guam

Distribution and Abundance of the Forest Birds of Guam: Results of a 1981 Survey (Google Books)

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Distribution and Abundance of the Forest Birds of Guam: Results of a 1981 Survey
By John Engbring, Fred L. Ramsey

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Page images
PDF
Table 24. (Concluded).

[graphic]
Response Subjective
Visual Flocking to assessment
Species conspicuousness tendency Mobility Song observer of agreement
Rufous-fronted Fantail Fair Usually male/ Low Moderate/ Attracted Good
female pairs frequent
White-throated Fair None Moderate Soft/ Minimal Fair
Ground-Dove infrequent
(low
frequency)
Vanikoro Swiftlet High Strong High VERY soft/ Minimal N/A*
frequent

[graphic]
* We felt assumptions were so poorly met for these species that population estimates were not made using this

program.

Table 25. Changes in distribution of Guam forest birds through history. The area (kmz) originally inhabited by all species is the amount of forest before the arrival of the Chomorro settlers, nearly the entire island (500 km2 .

[graphic]

Species	Area of original distribution (km?)	% of original range	Distribution in 1950's (kmz)	% of Present range	% of original range
Bridled White-eye	500	62%	309	10	3% 2%
Cardinal Honeyeater	500	67%	339	64	19% 13%
Guam Broadbill	500	62%	312	43	14% 9%
Guam Rail	500	62%	312	162	52% 32%
Mariana Crow	500	62%	312	74	24% 15%
Mariana Fruit-Dove	500	62%	309	39	13% 8%
Micronesian Kingfisher	500	67%	339	132	39% 26%
Micronesian Starling	500	67%	339	124	37% 25%
Rufous-fronted Fantail	500	62%	312	42	13% 8%
Vanikoro Swiftlet	500	95%	475	?	trace trace
White-throated Ground-Dove	500	62%	309	72	23% 14%

[merged small][graphic]
Introduced predators: The brown tree snake (also known as the Philippine rat snake), Boiga irregularis, is a potentially destructive predator, introduced about 1947. It is distributed over most of the island and forages both on the ground and in trees. The snake reaches a length of 2.5 m and is known to feed on birds and bird eggs. Other predators that may suppress populations of native birds include the monitor lizard (Varanus indicus), rats, feral cats, pigs, and dogs. Three species of introduced rats occur on Guam: the roof rat, Rattus rattus, Polynesian rat, 3, exulans, and Norwegian rat, R, norvegicus. The roof rat and Polynesian rat are relatively common rodents. A large number of feral cats and dogs roam Guam, and are especially common near residential areas; a few birds such as the flightless Guam Rail may be adversely affected by these predators. Most predators, with the exception of the brown tree snake, are believed to have been on Guam long before the present decline in bird numbers began (Jenkins 1983).

[graphic]
Pesticides: DDT and other chlorinated hydrocarbons were used by the military from World War II to the mid 1970's, and May have depressed forest bird populations. A study to determine the levels of residual pesticides on Guam was undertaken in June 1981 by the USFWS Patuxent Wildlife Research Center and the GAWRD. Preliminary results indicate that the use of pesticides is not currently influencing the abundance and distribution of native birds (C. Grue, pers. comm.), though they might have in the past.

Habitat Loss: Over the last 40 years, many forested areas of Guam have been converted to open fields, roads, residential areas, and military installations. Though much of the development on Guam has been related to military activities, the continued existence of birds in northern Guam is a direct result of military presence there. Without the military, much of northern Guam would undoubtedly be privately developed for tourism or residential areas, particularly on such desirable beach fronts as in Tarague or Ritidian Basins.

After World War II, large areas disturbed during the war were seeded with Leucaena glauca, a shrubby legume that forms dense,

homogeneous stands on many areas of Guam. Though several native species such as the Rufous-fronted Fantail and Guam Broadbill reside in thickets of Leucaena, it provides only marginal habitat for frugivorous species such as the Mariana Fruit-Dove and Whitethroated Ground-Dove. Though much of Guam has been altered, relatively suitable native forests remain in southern and northern Guam that are devoid of nearly all bird life.

[graphic]
In addition to human-induced alteration of forests, typhoons periodically destroy much of the vegetation on Guam. Typhoons, however, are not thought to have a major, lasting, negative impact on Guam bird densities (Jenkins 1983).

RECOMMENDATIONS

Positive actions will be needed before the decline of forest birds can be reversed. The first step is to implement studies that will explain the causes for the current low population numbers. Most logically, these studies should concentrate on disease and predation. Until clearly defined causes for the decline can be identified, efforts should be made to Maintain forests in regions that harbor native birds. ANY disturbance (n: the forest, besides directly removing habitat from native species, encourages the encroachment of introduced species that may be serving as disease reservoirs. Thus, new roads, housing, and other projects should be planned to minimize disturbance of forested tracts, and reforestation should be encouraged wherever feasible. The harvest of introduced ungulates (feral pig, §u§_scrofa, and sambar deer, Cervus unicolor) should be continued, since at high densities these species

[graphic]
May damage the forest understory.

Regions most valuable to forest birds are now well identified. The five regions in the extreme Northwest: Ritidian Basin, Pajon Basin, Tarague Basin, Uruno Basin, and Pajon Plateau, support ten species of native forest birds (all but the swiftlet). In the Northwest Field and Magazine regions, nine species reside (swiftlet and white-eye absent), and in Pati Basin, eight species can be found (swiflet, white-eye, and 'fruit-dove absent). In 'the remaining regions the number of resident species drops dramatically, and only five native species are found in Tarague Plateau, Andersen AFB, and Haputo Point; three in Central Plateau and Mt. Santa Rosa, and only one species in Dos Amantes and Andersen South regions. Certain regions are of high value even though they harbor few forest bird species. The Andersen South Region is valuable because of its relatively high density <yf rails, though there is evidence that the rail is now disappearing from this area. Cocos Island, a low, small, sandy islet, is important as a comparative study site for avian investigations, and special efforts should be made to minimize disturbances here. Though only one native forest bird, the Micronesian Starling, is found on Cocos Island today, there were probably never more than a few native forest birds here. Tourist resort development may ultimately alter much of the native forest on Cocos Island.

Initial steps for listing Guam forest birds on the U.S. Endangered Species List have been undertaken, and the Government of Guam in 1979 enacted its own endangered species act. In 1982, 12 native birds were listed as threatened or endangered and afforded protection under the Guam Act. These measures should help direct attention to the forest birds on Guam, and ultimately recovery plans May be developed for each species. Until such time, the most appropriate strategy is to accelerate investigative studies and to maintain the integrity of forest habitat in regions that still harbor native forest birds.

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Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia Mydas) (Google Books)

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2. Increased Human Presence

Human populations are growing rapidly in many areas of the insular Pacific and this expansion is exerting increasing pressure on limited island resources. Threats to sea turtles include increased recreational and commercial use of nesting beaches, the loss of nesting habitat to human activities (e.g., pig pens on beaches), beach camping and fires, an increase in litter and other refuse, and the general harassment of turtles. Related threats, such as coastal construction, associated with increasing human populations are discussed separately, (see Recovery – Sections 1.1, 1.2)

U.S. West Coast: Not a current problem.

American Samoa: Continued incremental loss of habitats occurs due to varied activities of a rapidly expanding human population. American Samoa has one of the fastest growth rates in the world; the doubling time is only 19 years.

Hawaii: Not a problem for green turtles nesting at remote NWHIs.

Guam: Habitat destruction is a major threat to Guam turtles. Guam had over 740,000 tourists in 1990. With tourism expected to increase, the number of hotels and other beachfront development and usage will also increase.

Republic of Palau: Most nesting beaches occur on inhabited islands (Helen Atoll, Merir, Tobi, Kayangel). Residents of these remote nesting areas have been dependent on green sea turtles for food. As transportation to these remote areas improves, pressures on turtle stocks are bound to increase.

CNMI: Nesting habitat along the sand beaches of the Saipan Lagoon is rapidly disappearing due to rampant development.

FSM: Minor problem due to construction on nesting beaches of livestock pens at Oruluk Atoll.
RMI: Minor problem, primarily limited to Majuro Atoll.
Unincorporated: Generally a minor problem.

3. Coastal Construction

The most valuable land on most Pacific islands is often located along the coastline, particularly when it is associated with a sandy beach. Construction is occurring at a rapid rate and is resulting in a loss of sea turtle nesting areas. This section discusses construction-related threats to the region's sea turtle nesting beaches, including the construction of buildings (hotels, houses, restaurants), recreational facilities (tennis courts, swimming pools), or roads on the beach; the construction of sea walls, jetties, or other armoring activities that can result in the erosion of adjacent sandy beaches; clearing stabilizing beach vegetation (which accelerates erosion); and the use of heavy construction equipment on the beach, which can cause sand compaction or beach erosion, (see Recovery – Sections 1.2.2, 1.2)

U.S. West Coast: Not a current problem.

American Samoa: Few green turtles occur around the inhabited islands of American Samoa. Hawaii: Not a current problem for green turtles at remote NWHIs.

Guam: Habitat destruction is a major threat to Guam turtles. Over 740,000 tourists visited Guam in 1990. With tourism expected to increase, the number of hotels and other beachfront development and usage will also increase.

Republic of Palau: Not a current problem. However, the newly independent Republic of Palau and the relaxation of U.S. environmental controls have opened opportunity for considerable road and resort planning and development during the past two years, some of which will lead to coastal construction.

CNMI: On Saipan, golf course, hotel and tourism-related development has severely impacted most of the historical nesting areas on the western portion of the island and residential development is beginning to threaten the eastern portion of the island. On Rota, nesting beaches appear limited to undeveloped private land due to heavy recreational use and shoreside tourist developments. Many of these "undeveloped" beaches are slated for development. On Tinian, the majority of the nesting beaches are on military-leased land where no construction is presently expected. Development of a large resort and casino on the southern side of the island will likely increase human disturbance on nesting beaches.

FSM: Construction of pig pens on turtle beaches is a problem at Oruluk Atoll, while coastal construction on the islets of Chuck lagoon has caused beach erosion (though no known nesting beaches have yet been affected).

RMI: Coastal construction is a moderate problem on Majuro Atoll, but no known nesting beaches are threatened. Military construction and activity at the U.S. missile testing facility at Kwajalein Atoll will occur near several turtle nesting beaches on the small outer islets.

Unincorporated: Generally a minor problem, except at Johnston Atoll where seawall construction has preempted use of beaches by nesting turtles.

4. Nest Predation

The loss of eggs to non-human predators is a severe problem in some areas. These predators include domestic animals, such as cats, dogs and pigs, as well as wild species such as rats, mongoose, birds, monitor lizards, snakes, and crabs, ants and other invertebrates, (see Recovery – Section 1.1.3)

U.S. West Coast: Not a current problem.

American Samoa: Not a current problem due to a recent rat eradication project. Rats had formerly been observed to attack hatchlings.

Hawaii: Possibly a moderate problem at the primary nesting areas in French Frigate Shoals due to predation by ghost crabs, mongooses, cats, dogs, birds, and possibly rats and feral pigs.

Guam: Predation by crabs, feral dogs and pigs is a problem. In one nest, 20% of the eggs were eaten by crabs. Some nests are fenced to keep pigs out.

Republic of Palau: Not known as a current problem, however at Ngerecher-Ngerkeklau islands where pig predation is likely and at Merir dog predation is likely a problem.

CNMI: Not known to be a problem.

FSM: Impacts are area dependant. Out of 33 nests monitored on Olimarao Island, 15 (45%) were attacked by ghost crabs. Twelve (36%) of these were completely destroyed, the other three produced only 47 hatchlings. However, it is quite possible that tampering with the nests increased the likelihood that these nests would be invaded. In any event, predation by ghost crabs should be considered a potential threat to nests deposited on the two islands within this atoll (S Kolinksi, A. Smith, pers. comm.).

On Gielop Island, one or more ghost crabs were present in four of the 15 nests (27%) at the time of examination (post-hatch). Predation damage appeared to have been minimal with the exception of one nest where 113 eggs produced only 42 hatchlings. Coconut crabs were commonly seen feeding on eggs strewn from 28 disrupted nests by the digging of other nesting turtles.

On Losiep Island (near Gielop island), Ulithi residents report that the introduction of monitor lizards by the Japanese has been the main cause for the virtual collapse of this island's nesting turtle population. Reports indicate that Losiep was once one of the main turtle islands for the region. Monitor lizards apparently feed on the turtles' eggs as they are being deposited, and may be able to dig down into a buried nest. On Oruluk Atoll, pig pens encroach on nesting beach areas.

RMI: According to a 1992 survey by Puleloa and Kilma (1992), Polynesian rat predation is very severe at Bikar. Because of the importance of Bikar (largest nesting area for green turtles in the RMI) this must be considered extremely serious.

Unincorporated: Apparently a minor problem.

5. Beach Erosion

Weather events, such as storms, and seasonal changes in current patterns can reduce or eliminate sandy beaches, degrade turtle nesting habitat, and cause barriers to adult and hatchling turtle movements on affected beaches, (see Recovery – Section 1.2.1, 1.1.5.2)

U.S. West Coast: Not a current problem.

American Samoa: Weather records indicate that a severe tropical storm or hurricane hits somewhere in the Samoan island chain every three years on average, causing extensive erosion. A predicted rise in sea level due to global warming would increase erosion problems.

Hawaii: Minor problem. Hurricane storm waves, tsunamis and coastal subsidence are known to cause erosion problems.

Guam: No information, but typhoons are frequent and likely to cause beach erosion.

Republic ofPalau: Occasional storm erosion occurs, and this is a distinct problem at Helen Island.

CNMI: Not thought to be a threat to turtle populations, but typhoons are frequent and likely to cause beach erosion.

FSM: Likely a problem, although severe tropical storms and typhoons are common for this region. Seasonal changes in wind direction (which occur towards the end of the main nesting season – late July/early August) cause erosion. Only one nest on Olimarao and no nests on Gielop Island were jeopardized by shifting shoreline sands. Yap State's low coralline atolls are extremely vulnerable to rises in sea levels and will be adversely affected if hypothesized rises occur. Some erosion of nesting beaches at Oroluk was reported in 1990 after passage of Typhoon Owen.

