

U.S. FISH AND WILDLIFE SERVICE
HAWAIIAN/PACIFIC ISLANDS NWR COMPLEX
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O'AHU NATIONAL WILDLIFE REFUGE COMPLEX

JAMES CAMPBELL NWR
PEARL HARBOR NWR
O'AHU FOREST NWR

Island of O'ahu, Hawai'i

ANNUAL NARRATIVE REPORT

Calendar Year 2000

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INTRODUCTION

The O`ahu National Wildlife Refuge Complex consists of the James Campbell NWR, Pearl Harbor NWR, and the newly established O`ahu Forest NWR. All administration is accomplished through the Complex office located in Haleiwa on the north shore of O`ahu. It takes about thirty minutes to reach any one of the refuge units from the office. Maintenance activities are primarily based out of the Ki`i Unit of the James Campbell NWR.

James Campbell National Wildlife Refuge

James Campbell NWR lies at the northernmost tip of O`ahu near the community of Kahuku and serves as a strategic landfall for native and migratory birds coming from as far away as Alaska, Siberia, and Asia. It is composed of two units - Punamano (37.5 acres) and Ki`i (107.5 acres). Punamano Unit is a natural spring-fed pond whereas the Ki`i Unit, a remnant of a formerly larger marsh, has been drastically modified by agriculture.

This large wetland was drained by a series of ditches designed to create terrestrial areas to be used for growing sugar cane. The Ki`i area was used as settling ponds to wash sugar cane at the Kahuku Sugar Mill. These ponds were used extensively by waterbirds. Closure of the mill resulted in the drying of these settling ponds. This prompted the Service to enter into a long-term lease agreement with the landowner, the Estate of James Campbell. The Refuge is currently managed by the Service under a 55-year lease; however, plans for land acquisition are underway.

The Refuge, under the lease agreement, was established in 1976 with the primary purpose of providing habitat for Hawai`i's four endemic, endangered waterbirds (Hawaiian stilt, coot, moorhen, and duck) and other native wildlife, as well as migratory waterfowl and shorebirds. Both units are located in a coastal area, and the topography is nearly flat. Currently, wetland habitat is sustained at the Ki`i Unit by water from three artesian wells which is piped into seven impoundments. This Refuge is one of the most productive waterbird wetlands for resident and migratory species on O`ahu. A total of 102 bird species have been documented on the Refuge since its creation.

Pearl Harbor National Wildlife Refuge

Freshwater wetlands have been severely reduced on O`ahu, so when shorebird habitat was to be destroyed for the construction of the Honolulu International Airport Reef Runway, lands were sought for mitigation. With the cooperation of the Federal Aviation Administration, the State of Hawai`i, the U.S. Navy, and the Fish and Wildlife Service, Pearl Harbor National Wildlife Refuge was established in 1972 on Navy land. The Service, under a use agreement from the Navy, manages two wetland units, the Waiawa Unit (24.5 acres) on the Middle Loch of Pearl Harbor and the Honouliuli Unit (37.4 acres) on West Loch of Pearl Harbor.

These two wetland units are extremely valuable. They provide habitat for Hawai`i's four endangered waterbirds (Hawaiian stilt, moorhen, coot, and duck) and serve as winter havens

for migratory waterbirds. Waiawa is comprised of two man-made ponds with water pumped in from a nearby spring. It empties into the harbor. Honouliuli is also comprised of two man-made impoundments and water is pumped in from an on-site freshwater well. Though these units are small, they provide a variety of wetland habitat, which makes them extremely important to the overall population of the four endangered waterbirds and to migratory waterbird species on O`ahu. The refuge has documented 83 species of birds.

A new unit has been established under Pearl Harbor National Wildlife Refuge. It is the Kalaeloa Unit, formerly part of the Barbers Point Naval Air Station. It was transferred to the Service on January 30, 2001 and consists of 37.4 acres of dry land coastal habitat located on the leeward side of the island. It comprises the largest native remnant stand of the endangered *Achyranthes splendens* var. *rotundata* and supports other native coastal plants. An additional 145-acre parcel is pending transfer which supports the largest population of the endangered *Chamaesyce skottsbergii* var. *skottsbergii* (akoko) on O`ahu.

O`ahu Forest National Wildlife Refuge

On December 21, 2000, the 4525 acres were purchased from Castle and Cooke, Inc. (via The Nature Conservancy) establishing the O`ahu Forest National Wildlife Refuge. The refuge, located on the upper slopes of the misty northern Koolau Mountains, contains at least nine native natural communities including lowland mesic forests, rainforest communities, high elevation cloud forest, and freshwater streams. The purchase allows the Service to protect some of the best remaining native forest in the northern Koolau Mountains and is the only area within the entire mountain range that is set aside for the primary purpose of resource management.

Within the refuge boundaries, the Service plans to implement conservation measures to perpetuate and enhance native flora and fauna and protect and recover endangered or threatened species. Koa and `ohi`a forests within the refuge support a rich diversity of native plants and animals including at least four species of endangered O`ahu tree snails, 17 endangered plant species, and one endangered bird, the O`ahu `Elepaio. Many other rare native flora and fauna species including native honeycreepers will also benefit from the protection and enhancement. Many of these native plants and animals that once thrived in these forests are either extinct or on the brink of extinction, and management intervention is needed to stabilize native ecosystems and prevent more species from becoming extinct.

The Island of O'ahu, Hawai'i -

O'ahu National Wildlife Refuge Complex

James Campbell National Wildlife Refuge

Ki'i Unit; Punamano Unit

Pearl Harbor National Wildlife Refuge

Honouliuli Unit; Waiawa Unit; Kalaeloa Unit

O'ahu Forest National Wildlife Refuge



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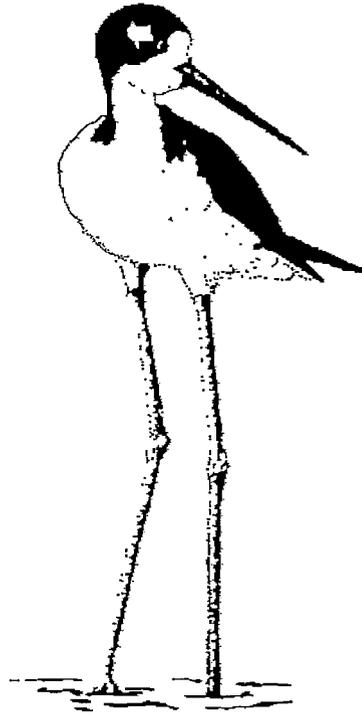
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Koloa

A. HIGHLIGHTS

- ▶ James Campbell NWR purchase still pending. (C. 1.)
- ▶ O`ahu Forest NWR established in December. (C. 1.)
- ▶ Acquisition of excess Navy land will help endangered plant recovery. (C. 1.)
- ▶ Senator Inouye's Ecosystem Restoration/Kahuku Flood Project is initiated. (D. 2.)
- ▶ Five-year hydrology study completed on James Campbell NWR. (D. 5a.)
- ▶ James Campbell NWR selected for amphibian study. (D. 5b.)
- ▶ Volunteer hours equivalent 1.4 FTEs. (E. 4.)
- ▶ Baseyard facilities are critical operation needs. (E. 5.)
- ▶ Refuge Biologist serves on wetland review team. (E. 7.)
- ▶ Disney re-enacts the bombing of Pearl Harbor - waterbird disturbances determined at the Pearl Harbor NWR. (E. 7.)
- ▶ Private, State, and Federal agencies form the Wetlands Restoration and Protection Partnership. Amphibious excavator promised by the City of Honolulu. (E. 8.)
- ▶ Growth of native sedges spurred by water level management. (F. 2a.)
- ▶ Restoration efforts supplemented by U.S. Navy Seabees. (F. 2b.)
- ▶ Prescribed burn ban efforts hinder pond management. (F. 9.)
- ▶ Regional Water Rights staff offer assistance to fix multiple problems at Ki`i. (F. 11.)
- ▶ Hawaiian coot numbers on the rise. (G. 2a.)
- ▶ Record number of stilt chicks fledge at Honouliuli. (G. 2a.)
- ▶ New Oahu NWRC brochure completed (H. 1.)
- ▶ Hawai`i Nature Center 3rd grade program in its seventh year at Honouliuli. (H. 2.)
- ▶ ARM participates in a live broadcast TV series about wetlands. (H. 2.)
- ▶ Third year of guide public tours at Ki`i well received. (H. 4.)
- ▶ Overlook planned for public viewing of Pearl Harbor NWR for the first time. (H. 6.)
- ▶ Maintenance battles fence problems. (I. 2.)
- ▶ Mechanical breakdowns cause all three water pumps to be replaced. (I. 4.)
- ▶ Rock landslide separates office from refuge for over a month. (I. 8.)
- ▶ VIPs range from Chief of NWRS to Congressmen. (J. 3.)
- ▶ Refuges filmed by CBS cinematographer. (J. 3.)



Hawaiian Stilt

B. CLIMATIC CONDITIONS

Near Perfect Weather Year Round - Weather on O`ahu is very consistent, with only moderate changes in temperature throughout the year. This is possible due to the year-round warm sea surface temperatures, which keep the overlying atmosphere warm as well. In practical terms there are only two seasons here: the summer months (called *Kau*) that extend from May to October and the winter months (*Ho`oilo*) that run from November to April. The average day-time summer temperature at sea level is 85 degrees F. while the average day-time winter temperature is 78 degrees. Night-time temperatures are approximately 10 degrees F. lower. In the higher elevations of O`ahu, there is a 3.5 degree drop in temperature for every thousand-foot rise above sea level.

There are as many different climate zones in Hawai'i as exist along the entire American coast from Alaska to Costa Rica. These islands can be described as an incredibly diverse collection of many microenvironments, each possessing unique weather, plants, and animals. Through most of the year Hawaiian weather patterns are affected primarily by high pressure zones in the north Pacific that pump relatively cool, moist trade winds down onto the island's northeastern slopes. This pattern holds true for most of the summer and approximately half of the time in the winter. These winds are forced up-slope by the mountain heights where ultimately their moisture condenses into clouds that produce rain. Most of the rain then falls in the mountains and valleys on the windward (northeastern) side of the islands. It is this weather phenomenon that creates the rich tropical environment and why weather can vary considerably across the island. The dry leeward side of the island averages only 25 inches of rain annually while the upper slopes in the mountains just five miles away receives an average of 158 inches of rain annually. The wettest months are from November to March.

**James Campbell National Wildlife Refuge
Weather Statistics**

| Month | High Temp F. for 2000 | Low Temp F. for 2000 | Average Rainfall |
|------------------|------------------------------|-----------------------------|-------------------------|
| January | 76.6 | 64.7 | 5.4 |
| February | 79.2 | 67.9 | 4.2 |
| March | 80.1 | 65.8 | 4.6 |
| April | 76.9 | 68.8 | 3.7 |
| May | 79.3 | 71.9 | 2.4 |
| June | 81.1 | 73.7 | 1.5 |
| July | 81.7 | 74.3 | 2.1 |
| August | 82.2 | 75.1 | 2.3 |
| September | 82.2 | 73.8 | 2.1 |
| October | 82.0 | 74.5 | 3.9 |
| November | 79.7 | 73.0 | 3.9 |
| December | 79.3 | 69.3 | 5 |
| Year | 80.8 | 73.0 | 41.3 inches |

Rainfall data is from Kahuku (station 912) on O`ahu. Height is about 13 feet above sea level. Temperature averages were provided from data collected by an automated weather system at the James Campbell NWR Ki'i Unit. A FTS automated system replaced a Solus system in April. The FTS system, with a remote dial-in, has proven to be more reliable and user friendly than the Solus system. Remote dial-in allows us to instantaneously evaluate weather from the office, which is very helpful particularly on potential burn days.

**Pearl Harbor National Wildlife Refuge
Weather Statistics**

| Month | Avg High Temp F. | Avg Low Temp F. | Warmest on Record | Coldest on Record | Average Rainfall |
|------------------|-------------------------|------------------------|--------------------------|--------------------------|-------------------------|
| January | 80 | 65 | 89 | 50 | 3.4 |
| February | 80 | 65 | 89 | 52 | 2.5 |
| March | 81 | 66 | 93 | 52 | 2.0 |
| April | 82 | 68 | 93 | 54 | 1.2 |
| May | 83 | 69 | 92 | 61 | 0.8 |
| June | 85 | 71 | 94 | 60 | 0.3 |
| July | 86 | 72 | 97 | 62 | 0.4 |
| August | 86 | 73 | 96 | 61 | 0.3 |
| September | 87 | 72 | 95 | 63 | 0.5 |
| October | 85 | 71 | 95 | 59 | 1.9 |
| November | 83 | 70 | 94 | 56 | 2.1 |
| December | 81 | 69 | 92 | 53 | 2.9 |
| Year | 83 | 69 | | | 18.3 inches |

Data is from Barbers Point Naval Air Station on O'ahu. Height is about 49 feet above sea level.

**O'ahu Forest National Wildlife Refuge
Weather Statistics**

| Month | Average High Temp F. | Average Low Temp F. | Average Rainfall |
|------------------|-----------------------------|----------------------------|-------------------------|
| January | Data not available | | 9.1 |
| February | | | 8.1 |
| March | | | 11.0 |
| April | | | 9.1 |
| May | | | 7.9 |
| June | | | 8.1 |
| July | | | 9.9 |
| August | | | 8.3 |
| September | | | 6.8 |
| October | | | 8.2 |
| November | | | 9.6 |
| December | | | 10.0 |
| Year | | 106.1 | |

Data is from Koolau Dam (833) on O'ahu. Height is about 1158 feet above sea level.

C. LAND ACQUISITION

1. Fee Title

James Campbell NWR

The purchase of the Ki'i and Punamano units is still months away. The purchase is pending subdivision, which we are told, will take at least six months or more to go through the City and County Land Court.

A Preliminary Project Proposal (PPP) to Conduct Detailed Planning for the Additions to the James Campbell National Wildlife Refuge (May 1999) was approved by the Director and signed on November 19, 1999. This enabled the Service to begin the planning process for the acquisition of additional lands surrounding the James Campbell NWR in order to complete habitat protection. The proposed additions total approximately 550 acres and would be purchased from the Estate of James Campbell. The lands to be added would include natural wetlands, man-made aquaculture impoundments, and a section of the coast with sand dunes and coastal strand vegetation. Other areas are fastlands that would serve as educational viewing sites, buffer areas from adjacent land uses, administration facilities, and access roads. The acquisition of additional lands would connect the two currently leased units and would incorporate historical wetlands to provide habitat for four endangered waterbirds and a variety of migratory waterbirds, and the beaches would serve as a protected area for nesting or basking green sea turtles, nesting sites for sea birds, and as a haul-out site for endangered monk seals.



Photo 1. Proposed land for purchase James Campbell NWR.

Pearl Harbor NWR, Kalaeloa Unit (Barbers Point)

Since the early 1990s, the Service has considered acquiring excess military land at the former Barbers Point Naval Air Station that contains habitats for endangered plants, endangered waterbirds, rare plants, and migratory shorebirds. The lands would be acquired through a public benefits conveyance from the Navy. Four separate parcels have been considered as a management unit under Pearl Harbor NWR. Two of the parcels, Ordy Pond and a seasonal wetland located next to the airport, were selected for their wetland values and associated endangered waterbird use, and the other two parcels were identified for their habitat values to restore endangered and native coastal plants. The plant parcels are highest priority to prevent the extinction or irreversible decline of listed plant species. These parcels are known by the endangered plant that they support, the *Achyranthes* Parcel and the *Chamaesyce* Parcel.



