

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE SPECIFICATION**  
**UPLAND WILDLIFE HABITAT MANAGEMENT**  
(acre)  
**CODE 645**

**SCOPE**

This document establishes the technical details, workmanship, and quality and extent of materials required to install the practice in accordance with the Conservation Practice Standard. The information shall be considered when preparing site-specific specifications for the practice.

The site-specific specifications for installing, operating, and maintaining the practice on a specific field or treatment unit shall be documented via the NRCS Hawaii Jobsheet for this practice and given to the client. Other documents such as practice worksheets, maps, drawings, and narrative statements in the conservation plan may be used to plan or design the practice and to prepare the site-specific specifications.

**HABITAT ELEMENTS**

The types, amount, and distribution of the following upland habitat elements have been identified for native forest and sea birds; the native bat and invertebrates; and upland game birds:

- Food (type)
- Nesting Cover (types of plants, trees, forest, etc.)
- Escape Cover (types of plants, trees, forest, etc.)
- Island Occurrence (where found)
- Elevation Range (where found)
- Breeding Habits
- Threats (disease, habitat loss, other animal species, etc.)

**Native Forest and Sea Birds**

The habitat elements for the following native forest and sea birds are listed in Table 1.

- Akiapola'au, (*Hemignathus munoi*)
- 'Alauahio or Maui Creeper (*Paroreomyza montana*)
- Crested Honeycreeper or 'Akohekohe, (*Palmeria dolei*)
- Hawaiian Dark-rumped Petrel or 'Ua'u, (*Pterodroma phaeopygia sandwichensis*)
- I'o
- Kaua'i 'O'o, (*Moho braccatus*)
- Maui 'Akepa, (*Loxops coccineus ochraceus*)
- Maui Parrotbill, (*Pseudonesor xanthophrys*)

- Nene, (*Nesochen sandvicensis*)
- Newell's Shearwater or 'A'o, (*Puffinus auricularis newelli*)
- Nuku-pu'u, (*Hemignathus lucidus*)
- Oahu Creeper, (*Paroreomyza maculata*)
- 'O'u, (*Psittirostra psittacea*)
- Palila, (*Loxioides bailleui*)
- Po'o-uli, (*Melamprosops phaeosoma*)
- Puaiohi or Small Kaua'i Thrush, (*Myadestes palmeri*)

### **Native Bat and Invertebrates**

The habitat elements for the Hawaiian hoary bat and the following native invertebrates are listed in Table 2.

- Hawaiian hoary bat (*Lasiurus cinereus semotus*)
- Oahu tree snails, (*Achatinella* spp.)
- Other native tree snails
- Native cave wolf spider, (*Adelocosa anops*)
- Native cave amphipod (*Spelaeorchesta koloana*)

### **Upland Game Birds**

The habitat elements for the following upland game birds are listed in Tables 3 & 4.

- Kalij pheasant (*Lophura leucomelana*)
- Ring-necked pheasant, (*Phasianus colchicus*)
- Lace-Necked, (*Streptopelis chinensis*)
- Barred dove, (*Geopelia striata*)
- California quail, (*Callipepla californica*)
- Chukar partridge, (*Alectoris chukar*)
- Wild turkey, (*Meleagris gallopavo*)
- Black francolin, (*Francolinus francolinus*)
- Erckel's francolin, (*Francolinus erckelii*)
- Gray francolin, (*Francolinus ondicerianus*)

### **MANAGEMENT ACTIONS**

The identification of the required management actions to achieve the planned purpose, will be based on Hawaii Biology Technical Notes No. 4, 5, and 6 or other suitable upland wildlife habitat evaluation procedures. The evaluation procedure will be used to determine a habitat suitability for either individual fields, habitat areas, type or natural community as well as to provide an overall evaluation for the entire property or operating unit.

Acceptable management actions include: manage vegetation; install game bird watering facilities; manage plant pests; manage animal pests; graze to control vegetation; implement fire control measures; and mitigate the effects of outdoor lighting.

Following are guidance for implementing the acceptable management actions.

## **MANAGE VEGETATION**

Vegetation may be maintained, developed, or improved for food, nesting and/or escape cover. Check the attached tables to determine species needs. One or more of the following conservation practices may be implemented to achieve this:

- **CONSERVATION COVER – 327**
- **CRITICAL AREA PLANTING – 342**
- **FOREST SITE PREPARATION – 490**
- **IRRIGATION WATER MANAGEMENT – 449**
- **RIPARIAN FOREST BUFFER – 391**
- **TREE PLANTING – 612**

The practices should be implemented in compliance with the standards and specifications in the Field Office Technical Guide (FOTG).

