Draft Post-Delisting Monitoring Plan for the Hawaiian Hawk, or Io (*Buteo solitarius*)

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John Klavitter, Refuge Biologist with Midway Atoll National Wildlife Refuge; Jay Nelson, Fish and Wildlife Biologist with PIFWO; Scott Fretz and David Leonard, biologists with the Hawaii Division of Forestry and Wildlife in Honolulu, Hawaii; Thane Pratt and Marcos Gorresen, research biologists with the U.S. Geological Survey, Biological Resources Discipline in Volcano, Hawaii; and Rhonda Loh, biologist with Hawaii Volcanoes National Park, Volcano, Hawaii.

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1. Background

The U.S. Fish and Wildlife Service (Service) is proposing to remove the Hawaiian hawk, or io, (*Buteo solitarius*) from the List of Endangered and Threatened Wildlife (73 FR 45680). Several studies (Baskett and Griffin 1985; Morrison *et al*. 1994; Hall *et al*. 1997; Griffin *et al*. 1998; Klavitter 2000; Klavitter *et al*. 2003; Gorresen *et al*. 2008) have shown that range-wide population estimates have been stable for at least 20 years and this species is not threatened with becoming endangered throughout all or a significant portion of its range in the foreseeable future. Section 4(g)(1) of the Endangered Species Act of 1973, as amended (Act) requires the Service to implement a system, in cooperation with the States, to monitor for not less than five years the status of all species that have recovered and been removed from the lists of threatened and endangered wildlife and plants (50 CFR 17.11, 17.12). The purpose of this post-delisting monitoring (PDM) is to verify that the Hawaiian hawk remains secure from risk of extinction after it has been removed from the protections of the Act.

1.1. History and Ecology

The Hawaiian hawk is a small, broad-winged hawk endemic to the Hawaiian Islands, and is the only member of the family Accipitridae that is resident and nests in the Hawaiian Islands (Berger 1981, p. 83). Currently, it occurs only on the island of Hawaii, but there have been at least 8 observations of vagrant individuals on the islands of Kauai, Oahu, and Maui since 1778 (Banko 1980, pp. 1-9), and fossil remains have been found on the islands of Molokai (Olson and James 1982, p. 35) and Kauai (Olson and James 1996, pp. 65-69; Burney *et al*. 2001, pp. 628-629).

The Hawaiian hawk occurs over much of the island of Hawaii, from low to high elevations, and occupies a variety of habitat types, including native forest, secondary forest consisting primarily of non-native plant species, agricultural areas, and pastures (Banko 1980, pp. 2-9, 15-16; Scott *et al*. 1986, pp. 78-79; Hall *et al*. 1997, p. 14; Griffin *et al*. 1998, p. 661; Klavitter 2000, pp. 2, 38, 42-45; Klavitter *et al*. 2003, pp. 169-170, 172, 173). Hawaiian hawks are monogamous and defend their territories year-round (Baskett and Griffin 1985, pp. 120-122; Griffin *et al*. 1998, p. 660; Clarkson and Laniawe 2000, pp 6-7; J. Klavitter, Service, pers. comm. 2006), although more aggressively during the breeding season (J. Klavitter, pers. comm. 2006). Egg-laying generally occurs from March to June, hatching from May to July, and fledging from July to September (Baskett and Griffin 1985, p. 110; Griffin *et al*. 1998, p. 656). A typical clutch size is one egg (Baskett and Griffin 1985, p. 76; Griffin *et al*. 1998, p. 657).

1.2. Population Trends

The Hawaiian hawk was listed as endangered on March 11, 1967 (32 FR 4001), based on its restricted range on the island of Hawaii, its small population size, which at the time was thought to be in the low hundreds (Berger 1981, p. 83), and the assumption that it was endangered by loss of native forest habitat from agriculture, logging, and commercial development (Service 1984, pp. 10-11). At the time of listing, however, there had been no systematic surveys or ecological studies of the species, and the only information available

was from anecdotal accounts that gave differing reports on its abundance and population trend in various parts of the island (Perkins 1903, p. 446; Munro 1944, p. 48; Morrison 1969, pp. 75-78). Banko (1980, p. 16) concluded that the species still occupied its entire historical range, but that it had experienced a long-term population decline and cautioned that conclusions concerning population size and trend must be considered tentative due to the scarcity of historical and current information. An intensive large-scale survey of Hawaiian forest birds was conducted from 1976 to1981 during which Hawaiian hawks were found in all study areas on the island of Hawaii, but the population size of the Hawaiian hawk was not estimated because the survey methods used were not suited to raptors (Scott *et al*. 1986, pp. 78-79).

