

Recovery Plan for *Spiranthes parksii* (Navasota ladies'-tresses)

Draft Amendment 1

Superseding only Part II, pages 21-22 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: 47 FR 19539.
Date: May 6, 1982.
Listed status: Endangered.
Recovery Plan: Navasota ladies'-tresses (*Spiranthes parksii*) Recovery Plan.
Prepared by: Dr. Hugh D. Wilson and Geyata Ajilvigi, Texas A&M University,
College Station, Texas.
Approved: September 21, 1984.
Five-year review: August 26, 2009.

b. Reason for amendment.

Section 4(f)(1)(B)(ii) of the Endangered Species Act (ESA) requires that each recovery plan 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 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 DPS) 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 Navasota ladies’-tresses Recovery Plan (Recovery Plan) contains only one downlisting criterion and no delisting criteria (U.S. Fish and Wildlife Service (USFWS) 1984, Part II. pp. 22-23):

“The criteria for initiation of downlisting procedures is the establishment and securing of two safe sites containing portions of existing *S. parksii* population, through cooperative agreements, purchases, easements or other means of obtaining management rights, and through preparation and implementation of management plans.”

The Recovery Plan did not describe what is meant by a safe site nor does it address the size of viable (resilient) populations.

The last 5-year status review was completed in 2009 and concluded that there should be no change in the listing status for Navasota ladies’-tresses. The 5-year review also recommended revising the Recovery Plan objectives and including specific, measurable, achievable, realistic and time-referenced (SMART) criteria that address the five-factor analysis and the revised recovery planning guidance (USFWS 2009, p. 52).

II. Methods used to revise the recovery criteria.

The process, review, and modification of the existing recovery criterion for the Navasota ladies’-tresses was based on the 2009 5-year review because it was more recent than the Recovery Plan (USFWS 1984). Additionally, the 5-year review contains a comprehensive assessment of all information known about this species through the time period ending in 2008. We requested new information that became available after completion of the 5-year review from other USFWS staff and external partners regarding field work, surveys, and research. We received little to no response regarding new locations or surveys for Navasota ladies’-tresses. Additionally, we reviewed our files and conducted online searches for information that became available between 2008 and 2018.

We used ArcMAP 10.6 to analyze Navasota ladies’-tresses element occurrence records acquired from the Texas Natural Diversity Database (TNDD 2018) and evaluated these locations with other geospatial data, including surface geology (U.S. Geologic Survey (USGS) 2018) and watersheds (U.S. Department of Agriculture 2018).

III. Rationale for amending 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 sizes, the number and distribution of populations, and the abatement of threats. After the species has attained the threatened status, it may be delisted when it has been monitored for a period of time needed to detect demographic trends, and as a result of applied recovery actions, this data demonstrates that trends are stable or improving and the species is no longer likely to become endangered.

Minimum viable population (MVP) refers to the smallest population size that has a high probability of surviving a prescribed period of time; hence, MVP is an important metric of the species' resilience. For example, Mace and Lande (1991, p. 151) propose that species or populations be classified as vulnerable when the probability of persisting 100 years is less than 90 percent. Determinations of MVP usually take into account the effective population size (n_e), rather than total number of individuals (n); (i.e. 10 genetically identical individuals (clones) would have an effective population size of 1).

MVP or Population Viability Analysis have not been calculated for Navasota ladies'-tresses, nor do we possess all the baseline demographic and life history data needed to perform these calculations. **Table 1** is an adaptation of a method for estimating plant MVPs published in Pavlik (1996). Species with factors (traits) that all fall under column A would have MVPs of about 50 individuals. Those with factors that all ascribe to column C would have MVPs around 2,500 individuals. We added an intermediate column (B) to Pavlik's table to account for species with intermediate or unknown factors. **Table 1** lists nine factors and the words in bold associated with each factor indicate the values, if known, for Navasota ladies'-tresses. This estimate is based on the following characteristics of Navasota ladies'-tresses: The species is a herbaceous, short-lived perennial. Although genetic evidence (Manhart and Pepper 2006, pp. 38, 50) indicates that rare instances of outcrossing occur, the vast majority of seeds are produced through apomixes (genetic cloning). The duration of seed viability is not documented. Optimal habitats are intact post oak savannas that are influenced by periodic wildfire, which we consider to be climax successional states. Although the capsules produce large numbers of seeds, individuals flower few times during their lifespans, and the seedling establishment rate is very low. Individuals do not form clonal colonies. Environmental variation ranks high due to wide annual fluctuations in precipitation in the species' post oak savanna habitats.

Three of the factors (perennial lifespan, self-fertilization (apomixis) and climax successional status) fall in column A, which requires an MVP of 50 individuals. One of the factors (unknown longevity of seed viability) falls in column B, which requires an MVP of 1000. Five factors (herbaceous growth form, low fecundity, rare ramet production, low survivorship, and high environmental variation) fall in column C, requiring an MVP of 2500. MVPs for each of the 9 factors were added together totaling 13,650. The weighted average of these 9 factors yields an estimated MVP for Navasota ladies'-tresses of approximately 1,500 individuals ($13,650/9=1,516$ rounded to 1,500).

