



Inventory of Reptiles and Amphibians  
in Hawai`i Volcanoes, Haleakalā,  
and Kalaupapa National Parks

Hawai'i  
Biological  
Survey

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Final Report

October 2005

**Inventory of Reptiles and Amphibians in Hawai'i  
Volcanoes, Haleakalā, and Kalaupapa  
National Parks**

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## Introduction

Hawai'i has a terrestrial herpetofauna consisting of six frogs, 19 lizards, one snake, and four turtles (McKeown, 1996; Kraus et al., 1999; Yamamoto and Tagawa, 2000; Kraus and Campbell, 2002; Kraus, 2002; Kraus and Duvall, 2004). Reports that *Gekko gecko* and *Osteopilus septentrionalis* are established in the state (McKeown, 1996) are unconfirmed and appear to be erroneous. All of these species are alien to Hawai'i, some of them are invasive.

Seven lizards were apparently introduced to Hawai'i as cargo stowaways during Polynesian colonization of the islands: *Gehyra mutilata*, *Hemidactylus garnotii*, *Hemiphyllodactylus typus*, *Lepidodactylus lugubris*, *Cryptoblepharus poecilopleurus*, *Emoia impar*, and *Lipinia noctua*. All of these except *G. mutilata* and *L. lugubris* have become relatively rare over the past century. This is often attributed to competition with more recently introduced reptile species – some of which attain high densities – but direct evidence is lacking and population declines due to other alien pest species cannot be ruled out. Because of these population declines, these five formerly widespread taxa could be expected to occur in any of the three parks of this survey but low population sizes and scattered distributions make them hard to detect in short surveys such as this one. Consequently, park staff should bear in mind that any of these five species not found in the current survey may nonetheless appear during future work.

A survey of the relevant literature on reptiles and amphibians in Hawai'i as well as of records in the Bishop Museum and United States National Museum indicates that virtually no prior records are available documenting occurrences of these taxa within the three parks considered herein. However, a short list of species was made for lower Kipahulu Valley by two botanists (Smith and Yoshinaga, 1980) and brief mention has been made of a few lizards living in Hawai'i Volcanoes National Park (Stone and Pratt, 1994). With the exception of the now-rare Polynesian introductions mentioned above, which may have undiscovered populations in one or more of these parks, the lists presented below should provide a complete picture of the herpetofauna in these areas as of 2005. It should be borne in mind that most of Hawai'i Volcanoes and Haleakalā National Parks provide unsuitable habitat for reptiles and amphibians because of their high elevations and cold temperatures. The snake, most lizards, and some of the frogs introduced to Hawai'i are largely limited in distribution to areas below ~600 m elevation. Only a few species (2 lizards, 3 frogs) are capable of occurring as anything other than transients or accidental introductions in areas above 1200 m.

## Materials and Methods

During four weeks from 8 August to 16 September, 2005, surveys were conducted by Fred Kraus and assistants for reptiles and amphibians in the national parks of Hawai'i Volcanoes (HAVO), Haleakalā (HALE), and Kalaupapa (KALA). Surveys largely involved daytime and nighttime searching in appropriate habitats for the targeted species. For skinks, commercial sticky traps were sometimes used to facilitate capture. Due to limited appropriate habitats and the short time available for surveys, efforts in HAVO

were concentrated along accessible roads, in HALE were restricted to the lowlands of the Kipahulu Unit below 200 m and to a nocturnal search of Hosmer's Grove for chameleons, and at KALA ranged across the Kalaupapa Peninsula and the upper rim of the park. The general regions collected and their associated forest types are illustrated in Figs. 1-3 and exact localities are provided in a database given to the National Park Service.

Most captured specimens were preserved to document localities and are deposited within the collections of the Bishop Museum and the three parks. An electronic copy of these data is appended to this report and copies of have already been forwarded to the collection managers at each of the three parks.

