



National Fish and Wildlife Foundation

Business Plan for Pacific Seabirds (Update)

September 2016

Purpose of a Business Plan

The purpose of a NFWF business plan is to provide a detailed blueprint of the strategies and resources required to achieve the desired conservation outcomes. The strategies discussed in this plan do not represent solely the Foundation's view of the actions necessary to achieve the identified conservation goals, but instead reflect the majority view of the many federal, state, academic, and organizational experts that were consulted during plan development. This plan is not meant to duplicate ongoing work but rather to invest in areas where gaps might exist so as to support the efforts of the larger conservation community.

Acknowledgements

We thank everyone who contributed to this business plan. We are especially grateful to the seabird experts, funding partners, and working group teams who took the time to develop, contribute, and review material. We acknowledge the contributions of Dantzker Consulting, Advanced Conservation Strategies, and Clarus Research for their evaluation of the Pacific Seabird Program and recommendations for continued implementation of this program. We also wish to acknowledge the valuable input resulting from discussions and written material provided by implementation and funding partners including (but not limited to): The American Bird Conservancy, BirdLife International, The David and Lucille Packard Foundation, The Farallon Institute, Island Conservation, the National Audubon Society, National Park Service, National Oceanographic and Atmospheric Administration, Oikonos, University of California Santa Cruz Coastal Conservation Action Lab, The University of Washington, The U.S. Fish and Wildlife Service, The U.S. Forest Service, and the U.S. Geological Survey.

About NFWF

The National Fish and Wildlife Foundation protects and restores our nation's wildlife and habitats. Chartered by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private contributions. NFWF works with government, nonprofit and corporate partners to find solutions for the most complex conservation challenges. Over the last three decades, NFWF has funded more than 4,000 organizations and committed more than \$2.9 billion to conservation projects. Learn more at www.nfwf.org.

Cover photo credit: Laysan Albatross, Guadalupe Island, Mexico: Grupo de Ecología y Conservación de Islas, A.C.

Executive Summary

The National Fish and Wildlife Foundation's Pacific Seabird Program will benefit the conservation of 9 focal seabird species, and will also improve habitat conditions for more than 70 additional seabird species. This aggressive investment in seabirds is already leveraging significant new funding, partnerships and capacity for seabird conservation in the Pacific.

Collectively between NFWF and partners, a total investment of \$50 million over the next 6 years will improve the conservation of seabirds and other endemic and critically endangered island plants and animals. Key actions identified in this business plan will restore focal seabird populations by reducing threats to island breeding colonies and for birds at sea. This plan expands upon the initial accomplishments and direction of the Foundation's existing Pacific Seabird Program and will focus on four geographic locations in the Pacific: Alaska, California Current, Chilean Islands and Hawaiian Islands. In addition, limited investments will continue on United States lands and territories in the Western/Central Pacific to increase much-needed understanding of threats and seabird resources.

The strategies focus on mitigating impacts to the most imperiled species (e.g., seabird species protected under U.S. Endangered Species Act, or listed as vulnerable, endangered or critically endangered under the International Union for the Conservation of Nature's [IUCN] Red List of Threatened Animals) and island systems supporting unique suites of declining seabirds and/or that are of importance to regional seabird populations.

The Pacific Seabird Program will emphasize five overarching strategies to address major threats to seabirds in the Pacific:

- **Management of non-native, invasive animals.** Introduced animals alter fragile island ecosystems through direct predation on seabirds and by destruction of breeding habitats. *PRIMARY ACTION:* Remove invasive animals from smaller islands; erect fencing to protect breeding seabirds and habitats on larger islands.
- **Restoration.** Invasive plants degrade nesting habitat, sea level rise threatens low lying colonies and human actions can impact survival and reproduction of seabirds. *PRIMARY ACTIONS:* Enhance degraded habitat, support translocation and social attraction efforts to increase population resilience, and ensure sustainability of investments through support of biosecurity planning and by investing in community engagement and outreach.
- **Reduce seabird by-catch.** Seabird by-catch by fisheries is a global problem, killing hundreds of thousands of seabirds annually. *PRIMARY ACTION:* Support innovation, outreach, training, and research for the development and adoption of best practices and effective mitigation measures in fisheries that inadvertently kill seabirds.
- **Protect seabird prey base.** Seabirds are dependent on abundant and available high quality prey. Loss of prey can have catastrophic effects on breeding success and survival. *PRIMARY ACTION:* Support development of science that seeks to integrate seabirds, as predators, into multi-species fisheries management planning.

- **Fill information gaps/ Monitoring/ Assessment.** The wide-ranging, pelagic nature of seabirds is a challenge to understanding and addressing conservation needs. *PRIMARY ACTION:* NFWF will invest in research, monitoring and assessment actions to improve the effectiveness of species conservation and the delivery and reporting of conservation actions over the life of this business plan.

Table 1. Priority seabirds and the primary strategies that will be used to deliver conservation outcomes for each.

<i>Species</i>	<i>Conservation Strategies</i>				
	<i>Invasive Animals</i>	<i>Restoration</i>	<i>Reduce By-catch</i>	<i>Protect seabird forage</i>	<i>Fill Information Gaps</i>
<i>Aleutian Tern</i>					✓
<i>Ashy storm-petrel</i>	✓	✓		✓	✓
<i>Black-footed Albatross</i>	✓	✓	✓	✓	✓
<i>Guadalupe Murrelet</i>	✓				✓
<i>Hawaiian Petrel</i>	✓	✓			✓
<i>Laysan Albatross</i>	✓	✓	✓	✓	✓
<i>Newell's Shearwater</i>	✓	✓			✓
<i>Pink-footed Shearwater</i>	✓	✓	✓	✓	✓
<i>Townsend's Shearwater</i>	✓				✓

The strategies proposed in this business plan were derived from existing conservation plans and input from seabird experts. The recommended strategies and actions are meant to supplement and fill gaps in current conservation efforts. The program will support actions that will result in meaningful and measureable outcomes, including both direct habitat and species management actions, as well as research that inform future conservation action. Overall, the anticipated outcomes include: the removal of non-native invasive mammal populations from 5 islands; enclosing more than 200 acres of seabird breeding habitat with fencing; restoration of more than 1,800 acres of seabird breeding habitat; establishment of 5 new colonies for 4 sea-level rise vulnerable seabird species; development of mitigation techniques for 2 fisheries with documented seabird bycatch; improved knowledge of predator prey interactions and forage species in the California Current and Gulf of Alaska; and completion of more than a dozen research projects to benefit seabird conservation.