The first detailed study of the ecology and life history of the Hawaiian hawk was conducted from 1980 to 1982 (Griffin *et al*. 1998). During this study, researchers found no significant difference in nest success in habitats dominated by native versus non-native vegetation (Griffin *et al*. 1998, p. 658). No evidence was found that the species was affected by avian diseases, such as avian malaria and avian pox; introduced mammalian predators, such as cats (*Felis catus*), rats (*Rattus* spp.), and mongooses (*Herpestes auropunctatus*); or environmental contaminants, such as DDT (Griffin *et al*. 1998, pp. 658, 661). Baskett and Griffin (1985, p. 26) briefly mentioned a population estimate of 1,400 to 2,500 birds, cited as Griffin *et al.* in prep., but Griffin *et al.* (1998) does not mention the 1,400 to 2,500 bird estimate.

The Service published a proposed rule to reclassify the Hawaiian hawk from endangered to threatened on August 5, 1993 (58 FR 41684), based on Baskett and Griffin's (1985, p. 36) population estimate of 1,400 to 2,500. However, the proposal was not finalized, because, during the public comment period, several commenters expressed concerns that the population data used in the proposal was not sufficiently current and there was not enough known about the hawk's breeding success to warrant a downlisting. Based on these comments, the Service funded an island-wide survey from December 1993 to February 1994 to provide a current assessment of the distribution and population status of the hawk on the island of Hawaii. The researchers found the Hawaiian hawk widely distributed in both native and non-native habitats and provided a population estimate of 1,600 birds (range = 1,200 to 2,400), made up of 1,120 adults, or 560 pairs (Morrison *et al*. 1994, p. 23; Hall *et al*. 1997, pp. 13-14).

In 1997 the Service formed the Io Recovery Working Group (IRWG) to evaluate existing recovery goals for the Hawaiian hawk in light of current knowledge, and formulate new goals if warranted; recommend strategies for minimizing negative interactions between the Hawaiian hawk and the endangered Hawaiian crow or alala (*Corvus hawaiiensis*); identify research and management priorities; and, write and revise a report summarizing their findings and recommendations. The IRWG (1998, p. 3) concluded that "… there was no substantive information to support listing of the io under the provisions of the Endangered Species Act, and there is no quantitative evidence the io was ever threatened or endangered." Further, the IRWG recommended that, rather than focusing on population numbers as a reflection of the Hawaiian hawk's overall status, field studies should focus on trend to be consistent with the guidelines published by the International Union for Conservation of Nature (IUCN) Species Survival Commission for identification of species at three levels of

risk: critically endangered, endangered, and vulnerable (IUCN 1996, p. 21, Annex 8-10; IRWG 1998, p. 4).

In keeping with the IRWG's recommendations, the Service funded a detailed ecological and demographic study of the Hawaiian hawk, conducted in 1998 and 1999, to obtain more comprehensive information about population size, amount of suitable habitat, survival of adult and first-year birds in native and non-native-dominated habitats, fecundity (average number of female offspring produced per individual breeding-aged female per year) in different habitats, and rate of population change in different habitats (Klavitter 2000; Klavitter *et al*. 2003). During this study, researchers found that Hawaiian hawks were broadly distributed throughout the island of Hawaii, and that 58.7 percent of the island (2,372 square miles (sq mi) (6,144 sq kilometers (km)) contained habitat that was useable by the hawk. Of this useable habitat, 31.8 percent (754 sq mi (1,954 sq km)) was located on State and Federal forests, parks, and refuges. The researchers estimated the total population at 1,457 ± 176.3 SE birds, with an average density of 0.24 ± 0.08 SE birds per sq km (Klavitter *et al*. 2003, p. 170). Population density varied somewhat among habitats, from 0.01 to 0.57 birds per sq km. The highest density ranks were within native forest with grass, fallow sugarcane fields, and orchards; the lowest were within native mamane-naio (*Sophora chrysophylla-Myoporum sandwicense*) forest, urban, and lava areas (Klavitter *et al*. 2003, p. 169). One young per nest fledged in all successful nests monitored during the study. Annual survival of juveniles and adults was high (0.50 ± 0.10 SE and 0.94 ± 0.04 SE, respectively), and fecundity was 0.23 ± 0.04 SE female young/breeding female in all habitats combined. There was no difference in fecundity between native and mixed, native and exotic, or mixed and exotic habitats (Klavitter *et al*. 2003, pp. 170-171). The rate of population growth based on data from all habitat areas was 1.03 ± 0.04 SE, which is not significantly different than 1.0, indicating that the population was stationary (neither increasing or decreasing) at the time of the study (Klavitter *et al*. 2003, pp. 170-171).