Below I present the results from these surveys, noting for each park the species present, their expected elevational and habitat distributions within each park, and their relative abundances. All terrestrial reptiles and amphibians in Hawai'i are alien but some are of greater ecological concern than others because of the high densities (and, typically, biomass) at which they can occur and the novel ecological attributes they bring to islands previously devoid of such taxa. Hence, following the list of species for each park I consider a number of potentially invasive reptile and amphibian species within Hawai'i, summarize their current distributions within the state, and assess their potential threats to the national parks.

Species vouchered by at least one specimen from within each park are indicated below with an asterisk. All of these are records from the current survey unless otherwise noted. Localities with vouchered specimens are listed under each species account; all GPS coordinates used the WGS84 datum.

#### Hawai'i Volcanoes National Park

*Bufo marinus* (cane toad) – Occasionally seen at upper elevations of the park by RM staff. Specimens are certainly transients from adjacent areas inasmuch as breeding habitat to support a population is lacking in the park. No serious threat to park resources.

\**Eleutherodactylus coqui* (coqui) – Found occasionally in wet forest around the park entrance, park headquarters, visitor center, and Kīlauea Iki overlook. Probably most records are accidental hitch-hikers on cars but some might be deliberate introductions. No population established at this time. Wet forest at park entrance area is likely at the upper elevational tolerance zone for the species. One of two herp species likely to seriously threaten park resources. Vouchered localities: Hwy. 11 entrance; Volcano House.

\**Rana catesbeiana* (bullfrog) – Adult and tadpoles collected in water trough at biocontrol greenhouse in 1995 and vouchered in the HAVO collection. Specimens introduced deliberately to control insects in this trough. Known to inhabit the golf course adjacent on Pi'i Mauna Rd. and found there by me within ~100 m of park boundary. Likely to occur in areas surrounding 'Ōla'a Tract that have large sources of permanent water. Likely to be at most a transient in the park as



breeding habitat to support a population is lacking. No serious threat to park resources. Vouchered localities: HAVO Greenhouse.

*Rana rugosa* (wrinkled frog) – Seen two or three times during 2004 in ‘Ōla‘a Tract by Jason Bazzano. Possibly capable of breeding in the *Carex* bog along SW edge of Tract but a survey for tadpoles revealed none and site may not receive sufficient sunlight to allow for proper growth of tadpoles. Likely to be a transient in the park or to breed at very low levels in bogs or pig wallows in the wet forest. In either case, numbers are likely to be too low to constitute a threat to park resources.

*Chamaeleo jacksonii* (Jackson’s chameleon) – Known to be established at Volcano Village, where it has been seen since at least 1997. Surveys in wet forest immediately adjacent to Volcano and at Thurston Lava Tube failed to reveal this species but it is only a matter of time until it becomes established in these areas. Seen by Linda Pratt in the lower reaches of the Kahuku Unit during 2005. This species will inhabit the wet and mesic forests of the park, possibly extending as high as timber line along the Strip Rd. One of two species likely to immediately threaten native wildlife in the park because of its high densities and novel feeding mechanism.

\**Gehyra mutilata* (stump-toed gecko) – Generally uncommon in low-elevation mesic forest, dry forest, and shrublands throughout the state. Probably occurs generally but at low densities in regions of the park below 600 m elevation and possibly somewhat higher. Vouchered localities: 19.29147°N, 155.14664°W.

\**Hemidactylus frenatus* (house gecko) – Ubiquitous throughout low-elevation mesic forest, dry forest, and shrublands in Hawai‘i and common where found. Probably inhabits all areas of the park below 600 m elevation and possibly somewhat higher. We saw specimens hunting in bare pahoehoe fields at night within the park; hence, it appears a capable colonizer of small patches of low vegetation within lava fields.. Impacts on native invertebrates unknown but possibly significant because of the high densities formed by the species. Vouchered localities: 19.29147°N, 155.14664°W; 19.29509°N 155.09837°W.