Photo 2. Coastal dryland habitat - Kalaeloa Unit

Achyranthes Parcel (37.5 acres): The core area for the endangered *Achyranthes splendens* var. *rotundata*, or `Ewa hinahina, supports a remnant native plant community. In addition to the endangered plant, native plants include dry coastal plants such as naio (*Myoporum sandwicense*), huehue (*Cocculus triolbus*), and kipukai (*Heliotropium currasavicum*). The bulk of the `Ewa hinahina core area, however, is dominated by an open-canopy forest of introduced kiawe (*Prosopis pallida*) trees. Indian fleabane (*Pluchea*

indica), sourbush (*Pluchea symphytifolia*), and grasses form a transition zone between the native plant community and the open-canopy kiawe forest. The substrate in this area is a thin layer of silty soil over coralline limestone.

We have noticed attempts by shearwaters to nest in the areas cleared of pluchea. Unfortunately all we see are wings. We have seen at least 8 sets in only a few months. Predation by either mongoose, cats, dogs, rats, or a combination of such is evidently high. Establishing this area for nesting shearwaters would not be recommended, however, since this area is the final approach path for aircraft landing at the Kalaeloa Airport.

Pre-acquisition planning for acquiring this area is completed. We are awaiting the Navy's approval on our recommended contaminant language for inclusion in the transfer letter. We have been issued a license to continue restoration activities which include volunteers clearing alien plants by hand and planting native and endangered coastal plants. (Note: this parcel was officially transferred to the Service on January 30, 2001.)

Chamaesyce Parcel (146.1 acres) - The core area for the endangered *Chamaesyce skottsbergii* var. *skottsbergii*, or `akoko, is dominated by introduced trees and grasses including introduced kiawe and the introduced koa haole (*Leucaena leucocephala*) trees. In places, the kiawe trees form a closed-canopy forest that apparently exclude the endangered `akoko by shading and competition. The understory is dominated by introduced grass such as buffelgrass (*Cenchrus ciliaris*) and shrubs, including the native `ilima (*Sida fallax*). The substrate in the `akoko core area is exposed coralline limestone with a thin layer of silty soil.

Late in the planning process, the Navy detected lead and arsenic in the soils of the parcel that were formerly used as skeet and trap range. A relatively large number of individual endangered plants are found within the contaminated area and would be affected by cleanup. At minimum, the Service is requiring the Navy to remediate the site to a level protective of refuge workers and visitors (400 mg of lead/kilogram of soil). The Navy is currently conducting a study of ecological and human health risks posed by lead shot on the site. This study will determine whether a more stringent cleanup standard than 400 mg/kg is required to protect the health of the endangered plants in the area.

The Service plans to accept title to this 146-acre parcel when the Navy either demonstrates that lead concentrations in soils are below levels that could cause any human health or ecological problems, or any necessary remediation is completed.

Seasonal Airport Wetland Parcel (45.7 acres) - A portion of this parcel contains a wetland characterized by open mudflats and dense stands of the introduced pickleweed (*Batis maritima*). This wetland floods seasonally, which attracts the endangered Hawaiian stilt. A transition zone containing Indian fleabane and kiawe trees surrounds the pickleweed flats. This site is located next to an airport and, if transferred, the Service, under restriction, could not improve the habitat to attract birds since it would be a hazard to aircraft using the runway.

The Service became aware of asbestos and lead-based paint concerns for two of the buildings located on the site. The Navy's intent was to transfer all buildings to us with no remediation. The Service would have to assume responsibility for any future lead abatement required at these buildings and would need to maintain the integrity of asbestos-containing materials to protect potential future building occupants from releases of asbestos.

Other concerns of this parcel involve sediment deposits within the wetland which are considered by archaeologists to be a "significant" repository for information that dates back thousands of years. For more information see the section on Ordy Pond below.

Ordy Pond Parcel (9.3 acres) - Ordy Pond is a high-salinity limestone anchialine pool. Introduced red mangrove (*Rhizophora mangle*) forms a dense monotypic stand bordering the pond. With restoration, including the removal of mangrove and other plants such as Indian fleabane, the pond may provide habitat for the endemic hypogeal shrimp (*Halocaridina rubra*), and endangered waterbirds such as the Hawaiian coot and stilt. This pond could have outstanding ecological value as a rare limestone anchialine pool where two native and rare anchialine shrimp are known to occur in the Ewa limestone plane. They could possibly recolonize or be re-introduced in the pool.

Contaminant problems are now known to be more serious than previously thought and would warrant removal of the contaminated sediments from Ordy Pond. Additional contaminants were also discovered in the sediments, including DDT, DDE, and Dicamba at levels toxic to aquatic organisms. Antimony, cadmium, copper, lead, and zinc were also detected in the sediments at concentrations documented to cause toxicity to estuarine and marine species. Picric acid, an ordnance-associated chemical, was also detected.

By accident, the Service also recently learned that sediment deposits in Ordy Pond and the Airport Wetland are considered by archaeologists to be a "significant" repository for sediments with paleoenvironmental information

that dates back thousands of years. Close examination of sediment cores from Ordy Pond and the Airport Wetland have revealed layers upon layers of ancient deposits - a unique archaeological resource that is not found anywhere else in the Hawaiian Islands. According to researchers, sediments have accumulated in stratified layers at the bottom of Ordy Pond and the Airport Wetland over a very long period of time. Using sophisticated coring equipment, scientists have recovered sediment core samples up to 17.5 meters (57.4 feet) thick. Carbon-14 dating techniques estimate the age of the sediments as 150 years old near the surface of the sediment core to 25,750 years old at the bottom of the pool. The cores showed a sequential record of regional climatological and biological information such as patterns of rainfall over time, and flora and fauna occurrences. Pollen and other plant and animal material deposits including diatoms, terrestrial snail shells, and reef debris were found within clearly delineated layers in the core samples. The Service felt that this valuable paleoenvironmental information should be preserved for future studies.



Photo 3. Ordy Pond

While both parcels have potential value as habitat for endangered species, those values are currently constrained by contaminants, low oxygen levels, and alien species. The loss of scientific information that would occur at Ordy

Pond in conjunction with conventional methods of cleaning or removal of soils along with the cost to the Service of removing the mangrove trees and alien fish at Ordy Pond, reduces the potential value of Ordy Pond as waterbird habitat or for anchialine pond restoration.

The constraints to our ability to properly manage these two areas, coupled with the importance of the sediment deposits in both sites to archaeologists, have resulted in the Service's determination that a National Wildlife Refuge is not the most appropriate use for these parcels and that sediment deposits are the primary resource that should be protected and managed on the parcels, but by an entity other than the Fish and Wildlife Service.

By letter of June 9, 2000, the Service formally amended the original application and withdrew the request for the two wetland parcels known as the Ordy Pond and the Airport Wetland.

Throughout the planning documents the Service referred to the proposed unit as the Barbers Point Unit of the Pearl Harbor National Wildlife Refuge. On November 13, 2000, in accordance with the Service Manual 040 FW2, the Director was requested to approve a name change from the Barbers Point Unit to the Kalaeloa Unit of Pearl Harbor National Wildlife Refuge. This name was selected because the traditional Hawaiian name for the Barbers Point area is "Kalaeloa" which means "long point." The official name change was supported through the Hawai'i State legislation and the entire area to be conveyed by the Navy will be known as the "Kalaeloa Community Development District." The name change request was granted on January 31, 2001.

O`ahu Forest NWR

On December 21, 2000, the Waipio Parcel (4525 acres) was purchased from Castle and Cooke, Inc., a Hawaiian Corporation (via The Nature Conservancy) for \$3,620,000. Established as the O`ahu Forest National Wildlife Refuge, it will be managed under the O`ahu NWR Complex. It is located in the upper slopes of the northern Koolau Mountains, on the island of O`ahu. This allows the Service to protect some of the best remaining native forest in the northern Koolau Mountains and is the only area within the mountain range that is set aside for the primary purpose of resource management.

Within the refuge boundaries, the Service plans to implement conservation measures to perpetuate and enhance the native flora and fauna, and protect and recover endangered or threatened species. At least nine native vegetation communities occur on the Refuge including koa and `ohi`a forests that support a rich diversity of native plants and animals. At least four species of endangered O`ahu tree snails, 17 endangered plant species, and one endangered bird, the O`ahu `Elepaio, inhabit there.

Other birds within the area include the Pueo or Hawaiian Owl and native honeycreepers, the O`ahu `Amakihi and `Apapane.



Photo 4. Oahu Forest National Wildlife Refuge

Harmful alien wildlife include a variety of invasive plants, predators including rats, mongooses, feral pigs, and predatory land snails. Management of natural resources on the Refuge will initially focus on stabilizing endangered and threatened plants and animals, and conducting baseline biological surveys that will help to direct intermediate and long-term Refuge management efforts and public use. Other important management programs will include habitat enhancement projects, such as controlling invasive alien plant and animals species.

After an initial start-up period, the Service is proposing to provide opportunities for limited visitor services on the Refuge. Management programs will help to protect the native biological diversity, recover threatened and endangered species, and provide opportunities for the public to learn about and enjoy Hawai`i's natural resources. Potential visitor programs include watchable wildlife hikes, photography, environmental education, and nature interpretation activities. Before authorization of an activity, the visitor service must be deemed compatible with the primary Refuge conservation purpose.

The Environmental Assessment was final March 2000. Surveys will be completed and small permanent concrete monuments will be set on the western corners. An additional monument will also be set at the intersection of the lower boundary and the Kipapa Trail.

2. **Easements**

Nothing to report.

3. **Other**

We appreciate all the hard work the Realty and Refuge Planning staff have accomplished for us over the past years in efforts to acquire the O`ahu Forest NWR, the Kalaeloa Unit, Pearl Harbor NWR, as well as new and leased lands under James Campbell NWR. Without their help and support none of this would have happened. We were happy to have several of them (see photo below) this past September for a site visit.



Photo 5. After a hard day's work of listening and touring, nothing brings the smiles back quicker than Haleiwa's shave ice as seen here with Chuck Houghten, Phyllis Ha, Georgia Shirilla, Cathy Sheppard, and Cathy Osugi.

D. PLANNING

1. **Master Plan**

The Environmental Assessment that evaluates the effects of establishing the proposed O`ahu Forest National Wildlife Refuge on the leeward slopes of the northern Koolau Mountains on O`ahu was completed and distributed in March 2000. Refuge

management programs were described in the Conceptual Management Plan. The purpose of the Refuge is to protect and recover endangered and threatened species and to conserve native biological diversity of the forest. A low level of compatible public use is being proposed that would include guided wildlife observation, photography, environmental education, and interpretation. The use of hunters to assist the Refuge controlling feral pigs and other nonnative wildlife will be considered following the completion of biological baseline surveys. A Feral Pig Control Plan will be developed with input from hunters and the community.

A Preliminary Project Proposal (PPP) to Conduct Detailed Planning for the Additions to the James Campbell National Wildlife Refuge (May 1999) was approved by the Director and signed on November 19, 1999. For more information please see Section C. Land Acquisition, 1. Fee Title.

2. Management Plan

Benefitting the community of Kahuku and the James Campbell NWR, Senator Inouye is championing an Ecosystem Restoration Project that would combine with it a flood control project. This will benefit residents of Kahuku, area farmers, other residents of Hawai'i, visitors to Hawai'i, and Hawai'i's tourism industry. Under recommendations of the Kahuku Regional Drainage Master Plan, the project would create new flood ways and enlarge the existing ocean outlets while providing wetland enhancement and the restoration of habitat in order to aid in the recovery of endangered waterbirds. The new areas identified for refuge acquisition are critical to the flood control project. They will also provide essential wetland, coastal dune and near shore habitat important to threatened green sea turtles, seabirds, endangered monk seals, and migratory waterbirds. Furthermore, the project would provide new opportunities to the public to view and learn about Hawai'i's wetlands.

Initial actions are to increase the drainage of three culverts crossing Kamehameha Highway and to enlarge the bridge at the Ki'i ditch. To complete the larger of the three culverts (Hospital Ditch), the State DOT has estimated that it will take a year for the planning and design and a year for construction. The cost for installing this one culvert is approximately \$2.5M.

3. Public Participation

In response to the proposed O'ahu Forest National Wildlife Refuge Environmental Assessment that evaluates the effects of establishing the refuge, the most numerous comments were from hikers wanting access to forest trails and from pig hunters who want access to hunt the area. Under the previous ownership, Castle and Cooke, Inc, no access was authorized for either activity though both activities occurred on a limited scale by trespass.

4. **Compliance With Environmental and Cultural Resource Mandates**

Nothing to report.

5. **Research and Investigations**

- a. Hydrology and Water and Sediment Quality at James Campbell National Wildlife Refuge near Kahuku, Island of O'ahu, Hawaii 2000. - A hydrologic investigation was done from November 1996 through February 1998 to identify and quantify principle inflows and outflows of water to and from the Refuge, identify hydraulic factors affecting flooding, document ground-water/surface interactions, determine the adequacy of the current freshwater supply, and determine water and sediment quality.

These goals were accomplished by installing and operating a network of stream-gaging stations, meteorology stations, and shallow ground-water piezometers, by computers water budgets for the two Refuge units, and by sampling and analyzing water and pond-bottom sediments for major ions, trace metals, and organic compounds.

The report was completed and provided to the refuge this year. Detail of the study along with the Summary and Conclusions are provided in U.S. Geological Survey, Water-Resources Investigations Report 99-4171.

- b. Amphibian Study - Due to increasing numbers of amphibian malformations nation wide, researchers have been investigating the problem at many levels, including conducting surveys on National Wildlife Refuges. Through an Environmental Contaminant Program, six refuges were selected to represent a wide variety of locations for the initial year of study. James Campbell NWR was one of the six areas selected to participate in the program to help address the issue of increased deformities in amphibians. On the night of June 9, 2000 fifty bullfrog "froglets" were collect by Refuge staff from our "clean" site of which only one appeared to have a possible deformity. It was later determined to be an old injury by the National Wildlife Health lab in Madison, WI. In order to complete our collection sample, we attempted to collect at least 50 more froglets from a potentially "contaminated" area. This task has proved to be more difficult, though our efforts will continue.



Photo 6. Deformed froglet submitted to National Health Lab.

- c. Investigation of Former Landfill - A former landfill for the town of Kahuku was located on the eastern boundary of the Ki'i Unit, James Campbell National Wildlife Refuge. In 1986, the landfill contents were bulldozed and moved to an area further east of the refuge. Since the move, localized debris is still scattered along the surface of the berm inside the refuge in the study area. The study area is approximately 2 acres in size and is isolated from the rest of the unit by the berm. The area is relatively dry and covered by vegetation.

A characterization and work plan for cleanup was supposed to take place this year. A request for a proposal was issued to Harding Lawson Associates to characterize and clean up the two-acre landfill, but it was held up in negotiation because there was not enough funding from the cleanup project funds to do the characterization. The objective of the contract will be to assess the presence and nature, if any, of contamination at the old landfill in the surrounding surface water wetlands on the refuge. Characterization will not be completed until FY01 provided the funding requested is received.

- d. PCB Spill Site - Chemical assays taken in June 1998 indicated a polychlorinated biphenyl (PCB) concentration of 1.88 parts per billion in a water sample taken from Pond E on the Ki'i Unit of James Campbell NWR.

