

## Restore the Farallones

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### Frequently Asked Questions

#### 1. What is the South Farallon Islands Restoration Project?

The U.S. Fish and Wildlife Service and its partner, Point Blue Conservation Science, are proposing to restore the native ecosystem of the South Farallon Islands by removing non-native, invasive house mice and eliminating their negative impacts on the wildlife and wild habitats of the islands.

#### 2. Who's conducting the project?

The U.S. Fish and Wildlife Service, which manages the land as the Farallon Islands National Wildlife Refuge, is the lead agency on the project. The Service's partner on the effort is Point Blue Conservation Science, a non-profit organization dedicated to conserving birds, other wildlife, and ecosystems through innovative scientific research and outreach. Point Blue is the globally recognized expert on the wildlife of the South Farallon Islands, which it has been studying on-site since 1968.

#### 3. Where are the Farallon Islands?

The Farallon Islands comprise three groups of small islands located nearly 30 miles west of San Francisco, California. Southeast Farallon Island, part of the South Farallon Island group, is the largest island at 70 acres.

#### 4. Why are the Farallon Islands so special?

The Farallon Islands (or Farallones) host a unique ecosystem. Surrounded by the productive ocean waters of the Gulf of the Farallones, the islands host the largest seabird nesting colony in the contiguous United States, with 350,000 breeding birds of 13 species. The rare ashly storm-petrel, a species found almost entirely on the California coast, has its largest colony here. Thousands of seals and sea lions of five species also utilize the islands for breeding and resting, and the endemic Farallon arboreal salamander and Farallon camel cricket occur nowhere else in the world. In addition, the Farallones host a unique plant community dominated by the maritime goldfield (also called Farallon weed), a species found only on seabird nesting islands in California and Oregon.

#### 5. What's the history of the Farallon Islands National Wildlife Refuge?

In 1909, President Theodore Roosevelt established the Farallon National Wildlife Refuge as a preserve and breeding ground for marine birds. The Refuge originally encompassed only the North and Middle Farallon Islands and Noonday Rock. In 1969 the Refuge was expanded to include the South Farallon Islands. The Farallon Islands National Wildlife Refuge, as it was renamed in 2017, is one of 562 National Wildlife Refuges managed by the U.S. Fish and Wildlife Service across the U.S.

The islands are surrounded by a marine area that is designated a California State Marine Reserve (established in 2010) managed by the California Department of Fish and Wildlife and within the Greater Farallones National Marine Sanctuary (established in 1981) managed by the National Oceanic and Atmospheric Administration.

## 6. Does anyone live on the Farallon Islands?

A small, rotating contingent of researchers from Point Blue Conservation Science resides on Southeast Farallon Island year-round to monitor wildlife, take care of the facilities, and safeguard the islands. Refuge Managers from the U.S. Fish and Wildlife Service and other researchers also occasionally visit the islands. The refuge is closed to the public, but boat tours take passengers close enough to enjoy spectacular island landscapes, thousands of seabirds, seals, sea lions, and other marine life.

## 7. Why are introduced, invasive species such a big problem on islands?

Of the nearly 250 recorded animal extinctions since 1500, 80% have been on islands. When causes could be determined, non-native, invasive species were responsible for 54% of these island extinctions.

Island species are especially vulnerable to extinction because of their small populations and limited habitat. Many island species have also evolved in isolated environments with limited competition and an absence of native predators. These island species are adapted to ecosystems that are comparatively safer than most continental ecosystems, making them vulnerable to introduced, invasive species. Non-native species often quickly alter and damage the ecosystems to which they are introduced, both directly and indirectly, and cause native species to decline or even become extinct.

## 8. How and when were house mice introduced to the Farallon Islands?

Non-native house mice were introduced, probably accidentally, to the South Farallon Islands by human visitors well before the Service's acquisition of the islands in 1969. Among these early visitors were seal hunters, commercial egg collectors, lighthouse keepers, and the U.S. Navy. Many of the seals and seabirds have recovered significantly from the harvesting that occurred in the 19th century and the large-scale human disturbance that finally ended with the establishment of the Refuge. But the invasive house mice remain as a damaging legacy.