\**Hemidactylus garnotii* (Indo-Pacific gecko) – Generally restricted in range to areas lacking *H. frenatus*. Hence, it is often found at elevations above what *H. frenatus* will tolerate, up to approximately 900 m, and on habitats at lower elevations lacking *H. frenatus*. Animals are most often seen on large trees with shaggy/scaly bark or on *Pandanus tectorius*, both of which provide daytime retreats. Never observed to be common in Hawai‘i since the post-WWII arrival of *H. frenatus*. Infrequent in the park. Vouchered localities: 19.34444°N, 155.22771°W.

*Hemiphyllodactylus typus* (tree gecko) – Likely to occur at low densities in dry and mesic scrub below 600 m in the park but unobserved during this survey. Generally

needs a fair degree of habitat structure in order to co-exist with the more common *H. frenatus* and *L. lugubris*.

\**Lepidodactylus lugubris* (mourning gecko) – Common throughout low-elevation mesic forest, dry forest, and shrublands throughout the state. Probably inhabits all areas of the park below 600 m elevation and possibly somewhat higher. We obtained specimens in small patches of vegetation within lava fields and in *Leucaena* stands. Vouchered localities: 19.29147°N, 155.14664°W.

*Cryptoblepharus poecilopleurus* (snake-eyed skink) – Reported from the Ka'ū Desert at 980 m (Fisher, 1948) and at unspecified lower elevations within the park (Stone and Pratt, 1994). Should be widespread throughout the coastal rocky areas of the park, extending as high as 1000 m in the open, dry areas but populations tend to be patchy and small, making this species difficult to detect.

\**Lampropholis delicata* (rainbow skink) – This skink occurs abundantly throughout the mesic and wet forests of the park wherever the forest canopy is thinly developed or where canopy openings allow sufficient sunlight to reach the ground (e.g., along roads and wide trails). Likely to also inhabit or transit through closed-canopy forest but at much lower densities. Specimens have been seen by me in the park as high as 1500 m and may occur higher. Vouchered localities: 19.34444°N, 155.22771°W; 19.44338°N, 155.31657°W.

*Ramphotyphlops braminus* (blind snake) – Not observed during this survey but may possibly occur in small areas of the park. Habitat preference is for loose soil at low (<600 m) elevations and such habitat is of very restricted distribution in the park; hence, the presence of this species remains uncertain.

#### Kalaupapa National Park

\**Bufo marinus* (cane toad) – Common on the peninsula and likely to occur in low densities as a transient throughout the remainder of the park. Breeding habitat is limited in the park and the species' preference for open, degraded areas makes it unlikely to pose any threat to park values. Vouchered localities: 21.18678°N, 156.97869°W.

\**Chamaeleo jacksonii* (Jackson's chameleon) – Established due to deliberate release in the last 3-5 years in the upper elevations of the park along Waikolu Valley. Apparently widespread now in this area and increasing in population density. Likely to inhabit all mesic and wet forests in the park and to pose a threat to native insects, tree snails, and (potentially) passerine eggs and nestlings once it reaches the high densities seen elsewhere in the state (Loope et al., 2001). Vouchered localities: 21.13058°N, 156.92122°W; 21.12661°N, 156.91606°W.

\**Gehyra mutilata* (stump-toed gecko) – Found along the upper rim of the park and at the crater. Likely to occur in low densities in all dry and mesic forests of the park

below approximately 600 m. Vouchered localities: 21.18594°N, 156.96769°W; 21.17486°N, 156.99899°W.

\**Hemidactylus frenatus* (house gecko) – Abundant on the peninsula and occurring in lower densities at 490 m in the park. Likely to occur in all dry and mesic forests in the park up to approximately 600 m elevation. Impacts on native invertebrates unknown but possibly significant because of the high densities formed by the species. Vouchered localities: 21.18678°N, 156.97869°W; 21.17486°N, 156.99899°W.