The researchers also pointed out that the population estimate in 1985 (1,400-2,500 birds) likely was biased high, because it assumed that the Hawaiian hawk was distributed island-wide at the same density as in a small study area representing less than one percent of the species' range (Klavitter *et al*. 2003, p. 172). However, because of the short duration of their study, the relatively low population size, and the possibility of environmental fluctuations, they did not recommend delisting. Instead, the researchers recommended either downlisting the hawk to threatened status or consideration of a "near threatened" status (IUCN 1996, p. 18, Annex 7-8; Klavitter *et al*. 2003, p. 173). Upon review of Klavitter (2000), the IRWG recommended that the Hawaiian hawk be delisted, with the caveat that regular monitoring take place to assess factors that may produce future population declines (IRWG 2001, pp. 3-4).

Most recently, the Service funded an island-wide survey that was completed in the summer of 2007. The researchers used updated vegetation maps and methods to calculate population and density estimates for the 1998-1999 survey data and the 2007 survey data. Using consistent maps and methods they were then able to compare population size and density over time to see if there had been significant changes. They found that the Hawaiian hawk population numbered 3,239 (95% CI = 2,610 to 3,868) in 1998 (Gorresen *et al*. 2008, p. 11), more than double Klavitter's original estimate of 1,457 (± 176.3 birds) (Klavitter 2000, pp.

38, 96; Klavitter *et al*. 2003, p. 170). Gorresen *et al*. (2008, p. 11) estimated the population in 2007 to number 3,085 hawks (95% CI = 2,496 to 3,680). There was no significant difference in densities found in 1998 and 2007 and no evidence that the hawk's spatial distribution had changed (Gorresen *et al*. 2008, p. 12).

1.3. Habitat Status

The Hawaiian hawk is broadly distributed throughout the island of Hawaii, and 58.7 percent of the island (2,372 sq mi (6,144 sq km)) contains habitat that is useable by the hawk. Fifty-five percent of this useable habitat is zoned for agriculture and 44.7 percent is zoned for conservation. Of these lands, 754 sq mi (1,953 sq km), or 32 percent, is located on protected lands in the form of State and Federal forests, parks, and refuges and only a very small percentage (less than 0.5 percent) is rural and urban-zoned land that is subject to future development (Klavitter *et al*. 2003, p. 170; State of Hawaii Department of Business, Economic Development and Tourism 2007; Chapter 205 Hawaii Revised Statutes).

The IRWG (2001, p. 3) identified (1) urbanization, (2) conversion of cane fields used for foraging to habitats not suitable for foraging such as eucalyptus forest, (3) increase in fire frequency, and (4) invasion of plant species in the understory that degrade foraging habitat by concealing prey as potential threats to the Hawaiian hawk's preferred nesting and foraging habitats. However, we currently have no evidence that the scale of these changes, if they materialize, would adversely impact the Hawaiian hawk throughout all or a significant portion of its range.

1.4. Disease Incidence

Unlike other Hawaiian forest birds, the Hawaiian hawk does not appear to be susceptible to avian pox and malaria (Baskett and Griffin 1985, pp. 105-108; Griffin *et al*. 1998, p. 661). Although the Hawaiian hawk is not currently known to be adversely affected by any diseases, the IRWG (2001, p. 3) identified disease as a potential factor that might lead to a decline in the size of the io population by reducing future reproduction and survival. In their report (IRWG 2001, p. 3) they state: "[d]isease could have a serious negative impact on `io as the population does not appear to be separated into disjunct subpopulations that could more easily evade an outbreak. The panmictic nature of the population [i.e., a population where all individuals are potential partners] may also limit genetic variability that could contribute to pockets of disease resistance, although genetic attributes have not been directly studied."