RMI: Moderate problem. Shoreline erosion occurs naturally on many islands in the atolls of the Marshalls due to storms, sea level rise from ENSO's (El Nino – Southern Oscillation) and currents. On the outer atolls, erosion has been aggravated by airfield and dock development, and by urban development on Majuro and Kwajalein Atolls.

Unincorporated: This is a problem at Palmyra Atoll.

6. Artificial Lighting

Hatchling sea turtles orient to the sea using a sophisticated suite of cues primarily associated with ambient light levels. Hatchlings become disoriented and misdirected in the presence of artificial lights behind (landward of) their hatching site. These lights cause the hatchlings to orient inland, whereupon they fall prey to predators, are crushed by passing cars, or die of exhaustion or exposure in the morning sun. Nesting adults are also sensitive to light and can become disoriented after nesting, heading inland and then dying in the heat of the next morning, far from the sea. Security and street lights, restaurant, hotel and other commercial lights, recreational lights (e.g., sports arenas), and village lights, especially mercury vapor, misdirect hatchlings by the thousands throughout the Pacific every year, (see Recovery – Sections 1.1.2, 1.1.4)

U.S. West Coast: Not a current problem.

American Samoa: Possibly a problem in coastal villages, although there are no documented cases of disoriented turtle hatchlings.

Hawaii: Not a current problem for green turtles at remote NWHIs, but possibly a problem on the MHI group.

Guam: A problem with unknown impact.

Republic ofPalau: Recently in 1994, the village of Melekeok (Melekeok State) reported that green turtle hatchlings were attracted into lighted houses and to street lights (M. Guilbeaux pers. comm.). Campfires and houselights are a problem at Angaur, Peleliu, Kayangel and the Southwest Island beaches.

CNMI: High potential as a future problem in Rota where resort development is flourishing. Presently not a problem on Tinian, but there is a potential problem as development continues. Most houses and hotels adjacent to the lagoon area of Saipan usually have some form of beach lighting. The Division of Fish and Wildlife routinely reviews all major development projects adjacent to beach fronts through the Coastal Zone Management permitting process. A permitting condition restricts the orientation of night lights onto the lagoon beach area, and most establishments comply with this.

FSM: Not a current problem. Only two islands within two separate atolls (Falalop Ulithi and Falalop Woleai) have electricity. These islands are not known to have significant numbers of nesting turtles. Light beacons for ships have been placed on two of the small uninhabited islands (Woleai, Ulithi Atoll), but the impact on hatchling orientation is unknown.

RMI: Portions of Majuro and Kwajalein are lighted, but the impact is unknown.

Unincorporated: Not a current problem.

7. Beach Mining

Sand and coral rubble are removed from beaches for construction or landscaping purposes. The extraction of sand from beaches destabilizes the coastline (e.g., reduces protection from storms), removes beach vegetation through extraction or flooding and, in severe cases, eliminates the beach completely. When mining occurs on or behind a nesting beach, the result can be the degradation or complete loss of the rookery. In addition, females can become confused when they emerge from the sea only to find themselves heading down slope into a depression formed by mining activities; too often the outcome is that the female returns to the sea without laying her eggs. Even when eggs are successfully deposited, reduced hatch success results if nests are flooded or excavated during mining, (see Recovery – Section 1.2.2)

U.S. West Coast: Not a current problem.

American Samoa: Despite educational attempts and enactment of protective laws, the tradition of removing sand and coral rubble from shorelines continues at a surprisingly high rate (100 cubic yards/week) for a small island with limited beaches. However, the impact to turtles is probably not significant because affected beaches are usually along the island roadway, and most of these beaches are too narrow (due to road placement) to be suitable for turtle nesting. In some areas, shoreline erosion, exacerbated by beach mining, jeopardizes the island highway.

Hawaii: Not a current problem.

Guam: No information.

Andersen Air Force Base (AFB), Establishment and Operation of an ... (Google Books)

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Other sources of mortality include predation by feral dogs, although the extent of this is unknown. Feral dogs may in fact be ...
Measurements of wild adult Philippine deer from Guam (Wheeler 1979, Conry 1984). Numbers appear as means t ...
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2010 – Full view
Micronesica – Volumes 23-24 – Page 175
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1990 – Snippet view – More editions
The locations of sightings were widespread and often far from human habitations, indicating that a feral population still occurs on the island. ... Philippine Deer, Cervus mariannus We follow recent taxonomic studies (Grubb & Groves 1982, Groves & Grubb 1987) and refer ... They were extirpated in the 1970s or early 1980s, apparently through heavy hunting pressure and predation by dogs (Lemke 1984).

3.5.2.1 Terrestrial Introduced Species

There are several vertebrate species that are not adversely affected by the urban environment and altered vegetation structure comprising most of Andersen AFB. These invasive, non-native species include: black drongo, black francolin, Eurasian tree sparrow, Philippine turtle dove, feral chickens, shrews, roof rats, and house mice. One native species, the yellow bittem, is also locally abundant and not sensitive to the altered environments. Several small reptiles and a single amphibian species also inhabit suitable areas within the modified forest on Northwest Field, and include the native Blue-tailed skink, native House geckos, and non-native curious skinks. An introduced snake species, the Brahminy blind snake, is also known to occur and was found during previous surveys. The introduced marine toad occurs throughout the area (Fritts and Rodda 1998; USAF 2000). See Table 3.5—3 for a complete list of English common names, Chamorro common names, and scientific names.

Table 3.5-3 English Common Names, Chamorro Common Names, and Scientific Names of Animal Species Present at Andersen AFB

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English C
Name1 .

Mammals

pPtfiliwppine deer Binadu Cervus mariannus Introduced Yes feral pigs babuen halomlano’ Sus scrofa Introduced Yes feral house cats Catus catus introduced No feral dogs Canis familiaris Introduced No shrews Ché’ka Suncus murinus Introduced No black rat Cha’ka Rattus rattus Introduced No house mouse Ché’ka Mus musculus Introduced No

Reptiles and Amphibians

Monilot Lizard Hilitai Varanus indicus Introduced No Brown tree snake Kulepbla Boiga irregularis Introduced No Blue-tailed skink achi‘ak Emoia caeruleocauda Native No House geckos Hemidactylus frenalus Native No curious skinks achi‘ak Cartia ailanpalai Introduced No Brahminy blind snake ulo’ attelong Ramphotyphlops Introduced No braminus marine toad Tot Bufo marinus Introduced No 341 Final 3-42 Final November 2006

[graphic]
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Environmental Impact Statement
Establishment and Operation of an ISR/Strike Capability Chapter 3
Andersen AFB, Guam Aflected Environment

Table 3.5-3 English Common Names, Chamorro Common Names, and Scientific Names of Animal Species Present at Andersen AFB (continued)

[graphic]
[graphic]
[graphic]
Eng'iigggg'mon Chamohgfnggmmo" ScientificName2 "13353522 "mes, species

Birds

black drongo Salin Taiwan Dicrurus macrocercus Introduced No black trancolin Francolinus francolinus Introduced Yes Eurasian tree sparrow Ga'ga' pale' Passer montanus Introduced No Philippine turtle dove Paluman Senesa Streptopelia bitorquata Introduced No feral chickens Gal/us gal/us Introduced No yellow bittern Kakkak lxobrychus sinensis Native No

[graphic][graphic][graphic]
[graphic]
' English and Chamorro names taken from hlIp://www.guatndawr.org/ 7 Table does not include threatened or endangered species

There are two introduced reptiles that are considered top predators: the monitor lizard, a reptile whose origin on Guam appears to be tied to the first settlements by humans, and the brown tree snake. Monitor lizards are more prevalent in forested regions of Andersen AFB. In addition to these reptiles, top predators also include domestic and feral house cats and feral domestic dogs, with additional predator pressure from rats.

The BTS was probably introduced to Guam as a passive stowaway in a military cargo ship moving material after World War (WW) 1]. The snakes' historic range includes portions of Indonesia, New Guinea, the Solomon Islands, and Australia (Rodda, et al. 1999). The BTS encountered an abundant prey base in Guam as well as an absence of natural predators and pathogens. The population of native forest birds and bats has declined on Guam because of the BTS (Savidge 1987; Wiles 1994) and loss of habitat from expanding agriculture and urban development (GovGuam DAWR 2005). The BTS is directly responsible for extinction or local extirpation of 11 of 18 native bird species throughout the Island of Guam, and five native birds (of 18) have experienced population declines of greater than 90 percent and are not recovering (Wiles, et al. 2003). In addition to native birds, three of 12 native lizards on Guam have been extirpated, and native bat species are heavily impacted by the BTS (Wiles, et al. 2003; GovGuam DAWR 2005). As the range of the BTS expanded, the decline of bird species has been particularly dramatic, with a rapid decline of several common native bird species occurring over a 1 to 3-year period during the early to middle 19805 (Wiles, et al. 2003). BTSs have been reported at densities as high as 40 individuals per acre of forest in a formerly used and now abandoned housing area south of Andersen AFB (Vice 2005). BTSs can bear two clutches of eggs per year, each clutch typically containing four to eight eggs (Vice 2005). Larger snakes prefer warm-blooded prey, especially birds and rodents. As birds, in particular, have become more scarce in forests, several extremely abundant non-indigenous lizards have supplemented the prey base. The BTS is a nocturnal species commonly found in trees, caves, and near limestone cliffs, but may move to the ground to forage during the night, probably for abundant skinks. They do not tend to occur in open grassy areas, but will cross unpaved roads and may occur in sparsely forested areas (Tobin, et al. 1999). The ecological impact of the BTS on Guam

[graphic][merged small]

has been catastrophic, and is the single greatest terrestrial ecological threat to all of the Mariana Islands and Hawaii (Engeman and Vice 2001; Wiles, et al. 2003).

The USDA WS operates the BTS interdiction and control program at Andersen AFB and at the commercial airport on Guam. The purpose of the interdiction and control program is to impede the spread of the BTS to other islands from the Andersen AFB passenger terminal and along flight lines. The USDA WS concluded that a two-phase effort is required to effectively reduce the possibility of off-Base transport. The first phase establishes BTS traps and nightly spotlight searches around the perimeter of areas where cargo is loaded for transport. This has proved to be effective against snakes that immigrate into cargo areas, but does not protect against snakes stowed in outbound cargo. The second phase is a program that inspects all cargo prior to leaving the island. The USDA WS uses trained dogs (Jack Russell terriers) to search for and detect snakes in outbound cargo. There are currently 14

inspection teams (a team consists of one handler and one dog) (Vice, et al. 2004). A review of data for 1994-1996 reveals that the use of dogs to detect BTSs in cargo departing Andersen AFB has been effective in reducing the spread of the snake to vulnerable destinations (Engeman, et al. 1998).

Brown tree snake control is a priority for the DoD (Kreig 2005). The 36 W1 32-7004 ensures that 100 percent of outbound craft (air and water) from Andresen AFB is inspected (USAF 2006). The 36 W1 327004 is contained in Appendix C of Appendix E to this EIIS.

3.5.2.2 Introduced Game Species

The black francolin (see Subchapter 3.5.2) is hunted throughout Guam, but is not hunted at Andersen AFB. Therefore, the black francolin is not considered a game species for this EIS, but is considered an introduced species.

Philippine Deer

Philippine deer were brought to Guam approximately 200 years ago from the Philippines, and rapidly spread throughout Guam. The Philippine deer is a regulated game species that typically live in forested areas and browse woody species and grasses. They appear to preferentially browse native woody species over non-native species. Population surveys of deer taken in 2000-2001 in MSA 1 revealed approximately 920 individuals, or 183 deer per square kilometer (Knutson and Vogt 2002), indicating some of the highest deer densities anywhere in the world. Further, these surveys suggest that individuals within the deer population are in generally good health, as determined by females breeding before 1 year of age (Shea, as cited in Knutson and Vogt 2002). Therefore, due to the general health of the population, the local carrying capacity has not yet been reached, and there are adequate resources to sustain deer on Guam.

A census of Philippine deer in the ASA project area was taken with spotlight surveys during January 2006 (Parsons 2006). The spotlight surveys suggest a maximum deer density to be 122 deer/square kilometer in the project area. Deer locations varied by vegetation community type.

F era! Pigs

Domestic pigs were brought to Guam by the Spanish in the late 1600s. Escaping to the wild, the pigs established feral breeding populations and now occur throughout Guam. Pigs, which

[graphic]

can eat almost anything, use their noses to root around in the forest floor searching for fallen fruits, young plants, coconuts, and animals such as worms and snails. They cause considerable damage by feeding on crops such as watermelon and taro. They also build and use wallows, which are pits that trap waterwhen it rains. Like deer, pigs have adequate resources to support their population, and maintain very high densities. Population surveys of pigs taken in 20002001 in MSA 1 and Andersen AFB indicated a pig population of approximately 186 individuals, or 38 pigs per square kilometer (Knutson and Vogt 2002).

A census of feral pigs in the ASA project area was taken with spotlight surveys during January 2006 (Parsons 2006). Six pigs were observed during the spotlight surveys, which suggests a density of 21.4 pigs/square kilometer.

Public Hunting

To hunt either deer or pigs on Andersen AFB, a GovGuam Hunting License and Andersen AFB Hunting Pennit are required to shoot

or bow-hunt on designated segments of Northwest Field and Andersen main base. Land available for public hunting, sometimes on alternate days and others open every day, totals approximately 1,265 hectares (3,126 acres).

Gun and bow hunting are permitted on the Base; however, at most of the 3,126 acres where hunting is allowed within Northwest Field and Andersen main, it is restricted to bow hunting. Recreational hunting, especially when restricted to bow hunting, is having almost no effect on the population densities of either pigs or deer (Knutson and Vogt 2002). The current public hunting areas on Andersen AFB are shown in Figure 3.5-3. In addition to public hunting, depredation hunts for Philippine deer and feral pigs resulted in the removal of 400 deer and 100 pigs over a 5-month period in 2005 (Andersen AFB 2006).

