

**FINAL Avoidance and Minimization Measures (AMMs)**  
**Final revised May 2023**

**ESA Listed Species**

**Endangered ‘ōpe‘ape‘a (Hawaiian hoary bat, *Lasiurus cinereus semotus*):** The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you incorporate the following applicable measures into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

**Endangered ‘ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*), Threatened ‘a‘o, (Newell’s shearwater, *Puffinus newelli*), and Endangered Hawai‘i Distinct Population Segment of the ‘akē‘akē (band-rumped storm-petrel, *Hydrobates castro*):**

Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable to light attraction.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Listed seabirds have been documented colliding with communication towers, particularly in areas of high seabird passage rate. In general, self-supporting monopoles are the least likely to result in collisions, whereas lattice towers, particularly those that rely on guy-wires, have a greater risk.

To avoid and minimize the likelihood that towers will result in collisions by listed seabirds we recommend you incorporate the following measures into your project description:

- The profile of the tower should be as small as possible, minimize the extent of the tower that protrudes above the surrounding vegetation layer, and avoid the use of guywires.
- If the top of the tower must be lit to comply with Federal Aviation Administration regulations, use a flashing red light versus a steady-beam red or white light.
- If possible, co-locate with existing towers or facilities.

Seabirds have been known to collide with fences, powerlines, and other structures near nesting colonies. To avoid and minimize the likelihood of collision we recommend you incorporate the following measures into your project description:

- Where fences extend above vegetation, integrate three strands of polytape into the fence to increase visibility.
- For powerlines, guy-wires and other cables, minimize exposure above vegetation height and vertical profile.

We recommend further coordination with our office to address specific project details and potential seabird interactions.

**Threatened nēnē (Hawaiian goose, *Branta (Nesochen) sandvicensis*):** Nēnē are found on the islands of Hawai‘i, Maui, Moloka‘i, and Kaua‘i. They are observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Threats to the species include introduced mammalian and avian predators, wind facilities, and vehicle strikes.

To avoid and minimize potential project impacts to nēnē we recommend you incorporate the following measures into your project description:

- Do not approach, feed, or disturb nēnē.
- If nēnē are observed loafing or foraging within the project area during the breeding season (September through April), have a biologist familiar with nēnē nesting behavior survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).
- Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of proposed project, or a previously undiscovered nest is found within the 150-foot radius after work begins.
- In areas where nēnē are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.

A 4(d) rule was established at the time the nēnē was downlisted to threatened status. Under the 4(d) rule, the following actions are not prohibited under the Act, provided the additional measures described in the downlisting rule are adhered to:

- Take by landowners, or their agents, conducting intentional harassment in the form of hazing or other deterrent measures not likely to cause direct injury or mortality, or nēnē surveys.

- Take that is incidental to conducting lawful control of introduced predators or habitat management activities for nēnē.
- Take by authorized law enforcement officers for the purpose of aiding or euthanizing sick, injured, or orphaned nēnē; disposing of dead specimens; and salvaging a dead specimen that may be used for scientific study.

**Endangered Hawaiian waterbirds (ae‘o, Hawaiian stilt, *Himantopus mexicanus knudseni*; ‘alae ke‘oke‘o, Hawaiian coot, *Fulica alai*; ‘alae ‘ula, Hawaiian common gallinule, *Gallinula galeata sandvicensis*; koloa maoli, Hawaiian duck, *Anas wyvilliana*):** Hawaiian waterbirds are currently found in a variety of wetland habitats including freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) lo‘i or patches, irrigation ditches, sewage treatment ponds, and in the case of the Hawaiian duck, montane streams and marshlands. Hawaiian stilts may also be found wherever ephemeral or persistent standing water may occur. Threats to these species include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards.

#### Guidance for Projects That May Create an Attraction for Hawaiian Waterbirds:

Based on the project details provided, your project may result in the creation of standing water or open water that could attract Hawaiian waterbirds to the project site. In particular, the Hawaiian stilt is known to nest in sub-optimal locations (e.g., any ponding water), if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance. Therefore, we recommend you work with our office during project planning so that we may assist you in developing measures to avoid impacts to listed species (e.g., fencing, vegetation control, predator management).

