



## IMPORTANT BIRD AREAS IN THE HAWAIIAN ISLANDS

DR. ERIC A. VANDERWERF<sup>1</sup>

### INTRODUCTION TO THE IMPORTANT BIRD AREAS PROGRAM

The Important Bird Areas (IBA) Program is a global effort developed by BirdLife International, a coalition of organizations in more than 100 countries, to assist with identification and conservation of areas that are vital to birds and other biodiversity. The IBA Program was initiated by BirdLife International in Europe in the 1980's. Since then, over 8,000 sites in 178 countries have been identified as Important Bird Areas, with many national and regional IBA inventories published in 19 languages. Hundreds of these sites and millions of acres have received better recognition and protection as a result of the IBA Program.

As the United States Partner of BirdLife International, the National Audubon Society administers the IBA Program in the U.S., which was launched in 1995 (see <http://www.audubon.org/bird/iba/index.html>). Forty-eight states have initiated IBA programs, and more than 2,100 state-level IBAs encompassing over 220 million acres have been identified across the country. Information about these sites will be reviewed by the U.S. National IBA Committee to determine whether they qualify as sites of continental or global significance.

Important Bird Areas may include sites for breeding, foraging, or migrating birds, may include public or private lands, and may be protected or unprotected. To qualify as an IBA, sites must support native birds that fall into one or more of the following categories:

- Species of conservation concern (e.g. threatened and endangered species)
- Restricted-range species that are vulnerable because they are not widely distributed
- Species that are vulnerable because they are concentrated in one habitat type or biome
- Species or groups of similar species (such as seabirds, waterfowl, and shorebirds) that are vulnerable because they occur at high densities due to their congregatory behavior

IBAs have no legal distinction and do not directly affect the actual status or use of lands, but it is hoped that identification as an IBA will enhance conservation of sites in several ways. The IBA process provides a scientifically-based means of cataloging the most important sites for birds throughout the country and the world, and the use of a hierarchical classification system further helps to prioritize conservation efforts. The identification of IBAs is an important step in larger

bird conservation initiatives and promoting positive actions to safeguard vital bird habitats. Conservation actions within IBAs reflect the unique circumstances of each site (e.g., size, location, and ownership). Public areas may be conserved by open-space acquisition, changes in land use practices, and by working with land managers to improve management for key species. Private lands may be conserved through public-private partnerships such as easements, habitat conservation plans and safe harbor agreements, and through landowner education.

### IDENTIFYING IMPORTANT BIRD AREAS IN HAWAII

The United States is unique among BirdLife partners in that the IBA Program is implemented on a state-by-state basis, with coordination of state-based efforts via Audubon's national IBA office. Audubon has taken this state-based approach in order to maximize the effectiveness of IBAs since they must be initiated and implemented locally.

Identification of Important Bird Areas in the Hawaiian Islands began in August 2006 with establishment of a Hawai'i IBA Technical Committee, lead by Bruce Casler, then of the National Audubon Society's Waimea Valley Audubon Center. The committee was composed of experts on the conservation, ecology, distribution, and natural history of Hawaiian birds and broader conservation issues. The following people served as members of the Hawai'i IBA Technical Committee: David Leonard and Fern Duvall of the Hawai'i Division of Forestry and Wildlife, Holly Freifeld, Beth Flint, Jack Jeffrey, and Mike Silbernagle of the U.S. Fish and Wildlife Service, Ron Walker of the Hawaii Audubon Society, Rob Shallenberger of the Nature Conservancy of Hawai'i, Bruce Casler, and Eric VanderWerf.

An organizational meeting of the Hawai'i IBA Technical Committee was held in early 2007. A preliminary list of potential sites was generated at that meeting, which was further discussed and revised by the committee via email over the next few months, then provided to Audubon's national IBA office. In June 2007, Eric VanderWerf was contracted to be the Hawai'i IBA coordinator by National Audubon Society. Responsibilities of the Hawai'i IBA coordinator included: compiling data and completing nomination forms for each of the potential sites; coordinating with the Hawai'i IBA Technical Committee to review the data and nomination forms; entering and managing data about Hawai'i IBAs in the Audubon IBA database and making them available to the public through the Audubon website; developing GIS maps of the IBAs; coordinating with

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the National IBA office to have these sites reviewed by the U.S. IBA Technical Committee; and summarizing the work in a final report.

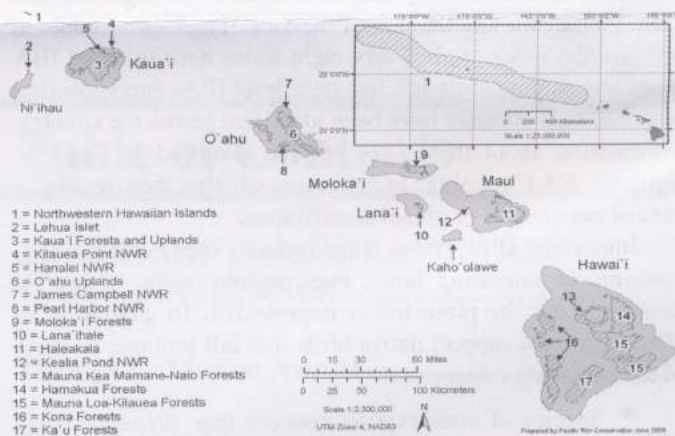
In most cases, state IBA Technical Committees first develop state-specific IBA criteria and then identify sites that qualify as state-level IBAs based on those criteria. Sites in each state are then evaluated using continental and global IBA criteria that were developed by Audubon and Birdlife, respectively, and sites meeting the prescribed thresholds are proposed as globally or continentally significant. In the case of Hawai'i, however, the goal as directed by Audubon was to immediately identify sites of global significance, so sites were evaluated with pre-existing global criteria. Because Hawai'i has so many endemic species, endangered species, and large breeding colonies of seabirds, many sites that are important in Hawai'i are also globally important. Sites in Hawai'i thus have been considered only at the global level, but it is still possible to develop state-specific criteria that might result in identification of additional sites that support bird populations important to Hawai'i in particular.