3.5.3 Threatened and Endangered Species

3.5.3.1 Plant Species

Four plant species are considered in this EIS. Among these species, only three are thought to occur in the vicinity of the ASA and Commercial Gate project areas. Only occurrences of T abernaemontana rotensis were recorded during January 2006 surveys.

Cyathea lunulata is an exceedingly rare Guam-listed endangered species. Cyathea generally grows along muddy drainage slopes in the hills of southern Guam (Moore and McMakin 2005). Little is known about the ecological relationships of Cyathea with pollinators, seed dispersers, or herbivores, and the possible reasons for its decline are unknown. Cyathea is not expected to occur within the ASA or Commercial Gate project areas.

Disposal and Reuse of Surplus Navy Property Identified in the Guam Land Use Plan (GLUP '94) (Google Books)

OCTOBER 8, 2019 ~ LEAVE A COMMENT

Proceedings – Vertebrate Pest Conference – Issue 24 – Page 304
https://books.google.com.ph › books

2010 – Snippet view – More editions
Depredation Investigation: Using Canine Spread to Identify the Predator Species David L. Bergman, William Sparklin, Christopher D. Carrillo, and James A. Schmidt, III USDA APHIS Wildlife Services, Phoenix, Arizona Scott Bender Navajo Nation Veterinary Program, Chinle, Arizona ... of measurements for coyotes and broad variation in feral/free ranging dogs that can overlap coyote measurements.
Arizona Highways – Volume 76, Issues 7-12 – Page 32
https://books.google.com.ph › books

2000 – Snippet view – More editions
The Arizona Bureau of Land Management (BLM) manages 10 herd areas in Arizona, supporting more than 3,000 wild burros ... Ranchers have reported that guard burros will attack feral dogs and coyotes, even killing predators with their sharp ...
When dogs run wild: the sociology of feral dogs and wildlife – Page 191
https://books.google.com.ph › books

Christine Gentry – 1983 – Snippet view – More editions
Index Abyssinian wolf, 13 Alabama, wildlife predation, 53, 68-70, deer studies, 111, 114, 116 Alaska, wildlife predation, 53, 82, coy-dogs, 156 Alaska red fox, 15 American pronghorn, 84 Antarctic Wolf, 11 Arctic fox, 17 Arizona gray fox, ...
The wild turkey and its management – Page 207
https://books.google.com.ph › books

Wildlife Society, Oliver H. Hewitt – 1967 – Snippet view

Analysis of 2,284 mammalian predator stomachs in Missouri revealed only a single occurrence of turkey remains— that in a bobcat (Korschgen, … These authors further call attention to the meager record of observed predator kills attributed to such animals as the fox, coyote or feral dog. … Predator— prey relationships were investigated in Arizona by trapping predators in areas of high turkey density.

Arizona-Sonora Desert Museum Book of Answers – Page 88

https://books.google.com.ph › books

David Wentworth Lazaroff – 1998 – Snippet view

Free-running cats and dogs aren't just prey for coyotes and bobcats; they're predators themselves. Unleashed dogs taken on hikes may leave the trail and frighten and harass desert wildlife. Feral dogs sometimes form packs that chase down …

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Ecosistemas de Pastizales, Especies en Peligro Y Ganadería …

https://books.google.com.ph › books

2006 – Snippet view

M. Donaldson: We have a number of predators on the Empire cienega north of Sonoita, south of Tucson. Predominantly it is feral dogs. Of the natural predators we have—lion, bear, and coyote—we don't have much of a problem with them.

Protected Plant Species

No species listed for protection by the federal government or GovGuam have been found on any of the GLUP parcels included within the proposed action. Only nine species of plants are threatened, endangered, or candidates for listing on Guam. The fire tree (Serianthes nelsonii) is Guam's only federally-listed endangered species. Two other species have been designated by GovGuam as endangered under Guam's Endangered Species Regulation No. 7 (Draft). These are the tsatsa or tree fern (Cyathea Iunulata) and the ufa halomtano (Heritiera Iongipetiolata). A complete listing of the status of protected plants is provided in Table 3.8-2.

The survey indicates that it would be possible for one of these, Heritiera longipetiolata, to occur in the limestone forest of the FAA Housing parcel. However, if found there, it would only occur on steep cliffs that would be protected as conservation land.

Several plants that are not threatened or endangered species but are considered rare (seldom occurring or found) have been found on or near several of the surveyed GLUP parcels. Additional information on the occurrence of these plants is found in the survey reports.

Table 3.8-2: Endangered, Threatened, and Candidate Plant Species of Guam

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Tsatsa Tree-Fern . ' rewrittsttere Cyathea Iunulata Endangered

Hayun-Iago No common name Serianthes nelsonii Endangered Endangered
Ufa-halomtano No common name Heritiera Iongipetiolata Endangered
No common name Coelogyne quamensis Species of concern
Discipina LycopOdlum Phlg'gmar'a Species of concern
var. longrfolrum
No common name Nervilia jacksoniae Species of concern
No common name Tabernaemqmana Candidate for listing
rotensrs
No common name Thelypteris warburgii Species of concern
No common name Tinosperma homosepela Species of concern
Sources: 1. Government of Guam, Department of Agriculture (November 1999), List of Species of Concern.
2. U.S. Fish And Wildlife Service, Honolulu Office (November 5, 1998), Pacific Island Plants and Animals: Listed, Proposed, or Candidate Species, as designated under the US. Endangered Species Act.

3.8.3 Important Habitats

Important habitats are those that support threatened or endangered flora or fauna, or that are considered rare (seldom occurring or found) within the region. On Guam, such habitats include native limestone forests, ravine forests, and wetlands. Table 3.8-3 identifies GLUP parcels containing protected species and important habitats.

Limestone forests (and ravine forests, which serve similar ecological functions) provide habitat for many threatened or endangered plant and animal species, particularly forest birds and fruit bats. A number of the GLUP parcels still contain limestone forest or ravine forest that represent diverse plant communities that could potentially provide habitat for wildlife. These include the FAA Housing, Barrigada, Nimitz Hill Vacant Lands, and Sasa Valley/Tenjo Vista parcels. The cliff line area at the FAA Housing parcel and the Sasa Valley/Tenjo Vista parcels were designated as part of the Guam National Wildlife Refuge in a 1994 Cooperative Agreement and 1993 Memorandum of Understanding between GovGuam, Navy, Air Force, and USFWS.

While possibly none of these sites contains truly pristine limestone forest, at least these remaining forest remnants still retain a degree of biodiversity. In addition, while Guam's wildlife, and particularly its avian fauna, have been adversely impacted due to predation by brown tree snake, it is possible that eventually this problem will be brought under control. The remaining limestone and ravine forest on Guam could then serve as habitat for the reestablishment of populations of native birds, bats, and other wildlife, either through reintroduction programs or by natural means. The ravine forest 'corridors" at the Tenjo Vista parcel have been identified as offering potentially important wildlife habitat.

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Table 3.8-3: GLUP Parcels Containing Protected Species and Important Habitats

Limestone forest present. USFWS
. recovery plans identify parcel as N2 FM Housmg None Observed potential habitat for Mariana crow and Mariana fruit bat.
Wetlands present on N5A and N58;
N5 Barrigada None present. limestone forest present on N58 and
NSD.
N108 Nimitz Hill Vacant Lands None present. Limestone forest present on N108.
Ravine forests found in narrow gullies;
None observed; habitats suitable to wetland areas occur along Marine
N128 Tenjo Vista support presence of endangered Drive; small wetlands are designated
species (birds and bats). as secondary habitat for endangered

common Mariana moorhen.
N14 Polaris Point None present. coas‘al mamh’ mangrove scrUb’ and
swamp forest wetlands occur here.
N15 New Apra Heights None present. Swamp forest wetland area on the site.
On Guam, wetlands provide important habitat for the endangered Mariana common moorhen. A number of the small wetlands at Tenjo Vista, although subjected to a variety of human disturbances (including an oil spill at one site), are listed in the Moorhen Recovery Plan (U.S. Fish And Wildlife Service, September 1992) as secondary moorhen habitat.
Mangrove swamp, another type of wetland habitat, is found at the Polaris Point parcel. Mangroves serve as breeding and nursery grounds for numerous species of fish, reduce deposition of terrigenous silt in coastal waters, and stabilize shorelines. Thus, mangroves serve several critical ecological functions, and their preservation is important if these functions are to be maintained.
With the exception of the wetlands designated as secondary moorhen habitat mentioned above, none of the habitats found on the GLUP parcels are considered critical habitat as defined by the Endangered Species Act (ESA) of 1973, as amended.
3.8.4 Wildlife
The following sections provide brief descriptions of the wildlife observed on the subject GLUP parcels. Mammalian, avian, and other forms of fauna are described, as well as threatened or endangered species that may occur on the various parcels. In general, the occurrence of native wildlife is closely linked to the presence of suitable habitat. The habitats on Guam that typically support native terrestrial fauna include wetlands and limestone and ravine forests. Parcels omitted from further discussion are those where wildlife has not been observed and is not expected to occur.
3.8.4.1 Mammals
The Mariana fruit bat (Pteropus mariannus mariannus), one of the only native mammalian species that could occur on any of the GLUP parcels, is an endangered species and is further discussed in Section 3.8.4.5, below.

The larger mammals found on Guam consist almost entirely of introduced species. Populati0ns of smaller mammals, including introduced rodents, have been kept in check due to predation by the brown tree snake. The mammals recorded or that may occur on GLUP parcels include the following introduced species: Guam deer (Cervus unicolor), feral pig (Sus scrofa), water buffalo (Bubalus bubalis), musk shrew (Suncus murinus), feral dog (Canis familiaris), feral cat (Fells catus), rat (Rattus spp.), and mouse (Mus musculus). One sighting of goats (Capra hircus) has been reported at the FAA Housing parcel (Whistler, 1998).

Disposal and Reuse of Surplus Navy Property Identified in the Guam Land Use ... (Google Books)

OCTOBER 8, 2019 ~ LEAVE A COMMENT

DISPOSAL AND REUSE OF SURPLUS NAVY PROPERTY ON GUAM
FINAL ENVIRONMENTAL IMPACT STATEMENT CHAPTER THREE

Table 3.8-2: Endangered, Threatened, and Candidate Plant Species of Guam

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I I "35321554" – , .sramseaaaai = em, fit; '
. ' rewrittsttere Tsatsa Tree-Fern Cyathea Iunulata Endangered
Hayun-Iago No common name Serianthes nelsonii Endangered Endangered
Ufa-halomtano No common name Heritiera Iongipetiolata Endangered
No common name Coelogyne quamensis Species of concern
Discipina LycopOdlum Phlg'gmar'a Species of concern
var. longrfolrum
No common name Nervilia jacksoniae Species of concern
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rotensrs
No common name Thelypteris warburgii Species of concern
No common name Tinosperma homosepela Species of concern

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Sources: 1. Government of Guam, Department of Agriculture (November 1999), List of Species of Concern.
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Table 3.8-3: GLUP Parcels Containing Protected Species and Important Habitats

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3.8.4 Wildlife

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3.8.4.1 Mammals The Mariana fruit bat (Pteropus mariannus mariannus), one of the only native mammalian

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3.8.4.2 Birds

Populations of most species of native birds on Guam, especially forest birds, have been either extirpated or severely decimated due in large part to predation by the brown tree snake. Most of the birds observed during the 1998 faunal survey are introduced species. A summary of the birds observed during these surveys is found in Table 3.8-4.

Besides the Pacific golden plover, observed in 1998, no other migratory or seabird species were seen. The 1988-1989 natural resources surveys reported other migratory birds and seabirds on Navy properties, some of which may have included sightings on the GLUP parcels. The migratory species reported and their preferred habitats were the white-tailed tropicbird (Phaethon lepturus [coastal cliffs]), brown noddy (Anous stolidus [coastal islands]), white tern (Gygis alba [coastal areas]), common greenshank (Tringa nebularia [wetlands]), and whimbrel (Numenius phaeopus [mowed grasslandsl). In addition to these species, the faunal survey also mentions that ruddy turnstone (Arenaria interpres) would be expected to occur, along with Pacific golden plover and whimbrel, on open lawn areas at the FAA Housing parcel.

Table 3.8-4: Bird Species Recorded on GLUP Parcels During 1998 Field Surveys

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‘Y .1 i ii . w _ F?“ 14»? f‘ , Pacific reef heron Egretta sacra ‘ Yellow bittern Ixobrychus sinensis ° ‘ Black francolin FrancOIlnus ‘ ° ° francolinus Blue-breasted quail Coturnix chinensis 0 Pacific golden plover Pluvialis fulva ‘ i . . . Streptopelia . . . . . Philippine turtle dove bitorquata Black drongo D’Cmrus e , . . macrocercus Eurasian tree sparrow Passer montanus ‘ ° ‘ P 0 e

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‘ – Species observed on Site Source: Bruner (1998)

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Reptiles are commonly found and widely distributed within a variety of habitats on Guam. However, there are no federally-listed threatened or endangered reptiles on Guam. GovGuam lists eight reptile species as endangered although these eight species are not known to be common; their disappearance is primarily attributed to the introduction of the brown tree snake and other introduced lizard-eaters. One of these species, the moth skink (Lipinia noctua) was found base-wide at the Navy Ordnance Annex in a 1996

Navy reptile survey. The northern portion of the Annex contains parcels N19A and N198.

The predatory brown tree snake has been responsible for the decimation of large numbers of native forest birds and other mammals and reptile species. Measures are underway to control this serious pest animal on Guam and to prevent its spread from Guam to other areas.

Vertebrates of widespread occurrence on Guam include the indigenous blue-tailed skink (Emoia caeruleocauda), the brown four-fingered skink (Carlia fusca), the introduced marine toad (Bufo marinus) and the Indian monitor lizard (Varinusi indicus). Other common Guam vertebrates potentially inhabiting the GLUP parcels include introduced species: the house gecko (Hermidactylus frenatus), mourning gecko (Lepidodactylus Iugubrus), green anole (Anolis carolinensis), brahminy blind snake (Ramphotyphlops braminus), eastern dwarf tree frog (Litoria fallax); and the indigenous stump-toed gecko (Gehyra mutilata).