To avoid and minimize potential project impacts to Hawaiian waterbirds we recommend you incorporate the following measures into your project description:

- In areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.
- If water resources are located within or adjacent to the project site, incorporate applicable best management practices regarding work in aquatic environments into the project design (see enclosure).
- Have a biological monitor that is familiar with the species’ biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). If a nest or active brood is found:
  - Contact the Service within 48 hours for further guidance.
  - Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.
  - Have a biological monitor that is familiar with the species’ biology present on the project site during all construction or earth moving activities until the

chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

**Endangered Hawaiian forest birds (O‘AHU:** O‘ahu ‘elepaio, *Chasiempis ibidis*; ‘i‘iwi, *Drepanis coccinea*; **KAUA‘I:** puaiohi, *Myadestes palmeri*; ‘akikiki, *Oreomystis bairdi*; akeke‘e, *Loxops caeruleirostris*; ‘i‘iwi, *Drepanis coccinea*; **HAWAI‘I:** ‘akiapōlā‘au, *Hemignathus wilsonsi*; ‘alawī, Hawai‘i creeper, *Loxops mana*; Hawai‘i ‘ākepa, *Loxops coccineus*; palila, *Loxioides bailleui*; ‘i‘iwi, *Drepanis coccinea*; **MAUI:** kiwīkiu, Maui parrotbill, *Pseudonestor xanthophrys*; ‘ākohekohe, crested honeycreeper, *Palmeria dolei*; ‘i‘iwi, *Drepanis coccinea*; **MOLOKA‘I:** ‘i‘iwi, *Drepanis coccinea*

Hawaiian forest birds’ current ranges are predominately restricted to montane forests above 3,500 feet in elevation due to habitat loss and threats at lower elevations. Hawaiian forest bird habitat has been lost due to development, agriculture, grazing, wildfire, and spread of invasive habitat-altering species. Forest birds are also affected by mosquito-borne diseases. Mosquitoes are not native to Hawai‘i; their occurrence increases in areas where ungulate presence results in small pools of standing water. Actions such as road construction and development increase human access and result in increased wildfire and invasive species threats. Grazing results in reductions in woody vegetation and increased grass cover, which reduces forest habitat quality and results in increased wildfire risk on the landscape.

Avoid conducting activities within forest bird habitat that:

- Promote the spread or survival of invasive species.
- Increase mosquito populations or stagnant water habitat.
- Increase wildfire threat to montane forest habitats.
- Remove tree cover during the peak breeding season between January 1 and June 30.

**Endangered Blackburn’s sphinx moth (*Manduca blackburni*):** NOTE: Found on Hawai‘i, Maui, Kaho‘olawe, Moloka‘i, and Lāna‘i.

The adult Blackburn’s sphinx moth feeds on nectar from native plants, including beach morning glory (*Ipomoea pes-caprae*), ‘ilie‘e (*Plumbago zeylanica*), maiapilo (*Capparis sandwichiana*), and others. Blackburn’s sphinx moth larvae feed on non-native tree tobacco (*Nicotiana glauca*) and native ‘aiea (*Nothocestrum* spp.). To pupate, the larvae burrow into the soil and can remain in a state of torpor for a year or more before emerging from the soil. Soil disturbance can result in death of the pupae.

We offer the following survey recommendations to assess whether the Blackburn’s sphinx moth occurs within the project area:

- A biologist familiar with the species should survey areas of proposed activities for Blackburn’s sphinx moth and its larval host plants prior to work initiation.
  - Surveys should be conducted during the wettest portion of the year (usually November-April or several weeks after a significant rain) and within 4-6 weeks prior to construction.
  - Surveys should include searches for adults, eggs, larvae, and signs of larval feeding (chewed stems, frass, or leaf damage).

- If moths, eggs, larvae, or native ‘aiea or tree tobacco over 3 feet tall, are found during the survey, please contact the Service for additional guidance to avoid impacts to this species.