The use of plant materials will be appropriate to wildlife habitat of concern. Native plants will be used wherever possible.

## **INSTALL GAME BIRD WATERING FACILITIES**

Game bird watering facilities may be installed to supplement existing habitat conditions and to meet the water requirements of the wildlife species being managed.

Facilities will be designed to provide water at the approximate ground level, or by containing overflows from tanks and troughs at ground level. Facilities that may be damaged by domestic livestock will be protected by fencing.

Design and application assistance can be coordinated with the Hawaii Department of Land and Natural Resources to insure that locations and designs will complement the habitat of the wildlife species concerned.

### **Types of Facilities**

1. Raintraps – Impervious catchments with storage tank and drinking troughs
2. Dugouts, pits or drinking troughs supplied by surface runoff, stream diversion, spring flow or a well.
3. Drinking troughs supplied from a pipeline.

Facilities will be designed to supply the following water requirements:

- Quail and chukar: 750 gallons per covey on yearlong basis.
- Lace-necked and barred doves: 2 to 5 gallons per day available year round.
- Pheasants: 2 to 5 gallons per day available year round.

### Water Storage Tank Capacity

| Average Rainfall | Minimum Facility Storage Capacity |
|------------------|-----------------------------------|
| 10" or less/year | 750 gallons                       |
| Above 10"/year   | 200 gallons                       |

### MANAGE PLANT PESTS

The following conservation practices may be implemented to manage plant pests (weeds, insects, and diseases).

- **BRUSH MANAGEMENT – 314**
- **PEST MANAGEMENT – 595**

The practices should be implemented in compliance with the standards and specifications in the FOTG. No pesticides are permitted within open water areas (e.g. ponds, lo'i, auwai). Only pesticides registered for use along waterway banks are permitted. All instructions on the pesticide labels must be followed.

Biological control (e.g., using predator or parasitic species) may be considered to manage plant pests.

#### Mosquito Control

Mosquitoes may be managed by reducing the number of breeding sites for mosquitoes in and adjacent to all essential forest bird habitats. Mosquitoes that carry diseases mainly breed in stagnant freshwater, including pig wallows and troughs. Exclusion of pigs from the wildlife area, and regular flushing of troughs (at least once a week) can also curtail mosquitoes.

### MANAGE ANIMAL PESTS

The management of animal pests (feral ungulates, rats, mice, mongoose, feral cats and dogs) can be accomplished by fencing, trapping, hunting, controlling pets and feral animals, controlling exotic fish, and/or using biological control.

#### Fencing

Fencing may be used to enhance and maintain native plant species and associated wildlife by restricting feral ungulates, including pigs, goats, deer, sheep, mouflon, and cattle. Fences also serve to restrict the introduction of non-native, invasive plants, which may be spread by feral animals.

Note the threats and habitat elements of the target species in the tables, and use fencing as necessary. Fencing should be installed in compliance with the standards and specifications for the **FENCE (382)** practice in the FOTG.

#### Trapping

Traps or poison-bait stations for feral animals may be used to enhance and maintain wildlife.

From sea level to over 9,800 feet elevation, rats prey on native bird eggs, nestlings, and especially on Oahu, native land snails. Rat traps or poison-bait stations should be placed and maintained until rats are no longer a problem in selected areas. Black rats (*Rattus rattus*) and house mice (*Mus musculus*) respond well to diphacinone poison and to snap trapping. They favor apple or peanut butter-flavored bait. Mongoose also respond well to diphacinone baiting, yet prefer fish flavored bait. Larger traps than the ones used for mongoose are typically needed for feral cats.

Pigs have been successfully trapped through the use of corral traps or box-traps. The advantage of trapping of this kind is it does not require the use of toxins. The disadvantages are that trapping is labor intensive, and its application is limited to areas within reasonable proximity to vehicular access.

For specific trap types, schedules, spacing, and other requirements, contact the NRCS State Biologist and/or U.S. Fish and Wildlife Service (FWS), the State of Hawaii Department of Land and Natural Resources (DLNR) or other experienced wildlife/habitat managers.

