Nēnē or Hawaiian Goose
(*Branta sandvicensis*)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed:

Nēnē or Hawaiian Goose

(*Branta sandvicensis*)

TABLE OF CONTENTS

5-YEAR REVIEW
Nēnē or Hawaiian Goose / (*Branta sandvicensis*)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between March 2010 and July 2011. The Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose (USFWS 2004) was one source of information for this five-year review of the Hawaiian Goose (*Branta sandvicensis*). Considerably more recent information about the status and biology of this species was obtained from additional sources, especially from the Nēnē Recovery Action Group. . The document was then reviewed by the Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

1.3.2 Listing history

Original Listing
FR notice: U.S. Fish and Wildlife Service. FR notice: USFWS. 1967. Native Fish and Wildlife: Endangered Species; Federal Register 32(48): 4001.
Date listed: March 11, 1967
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings: None

1.3.4 Review History:
Species status review FY 2011 Recovery Data Call (August 2011): Stable

Recovery achieved:
2 (25-50%) [FY 2007 Recovery Data Call] (last year reported)

1.3.5 Species' Recovery Priority Number at start of this 5-year review: 2

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose (*Branta sandvicensis*) (USFWS 2004)

Date issued: September 24, 2004

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
__X__ ***Yes***
_____ ***No***

2.1.2 Is the species under review listed as a DPS?
____ ***Yes***
__X_ ***No***

2.1.3 Was the DPS listed prior to 1996?
____ ***Yes***

____ ***No***

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ ***Yes***
____ ***No***

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ ***Yes***
____ ***No***

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ ***Yes***
__X_ ***No***

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ ***Yes***
____ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

___ ***Yes***
_X_ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

_X__ ***Yes***
____ ***No***

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

1) **Self-sustaining populations exist on Hawaii, Maui, Molokai, Lanai, Kahoolawe, and Kauai.** Self-sustaining is defined as maintaining or increasing established population levels without additional releases of captive-bred nēnē, although habitat manipulation, such as predator control or pasture management, may need to be continued. At least 7 populations must exist with the following minimum population sizes: 2 populations with 500 breeding adults each, 1 population with 300 breeding adults, 2 populations of 250 breeding adults each, and 2 populations of 100 breeding adults each. The larger 3 populations must be distributed on Hawaii, East Maui, and Kauai, while 2 of the smaller populations must occur on 2 of the following: East Maui, Molokai, Kahoolawe, or Lanai. Increasing population sizes, establishing multiple populations, and providing for breeding in the wild will address threats to nēnē associated with reduced genetic diversity, behavioral issues stemming from captive conditions, and the potential for disease transmission.

   This criterion has not been achieved. Although the Kauai population may be considered self-sustaining, none of the other populations are at this time. The number of populations or distribution indicated above has not been achieved. A minimum viable population size should be determined for nēnē on Hawaii, Maui Nui, and Kauai to determine if these population estimates and distributions are realistic and are likely to lead to long-term persistence of nēnē based on current information. This is Action 7.6 in the draft revised recovery plan (USFWS 2004).

2) **Sufficient suitable habitat to sustain the target nēnē population levels on each island is identified, protected, and managed in perpetuity.** Securing high quality nesting and rearing habitat and associated summer flocking habitat is key to nēnē population stability and growth. Where migration continues to be important, particularly on Hawaii, the management of established routes and new altitudinal migration routes must be taken into account to ensure the persistence of all habitats necessary for the recovery and long-term existence of nēnē. Both public and private lands are important to nēnē recovery and portions of some nēnē populations may need to be managed on private lands. Critical elements of habitat identification, protection, and management will include addressing the threats to nēnē posed by introduced predators, loss of suitable lowland habitat, poor nutrition, and human-caused disturbance and mortality.

This criterion has not been achieved. An on-going satellite telemetry study is increasing our understanding of how nēnē on Hawaii Island use summer flocking habitat and identifying important migration corridors. This important information highlights the sometimes complex movements of individuals between different locations and habitat types during the year, and will allow us to identify and target areas needed for protection and management. We need similar work conducted on Maui, Molokai, and Kauai. More work also is needed to better address many of the threats, including predation by mongooses and feral and free-ranging cats in particular, poor nutrition (managers lack resources to manage and restore habitat for nēnē), and human-caused disturbance (often the result of habituation).