If no Blackburn’s sphinx moth, ‘aiea, or tree tobacco are found during surveys, it is imperative that measures be taken to avoid attraction of Blackburn’s sphinx moth to the project location and prohibit tree tobacco from entering the site. Tree tobacco can grow greater than 3 feet tall in approximately 6 weeks. If it grows over 3 feet, the plants may become a host plant for Blackburn’s sphinx moth. We therefore recommend that you:

- Remove any tree tobacco less than 3 feet tall.
- Monitor the site every 4-6 weeks for new tree tobacco growth before, during, and after the proposed ground-disturbing activity.
  - Monitoring for tree tobacco can be completed by any staff, such as groundskeeper or regular maintenance crew, provided with picture placards of tree tobacco at different life stages.

**Threatened (Central North Pacific DPS) (Hawai‘i and Johnston Atoll) and Endangered (Central West Pacific DPS (Mariana Archipelago and Wake NWR) and Central South Pacific DPS (American Samoa, Palmyra, Kingman, Howland, Baker and Jarvis NWR)) Green sea turtles (*Chelonia mydas*) and Endangered Hawksbill sea turtle (*Eretmochelys imbricata*) (collectively referred to as sea turtles):** The Service consults on sea turtles and their use of terrestrial habitats (beaches where nesting and/or basking is known to occur), whereas the National Oceanic and Atmospheric Administration (NOAA) Fisheries consults on sea turtles in aquatic habitats. We recommend that you consult with NOAA Fisheries regarding the potential impacts from the proposed project if it may affect off-shore or open ocean habitats.

Green sea turtles may nest on any sandy beach area in the Pacific Islands. Hawksbill sea turtles exhibit a wide tolerance for nesting substrate (ranging from sandy beach to crushed coral) with nests typically placed under vegetation. Both species exhibit strong nesting site fidelity. Nesting occurs on beaches from May through September, peaking in June and July, with hatchlings emerging through November and December. In Guam and the Marianas, nesting occurs throughout the year, peaking in April and July. In American Samoa, nesting occurs from October to March.

Information for projects occurring on sandy beaches OR in areas where hawksbills are known to occur:

Construction on, or in the vicinity of, beaches can result in sand and sediment compaction, sea turtle nest destruction, beach erosion, contaminant and nutrient runoff, and an increase in direct and ambient light pollution which may disorient hatchlings or deter nesting females. Off-road vehicle traffic may result in direct impacts to sea turtles or nests, and also contributes to habitat degradation through erosion and compaction.

Information for projects with a beach hardening, stabilization, or nourishment component:

Projects that alter the natural beach profile, such as nourishment and hardening, including the placement of seawalls, jetties, sandbags, and other structures, are known to reduce the suitability of on-shore habitat for sea turtles. These types of projects often result in sand compaction,

erosion, and additional sedimentation in nearshore habitats, resulting in adverse effects to the ecological community and may inhibit future sea turtle nesting. The hardening of a shoreline increases the potential for erosion in adjacent areas, resulting in subsequent requests to install stabilization structures or conduct beach nourishment in adjacent areas. Given projected sea level rise estimates, the likelihood of increase in storm surge intensity, and other factors associated with climate change, we anticipate that beach erosion will continue and likely increase.

Where possible, projects should consider alternatives that avoid the modification or hardening of coastlines. Beach nourishment or beach hardening projects should evaluate the long-term effect to sea turtle nesting habitat and consider the cumulative effects.

To avoid and minimize project impacts to sea turtles and their nests we recommend you incorporate the following measures into your project description:

- No vehicle use on or modification of the beach/dune environment during the sea turtle nesting or hatching season (See nesting date ranges above).
- Do not remove native dune vegetation.
- Incorporate applicable best management practices regarding Work in Aquatic Environments (see enclosed) into the project design.
- Have a biologist familiar with sea turtles conduct a visual survey of the project site to ensure no basking sea turtles are present.
  - If a basking sea turtle is found within the project area, cease all mechanical or construction activities within 100 feet until the animal voluntarily leaves the area.
  - Cease all activities between the basking turtle and the ocean.
- Remove any project-related debris, trash, or equipment from the beach or dune if not actively being used.
- Do not stockpile project-related materials in the intertidal zone, reef flats, sandy beach and adjacent vegetated areas, or stream channels.

