

Recovery Plan for *Ipomopsis sancti-spiritus* (Holy Ghost Ipomopsis)

Original Approved: 2002

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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 proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an appendix that supplements the recovery plan, superseding only Part II, Objectives and Criteria (pages 18-21), of the recovery plan (USFWS 2002).

**For
U.S. Fish and Wildlife Service
Southwest Regional Office
Albuquerque, NM 87103**

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

BACKGROUND INFORMATION

Recovery plans should be consulted frequently, used to initiate recovery activities, and updated as needed. A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures that the species benefits through timely, partner-coordinated implementation based on the best available information. The need for, and extent of, plan modifications will vary considerably among plans. Maintaining a useful and current recovery plan depends on the scope and complexity of the initial plan, the structure of the document, and the involvement of stakeholders.

An amendment involves a substantial rewrite of a portion of a recovery plan that changes any of the statutory elements. The need for an amendment may be triggered when, among other possibilities: (1) the current recovery plan is out of compliance with regard to statutory requirements; (2) new information has been identified, such as population-level threats to the species or previously unknown life history traits, that necessitates new or refined recovery actions and/or criteria; or (3) the current recovery plan is not achieving its objectives. The amendment replaces only that specific portion of the recovery plan, supplementing the existing recovery plan, but not completely replacing it. An amendment may be most appropriate if

significant plan improvements are needed, but resources are too scarce to accomplish a full recovery plan revision in a short time.

Although it would be inappropriate for an amendment to include changes in the recovery program that contradict the approved recovery plan, it could incorporate study findings that enhance the scientific basis of the plan, or that reduce uncertainties as to the life history, threats, or species' response to management. An amendment could serve a critical function while awaiting a revised recovery plan by: (1) refining and/or prioritizing recovery actions that need to be emphasized, (2) refining recovery criteria, or (3) adding a species to a multispecies or ecosystem plan. An amendment can, therefore, efficiently balance resources spent on modifying a plan against those spent on managing implementation of ongoing recovery actions.

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

The recovery criteria were developed and reviewed by a group of individuals consisting of species experts, biologists, and botanists from New Mexico Energy, Minerals and Natural Resources Department, U.S. Forest Service, and the U.S. Fish and Wildlife Service (Service). The development process was informed by the best available science regarding species biology and current threats. The recovery criteria were designed to be objective and quantifiable, in order to meet the conditions needed to ensure species viability through sustainment of populations in the wild that demonstrate resiliency, redundancy, and representation.

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

The following summarizes the recovery criteria for the Holy Ghost Ipomopsis. For a detailed version of the criteria, please reference the 2002 Holy Ghost Ipomopsis Recovery Plan (USFWS 2002, pp. 18-22).

Downlisting Criteria

The Holy Ghost Ipomopsis will be considered for downlisting when:

1. The Holy Ghost Canyon population has been maintained at an average of 2,000 plants per year.
2. Four additional populations in the upper Pecos Basin have been established.
3. A management plan to assure the continued survival of the species has been implemented.

Delisting Criteria

Criteria for removing the Holy Ghost Ipomopsis from the Endangered Species list will be determined after further research provides more knowledge about long-term population viability.

Synthesis

Since the recovery plan was published in 2002, several studies and continual yearly monitoring have been conducted which have added greatly to our knowledge of this species (Sivinski and Tonne 2005, 2006, 2007, 2008, 2009, 2010, 2011; Roth 2013, 2015a, 2015b, 2016). Field data from yearly monitoring have indicated that the method introduced in the 2002 Holy Ghost Ipomopsis Recovery Plan for estimating population numbers from transect survey data was inaccurate. The method suggested utilizing a standard multiplier based on an average ratio of rosettes to flowering plants to determine population numbers; however, recent data suggest that a multiplier based on the current year's ratio of rosettes to flowering plants would be more appropriate based on the large range of potential ratios (USFWS 2008). Therefore, the initial population value used to determine numbers needed for species recovery is most likely inaccurate.

In addition, the Holy Ghost Canyon population is increasingly confined to a narrow strip associated with Forest Road 122, leading to an even more limited distribution and increasing exposure to threats associated with road maintenance and recreation. Emerging threats since the time of listing include an increased forest canopy leading to high risk of catastrophic fire, the influx of invasive plants, and potential effects of climate change (e.g., increasing temperatures, increased periods of drought, habitat drying, etc.) (USFWS 2008). Therefore, the threats to this increasingly narrow endemic species have increased since time of listing and since the 2002 Holy Ghost Ipomopsis Recovery Plan was published.

