

National Fish and Wildlife Foundation
Keystone Initiative - Birds - Pacific Seabirds - Fall 2015 - Submit Interim Programmatic Report (New Metrics)
Grantee Organization: Point Reyes Bird Observatory dba Point Blue Conservation Science
Project Title: Farallon Ashy Storm-Petrel Population Status Evaluation (CA)
Submitted by Russell Bradley on 11/02/2016

Easygrants ID: 49871
NFWF Project ID: 0101.15.049871

Project Period	11/02/2015 - 12/31/2017
Project Location Description (from Proposal)	Farallon National Wildlife Refuge, California
Project Summary (from Proposal)	Investigate the population impacts of a drought-caused reduction in burrowing owl abundance in 2015 on Ashy storm-petrel (ASSP) survival and breeding success. Project will evaluate whether recent declines for ASSP have continued, will help strengthen overall support for management actions to benefit ASSP, and has the potential to provide strong scientific support for eradicating mice to reduce burrowing owls and thus increase ASSP survival and breeding success.
Project Status and Accomplishments	In year one of our project, Farallon Ashy Storm-Petrel Population Status Evaluation, Point Blue analyzed the survival rates of ashy storm-petrels in recent years; estimated the total size of the Farallon ashy storm-petrel population; and determined that after a marked recent drop in survival and population size of ashy storm-petrels (observed from about 2007 through 2011), survival rates are no longer declining and population size has stabilized. This is consistent with an observed reduction in overwinter attendance on the Farallones by burrowing owls. These results provide support for proceeding with efforts to reduce burrowing owls on the Farallon National Wildlife Refuge as a means to aid a species of conservation concern and facilitate recovery in the future.

Activities and Outcomes

Funding Strategy	Planning, Research, Monitoring
Activity / Outcome	Pac Seabirds - Research - # studies used to inform mgmt
Required	Recommended
Description	Enter the number of studies completed whose findings are used to adapt management/ inform mgmt decisions

# studies used to inform mgmt - Current	3.00
# studies used to inform mgmt - Grant Completion	6.00

Notes	<p>a) Strengthen scientific support for management actions to benefit ashy storm-petrels. Through validation of our previous modelling efforts, this project could show strong scientific support for the quantified population level impacts to ashy storm-petrels by reducing burrowing owl numbers through mouse eradication. We have the unique datasets, expertise, and experience to achieve this outcome, which would provide insight on potential benefits to Farallon ashy-storm-petrels through a “natural experiment” in owl reduction.</p> <p>b) Provide the scientific basis, in terms of estimated colony population status, for listing or not listing the ashy storm-petrel under the Endangered Species Act. Evaluation of current demographic trends for the Farallon storm-petrel population will determine if recent declines have continued. These analyses could provide further solid science basis to conservation action. We have the unique datasets, expertise, and experience to achieve this outcome, which would be critical in any consideration of listing for the species.</p> <p>c) Increase quality of long-term monitoring data. Utilize high quality reproductive success data to obtain a better understanding of how ashy storm-petrel populations can be expected to behave in the future, when coupled with the better information on survival and trends in b) and also in a), above. Increased use of high quality cameras and pilot studies using PIT tags will allow us to monitor a minimum of 50 active storm-petrel breeding sites annually for many years to come, ensuring collection of high quality reproductive success data for the Farallon ashy storm-petrel population. We have the unique experience and expertise to achieve this outcome, which will provide critical maintenance and expansion of the most comprehensive time series of key ashy storm-petrel demographic parameter. This type of high quality data on reproductive success is crucial for long term conservation assessments for this species.</p>
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Funding Strategy	Planning, Research, Monitoring
Activity / Outcome	Pac Seabirds - Research - # research studies completed
Required	Recommended
Description	Enter the number of research studies completed

# research studies completed - Current	3.00
# research studies completed - Grant Completion	6.00

Notes See notes for Research informing management metric

Funding Strategy Planning, Research, Monitoring
Activity / Outcome Pac Seabirds - Monitoring - # monitoring programs
Required Recommended
Description Enter the number of monitoring programs established or underway

monitoring programs - Current 1.00

monitoring programs - Grant Completion 1.00

Notes See notes for Research informing management metric

The following pages contain the uploaded documents, in the order shown below, as provided by the grantee:

Upload Type	File Name	Uploaded By	Uploaded Date
Interim Report Narrative	2016.11.02_NFWF_ASSP_InterimReport_FINAL.pdf	Bradley, Russell	11/02/2016

The following uploads do not have the same headers and footers as the previous sections of this document in order to preserve the integrity of the actual files uploaded.