#### For projects with lighting near beaches:

Optimal sea turtle nesting habitat is a dark beach free of barriers that restrict sea turtle movement. Nesting turtles may be deterred from approaching or laying successful nests on lighted or disturbed beaches. They may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location (such as at or below the high tide line). Hatchlings that emerge from nests may also be disoriented by artificial lighting. Inland areas visible from the beach should be sufficiently dark to allow for successful navigation by hatchlings to the ocean.

To avoid and minimize project impacts to sea turtles from lighting we recommend incorporating the following applicable measures into your project description:

- Avoid nighttime work during the nesting and hatching season.
- Minimize the use of lighting on or near beaches and shield all project-related lights so the light is not visible from any beach.
  - If lights can't be fully shielded or if headlights must be used, fully enclose the light source with light filtering tape or filters.
- Incorporate design measures into the construction or operation of buildings adjacent to the beach to reduce ambient outdoor lighting such as:

- tinting or using automatic window shades for exterior windows that face the beach;
- reducing the height of exterior lighting to below 3 feet and pointed downward or away from the beach; and
- minimize light intensity to the lowest level feasible and, when possible, include timers and motion sensors.

**Endangered pe‘e pe‘e maka‘ole, Kaua‘i cave wolf spider (*Adelocosa anops*) and Kaua‘i cave amphipod (*Spelaeorchestia koloana*):**

The Kaua‘i cave wolf spider and amphipod may be in the vicinity of the proposed project area. In addition, the proposed project also occurs within designated critical habitat for both animals. One of the primary threats to these two species is their mesocavern (underground spaces, caves, cracks, crevices) habitat being exposed to drying conditions, most typically from increased airflow created by breaking through the mesocaverns.

These species are restricted to subterranean mesocavern (cracks, voids, spaces, caves) bearing rock with above ground soil deposits of less than 12 inches within the Kōloa District of the island of Kaua‘i. Mesocaverns that provide appropriate food sources (woody debris, plant roots penetrating the mesocavern) and conditions approaching 100 percent relative humidity levels are likely to contain these unique animals. All known areas likely to contain these animals have been designated critical habitat for these species.

**Survey Recommendations:**

- Survey the project area for depth of soil deposits and the presence of caves. Any areas with soil deposits greater than 12 inches are not likely to provide appropriate habitat or have the species present. Contact the Service and do not disturb the vegetation or soil in areas with soil deposits less than 12 inches or if a cave is found.

**Enhance cave invertebrate habitat if possible:**

- Outplant native plants like maiapilo (*Capparis sandwichiana*) so roots eventually provide a food source and irrigate the surface. Control established ecosystem-altering non-native invasive plant species around all caves.
- Enhance habitat by sealing currently non-occupied caves with temporary air blocks – to increase relative humidity by restricting air flow through cave entrances.
- Design permanent air blocks (e.g., walls) and develop plans to replace temporary air blocks.

**Endangered picture-wing flies (*Drosophila aglaia*, *D. differens*, *D. digressa*, *D. hemipeza*, *D. heteroneura*, *D. montgomeryi*, *D. mulli*, *D. musaphilia*, *D. neoclavisitae*, *D. obatai*, *D. ochrobasis*, *D. sharpi*, *D. substenoptera*, *D. tarphytrichia*):**

Picture-wing flies live in montane forest habitat and are restricted to single islands. Larvae of each species are dependent on a single or a few related plant species. The flies are threatened by destruction of habitat from non-native ungulates and invasive weeds, and also directly threatened by a variety of introduced invertebrates, including yellow jackets, crane flies, and several ant species.

- Avoid clearing forest vegetation within 200 feet of a site potentially occupied by endangered *Drosophila*.
- Restrict construction equipment to existing roads and trails.
- If the site is potentially occupied by endangered *Drosophila* based on location and presence of host plants, consult the Service since permits are required to conduct surveys.