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 Holy Ghost Ipomopsis no longer meets the definition of an endangered or threatened species and may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. 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 which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

We provide both downlisting and delisting criteria for the Holy Ghost Ipomopsis, which will supersede those included in 2002 Holy Ghost Ipomopsis (*Ipomopsis sancti-spiritus*) Recovery Plan as follows:

Downlisting Recovery Criteria

The Holy Ghost Ipomopsis will be considered for downlisting when:

1. The Holy Ghost Canyon population is shown to be stable or improving over a 20-year period with at least 8,000 individuals according to the following measures:
 - a) The Holy Ghost Canyon population has been designated as the core recovery population. The Holy Ghost Canyon population includes the natural population along Holy Ghost Canyon road and any augmentation efforts which have resulted in successful reproductive exchange. This core population should be monitored yearly

- using annual demographic trend monitoring at representative sites to provide a population estimate based on methodology peer-reviewed by species experts and approved by the Service. The 20-year monitoring period will accommodate for periods of fluctuation in population size or years when monitoring may not be possible; this monitoring period may include any data that satisfies accepted monitoring techniques and analyses.
- b) Approximately every 5 years range wide and peripheral counts will be conducted using standardized methods peer-reviewed by species experts and approved by the Service.
 - c) Species presence and abundance is maintained at 8,000 individuals within the core Holy Ghost Canyon population. The population shall be considered stable when a linear regression analysis (or other method which has been peer-reviewed by species experts and approved by the Service) of the population numbers estimated from the results of annual demographic monitoring reveals no significant decline in numbers.
 - d) A population viability analysis (PVA) (or other appropriate method which has been peer-reviewed by species experts and approved by the Service) will be conducted to determine the demographic parameters necessary to maintain a *resilient* population. A *resilient* population is one that is able to maintain approximately a 95% likelihood of persistence over a 100-year period (or other appropriate period of time). Based on the PVA, the recovery criteria may be reassessed or adjusted to establish an accurate population number to achieve a resilient population, if necessary.

Justification: These criteria establish a resilient core population which is able to withstand the threat of demographic and environmental stochasticity.

- 2. At least four additional populations in the upper Pecos Basin, each with at least 800 individuals, have been established according to the following measures:
 - a) Maintain or increase suitable habitat within currently established population areas or identify additional suitable habitat in other areas.
 - b) Monitor these four additional populations yearly for 20 years at representative sites to provide a population estimate based on methodology peer-reviewed by species experts and approved by the Service. The 20-year monitoring period will accommodate for periods of fluctuation in population size or years when monitoring may not be possible.
 - c) Species presence and abundance is maintained at 800 individuals within these additional populations. The populations shall be considered stable when a linear regression analysis (or other method which has been peer-reviewed by species experts and approved by the Service) of the population numbers estimated from the results of annual demographic trend monitoring reveals no significant decline in numbers.
 - d) A population viability analysis (PVA) (or other appropriate method which has been peer-reviewed by species experts and approved by the Service) will be conducted to determine the demographic parameters necessary to maintain *resiliency* across these four populations. A *resilient* population is one that is able to maintain

approximately a 95% likelihood of persistence over a 100-year period (or other appropriate period of time). Based on the PVA, the recovery criteria would be reassessed or adjusted to establish an accurate population numbers to achieve a resilient population, if necessary.

Justification: The criteria ensure redundancy through the establishment of four additional resilient populations of Holy Ghost Ipomopsis.

3. Genetic diversity and structure will be maintained within the core Holy Ghost Canyon population of 8,000 individuals and the four additional populations within the upper Pecos Basin of 800 individuals each, according to the following measures:
 - a) Any efforts undertaken to augment the Holy Ghost canyon population will utilize standardized methods peer-reviewed by species experts and approved by the Service to maintain sufficient genetic diversity within the population to ensure population resiliency.
 - b) Any efforts undertaken to establish and/or augment the four additional populations of Holy Ghost Ipomopsis outside of Holy Ghost canyon will utilize standardized methods peer-reviewed by species experts and approved by the Service to maintain sufficient genetic diversity within and among those populations to ensure population resiliency.

Justification: These criteria ensure genetic and ecological representation of Holy Ghost Ipomopsis across large portions of its range.

4. The Holy Ghost Canyon and additional populations within the Upper Pecos Basin must be protected through the development and implementation of species-specific management recommendations that protect the species from identified threats and are consistent with land uses in the area. In addition, the designation of Holy Ghost Canyon as a Botanical Area, or other special management area, to highlight its unique botanical status should be considered as an added measure of protection for the habitat itself.

