U.S. Fish & Wildlife Service

# Recovery Plan for the Ohlone Tiger Beetle (*Cicindela ohlone*)

*Ohlone tiger beetle (Photo credit: Alex Jones, UCSC)*

U.S. Fish and Wildlife Service
Pacific Southwest Region

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

# Acronyms and abbreviations used in this recovery plan

| | |
|---|---|
| RIS | Recovery Implementation Strategy |
| SSA | Species Status Assessment |
| Act | Endangered Species Act |
| Service | U.S. Fish and Wildlife Service |
| beetle | Ohlone tiger beetle |

## Purpose and Disclaimer

This document presents the U.S. Fish and Wildlife Service's (Service) plan for the conservation of the Ohlone tiger beetle. 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, a Species Status Assessment (SSA). The SSA report delivers 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 complimentary 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's definitions of a threatened species or endangered species) and include a recovery strategy, recovery criteria, recovery actions, and the estimates of time and cost needed to achieve recovery. 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

This recovery plan describes criteria for determining when the Ohlone tiger beetle should be considered for down- and de-listing, lists site-specific actions that will be necessary to meet those criteria, and estimates the time and cost to achieve recovery. Additionally, it includes a summary of information on the species' biology and status, along with a brief discussion of factors limiting its populations. The SSA contains a detailed discussion of these and other topics pertinent to the recovery of the Ohlone tiger beetle. The RIS contains detailed, on-the-ground activities for implementing recovery actions. These supplemental documents are available at

https://ecos.fws.gov/ecp/species/8271. The RIS and SSA are finalized separately from the Recovery Plan and will be updated on a routine basis.

## Summary of the Species Status Assessment

The Ohlone tiger beetle is listed as an endangered species under the Endangered Species Act (Service 2001, entire). The species is a narrow endemic with a small range, and it is currently found only in four disjunct areas of Santa Cruz County, California. The primary threats facing the species are habitat loss and degradation, and changes in rainfall patterns with climate change.

The Ohlone tiger beetle requires coastal terrace grasslands with Watsonville or potentially Bonnydoon loam soils, abundant arthropod prey, and patches of bare ground spaced between vegetation in its grassland habitat. Patches of bare ground are especially important for the species because they make it easier for beetles to see prey, find mates, dig burrows and oviposition chambers, and to bask in the sun and thermoregulate. Patches of bare ground are maintained in grasslands by periodic disturbances like fire and grazing, and these disturbances also maintain grassland habitat overall by preventing woody plant encroachment. Because periodic disturbances are so important for the species, management or other land-use practices that provide these disturbances are needed for the species to continue to persist in the wild.

For the SSA, we assessed the Ohlone tiger beetle's overall viability by assessing its current and future resiliency, redundancy and representation. In conducting the assessment, we divided the species' range into five analysis units, based on the five disjunct areas that the beetle currently or historically occupied (Figure 1). We assessed the beetle's current condition in each analysis unit by assessing the habitat quantity and quality, the beetle's population size, and its occupancy over space and time. We assessed future condition of each analysis unit by projecting into the future the threats and conservation actions that most strongly affect the species under higher- and lower-threat scenarios.

Based on our assessment, the Ohlone tiger beetle currently has three analysis units with moderate resiliency and one with low resiliency, and one analysis unit where the species has been extirpated. The species likely has lower redundancy and representation than it had historically. Over the next 35 years, the beetle's resiliency is likely to drop, particularly if threats to the species increase substantially: under a higher-threat scenario, two of the beetle's analysis units are projected to become potentially extirpated, largely because management is projected to stop under this scenario across a large portion of the species' range. Of the two remaining analysis units, one unit is projected to drop to low condition while the other is projected to remain in moderate condition. Under this higher-threat scenario, the beetle's redundancy and representation decline substantially because the species' abundance declines and its range contracts. By contrast, under a lower-threat scenario, the beetle's resiliency is projected to remain similar to what it is today. Under this scenario, management and threats continue at similar rates, and three analysis units are projected to remain in moderate condition for resiliency, while one becomes potentially extirpated. Under this scenario, redundancy and representation are projected to decrease slightly or to remain similar to what they are today, because

the beetle's abundance and range size are not expected to change substantially.

