

**Recovery Plan for
Potamogeton clystocarpus Fernald (Little Aguja Pondweed).**

Draft Amendment 1

Superseding only Part II, page 21 of the Recovery Plan.

U.S. Fish and Wildlife Service
Region 2
Albuquerque, New Mexico
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Approved: DRAFT Date: _____
Regional Director, Region 2
U.S. Fish and Wildlife Service

I. Background Information.

a. Summary of prior actions.

Listing: 56 FR 57844.
Date: November 14, 1991.
Listed status: Endangered.
Recovery Plan: Little Aguja Pondweed (*Potamogeton clystocarpus*) Recovery Plan.
Prepared by: Kathryn Kennedy, U.S. Fish and Wildlife Service, Austin, Texas.
Approved: June 20, 1994.
Five-year review(s): August 31, 2018.

b. Reason for amendment.

Section 4(f)(1)(B)(ii) of the Endangered Species Act (ESA) 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 are targets for determining when recovery objectives have been met, and should address the biodiversity principles of resilience, redundancy, and representation (Shaffer and Stein 2000, pp. 307—310; National Marine Fisheries Service and USFWS 2010, pp. 5.1-14–5.1-19). Recovery criteria establish when an endangered species may be reclassified (downlisted) as threatened, or when any listed species may be removed from the endangered species list (delisted). The term “endangered species” means any species (species, sub-species, or distinct population segment) that 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.

The original Little Aguja Pondweed Recovery Plan (Recovery Plan) (U.S. Fish and Wildlife Service (USFWS) 1994, p. 21) states:

“No recovery criteria for the species have been developed as there is no recorded information about the numbers of individuals in sustainable populations, the distribution of populations in the habitat, or the dynamics of the plants in these changeable habitats. This information is needed to serve as a basis for delimiting the number of individuals that would constitute a viable population and the number of populations that would constitute full recovery. These parameters will need to be determined and are included as tasks in the plan.”

The 5-year review (USFWS 2018, pp. 3, 23, 25) recommends revising the Recovery Plan to include both downlisting and delisting criteria that comply with updated recovery planning guidance.

c. Brief summary of the species’ current status (USFWS 2018).

Between 2000 and 2004, Little Aguja pondweed was documented at 22 sites in the Davis Mountains, Jeff Davis County, Texas: 17 in Little Aguja Creek, and 5 in Madera Creek (Hellquist *et al.* 2005). These sites totaled at least 511 individuals, and possibly twice that number; however, populations fluctuate widely under the influence of droughts and flash floods. Additionally, the species has been confirmed in another undisclosed stream in the Davis Mountains (Hellquist *et al.* 2005, p. 24; Karges 2018). We have no evidence that the populations have been monitored since that time, but the sites and supporting watersheds appear secure. At least 21 of the sites occur on lands managed for conservation purposes. The Nature Conservancy protects, through ownership or conservation easements, more than 100,000 ac of land in watersheds of streams in the Davis Mountains (The Nature Conservancy 2018).

The current and projected land uses within the watersheds occupied by Little Aguja pondweed are compatible with the species’ long-term conservation. The most significant threats are the demographic and genetic consequences of small population sizes, due to demographic and environmental stochasticity, loss of genetic diversity, genetic drift, and inbreeding depression. Additional threats, such as increased temperatures and changes in precipitation amounts and patterns, may emerge as a result of climate changes. However, we do not know how Little Aguja pondweed will respond to these changes and the complex interactions between entire communities of plants and animals and their environment.

II. Methods used to establish the recovery criteria.

We requested information about Little Aguja pondweed individually from botanists at Texas Parks and Wildlife Department (TPWD), The Nature Conservancy, and Sul Ross State University. Although we have not appointed a recovery team for this species, the rationale used

here was developed by the South Texas Plant Recovery Team for revising delisting criteria of several listed plants in South Texas. The appointed members of this team include representatives from TPWD, The Nature Conservancy, the University of Texas Rio Grande Valley, Sul Ross State University, the U.S. Department of Agriculture - Natural Resources Conservation Service, Texas A&M-Kingsville, the USFWS' Lower Rio Grande Valley National Wildlife Refuge, and private landowners.

These revised criteria are also based on the recommendations and new information summarized in the 5-year review (USFWS 2018).