**Farallon Ashy Storm-Petrel Population Status Evaluation
Interim Programmatic Report Narrative
to the Pacific Seabird Program of the National Fish and Wildlife Foundation**

1. Summary of Accomplishments

In year one of our project, *Farallon Ashy Storm-Petrel Population Status Evaluation*, Point Blue analyzed the survival rates of ashy storm-petrels in recent years; estimated the total size of the Farallon ashy storm-petrel population; and determined that after a marked recent drop in survival and population size of ashy storm-petrels (observed from about 2007 through 2011), survival rates are no longer declining and population size has stabilized. This is consistent with an observed reduction in overwinter attendance on the Farallones by burrowing owls. These results provide support for proceeding with efforts to reduce burrowing owls on the Farallon National Wildlife Refuge as a means to aid a species of conservation concern and facilitate recovery in the future.

2. Project Activities & Outcomes

Activities

- a) Test whether reduced burrowing owls in 2012-2015 led to increased survival and abundance of ashy storm-petrels.

Burrowing owl occurrence and activity at the Farallon National Wildlife Refuge reached a peak in 2010/2011. During that same year, ashy storm-petrel survival reached its lowest level in the last decade, having shown a multi-year decline; population size was also declining during this same period (2007 to 2011) that showed a steep increase in burrowing owl attendance. Thus, the evidence clearly points to the increased abundance and activity of burrowing owl leading to predation of ashy storm-petrels, thus decreasing survival and contributing to the observed population decline. However, since 2011, burrowing owl numbers have been lower than those observed in 2009-2010 and 2010-2011. As part of this project, we added data from 2012 to the present for ashy storm-petrels and burrowing owls and carried out new analyses for these years (our previous analysis was only through 2012). We analyzed survival and population size in the most recent years, to determine whether the decrease in burrowing owl abundance/activity resulted in increased survival and/or change in the abundance of the ashy storm-petrels population. We hypothesized that with a lower abundance of burrowing owls, the previous decline in population size would be reduced or eliminated, and might even lead to population increase. Such a change in survival and population trend was predicted by our initial modeling exercise¹. The additional years of data, and the analysis that it allowed, provides the opportunity to confirm our modeling efforts,

¹ Nur, N., Bradley, R., Salas, L., & Jahncke, J. 2013. Modeling the impacts of house mouse eradication on Ashy Storm-Petrels on Southeast Farallon Island. Unpublished report to the U.S. Fish and Wildlife Service. PRBO Conservation Science, Petaluma, California. PRBO Contribution Number 1880.

and refine our understanding of the interaction of burrowing owls and one of their key prey species, ash storm-petrels.

In this regard, we paid specific attention to the 2014-2015 year, since in fall 2014 the Farallon mouse population crashed earlier than usual, resulting in especially low burrowing owl overwintering attendance, the lowest observed since 2007/2008. In short, the reduced abundance of burrowing owls in recent years, provided the opportunity to confirm the hypothesized benefits to ash storm-petrels resulting from the proposed eradication of house mice on the Farallones, those benefits arising from an increase in survival and/or change in population trend of the storm petrel.

As part of this project, we found that burrowing owl attendance in the fall/winter was 40% lower in recent years (2011/2012 to 2014/2015) compared to the previous 2 years (2009/2010 and 2010/2011; Figure 1). Overall, this change in burrowing owl attendance was associated with the observation of a modest change in survival of ash storm-petrels: average survival for the four most recent 12 month periods (2011/2012 to 2014/2015) was greater than the estimate of survival for 2010/2011, the year of peak burrowing owl attendance, by 6.0% (Figure 2). This comparison suggests that further decrease in burrowing owl attendance, such as that resulting from the proposed eradication of house mice on the Farallon islands, would indeed result in further increases in survival and thus help support recovery of this depleted population. However, survival of ash storm-petrels for 2014/2015, the year of markedly low burrowing owl attendance, was indistinguishable from survival observed in the previous three years, when burrowing owl attendance was on average 68% higher than it was in 2014/2015 (Figure 2). It is important to note that results of the statistical analysis provided low confidence in the estimates for any single year. The power of the results of our statistical analysis lies in estimates based on multiple years of data, rather than basing comparison on any single year. The same point applies to consideration of population size of storm petrels: the focus should be on the pattern of change over time and not the value for any one year.