Pacific Seabird Program Background

The Seabird Keystone Initiative was one of more than a dozen initiatives approved for implementation by the NFWF Board of Directors in 2009. The original Seabird Keystone initiative business plan identified eight species across five main geographies. In 2011, NFWF made a major, expanded commitment to the Pacific portion of the Foundation's seabird initiative which became the Pacific Seabird Program. The business plan for the Pacific Seabird Program was developed in 2011/12; the \$20M program was established with 5-years of funding invested over 6 years.

The goals of the Pacific Seabird Program were to improve the survival and reproduction for ten focal species across four geographic regions. The business plan identified six primary strategies for mitigating threats to seabirds during the breeding and non-breeding period. This full life cycle approach was expected to result in measurable gains for priority populations. Expected outcomes and outputs from 2011-2016 investments include:

1. Focal species with increased or expected increases in breeding success: **6**
2. Focal species with increased or expected increases in populations: **7**
3. # islands free of invasive mammals: **7 (totaling 48,500 acres)**
4. # of predator/mammal exclusion fences constructed: **7 (totaling 2,900 acres)**
5. Total acres of breeding habitat free of invasive plants: **1,100**
6. # of fisheries with reductions in seabird bycatch : **5**

In 2014, a 3rd party evaluation of the program was contracted to assess programmatic "architecture" and implementation progress. The final evaluation report indicated that the seabird program 1) is on-track to achieve its goals, 2) is expected to produce high conservation returns with manageable risk, 3) is having a significant influence on seabird conservation, 4) is providing significant leveraging capacity, and 5) the diverse portfolio of strategies is one of its greatest strengths. Key recommendations from the evaluation were:

1. Continue to facilitate stakeholder engagement and strengthen partnerships
2. Expand leverage of PSP investments by partnering with other funders and facilitating connections among grantees
3. Maintain core strategies, geographies, and species and continue support for several ongoing, incomplete conservation actions.

The following business plan provides a framework for the continuation of this landmark program with a renewed 5 year/\$25M investment. The business plan includes species and strategy goals that will be reached at the conclusion of this program, in 2021.

Conservation Need

Seabirds represent a diverse group of birds whose life history cycles are intricately linked to marine and coastal resources. Seabirds are characterized by delayed maturity (often 3–8 years before attempting to breed), low reproductive output (1–2 eggs), high parental care (young are dependent upon parents for 3–12 months), and high adult survival. Seabirds forage at sea, often far from breeding colonies; disperse over vast distances; and are both colonial and solitary breeders. The overlap of seabirds and humans on oceanic islands and in the marine environment has driven many species to the brink of extinction. Consequently, a major challenge to effective seabird conservation is to mitigate human-induced threats at multiple temporal and spatial scales; in other words, to protect and restore habitats utilized by seabirds throughout the entire life cycle (on both land and at sea). Consider the following facts:

- 97 of 346 seabird species (28%) are globally threatened; seabirds are more threatened than all other bird groups of similar size (figure 1 see chart a), including for example, parrots (374 species; 26% imperiled) and doves (318 species; 19% imperiled).¹
- Overall, pelagic seabirds are more threatened than coastal species (figure 1 see chart b).
- 75% of threatened seabirds are at risk due to invasive animals on breeding islands; 41% are threatened by fisheries bycatch; 27% by human disturbance; and 14% are threatened by habitat loss (note: double-counting occurs because species often face multiple threats).

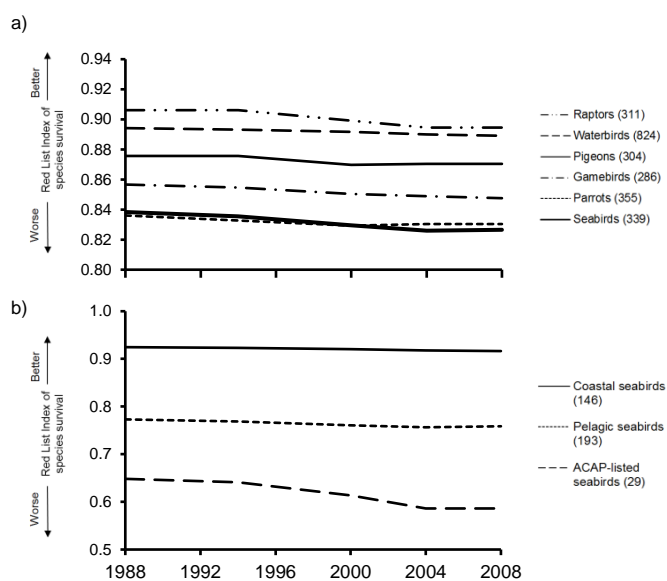


Figure 1: The top chart a) shows the extinction risk for seabirds relative to other bird taxonomic groups; chart b) shows the relative extinction risk between three sub-groups of the seabird "family". A Red List value of 1 equates to all species being listed as least concern while a value of 0 indicates extinction. The value is calculated from the number of species in each Red List category that change status between assessments.

More than 85 seabird species are regularly found in the eastern Pacific² and more than one-quarter face severe threats; 13 are listed on the IUCN "Red List" as Critically Endangered, Endangered, or Vulnerable. Nationally, five species are listed under the Endangered Species Act, 27 are listed as "Red or Yellow" on the 2014 State of the birds report³ and 35 are listed as species that are "highly imperiled or high concern" in the Waterbird Conservation Plan for the Americas⁴.

¹ Croxall, J.P., S.H.M. Butchart, B. Lascelles, A.J. Sattersfield, B. Sullivan, A. Symes and P. Taylor. 2012. Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International 22: 1-34.

² List collated from breeding records and pelagic reports – incidental occurrences were not included.