The primary information needed to support the nomination of an IBA is a reliable estimate of the number of birds using that site. For species that are not resident, it is important to know their seasonal occurrence, rather than just the total during the entire year. Because the conservation value of a site may change over time due to shifts in land use, threats, or ownership, it is important to report counts of birds in a particular year rather than as an average over a number of years. It is also important that the identification of an IBA be based on relatively current data. In order to qualify as an IBA at the global or continental level, Audubon recommends that the data upon which a nomination is based be no more than 10 years old. In Hawai'i, the only quantitative information available for some sites is more than 20 years old, and this has been provisionally accepted, but more current information is urgently needed. Additional surveys have been conducted for most endemic and endangered forest birds, but some of this data has not yet been analyzed and for some species the only quantitative information is provided by Scott et al. (1986), based on surveys conducted in the late 1970s and early 1980s.

## SUMMARY OF IMPORTANT BIRD AREAS IN HAWAII

**Locations and General Descriptions.** The Hawai'i IBA Technical Committee identified 17 IBAs that are located on all but two of the Hawaiian Islands (Table 1; Figure 1). The largest island, Hawai'i, had the most IBAs (5), followed by Kaua'i (3), O'ahu (3), Maui (2), Moloka'i (1), and Lāna'i (1). The Northwestern Hawaiian Islands (NWHI) were grouped into a single IBA that encompasses all 10 islands, atolls, and exposed reefs (Nihoa, Necker, Gardner Pinnacles, French Frigate Shoals, Laysan, Lisianski, Maro Reef, Pearl and Hermes, Midway, and Kure), as well as the offshore waters between the islands. Grouping the NWHI into a single IBA and including a marine component deliberately highlights the importance of offshore habitat to foraging seabirds and the threats that occur in this environment. However, many of the seabirds nesting in the NWHI and in the main Hawaiian islands use waters hundreds or even thousands of kilometers from shore. In order to fully meet the habitat requirements of these species a more complete assessment is needed of non-breeding distributions at sea, which likely would result in identification of much larger marine IBAs that encompass international waters.

**Figure 1.** Map of the Hawaiian Islands showing the locations of Important Bird Areas.



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850 Richards Street, Suite 505

Honolulu, HI 96813

Phone/Fax: (808) 528-1432

E-mail: [hiaudsoc@pixi.com](mailto:hiaudsoc@pixi.com) Website: [www.hawaii.audubon.com](http://www.hawaii.audubon.com)

Pacific Fisheries Coalition (PFC) (a project of HAS)

Tel: (808) 262-6859 Website: [www.pacfish.org](http://www.pacfish.org)

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**Table 1.** List of 17 Important Bird Areas in the State of Hawai'i, including the size and number of bird species for which each area qualifies as an IBA.

| Island      | Important Bird Area                     | Size (ha)   | # of Qualifying Bird Species |
|-------------|---|-------------|------------------------------|
| 10 Islands  | Northwestern Hawaiian Islands           | 362,061,000 | 26                           |
| Lehua Islet | Lehua Islet                             | 117         | 5                            |
| Kaua'i      | Kaua'i Forests and Uplands              | 77,420      | 14                           |
| Kaua'i      | Kīlauea Point National Wildlife Refuge  | 82          | 6                            |
| Kaua'i      | Hanalei National Wildlife Refuge        | 371         | 5                            |
| O'ahu       | O'ahu Uplands                           | 39,704      | 4                            |
| O'ahu       | James Campbell National Wildlife Refuge | 66          | 6                            |
| O'ahu       | Pearl Harbor National Wildlife Refuge   | 25          | 5                            |
| Moloka'i    | Moloka'i Forests                        | 12,295      | 4                            |
| Lāna'i      | Lāna'ihale                              |             | 1                            |
| Maui        | Haleakalā                               | 46,602      | 10                           |
| Maui        | Keālia Pond National Wildlife Refuge    | 280         | 4                            |
| Hawai'i     | Mauna Kea Mamane-naio Forests           | 21,142      | 6                            |
| Hawai'i     | Hāmākua Forests                         | 51,168      | 10                           |
| Hawai'i     | Mauna Loa-Kīlauea Forests               | 109,068     | 10                           |
| Hawai'i     | Kona Forests                            | 65,266      | 8                            |
| Hawai'i     | Ka'ū Forests                            | 44,145      | 10                           |

A description of each site, its ornithological significance, and conservation issues at each site can be viewed at <http://iba.audubon.org/iba/stateIndex.do?state=US-HI>. The 17 IBAs can be divided into three general categories: 1) Upland sites in the mountains of the main islands; 2) Wetland and coastal sites in the lowlands of the main islands; and 3) Remote islets and atolls. Most of the upland sites qualified for global IBA status based on populations of endemic Passerines, many of which are endangered, although some upland sites also contain important breeding populations of endangered seabirds, such as the Kaua'i Uplands, Haleakalā, and Lāna'ihale. The coastal and wetland sites qualified for global IBA status based on endemic waterbirds such as Hawaiian Coot and Hawaiian Duck, concentrations of migratory shorebirds such as Bristle-thighed Curlew and Pacific Golden Plover, and Kīlauea Point also qualified based on large numbers of seabirds. The endangered Nēnē was a qualifying species for several upland and coastal sites due to its use of a variety of habitat types. Lehua Islet and the NWHI qualified for global IBA status based on large numbers of a variety of seabirds, and the NWHI also supported four endemic species that are endangered, the Laysan Duck, Laysan Finch, Nihoa Finch, and Nihoa Millerbird.