Navasota Ladies'-tresses are distributed through habitats in relatively small, scattered colonies, and it is difficult to delineate populations. Therefore, it is more practical to apply MVP sizes to metapopulations consisting of multiple colonies or subpopulations. This provisional MVP may be revised in the future if accumulated data permits actual calculations. This estimate of MVP is based only on numbers of mature individuals (those that have flowered at least once or are judged capable of flowering) because most juveniles die before they are able to reproduce and therefore do not contribute to the gene pool or the effective population size. Furthermore, population surveys that do not distinguish mature plants from seedlings would appear to fluctuate wildly, depending on how recently seeds germinated and the proportion of surviving seedlings.

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. Consequently, 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).

Documentation indicates that Navasota ladies'-tresses occur up to 305 meters away from drainage courses (USFWS 2006). Seasonal variation in soil water content shows that Navasota ladies'-tresses occur in areas with high water content likely related to their preferential association with stream banks and drainages in the post oak savanna (Ariza 2013). Due to the association with these types of watercourses, it is likely that metapopulations disperse along these watercourses. Therefore, we are using the USGS hydrologic unit code (HUC) 8-digit watershed boundaries to represent the species' geographical distribution (USGS 2018). In order to conserve the entire range of the species' genetic and geographical adaptation, we have adopted the criterion of one or more protected populations (or metapopulations) of approximately 1,500 individuals in each of the HUC-8-digit watersheds of its known occurrence. (See **Figure 1**). Navasota ladies'-tresses occurs in seven HUC 8-digit units: Navasota HUC8 12070103, Lower Brazos - Little Brazos HUC8 12070101, Lower Trinity-Tehuacana HUC8 12070204, Lower Trinity-Kickapoo HUC8 12030202, Yegua HUC8 12070102, Lower Colorado-Cummins HUC8 12090301, and the Lower Angelina HUC8 12020005.

Table 1. Minimum viable population guidelines applied to Navasota ladies'-tresses (adapted from Pavlik 1996, p. 137).

Factor	A. MVP of 50 individuals for species with these traits.	B. Intermediate MVP Range (1,000) for species with intermediate or unknown traits.	C. MVP of 2,500 individuals for species with these traits.
Longevity	Perennial		Annual
Breeding System	<u>Self-fertilization (Apomixis)</u>		Outcrossing
Growth Form	Woody		Herbaceous
Fecundity	High		Low
Ramet Production	Common		Rare or None
Survivorship	High		Low
Longevity of Seed Viability	Long	Unknown	Short
Environmental Variation	Low		High
Successional Status	Climax		<u>Seral or Ruderal</u>
Total MVP / Factors (9)	150	1000	12500

IV. Amended Recovery Criteria.

a. Downlisting Recovery Criteria.

Navasota ladies'-tresses will be considered for downlisting when:

1. One or more viable populations or metapopulations occur in each of the seven HUC 8-digit watersheds within its known range. To be considered viable, each population or metapopulation will consist of at least 1,500 mature individuals, and will total at least 10,500 individual plants across the seven HUCs.

Justification: This criterion sets the estimated MVP of 1,500 mature individuals as the metric of resilience. The distribution of viable populations in each of the HUC 8-digit watersheds comprising the known geographical range serves as the metric of redundancy and representation.

2. The populations or metapopulations that meet criterion 1 occur in protected natural areas. Protected natural areas include lands owned by federal, state, or local government agencies, or by private landowners, that are legally protected for the purpose of conserving native plants and animals and their habitats. Examples include, but are not limited to, state parks, state natural areas, and state wildlife management areas,

conservation easements on private lands, lands owned and managed for conservation by non-profit organizations, and legally-binding long-term management agreements with other public agencies or private landowners. To be considered under this criterion, the potential habitats of Navasota ladies'-tresses must be managed in a manner that promotes the continued survival of this species.

Justification: This criterion addresses threats to Navasota ladies'-tresses. There are few regulatory mechanisms available that provide protection for listed plants that occur on private lands. In addition, the existing known occurrences of Navasota ladies'-tresses are not fully protected at this time nor do the known sites have management plans. Long term management plans along with 3rd-party conservation easements are one of the few measures that can be taken to ensure protection in perpetuity.

