



ISLAND CONSERVATION

Preventing Extinctions

WORKING DRAFT

Fall Field Trial Plan

November 27-December 17, 2012

on the Farallon National Wildlife Refuge



***Trial Plan for U.S. Fish and Wildlife Service
Farallon National Wildlife Refuge
San Francisco Bay Refuge Complex***

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EXECUTIVE SUMMARY

The South Farallon Islands lie 30 miles west of San Francisco, California, and harbors the largest island breeding seabird colony in the continental U.S., but invasive House mice (*Mus musculus*) are causing significant impacts to the IUCN-Endangered Ashy Storm-petrel (*Oceanodroma homochroa*) and other native and endemic species of the Farallon ecosystem. The USFWS is proposing to remove all introduced mice as part of the Farallon Restoration Project (www.restorethefarallones.org). Mouse removal methods being considered include a one-time aerial application of grain-based pellets with a small amount of rodenticide. While the timing of any proposed mouse removal would likely occur when most resident seabirds are not present on the islands, there exists a risk of rodenticide exposure to a fraction of the remaining non-breeding Western Gulls (*Larus occidentalis*) that may roost on the island during the fall and winter.

A field research trial is to be conducted on the South Farallon Islands (SFI) of the Farallon National Wildlife Refuge from November 27, 2012 to December 17, 2012. This field trial is being conducted to provide information that will aid in the operational planning of the proposed project, with a focus on measures to assess and reduce primary and secondary exposure to gulls during the fall non-breeding season. In the spring, the Farallones are home to a large breeding colony of Western gulls. Avian hazing techniques have been proposed as one of several mitigation measures to reduce gull exposure to the rodenticide. Avian hazing has been successful in hazing gulls from airports, landfills and sensitive breeding areas on Refuges and other areas throughout California and the U.S.

Hazing trial design and staffing to implement the hazing trial was provided primarily by the Farallon Restoration Project Partners (U.S. Fish and Wildlife Service, PRBO Conservation Science and Island Conservation) with the assistance of expert professional avian hazing staff from USDA-APHIS Wildlife Services, CDFG-OSPR, and the Oiled Wildlife Care Network's Winston Vickers and Paul Gorenzel. NASA Ames Research Center's Unmanned Aerial Systems Project Office participated in a field trip to the island on November 6, 2012 to assist in designing the aerial monitoring aspect of the trial using unmanned aerial vehicles.

One of the primary trial goals of the trial is to determine what techniques and staffing levels might be required to effectively monitor and haze gulls from the Farallon Islands during a potential mouse removal operation in order to reduce exposure to gulls and other birds, while minimizing disturbances to pinnipeds. The avian monitoring and hazing techniques being tested on the islands during this trial may also be of use to local and international organizations involved in the monitoring and prevention of oiled seabirds and other wildlife in the event of an oil spill or other incident where seabirds may need to be excluded from a hazardous area.

ACKNOWLEDGEMENTS

Island Conservation would like to extend its thanks to all those involved in developing the trial plan and loaning gear and equipment, including: Gerry McChesney and Jonathan Shore (USFWS), Russ Bradley, Pete Warzybok, Jim Tietz, and Ryan Berger (PRBO), Paul Gorenzel and Winston Wickers (OWCN), Valerie Burton, Derek Milsaps, and Eric Covington (USDA-APHIS WS). We would also like to thank volunteers who participating and contributing to the trial including Holly Gellerman, Kyra Mills-Parker, Paul Steinberg, Liz Ames, John Warzybok, and Lara White. Special thanks also go to Todd Weitzman of Bird Gard, LLC for the loan of seven biosonic BirdGard units for the duration of the trial. The Gulf of the Farallones National Marine Sanctuary also provided comments on the draft trial plan.

Sansone Company and the U.S. Coast Guard provided invaluable support in moving fuel and freight to the island. We are also grateful to external reviewers providing feedback, including Laird Henkel and Holly Gellerman (OSPR-CDFG) and Mike Ziccardi and Kyra Mills (OWCN). Randy Berthold and Bruce Storms of NASA Ames Research Center's Unmanned Aerial Systems Project Office participated in a field trip to the island on November 6, 2012 to assist in designing the aerial monitoring aspect of the trial.

The avian hazing trial has been made possible due to support from the Luckenbach Trustee Council oil spill settlement funds, the National Fish and Wildlife Foundation Coastal California Restoration Settlement Funds Grant #8001.04.034554, and the California Department of Fish and Game's Oil Spill Response Trust Fund through the Oiled Wildlife Care Network (OWCN) at the Wildlife Health Center, School of Veterinary Medicine, University of California, Davis.

OBJECTIVES

- Establish pre-trial numbers of gulls and pinnipeds and monitor and document the effects of various avian hazing operations on gulls, seabirds and pinnipeds present on the island
- Haze a maximum number of gulls from Southeast Farallon (SEFI), West End Island (WEI), and offshore islets while also assessing the relative success of various avian hazing techniques and tracking the amount of supplies and personnel hours required
- Conduct bait trials that will demonstrate how feasible it is to haze gulls from placebo pellets and how bait products degrade in the Farallon Island environment

OVERVIEW

TIMING

The field trial is scheduled to occur from November 27 to December 17, 2012, weather permitting. Two personnel change-overs will occur: on December 5 and December 12. If weather or sea conditions interfere, attempts will be made on each following day until successful.

TRANSPORTATION & LOGISTICS

Fuel for the helicopter was sourced at Half Moon Bay Airport, loaded into 55-gallon drums, and transported to Southeast Farallon Island by a U.S. Coast Guard helicopter conducting Septic maintenance on November 14. Other supplies were taken to the island via a helicopter chartered by Sansone Inc.

Most personnel and equipment will initially be transported to the island via “*Outer Limits*” captained by Jim Robertson. Two personnel change-overs will be conducted on December 5 and December 12, one of which may be supported by an additional smaller boat charter with Captain Jody Harris on the “*Farallon*.” All personnel and gear remaining on the island at the end of the trial will return to the mainland via “*Outer Limits*.”

Prior to departing for the island, the captain of the Outer Limits will be contacted on Friday, November 23, in order to assess the sea and weather conditions forecast for the Tuesday departure. If conditions do not look promising at that time for Tuesday, November 27, the captain will be contacted on Sunday, November 25 and an assessment of the conditions will again be made.

Personnel will meet to check-in and load personal gear and equipment at the dock in Sausalito on November 26 and spend the night in a hotel in the area. Personnel will depart for the island from the dock at Sausalito at sunrise on Tuesday, November 27, unless weather or wave conditions preclude departure that day.

In advance of scheduled personnel change-overs, Captain Jody Harris will be contacted in order to assess the weather and sea conditions two days prior to scheduled change-over dates.

STAFFING

Staffing for the hazing trial will be provided primarily by the core Farallon Restoration Project Partners (Island Conservation, USFWS, and PRBO). Supplemental expert staff will come from Oiled Wildlife Care Network, OSPR and USDA-APHIS. Each of these entities will provide two personnel weeks (two personnel for one week each). A personnel schedule can be found in Appendix 1. To ensure efforts are coordinated, an **Incident Command Structure** (ICS) will be utilized for the duration of the trial. The ICS will allow for the controlled flow of information and supervision up and down the command structure. The Farallon Trial ICS can be found in Appendix 2. In the interest of maintaining consistent personnel

structure, Island Conservation will serve as the lead coordinator for the trial, because the same Island Conservation staff will be present for the entire trial. The USFWS will staff the role of Deputy Incident Commander, to ensure that the ICS does take precedence over any required USFWS or PRBO management protocols on the Refuge.

Two advisory groups have been created to deal with decisions that will likely need to be made as the trial progresses. An **Operational Advisory Group (OAG)** has been designed to meet daily at mid-day to make normal daily scheduling, staffing and operational decisions for the trial, following feedback from staff during the hot debrief. The OAG includes a representative from each of the six major agencies participating in the trial. The Incident Commander will facilitate daily Operations Advisory Group meetings; other personnel will be brought into Operations Advisory Group meetings as needed.

A smaller **Incident Advisory Group (IAG)**, consisting of the three core Farallon Restoration Project Partners (USFWS, PRBO and IC) will meet as necessary to make strategic decisions should any incident occur requiring careful discussion. Other personnel will be brought into Incident Advisory Group meetings when needed. The Incident Advisory Group will be lead by the Incident Commander, and the Incident Commander will facilitate daily Incident Advisory Group meetings. The Incident Advisory Group will coordinate with the Operations Advisory Group to ensure that implementation happens according to plan. The OAG and IAG diagrams and can be found in Appendix 2.

It is anticipated that personnel will be working from early morning until well into the evening, though several hours each day will be slated for resting and other personal time. While personnel are not expected to work more than 8 hours each day, the work shifts may fluctuate daily (See Appendix 1 for the daily schedule). It is likely that dawn and dusk will be the busiest times for hazing, with less intensive hazing being required at night and during mid-day. It is anticipated that an All Staff Meeting hot debrief will occur each day just prior to lunchtime and the mid-day OAG meeting. A proposed daily schedule and recommended rotation for hazing shifts can be found in Appendix 1.

Position Descriptions and Responsibilities

Incident Commander – Trial Coordinator

The Incident Commander is ultimately responsible for the entire trial operation, and all Hazing and Monitoring Supervisors report to the Incident Commander. The main role of the Incident Commander (IC) is to coordinate island-wide hazing activities and communicate with monitoring personnel, signaling to hazers to give approval for hazing to maximize effectiveness and to reduce disturbance to pinnipeds. The Hazing Coordinator will also coordinate with the Monitoring Supervisor to ensure the trial activities are conducted in coordination with the needs of the PRBO Intern Supervisor.

Deputy Coordinator

The Deputy Coordinator will be a USFWS Refuge Manager or Refuge Biologist who assists the Incident Commander in ensuring the trial activities are in keeping with the Refuge's policies and permitted activities, and will assist the IC at the IC's request. A Deputy Coordinator will be present on island to witness the entire trial, and will provide advice to the IC from a resource management perspective.

Second in Command

This position will assume responsibility for the operation if the Incident Commander is no longer able to do so, and may assist the IC as requested during the trial. The SIC is responsible for daily ensuring that the Supervisors and their teams are recording, summarizing, and reporting their data in field notebooks

and transferring it regularly to digital formats, as well as assisting in downloading and managing GPS-based data generated during operations. While the SIC will report to the IC for these record-keeping matters.

Hazing Supervisor

The Hazing Supervisor is responsible for all aspects of communication and record-keeping regarding the hazing of birds. The Hazing supervisor will be responsible for ensuring that all hazing activities are in keeping with the operational plans, permits and authorizations, especially those relating to minimizing the incidental harassment of marine mammals. The Hazing Supervisor helps direct the assigned activities of the hazing teams, and helps reduce the possibility of any hazing activity that might result in the injury of any pinniped. The Hazing Supervisor reports to the Incident Commander.

Monitoring Supervisor

The Monitoring Supervisor is responsible for all aspects of communication and record-keeping regarding the monitoring of birds and marine mammals during the trial. The Monitoring Supervisor helps direct the activities of the monitors. The Monitoring Supervisor reports to the Incident Commander. The Monitoring Supervisor will also communicate with the PRBO Intern Supervisor to ensure that the trial activities being planned are being done in a coordinated manner with existing island operations.

Hazers

The Hazers works with the Hazing Supervisor to carry out the assigned hazing tasks, and are responsible for policing specific sectors of the islands. They will request permission for initiating hazing activities from the Hazing Supervisor. The Hazers will be paired with the Monitors, and hazers will coordinate with monitors to ensure that their actions are not likely to cause injuries to pinnipeds. Hazing crews report to the Hazing Supervisor. At least four Hazers are capable of using all pyrotechnic devices (ATF permitted) such as bird bombs, cracker shells, and CAPA launchers.