The only Hawaiian Islands on which no IBAs were identified are Kaho'olawe and Ni'ihau. Kaho'olawe was used as a bombing range by the U.S. Navy for several decades after World War II and has been severely impacted. It currently supports only a small number of relatively common seabird species, but revegetation efforts are underway and predators including feral cats and mice may be eradicated in the future (Kaho'olawe Island Reserve Commission 2004). A variety of seabirds may recolonize Kaho'olawe naturally once the threats have been sufficiently ameliorated, and the island could serve as a suitable reintroduction site. The southern portion of Ni'ihau contains several shallow playa lakes that support large numbers of endangered Hawaiian Coots and Stilts in some years (USFWS 2005), but no surveys have been conducted during the last 10 years due to lack of access to this privately-owned island. It

is likely that Ni'ihau still supports important concentrations of endangered waterbirds during the winter months when these playa lakes fill with water, but lack of current information on habitat conditions and waterbird numbers makes it difficult to support nomination of these lakes as an IBA at this time.

The list of 17 sites in Hawai'i identified as globally Important Bird Areas is similar to a list of 16 nationally important sites in Hawai'i identified by the American Bird Conservancy (ABC 2003). Four sites identified here were not included on the ABC list: Lehua Islet, Moloka'i Forests, Lāna'ihale, and Kīlauea Point National Wildlife Refuge. Conversely, three sites in Hawai'i identified as nationally important by ABC did not qualify as globally important during the identification process prescribed by Audubon: Kakahai'a National Wildlife Refuge on Moloka'i, Hulē'ia National Wildlife Refuge on Kaua'i, and Kawainui Marsh on O'ahu. Kakahai'a National Wildlife Refuge was created to protect habitat for endangered waterbirds, particularly the Hawaiian Stilt, but it has since become dry and overgrown with invasive alien plants. It no longer provides suitable habitat for stilts or other wetland birds and does not currently support any native bird species. Hulē'ia National Wildlife Refuge and Kawainui Marsh do provide suitable habitat for waterbirds, including the endangered Hawaiian Stilt, Hawaiian Coot, Hawaiian Common Moorhen, and Hawaiian Duck, and are locally important, but the number of each species present at these sites was not large enough to meet criteria prescribed for global significance by the National Audubon Society.

**Key Bird Species.** The 17 sites identified in Hawai'i qualified for inclusion as globally Important Bird Areas based on a total of 53 bird species (Table 2). This total includes 30 taxa endemic to the Hawaiian Islands at the species or subspecies level, 19 species that are indigenous breeders in Hawaiian Islands, and four species that are non-breeding migrants in the Hawaiian Islands. Twenty-nine of the species are listed as threatened or endangered under the U.S. Endangered Species Act, two species

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**Table 2** Key bird species for which sites in the Islands qualify as globally Important Bird Areas.

| Common Name              | Scientific Name                         | Status <sup>1</sup> | USA                       | IUCN                      | Sites   |
|--------------------------|---|---------------------|---------------------------|---------------------------|---|
|                          |   |                     | Threat Level <sup>2</sup> | Threat Level <sup>3</sup> |   |
| Black-footed Albatross   | <i>Phoebastria nigripes</i>             | I                   | BCC                       | E                         | NWHI, Lehua Islet   |
| Laysan Albatross         | <i>Phoebastria immutabilis</i>          | I                   | BCC                       | V                         | NWHI, Kīlauea Point, Lehua Islet  |
| Short-tailed Albatross   | <i>Phoebastria albatrus</i>             | I                   | E                         | V                         | NWHI  |
| Hawaiian Petrel          | <i>Pterodroma sandwichensis</i>         | E                   | E                         | V                         | Haleakalā, Kauaʻi, Lānaʻihale, Molokaʻi                                   |
| Bonin Petrel             | <i>Pterodroma hypoleuca</i>             | I                   |                           |                           | NWHI  |
| Bulwer's Petrel          | <i>Bulweria bulwerii</i>                |                     |                           |                           | NWHI  |
| Wedge-tailed shearwater  | <i>Puffinus pacificus</i>               | I                   |                           |                           | NWHI, Kīlauea Point, Lehua Islet  |
| Christmas Shearwater     | <i>Puffinus nativitatus</i>             | I                   |                           |                           | NWHI  |
| Newell's Shearwater      | <i>Puffinus auricularis newelli</i>     | E                   |                           | E                         | Kauaʻi, Kīlauea Point, Lehua Islet  |
| Band-rumped Storm-Petrel | <i>Oceanodroma castro</i>               | I                   | C                         |                           | Kauaʻi  |
| Tristram's Storm-petrel  | <i>Oceanodroma tristrami</i>            | I                   | BCC                       | NT                        | NWHI  |
| White-tailed Tropicbird  | <i>Phaethon lepturus</i>                | I                   |                           |                           | Kauaʻi  |
| Red-tailed Tropicbird    | <i>Phaethon rubricauda</i>              | I                   |                           |                           | NWHI, Kīlauea Point, Lehua Islet  |
| Masked Booby             | <i>Sula dactylatra</i>                  | I                   |                           |                           | NWHI  |
| Red-footed Booby         | <i>Sula sula</i>                        | I                   |                           |                           | NWHI, Kīlauea Point   |
| Great Frigatebird        | <i>Fregata minor</i>                    | I                   |                           |                           | NWHI  |
| Hawaiian Goose or Nēnē   | <i>Branta sandvicensis</i>              | E                   | E                         | V                         | Haleakalā, Hāmākua, Hanalei, Kaʻū, Kauaʻi, Kīlauea Point, Kona, Mauna Loa |
| Hawaiian Duck or Koloa   | <i>Anas wyvilliana</i>                  | E                   | E                         | E                         | Hanalei, James Campbell, Keālia Pond, Pearl Harbor                        |
| Laysan Duck              | <i>Anas laysanensis</i>                 | E                   | E                         | CR                        | NWHI  |
| Hawaiian Hawk or ʻIo     | <i>Buteo solitarius</i>                 | E                   | E                         | NT                        | Hāmākua, Kaʻū, Kona, Mauna Loa  |
| Hawaiian Common Moorhen  | <i>Gallinula chloropus sandvicensis</i> | E                   | E                         |                           | Hanalei, James Campbell NWR, Pearl Harbor                                 |
| Hawaiian Coot            | <i>Fulica alai</i>                      | E                   | E                         | V                         | Hanalei, James Campbell, Keālia Pond, Pearl Harbor                        |
| Pacific Golden-Plover    | <i>Pluvialis fulva</i>                  | M                   | BCC                       |                           | NWHI, James Campbell, Keālia Pond, Pearl Harbor                           |
| Hawaiian Stilt           | <i>Himantopus mexicanus knudseni</i>    | E                   | E                         |                           | Hanalei, James Campbell, Keālia Pond, Pearl Harbor                        |
| Wandering Tattler        | <i>Heteroscelus incanus</i>             | M                   |                           |                           | NWHI  |
| Bristle-thighed Curlew   | <i>Numenius tahitiensis</i>             | M                   | BCC                       | V                         | NWHI, James Campbell  |
| Ruddy Turnstone          | <i>Arenaria interpres</i>               | M                   |                           |                           | NWHI  |
| Gray-backed Tern         | <i>Sterna lunata</i>                    | I                   |                           |                           | NWHI  |
| Sooty Tern               | <i>Sterna fuscata</i>                   | I                   |                           |                           | NWHI  |
| Brown Noddy              | <i>Anous stolidus</i>                   | I                   |                           |                           | NWHI  |
| Black Noddy              | <i>Anous minutus</i>                    | I                   |                           |                           | NWHI  |
| Blue-gray Noddy          | <i>Procelsterna cerulea</i>             | I                   | BCC                       |                           | NWHI  |
| White Tern               | <i>Gygis alba</i>                       | I                   |                           |                           | NWHI  |
| Kauaʻi ʻŌʻō              | <i>Moho braccatus</i>                   | X                   | E                         | EX                        |   |
| Hawaiian Crow or ʻAlalā  | <i>Corvus hawaiiensis</i>               | X                   | E                         | EW                        |   |
| ʻElepaio                 | <i>Chasiempis sandwichensis</i>         | E                   | E,BCC                     | E                         | Hāmākua, Kaʻū, Kauaʻi, Kona, Mauna Kea, Mauna Loa, Oʻahu Uplands          |
| Kāmaʻo                   | <i>Myadestes myadestinus</i>            | X                   | E                         | EX                        |   |
| ʻŌmaʻo                   | <i>Myadestes obscurus</i>               | E                   | BCC                       | V                         | Hāmākua, Kaʻū, Mauna Loa  |
| Puaiohi                  | <i>Myadestes palmeri</i>                | E                   | E                         | CR                        | Kauaʻi  |
| Nihoa Millerbird         | <i>Acrocephalus familiaris</i>          | E                   | E                         | CR                        | NWHI  |
| Laysan Finch             | <i>Telespyza cantans</i>                | E                   | E                         | V                         | NWHI  |
| Nihoa Finch              | <i>Telespyza ultima</i>                 | E                   | E                         | CR                        | NWHI  |
| ʻŌʻū                     | <i>Psittirostra psittacea</i>           | X                   | E                         | CR                        |   |
| Palila                   | <i>Loxioides bailleui</i>               | E                   | E                         | E                         | Mauna Kea   |
| Maui Parrotbill          | <i>Pseudonestor xanthophrys</i>         | E                   | E                         | CR                        | Haleakalā   |
| Hawaiʻi ʻAmakihi         | <i>Hemignathus virens</i>               | E                   | BCC                       |                           | Haleakalā, Hāmākua, Kaʻū, Kona, Mauna Kea, Mauna Loa, Molokaʻi            |