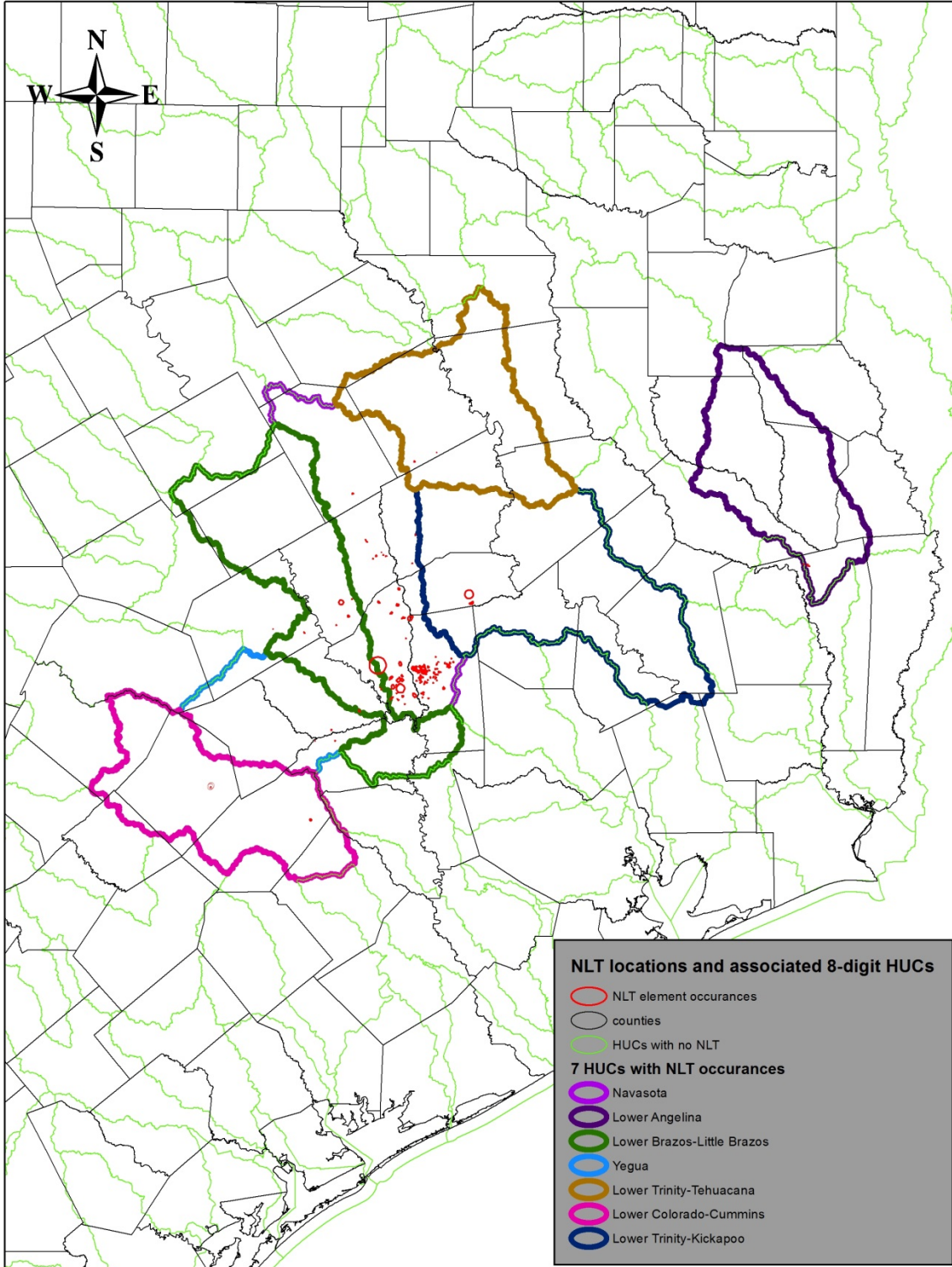
b. Delisting Recovery Criteria.

Navasota ladies'-tresses will be considered for delisting when:

1. The criteria for downlisting to threatened, described above, have been met: One or more populations or metapopulations, each consisting of consisting of 1,500 or more mature individuals, occur in protected natural areas within each of the 7 HUC-8 watersheds of the species' geographic range.
2. Periodic monitoring indicates that the minimum viable population level of 1,500 individuals within each protected natural area remains stable or increases over a period of at least 39 years. Monitoring (censuses) of each protected natural area must be conducted annually for the first 10 years and subsequently every 5 years up to the 39 year timeline.

Justification: This criterion serves as the metric for successful habitat management and abatement of threats. To be delisted, the protected populations or metapopulations must be monitored long enough to detect stable or increasing demographic trends and responses to threats, including the potential threats of climate changes. The species cannot be identified, and therefore, population sizes cannot be determined, unless individuals are both actively growing and flowering. Mature Navasota ladies'-tresses do not flower every year and their live tubers may remain dormant for two to several years without producing above-ground leaves or flower stems (Wonkka 2012; Ariza 2013). For these reasons, monitoring must be conducted over multiple years to determine population sizes. We estimate that at least 3 generations must be completed to be able to detect demographic trends. One generation span is the time required for a newly formed seed to disperse, germinate, grow to a mature size, flower, and disperse new seeds. Although the generation span of Navasota ladies'-tresses has not been documented, the generation span of Autumn ladies'-tresses (*Spiranthes spiralis*), a European member of this genus, requires 13 to 14 years (Jacquemyn and Hutchins 2010, p. 1264). Using Autumn ladies'-tresses as a surrogate for generation span, we provisionally estimate that the protected populations must be monitored for at least 39 years to demonstrate that the species is no longer likely to become endangered in the foreseeable future.

Figure 1. Map depicting NLT known locations within HUCs



IV. Literature Cited.

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