Monitors

The Monitors work with the Monitoring Supervisor to carry out the assigned bird and mammal monitoring tasks. They will often be paired with the Hazers, monitoring the effects of the hazing activities, and reporting them up the chain of command. Monitoring crew personnel report to the Monitoring Supervisor. Approximately four monitoring personnel will be present during daylight hours (one for West end, three for SEFI).

Aerial Operations Supervisor

The Aerial Operations Supervisor (AOS) is the site controller for helicopter operations and will be the point of contact for the helicopter pilot during operations. The Air Operations Supervisor will assist the Helicopter Pilot maintain a safe Landing Zone, and communicates aerial operational plans between the IC and the pilot. The AOS will relay requests for authorization to start and flying the helicopter prior to any flights commencing. Flight plans and routes and elevations will be approved ahead of time by the IC. The AOS may assist the pilot with refueling and maintenance if necessary. During air operations, the Air Operations Supervisor reports to the IC.

Helicopter Pilot

The Helicopter Pilot is responsible for all aspects of the helicopter during helicopter operations. The Pilot is responsible for the aerial flights being in accordance with the daily operational flight plan. The Pilot will consult with the Aerial Operations Supervisor to ensure that the IC has given permission for all flights to be conducted. While piloting the helicopter, if flight deviations are required, the Pilot or

passenger (Monitoring Supervisor) will report such requests immediately to the Incident Commander for approval.

PRBO Intern Supervisor

While the Intern Supervisor will not be directly called on to work full-time on the trial operations, the position will be called on at times for duties other than supervising the two PRBO interns that are not scheduled to be a part of daily trial operations. The Intern Supervisor will assist with logistical support for the trial such as safe-boat transfer of personnel and supplies to/from boats, as well as some monitoring activities, field orientation and training, and serving as a communications assistant and Safety Officer, as described in the Safety Plan (ensuring that personnel are briefed on safety issues and plans, that safety issues are addressed and resolved, and that the medics are prepped to respond to a medical emergency).

According to the schedule, as many as eleven people would be brought onto the islands for the express purposes of the hazing trial, and would be housed primarily in the USFWS (Coast Guard) house, with one or two in the PRBO house, as space permits.

BRIEFINGS AND TRAINING

Prior to departing the mainland, personnel will be asked to take part in an on-line training course on the Incident Command Structure (ICS), which is useful for those who have never been a part of an ICS in the past. Personnel will also be briefed on appropriate biosecurity for transporting gear and personal items to the island. During the boat transfer to the islands, briefings will be conducted for safety during the landing and the transport of gear and personnel to the island. Immediately upon arrival at the island, a circumnavigation of the islands will be conducted to orientate the team to the islands' geography and place names. Upon transfer of crew and equipment to the island, a team meeting will be held and an on-island orientation will occur. Training sessions will commence on the afternoon of the first day (Day I) and will likely continue onto the following day (Day II) and include the following components:

- On-island trainings:
 - General Orientation & Natural Resource Protection (USFWS/PRBO)
 - ICS for the trial (IC)
 - Radio Communications (IC)
 - Safety
 - General (Safety Officer—Jim Tietz/R. Berger)
 - Aviation (IC)
 - Pyrotechnics (WV)
 - Helicopter Protocols (IC + pilot)
 - GPS use (IC)
 - Data Collection/Record Keeping (PRBO)
 - Hazing Methods (deployment and general functioning) (USDA + OWCN)

Designated partners (indicated in parentheses) will be responsible for conducting each of the above components.

Throughout the course of the trial, the team will meet daily to recap the progress of the trial, as well as review overall hazing success. Daily Hazing Team and Monitoring Team assignments and individual daily work assignments will be made and distributed at this time.

PERMITS

Prior to implementing the trial, the plan will be reviewed for its concurrence with issued permits.

A Section 7 Biological Opinion has been written by NOAA-NMFS and an Incidental Harassment Authorization (IHA) has been issued and published in the Federal Register to allow for trial operations to incidentally harass Steller sea lions and other pinnipeds present. The application was published in the Federal Register on August 27th and the IHA was issued November 7, 2012, and is valid through November 6, 2013. The IHA and Biological Opinion specifies the procedures to be followed to avoid and minimize and monitor any impacts to pinnipeds during avian hazing activities. The permit covers level B harassment impacts to Steller sea lions, Harbor seals, Northern elephant seals, Northern fur seals, and California sea lions.

A Wilderness Determination is being processed by the USFWS Project Leader to allow for access the Wilderness Area on West End. Use of these areas might include on-the-ground hazing as well as aerial monitoring and hazing. A Categorical Exemption for the trial is being processed by the USFWS Farallon Refuge Manager. A Sanctuary Permit has been applied for with the Gulf of the Farallones National Marine Sanctuary.

All personnel intending to use any pyrotechnic device other than whistlers have been permitted to handle them by the Bureau of Alcohol, Tobacco, and Firearms. State and federal employees are not required to obtain a permit to use pyrotechnics. Island Conservation obtained an ATF permit for the use of explosive pest control devices (EPCD) on November 9, 2012.

Aerial monitoring proof of concept trials will be conducted using unmanned aerial systems (UAS) by NASA Ames Research Center in January or February 2013, due to the FAA processing time required for NASA Ames to obtain a Certificate of Authorization (COA) for the flights.

SAFETY

A separate Trial Safety Plan has been written and distributed to personnel before leaving for the island. Based on the current certification and experience levels of personnel on-island, a Safety Officer will be assigned who will be responsible for daily implementation of this Safety Plan. The Safety Plan encompasses both general safety and aviation safety. Personnel will be requested to acknowledge having read the plan, agree to its provisions and be aware of the potential risks the island environment presents. A Trial staff member with suitable training will be assigned as a medic to assist personnel with minor to moderate medical needs, and will be the primary care giver and liaison with off-site medical advisors during medical emergencies. The medic reports to the Safety Officer. Emergency procedures and emergency contact lists are provided in the Safety Plan. An Off- Island Partnership Communication Team will receive reports of any incidents from the Incident Commander, and the Incident Commander will be responsible for any communications to the off-island Communications Team or with any agencies, the public or the media regarding the trial or the project.

BIOSECURITY

As a unique island ecosystem that sees a frequent exchange of personnel and gear between the archipelago and the mainland, FNWR is at risk of invasions by introduced species. In general, the success of biosecurity measures rests on the inspection and packaging of supplies, equipment, and personal gear transported to the island, as well as on-island awareness. In an effort to minimize this risk to the archipelago during the course of the Fall 2012 field trial, all personnel will follow the guidelines for biosecurity when assembling and packing supplies, equipment and personal gear destined for the islands.

A biosecurity checklist has been developed and can be found in Appendix 3. All personnel travelling to the island will be asked to review and sign off on the biosecurity protocol.

METHODS

A general schedule of hazing, monitoring, and bait-related activities can be found in Appendix 1.

SCOPE

The trial will encompass the extent of the SFI and will aim to haze gulls from the islands for up to 18 days. Hazing and monitoring personnel will need access to the greatest extent of the SFI, including WEI. The tools currently intended for use on the Farallon NWR for the purpose of hazing gulls are as follows:

- Human movements
- Effigies (gull and predator)
- Gas exploder or “Zon”
- Biosonics (Bird Gard, Long Range Acoustic Device—LRAD)
- Lasers (50 mW & 5 mW)
- Pyrotechnics (bangers, CAPA, cracker shells)
- Kites (Stationary & mobile)
- Mylar
- Helicopter
- As weather, staff, and permitting allow: from a boat, and government and/or civilian-owned remote-controlled aircraft (UAVS)

Background information on these bird hazing tools and methods can be found in Appendix 5.

Given the treacherous nature of the crossing between WEI and SEFI and the need to monitor and haze gulls in the early morning and late evening, personnel will be required to camp for a few nights on WEI. The scheduling for these overnight deployments will be determined by gull movements and behaviors.

GULL & PINNIPED MONITORING

As monitors, PRBO staff will take the lead in documenting harassment or disturbance caused by hazing activities as required by the Section 7 IHA permit and granting agency requirements. PRBO and USFWS staff have prior experience in counting and documenting disturbances to the pinniped populations and PRBO will develop the protocols and training necessary for other field staff to conduct the monitoring of their areas.

PRBO will also develop the protocols necessary to support proper documentation of gull numbers and retreat sites prior to and during hazing operations, as well as up to seven days after the cessation of hazing activities. These data will be collected by PRBO and USFWS staff who are experienced at identifying, and counting gulls, pinnipeds and other wildlife.

Monitoring of gulls and pinnipeds during the trial will take place by personnel on foot, from the air during daily dawn/dusk helicopter flights, and by using the Cal-Academy web-camera, as needed.

Areas that cannot be monitored by personnel stationed on land (blackened areas in Figure 1) will be monitored by helicopter. The helicopter will specifically be used to support the monitoring of gull roosts and congregation sites. The helicopter will mainly be used to survey these blind spots in the morning, at noon, and in the evening, weather permitting. It is possible that the helicopter will be used to support the monitoring of pinnipeds during over-flights of the island. The helicopter may be used for hazing gulls at the discretion of the IC if it is deemed to be a safe and effective means.

Pre-trial monitoring

Prior to the initiation of hazing activities, a complete gull census of areas visible from SEFI (colored blocks in Figure 1) will be conducted every morning and evening for a minimum of five days to establish a baseline population for gulls on the islands. The numbers of gulls occupying discrete areas on SFI will be recorded for each of the colored blocks in Figure 1.

During the week leading up to the beginning of the trial, PRBO staff will conduct a single archipelago-wide census of pinnipeds. This visit is scheduled for November 22, in order to coincide with the weekly visit to WEI. The numbers of each species and the loafing areas being used by these animals will be recorded and a map of areas being used by pinnipeds will be generated, with an eye to identifying sensitive areas which need to be considered during monitoring and hazing operations.

A map of the islands with recognized place names can be found in Appendix 4.

