

**Amendment to the Recovery Plan for *Phacelia argillacea* (clay phacelia)**  
**[https://ecos.fws.gov/docs/recovery\\_plan/820412.pdf](https://ecos.fws.gov/docs/recovery_plan/820412.pdf)**

Original Approved: April 12, 1982

Original Prepared by: Phacelia argillacea Recovery Committee, U.S. Fish and Wildlife Service,  
Interior Regions 5 and 7, Denver, Colorado

**AMENDMENT**

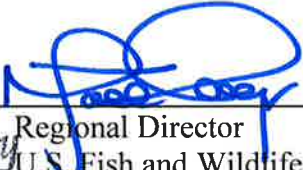
We have identified information that indicates a need to amend the delisting recovery criteria for clay phacelia (*Phacelia argillacea*) which have been in place since the recovery plan was completed in 1982. In this modification, we discuss the adequacy of the existing delisting recovery criteria, identify amended delisting recovery criteria, and present the rationale supporting the recovery plan modification. The modification will be included as an appendix that supplements the existing recovery plan, superseding only the delisting recovery criteria in the Recovery (Part II) section (pages 5 - 10) of the recovery plan (USFWS 1982).

**For**  
**U.S. Fish and Wildlife Service**  
**Interior Regions 5 and 7**  
**Denver, CO 80225**

**September 2019**

Approved: \_\_\_\_\_

Date: 10.21.19

  
Regional Director  
*Deputy* U.S. Fish and Wildlife Service  
Interior Regions 5 and 7

**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 A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited and therefore warrants a modification.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 contradicts 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 the implementation of ongoing recovery actions.

In this recovery plan amendment, we are amending the existing recovery criteria for clay phacelia and defining what constitutes a population. The 1982 recovery plan (USFWS 1982) does not include delisting recovery criteria that are quantitative, nor does it present the parameters used to define a population. By modifying the existing recovery criteria to be objective and measurable, we will be able to show when the criteria are met.

## **METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT**

The Utah Ecological Services Field Office prepared this amendment. We coordinated recovery review and criteria development with the species' experts in Utah (U.S. Forest Service, Weber State University, Utah Natural Heritage Program, The Nature Conservancy), and we reviewed existing quantifiable recovery criteria for other narrow, endemic species (Revised Recovery Plan for Hawaiian Forest Birds, [https://ecos.fws.gov/docs/recovery\\_plan/060922a.pdf](https://ecos.fws.gov/docs/recovery_plan/060922a.pdf); Revised Recovery Plan for Alala/Hawaiin Crow, [https://ecos.fws.gov/docs/recovery\\_plan/090417.pdf](https://ecos.fws.gov/docs/recovery_plan/090417.pdf)). We also reviewed recommendations for quantifiable demographic and threat-based recovery criteria (Doak *et al.* 2015); the 2013 5-year review for clay phacelia; recent information on the species; recovery actions that have been taken since the development of the original plan; monitoring data provided by the U.S. Forest Service and Weber State University; and the survey extent for the species in Utah.

Our evaluation of the 1982 recovery plan (USFWS 1982), and the original 1978 listing rule (43 FR 44810) indicated that we did not present how we defined a population for clay phacelia. For this amendment and managing for clay phacelia in the future, we use NatureServe guidelines for delimiting plant populations (NatureServe 2004) based on the proximity of occupied habitat areas to one another. We considered locations within 2 kilometers (km) (1.24 miles (mi)) of each other and suitable habitat in between them to be a single population.

Plant locations that are greater than 2 km (1.24 mi) from each other with unsuitable habitat in between them are considered separate populations (NatureServe 2004). Based on this criterion, there are three populations of clay phacelia (Tucker-Clear Creek, Water Hollow – Garner Canyon, and Tie Fork); this is an increase since the time of listing when we knew of only one population (Tucker-Clear Creek). The amended delisting recovery criteria were peer reviewed in accordance with the Office of Management and Budget (OMB) Peer Review Bulletin following the publication of the Notice of Availability.

