

List of Three Reviewers

Please list the names, affiliations, current phone numbers, mailing addresses and **e-mail addresses** for three external reviewers. Reviewers should have expertise in your proposed research area, and should be capable of objectively reviewing your proposal.

1. Mark Rauzon, Laney College
2. Michelle Hester michelle@oikonos.org
3. Joelle Buffa 757-824-3272 clyde_joelle@verizon.net; Former Farallon island refuge manager
4. Possibly Dave Riensche ? Wildlife Resource Analyst, East Bay Regional Park District.
driensche@ebparks.org phone 510-544-2319; or possible collaborator? (gull hazing coordinator at East Bay tern island colony...VPC presenter)

Letters from collaborating investigators

Proposals lacking letters from referenced investigators approving the proposed work will be considered a detriment to the application.

PRBO Russ Bradley –

FWS Gerry –

Winston –

Abstract

This project will develop and test a combination of innovative techniques for monitoring and hazing gulls and other marine birds that could be used to reduce the number of birds that might be exposed to oil spills and potential toxins along coastal areas and islands. A hazing trial will be conducted on the South Farallon Islands during November-December 2012 (non-breeding season) to determine which techniques are most effective at hazing gulls off the islands and keeping them away from the area for a two to three week period. Methods used may include lasers, spot-lights, bio-sonics, pyrotechnics, effigies, and kites for gull hazing; and the use of specially equipped Unmanned Aerial Vehicles (UAVs) for marine mammal and seabird monitoring. UAVs may be more effective and cost efficient than traditional aerial, land and vessel-based wildlife monitoring techniques and provide real time feedback on bird and wildlife presence and response to hazing efforts. We will generate cost estimates for the personnel, equipment, and materials needed to safely and effectively haze gulls for extended periods, quantify the effective distances for the various techniques, map where gulls retreat to when hazed, and record any habituation responses to hazing by seabirds and marine mammals after extended hazing. This project will assist oil spill response decision-making by highlighting the most effective and innovative strategies and tools for hazing and monitoring wildlife use during oils spills or toxic exposure risk events along Pacific coastal areas.

Budget - separate Budget form

Background Information

Broadly describe the identified problem that this proposal will address, the findings from previous work (if any) to address or mitigate this problem, information pertaining to the methods that the project intends to use, and a succinct synopsis of the hypothesis. Please include all references in the Literature Cited section of the Appendix. Do not exceed 2 pages.

The South Farallon Islands support the largest and one of the most diverse seabird colonies in the contiguous United States, with nearly 200,000 breeding individuals and five species of marine mammals. In addition, half of the world's population of Ashy Storm-Petrels (*Oceanodroma homochroa*) breeds on the South Farallon Islands. In recent decades, this IUCN endangered species has declined substantially, in part due to several hundred storm-petrels being killed each year as a result of the presence of invasive house mice (*Mus musculus*).

Given the documented impact of house mice, the U.S. Fish and Wildlife Service (USFWS), Island Conservation (IC), and PRBO Conservation Science are developing an Environmental Impact Statement (EIS) for house mouse eradication from the Farallones to protect the Ashy Storm-Petrel and other native species. Several action alternatives currently being developed involve the use of pellets containing rodenticide that would be spread throughout the island. In addition to mice, these pellets may be ingested either primarily or secondarily by non-target seabird and shorebird species. Although the proposed mouse eradication would likely be carried out in autumn when most seabirds are absent from the South Farallon Islands, some Western Gulls (*Larus occidentalis*), other migrant gull species, and certain shorebirds, such as Black Oystercatchers (*Haematopus bachmani*) would occur on the island at this time. **Daily** numbers of gulls present during the season of a likely implementation period range from the low hundreds to low thousands. We are requesting funds to test different tools to haze gulls and other birds from the Farallon Islands to reduce the risk they will come into contact with the rodenticide.

In addition to the primary purpose, information from these trials can be used for myriad other needs. This project will develop improved techniques for hazing gulls and other marine birds that can be used during oil spills to reduce the number of birds that come into contact with oil.

