U.S. Fish & Wildlife Service

Recovery Plan for Showy Indian Clover (*Trifolium amoenum*)

Photo credit: Valary Bloom, FWS

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

Approved: JILL RUSSI Digitally signed by JILL RUSSI Date: 2025.02.21 16:37:54 -08'00'

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Literature Citation should read as follows:

U.S. Fish and Wildlife Service. 2025. Recovery plan for Showy Indian Clover (*Trifolium amoenum*). U.S. Fish and Wildlife Service, California-Great Basin Region, Sacramento, California.

An electronic copy of this recovery plan will be made available at: https://www.fws.gov/endangered/species/recovery-plans.html

Acknowledgments

The recovery planning process has especially benefited from the advice, assistance, and expertise of Drs. Peter Connors, Diana Immel (Jeffery), and Jackie Sones.

We also recognize and thank the following individuals formerly of the Sacramento Fish and Wildlife Office for their contributions:

Valary Bloom, Daphne Gille, Cay Goude, Elisha Hull, Sarah Markegaard, and Elizabeth Warne.

RECOVERY PLAN FOR
SHOWY INDIAN CLOVER (*TRIFOLIUM AMOENUM*)

Purpose and Disclaimer Statement

This document presents the U.S. Fish and Wildlife Service's (Service) plan for the conservation of the showy Indian clover. The recovery plan is the second part of the Service's 3-part recovery planning framework, and includes the statutorily required elements pursuant to section 4(f) of the Endangered Species Act (Act). This recovery plan is informed by the first part of the framework, in this case a Species Biological Report. The Service's Species Biological Report provides foundational science for informing decisions related to the Act and includes an analysis of the best available scientific and commercial information regarding a species' life history, biology, and current and future conditions that characterizes the species' viability (i.e., ability to sustain populations in the wild over time) and extinction risk. We have also prepared a Recovery Implementation Strategy (RIS), the third part of the framework. The RIS is an easily updateable operational plan that is separate and complementary to the recovery plan that details the on-the-ground recovery activities needed to complete the recovery actions contained in the recovery plan.

Recovery plans describe the envisioned recovered state for a listed species (when it should no longer meet the Act definitions of a threatened species or endangered species) and includes a recovery strategy, recovery criteria, recovery actions, and the estimates of time and cost needed to achieve it. Plans are published by the Service and are often prepared with the assistance of recovery teams, contractors, State agencies, and others. Recovery plans do not necessarily represent the views, official positions, or approval of any individuals or agencies involved in plan formulation, other than the Service. They represent the official position of the Service only after they have been signed by the Regional Director as approved. Recovery plans are guiding and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and completion of recovery actions.

Introduction

The following is a brief overview of the natural history and status of showy Indian clover, as documented in the Biological Report (Service 2020). Please refer to the Biological Report and the most recent five-year review (Service 2023) for expanded information.

The showy Indian clover was listed as endangered throughout its range in 1997. The Service has designated recovery priority number 2 for the species because the taxon is a full species, faces a high degree of threat, and has high potential for recovery. The showy Indian clover is endemic to California and is found in a variety of habitats including low, wet swales, grasslands, and grassy

hillsides. The species is a winter annual and is shade intolerant. The species is an annual plant known to fluctuate markedly in response to environmental conditions from year to year and among sites (Immel 2009). The now-extirpated Occidental population in Sonoma County possessed an erect phenotype of the species whereas the still-extant Dillon Beach population possesses a prostrate phenotype. The listing rule for the species identifies loss of habitat from urbanization and agricultural conversion as the major threat to the species and the primary cause of the species' historical decline. Additional threats to the species occur from erosion, recreational activities, and competition with non-native species such as iceplant (*Carpobrotus edulis*).

The historical range of the species spanned from the western edge of the Sacramento Valley in Solano County, west and north to Marin, Napa, and Sonoma Counties, and south into San Mateo County. Currently, there are two remaining populations of the species. A naturally occurring population continues to survive on private property in Dillon Beach (Dr. Peter Connors, University of California-Davis, *in litt.* 2023) and an out-planted population continues to survive on federal land at Point Reyes National Seashore (Voeller *et al.* 2023, p. 4.). Both these remaining populations are in Marin County and contain the prostrate phenotype of the species. Service partners also outplanted the species at the Bodega Marine Reserve in Sonoma County in 1997 and the Ring Mountain Preserve in Marin County in 2016. However, to date these outplanting efforts have not produced self-sustaining populations.

