau of Reclamation, dated July 13, 2018. Subject: AMGR Summary Docs.