3.8.4.4 Invertebrates

Invertebrate species potentially inhabiting the GLUP parcels include earthworms (Oligochaeta) and arthropods. Arthropods include spiders (Araneae), beetles (Coleoptera), millipedes (Diplopoda), flies (Diptera), mosquitoes (Diptera—Culicidae), water spiders and water boatmen (Heteroptera), bees and wasps (Hymenoptera), butterflies and moths (Lepidoptera), dragonflies (Odonta—Anisoptera), damselflies (Odonta-Sygoptera), and grasshoppers (OrthopteraAcrididae). Aquatic insects, flatworms (Turbellaria), snails (Achantina fulica, Physa sp., and Pila conica), and earthworms may also occur in the wetland areas.

Two tree snail species, Partula gibba and P. radiolata, are known to exist in limestone forest at Hilaan and Haputo on either side of the FAA Housing parcel. It is possible that these species could also occur on the FAA Housing parcel. P. gibba is listed as endangered and P. radiolata as threatened by GovGuam. Both species are presently considered as candidates for federal listing.

Two federal candidate butterflies (Hypo/imnas octocula marianesis and Vagrans egestina) and a butterfly (Euploea eleutho) proposed for listing by GovGuam and known to occur on Guam have not been identified on the GLUP parcels. Refer to Table 3.8-5 for their GovGuam and federal status.

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Table 3.8-5: Invertebrate Species on Guam

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Chamorro Name, ‘A English Name , Scientific Name Molluslsm ti‘Y‘Yf‘fi-“nf-R‘;‘1’2311;r?717’\5‘35*?”1. ‘qq@ijTYtAHF.3154231‘. i .. Akaleha’ Mt. Alifan tree snail Panula salifana Endangered Species of concern Akaleha’ Humped tree snail Partula gibba Threatened Candidate for listing Aka/eha’ Guam tree snail Partula radiolata Endangered Candidate for listing Akaleha’ Fragile tree snail Samoana fragilis Endangered Candidate for listing Succinea guamensis Species of concern Succinea piratarum Species of concern Succinea quadrasi Species of concern ‘ _ Marianas eight-spotted HYPOIImflBS octocula Candidate for listing butterfly marianesis Marianas wandering Vagrans egestina ‘ Candidate for listing butterfli . Marianas euploea Euploea eleutho Canq’date Removed’ for listing

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‘ ‘Removed’ – USFWS removed species from the candidate list as currently available information does not support issuance of a proposed listing.

3.8.4.5 Protected Animal Species

No threatened or endangered animal species were observed on any of the parcels during the surveys. Further information concerning the status of Guam's threatened and endangered animal species is summarized in Table 3.8-6.

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. Anas plrhynch Nganga Mariana mallard oustaleu. Endangered possibly extinct . l . Endangered; Sasangat Micronesian megapode Megapodius Iaperouse Endangered possibly extinct r . . Endangered; Koko Guam rail Callirallus owstoni Endangered possibly extinct Pulanat Mariana common moorhen Calllnula chloropus Endangered Endangered guamr Totot Mariana fruit-dove Ptilinopus roseicapilla Endangered Pullman apaka / Whitethroated ground-dove Calllcolumba Endangered Puluman fache xanthronura Yayaguak Mariana (Island) swiftlet Collocalia bartschi Endangered Endangered Sihek Micronesian kingfisher Halycyon cinnamomina Endangered Endangered; possibly extinct Aga Mariana crow Corvus kubaryi Endangered Endangered

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Literature Review and Synthesis of Information on Pacific Island ..., Volume 2 (Google Books)

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Table 2. Summary of the Characteristics of the Trust

Mariana
Islands: A series of volcanic islands with a total land area of 370 mi.

Guam:

Territory of the Pacific Islands

2

The archipelago includes 14 northern islands (Saipan, 47 sq mi, Tinian, 39 sq mi, Rota, 33 sq mi) and Guam, the largest island (210 sq mi). The islands were occupied presumably by the Indo-Malayans, perhaps around 1200 A.D., then by the Spanish, United States, Japan, and recently by the United States. It has the current status of a commonwealth. Copra was the principal economy, but today military establishments and tourism are the most important sources of revenues. The natural vegetation has been greatly altered by man. Crop and ornamental plants and weeds were introduced, upland areas were at one time subjected to slash and burn agriculture, and wetlands were used for taro and rice. Today upland areas are still burned although slash and burn techniques are no longer applied. Crops (e.g., dry land row agriculture) are important; open pasture land is often

common. Koa trees have been planted in many areas to prevent soil loss. Guam, Saipan, and Tinian served as battlegrounds during World War II. Today, there is but 1 endemic genus (Guamia) and 68 endemic species of plants in the Marianas. There are 17 wetlands remaining on Guam, 7 on Saipan, and 2 on Tinian. Mangrove wetlands contain Avicennia, Brugiera, and Rhizophora; marshes have Phragmites and Scirpus. The northern Marianas have tolero elements in their biota (Usinger, in Gressitt, 1963).

Guam measures 32 mi long by 4 to 10 miles wide and has a total area of 210 sq miles. The southern half contains volcanic hills (up to 1,329 ft high) with sword grass, streams, and fertile areas. The northern half is mainly a plateau about 500 ft in elevation and contains dense vegetation. An extensive fringing reef surrounds the island. The island vegetation has been vastly altered from its primitive state due to large-scale clearing and repeated burning, but especially by introduced exotic plants and grazing animals that have permanently altered the structure and composition of the vegetation (Fosberg, 1960). There are extensive air and naval bases. Tourism has increased considerably in recent years. Agriculture consists of tropical fresh fruits and vegetables, hogs, cattle, horses, and Carabaos. There is licensed hunting for deer, pigs, certain birds, and fruit bats. Prior to 1940, Marianas' fruit bats (Pteropus mariannus) numbered in the thousands. The population has been declining and today is well below 1,000 individuals, the major colony located on Anderson Air Force Base. Reductions in fruit bats are due to habitat destructions, illegal hunting, and destructive typhoons and tropical storms. Because the fruit bat is considered a delicacy, selling up to $20 per bat in restaurants, it may well become an endangered species in the Marianas (already protected

– Continued next page –

[blocks in formation]
Tinian:

Saipan:

Agiguan:
(Aguijan)

Rota :

Cocos :

on Guam). The Governor of Guam has established five representative terrestrial conservation reserves with permanent transects.

There are restrictions on hunting in Guam. All wild birds except game species (Philippine Turtle Dove, Painted Quail)

are protected by law. Sport fishing methods are regulated and include gillnets, cast nets, surround nets, and fish weirs. No electric fishing is allowed. There are specific regulations for collecting spiny lobsters, coconut crabs, mangrove crabs, and Trochus shells. Live coral between shore and a depth of 60 ft cannot be removed except by special license.

There are no officially threatened or endangered algae, macro-invertebrates or fish in the coastal marine waters of Guam. A general account of Guam reef biology is qiven by Randall and Eldredge (1977). The physiography, marine plants, selected marine invertebrates, and currents of Agat Bay, about 3.5 mi of coastline on the west side of southern Guam, are presented in Eldredge et al. (1977).

Tinian coil is derived in part from decomposed limestone. A list of species is given in Table 17. The island has undergone extensive development, of buildings and an airport, impacting about half of the land area.

Saipan is an island measuring 47 sq mi in area. The Southern portion is flat and the northern with cliffs on which is located a World War II memorial park (violent fighting took place here between the Japanese and the U. S.). A fringing reef occurs on the west side. Saipan currently serves as the headquarters for the U. S. Trust Territory of the Pacific Islands. Considerable military expansion (boat harbor, buildings, and an airfield) is taking place. Tourism has increased considerably in recent years.

Wild goats are causing serious damage on this island, which measures about 3 sq. mi. in area.

An island measuring 33 sq mi and with a series of plateaus (: 1,625 ft high) surrounded by slopes. The biota comprises 149 species of marine fish, a toad (Bufo), two species of skinks, chameleons, several species of geckos, a burrowing snake (Typhlops braminus), monitor lizard, green and hawksbill turtles, 30 species of birds, feral dogs and cats, mice, Norway rat, musk shrew, deer, and two species of bats, including the giant fruit bat or flying fox (Brewer 1977).

See Randall et al. (1975) for a detailed natural history.

Table 2. (Continued)

American Samoa ISlands:

Tutuila
Island:

Ta'u and the Manua Islands:

Rose
Island:

American Samoa represents part of a 350 mi chain of islands. It has many faunal elements in common with the eastern Caroline Islands (Gressitt 1956). American Samoa comprises 7 is lands (all rocky and volcanic except Rose) with a total land area of 76 sq mi. American Samoa was occupied by the Dutch, French, Russians, British, United States, Germany, and currently the United States. It is in part densely forested, has hills with poor soil but fertile valleys. About 2/3 of the original rain forest has been destroyed or damaged by man's activities. Relatively little damage has reportedly occurred from introduced species (Environmental Consultants, Inc. 1976). The main economics of the islands comprise taro fields and fishing, especially tuna canning. Tourism has become important in recent years. There are no minerals currently being exploited. The islands sustain severe hurricanes.

American Samoa has 488 species of vascular plants (348 species of flowering plants of which 312 species are native (i.e., endemic and indigenous) and 140 species of ferns and allies). Ten species of plants are endemic to American Samoa and another 68 species are endemic to the entire Samoan chain. There is 1 species of amphibian (introduced Bufo marinus), 15 species of reptiles (4 species native), 60 species of birds of which 24 species are seabirds and 8 species are introduced, and 14 species of mammals of which 9 species of terrestrial mammals are introduced. Two bats are native including the fruit bat. Ten species are recommended as threatened and 3 species as endangered. Some 24 species are considered rare or have a restricted distribution. Four wildlife sanctuaries are proposed (see Environmental Consultants, 1976). Further information on Samoa is given by the Office of Samoan Information (1975 on).

Tutuila Island measures 25 by 2 to 6 mi and contains 52 sq mi of land. The principal town of this chief American Samoan Island is Pago Pago. A mountain range (up to 2,141 ft high) extends the length of the island and is densely wooded. Canneries and other construc-tion now impact about half of the island. The small Aunu'u Island is located about 1 mi off Tutuila.

Ta'u measures 17 sq mi and has a mountain that is 3,056 ft high. It is the largest of the Manua Islands. The remaining islands (Olosega, Ofu, etc.) occupy an area of 1-3 sq mi each.

A small (<3 sq mi) uninhabited atoll, established as a Nation-al Wildlife Refuge on July 5, 1973 (the establishment was later ratified by the Samoan Legislature). The refuge extends down to the low water line and across the mouth of the main

channel from the low waterlines at each Side,

– Continued next page

[blocks in formation]
Caroline
Islands:

Yap Islands:

Kusaie ISland:

Senyavin
Islands:

The Caroline Islands include 936 islands, islets, and atolls for a total land area of 461 sq mi. The eastern Carolines comprise Truk, Ponape, and Kusaie, among others; the western Carolines include Palau, Yap, and other islands. These are high volcanic islands with predominant savannas on the Palaus and Yap and forests on Truk, Ponape, and Kusaie. Natives have lono burned savannas. Dogs, deer, and cattle were introduced early in the 19th century. Typhoons (about 25 per year) cause considerable damage on occasion. Bauxite is mined. Many of the faunal elements of the eastern Carolines are in common with those of Samoa and Fiji. The natural history of Namoluk Atoll, eastern Caroline Islands, is presented by Marshall and Fosberg (1975).

Consist of 4 large and 10 small wooded volcanic islands (85 sq mi), the most important of which are Yap, Tomil, Map, Rumung, Ulithi, Fais, and Ngulu. These islands are surrounded by a 16 mi long reef. Yap is hilly (up to 570 ft high), the soil is lateritic, and the rainfall heavy (122 in. annually). The natives are of Malay origin; the area was later occupied by the Spanish, Germans, Japanese, and currently the United States. Economic products include chestnuts, bananas, copra, taro, cattle, swine, poultry, and bonito. There has been some land clearing and small amounts of copper and bauxite have been mined. See Tsuda (1978) for a detailed natural history.

A 9 by 6 mi mountainous island (up to 2,064 ft) located in the eastern Carolines. It has a fringing reef and two good harbors, especially Lele on the east coast. Kusaie was bombed by the Americans during World War II. It has a fauna younger than Hawaii, with a few endemic species (Gressitt, 1956).

Comprises Ponape and Pingelap Islands in the eastern Carolines.

Ponape is a large (176 sq mi) hilly, fertile island surrounded by a barrier reef. The coastal regions are settled but the interior is practically uninhabited. The culturing of yams is highly developed on Ponape. The island contains ancient ruins. It was occupied by a Japanese garrison during World War II. It Contains a terrestrial fauna younger than Hawaii, with few endemic species (Gressitt 1956).

Pingelap contains three small islands.

Plants of Satawal Island are discussed by Fosberg (1969a) and those of Fais Island by Fosberg (1969b). The biology of Kapingamarangi Island is described by Niering (1956) and Newhouse (1960).

A small (3 sq mi), low, sandy atoll comprising three islets Surrounding a lagoon. It was occupied by the Spanish, British, United States, Japan, and finally retaken by the United States

– Continued next page –

Table 2. (Continued)

after heavy fighting with the Japanese during World War II. It has had a cable station, seaplane base, air, submarine, and naval base and serves as a stopover for travelers from Hawaii

to Japan. Tru Truk has 11 major islands (39 sq mi of land area) and many Island : small coral islands located within a 40 mi wide lagoon. During

World War II, the Japanese chopped the tops off two islands and dredged deep channels. The islands were heavily shelled. Copra and bonito were valuable economic products, but breadfruit and taro are the most important food crops today. Truk has the world's largest collection of artificial reefs (~ 60 sunken ships). Many common marine organisms are discussed by Earle (1976), with underwater photographs and limited identifications of sea life (see also Tsuda et al. 1977).