## 9. How many mice are on the South Farallon Islands?

The invasive house mouse population fluctuates seasonally and annually, but a recent sample of mouse density on Southeast Farallon Island suggests a density of up to 1,270 mice per acre at certain times of the year. The population of mice on the Farallon Islands can reach plague levels and is among the highest mouse densities reported on any island worldwide. The density is such that, according to researchers on the island, the ground appears to "move" with mice.

## 10. How do mice harm the South Farallon Islands' species and ecosystems?

Invasive, non-native house mice have direct and indirect harmful impacts on the islands' breeding seabirds, especially ashy storm-petrels, but also on Leach's storm-petrels, as well as on native salamanders, crickets and other invertebrates, and native plants.

Ashy storm-petrels are harmed indirectly by the mice, which attract large numbers of burrowing owls that stop at the islands to rest on their fall migration and find a plentiful food source when invasive mice are at a seasonal population peak. So instead of continuing on their migration, several owls remain on the islands through the winter to feed on the mice. This keeps them on the island long past the natural time for them to move on. But the mouse population crashes each winter, forcing the owls to seek other prey. The owls then feed on the rare ashy storm-petrels, reducing their population. The owls also feed extensively on rare Farallon camel crickets. Removing house mice from the South Farallon Islands would break this chain of events. With no mice to feed on, the visiting owls would continue on their southward migration instead of feeding on rare Farallon birds and crickets.

Invasive mice also feed extensively on native invertebrates, reducing their populations, and compete for food with endemic Farallon arboreal salamanders. In addition, mice feed heavily on native plant seeds such as the maritime goldfield, reducing their populations in favor of more hardy non-native plants.

## 11. How is the Service proposing to remove invasive mice from the South Farallon Islands?

The Service conducted a thorough, science based Environmental Impact assessment over a number of years and came up with three alternatives to consider:

1. Alternative A: Taking No Action, which would allow mice to remain on the South Farallon Islands and continue to negatively impact the islands' storm-petrels and other native and endemic species.
2. Alternative B (the Service's Preferred Alternative): Eradicate invasive house mice from the South Farallon Islands by the aerial broadcast of rodent bait containing Brodifacoum-25D Conservation.
3. Alternative C: Eradicate invasive house mice from the South Farallon Islands by the aerial broadcast of rodent bait containing Diphacinone-50 Conservation.

## 12. What are the objectives of the proposed restoration?

1. The complete removal of invasive house mice from the South Farallon Islands using the best available methods;
2. Minimize and mitigate any negative impact to the native species and other natural and cultural resources of the islands;
3. Ensure human safety is preserved during project implementation;
4. Ensure that benefits of mouse removal outweigh any incidental negative effects from project implementation; and
5. Prevent the future reinvasion of house mice through implementation of a biosecurity plan.

## 13. What are the longer-term goals?

1. To increase the population sizes of ashy and Leach's storm-petrels;
2. To restore native ecosystem functions altered by invasive house mice;
3. To increase the abundance and recruitment of native vegetation;

4. To increase the productivity and abundance of endemic Farallon arboreal salamanders and endemic Farallon camel crickets and other native invertebrates;
5. To improve the wilderness character of the Farallon Islands; and
6. To improve species and ecosystem adaptability and resilience in light of projected future climate change.

#### 14. What other alternatives were considered and why were they dismissed?

To decide which action alternatives to include in the Environmental Impact Statement, the Service conducted a detailed Alternatives Selection Process using information provided during the Public Scoping process, as well as from scientific literature and experts in the field. In total, 49 different mouse removal methods were assessed, including a sustained population control program; the use of bait stations; hand broadcasting of bait; trapping; introduction of disease targeting the mice; introduction of a biological control agent such as snakes or cats; fertility control; and burrowing owl relocation. Alternatives were dismissed from detailed consideration if they did not meet most project objectives, did not meet safety and logistical requirements, or were not feasible to implement at this time. After a thorough assessment, all but two potential action alternatives were dismissed on various grounds.