A Level I acquisition survey in July 1998 revealed that approximately 20 to 40 gallons of (PCB) laden electrical transformer oil were spilled nearby in 1979. The area has flooded occasionally since the spill, and some soil has been placed over the site to improve the road bed. In November of 1998, emergency funds were requested to clean up the PCB- contaminated soil.

In FY00 a contract was established using FY99 carry-over funds. An environmental consulting firm, Harding Lawson Associates, was contracted to develop a work plan, a sampling and analysis plan, a health and safety plan, and periodic formal reports (Contract No. 1448-98695-98-C007). Extent of of contamination and characterization were two of the primary objectives.

The characterization report revealed that an area in the roadway had a PCB concentration of 62 ppb. Additional task orders will be issued to first determine the extent of the contamination and secondly to remove the contaminated soils and perform confirmation sampling. The PCB remediation was completed in FY00 and the contract with Harding Lawson Associates amounting to \$103,000 was funded with Emergency Construction Funds from the Division of Engineering in Denver.

Actual site cleanup, if needed, will not occur until FY02. Another funding proposal will need to be submitted to complete the project for removal of hazardous material if present above levels protective to endangered and other sensitive species.

- e. Waiawa Unit Ecological Risk Assessment Pearl City Peninsula Landfill - The Pearl Harbor NWR Waiawa Unit is located adjacent to a superfund site which is an old landfill of the U.S. Navy. There is concern that contaminants from this landfill are entering the refuge. An assessment is under contract (PACNAVFACENGCOM Contract No. N62742-98-D-1808) to determine the biological risk. Human health is also of concern due to Refuge staff potentially being exposed to a variety of contaminants.

The Waiawa Unit Screening-Level Ecological Risk Assessment (SERA) was performed with groundwater, surface water, and sediment at the unit. During the SERA, analyte concentrations in both the Waiawa Unit itself and the Waiawa Unit freshwater supply source were evaluated. Results of the Draft Screening-Level Ecological Risk Assessment Report, June 2000 indicated the potential for risks to occur to ecological receptors associated with both Waiawa Unit and the freshwater intake area. Data collected from two previous investigations: a Remedial Investigation conducted between December 1991 and March 1993 (Ogden, 1995) and a Removal Site Evaluation conducted between July 1996 and March 1997 (Earth Tech, Inc., 1998) were used for SERA evaluation.

Upon Refuge staff review of the Draft SERA document, the Service agrees with the Report's conclusion that there is potential risk to on-site ecological receptors and agrees with the Report's recommendation that a baseline ecological risk assessment is warranted to assess the actual risk to fish and wildlife resources at the site. This was by letter of November 13, 2000.



Photo 7. RM Stovall collects dead Tilapia from Waiawa in hopes to determine cause of death.

- f. Leeward Community College Chemical and Biological Monitoring - A Special Use Permit was issued to University of Hawai'i, Leeward Community College to conduct scientific research at the Waiawa Unit of Pearl Harbor NWR for the purpose of providing air and surface water temperatures, salinity, pH, total suspended solids, dissolved oxygen, chlorophyll, nitrogen and phosphorous content. Biology Teacher Frank Stanton lead the classroom study. SUP 12524-ORC-11-2000.
- g. University of Hawaii study - A study on James Campbell NWR and Pearl Harbor NWR has been initiated through the University of Hawaii to investigate growing native wetland plant species for possible mitigation purposes.

6. **Other**

Nothing to report.

E. ADMINISTRATION

1. Personnel

The O`ahu NWR Complex consists of the following staff members:

| Name | Title | Grade | EOD | Status |
|---------------------|--------------------|--------------|------------|---------------|
| Donna Stovall | Refuge Manager | GS-12 | 10-12-1997 | PFT |
| Margo Stahl | Assistant Manager | GS-12 | 06-21-1998 | PFT |
| Michael Silbernagle | Wildlife Biologist | GS-12 | 10-01-1992 | PFT |
| Laura McNeil | Admin. Support | GS-06 | 12-07-1997 | PFT |
| George Fisher | Tractor Oper. -Sup | WS-04 | 10-24-1999 | PFT |
| Gregory Smith | Tractor Operator | WG-06 | 04-25-1994 | PFT |
| Maurice Blackwell | Tractor Operator | WG-06 | 07-04-1999 | PFT |
| Jeffrey Albeso | Tractor Operator | WG-06 | 06-08-1997 | Term |
| Vacant | Biologist | | | |



Photo 8. Front: Donna Stovall, Laura McNeil Back: Greg Smith, Jeffrey Albeso, Michael Silbernagle, George Fisher, Maurice Blackwell, and Margo Stahl

Having a crew of four maintenance employees has been a critical factor enabling us to accomplish several maintenance projects that have been on the “things needing done” list for a long time. Almost every habitat-related task on our wetlands and on the newly acquired O`ahu Forest NWR and the new Pearl Harbor NWR unit Barbers Point is very labor intensive, making personnel our number one resource.

The Tundra to Tropics funded a biologist position which was not filled due to the overall budget shortage.

Funding to conduct the amphibian/water quality study enabled us to renew Jeffrey Albeso, a term employee who worked on finding froglets for the amphibian study.

RM Stovall attended the TEA-21 training in Seattle from January 19th-20th. Prior to the training, she stopped at Willapa NWR to discuss first hand their amphibious brush cutter for possible use at our refuges and other wetland areas in Hawai`i.

ASA McNeil attended computer training at NCTC July 17-21.

ARM Stahl completed a voluntary assignment to Loxahatchee NWR in Florida from June 14th through August 18th.

RM Stovall, ARM Stahl, and WB Silbernagle attended Compatibility Training in Honolulu, October 24-25.

Term employee Jeffrey Albeso attended the New Employees Orientation in Portland October 23-27.

2. Youth Programs

Nothing to report.

3. Other Manpower Programs

Nothing to report.

4. Volunteer Programs

Refuge staff coordinated and participated in the following events: Earth Day, Catch the Drift and Bag It Day, National Public Lands Day, National Wildlife Refuge Week, and Make a Difference Day.

Total volunteer service equaled 2912 hours or equivalent to 1.4 FTEs. This includes one volunteer, Kathy Hachey, who has reached 1000 hours of providing a valued assistance to WB Silbernagle in the biological section over the past year and a half.



Photo 9. 1000 hour award given to Volunteer Kathy Hachey.

Earth Day was celebrated in a number of ways this year. ARM Stahl supplied a display for the Leeward Community College week-long Earth Day event. In lieu of the beach dune cleanup previously scheduled by the refuge with approval from the Estate of James Campbell, staff assisted Marine Corps Base Hawaii with a day of marine debris removal in Kaneohe Bay. The beach dune cleanup was postponed to “Catch the Drift and Bag It Day”.



Photo 10. The Navy helped catch BIG drift for bagging. GO NAVY!

Other volunteers consist of a small group of local birders who are providing interpretation and excellent bird spotting during the guided tours at James Campbell NWR, and the remainder are various weekend warriors willing to give up a Saturday for a good cause.

Partnerships continuing or established are with the Navy, LCC, TNC, BYU, and the Sierra Club. These organizations provide excellent volunteer assistance.

ARM Stahl participated in a series of meetings at The Nature Conservancy headquarters to help form the Volunteer Stewardship Network (VSN), affiliated with Malama Hawaii, to empower volunteers to protect Hawai`i's natural heritage. The VSN seeks to develop a network of volunteers or projects at multiple entry levels and to provide them with the resources they need to make the most of their commitment. Read about the VSN at www.malamahawaii.org.



Photo 11. FWS participates with TNC during a volunteer workshop.

5. **Funding**

Critical facility needs consist of a maintenance baseyard that will provide employees a safe place to work, a conducive place to work, and will provide protection for Service equipment away from the salt air and environment as well as from thieves and vandals. Both the station safety audit and an Environmental Compliance Audit have documented violations due to the unsafe conditions in which our maintenance workers are having to work.

O'ahu NWRC couldn't fund several critical equipment repairs and replacements. Most of the equipment being used is old and corroded due to lack of protection from the harsh coastal environment. Mower parts and tractor repairs (our primary tools) are still needed in order to be operated properly. Our 8-inch trash pump has been in a "lock out" situation for several years. Both of our pumps supplying water to our Pearl Harbor units had to be replaced this year due to mechanical failure as did our 40 hp pump at Ki'i. We have minimal equipment and what we have requires maintenance. The Annual Maintenance allocation came at a very critical time. It enabled us to repair and replace some of the pieces of equipment that were an absolute necessity to our programs.

Funding Allocations - Fiscal Year 2000

| | | |
|--------------------|---------------------------|------------------|
| 1130 - IAMP | Amphibian Study | 9,000 |
| 1261 - 0000 | Base O & M | 472,700 |
| 1261 - 110V | Volunteer | 990 |
| 1261 - C302 | Challenge Grant | 44,380 |
| 1262 - A114 | Annual Maintenance | 59,000 |
| 1902 - 0127 | MIPR Reimbursement | 5,873 |
| 7201 - 0488 | Donations | 251 |
| 9251 - 0000 | Fire base | 4,000 |
| 9263 - | Fire account used | 8,250 |
| TOTAL | | \$604,444 |

Ecological Services contributes funding for ARM Stahl's salary. Project funding (non 1260), U.S. Navy reimbursable, and donations helped us to balance. Approximately 17% of this year's expenditures were from sources other than 1260 dollars.

TEA-21 funding was approved to improve an old railroad right-of-way accessing the Honouliuli Unit of Pearl Harbor NWR so that school buses and other vehicles could access the refuge without getting stuck. This unit serves as the prime location for thousands of third graders each year through the Hawaii Nature Center program and will be the future location of a new wildlife overlook and interpretive site. On the 24th of January, RM Stovall met with Dick Kuehner of EPIC and David Gedeon, a Federal Highways Administration representative, to discuss this refuge road project and requirements of using TEA-21 Refuge Roads funding for improvements. It was confirmed that the road would have to be open to the general public on a daily basis in order for it to be an authorized TEA-21 project. This right-of-way is parallel to an

asphalt recreational bike path and located behind a residential community. The refuge is located approximately three tenths of a mile down this right-of-way. In response to complaints and concerns by community residents, the entrance to the right-of-way was gated by the Navy in 1998 so that all unauthorized vehicles could not gain access. RM Stovall was concerned, that if this portion of the right-of-way is turned into a public road with parking next to the 36-acre refuge, it will negatively affect some of the endangered waterbirds, reduce the quality of experience at the wildlife overlook to be located adjacent to the right-of-way, increase opportunities for vandalism, dumping, and trespass, increase staff time required for enforcement, renew the complaints and concerns by community residents, reduce the quality of experience by recreational bicyclists and hikers along that portion of the bike path, and provide unnecessary public parking when parking is available on both sides of the refuge at city parks connected via the bike path. After considering both the advantages and disadvantages of the project, RM Stovall made the determination to allow the TEA-21 funding to be spent on other projects and keep the road closed to the general public.

6. Safety

O`ahu NWR Complex has an excellent safety record. No lost time accidents occurred in 2000. Staff safety meetings are held monthly. In addition to annual safety training (Defensive Driving, CPR, and Hearing tests), the following topics were presented during the year.

Monthly Safety Meeting Topics:

| | |
|-------------|--|
| January - | How to Respond in Driving Emergencies |
| February - | GSA Vehicle Safety - What to do in an accident |
| March - | Hand and Portable Powered Tool Safety |
| April - | Protect Your Back |
| May - | Sun and Sunscreen |
| June - | Parasitic Infections |
| July - | Catalytic Converters Start Fires |
| August - | Safe Tractor Operation |
| September - | Back Pain |
| October - | Cumulative Trauma Disorders |
| November - | Cardio Pulmonary Resuscitation (CPR) Training (Annual) |
| December - | Hearing Tests (Annual) |

Regional Safety Manager Gary Wilson conducted a site visit on April 5. He was shown the facility baseyard (our lean-to) at Ki`i and we stressed the need for a maintenance building to provide a safe place to work and to provide protection for our equipment from the harsh coastal environment.

The staff recognized April 5th as the Department of Interior's Safety Day.

7. Technical Assistance

WB Silbernagle worked with Regional biological staff to develop a comprehensive wetlands monitoring and data collection database. This will allow standardization of data among Hawai'i's wetland refuges. This project is ongoing at this time. WB Silbernagle also served on the Wetland Review Team who evaluated wetland management programs on O'ahu, Maui, and Kauai.

ARM Stahl addressed the annual retreat of the Hawaii Audubon Society (HAS) on January 22nd in Waimanalo. Discussions included the Audubon Refuge Keeper (ARK) program that the Audubon Society has agreed to participate in. Projects were discussed for possible funding requests. ARM Stahl also thanked the HAS for providing funds to match our Fish and Wildlife Foundation Grant to control vegetation at Punamano.

Refuge staff provided comments and assistance on two Integrated Natural Resource Management Plans (INRMP) for the Navy which includes the Pearl Harbor NWR. Staff also discussed management objectives of the Plans and how the Refuge units could be incorporated into their plan. Under the Sikes Act Improvement Act of 1997, military installations are required to prepare and implement a plan for the management, conservation and rehabilitation of their natural resources. The INRMP for the Naval Magazine Pearl Harbor (NAVMAG) and the INRMP for the Pearl Harbor Naval Complex, which includes the waters of Pearl Harbor shoreward of the harbor entrance, the intertidal area of the harbor, the fast lands controlled by Naval Station Pearl Harbor, Fleet and Industrial Supply Center Pearl Harbor (FISC), and Public Works Center Pearl Harbor, are both in their second year of planning and are anticipated to be completed next year. The INRMP for NAVMAG covered the Honouliuli Unit and the Naval Station INRMP covered the Waiawa Unit of the Pearl Harbor NWR.

Disney Studios (Touchstone Pictures) via the Hawaii Film Office contacted the Refuge office to discuss their upcoming motion picture, *Pearl Harbor*. If deemed compatible, scenes will be shot on location at the "moth ball fleet of ships" in Middle Loch near the Waiawa Unit. Refuge staff met with representatives of the Disney Film Corporation, Helber, Hastert & Fee environmental compliance consultants, the U.S. Navy, and the State Department of Land and Natural Resources on several occasions to determine compatibility at the Waiawa Unit of Pearl Harbor NWR. The Disney film producers are requesting to re-enact the bombing of Pearl Harbor for the movie. Plans were discussed to determine if their activity would in any way disturb the endangered waterbirds at the refuge. Though most of the filming will occur at Ford Island, various inactive ships in Middle Loch will be used which are relatively close to the Waiawa Unit. Sound tests were conducted to determine the level of disturbance. Decibel readings were recorded within the refuge while a series of gun shots were fired from a boat in Pearl Harbor. The sounds of these gun shots were

reportedly similar to sounds generated by the pyrotechnics exploded during the filming of the movie which will be later enhanced by computer. Observations of bird behavior occurred simultaneously with the shootings which had little to no impact on bird behavior. During the test shot closest to the refuge, one stilt flew but landed again quickly close to the same spot. It couldn't be determined if it took flight due to the shot. The manager noted that background sounds from ongoing landfill work, aircraft flying over head, and boat engine sounds from the Harbor may have contributed to the lack of response to these new sounds. Results of the testing and other pertinent information will be sent via the Navy to the Service asking for concurrence that the expected filming is not likely to adversely affect listed species. The Service concurred as long as a monitoring component is included, Best Management Practices are in place for water quality issues, NMFS concurs on turtle impacts, and provided that the prevailing wind blows sound and smoke away. The filming in the Harbor occurred without incident or disturbance to the birds at Waiawa.



