

Recovery Plan for Five Plants from Monterey County, California

Original Approved: 2004

Original Prepared by: Ventura Fish and Wildlife Office

DRAFT AMENDMENT

We have identified information that indicates the need to amend recovery criteria for these 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 describe the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an appendix that supplements the recovery plan, superseding only section III. pp. 49-56 for *Astragalus tener* var. *titi* (coastal dunes milk-vetch), *Piperia yadonii* (Yadon's piperia), *Potentilla hickmanii* (Hickman's potentilla), and *Trifolium trichocalyx* (Monterey clover) of the recovery plan.

**For
U.S. Fish and Wildlife Service
Pacific Southwest Region
Ventura, CA**

September 2018

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 A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited and therefore warrants modification.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

This amendment was prepared by the Ventura Fish and Wildlife Office. We used information from our files, the California Natural Diversity Database maintained by the California Department of Fish and Game, and information from species experts. The amended criteria will be peer reviewed in accordance with the 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 (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 listing factors.

Recovery Criteria

See previous version of criteria in the recovery plan for *Astragalus tener* var. *titi* (coastal dunes milk-vetch), *Piperia yadonii* (Yadon's piperia), *Potentilla hickmanii* (Hickman's potentilla), and *Trifolium trichocalyx* (Monterey clover) pp. 49-56. The recovery plan is available [here](#).

SYNTHESIS

Astragalus tener var. *titi* (coastal dunes milk-vetch)

Astragalus tener var. *titi* (coastal dunes milk-vetch) is a small annual plant in the pea family (Fabaceae). Historically, populations occurred in San Diego, Los Angeles, and Monterey Counties. It is currently known from one highly fragmented population located on a coastal terrace grassland along 17-Mile Drive in Pebble Beach on the Monterey Peninsula, Monterey County, California. The population is bordered along one side by the Pacific Ocean and the other side by a golf course; 17-Mile Drive bisects the population. The small size of the population and its proximity to a variety of human recreation activities makes it vulnerable to stochastic extinction.

At the time of our last 5-Year Review (Service 2009a, entire), the status of *Astragalus tener* var. *titi* has not changed substantially since the time of listing in 1998. At that time, only one population was known from along the coast in Pebble Beach, Monterey County, California. Since 1982, annual population numbers have fluctuated between less than 100 and 7,000,

depending on winter and spring climatic conditions; less than 100 individuals were observed in 2008. The population occurs on private lands owned by the Pebble Beach Company and the Monterey Peninsula Country Club. The two landowners have undertaken measures to protect and manage the habitat for *Astragalus tener* var. *titi*, including establishing one enclosure to protect a portion of the population, removing nonnative species from its habitat, and installing sensitive habitat signs along the road margins. Recent research indicates that the taxon may not be as restricted in its habitat characteristics as previously thought. Nevertheless, *A. tener* var. *titi* continues to be threatened by human activities such as hiking, picnicking, ocean viewing, wildlife photography, equestrian use, and golfing. In addition, because of habitat conversion that has already occurred, there is little suitable habitat into which the taxon might expand adjacent to its current distribution. Deposition of cobble and saltwater inundation appear to be new events that threaten the continued existence of the individuals along the edge of the coastal bluffs.

Piperia yadonii (Yadon's piperia)

Piperia yadonii (Yadon's piperia) is a slender perennial herb in the orchid family (Orchidaceae). It is endemic to Monterey County and is found within Monterey pine forest and maritime chaparral communities. As observed with other orchids, germination of seeds is believed to involve a symbiotic relationship with a fungus. The blooming season is brief, usually starting in mid-June and ending in early August. Individuals that flower in one year may not flower the next, and a portion of the population may be completely dormant in any given year. At the time of listing in 1994, habitat fragmentation and development were detailed as threats to the species.