### **Hunting**

Feral ungulates may be controlled by hunting. Certain ungulates in Hawaii have specific hunting seasons, and may need permits. All hunting should be done in accordance with the DLNR hunting program.

Recreational hunting has not been shown to be effective in remote areas having rugged terrain with no roads for vehicular transit.

### **Controlling Household Pets and Feral Cats and Dogs**

Household pets and feral cats and dogs prey on bird eggs and young hatchlings. These animals should not be allowed in nesting areas. Dogs, especially, chase and harass birds to the point that they will not return to their nesting areas. Dogs should be prevented from entering the areas by fencing or restraining (leashing) the animal.

### **Biological Control**

Biological control (e.g., using predator or parasitic species) may be considered to manage animal pests.

## **GRAZE TO MANAGE VEGETATION**

Grazing can be used to maintain or improve upland vegetation or in some instances to control invasive vegetation (e.g. California or kikuyu grass). Domestic ungulates should be removed and excluded from the management area during nesting or roosting times. See Table 1 the proper times to exclude domestic ungulates.

Grazing should be implemented in compliance with the conservation practice standards for:

**PRESCRIBED GRAZING – 528A;** and/or

**FENCE – 382.**

Grazing should take place after the area has been inventoried and determined to have no impacts to threatened and endangered plant species.

## **IMPLEMENT FIRE CONTROL MEASURES**

Fire control measures may be used on a case-by-case basis to ensure the establishment, development, and management of upland vegetation for the intended purpose.

Particularly on the leeward sides of all islands, potential for wildfires has increased due to increasing dominance of invasive grasses and plants, dramatically adding to fuel loads. Fires are capable of destroying fire-sensitive native forestlands, which are habitat for many native species. In order to lessen the fuel load and decrease possibility of fires in native habitats, low intensity prescribed burning can be used. Firebreaks may be needed to control the prescribed burn or to protect areas. These conservation practices should be implemented in compliance with the conservation practice standards for:

### **PRESCRIBED BURNING – 338**

#### **FIREBREAK – 394**

All burning plans must be approved by the NRCS Grazing Specialist, the State Department of Health, and the local fire department.

## **MITIGATE EFFECTS OF OUTDOOR LIGHTING**

To mitigate the effects of outdoor lighting on habitat for seabirds, the following guidelines should be followed:

- Light poles should be limited to a height of 25 feet. Lights situated on higher poles are more likely to cause seabird fall-out than lights on other poles.
- All lights should be directed downward, be shaded to prevent light from escaping horizontally, and be of as low wattage as possible. It is also recommended that lights be muted colors, such as yellow or green.

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**TABLE 1: NATIVE FOREST AND SEA BIRD HABITAT ELEMENTS (Page 1 of 3)**

| <u>Species</u>                                                                                | <u>Food</u>                                                          | <u>Nesting Cover</u>                                                                                              | <u>Escape Cover</u>                                                        | <u>Island Occurrence</u>                                                                | <u>Elevation Range</u>                                                  | <u>Threats</u>                                                                                     |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>Akiapola'au</b><br>( <i>Hemignathus munoi</i> )                                            | insects from koa and mamane trees, esp. beetle larvae                | koa-'ohi'a forests, dry mamane-naio woodlands                                                                     | koa-'ohi'a forests, dry mamane-naio woodlands                              | Endemic to Big Island                                                                   | 3,300 – 7,000 ft. in Ka'u, Hamakua, Kona<br>6,000-8,700 ft on Mauna Kea | Avian diseases, loss of dry forests due to sandalwood harvests and goat, cattle, and sheep grazing |
| <b>'Alauahio or Maui Creeper</b><br>( <i>Paroreomyza montana</i> )                            | insects from koa and mamane trees, esp. beetle larvae                | koa-'ohi'a forests, dry mamane-naio woodlands                                                                     | koa-'ohi'a forests, dry mamane-naio woodlands                              | common on slopes of Haleakala above 3,000 ft (e.g Polipoli Springs, Hosmer Grove)       | 3,000 – 8,000 ft                                                        | Avian diseases, loss of dry forests due to sandalwood harvests and goat, cattle, and sheep grazing |
| <b>Crested Honeycreeper or 'Akohekohe</b><br>( <i>Palmeria dolei</i> )                        | nectar of 'ohi'a trees; also on flowers of ohelo and akala; insects; | 'ohi'a and koa-'ohi'a forests                                                                                     | 'ohi'a and koa-'ohi'a forests                                              | windward slopes of Haleakala                                                            | 4,200 – 7,100 ft.                                                       | Avian diseases, disturbances to habitat by introduced plants, grazing animals;                     |
| <b>Hawaiian Dark-rumped Petrel or 'Ua'u</b><br>( <i>Pterodroma phaeopygia sandwichensis</i> ) | fish, squid, and crustaceans                                         | burrows along rock outcrops, under cinder cones and lichen-covered lava; vegetation mostly grass and bracken fern | rocky burrows                                                              | Haleakala National Park on Maui; Mauna Kea and Mauna Loa on Hawai'i; Lana'i, and Kaua'i | above 7,200 ft.                                                         | Avian diseases, predators (rats, feral cats, mongooses); habitat destruction; ocean pollutants     |
| <b>I'o, Hawaiian Hawk</b><br>( <i>Buteo solitarius</i> )                                      | rats, mice, insects, birds, other small animals                      | Nests in large trees, such as ohia; nest season March - September; clutch size 1-3;                               | koa-'ohi'a forests, wooded pasture, Eucalyptus and other nonnative forests | Big Island, few sightings on Maui and Oahu                                              | sea level -8,500 ft                                                     | Hunting, deforestation of large trees, predation by aliens, avian diseases                         |