[ocr errors]
Consist of 26 major islands within a coral barrier reef (15 by 150 km). The northern islands are volcanic whereas the southern are coral islands. The larger volcanic islands (Babel thuap, Arekabesan, Malakal, and most of Korror) are well wooded with extensive interior Savannas. All the other islands are raised limestone reefs. Wolcanic islands contain original forest, secondary forest, scrubland, relatively sterile grasslands, urban areas, and farmlands. Raised limestone islands have thick original forests, second-growth forests, and several small urban areas. The islands were occupied by Spain, Germany, Japan, and the United States. The Japanese established the Palau Tropical Marine Biological Station in 1933. Babel thuap is 240 m high with volcanic rock and soil and abundant vegetation. There is heavy rainfall and extensive fresh-water runoff. The Palaus have few endemic rats and bats and 56 species of birds, of which about 12 are endemic. At least 9,000 tons of fish are caught annually in offshore waters, the Palauans deriving 90 percent of their animal protein from the sea. Trochus shell beds, a former principal commercial product for mother-of-pearl buttons, have

become seriously depleted. The shell fish biota reportedly includes a rare species of giant clam (Tridacna). Turtles and squid are fished. Copra and bauxite are major economic products. The human population numbers about 14,000, with about half of the people living on Korror. Dry land row agriculture is common and the cassava is an important product. Palau has 300 lime-stone islands, the largest of which is Ngeruktabel (18 sq km in area and 220 m high). One of them has a marine lake in which there is a live-young bearinq frog. A total of 24 marine lakes are known; they connect to the ocean via tunnels. Marcharchar has 12, Ngeruktabel has 6, and Oreor (Korror) 2. Their size varies from 30 m across to 2 km in diameter and 194 ft deep.

Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia Mydas) (Google Books)

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2. Increased Human Presence

Human populations are growing rapidly in many areas of the insular Pacific and this expansion is exerting increasing pressure on limited island resources. Threats to sea turtles include increased recreational and commercial use of nesting beaches, the loss of nesting habitat to human activities (e.g., pig pens on beaches), beach camping and fires, an increase in litter and other refuse, and the general harassment of turtles. Related threats, such as coastal construction, associated with increasing human populations are discussed separately. (see Recovery – Sections 1.1,1.2)

U.S. West Coast: Not a current problem.

American Samoa: Continued incremental loss of habitats occurs due to varied activities of a rapidly expanding human population. American Samoa has one of the fastest growth rates in the world; the doubling time is only 19 years.

Hawaii: Not a problem for green turtles nesting at remote NWHIs.

Guam: Habitat destruction is a major threat to Guam turtles. Guam had over 740,000 tourists in 1990. With tourism expected to increase, the number of hotels and other beachfront development and usage will also increase.

Republic of PaIau: Most nesting beaches occur on inhabited islands (Helen Atoll, Merir, Tobi, Kayangel). Residents of these remote nesting areas have been dependent on green sea turtles for food. As transportation to these remote areas improves, pressures on turtle stocks are bound to increase.

CNMI: Nesting habitat along the sand beaches of the Saipan Lagoon is rapidly disappearing due to rampant development.

FSM: Minor problem due to construction on nesting beaches of livestock pens at Oruluk Atoll.

RMI: Minor problem, primarily limited to Majuro Atoll.

Unincorporated: Generally a minor problem.

3. Coastal Construction

The most valuable land on most Pacific islands is often located along the coastline, particularly when it is associated with a sandy beach. Construction is occurring at a rapid rate and is resulting in a loss of sea turtle nesting areas. This section discusses construction-related threats to the region's sea turtle nesting beaches, including the construction of buildings (hotels, houses, restaurants), recreational facilities (tennis courts, swimming pools), or roads on the beach; the construction of sea walls, jetties, or other armoring activities that can result in the erosion of adjacent sandy beaches; clearing stabilizing beach vegetation (which accelerates erosion); and the use of heavy construction equipment on the beach, which can cause sand compaction or beach erosion. (see Recovery – Sections 1.2.2, 1.2)

[graphic]
U.S. West Coast: Not a current problem.

American Samoa: Few green turtles occur around the inhabited islands of American Samoa.

Hawaii: Not a current problem for green turtles at remote NWHIs.

Guam: Habitat destruction is a major threat to Guam turtles. Over 740,000 tourists visited Guam in 1990. With tourism expected to increase, the number of hotels and other beachfront development and usage will also increase.

Republic of Palau: Not a current problem. However, the newly independent Republic of Palau and the relaxation of U.S. environmental controls have opened opportunity for considerable road and resort planning and development during the past two years, some of which will lead to coastal construction.

CNMI: On Saipan, golf course, hotel and tourism-related development has severely impacted most of the historical nesting areas on the western portion of the island and residential development is beginning to threaten the eastern portion of the island. On Rota, nesting beaches appear limited to undeveloped private land due to heavy recreational use and shoreside tourist developments. Many of these "undeveloped" beaches are slated for development. On Tinian, the majority of the nesting beaches are on military-leased land where no construction is presently expected. Development of a large resort and casino on the southern side of the island will likely increase human disturbance on nesting beaches.

FSM: Construction of pig pens on turtle beaches is a problem at Oruluk Atoll, while coastal construction on the islets of Chuck lagoon has caused beach erosion (though no known nesting beaches have yet been affected).

RMI: Coastal construction is a moderate problem on Majuro Atoll, but no known nesting beaches are threatened. Military construction and activity at the U.S. missile testing facility at Kwajalein Atoll will occur near several turtle nesting beaches on the small outer islets.

Unincorporated: Generally a minor problem, except at Johnston Atoll where seawall construction has preempted use of beaches by nesting turtles.

4. Nest Predation

The loss of eggs to non-human predators is a severe problem in some areas. These predators include domestic animals, such as cats, dogs and pigs, as well as wild species such as rats, mongoose, birds, monitor lizards, snakes, and crabs, ants and other invertebrates. (see Recovery -Section 1.1.3)

U.S. West Coast: Not a current problem.

American Samoa: Not a current problem due to a recent rat eradication project. Rats had formerly been observed to attack hatchlings.

Hawaii: Possibly a moderate problem at the primary nesting areas in French Frigate Shoals due to predation by ghost crabs,

mongooses, cats, dogs, birds, and possibly rats and feral pigs.

Guam: Predation by crabs, feral dogs and pigs is a problem. In one nest, 20% of the eggs were eaten by crabs. Some nests are fenced to keep pigs out.

Republic of Palau: Not known as a current problem, however at Ngerecher-Ngerkeklau islands where pig predation is likely and at Merir dog predation is likely a problem.

CNMI: Not known to be a problem.

FSM: Impacts are area dependant. Out of 33 nests monitored on Olimarao Island, 15 (45%) were attacked by ghost crabs. Twelve (36%) of these were completely destroyed, the other three produced only 47 hatchlings. However, it is quite possible that tampering with the nests increased the likelihood that these nests would be invaded. In any event, predation by ghost crabs should be considered a potential threat to nests deposited on the two islands within this atoll (S Kolinksi, A. Smith, pers. comm.).

On Gielop Island, one or more ghost crabs were present in four of the 15 nests (27%) at the time of examination (post-hatch). Predation damage appeared to have been minimal with the exception of one nest where 113 eggs produced only 42 hatchlings. Coconut crabs were commonly seen feeding on eggs strewn from 28 disrupted nests by the digging of other nesting turtles.

On Losiep Island (near Gielop island), Ulithi residents report that the introduction of monitor lizards by the Japanese has been the main cause for the virtual collapse of this island's nesting turtle population. Reports indicate that Losiep was once one of the main turtle islands for the region. Monitor lizards apparently feed on the turtles' eggs as they are being deposited, and may be able to dig down into a buried nest. On Oruluk Atoll, pig pens encroach on nesting beach areas.

RMI: According to a 1992 survey by Puleloa and Kilma (1992), Polynesian rat predation is very severe at Bikar. Because of the importance of Bikar (largest nesting area for green turtles in the RMI) this must be considered extremely serious.

Unincorporated: Apparently a minor problem.

5. Beach Erosion

Weather events, such as storms, and seasonal changes in current patterns can reduce or eliminate sandy beaches, degrade turtle nesting habitat, and cause barriers to adult and hatchling turtle movements on affected beaches. (see Recovery – Section 1.2.1, 1.1.5.2)

U.S. West Coast: Not a current problem.

American Samoa: Weather records indicate that a severe tropical storm or hurricane hits somewhere in the Samoan island chain every three years on average, causing extensive erosion. A predicted rise in sea level due to global warming would increase erosion problems.

[graphic]
Hawaii: Minor problem. Hurricane storm waves, tsunamis and coastal subsidence are known to cause erosion problems.

Guam: No information, but typhoons are frequent and likely to cause beach erosion.

Republic of Palau: Occasional storm erosion occurs, and this is a distinct problem at Helen Island.

CNMI: Not thought to be a threat to turtle populations, but typhoons are frequent and likely to cause beach erosion.

FSM: Likely a problem, although severe tropical storms and typhoons are common for this region. Seasonal changes in wind

direction (which occur towards the end of the main nesting season – late July/early August) cause erosion. Only one nest on Olimarao and no nests on Gielop Island were jeopardized by shifting shoreline sands. Yap State's low coralline atolls are extremely vulnerable to rises in sea levels and will be adversely affected if hypothesized rises occur. Some erosion of nesting beaches at Oroluk was reported in 1990 after passage of Typhoon Owen.

RMI: Moderate problem. Shoreline erosion occurs naturally on many islands in the atolls of the Marshalls due to storms, sea level rise from ENSO's (El Nino – Southern Oscillation) and currents. On the outer atolls, erosion has been aggravated by airfield and dock development, and by urban development on Majuro and Kwajalein Atolls.

Unincorporated: This is a problem at Palmyra Atoll.

6. Artificial Lighting

Hatchling sea turtles orient to the sea using a sophisticated suite of cues primarily associated with ambient light levels. Hatchlings become disoriented and misdirected in the presence of artificial lights behind (landward of) their hatching site. These lights cause the hatchlings to orient inland, whereupon they fall prey to predators, are crushed by passing cars, or die of exhaustion or exposure in the morning sun. Nesting adults are also sensitive to light and can become disoriented after nesting, heading inland and then dying in the heat of the next morning, far from the sea. Security and street lights, restaurant, hotel and other commercial lights, recreational lights (e.g., sports arenas), and village lights, especially mercury vapor, misdirect hatchlings by the thousands throughout the Pacific every year. (see Recovery – Sections 1.1.2,1.1.4)

U.S. West Coast: Not a current problem.

American Samoa: Possibly a problem in coastal villages, although there are no documented cases of disoriented turtle hatchlings.

Hawaii: Not a current problem for green turtles at remote NWHIs, but possibly a problem on the MHI group.

Guam: A problem with unknown impact.

[graphic]
Republic of Palau: Recently in 1994, the village of Melekeok (Melekeok State) reported that green turtle hatchlings were attracted into lighted houses and to street lights (M. Guilbeaux pers. comm.). Campfires and houselights are a problem at Angaur, Peleliu, Kayangel and the Southwest Island beaches.

CNMI: High potential as a future problem in Rota where resort development is flourishing. Presently not a problem on Tinian, but there is a potential problem as development continues. Most houses and hotels adjacent to the lagoon area of Saipan usually have some form of beach lighting. The Division of Fish and Wildlife routinely reviews all major development projects adjacent to beach fronts through the Coastal Zone Management permitting process. A permitting condition restricts the orientation of night lights onto the lagoon beach area, and most establishments comply with this.

FSM: Not a current problem. Only two islands within two separate atolls (Falalop Ulithi and Falalop Woleai) have electricity. These islands are not known to have significant numbers of nesting turtles. Light beacons for ships have been placed on two of the small uninhabited islands (Woleai, Ulithi Atoll), but the impact on hatchling orientation is unknown.

RMI: Portions of Majuro and Kwajalein are lighted, but the impact is unknown.

Unincorporated: Not a current problem.

7. Beach Mining

Sand and coral rubble are removed from beaches for construction or landscaping purposes. The extraction of sand from beaches

destabilizes the coastline (e.g., reduces protection from storms), removes beach vegetation through extraction or flooding and, in severe cases, eliminates the beach completely. When mining occurs on or behind a nesting beach, the result can be the degradation or complete loss of the rookery. In addition, females can become confused when they emerge from the sea only to find themselves heading down slope into a depression formed by mining activities; too often the outcome is that the female returns to the sea without laying her eggs. Even when eggs are successfully deposited, reduced hatch success results if nests are flooded or excavated during mining. (see Recovery – Section 1.2.2)

U.S. West Coast: Not a current problem.

American Samoa: Despite educational attempts and enactment of protective laws, the tradition of removing sand and coral rubble from shorelines continues at a surprisingly high rate (100 cubic yards/week) for a small island with limited beaches. However, the impact to turtles is probably not significant because affected beaches are usually along the island roadway, and most of these beaches are too narrow (due to road placement) to be suitable for turtle nesting. In some areas, shoreline erosion, exacerbated by beach mining, jeopardizes the island highway.

Hawaii: Not a current problem.

Guam: No information.

Marinas Islands Military Training Plan [GU,AK,AS,HI]: Environmental Impact ... (Google Books)

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undeveloped land exist in the northern and southern regions, while the built environment tends to dominate the visual setting in urban and suburban areas in the central part of the island. Steep cliffs edge the northern half of the island, while mountains and hills serve as backdrop to the central and southern areas.

Tinian's built environment is sparse and is concentrated in the southwestern portion of the island. In most areas, the visual setting consists of fields and wooded areas covering the relatively gentle topography. Small beaches occur intermittently around the island, and several ridges provide a backdrop to many views. Tinian's most notable physical attraction is a blowhole on the northeast coast.