\**Hemidactylus garnotii* (Indo-Pacific gecko) – Found in one location along the rim of the park at 490 m. Likely to occur in mesic and dry forests in the park wherever densities of *H. frenatus* are low enough to permit persistence. This is likely to consist primarily of the upper-elevation mesic forests from 400-1000 m elevation. Vouchered localities: 21.17486°N, 156.99899°W.

\**Hemiphyllodactylus typus* (tree gecko) – Found at the mouth of Wai'ale'ia Stream and along the upper rim of the park at 490 m. Likely to occur in low densities throughout the dry and mesic forests of the park below approximately 600 m. Vouchered localities: 21.17486°N, 156.99899°W; 21.17338°N, 157.00110°W; 21.17022°N, 156.94415°W.

\**Lepidodactylus lugubris* (mourning gecko) – Abundant on the peninsula and likely to occur in all dry and mesic forests up to approximately 600 m. Vouchered localities: 21.18678°N, 156.97869°W; 21.18291°N, 156.97015°W; 21.17022°N, 156.94415°W; 21.17338°N, 157.00110°W.

*Cryptoblepharus poecilopleurus* (snake-eyed skink) – Likely to inhabit part of the rocky shoreline of the park but not observed during this survey. Populations tend to be patchy and small, making this species difficult to detect. Common on nearby Mōkapu Island, supporting its conjectured presence in the park.

*Emoia impar* (azure-tailed skink) – Recently reported by Guy Hughes as present at nearby Kala'e; hence, may occur at low densities in adjacent areas of the park. Also reported by Fern Duvall on nearby Mōkapu Island.

\**Lampropholis delicata* (rainbow skink) – Seen by us along the lower reaches of Wai'ale'ia Stream and in the upper elevations of Waikolu Valley. Known to be common in the park but rarely seen by us due to dry weather conditions. Will occur in all mesic and wet forests of the park. Vouchered localities: 21.16868°N, 156.94576°W.

\**Lipinia noctua* (moth skink) – Known in the park only from Huelo Island, where it inhabits the leaf litter among the *Pritchardia* palms and was collected in 1999 by Fern Duvall. May possibly be exterminated from the mainland portions of the park due to competition with the more recently introduced *Lampropholis delicata*.



Alternatively, it may persist there but be driven by competition into the trees where it is difficult to locate. Vouchered localities: 21.17075°N, 156.92117°W.

*Ramphotyphlops braminus* (blind snake) – Occurs in low densities in dry and mesic forests of the park, probably below 300-400 m elevation. Repeatedly seen by park staff but encounters are rare and we did not observe the species during our short stay.

#### Haleakalā National Park

\**Bufo marinus* (cane toad) – Living throughout the lower reaches of the Kipahulu Unit, breeding in taro loi at 100 m elevation, and common throughout that immediate area. Prefers open habitat, so unlikely to be seen in native forest except as occasional transients. Vouchered localities: 20.66702°N, 156.04854°W.

*Rana catesbeiana* (bullfrog) – Reported as present in lower Kipahulu Valley by Smith and Yoshinaga (1980) but not observed during this survey. Apparently absent from the taro loi in the park, which constitutes the closest thing to breeding habitat available in the park. Reported specimens are probably transients from adjacent lands having suitable breeding habitat.

\**Rana rugosa* (wrinkled frog) – Living in the lower reaches of the Kipahulu Unit and breeding in some numbers in the taro loi at 100 m elevation. Likely to occur in all area streams. On other islands, this species can occur up to ~1500 m but RM personnel report never seeing the frog in Kipahulu Valley above ~700 m, suggesting it may be flushed out of its natural streamside habitats by frequent flooding events, thereby preventing it from attaining the higher elevations it is physiologically capable of. Vouchered localities: 20.66702°N, 156.04854°W.

\**Gehyra mutilata* (stump-toed gecko) – Common in coastal and low-elevation mesic and wet forests in the Kipahulu Unit, especially among *Pandanus* trees and unlit buildings. Likely restricted to areas below 600 m. Vouchered localities: 20.65939°N, 156.04657°W; 20.66187°N, 156.04280°W; 20.66702°N, 156.04854°W.