General Species Information (check Critical Habitat layers for specific locations):

Species	Island	Habitat	Host plant(s)
<i>D. aglaia</i> :	O‘ahu	Mesic forest	<i>Touchardia oahuensis</i>
<i>D. differens</i>	Moloka‘i	Wet forest	<i>Clermontia</i> spp.
<i>D. digressa</i>	Hawai‘i	Mesic to wet forest	<i>Charpentiera</i> spp., <i>Ceodes</i> spp. or <i>Rockia sandwicensis</i> ( <i>Pisonia</i> spp.)
<i>D. hemipeza</i>	O‘ahu	Mesic forest	<i>Cyanea</i> spp., <i>Lobelia</i> spp., and <i>Urera kaalae</i>
<i>D. heteroneura</i>	Hawai‘i	Mesic to wet forest	<i>Cheirodendron trigynum</i> ssp. <i>trigynum</i> , <i>Clermontia</i> spp., <i>Delissea argutidentata</i>
<i>D. montgomeryi</i>	O‘ahu	Mesic forest	<i>Urera kaalae</i>
<i>D. mulli</i>	Hawai‘i	Wet forest	<i>Pritchardia beccariana</i>
<i>D. musaphilia</i>	Kaua‘i	Mesic forest	<i>Acacia koa</i>
<i>D. neoclavisetae</i>	Maui	Wet forest	<i>Cyanea</i> spp.
<i>D. obatai</i>	O‘ahu	Dry to mesic forest	<i>Dracaena</i> spp.
<i>D. ochrobasis</i>	Hawai‘i	Mesic to wet forest	<i>Clermontia</i> spp., <i>Marattia</i> spp., <i>Myrsine</i> spp.
<i>D. sharpi</i>	Kaua‘i	Wet forest	<i>Cheirodendron</i> spp, <i>Polyscias</i> spp.
<i>D. substenoptera</i>	O‘ahu	Wet forest	<i>Cheirodendron</i> spp, <i>Polyscias</i> spp.
<i>D. tarphytrichia</i>	O‘ahu	Mesic forest	<i>Charpentiera</i> spp.

**Endangered Hawaiian yellow-faced bees (*Hylaeus anthracinus*, *H. assimulans*, *H. facilis*, *H. hilaris*, *H. kuakea*, *H. longiceps*, and *H. mana*):**

General species information (bold islands are known populations):

Species	Island(s)	Habitat
<i>H. anthracinus</i>	<b>Hawai‘i, Maui, Kaho‘olawe, Lāna‘i, Moloka‘i, O‘ahu</b>	Coastal and lowland dry forests
<i>H. assimulans</i>	<b>Maui, Kaho‘olawe, Lāna‘i, O‘ahu</b>	Coastal and lowland dry forests
<i>H. facilis</i>	Maui, Lāna‘i, <b>Moloka‘i, O‘ahu</b>	Coastal and dry and mesic shrublands and forests
<i>H. hilaris</i>	Maui, Lāna‘i, <b>Moloka‘i</b>	Coastal to dry forest; obligate parasite on <i>H. anthracinus</i> , <i>H. longiceps</i> , and <i>H. asssimulans</i> .
<i>H. kuakea</i>	<b>O‘ahu</b>	Lowland mesic
<i>H. longiceps</i>	<b>Maui, Lāna‘i, Moloka‘i, O‘ahu</b>	Coastal and dry shrubland



Species	Island(s)	Habitat
<i>H. mana</i>	O‘ahu	Lowland mesic; possible close association with <i>Santalum freycinetianum</i>

For coastal species:

Coastal populations of yellow-faced bees occur in habitat along rocky shorelines with *Scaevola taccada* (naupaka) and *Heliotropium arboreum* (tree heliotrope) with either landscaped vegetation, non-native kiawe (*Prosopis pallida*), or bare rock inland. Bees are restricted to an extremely narrow corridor, typically 10–20 meters wide, and do not occur on sandy beaches or inland, or on landscaped native plants on hotel grounds. Documented nectar plants include naupaka, *Sida fallax* (‘ilima), *Euphorbia* spp. (‘akoko), *Argemone glauca* (pua kala), *Myoporum sandwicense* (naio), and tree heliotrope.