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|                                    |                               |   |     |    |   |
|------------------------------------|-------------------------------|---|-----|----|---|
| O'ahu 'Amakihi                     | <i>Hemignathus flavus</i>     | E | BCC | V  | O'ahu Uplands   |
| Kaua'i 'Amakihi                    | <i>Hemignathus stejnegeri</i> | E | BCC | V  | Kaua'i  |
| 'Anianiau                          | <i>Hemignathus parvus</i>     | E | BCC | V  | Kaua'i  |
| Nukupu'u                           | <i>Hemignathus lucidus</i>    | X | E   | CR | Kaua'i, Haleakalā   |
| 'Akiapōlā'au                       | <i>Hemignathus munroi</i>     | E | E   | E  | Hāmākua, Ka'ū, Mauna Loa  |
| 'Akikiki or Kaua'i Creeper         | <i>Oreomystis bairdi</i>      | E | C   | CR | Kaua'i  |
| Hawai'i Creeper                    | <i>Oreomystis mana</i>        | E | E   | E  | Hāmākua, Ka'ū, Kona, Mauna Loa  |
| O'ahu 'Alauahio                    | <i>Paroreomyza maculata</i>   | X | E   | CR |   |
| Kākāwahie or Moloka'i Creeper      | <i>Paroreomyza flammea</i>    | X | E   | EX |   |
| Maui 'Alauahio                     | <i>Paroreomyza montana</i>    | E | BCC | E  | Haleakalā   |
| 'Akeke'e                           | <i>Loxops caeruleirostris</i> | E | BCC | E  | Kaua'i  |
| 'Ākepa                             | <i>Loxops coccineus</i>       | E | E   | E  | Hāmākua, Ka'ū, Kona, Mauna Loa  |
| 'Iwi                               | <i>Vestiaria coccinea</i>     | E | BCC | NT | Haleakalā, Hāmākua, Ka'ū, Kaua'i, Kona, Mauna Kea, Mauna Loa, Moloka'i, O'ahu Uplands |
| 'Apapane                           | <i>Himatione sanguinea</i>    | E | BCC |    | Haleakalā, Hāmākua, Ka'ū, Kaua'i, Kona, Mauna Kea, Mauna Loa, Moloka'i, O'ahu Uplands |
| 'Ākohekohe or Crested Honeycreeper | <i>Palmeria dolei</i>         | E | E   | CR | Haleakalā   |
| Po'ouli                            | <i>Melamprosops phaeosoma</i> | X | E   | CR | Haleakalā   |

<sup>1</sup> E = endemic to the Hawaiian Islands; I = indigenous to the Hawaiian Islands; M = non-breeding migrant in the Hawaiian Islands; X = possibly extinct (not counted in species total for IBA qualification purposes).