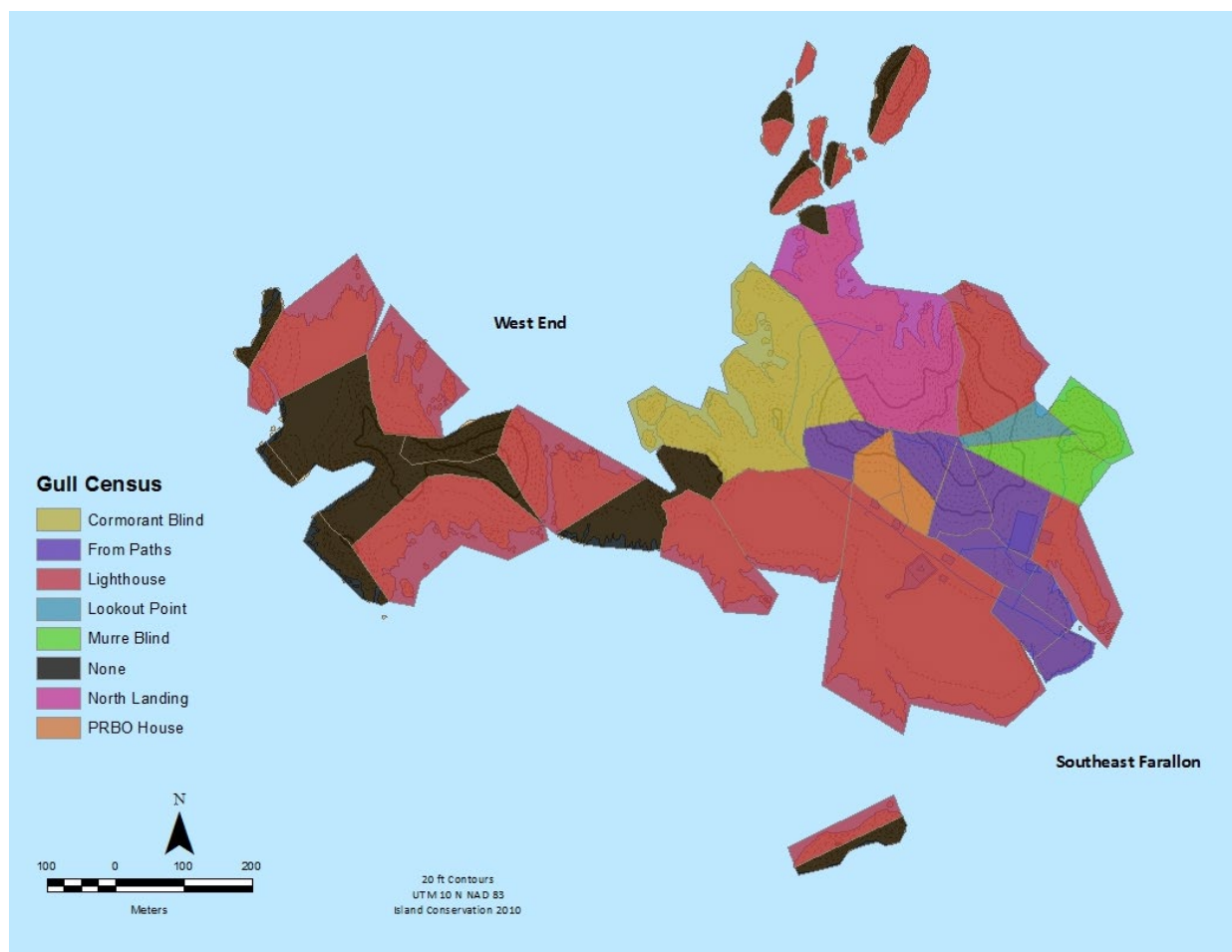


Figure 1. Gull Census Areas.

The gull census encompasses all colored areas not blocked out in black. Areas in black are not visible from Lighthouse Hill or from the ground on SEFI. The gull census will document the numbers of gulls using each of the discrete areas delineated by different colors on the map.

Monitoring: Sectors

Monitoring will require at least four individuals: one person on WEI, two personnel on foot on SEFI (one of whom may move between lighthouse and the ground depending on gull movements), and one person at the lighthouse. Each monitor will be responsible for tracking the behavior and movements of gulls and pinnipeds in one of the following sectors (Figure 2):

- Ground: WEI—western portion, excluding the eastern extreme of maintop—and Weather Service Peninsula
- Ground: Tower Point, area above North Landing, Sea Lion Cove, Corm Blind Hill and intertidal areas surrounding
- Ground/Lighthouse: southwest face of LHH, Shubrick Point, eastern Marine Terrace, Sea Pigeon Flat
- Lighthouse: Maintop, Weather Service Peninsula, western Marine Terrace, Saddle Rock, Aulon Peninsula, Fertilizer Flat, Blowhole Peninsula

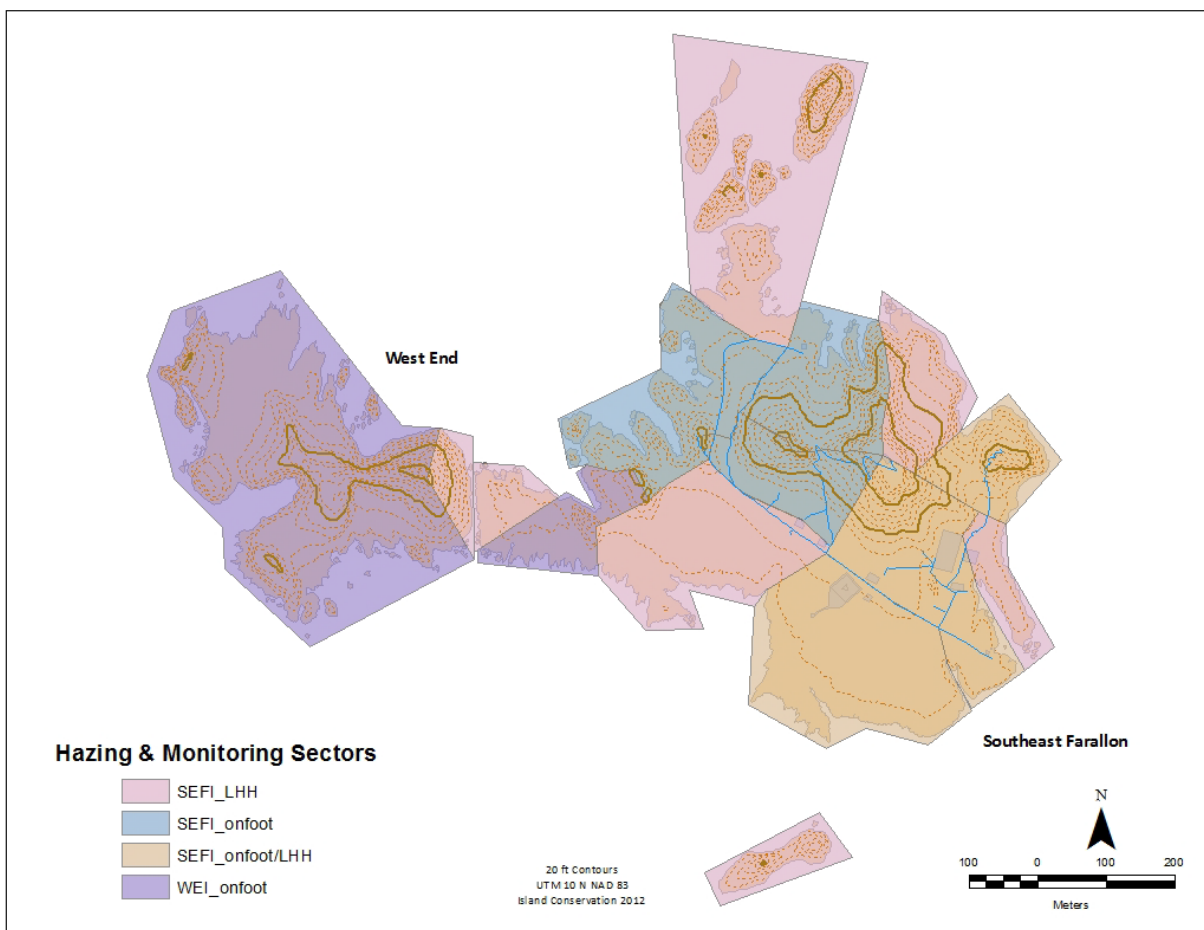


Figure 2. Proposed Hazing and Monitoring Sectors.

The island has been divided into 4 sectors for the purposes of hazing and monitoring gulls and pinnipeds

Monitoring: Phase 1—Stationary Methods

The hazing portion of the trial will begin on Day III (see Appendix 1 for trial schedule). At the beginning of the trial, early morning (pre-dawn) and dusk hazing sessions will consist of the use of lasers and human activity. Hazing and monitoring personnel will work as a team, travelling within their sector to haze and record gull numbers.

Prior to morning twilight, it will be difficult to accurately count the number of gulls using the islands or being impacted by hazing. In this case, monitors will use spotlights to estimate the numbers of gulls flushing up into the air in response to laser use. Daytime monitoring will consist of monitors accompanying hazing personnel and recording impacts of stationary hazing methods.

In the evening, upon initiating hazing with human activity and lasers, monitors will again work with hazers to determine the numbers of birds leaving the island. Nighttime patrols will take place between the hours of 20.00 and 22.00. A minimum of one hazer and one monitor will conduct the patrol, by walking the perimeter of the island, ensuring that primary roost sites are clear of gulls, documenting the numbers of gulls encountered, and hazing as needed. Information on gull behavior learned during these

periods will be used to adaptively manage hazing operations. This activity should take less than two hours.

Monitoring personnel have the following responsibilities during Phases 1 & 2:

- Work with designated hazer to quantify numbers of gulls responding to early morning and evening laser treatments
- Participate in assessing stationary hazing tools during daylight hours
- Participate in nighttime gull surveys/hazing

Monitoring: Phase 2—Combined methods

Early morning, daytime, and evening monitoring activities will continue as before.

Monitoring: Phase 3—Pyrotechnics

The monitors are integral to the safe, successful, and legal use of pyrotechnics on the islands. When pyrotechnics are first used, hazers will deploy pyrotechnics at decreasing distances from pinnipeds while monitors closely observe pinnipeds for any signs of harassment in these animals. This will inform future hazing operations as to the tolerance of pyrotechnics by these animals. Monitors must have a sufficient amount of light to observe and document pinniped responses to pyrotechnics. If monitors cannot see pinnipeds, hazers will not proceed with pyrotechnic use.

During this phase of the trial, each monitor is expected to communicate with their designated hazer in order to:

- Ensure they are ready to document animal responses
- Ensure that sufficient personnel is available to record any responses to hazing
- Document the number of pinnipeds prior to hazing activities, quantify those responding to activities, and categorize their responses to hazing activities
- Characterize the responses of gulls to hazing activities and quantify the percentage of gulls responding

Monitoring: Phase 4—Habituation

Monitoring needs during this phase of the trial will be restricted to the two localized gull roosts chosen for the assessment of gull habituation.

It is expected that signs of habituation in gulls include the following:

- 1) Not responding to hazing and continuing to roost in target area
- 2) Becoming less responsive to hazing and returning to roost more quickly; pyrotechnics need to be used with greater frequency
- 3) Becoming more tolerant of hazing and remaining close to hazing tools; decreasing range of effectiveness

In order to assess habituation, monitors will monitor gulls in the following manner:

- 1) The percent of gulls responsive to hazing tools
- 2) The frequency with which pyrotechnics need to be fired in order to maintain designated gull roosts free of gulls
- 3) The effective distance of pyrotechnics

Monitors will continue to record the responses of pinnipeds to pyrotechnics and human activity during this phase of the trial.

GULL HAZING

A hazing strategy was developed with a goal to evaluate specific techniques in isolation, beginning with some of the more passive/stationary techniques during the day, in conjunction with more intensive hazing at dawn and dusk. It is hoped that this approach will effectively haze a substantial portion of gulls on WEI and SEFI. However, within a few days habituation to hazing techniques is expected to occur, at which point hazers will resort to combined hazing methods and finally moving on to pyrotechnics. The broad-scale use of pyrotechnics will then cease and pyrotechnic use will be limited to two isolated locations on SEFI, in order to test for habituation. The whole trial has been broken down into four phases, each with distinct goals. The general scheme of the four phases can be found in Table 1. Table 2 details the hazing methods to be used in each of the four phases.

Table 1. Phased hazing and monitoring. Each phase of the trial has a distinct goal and scope.

Phase	Goal	Scope	Expected durations (days)	Criteria for advancing to next phase
1	<ul style="list-style-type: none"> Assess the effective distance of individual methods in localized areas 	Localized areas SEFI & WEI	2	Minimum two days of data
2	<ul style="list-style-type: none"> Assess the effective distance of combined methods Determine efforts needed for island-wide hazing 	Island-wide	4-6	If hazing tools are not effective at clearing both islands
3	<ul style="list-style-type: none"> Assess whether pyrotechnics will counteract habituation to other methods Determine if pyrotechnics can be effective in hazing areas which cannot be accessed on foot 	Island-wide	5-7	Reduced personnel
4	<ul style="list-style-type: none"> Evaluate how quickly gulls will habituate to pyrotechnics 	Specific roosts on SEFI	5	

Table 2. Phased hazing strategy. Hazing will progress from least aggressive methods to most aggressive methods.