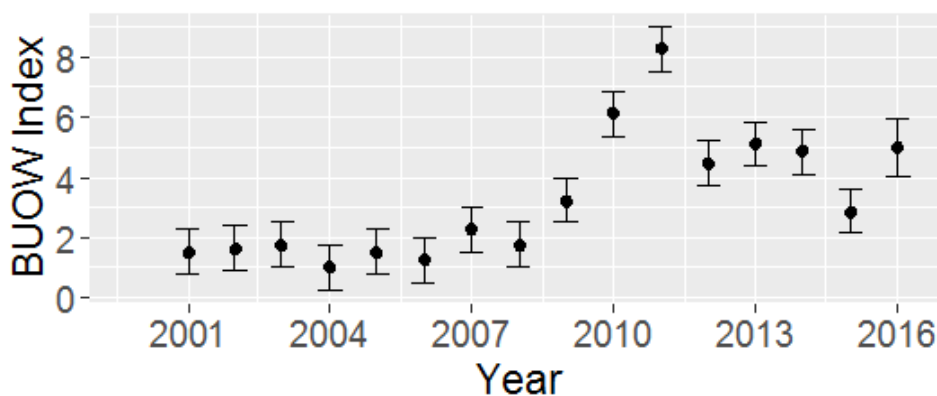


Figure 1. Burrowing owl index of overwinter attendance, 2001-2016, on Southeast Farallon Island. Monthly average of maximum observed owls per month; for September of previous year to April of the listed year, and Standard Error of the estimate).

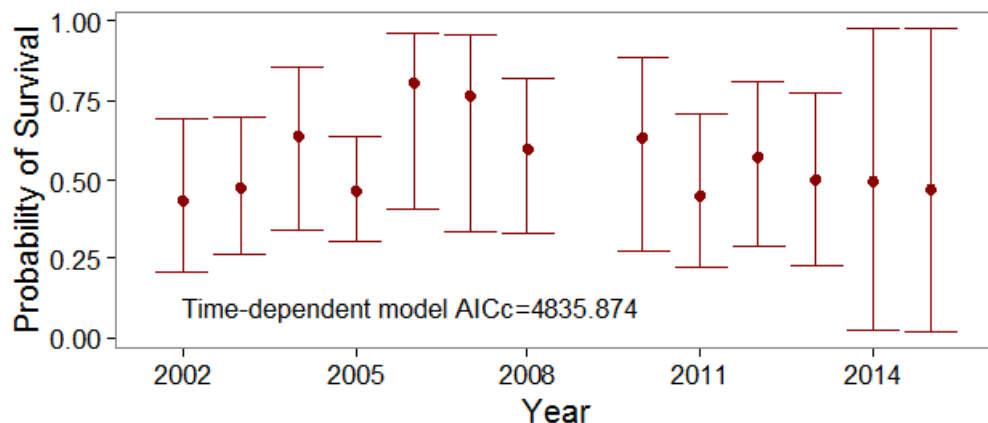


Figure 2. Variation among years for annual survival probability of ash storm-petrels on Southeast Farallon Island to the year shown in the Figure; thus “2002” refers to survival from 2001 to 2002. Shown are year-specific model estimates and the 95% Confidence Interval around those estimates. 2016 was last year of study and thus survival could not be estimated for that year. Recapture data were inadequate to estimate annual survival from 2000 to 2001 or from 2008 to 2009.

We found that the ash storm-petrel population trend in recent years has indeed evidenced a change, concomitant with the reduction in burrowing owl attendance (Figure 3). Looking at the full time series, in the first seven years, from 2001 to 2007, the population displayed a strong increase in population size (increasing at 17.5% per year, $P < 0.015$), confirming results from our earlier analysis. However, from 2007 to 2012 the population decreased by 7.0% per year ($P < 0.1$), this decrease coinciding with the period of increase in burrowing owl overwinter attendance. However, from 2012 to 2015 the population showed stability: the estimated change in size is less than 0.1% per year. Thus, the time series indicates that, after 2011 (the year of peak burrowing owl attendance), the population trend changed from decline to stability, just as the level of burrowing owl changed from high (averaging 7.2 for 2009/2010 and 2010/2011) to moderate (averaging 4.3 for the period 2011/2012 to 2014/2015).