## **ADEQUACY OF RECOVERY CRITERIA**

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 as categorized by the five factors to determine if the species meets the definition of threatened or endangered.

### **Recovery Criteria**

The recovery objective is the preservation and enhancement of the clay phacelia population and its habitat, as described on page ii in the 1982 recovery plan. The recovery objective on pages 5 – 6 is the downlisting criterion for the species. The delisting criterion is identified on pages 6 and 10. The 1982 recovery plan is available online, here: [https://ecos.fws.gov/docs/recovery\\_plan/820412.pdf](https://ecos.fws.gov/docs/recovery_plan/820412.pdf)

#### Current Recovery Criteria

The recovery plan identifies the following recovery criteria to achieve downlisting and delisting:

##### Downlisting Recovery Criterion

1. To establish a self-sustaining population of 2,000 to 3,000 individuals on 120 acres of protected habitat and possibly establish at least one new population.

##### Delisting Recovery Criterion

1. Clay phacelia will be delisted when the U.S. Fish and Wildlife Service through collaboration with professional botanists, including the Utah Native Plant Society, is satisfied that adequate self-sustaining populations have been established.

### **Synthesis**

Clay phacelia is a showy, biennial plant in the forget-me-not family (*Boraginaceae*) that occupies steep hillsides of Green River shale in Spanish Fork Canyon, Utah County, Utah. The species has blue to violet flowers that attracts a variety of bee pollinators (USFWS 2013).

The species likely requires insect pollinators to produce seeds, and large individuals produce abundant amounts of seed (USFWS 2013). Clay phacelia relies on a long-lived, dormant seedbank to survive periods of unfavorable climate conditions such as drought. Clay phacelia appears to be highly sensitive to seasonal precipitation as spring seedling emergence depends on winter precipitation and seedling summer survival depends on summer precipitation and suffers high mortality rates during the first year above-ground (USFWS 2013; Meyer 2018a; Skopec 2018).

At the time of listing, there was one known population of clay phacelia (Tucker – Clear Creek) of 9 individuals on private lands. The population was bisected by a railroad and highway. The status of clay phacelia has improved slightly since then with the location of a new population on private lands (Water Hollow – Garner Canyon). The population size of the Tucker – Clear Creek population is larger now, with 237 individuals documented in 2017, and includes habitat on private and Bureau of Land Management (BLM) lands (Skopec *et al.* 2018). The Water Hollow – Garner Canyon population contains approximately 100 individuals based on the last partial-population estimate in 2006.

Pilot clay phacelia introductions were attempted at two locations on U.S. Forest Service (USFS) lands (Tie Fork and Water Hollow – Garner Canyon). These introduction efforts resulted in the development of a successful propagation protocol for the species but were not large enough to maintain the species' presence on Federal lands.

At the time of our last five-Year Review, we did not provide a range-wide total population estimate for clay phacelia (USFWS 2013). We now cautiously estimate there are 340 individuals range-wide. Past population counts haven't distinguished between juvenile and reproductive plants, and have not estimated the seed output of reproductive plants. We consider a meaningful measure of population health (resilience) to be the mean number of reproductive individuals and their estimated seed output over a minimum five-year period. Since the above-ground plant abundance fluctuates dramatically from year to year, the measure of reproductive output over time will serve as the population estimate that takes into account the size of the population's viable seedbank (Meyer 2018b).

At the time of our last five-year review, many of the threats identified at the time of listing and the original recovery plan continue to impact clay phacelia (USFWS 2013). The highway and railroad that bisect the Tucker – Clear Creek population and are directly adjacent to the Water Hollow – Garner Canyon population serve as corridors for weed dispersal into the population areas and may impact pollinator movement (i.e., gene flow) between populations (Aizen *et al.* 2002; Debinski and Holt 2000; Gathmann and Tschardt 2002; Kolb 2008; Lennartsson 2002). Within the species' small range, continued habitat fragmentation is likely now that the Highway 6 corridor in Spanish Fork Canyon is a designated national energy corridor under section 368 of the Energy Policy Act of 2005. National energy corridors are designated to encourage and facilitate the installation of additional transmission lines, and two transmission lines are currently planned within the species' range (USFWS 2016a and 2016b).