	Time of Day	Early Morning	Day	Dusk	Night
<div style="writing-mode: vertical-rl; transform: rotate(180deg);"> Least Aggressive ↓ Most Aggressive </div>	Stationary Methods (Phase 1)	Humans Lasers	Effigies Zon Stationary Kites Biosonics	Humans Lasers	Humans Lasers
	Combined Methods (Phase 2)	Humans Lasers	Humans Effigies Zon Stationary Kites Biosonics Mobile Kites Mobile Effigies Helicopter	Humans Lasers	Humans Lasers
	Pyrotechnics (Phases 3 & 4)	Humans Lasers Pyrotechnics	Humans Effigies Zon Stationary Kites Biosonics Mobile Kites Mobile Effigies Helicopter Pyrotechnics	Humans Lasers Pyrotechnics	Humans Lasers

Hazing: Sectors

Hazing of gulls on the islands will require four personnel with assignments identical to monitoring assignments. Each hazer will be responsible for tracking and responding to the behavior of gulls in one of the following areas:

- Ground: WEI—western portion, excluding the eastern extreme of maintop—and Weather Service Peninsula
- Ground: Tower Point, area above North Landing, Sea Lion Cove, Corm Blind Hill and intertidal areas surrounding
- Ground/Lighthouse: southwest face of LHH, Shubrick Point, eastern Marine Terrace, Sea Pigeon Flat
- Lighthouse: Maintop, Weather Service Peninsula, western Marine Terrace, Saddle Rock, Aulon Peninsula, Fertilizer Flat, Blowhole Peninsula

The sectors within the islands will likely evolve over time as gulls respond to hazing efforts and adapt their loafing and roosting behavior.

During all hazing periods, a Hazing Coordinator will be responsible for:

- Ensuring hazers coordinate hazing efforts to maximize the effect of hazing
- Identifying where gulls are retreating to and communicating this information to relevant hazers
- Particularly in Phase 3: Relaying incidences of pinniped harassment from monitors to teams whose activities have affected animals in a different sector

Hazing: Phase 1—Stationary Methods

Hazing will begin on Day III (see Appendix 1 for trial schedule). At the beginning of the trial, early morning and dusk hazing sessions will consist of the use of lasers and human activity. In the hazing trial conducted in January 2011, lasers were effective 30 minutes after sunset until about 15 minutes before sunrise. The sunrise and sunset times for the islands on November 27, 2012 are at 0703 and 1651, respectively. Hazing and monitoring personnel will work as a team, travelling within their sector to haze and record gull numbers between the hours of 0530 and 0730.

After hazing gulls off the island during the dawn session using lasers, several passive and stationary hazing methods will be installed across the islands (See Figure 3), including a helikite, zons, effigies, and bioacoustic systems. When visual devices (such as effigies and kites) are deployed, the hazer will fire a single cap towards nearby loafing or roosting gulls in an effort to draw their attention to these tools.

These hazing tools will be assessed 3-4 four times per day for signs of habituation and gull encroachment. Personnel will determine the effective radius of tools based on distance markers placed at a standard distance from each hazing tool. Gulls persisting around these tools will be tolerated for a maximum of two days, at which point, hazing will progress to Phase 2.

It is anticipated that with daytime hazing tools in place, daytime hazing activities will largely involve personnel walking around and inspecting loafing sites and checking on the condition of hazing tools. In this phase of the trial, gulls found loafing around hazing methods shall be tolerated until Phase 2 is initiated (On Day V or VI), unless otherwise directed by the Incident Commander.

Dusk hazing will involve the use of lasers in an effort to prevent gulls from settling on nighttime roost sites. Gulls persisting on loafing sites not targeted during daytime hazing activities should be subject to laser treatment at this time, allowing monitors to record the number of gulls using loafing sites. After nightfall, a single hazer-monitor team will be sent out to target groups of gulls which might have returned to roosts since sunset. Lasers will be used at this time to haze them from the island.

During phases 1 & 2, hazing personnel have the following responsibilities:

- To record and assess the effectiveness of stationary hazing methods
- To “police” their respective sector in the early morning and early evening hours, working to keep a maximum of gulls off their sector at dawn and dusk
- To work with the monitor to determine the number the number of gulls responding to laser treatments
- During nighttime surveys, to work with a monitor to haze a maximum number of gulls off the island which persist beyond sunset.
- To track the amount of effort spent in hazing gulls

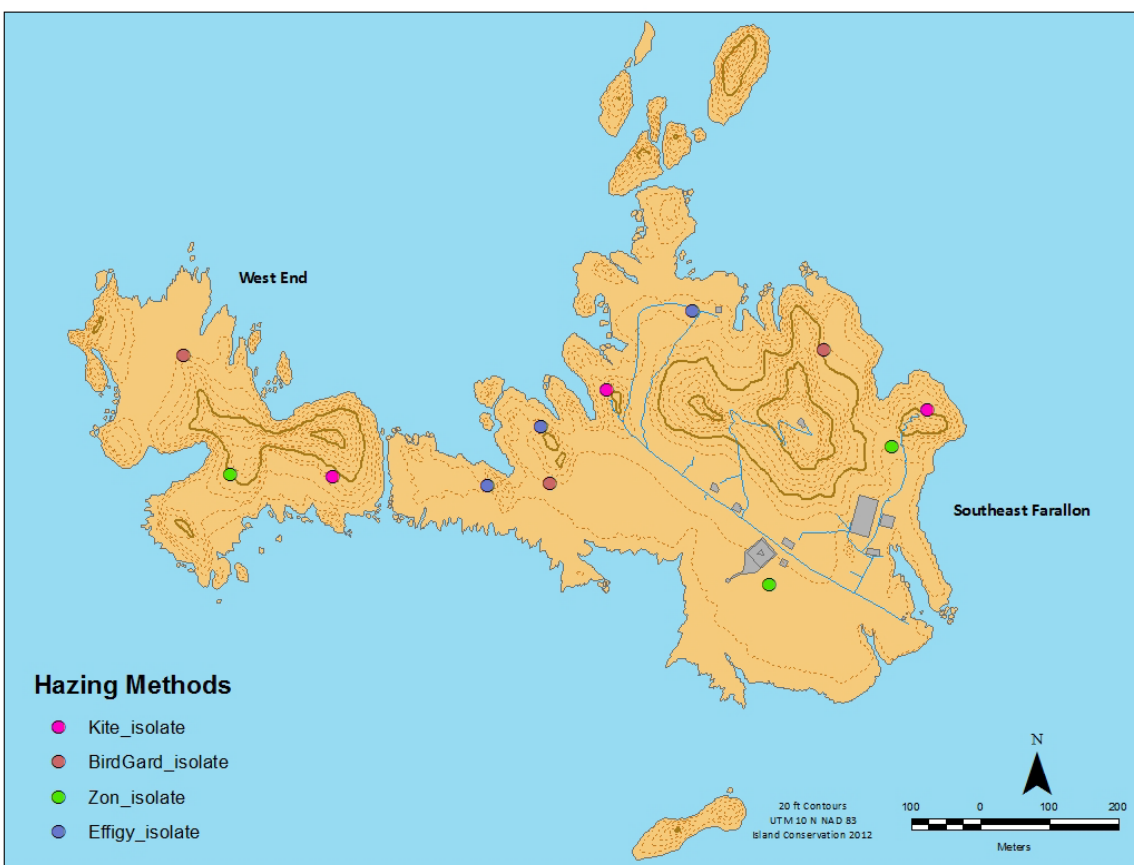


Figure 3. Phase 1—Isolated Hazing Methods. Tools will be placed in isolation during Phase 1 of the trial. This map indicates where specific tools will initially be trialed.

Hazing: Phase 2—Combined Methods

The second phase of the trial will involve combining methods to cover the entirety of SFI as effectively as possible. Hazing methods already in place will either be swapped out for another tool or will have an additional method added. Visual stimuli (such as effigies) that prove ineffective after two days will be supplemented with an audio-based stimulus (such as a zon), and vice versa. Gulls will not be allowed to loaf or roost anywhere on the islands during this phase of the trial. The efficacy of combined methods will be assessed, where possible, and methods will be moved or changed as gull behavior requires. Additional daytime hazing tools used might include personnel walking around the islands with effigies on poles or guiding kites. Figure 4 illustrates where certain methods might be effectively employed across SEFI and WEI, though actual locations are subject to change according to on-the-ground requirements.

Early morning and evening hazing (lasers) and monitoring activities will continue as before. The responsibilities of hazing personnel during Phase 2 are unchanged from the expectations for them during Phase 1.

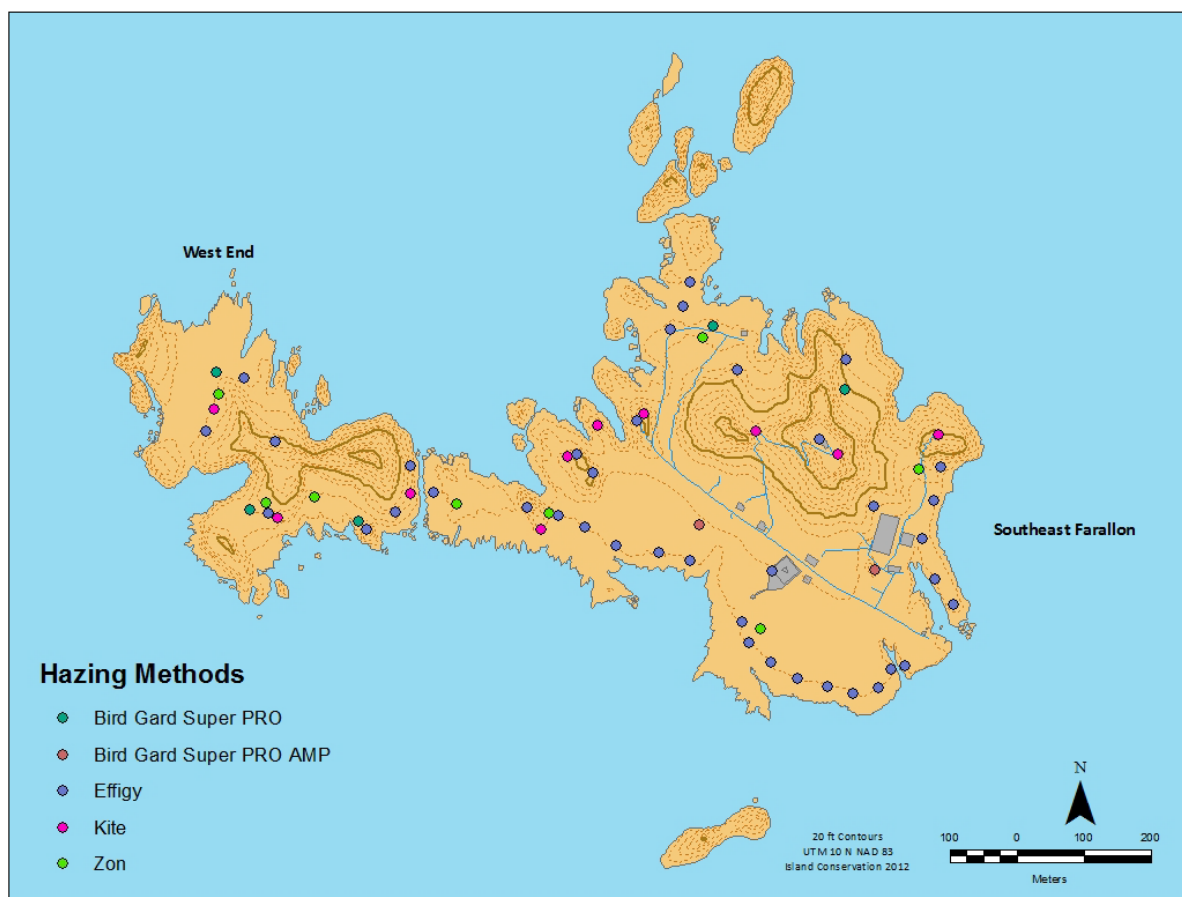


Figure 4. Phase 2—Combined Hazing Methods. Effigies, kites, biosonics, and zons will be trialed in combination across the islands in Phase 2.