*Hylaeus kuakea* has only been found at two sites in lowland mesic forest of the Wai‘anae Mountains. Little is known about its habitat needs and distribution within its range.

*Hylaeus mana* is restricted to a few populations in a narrow band of native mesic koa forest around 1,400 feet in elevation in the Ko‘olau Mountains. Limited information suggests that it has a possible close association with *Santalum freycinetianum*.

Threats to yellow-faced bees include habitat destruction and modification from land use change, non-native plants, ungulates, and fire, along with predation by non-native ants and wasps.

To avoid and minimize project impacts to yellow-faced bees and their nests, we recommend you incorporate the following applicable measures into your project description:

- If an action will occur in or adjacent to known occupied habitat, a buffer area around the habitat may be required and can be worked out on a site-specific basis through consultation with the Service.
- For coastal species, protect all coastal strand habitat from human disturbance, including:
  - No fires or wood collecting.
  - Leave woody debris in place.
  - Restrict vehicles to existing roads and trails.
  - Post educational signs to inform people of the presence of sensitive species.

**Endangered Hawaiian tree snails (*Achatinella* spp., (O‘ahu), *Partulina* spp. (Lāna‘i), Newcomb’s tree snail (*Newcombia cumingi*) (West Maui), Tutuila tree snail (*Eua zebrina*) (American Samoa) and the American Samoa land snail Sisi or akaleha’ (*Ostodes strigatus*):**

Hawai‘i: Hawaiian tree snails are found in montane wet forests, usually dominated by ‘ōhi‘a (*Metrosideros polymorpha*). Snails feed on fungi and algae that grow on the leaves of trees. *Newcombia cumingi* is found nearly exclusively on ‘ōhi‘a, while other species can occur on a variety of predominately native, but also some non-native tree species. Common native species include *Hydrangea arguta*, *Psychotria* spp., *Melicope* spp., *Coprosma* spp., *Kadua* spp., *Antidesma* spp., and *Perrottetia sandwicensis*. Threats to tree snails include habitat destruction and fragmentation resulting from the impacts of non-native ungulates such as pigs, goats, and

deer, habitat modification due to invasive plants, and predation by non-native mammals, reptiles, flatworms, and snails. Wildfire is also a threat to the tree snails.

American Samoa: *Eua zebrina* is a tree snail found on the islands of Tutuila and Ofu, where they are found primarily on leaves of understory trees. Native forest canopy and understory is a critical need for this species, as all live snails have been found on understory plants beneath native canopy. *Ostodes strigatus* is a ground-dwelling snail found in rocky areas under relatively closed canopy with sparse understory. It is endemic to Tutuila. Closed canopies and areas with heavy tree cover appear to be an important habitat factor for this species. Threats include habitat destruction through agriculture, urban development and introduced ungulates, fire, predation by introduced rats and invertebrates, typhoons, public collection, and low numbers of individuals.

Listed tree snails may occur in the vicinity of the proposed project area. To avoid potential adverse effects to listed tree snails, we offer the following recommendations:

- Where work must be conducted in forested areas, survey proposed project sites for the presence of tree snails. Surveys may only be conducted by biologists holding a Service permit for this work.
- If any tree snails are found, determine the extent of the colony by surveying outwards in all directions from the original sighting until individuals are no longer detected.
- Avoid cutting or removing vegetation within 200 feet of the known occurrence to minimize impacts to the tree snails and their habitat.
- Mark the trees and shrubs occupied by tree snails with brightly colored flagging tape and keep foot traffic to a minimum of 33 feet from marked vegetation to avoid inadvertently dislodging and trampling individuals.
- Avoid clearing understory and overstory forest vegetation outside existing developed areas. Intact vegetation is important for maintaining microclimates and air movement conditions that allow snails to survive in a given area.
- Confine movement of heavy equipment to existing roadways.
- If helicopters are used to reach the project site, avoid affecting the occupied site with helicopter rotor wash that could dislodge snails by selecting alternate landing areas.
- Train personnel who work in tree snail habitat to identify the listed species and their habitat.