Project proponents for the two planned transmission lines committed to avoiding and minimizing impacts to clay phacelia through section 7 consultation of the Act. There is also active management of weeds in the Tucker – Clear Creek population by private, state, and federal conservation partners. We are exploring the use of alternative non-chemical weed control methods and low-residual herbicides in and near occupied habitat.

Herbivory by native and domesticated ungulates is another threat to clay phacelia. Periodic herbivory, largely from mule deer, at the Tucker – Clear Creek population has repeatedly resulted in significant plant losses (Skopec *et al.* 2018). There are plans to actively manage the threat of herbivory by installing fences and cages, repairing existing fences, and monitoring wildlife activity at the Tucker – Clear Creek, Tie Fork, and Water Hollow – Garner Canyon populations.

There is a high frequency of wildfire occurrence in Spanish Fork Canyon that could impact this species. Wildfire has not impacted clay phacelia. However, the risk and severity of wildfire in occupied habitat increases with the spread and coverage of weeds from the adjacent road and other habitat disturbances. Wildfire has the potential to be a catastrophic event that could result in the loss of a clay phacelia population if high fire temperatures kill the viable seedbank. We recommend the preparation of a fire management plan for clay phacelia to support fire and post-fire planning efforts.

The feasibility of implementing recovery actions for clay phacelia depends on the protections afforded to the species on federal, state, and private lands. There are no laws protecting clay phacelia on the state or private lands in Utah, and recovery implementation is dependent upon the willingness and support of state agencies and individual landowners. On federal lands managed by the BLM and USFS, clay phacelia is afforded protections under the Federal Land Policy and Management Act (FLPMA) ([Pub.L. 94–579](#)), the National Environmental Policy Act (NEPA) (42 U.S.C. 4371 *et seq.*), and the ESA.

There is a recognized need to improve clay phacelia's resiliency and redundancy by introducing plants at all three populations to increase plant abundance and introducing additional populations on federal lands. There is a high potential to establish new populations within Spanish Fork Canyon on Federal lands, although our understanding of microsite preferences for the species within Green River shale is limited. A micro-level analysis (e.g., unmanned aerial system (drones) surveys at low elevation, with high-resolution imagery) of currently occupied habitat should be completed to help identify suitable introduction sites and improve the species' habitat model (USFWS 2018). Recovery efforts should also support and maintain clay phacelia's genetic diversity (representation) and recognize that active genetic management of future introduction efforts is needed. The U.S. Forest Service and other conservation partners are propagating plants from the Tucker – Clear Creek population to support future introduction efforts on Federal lands.

## AMENDED RECOVERY CRITERIA

Recovery criteria serve as an 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 ESA are no longer necessary and clay phacelia 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 DPS) 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 ESA. 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 ESA 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, States, and 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 Federal Lists of Endangered and Threatened Wildlife and Plants, 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 amended delisting criteria for clay phacelia, which will supersede those included in the Clay phacelia (*Phacelia argillacea* Atwood) recovery plan, as follows:

### Delisting Recovery Criteria

Clay phacelia will be considered for delisting when the amended recovery criteria are met. We are replacing the delisting criterion 1, above, with the amended criteria. We are removing the delisting criterion 1, above because it is not objective or measureable. The amended delisting recovery criterion provides a quantifiable approach to determining when clay phacelia has recovered to the point that it may be delisted:

## Amended Delisting Recovery Criteria

The clay phacelia will be considered for delisting if the following criteria are met:

1. Maintain at least two natural populations (Tucker – Clear Creek and Water Hollow – Garner Canyon) and three introduced populations at a level that demonstrates a stable or increasing growth rate ( $\lambda$  greater than 1) over a consecutive ten-year period once the target population size is met as specified in criterion two. Population growth rates will be determined by a population viability analysis based on measures of adult plant abundance and reproductive output (seed production of adult plants). These measures may fluctuate on an annual basis, but the defined populations should have a stable or increasing growth rate over the ten-year time period.