At the time of the 2009 5-Year Review, much of the habitat fragmentation occurred in the past. The resulting effects of habitat fragmentation are still a threat, and the potential for further fragmentation of the remaining populations continues to be a threat (Service 2009b). Since the time of listing, the threat of development and habitat fragmentation has been reduced somewhat; in particular, some of the densest populations of *Piperia yadonii* on Monterey Peninsula have been set aside in designated Open Space areas by Pebble Beach Company and will likely not be developed in the future. In addition, there are plans to acquire populations of *P. yadonii* in the near future for conservation, and they will receive an additional level of protection through implementation of management plans. Even so, more populations in permanent protection and managed for conservation are needed to ensure the long-term survivability of the species. Since the time of listing, extensive surveys have detected an expanded known range, additional populations, and higher numbers of individuals. However, a number of factors have been shown to reduce the reproductive potential of the species, including high rates of herbivory that have significantly affected the populations of *P. yadonii* over time by reducing the ability of individual plants to survive and reproduce.

Potentilla hickmanii (Hickman's potentilla)

Potentilla hickmanii (Hickman's potentilla) is a small perennial herb in the rose family. It is restricted to two general areas, one in San Mateo County and one in Monterey County, California, where it occurs within coastal terrace prairie habitat. In San Mateo County, a population of between 2,000 and 3,000 individuals is scattered over a half square mile (sq mi) (130 hectares (ha)). In Monterey County, one population comprised of less than 20 plants occurs on less than one quarter of an acre (0.1 ha). The coastal terrace prairie habitat that the species occurs in has been subjected to alteration and destruction due to development, changes in

hydrologic regime, and invasion by nonnative species. In addition, the Monterey County population of *P. hickmanii* is subject to grazing by deer, cattle, gophers, snails and slugs; and it is experiencing reproductive failure.

At the time of the 2009 5-Year Review, in addition to the two native populations, greenhouse-grown plants were outplanted to a site at Point Lobos State Reserve in Monterey County in 2006; whether these plants result in the establishment of a viable population remains to be seen (Service 2009c, entire). The outplanted individuals contribute at least temporarily to the total number of individuals, but their long-term contribution has not been assured. However, even with these increases, the total number of populations and individuals remain very small. Habitat threats remain at all native sites; and these include alteration in hydrology and grazing by a variety of wildlife species, cattle, and nonnative slugs and snails. A portion of the Montara population has been secured from development due to abandonment of the Devil's Slide bypass project and the acquisition by the Peninsula Open Space Trust of the remaining portion of this population; the Pebble Beach population occurs on private lands with protective land use designations.

Trifolium trichocalyx (Monterey clover)

Trifolium trichocalyx is a small annual plant in the pea family (Fabaceae). The species is only known to occur in a 206-acre (83-hectare (ha)) area in the central portion of the Monterey Peninsula, Monterey County, California. This area is bordered by golf courses and residential development to the west and residential and commercial development to the north, east, and south. *Trifolium trichocalyx* is a classic fire follower, taking advantage of reduced forest cover that allows a significantly higher proportion of light to reach the herbaceous ground cover for the first few years after a fire. The species becomes scarce when the forest canopy closes persisting primarily as a seed bank in the soil while shade and competition increase during succession of the forest community. The area known to support the species has not undergone a significant fire since 1987 when approximately 160 acres (65 ha) burned.

At the time of the 2009 5-Year Review, the species had not been observed since 1995 when 22 individuals were located, and the status of the species had not changed substantially since the time of listing in 1998 (Service 2009d, entire). At that time, the species was only known from the Huckleberry Hill area on the Monterey Peninsula, Monterey County, California, where habitat for the species has declined from 1,754 acres (710 ha) to the then current extent of 539 acres (218 ha) due to residential and recreational development. Since 1988, annual population numbers have fluctuated between approximately 1,000 plants in 1988 (which were identified in an approximately 160 acre (65 ha) burned area at Huckleberry Hill) to 22 plants in 1995. The majority of known occurrences are within the Huckleberry Hill Natural Reserve and the Morse Reserve, with additional occurrence locations adjacent to and south of these areas. The remaining Monterey pine forest habitat (which may harbor *Trifolium trichocalyx* seed banks) on the Monterey Peninsula is still threatened with development. The species continues to be threatened by the alteration of natural fire cycles within the Monterey pine forest. Additionally, for this fire-follower to survive between fire cycles, the plant's habitat and seed bank must remain relatively intact and undisturbed. In addition, there is little suitable habitat for the taxon to expand its current distribution because of residential and recreational development that has

already occurred. The persistence of this plant species is wholly dependent on maintaining the remaining existing habitat and the recurrence of fire, whether intentional or unintentional.