#### 15. What is the current status of the project?

##### NEPA

The U.S. Fish & Wildlife Service was required to evaluate the environmental effects of this proposed project according to the guidelines for implementing the National Environmental Policy Act (NEPA). The multi-year NEPA process included notifying other government agencies, private stakeholders, and the public of the proposed project and giving the opportunity for all to provide comments into the scope of the issues to be addressed in the Environmental Impact Statement (EIS) and, later, to provide comments on the draft EIS.

The Service has now completed its analyses and Final EIS. The Notice of Availability for the Final EIS was published in the Federal Register on March 15, 2019. The Final EIS is available from [regulations.gov](https://www.regulations.gov), Docket No. FWS-R8-NWRS-2013-0036.

#### 16. What are the expected benefits of this project?

1. Seabirds: Ashy and Leach's storm-petrels are expected to benefit as a consequence of reduced predation and improved survivorship. In particular, eradicating house mice is expected to reduce the numbers of overwintering burrowing owls and resulting owl predation on storm-petrels.
2. Salamanders: The endemic Farallon arboreal salamander is anticipated to benefit from the removal of a likely competitor for invertebrate prey and a potential predator of salamander eggs and juveniles.
3. Invertebrates: Native invertebrates of the South Farallon Islands, including the endemic Farallon camel cricket, are expected to benefit from reduced predation pressure from invasive mice and other predators attracted to the islands by the mice, such as burrowing owls.
4. Plants: Native plants stand to benefit as a consequence of reduced seed and seedling predation.

#### 17. Why is it important to protect the Ashy Storm-Petrel?

The ashy storm-petrel is a small, grayish-brown nocturnal seabird. Its breeding range is limited to rocks and small islands off the coast of California, and northern Baja California, Mexico. Some experts estimate that there are only about 5,000-10,000 breeding ashy storm-petrels. Nearly half the world population breeds on the South Farallon Islands. The remainder nest on the Channel Islands off southern California and other small rocks and islands along the coast. They spend most of their time far at sea where they feed on small fish and invertebrates. Because of their secretive nature, they are rarely seen on land. However, in the fall months they congregate in large flocks at sea which are a favorite sight of ocean birdwatching trips.

Because of its small world population and the numerous threats it faces, the species is listed as Endangered by the International Union for Conservation of Nature (IUCN). The U.S. Fish & Wildlife Service has identified the ashy storm-petrel as a Bird Species of Conservation Concern and it is listed as a Bird Species of Conservation Concern by the California Department of Fish and Wildlife. Taking measures to reduce risks to the ashy storm-petrel population, such as mouse eradication on the South Farallon Islands, is expected to help keep the rare, threatened bird off the federal Endangered Species list.

### **18. Aren't Burrowing Owls native to the South Farallon Islands, and therefore part of the natural ecosystem?**

Yes, as visiting migrants. However, it is not natural for the owls to remain on the islands for extended periods of time, such as through the winter, when they prey on storm-petrels. The presence of mice entices them to stay longer than they naturally would.

### **19. Is the Service certain that, if the mice are eradicated, the owls won't stay through winter anyway?**

The Service is confident that once mice are removed, most if not all burrowing owls landing on the South Farallones in the fall will continue on their migratory path and find more suitable wintering areas on the mainland, having found insufficient food resources on the islands.

Predatory bird populations on the South Farallon Islands have been monitored by biologists from Point Blue Conservation Science since 1968. This long-term data shows that most birds of prey that do not eat mice, such as Sharp-shinned Hawks and Cooper's Hawks, do not over-winter on the Refuge even though they are occasionally present briefly during the fall migration period. In contrast, the mouse-eating Burrowing Owls have a much higher tendency to spend the winter on the South Farallones.