Hazing: Phase 3—Pyrotechnics

The focus of Phase 3 is to introduce the use of pyrotechnics as a hazing tool, once other methods have been ineffective in achieving 100% clearance of gulls from the islands. Personnel will rely mainly on simple bird bombs and whistlers (fired from a pistol-style record launcher), though cracker shells and CAPA charges will likely also be employed in an effort to reach more distant groups of gulls. It is anticipated that at this point in the trial, gulls will have retreated to isolated pockets where they cannot be flushed by any other means.

On the first day of pyrotechnic use, hazers will attempt to gauge the tolerance of pyrotechnics by pinnipeds. Hazers will use pyrotechnics at decreasing distances from pinnipeds, using a range finder to determine proximity and while the monitor assesses the response of the animals. Pyrotechnics will primarily be used at dawn and dusk, but will also be employed during the daytime, as needed. Pyrotechnics will only be employed in the morning once personnel can see well enough to document any incidences of pinniped harassment. Prior to that time of day, lasers will continue to be used. This is also true for evening pyrotechnic use; pyrotechnics will only be used for as long as monitors are able to observe pinniped behavior.

Hazers will need to work closely with their designated monitor to track pinniped responses to pyrotechnics and ensure that their efforts lead to successful data collection and hazing. Hazers may be required to take monitoring data if the monitor cannot adequately record animal responses.

During this phase, hazers have the following responsibilities:

- To track the number and variety of supplies used while carrying out hazing activities.
- To track personnel effort needed to haze gulls
- To pick up any spent shell-cracker cartridges
- To avoid directing pyrotechnics charges with any residue over the ocean
- When using lasers and pyrotechnics, communicate with designated monitor to ensure that:
 - the monitor is prepared to record animal responses to hazing
 - the monitor is managing to record gull behavior
 - the monitor is managing to record pinnipeds responses/harassment incidents

Hazing: Phase 4—Habituation

Hazing during this phase will involve the use of pyrotechnics to completely haze 2 designated roosts on SEFI. Stationary methods will remain in place in these areas and will be used in conjunction with human movements and pyrotechnics to maintain these roosts free of gulls. De mobilization will occur concurrent with Phase 4.

Additional hazing methods

On those days where a vessel has been chartered to come out to the island, at least one hazer and one monitor will be transported to the vessel for a trip around the island, assuming sea conditions meet safety standards. The monitor will record any congregations of gulls which cannot be seen from the island as well as the effects of hazing from the boat. The hazer will use pyrotechnic devices to flush any gulls detected on these areas, especially offshore and northern islets, and the backside of the Great Arch. Depending on weather, sea conditions, and staff availability, certified personnel may also use the USFWS Safeboat to perform some avian hazing and/or monitoring from this vessel.

Due to limitations of space and time, the exploration of unmanned aerial vehicles (UAVs) to monitor wildlife on the Farallones, and the use of trained dogs to haze gulls on Southeast Farallon will be explored during subsequent field visits to the island in January or February 2013. Randy Berthold and Bruce Storms of NASA Ames Research Center's Unmanned Aerial Systems Project Office participated in a field trip to the island on November 6, 2012 to assist in designing the aerial monitoring proof of concept trial using unmanned aerial vehicles. The FAA requires a 60-day processing to issue a COA permit to NASA for the aerial trial. A trained dog handler will likely also be taken out to the island during this time to assess the cost and possible effectiveness of dogs for hazing gulls.

BAIT TRIALS

Two placebo (non-toxic) versions of two registered bait pellets will be tested during the trial:

- ~1g (3/8") Bell Laboratories, Inc. Conservation Dry Formulation pellet (placebo version of 25D)
-
- ~1 g Hacco, Inc. Ramik Green® pellet (placebo version of D50)

Both products are designed to mimic exactly the toxic forms of these bait products. Both products will also be infused with 0.2% pyranine, a non-toxic food-grade biomarker (also known as Solvent Green 7). The presence of this biomarker can be detected with an ultraviolet light.

Targeted Bait Test

In an effort to determine if gulls can be successfully hazed off a plot of land which has had a placebo bait broadcast at an established and uniform density, three areas across WEI and SEFI have been chosen for close monitoring for the consumption of bait pellets by gulls. These small plots (≤ 1.5 ha) have been chosen for the ease of hand broadcasting bait pellets and monitoring subsequent gull behavior at these sites.

Prior to hazing activities—on Day II or III—three plots (see Figure 5) will be demarcated using pin flags. Once hazing has begun—on Day V or VI of the trial—these three plots will be hand-broadcast with one of the two bait types. The bait product manufactured by Bell Laboratories, Inc. will be broadcast at a density of 18 kg/ha, as per the label registration limit. The bait product manufactured by Hacco, Inc. will be broadcast at a density of 48 kg/ha.

The boundaries of these areas will be clearly marked with pin flags so that observers can monitor the area from a distance. The monitoring team will track gull activity within these plots during regularly-scheduled surveys. Plots will also be observed at night to determine if gulls alight on the plots in the dark and to determine if gulls will eat pellets at night.

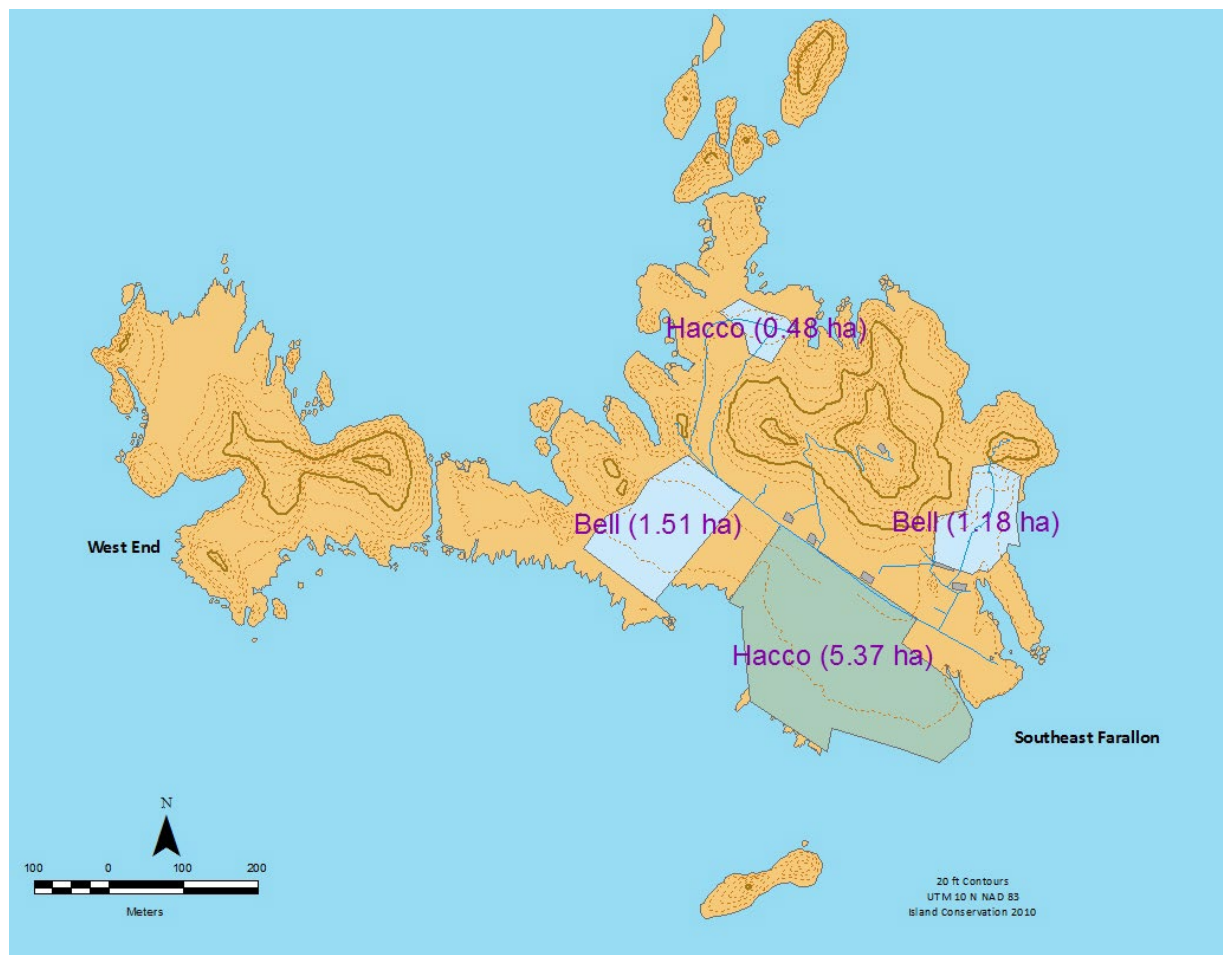


Figure 5. A map of areas to be baited by hand-broadcast. Areas in blue represent plots which will be subject to the targeted bait tests, while the area in green will be used for the bait availability study. The types of bait (referred to by name of manufacturer) and the areas of these plots are indicated.

Bait Degradation

A bait degradation (weathering) trial will be conducted using placebo versions of the two types of bait pellets. Bait cages of wire hardware cloth will be used to prevent the pellets from being consumed or disturbed by mice or birds. Each cage, which has 16 compartments, will have eight pellets of each formulation placed in each cage. Two cages will be placed in each of three locations: the Water tank at the saddle on the lighthouse trail, the cisterns on the Marine Terrace, and North Landing (See Figure 6.) Cages will be tested on bare soil, rock, and vegetated substrates. The establishment of bait degradation cages will likely occur in November during a 1-day strike team visit to the island to transfer supplies to the island.

Cages will be sampled every seven days after deployment by PRBO staff until April 1. Each pellet in each cage will be inspected for signs of degradation and classified using a bait degradation scale ranging from 1- 6, after Craddock (2004).

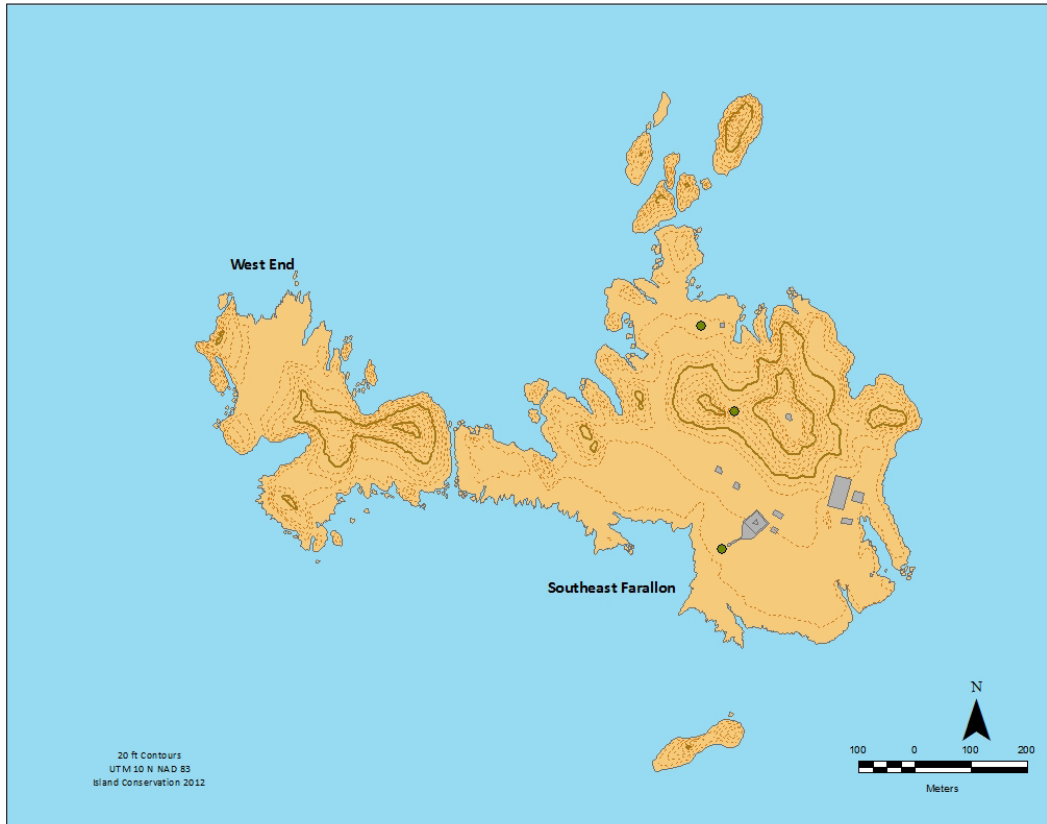


Figure 6. Location of Bait Degradation Cages (green dots)

Bait Availability

In November 2010, a bait availability study was conducted using the Bell Laboratories, Inc. placebo pellet. A similar trial will be conducted during this trial, using the ~1 g Hacco, Inc. Ramik Green placebo pellet. The goal of this trial is to establish how long pellets remain available to mice over the course of a seven-day period. Results from this trial can be used to inform decisions on baiting application rates for a future eradication.