Overall, the Ohlone tiger beetle has some near-term extinction risk, and this risk is likely to increase in the future, particularly under a higher-threat scenario for the species, with resiliency, redundancy and representation all decreasing, largely because management stops across a large portion of the species occupied habitat.

## Recovery Strategy

We believe that recovery of the Ohlone tiger beetle will be achieved when the species has at least four analysis units across the species' range with minimum population sizes above 1000 for one analysis unit and above 500 for the other three. The main way to reach this state will be to increase the resiliency of the beetle at existing analysis units by expanding habitat management and potentially reintroducing the beetle into new analysis units with suitable habitat. To achieve recovery, we will also need to ameliorate threats, the biggest of which is habitat degradation, the threat that the species' habitat will become degraded and unsuitable if periodic fire or grazing stop in places without long-term assurances for management. Therefore, an important part of the recovery strategy is to obtain long-term assurances for management, particularly within Marshall Fields and Moore Creek, which currently lack these assurances in part or full.

At two of the existing analysis units (Glenwood and Santa Cruz Gardens), it may not be possible to expand the beetle's occupancy to surrounding sites, because surrounding areas are forested, developed, or they potentially have the wrong soil type. We may instead need to increase the beetle's abundance at these units by improving management efficacy within currently occupied habitat. This will require a better understanding of how to manage for the species with the help of research and adaptive management. We may also need to implement translocations to augment existing analysis units or to reintroduce beetles into a new analysis unit to reach the population sizes and analysis units needed for recovery (see Figure 2 for a visual depiction of this potential route to recovery).

There are several uncertainties that will need to be addressed to recover the Ohlone tiger beetle. One is that we don't fully understand the Ohlone tiger beetle's specific habitat and resource needs, making it more challenging to expand the beetle's range, because we do not fully understand how to identify potentially suitable habitat into which the species can be reintroduced. Research is needed to address this and other uncertainties, including how to improve management for the beetle and how populations of the species are structured.

For all steps of recovery, it will be important that we maintain strong relationships and work collaboratively with our partners, who are already managing, monitoring, and researching the Ohlone tiger beetle. Effective partnerships are particularly important for the species because it occupies land owned by a variety of different organizations over the species' small range. These organizations include the Land Trust of Santa Cruz County, University of California, Santa Cruz, private landowners, California State Parks, and the City of Santa Cruz. We will need to work collaboratively

with these and other partners to monitor the Ohlone tiger beetle, manage and protect its habitat, and conduct the research needed to answer recovery questions.

# Recovery Criteria

Recovery criteria are statutorily required elements of recovery plans that provide objective, measurable descriptions of a recovered state for a listed species, as described in 4(f)(1)(b)(ii) of the Act. Recovery criteria describe the conditions of resiliency, redundancy, representation, and threat abatement that indicate when the Ohlone tiger beetle may no longer meet the Act's definitions of an endangered species or threatened species. Recovery criteria present our best estimate of a species' recovered condition at the time of recovery plan development. Changes in available information, technologies, and our understanding of the species over time might mean that the recovered state envisioned by the recovery criteria differs from our assessment in a later status determination.

## Downlisting Criteria

The following downlisting criteria, when met collectively, would indicate that the Ohlone tiger beetle may be reclassified as a threatened species.

1. The Ohlone tiger beetle is distributed among three analysis units that each have had stable or increasing abundances over the previous five years. Minimum population size over that period is at least 500 for one of the analysis units and at least 200 for the other two.
2. Long-term management in each of the three analysis units is assured and is financially sustainable, and this management is sufficient to maintain high-quality grassland habitat with patches of open bare ground, and to limit negative impacts from recreation. The area of habitat managed is sufficient to maintain beetle numbers from downlisting criterion 1.

*Justification for downlisting criteria*

These downlisting criteria address the biggest near-term threat to the Ohlone tiger beetle: that occupied habitat will become degraded and unsuitable if management for the species stops. Currently, management is at risk of stopping across a large part of the species' range because there are no long-term assurances for management for all of Marshall Fields and for parts of Moore Creek. Although habitat is currently being managed in both units, without long-term assurances, management is at risk of stopping in the future. Habitat management is important for the Ohlone tiger beetle because it provides periodic disturbances like grazing and fire that maintain the patches of bare ground the species needs, and it prevents woody plants from encroaching into grasslands and creating a shady understory.