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Woog (2002) studied reproductive success and paring in nēnē in relation to age and body size. Clutch size and number of eggs hatched increased initially with age in males and females, then leveled off, and declined in older birds. However, some older females had large clutches and hatched a higher proportion of eggs. The number of eggs hatched increase with pair duration initially, then decreased, perhaps attributable to advanced age of at least one of the pair. Young and old females had the best reproductive success when paired with a middle-aged partner, likely because middle-aged males have a higher reproductive success than younger or older males. Body size did not affect reproductive success (Woog 2002).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

As Table 1 below indicates, nēnē numbers apparently increased from 2006-2007, with slight declines in 2008 and 2009 coinciding with El Nino (droughts). Monitoring data suggest that mild droughts suppress population growth largely by decreasing reproductive success: however, severe droughts also cause significant adult mortality, resulting in population declines that can take years to reverse (Hawaii Volcanoes National Park, unpublished data). Popoulation numbers are projected to be higher in 2011 than 2010. Nēnē fare best on Kauai Island due to lack of an established mongoose population, as well as greater lowland habitat availability (important for breeding; Banko *et al*. 1999, USFWS 2004).

Table 1: Population estimates for nēnē on Maui, Molokai, Kauai, and Hawaii from 2006-2010 (Nēnē Recovery Action Group 2006-2010).

	Maui	Molokai	Kauai	Hawaii	Total
2006	360	84	829	481	1754
2007	462	146	800-860	611*	2019
2008	425	152	820-870	503	1900-1950
2009	416	165	850-900	446	1877-1927
2010	386	112	910-1000	480	1888-1978

*this high number likely reflects inaccurate estimates from Hakalau National Wildlife Refuge (NWR) and west Hawaii due to changes in staff.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Veillet *et al*. (2008) looked at polymorphic satellites in nēnē and their data corroborates previous studies showing high levels of inbreeding in wild nēnē populations that may impact breeding success and juvenile survival (Paxinos *et al*. 2002, Rave 1994). Veillet *et al*. (2008) also identified some markers that may be useful in future genetics work.

2.3.1.4 Taxonomic classification or changes in nomenclature:

No new information.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Over the past several years, Hawaii Volcanoes National Park and the Pacific Island Ecosystems Research Center (PIERC) of the U.S. Geological Survey have been working cooperatively on a satellite telemetry study of nēnē movements and habitat use on Hawaii Island. These data indicate the saddle road migratory route (Banko *et al*. 1999, Elder and Woodside 1958, USFWS 2004) is still in use and that nēnē are recovering many traditional movement patterns lost during their population decline in the 1900s (S. Hess and C. Cornett, USGS, pers. comm. 2011). This research has also revealed several key flocking locations that are used by multiple populations resulting in increased mixing among formerly distinct populations in recent years. Similar research needs to be conducted on Maui, Molokai, and Kauai as well.

Due to the high reproductive success of nēnē at Kauai Lagoons (KL), the resort currently supports around 400 individuals during the breeding season and is the fastest growing breeding population on the island (T.

Kaiakapu, DOFAW, pers. comm. 2011). Unfortunately, KL is immediately adjacent to the Lihue Airport. The presence of that many large-bodied, flocking birds adjacent to the airport and flying across the runways is considered a risk to aviation safety by the Federal Aviation Administration; State of Hawaii Department of Transportation; and U.S. Department of Agriculture, Wildlife Services. On April 14, 2011, the Governor of Hawaii issued a proclamation directing the Department of Land and Natural Resources (DLNR) to relocate all nēnē from the KL site within a five year period and to conduct the relocation in a manner consistent with the recovery goals for this species (State of Hawaii 2011). At this time, DLNR Division of Forestry and Wildlife (DOFAW) has drafted a plan that is in review and has moved 6 pairs of adult nēnē from KL to Haleakala Ranch, Maui, following a quarantine period to ensure the birds were malaria-free (S. Fretz, DOFAW, pers. comm. 2011). At this time, it is unclear how this large-scale relocation will impact the birds that will be translocated, the nēnē population on Kauai, or the nēnē population on the island they are moved to. However, efforts are being made to try and integrate most of the birds into core populations on the designated islands to reduce the possibility of additional problems. In addition, the birds will be kept in their new locations (e.g., via penning, wing clipping) for a year to increase the chances of them imprinting on the new site and to slowly integrate the new birds into existing wild populations, and to minimize attempts to fly back to Kauai.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

No new information.