Prior to any hazing, ten bait availability plots (measuring 1m x 10m) will be established on the Marine Terrace. Once hazing activities have been initiated, a ~5-hectare portion of the Marine Terrace (see Figure 5) will be hand-broadcast with the Hacco, Inc. bait at an approximate density of 48 kg/ha. Immediately following the bait broadcast, these plots will be calibrated to contain a representative number of pellets for a bait application of 48 kg/ha. The availability of pellets within these plots will be monitored every day for a total of seven days to assess uptake rates.

APPENDICES

APPENDIX 1: STAFFING & SCHEDULING

Staff On-island Schedule

This Gantt chart indicates which staff will be on-island for the hazing trial between November 27 and December 17, 2012. The “B” in the transport row indicates dates of staff change-overs. Scheduled transportation is subject to sea conditions and weather. The days outlined in heavy black represent the extent of the 18-day hazing period.

Transport				B			B											PRBO											B			B
Trial Day				0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI							
Date				26-Nov	27-Nov	28-Nov	29-Nov	30-Nov	1-Dec	2-Dec	3-Dec	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec	15-Dec	16-Dec	17-Dec							
Personnel																																
1	Dan Grout (IC)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
2	Madeleine Pott (IC)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
3	Tommy Hall (IC)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
4	Jonathan Shore (USFWS)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
5	Gerry McChesney (USFWS)											x	x	x	x	x	x	x	x													
6	Russ Bradley (PRBO)			x	x	x	x	x	x	x	x																					
7	Pete Warzybok (PRBO)											x	x	x	x	x	x	x	x													
8	John Warzybok (PRBO)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
9	Liz Ames (PRBO)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
10	Winston Vickers (OWCN)			x	x	x	x	x	x	x	x																					
11	Paul Gorenzel (OWCN)											x	x	x	x	x	x	x	x													
12	Valerie Burton (USDA-APHIS)			x	x	x	x	x	x	x	x	x																				
13	Derek Millsaps (USDA-APHIS)											x	x	x	x	x	x	x	x													
14	Chris Gularte (Specialized Aviation)						x	x	x	x	x	x	x	x	x																	
15	Kyra Mills Parker (OWCN)																		x	x	x	x	x	x								
16	Holly Gellerman (CDFG-OSPR)																		x	x	x	x	x	x								
Total personnel:				9	9	9	10	10	10	10	10	10	10	11	11	11	10	10	10	7	8	8	8	8	8							
				Red type font indicates personnel who are currently allowed under federal law to use EPCDs without the need for a permit																												
				Blue type font indicates personnel who have been included under Island Conservation's ATF User Permit																												

Trial Activity Schedule

Transport	B			B								PRBO				B				B		
Personnel change-over/departure				x												x				x		
Trial Day	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI
Date	26-Nov	27-Nov	28-Nov	29-Nov	30-Nov	1-Dec	2-Dec	3-Dec	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec	15-Dec	16-Dec	17-Dec
Activity																						
Meet & check-in Sausalito	x																					
Depart for islands		x																				
Training/orientation		x	x																			
Mark baiting zones			(x)	(x)	x																	
Helicopter arrives on-island				x																		
Gull and pinniped monitoring				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Phase 1: Stationary methods				x	x																	
Phase 2: Combined methods						x	x	x	x	(x)	(x)											
Phase 3: Pyrotechnics										(x)	(x)	x	x	x	x	x						
Phase 4: Habituation																	x	x	x	x	x	
Hand-broadcast bait							x	(x)														
Calibrate availability plots							x	(x)														
Monitor bait availability							x	x	x	x	x	x	x	(x)								
Bait degradation deployment									x	(x)												
Remove partner tools																x	(x)					
DNA collection																		x	(x)			
Final Demobilization																			x	x	x	(x)

Activities in parentheses indicate that the timing of the activity will depend on personnel availability or gull behavior and may be pushed to another day.

Daily Schedule

The schedule below has been designed to ensure that staff assignments do no amount to more than an 8-hour workday.

(Sunrise during the trial is from 7:03- 7:20 am, and sunset is from 4:52 to 4:53 pm)

Working hours	Time	Tasks	Personnel participating
2	0530-0730	Dawn Hazing	All
1.5	0730-0900	Breakfast break	All
2	0900-1100	Daytime Hazing	Two 2-person teams
2	0900-1100	Daily Tasks*	All others
1	1100-1200	Team Meeting	All
2	1200-1400	Lunch break	All
2	1400-1600	Daytime Hazing	Two 2-person teams†
2	1600-1800	Dusk Hazing	All
2	1800-2000	Dinner break	All
2	2000-2200	Nighttime patrol	One 2-person team†

*Daily Tasks are not anticipated to take more than 1 hour. Daily tasks include: cleaning pyrotechnic launchers, maintaining pyrotechnics records, tallying IHA harassment incidents, charging radios, entering bait availability data, entering monitoring and hazing data, downloading GPS data...

†Personnel not assigned to these shifts may use this time as personal time

Sample Staff Rotation

A sample staff rotation has been developed for those work shifts which do not require all trial personnel to participate.

The numbers indicate individual personnel participating in each hazing shift.

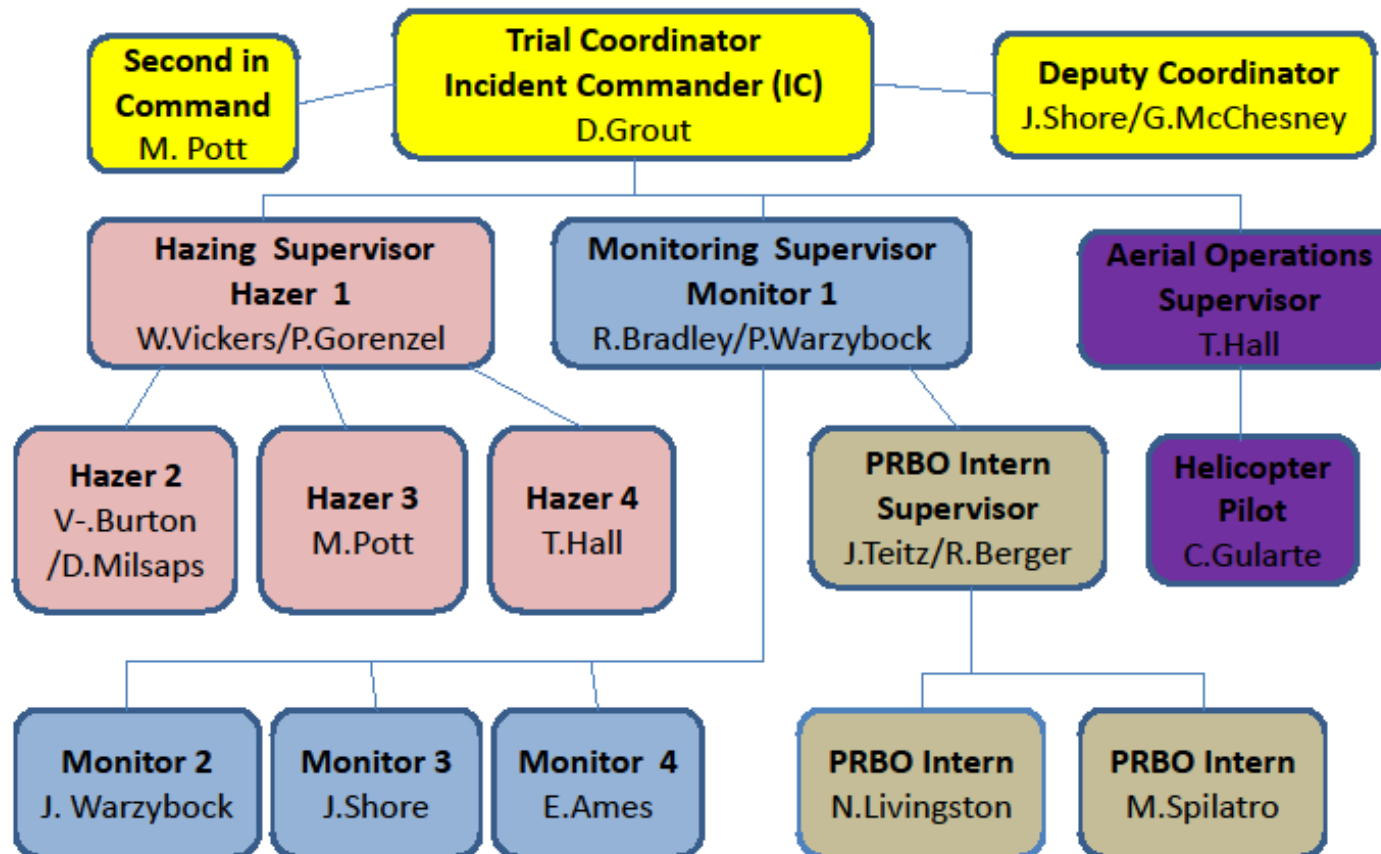
Hazing Shift	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
0900-1100	1	3	5	7	9	1	2
0900-1100	2	4	6	8	10	3	4
0900-1100	3	5	7	9	1	5	6
0900-1100	4	6	8	10	2	7	8
1400-1600	5	7	9	1	3	9	10
1400-1600	6	8	10	2	4	2	1
1400-1600	7	9	1	3	5	4	3
1400-1600	8	10	2	4	6	6	5
2000-2200	9	1	3	5	7	8	7
2000-2200	10	2	4	6	8	10	9