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 protections afforded by the Act are no longer necessary and *Astragalus tener* var. *titi* (coastal dunes milk-vetch), *Piperia yadonii* (Yadon's piperia), *Potentilla hickmanii* (Hickman's potentilla), and *Trifolium trichocalyx* (Monterey clover) 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 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 *Astragalus tener* var. *titi* (coastal dunes milk-vetch), *Piperia yadonii* (Yadon's piperia), *Potentilla hickmanii* (Hickman's potentilla), and *Trifolium trichocalyx* (Monterey clover) which will supersede those included in the Recovery Plan For Five Plants from Monterey County, California, as follows:

Current recovery criteria (from original recovery plan)

Astragalus tener var. *titi* (coastal dunes milk-vetch)

Downlisting for *Astragalus tener* var. *titi* can be considered when all of the following criteria have been achieved:

- 1) At least five viable populations (i.e., populations that are stable or increasing based on multiple years of monitoring, including at least two populations in San Diego or Los Angeles Counties) occur on suitable habitat with few to no nonnative competitors, and no threats from trampling. The area surrounding each population should allow for movement and expansion.
- 2) A minimum of five populations are on land that is permanently protected from development (e.g., residential, commercial, recreational, etc.) including the population that currently exists on Pebble Beach and Monterey Peninsula Country Club property. Funds must be available for appropriate long-term management. Protected habitat must be of adequate size and configuration to ensure that ecosystem and community processes (i.e., hydrologic regime, food webs, pollinator fauna, coastal dune community associates, and associated species) are maintained, and an adequate diversity of sites exist for colonization of new areas as microhabitat conditions change.
- 3) Site selection, restoration, and plant reintroduction has been initiated in at least two historical localities in Los Angeles or San Diego Counties. These two reintroduced populations will be considered as part of the five populations of plants described in 1(a) and 1(b) above.

- 4) The populations of plants are being adequately maintained, such that encroachment by nonnative plants, excessive herbivory, fire prevention activities, or other threats are not negatively affecting *Astragalus tener* var. *titi* directly or indirectly.
- 5) The 17-Mile Drive population and additional populations have been appropriately managed such that monitoring has determined that these populations are stable or increasing for a minimum of 3 consecutive years.
- 6) A seed bank has been established at a recognized institution that is certified by the Center for Plant Conservation.

Piperia yadonii (Yadon's piperia)

Downlisting for *Piperia yadonii* can be considered when all of the following criteria have been achieved:

- 1) Secure and protect areas throughout the present range of *Piperia yadonii* that contain populations of sufficient size to ensure the long-term survival and recovery of the species. In the draft recovery plan, we stated that areas should be established that encompass and protect metapopulations of the *P. yadonii*; however, the information needed to define and delineate metapopulations is not available at this time. Until sufficient information is available for a metapopulation approach to *P. yadonii* conservation, we have identified areas and populations of plants that need to be protected to accomplish the goal of downlisting the species. To facilitate the identification of these areas and populations, we have divided the current range of the species into five geographic areas based on the known distribution of the plant (California Natural Diversity Data Base 2004): the Monterey Peninsula (Area 1), the area interior of the Monterey Peninsula (Area 2), northern Monterey County-Prunedale-Elkhorn (Area 3), the area east of Point Lobos State Reserve-Point Lobos Ranch (Area 4), and Palo Colorado Canyon (Area 5). The goal is to protect self-sustaining populations of *P. yadonii* in each of these five areas. By doing so, we will ensure both the preservation of the plant throughout its range and its representation in both of the community types in which it is known to occur (Monterey pine forest and maritime chaparral). A minimum of 12 populations will require protection: four in Area 1, three each in Areas 2 and 3, and one each in Areas 4 and 5. The two largest populations of *P. yadonii* occur in Area 1, and both of these populations should be protected to the maximum extent feasible. However, if this is not feasible, additional protected areas may be required in Area 1. These additional areas would be necessary to ensure an adequate number of individuals are protected and that Monterey Pine Forest habitat occupied by *P. yadonii* is adequately represented. The protected areas must be of adequate size and configuration to ensure the following: 1) maintenance of ecosystem and community processes and constituent species (e.g., hydrologic regime, drainage patterns, proximity to pollinator habitat, Monterey pine forest and maritime chaparral community associates); 2) continued, unimpeded gene flow between populations, either through wind-dispersed seed or animal-mediated pollen exchange; 3) an adequate diversity of sites for population expansion and for colonization of new areas as microhabitat conditions change; and 4) the persistence of *P. yadonii* populations