Our downlisting criteria also ensure that the beetle's analysis units have some resiliency to withstand environmental fluctuations, with at least 200 individuals in two of the analysis units and at least 500 in the other one. These numbers correspond with the minimum population sizes that contribute to moderate and high resiliency, respectively, for analysis units in the 2026 SSA for the species (Service

2026, p. 35). The population sizes needed for downlisting are not large enough to ensure the species will continue to persist in the long term, which is why we include them as downlisting and not delisting criteria. However, they are large enough to ensure the species will persist into the near future, and criterion 2 ensures that the biggest near-term threat to the species, habitat degradation, is ameliorated.

## Delisting Criteria

The following delisting criteria, when met collectively, may indicate that the Ohlone tiger beetle no longer meets the Act's definitions of either a threatened or endangered species, and may be able to be removed from the Federal Lists of Endangered Wildlife and Plants:

1. The Ohlone tiger beetle is distributed among four analysis units that each have had stable or increasing abundances over the previous ten years. Over this time, the minimum population size is at least 1000 for one of the analysis units and at least 500 for the other three.
2. Each of the four analysis units occurs on land that is protected from development by a legally binding agreement, such as a fee title or conservation easement. The area of habitat protected is sufficient to maintain beetle numbers from delisting criterion 1.
3. Long-term management in each of the four analysis units is assured and is financially sustainable, and this management is sufficient to maintain high-quality grassland habitat with patches of open bare ground and to limit negative impacts from recreation. The long-term assurances for management include all protected habitat under delisting criterion 2.

*Justification for delisting criteria*

When the Ohlone tiger beetle has three analysis units with at least 500 individuals each, and one analysis unit with at least 1000 individuals, this suggests that the species has sufficient resiliency and redundancy to persist into the future. A minimum population size of 500 corresponds with the minimum population size that contributes to high resiliency for analysis units in the 2026 SSA for the species (Service 2026, pp. 33–34). Because there is uncertainty about what minimum population size the species needs, we have also stipulated that at least one analysis unit has a minimum of 1000 individuals over ten years, to provide additional assurances for the species. These numbers are within the range we received from experts when we conducted an expert elicitation on this question (Service 2026, p. 33). These minimum population sizes ensure that beetle populations can withstand normal variation in habitat quality, as well as fluctuations due to rainfall, prey availability, and demographic stochasticity. This criterion also ensures that the Ohlone tiger beetle has enough redundancy to withstand catastrophic events, because it ensures that if one analysis unit becomes extirpated after a catastrophe, then there are at least three units remaining with large enough population sizes to persist into the future.

Delisting criterion 2 protects the beetle from development by ensuring there are legally binding

protections to high-quality habitat, and criterion 3 protects that habitat from becoming degraded by ensuring it is managed for the beetle into the future. Management is needed to maintain high quality habitat because management tools like fire and grazing prevent thatch accumulation, increase bare ground, and prevent woody plant encroachment into grasslands.

## 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.

1. **Manage habitat that supports the Ohlone tiger beetle to maintain grasslands for the species with open patches of bare ground and to limit negative impacts from recreation (Priority 1).** The Ohlone tiger beetle depends on periodic fire, grazing, or other types of disturbance to prevent habitat degradation and maintain high-quality grassland habitat. These disturbances historically occurred because of wildfire and grazing by native megafauna, and later because of human land-use practices like controlled burns and recreational or livestock grazing. These practices have declined or changed over time, and so today, conservation and habitat management are important for providing the fire, grazing, or mowing that the species needs. Most of the beetle's occupied habitat is currently managed for the species, and continuing this management will be necessary to maintain the beetle's current resiliency, redundancy and representation. Expanding management to new places will be needed to increase resiliency and redundancy from existing levels and reach four analysis units with large enough population sizes for recovery. Management for the beetle should also include management for recreational activity, because recreationists can both benefit and harm the beetle: recreationists create trails that serve as habitat, but they can also disrupt mating, alter habitat, and bicyclists can crush and kill adult beetles.