One disease of concern is West Nile virus. This disease, which is primarily transmitted by infected mosquitoes, has been reported in all of the 48 conterminous United States and is potentially fatal to many species of birds, including members of the genus *Buteo* (Center for Disease Control 2005, 2007). Hawaii and Alaska are the only two states that have reported no occurrences of West Nile virus to date (Hawaii State Department of Health 2006; Center for Disease Control 2007). The Hawaii State Department of Health has an ongoing, multi-agency West Nile virus surveillance program in place on all of the main Hawaiian Islands, which involves surveillance for infected mosquitoes and dead birds, as well as live bird

surveillance at major ports of entry, equine surveillance, and human surveillance (Hawaii State Department of Health 2006). To date, no cases of West Nile virus have been reported in Hawaii; however, there is currently no certainty that we can prevent the disease from arriving and spreading. Should this disease arrive on the island of Hawaii, native birds may be particularly susceptible as they are likely to be immunologically naïve to arboviruses such as West Nile virus, because they evolved in the absence of biting insects (van Riper *et al*. 1986, p. 340). Furthermore, there are a number of introduced birds (e.g., house sparrows and house finches) and mosquitos (e.g., *Culex quinquefasciatus*) that could support West Nile virus amplification in Hawaii and transport it from low to middle to high elevations (Marra *et al*. 2004, p. 398) throughout the range of the Hawaiian hawk. In conjunction with the State's West Nile virus surveillance program, we will continue to monitor for the disease in Hawaii and, in the event of its arrival, evaluate its effects on the Hawaiian hawk and take steps to re-list the species if monitoring reveals declines or potential declines that warrant protection of the Hawaiian hawk under the Act.

2. Justification, Purpose, and Objectives

Section 4(g)(1) of the Act, added in the 1988 reauthorization, requires the Service to implement a system, in cooperation with the States, to monitor for no fewer than 5 years the status of all species that have recovered and been removed from the List of Threatened and Endangered Wildlife and Plants (50 CFR 17.11, 17.12). The purpose of this post-delisting monitoring (PDM) is to verify that a species delisted due to recovery remains secure from risk of extinction after it has been removed from the protections of the Act. Section 4(g)(2) of the Act requires the Service to make prompt use of the emergency listing provisions under section 4(b)(7) to prevent a significant risk to the well being of any recovered species.

Section 4(g) of the Act explicitly requires cooperation with the States in development and implementation of PDM programs, but the Service remains responsible for compliance with section 4(g) and therefore must remain actively engaged in all phases of PDM. The Service also seeks active participation of other entities that are expected to assume responsibilities for conservation of the species or its habitat following delisting.

In keeping with that mandate, the Service developed this draft PDM plan in cooperation with the Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), the National Park Service (NPS), and the U.S. Geological Survey, Biological Resources Discipline (USGS-BRD). All public comments received on this draft PDM plan will be considered and incorporated into the final PDM plan as appropriate. The final PDM plan and any future revisions will be posted on our Endangered Species Program's national web page (http://endangered.fws.gov) and on the Pacific Islands Fish and Wildlife Office web page (http://www.fws.gov/pacificislands).

We intend to monitor the status of the Hawaiian hawk, in cooperation with DOFAW, the NPS, and USGS-BRD, through periodic (every 5 years through 2032) island-wide surveys. If data from these surveys or from some other source indicates significant declines in Hawaiian hawk distribution and abundance or if the species may require protective status under the Act for some

other reason, the Service will consider initiating procedures to re-list the Hawaiian hawk, including, if appropriate, emergency listing.

3. Implementation

Post-delisting monitoring is a cooperative effort between the Service, DOFAW, USGS-BRD, and NPS. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the Hawaiian hawk following removal of protections under the Act. To the extent feasible, the Service intends to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation.

The Pacific Region (Region 1) of the Service, through the Pacific Islands Fish and Wildlife Office (PIFWO) in Honolulu has the lead responsibility for this monitoring effort, but assistance from and collaboration with DOFAW, NPS, and USGS-BRD, are crucial for its successful implementation. Continuing advice and assistance from the IRWG will also be essential.