throughout the full range of environmental conditions they are likely to encounter (e.g., extended drought, wildfire). Protected areas should be as large as possible (e.g., hundreds of acres) and configured such that they preserve ecosystem function and minimize the adverse influences of adjacent development. Protected areas of greater than a hundred acres will not be feasible at all locations; therefore, the ability of smaller areas to fulfill the criteria should also be considered. Adequate, long-term funding should be available for these protected areas to allow for their maintenance.

- 2) Protected areas are adequately maintained, such that encroachment by non-native plants (e.g., *Genista monspessulana*, *Cortaderia jubata*), excessive herbivory (from deer and rabbits), edge effects from road maintenance, fuel modification activities, or other threats do not directly or indirectly adversely affect *Piperia yadonii* and its habitat.
- 3) Results of monitoring activities have determined that the protected populations of *Piperia yadonii* are of adequate size to be self-sustaining and to ensure their long-term persistence. Because this species is a perennial that exhibits dormancy, spending an undetermined period underground between seed germination and emergence of first leaf aboveground, it is likely that a minimum of 10 to 15 years of monitoring will be needed in order to define a population trend.

Potentilla hickmanii (Hickman's potentilla)

Downlisting for *Potentilla hickmanii* can be considered when all of the following criteria have been achieved:

- 1) At least five viable populations (i.e., populations that are stable or increasing based on a minimum of 10 years of monitoring) occur in suitable habitat.
- 2) All five of the sites are on land that is protected from human-induced disturbance. Funds must be available for appropriate long-term management. As determined by research, protected habitat must be of adequate size (large enough to support a functioning ecosystem [e.g., species present to support seed dispersal and pollination, areas that support fluctuating distributions, areas that harbor suitable unoccupied habitat for population expansion]) and configuration to ensure that ecosystem and community processes and associated species (e.g., hydrologic regime, food webs, pollinator fauna, forest meadow communities) are maintained, and that an adequate diversity of sites exist for population expansion and for colonization of new areas as microhabitat conditions change. One of these protected sites should be the Indian Village population; another should be the Montara population in San Mateo County.
- 3) Surrounding vegetation has been managed for a reduction of nonnative plant species and nonnative snails and slugs. The populations should be adequately maintained, such that encroachments by nonnative plants and herbivorous predators (including deer) are not negatively affecting *Potentilla hickmanii* directly or indirectly.
- 4) The populations have been appropriately managed to such a degree that monitoring has determined the populations are of adequate size, density, and number that the trend for each of the populations is projected to be stable or increasing in the future.

- 5) A seed bank has been established at a recognized institution certified by the Center for Plant Conservation.

Trifolium trichocalyx (Monterey clover)

Downlisting for *Trifolium trichocalyx* can be considered when all of the following criteria have been achieved:

- 1) At least five viable populations (i.e., populations that are stable or increasing based on a minimum of 12 years of monitoring) occur in suitable habitat. One of these populations is the Huckleberry Hill population.
- 2) All five of the sites are on land that is protected from human-induced disturbance (i.e. development, recreation) that would negatively affect growth or reproduction of the plants. Funds must be available for appropriate long-term management. As determined by research, protected habitat must be of adequate size (large enough to support a functioning ecosystem [e.g., species present to support seed dispersal and pollination, areas that support fluctuating distributions, areas that harbor suitable unoccupied habitat for population expansion]) and configuration to ensure that ecosystem and community processes and associated species (e.g., hydrologic regime, fire, food webs, pollinator fauna, Monterey pine forest communities) are maintained, and that an adequate diversity of sites exist for population expansion and for colonization of new areas as microhabitat conditions change.
- 3) The Huckleberry Hill population and four additional viable populations (as described in (a) above) have been managed so as to allow regeneration of plants and replenishment of the seed bank found in the soil within the protected habitat.
- 4) A seed bank has been established at a recognized institution certified by the Center for Plant Conservation.