2. **Augment or establish analysis units of the Ohlone tiger beetle using controlled propagation, translocations, or other methods (Priority 1).** Translocations and controlled propagation are important tools for recovering the Ohlone tiger beetle because such methods can increase abundance and occupancy at extant analysis units, particularly if abundance declines significantly. Translocations and controlled propagation can also be

used to expand the species' range to new analysis units. This recovery action could be used to help the beetle disperse to new sites within Moore Creek and Marshall Fields, if needed. This recovery action would also be necessary to establish a new analysis unit, which may be needed to reach four analysis units with large enough population sizes to meet the recovery criteria.

3. **Conduct range-wide surveys and monitoring (Priority 2).** One important step for recovering the beetle will be to conduct surveys and to develop and implement a standardized protocol for monitoring the species. Habitat and discovery surveys are needed to determine if there are any Ohlone tiger beetles outside the species' known range and to determine where there is potentially suitable habitat where the species could be reintroduced. A standardized protocol for monitoring is needed to track how the beetle's population sizes are changing over time and to compare the population sizes of different analysis units. Monitoring is also a critical component of adaptive management, because it makes it possible to assess how changing management practices impact a species.

   Currently, there is monitoring for the beetle in all analysis units, but there is not a standardized protocol used by each monitoring effort and that is consistent across analysis units. This makes it challenging to compare population sizes between analysis units. Methods do exist for estimating the beetle's population size, and they call for monitoring at regular intervals over the course of the season, using fixed transect counts and surveying in all types of weather (Holmes and Arnold 2015, entire). These guidelines could be used as a starting point for developing the monitoring protocol, and they have already been used to track population trends over time at parts of Moore Creek, Marshall Fields, and Glenwood.

4. **Protect habitat that currently supports the beetle or where the species can be introduced (Priority 2).** Protecting the Ohlone tiger beetle's habitat is important because it protects the species from the threat of development. Much of the beetle's habitat is already protected, but, at some locations, it will likely be necessary to protect additional habitat to recover the species: within Marshall Fields and Moore Creek there is unprotected land with suitable or potentially suitable habitat for the beetle, and protecting and managing this habitat would help to increase the analysis unit's population size and resiliency. Additionally, at any newly established analysis unit, protecting and managing habitat would be needed to recover the beetle, increase resiliency and protect the species from development. Protection can be through fee title, easement, or other durable agreement.

5. **Conduct research to better understand the species' biology, habitat needs and management needs (Priority 2).** Research is important for recovering the Ohlone tiger beetle because it can help address uncertainties about how to recover the species. For example, research can help us better understand how to effectively manage the beetle's habitat, leading to improvements in management that could help to increase the beetle's resiliency. Research can also help determine more precisely what resources the species needs and increase the

chance that reintroducing the beetle to new places is successful. Finally, research can help obtain better estimates of what population size the Ohlone tiger beetle needs to persist into the future. This information could lead to more accurate recovery criteria for the Ohlone tiger beetle.

**Table 1. Crosswalk table linking listing factors, specific threats to the Ohlone tiger beetle, recovery criteria and recovery actions. At present, the listing factors B, C, and D do not apply for this species.**

| Listing factor | Threat description | Recovery criteria | Recovery actions |
|---|---|---|---|
| **Factor A**<br>The present or threatened destruction, modification, or curtailment of its habitat or range | Habitat loss<br>Habitat degradation | Downlisting: 2<br>Delisting: 2, 3 | 1, 3, 4, 5 |
| **Factor E**<br>Other natural or manmade factors affecting its continued existence | Climate change<br>Recreation<br>Wildfire | Downlisting: 1, 2<br>Delisting: 1, 3 | 1, 2, 3, 4, 5 |

# Estimated Time and Cost of Recovery Actions

We estimate that the cost of recovery of the Ohlone tiger beetle is $20.5 million (Table 2), based on the recovery actions described in this plan. We estimate that these actions could be completed in thirty years, assuming effective coordination and cooperation among partners.