The goal of the hazing trial is to determine which techniques are most effective at hazing gulls and keeping them away from a specified area during the period of risk. Specifically, we will:

- Establish which hazing techniques are most effective;
- Estimate the personnel, equipment, and materials needed to safely and effectively haze gulls for extended periods;
- Determine the effective distances for the various techniques and tools;
- Assess which methods are most appropriate in different areas of the South Farallon Islands;
- Observe gulls and ascertain where they retreat to when hazed (i.e., whether or not they leave the South Farallon Islands or return to land elsewhere on the islands); and
- Observe marine mammals and document behavioral reactions to bird hazing techniques.

Preliminary field trials were conducted in January 2011 that assisted in defining which hazing tools have the greatest probability of success. Table 1 lists the hazing techniques and select characteristics that could be tested on the South Farallon Islands.

Table 1. Potential Hazing Techniques to trial on the South Farallon Islands.

<i>Method</i>	<i>Mode of action</i>	<i>Predicted Efficacy Coverage</i>	<i>Predicted Efficacy Duration</i>	<i>Cost*</i>	<i>Day/Night/Fog</i>	<i>Sensory Mechanism Primary</i>	<i>Sensory Mechanism Secondary</i>
Helicopter	Active	High	High	High	Day	Visual	Auditory
UAV**	Active	Medium	Medium	Medium	Day	Visual	Auditory

Human w/dog	Active	Medium	High	Low	Day Night Fog	Visual	Auditory
Active human hazing	Active	Low	Low	High	Day Night Fog	Visual	Auditory
Pyrotechnics	Active	Medium	Low	Low	Night Day	Visual	Auditory
Lasers	Passive	High	Low	Medium	Night	Visual	
Spotlight	Passive	Medium	Low	Low	Night	Visual	
Kites	Passive	Medium	Medium	Low	Day	Visual	
Biosonics	Passive	Low	Low	Medium	Day Night Fog	Auditory	
Zon Gun (loud noises)	Passive	Low	Low	Low	Day Night Fog	Auditory	
Mylar tape	Passive	Low	Medium	Low	Day Night Fog	Visual	
Effigies	Passive	Low	High	Low	Day	Visual	

*adjusted to reflect cost in relation to estimated area covered by each hazing technique (predicted efficacy coverage category)

**UAVs were listed as a possible hazing tool in the pre-proposal. However, concerns over UAV-bird collisions led the USGS to allow the use of their UAVs in this project to visual monitoring only. Thus it is unlikely that any USGS UAVs will be tested for hazing efficacy, although other aerial hazing methods/devices will be tested. We hypothesize that it is possible to haze a large percentage of gulls from South Farallon Islands and that a combination of hazing techniques will be most effective at hazing gulls for an extended period.

Hypothesis and Specific Aims

Include explicit hypotheses if the project is a scientific investigation, or intended outcomes if it has a technology development focus. Do not exceed 1 page.

A. We hypothesize that it is possible to haze a large percentage of the roosting gull population off the South Farallon Islands for extended periods of time.

B. We hypothesize that employing combinations of active hazing tools (see table 1 for definitions) with passive hazing techniques will be the most efficient at maintaining gulls away from specified areas for extended periods of time.

C. We hypothesize that UAVs will be effective at evaluating the efficacy of hazing techniques and improve efficiency by providing real time feedback on bird presence to direct hazing efforts.

The main objectives of this proposal are to determine:

- 1) if it is possible to haze a large percentage of gulls off the entire South Farallon Islands for an extended period of time; and
- 2) the most effective and cost efficient techniques for hazing and dispersing gulls at large roost sites.

We will test available hazing techniques individually to quantify for each technique the effective range and effective duration before gulls return to the area. Efficiency (reflective of cost) for each technique will be quantified using person hours to implement. We will test combinations of techniques, primarily intensive techniques such as helicopters, human facilitated hazing and human with dog facilitated hazing, followed by less intensive techniques such as effigies and lasers, to determine which combinations are most effective and efficient. While many of these techniques have been tested

elsewhere (Baxter, 2007; Carter, 1999; Carter 2000; Castelli and Slegs 2000; Gilsdorf, J. et al. 2002), it is important to test these methods in the Farallon environment to understand as completely as possible the capacity to haze gulls during the proposed house mouse eradication. We also propose to test new tools, specifically UAVs, for their capacity to provide real time monitoring of hazing effectiveness. Real time monitoring will facilitate adaptive management of hazing operations thereby improving efficiency.