\**Hemidactylus frenatus* (house gecko) – Common in coastal and low-elevation mesic and wet forests in the Kipahulu Unit, especially among buildings. Likely restricted to areas below 600 m. Vouchered localities: 20.65939°N, 156.04657°W; 20.66702°N, 156.04854°W.

\**Hemidactylus garnotii* (Indo-Pacific gecko) – Infrequent in coastal and low-elevation mesic and wet forests in the Kipahulu Unit, especially among *Pandanus* trees. Likely restricted to areas below 600 m in this heavy-rainfall area but may possibly ascend higher. Vouchered localities: 20.66187°N, 156.04280°W; 20.66702°N, 156.04854°W.

- \**Hemiphyllodactylus typus* (tree gecko) – Infrequent in coastal and low-elevation mesic and wet forests in the Kipahulu Unit, being found on low vegetation and under logs. Likely restricted to areas below 600 m. Vouchered localities: 20.65939°N, 156.04657°W; 20.66908°N, 156.05297°W.
- \**Lepidodactylus lugubris* (mourning gecko) – Abundant in coastal and low-elevation mesic and wet forests in the Kipahulu Unit, especially on *Scaevola*, *Pandanus*, and buildings. Likely restricted to areas below 600 m. Vouchered localities: 20.65939°N, 156.04657°W; 20.64793°N, 156.08459°W; 20.66702°N, 156.04854°W.
- Cryptoblepharus poecilopleurus* (snake-eyed skink) – One specimen observed by Fern Duvall on a coastal cliff edge and previously reported by Smith and Yoshinaga (1980). Appropriate habitat is extensive in the eastern units of the park but the populations are of spotty distribution and small size, making this species difficult to detect.
- \**Lampropholis delicata* (rainbow skink) – Common in wet and mesic forests from sea level to an undetermined elevation. We saw a specimen at approximately 200 m elevation but the species is capable of occurring elsewhere in Hawai'i to 1500 m. RM personnel report never seeing the species above 700 m in Kipahulu Valley, so it may be restricted to lower elevations in the park because of its need for occasional sunshine. Vouchered localities: 20.65939°N, 156.04657°W.
- \**Ramphotyphlops braminus* (blind snake) – Common in low-elevation areas of the park, probably being restricted to areas below ~600 m. Specimens collected during this survey were obtained by digging through a soil pile in an open field near the Kipahulu campground. Vouchered localities: 20.66079°N, 156.04573°W.

### Threats Posed by Species of Particular Concern

#### Amphibians

*Bufo marinus* (cane toad) – Widely distributed throughout the lowlands of the state, preferring drier and mesic areas but occurring occasionally in wet forests. Mostly inhabits areas below 1000 m but animals can occasionally be found up to ~1500 m. Requires shallow standing water in which to breed. Threats to native wildlife would be primarily in the form of predation of native ground-dwelling invertebrates but these are generally scarce or absent in the trashed habitats the toad prefers. Breeding habitat is absent from HAVO, apparently limited to a single site at HALE, but present on the Kalaupapa Peninsula. Threat to these parks is minimal because specimens in HAVO are occasional transients and don't attain the densities necessary to achieve significant impact and individuals at HALE and KALA only form moderate densities in areas largely devoid of native wildlife.