Photo 12. Battleships located next to the Waiawa Unit made this area a prime site for the movie “Pearl Harbor”

However, five Japanese Zeros and a twin engine bomber were observed flying very low over our north shore refuge, James Campbell NWR, while filming the movie *Pearl Harbor* on Saturday April 29th. Disney contacts were immediately contacted and were told to cease the flight at once. Producers claimed that they were unaware that a refuge was present at the area and the Service was unaware that activity was planned on the north shore of the island.

In coordination with V.A. Sridhar, the maintenance crew assisted Tern Island Field Station by capping five fuel tanks and preparing them to be barged out to the refuge. To go on the same barge, they also delivered a John Deere tractor that had been stored at Ki'i baseyard.

Refuge personnel assisted with the State of Hawai'i's bi-annual Waterbird Survey on January 19, 2000. Data collected was submitted to the State.

ARM Stahl served as FWS Instructor at NCTC for ES Basic Training April 3-7. This was a pilot course to see if ES Basic Training could be reduced from two weeks to one week.

8. Other Items

Hawai'i's wetlands are plagued with invasive alien vegetation which grows exceedingly well in our tropical environment, choking out wetlands and rendering them valueless. To more efficiently restore and maintain suitable wetland habitat in varying depths of water, mud and muck, RM Stovall sought equipment capable of traversing all sorts of terrain. After an extensive amount of research, an amphibious long reach excavator, which could traverse any wetland no matter what the terrain and tackle any sort of vegetation from California grass to mangrove, depending on the attachment used, was proposed. A company out of Louisiana, Quality Industries, Inc., makes amphibious tracks suitable for any brand of excavator. However, costs including the amphibious tracks, excavator, long reach arm, multiple attachments (slashbusters, bulrush bucket, tiller with dredge pump), along with shipping, almost reached \$500,000.

A machine of this caliber shared among wetland managers on the island would make a momentous effort in restoring Hawai'i's wetlands and shorelines for four endangered waterbirds, migratory shorebirds and waterfowl, and native fisheries. To realize this, RM Stovall's efforts refocused on creating a partnership with private, non-profit, State, and Federal land management agencies. Informally, the Wetland Restoration and Protection Partnership was formed. Entities interested in the partnership included the U.S. Fish and Wildlife Service, City and County of Honolulu, U.S. Navy, U.S. Attorney's Office (Weed and Seed Program), State of Hawaii Department of Land and Natural Resources, Ducks Unlimited, Kaneohe Marine Corps, Kamehameha Schools Bernice Pauahi Bishop Estate, and U.S. Army Corps of Engineers.

Though the reasoning behind the U.S. Attorney's office for joining the Partnership was totally different from wetland managers, the end result is the same. U.S. Attorney Steve Alm requested a meeting with FWS personnel to discuss the Weed and Seed program, which is a federal program that combines law enforcement and social agencies to weed the area of criminals and then seeds the area with prevention

programs. The next designated site was focused on the city of Waipahu. Pacific Island Ecoregion Manager Robert Smith, Hawaiian/Pacific Islands NWRC Project Leader Jerry Leinecke, External Affairs Chief Barbara Maxfield, and RM Stovall attended the meeting. The U.S. Attorney had heard about a machine that was being considered to remove mangrove and was interested in getting more details. He felt that if the mangrove was removed along the Pearl Harbor shoreline and bike path then much of the criminal activity it was harboring would be removed. RM Stovall provided additional information about the machine and the partners interested in its use. The U.S. Attorney then set up a meeting with the Mayor of Honolulu, Jeremy Harris, to recruit their support. A meeting with Mayor Harris and his Division Chiefs was held on May 25. The Mayor supported the project and committed \$500K to purchase the machine if we handled the mangrove removal using the machine. This of course was a great boost to the restoration efforts of the Partnership since the funding to purchase the machine had not been available.



Photo 13. Amphibious Excavator similar to one being proposed for O`ahu.

Jim Atkinson of Quality Industries Inc. came out to Hawai`i April 11-13 to look at several of the wetland sites and learn what our expectations were for restoration. A meeting with the partners was held on the 13th and Mr. Atkinson was able to address many of their questions and concerns. His main recommendation was to go with an long reach excavator with multiple attachments instead of a drum mower. This way the machine would be much more flexible and able to complete a multitude of job tasks and it would be a much safer and easier method to remove the mangrove along the Pearl Harbor shoreline. Thanks goes to the Ecological Services division for paying associated travel costs which will be reimbursed with the purchase of the machine.

Once purchased, this machine will be used to restore and maintain about two thousand acres of wetland habitat which include refuge lands, private and State lands, and other Federal lands on O`ahu including the Pearl Harbor shoreline. Though the machine has not yet been purchased, the City and County of Honolulu has committed to the purchase (\$500K) of the amphibious excavator. Operational funding in the amount of \$276K has been secured of which \$176K is site specific (\$150K for the Waiawa Unit of Pearl Harbor NWR and \$26K for the Punamano Unit of James Campbell NWR). Grants include \$100K from the Hawaii Biodiversity Joint Venture Program and we are working on a \$1M grant application through the North America Wetlands Conservation Act (NAWCA). If successful, it will be the first NAWCA grant awarded for the State of Hawaii.

F. HABITAT MANAGEMENT

1. General

Hawai`i is the nation's endangered species capital. The peril that faces native Hawaiian flora and fauna, due to lose of habitat and exotic species, is comparable to no other State. Many of these species are endemic and occur only in Hawai`i. Responsibilities of the O`ahu NWR Complex include the protection, enhancement, and management of three refuges consisting of 11 distinct natural community types ranging from dryland coastal ecosystems to wetlands to upper elevation rainforests. There are at least 30 endangered species consisting of plants, waterbirds, forest birds, and terrestrial mollusks that are dependent on these communities for survival.

The O`ahu NWR Complex consists of three distinct refuges: James Campbell NWR, Pearl Harbor NWR, and O`ahu Forest NWR. The James Campbell refuge, located on the north shore of O`ahu, and Pearl Harbor refuge on the south shore are significant remnants of O`ahu's wetlands. Both refuges were established to provide for Hawai`i's four endangered waterbirds as well as migratory waterfowl and shorebirds. A recent addition to the Pearl Harbor NWR is the Kalaeloa Unit, established to protect endangered plants and their dryland coastal habitat. The third refuge is the newly acquired O`ahu Forest NWR. It is the only area within the Koolau Mountain range formally protected for native species. This refuge protects and enhances high elevation native forest ecosystems with at least 24 endangered species of plants, terrestrial mollusks, and birds.

No other Pacific Island refuge has such a broad and diverse range of protected habitat and management programs for endangered and rare endemic species.

2. Wetlands

a. James Campbell NWR

Water levels were drawn down in several Ki'i Unit impoundments due to an inadequate water supply to manage all impoundments. In Pond G, where the pond was dry, yet a moist subsurface condition existed, there was an emergence of several native wetland species. They included *Cyperus javanicus* (marsh sedge), *Cyperus polystachyos* (sedge), and *Scirpus maritimus* (makai sedge). Non-native species including *Echinochloa crus-galli* (barnyard grass), *Eleocharis sp.* (spike rush), and *Typha sp.* (cattail) also became evident. All these species provide nesting and/or cover structure, or seed sources for resident and migrating waterbirds. The first three species are indigenous. Other native species also grew in the pond. All this has led to increased diversity in the pond. Similar results were observed in Pond B following habitat work in 1999. This pond had more nests of the endangered Hawaiian coot than any other pond on the Refuge.



Photo 14. Wetland habitat work at Kii Unit.

The Punamano Unit of James Campbell National Wildlife Refuge is a 40-acre wetland that is being taken over by bulrush. This natural spring wetland is increasingly becoming of less and less value to waterbirds (including Hawai'i's endanger species) due to the increasing growth of bullrush. The National Fish and Wildlife Foundation (NFWF) funded a challenge grant to restore this unit. The original method of restoration proposed helicopter services to apply herbicide to bulrush because at the time this project was

proposed, there was no other efficient means of controlling the vegetation that has almost covered this natural wetland. With the pending purchase and use of an amphibious excavator through the Wetland Restoration and Protection Partnership (see Section E.8.) we requested that the project funding be approved for the operation of the amphibious excavator. NFWF approved the request and granted an extension in the project completion date.

The refuge needs a dependable water source to provide an adequate amount of water free from contaminants. Impoundments are currently managed using water from three artisan wells which do not produce the volume needed for management activities. Fresh water is crucial to endangered waterbird management. Water output of high quality can be increased by acquiring additional fresh water sources and/or drilling additional wells. Adequate water volume will increase management's flexibility to provide water where and when it is needed, especially during the dry summer months when nesting habitat is critical.



Photo 15. Maintenance Supervisor Fisher partakes in the never ending and tedious job of vegetation control - but the results are worth it.

b. Pearl Harbor NWR

The Honouliuli pump was discovered to be inoperative on March 3, 2000. Records suggest the pump probably went out on or about March 1, 2000. Attempts to repair the pump failed. A back-up pump that had been stored for many years also failed and a new pump had to be ordered for the site. After

all the testing and attempts to get an operative pump failed, water was put into the Honouliuli Unit Pond 2 impoundment using a small portable gasoline powered pump. The pumping began on March 14 and continued through the month. No water flowed to Pond 1 during the breakdown and led to the consideration that Pond 1 habitat work might be able to be accomplished this year and led us to contact the U.S. Navy Seabees for help.

Major habitat work was accomplished in Pond 1, Honouliuli Unit. Eighty percent of the non-semipermanent portion of the pond was covered with dense undesirable vegetation. This vegetation was removed and some excessively high portions of the pond were lowered. The work in Pond 1, Honouliuli Unit, was a cooperative effort, with the U.S. Navy Seabees answering our call for need. Once the FWS maintenance crew removed the vegetation, the Seabees provided equipment and operators to sculpt the pond bottom and accomplished the dirt work that refuge staff could not without a dozer. The Seabees were on site August 7-11.



Photo 16. FWS maintenance crew remove invasive vegetation.



Photo 17. Navy Seabees contouring perfect mudflats.

Lowering and holding the water level in Pond 2, Honouliuli Unit, for longer than normal periods resulted in several lush areas of *Scirpus maritimus*. Shortly after reintroduction of water to the newly vegetated areas, 15 out of 17 endangered Hawaiian coot nests were discovered in Makai. *Bacopa Monnieria*, native to Hawai'i, has also become well established in the pond and is now covering many mud flats.



Photo 18. Excellent waterbird habitat in Honouliuli Unit, Pond 2

The Waiawa Unit needs a dependable water source to provide an adequate amount of freshwater. Impoundments are currently managed using water from a natural spring that is channeled into a creek and then pumped from a cistern located within the creek. The system can be easily compromised from surface contaminants entering the creek or the pipe prior to being pumped into the refuge. High quality freshwater is crucial to endangered waterbird management as well as quantity of water. We need to provide a secure, quality water source by pumping water directly from the spring or a well to the refuge, thereby providing necessary water for habitat and eliminating risks of surface contamination.

c. Wetland Restoration Partnership Lands

See E. Administration 8. Other Items for information regarding the Wetland Restoration Partnership and use of an amphibious excavator to restore wetlands throughout O`ahu and possibly throughout Hawai`i.

3. Forests

O`ahu Forest National Wildlife Refuge is located on the upper slopes of the misty northern Koolau Mountains and protects some of the last remaining intact native forests on O`ahu. At least nine native natural communities have been identified in the area including lowland mesic forests, rainforest communities, high elevation cloud forest, and freshwater streams.



Photo 19. O`ahu Forest NWR one of the few remaining native forests on O`ahu.

Moisture gradients and other environmental differences (temperature, slope, aspect, and exposure to wind and sun) within the refuge provide a diversity of ecological types in close proximity to one another. Mesic are found in the lowest areas of the refuge while wet forests occur in the middle and upper elevation. The highest elevations (2600 ft) are almost constantly shrouded in clouds and the high rainfall, fog, drip, and poor soil drainage near the summit contribute to plant associations made up of stunted plants covered with moss, ferns, and other epiphytes. Near the summit crest along exposed cliffs are natural communities featuring plants adapted to strong winds and steep cliff faces.

The nine native communities consist of:

Lama/`Ohi`a Lowland Mesic Forest - Remnants of this native natural community type are found intermixed with nonnative dominated communities in the lowest elevations of the refuge (or just below the lower boundary). Rainfall varies seasonally and can exceed 64 inches annually. Lama/`Ohi`a forest occurs on steep-sided slopes of gulches and in valleys where they have been protected from wildfires. Lama (*Diopyros sandwicensis*) trees are codominate with `ohi`a (*Metrosideros polymorpha*).



Photo 20. Ohi`a blossoms.

Koa/`Ohi`a Lowland Mesic Forest - Occurs in the lowest elevations of the refuge between 1,000 to 2,100 feet above sea level. Rainfall ranges from 30 inches to greater than 75 inches annually. The understory features uluhe mat

ferns (*Dicranopteris linearis*) that have been invaded with introduced broomsedge (*Andropogon virginicus*) in areas that have been burned by fire.

‘Ohi`a Lowland Mesic Forest - This community supports a number of rare plants and provides habitat for endangered O`ahu tree snails, native forest birds, and native insects. There is a distinctive mixture of native trees and shrubs with a relatively closed canopy.

‘Ohi`a Lowland Wet Forest - With increasing elevation and moisture, mesic forest communities grade into wet forests dominated by ‘Ohi`a. This dense rainforest supports a mixture of native trees and rare plants and is widespread in the upper slopes of the leeward Koolau Mountains.

Loulu Hiwa Lowland Wet Forest - This rare native natural community type consists of groves of native loulu hiwa palms (*Pritchardia martii*) that occur on steep windward slopes and gulches at the heads of valleys within the refuge. Reports indicate there are fewer than 10 intact examples of this community type and all are restricted to the Koolau Mountains of O`ahu. Consequently, this natural community is considered globally rare.

Uluhe Lowland Wet Shrubland - This common shrubland is comprised primarily of uluhe (*Dicranopteris linearis*).

Mixed Fern/Shrub Montane Wet Cliff - This natural community is encountered near the cloud-shrouded summit. It is dominated by low-statured plants. Several endangered plants and tree snails have been found on low shrubs in this community type.

‘Ohi`a Montane Wet Shrubland - This shrub community grows on the cool wet windward cliffs and upper ridge crests of the refuge generally above the 2,500-foot elevation. Annual rainfall exceeds 100 inches and can approach 200 inches. Vegetation includes stunted `ohi`a trees and other dwarf endemic trees and shrubs along with an abundance of epiphytic bryophytes, ferns, and lichens.

Hawaiian intermittent stream aquatic community - Hawaiian streams in the refuge are classified as intermittent. Even as high as the uppermost elevations, some water is present year round in pools, and during times of moderate rainfall the streams are flowing. Streams support native amphidromous fishes (gobies), snails, shrimp, and other invertebrates including native insects, and a native freshwater sponge.

O`ahu Forest NWR has at minimum 23 listed species. It is critical that basic biological information be collected to provide sound foundations for all management

activities. This information is essential to implementing a recovery program. Surveys are needed to locate, identify, and estimate population density of threatened and endangered species (plants, birds, and terrestrial invertebrates.) In turn, this information will identify management priorities which are extremely important due to the magnitude of challenges threatening these endangered species.



Photo 21. Endangered Tree Snails located within O`ahu Forest NWR.

Biologists are needed to survey for endangered species and their essential habitats to begin implementing recovery programs. Management for a healthy and diverse native ecosystem will be a very labor intensive program over very rugged and difficult to access terrain. Refuge start up costs are needed to provide personnel, equipment, and gear necessary to conduct studies in remote areas inaccessible to vehicles.