The role of the PIFWO is to:

- Coordinate development and distribution of the PDM plan;
- Determine budget requirements to carry out the monitoring;
- Coordinate and track the island-wide surveys;
- Coordinate and track disease monitoring;
- Compile all monitoring results and coordinate their analysis;
- Ensure that monitoring methods prescribed in the PDM plan are followed;
- Prepare periodic and final reports for distribution to all cooperators and interested parties; and,
- Coordinate meetings or conference calls to discuss monitoring results and their interpretation.

The role of DOFAW is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys as staff and funds allow;
- Assist with coordination and implementation of disease monitoring efforts, as staff and funds allow; and,
- Communicate with the PIFWO about any projects that may reduce the quantity or quality of the hawk's preferred habitat.

The role of NPS is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys, as staff

and funds allow;
- Assist with coordination and implementation of disease monitoring efforts on NPS lands, as staff and funds allow; and,
- Communicate with the PIFWO about any projects on NPS lands that may reduce the quantity or quality of the hawk's preferred habitat.

The role of USGS-BRD is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys, as staff and funds allow;
- Assist with coordination and implementation of disease monitoring efforts, as staff and funds allow; and,
- Assist with analysis of monitoring data, including estimation of population size and trend, as staff and funds allow.

4. Methods

4.1. Population Trend Monitoring

4.1.1. Playback Response Study

Playbacks have been used in previous population studies of the Hawaiian hawk (Baskett and Griffin 1985; Morrison *et al*. 1994; Hall *et al*. 1997; Griffin *et al*. 1998; Klavitter 2000; Klavitter *et al*. 2003; Gorresen *et al*. 2008) because they are effective in increasing hawk detection, but they cause a positive movement bias and inflated density estimates. Therefore, correcting counts for movement bias is critical to achieving accurate density estimates. The regression model applied by Gorresen *et al*. (2008, p. 4) had an R^2 of only 0.15 because of high variability in the distances hawks moved prior to detection and the limited number of hawks (n = 28) used to characterize the relationship of unobserved and observed distances. Additional measures of observer-hawk distances and unobserved movement are needed to better establish the relationship of Hawaiian hawk responses to playback broadcasts which, in turn, will produce more accurate population estimates.

Therefore, prior to the initiation of additional population surveys, we plan to conduct a short study to better define the Hawaiian hawk's response to call playbacks. More refined data will then be used to obtain more accurate hawk density and population estimates (M. Gorresen, USGS-BRD, pers. comm. 2008; Gorresen *et al.* 2008, pp. 8-9). The study will be conducted over a period of 4 to 6 weeks, utilizing between 2 and 4 researchers, sometime prior to 2012 to avoid possible acclimatization issues that may affect the VCP surveys.

Using methods described in Klavitter and Marzluff (2007, p. 84), we intend to search for hawks while driving on unpaved roads. One or more observers will watch the hawk while another observer, the surveyor, moves some distance away to perform a 10-minute

point count using playbacks. The observer(s) will use a GPS receiver to measure the distance from the bird to the surveyor at the start and end of the point count. At least 20 birds will need to be included in this study as a suitable sample size.

If after several months these methods prove unsuitable for locating a sufficient number of birds, we may capture up to 20 birds and attach radio-tags to them to enable researchers to more readily locate the birds for the playback study, as was done by Klavitter and Marzluff (2007, p. 84).

4.1.2. Abundance and Distribution

In 2012 and every 5 years thereafter through 2032, we will conduct island-wide variable circular plot (VCP) surveys (Reynolds *et al*. 1980, pp. 309-313) following the methodologies described by Gorresen *et al*. (2008, pp. 3-6). The surveys will be conducted from March through July, following the stations used in the 2007 surveys. A total of 577 stations will be surveyed, spaced at 1 mile (1.6 kilometer) intervals, mostly along roads (Figure 1). Region-habitat strata with high variance relative to mean density may be augmented with additional samples in future surveys to help reduce variance. Each point will be surveyed for 10 minutes using playback recordings of adult and fledgling Hawaiian hawks. The playbacks will be conducted for 1-minute periods during the first, fourth, and eighth minutes. At each point, a record will be made whether hawks were detected, the distance at which the detection was made, type of detection (audio or visual), surveyor's percentage of view obstructed, and the habitat associated with each detection. Counts will be corrected for movement bias using information gathered from the playback response study, as described in Gorresen *et al.* 2008 (pp. 3-4, 6-8). Point count data will be analyzed with the program DISTANCE (Thomas *et al*. 2005). The best model will be selected using minimum Akaike Information Criterion values (AIC), and a global detection function will be calculated to generate densities from count data (Buckland *et al*. 2001, pp. 54-55). Densities will be used to extrapolate population estimates and differences in estimated hawk densities will be compared among years, regions, and habitats with a three-way repeated measures analysis of variance (ANOVA), as described in Gorreson *et al*. (2008, pp. 6-8).

