

## Frequently Asked Questions

### **Q: How will this project affect me?**

A: The type of eradication activities proposed in this project generally have nearly no effect on public activities. Farallon National Wildlife Refuge is closed to the general public to protect its sensitive species and ecosystems. The only effect of eradication activities on members of the general public that has so far been identified is the closure of waters immediately surrounding the island during helicopter operations if the Refuge chooses to aurally broadcast the bait. The habitat and biodiversity gains that the project is designed to achieve would further increase the natural and aesthetic value of the islands, which are a secret treasure of the Bay Area. There are very few other examples of such a biologically important site so close to a major metropolitan area, thanks to the efforts of the local and national groups that have worked since the turn of the 20<sup>th</sup> century to protect and restore these islands for the future. The removal of non-native house mice is a project fully in the spirit of the last century of preservation and protection on the Farallons.

### **Q: Why are non-native species such a threat?**

A: Non-native species damage the ecosystems to which they are introduced and cause native species to decline or even go extinct. It is now widely accepted that the natural world is currently facing a particularly high rate of species extinction, that most recent extinctions can be directly attributed to human activity, and that for ethical, cultural, aesthetic, and economic reasons, this current rate of extinction is cause for considerable concern. Non-native species are one of the major worldwide causes of anthropogenic extinctions. In fact, introduced species are responsible for 39% of all recorded animal extinctions since 1600 for which a cause could be attributed.

### **Q: Why are non-native species such a big problem on islands?**

Island species are especially vulnerable to extinctions because of their small populations and limited habitat, and their adaptation to isolated environments that are comparatively safer than most continental ecosystems makes them likewise vulnerable to aggressive introduced species. Of the 484 recorded animal extinctions since 1600, 75% were island endemics. Introduced species were completely or partially responsible for 67% of these island extinctions.

Islands are high-value targets for actions to conserve biodiversity because

1. A large percentage of their biota are endemic species and subspecies with small populations, which makes them particularly extinction-prone.
2. They are critical habitat for seabirds and pinnipeds, which feed over thousands of square kilometers of ocean but are dependent on small isolated islands for safe breeding and nesting. Protection of these animals at their island breeding sites is orders of magnitude more straightforward than protecting them from threats at sea (such as plastics pollution and accidental or deliberate entanglement in fishing tackle) that could affect them anywhere along their travels.
3. Many islands are sparsely inhabited or uninhabited by humans, keeping the socioeconomic costs of protection low.

By restoring and protecting islands, functioning ecosystems can be maintained without large expenditures for land acquisition or management, or significant conflict with local human populations.

### **Q: Are there any land mammals native to the Farallons?**

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

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

A: Data from long-term monitoring of the Farallons ecosystem show that mice still 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 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 Farallons will benefit the islands' native species with no reasonably foreseeable negative consequences. In similar island rodent removals, researchers have often recorded biodiversity gains above and beyond their predictions. Nevertheless, the Refuge 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 of native species on the South Farallons will be an important component of the restoration project.

**Q: The mice have been there a long time; why is the Refuge focusing on their eradication now?**

A: A combination of the results of ongoing research and a favorable funding environment has inspired the Refuge to take on this project. The Refuge has been concerned about the decline in the ash storm-petrel population for many years, but researchers have only recently documented the magnitude of the burrowing owls' impact on petrels, as well as the damage that mice are having on the islands' ecosystem in general. Island managers have tried to enhance petrel breeding habitat on the island, relocated burrowing owls, and considered ongoing mouse control as management options. However, all of these activities would have to continue indefinitely and would soon become prohibitively expensive given the Refuge's limited funding. At the same time, the Trustee Council in charge of restoring populations of seabird species affected by oil spills associated with the wreck of the *SS. Jacob Luckenbach* listed the ash storm-petrel as a target species for restoration. In their Draft Restoration Plan released in early 2006, the Council identified removal of mice from the South Farallons as the management action most likely to lead to an increase in ash storm-petrel numbers, and the Trustees plan to make funding available for this project in the near future.

**Q: I have been trying to get rid of mice in my house for as long as I can remember. Is the Refuge confident that they can successfully eradicate mice from a whole island?**

A: Yes. 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 whole-island rodent eradications by the 1970s. The Refuge and its partners know of over 20 successful island mouse eradications worldwide, and that number is steadily growing. The small size of the South Farallons, the relative scarcity of non-target species present on the islands during the early winter months, and locally available expertise in island rodent eradications all contribute to the probability of this project being not only successful, but exemplary on a global scale.