**Table 2. Estimated time and cost of recovery actions for the Ohlone tiger beetle.**

| Recovery Action Number | Recovery Action | Estimated Years to Achieve | Estimated Cost |
|---|---|---|---|
| 1 | Manage habitat that supports the Ohlone tiger beetle to maintain grasslands for the species with open patches of bare ground and to limit negative impacts from recreation. | 30 | $1,040,000 |

| Recovery Action Number | Recovery Action | Estimated Years to Achieve | Estimated Cost |
|---|---|---|---|
| 2 | Augment or establish analysis units of the Ohlone tiger beetle using controlled propagation, translocations, or other methods. | 15 | $114,000 |
| 3 | Conduct range-wide surveys and monitoring. | 30 | $3,567,000 |
| 4 | Acquire or otherwise protect habitat that currently supports the beetle or where the species can be introduced. | 10 | $15,000,000 |
| 5 | Conduct research to better understand the species' biology, habitat needs and management needs. | 15 | $825,000 |
| Total | | | $20,546,000 |

# Figures

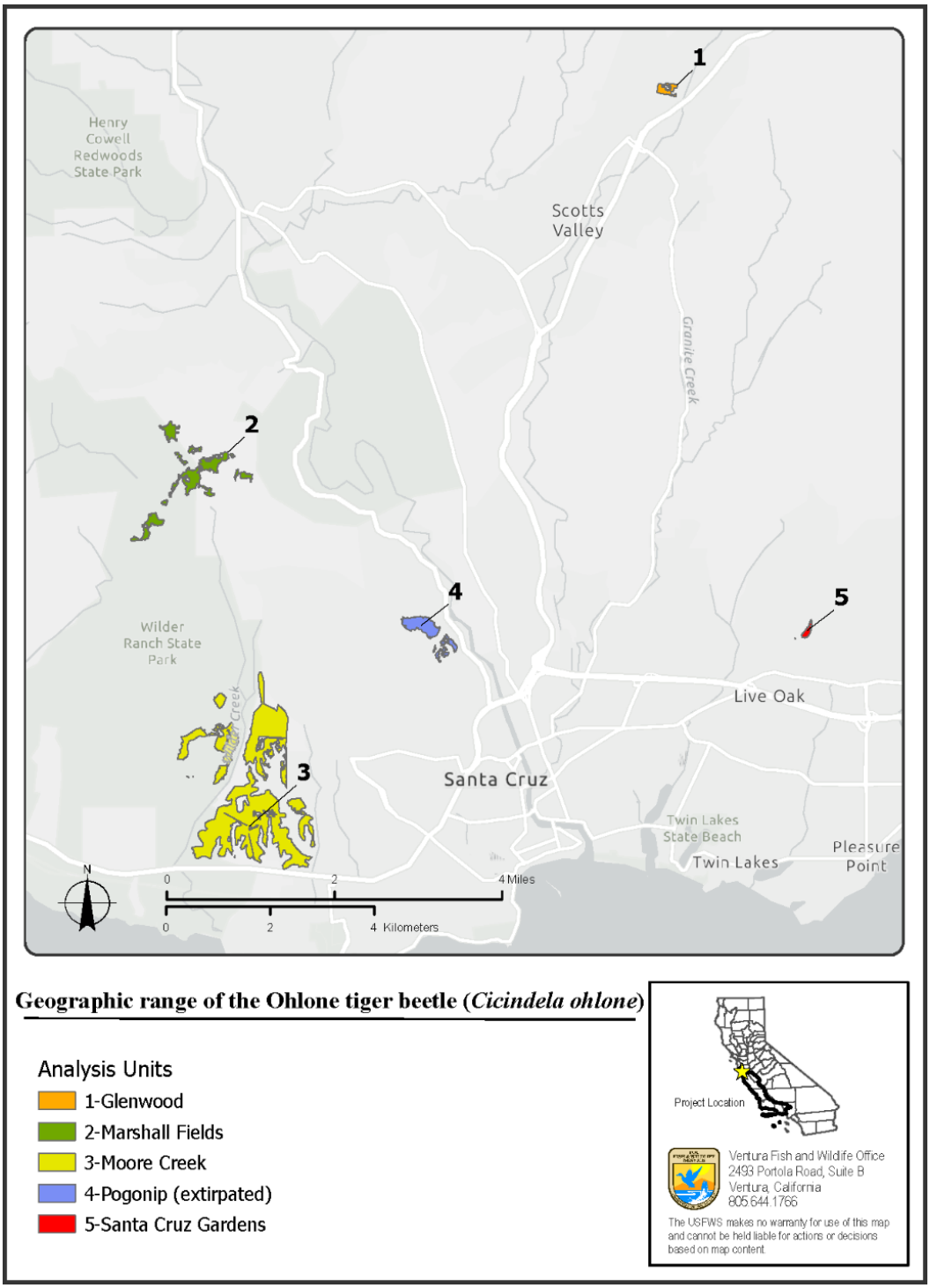


**Figure 1. Map of the Ohlone tiger beetle's analysis units. The analysis units making up the current distribution are Glenwood, Marshall Fields, Moore Creek and Santa Cruz Gardens. The Pogonip analysis unit is extirpated and part of the historical distribution.**