*Justification:* The population viability analysis will incorporate important life history characteristics of clay phacelia. We expect a period of ten years should be long enough to include variability in the timing and extent of precipitation that occurs in the species' range. We identify that an increasing population trend is needed for all natural and introduced populations due to their currently low population sizes. We anticipate that increasing population growth rates over this time period will indicate that the five populations are resilient to stochastic events and other stressors.

2. Maintain an estimated 15,000 adult plants range-wide over a ten-year period. This population estimate will be based on adult plant abundance summed across the time period.

*Justification:* The estimate of 15,000 adult plants assumes a population target of 3,000 adult plants for each of the five populations over the ten-year time period, or an average of 300 adult plants per year. We selected the number of adult plants for this criterion because this life stage is the largest contributor to population growth and indicates active regeneration from the seedbank is occurring. The population target is based on best available information for the species including: life history characteristics, population trend, expert opinion, and published literature regarding minimum viable plant population size. Clay phacelia's short life span, high annual variation in above-ground abundance, and persistent seedbank were important considerations, as was expert opinion and a minimum viable population evaluation for plant taxa (Traill *et al.* 2007, Table 2). The adult plant target is based on a sum of adult plants over a ten-year time period to account for one-year survival of adult plants and standardize their contribution to population growth over time. We consider this to be an adequate measure of clay phacelia abundance given the species' strong dormancy response to unfavorable climate conditions that limits the usefulness of more conventional measures of abundance (*i.e.* mean abundance).

3. The three introduced populations collectively demonstrate 80 percent of the genetic variation of the two natural populations over a minimum of five generations (a consecutive ten-year period). Genetic variation (measured as the number and frequency of unique alleles within a population) is anticipated to vary from year-to-year, but we expect this measure will provide a meaningful evaluation of population-level genetic diversity over this time-period.

*Justification:* Attainment of this criterion would indicate that introduced populations contain a similar level of genetic health (representation) as natural populations. This criterion would also indicate the successful genetic management of introduction efforts to create populations that have the ability to adapt to near and long-term changes in the environment. This criterion does not apply to natural populations.

4. Long-term habitat protections are in place for the five populations to protect clay phacelia from identified threats. Habitat protection can be achieved via fee acquisition, land trades, conservation easement, or long-term management agreements in accordance with federal and state authorities, and private land owner voluntary commitments. Protections should include efforts to protect occupied and suitable habitat from fragmentation and development, and management objectives to address herbivory, weed invasion, and other potential threats that may exert a population-level effect. The combination of habitat protection and threat reduction will support increasing population trends and a larger population size needed to maintain population resiliency, as we state in criteria 1 and 2.

*Justification:* Habitat protections and regulatory mechanisms are needed to provide assurances that land use threats (road and energy development) and habitat management threats (herbivory and weed invasion) do not threaten the continued existence of clay phacelia or its habitat.

5. Clay phacelia is represented in an *ex-situ* seed collection that is managed according to the Center for Plant Conservation guidelines (Guerrant *et al.* 2004). The *ex-situ* seed collection should contain existing levels of genetic diversity (or representation) across the species' range. Seed collection efforts should take place over a ten-year period and prioritize collection within natural populations.

*Justification:* Having off-site preservation of natural populations will help preserve the breadth of adaptive diversity of the species (representation) and support introduction efforts. This criterion also provides additional redundancy to enable the species to withstand catastrophic events, such as wildfire.