**Q: Can't you just trap all the mice?**

A: Not successfully. Nearly every inch of land on the South Farallons is suitable mouse habitat, including many seemingly sheer cliffs. The number of traps and effort that would be required to ensure that every mouse was trapped makes this solution technically impossible. Furthermore, the amount of wildlife and habitat disturbance that would occur by repeatedly placing traps in areas that have been protected from human disturbance for decades makes this alternative environmentally unacceptable.

**Q: Aren't the burrowing owls a native species and therefore part of the natural ecosystem?**

A: While burrowing owls are native to nearby mainland California, they are not a natural part of the Farallons ecosystem. During migration periods, the Farallons are a uniquely ideal location to spot a wide variety of vagrant migratory birds. Many of these birds land on the Farallons to rest, burrowing owls among them, but they soon leave to continue their migration without having any effect on the island ecosystem. The burrowing owls that do stay do so as a direct result of the seasonally abundant food resource of non-native mice. There is no evidence to suggest that burrowing owls were present on the islands before mice were introduced. Furthermore, researchers on the island have documented very high mortality in overwintering burrowing owls by the end of the spring season, indicating that the environment of the Farallons is ultimately inhospitable to these unfortunate birds. While the fall arrival of vagrant burrowing owls on the islands is a natural process, the owls that stay for the winter are clearly out of synch with the natural harmony of the ecosystem.

**Q: Is the Refuge certain that the owls will leave once the mice are gone?**

A: 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 Farallons have been monitored by biologists from PRBO Conservation Science since 1968. This long-term data set shows that 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 do feed on mice such as burrowing owls, barn owls and kestrels, have a much greater tendency to spend the winter on the South Farallons. Even among these mouse-eating raptors, only a few individuals stay for the winter after arriving in the fall. Almost without exception, these are young-of-the-year birds whose migration and winter residency patterns have not yet been established. Furthermore, researchers have never documented a case of an individual owl returning to the island in subsequent years. The Refuge is confident that once mice are removed, any owls landing on the South Farallons 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.

**Q: If the Refuge uses a helicopter to aerially broadcast bait pellets over the entirety of the South Farallons, will disturbance from the noise and propeller wash harm the islands' sensitive species?**

A: The use of a helicopter during island eradication projects generally has no long-term disturbance effects on native species. While the helicopter is operating, likely for a period of only a few hours in the case of the Farallons, birds and pinnipeds that are resting may flush and disperse. Seabirds and pinnipeds are particularly sensitive to disturbance during breeding season. However, a helicopter application on the Farallons would take place during a season when none of these species are breeding, and the animals that would be disturbed would be unlikely to suffer anything but a short-term inconvenience. Furthermore, since only a small part of the island will be treated at a time, alternative habitat for the birds and marine mammals to roost or haul out will be available on undisturbed parts of the island. Carefully controlled and monitored helicopter operations by the US

Coast Guard to service the lighthouse during the fall and winter seasons over the past two decades have caused no negative impact to marine mammal or seabird populations.

**Q: How long will the rodenticide be present in the environment?**

A: On the Anacapa Islands in southern California, researchers detected measurable levels of rodenticide (in some portions of ???) the soil surface up to six months after bait was applied during an aerial-broadcast rat eradication, but rodenticide was not detectable in the majority of soil samples after only five days. The cereal-based bait pellets are designed to degrade rapidly in moist environments such as that of the Farallons, making them essentially inaccessible for ingestion after a few weeks. 

**Q: The Farallons are the most important seabird breeding colony in the lower 48 States, with a conservative estimate of 250,000 breeding birds present during peak season. Does the rodenticide harm seabirds?**

A: The rodenticide poses no risk to seabird populations. Most seabirds are exclusively marine predators and do not feed while on land, making the risk that they will be affected by the rodenticide negligible. The one exception to this is western gulls, which are known to swallow a wide variety of items, edible or otherwise. The Refuge recognizes the risk that the aerial broadcast of bait pellets would pose to individual gulls on the islands. Island managers are prepared to minimize this exposure risk by conducting the operation during the early winter when the number of gulls and other seabirds present on the islands is significantly lower than during the breeding season. On the Anacapa Islands in southern California, researchers found only two gulls dead from rodenticide exposure after an early winter aerial-broadcast rat eradication. This represented an incidental loss rate that while unfortunate, had absolutely no population-level effect on Anacapa's gulls.