<sup>2</sup> E = endangered; T = threatened; C = candidate for listing; BCC = bird of conservation concern (U.S. Fish and Wildlife Service 2002).

<sup>3</sup> CR = critically endangered; E = endangered; V = vulnerable; NT = near threatened; EX = extinct; EW = extinct in the wild (IUCN 2006).

are candidates for listing, and 15 species are considered birds of conservation concern by the U.S. Fish and Wildlife Service (2002). The NWHI qualified as globally significant based on the most species (26), including three endemic Passerines, the endemic Laysan Duck, four migratory shorebirds, and 18 indigenous seabirds. The Kaua'i Forests and Uplands site had the second most qualifying species (14), followed by Haleakalā on Maui and Hāmākua Forests, Mauna Loa-Kīlauea Forests, and Ka'ū Forests on Hawai'i (10 species each). Lāna'ihale had only a single qualifying species, the Hawaiian Petrel.

Table 2 also includes eight additional species that are possibly extinct or extinct in the wild, several of which are also listed under the U.S. Endangered Species Act. These species were not considered in whether a site qualified for IBA status because their existence is not certain, but all areas in Hawai'i that may contain possibly extinct species were included in one of the identified IBAs, so even though these possibly extinct species were not considered explicitly, they have not "fallen through the cracks." The Hawaiian Crow or 'Alalā is extinct in the wild, but a captive breeding program has been established that contains over 50 individuals (U.S. Fish and Wildlife Service 2003), and several potential reintroduction sites are located in the Kona, Ka'ū, and Haleakalā IBAs. Surveys have been conducted to search for other very rare birds, but the status of some species remains poorly known (Reynolds and Snetsinger 2001, U.S. Fish and Wildlife Service 2006). Some species probably are extinct, such as the Kākāwahie or Moloka'i Creeper and the Kaua'i 'Ō'ō, but additional surveys are needed to better ascertain whether other species are still extant, and the validity of some species observations, such as Nukupu'u and O'ahu 'Alauahio, has been questioned (Shallenberger and

Pratt 1978, Pyle and Pratt 2000). The last known Po'ouli died in captivity before a mate could be obtained for captive breeding, but it is possible that a few individuals still exist in the wild (VanderWerf et al. 2006).

**IBA Boundaries and Land Ownership.** Some of the Important Bird Areas in the Hawaiian Islands encompass lands owned and managed by a single entity, such as Hanalei, Kīlauea Point, James Campbell, Pearl Harbor, and Keālia Pond National Wildlife Refuges. The boundaries of these IBAs were easy to define because the habitat important to birds largely coincided with the land parcel. The Northwestern Hawaiian Islands IBA also consists of a single management unit, the Papahānaumokuākea Marine National Monument, though it is jointly administered by the State of Hawai'i, the U.S. Fish and Wildlife Service, and the U.S. National Oceanic and Atmospheric Administration. In most other cases, however, the IBA boundaries were based on biological considerations rather than land ownership and parcel boundaries. Bird habitats do not necessarily coincide with political units, and an effort was made to identify and include all lands in each area that contain the biological elements important to birds. For example, the Haleakalā IBA includes not only Haleakalā National Park, but also Hanawī State Natural Area Reserve, The Nature Conservancy of Hawai'i's Waikamoi Preserve, and adjacent State and private lands that also contain important habitat. Similarly, Hakalau Forest National Wildlife Refuge forms the centerpiece of the Hāmākua Forests IBA, but the IBA also includes adjacent State and private lands that support part of the significant bird populations in that area. The proportional land ownership of each IBA is summarized in Table 3.

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**Table 3.** Land ownership of Important Birds Areas in the Hawaiian Islands, in hectares (ha) and as a percentage.

| Important Bird Area           | Federal ha (%)     | State ha (%)   | County ha (%) | Private ha (%) |
|-------------------------------|--------------------|----------------|---------------|----------------|
| Northwestern Hawaiian Islands | 362,060,919 (>99%) | 81 (<1%)       | 0             | 0              |
| Lehua Islet                   | 117 (100%)         | 0              | 0             | 0              |
| Kaua'i Forests and Uplands    | 0                  | 45,689 (62%)   | 0             | 28,530 (38%)   |
| Kīlauea Point N.W.R.          | 82 (100%)          | 0              | 0             | 0              |
| Hanalei N.W.R                 | 371 (100%)         | 0              | 0             | 0              |
| O'ahu Uplands                 | 4,714 (12%)        | 11,883 (30%)   | 1,609 (4%)    | 21,498 (54%)   |
| James Campbell N.W.R          | 66 (100%)          | 0              | 0             | 0              |
| Pearl Harbor N.W.R            | 25 (100%)          | 0              | 0             | 0              |
| Moloka'i Forests              | 2,951 (24%)        | 5901 (48%)     | 0             | 3,443 (28%)    |
| Lāna'ihale                    | 0                  | 0              | 0             | 2,195 (100%)   |
| Haleakalā                     | 11,869 (26%)       | 29,496 (63%)   | 0             | 5,237 (11%)    |
| Keālia Pond N.W.R             | 0                  | 0              | 0             | 280 (100%)     |
| Mauna Kea Mamane-Naio Forests | 0                  | 21,142 (100%)  | 0             | 0              |
| Hāmākua Forests               | 13,145 (26%)       | 28,687 (56%)   | 0             | 9,336 (18%)    |
| Mauna Loa-Kīlauea Forests     | 31,135 (28%)       | 69,568 (63%)   | 0             | 9,365 (9%)     |
| Kona Forests                  | 2,166 (3%)         | 38,753 (60%)   | 0             | 24,347 (37%)   |
| Ka'ū Forests                  | 11,478 (26%)       | 29,781 (67%)   | 0             | 2,886 (7%)     |
| Total All Areas Combined      | 362,139,038 (>99)  | 279,981 (<.1%) | 1,609 (<.1%)  | 107,117 (<.1%) |
| Total without NWHI            | 78,119 (17%)       | 279,900 (60%)  | 1,609 (0.3%)  | 107,117 (23%)  |

**Threats.** Alien species are the most serious threat to birds and Important Bird Areas in the Hawaiian Islands, in terms of both the number of sites where they constitute a threat and the severity of the threat they pose (Table 4). All 17 Important Bird Areas in Hawai'i are affected by a variety of invasive alien species, including alien plants, alien animals, and feral domestic animals.