Amended recovery criteria

Astragalus tener var. *titi* (coastal dunes milk-vetch)

Delisting Criteria: Delisting may be warranted when the downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability. With respect to resiliency, all of the colonies in the Monterey Bay are considered to be part of one population. While some annual variability has been observed in the size of the population, numbers typically have not been over 3,000 individuals – a small number for an annual taxon. The historical distribution of colonies within three geographically separated areas (Monterey Peninsula, coastal Los Angeles County, and coastal San Diego County) is important to its redundancy and representation. Currently, the taxon only occurs on the Monterey Peninsula; therefore, redundancy and representation is low. Establishing additional colonies in the historical areas of Los Angeles County and San Diego County is key to increasing resiliency, redundancy, and representation for this taxon.

When the downlisting criteria have been met for a species, the species can be considered for delisting if:

- 1) threats are reduced or eliminated so that protected populations are capable of persisting without significant human intervention, or perpetual endowments are secured for management necessary to maintain the continued existence of the species. The most outstanding management needs currently are: protection from recreational activities such as hiking, picnicking, equestrian use, and golfing;
- 2) unoccupied habitat in the area has been assessed for its suitability for reintroduction efforts directly adjacent to occupied patches to allow for expansion, especially to offset losses of patches along the immediate coast due to storm surge and saltwater intrusion; and two additional, new populations are established and protected where appropriate, with a goal of increasing redundancy and representation with the establishment of new populations in Los Angeles and San Diego Counties; and
- 3) all protected populations remain viable for at least 10 years to demonstrate long-term viability under a range of environmental conditions. We expect above-ground population size to fluctuate annually, based on response to amount and timing of rainfall (e.g. see Fox et al. 2005). Therefore, a period of 10 years should be long enough to include most of the variability in rainfall that occurs in this region (Zedler & Black 1989; NOAA 2018).

Piperia yadonii (Yadon's piperia)

Delisting Criteria: Delisting may be warranted when the downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability. For this taxon, the distribution of populations throughout Monterey County is important to its resiliency, redundancy, and representation. The downlisting criteria for this species discuss the goal of protecting multiple populations in each of five geographic areas within the County. Since the time the recovery plan was written in 2004, known populations have been provided with protection and management, additional populations have been discovered in several different habitat types, and research has been conducted that contributes to our understanding of how the species responds to annual variation in climatic conditions. Furthermore, robust abundance in favorable years, coupled with its perennial life history, contributes to its resiliency.

When the downlisting criteria have been met for a species, the species can be considered for delisting if:

- 1) threats are reduced or eliminated so that protected populations are capable of persisting without significant human intervention, or perpetual endowments are secured for management necessary to maintain the continued existence of the species. The most outstanding management needs currently are: a) maintaining and restoring habitat through control of nonnative species (especially grasses and broom) and b) control of herbivory by deer and small mammals;
- 2) a seed bank has been established at a recognized institution certified by the Center for Plant Conservation; and

- 3) all protected populations remain viable for at least 10 years to demonstrate long-term viability under a range of environmental conditions. Based on recent research by Graff (2006), we expect above-ground population size to fluctuate somewhat on an annual basis, based on response to amount and timing of rainfall. Even though this is a perennial species, the aboveground portion is herbaceous and dies back each year and thus responds to some extent like an annual species. Therefore, a period of 10 years should be long enough to include most of the variability in rainfall that occurs in this region (Zedler & Black 1989; NOAA 2018).

Potentilla hickmanii (Hickman's potentilla)

Delisting Criteria: Delisting may be warranted when the downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term viability. With respect to resiliency, the colonies on the Monterey Peninsula are extremely small, while colonies in San Mateo County are more robust; overall, however, resiliency is still low. With respect to redundancy and representation, the species only occurs in one population on the Monterey Peninsula and two populations in San Mateo County; therefore, redundancy and representation are also low. Establishing additional populations, particularly in Monterey Peninsula area, is key to increasing resiliency, redundancy, and representation for this species.