4.2. Disease Monitoring

All dead Hawaiian hawks found by field crews during VCP surveys or reported by the public will be salvaged and necropsied to determine the cause of death. Monitoring cooperators will report all dead, injured, and diseased birds to the PIFWO, who will collate information on disease, cause of injury or death, location, date, and any other relevant data. We will also continue to participate in and coordinate with the ongoing multi-agency West Nile Virus surveillance program administered by the Hawaii State Department of Health (Hawaii State Department of Health 2006). If West Nile Virus is detected in any birds on the island of Hawaii monitoring efforts for Hawaiian hawk will be reassessed.

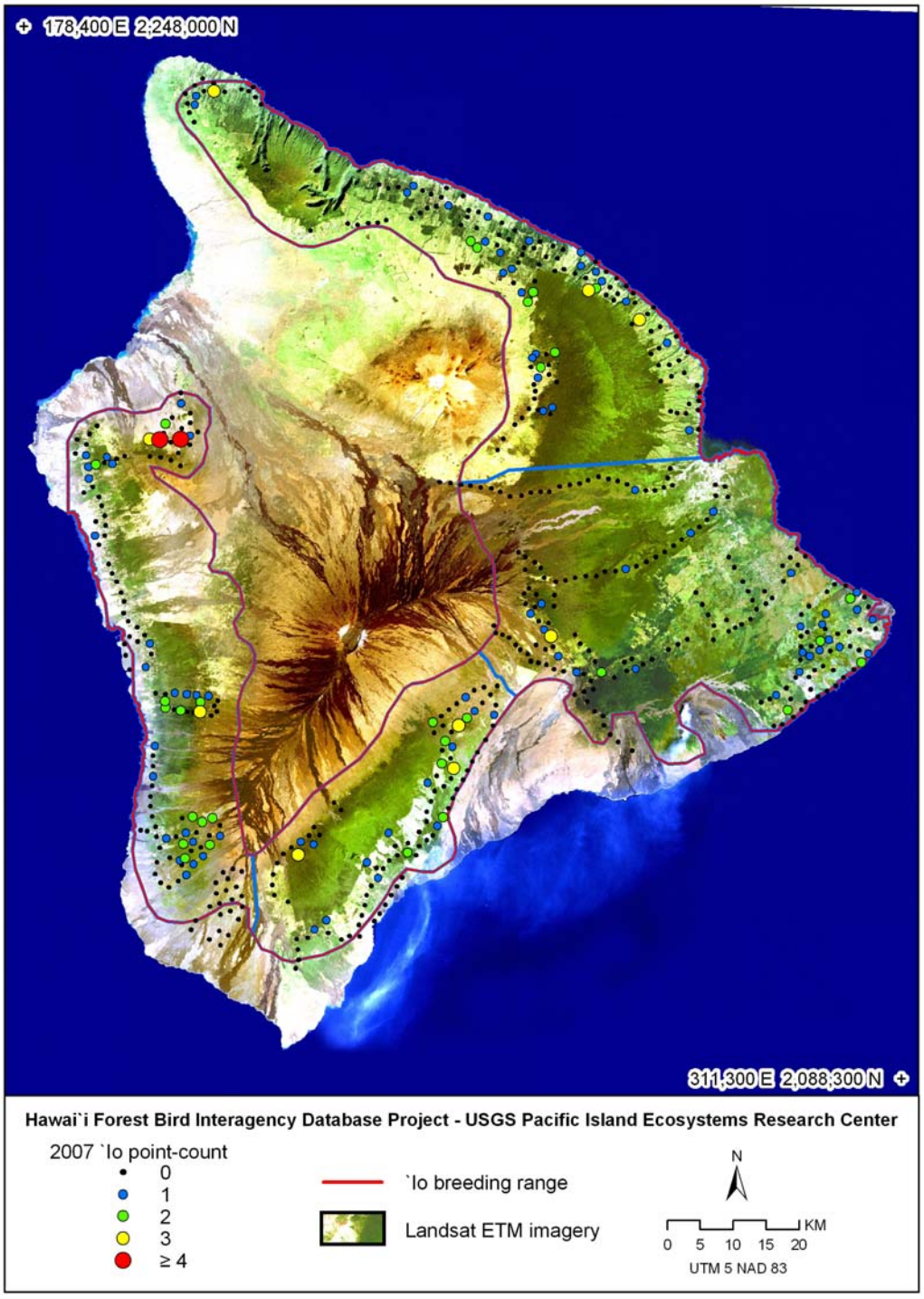

Figure 1. Location of Hawaiian hawk survey stations on the island of Hawaii during the 2007 abundance survey (Gorresen *et al*. 2008).

5. Triggers and Responses

Variable Circular Plot surveys have been used to assess the status of the Hawaiian hawk population on the island of Hawaii, documenting a stable population that currently numbers approximately 3,085 hawks (95% CI = 2,496 to 3,680) (Gorresen *et al*. 2008, p. 6). Barring some catastrophic event, such as the arrival of West Nile virus to Hawaii, we anticipate that the Hawaiian hawk population will remain stable over the monitoring period.

Using the coefficient of variation (CV) from 2007 survey efforts (CV = 0.098) and setting the significance level to 0.20 and the power to 0.80 we used TRENDS software to estimate the minimum detectable population change using a one-tailed significance test for a linear negative change. The population estimate in 1998 will be used as the baseline year from which to assess whether or not the population is declining. Thus, the following values represent the minimum statistically significant population decline we will be able to detect assuming CV = 0.098, alpha = 0.20, and power = 0.80:

Year	Minimum detectable decline (%) from 1998 population estimate
2012	14
2017	12
2022	11
2027	10
2032	9

If we detect statistically significant decline (alpha = 0.20, power = 0.80) in the total population estimate or in the population estimates for any given region or habitat-type, we will promptly evaluate the potential causes, including evaluation of habitat quantity and quality trends, disease, weather, and other possible limiting factors, take remedial steps, examine whether additional monitoring is necessary, and possibly relist the Hawaiian hawk. Any relisting decision by the Service will be made by evaluating the status of Hawaiian hawks relative to the Act's five listing factors (section 4(a)(1)) and will require the solicitation of public comments and peer review.

