

# South Farallon Islands Restoration Project

## Frequently Asked Questions



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

The U.S. Fish and Wildlife Service, PRBO Conservation Science, and Island Conservation established the South Farallon Islands Restoration Project to protect and restore the ecosystem of the Farallones, including seabirds and other native species, by removing non-native house mice.

### 2. Why is this project necessary?

The islands of the Farallon National Wildlife Refuge host the largest seabird breeding colony in the United States outside of Alaska and Hawai'i. Twenty-five percent of California's breeding seabirds, with more than 300,000 individuals of 13 species, can be found there. Prior to human-caused disturbances, the number of seabirds that formerly bred here were in excess of 1 million birds!

About fifty percent of the world's population of the rare Ashy Storm-petrel (listed as a Species of Management Concern by the U.S. Fish and Wildlife Service and Endangered by the International Union for Conservation of Nature) breeds on the Farallon National Wildlife Refuge islands. Unfortunately, the presence of introduced, non-native house mice threatens this globally significant seabird colony. Ashy Storm-petrels on the Farallones declined by 40% from 1972-1992 and have not recovered. A Population Viability Analysis (assessing the ability of a population to survive over time) conducted in the mid-1990s found that predation alone could account for the observed population decline in Ashy Storm-petrels.

The removal of invasive mice from the South Farallon Islands will help restore the islands' ecosystem by providing safer habitat for native animal and plant species, such as the Ashy Storm-petrel, Farallon Arboreal Salamander and Farallon Camel Cricket. Increases in native seabird populations, particularly storm-petrels, and salamanders and invertebrates are expected as a result of this proposed project.



### 3. Where are the Farallon Islands?

The Farallon Islands comprise three groups of small islands, located approximately 27 miles west of San Francisco, California. Southeast Farallon Island, in the South Farallon island group, is the largest island at 70 acres. This project will occur on the South Farallon Islands (120 acres total) – mice are not known to occur on the other island groups.

### 4. Who manages the Farallon Islands?

In 1909, President Theodore Roosevelt established the Farallon National Wildlife Refuge as a preserve and breeding ground for marine birds under Executive Order 1043. 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 National Wildlife Refuge is one of seven National Wildlife Refuges in the San Francisco Bay National Wildlife Refuge Complex, and is just one of 550 refuges in the National Wildlife Refuge System. National Wildlife Refuges are managed by the U.S. Fish and Wildlife Service (the Service).

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

### 5. What is so special about these islands?

The Farallon Islands sit at the Continental Shelf's edge, where the ocean floor plunges from 300 feet to more than two miles deep. This change creates perfect conditions for ocean upwelling. Cold-water upwelling produces an abundance of nutrients and krill, which provide food for marine fish, birds, and mammals. The islands are home to 13 species of breeding seabirds, including the world's largest population of the rare Ashy Storm-Petrel, five species of marine mammals, an endemic salamander and an endemic cricket. Great White Sharks, several whale species and other marine creatures forage in the surrounding waters.

### 6. How were house mice introduced to the Farallon Islands?

House mice were introduced to the South Farallon Islands, probably accidentally, by human visitors well before to 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 19<sup>th</sup> century and large-scale human disturbance that finally ended with Refuge establishment. The house mice remain, however, as a damaging legacy of earlier island users.



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

The house mouse population fluctuates seasonally and annually, but a recent sample of mouse density on Southeast Farallon Island suggests a preliminary density estimate of 500 mice per acre at times – which would be among the highest mouse densities reported in scientific literature worldwide. According to researchers on the island, the ground “moves” with mice.

## 8. Why are non-native species such a big problem on islands?

Of the 484 recorded animal extinctions since 1600, 75% were island endemic species. Non-native, invasive species were completely or partially responsible for 67% of these island extinctions. Island species are especially vulnerable to extinction because of their small populations and limited habitat. Furthermore, many island species have evolved in isolated environments in the 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 animal species often significantly damage the ecosystems to which they are introduced, both directly and indirectly, and cause native species to decline or even become extinct.

## 9. How do mice harm the ecosystem?

Direct and indirect impacts from introduced mice are a problem for breeding seabirds on islands around the world where they have been introduced intentionally or accidentally by human activity.

Several migrating Burrowing Owls land on the Farallones in the course of their fall migration and find a plentiful food source when mice are at a seasonal population peak. The mice are plentiful during the fall season, but by winter the mouse population plummets according to its predictable annual cycle when many mice die off. Left without a reliable food source, the owls are forced to prey instead on Ashy Storm-Petrels, which begin arriving in late winter in preparation for the spring breeding season. Removing house mice from the South Farallon Islands would prevent Burrowing Owls from remaining on the islands during the winter and preying upon Ashy Storm-Petrels.

Mice also feed extensively on native invertebrates, reducing their populations and competing for food with endemic Farallon arboreal salamanders. In addition, mice may contribute to the spread of invasive plants by spreading the seeds.