Experimental or implementation plan for each specific aim

Be sure to indicate the resources already in place and ready to be used for this project, including facilities and major equipment. Include explanation of arrangements with other organizations. Do not exceed 3 pages total.

Hypothesis A: We will test each hazing tool and record its effective area of coverage (measured in area and estimated using range finders), person hours to implement, and duration of hazing effectiveness (recorded as time between hazing and return of gulls). Each tool will be tested a minimum of 6 times over the course of the trial. Acclimatization by gulls to each technique will be tested by looking at changes in hazing effectiveness (changes in effective area and duration of effectiveness) over subsequent uses of the tool. Simple descriptive statistics will be used to characterize the results of the trials.

Hypothesis B:

Combining active and passive hazing tools is predicted to result in more efficient hazing, as defined by area of coverage and duration of effectiveness, than tools used by themselves. We will test at least 4 combinations of the most promising hazing tools; for example, human hazing combined with gull effigies. The results of these will be compared with the results of these tools individually and assessed for efficiency- i.e. does the extra effort to deploy the combined tools result in sufficient increase in efficacy to justify the extra effort.

Hypothesis C: Drones or UAVs will be fitted with cameras and other equipment and used to monitor selected areas of the islands, especially those that cannot be easily viewed from land-based locations. A cost-benefit analysis will be done to compare the effectiveness of UAVs, helicopters and field personnel for monitoring effectiveness of hazing techniques. As this trial is designed to assist with planning an island-wide hazing effort as part of a proposed house mouse eradication effort, we will also assess which of these techniques is most efficient at quickly identifying areas on the South Farallon Islands where gulls are present, and thus require hazing efforts.

Detailed Methods by Hazing Technique:

1. Lasers: Two different handheld lasers could be used during the course of the trial: red or green Avian Dissuader® (50mW) and handheld green laser pointer (5mW). These lasers will likely be used during pre-dawn hours (0530 - 0700 h) to haze gulls already settled on the island. The use of lasers is considered one of the more potentially effective hazing methods as it can be done at a distance, is very effective on birds at night, and does not appear to affect pinnipeds. Lasers will be used as much as possible; however, they are only effective at night.
2. Spotlight: Spotlights (10 million candlepower) could be used during pre-dawn hours (0530 - 0700 h) to haze gulls already settled on the island. The spotlight may also be tested to haze gulls intermittently settling on ledges. Two short nighttime (2000 - 2300 h) sweeps by gull roosting areas may be attempted to haze any gulls that might have settled back on the island during the course of the evening.

3. Biosonics: Up to three Bird-Guard broadcasting units (bird distress calls) could be used to deter gulls from alighting on the island, as well as encourage them to flee if they are already present. Speakers will be placed in accessible locations. Additionally, up to three Bird Gard® SUPER PRO systems could be used to cover problem gull areas on each island. A number of electronic chips with both gull distress and predator calls could be used.
4. Pyrotechnics: Bird bombs, CAPA charges, screamers, and screamer-bangers could be used to deter gulls during daylight hours.
5. Zon gun: A Zon gun air cannon will be used to deter problem birds. This involves a propane canister which charges a cylinder to produce a loud sound periodically.
6. Helicopter: A helicopter may be used during the trial to haze gulls in remote portions of the islands. Additional operational purposes include:
 - a) Perimeter monitoring flights around the islands to determine the location and numbers of gulls and pinnipeds in remote areas that cannot be viewed from Southeast Farallon Island observation points;
 - b) Moving and deploying personnel and equipment to and from inaccessible areas; and
 - c) Conducting radio-telemetry flights to examine movement patterns of gulls, as well as hazing efficacy.
7. Human movements: Accessing areas on remote West End Island to investigate possible gull roosting areas, haze gulls, and monitor pinniped responses to hazing activities. Up to five researchers and hazers may be needed to conduct the trial.
8. Kites and radio-controlled aircraft: The use of predator kites (such as Eagle or Helikites) or radio-controlled aircraft may be effective in hazing gulls. Several kites/aircraft may be used to assess their potential in windy and windless settings.
9. Mylar tape: Bamboo poles measuring approximately two meters high with 1 meter lengths of mylar tape tied to their tops could be placed in areas popularly used by gulls. Strips of mylar measuring 1-1.5 meters could be tied to two pieces of monofilament strung between bamboo poles, with the distance between the monofilaments being approximately four meters.
10. Trained dogs: Well-trained herding dogs (e.g., border collies) have been utilized to haze birds in certain areas and can cover a large amount of terrain over a long period of time with little impact on the environment. Any dogs used for this purpose would have the necessary immunizations and certificates to ensure that no diseases are transmitted between dogs and pinnipeds, and dogs would be controlled so that no pinnipeds or other non-target wildlife are harassed.