4. **Croplands**

Nothing to report.

5. **Grasslands**

Nothing to report.

6. **Other Habitats**

The newest unit of Pearl Harbor NWR, the Kalaeloa Unit, was formerly part of the Barbers Point Naval Air Station and was transferred to the Service on January 30, 2001. It consists of 37.4 acres of dry land coastal habitat located on the leeward side

of the island and is the largest native remnant stand of the endangered 'Ewa hinahina (*Aycharanthes splendens* var. *rotudata*) and other native coastal plants. The bulk of the area, however, is dominated by an open-canopy forest of introduced kiawe trees (*Prosopis pallida*) and koa haole (*Leucana leucocephala*). Indian fleabane (*Pluchea indica*), sourbush (*Pluchea symphytifolia*), and grasses form a transition zone between the native plant community and the open-canopy kiawe forest. The substrate in this area is a thin layer of silty soil over coralline limestone.



Photo 22. The endangered *Aycharanthes splendens* var. *rotudata*.



Photo 23. TO Smith helps volunteers carry out invasive weeds to allow space to outcrop native vegetation.

An additional 145-acre parcel is pending transfer. This parcel supports the largest population of the endangered `akoko plant (*Chamaesyce skottsbergii* var. *skottsbergii*) on O`ahu. The core area is dominated by introduced trees and grasses including kiawe and koa haole. In places, the kiawe trees form a closed-canopy forest that apparently exclude the endangered `akoko by shading and competition. The understory is dominated by introduced grass, such as buffleggrass (*Cenchrus ciliaris*) and shrubs, including the native `ilima (*Sida fallas*). The substrate is exposed coralline limestone with a thin layer of silty soil.

7. **Grazing**

Nothing to report.

8. **Haying**

Nothing to report.

9. **Fire Management**

Our James Campbell NWR prescribed burn season was almost a complete disaster due to the wildfires on the mainland. Though we are surrounded by an ocean, aquaculture farms, and large ditches we were unable to obtain permission to conduct a prescribed burn. In mid September, no longer able to wait for the ban to be lifted, we had to remove the vegetation previously killed by herbicide application. Without proper equipment this took many hours and left us with large berms of dead vegetation around the ponds' edges that had to be removed.



Photo 24. Pond's edge covered with California Grass needing a burn.

Vegetation in areas not solid enough to access with heavy equipment were removed by hand which was very frustrating since it would have carried an excellent fire and taken only a slight fraction of the amount of time. However, before we completed the painstaking efforts of hand removal (by staff and volunteers), the burn ban was fortunately lifted and we were able to burn the remaining areas. Andy Kikuta from Hakalau NWR was qualified to certify WB Silbernagle as a Burn Boss for that fuel type. Though the cost to burn is high (approximately \$1,600/acre), it is our most efficient manner to remove much of the vegetation overgrowth within the James Campbell NWR ponds.

Wildfires are not a natural occurrence in Hawai'i's wet forest habitats. The lower portion of O'ahu's forests are dry and are periodically subjected to dangerous wildfires that are either purposefully or accidentally started. Wildfires in the lower dry areas have devastated native dry natural communities not only through burning, but also through subsequent colonization of non-native grasses and weeds that prevent recolonization by native species. A wildfire management plan/program needs to be developed for O'ahu Forest NWR and coordinated with adjacent landowners along with local and regional wildfire experts.

ARM Stahl and TO Blackwell attended fire fighting training at Volcanoes National Park February 22-25.

10. Pest Control

Due to the remoteness of the Hawaiian Islands, only a relatively few species of plants and animals managed to colonize before humans arrived. From the original several hundred species that arrived by ocean or air, many thousands of species evolved, most of which are unique to Hawai'i. Changes to the landscape began with the arrival of the Polynesians who brought with them plants for cultivation, domesticated animals such as pigs, dogs, and chickens, and incidental rats and insects. Another wave of non-indigenous species were introduced with the arrival of the Europeans in 1778, making the rate of introductions many times over a natural rate. Many of these species, in addition to subsequent introductions (even deliberate, well intentioned introductions), have now turned into pest species and have played a significant role in the extinction of indigenous species and continue to do so.

a. Wetland Pest Control

The alteration of wetland plant communities due to invasion by nonnative plants greatly reduces the usefulness of wetland areas to native waterbirds. This primary problem we face creates a habitat maintenance program that is very labor intensive and we are further encumbered by a 12-month growing season. Species such as California grass (*Brachiaria mutica*), pickleweed (*Batis maritima*), and Indian fleabane (*Pluchea indica*) out-compete more

desirable species and eliminate open water, exposed mudflats, and shallows. Refuge management employs a mixture of control measures for alien invasive plants. These measures include chemical controls, mechanical controls by hand and tractor, water level manipulations, and prescribed fire.

Under the Department of Interior Pesticide Use Proposal, the herbicide Rodeo® is applied for the purpose of controlling undesirable vegetation encroaching into endangered species habitat, creating suitable open water and/or vegetative interspersion, reducing predator concealment cover, and maintaining suitable wetland successional stages for endangered waterbirds and other migratory waterbird species. This is achieved through spraying and burning or spraying and mowing the dead vegetative residue. For Pearl Harbor NWR, approximately 5.5 acres (2.8 acres and 2.7 acres at Honouliuli and Waiawa, respectively) was sprayed this year. At James Campbell NWR approximately 6.5 acres were treated this year. Once the herbicide kills the vegetation, prescribed burns are used as a mechanism to maintain interspersion and return nutrients to the soil. This in turn promotes the invertebrate prey base needed by many of the waterbirds that use the refuge. Prescribed burns are carried out only at the James Campbell NWR (see Section F.9.).

The introduction of mammalian predators has had a severe negative impact on all populations of waterbirds. The small Indian mongoose (*Herpestes auropunctatus*) was first introduced on the island of Hawai'i in 1883 by the Hilo Planters Association as a means of controlling rats in sugarcane fields and was subsequently introduced to O'ahu, Maui, and Molokai. They have since become a serious threat to waterbirds, taking eggs, young birds, and nesting adults.



Photo 25. Trapping mongooses is essential for protection of birds.

This animal spread rapidly and now occurs from sea level to approximately 10,000 feet, but is most numerous below 2,000 feet. It is primarily diurnal, and since rats are primarily nocturnal, the mongoose was ineffective in controlling rat populations. Female mongooses generally breed at one year old and produce two litters (averaging two pups per litter) annually. The breeding season in Hawai`i is from February into September and wetlands provide some of the most productive habitat for these animals.

Cats (*Felis catus*) became established in Hawai`i shortly after European contact and were likely “ship cats” to catch rats and mice on the sailing vessels. Feral cats are common around Hawaiian wetlands, particularly those that are in close proximity to housing areas. These cats are common predators of waterbirds. This is especially noticeable at Pearl Harbor NWR.

Dogs were originally introduced to Hawai`i by the early Polynesians. The general consensus is that there was one distinct breed (the “poi dog”) but as European breeds were introduced, crossbreeding resulted in loss of the Hawaiian breed identity. Dog activity is sporadic but common and dogs have the potential to cause extensive damage in breeding areas, in a very short time span preying on waterbird nests, young, and adults.



Photo 26. Feral dogs wreck havoc in Kii.

One of the avian predators is the cattle egret, who specifically preys upon nestlings. Populations close to the refuge have reached into the thousands. Control measures are taken to reduce local populations on or adjacent to the refuge.

Assistance from the U.S. Department of Agriculture Animal and Plant Health Inspection Service, Wildlife Services, is contracted to conduct operational predator control within the James Campbell and Pearl Harbor refuges. They are to reduce or eliminate predation caused by mongoose and other predatory animals such as rats, cattle egrets, and feral dogs and cats in order to protect and enhance the survival of the four species of endangered Hawaiian waterbird populations. Live traps are the primary method of control and are checked every 48 hours. When controlling cattle egrets, only steel shot is used and all carcasses are removed for proper disposal. The contract cost for FY 2000 was \$30,238.

**Wildlife Services Predator Control
Calendar Year 2000**

| Species Removed | James Campbell NWR | Pearl Harbor NWR | | Total |
|-----------------|--------------------|------------------|-------------|-------|
| | Ki'i Unit | Honouliuli Unit | Waiawa Unit | |
| Mongoose | 134 | 76 | 85 | 295 |
| Cattle Egret | 461 | 4 | 47 | 512 |
| Feral Dog | 12 | 0 | 7 | 19 |
| Feral Cat | 6 | 13 | 4 | 23 |

Note: Two feral pigs were also taken from the Ki'i Unit in 2000.

b. Forest Pest Control

Alien plants and animals are the primary threat to native forest species. Invasive alien plants (see below) compete for space, light, water, and nutrients. Non-native birds eat the food and occupy nesting areas needed by native bird species. Mosquitoes serve as vectors for lethal bird diseases such as avian malaria. The invertebrate, two-spotted leaf hopper, can devastate native vegetation. Black rats (*Rattus rattus*) and Polynesian rats (*Rattus exulans*) eat the fruit and bark of native plants; prey on bird eggs and nestlings; and are major predators of endangered tree snails. Pigs (see below) forage on native plants and seeds, and create an environment where invasive species flourish. The list continues with nonnative predatory tree snails, ants, . . . we have plenty of pests to control.

Feral pigs (*Sus scrofa*) have been known to exist in the Koolau Mountains for many years and are responsible for much of the disturbance and wet forest

modification. While foraging, feral pigs root and trample the forest floor, which encourages the establishment of alien plants in newly disturbed soil. Pigs also are a primary cause of spreading alien plant seeds through their feces and on their bodies, accelerating the spread of nonnative plants through the forest. Particularly bad within the refuge is the spread of strawberry guava (*Psidium Cattleianum*). New plants quickly develop into dense stands, blocking out most other plants and displacing natural vegetation. Pigs also feed on the starchy interiors of the extremely slow growing native tree fern and other succulent-stemmed plants.

In addition to strawberry guava, alien plants of particular concern include Christmas berry (*Schinus terebinthifolius*) a fast growing tree able to form dense thickets, Koster's curse (*Clidemia hirta*), which is rapidly displacing native vegetation by forming a dense understory, and Lantana (*Lantana camara*), an aggressive thicket-forming shrub that produces chemicals that inhibit the growth of other plant species.

Since the O'ahu Forest NWR was established late in the year and without funding, no pest control measures have yet been implemented. Pest control measures needed are tremendous and will be key to restoring and/or maintaining a healthy and diverse native ecosystem. Management programs complete with staff and associated costs must be initiated as soon as possible due to the tremendous effort needed to reduce or eliminate primary threats to the recovery of endangered and/or threatened species and to promote rehabilitation of the native ecosystem.

The Refuge's terrain prohibits the use of vehicles (even ATVs), allowing access only by foot or helicopter. Due to these limitations, helicopter services will often be required to access most locations within the O'ahu Forest, especially to establish remote field camps.

11. Water Rights

A new flow meter (Serial #G-05162) in Well #6 was returned to Sparling Instruments January 18th for warranty work. It was installed in March of 1999 and was operable for less than seven months. The flow meter (Serial #G-04683) in Well #7 is also inoperable and has been for many months but funding to repair the meter has not been available. Flow meter (Serial # G-04682) is also inoperable and in storage needing repairs. The only flow meter (Serial # G-04684) currently in operation was rebuilt in 1998. It has not been without its problems, however. Although these meters are mechanical with few moving parts, since our water source is from an artesian well and the water flow is strictly gravitational we are faced with the very unusual fact that these new and/or rebuilt meters stop working only after a few months.

Regional Water Rights staff assisted the refuge in correcting these problems that have plagued us for years. We discovered there is a build up of a rust-like material in the PVC pipes, on the flow meter components, and on the surface, even though it is a fresh water well. It appears this continual encrustation and build-up around the bearings is causing the meters to malfunction and provide inaccurate flow data or no data. After discussing options, the best solution appears to be replacing the type of meter to eliminate this problem. We all wanted to find the cause and fix the problem so that our records could show accurate water usage. Flow meters at the Honouliuli and Waiawa Units of Pearl Harbor have operated mostly without incident.

Regional Water Rights staff is also providing assistance to determine if we have enough yield to pump water from the wells instead of using the current gravity flow method. If a pump was installed, it could provide badly needed additional water for pond management and enable us to stay ahead of natural evaporation without the cost of drilling an additional well. Each year, particularly in the dry summer months, wetland habitat is lost due to a water deficit. This dryness for long periods also stimulates undesirable vegetation such as California grass and Pluchea, causing more maintenance attention.

12. Wilderness and Special Areas

Nothing to report.

13. WPA Easements

Nothing to report.

14. Farmers Home Administration Conservation Easements

Nothing to report.

15. Private Lands

Nothing to report.

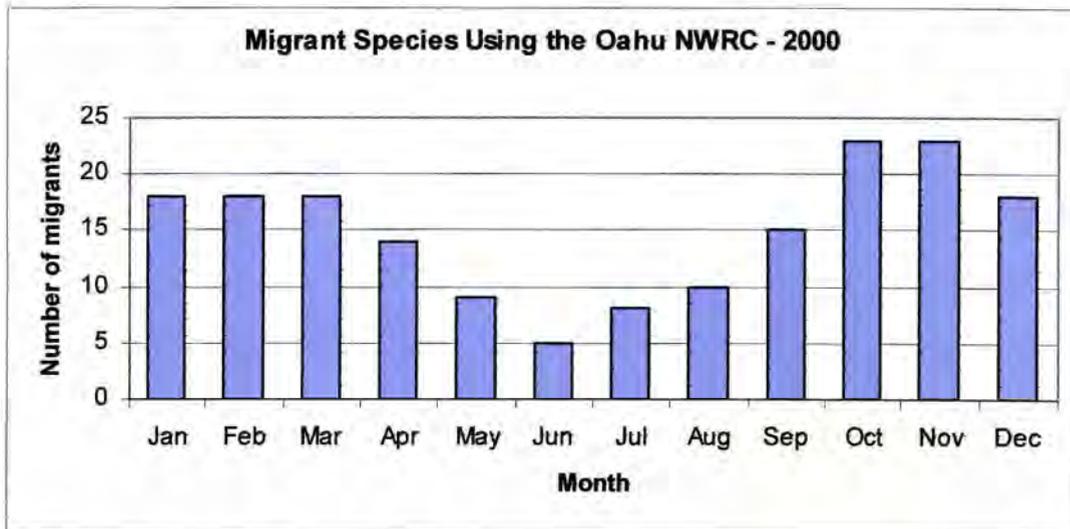
G. WILDLIFE

1. Wildlife Diversity

O`ahu - the gathering place of ancient Hawai`i - still harbors scattered outposts of original natural habitats that have existed in isolation for centuries and now serve as the last reservoirs for Hawai`i's unique plants and animals and as winter havens for migratory birds.

The isolation of the Hawaiian Islands led to an evolution of unique plant and animal species found nowhere else in the world. O`ahu, with 75% of the State's population and less than 10% of its land area, faces threats to its native species that are almost overwhelming. To help offset this, the Service has set aside three national wildlife refuges where O`ahu's remaining native birds, plants, and invertebrates have a chance to survive and hopefully prosper. O`ahu's national wildlife refuges scatter across several distinct habitat types: wetland, mesic (moist) forest, coastal, and dryland forest. Each type supports a broad array of wildlife.

Bird lists for the O`ahu Complex can be located in the back pocket of this narrative.