³ <http://abcbirds.org/wp-content/uploads/2015/06/State-of-the-Birds-2014-Watch-List.pdf>

⁴ <http://www.waterbirdconservation.org/>

Without immediate action, risk of extinction for several species is high⁵. For others, more than a century of predation by non-native invasive predators, destruction of nesting habitat, incidental capture in fisheries and human disturbance have drastically reduced populations. Climate change, including sea-level rise, is projected to have a compounding effect on several important threats, including habitat loss and change, forage distribution and abundance, invasive species and anthropogenic factors (i.e., wind energy development). The recognized long-term threats to seabirds include:

- Non-native invasive animals on breeding islands (results in diminished adult survival and reproduction)
- Degradation of nesting habitat by non-native, invasive animals and plants and including anthropogenic impacts (e.g., power line collisions and lighting).
- Incidental capture of seabirds (by-catch) in fisheries (results in diminished survival and recruitment).
- Decline of forage base for breeding and non-breeding seabirds.
- Marine pollution and marine resource development (i.e., plastic debris, oil/gas exploration, shipping, wind energy).

Mammals are typically brought to remote islands by humans either accidentally as stowaways on ships, or deliberately for hunting, ranching, or biological control of previously introduced species (Harris 2009, Hilton and Cuthbert 2010). Direct effects include predation and disruption of breeding activities. Indirect effects include habitat transformation due to overgrazing and major shifts in nutrient cycling due to a halting of nutrient input from seabird guano (Croll *et al.* 2005). Despite accelerated efforts to remove introduced mammals from remote islands, invasive, non-native mammals are still present on roughly 80% of islands worldwide (Aguirre-Munoz *et al.* 2008).

The incidental capture of seabirds by fisheries is a global issue. For example, seabird by-catch rates in longline fisheries may exceed 160,000 individuals/year worldwide (Anderson *et al.* 2011). Further, in Pacific fisheries, a minimum of 25,000 seabirds are killed annually, with ~60% killed in pelagic longline tuna fleets (Anderson *et al.* 2011). Several NFWF focal species including Black-footed Albatross, Laysan Albatross and Pink-footed Shearwater are vulnerable to bycatch. Reviews of seabird by-catch have concluded that reported levels are unsustainable due to an overall reduction in adult survival (Tuck *et al.* 2001, Rivalan *et al.* 2010). In recent years, effective response measures have emerged from the increasing variety and efficacy of technical measures designed to mitigate, and even eliminate, incidental catch of seabirds (Birdlife International 2009).

Overall, the challenge to our understanding of seabirds is that the vast majority of data for seabirds are derived from breeding colony studies (where most birds spend less than half of their lives). Many species are well studied and the threats and limiting factors to breeding are largely understood. However, to achieve effective seabird conservation, actions are necessary that integrate the needs of species at the breeding colony level and across open ocean habitats. For some species, an essential first step to conservation is to understand the suite of threats, to evaluate the population constraints, and to learn more about movements and distribution of individuals throughout the annual lifecycle.

⁵ Ruiz, D. M., Tinker, T., Newton, K.M., Tershy, B. and D.Croll.2016. Threatened seabird mPVA Report. Unpublished Report - UCSC Coastal Conservation Action Lab.

Current Conservation Context

The recommended strategies will provide direct benefit to seabird populations and will supplement and fill important gaps in current conservation efforts. The 3rd party evaluation noted that a key strength of NFWF's approach to seabird conservation is the diverse portfolio of strategies. Specifically, NFWF's willingness to support community and organizational capacity and projects that fill scientific information gaps and address forage resources differentiates this program from other efforts focused on invasive animals and bycatch reduction. Overall, the evaluation noted that the Pacific Seabird Program is filling important funding and conservation gaps, has catalyzed new partnerships, and is providing a funding stream for project development all while remaining focused on delivering measurable outcomes for species and habitats.

As of 2011 and continuing today NFWF remains one of the two major funders of seabird conservation in the philanthropic sector (along with the David and Lucille Packard Foundation). Within this arena NFWF plays a convening and leadership role, as evidenced by a NFWF-led symposium and workshop at the 2015 World Seabird Conference focused on "outcome-based conservation". Outputs from this workshop include development of a pay for success model for increasing funding for seabird restoration and the initiation of a funders collective (8 foundations; goals include increase funding, coordination, data sharing and leverage of projects supporting conservation of seabirds).

Beyond the philanthropic sector, the seabird community is populated with extraordinary organizations that fill critical leadership roles (i.e., Agreement for the Conservation of Albatross and Petrels, BirdLife's Global Seabird Program), funding roles (i.e., the Global Environmental Facility, U.S. Fish and Wildlife Service) and demonstrate implementation competency (Island Conservation, Grupo de Ecología y Conservación de Islas). Multi-lateral efforts, such as the NAFTA Tri-lateral agreement are also important forums that continue to raise awareness about the importance of island restoration continentally. Global data sharing is resulting in new prioritization efforts to guide seabird conservation activities in the 21st century (i.e., Lewison *et al.* 2012; Dawson *et al.* 2014). Overall, the Pacific Seabird Program is playing an important role in the community, connecting science and conservation with dedicated funding focused on delivery of on-the-ground impact for species and habitats.

Conservation Outcomes

The goal of the Pacific Seabird Program is to **enhance the viability of target seabirds by increasing population size through improved survival and reproduction**. The anticipated changes in productivity and survival will result in an increase in long-term viability of populations and have the potential to improve the conservation listing status for several focal species. NFWF investments will also build resilience to the effects of climate change through short-term increases in reproduction and through translocation and social attraction. Projected outcomes for the focal species are summarized in table 2 (page 16); projected outcomes for key strategies are summarized in table 3 (page 17).

Overall, five of nine focal species are at risk of extinction in the next 100 years; strategies and actions in this plan have the potential to reduce extinction risk for these species as well as benefit five additional seabird species also at risk of extinction in the next 100 years. In addition to this species evaluation, a global prioritization of more than 1,400 islands designed to assess the impacts of invasive animals on IUCN *critically endangered* and *endangered* species (including seabirds) indicates that all but one of the eradication actions the Foundation is considering or engaged in through this plan are a global priority (rankings for three sites were in the top 10 – Gough Island, Guadalupe Island and Alejandro Selkirk Island). Kahoolawe Island in Hawaii is the only unranked site in the Foundation “list” - this is due to the lack of IUCN listed species using the island; however, long-term, Kahoolawe offers unique potential as a climate refuge for multiple endemic range restricted species in Hawaii.