**TABLE 1: NATIVE FOREST AND SEA BIRD HABITAT ELEMENTS (Page 2 of 3)**

| <u>Species</u>                                                                | <u>Food</u>                                                                                      | <u>Nesting Cover</u>                                                                 | <u>Escape Cover</u>                                | <u>Island Occurrence</u>                                                                                                          | <u>Elevation Range</u> | <u>Threats</u>                                                                               |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------|
| <b>Kaua'i 'O'o</b><br>( <i>Moho braccatus</i> )                               | spiders, moths, beetles, insect larvae, small snails; lobelia, 'olapa fruits; nectar of 'ohi'a   | 'ohi'a trees                                                                         | wet 'ohi'a forests                                 | Alaka'i Swamp on Kaua'i                                                                                                           | 3,300 – 3,900 ft.      | Avian diseases, habitat disturbances                                                         |
| <b>Maui 'Akepa</b><br>( <i>Loxops coccineus ochraceus</i> )                   | insects; nectar from 'ohi'a and other flowers                                                    | 'ohi'a trees                                                                         | 'ohia and koa-'ohi'a forests                       | windward Haleakala                                                                                                                | 3,600 – 6,800 ft       | Avian diseases, destruction of koa-'ohi'a forests                                            |
| <b>Maui Parrotbill</b><br>( <i>Pseudonesor xanthophrys</i> )                  | insects; beetle larvae (esp. coleoptera and lepidoptera larvae); larvae and pupae of small moths | mainly ohia trees                                                                    | upper koa-'ohi'a rainforest                        | East Maui, 5,000 acres from the upper Waikamo watershed southeast to upper Kipahulu Valley                                        | 4,300 – 7,000 ft       | Avian diseases, habitat destruction by feral pigs; introduced plants; mosquito-born diseases |
| <b>Nene</b><br>( <i>Nesochen sandvicensis</i> )                               | seeds of grasses and herbs; leaves, buds, flowers, and fruits of plants                          | ground nests                                                                         | lives on rugged lava flows on high volcanic slopes | In Hawai'i, Ka'u district, southeast slopes of Hualalai, windward side of Mauna Kea-Mauna Loa; in Maui, upper slopes of Haleakala | 4,300 – 7,900 ft       | Habitat alterations; predation; reproductive failure                                         |
| <b>Newell's Shearwater or 'A'o</b><br>( <i>Puffinus auricularis newelli</i> ) | primarily squid                                                                                  | burrows under dense stands of uluhe and other ferns within steep mountainous terrain | steep mountain terrain; uluhe ferns                | on mountainous terrain of Kaua'i; also on Hawai'i and Moloka'i; may be undetected in remote areas on other islands                | 500 – 2,300 ft.        | Predation (esp. cats and rats); forest fires; habitat alteration; urban lights               |