On Rota, beaches line the northern coast of the island, and coral reefs can be found just off shore on the southwestern coast. Steep cliffs define the southern coast while gentle hills connect the southern plateau, known as the Sabana, to the northern plateau. Much of Rota is covered with vegetation and rural/agricultural land. Except for a few towns, the airport, and the increasing resort development in the northern region, very little urbanization has occurred. Most of Rota's built environment is concentrated in Songsong Village on the narrow isthmus connecting Mount Taipingot to the rest of the island.

The outline of FDM is defined by steep cliffs that drop off into the ocean. The base area of these cliffs have eroded in several places leaving behind large caverns. The northern half of the island is relatively flat and covered with vegetation. The southern portion is rocky with some vegetation. FDM has few beach areas and is completely undeveloped.

3.2.7 Natural Hazards and Constraints

The primary natural hazards are typhoons and earthquakes. The Marianas are in a typhoon belt and are frequently subjected to the powerful winds and heavy rains that characterize these storms. The typhoons are most common during the rainy season, with high winds in excess of 39 km per hour extending out more than 160 km from the center of a storm.

The Marianas are also located in a seismically active area. The nearby Mariana Trench is a low point in the ocean floor where two sections of the ocean floor collide and one slides beneath the other, causing periodic earthquakes. Earthquakes of low magnitude occur throughout the year.

3.3 BIOLOGICAL ENVIRONMENT OF THE MARIANA ISLANDS

Several endangered species and their primary habitats occur in the Mariana Islands at or near the proposed training sites. Native species of concern on the islands of Guam, Tinian, and Rota include several endangered birds, an endangered bat, threatened and endangered sea turtles, and endangered plants. There are no designated critical habitat areas in the Mariana Islands. Primary habitats for these endangered species include wetlands, native limestone forests, coral reefs, and beaches. In some cases, primary habitat for an endangered species may occur on more than one island, since some species occasionally migrate or recruit between islands.

The major terrestrial habitat types common to the Mariana Islands include limestone and ravine forests, secondary growth forest, savanna, tangantangan stands, open weedy areas, wetlands, and

strand Vegetation. The major marine habitat types include shoreline and strand vegetation, beaches, coral reef, and benthic communities.

historical poaching pressure, the loss and modification of habitat, noise disturbance, and predation, all of which have resulted in mortality, decreased nesting success, and reduced reproductive success. The greatest threat to terrestrial endangered species on the Mariana Islands is the brown tree snake (BTS) (Boiga irregularis). The BTS has reached very high densities on Guam and caused the population declIne and, in some cases, extinction of many of Guam's birds, lizards, and bats.

An overview of biological resources of the islands of Guam, Tinian, Rota, and FDM is given below. Appendix C contains maps of sensitive habitat areas on the islands of Guam, Tinian, and Rota and

3.3.1 Guam

3.3.1.1 Habitat

Today only 38 percent of Guam is forested. Much of the limestone forest acreage has been reduced by a Variety of human and natural influences and converted to brush and grassland. Erosion is now a major problem in some areas.9 A long history of island settlement, combined with more recent urbanization, fire, agricultural development, and the impacts of World War II, have all contributed to the alteration of Guam's forests, so they now contain Various proportions of introduced species, mostly naturalized cultivars. The most suitable habitats for native fauna are native limestone and ravine forests. Wetlands also provide Important habitat for native and migratory bird species. More disturbed areas, such as tangantangan stands or weedy fields, are less suitable

as habitat for native fauna.

Limestone forests occur most frequently on the limestone plateau of northern Guam, which includes AAFB, Andersen South, the two NCTAMS sites, and the limestone of Orote Point.

[graphic]
9The Guam EPA developed the Guam Soil Erosion and Sedimentation Control Manual in 1986, and is currently spending $750,000 on erosion control in the NAVACTS Ordnance Annex, in part to prevent the siltation of

Fena Reservoir.

[graphic]

Relatively well preserved and pristine native limestone forest growth occurs at AAFB and Orote Point; it contains 27 endemic and seven rare plant species,‘° including the last individual fire tree on Guam (Serianthes nelsonii) at Ritidian Point. Limestone forest is an important refuge for endangered birds and bats (see Section 3.3.1.3). Southern Guam also contains areas of limited ravine forest and extensive open grasslands (savanna).

The dominant introduced weedy species is tangantangan (Leucaena leucocephala), which is rumored to have been seeded from the air to revegetate the island after the U.S. invasion during World War II.

Aquatic habitats include rivers, freshwater wetlands, estuarine wetlands, and marine waters. Freshwater wetlands offer potential habitat for the endangered Mariana common moorhen (Gallinula chloropus guami) and for non-endangered native and migratory waterbirds. Estuarine wetlands, including mangrove swamps, provide nursery grounds for numerous marine and estuarine animals. The protection they provide is essential to the continued survival of many marine organisms.

Coastal vegetation on Guam includes coastal strand, which borders flat sandy beaches and contains sand-binding herbs and salt-tolerant vegetation. Coastal strand is found at the Waterfront Annex, in a thin band in Apra Harbor near the high tide line. Deep, sandy beaches (important for the successful nesting of sea turtles) are located at Ritidian Point, in the Marine Resources Preserve

Shoreline at AAFB, and in Apra Harbor. The shallow coastal areas, reefs, and lagoons in these areas are frequented by sea turtles.

Conservation areas include the Guam National Wildlife Refuge areas at Ritidian Point, NCTAMS Finegayan, AAFB, Apra Harbor, and the Ordnance Annex; the Anao, Cotal, Bolanos, and proposed Falcona Beach Conservation Areas; and the Haputo and Orote Ecological Reserve Areas (ERAS)

3.3.1.2 Marine Environment

Approximately 220 Species of marine benthic algae, three species of seagrasses, 267 species of stoney corals, and 800 fishes inhabit the coastal waters of Guam.H Coral reef surrounds at least three-quarters of the island, including several areas in the Waterfront Annex vicinity.

3.3.1.3 Rare, Threatened, and Endangered Species

Currently, three plant, three mammal, ten reptile, four invertebrates, and 18 bird species are listed as threatened or endangered by the federal and Guam territorial governments, although some of these are extinct on Guam (see Table G2 in Appendix C). These threatened and endangered species have benefitted from inhabitating military land which indirectly serves as a wildlife preserve because it has remained relatively undeveloped and has restricted access.

The three plant species listed as endangered on Guam are the fire tree (Serianthes nelsonii), the ufa tree (Heritiera Iongipetiolata), and the tree fern (Cyanthea lunulata).

[graphic][merged small]
II – U – . . . . Report No. 73'Nemty of Guam Mame Laboralory (1981) A Working List of Marine OrganIsms from Guam. Technical

JANUARY 1997

[graphic][graphic][graphic]
[graphic][merged small]
DRAFT ENVIRONMENTAL IMPACT STATEMENT
MILITARY TRAINING IN THE MARIANAs

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The only known adult endangered fire tree is found in the limestone forest at AAFB. Threats to the survival of this tree include typhoons, herbivory by feral ungulates, insect infestations, loss of genetic diversity, wildland fires, and damage from other wildlife.12 A recovery program is currently in effect for this species. The ufa plant is a rare endemic limestone forest plant, also found at AAFB

and Orote Point. Drypetese dolichocarpa, another rare plant, has only eight individuals remaining, all at AAFB.

Guam has or had two endangered bat species and one bat that is a species of concern (SOC). The endangered little Mariana fruit bat (Pteropus tokudae) and the SOC sheath-tailed bat (Emballonura semicaudata) have not been sighted in approximately 20 years and are thought to be extinct on the island. If any colonies of these bats exist on Guam, it is likely that they would be in the limestone forest areas of the NAVACTS Ordnance Annex.'3

The remaining extant species, the endangered Mariana fruit bat (Pteropus mariannus), number fewer than 400 individuals. Most of these bats aggregate at a roost site on Pati Point." Other smaller roosts have been recorded in recent years along the northern cliffline between Ritidian and Pati Points. A small number of bats (IO-25 individuals) occur in the Ordnance Annex, foraging at night between Mount Almagosa and East Tower. The preferred habitats for the bat include inaccessible cliffline and native limestone and ravine forests.15 They are extremely sensitive to human disturbance and have been known to abandon their roosts at the slightest interference. Two of the most important reasons for the decline of these fruit bats have been poaching and predation by the BTS. Fruit bats are considered a gastronomic delicacy by the Chamorros, and although these bats are protected by law, illegal poaching still occurs. A 1991 poaching event at the last remaining bat roost on Guam reduced the population by 30 percent.16 BTS are capable of preying on young bats, which are particularly vulnerable to predation because they are not yet able to fly and are too large to be carried by their mothers during nighttime foraging." Several snakes have been captured or seen within 100 m of the colony at Pati Point.

Endangered and threatened reptile species on Guam include two sea turtles, three geckos, and five skinks (see Table C-2). Threatened green sea turtles use the beaches at the Waterfront Annex and AAFB for nesting. The green sea turtle nesting season is generally April through August. The hawksbill sea turtle nests only sporadically in Guam, between the months of May and October.'a Currently, the primary threat to green sea turtles is habitat destruction, followed by poaching and

[graphic]
"USFWS and USAF with Guam DAWR (November 1995) Integrated Natural Resources Management Plan for Andersen Air Force Base, Guam.

13Personal communication with Gary Wiles, Guam DAWR, May 16, 1996.

I'Wiles, et al. (1995) The status and distribution of endangered animals and plants in northern Guam. Micronesia 28:31-49.

“BioSystems Analysis, Inc. (September 1990) Natural Resources Management Plan: Naval Station, Guam. Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command.

‘°UsFws and UsAF with Guam DAwR (November 1995).
17Gary Wiles, DAWR (November 1990) Mariana Fruit Bat and Little Mariana Fruit Bat Recovery Plan.

“Karen L. Eckert, Ph.D. (September 1991) The Biology and Population Status of Marine Turtles in the North Pacific Ocean.

[graphic]
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OVERVIEW OF AFFECTED ENVIRONMENT

nest predation by feral dogs and pigs. AAFB beaches and offshore areas have been protected from large scale development and human activity. Current management programs include law enforcement, population surveys, tagging, and nesting studies. In the Ordnance Annex, the Pacific slender-toed geckos (Nactus pelagicus) and moth skink (Lipinia noctua) have been recently located by the National Biological Survey (NBS) and the USFWS.19 Both occur in substantial numbers (5002000/ha). The same survey also located the endangered Mariana Islands fragile tree snail (Samoana fragilis), threatened Pacific tree snail (Partula radiolata), and the Marianas euploea butterfly, a candidate for federal listing.

The avifauna of Guam once included many native forest birds, waterbirds, seabirds, and numerous migrant species. Today, however, many of the native birds are experiencing severe population declines due to both human activities, such as habitat destruction, and brown tree snake predation. Native birds listed by the territory as endangered are the rufous fantail (Rhipidura rufifrons), Mariana fruit-dove (PtI’linopus roseicapilla), cardinial honeyeater (Myzomela rubrata saffordI), Micronesian starling (Aplonis opacus guami), white-throated ground-dove (Gallicolumba x. Xanthonura), wedge-tailed shearwater (Puffinus pacificus), and white-browed crake (Porzana cinerea). All of these species are presumed to be extinct on Guam with the exception of the Micronesian starling, which is found on AAFB in the southeastern section near the base housing, and is also found in the Anao Conservation Area to the south.

Federally listed endangered native birds presumed to be extinct on Guam include the bridled white-eye (Zosterops conspicillatus conspicillatus), Micronesian megapode (Megapodius laperous), Guam broadbill (Myiagra freycinetr), nightingale red-Warbler (Acrocephalus luscinia), and Mariana mallard (Anas oustaletI). The Micronesian kingfisher (Halcyon cinnamomina) and Guam rail (Rallus owstonI) are probably extirpated from the wild but are the subject of captive breeding programs.’0

Federally listed native birds still known to occur on the island are the endangered Mariana crow (Corvus kubaryl), island swiftlet (Aerodramus vanikorensis bartschr), and Mariana common moorhen. The endemic Mariana crow is estimated to have a current population of 540 individuals restricted in distribution to AAFB, mostly occurring in the northern cliffline forests.21 The island swiftlet occupies limestone caves in the NAVACTS Ordnance Annex, located northeast of Fena Reservoir near the Bonya River and the Maemong River drainage area. The Mahlac Cave harbors

tlkrle mlostdsizgnificant colony of swiftlets on Guam. Approximately 300-350 individuals remain on t e is an .

The complex of marshes, ponds, and mangrove swamps near the entrance to Apra Harbor provides breedrng, nestIng, and foragIng habitat for the Mariana common moorhen, the only remaining wetland-dependent, non-migratory bird species on Guam. No moorhens are found on the Atantano

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USFWS (July 1996) final Report: The Effects of Aircraft Overflights on Endangered Mariana Crows and

Mariana Fruit Bats at Andersen Air Force Base, Guam. Prepared for Department of the Navy, Pacific Division, Naval FacIlItIes Engineering Command.

Mariana Islands Range Complex: Environmental Impact Statement, Volume 1 (Google Books)

OCTOBER 6, 2019 ~ LEAVE A COMMENT

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TERRESTRIAL SPECIES AND HABITATS

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Sgecies Description and Regulatogy Status. The Guam Micronesian kingfisher, known as "sihek" in Chamorro, is a sexually dimorphic forest kingfisher in the family Alcedinidae (Baker, 1951). The adult male has a cinnamon-brown head, neck, upper back, and under parts. The lower back, lesser and underwing coverts, and scapular feathers are greenish-blue and the tail is blue. The feet and iris of the eye are brown and the bill is black except for some white at the base of the lower mandible. The female resembles the adult male, but the upper breast, chin, and throat are paler and the remaining underparts and underwing lining are white instead of cinnamon. Males weigh between 1.8 to 2.3 oz (51 and 64 gm) and females weigh between 2.0 to 2.7 oz (58 and 76 gm) (Baker, 1951; Jenkins, 1983).

The Guam Micronesian kingfisher was listed as endangered on August 27, 1984 (49 FR 33881 — 33885). On October 28, 2004,

approximately 376 acres (152 hectares) were designated as critical habitat for the Guam Micronesian kingfisher on Guam (69 FR 629446). All critical habitat for this subspecies is found on the fee simple portion of the Guam National Wildlife Refuge.