Overall program investments will result in the following short and long-term gains for seabirds:

- Seabird focal species with measurable increases in breeding success (see table 2): **6**
 - Black-footed Albatross
 - Hawaiian Petrel
 - Laysan Albatross
 - Newell’s Shearwater
 - Pink-footed Shearwater
 - Townsend’s Shearwater
- Seabird focal species with measurable increases in populations: **3**
 - Black-footed Albatross (6,000 additional breeding pairs)
 - Laysan Albatross (200,000 additional breeding pairs)
 - Pink-footed Shearwater (>10% increase⁶)
- # of seabird species (4 focal) benefitting from translocation/social attraction: **6**

⁶ A 2016 census of Santa Clara yielded an 843 pair increase in PFSH or a 14% change from 2003-07 estimates – see Hodum et al. 2016. Conservation of the Pink-footed Shearwater Final Report. Planned census work on RC and Mocha is expected to demonstrate similar population level increases for the species.

Geographic Focus

The majority of program investment will be focused in four broad geographic regions (Alaska, California Current, Chilean Islands and Hawaiian Islands; figure 2) These regions were selected because they support focal species and significant concentrations of seabirds, including additional threatened and imperiled species of national interest.



Figure 2. Four major regions that will be the focus of the Pacific Seabird Program.

Implementation Plan

The Pacific Seabird Program will principally focus investments on nine focal species and five strategies to increase survival and improve reproductive success (see Appendix 1 for species/strategy table). To ensure the persistence of viable seabird populations, it is critical to take a full life cycle approach to mitigating threats during the breeding and non-breeding periods. Overall, the principal threats and types of conservation actions necessary to secure seabird populations are well understood. A programmatic conceptual model demonstrates the linkage between threats, stressors, contributing factors and viable seabird populations (see Appendix 2). Strategy level results chains for the management of non-native, invasive animals and bycatch reduction strategies (figures 3 & 4) are included in the implementation plan to highlight the relationships between threats and the sequence of strategies-to-outcomes by which we intend to reach programmatic goals. In addition to these strategies, we will also support restoration actions, biosecurity planning, and investments in organizational and community capacity to ensure that NFWF investments are resulting in sustainable gains for seabird populations. We also recognize that conservation actions and strategies will be more effective with assessment and monitoring.

Strategy 1: Management of non-native, invasive animals

Introduced and invasive animals alter fragile island ecosystems and can have a multitude of direct and indirect negative effects on seabirds (Burger and Gochfeld 1994).

1.1 Eradication of invasive animals

Removal of invasive animals typically offers a rapid and impressive return on seabird conservation investments. In more than 200 eradications of invasive predators worldwide where seabirds were the principal beneficiary, approximately 75% resulted in a rapid increase in reproductive success, survival of adults, or re-colonization by seabirds (Nogales *et al.* 2004, Howald *et al.* 2007, Jones *et al.* 2016).

NFWF will invest in the removal of non-native invasive animals (eradication and fencing) for focal species and also on islands recognized as global priority sites. NFWF will engage with key partners with a proven track record of implementing successful eradication programs. NFWF will support all phases of project development including 1) project *scoping*; 2) a *feasibility assessment*; 3) securing *partnership agreements* and developing a communication strategy including *outreach and capacity building*; 4) completion of *environmental compliance review*; 5) support for *pre-implementation ecological monitoring* and pre-implementation research including *bait trials*; 5) development of an *operational plan & fundraising strategy*; 6) project *implementation* and 7) *post-implementation monitoring* to assess success/ecological benefits (figure 3).