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 ESA (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 Amended Recovery Criteria**

We have amended the recovery criteria for clay phacelia to include quantitative delisting criteria that incorporate the biodiversity principles of representation, resiliency, and redundancy (Shaffer and Stein 2000) and threats analyzed in the latest 5-year review (USFWS 2013). The amended recovery criteria are based on our understanding of the species' needs and requirements. This includes information gathered since the original recovery plan was published, such as more recent information about population status and trends, along with an updated understanding of the threats acting on the species. The amended criteria are based on increasing the population trend and population size, maintaining genetic diversity, reducing threats to the species, and include a temporal aspect to ensure the species is resilient to expected variation within a reasonable time frame, such that the species will no longer meet the definition of threatened or endangered given current information.

### **ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS**

No additional site-specific recovery actions are necessary for this species; therefore, this is not applicable.

### **COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS**

No additional site-specific recovery actions are necessary for this species; therefore, this is not applicable.

### **LITERATURE CITED**

- Aizen, M.A., L. Ashworth, and L. Galetto. 2002. Reproductive success in fragmented habitats: do compatibility systems and pollination specialization matter? *Journal of Vegetation Science* 13:885-892.
- Debinski, D.M. and R.D. Holt. 2000. A survey and overview of habitat fragmentation experiment. *Conservation Biology* 14:342-355.
- Doak, D.F., G.K. Himes Boor, V.J. Bakker, W.F. Morris, A. Louthan, S.A. Morrison, A. Stanley, and L.B. Crowder. Recommendations for Improving Recovery Criteria under the US Endangered Species Act. *Bioscience* 65(2): 189 – 199.

Gathmann, A. and T. Tschardt. 2002. Foraging ranges of solitary bees. *Journal of Animal Ecology* 71:757–764.

Guerrant, E.O., P.L. Fielder, K. Havens, M. Maunder. 2004. Revised genetic sampling guidelines for conservation collections of rare and endangered plants, Appendix 1. In E.O. Guerrant, K. Havens, and M. Maunder (Eds.), *Ex Situ Plant Conservation: Supporting Species Survival in the Wild* (pp. 419-441). Island Press.

Kolb, A. 2008. Habitat fragmentation reduces plant fitness by disturbing pollination and modifying response to herbivory. *Biological Conservation* 141:2540–2549.

Lennartsson, T. 2002. Extinction thresholds and disrupted plant-pollinator interactions in fragmented plant populations. *Ecology* 83: 3060–3072.

Meyer, S. 2018a. *Phacelia argillacea* Seed Retrieval Experiment – Ten Year (Final) Results. U.S. Forest Service Shrub Sciences Laboratory, Provo, Utah. 2 p.

Meyer, S. 2018b. Status and Recovery Questionnaire Conducted for Clay phacelia (*Phacelia argillacea*). Research Ecologist, U.S. Forest Service Rocky Mountain Research Station, Shrub Sciences Laboratory, Provo, Utah. 11p.

NatureServe. 2004. A Habitat-Based Strategy for Delimiting Plant Element Occurrences: Guidance from the 2004 Working Group. 15p.

Shaffer, M.L. and B.A. Stein. 2000. Chapter II Safeguarding Our Precious Heritage, pp. 308-311 In BA Stein, LS Kutner, and JS Adams (Eds) *Precious Heritage: The Status of Biodiversity in the United States*. A Joint Project of The Nature Conservancy and Association for Biodiversity Information. Oxford University Press, New York. 416 p.

Skopec, M., J. Dinsdale, H. Gardner, and J. Schmalz. 2018. Clay phacelia Herbivory Protection. Interim Performance Report for Agreement F14AC01055 for work completed December 2016 – December 2017. Weber State University. 11 pp.

Skopec, M. 2018. Status and Recovery Questionnaire Conducted for Clay phacelia (*Phacelia argillacea*). Professor of Zoology, Weber State University, Ogden, Utah. 13 pp.

Traill, L.W., C. J. A. Bradshaw, and B. W. Brook. 2007. Minimum viable population size: A meta-analysis of 30 years of published estimates. *Biological Conservation* 139:159–166.