Alien and feral animals threaten birds in a variety of ways, including predation on adults and nests, destruction and degradation of habitat by grazing and browsing, dispersing seeds of alien plants, preventing regeneration of native forest, and as vectors of disease (Scott et al. 2001). Rats, particularly the black or ship rat (*Rattus rattus*), prey on virtually all birds in Hawai'i and are the most serious predators on nests of many forest birds (Atkinson 1977, VanderWerf and Smith 2002). Mongoose (*Herpestes auropunctatus*) and feral cats (*Felis catus*) are the most serious predators on many ground-nesting birds such as Nēnē, Hawaiian Coot, Hawaiian Stilt, Hawaiian Common Moorhen, Hawaiian Duck, Hawaiian Petrel, Newell's Shearwater, and other seabirds. Mongoose do not currently occur on Kaua'i, and it is no coincidence that Kaua'i supports the largest populations of Nēnē and Newell's Shearwater. Feral cats are a threat to birds in 15 of the 17 IBAs; only the remote Northwestern Hawaiian Islands and Lehua Islet are free of feral cats. Feral cats also carry Toxoplasmosis, which can be fatal to the Hawaiian Crow or 'Alalā (USFWS 2003). Predation by feral dogs (*Canis familiaris*) is less frequent, but can be locally very serious, particularly for ground-nesting seabirds that are not able to flee quickly. Barn Owls are not native to Hawai'i, and are known to prey on a variety of birds, including seabirds

such as Newell's Shearwater and Hawaiian Petrel and a variety of forest birds (VanderWerf et al. 2007). Feral Mallards (*Anas platyrhynchos*) pose a threat to Hawaiian Ducks in particular through hybridization (USFWS 2005). Alien birds such as the Japanese White-eye (*Zosterops japonicus*) and Japanese Bush-warbler (*Cettia diphone*) may compete for food with native birds, but the extent and severity of competition is not well known and difficult to document.

Feral pigs (*Sus scrofa*) are common in most areas in Hawai'i and degrade habitat by rooting in the understory, spreading the seeds of invasive alien plants, and creating breeding sites for non-native mosquitoes that transmit disease. Hollowed trunks of tree ferns toppled by feral pigs are the primary breeding site for mosquitoes in some areas. Feral cattle (*Bos taurus*), sheep (*Ovis aries*), and goats (*Capra hircus*) occur in many areas, and their grazing and browsing seriously damages native vegetation and their trampling causes erosion and damages the root system of native plants. Damage from feral sheep and goats has been particularly severe on leeward Haleakalā, portions of the Alaka'i Plateau, and in the Kona and Ka'ū areas of Hawai'i. Mouflon sheep (*Ovis musimon*) were deliberately established to provide sport hunting on the island of Hawai'i, where their browsing has severely damaged dry forest habitat of the Palila and other birds (USFWS 2006, Leonard et al. 2008).

The alien southern house mosquito (*Culex quinquefasciatus*) poses an important threat to forest birds by transmitting alien diseases, primarily avian malaria (*Plasmodium relictum*) and avian pox virus (*Poxvirus avium*), to which many native forest birds have little immunity (Atkinson et al. 1995, van Riper et

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**Table 4.** Summary of threats affecting 17 Important Bird Areas in the Hawaiian Islands. Threat categories were pre-defined by the National Audubon Society and were adapted to Hawai'i as well as possible.

| Threat                                     | Number of Sites | Severity <sup>1</sup> (avg±SD) | Comments  |
|--|-----------------|--------------------------------|---|
| Alien and feral animals (other than birds) | 17              | 8.7±1.4                        | Rats, mongoose, mouflon sheep, axis deer, bullfrogs, feral cattle, sheep, and goats |
| Alien plants                               | 17              | 8.2±2.0                        | Numerous species  |
| Feral cats                                 | 15              | 7.4±1.5                        | All sites except remote islands   |
| Mosquito-borne diseases                    | 8               | 9.5±0.9                        | Avian malaria and pox virus   |
| Feral pigs                                 | 8               | 8.5±0.8                        | Primarily in wet and mesic forests  |
| Climate change                             | 7               | 9.9±0.4                        | Increasing temperatures leading to mosquito expansion                               |
| Forest grazing                             | 7               | 7.1±2.4                        | By domestic cattle and feral sheep and goats  |
| Alien birds                                | 6               | 7.5±1.6                        | Predation by Barn Owls, hybridization by feral Mallards with Hawaiian Ducks         |
| Sea level rise                             | 5               | 9.2±0.8                        | NWHI and coastal wetlands   |
| Development and urbanization               | 5               | 6.0±1.9                        | Habitat destruction, residential development, light attraction                      |
| Avian botulism                             | 4               | 4.5±1.3                        | All wetland sites   |
| Human disturbance                          | 4               | 3.0±0.8                        | Aircraft, vehicles, human foot traffic  |
| Feral dogs                                 | 3               | 7.0±1.0                        | Predation on ground-nesting birds   |
| Fire                                       | 3               | 5.0±1.7                        | Arson, military training, vehicle traffic   |
| Agricultural development                   | 2               | 6.5±2.1                        | Hanalei, Kona forests   |
| Logging, deforestation                     | 2               | 6.5±0.7                        | Logging of koa  |
| Infrastructure                             | 1               | 8                              | Utility lines, towers, Kaua'i   |
| Drought                                    | 1               | 8                              | Keālia Pond   |
| Overfishing                                | 1               | 5                              | NWHI  |
| Pollution                                  | 1               | 5                              | NWHI; marine debris, plastics, contaminants   |
| Water diversions                           | 1               | 5                              | Keālia Pond   |
| Plantation forestry                        | 1               | 4                              | Primarily <i>Eucalyptus</i> and silk oak  |
| Hurricanes                                 | 1               | 4                              | NWHI  |
| Wind towers                                | 1               | 3                              | Lāna'ihale  |