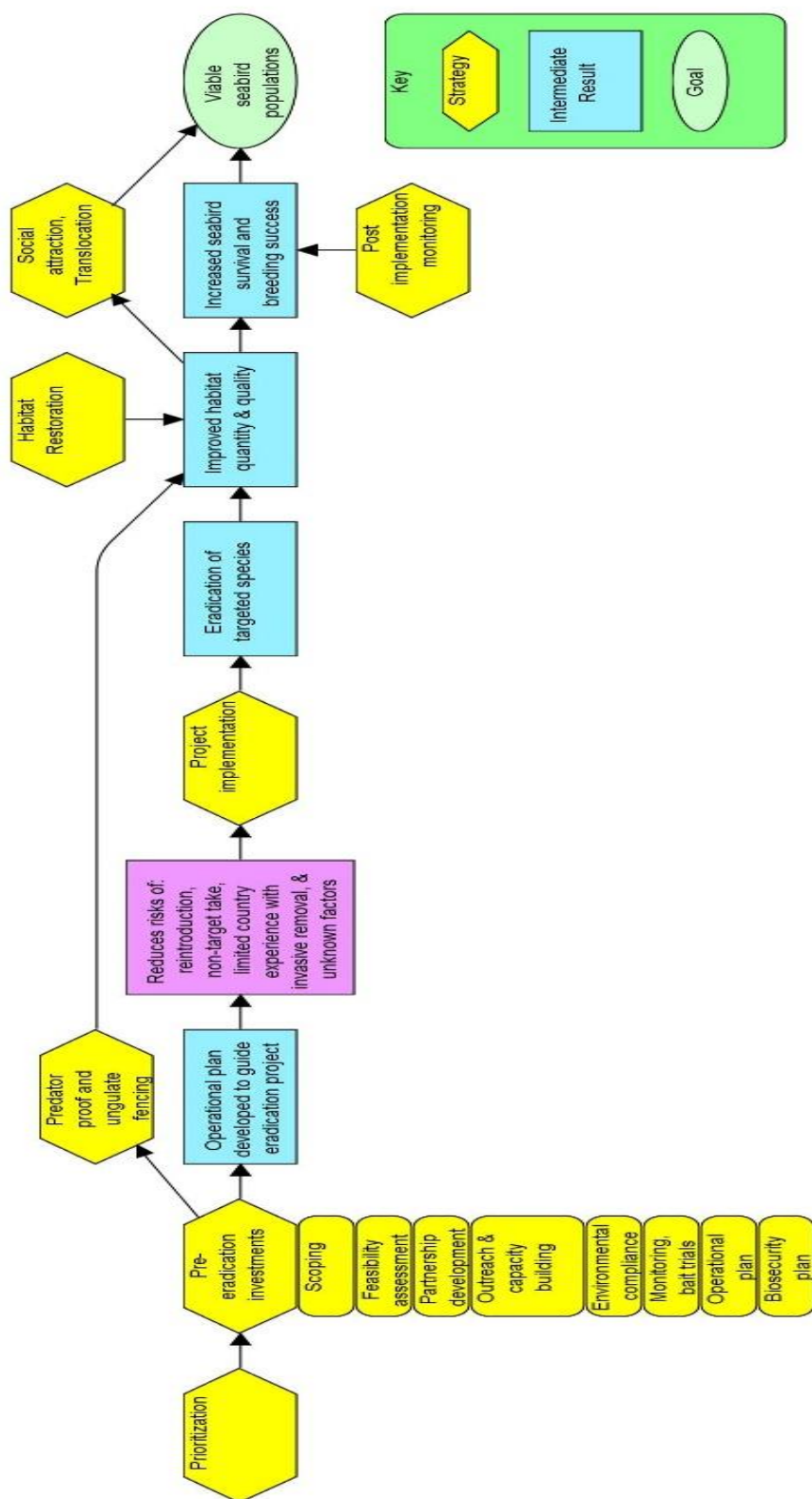


Figure 3. Results chain depicting the sequence of strategies-to-outcomes for invasive management strategies

Example invasive removal action: Eradicate cats from Guadalupe Island: On Guadalupe Island,



Laysan Albatross and 9 additional seabird species will benefit from cat eradication on Guadalupe Island.

feral cats have caused the extinction of five endemic birds and reduced the number of breeding seabirds. The eradication of feral cats is recognized as both a national and global priority. 2017 will be year one of a 4-year project to eradicate feral cats from the island. The project will consist of three phases: 1) Cat population reduction (2 years); 2) Removal of remaining cats (1 year); and 3) Post-implementation monitoring (1 year). A key aspect of this project is the development of a biosecurity strategy for the island. Overall, the removal of feral cats from Guadalupe will protect populations of 10 breeding seabirds and

increase resilience for several species by providing sea level rise safe breeding habitat for Laysan and Black-footed Albatross.

1.2 Fencing (predator proof and ungulate)

NFWF will invest in predator-proof and ungulate fencing for focal seabirds to increase in situ protection of breeding colonies when eradication and control are impractical solutions. Predator-proof fencing is a recent, proven technology developed in New Zealand. To date more than 50 fences have been constructed (Young *et al.* 2012). These fences are capable of excluding non-native animals as small as a baby mouse and are designed to prevent animals from digging under or climbing over the fence. The use of the predator-proof fencing is the best alternative in landscapes too large and complex to attempt an eradication; fences thus increase management efficiency by shifting the focus from control to local eradication. In Hawaii, the use of predator-proof fencing is especially promising because it can protect an entire ecosystem, including native vegetation, and has value in locations where birds and other native species can breed and forage free from introduced predators (Young *et al.* 2012).

Strategy 2: Restoration

NFWF will invest in restoration actions for focal seabirds that enhance degraded habitat, improve population resilience by increasing the number and distribution of colonies for focal species, and will ensure long-term sustainability of investments through support of biosecurity planning and by investing in community engagement and outreach. Restoration projects (Strategy 2) are often conducted in conjunction with or following the eradication of non-native invasive animals (Strategy 1).

2.1 Habitat restoration

Replacement of native plant communities by dense, monotypic stands of invasive species creates an acute disruption of ecosystem structure and function. For seabirds, such stands of invasive plants degrade breeding habitat and can reduce reproductive success. NFWF will support a three-tiered approach to restoring seabird habitats: (a) removal of invasive plants; (b) planting native species and, (c) implementation of biosecurity and monitoring plans to prevent re-establishment and introduction of invasive species.

2.2 Translocation/social attraction

Colony formation in seabirds is expedited by social attraction in that the presence, density, and success of breeders play a role in attraction of recruits (Kildaw *et al.* 2005). Managers have successfully used decoys, audio lures, and translocations to facilitate the establishment of colonies (Jones and Kress 2012). Translocation is an extension of husbandry and involves moving seabird chicks to new habitat where they are raised to fledging. NFWF will support establishing new colonies of focal seabirds threatened by sea level rise and in landscapes where eradication of non-native invasive mammals is not feasible and social attraction and translocation to predator-free refuges (e.g., fenced areas) is the best option for long-term protection.

2.3 Capacity building/Biosecurity planning

Building community support and local and organizational capacity is a critical conservation step for protecting seabird resources where they overlap with human communities. NFWF's strategy emphasizes support to conservation partners that have an on-the-ground presence in communities and are fostering pride and ownership of conservation actions and natural resources; community engagement activities will be supported on Isla Mocha and the Juan Fernandez Islands, Chile, Guadalupe Island, Mexico and more broadly in Hawaii. Development of biosecurity planning with local communities is one of the surest way to reduce risk of reintroduction; biosecurity planning support will be focused in Alaska, Chile, Mexico and Hawaii.

Strategy 3: Reduce seabird by-catch

The incidental capture of seabirds in fisheries is a global issue. However, quantifying the scale of the problem is often a challenge due to the lack of observers for many fleets, the sheer number of fisheries involved, the geographic scale of the fisheries, and the lack of widespread industry standards or government regulation for quantifying by-catch.

3.1 Focal species bycatch reduction

To reduce bycatch of focal seabird species NFWF will support several actions in Alaska (including the western Bering Sea), Chile and Hawaii including: 1) *assessments of seabird bycatch rates* in target fisheries; 2) *increased observer coverage in fisheries with known seabird bycatch*; 3) *outreach to fleet vessels and captains* to increase voluntary adoption of mitigation gear and 4) *implementation of proven mitigation techniques* to reduce bycatch of focal seabird species (figure 4).

3.2 BMP research/Innovation

In parallel with assessing bycatch rates, conducting outreach, and supporting use of proven technologies, NFWF will advance reductions in seabird bycatch through support of the development and testing of gear specific mitigation measures to further reduce seabird/gear interactions. Areas ripe for investment include testing of techniques and tools to reduce seabird bycatch in nets (e.g., Chilean purse seine fishery as well as testing and evaluation of new tools for longline fleets including line weighting and hook “protection” methods such as “Hookpods”). Lastly, support for market-based solutions such as marine stewardship certification, will be explored as a strategy for reducing bycatch rates in specific fisheries.