At species listing, the naturally occurring Dillon Beach population was subdivided into a primary occurrence area and a smaller secondary occurrence area located approximately 500 meters from the primary occurrence area. Based on the most recent systematic surveys in 2013, the primary and secondary occurrence areas together covered approximately 0.41 acre (Connors, *in litt.* 2013). Additionally, Dr. Connors observed a mean density of approximately 17 plants per square meter (mean of 608 seedlings across 36 one-square meter survey plots) over 10 years of systematic monitoring of this population from 1997-2007 and an additional survey in 2010 (calculated from Connors 2007, p. 2 and Connors 2010, p.1).

Recovery Strategy

The purpose of this recovery plan is to outline recovery actions that will prevent further loss of natural and experimental populations of showy Indian clover and promote recovery of the species. The species is currently known at only one historical location and one outplanted population and thus our primary management goal is to protect and ensure survival of these existing populations through management of threats such as invasive species. Our secondary goal is to establish additional geographically-widespread stable and self-sustaining outplanted populations to protect the species against regional-scale stochastic events such as wildfire and drought. We would consider these outplanted populations as stable and self-sustaining when their geographic breadth and seedling densities are similar to the demographics observed in the currently stable and self-sustaining Dillon Beach population; specifically a coverage of 0.41 acre with a density of 17 plants per square meter. Historically, the species occurred across five separate counties, and thus our strategy is for the species to possess at least five geographically-widespread populations to approach the species' historical levels of redundancy. We do not specify that these five geographically-widespread populations must occur in the five counties of the species' historical range because Solano County in particular likely no longer contains

suitable habitat for the species. The two existing populations of the species are approximately fifteen miles apart and thus for this document we define "geographically-widespread" to indicate a species condition where at least three of five populations are located greater than fifteen miles from each other. Our tertiary goals are to continue monitoring of existing populations, promote research to determine whether the prostrate and erect forms of the species are ecologically and reproductively distinct, and to produce and store seed of the species as a reserve in case of extirpation of currently existing populations.

Recovery Criteria

An endangered species is defined in the Act as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. When we evaluate whether or not a species warrants downlisting or delisting, we consider whether the species meets either of these definitions. A recovered species is one that no longer meets the Act's definitions of threatened or endangered due to the alleviation of threats. Determining whether a species should be downlisted or delisted requires consideration of the same five categories of threats which were considered when the species was listed and which are specified in section 4(a)(1) of the Act.

Recovery criteria are conditions that, when met, indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are mileposts that measure progress toward recovery. Because the appropriateness of delisting is assessed by evaluating the five threat factors identified in the Act, the recovery criteria below pertain to and are organized by these factors. These recovery criteria are our best assessment at this time of what needs to be completed so that the species may be removed from the list of threatened and endangered species. Because we cannot envision the exact course that recovery may take and because our understanding of the vulnerability of a species to threats is likely to change as more is learned about the species and its threats, it is possible a status review may indicate that delisting is warranted although not all recovery criteria are met. Conversely, it is possible that the recovery criteria are met however a status review may indicate that downlisting or delisting is not warranted.

Downlisting Criteria

To downlist species from endangered to threatened status, the species must not be in danger of extinction throughout all or a significant portion of its range. The showy Indian clover is extirpated throughout much of its historical range. However, the species has persisted at the natural Dillon Beach population as well as the outplanted population at Point Reyes National Seashore. As described above, we expect that a population with parameters similar to the Dillon Beach population (a geographic coverage of 0.41 acre with a density of 17 seedlings per square meter) is likely sufficiently robust to sustain itself even in the presence of threats such as erosion, trampling, and encroachment by non-native plants. Therefore, we use these population parameter values as criteria for the down and delisting of the species.

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

To reclassify the showy Indian clover to threatened status, threats to the species and its habitat

must be reduced. This reduction will be accomplished when the following have occurred:

Urbanization and land development.

A1 The species persists in at least five total geographically-widespread populations (including the current Dillon Beach and Point Reyes National Seashore populations), as defined above. Each population possesses a minimum mean geographic coverage of 0.41 acre with a minimum density of 17 seedlings per square meter in survey transects over a **five-year** period including at least one below-average rain year for the population locality. This observation period must contain a below-average rain year in order to demonstrate the population's ability to withstand this frequent stressor.

Erosion and geological events.

A2 For each of the five populations described in Downlisting Criterion A1 above, there is a site-specific monitoring plan in place to monitor the effects of erosion on the population.

Trampling.

A3 For each of the five populations described in Downlisting Criterion A1 above, there is a site-specific monitoring plan in place to monitor the effects of trampling and recreational activity on the population.

Non-native invasive species.

A4 For each of the five populations described in Downlisting Criterion A1 above, there is a site-specific monitoring plan in place to monitor the effects of non-native invasive species on the population.

Delisting Criteria

The ultimate goal of the recovery plan is to remove the showy Indian clover from the *Federal List of Endangered and Threatened Plants* (50 CFR § 17.12) by ensuring the long-term viability of the species in the wild. To delist the showy Indian clover, the species must possess multiple geographically-dispersed, stable, and self-sustaining populations with management in place to address threats to these populations.