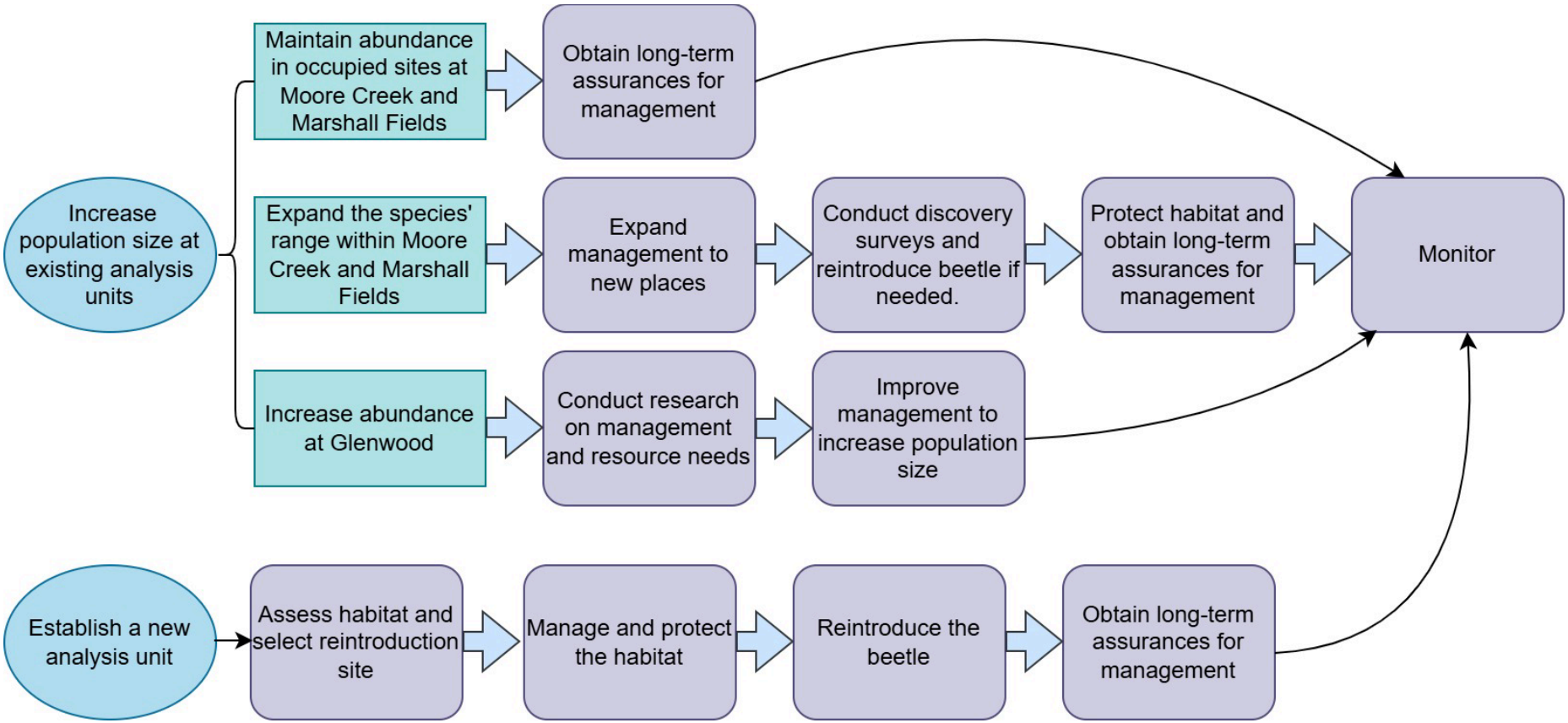


**Figure 2. A flowchart showing one possible route to recovery for the Ohlone tiger beetle under our recovery strategy.**

# Literature Cited

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