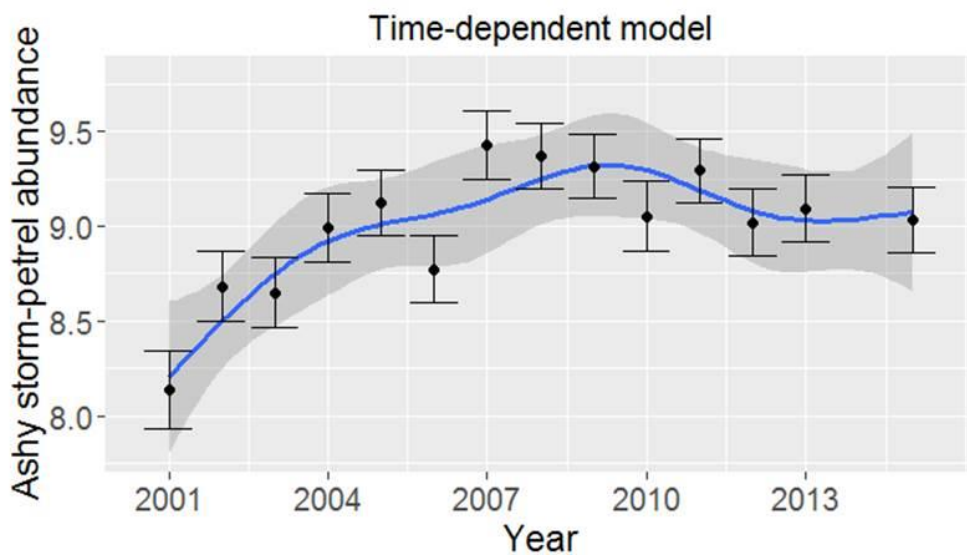


Figure 3. Change in estimated population size index of ash storm-petrels over time, derived from the best year-specific statistical model, based on captures of individually-banded ash storm-petrels, 2000

to 2016. The index reflects the natural log of estimated population size. Shown is the 95% Confidence Interval around the year-specific estimate and a smoothing function through the results. Note that population size in 2014 was not estimable due to constraints on estimating model components for that year. 2016 was the last year of capture in the dataset, and so population size could not be estimated for that year.

Thus, the moderate decline in burrowing owls observed for 2011-2015, compared to the peak in 2010-2011, was associated with a change in population trend, from decline to stability; furthermore, this change in trend was consistent with the observed pattern of survival for the storm petrels over this time period.

b) Assess the current status of the Farallon population of ashy storm-petrels through updated demographic modelling.

The datasets compiled and the statistical analysis completed will contribute to updated demographic modelling, allowing us to better project future impacts of the proposed mouse eradication. Such work will be completed in the next year of the project. However, we have made important strides in the analysis. We have added four years of capture histories not previously available, which has allowed us to estimate survival up to 2015, population size up to 2015, and in particular, to use the full dataset to statistically estimate the effect of a change in burrowing owl attendance on ashy storm-petrel survival. That result is a key component of the modeling we will undertake. The statistical analysis has confirmed a strong relationship between the index of burrowing owl overwinter attendance in a year and the survival of ashy storm-petrels to the spring of that year. The estimated relationship is statistically significant ($P < 0.01$) and is depicted in Figure 4. As the burrowing owl index increases from 2 to 8, estimated survival of ashy storm-petrels decreases from about 0.70 to about 0.50. Thus, a decrease in the burrowing owl abundance index by 1 unit, is expected to increase ashy storm-petrel survival by about 3%. The modeling to be completed in year two will explore the implications of a change in burrowing owl overwinter attendance, resulting from the proposed mouse eradication, on future trends of the Farallon Island ashy storm-petrel population.