When the downlisting criteria have been met for this species, it can be considered for delisting if:

- 1) threats are reduced or eliminated so that protected populations are capable of persisting without significant human intervention, or perpetual endowments are secured for management necessary to maintain the continued existence of the species. The most outstanding management needs currently are: a) maintaining and restoring habitat through control on nonnative grass species (for both Monterey Peninsula and San Mateo County populations) and b) control of herbivory by deer and small mammals (for the Monterey Peninsula population);
- 2) unoccupied habitat in the area has been assessed for its suitability for reintroduction efforts; the Monterey Peninsula area should be further assessed for potential sites. Two additional, new populations are established and protected where appropriate; and
- 3) all protected populations remain viable for at least 10 years to demonstrate long-term viability under a range of environmental conditions. We expect above-ground population size to fluctuate annually based on response to amount and timing of rainfall (e.g. see Fox et al. 2005). Even though this is a perennial species, the aboveground portion is herbaceous and dies back each year and thus responds to some extent like an annual species. Therefore, a period of 10 years should be long enough to include most of the variability in rainfall that occurs in this region (Zedler & Black 1989; NOAA 2018).

Trifolium trichocalyx (Monterey clover)

Delisting Criteria: Delisting may be warranted when the downlisting criteria have been met and the species exhibits sufficient resiliency, redundancy, and representation to support long-term

viability. Since the time the recovery plan was written, two colonies of the species have been discovered in Mendocino County. For this species, the distribution of colonies within two geographically separated areas (Monterey Peninsula area and the Big River Forest area in Mendocino County) is important to its resiliency, redundancy, and representation. With respect to resiliency, the two colonies in the Monterey Bay area are in poor or declining condition and are represented by a small number of individuals; as of 2016, less than 30 individuals were located here (McCabe 2017). In Mendocino County, two colonies comprised approximately 5,000 and 50 individuals, respectively, when seen in 2011. Thus, three out of four colonies were comprised of a very small number of individuals, with the fourth comprising a number of individuals still considered small for an annual species. In addition, with respect to redundancy and representation for the species, these attributes are also not robust, given there are only four colonies in two locations. Therefore, delisting criteria focus on increasing the number of colonies and individuals, such that resiliency, redundancy, and representation are all increased.

When the downlisting criteria have been met for this species, it can be considered for delisting if:

- 1) threats are reduced or eliminated so that protected populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species. We currently know so little about this species that it is difficult to determine what its specific habitat needs are. To the best we know now, the most outstanding management need currently is to integrate, or find a replacement for, a fire regime as a means of revitalizing declining or senescing colonies;
- 2) unoccupied habitat in the area has been assessed for its suitability for reintroduction efforts; the area in Mendocino County where colonies were discovered in 2011 should be assessed as well as the Monterey Peninsula area. Also, two additional, new populations are established and protected where appropriate; and
- 3) all protected populations remain viable for at least 10 years to demonstrate long-term viability under a range of environmental conditions. Assuming that habitat was being managed to incorporate a fire regime to increase openness and to release fire-adapted seed, we would then expect above-ground population size to fluctuate annually based on response to amount and timing of rainfall (e.g. see Fox et al. 2005). Therefore, a period of 10 years should be long enough to include most of the variability in rainfall that occurs in this region (Zedler & Black 1989; NOAA 2018).

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 Recovery Criteria

We have amended the recovery criteria for *Astragalus tener* var. *titi* (coastal dunes milk-vetch), *Piperia yadonii* (Yadon's piperia), *Potentilla hickmanii* (Hickman's potentilla), and *Trifolium trichocalyx* (Monterey clover) to include delisting criteria that incorporate the biodiversity principles of representation, resiliency, and redundancy (Schaffer and Stein 2000) and threats addressed under the five factors. The amended criteria were developed based on the Service's current understanding of the species needs and requirements. This understanding 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 criteria presented are based on the reduction of threats to the species, and they include a temporal aspect to ensure that the species are resilient to expected variation within a reasonable time frame.

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