U.S. Fish and Wildlife Service (USFWS). 1982. Clay phacelia, *Phacelia argillacea* Atwood, Recovery Plan. U.S. Fish and Wildlife Service, *Phacelia argillacea* Recovery Committee, UT. 28 pp.

U.S. Fish and Wildlife Service (USFWS). 2013. Clay Phacelia (*Phacelia argillacea*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Utah Field Office, West Valley City, UT. 31 pp.

U.S. Fish and Wildlife Service (USFWS). 2016a. Biological Opinion for the Energy Gateway Wouth Transmission Line Right of Way Project. U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, WY. 55 pp.

U.S. Fish and Wildlife Service (USFWS). 2016b. Biological Opinion for the TransWest Express Transmission Line Right of Way Project. U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, WY. 118 pp.

U.S. Fish and Wildlife Service (USFWS). 2018. *Phacelia argillacea* Status and Recovery Criteria Discussion. August 29, 2018. Final Meeting Notes. 3 pp.

## **APPENDIX A – SUMMARY OF PUBLIC, PARTNER, AND PEER REVIEW COMMENTS RECEIVED**

### **Summary of Public Comments**

We published a notice of availability in the Federal Register on August 6, 2019 (84 FR 38284-38257) to announce that the draft amendment for the clay phacelia (*Phacelia argillacea*) Recovery Plan (Recovery Plan) was available for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base, assumptions, and conclusions presented in the draft amendment. An electronic version of the draft recovery plan amendment was also posted on our Species Profile website ([Clay Phacelia Revision](#)).

We also developed and implemented an outreach plan that included: (1) publishing a news release on our national webpage (<https://www.fws.gov/news/>) on August 5, 2019, (2) sending specific notifications to Congressional contacts in Districts (include appropriate Districts, consult the corresponding Outreach Plan or contact your Regional Public Affairs Officer for more information), and (3) sending specific notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the Federal Register publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the draft amendment.

We received no responses to the request for public comments.

### **Summary of Peer Review Comments**

In accordance with the requirements of the Act, we solicited independent peer review of the draft amendment from botanists with the U.S. Forest Service (USFS) and Weber State University (WSU) who have knowledge of clay phacelia. Peer review was conducted concurrent with the Federal Register publication. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to the species. The qualifications of the peer reviewers are in the decision file and the administrative record for this Recovery Plan amendment.

In total, we solicited review and comment from three peer reviewers. We received comments from two peer reviewers. The two peer reviewers are representatives from the USFS and WSU. In general, the draft amendment was well-received by the peer reviewers and garnered positive comments.

We considered all substantive comments, and to the extent appropriate, we incorporated the applicable information or suggested changes into the final Recovery Plan amendment. Below, we provide a summary of specific comments received from peer reviewers with our responses. We appreciate the input from all commenters, which helped us to consider and incorporate the best available scientific and commercial information during development and approval of the final Recovery Plan amendment.

*Peer Review Comment (1):* The Service should explicitly address the downlisting criteria in the recovery plan amendment. It is unclear whether the original downlisting criterion is meant to stand as written, namely the maintenance of 'a single population of 2000-3000 plants on at least 120 acres of suitable habitat and possibly establish at least one new population'.

*Response:* This recovery plan amendment addresses our Agency Priority Goals (APG) to include at least one quantitative recovery criteria within recovery plans for what constitutes a recovered species. As such, this recovery plan amendment revised the delisting criteria for clay phacelia and the downlisting criterion stands as written at this time. We will continue to evaluate the accuracy and usefulness of the recovery plan with respect to current information and status of conservation actions, and may pursue a full revision of the plan in the future, if appropriate.

*Comment (2):* Please identify the need for more detailed knowledge of what constitutes suitable habitat for clay phacelia. This information will be essential for choosing introduction sites and identifying areas to fence and perform weed control to address threats to the species. There is no discussion of the existing habitat suitability model, which is admittedly not very useful, but should be referenced.