We do not expect one hazing technique to be effective for all birds in all conditions. Multiple techniques must be tested and their relative efficacy scored in different conditions. To track trial results against our expectations we have listed all hazing techniques proposed for this trial and categorized them as low, medium and high for predicted efficacy (area and duration) and cost (Table 1). We have also categorized them based on ambient conditions (day, night, limited visibility/fog, and high winds) to identify which techniques can be used in various conditions.

As part of the Farallon Island house mouse eradication planning project, this project leverages significant additional resources by utilizing in-kind support of resources and facilities from several organizations:

- Funding from the California Coastal Restoration fund is funding a portion of this project – see Supplemental Funds form
- USFWS Refuge and PRBO housing and office facilities on Southeast Farallon Island
- USFWS boat and on-island communications for logistical support
- USFWS staff for assistance and support
- USGS UAVs pilots, and the use of unmanned aerial vehicles
- **Two** Biosonics (digital bird repelling devices) from BirdGard, LLC
- Additional hazing equipment may be available by loan from OSPR

USFWS-Refuges: USFWS is a collaborator on this project and their assistance is critical to project success. The value of the in-kind project support by USFWS-Refuges is estimated at **\$10,000** and includes: staff time for planning, project review, field work, and report writing/review; and housing facilities on the island. The USFWS will review all proposed research and management activities, review the project design and methods, assist in collecting the data in the field, and will act as the lead agency in determining how the study is implemented. The USFWS will also provide review and edits to summary reports. The USFWS will provide the use of their boat for transferring personnel and equipment between the charter vessel and the island as well as to access remote portions of the islands.

PRBO Conservation Science: PRBO conducts most field related biological research and logistical support on the Farallones for the USFWS. They provide the majority of the staff on the island, and are key collaborators on this project. In addition to on-island field staffing, PRBO with the support of USFWS will provide in-kind project support including: equipment, field survey supplies, biological expertise, and statistical advice. PRBO's assistance will be essential to designing and implementing the monitoring/hazing trial, including mapping and identification of wildlife species, recording the effects of the hazing efforts on wildlife species, and guiding when and where various hazing techniques are used. Their role in the project also includes...**XXX** and their contribution to the project is valued at \$xxx.

USGS: USGS will provide guidance in project design, the use of the UAVs, cameras, software, **and** other equipment, as well as trained personnel (pilots) to oversee the operation of the UAV monitoring activities. Their support has an in-kind value of approximately **\$XXX**. We will be relying upon the use of at least two of USGS UAVs and flying expertise for two weeks. The involvement of the UAV and the Unmanned Aerial Services (UAS) program is critical to the success of this innovative aspect of the monitoring study.

USDA Wildlife Services: The USDA-APHIS Wildlife Services will be involved in the planning, design review, and implementation of portions of the study.

CDFG-OSPR (Oil Spill Prevention and Response) OSPR provided bird hazing equipment to IC for the pilot hazing trial conducted on the Farallones in 2011 and there is a possibility they may loan specialized hazing equipment to IC for this trial as well. However, this is currently unconfirmed.