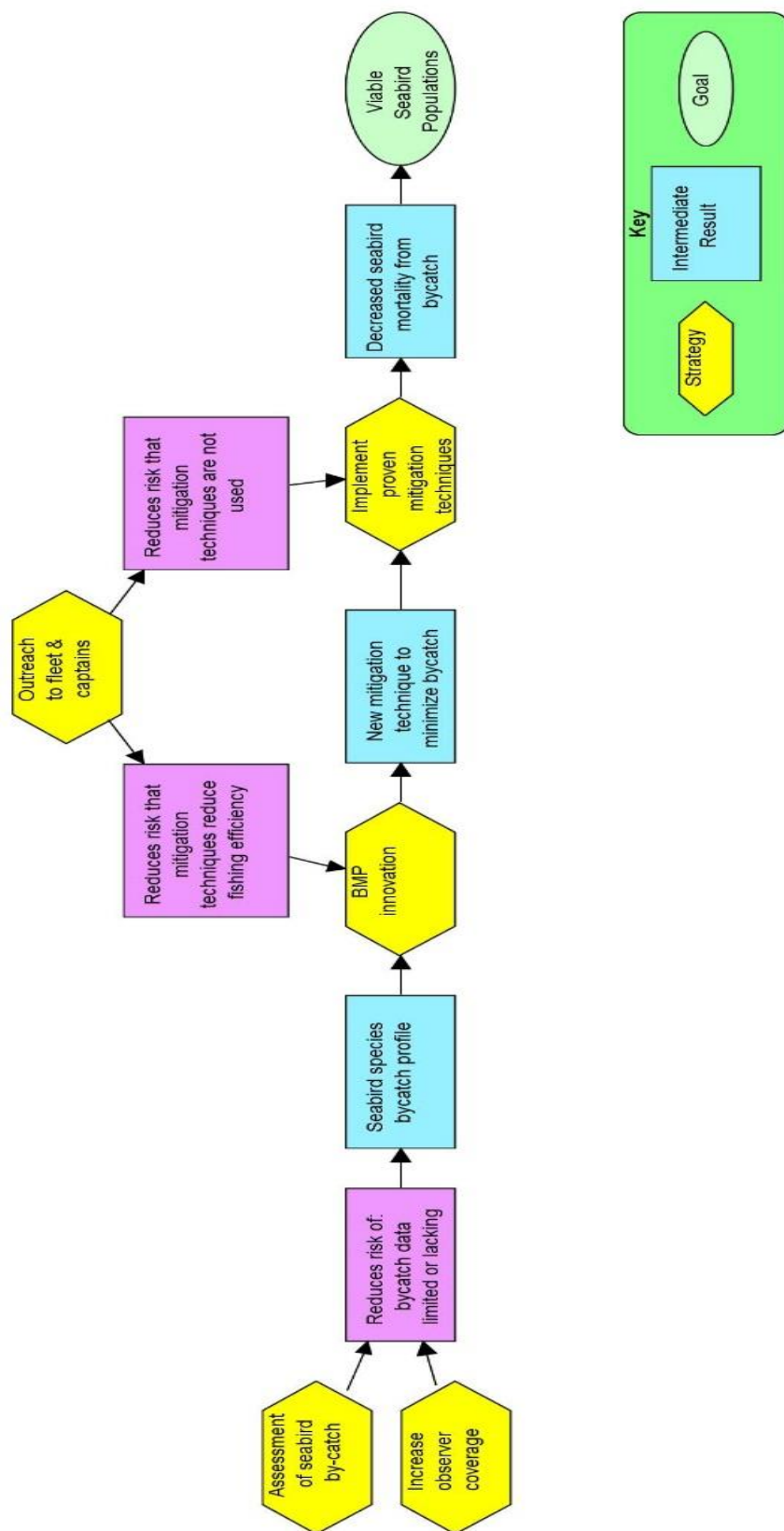


Figure 4. Results chain depicting the sequence of strategies-to-outcomes for bycatch reduction.



Pink-footed Shearwater and other seabirds interact with a purse seine net, Chile.

Example bycatch action: Pink-footed Shearwater (PFSH) bycatch/ mitigation. High by-catch rates of Pink-footed Shearwater has been documented in Chilean purse-seine fleet operating in the Humboldt Current. A modified purse seine net shows promise for reducing bycatch without impacting fishing efficiency. Next steps: Determine seabird bycatch rates; conduct testing of modified nets; conduct outreach to captains around bycatch risk and gear modifications; develop BMP use of mitigation measures for the fleet to reduce PFSH bycatch; and implement use of modified gear.

Strategy 4: Improve seabird forage management

Understanding the specific relationships between predators (seabirds) and prey, and between seabirds and fisheries associated with those prey species, are critical steps for implementation of conservation.

NFWF will invest in protecting seabird forage by generating science to describe the spatial and temporal use of forage species by seabirds. Specific activities will include: 1) cataloguing prey use; 2) identifying the spatial distribution, overlap, and timing of predators and prey; 3) identifying the minimum prey threshold required to support viable seabird populations; 4) identifying conditions that result in prey switching, and; 5) updating “fisheries-independent” measures of stock size for key forage species. These data will be compared to current stock size estimates and fisheries management to inform ecosystem level planning. The overall goal is to integrate seabird data into forage management and planning.

5: Research and monitoring

NFWF will invest in research, monitoring, and assessment actions to improve the effectiveness of species conservation, strategies and the delivery and reporting of conservation actions over the life of this business plan.

5.1 Focal species and strategy research

For several seabird species, lack of information is the primary obstacle to effective conservation; these information gaps can hinder initiation of effective and justifiable action. Species of interest (due to observed declines and/ or current listing review) for which we need additional data include Aleutian Tern, Scripps’s Murrelet and Tufted Puffin. Information gaps also exist within regions with respect to the distribution and abundance of priority species as well as for threats (e.g., unknown population impact of plastic ingestion). Thus filling specific information gaps with targeted research will allow for more effective, directed conservation actions in the future. Species-specific results chains will be developed with stakeholders to guide species-level investments.