*Response:* We revised the draft amendment to state our limited understanding of microsite preferences for clay phacelia within Green River shale as well as the need to improve the species' habitat model.

*Comment (3):* We do not know the carrying capacity of the habitat to support clay phacelia, i.e., how much suitable habitat will be required to sustain a population that averages 3,000 adult plants over time? If the area is a mosaic of suitable and unsuitable habitat, how much will that increase the area that must be defended? The Nature Conservancy Tucker Preserve is a case in point—most of the Preserve has never been observed to support clay phacelia plants, which are concentrated in a fairly small area, even though much of the unoccupied area appears superficially to be suitable habitat. Whether population size at the Tucker Preserve is limited by habitat restrictions or seed limitation is a question that will be addressed at some point through attempted population augmentation. This will be necessary under the new recovery guidelines, as the Tucker-Clear Creek population has never approached even 1,000 plants.

*Response:* We will evaluate the carrying capacity of occupied habitat when we perform population augmentation efforts and the carrying capacity of suitable habitat where we perform population introductions. We will continue to evaluate the accuracy and usefulness of the recovery plan with respect to current information and status of conservation actions, and may pursue a full revision of the plan in the future, if appropriate.

*Comment (4):* The second recovery criterion of 15,000 adult plants is based on a meta-analysis rather than a species-specific analysis. This target ignores the major contribution of the persistent seed bank to population stability in clay phacelia, and may be unrealistically high. Given the known ability of the Tucker-Clear Creek population to persist over the nearly 50 years since its discovery with an adult population size that has likely never exceeded 200 plants, expecting an average population size there of 3,000 plants is aiming very high. This may be a

suitable goal in concept for defining delisting criteria, but actually implementing introductions and augmentations that could potentially achieve this goal could be quite difficult.

*Response:* A recovery plan is a living document, reflecting meaningful change when new substantive information becomes available. We based the population target of 15,000 individuals on best available information for the species including: life history characteristics, population trend, expert opinion, and published literature regarding minimum viable plant population size. We will update the clay phacelia population target when we have a species-specific analysis of demography and population viability.

*Comment (5):* The second recovery criterion of 15,000 adult plants will be calculated as a population mean over a 5-year minimum period. There are often years with very few adult individuals present, so to achieve the criterion, there must also be years with numbers several times the target average in order to maintain that average over the long term. Also, the defended area for each population would need to include enough suitable habitat to support the maximum expected number of adult individuals, not the mean expected number. This might make the defended area unmanageably large, or necessitate multiple introduction sites within the NatureServe definition of a population newly adopted in this document, in order to achieve the required area of suitable habitat.

*Response:* We revised the second recovery criterion to state that a sum total of 15,000 adult plants in the range-wide population is needed over a ten-year period.

*Comment (6):* The first recovery criterion includes a requirement for continued upward population trend even after the second recovery criterion has been met. It makes more sense to require that the population size remain stable through time after meeting the second recovery criterion and thus it should not be expected to be on a perpetual upward trajectory particularly when encountering the carrying capacity and suitable habitat limitations. This needs to be clarified.

*Response:* We revised the first recovery criterion to state that the population trend should be stable or increasing over a ten year period.

*Comment (7):* There are a large number of unknowns that still limit our ability to design introduction efforts for clay phacelia. It is clear that in order to effectively implement the amended recovery plan, new research will be needed, and considerable resources will be required for monitoring even after populations are successfully established or augmented. Our knowledge of genetic issues for clay phacelia is still rudimentary, so we will also need to decide how important it is to have better information prior to initiating further introduction studies. Also, the quantity of ex situ produced seed that will be required to implement the amended recovery plan is truly prodigious. Seed production at this level is possible, but it will also require considerable resources.

*Response:* We identified the research and monitoring needs for clay phacelia in the most recent Five Year Review which includes many of the research needs the peer reviewer identified

(USFWS 2013). We will work to update the research and monitoring needs for the species in the next Five Year Review.