6. Periodic and Final Reports

A report summarizing the activities, data collected, and results of each component of the PDM plan will be prepared by the PIFWO every 5 years, immediately following monitoring efforts. These reports will be prepared and reviewed in a timely manner to ensure that adequate data are being collected, to allow evaluation of the efficacy of the monitoring programs and their modification if necessary, and to allow periodic assessment of the status of the Hawaiian hawk. The PIFWO will compile all results, synthesize draft reports for review and comments by all cooperators, and distribute final reports to all cooperators. Each report will comment on the status of the Hawaiian hawk relative to the need for relisting.

At the end of the monitoring period (2032), a final report summarizing the results of the monitoring effort will be prepared. The final report will include a discussion of whether

monitoring should continue for any reason. If the results are inconclusive, monitoring should continue and the monitoring plan should be modified as appropriate. The final report will be posted on our Endangered Species Program's national web page (http://endangered.fws.gov) and on the Pacific Islands Fish and Wildlife Office web page (http://www.fws.gov/pacificislands).

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Appendix 1. Proposed Timeline and Budget

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Travel & Materials	Personnel	TOTAL
2010		Preparation		Playback Response Study			Analysis				$ 3,000 to *$7,000	$ 15,000	$ 18,000 to *$22,000
2012		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2017		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2022		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2027		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2032		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
										TOTAL			$ 243,000 to *$247,000

* With radio-telemetry, if needed.
Note: some of these tasks are part-time and spread over several months (e.g., preparation for Playback Response Study and VCP fieldwork)
Note: Cost estimates for VCP surveys are based on the costs of the 2007 Surveys conducted by USGS-BRD and funded by the USFWS, utilizing USFWS, DOFAW, and other staff field time not accounted for in the proposed budget.