III. Rationale for establishing the recovery criteria.

USFWS bases assessments of species viability, defined as the likelihood of persistence over the long term, on analyses of the species' resilience, redundancy, and representation. Resilience refers to the population size necessary to endure stochastic environmental variation (Shaffer and Stein 2000, pp. 308-310). Redundancy refers to the number and geographic distribution of populations or sites necessary to endure catastrophic events (Shaffer and Stein 2000, pp. 308-310). Representation refers to the extent of genetic and ecological diversity, both within and among populations, necessary to conserve long-term adaptive capability (Shaffer and Stein 2000, pp. 307-308). In this amendment, we base the criteria for downlisting to the threatened status on the minimum conditions necessary so that the species is no longer in danger of extinction, but is still likely to become endangered within the foreseeable future. These criteria are defined by minimum viable population (MVP) sizes, the number and distribution of populations, and the abatement of threats through the conservation and protection of populations and habitats. These criteria must define "individual" and specify which individuals can contribute to determinations of MVP, and must also describe when and how population sizes can be determined and how populations are to be delimited.

The delisting criteria (for removal from the list of threatened and endangered species) consist of attaining the downlisting criteria levels and sustaining or improving this status long enough to demonstrate that Little Aguja pondweed is no longer likely to become endangered in the foreseeable future. This will require a defined period of monitoring needed to detect demographic trends and responses to climate changes.

The five-year review (USFWS 2018, pp. 13–14) adapted the surrogate species method of Pavlik (1996, p. 137) to provisionally estimate an MVP of 900 mature, genetically distinct individuals for Little Aguja pondweed. Mature individuals are those that have flowered at least once or are judged capable of flowering. Most juveniles (seedlings) die before they are able to reproduce and therefore do not contribute to future populations or genetic diversity. Furthermore, population surveys that do not distinguish mature plants from seedlings would appear to fluctuate wildly, depending on how recently seeds had germinated and the proportion of surviving seedlings. Little Aguja pondweed reproduces both sexually, through the fertilization of flowers, and asexually, through rhizomes and turions. However, asexual reproduction creates

genetically identical clones of the parent plant that collectively contribute a single individual to the effective population size.

The numbers of individuals observed in surveys varies greatly, due to the variations in rainfall and the severity of floods. Therefore, the determinations of population sizes should be based on the numbers observed during the most recent favorable conditions; as used here, favorable conditions are average or above-average precipitation during the March through November growing season. Surveys cannot detect the numbers of viable, dormant propagules—seeds, rhizomes, and turions—that persist in dry stream beds and are able to germinate and produce living stems when favorable weather returns. We do not know how long dormant seeds of Little Aguja pondweed can remain viable, but seeds of other *Potamogeton* species have remained viable after storage in wet mud for 2 to 5 years (Muenscher 1936, p. 805). Hence, we provisionally estimate that Little Aguja pondweed seeds may remain viable for up to 5 years. For these reasons, we provisionally specify that population size determinations may be based on the greatest numbers observed during spans of 5 consecutive years.

We are not aware of a scientific method to determine the minimum number of populations or metapopulations needed to assure long-term survival of a species; in general, more populations distributed over a wider geographic range are better. Hence, the distribution of viable populations (as described above) throughout the species' range is a quantitative metric of both redundancy and representation, provided that we are able to delineate populations (or metapopulations). The five-year review (p. 14) provisionally estimates that the long-term viability of Little Aguja pondweed requires at least 5 resilient populations distributed widely in the Davis Mountains (see Figure 1). As used here, “wide distribution” is a qualitative measure that means “as wide as possible” since this isolated mountain range spans only about 54 kilometers (34 miles) north to south and east to west, and has a limited number of streams that could support the species. (Note: If natural populations of Little Aguja pondweed are discovered in other mountain ranges, its population redundancy and potential for recovery would be correspondingly greater). Since gene flow of this aquatic plant occurs easily within an occupied stream, but rarely between streams, we delimit populations as separate streams and canyons within the Davis Mountains that support one or more colonies of Little Aguja pondweed. The geographic distribution of this criterion may be met by populations that occur in separate 12-digit hydrologic unit code (HUC-12) watersheds (U.S. Department of Agriculture-Natural Resources Conservation Service 1999–Present). Suitable habitat for Little Aguja pondweed may occur in as many as 10 or 15 of the HUC-12 watersheds in the Davis Mountains, but, due to restricted access to private lands, we cannot yet verify how many suitable habitats actually exist. We chose the criterion of 5 populations because this is the largest number that is also likely to be realistic and attainable.