## 10. What steps are being proposed? How will the mice be eradicated?

Although the project partners are committed to the goals of this restoration project, no decisions have yet been made regarding appropriate methods of mouse removal. In accordance with the National Environmental Policy Act, a number of alternatives to accomplish mouse removal are being developed and analyzed for their effects on the environment. The public will have several opportunities to comment on potential alternatives when they are developed.

One method being analyzed as a possible alternative is the use of rodenticide. If rodenticide were to be used, every mouse territory (territories can be as small as several square feet) would have to be targeted at the same time. All of the baits being analyzed as possible methods of eradication have been specially formulated and tested for use in conservation projects and contain the minimum effective concentration of rodenticide (measured in tens of parts per million). The South Farallon Islands' rugged and difficult terrain and sensitive seabird breeding habitat prohibit foot access to much of the islands, leaving an aerial application of rodent bait a likely potential technique in the event that the use of rodenticide were selected as the preferred option.

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

The U.S. Fish & Wildlife Service is required to evaluate the environmental effects of this proposed project according to the guidelines for implementing the National Environmental Policy Act (NEPA). The NEPA process includes 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.

On April 13, 2011, the U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex, published a Notice of Intent to prepare an EIS for the South Farallon Islands Non-native Mouse Eradication Project. Through June 10, 2011, the Service accepted written suggestions on the scope of the issues and concerns that should be addressed in the draft EIS, including the range of suitable alternatives, appropriate mitigation measures, and the nature and extent of potential environmental impacts. When the draft EIS is issued, it will list some proposed alternatives which will be subject to another round of public comment and review. A final EIS will then incorporate input from the public and other agencies and propose a preferred alternative.

The Service is examining action alternatives that will provide a high likelihood of success based on similar projects elsewhere, while minimizing incidental impacts to other resources. As always, a "no-action" alternative will also be examined as part of the EIS process. The Service will only move forward with a proposed preferred alternative that, after careful analysis, review and public comment, is considered to have greater benefits than risks for the ecosystem of the Farallones.



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

If house mice are eliminated from the Farallones, Burrowing Owls arriving there are expected to disperse from the island after a few days like the many other errant migrating landbirds that arrive each fall. With owls absent from the islands during the spring breeding season, the Ashy Storm-Petrel population will have a much better chance of recovering.

Eradicating house mice will also benefit the islands' native invertebrates, salamanders and possibly plants. Researchers on other islands have documented significant increases in the numbers of invertebrates and herptiles (lizards and amphibians) after invasive rodents have been removed.

## 13. 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, southern Oregon, and northern Baja California. Some experts estimate that there are only about 5,000 breeding Ashy Storm-Petrels; more than half of the breeding population nests at the South Farallones.

The number of breeding Ashy Storm-Petrels on the Farallones declined over 40% in a recent 20-year period. Biologists now believe that a major cause of this decline has been predation by Burrowing Owls, which are supported by invasive house mice prior to the Ashy Storm-Petrel breeding season. It is widely believed that the breeding population is still depressed due to the presence of mice on the island. The U.S. Fish & Wildlife Service has identified the Ashy Storm-Petrel as a Species of Management Concern.

## 14. Aren't the Burrowing Owls a native species and therefore part of the natural ecosystem?

While Burrowing Owls are native to coastal California and a natural migrant to the islands, the large numbers of wintering owls on the Farallones is not natural. During migration periods, the Farallones are a uniquely ideal location to spot a wide variety of vagrant migratory birds. Many of these birds land on the Farallones to rest, but they soon leave to continue their migration without having any noticeable effect on the island ecosystem. The Burrowing Owls that stay do so as a direct result of the seasonally abundant food resource of non-native mice.



**15. Aren't the Burrowing Owls also a Species of Concern? What precautions would be taken to protect the owls on the islands in the course of a mouse eradication effort?**

The Burrowing Owl is listed as a Species of Concern by the State of California. Any mouse removal effort would involve minimizing threats to owls on the island. Similar projects elsewhere have included techniques such as capturing and holding sensitive species in captivity during various types of operations.

**16. Is the Service certain that the owls will leave once the mice are gone?**

All of the available data indicate that owls will not remain on the island once mice have been removed. Predatory bird populations on the South Farallon Islands have been monitored by biologists from PRBO Conservation Science since 1968. This long-term data set 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 for a few days at a time during the fall migration period. In contrast, predatory birds that feed on mice – such as Burrowing Owls – have a much higher tendency to spend the winter on the South Farallones. Even among these mouse-eating raptors, only a few individuals stay for the winter after arriving in the fall. The Service, PRBO, and Island Conservation are confident that once mice are removed, any 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.

**17. The mice have been there a long time; have the native species adapted to them?**

Data from long-term monitoring of the Farallones ecosystem demonstrate that mice now have noticeable impacts on native species. In fact, recent research on mouse food habits and population cycles on the Refuge shows that mice may compete with native species such as the endemic Farallon Arboreal Salamander for food items, suppress the growth of native plants by eating the flower buds, and possibly play a role in spreading seeds of damaging non-native weeds around the islands. Furthermore, because mice reproduce quickly, thrive in a wide variety of habitats, and can eat a range of food items, they are able to adapt to environmental changes much more quickly than native species.