*Eleutherodactylus coqui* (coqui) – Widely distributed throughout the wet and mesic lowlands of Hawai'i Island and Maui up to ~1200 m, including Volcano Village and Hāna. Currently not established on Moloka'i but at least one accidental introduction in potted plants has been documented. Statewide spread is mostly unintentional via transported nursery materials and intentional via deliberate introduction by yahoos, but the pattern of frog introductions at HAVO suggests accidental transport on vehicles may also be a concern. The species does not require standing water to reproduce, instead developing directly into tiny froglets from eggs laid in moist soil or leaf litter. It is potentially capable of inhabiting the wet forests up to at least 1200 m in all three parks. The tremendous densities these frogs are capable of attaining makes them a potential threat to native arthropods and snails in all three parks, as well as the bane of a peaceful nocturnal ambience. This species is a considerable threat to all three parks and their abundance and wide range on Hawai'i Island makes them a constraint threat to HAVO in particular. In this park it would be wise to maintain the program of periodic nocturnal auditory surveys to detect the presence of and eradicate newly introduced animals. Such surveys should include the wet areas of the park around which visitors and their vehicles are prone to congregate, especially the entrance sign to the park on Hwy. 11, the visitor's center and associated buildings, Kīlauea Iki overlook, and the area around Thurston Lava Tube. Surveys at the border of the park with Volcano Village would also be sensible, as might occasional surveys (2-4/summer) in the wet forests of the Nāpau Crater area, although these areas are mostly under threat from gradual frog population expansion from adjacent private lands, which may be less of a threat if control measures outside the park can keep nearby populations from expanding. On Maui, frog populations are far fewer and apparently all due to unintentional transport among live plants. As a result, populations are fewer than on Hawai'i Island. The closest that frogs have been reported to HALE is from Hāna. Support of eradication efforts there by the Maui Invasive Species Committee and efforts to eradicate any other incipient populations that might arise in the Hāna – Kīpahulu area should be sufficient to protect the park at this time. Law-enforcement rangers that rove in this area should be trained to recognize the frog's call and may serve as the best means of detecting any populations that might arise in the area. No special measures need to be taken at KALA at this time. In this park, frogs are unlikely to easily establish in the settlement (and could be easily eradicated if they did) but are more likely to invade along the upper edge of the Pali, should they eventually establish populations on Moloka'i.

*Eleutherodactylus planirostris* (greenhouse frog) – Becoming widely distributed in wet, mesic, and regularly watered areas below 600 m on the four main islands. Of small size but can attain high population densities. Potential threats to native wildlife would be primarily to small, soil-dwelling invertebrates but this has not been investigated. Not known currently from any park. Unlikely to pose a threat to any part of HAVO unless it is capable of eventually invading the wet forest near Nāpau Crater by population expansion from adjacent infested areas.

Unlikely to be a major threat to HALE because populations should be restricted to the lowland alien forests in the eastern part of the park. Unlikely to be of major importance to KALA for the same reason.

*Rana catesbeiana* (bullfrog) – Widespread in wet and mesic lowlands across the state up to at least 1200 m. Bullfrogs threaten native wildlife, including waterbird chicks and potentially bats, via predation. The species requires large, open bodies of standing water in which to live and breed and such habitat is lacking from all three parks. The species is occasionally transient in HAVO and probably entirely absent from the other two parks. It poses no significant existing or anticipated threat to any park.

*Rana rugosa* (wrinkled frog) – Widespread in wet and mesic areas of the four main islands but absent from Moloka'i. Occurs from near sea level to ~1500 m, breeding in shallow pools, taro loi, and quite sidewaters of streams. It is potentially a threat to native invertebrates in these areas but this potential has never been investigated. Acceptable breeding habitat is absent in HAVO and the few specimens seen there appear to be transients from areas adjacent to 'Ōla'a Tract. Present in low elevations (100 m) at HALE but never seen by RM staff working in the native areas of Kipahulu Valley above 700-900 m. Possibly flushed from these areas due to frequent flooding. As long as specimens are unable to colonize the native forests of Kipahulu Valley, this species is unlikely to pose a significant threat to most native invertebrates. However, should native damselfly populations occur in the lower reaches of Kipahulu Valley, these could possibly experience some predation pressure from these frogs.