2. Endangered and/or Threatened Species

Hawai`i, unfortunately known as the nation's extinction capital, has the greatest concentration of threatened and endangered species in the United States and the greatest number of extinct species as well. Its unique biota developed due to a 2,500-mile-wide ocean moat that makes it one of the most remote land masses in the world. More than 90 percent of its species are endemic only to Hawai`i. Introduction of new species has played a significant role in the extinction of indigenous species and continues to do so today.

- a. Wetland Species - The James Campbell NWR and Pearl Harbor NWR provides critical habitat for four endangered Hawaiian waterbirds.

Hawaiian Coot ('alae ke'oke'o) - The Hawaiian coot is endemic to the Hawaiian Islands. This species probably originated from a group of migrant North America coots that remained as residents. The taxonomic status has been debated extensively but in 1993 The American Ornithologists' Union recognized the Hawaiian coot as a distinct species. The Hawaiian coot is smaller in body size than the mainland coot; however, its white bulbous

frontal shield is distinctly larger. A small percentage of the population has a red bulbous shield at the top of the frontal shield.



Photo 27. The endangered Hawaiian Coot.

Nesting occurs mostly from March through September, although some nesting occurs year-round. Water levels are critical for nest initiation and success. Clutch size ranges from 3 to 10 eggs with an average of 5 eggs.



Photo 28. Hawaiian Coot chick freshly hatched.

At the Honouliuli Unit there were 36 successful coot nests from 51 possible with 7 known failures and the remaining nests were unknown.

Conservatively, we anticipate that over 100 coot chicks fledged; however, several nests were missed due to lack of staff time to conduct nest checks.

Coot numbers have consistently increased on Ki'i Unit to 300+ birds due to habitat maintenance work over the last five years. Water is currently one of our limiting factors, preventing us from providing habitat in all ponds at once. About half of the unit is sacrificed due to a shortage of available water.

| Hawaiian Coot Peak Counts by Refuge Unit - 2000 | | | | |
|--|--------------------|---------------|------------------|-------------|
| Hawaiian Coot | James Campbell NWR | | Pearl Harbor NWR | |
| | Kii Unit | Punamano Unit | Honouliuli Unit | Waiawa Unit |
| | 358 | 5 | 114 | 48 |

Hawaiian Moorhen ('alae 'ula) - The Hawaiian moorhen is an endemic subspecies of the common moorhen, though there are no evident plumage or measurable differences from the North American moorhen. The moorhen is quite secretive; its preference to forage in dense emergent vegetation makes it difficult to census. Accurate population assessments are impossible. Counts do, however, provide a rough idea of population trends.



Photo 29. The secretive endangered Hawaiian Moorhen.

Though survey numbers fluctuate greatly due to the secretiveness of the bird, the moorhen population seems to be on the increase. Recent survey counts for the Ki'i Unit shows the moorhen population to be about 50 birds but the truer population is probably double that. Techniques (studies) to better monitor these birds are needed.

Nesting occurs year-round but most of the activity extends from March through August. Nesting is keyed to water levels and vegetation growth and clutch size averages 5 eggs per nest.

| Hawaiian Moorhen Peak Counts by Refuge Unit - 2000 | | | | |
|--|--------------------|---------------|------------------|-------------|
| Hawaiian Moorhen | James Campbell NWR | | Pearl Harbor NWR | |
| | Kii Unit | Punamano Unit | Honouliuli Unit | Waiawa Unit |
| | 57 | 3 | 4 | 5 |

Hawaiian Stilt (āe'o) - Great success occurred at the Honouliuli Unit of Pearl Harbor NWR this season. Pond 2, a 13-acre pond, fledged a record of 51 stilt chicks from 23 successful nests averaging 2.22 birds per nest. The State-wide average is less than a bird per nest. The Honouliuli Unit recorded a total of 31 nests of which 8 failed. Much of the success can be attributed to a large midge and various insect food supply, predator control, and increased habitat maintenance prior to the nesting season. The increased number of insects, we believe, is associated with leaving the pond water down for a longer period of time, about 5 months (March-July). Other benefits include seeing a large germination of Makai sedge in the pond. However, one of the disadvantages include a stimulated growth of *Bacopa monnieri* (water hyssop), which now covers most of the exposed mudflats and has limited shorebird foraging habitat.

This success may be due to a combination of actions. This pond was drained last August and left dry for a couple of months before flooding. This action after flooding really stimulated *Ruppia* (widgeon grass) growth, which serves as a great food source for the coots, moorhen, and ducks.

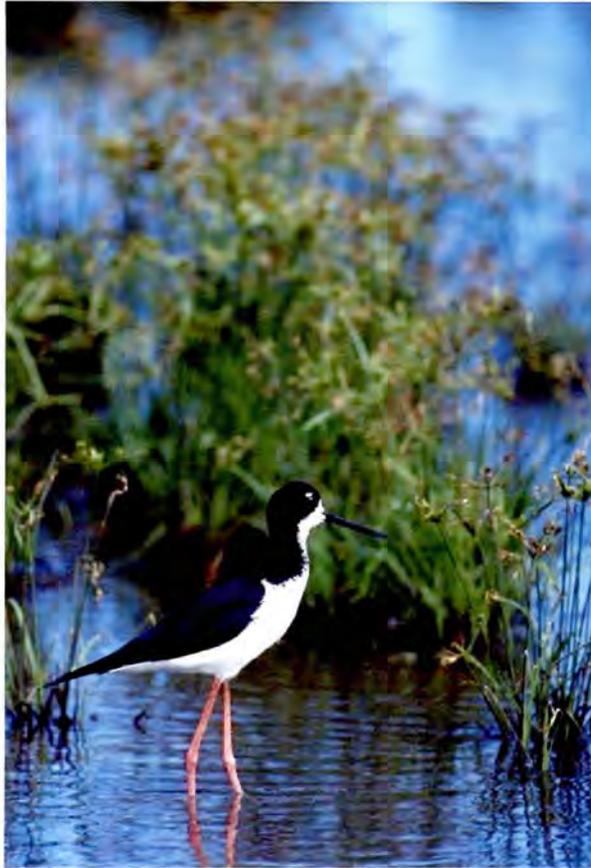


Photo 30. The endangered Hawaiian Stilt.

We hope, with the restoration of the 5-acre Pond 1, that its success will also increase. For many years, due to the overgrowth of vegetation, Pond 1 has not had a successful coot or stilt nest. Again, due to our increased ability to provide additional maintenance (four maintenance personnel) compared to previous years, we already have seen great results in Pond 1 and anticipate good nesting success.

| Hawaiian Stilt Peak Counts by Refuge Unit - 2000 | | | | |
|---|--------------------|---------------|------------------|-------------|
| Hawaiian Stilt | James Campbell NWR | | Pearl Harbor NWR | |
| | Kii Unit | Punamano Unit | Honouliuli Unit | Waiawa Unit |
| | 155 | 4 | 99 | 76 |

Stilts on the James Campbell NWR, Ki'i Unit have remained fairly constant since the early 90s, with peaks of over 100 birds. Peaks normally occur between September and April. Stilts who seem fairly mobile based, on what

little information we have, appear to travel in localized intra island movements. A banding program could really benefit biologists by providing a better understanding of the movements, family structure (to help determine site tenacity), and longevity.



Photo 31. Newly hatched stilt chick.

Hawaiian Duck (koloa) - Though closely related to the North American mallard, the koloa is a distinct species. It is a small, drab-brown duck of which both sexes are mottled and similar to that of a female mallard. It has an emerald green to blue speculum. Koloa breed year round, with a peak breeding period between January and May. Clutch size ranges from 2 to 10 eggs.

Koloa numbers declined noticeably early in the 20th century caused by predation of rats, mongooses, dogs, cats, habitat reduction and hunting. Due to domestic mallards, there is a high percentage of mallard-koloa hybrids on O`ahu and it is unknown if a pure genetic strand still exists here. Only on Kauai are there no known hybrid koloa.



Photo 32. The endangered Hawaiian Duck (*Koloa*)

| Hawaiian Duck Peak Counts by Refuge Unit - 2000 | | | | |
|--|--------------------|---------------|------------------|-------------|
| Hawaiian Duck | James Campbell NWR | | Pearl Harbor NWR | |
| | Kii Unit | Punamano Unit | Honouliuli Unit | Waiawa Unit |
| | 91 | 15 | 18 | 9 |

- b Forest Species - The O'ahu Forest NWR refuge supports at least 17 species of endangered plants, one candidate, and four plant species of concern, at least four species of endangered tree snails (*Achatinella*), a damselfly listed as a candidate, an endangered bird (the O'ahu`elepaio), and the Pueo or short-eared owl which is listed endangered with the State, as well as other rare and native flora and fauna species. Many of the native plants and animals that once thrived in these forests are either extinct or on the brink of extinction, and management intervention is needed to stabilize native ecosystems and prevent more species from becoming extinct.

It is critical that basic biological information be collected to provide sound foundations for all management activities. This information is essential to implementing a recovery program. Surveys are needed to locate, identify, and estimate population density of threatened and endangered species (plants, birds, and terrestrial invertebrates.) In turn, this information will identify

management priorities which are extremely important due to the magnitude of challenges threatening these endangered species. Management for a healthy and diverse native ecosystem will be a very labor intensive program over very rugged and difficult to access terrain. Refuge start-up costs are needed to provide personnel, equipment, and gear necessary to conduct studies in remote areas inaccessible to vehicles.

Plants - The Recovery Plan for O`ahu Plants (USFWS 1998) covers 66 plant taxa, all of which are listed as endangered and 56 of which are endemic to the island of O`ahu. Of the two mountain ranges on O`ahu (Waianae and Koolau), the Koolau range is younger, was built by volcanic eruptions, and receives much more rainfall than the Waianae Mountains. The vegetation communities of the Koolau Mountains, especially in the upper elevations to which many of the 66 plant taxa are restricted, are primarily lowland mesic and wet forests dominated by o`hia (*Metrosideros polymorpha*) and other trees and ferns. Most of the remaining native vegetation is restricted to steep valley headwalls and summit areas. The windswept ridges are very steep and are characterized by grasses, ferns, and low growing, stunted shrubs.

The Recovery Plan for the Koolau Mountain Plant Cluster (USFWS 1995) is part of the Recovery Plan for O`ahu Plants. This plan covers 11 plant taxa, all of which are listed as endangered with the following numbers of known remaining individuals at the time the plan was written: *Chamaesyce deppeana* (akoko) - fewer than 50; *Cyanea crispa* (no common name (NCN)) - fewer than 33; *Cyanea truncata* (haha) no known populations; *Cyrtandra crenata* (haiwale) no known populations; *Cyrtandra polyantha* (haiwale) - fewer than 5; *Eugenia koolauensis* (nioi) - fewer than 220; *Hesperomannia arborescens* (NCN) - fewer than 100; *Lobelia oahuensis* (NCN) - fewer than 110; *Melicope lydgatei* (alani) - fewer than 5; *Phlegmariurus nutans* (wawaeiole) - fewer than 4; and *Tetraplasandra gymnocarpa* (oheohe) - fewer than 60. Ten of these taxa are currently restricted to the island of O`ahu. *Hesperomannia arborescens* has one population each on the islands of Molokai and Maui. Historically, three of the taxa were known from Molokai (*Eugenia koolauensis* and *Hesperomannia arborescens*), Lanai (*Hesperomannia arborescens*) and Kauai (*Phlegmariurus nutans*).

O`ahu `Elepaio - The O`ahu `elepaio, placed on the endangered species list on May 18, 2000, was once common and widespread in forested areas throughout the island at all elevations. The species is thought to occupy less than four percent of its original range. It is a member of the monarch flycatcher family. Adults have a dark brown crown and back, white underparts with light brown streaks on the upper breast, and white wing bars, rump, and tail-tips. The long tail is often held up at an angle. `Elepaio are nonmigratory, territorial, and often mate for life.



Photo 33. The endangered O'ahu 'Elepaio.

In Hawaiian legend, 'elepaio helped canoe makers judge the quality of koa logs to make into canoes. If the bird landed on the log and pecked at it, the wood was considered to be of poor quality. If, however, it landed on the log and sang "ono-ka-ia", the log was considered sound. Because the 'elepaio is an insect-eater, its ability to identify insect infested wood made it a valuable resource to early Hawaiians.

O'ahu Tree Snails - The entire genus of *Achatinella* was listed as endangered on August 31, 1981. This genus consists of 41 species of the O'ahu tree snail, endemic to the island of O'ahu. In 1992, 16 species were presumed extinct, 5 species have not been seen in over 15 years, and 18 of the remaining 20 species are on the verge of extinction. Of these 18 species, 11 of these range within the O'ahu Forest, though many have not been seen for many years. They consist of *A. apexfulva*, *A. bulimoides*, *A. byronii*, *A. casta*, *A. decipiens*, *A. dimorpha*, *A. elegans*, *A. leucorraphe*, *A. lila*, *A. livida*, *A. papyracea*, and *A. swiftii* (Recovery Plan, O'ahu Tree Snails, April 1993).

Shells of the adult O'ahu tree snails average in size from 0.5 inches to just over an inch in length. The shells are brilliantly colored and patterned in shades of orange, yellow, brown, green, gray, black and white with smooth glossy surfaces. The genus is characterized by a small tooth which protrudes from the central column of the shell. (See Photo 18 Section F.3)

O`ahu tree snails are found primarily in moist or wet forestland at elevations above 1,000 feet. Though primarily nocturnal, they may become active in the daytime during and/or after heavy rains. Native shrubs and trees are the preferred habitat and they usually rest on branches, trunks, or on the underside of leaves. They are relatively sedentary, with some individuals spending their entire life in a single tree.

Achatinella takes an unusually long time to reach sexual maturity and have a low reproductive rate. Though each snail possesses both male and female sexual organs, they cannot fertilize themselves. They breed throughout the year and can bear up to four young each year.

The most serious threats to the survival of O`ahu tree snails are predation by the introduced carnivorous snail, *Euglandian rosea*, predation by rats and loss of habitat due to invasive alien vegetation. The carnivorous snail was introduced from Florida in 1955 in an effort to control the giant African snail. The *Euglandian rosea* follows mucous trails of other gastropods and will climb trees and bushes to capture its prey.

Hawaiian legends say the O`ahu tree snails sang. It was later realized that it was crickets creating the song, but traditions are still carried on today. Collectors gathered the brightly colored snails and their beauty led to an appreciation of the tree snail that helped inspire a more general awareness. Collecting and commercial exploitation helped to reduce *Achatinella* populations. In the mid to late 1800's "land shell fever" hit the island and hundreds of thousands of snails were collected for their shells. Many shell leis were made and by 1914 several species had declined drastically and were considered rare. Though shell collecting subsided around 1940, most species were severely decimated.

- c. Dryland Coastal Plant Species - Pre-acquisition planning for the endangered *Achyranthes* Plant Parcel is completed. We are awaiting the Navy's approval on our recommended contaminant language for inclusion in the transfer letter. We have been issued a license to continue restoration activities which include volunteers clearing alien plants by hand and planting native coastal plants. We have also noticed attempts by shearwaters to nest in the areas cleared of pluchea. Unfortunately all we see are wings. We have seen at least 8 sets in the last few months. Predation by either mongoose, cats, dogs, rats, or a combination of such is evidently high. Establishing this area for nesting shearwaters would not be recommended, however, since this area is the final approach for aircraft landing at the Kalaeloa Airport.