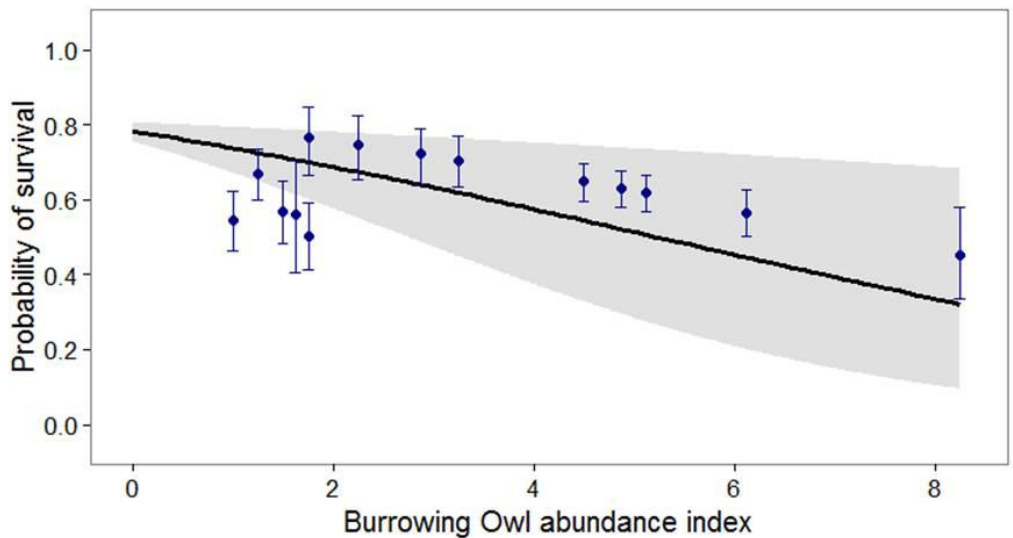


Figure 4. Graphical presentation of the statistical model of ashy storm-petrel annual survival in relation to the burrowing owl abundance index (reflecting overwinter attendance), based on captures of ashy storm-petrels on the Farallon Islands, 2000 to 2016. Depicted are annual estimates from the preferred

model and the statistical relationship between storm petrel survival and burrowing owl index ($P < 0.01$); the shaded region provides the 95% CI around the slope of the relationship.

- c) Improve our capacity to detect storm-petrel breeding sites for long-term monitoring.

We increased our capacity to collect high quality reproductive success data for ash storm-petrels breeding on the Farallon Islands in 2016 by utilizing one new crevice camera system. During the next field season, we will purchase another camera system and implement, (contingent on approval from our partners at USFWS) a pilot study using Passive Interrogated Transponder (PIT) tags on banded storm-petrels to link our mistnet and breeding studies. The use of PIT tags has the potential to greatly increase our detection of breeding sites for birds that we capture in our mist-net efforts. These efforts will ensure continued and expanded monitoring of ash storm-petrel reproductive success on the Farallones.

Outcomes

- a) Strengthen scientific support for management actions to benefit ash storm-petrels. Through validation of our previous modelling efforts, this project could show strong scientific support for the quantified population level impacts to ash storm-petrels by reducing burrowing owl numbers through mouse eradication.

We determined that after a marked recent drop in survival and population size of ash storm-petrels (observed from about 2007 through 2011), survival rates in the most recent years are now no longer declining and population size has stabilized, consistent with an observed reduction in overwinter attendance on the Farallones by burrowing owl. These results provide support for proceeding with efforts to reduce burrowing owl on the Farallon National Wildlife Refuge

- b) Provide the scientific basis, in terms of estimated colony population status, for listing or not listing the ash storm-petrel under the Endangered Species Act. Evaluation of current demographic trends for the Farallon storm-petrel population will determine if recent declines have continued. These analyses could provide further solid science basis to conservation action.

We have made progress towards better estimation of population size and status. The recently observed declining trend in population size appears to have been reversed: population stasis, not decline, has been observed. Full population modeling to inform conservation status will be completed in project year 2.

- c) Increase quality of long-term monitoring data. Utilize high quality reproductive success data to obtain a better understanding of how ash storm-petrel populations can be expected to behave in the future, when coupled with the better information on survival and trends in b) and also in a), above. Increased use of high quality cameras and pilot studies using PIT tags will allow us to monitor a minimum of 50 active storm-petrel breeding sites annually for many years to come.

Our new camera system helped us to monitor 43 active storm petrel breeding sites in 2016. With the new camera system and PIT tag pilot studies, we will meet our goal of following 50 active sites.