Life Histogy and Ecology. Guam Micronesian kingfishers feed both on invertebrates and small vertebrates, including insects, segmented worms, hermit crabs, skinks, geckoes, and possibly other small vertebrates (Baker, 1951; Jenkins, 1983). This species typically forage by perching motionless on exposed perches and swooping down to capture prey on the ground (Jenkins, 1983). Guam kingfishers also will capture prey from foliage and were observed gleaning insects from tree bark (Maben, 1982).

This subspecies nests in cavities, and breeding activity appears to be concentrated from December to July (Baker, 1951; Jenkins, 1983). Nests are reported in a variety of trees, including Ficus spp., Cocos nucifera, Artocarpus spp., Pisonia grandis, and Tristiropsis obtusangula (Baker, 1951; Jenkins, 1983). Pairs may excavate their own nests in sofl trees, arboreal terrnitaria (the nests of termites [Nasutitermes spp.]), arboreal fern root masses, or they may utilize available natural cavities such as broken tree limbs (Jenkins, 1983). Jenkins (1983) observed that some excavated cavities were never used as nesting sites, which suggests that the process of excavating nest sites may be important in pair-bond formation and maintenance.

Both male and female Guam Micronesian kingfishers incubate eggs and brood and feed nestlings (Jenkins, 1983). Clutch sizes from wild populations (n = 3) were either one or two eggs (Baker, 1951; Jenkins, 1983) and clutch sizes of one to three eggs are reported in the captive population (Bahner et al., 1998). Incubation, nestling, and fledgling periods for populations of Guam Micronesian kingfishers in the wild are unknown. However, incubation and nesting periods of captive birds averaged 22 and 33 days, respectively (Bahner et al., 1998).

Jenkins (1983) reported that the Guam Micronesian kingfishers nest and feed primarily in mature, secondary growth, and, to a lesser degree, in scrub limestone forest. It is also found in coastal strand vegetation containing coconut palm as well as riparian habitat. However, Jenkins (1983) reported that it was probably most common along the edges of mature limestone forest. Few data exist about specific kingfisher nest sites in the wild, but in one study in northern Guam l6 nest sites were correlated with closed canopy cover and dense understory vegetation. In this study, nest cavities were excavated in the soft, decaying wood of large, standing dead trees averaging 17 in. (43 cm) in diameter. Research on the Pohnpei Micronesian kingfisher indicates an area of approximately 20 to 25 acres (8 to 10 hectares) of mixed forest, and open area may be needed to support a pair of kingfishers. It should be noted that Micronesian kingfisher territories may differ from Pohnpei Micronesian kingfisher territories due to differences in forest structure on Guam and Pohnpei (MueIler-Dombois and Fosberg, I998).

[graphic]
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Population Status and Distribution. This subspecies of Halcyon cinnamomina is endemic to Guam. The other two subspecies occur on the islands of Pohnpei (Halcyon cinnamomina reichenbachii) and Palau (Halcyon cinnamomina pelwensis). The Guam Micronesian kingfisher was considered “fairly common” and occurred throughout forested areas on Guam in 1945 (Baker, 1951). Populations in southern and central Guam disappeared by the 1980s (Jenkins, 1983) and only 3,023 individuals were recorded in 1981 in northern Guam (Craig, 1994). This population subsequently declined rapidly, and by 1985 only 30 individuals were recorded on Guam. This subspecies was believed extirpated in the wild by 1988 (Wiles et al., 2003).

Between 1984 and 1986, 29 Guam Micronesian kingfishers were captured and sent to zoological institutions in the mainland Unites States (Hutchins et al., 1996). As of December 2005, the captive population included 79 individuals in 12 captive breeding institutions (Smithsonian National Zoological Park, 2007).

The Guam Micronesian kingfisher is currently found only in captivity and is not found in the MIRC Study Area. However, habitat required to support the recovery of the species is located within the Study Area. As stated in the “Population Status and Distribution” section above, Guam Micronesian kingfishers are believed to utilize mature limestone forest, secondary forests, and coastal forests dominated by coconut trees for foraging and nesting. Unfortunately, a detailed assessment of the available Guam Micronesian kingfisher habitat on Guam is not complete. However, Donnegan et a1. (2004) completed a vegetation survey of Guam that classifies the vegetation into general categories. Of these categories, limestone forest and plantation forest contain components that Guam Micronesian kingfishers utilize for nesting and may be potential breeding habitat for this species. In 2002, the USFWS identified

approximately 14,338 acres (5,803 hectares) in northern Guam as essential habitat for the Guam Micronesian kingfisher (USFWS, 2004a). Utilizing the recent vegetation assessment (Donnegan et al., 2004), it is estimated that approximately 12,026 acres (4,867 hectares) of potential Guam Micronesian kingfisher breeding habitat is located within these essential habitat areas. Approximately 9,508 acres (3,848 hectares) of this habitat are located on Andersen AFB.

Threats. The primary threats to the Guam Micronesian kingfisher are habitat destruction and modification, predation by brown tree snakes, and limited population growth in the captive population (USFWS, 2004a).

3.11.2.2.9 Megapodlus Iaperous (Micronesian megapode. 535809?" I 33531193')

Species Description and Regulatog Status. The Micronesian megapode, known as the "sasangat" in Chamorro and "sasangaf' in Carolinian, is a member of Family Megapodiiadae within Order Galliforrnes. Micronesian megapodes are pigeon-sized, ground dwelling birds inhabiting primarily forest floors, but are capable of inter-island flying (DoN, 2003a). The megapode weighs approximately 12.3 oz (350 gm) (USFWS, 1998b), has dark gray-brown to black plumage, and a gray head with a slightly darker, short, rough chest. The flight and tail feathers are gray-black. Feathers around the eye, ear, and throat are sparse or absent, revealing red skin and a red gular skin patch when the neck is extended. The bill is yellow with the upper mandible clove-brown to black at the base, and the iris is orange-brown to dark brown (Baker, 1951).

The Micronesian megapode was first listed as endangered in 1970 in the Northern Mariana Islands (under the Endangered Species Conservation Act, 35 FR 8491 — 8498); 'he Species IS not listed on Guam due to prior extirpation on the island. No critical habitat is designated for this species. On April 29, 2008, the USFWS initiated a 5-year status review to evaluate the regulatory status of this species based on recent species information (73 FR 23264 – 23266).

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Life Histog and Ecology. Megapodes are generally associated with forest habitats; however, the breeding population on FDM and other islands suggests that megapodes may be less dependent on forested areas as previously thought. Megapodes primarily select nest sites in sun-warmed cinder fields on volcanic islands and exposed limestone flats, but may nest in roots of rotting trees, logs, and in patches of rotting sword grass.

The breeding season for Micronesian megapodes is reported on Saipan to begin in November and last through December, although the season may be year round. Megapodes are considered "incubator" birds because they rely on external energy sources, such as solar heat, volcanic activity, or heat produced from microbial decomposition of organic matter as heat sources for incubation (Clark, 1964).

Multiple eggs are laid singly in a breeding season, each egg laid after an interval of approximately one week. Each egg measures approximately 3 in. by 2 in. (70 mm by 44 mm). Chicks emerge from nests super-precocial and able to function (and fly) independent of the parent birds (U SFWS, 1998b).

Pogulation Status and Distribution. Small remnant populations are known to exist on the southern Mariana Islands of Aguijan, Tinian, Saipan, and FDM; larger populations are reported on uninhabited northern islands of Anatahan, Guguan, Sarigan, Lamagan, Pagan, Ascuncion, Maug, and possibly Agrihan (USFWS, 1998b). The total number of individual birds is thought to range from 1,440 to 1,975.

On Guam and Rota, megapodes were probably extirpated before the arrival of the brown tree snakes to Guam, as they were reported as "very rare" by early European naturalists (USFWS, 1998b), but one or two were collected in the late 1890s on Guam and one on Rota. Saipan is believed to support a population less than 100 individuals (DoN, 2004).

On Tinian, megapode detections have never been numerous (O'Daniel and Kreuger, I999). Megapodes have been sighted on Tinian within forested portions of the Maga area (to the northeast of the Voice of America Relay Station (Witteman, 2001), a small section of native forest adjacent to Cross Island Road in the Bateha area (O'Daniel and Kreuger, 1999) and the Mount Lasso area south of the overlook on the ridgeline (O'Daniel and Kreuger, 1999). NAVFACPAC biologists conduct monthly monitoring surveys through native forest habitats on Navy-leased lands. Seven transects are surveyed monthly for forest birds (including megapodes), and more intensive surveys (point counts using megapode call playbacks following Witteman's methods [2001]) along the transects were conducted in August 2005 and February 2006. Because of past detection of megapodes along the Maga transect, (shown on Figure 3.1 1-8) focused "sweep" surveys are conducted in conjunction with playback call recordings. Since 1995, biologists have detected 13 megapodes on Tinian during 234 individual survey efforts (NAVFACPAC, 2008c). Because some of these detections may be repeat observations of the same bird, it is not possible to determine a population size for Tinian. Occasional sightings of megapodes suggest fairly regular but occasiond movement from Aguigan. Aguigan is known to have a small population of megapodes: 16 birds were heard during forest bird point-count surveys in 2002, 12 in 2000, II in 1992 (CNMI DFW, 2003).

Surveys on FDM in 1996 documented the presence of the Micronesian megapode (Lusk er al. 2000). From this survey, it was estimated that a population of 10 megapodes were on FDM (Lusk and Kessler I996, USFWS, 1998). However, due to an incoming typhoon, biologists were only on the island for about 5.5 hours, so this estimate was based on limited data. FDM was surveyed more thoroughly in December 2007 by NAVFACPAC biologists, which provided an estimate of 21 adult pairs (NAVFACPAC, 2008a). Results of the most recent surveys on FDM are shown in Figure 3.11-9). Mitigation measures specified in previous Section 7 ESA consultations between the Navy and USFWS coupled with the restricted access preventing poaching activities may have benefited megapodes on FDM. The mitigation measures included maintaining a no fire zone on the northern portion of the island and the use of inert ordnance in an area south of the no fire zone (explosive ordnance is deployed to the south of this area).

[graphic]
Threats. Threats to Micronesian megapodes include poaching, invasive species predation (such as monitor lizards, feral dogs, cats, and pigs, and various species of rats), introductions of brown tree snakes from Guam, competition from introduced game birds and feral chickens (USFWS, 1998b), and the diseases associated with introduced species. Other threats include volcanic activity (such as Anatahan island eruptions), typhoons, and drought. Although these threats to megapodes are largely absent on FDM, direct mortality from live-fire activities limits megapode success on FDM. Although the stunted woody vegetation of FDM and lack of tall stature forests does not represent ideal habitat for megapodes, a lack of people appears to be enough for higher megapode numbers regardless of habitat type. Hunting pressure and egg harvesting may affect megapode success (presence and density) more than previously thought on other inhabited or accessible islands. Islands with higher densities (Sarigan, Guguan and now FDM) are those islands that have not been inhabited in the last 50 years or so (CNMI DFW, 2000 [Technical Reports #3-8]). As vegetation continues to recover and provide habitat for megapodes on the northern portion of FDM and within the inert ordnance area, the vegetation may increase potential for wildland fires in occupied megapode habitat areas by increasing the fuel load.

3.11.2.2.10 Rallus owstoni (Guam rail, Ko'ko)

Species Description and Regulatogy Status. The Guam rail, known as "koko" in Chamorro, is a flightless rail in the family Rallidae. Males and females look outwardly similar but, on average, females (8 oz [212 gm]) weigh less than males (9 oz [241 gm]; Jenkins, 1983). The head, neck, and eye stripe of the Guam rail are brown and the eyebrow, lower neck, and upper breast are grey. Their lower breast, abdomen, under tail coverts, and tail are blackish with white barrings. Their legs, feet, and iris are brown and their bill is gray. The Guam rail was listed as endangered in 1984 (USFWS, 1984).

Life Histog and Ecology. Guam rails are territorial ground nesters that breed year-round (Jenkins, 1983, USFWS, 1990a); however, peak breeding may occur during the rainy season (July through November; Perez, 1968). Clutches typically consist of three to four eggs and broods range from one to four chicks. Guam rails are omnivorous but appear to prefer animal matter over vegetable foods. They are known to eat gastropods, skinks and geckos, insects, carrion, seeds, and palm leaves (USFWS, 1990a). This species is primarily believed to prefer secondary vegetation although it was found in all habitats except wetlands, although savanna and mature forest may be marginal habitats (Jenkins, 1983; USFWS, 1990a).

Population Status and Distribution. The Guam rail is endemic to Guam. This species was once distributed throughout Guam but by

1981 a population of approximately 2,300 birds existed in northern Guam (Craig, 1994; USFWS, 1990a). In 1983, it was estimated that fewer than 100 individuals remained and it was considered extinct in the wild by 1987 (Witteman et al.. 1990). AS of 2003, 129 individuals are found in captivity in zoological institutions and GovGuam DAWR captive propagation facilities (USFWS, 2006a). Efforts to establish an experimental population on the island of Rota have been underway since 1989 (Beuprez and Brock, 1999a). The current population on Rota is estimated to be approximately 40 to 70 individuals (USFWS, 2006b).

Threats. The primary threats to the Guam rail are predation by brown tree snakes and feral cats (USFWS, 1984; 1990a). Predation by brown tree snakes is believed to be the primary factor in the decline of the species on Guam, and high snake populations on Guam still threaten recovery efforts. However, feral cat predation is found to be a major obstacle to efforts to establish an experimental population on Rota and re-establish a population on Guam (Beauprez and Brock, 1999a; 1999b).

[graphic]
TERRESTRIAL srecnzs AND HABITATS 3-‘ 1-45

Species Description and Regulatogy Status. The Rota bridled white-eye is a passerine forest bird endemic to Rota. Its plumage is mostly yellow, and its bill, legs, and feet are yellowish-orange (Pratt er al., 1987). Wing, tail, and tarsal lengths taken from 21 adult birds averaged 2.2 in. (5.6 cm), 1.5 in. (3.8 cm), and l in. (2.6 cm), respectively (USFWS, 2006b). Average weights taken from these birds were 0.34 oz (9.7 gm) for males and 0.32 oz (9.2 gm) for females.