**Q: Will the rodenticide harm songbirds on the Farallons?**

A: There are no resident or breeding songbirds on the Farallon Islands. A few scattered trees provide shelter for vagrant landbirds who, lost or blown off-course, land on the island during spring and fall migration. All but a handful of these birds leave the island after a few days or less, meaning that fewer than 25 individual small songbirds (sparrows, warblers, and a few other species of passerines) are present on the island outside of migratory seasons. Incidental mortality among individual grain-eating birds that are attracted to the bait pellets would have absolutely no population-level effects. There is also a very limited risk of secondary rodenticide exposure in birds that feed on insects. Again, incidental mortality among these individuals would have no population-level effects. In other eradication projects where mortality among rare native songbirds was cause for ecologically reasonable concern, island managers have successfully live-captured and held native birds during bait application. This additional mitigation would be costly, but the Refuge will take it into consideration during the environmental assessment.

**Q: What about the other native species on the Farallons such as salamanders, insects and plants? Will applying poison to the environment negatively impact them?**

A: None of the rodenticides that the Refuge is assessing for this project have toxic effects on plants or insects. There are no laboratory data on the effects of these rodenticides on salamanders, but careful monitoring on Anacapa during aerial-broadcast rat eradication found no evidence of negative impacts on native salamanders or reptiles, and mouse eradications on other islands have been followed by dramatic increases in reptile populations. Essentially, the evidence available suggests that removing mice from the South Farallons using a rodenticide bait will have a noticeably positive effect

on native salamanders, but during the environmental assessment the Refuge will nevertheless carefully examine potential effects of an aerial bait broadcast on the native salamander population.

**Q: What animals eat the mice? Will these species be at risk of secondary poisoning if they eat poisoned mice?**

A: Burrowing owls, barn owls, and infrequently-occurring kestrels are the only birds of prey occurring on the Farallons that eat mice. Western gulls on the island occasionally eat mice as well. There is a risk that these birds of prey and gulls will be exposed to the rodenticide by eating poisoned rodents (called “secondary exposure”), but if the Refuge chooses aerial broadcast during the early winter, there will be very few birds of prey (primarily the owls that are contributing to ashy storm-petrel decline) and relatively few gulls on the islands. Incidental mortality in any of these birds would have no population-level effects. Nevertheless, island managers conducting similar rodent eradications have successfully live-captured and held birds of prey during and immediately after bait application. Catching birds of prey is difficult, as land managers discovered in earlier attempts to capture and relocate burrowing owls, but the Refuge will take this option into consideration during the environmental assessment.

**Q: The Farallons host a spectacular nearshore marine environment that is protected as part of the Gulf of the Farallones National Marine Sanctuary. Is the rodenticide safe for the marine ecosystem?**

A: Island rodent eradications such as the one proposed on the Farallons pose no risk to the marine ecosystem in general. If any bait does enter the nearshore waters, which is possible if the Refuge chooses to aerially broadcast the bait, the risk it will pose to the marine ecosystem is negligible because

1. The pelletized rodenticide is present in such low concentrations and has such a low water solubility that even if a large number of pellets entered the ocean at the same location, the amount of rodenticide suspended in the water at that location would be below detectable levels immediately or very soon after the time of entry. In one unfortunate case in New Zealand that illustrates this fact, a truck containing 18 tons of rodenticide-infused bait similar to the baits being assessed for this project overturned in an accident on a coastal road and spilled its load into the marine environment. Even with 18 tons of bait spilled at a single location, many times more than will be applied to the ENTIRE area of the South Farallons, researchers could not detect any of the rodenticide in the water immediately surrounding the spill within 36 hours.
2. None of the baits that the Refuge is assessing have an effect on invertebrate animals, such as those that make up much of the intertidal ecosystem. During the aerial-broadcast eradication of rats from the Anacapa Islands in southern California, researchers monitored the intertidal ecosystem extensively and found no evidence of mortality or negative population changes as a result of the bait broadcast.
3. Very few, if any, fish are attracted to the grain-based bait pellets. Researchers have conducted bait palatability experiments with fish in southern California and found few species that even took apparent interest in non-toxic bait pellets that were thrown into the water, and no species that actually consumed the pellets.
4. The bait pellets that the Refuge is assessing are composed of compressed grain, similar to breakfast cereal. Any bait pellets that do enter the water will absorb water immediately, become soft and disintegrate rapidly, aided by the constant wave action close to shore.

**Q: Five species of pinnipeds breed on the beaches and rock outcrops of the Farallons, including the Endangered Steller sea lion. Is there a risk that the rodenticide will poison some of these marine mammals?**

A: The risk that the rodenticide poses to marine mammals is negligible. While in theory the rodenticides that the Refuge is assessing are toxic to all vertebrates with a large enough dose, even the smallest pinnipeds would have to consume hundreds of bait pellets to experience any toxic effects. Pinnipeds are exclusively marine carnivores, and do not eat while hauled out on land, so there would be no foreseeable circumstance in which they would ingest any bait pellets, let alone enough pellets to have any toxic effects.

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