On a scale from 1 (lowest) to 10 (highest). Values are average±standard deviation calculated from the scores at all sites where that factor was considered a threat.

al. 2002, VanderWerf et al. 2006). The malaria parasite and mosquito larvae do not develop well at colder temperatures, so abundance of most forest birds is higher above 1,500 meters elevation, and several endangered species, such as 'Ākiapolā'au, Maui Parrotbill, Hawai'i Creeper, and 'Ākepa occur only above 1,500 meters (Warner 1968, Scott et al. 1986). Nectarivorous species like 'Iwi and 'Apapane that move altitudinally in search of flowering trees can be exposed to mosquito-borne diseases when they descend.

Invasive alien plants threaten forest birds by displacing native plants needed for nesting and foraging, and often grow in monocultures that reduce floristic diversity and food availability. In addition, alien trees with fleshy fruits may attract nest predators such as rats into the forest canopy, where they prey on bird nests (VanderWerf and Smith 2002). The list of alien plants that threaten native forest habitats in Hawai'i is lengthy, but some of the most serious invasive plants are strawberry guava (*Psidium cattleianum*), fire tree (*Myrica faya*), *Miconia calvescens*, *Tibouchina urvilleana*,

and Christmasberry (*Schinus terebinthifolius*). In coastal wetlands, invasive alien plants degrade habitat quality by encroaching and choking wetlands and require regular control through prescribed burning, water level fluctuation, or mechanical clearing. Some of the most serious invasive plants in wetlands are California grass (*Brachiaria mutica*), saltwort (*Batis maritima*), mangrove (*Rhizophora mangle*), and Indian fleabane (*Pluchea indica*). Plantations of non-native trees, such as Eucalyptus, silk oak (*Grevillea robusta*), and Japanese tsugi pine (*Cryptomeria japonica*), are a threat in some areas, such as Ka'ū and Hāmākua on Hawai'i and on O'ahu, by spreading into adjacent native forest areas.

Global climate change and related sea level rise are also very serious threats to IBAs in Hawai'i (Table 4). The direct effects of climate change may be most obvious on low-lying islands and at coastal sites through rises in sea level, but the increased frequency of tropical storms and shifts in rainfall patterns associated with climate change will affect all areas.

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The NWHI and the many seabirds they support may be most seriously affected. Even small rises in sea level could periodically inundate some of these islands, and increased frequency and severity of storms could exacerbate sea level rise and disrupt seabird nesting. Coastal wetlands at Hanalei, James Campbell, Pearl Harbor, and Keālia Pond are less than five meters above current sea level. Sea level rise and surge from more frequent and intense storms could inundate freshwater and brackish coastal wetlands needed by waterbirds.

Climate change also poses a serious threat to upland areas and endemic forest birds because it may raise the inversion layer and alter orographic rainfall patterns, and because it may worsen the threat from disease by allowing alien mosquitoes to increase in distribution (Benning et al. 2002, Harvell et al. 2002). The parasite that causes avian malaria does not develop in birds below 13° Celsius (C) (55° Fahrenheit (F)), and maximum malaria transmission occurs where mean ambient summer temperature is 17° C (63° F) (LaPointe 2000). Between 13° and 17° C (55° and 63° F), malaria transmission is sporadic and usually associated with warmer periods, such as El Niño events (Feldman et al. 1995). According to the Intergovernmental Panel on Climate Change (IPCC 2007), the global average surface warming is likely to be 2° C to 4.5° C, with a best estimate of about 3° C, and is very unlikely to be less than 1.5° C. Benning et al. (2002) used GIS simulation to show that an increase in temperature of 2° C would raise the 17° C isotherm by 300 m (984 ft). This would result in an 85 percent decrease in the land area on Kaua'i where malaria transmission currently is only periodic. Loss of such a large proportion of suitable habitat would likely result in severe declines and perhaps extinction of some endemic forest bird species, such as the 'Akikiki and 'Akeke'e (Still et al. 1999). Increases in summertime temperatures and malaria prevalence have been reported on Hawai'i (Freed et al. 2005), and increases in the altitude of the heat-trapping inversion layer have already been detected in Hawai'i (Cao et al. 2007).

## CONCLUSIONS AND RECOMMENDATIONS

All of the sites in Hawai'i identified as Important Bird Areas were already known to be important, but it is hoped that identification as IBAs will provide greater recognition that may lead to enhanced protection and funding for management. The land comprising most sites is largely protected from development, and at least a portion of most sites already receives some level of management that benefits bird populations and bird habitat. However, in island ecosystems like those in Hawai'i, simply protecting habitat from development is not sufficient for ensuring conservation. All sites face serious threats that require active management, and most areas could benefit substantially from improved management. Some areas are used for multiple purposes that are not always compatible with conservation of native species. Further recognition of the significance of these sites as IBAs can help to enhance awareness of their conservation needs.

The fact that so many sites in Hawai'i qualify as globally significant demonstrates the important place Hawai'i has in

global biodiversity, and also the responsibility we in Hawai'i share in helping to protect that diversity. The precarious status of so many Hawaiian species indicates that our shared responsibility is not being adequately met and underscores the need for improved stewardship. This improvement must begin locally, but local efforts would be aided by greater recognition at the national and global levels of the challenges involved in conserving the Hawaiian avifauna and the habitats on which it depends. I hope the information in this report about bird populations and threats will be useful, that land owners and managers will use identification of lands as Important Bird Areas as additional justification for obtaining conservation funding, and that increases in public awareness and appreciation of Hawai'i's unique avifaunal heritage will translate into greater public support and advocacy for conservation actions and funding.