OWCN or IWS: Winston Vickers', with XXX, expertise will be critical to project success. His role will include

Proposed Timeline

This project requires planning in advance of the field trials, which is underway. The timeline, Table 2, shows all activities to be conducted under this proposal.

Table 2. Proposed timeline

Activity	2012			2013						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Conduct planning for field trials	X	X								
Conduct field trials			X	X						
Analyze field trial data				X	X	X				
Write report based on data analysis							X	X	X	

Significance to Oiled Wildlife Capture and Care

Describe how the project pertains to the goals of the OWCN as described in the Proposal Guidelines. If the project is not taking place in California, describe how the project has implications for understanding or improving oiled wildlife and/or ecosystem health in this region. Do not exceed 2 pages.

Improve Animal Care - Determine and test methods for mitigating the effects of oil on wildlife

Oil spills pose significant risk to marine birds and an effective method to reduce this risk is keeping birds from coming into contact with the oil. Hazing is a proven tool (Gorenzel and Salmon 2008) to keep birds away from oil spills. However, birds can become accustomed to hazing techniques over time and therefore hazing can become less effective. Hazing is also most effective at moving birds short distances and over relatively small areas (Cook et al. 2008). Developing techniques that will haze large numbers of birds over large areas and during extended time periods will greatly improve the capacity of oil spill response teams to protect wildlife. We propose to test techniques on the Farallon Islands with a goal of evaluating hazing tools with a broad application. By conducting testing on the Farallon Islands we also will be evaluating methods specific to these islands, which support the largest breeding colony of marine birds in the contiguous U.S., including the world's largest breeding colonies of Western Gulls, Ashy Storm-Petrels, and Brandt's Cormorants. In the event of a spill threatening the Farallon Islands or other similar locations, this study could prove valuable when developing a response plan.

The proposed project is part of a restoration project to offset bird mortalities associated with the Luckenbach oil spill. The eradication of the invasive house mouse from the Farallon Islands is being proposed to compensate for Ashy Storm-Petrel and other *Procellariiformes* seabird mortality from the spill. Additional benefits will be realized for other seabird species as well as the entire Farallon Islands ecosystem. The proposed hazing trial is designed to help develop mitigation strategies for several proposed action alternatives to reduce the risk of western gulls and other species (primarily other gulls and shorebirds) coming into contact with rodenticide. The same methods to haze western gulls and other species would be effective during an oil spill response. Furthermore, as this project is part of a larger restoration effort, OWCN's investment will be significantly leveraged. We have received funds

from the Coastal California Restoration Fund to support a portion of this project. If the proposed mouse eradication is implemented with hazing as mitigation, the hazing results will be available to OWCN.

Literature Cited

Baxter, A. 2007. Laser dispersal of gulls from reservoirs near airports. Bird Strike Committee USA/Canada Proceedings, 9th Annual Meeting, Kingston, ON.

Carter, N. 1999. The Use of Border Collies in Avian and Wildlife Control Programs. Pages 265-282 *in* Proceedings of the International Seminar on Flight Safety and Birds in the Middle East. International Center for the Study of Bird Migration.

Carter, N. 2000. Analysis of the Use of Radio-Controlled Models in Bird Dispersal. Bird Strike Committee USA/Canada, 2nd Annual Meeting, Minneapolis, MN.

Castelli, P. and S. Sleggs. 2000. Efficacy of border collies to control nuisance Canada Geese. Wildlife Society Bulletin 28:385-392.

Cook, A., S. Rushton, J. Allan, and A. Baxter. 2008. An Evaluation of Techniques to Control Problem Bird Species on Landfill Sites. Environmental Management 41:834-843.

Gilsdorf, J., S. Hyngstrom, and K. VerCauteren. 2002. Use of frightening devices in wildlife damage management. Integrated Pest Management Reviews 7:29-45.

Gorenzel, W. and T. Salmon. 2008. Bird Hazing Manual Techniques and Strategies for Dispersing Birds from Spill Sites. University of California, Davis, CA.

Appendices - Permits

Permit pending NMFS request for an incidental harassment authorization (IHA) for marine mammals.
FAA -COA permission pending

- Incidental harassment authorizations for marine mammals
- FAA cooperative agreement needed for the use of UAV's.