Scientists familiar with the full spectrum of similar restoration projects predict that removing mice from the South Farallones will benefit the islands' native species with no reasonably foreseeable negative consequences. In similar island rodent removals, researchers have recorded biodiversity gains above and beyond their predictions. Nevertheless, the Service recognizes that the removal of one species from an ecosystem that has existed in its presence for a long period of time can have unforeseen consequences, particularly in large and complex systems. Therefore, post-project monitoring on the South Farallones will be an important component of the restoration project.



### 18. The mice have been there a long time; why is the Service focusing on their eradication now?

The Service has been concerned about the decline in the Ashy Storm-Petrel population for many years, but researchers have only recently documented the magnitude of the Burrowing Owls' impact on petrels, and are only beginning to realize the potential damage that mice are having on the islands' ecosystem in general. Island managers have tried to enhance storm-petrel breeding habitat on the island, relocated burrowing owls, and considered ongoing mouse control as management options. However, all of these activities provide only partial solutions. Recent advancements in techniques used to eradicate rodents from island environments have made the complete removal of invasive mice from the island feasible.

### 19. Who is involved in the project?

The U.S. Fish and Wildlife Service, PRBO Conservation Science, and Island Conservation have partnered to restore native seabird populations, particularly the Ashy Storm-Petrel, and other native species on the South Farallon Islands. The Service manages all of the Farallon Islands as part of its National Wildlife Refuge System. The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

PRBO Conservation Science (PRBO) is dedicated to conserving birds, other wildlife, and ecosystems through innovative scientific research and outreach. PRBO has been studying the wildlife of the South Farallon Islands since 1968. Island Conservation (IC) is a nonprofit organization dedicated to preventing extinctions by removing invasive species from islands. Island Conservation has protected 288 plant, animal, and reptile species and 308 seabird colonies on 45 islands by removing invasive species. IC is assisting with planning and implementing the project.

### 20. Does this project fall within the Refuge's purpose and responsibility?

In 2009, the Service completed a Comprehensive Conservation Plan (CCP) and Environmental Assessment/Finding of No Significant Impact to guide the management of the Farallon National Wildlife Refuge over a 15-year period. The wildlife management goal identified in the CCP is to protect, inventory, monitor, and restore to historic levels breeding populations of 12 seabird species, 5 marine mammal species, and other native wildlife. One of the strategies identified to meet this goal is the eradication of the house mouse and the prevention of future human introduction of mice.



## 21. Does the Service have experience in restoring island habitat?

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.
- 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.
- Night lighting is minimized and screened from view so that nocturnal species are not disturbed.
- Removing all 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

## 22. Have projects like this succeeded elsewhere?

Yes, invasive rodent removal projects have been successfully completed on over 320 islands worldwide, including on California's Anacapa Island in the Channel Islands National Park, three National Wildlife Refuges in the Pacific, on two islands off the coast of Mexico, on many islands off the main islands of New Zealand, and earlier this year, on several islands in the Galápagos Archipelago. Land managers have successfully eradicated house mice from more than 30 islands worldwide.

Earlier in the 20<sup>th</sup> century, scientists concerned with the negative impacts of non-native species believed that non-native rodents on islands could not be completely removed. However, dedicated researchers carefully studied rodent behavior in island environments, developed new and more effective rodenticides, tested novel methods of delivering bait, and were conducting successful rodent removal projects by the 1970s.

Current techniques for removing mice using the aerial application of rodent bait have good success rates. With those best practice techniques mice have been successfully removed from 11 islands up to 9,500 acres (the South Farallones are 120 acres) with 100% success. Several of these islands are similar to the South Farallones' climate and ecology. The small size of the South Farallones and the relative scarcity of non-target species present on the islands during the early winter months point to the likely success of an aerial application, in the event that the use of rodenticide were selected as the best option.



### 23. Are there any land mammals native to the Farallones?

No. The introduced house mice are the only land mammals present.

### 24. How is the project being funded?

In November 2006, the Luckenbach Trustee Council (a group representing multiple federal and state agencies) published a Final Damage Assessment and Restoration Plan, with an associated EA, for projects to be funded with mitigation funds from multiple oil spills off the San Francisco coast associated with the sunken vessel *S.S. Jacob Luckenbach*. Removing the invasive house mouse population from the Farallones was one of the projects identified for funding in these documents.

Additional funding for this project has been provided by the California Coastal Conservancy, the National Fish & Wildlife Foundation, and the Commonwealth Ocean Policy Program.

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

A small contingent of researchers from PRBO Conservation Science resides on the island to monitor wildlife, caretake facilities, and safeguard the island. 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.

### 26. How can I learn more about the project?

You can learn more about the Farallon Islands, the proposed project, and the NEPA process by visiting [www.restorethefarallones.org](http://www.restorethefarallones.org).