Justification: These criteria will help ameliorate threats to the Holy Ghost Ipomopsis via management actions.

Delisting Recovery Criteria

The Holy Ghost Ipomopsis will be considered for delisting when:

1. The Holy Ghost Canyon population is shown to be stable or improving over a 20-year period with at least 10,000 individuals according to the following measures:
 - a) The Holy Ghost Canyon population has been designated as the core recovery population. The Holy Ghost Canyon population includes the natural population along Holy Ghost Canyon road and any augmentation efforts which have resulted in successful reproductive exchange. This core population should be monitored yearly using annual demographic trend monitoring at representative sites to provide a population estimate based on methodology peer-reviewed by species experts and

- approved by the Service. The 20-year monitoring period will accommodate for periods of fluctuation in population size or years when monitoring may not be possible; this monitoring period may include any data that satisfies accepted monitoring techniques and analyses.
- b) Approximately every 5 years, range wide and peripheral counts will be conducted using standardized methods peer-reviewed by species experts and approved by the Service.
 - c) Species presence and abundance is maintained at 10,000 individuals within the core Holy Ghost Canyon population. The population shall be considered stable when a linear regression analysis (or other method which has been peer-reviewed by species experts and approved by the Service) of the population numbers estimated from the results of annual demographic monitoring reveals no significant decline in numbers.
 - d) A population viability analysis (PVA) (or other appropriate method which has been peer-reviewed by species experts and approved by the Service) will be conducted to determine the demographic parameters necessary to maintain a *resilient* population. A *resilient* population is one that is able to maintain approximately a 95% likelihood of persistence over a 100-year period (or other appropriate period of time. Based on the PVA, the recovery criteria would be reassessed or adjusted to establish an accurate population numbers to achieve a resilient population, if necessary.

Justification: These criteria allow for the threat of demographic and environmental stochasticity to be mitigated through the establishment of a resilient core population which is protected from random population fluctuations.

- 2. The additional populations outside of Holy Ghost Canyon are shown to be stable or improving over a 20-year period with at least 1,000 individuals each according to the following measures:
 - a) Maintain or increase suitable habitat within currently established population areas or identify additional suitable habitat in other areas.
 - b) Monitor these four additional populations yearly for 20 years at representative sites to provide a population estimate based on methodology peer-reviewed by species experts and approved by the Service. The 20-year monitoring period will accommodate for periods of fluctuation in population size or years when monitoring may not be possible.
 - c) Species presence and abundance is maintained at 1,000 individuals within these additional populations. The populations shall be considered stable when a linear regression analysis (or other method which has been peer-reviewed by species experts and approved by the Service) of the population numbers estimated from the results of annual demographic trend monitoring reveals no significant decline in numbers.
 - d) A population viability analysis (PVA) (or other appropriate method which has been peer-reviewed by species experts and approved by the Service) will be conducted to determine the demographic parameters necessary to maintain *resiliency* across these four populations. A *resilient* population is one that is able to maintain approximately a 95% likelihood of persistence over a 100-year period (or other appropriate period of

time). Based on the PVA, the recovery criteria would be reassessed or adjusted to establish an accurate population numbers to achieve a resilient population, if necessary.

Justification: The criteria ensure redundancy through the establishment of four additional resilient populations of Holy Ghost Ipomopsis.

3. Genetic diversity will be maintained within the core Holy Ghost Canyon population of 10,000 individuals and the four additional populations within the upper Pecos Basin of 1,000 individuals each, according to the following measures:
 - a) Any efforts undertaken to augment the Holy Ghost canyon population will utilize standardized methods approved by the Service and peer-reviewed to maintain sufficient genetic diversity within the population to ensure population resiliency
 - b) Any efforts undertaken to establish and/or augment the four additional populations of Holy Ghost Ipomopsis outside of Holy Ghost canyon will utilize standardized methods approved by the Service and peer-reviewed to maintain sufficient genetic diversity within and among those populations to ensure population resiliency

Justification: These criteria ensure genetic and ecological representation of Holy Ghost Ipomopsis across large portions of its range.

4. The existing species-specific management recommendations should be proven effective and successful in protecting the species over the 20-year period required to reach delisting criteria described above. In addition, all land managing agencies will have developed a Post-Delisting Monitoring Plan (which has been approved by the Service's Southwest Regional Director) to cover a minimum of 5 years post-delisting of the species and be prepared to implement this plan prior to delisting to ensure the ongoing conservation of the listed species and the continuing effectiveness of management actions.
 - a) In addition to this criterion, monitoring and research have been completed to conclude with a high degree of certainty that population sizes, quality, configuration, and management are adequate to provide a high probability of species survival (greater than 90 percent over 100 years).