Conservation and protection of at least two Little Aguja pondweed populations and habitats has been accomplished through The Nature Conservancy's acquisition of land for the Davis Mountains Preserve and through conservation easements. The conservation and protection of additional populations of Little Aguja pondweed—if they exist—may be accomplished through similar measures, or through long-term conservation agreements with private landowners.

The period of monitoring necessary to detect demographic trends requires the passage of multiple generation spans and multiple cycles of above- and below-average precipitation. However, we do not yet know the length of the generation span. The five-year review (USFWS 2018, pp. 20, 23) projects that the species' response to climate changes may require about 50 years to detect, during which time demographic trends should also be apparent.

IV. Amended Recovery Criteria.

a. Downlisting Recovery Criteria.

We establish downlisting criteria for Little Aguja pondweed based on the minimum conditions that justify reclassification of the species. Little Aguja pondweed will be considered for downlisting when:

1. Five or more protected, viable populations occur in separate streams or canyons of the Davis Mountains (or other mountain ranges, if the species is discovered elsewhere). The populations should be distributed as widely as possible to represent the species' full range of geographic and ecological adaptation, and to reduce the vulnerability to environmental stochasticity.

Justification: The five-year review (USFWS 2018, p. 14) requires at least 5 resilient populations distributed widely in the Davis Mountains as the metric of redundancy and representation needed for long-term viability of Little Aguja pondweed ; see also the discussion in Section III. The necessary geographic distribution of this criterion may be based on occurrence of populations in separate 12-digit hydrologic unit code (HUC-12) watersheds (see Figure 1; U.S. Department of Agriculture-Natural Resources Conservation Service 1999–Present).

2. Viable populations have 900 or more mature, genetically distinct individuals. Mature individuals have flowered at least once or are judged capable of flowering. For this purpose, multiple genetically identical clones constitute a single individual. The determinations of population sizes may be based on the largest numbers observed during a span of five consecutive years.

Justification: The most significant threats to the continued survival of Little Aguja pondweed are the demographic and genetic consequences of the small numbers and sizes of its populations. The five-year review (USFWS 2018, pp. 13–14) provisionally estimated an MVP of 900 mature genetically distinct individuals as the metric of resilience needed for the long-term viability of Little Aguja pondweed. Since Little Aguja pondweed is an obligate aquatic species, the determinations of population sizes should be based on the numbers observed during the most recent favorable conditions when precipitation within occupied watersheds during the March–November growing season has been average or above-average. However, favorable conditions do not occur every year; moreover, we do not know how long dormant propagules can remain viable. For these reasons, we provisionally specify that population size determinations may be based on the greatest numbers observed during spans of five consecutive years.

3. Protected populations occur on lands that are legally protected and managed to conserve the Region's native flora and fauna, including Little Aguja pondweed and its habitats. Examples include, but are not limited to, conservation easements on private lands, lands owned and managed for conservation by non-profit organizations, and legally binding long-term management agreements with private landowners.

Justification: This criterion addresses threats to Little Aguja pondweed. Protection, conservation, and management of Little Aguja pondweed habitats must be long-term to ensure its continued survival for the foreseeable future.