APPENDIX 2: ORGANIZATION OF ISLAND PERSONNEL

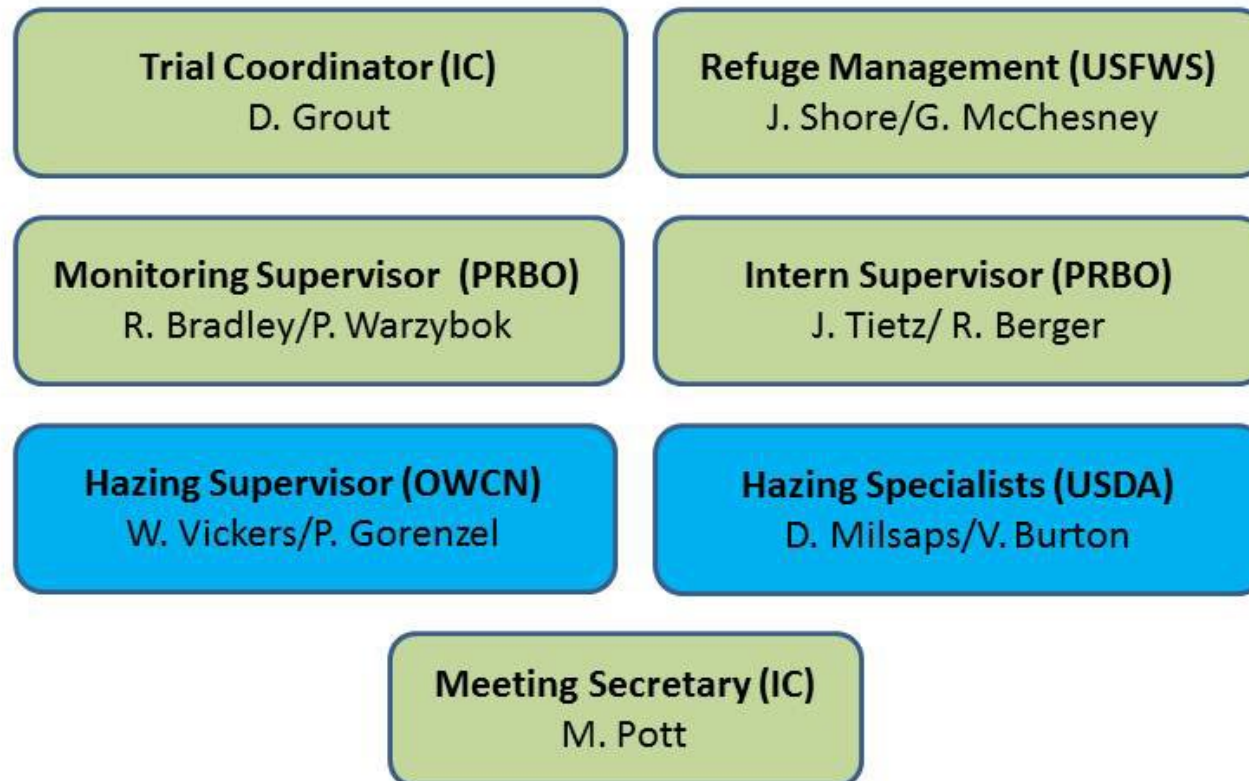
Nov. 15 2012


Incident Command Structure (ICS)

Farallon Avian Hazing Trial



Operational Advisory Group (OAG)




 Green denotes Core Partners for Farallon Mouse Eradication

Incident Advisory Group (IAG)

USFWS
G. McChesney/ J. Shore

PRBO
R. Bradley/ P. Warzybok

ISLAND CONSERVATION
D. Grout

 Green denotes Core Partners for Farallon Mouse Eradication

APPENDIX 3: BIOSECURITY PROTOCOL

Packing for the island:

- All gear will be inspected and cleaned (if necessary) before being brought to the island. This includes clothes and boots. Carefully inspect any items with Velcro.
- All food will be packed in rodent-proof containers (hard sided, closed tightly).
- As much gear as possible will be packed in rodent-proof containers. If rodent proof containers are limited or too small, items will be packed in dry bags or contractor bags (thick trash bags) and sealed tightly.
- Gear will be cleaned and packed in a location that is free of insects and seeds, preferably indoors.
- If possible, soft gear (tents, boots, clothing, tarps, etc.) should be frozen for 48 hours prior to going out to island.
- Corrugated cardboard will not be used.
- When packing, we will be wary of leaving containers open/exposed for extended lengths of time. Containers should only be open when they are being packed or something is being taken out.

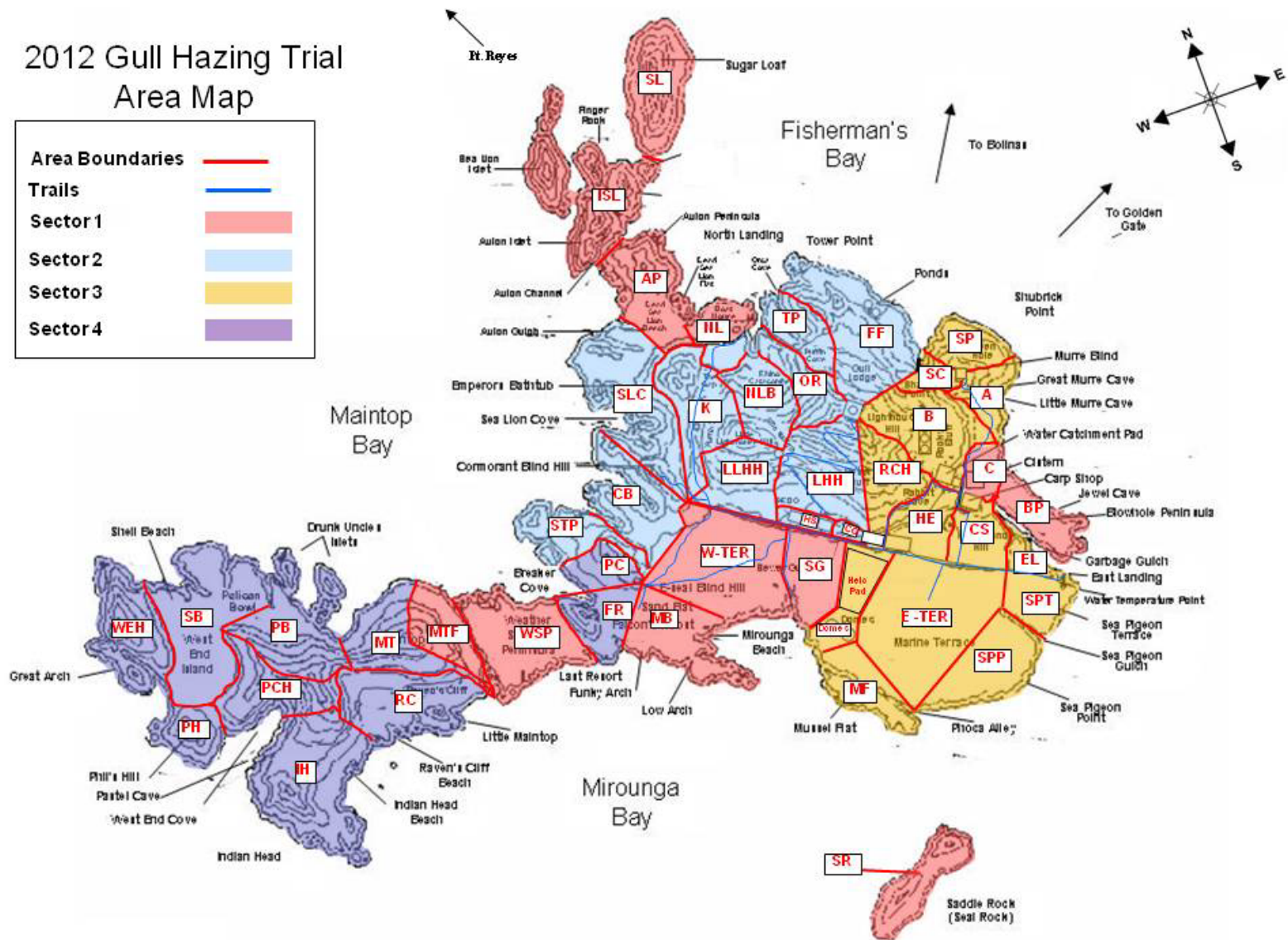
Transportation to Island:

- We will contract with vendors who agree to allow us to inspect their vessel and/or require necessary preventative measures be in place.

While on Island:

- All gear will be unpacked in the Coast Guard House. All doors and closets will be kept shut during unpacking.
- A can of bug spray will be available to deal with any invertebrates that may be found while unpacking.
- Prior to each entry into a Wilderness Area (all of WEI and the restricted area on SEFI) the soles of boots (especially mud), laces, and the pockets and hems of clothes/equipment will be carefully inspected and cleaned. Any seeds will be removed and bagged in a ziplock for incineration.

APPENDIX 4: SFI TARGET AREAS AND PLACE NAMES



SFI Target Area Abbreviations

Code	Area	Description
A	Gull Plot A	Includes everything from Queen's Bath to Murre Blind on South side of Shubrick
AP	Aulon Peninsula	Includes Dead Sea Lion Flat
B	Gull Plot B	Includes area from the catchment pad up hill to old water tanks and SE face of LHH
BP	Blowhole Peninsula	All of Blowhole Peninsula from the top of Garbage Gulch to the end
C	Gull Plot C	Includes Cistern and area SE of trail to Murre Blind out to the inside end of Garbage Gulch
CB	Corm Blind	Includes the area below the Corm Blind and Cross Channel
CG	Coast Guard	Area between CG House and Power House
CS	Carp Shop	Area between bounded by Cart Path, Carp Shop, Heligoland Hill and Garbage Gulch Annex
DOMES	Domes	Area between lower end of Helo Pad and the NW end of Mussel Flat including the Domes and intertidal area by Stinky Ponds
EL	East Landing	Area between the East Landing and Garbage Gulch Annex on the NE side of the Cart Path
E-TER	East Marine Terrace	Eastern portion of the Marine Terrace between the Helo Pad and the end of Sea Pigeon Gulch from the Cart Path to the upper extent of the intertidal
FF	Fertilizer Flat	Area includes Fertilizer Flat and the Eastern side of Lighthouse Hill and Tower Point
FR	Falcon's Roost	Small hill at the Eastern end of Weather Service Peninsula
HE	Heligoland	Area between Heligoland Hill and the boardwalk that runs from the Power House to the Catchment Pad south to the Cart Path
HELO	Helicopter Pad	Concrete Pad SW of Power House
HS	House	Area around PRBO and Coast Guard Houses from Cart Path to rock wall/catacombes behind houses
IH	Indian Head	On West End Island including Indian Head, Indian Head Beach and the area above Indian Head Beach
ISL	Islets	All the smaller islets on the North side of SEFI including Chocolate Chip, Finger Rock, Arch Rock, Aulon Islet and Sea Lion Islet
K	Gull Plot K	Everything above the old lower pathway to NL between the Corm Blind and the Gap including W face of LLHH
LHH	Lighthouse Hill	For this study, LHH is just the SW face where the trail ascends from the houses to the top
LLHH	Little Lighthouse Hill	The South and SW faces of Little Lighthouse Hill
MB	Mirounga Beach	The greater Mirounga Beach area where E-seals breed including Sand Flat and Low Arch up to the E-seal Blind
MF	Mussel Flat	Mussel Flat and the intertidal area below the East Terrace
MT	Maintop	The Western side of Maintop on West End Island
MTF	Maintop Face	The Eastern Face of Maintop on West End Island including Jordan Channel
NL	North Landing	The area between the Gap and North Landing as far West as the Sea Lion Cove Blind and Habitat Sculpture and the NW face of LLHH