Late in the planning process for the endangered `Akoko Plant Parcel, the Navy detected lead and arsenic in the soils that were formerly used as skeet

and trap range. A relatively large number of individual endangered plants are found within the contaminated area and would be affected by cleanup. The Navy's risk to human health assessment concluded that cleanup is not required. The Service is awaiting EPA's review of the Navy's conclusions.

3. Waterfowl

Twenty-four species of ducks and geese have been recorded as visitors to the wetland refuges on O`ahu. The most common migrants include the Northern pintail, Northern shoveler, lesser scaup, green-winged teal, American wigeon, and the mallard. Mallards, however, are often difficult to distinguish from resident mallards. Wintering migratory waterfowl use the wetland refuges from September through May, and these units are managed to provide critical habitat for the State's population.

Other migratory waterfowl species documented include greater white-fronted goose, snow goose, brant, Canada goose, garganey, blue-winged teal, cinnamon teal, gadwall, Eurasian wigeon, canvasback, redhead, ring-necked duck, tufted duck, greater scaup, bufflehead and common merganser.

| <u>Primary Waterfowl Species</u> | <u>Location</u> | <u>Peak Count</u> | <u>Date</u> |
|----------------------------------|-----------------|-------------------|-------------|
| Northern Pintail | Honouliuli Unit | 111 | 01/06/00 |
| Northern Shoveler | Kii Unit | 98 | 11/29/00 |
| American Green-winged Teal | Kii Unit | 8 | 02/10/00 |
| American Wigeon | Honouliuli Unit | 4 | 11/18/00 |
| Eurasian Wigeon | Kii Unit | 1 | 10/15/00 |

Four Canada geese have been continually present on the Ki`i Unit since November 10, 1999, and were last seen on March 10, 2000. None of the geese were seen after this date. Prior to their departure, shorter, then longer, flights around the refuge occurred with greater frequency. Based on this behavior, it is visibly detectable when geese are preparing to depart. This behavior has also been noted in the past.

Fulvous whistling ducks first appeared in Hawai`i in 1982 on O`ahu, and became established on the north shore in the vicinity of the refuge. It is suspected the birds were illegally introduced to the area, but it may have been from natural colonization. The first record of breeding by this species in Hawai`i was in 1984 at the Ki`i Unit. Nests of this species have only been found on the Ki`i Unit. There is only a lone whistling duck left and it is only a matter of time before its time will pass. But for now, it can still be occasionally seen or heard on Ki`i.

4. Marsh and Waterbirds

Black-crown night herons, or `Auku`u, are common on the wetlands and are indigenous to Hawai`i. The Hawaiian form has not differentiated greatly from its North American counterpart. Though the heron normally feeds on crustaceans, fish, shrimp, and frogs, it has been documented on occasion to take young waterbirds. It is not known to what extent they are influencing the populations of endangered waterbirds. Aquaculture farmers adjacent to the refuge consider the `Auku`u a threat to their shrimp and prawns, and it is likely the `Auku`u population will increase on the refuge now that the aquaculture farms are operational again since closing in 1995.

The average population of Black-crown night herons for James Campbell NWR, Pearl Harbor NWR, Honouliuli Unit, and Pearl Harbor NWR, Waiawa Unit during 2000 were 34, 29, and 13 respectively.

Cattle egrets have established a roost next to the refuge with counts of over 2000 birds. The cattle egret was introduced to Hawai`i in 1959 in an effort to control arthropod pests in cattle and other livestock. Cattle egrets are known to feed on waterbird chicks, though to what extent it is difficult to determine, but in numbers large enough to warrant control measures. See the section on Pest Control for more information.

The average population of cattle egrets for James Campbell NWR, Pearl Harbor NWR, Honouliuli Unit, and Pearl Harbor NWR, Waiawa Unit during 2000 were 55, 12, and 8 respectively. These counts only include those observed within the refuge boundary and do not include adjacent rookeries.

5. Shorebirds, Gulls, Terns and Allied Species

The wetland refuges provide some of the best shorebird habitat on O`ahu, and numerous species can be seen during the fall, winter, and spring months. These sites serve as the sole destination for many different species. Some migrants come and go like clockwork while the arrival of others can be a complete surprise. In Hawai`i, one never knows what might show up after a very long flight over the Pacific Ocean. Habitat and water level manipulations greatly benefit these migrants and are equally beneficial for the endangered waterbirds.

Anticipated seasonal guests found on the refuge include the Pacific golden plover or Kolea that migrates from Alaska each year. The plover makes Hawai`i its home for several months until such time as it migrates back to Alaska in early May. Ruddy turnstones and sanderlings are both common winter visitors, arriving in August and leaving for the arctic breeding grounds in April and May. Bristle-thighed curlews thrill bird watchers on our guided tours conducted on the James Campbell NWR, especially those who have tramped many miles in Alaska looking to add this bird to

their life list unsuccessfully. Long-billed dowitchers, usually in small groups, can be easily identified by their feeding habits, probing for worms, grubs, and other invertebrates. These birds journey between O'ahu's wetland refuges and the Arctic tundra of eastern Siberia and western North America. When not nesting in Alaska, wandering tattlers are generally seen along rocky shorelines. However, the mudflats of the wetland refuges serve as a perfect place to feed and rest in preparation for their long trip back north.

| <u>Primary Shorebird Species</u> | <u>Location</u> | <u>Peak Count</u> | <u>Date</u> |
|----------------------------------|-----------------|-------------------|-------------|
| Pacific Golden-plover | Honouliuli Unit | 219 | 04/14/00 |
| Ruddy Turnstone | Kii Unit | 125 | 10/11/00 |
| Sanderling | Kii Unit | 32 | 10/11/00 |
| Bristle-thighed Curlew | Kii Unit | 26 | 11/18/00 |
| Wandering Tattler | Waiawa Unit | 11 | 07/30/00 |
| Long-billed Dowitcher | Kii Unit | 7 | 01/06/00 |

Photo 34.

Bristle-thighed Curlews are easy to spot and hear.

They proved to be an exciting attraction on refuge tours.



Photo 35.

The Ruff, an African species, is a rare but annual visitor to O'ahu's wetland refuges. This year a Ruff was first documented on March 3rd.

Though not as common as other winter shorebird, visitors also include dunlins, pectoral sandpipers, lesser yellowlegs, sharp-tailed sandpipers, and the occasional gull or tern which have included Glaucous-winged gulls, Bonaparte's gulls, and Caspian terns. For a complete listing of birds please see the bird list located in the back cover of this narrative.



Photo 36. Few gulls make it to Hawaii; a Glaucous-winged Gull did.



Photo 37. Long-billed Dowitchers migrate annually to the refuges.

6. Raptors

Hawaiian short-eared owls, or pueo are frequently observed hunting over the wetland refuges and occasionally perched, which allows for a nice long look through binoculars. They can also be found within the O`ahu Forest NWR. The pueo is an endemic race and occurs on all main Hawaiian islands. The State has listed the pueo as endangered on O`ahu. Ancient Hawaiians worshiped the pueo as a god and revered them as guardian spirits.

The barn owl, common on O`ahu, was introduced from North America in 1958 for rodent control and to decrease the impacts of rodents on sugar cane production.

Ospreys are rare but regular winter visitors that can sometimes be observed hunting over the wetland refuges. There were, however, no documented sightings this year.

The island of O`ahu does not have the endangered `io or Hawaiian Hawk. It is located on the Big Island.

7. Other Migratory Birds

A new seabird species was recorded for James Campbell NWR this year. On February 24th, a black-footed albatross was observed by WB Silbernagle and a volunteer. The bird approached from Kahuku side of Pond A flying parallel to the coastline and directly in front of the observers. The albatross began to be mobbed by five bristle-thighed curlews as it flew over the pond. The sighting conditions were excellent and there was no doubt about the identification of the bird.

Great frigatebirds are occasionally seen soaring effortlessly over the wetland refuges and at times taking a Tilapia or two from the ponds. In addition to the frigatebird, other species of seabirds occasionally seen overhead or in the vicinity include red-footed boobies, black noddies, brown noddies, Laysan albatross, red-tailed tropicbird, and the white-tailed tropicbird.

8. Game Mammals

Ring-necked pheasants reside primarily on the James Campbell NWR but can also be seen or heard at Pearl Harbor NWR. They use the tree and shrub areas for nesting and brood rearing. These birds after being introduced in 1865 are now common on all main Hawaiian islands.

Zebra and spotted doves are common on all three refuges and to a lesser extent the rock dove. The zebra and spotted dove were both introduced from Asia in 1922 and in the mid 1800s respectively. The rock dove or domestic pigeon was first introduced in 1796 and is more common in urban areas.

Erckel's francolin resides in the O`ahu Forest NWR though is not seen or heard of in great numbers. They usually are in habitats above 1,000-foot elevation but at times are located at sea level. These birds were introduced to Hawai`i in 1957 from Africa.

9. Marine Mammals

Endangered Hawaiian monk seals (and threatened green sea turtles) are known to occur in waters offshore of Kahuku and have basked on the shore line next to the refuge. These coastal dunes are within our proposed boundary of the refuge and, if the dunes are purchased, its protection and enhancement could further entice seals, turtles, and nesting seabirds to the area. The only documented nesting beach of the island of O`ahu is just to the north of this area.

10. Other Resident Wildlife

Nothing to report.

11. Fishery Resources

Streams in the O`ahu Forest have not been intensively or systematically surveyed for native stream fishes. Native aquatic species documented from streams within the Refuge include the indigenous goby or `o`opu nakea (*Awaous guamensis*) and the `o`opu nopili (*Aocyopterus Stimpson*) and `o`opu alamo`o (*Lentipes concolor*).

Native invertebrates are opae kala`ole, a mountain opae (*Atyoida bisulcata*), *hihiwai* (*Neritina granosa*) and *Lymnaeid* snails (*Lymnaeidae*) along with a fresh water sponge (*Heteromyenia baileyi*).

Like many streams in Hawai`i, streams on O`ahu are realizing an increasing amount of non-native aquatic life. These would include guppies (*Poecilia reticulata*), mollies (*Poecilia sp.*), Dojo (*Misgurnus anguilli*), an oriental weather fish, and unfortunately a bristlenose catfish (*Ancistrus C.F. temmincki*) which resembles the *pleicostomus* and is advancing upstream. These fish are aggressive and have spikes. They are competing with native species for space and food and could out-compete native fish if their numbers are not controlled.

12. Wildlife Propagation and Stocking

Nothing to report.

13. Surplus Animal Disposal

Nothing to report.

14. Scientific Collections

Nothing to report.

15. Animal Control

Please see the Pest Control section F. 10.

16. Marking and Banding

Nothing to report.

17. Disease Prevention and Control

Nothing to report.

H. PUBLIC USE

1. General

Currently, little to no U.S. Fish and Wildlife Service visitor opportunities exist on the island of O`ahu, the most populated and visited of all the Hawaiian Islands. There is a considerable demand from local school groups, commercial tour operators, and the general public for access into the refuge to view wildlife. None of the refuges are "open" to the general public; however, through guided tours, environmental education, special events, and special use permits thousands of people get to visit these special places. During FY00, there were 2,615 visitors recorded at James Campbell NWR and 4,754 visitors at Pearl Harbor NWR.

The very first O`ahu NWRC brochure was printed this year and will include the James Campbell NWR, Pearl Harbor NWR (plus the new Kalaeloa Unit), and the recently established O`ahu Forest NWR. Funding was provided by TEA-21 funds and the project was coordinated and contracted through EPIC in the regional office.

The Service plans to implement a visitor use program on the O`ahu Forest NWR once sufficient baseline inventories are completed to ensure the program can be compatible with the purpose of the refuge. Trails will be restored to allow wildlife viewing with environmental education being a focus. These opportunities will enable the public to see, learn about, and enjoy the natural resources of the refuge and will increase the public's knowledge and appreciation of Hawai`i's native ecosystem as well as build support for Service conservation programs. By agreement of purchase and access, the Service is limited to no more than 100 visitors per month and on a guided basis.



Photo 38. Guided tour participants enjoy the kiosk shade while viewing Kii's waterbirds.

2. Outdoor classroom - Students

Since 1993, a special use permit has been issued to Hawaii Nature Center, a non-profit organization, to conduct an educational wetland program for third grade students at the Honouliuli Unit, Pearl Harbor NWR. During the Hawaiian stilt non-nesting season, approximately 6,000 students participate annually in the program. They turn away about 1,000 students each year due to the popularity of the program. In efforts to expand the program, the Center conducted a trial run at the Ki'i Unit of James Campbell NWR. It was a great success. They are now trying to find a sponsor to help fund this new location.

A Special Use Permit was authorized to several educational organizations and school groups. The Moanalua Gardens Foundation, a recipient of one of these permits, conducts regular wetland education programs on the Ki'i Unit of James Campbell and has since 1985. About 20 classes are brought out over the course of the season. This year over 700 students participated in their wetland program.



Photo 39. Hawaii Nature Center Students anxious to “discover!”



Photo 40. Volunteer Mike Ord assists a young birder.

ARM Stahl participated in "Journey to Wetlands 2000", a three-part interactive distance learning series for fourth to eighth grade students. The series was broadcast live from the Public Educational TV studio in Honolulu, directly into classrooms both in Hawai'i and in 27 states throughout the U.S. The viewing audience was estimated to be about 750,000 kids. The series was also sent to schools on the Islands of Micronesia. The programs were hosted by Kid Science teacher, Patty Miller who was joined by Margo Stahl, a guest scientist, in a special classroom of kids. The studio students modeled activities, demonstrations, and experiments that could be duplicated by students in the classrooms. The programs featured live talk, video segments, and student activities. Students were able to interact via the telephone and the internet. Lesson plans were posted on the website for teacher access. Margo Stahl also took the camera crew to the Pearl Harbor NWR Units and Kawainui Marsh (wetland managed by Department of Land and Natural Resources) to discuss wetland issues and wildlife needs that became part of the video segments.

Forty-two students from University of Hawaii's Leeward Community College class taught by Frank Stanton visited the Waiawa Unit of Pearl Harbor NWR. This class is an on-going program to educate college students in practical aspects of environmental monitoring. Over a series of visits, they collected water samples, analyzed data and prepared reports of their findings.

3. **Outdoor Classrooms - Teachers**

Nothing to report.

4. **Interpretive Foot Trails**

This is the third year that the guided public use program has been conducted on James Campbell NWR. There were 2,495 visitors who utilized the foot tour route on the Ki'i Unit. Approximately half were guided tour participants and the other half primarily Special Use Permit environmental education classrooms. This activity is authorized during the stilt non-nesting season. The scheduled guided tours at Ki'i have been very well received and really enjoyed by all participants. We offer a guided tour every Thursday and Saturday from August 1 through February 15. Most tours were led by refuge volunteers.



Photo 41. ARM Stahl with volunteer guides Bob Pyle, Mike Ord, Pete Donaldson, and Dick May.

5. **Interpretive Tour Routes**

Nothing to report.

6. **Interpretive Exhibits/Demonstrations**

To increase public awareness, environmental education, and to offer compatible visitor activities, additional lands are needed at James Campbell NWR that would enable the Service to provide public use/interpretive facilities. The program could provide year-round wildlife viewing opportunities for over a million visitors annually as well as an outdoor education center for students. Activities would focus on the importance of wetlands, their cultural significance, the plight of native plants and birds, and the Service's efforts to preserve essential wetland habitat and save these species from extinction.