**TABLE 1: NATIVE FOREST AND SEA BIRD HABITAT ELEMENTS (Page 3 of 3)**

| <u>Species</u>                                                        | <u>Food</u>                                                                               | <u>Nesting Cover</u>                                        | <u>Escape Cover</u>                                                                                                 | <u>Island Occurrence</u>                                                                                                    | <u>Elevation Range</u> | <u>Threats</u>                                                                 |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------|
| <b>Nuku-pu'u</b><br>( <i>Hemignathus lucidus</i> )                    | wood-boring beetles, moth larvae, spiders; nectar from 'ohi'a and lobelia flowers         | dense, wet 'ohi'a and koa'-ohi'a forests; nests March - May | dense, wet 'ohi'a and koa'-ohi'a forests                                                                            | In Kaua'i, near the Wainiha Pali in the Alaka'i Swamp; In Maui, on the northeast slopes of Haleakala and in Kipahulu Valley | 4,000 – 6,400 ft.      | Avian diseases, habitat disturbances by feral animals; introduced plants       |
| <b>Oahu Creeper</b><br>( <i>Paroreomyza maculata</i> )                | insects, beetle larvae                                                                    | mixed 'ohi'a-koa forests;                                   | mixed 'ohi'a-koa forests;                                                                                           | Moanalua Valley, North Halawa Valley, valley south of Manana trail                                                          | 1,000 – 2,000 ft.      | Avian diseases, habitat destruction; introduced plants; animals; avian disease |
| <b>'O'u</b><br>( <i>Psittirostra psittacea</i> )                      | fruits of lobelia, guava, ie'ie; buds and blossoms of 'ohi'a; insects (esp. caterpillars) | wet ohia forests, nests March - May                         | wet 'ohi'a forests                                                                                                  | central and southeast areas of Alaka'i Swamp of Kaua'i; windward districts of Hawai'i                                       | 3,000 – 6,900 ft.      | Avian diseases, grazing of feral animals                                       |
| <b>Palila</b><br>( <i>Loxioides bailleui</i> )                        | green seed pods, young leaves, buds, and flowers of mamane trees; naio and poho berries   | branches of mamane trees                                    | mamane-naio forests                                                                                                 | slopes of Mauna Kea on Hawai'i                                                                                              | 6,500 – 9,600 ft.      | Avian diseases, predation, competition, fire, feral animal                     |
| <b>Po'o-uli</b><br>( <i>Melamprosops phaeosoma</i> )                  | small snails, beetles; insects and larvae                                                 | nest is built in canopy of 'ohi'a                           | 'ohi'a forest under-story <i>Comprosmia</i> , <i>Vaccinium</i> , <i>Styphelia</i> , <i>Rubus</i> , and other shrubs | upper Hanai and Kuhiwa watersheds on the northeast slopes of Haleakala                                                      | 4,600 – 6,700 ft.      | Avian diseases, habitat disturbances; feral animals;                           |
| <b>Puaiohi or Small Kaua'i Thrush</b><br>( <i>Myadestes palmeri</i> ) | purple berries of 'olapa; spiders and caterpillars                                        | Fern and sedge-covered stream banks in ohia forests         | high elevation ohia forests in the Alakai Swamp.                                                                    | found only in the Alaka'i Swamp of Kaua'i                                                                                   | above 4,000 ft.        | Habitat disturbances; introduced plants, animals; avian disease; predation     |