5.2 Prioritization/ monitoring/ program assessment

To effectively implement, measure, and report project and programmatic level outcomes, dedicated resources are needed to capture project and programmatic level data. Recently completed prioritization

exercises, population viability analyses, and return on investment tables are yielding significant planning data that served as a basis for updating sections of the Pacific Seabird Program business plan (Dawson *et al.* 2014, Ruiz *et al.* 2016). New tools are also in development and are needed to further extend portfolio style planning for seabird conservation. Support for development of monitoring tools is also critical for species and locations that would be difficult to survey using traditional techniques (e.g., cryptic, nocturnal species and for remote uninhabited islands). At a key stage in the program's lifecycle, NFWF will commission a third-party evaluation to examine the factors that have facilitated and hindered successful program implementation thus informing future decision-making, and summarizing the outcomes of the program.

SBIRD

The **Strategic (Biologically Important) Response and Development (SBIRD)** strategy is a mechanism to incorporate flexibility into the Pacific Seabird Program by creating a rapid response funding tool for supporting conservation actions that align with program goals. This flexibility requires funding decisions to be made outside standard grant review using the board notification process, projects will be capped at \$100k although exceptions are possible especially for awards expiring between RFPs. Projects supported under SBIRD will be reviewed by NFWF's Senior Scientist for Bird Conservation, the Bird and Wildlife Director, the VP for Science, and others on a case-by-case basis (e.g., agency partners). Funding will not be set aside for SBIRD – project funding will come from strategy budgets.

Implementation Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could have a negative effect on a program's desired outcome. In consultation with external experts, we assessed seven risk event categories to determine the extent to which they would impede progress towards our stated business plan strategies and goals (table 2) during the next 5 years.

Table 2: Risk assessment summary

RISK CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Regulatory Risks	Low	Specific, preferred toxicants, not currently authorized for intended use may have to proceed through the environmental review and registration process, which could delay or prohibit use.	Thorough and careful project planning combined with a communication strategy will alleviate most concerns. The use of pesticides and lethal control could trigger challenges. Overall the risk is likely to result in delays and not prevent a project from proceeding.
Financial Risks	Low	Invasive animal eradication projects tend to be expensive and require sustained investment throughout all phases of a project. Match funding may be challenging to raise for some projects.	Developing financial benchmarks for complex and expensive eradication efforts will be critical for evaluating fundraising progress. Reviewing the fundraising history of applicants is an important safeguard for reducing the risk of insufficient match.
Environmental Risks	Moderate	Sea level rise, enhanced storm surges, ocean acidification, ocean warming and changing fish distributions could all be detrimental.	Short-term environmental risks are low. Over the longer term, changing oceanic conditions and climate are likely to impact some populations. Creating high island predator free colonies through social attraction and translocation is one strategy for building long-term population resilience to projected changes.
Scientific Risks	Moderate	Population size and distribution of some species is largely unknown; there is also a lack of knowledge about some potential ocean stressors, i.e. oil, plastics	The body of science that underlies this program, has a deep base. In those cases where scientific knowledge is low, the business plan outlines a plan for obtaining information prior to implementation of conservation action.
Social Risks	Moderate	Resolution of actual and/or perceived human-wildlife conflicts usually requires human behavioral change.	Social risks revolve around securing and maintaining behavioral change. Developing up-front strategies to advance local community engagement throughout all stages of a project is critical. Risk associated with human behavioral change is difficult to predict.
Economic Risks	Low	If bycatch reduction gear is perceived to be more expensive, harder to use, or impact fishing success, use will be reduced.	Tied to Social Risks above. Adoption of bycatch mitigation measures is increased through direct engagement with fishing communities. Development of mitigation using local communities that design and manufacture fishing gear for local fleets' further increases likelihood of successful use.
Institutional Risks	Low	Land owners/managers, regulating agencies, jurisdictions all may be reluctant to engage in eradication programs or restoration activities.	NFWF program managers are in part, managing risk by investing in organizations with a proven track record of success; for new partners a deeper review of a project's ability to implement and deliver outputs is conducted. Outreach and engagement are important activities for building capacity in communities without previous implementation experience.

Monitoring & Evaluating Performance

For six of nine focal species, monitoring data (primarily reproductive success and population counts) are available to assess species response and to set business plan goals. For the remaining focal species, success will be measured using alternate metrics: for the data deficient Aleutian Tern, stakeholders are challenged to implement conservation due to data gaps. Using a recently developed data synthesis, the goal of NFWF support is to fill knowledge gaps resulting in development of a conservation action plan. For Ashy Storm-petrel, a NFWF-funded prioritized conservation action plan was completed in 2016; the next step is to support high priority actions including development of a range wide index monitoring program. Lastly for the range restricted Guadalupe Murrelet, the goal is to reduce overall extinction risk by establishing an additional population on Guadalupe Island following cat eradication (currently the global population is concentrated on just three small offshore rocks).

The Foundation will support monitoring of proxy population parameters including reproductive success (also burrow occupancy and fledging success) in addition to population counts to assess species outcomes (table 3). While we ultimately expect longer-term population scale responses for several focal species, those outcomes will not be realized until after the 5-year time-frame covered by this plan.⁷ Reproductive success data expressed as the number of chicks fledged per pair provides an accurate indicator of within season breeding performance and an index of potential future recruitment class strength.⁸ Many of the species outcomes will be tracked using data from existing third-party sources. Key data sources include the following:

- **United States Fish and Wildlife Service**— annual nest counts for Black-footed and Laysan albatross at Midway Atoll National Wildlife Refuge.
- **Hawaii Department of Land and Natural Resources** - annual nest counts for Black-footed and Laysan Albatross at Kure Atoll.
- **Grupo de Ecología y Conservación de Islas (GECI)** – annual nest counts for Laysan Albatross on Guadalupe Island.
- **Kauai Endangered Seabird Recovery Project** – annual reproductive success monitoring for Hawaiian Petrel and Newell’s Shearwater.
- **Oikonos** – annual reproductive success monitoring, burrow counts and burrow occupancy data for Pink-footed Shearwater. Periodic population estimates are also available.
- **American Bird conservancy/GECI** – Townsend’s Shearwater data call rate, search efficiency and reproductive success data.