A memorial overlook is planned for the Honouliuli Unit of Pearl Harbor NWR. This idea stemmed from a desire to re-tell a little history of the refuge in addition to affording residents and visitors of Hawai'i an opportunity to view and learn about refuge wetlands. The history begins with the City of Honolulu needing a new airport runway. Most people are not aware that the Pearl Harbor National Wildlife Refuge was created as "mitigation" for the construction of the Honolulu International Airport Reef Runway. Initial efforts to create this refuge started with Betty Nagamine, a

teacher and a volunteer with the Hawaii Audubon Society. She lobbied relentlessly to Herman Bliss, the Hawai'i Regional Director of the Federal Aviation Administration, for mitigation due to impacts from the fill associated with the creation of the reef runway. This started a series of discussions with various agencies. Though a lot of cooperation, the Federal Aviation Administration, the State of Hawaii, the U.S. Navy and the Fish and Wildlife Service made the refuge a reality, and the Pearl Harbor National Wildlife Refuge, composed of two units, was established in 1972 under a Use Agreement between the Navy and the Fish and Wildlife Service.

Betty's noble efforts not only helped to create the Pearl Harbor Refuge they consequently created a special bond between her and Mr. Bliss. They were married soon thereafter. Unfortunately there is a sad ending to their happy story. Betty Nagamine Bliss was killed in a tragic car accident on the mainland recently, so this refuge overlook and interpretive site will be dedicated to her memory and show how one person can make a difference.

The project consists of constructing a handicap accessible platform to overlook Pearl Harbor and the Honouliuli Unit of Pearl Harbor National Wildlife Refuge. Panels facing the refuge will serve as observation blinds as well as interpret the importance of wetlands in Hawai'i, the management of endangered species, the area's cultural significance, and how through cooperative efforts this special place was created to benefit local residents and visitors of Hawai'i. This will be tied to the State's Pearl Harbor Historic Trail Project and construction is expected to be completed in 2004.

7. Other Interpretive Programs

Our first commercial guiding Special Use Permit was issued this year. It was issued to the well known author Douglas Pratt who has published several bird identification books. The permit was for providing guided wildlife observation services on Pearl Harbor NWR.

ARM Stahl participated in the KHET Public Educational TV Interactive Wetlands Program for grades 5-8 on March 8-9.

ARM Stahl made a presentation and took a tour group of 50 people from the Kapolei Hawaii Civic Society to the Kalaeloa Unit to view the plant restoration work. Benton Pang from the ES office, Nat Pak from The Nature Conservancy and Bruce Koebele from Kaala Farms also participated in the event.

TO Blackwell made a presentation to the Pearlridge Elementary School on May 5 to approximately 100 first grade students.

Staff celebrated National Wildlife Refuge Week by conducting guided tours of both wetland refuges and hosting volunteer work day with Leeward Community College

students assisting us with plant native and endangered coastal plants at the Kalaloa Unit of Pearl Harbor NWR.

8. Hunting

Public hunting is not authorized on all three refuges. As identified in the Interim Compatibility Determination for O`ahu Forest NWR, a managed hunt, using local hunters for the purpose of controlling feral pig populations, could be a very valuable tool for managing the O`ahu Forest NWR.

9. Fishing

Fishing is not authorized on any of the three refuges.

10. Trapping

Trapping only occurs in conjunction with pest control (see Section F. 10).

11. Wildlife Observation

The Service proposed allowing visitors to hike into O`ahu Forest NWR for the purpose of wildlife observation. An Interim Compatibility Determination for Wildlife Observation, Photography, and Environmental Education and Interpretation was signed this year. Once provisions for the program are in place to ensure compatibility with the purposes of the refuge, the refuge would be opened for small groups of visitors for day hikes on designated trails. Based on the purchase agreement, there must be a staff person per 15 participants, no unguided parties will be allowed to cross private lands in order to access the refuge, and total number of visitors per month will not exceed 100 visitors. Participants must hike approximately one mile to reach the refuge boundary.

An overlook is planned for the Honouliuli Unit of Pearl Harbor NWR. Once completed, this will be the first time the general public is allowed on the refuge. For more information please refer to H. 6. Interpretive Exhibits/Demonstrations.

12. Other Wildlife Oriented Recreation

Nothing to report.

13. Camping

Nothing to report.

14. Picnicking

Nothing to report.

15. Off-Road Vehicling

Nothing to report.

16. Other Non-Wildlife Oriented Recreation

Nothing to report.

17. Law Enforcement

WB Silbernagle attended and successfully completed the R1 Refuge Officer Inservice January 26th -30th at Marana, Arizona.

RM Stovall attended and successfully completed the R1 Refuge Officer Inservice refresher training February 29 - March 4 at Marana, Arizona.



Photo 42. Hawaii's Law Enforcement Officers qualify with Service firearms at Haleakala National Park on Maui. The magnificent seven from left to right are Roger DiRosa, Kevyn Paik, Bob Dieli, Donna Stovall, David Johnson, Steve Berger, and Michael Silbernagle.

Evidence of a break-in at the Ki'i Unit baseyard was found Friday morning the 4th of February. Someone cut through the fence and broke into the 40-foot container via the air ventilation turbine in the roof. Stolen items include a generator, work boots, tool sets, Gortex jacket, and miscellaneous tools and equipment valued at over \$3,300. A police report was taken and the area was dusted for finger prints. Steel screens were placed over the vent holes to prevent access in the future.

On December 18th, staff arrived at the baseyard to discover another break-in. They had drilled open our container van locks to gain access. In one container van a gas powered welder/generator, two air compressors, power washer, gas powered self propelled brush cutter, portable generator, and other miscellaneous tools and equipment were missing. The second container was open and pilfered through, but nothing appeared to be missing. A GSA pickup was broken into and vandalized. The passenger side door and truck tool box was pried open. A pair of binoculars and a digital volt meter were taken along with a box of miscellaneous tools. The truck also had graffiti on the passenger side of the truck. Total cost of lost equipment was approximately \$16,000.



Photo 43. Vandalism/Theft on December break-in at Kii Unit.

The December break-in was the first time the thieves gained access with a vehicle, which enabled them to carry off so much more. Each time we get broken into, so does our neighbor the Kahuku Wastewater Treatment Plant. Over the last three years approximately \$24,000 of equipment and tools were stolen from the baseyard. Together with the Plant we hope to install some sort of security system in the near future to deter further break ins.

18. Cooperating Associations

Nothing to report.

19. Concessions

Nothing to report.

I. EQUIPMENT AND FACILITIES

1. New Construction

Critical facility needs consist of a maintenance baseyard that will provide employees a safe place to work, a conducive place to work, and will provide protection for Service equipment away from the salt air and environment as well as from thieves and vandals. Both the station safety audit and an Environmental Compliance Audit have documented violations due to the unsafe conditions in which our maintenance workers are having to work. Current conditions consist of a one-sided shed providing little to no protection from the environment. There are also no utilities available such as clean water or electricity, creating multiple safety violations based on job requirements.



Photo 44. With good team work anything can happen. Maintenance personnel Albeso, Smith, Blackwell, and Service employee Ron Walker got caught on camera.

2. Rehabilitation

Two of the five debris grate sections under the pump house at Ki'i have completely rusted apart. All five will require replacement. New grates, each 12' long, have been purchased and will be installed by a contractor. Plans are to replace the grates at the same time the pumphouse will be replaced. The pumphouse contract was awarded to JMI Contractors. On April 10 the contractors started the project to replace the pumphouse. The contract consisted of demolishing the existing pumphouse, installing a prefabricated building with a removable roof similar to the existing roof, and replacing floor grates.



Photo 45. Contractors replace the metal grates and the pumphouse.

The maintenance crew replaced a badly deteriorated fence line at the Ki'i unit. The harsh coastal environment requires that the wire be replaced frequently. Maintenance also continued to install metal arms strung with barbed wire along our fence line at the Honouliuli Unit in an effort to reduce trespassers.

On April 12, a new Myer submersible pump was installed at Honouliuli. This pump replaces the old Goulds pump that went out on March 8. The total cost to remove the old pump and install a new pump was \$3,000 not including staff time.

Maintenance replaced a deteriorated concrete box water control structure in Pond 1 at Honouliuli Unit, Pearl Harbor NWR, with a new fiberglass structure. They also excavated sediment from Pond 1's perimeter moat to deter predator accessing the pond. Additionally, the work sets the stage for improved moist soil management.

Maintenance staff along with Regional Water Rights personnel replaced the water level recorder at James Campbell NWR, Punamano Unit.



Photo 46. Water level recorder and structure replaced at Punamano.

3. Major Maintenance

At the James Campbell NWR, a new waterline and valve was installed between Pond A and B to improve water flow to Pond A. This will enable us to fill Pond A without affecting Pond B, which greatly increases options and flexibility to manage water.



Photo 47. New pipe installed crossing Pond B at Kii.

4. Equipment Utilization and Replacement

Due to mechanical failure all three of our pumps went out this year. The pumps at each of our Pearl Harbor NWR units that supply water to the ponds had to be replaced, and the large 40 hp pump which pumps ditch water to the outlet at the James Campbell refuge had to be repaired and the casing replaced. We are obligated to have this pump fully functional as a condition of our lease to drain the surrounding community. Combined, the cost set us back about \$20K. This had been listed as an MMS project, but since it was not funded, the cost primarily was taken from other accounts.



Photo 48. Waiawa Unit drying up due to mechanical failure of pump.

Heavy mowing needs place great stress on the aging quality of our machines. Our equipment quickly deteriorates due to constant exposure to the salt air. In addition to minor breakdowns and routine maintenance, unexpected costly repairs included replacing the creep gear on the Kubota (four months in the shop), replacing the shaft on the flail mower, and fixing the John Deere's Air conditioning unit twice. Total repairs on tractors were \$10K.

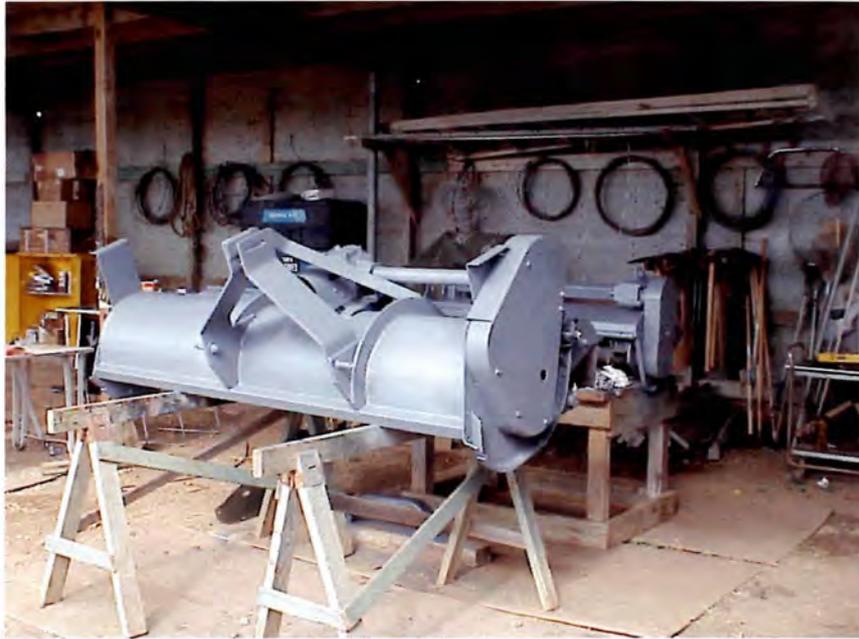


Photo 49. Maintenance staff painted mowing implements with bed liner paint to prolong their usable life in this harsh coastal environment. It seems to be working well.

Through out the year, several fiberglass water control structures were replaced by the maintenance staff to enable us to more easily control water flow to seven Ki`i ponds.



Photo 50. A fiberglass water control structure replaced the old rusted corrugated metal structures. These will withstand the salt air much better.

5. Communications

Our station's Nextel cell phones serve as our mobile radios due to its direct connect feature. It has really worked well for us and at a considerable cost savings compared to the purchase of digital hand held radios plus cell phone/pager costs. This purchase came about due to the fact we needed radios for our prescribed fire season; however, one digital (required) hand-held radio was costing close to \$2,500 and we needed eight. Based on fire funds it would have taken about five years to purchase eight radios. The purchase of cheap walkie-talkies was not possible because they used public frequencies. We inquired about borrowing a fire cache complete with radios during our fire season but could not get a guarantee that one would be available.

We discovered in 1999 that Nextel had phones that had "radio" capabilities called direct connect. This feature could enable us to have group talk or single connect just like a radio. With these new phones we have the convenience of year-round private "radio" use, which is much easier than dialing cell phone numbers as well as our "radio" having phone capabilities. Other positive points regarding these phones are that, though we are using it like a radio, the conversation has the same privacy as a phone call, the speaker can be used for teleconferencing with a room full of people, and you can send text messages through the internet! Bottom line we were able to save \$20,000 by switching cell phones and we have been extremely satisfied. The only disadvantage is not having other government agency frequencies available in case of a wildfire. However, when you are surrounded by water, that chance is remote and therefore not a big concern.

6. Computer Systems

All of the preparations for Y2K evidently paid off; with additional funding we were able to upgrade most of our old computers, which made the new year come and go without any complications. Our new computers also make life behind the desk much more pleasant and efficient.

7. Energy Conservation

Staff continues to recycle cans, paper, and cardboard. Local recycling bins make it convenient to drop off.

8. Other

In efforts to re-instill the culture's importance to care for the *`aina* or land, a sign was erected at Kalaeloa which included the Hawaiian interpretation of the message.



Photo 51. In hopes of protecting endangered plants this Hawaiian language sign was erected at the Kalaeloa Unit, site of native and endangered plants.

A landslide near Waimea Beach caused the closure of Kamehameha Highway. This is the only route around the North Shore and the most direct link between the Haleiwa Office and the James Campbell NWR. The closure resulted in significant extra driving time to accomplish all work at both the James Campbell and Pearl Harbor NWRs. A new road must be constructed to eliminate the fear of possible injury to people and vehicles traveling this major artery.

J. OTHER ITEMS

1. Cooperative Programs

Nothing to report.

2. Other Economic Uses

Nothing to report.

3. Items of Interest

VIP visitors: Jim Kurth, Chief of National Wildlife Refuge System; Representative Abercrombie's Washington Office aides; Senator Inouye's Hawai'i Office aides; State Representative Willie Espero, and various Washington and Regional FWS Staff.

Chief Jim Kurth was the first recipient to receive the official Passport stamp of the James Campbell and Pearl Harbor refuges.



Photo 52. Jim Kurth, Chief of Refuges getting his passport book stamped by ASA McNeil.

CBS Cinematographer Ray Bribiesca was escorted to the James Campbell, Pearl Harbor, and O`ahu Forest refuges to obtain general film footage of the refuge and wildlife. Footage of O`ahu Forest NWR will be used for the annual show "Gifts to Ourselves." Both locations will be aired at different times as ending footage on the CBS Sunday Morning program with Charles Osgood.

WB Silbernagle helped judge the Annual Junior Duck Stamp Contest on 3/17/2000.

4. Credit

"Thanks" to not having E-mail for several months (late 2001/early 2002), time was afforded to RM Stovall to create this narrative with input and review from the staff. A special thanks goes to our new Administrative Office Assistant, Pamela Gibson, a free lance writer, who edited the report.



General information regarding weather in Hawai'i was found at www.gohawaii.com/hoeko/weather/report.html and at www.worldclimate.com.

K. FEEDBACK

Though very important for the historical record of the Refuge Complex, annual narratives are getting harder and harder to accomplish as other priorities take precedence. This narrative is not consecutive to the previous one (of which I won't reveal the date), but it is now our most current, and I am happy to have it finished!