**TABLE 2: NATIVE BAT AND INVERTEBRATES HABITAT ELEMENTS (Page 1 of 1)**

| <u>Species</u>                                                                         | <u>Food</u>                                                 | <u>Nesting Cover</u>                                                                                             | <u>Escape Cover</u>                                          | <u>Island Occurrence</u>                                                               | <u>Elevation Range</u>                                                                           | <u>Threats</u>                                                                                                           |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Hawaiian Hoary Bat</b><br>( <i>Lasiurus cinereus semotus</i> )                      | insectivorous, e.g. moths beetles, termites                 | roost on trees, both native and non-native. roosting occurs throughout the year; bat pups cannot fly for 4 weeks | native and non-native; ohia, kukui, coconut, kiawe, and hala | populations on Big Island, Maui, Kauai; spotted on Molokai, Oahu, Kahoolawe, and Lanai | sea level to 13,000 ft.; migrate attitudinally (i.e. not as visible at low elevations in winter) | Deforestation; pesticides, barbed wire, rats                                                                             |
| <b>Oahu Tree Snails</b><br>( <i>Achatinella</i> spp.)                                  | microscopic algae or fungi                                  | not applicable                                                                                                   | mesic forest, wet forest                                     | On Oahu, in Ko'olau and Wai'anae ranges;                                               | 670 – 959 m in Ko'olau range;<br>800 – 950 m in Wai'anae Range                                   | Habitat loss; predators (esp. cannibal snails, rats, ants)                                                               |
| <b>Other Native Tree Snails</b><br>( <i>Partulina</i> spp.,<br><i>Perdicella</i> spp.) | microscopic algae or fungi                                  | not applicable                                                                                                   | mesic forest, wet forest                                     | Some on all main islands; most on Maui                                                 | unknown                                                                                          | Habitat loss; predators (esp. cannibal snails, rats, ants)                                                               |
| <b>Native Cave wolf spider</b><br>( <i>Adelocosa anops</i> )                           | native and some non-native amphipods                        | not applicable                                                                                                   | Caves (no real cover, as they are blind, slow moving)        | Kauai                                                                                  | Koloa Waikomo lava series, dark, humid parts of lava tubes                                       | Human disturbances, food deficiency (woody vegetation roots), rats, increased air circulation (low humidity), pesticides |
| <b>Native Cave amphipod</b><br>( <i>Spelaeorchesta koloana</i> )                       | rotting roots of woody vegetation, rotting sticks, branches | not applicable                                                                                                   | Caves (no real cover, as they are blind, slow moving)        | Kauai                                                                                  | Koloa Waikomo lava series, dark, humid parts of lava tubes                                       | Human disturbances, food deficiency (woody vegetation roots), rats, increased air circulation (low humidity), pesticides |

**TABLE 3 - GAME BIRD HABITAT ELEMENTS**

(Page 1 of 1)

**Typical Vegetation used for Food, Cover, Shelter (not all-inclusive; other grains and noninvasive species can be used, with the concurrence of the State Biologist or Division of Forestry and Wildlife staff.)**

| Number | Common Name        | Scientific Name                                |
|--------|--------------------|------------------------------------------------|
| 1      | bromegrass         | <i>Bromus catharticus</i>                      |
| 2      | bristly foxtail    | <i>Setaria verticillata</i>                    |
| 3      | Hawaiian piligrass | <i>Heteropogon contortus</i>                   |
| 4      | alfalfa            | <i>Medicago sativa</i>                         |
| 5      | burclover          | <i>Medicago polymorpha</i> , <i>M. hispida</i> |
| 6      | Japanese tea       | <i>Cassia leschenaultiana</i>                  |
| 7      | panini             | <i>Opuntia megacantha</i>                      |
| 8      | pigeon pea         | <i>Cajanus cajan</i>                           |
| 9      | sheep sorrel       | <i>Rumex acetosella</i>                        |
| 10     | white clover       | <i>Trifolium repens</i>                        |
| 11     | akia               | <i>Wikstroemia</i> sp.                         |
| 12     | ilima              | <i>Sida</i> sp.                                |
| 13     | mamani             | <i>Sophora chrysophylla</i>                    |
| 14     | ohelo              | <i>Vaccinium reticulatum</i>                   |
| 15     | popolo             | <i>Solanum nodiflorum</i>                      |
| 16     | pukiawe            | <i>Styphelia tameiameia</i>                    |