## Reptiles

*Anolis sagrei* (brown anole) – Becoming widespread in the dry and residential lowlands of O'ahu; recently documented from similar areas on Kaua'i and Maui; unknown from Hawai'i Island or Moloka'i. The species is largely spread unintentionally in the nursery trade and as hitchhikers on vehicles. Their eventual spread across the sunny lowlands of the state seems unstoppable. These lizards form tremendously high densities and anecdotal evidence suggests they can seriously deplete insect communities in areas that they invade. They are unlikely to ever pose a threat to HALE because of the paucity of preferred habitat (although the species could probably establish in the area immediately surrounding the Kipahulu visitor center). The species has the potential to be a significant threat to insect communities of the dry lowlands of HAVO and KALA at such time as the lizards become established on those islands. Awareness of the lizard's appearance among park staff might serve as a system alerting managers to the species' presence at an early enough time to allow for eradication, at such time as they become present on Hawai'i Island and Moloka'i. Areas of most likely introduction in HAVO are at the pullovers along Chain-of-Craters Rd. below ~600 m elevation, although it is currently unclear what the upper elevational limit

for this species is. Introduction to KALA would most likely be at the settlement in potted plants, if such are allowed to be imported. A program for early detection and eradication in these two parks is highly recommended. Once the species has been established in an area for a year or more it is probably impossible to eradicate.

*Chamaeleo jacksonii* (Jackson's chameleon) – Becoming widely distributed by human release in wet and mesic forests of the main islands at low and mid-elevations. In its native range on equatorial Mt. Kenya, this species occurs as high as 3270 m (F. Duvall, pers. comm.) and tolerates nightly temperatures dipping as low as 5-10 C (Nečas, 1999). The highest known populations in Hawai'i are currently ~1500 m but it is reasonable to expect the species to survive at higher elevations approximating the temperature regime found in its native range. These lizards occur at high densities, introduce a novel feeding mechanism to Hawaiian ecosystems, and can occupy native rainforests. The species is known to feed on insects, snails, and bird eggs and may be capable of taking nestlings of small native passerines. It is currently unknown from HAVO and HALE but is known to be common in nearby Volcano and Hāna. It seems only a matter of time before chameleons become established in both parks, either via intentional release or via natural expansion of existing populations. In KALA these lizards have become recently established along the upper margin of the Pali bordering TNC's Kamakou Preserve, clearly due to deliberate release. Control options for this cryptic, canopy-inhabiting species are unknown and probably impossible to develop but the opportunity should be taken to study the ecological effects of the species on native invertebrate communities once they expand into park property.

*Lampropholis delicata* (rainbow skink) – Widely distributed in wet and mesic forests of all major islands from sea level to at least 1500 m. This species forms high densities and may impact native soil invertebrates in all three parks but this possibility remains uninvestigated. Common throughout the wet and mesic forests of all three parks and ineradicable from them. This species is, however, reportedly absent from native mid- and upper-elevation forests within Kipahulu Valley, according to vegetation-management personnel. The species clearly expands into some native, upper-elevation forests in Hawai'i via networks of opened trails because of the access to sunshine that they provide. Keeping trails within Kipahulu narrow and under closed canopies may thwart the spread of this species into native forests of the region or at least reduce population densities to ecologically insignificant levels.

*Palea steindachneri* (wattle-necked softshelled turtle) – Known from lowland waterways of Kaua'i and O'ahu. Suitable habitat for this species is lacking in all three parks, so the turtle poses no threat to native species in any park.

*Pelodiscus sinensis* (Chinese softshelled turtle) – Known from lowland waterways of Kaua'i, O'ahu, and Maui. Suitable habitat for this species is lacking in all three parks, so the turtle poses no threat to native species in any park.

*Trachemys scripta* (red-eared slider) – Known from lowland waterways of O‘ahu and Maui and spread via deliberate release of pet animals. Suitable habitat for this species is lacking in all three parks, so the turtle poses no threat to native species in any park. The sole specimen reported from HAVO in park files is certainly an isolated pet release.

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Figure 2. Kalaupapa National Historical Park, showing the distribution of forest types.