NLB	North Landing Bowl	The area above NL between LLHH and Orca Ridge where the old trail is, includes Egger's House and NE face of LLHH
OR	Orca Ridge	NW ridge of LHH opposite the North Landing
PB	Pelican Bowl	On West End Island, the area on the NE side between Maintop and Shell Beach
PC	Pointy Cliff	Pointy Cliff and the area SW of Pointy Cliff to Breaker Cove
PCH	Pastel Cave Highlands	On West End Island, the area on the West side above Pastel Cave and West End Cove
PH	Phil's Hill	On West End Island, small Hill on the West side, North of West End Cove
RCH	Rabbit Cave Highlands	Southeast Slope of LHH above Rabbit Cave
RC	Raven's Cliff	On West End Island, Southeast Slope of Maintop including Raven's Cliff Beach and Little Maintop
SB	Shell Beach	On West End Island, Expansive flat area on NW side between Pelican Bowl and West End Head
SC	Shubrick Cove	Area between Shubrick Point and Lighthouse Hill, including hill above Shubrick Cove
SG	Sewer Gulch	Area on Marine Terrace in Front of Houses between the SG trail and the Helo Pad
SLC	Sea Lion Cove	Area on West side of SEFI between the Corm Blind and Dead Sea Lion Flat, below the old trail to NL
SL	Sugar Loaf	Largest of the islets off the North side of SEFI
SP	Shubrick Point	All of Shubrick Point visible from inside the Murre Blind as well as the NE face below the old gun turret
STP	Study Point Peninsula	Peninsula on SEFI, West of Pointy Cliff between Boiler Cove and Breaker Cove
SPP	Sea Pigeon Point	Southeast portion of marine terrace between the end of Sea Pigeon Gulch and Phoca Alley including all intertidal
SPT	Sea Pigeon Terrace	Portion of marine terrace between the end of Sea Pigeon Gulch and the Cart Path, east to the intertidal
SR	Saddle Rock	Islet off the SE side of SEFI
TP	Tower Point	Hill directly across (east) from North Landing
WEH	West End Head	On West End Island, farthest West hill side past Shell Beach
WSP	Weather Service Peninsula	Peninsula on SEFI between Falcon's Roost and Jordan Channel
W-TER	West Marine Terrace	Western portion of the Marine Terrace between Sewer Gulch trail and Corm Blind Hill from NL trail to E-seal Blind hill

APPENDIX 5: BACKGROUND INFORMATION

The vast majority of information available on gull hazing methods comes from those individuals and groups attempting to haze gulls from airfields, agriculture, aquaculture and landfill facilities, and chemical hazard sites. There are a wide range of techniques available, including lethal and nonlethal methods, those requiring substantial manpower and those requiring relatively little. For succinct descriptions of advantages and disadvantages of these techniques, see: Gorenzel & Salmon 2008 and Harris & Davis 1998.

There are many cases where the greatest efficacy in hazing gulls is achieved through integrating a number of methods into the hazing program. Harris and Davis (1998), in their report to the Canadian Government, list pyrotechnics, falconry, distress and alarm calls, and shooting (lethal removal) as key components of any effective hazing program, citing the use of effigies as a possible supplementary technique. The use of multiple audible and non/lethal techniques were more effective than multiple visual deterrents such as mylar & balloons (Cook et al. 2008). On-demand systems or those systems responsive to changes in animal behavior, as opposed to continuous or randomly activated systems, were also found to be most effective in dispersing problem birds (Ronconi and St. Clair 2006).

Lasers & lights

Lasers are concentrated light beams used in low lighting conditions to disperse or deter roosting & feeding birds. They remain one of the most effective tools for dispersing birds at night, when most other techniques are ineffective. Lasers emit either green or red light and are highly portable (Gorenzel and Salmon 2008). Lasers are not effective on all bird species, but there is considerable evidence that lasers can be used to effectively deter gulls (Blackwell et al. 2002, Baxter 2007). All-night control of gulls at a reservoir found that lasers could be used to disperse a population of 5,000 gulls, with no individuals remaining at daybreak. Researchers also observed an additive effect, whereby fewer and fewer gulls attempted to return to roost once hazing had begun. No habituation to the laser was seen for the duration of the 26-day trial and gull response to the laser was always immediate (Baxter 2007).

A study conducted on geese reduced use of the treated area by 34-93%, but prior use of the laser did not deter geese from using the treated area during the daytime. Researchers suggested that geese which were most responsive (populations which saw greatest reductions) were those exposed to little human disturbance and accustomed to very little ambient light during the night (Sherman and Barras 2004). There has been some use of moving spotlights or beacons to disperse or deter birds. In one instance, the intermittent use of a spotlight to deter waterfowl from contaminated bodies of water cut the number of birds using ponds by 90% and reduced bird mortality to less than one-third of that recorded the previous year. During the second year of operation, the beacon further reduced bird mortality to one-sixth of that seen during the first year (Read 1999). Gorenzel & Salmon (2008) also recommend the use of spotlights or strobes, though they suggest that efficacy is variable and other methods may need to be used to supplement spotlight use.

Biosonics (Bird Gard & LRAD)

Biosonics, or bioacoustics, as a hazing method, involves using animal alarm or distress calls to alter the behavior or behavioral patterns of target species, typically causing them to vacate or avoid an area. The vocalizations used are usually those emitted by a predator of the target species or the alarm or distress call of the target species (or a closely related species). Vocalizations are typically broadcast from

commercially available units or can be assembled from their component parts. (Gorenzel and Salmon 2008). Biosonics have often been used to haze a variety of seabirds at locations such as: landfills, in association with airfields, at aquaculture facilities, and contaminated ponds (Gosler et al. 1995, Mott and Boyd 1995, Stevens et al. 2000, Cook et al. 2008).

The efficacy of biosonics has been found to be highly variable from one situation to the next. In studies specifically concerned with gulls, the numbers of gulls are typically reduced significantly within the first few weeks (Gosler et al. 1995, Baxter et al. 1999, Baxter 2000). Stout et al. (1975) found that distress calls were more effective at dispersing gulls than alarm, mew, trumpet, or choke type calls. In one study at a UK landfill where distress calls were the only method used, the numbers of gulls observed was reduced by 66-83% (Baxter 2000). Gosler (1995) observed that distress calls can be effective at dispersing and deterring gulls from returning, if there are alternate sites available to these individuals. Habituation to this method has been observed in a number of gull species and starts within one to four weeks of initiating hazing by this method (Baxter 2000, 2001, Soldatini et al. 2008).

When using distress calls, Gorenzel & Salmon (2008) recommend using distress calls from the target species, preferably from individuals inhabiting the same region as target individuals. Montoney & Boggs (1995) found that Laughing Gulls (*Leucophaeus atricilla*) are responsive to the distress calls of other species, although Baxter (1999) found conspecific bird calls to be significantly more effective than congeneric calls in dispersing birds. Interviews conducted by Harris & Davis (1998) indicated that distress calls enhanced by the use of pyrotechnics were more effective than calls alone. There has been only limited research into the effect of predator calls on target species. Harris & Davis (1998) reported that Gunn (1973) found gulls to be responsive to Peregrine Falcon calls.

Effigies

Typically, human effigies or models (scarecrows) or predator models are recommended as a bird hazing technique (Curtis et al. 1996, Gorenzel and Salmon 2008). However, the use of dead bird effigies (gulls and vultures) has been shown to be effective in scaring birds (Stout et al. 1975, Seamans 2004). Stout et al. (1975) conducted a comprehensive study which found that effigies positioned on their sides (with wings folded) or effigies with wings outstretched elicited the greatest response from gulls. Taxidermy gulls were more effective at dispersing gulls than other imitation (fiberglass molded & partial taxidermy mounts) models, but these specimens often deteriorated in wet weather. They also showed that the greatest effect was seen in groups of gulls exposed to both effigies and distress calls, with no habituation in individuals. In the presence of food, however, gulls resisted dispersal. The combination of distress calls and effigies was the most effective method when food was available, yet still not successful in completely dispersing birds. Stout & Schwab (1979) found that by using very life-like models of Ring-billed Gulls (*Larus delawarensis*), Herring Gulls (*Larus argentatus*), and Laughing Gulls, that they were able to reduce the number of loafing gulls by 80% in a popular loafing area. In another study, effigies placed in loafing areas achieved similar results (gulls retreated to alternative sites), whereas effigies placed in areas of nesting or food sources had little effect (Seamans et al. 2007). Habituation to this technique was seen after as little as four weeks and as long as eight months after deploying effigies (Stout and Schwab 1979, Seamans et al. 2007).

Mylar tape

Mylar flags or tape have frequently been prescribed as a stimulus used to deter birds from cropland or contaminated areas (Littauer 1990, Gorenzel and Salmon 2008). Mylar is a reflective plastic ribbon with

one side colored either red or yellow. It is often tied to poles or suspended from overhanging lines, where its motion in the wind creates a humming or crackling sound and it reflects sunlight. It has been shown to be of variable efficacy in preventing passerines from feeding on food crops (Gilsdorf et al. 2002). Belant & Ickes (1997) conducted an experiment on Herring Gulls and showed that mylar was 50% effective in reducing the number of gulls using loafing areas, but was totally ineffective in deterring populations of nesting birds.

Pyrotechnics

Pyrotechnics describe a wide variety of tools which can be used to non-lethally haze birds. Pyrotechnics are primarily an auditory stimulus, creating a loud bang or report, but many charges also produce bright flashes or spiraling light. Pyrotechnic charges are fired from a handheld pistol-style or shotgun-style launcher (Gorenzel and Salmon 2008). Pyrotechnics are used by a majority of airport control programs throughout North America (Harris and Davis 1998). When trialed individually against other techniques (taste deterrents sprayed on refuse) at a landfill, pyrotechnics were effective at reducing the number of foraging gulls from 2,000-2,500 gulls to between 40-50 gulls (Curtis et al. 1995). A study at another landfill in Denver, CO reflected similar findings of 90-95% reduction in gulls—sometimes 100% (Barnes et al. 1999). Habituation to this method can occur, if pyrotechnics are not used sparingly to disperse groups of gulls (Harris and Davis 1998). Some of the frequently cited advantages to this method are: relatively low cost, highly portable, and simple to execute (Curtis et al. 1995, Harris and Davis 1998, Gorenzel and Salmon 2008).

Trained Dogs

Trained dogs—typically border collies—are commonly used to haze or “run off” problem birds (including gulls and geese) from urban areas such as golf courses, often achieving 100% hazing success in treated areas (Castelli and Sleggs 2000, Holevinski et al. 2007). Outside of the urban environment, border collies have been used to a limited degree at air force installations. At airfields (with mixed bird species, including some gulls), clearance rates ranged from 40% to 99.9% within a 2 kilometer radius (Carter 1999, Patterson 2000). In another instance, a 57% reduction in bird strikes was observed at an airfield (Froneman and van Rooyen 2003). It was noted, however, that as soon as dogs were removed from a treated area, birds returned, even over the course of just a weekend (Carter 1999). The success of border collie programs are largely dependent upon skilled handlers and properly trained dogs (Froneman and van Rooyen 2003). Carter (1999) suggests that a single dog and handler can maintain an area of 50 square kilometers (usually runways, and thus flat ground) free of unwanted animals. Collies are not bred or trained to harm wildlife and can be used to safely disperse birds or mammals.

Kites/balloons

Kites in the shape of predators or painted with predators have been used in the past to deter birds from feeding at aquaculture and agriculture facilities. These stimuli typically take the form of a traditional kite or consist of a kite held aloft by a Helium-filled balloon—a Helikite® (Harris and Davis 1998). The unpredictable movement of a kite in the wind serves to slow the habituation of gulls to this method, while not disturbing pinnipeds. There has been limited research conducted to fully evaluate this technique, but one study indicated that the use of Helikites® had no effect on gulls persisting at a landfill site (Baxter 2001). A report to Transport Canada indicated that the usefulness of kites “is limited by habituation [and] are recommended only for situations where short-term and local control is sufficient” (Harris and Davis 1998).

Gas exploder or “Zon”

Gas exploders, also called propane cannons or “Zon guns,” produce a loud, directional blast similar to that emitted by a cracker shell from a 12-gauge shotgun (D. Milsaps, pers. Comm.). They are easily and readily moved, can be automated and used with an on/off timer, firing either regularly or randomly. Some models can also be placed on a stand and programmed to rotate after each blast (Gorenzel and Salmon 2008). Unless zons are moved frequently and blasts randomly fired, gulls readily habituate to this method, often within a few days (Harris and Davis 1998). Hazing with zons has been found to have an effect, but a study by Washburn et al. (2006) indicated that zons did not significantly alter gull behavior at an airport, even when reinforced with lethal control methods.

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