**TABLE 4: TYPICAL GAME BIRD HABITAT ELEMENTS (Page 1 of 2)**

| <u>Species</u>                                                | <u>Food</u>                                                                             | <u>Nesting Cover</u>                                                                                    | <u>Escape Cover</u>                                                            | <u>Island Occurrence</u>                                                            | <u>Elevation Range</u>                                    | <u>Threats</u>                                                                                                   |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Kalij Pheasant</b><br>( <i>Lophura leucomelana</i> )       | 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 14, 15, 16                                              | variety of forest types, native rain forests, silk oak and eucalyptus groves, and other exotic forests. | variety of forest types from native to exotic                                  | Big Island (Hawaii)                                                                 | 0 – 10,000 ft.                                            | predation (esp. cats and rats); parasites; forest fires; habitat alteration; lack of water                       |
| <b>Ring-necked Pheasant</b><br>( <i>Phasianus colchicus</i> ) | 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 14, 15, 16                                              | 1, 3, 4, 5, 8, 16<br>Breeds Feb-July; clutch size 6 to 11 eggs                                          | All habitat types except dense rain forests, alpine zones, and very dry areas. | largely confined to windward slopes of Mauna Kea and Mauna Loa at higher elevations | 0 – 10,000 ft.                                            | predation (esp. cats and rats); parasites; forest fires; habitat alteration; too much woody cover; lack of water |
| <b>Lace-necked Dove</b><br>( <i>Streptopelis chinensis</i> )  | 2, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15.<br>mostly seeds, some fruits, NA on animal matter | practically any forest; Breeds Feb-July; clutch size 6 to 11 eggs                                       | All habitat types                                                              | common on all main islands                                                          | 0 – 8,000 ft. on Hawaii; up to 4,000 ft. on other islands | Lack of water; predation (esp. cats and rats); forest fires; habitat alteration                                  |
| <b>California Quail</b><br>( <i>Callipepla californica</i> )  | 1, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16                                                | 1, 3, 5, 14, 16;<br>nests Feb-June<br>12 –16 eggs laid                                                  | Usually found in flocks. Common in grassland that borders wooded tracts        | common only in North Kona, Mauna Kea, and Hawaii Volcanoes National Park            | 0 – 11,000                                                | predation (esp. cats and rats); forest fires; overgrazing; habitat alteration; too much woody cover              |
| <b>Chukar Partridge</b><br>( <i>Alectoris chukar</i> )        | 1, 3, 4, 5, 6, 0, 11, 12, 13, 14, 16                                                    | 1, 3, 16                                                                                                | Inhabits barren, dry habitats; 1, 3, 4, 5, 11, 13, 14, 16                      | All main islands; most abundant on Mauna Kea and Haleakala, Maui                    | 1,000 – 11,000 ft.                                        | predation (esp. mongoose and rats); forest fires; habitat alteration; too much woody cover                       |

**TABLE 4: TYPICAL GAME BIRD HABITAT ELEMENTS (Page 2 of 2)**

| <u>Species</u>                                                | <u>Food</u>                                                       | <u>Nesting Cover</u>                             | <u>Escape Cover</u>                                                                                                  | <u>Island Occurrence</u>                                                                                                           | <u>Elevation Range</u>                          | <u>Threats</u>                                                                         |
|---------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Wild Turkey</b><br>( <i>Meleagris gallopavo</i> )          | 1, 5, 10, 11, 12, 13, 14, 15, 16, usually forages on forest edges | 16; usually nests on the ground at base of trees | Native koa/ohia and mamane/naio forests, as well as silk oak and eucalyptus forest. Favors forests w/open understory | established on Niihau, Lanai, Maui; common in Hawaii (esp. Puu Waa Waa, Hualalai, Mauna Kea)                                       | mostly between 2,000 – 5,000 ft.                | predation (esp. cats and rats); forest fires; habitat alteration                       |
| <b>Black Francolin</b><br>( <i>Francolinus francolinus</i> )  | 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 14, 15, 16                        | 1, 3, 4, 5, 8, 16                                | Open pasture; dry grassland habitats                                                                                 | established on Molokai, Maui, Lanai; most common in drier parts of NW Hawaii                                                       | 0 – 2,300 m on Hawai'i; <1,300 m in East Maui;  | predation (esp. cats and rats); forest fires; habitat alteration; too much woody cover |
| <b>Erckel's Francolin</b><br>( <i>Francolinus erckelii</i> )  | 1, 3, 4, 5, 6, 0, 11, 12, 13, 14, 16                              | 1, 3, 16                                         | Open grasslands; the francolin most likely to inhabit rainforests                                                    | established on six largest islands; esp. common on the leeward slope of Mauna Kea and Lanai                                        | usually above 1,000 ft.; sometimes at sea level | predation (esp. cats and rats); forest fires; habitat alteration; too much woody cover |
| <b>Gray Francolin</b><br>( <i>Francolinus pondicerianus</i> ) | 1, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16                          | 1, 3, 5, 14, 16                                  | Roadsides near Kiawe thickets; attracted to irrigated places, lawns and golf courses                                 | established on all main islands; abundant in lowlands of Maui, Lanai, Molokai, and Hawaii; local and seldom seen on Oahu and Kauai | mostly 0 – 1,000 m                              | predation (esp. cats and rats); forest fires; habitat alteration; too much woody cover |