In addition, the Foundation will support collection of data reporting on intermediate outcomes of threat reduction activities (table 4). At the finest scale, individual projects will be required to develop metrics and monitoring plans to assess implementation of the work and whether the goals were achieved.

⁷ Collecting species-specific population data for focal seabirds in a 5-year business plan (investment strategy) is not feasible due to life history constraints (delayed age of first breeding) and lag-times between treatment and response for restoration activities.

⁸While PVA (population viability analysis) sensitivity analyses show that adult and juvenile survival rates are the most sensitive parameters influencing seabird population demographics (Cuthbert et al 2001), collecting these data requires long-term mark-recapture studies.

Monitoring will be conducted by grantees and where appropriate will follow published best practice guidelines or standardized methods. Contracting to independent (3rd party) monitoring programs or review of monitoring plans is an option for specific projects; in particular, independent verification of absence confirmation (following an invasive animal eradication) and ecosystem response to invasive removal are potentially important audit functions for large, expensive eradication projects.

Table 3. Core metrics for measuring progress on program focal species.

Category	Metrics	Baseline	2021 Goal	Data source(s)
Aleutian Tern	<i># of conservation action plans developed</i>	0	1	Technical committee
Ashy Storm-petrel	<i># of conservation actions completed</i> ⁹	0	4	projects
Black-footed Albatross	<i># of new populations established</i>	0	2	projects
	<i>Average # breeding pairs</i>	21,800	30,500 ¹⁰	USFWS/ Midway
		2,400	2,900	DLNR/ Kure
Guadalupe Murrelet	<i># of new populations established</i>	0	1	GECI/ Guadalupe
Hawaiian Petrel	<i>Average # chicks produced per pair</i> ¹¹	0.35	0.6	KESRP
	<i># of new populations established</i>	0	3	projects
Laysan Albatross	<i># of new populations established</i>	0	2	projects
	<i>Average # breeding pairs</i>	408,000	640,000	USFWS
		20,200	25,900	DLNR/ Kure
		400	600 ¹²	GECI/Guadalupe
Newell's Shearwater	<i>Average # chicks produced per pair</i>	0.5	0.7	KESRP
	<i># of new populations established</i>	0	2	projects
Pink-footed Shearwater	<i>Average % burrows occupied</i>	0.65	0.7	Oikonos
	<i>Average # chicks produced per pair</i>	0.72 ¹³	0.72	Oikonos
Townsend's Shearwater	<i>% of nesting area surveyed</i>	5%	100%	ABC/GECI
	<i># calls per minute</i>	<2.0	>2.0	ABC/GECI
	<i># fledglings per nest</i>	0.2 to 0.4	0.5 to 0.7	ABC/GECI

⁹ From Ashy Storm-petrel conservation Action Plan

¹⁰ Analyses by Finklestein and Bakker (easy grant #40744) suggest a 400,000pr and 20,000pr increase for Laysan and Black-footed Albatross at Midway and Kure Atoll 25 years after initiation of habitat restoration.

¹¹ Baseline and goal information summarized from Greismer and Holmes 2011 and Raine et al 2016a +b.

¹² Analysis by GECI predicts an increase in the number of albatross on Guadalupe Island in response to cat eradication; in the absence of control, the albatross population is predicted to decline to 49 individuals in 2021.

¹³ The initial baseline reproductive success for PFSH was set in 2011 at 0.6 chicks/pair. Conservation action and success has increased the average annual rate to 0.72; the revised goal is to maintain a 5-year breeding success rate of at least 0.72, PVA modeling suggests that extinction probability for the species (over the next 100 years) is low based on current demographic parameters.

Table 4. Core metrics for measuring progress on program strategies.

Category	Sub-Strategy	Metrics	Baseline	2021 Goal	Data source(s)
Management of non-native, invasive animals	Eradication of invasive animals	# of non-native mammal populations eradicated	0	7	projects
		# of acres under improved management	0	91,000	projects
	Fencing (predator proof/ungulate)	# of fences completed protecting focal seabird species	0	5	projects
Restoration	Habitat restoration	# of acres of seabird breeding habitat restored	0	1,800	projects
	Translocation/social attraction	# of translocation and social attraction projects initiated for focal and non-focal seabirds	0	8	projects
	Capacity building /Biosecurity planning	# of people with improved knowledge of seabird conservation	0	TBD	projects
		# of biosecurity plans developed	0	4	projects
Reduce seabird bycatch	Focal species bycatch reduction	# of fisheries with improved seabird bycatch knowledge/protection	0	3	projects
	Best management practice research/Innovation	# of research projects completed	0	4	projects
Improve seabird forage management		# of research projects completed contributing to improved management	0	8	projects
Research and Monitoring	Focal species and strategy research	# of research projects completed resulting in improved species conservation	0	8	projects
	Prioritization / Monitoring/ Assessment	# of prioritization efforts, monitoring plans and program assessments completed	0	4	projects

Budget

The following budget shows (table 5) the estimated costs to implement the business plan activities. This budget assumes that current activities funded by others will, at a minimum, continue.

Table 5. Pacific Seabird Program 2016-2021 budget.

BUDGET CATEGORY	YEARS 6-10	TOTAL
Strategy 1: Management of non-native, invasive animals		\$13.5M
<i>1.1 Eradication of invasive animals</i>	\$10M	
<i>1.2 Fencing (predator proof/ungulate)</i>	\$3.5M	
Strategy 2: Restoration		\$5.5M
<i>2.1 Habitat restoration</i>	\$1.5M	
<i>2.2 Translocation/social attraction</i>	\$2.5M	
<i>2.3 Capacity building /Biosecurity planning</i>	\$1.5M	
Strategy 3: Reduce seabird bycatch		\$2M
<i>3.1 Focal species bycatch reduction</i>	\$1.5M	
<i>3.2 Best management practice research/Innovation</i>	\$0.5M	
Strategy 4: Protect seabird prey base		\$1.0M
Strategy 5: Fill information Gaps/Monitoring/Assessment		\$3.0M
<i>5.1 Focal species and strategy research</i>	\$2.0M	
<i>5.2 Prioritization / Monitoring/ Assessment</i>	\$1.0M	
TOTAL BUDGET		\$25.0M

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