2.3.1.7 Other:

At this time, captive propagation of nēnē has been discontinued. This program was a major factor in saving the nēnē from extinction and reestablishing it throughout Hawaii. Kauai Island birds may be used for future translocation efforts to bolster existing populations, but because the Kauai birds have the lowest genetic diversity of all captive and wild nēnē (Rave 1995) this practice could increase genetic problems. For some managers, therefore, it may be preferable to consider on-site, small scale, semi-captive breeding.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Lowland habitat is seasonally important for nēnē populations, which are believed to once have nested primarily in leeward lowlands (Baldwin 1947, Banko *et al*. 1999). Kauai has the most lowland habitat available, and it is believed that this, combined with the lack of an established mongoose population, has resulted in the largest population of all the islands (USFWS 2004). Managers therefore expanded efforts to find lowland areas for nēnē introductions, resulting for example, in the Puu O Hoku Ranch Safe Harbor Agreement. Nēnē numbers here have grown from 63 introduced birds (between 2001-2004) to around 112 birds in 2010. Due to problems encountered at KL, however, long-term planning needs to de-emphasize lowland areas that may conflict with airports.

As populations expand, another concern is determining habitat use during the summer flocking period and providing enough protection for the birds during that time. We are currently acquiring extensive information on remote summer habitat use on Hawaii Island through satellite telemetry, and this information will be used to identify and prioritize important areas for protections, such as conservation easements.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Not considered a threat to this species.

2.3.2.3 Disease or predation:

Predation is believed to be the main threat to this species at this time (USFWS 2004). Mongooses are believed to be the most serious egg predator (Banko 1988, 1992, Black and Banko 1994, Stone *et al*. 1983). Rats and pigs also take eggs and cats have been observed moving eggs in nests, so they may also predate eggs (Baker and Baker 1995; Zaun *in litt*. 2008). Goslings are taken by mongooses, rats, pigs, and cats (Banko 1992, Hoshide *et al*. 1990; K. Misjon, NPS, pers. comm. 2011). Dogs and mongooses have been cited as being responsible for most known cases of predation on adult birds, but cats and probably pigs are known to be significant predators of adults as well (Banko and Elder 1990, Kear and Berger 1980; K. Misjon, NPS, pers. comm. 2011). Population numbers at Hawaii Volcanoes National Park increased during the period 1989-1999, probably in part, because of intensive predator control (Rave *et al*. 2005). Predator control is also important at Haleakalā National Park, Kauai National Wildlife Refuge Complex, and Hakalau Forest National Wildlife Refuge and nēnē managers consider predator control a critical part of all programs.

The role of disease in the decline of the nēnē is poorly documented and not well understood (USFWS 2004). Avian pox may be common, but is

generally not considered fatal to nēnē (Banko *et al*. 1999). Avian malaria is documented to occur in nēnē, but based on examination of salvaged birds, does not appear to be problematic for them (T. Work, pers. comm. 1998 in USFWS 2004). However, concern about the potential to transfer unique regional strains of avian malaria between islands has resulted in quarantine testing of any nēnē to be moved interisland to ensure they are not infected (USFWS 2004). The spread of avian influenza and West Nile virus (WNV) on the mainland has serious implications if either arrives in Hawaii. WNV causes mortality in domestic geese, with goslings more susceptible than adults. Of the three known cases of nēnē infected with WNV on the U.S. mainland, all were adults and one died (Jarvi *et al*. 2008).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Not considered a threat to this species.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Habituation to humans results in direct harm to birds such as road kills and being struck by golf balls. A common cause of known mortality in adults at Hawaii Volcanoes National Park during 1989-1999 was road kill (Rave *et al*. 2005). It is important to conduct outreach to prevent people from feeding nēnē and to keep them wild. Vehicle-related mortality also occurs where roads pass though nēnē habitat, such as location where roads bisect nesting and rearing habitat, roosting and day-use sites, or a historic flocking area. This forces birds, including families with unfledged goslings, to cross dangerous roads.