Justification: These criteria will help ensure the continued amelioration of threats to the Holy Ghost Ipomopsis via management actions.

All classification decisions consider the following five factors: (1) is there a present or threatened destruction, modification, or curtailment of the species' habitat or range; (2) is the species subject to overutilization for commercial, recreational scientific or educational purposes; (3) is disease or predation a factor; (4) are there inadequate existing regulatory mechanisms in place outside the Act (taking into account the efforts by states and other organizations to protect the species or habitat); and (5) are other natural or manmade factors affecting its continued existence. When delisting or downlisting a species, we first propose the action in the *Federal*

Register and seek public comment and peer review. Our final decision is announced in the *Federal Register*.

Rationale for Recovery Criteria

While some of the existing downlisting recovery criteria are objective and measurable, the targets set for recovery are inadequate based on recent trends and new information since the 5-year review in 2008, as well as imprecise population estimates used in the original recovery plan. Since that time, yearly monitoring and a 2015 census have been completed for the Holy Ghost Canyon population. From 2003-2008, an average of 703 total plants were counted per year. From 2008-2012, an average number of 484 total plants were counted per year, indicating a downward population trend. From 2013-2017, an average of 593 total plants were counted per year (Roth 2015a). While numbers since 2012 appear to be increasing, the population still remains below the average number of plants used for the most recent 5-year review (n=703) (USFWS 2008). The 2015 census documented 6,052 total plants in Holy Ghost Canyon, which is well above the estimate provided for the original downlisting criteria (Roth 2015b). However, with the evidence of a declining population trend based on yearly monitoring and the continued persistence of threats to the species, the original estimate provided for downlisting would not represent a viable population. In addition, the original delisting recovery criteria are not considered objective and measurable. These criteria refer to the need to conduct a population viability analysis to determine population numbers needed to achieve recovery. Thus, these criteria needed to be re-evaluated and amended accordingly based on the best available science.

In the development of these amended recovery criteria, we used the three conservation biology principles of resiliency, representation, and redundancy (Shaffer and Stein 2000, pp. 306-310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity; representation supports the ability of the species to adapt over time to long-term changes in the environment; and redundancy supports the ability of the species to withstand catastrophic events. The amended downlisting and delisting criteria number 1 are objective and measurable in relation to the concept of population resiliency. These criteria allow for the threat of demographic and environmental stochasticity to be mitigated through the establishment of a core population which is protected from random population fluctuations. The population abundance values (8,000 for downlisting and 10,000 for delisting) indicated in the amended criteria reflect species experts' opinions on the number of individuals needed within the Holy Ghost Canyon population to establish population resiliency; these values are based on interpretations of data from the 2015 census and population trends observed from previous years of monitoring. Population persistence over time will be achieved via stable or increasing demographic trends. The amended downlisting and delisting criteria number 2 are objective and measurable in relation to the concept of population redundancy. The criteria ensure the establishment of four additional resilient populations of Holy Ghost *Ipomopsis* which will provide redundancy. Redundancy provides for security against extinction from catastrophic events that could impact a single population by ensuring that one or more additional resilient, representative populations persist. The population abundance values (800 for downlisting and 1,000 for delisting) indicated in the amended criteria reflect species experts' opinions on the number of individuals needed within each population to establish population resiliency; these values are based on interpretations of population trends observed from previous years of monitoring. The amended downlisting and delisting criteria number 3 are objective and

measurable in relation to the concept of population representation. These criteria ensure that Holy Ghost Ipomopsis populations have genetic representation, while having Holy Ghost Ipomopsis across large portions of their range ensures ecological representation. Diversity within and among populations should confer populations, and the species, greater resistance to pathogens and parasites and greater adaptability to environmental stochasticity (random variations, such as annual rainfall and temperature patterns) and environmental changes. The amended downlisting and delisting criteria number 4 are objective and measurable in relation to the concept of threats management. These criteria will help ensure management actions which ameliorate recognized threats and help to sustain the Holy Ghost Ipomopsis in its natural habitat over a biologically meaningful timeframe within the conditions on the landscape and inherent biological limitations of the species.

Based on the best available information that includes the input and data from species experts during our recovery criteria review, these amended recovery criteria provide quantifiable measures for identifying and implementing recovery actions (developing the various methodologies stated in the amended recovery criteria) , a means to measure progress towards recovery, and the ability to recognize when recovery will be achieved.

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Not applicable

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS.

Not applicable

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