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

To delist the showy Indian clover, the species must have at least five (5) geographically-dispersed, stable, and self-sustaining populations and with management in place to address threats to these populations. This will be accomplished when the following have occurred:

A1 The species persists in at least five total geographically-widespread populations (including the current Dillon Beach and Point Reyes National Seashore populations). Each population possesses a minimum mean geographic coverage of 0.41 acre with a minimum density of 17 seedlings per square meter in survey

transects over a **ten-year** period including at least two below-average rain years for the population locality. As in the downlisting criteria above, this observation period must include at least two below-average rain years to demonstrate the population's ability to withstand this frequent stressor.

A2 The geographic breadth of at least five total populations meeting the specifications described in Delisting Criterion A2 above are protected from incompatible uses through a formal agreement with the landowner such as a conservation easement or Conservation Benefit Agreement with the Service.

Erosion and geological events.

A3 A site-specific management plan to control the effects of erosion on the species is developed and implemented for any populations threatened by erosion (e.g. the Dillon Beach population).

Trampling.

A4 A site-specific management plan to control the effects of trampling and recreational activity on the species is developed and implemented for at least five populations meeting the specifications of Delisting Criterion A1 above.

Non-native Invasive species.

A5 A site-specific management plan to control the effects of non-native invasive species on the species is developed and implemented for at least five populations meeting the specifications of Delisting Criterion A1 above.

Recovery Actions

Recovery actions are the statutorily required, site-specific management actions needed to achieve recovery criteria, as described in section 4(f)(1)(B)(i) of the Act. The Service assigns recovery action priority numbers (1-3) to rank recovery actions. The assignment of priorities does not imply that some recovery actions are of low importance, but instead implies that lower priority items may be deferred while higher priority items are being implemented. Recovery action priority numbers are based on the following:

Priority 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2: An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery of the species.

The following recovery actions with priority numbers have been identified for Showy Indian Clover. The delisting or downlisting criteria associated with each action are listed in parenthesis.

1. **Protect and manage existing populations of showy Indian clover (Priority 1; Downlisting Criteria A1-4; Delisting Criteria A1-5)**.

   Protection of existing populations and management of inhabited areas for the benefit of the species would reduce threats to the species from development, trampling, erosion, and non-native plant species.

2. **Increase the number of existing showy Indian clover populations and the number of plants within each population (Priority 1; Downlisting Criterion A1; Delisting Criteria A1-2)**.

   Outplanting and translocation efforts would reduce the vulnerability of the species to catastrophic events and population augmentation would improve the resilience of populations.

3. **Conduct range-wide and long-term monitoring of showy Indian clover populations. (Priority 2; Downlisting Criteria A2-4; Delisting Criteria A3-5)**.

   Monitoring of known populations will allow the Service and its partners to make informed decisions on the pace and progress of recovery for the species.

4. **Conduct rangewide field surveys (Priority 3; Downlisting Criterion A1; Delisting Criterion A1).**

   The species is currently known from only two localities. Additional unknown localities of the species may persist, particularly on private lands. Identification of additional localities would inform our assessment of redundancy of the species and also potentially provide new genetic stock for translocation efforts.

5. **Perform research on the fundamental biology of showy Indian clover throughout its known range (Priority 3; Downlisting Criterion A1; Delisting Criterion A1).**

   The specific microhabitat needs of the species are still relatively unknown. Further research into the habitat needs of the species will assist in future translocation and propagation efforts. Additionally, the relationship between the prostrate and erect forms is still unknown and breeders have not yet attempted to cross these forms. Assessing whether these distinct phenotypes represent reproductively-isolated groups would inform the classification and listing status of the species.

Table 1. Recovery Actions and estimated costs.

Recovery Action	Estimated Cost
1. Protect and manage existing populations of showy Indian clover.	$11,000,000
2. Increase the number of existing showy Indian clover populations and the number of plants within each population.	$660,000
3.Conduct range-wide and long-term monitoring of showy Indian clover populations.	$1,160,000
4. Conduct rangewide field surveys.	$110,000
5. Perform research on the fundamental biology of showy Indian clover throughout its known range.	$300,000
Total Estimated Cost	**$13,230,000**

Estimated time and cost of recovery actions

We estimate that the cost of completing recovery actions sufficient to delist the species entirely would be $13,230,000. We estimate implementation of these actions sufficient to delist the species would require around 50 years with an estimated completion year of 2074. Our relatively long estimate of the time required to complete actions and delist the species is a result of the species' limited abundance and remaining uncertainty about the species' requirements for successful outplanting.

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