**Aquatic invertebrates in Hawai'i: Newcomb's snail (*Erinna newcombii*) (Kaua'i), Anchialine pool shrimp (*Procaris hawaiiiana*) (Hawai'i Island, Maui) and *Vetericaris chaceorum* (Hawai'i Island), Hawaiian damselflies (crimson [*Megalagrion leptodemas*] (O'ahu), flying earwig (*M. nesiotes*) (Maui), blackline (*M. nigrohamatum nigrolineatum*) (O'ahu), oceanic (*M. oceanicum*) (O'ahu), Pacific (*M. pacificum*) (Moloka'i, Maui, Hawai'i), and orange-black (*M. xanthomelas*) (Hawai'i, Maui, Lāna'i, Moloka'i, O'ahu):**

Newcomb's snail is restricted to fast-flowing freshwater streams on Kaua'i, where it feeds on vegetation growing on submerged rocks. Threats to the species include reduced stream flow from drought, water diversion projects, or other natural and human causes; predation by introduced snails, flies, and aquatic species; and small population dynamics.

- Applicable best management practices regarding work in aquatic environments (see enclosure) should be incorporated into the project design to minimize the degradation of water quality and impacts to fish and wildlife resources.
- Permits are required for accurate surveys of this species, so consult with the Service if work will be done in proximity to stream areas or within water bodies.

**Damselflies** – All of the species are site specific, so check for detailed locations if stream work is occurring.

*Megalagrion leptodemas* breeds in slow reaches of streams and seep-fed pools.

*Megalagrion nesiotes* is found along one stream on Maui (formerly on Hawai‘i as well). Naiads may be terrestrial or semi-terrestrial and the species appears to be closely associated with uluhe.

*Megalagrion nigrohamatum nigrolineatum* occurs in slow sections or pools along mid-reach and headwater sections of upland streams and seep-fed pools.

*Megalagrion oceanicum* is found in swiftly flowing sections of streams, usually amid rocks and gravel in stream riffles. Naiads can forage out of the stream on wet moss on rocks.

*Megalagrion pacificum* is found in seepage-fed pools cut off from the main stream channel, usually in areas with thick vegetation. Formerly found on all islands, now known from Moloka‘i, Maui, and Hawai‘i Island at low elevations.

*Megalagrion xanthomelas* is known from Hawai‘i, Maui, Lāna‘i, Moloka‘i, O‘ahu, and formerly Kaua‘i. It breeds in a widespread number of sites, including anchialine pools, coastal wetlands, small streams, and artificial ponds at low elevations.

Hawaiian damselflies are found in aquatic habitats across the islands, with high species endemism within islands. Breeding habitat includes anchialine pools, perennial streams, marshes, ponds, and even artificial pools and seeps. Major threats include introduced fish, amphibians, and invertebrates in streams, reduced stream flow from drought and water diversion, small isolated populations, reduced habitat quality from ungulates and nonnative plants, and possibly over-collection.

- Applicable best management practices regarding work in aquatic environments (see enclosure) should be incorporated into the project description to minimize the degradation of water quality and impacts to fish and wildlife resources.
- Permits are required for accurate surveys of this species, so consult with the Service if work will be done in proximity to stream areas or within water bodies.

### **Anchialine pool shrimp**

*Procaris hawaiiiana* is restricted to a small number of anchialine pools on Hawai‘i and Maui, while *Vetericaris chaceorum* is found in only two anchialine pool areas on Hawai‘i. Threats to these species include habitat loss due to in-filling and bulldozing of anchialine pools, waste disposal including used oil and grease into pools, non-native fish, human use of pools for bathing, water extraction, in-flow of fertilizer and pesticides, and collection for the aquarium trade.