Studies have shown that parent reared birds are more dominant, more vigilant, and have greater reproductive success than goslings reared in 'sibling groups' (Marshall and Black 1992, Woog 1993). Low genetic variation may limit reproductive success and survival (USFWS 2004). Studies have shown that nēnē went through a prehistoric population bottleneck and have very low genetic diversity (Paxinos *et al*. 2002, Rave 1994, Rave *et al*. 1999, Veillet *et al*. 2008). Some studies indicate that inadequate nutrition is a factor limiting nēnē reproduction and gosling survival, especially on Hawaii and Maui, and especially in harsh conditions (Baker and Baker 1995, Hu 1998, Rave *et al*. 2005, Tamayose 2006, USFWS 2004).

Wind farms are a new threat to nēnē. Section 7 consultation and Habitat Conservation Plans (HCPs) are approved or being planned and are likely to affect nēnē on Maui, Molokai, and Hawaii Island. To date, at least six nēnē have been killed at the West Maui wind farm site.

2.4 Synthesis

Nēnē populations are currently stable on most islands and increasing on Kauai. However, predation and the potential for sustained drought remain important threats. It is likely that without predator control, populations would not fare as well. If mongoose ever become established on Kauai, it will likely have a major impact on the Kauai nēnē population. In addition, we lack resources to deal with nutritional concerns on Hawaii and Maui Islands, including managing pastures, restoring habitat, and developing alternative breeding sites. Finding lowland sites for breeding on those islands is also proving difficult. Around 400 birds are slated to be moved from the KL area of Kauai to Hawaii, Maui, other areas of Kauai, and Molokai. It is unclear how these birds will fare in the new locations and what impact they will have on the nēnē populations on those islands. Possible concerns include low genetic variation in Kauai birds, behavioral issues (habituation to humans), birds moving to inappropriate areas after release due to their inexperience, greater impacts from predation since Kauai birds are naive about mongoose predation, and the lack of lowland habitat that may reduce breeding success. In summary, the recovery goals for this species have not been met and threats are not well managed; therefore, at this time, the nēnē still meets the definition of endangered.

3.0 RESULTS

3.1 Recommended Classification:

____ **Downlist to Threatened**
___ **Uplist to Endangered**
____ **Delist**
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
_X__ **No change is needed**

3.2 New Recovery Priority Number: N/A

Brief Rationale:

3.3 Listing and Reclassification Priority Number: N/A

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Identify and protect nēnē habitat, particularly summer flocking areas and potential lowland breeding sites
- Control alien predators
- Manage habitat and existing populations for sustainable productivity and survival
- Conduct research on improving nutritional quality and availability of food
- Conduct research on habitat restoration
- Establish additional populations
- Determine minimum viable population estimates by island and state-wide
- Utilize results of genetic studies to enhance flock management
- Identify new research needs and continue research
- Provide public outreach programs

5.0 REFERENCES

Baker, P.E. and H. Baker. 1995. Nene gosling mortality in Haleakalā National Park, Maui, 1995/96 breeding season. Unpublished report to Hawai`i Division of Forestry and Wildlife, HI. 31 pp.

Banko, P.C. 1988. Breeding biology and conservation of the nene, Hawaiian goose (*Nesochen sandvicensis*). Ph.D. dissertation, University of Washington, Seattle, WA.

Banko, P.C. 1992. Constraints on productivity of wild nene or Hawaiian geese *Branta sandvicensis*. Wildfowl 43: 99-106.

Banko, W.E. and W.H. Elder. 1990. History of endemic Hawaiian birds. Part I. Population histories-species accounts: scrub-grassland birds: Nēnē-Hawaiian goose. Avian History Report 13A. Cooperative National Park Resources Studies Unit, University of Hawaii, Manoa, Honolulu, HI.

Banko, P.C., J.M. Black, and W.E. Banko. 1999. Hawaiian goose (Nene) (*Branta sandvicensis*). *In* The Birds of North America, No. 434 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, PA.

Black, J.M. and P.C. Banko. 1994. Is the Hawaiian goose (*Branta sandvicensis*) saved from extinction? Pages 394-410 *in* P.J.S. olney, G.M. Mace, and A.T.C. Feistner (editors). Creative conservation – interactive management of wild and captive animals. Chapman and Hall, London, U.K.

Elder, W.H. and D.H. Woodside. 1958. Biology and Management of the Hawaiian Goose. Trans. 23rd N.A. Wildl. Conf: 198-215.