### **20. If a mouse eradication were to be conducted using rodenticide, what native wildlife could be impacted and what precautions would be taken to protect them from primary or secondary exposure to the bait?**

#### **Gulls**

Gulls, especially western gulls, would normally be at risk of either consuming bait pellets directly or consuming mice that have eaten bait, and could experience negative impacts from the rodenticide. However, based on extensive research and field tests, the Service is confident that gulls can be kept away from an impacted area during a mouse eradication. Specifically, the Service would conduct a gull hazing program to remove gulls from the island during the operation and for the short duration of bait availability. In addition, the Service would remove any mouse carcasses detected, to further reduce the risk to gulls and other scavengers.

#### **Raptors**

Raptors, such as burrowing owls and peregrine falcons, could also be at risk if they fed on exposed mice, gulls or invertebrates. Thus, efforts would be made to capture, hold or translocate any raptors present on the islands for the duration of the eradication project.

### Salamanders

Salamanders could be exposed to rodenticide by consuming insects that have eaten bait pellets. However, the threat to salamanders is expected to be low. Nonetheless, because of the uniqueness of the island population, a limited number of salamanders would be captured and held for the duration of the project as a precautionary measure.

## 21. How could fish and the marine ecosystem be impacted, and what precautions would be taken to protect them from primary or secondary exposure to the bait from a mouse eradication?

Only the land surface of the islands, and not the marine environment, would be targeted for bait application. Measures to reduce the risk of bait entering the marine environment would include GPS precision guided flight paths and the use of a precision application bait bucket. However, a small amount of bait could still inadvertently enter the marine environment immediately adjacent to the islands. Because bait pellets would disintegrate quickly upon entering the water and the rodenticide is not soluble in water, risks to marine wildlife and water quality would be very low, based on other eradication projects. Very few of the fish and marine invertebrate species living in the waters around the Farallon Islands would be expected to consume an encountered bait pellet. Studies have shown that most invertebrates are not impacted by rodenticides such as brodifacoum. Given these factors, the risk of exposure to rodenticide by marine fish and invertebrates would be limited to a small number of individuals, with no significant impacts to populations.

## 22. What other restoration measures has the Service undertaken on the Farallon Islands in the past?

Since the Service began active stewardship of the South Farallon Islands in 1969, several restoration and enhancement measures have been implemented, including:

- Closing the Refuge to public access to protect wildlife and habitats.
- Designating all but Southeast Farallon Island as wilderness.
- Closing off sensitive areas to human access (including biologists).
- Removal of feral rabbits and cats from the islands in the 1970s, with the last of these invasive animals removed in 1974.
- Controlling introduced (non-native) flora.
- Installation of boardwalks to prevent trampling of sensitive habitat and limiting most human activities to only a few established trails.
- Minimizing night lighting and screening it from view so that nocturnal species are not disturbed.
- Removing unneeded structures to maximize natural habitat available to wildlife.
- Limiting the number of people allowed on the island at one time.
- Construction of the "Murre Ledge" to shield an expanding Common Murre colony from human disturbance, using materials from removed building foundations.
- Construction of artificial habitats for crevice-nesting species, including ashy storm-petrels, using the remains of removed building foundations.
- Rebuilding and maintaining rock walls that are used by crevice-nesting seabirds, including ashy storm-petrels.

## 23. Have projects like this succeeded elsewhere?

Yes, invasive rodent removals have been successfully completed on nearly 700 islands worldwide, including on California's Anacapa Island in the Channel Islands National Park, three National Wildlife Refuges in the Pacific, two islands off the coast of Mexico, many islands off the

main islands of New Zealand, and recently, multiple islands in the Galápagos Archipelago. Land managers have successfully eradicated house mice from more than 60 islands worldwide. Nearly all of these successful projects utilized techniques like that proposed for the South Farallon Islands house mouse eradication.

#### 24. How can someone learn more about the project?

More information about the Farallon Islands, the proposed project, and the environmental review process can be found at [www.restorethefarallones.org](http://www.restorethefarallones.org).

For further information, contact Farallon Islands National Wildlife Refuge manager Gerry McChesney at [Gerry\\_mcchesney@fws.gov](mailto:Gerry_mcchesney@fws.gov), or Public Affairs Officer Doug Cordell at [doug\\_cordell@fws.gov](mailto:doug_cordell@fws.gov)

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