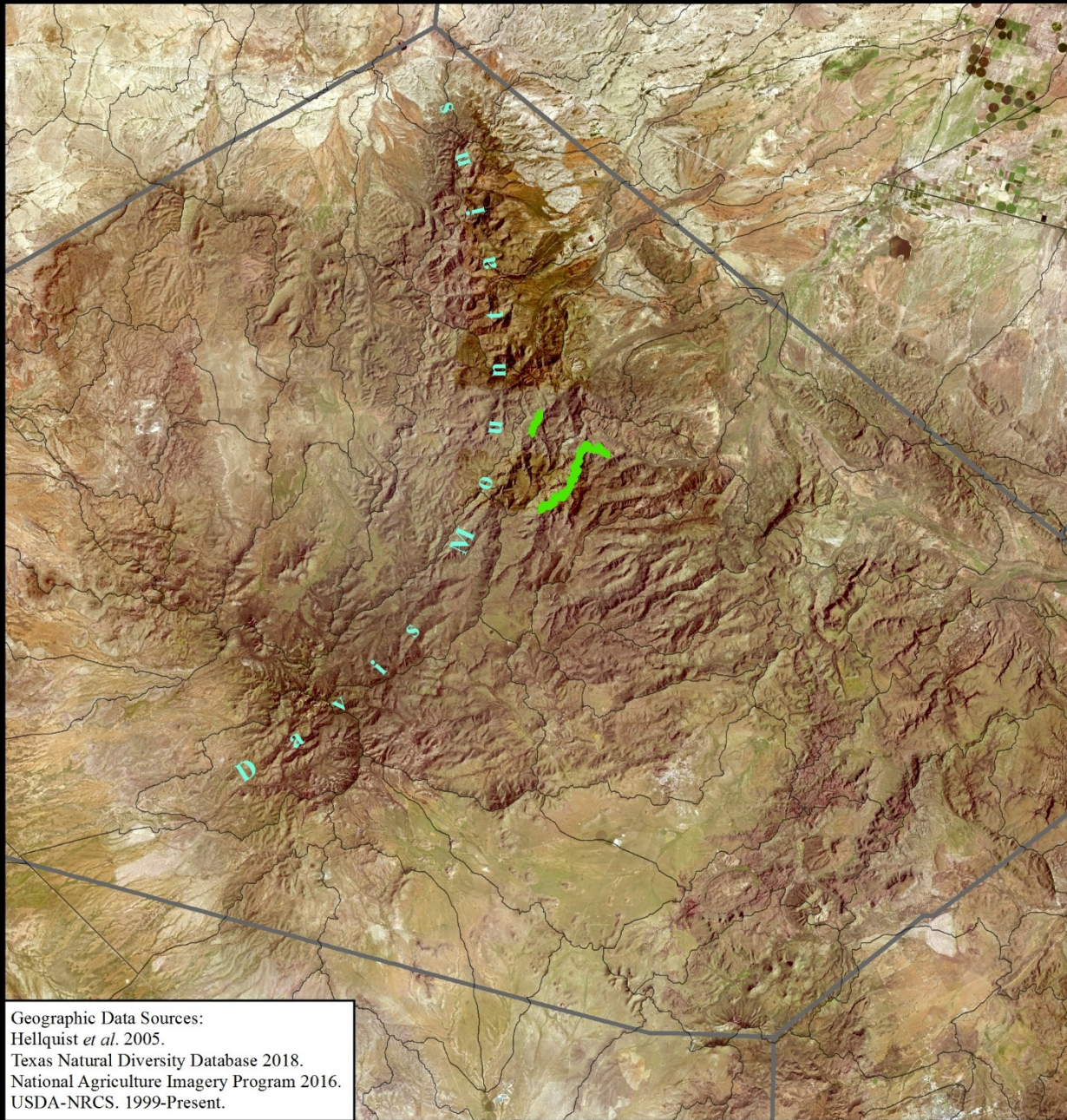
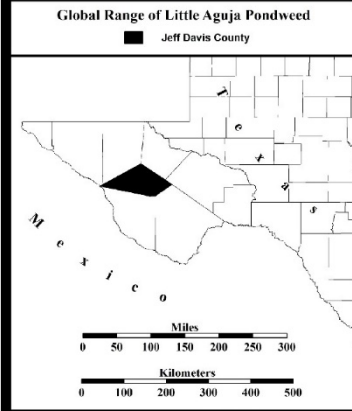
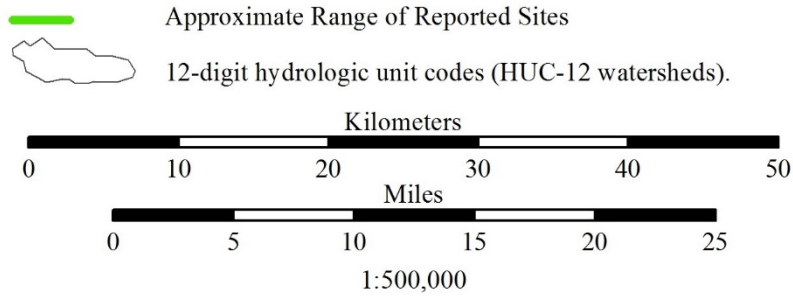
b. Delisting Recovery Criterion.

Little Aguja pondweed will be considered for delisting when:

1. Periodic monitoring indicates that the downlisting criteria have been met, and that demographic trends have subsequently remained stable or have increased over a period of 50 years. Monitoring (censuses) of each protected population must be conducted at least once every 5 years.

Justification: The period of monitoring necessary to detect demographic trends requires the passage of multiple generation spans and multiple cycles of above- and below-average precipitation. The five-year review (USFWS 2018) projected that the species' response to climate changes may require about 50 years to detect, during which time demographic trends should also be apparent.

Figure 1. Little Aguja Pondweed Populations in the Davis Mountains of Texas.



IV. Literature Cited.

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