Hoshide, H.M., A.J. Price, and L. Katahira. 1990. A progress report on nene *Branta sandvicensis* in Hawaii Volcanoes National Park from 1974-89. Wildfowl 41: 152-155.

Hu, D. 1998. Causes of extinction and endangerment in Hawaiian birds. Ph.D. dissertation, University of California, Davis, CA.

Jarvi, S.I., M.M. Lieberman, E. Hofmeister, V.R. Nerurkar, T. Wong, and C. Weeks-Levy. 2008. Protective efficacy of a recombinant subunit West Nile virus vaccine in domestic geese (*Anser anser*). Vaccine 26: 5338-5344.

Kear, J. and A.J. Berger. 1980. The Hawaiian goose: an experiment in conservation. Buteo Books, Vermillion, SD.

Marshall, A.P. and J.M. Black. 1992. The effect of rearing experience on subsequent behavioural traints in Hawaiian geese, *Branta sandvicensis*: implications for the recovery programme. Bird Conservation International 2: 131-147.

Paxinos, E.E., H.F. James, S.L. Olson, J.D. Ballou, J.A. Leonard, and R.C. Fleischer. 2002. Prehistoric decline of genetic diversity in the Nene. Science 296: 1827.

Rave, E.H. 1994. Genetic analyses of captive and wild populations of Hawaiian geese. M.S. thesis, University of North Dakota, Grand Forks, ND. 100 pp.

Rave, E.H. 1995. Genetic analyses of wild populations of Hawaiian geese using DNA fingerprinting. Condor 97: 82-90.

Rave, E.H., R.C. Fleischer, F. Duvall, and J.M. Black. 1999. Effect of inbreeding on reproductive success in captive populations of Hawaiian geese. Wildfowl 49: 36-44.

Rave, E.H., A. Cooper, D. Hu, R. Swift, and K. Misajon. 2005. Population and reproductive trends of nene *Branta sandvicensis* in Hawaii Volcanoes National Park, 1989-1999. Wildfowl 55: 7-16.

Stone, C.P., H.M. Hoshide, and P.C. Banko. 1983. Productivity, mortality, and movements of nene in the Ka`u desert, Hawaii Volcanoes National Park, 1981-1982. Pacific Science 38: 301-311.

Tamayose, J. 2006. Supplemental feeding influences reproductive success of the Hawaiian goose (*Branta sandvicensis*) at Haleakalā National Park, Maui, Hawai`i. M.S. thesis, Oregon State University, OR. 32 pp.

U.S. Fish and Wildlife Service. 1967. Native fish and wildlife: Endangered species. Federal Register 32(48): 4001.

U.S. Fish and Wildlife Service. 2004. Draft revised recovery plan for the nēnē or Hawaiian goose (*Branta sandvicensis*). U.S. Fish and Wildlife Service, Portland, OR. 148 + xi pp.

U.S. Fish and Wildlife Service. 2009. Initiation of 5-year reviews for 103 species in Hawaii. Federal Register 74(49): 11130-11133.

Woog, F. 1993. Őkologie der Hawaiigans (*Branta sandvicensis*) in vershiedenen habitaten des Haleakalā Nationalparks auf Maui (Hawai`i, U.S.A.) zur Brutzeit mit besonderer Berűcksichtigung der Nahrungsőkologie. Diploma thesis, Universität Hohenheim.

Veillet, A., R. Shrestha, and D.K. Price. 2008. Polymorphic microsatellites in nēnē, the endangered Hawaiian goose (*Branta sandvicensis*). Molecular Ecology Resources: 1158-1160.

Personal communications

Misajon, K. 2011. Biologist, National Park Service, Hawaii Volcanoes National Park, HI.

In Litt. Communications

Zaun, B. 2008. Formerly Refuge Biologist, U.S. Fish and Wildlife Service, Kauai National Wildlife Refuge Complex, Kauai, HI.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of **Nēnē or Hawaiian Goose**
(*Branta sandvicensis*)

Current Classification: E

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Annie Marshall, Fish and Wildlife Biologist
Jess Newton, Recovery Program Leader
Assistant Field Supervisor for Endangered Species

Approved _____ Date 9/30/2021
for **Field Supervisor, Pacific Islands Fish and Wildlife Office**