<sup>1</sup>Pacific Rim Conservation, 3038 Oahu Avenue, Honolulu, HI 96822, USA, [ewerf@hawaii.rr.com](mailto:ewerf@hawaii.rr.com)

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## George C. Munro Award

Congratulations to Virginia Tice, recipient of the 2008 George C. Munro Award for Environmental Law. This award was established by the Hawaii Audubon Society in memory of George C. Munro for his pioneering work in protecting Hawaii's native wildlife. The cash award is given annually for the highest grade in the Environmental Law course at the University of Hawaii's William S. Richardson School of Law. Best wishes for a successful career in protecting Hawaii's precious environment!

## HAS Field Trips

Contact the HAS Office at: (808) 528-1432, [hiaudsoc@pixi.com](mailto:hiaudsoc@pixi.com)

**Saturday, October 25**

**James Campbell National Wildlife Refuge with Mike Ord, Peter Donaldson, and Ron Walker 8:30 - 11:30 a.m.**

These expert birders will lead you in the viewing of endangered waterbirds and other migratory waterfowl at one of O'ahu's few remaining wetlands. **THIS TRIP IS LIMITED TO 25 PARTICIPANTS. REGISTRATION IS REQUIRED.** Call the HAS office to reserve your space.

## HAS Program Meetings

Program Meetings are sponsored by HAS and the UH Biology Department, and are held at UH Mānoa's St. John lab building (Botany Building) in room 011 (ground floor auditorium). The address is 3190 Maile Way. Attendance is free and open to the public.

**October 27, Monday, 6:45 - 8:45 p.m.**

**Declining Palila Populations, with Dr. Paul Banko**

Dr. Paul Banko of the USGS Pacific Island Ecosystems Research Center on Hawai'i Island will present a talk on the decline of the Palila, an endemic and endangered finch-billed honeycreeper found only on the slopes of Mauna Kea.

**November 10, Monday, 6:45 - 8:45 p.m.**

**Impact of Feral Cats, with Norma Bustos**

Norma Bustos, a Hawaii Audubon Society board member and wildlife biologist, will speak on the effect of feral cat populations on native avian populations.

Announcing Hawaii Audubon Society's  
**Annual Awards Dinner**

Monday, October 20, 2008

6:00 to 9:00 p.m.

Treetops Restaurant, Paradise Park

3737 Manoa Road



Featuring a special presentation by Dr. Frank J. Bonaccorso

**A Night in the Life of 'Ope'ape'a: Radio-Tracking Hawaiian Bats**

Dr. Bonaccorso is a Research Biologist with the U.S. Geological Survey at the Pacific Island Ecosystems Research Center located in Hawai'i Volcanoes National Park where he is project leader for research on the endangered Hawaiian hoary bat. He will speak on his research in Hilo and Kona on the natural history of this intriguing animal, one of only two mammals native to the Hawaiian islands.

Enjoy a buffet dinner and silent auction, meet Hawaii Audubon Society Board of Directors, staff, and fellow members, and congratulate the outstanding volunteers, corporate leaders, and public servants as they receive Hawaii Audubon Society awards.

Cost is \$25 per person. Please make your reservations by October 15 by calling (808) 528-1432, emailing [hiaudsoc@pixi.com](mailto:hiaudsoc@pixi.com), or by registering on our website, [www.hawaii-audubon.com](http://www.hawaii-audubon.com). Mail checks to Hawaii Audubon Society, 850 Richards St. #505, Honolulu, HI 96813. We look forward to seeing you there!

## IN MEMORIAM DAVID H. WOODSIDE

By Ron Walker



In 1962 David Woodside and colleagues released the Mariana Swiftlet (*Aerodramus bartschi*) in Halawa and Moanalua Valleys on O'ahu (left photo). Several articles on the subject were published in the 'Elepaio. At right, he is shown thirty years later visiting the tunnel in Halawa Valley where a small breeding population of the birds was established. Photos courtesy of Ulalia Woodside.



David H. Woodside passed away on June 24, 2008 at age 84. He spent 27 years as a wildlife biologist with the State of Hawai'i and 22 years with the U.S. Fish and Wildlife Service. He lived in retirement in Waimanalo with his wife, Leiana, and daughter, Ulalia. His association with the Hawaii Audubon Society goes back to 1940 when notes on his fieldwork first appeared in the 'Elepaio. He was a protégé of George C. Munro, one of the founders of the Society. His extraordinary career in and out of government was marked by many accomplishments throughout the Pacific and on all the islands of Hawai'i. Dave was widely respected for his encyclopedic knowledge of wildlife, particularly birds. He received many honors, including a Lifetime Achievement Award from the Hawaii Audubon Society, a Superior Service Award of the U.S. Department of the Interior, and Lifetime Achievement Award from the Hawai'i Conservation Alliance. On August 19<sup>th</sup>, family, friends and former co-workers gathered on the beach fronting his home for a moving ceremony honoring his life. His ashes were committed to the sea he loved by his daughter.

Aloha, Kawika.

### Membership in Hawaii Audubon Society 2008

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| Regular Member:..... \$ 25.00    | Foreign Membership (Airmail)       |
| Student Member:..... \$ 15.00    | Mexico..... \$ 26.00               |
| Supporting Member:..... \$100.00 | Canada..... \$ 28.00               |
|                                  | All other countries ..... \$ 33.00 |

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## Calendar of Events

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**Monday, October 20**

**ANNUAL AWARDS DINNER**

Please join us for this special event!

*See page 60*

**Saturday, October 25**

**HAS Field Trip**

James Campbell National Wildlife Refuge

*See page 59*

**Monday, October 27**

**HAS Program Meeting**

Declining Palila Populations, with Dr. Paul Banko

*See page 59*

**Monday, November 10**

**HAS Program Meeting**

Impact of Feral Cats, with Norma Bustos

*See page 59*

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