If work is occurring within an anchialine pool, ground disturbance occurs near the pools that increases run-off, erosion, or sedimentation, or toxic organic or inorganic substances, or increases the opportunity for the introduction of non-native fish, we recommend the project

proponent consult with us to avoid Section 9 violations and provide the ACOE/Service joint BMPs. If work is occurring around pools we can offer the following:

- Applicable best management practices regarding work in aquatic environments (see enclosure) should be incorporated into the project description to minimize the degradation of water quality and impacts to fish and wildlife resources.
- Protect anchialine pools (both in and around) from human disturbance by implementing the following measures:
  - Restrict vehicles to existing roads and trails.
  - Prevent trash, and other waste from entering into anchialine pools.
  - Avoid or limit to the maximum extent practicable entrance into the anchialine pools.
- Install educational signs near anchialine pools to inform people of the presence of sensitive species and habitats.

## **Migratory Bird Treaty Act protected species**

**White terns or Manu o Kū (*Gygis alba*):** The white tern is not federally listed, but it is a listed species under Hawai'i State law. White terns often nest in urban parks and residential areas from Hawai'i Kai to Hickam Air Force Base on the island of O'ahu. White terns breed during all months of the year, but the core breeding season is January through June, with a major peak in March. White terns do not build nests, instead they lay a single egg directly on a ledge, tree branch, or other suitable location. The egg will hatch after approximately 35 days, after which it takes 45 days for the chick to be mature enough to leave the tree on its own. Signs that white terns are present include accumulation of white feathers or white droppings underneath the tree.

To avoid and minimize potential project impacts to white terns we recommend you incorporate the following applicable measures into your project description:

- If tree trimming is part of your project, please examine all trees slated to be cut to determine if there are white terns nesting in them.
- Do not trim branches or remove trees with nesting white terns.
- Do not disturb a nesting tree or branch for at least 80 days from when the egg is laid.

**Wedge-tailed shearwater or 'ua'u kani (*Ardenna pacificus*):** Unlike other Hawaiian seabird species, wedge-tailed shearwaters nest in littoral vegetation along coastlines. Nesting adults, eggs, and chicks are particularly susceptible to impacts from human disturbance and predators.

To avoid and minimize potential project impacts to wedge-tailed shearwaters we recommend you incorporate the following measures into your project description:

- Conduct surveys throughout the project area during the species' breeding season (March through November) to determine the presence and location of nesting areas.
- If wedge-tailed shearwaters nest within a proposed project area and the project would cause ground disturbance, time project construction outside of the breeding season.
- If outdoor lighting is needed, use light shields that are completely opaque, appropriately sized, and positioned so that the bulb is only visible from below and that light from the shielded source cannot be seen from the beach.

- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.

**Hawaiian hawk or ‘io (*Buteo solitarius*):** The Hawaiian hawk was recently federally delisted, but remains a listed species under Hawai‘i State law. The Hawaiian hawk is known to occur across a broad range of forest habitats throughout the Island of Hawai‘i. Loud, irregular and unpredictable activities, such as using heavy equipment or building a structure, near an endangered Hawaiian hawk nest may cause nest failure. Harassment of Hawaiian hawk nesting sites can alter feeding and breeding patterns or result in nest or chick abandonment. Nest disturbance can also increase exposure of chicks and juveniles to inclement weather or predators.

To avoid and minimize impacts to Hawaiian hawks we recommend you incorporate the following applicable measures into your project description:

- If work must be conducted during the March 1 through September 30, the Hawaiian hawk breeding season, have a biologist familiar with the species conduct a nest search of the project footprint and surrounding areas immediately prior to the start of construction activities.
  - Pre-disturbance surveys for Hawaiian hawks are only valid for 14 days. If disturbance for the specific location does not occur within 14 days of the survey, conduct another survey.
- Clearing of vegetation or construction activities should not occur within 1,600 feet of any active Hawaiian hawk nest during the breeding season until the young have fledged.
- Regardless of the time of year, avoid trimming or cutting trees containing a hawk nest, as nests may be re-used during consecutive breeding seasons.