The Rota bridled white-eye was listed as endangered on January 22, 2004 (69 FR 3022 – 3029), and because it is endemic to the island of Rota, its listing is specific to the island. On April 29, 2008, the USFWS initiated a 5-year status review to evaluate the regulatory status of this species based on recent species information (73 FR 23264 – 23266).

Life Histog and Ecology. Rota bridled white-eye primarily forage in the outer canopy of forests for insects, fruit, or nectar. These forests are divided into the following three types based on dominant canopy tree species: 1) mixed oschal and joga forests (dominated by Hemandr’a Iabyrinthica and Elaeocarpus joga); 2) faniok forest (dominated by Merrilliodendron megacarpum); and 3) sosugi forest (dominated by Acacia confusa, an introduced species). The majority of foraging observations were reported in Elaeocarpus joga, Hernandia Iabyrinthica, Macaranga thompsonii, Merrilliodendron megacarpum, and Premna obtusifolia. Rota bridled white-eye nests are reported in Merrilliodendron megacarpum. Hernandia Iabyrinthica, Elaeocarpus joga, and Acacia confusa trees 10 to 49 ft (3 to 15 m) tall and l to 24 in. (2 to 60 cm) in diameter (USFWS, 2006c).

Breeding was observed between December and August (Amidon et al., 2004). Because this time period covers portions of both the wet season and dry season, the species may breed year-round, similar to the Guam bridled white-eye (Marshall, 1949; Jenkins, 1983). Rota bridled white-eye nests are cup-like and typically suspended between branches and branchlets or leaf petioles (Amidon et al., 2004).

Eggs are light blue, and clutch sizes of one to two eggs were observed (Amidon et al., 2004), although clutch sizes of three eggs are possible based on observed clutch sizes for bridled white-eyes on Guam, Tinian, and Saipan (USFWS, 2006c). Incubation times range from 10 to 12 days, followed by 10 to 14 days before hatchlings fledge. The post-fledging parental attendance period is unknown, but observations of one banded nestling indicate it is at least 8 days (Amidon et al., 2004).

Population Status and Distribution. The Rota bridled white-eye is endemic to Rota. Currently, the species is primarily restricted to mature forests above 490 ft (150 m) in the Sabana region of Rota. As of August 1999, the population on Rota numbered approximately 1,000 individual birds and the species’ core range consisted of 682 acres (254 hectares) (USFWS, 2006c).

Threats. Current threats include habitat loss and degradation, predation by introduced rats and black drongos (Dicrurus macrocercus), and susceptibility of the single small population to random catastrophic events, such as typhoons. In addition, potential establishment of a new predator, such as the brown tree snake or avian diseases, such as West Nile virus, also threaten recovery of the species.

3.11.2.2.12 Pteropus mariannus mariannus (Mariana fruit bat, Fanihi l Payesyes, Pai’ scheei)

Species Description and Regulatogy Status. The Mariana fruit hat or flying fox, known as “fanihi” in Chamorro and “Pyesyes” or “Pai’ scheei” in Carolinian, is a medium-sized fruit bat in the Family Pteropodidae that weighs 0.66 to 1.15 lb (0.33 to 0.58 kg). Males are slightly larger than females. The underside (abdomen) is black to brown with gray hair interspersed that creates a grizzled appearance. The shoulders (mantle) and sides of the neck are bright golden brown, but may be paler in some individuals. The head varies from brown to dark brown. The well-formed, rounded ears and large eyes give the face a canine appearance.

[graphic]

The Guam population of the Mariana fruit bat was listed as endangered on August 27, 1984 (49 FR 33881 — 33885). However, in 2005 the subspecies was listed as threatened throughout the Mariana Islands and downlisted to threatened on Guam (70 FR 1 190 – 1210). On October 28, 2004, approximately 376 acres (152 hectares) were designated as critical habitat for the Mariana fruit bat on Guam (69 FR 629446). All critical habitat for the species is found on the fee simple portion of the Guam National Wildlife Refuge.

Life Histog and Ecology. During the day, Mariana fruit bat roosts in colonies of a few to over 800 animals (Wiles, 1987a; Pierson er al., 1996; Worthington and Taisacan, 1995a), as well as in non-colonial roost sites. Bats are typically grouped into harems (one male and two to 15 females) or bachelor groups (predominantly males); some single males reside at the colony’s periphery (Wiles, 1987a). On Guam, the average estimated sex ratio in one colony varied from 37.5 to 72.7 males per 100 females (Wiles, 1982). A smaller number of bats roost solitarily away from the colony (Wiles et al., 1989; Janeke, 2006). Reproduction in Mariana fruit bats was observed year-round on Guam (Perez, 1972; Wiles, 1983) and on Rota; individual females have a single offspring each year (Pierson et al., 1996). Wiles (1987a) found no apparent peak in births on Guam, but a peak may occur in May and June on Rota. Glass and Taisacan (1988) suggested a similar pattern on Rota, but also indicated that a peak birthing season may occur during May and June. Although specific data for the Mariana fruit bat are lacking, female bats of the family Pteropodidae have one offspring per year, generally are not sexually mature until at least 18 months of age, and have a gestation period of four to six months (Pierson et al., 1996; Mcllwee and Martin, 2002). The average lifespan of this species is unknown; the longevity of a similar species in Australia is 4 to 5 years, with a maximum of eight years (Vardon and Tidemann, 2000).

Colonial roost sites are an important aspect of the Mariana fruit bat’s biology because they are used for

sleeping, grooming, breeding, and intra-specific interactions (USFWS, 1990b). Published reports of roost

sites on Guam indicate these sites occur in mature limestone forest and are found within 328 it (100 m) of

262 to 59l-ft (80- to 180-m) tall clifflines (USFWS, 1990b). Native forest habitat is also an important

aspect of fruit bat biology as it is also used for roosting, feeding, etc. by non-colonial bats. On Guam,

Mariana fruit bats prefer to roost-mature Ficus spp. and Mammea odorata trees but will also roost in other tree species such as Casuarina equisetifolia, Macaranga thompsonii, Guertarda speciosa, and Neisosperma oppositifolia (Wheeler and Aguon, 1978’, Wiles, 1981; 1982b). On other islands in the Mariana archipelago, Mariana fruit bats were observed in secondary forest and Casuarina equisetifolia groves (Glass and Taisacan, 1988-, Worthington and Taisacan, 1995a; Worthington et al., 2001). Factors involved in roost site selection are not clear, but data from Guam indicate that some sites may be selected for their inaccessibility by humans and thus limited human disturbance. Fruit bats will abandon roost sites if disturbed and are reported to move to new locations up to 6 mi (10 km) away (USFWS, 1990b).

Several hours after sunset, bats depart their roost sites to forage for fruit and other native and non-native plant materials such as leaves and nectar (USFWS, 1990a; Janeke, 2006). This species feeds on a variety of plant material but is primarily frugivorous (Wiles and Fujita, 1992). Specifically, Mariana fruit bats forage on the fruit of at least 28 plant species, the flowers of 15 species, and the leaves of two plant species (Wiles and Fujita, 1992). Some plants used for foraging include Artocarpus spp., Carica papaya. Cycas micronesica, Ficus spp., Pandanus tectorius, Cocos nucifera, and Terminalia catappa. Many of these plant species are found in a variety of forested habitats on Guam, including limestone, ravine, coastal, and secondary forests (Stone, 1970; Raulerson and Rinehart, 1991; Janeke, 2007).

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Population Status and Distribution. This subspecies of Preropus mariannus is endemic to the Mariana archipelago, where it is found on most of the 15 major islands. There are no records of fruit bats on Uracas, and fruit bats were observed only once on FDM.

On Guam, the sighting of fruit bats was considered to be “not… uncommon” in the 1920s (USFWS, 2006b). Woodside (1958) reported that in 1958, the Guam population was estimated to number no more than 3,000, although the method used to make this estimate is not known. This estimate had dropped by an order of magnitude to between 200 and 750 animals by 1995 (Wiles er a1., 1995; Wiles, I996). The most recent surveys at Pati Point estimated the bat population at 3040 individuals (USFWS, 2006b). Non-colonial bats roost throughout Northwest Field, Tarague basin, Jinapsan, Guam National Wildlife Refuge lands, NCTS and private lands in northern Guam. In September 2008, an observation of a fruit bat was recorded within the Ordnance Annex (Brooke, 2008). The island-wide population on Guam is likely not to exceed 100 (Brooke, 2007).

The island of Tinian once held a large number of fruit bats; however, by 1979, Wheeler (1980) estimated the population declined to 25-100 individuals. The population continued to decline with fewer than 25 bats remaining in the 1980s (Wiles et al., 1989; Stinson et a1., 1997). By 1994 the status of the fruit bat on the island was uncertain, being rare or extirpated (Stinson et al., 1997). Kreuger and O’Daniel (1999) conducted surveys for Mariana fruit bat on Tinian and recorded two incidental observations, and Navy biologists have recorded fruit bat observations within the MLA (Brooke, 2007).

No known historical records exist to document the status of the Mariana fruit bat prior to the 20th century, although the abundance of bats is mentioned in many writings from early Europeans. Surveys on most or all islands in the archipelago were conducted in 1983 (Wiles 2101., 1989), 2000 (Cruz et 01., 2000a-1), and 2001 (Johnson, 2001). The relatively isolated northern islands support the majority of the fruit bats in the archipelago, but because of their remote location, these islands were not surveyed as frequently as the southern islands (i.e., Saipan, Tinian, Aguijan, and Rota). Individual surveys were conducted on several of the southernmost of these islands at relatively frequent intervals (e.g., Kreuger and O’Daniel, I999; Kessler, 2000; Worthington et 01., 2001). A conservative interpretation of these data indicates a 37 percent decline in fruit bat numbers between 1983 and 2000 among the six northern islands surveyed in both years (USFWS, 2007). The majority of this decline was recorded on two of the three largest northern islands, Anatahan and Pagan, which together harbored roughly 70 percent of the archipelago’s fruit bats in the 1980s (Wiles et a1., 1989).

Threats. The primary threats to the Mariana fruit bat throughout its range are illegal hunting, habitat destruction both by volcanic eruptions and man-made disturbances, (USFWS, 2005b). In addition, predation by the BTS threatens the Mariana fruit bat on Guam (USFWS, 2005b) and is attributed to the absence of Mariana fruit bat juveniles at the Pati Point colony.

3.11.2.3 Designated Critical Habitat

Potential impacts to critical habitat designations on Guam and Rota are also evaluated in this EIS. As shown in Table 311-5, critical habitat has only been designated by the USFWS on Guam and Rota. On Guam, critical habitat has been designated for the Mariana fruit bat, Mariana crow, and Micronesian kingfisher. On Rota, critical habitat has been designated for the Rota bridled white-eye, Mariana fruit bat, and Mariana crow. No other critical habitat designations are in effect on other islands within the MIRC Study Area.

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Table 3.11-5: Critical Habitat Designations in the Mariana Islands for Terrestrial Species

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Rota bridled white-eye

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Nosa luta I

Rota Bridled White-Eye Unit. located in southern Rota containing 3.958 ac (1.602 hectares) of forested land. This area contains forested areas on 3.700 ac (1.498 hectares) of public and 258 ac

[graphic]
(104 hectares) of private lands along the slopes and top of the Sabana plateau. Approximately 62 percent (2.292 acres [928 hectaresl) of the public land within this proposed designation is within the Sabana Conservation Area.

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Spatial extent provided in 50 FR 53589 and GIS files downloaded from USFWS Critical Habitat Portal.

TERRESTRIAL SPECIES AND IIABITATS

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A candidate species is one that is the subject of either a petition to list or status review, and for which the USFWS has determined that listing may be warranted (USFWS and NMFS, 1998). Candidate species receive no statutory protection under the ESA. However, the USFWS encourages the formation of partnerships to conserve these species because they are by definition species that may warrant fiiture protection under the ESA. Four candidate species are addressed in this EIS and include three partulid snail species and one butterfly species.

Hypolimnas octocula mariannensis (Mariana eight-spot butterfly, Ababbang l Libwueibogh)

Species Description and Regulatog Status. The Mariana eight-spot butterfly, known in Chamorro as the “Ababbang” and in Carolinian as “Libwueibogh,” is a nymphalid butterfly species endemic to Guam and Saipan. Like most nymphalid butterflies, orange and black are the primary colors exhibited by this species. Females are larger than males, and appear more orange in color than males, and have black bands across the top margins of both pair of wings. Males are predominantly black with an orange stripe running vertically on each wing. The stripe on the hindwings exhibits small black dots in a vertical row. Large white spots are exhibited across the entire length of the wings (Swezey, 1942).

This species is a Federal candidate for T&E listing (USFWS, 2002), and the candidate status was reaffirmed in 2005 (71 FR 53755 —

53835, USFWS 2005b).

Life Histog and Ecology. The larvae of this species feed on two native herbaceous plants, Procris pedunculata and Elatostema calcareum. These forest fleshy herbs only grow on karst limestone within limestone forests.

Population Status and Distribution. The Mariana eight-spot butterfly was apparently always uncommon on Guam and declined primarily due to browsing of the two host plants by introduced deer. The Mariana eight-spot butterfly is believed to have been extirpated from Saipan, but occurs rarely in Guam's northern forests. During surveys conducted in 1995, areas of Saipan supported healthy populations of the host plants, but no butterflies were observed (Schreiner and Nafus, 1996). Two Mariana eight-spot butterflies were observed in 2006 (Lawrence, 2006) along a rocky pinnacle karst area toward Pati Point, approximately 0.5 mi (0.8 km) from the Aircraft Staging Area (ASA) project area on Andersen AFB. The two butterflies were observed to be aggressively defending an area containing Procris pedunculata and Elatostema calcareum from an individual Euploea spp. butterfly, later identified from similar observations as Euploea eunice hobsonii (Parsons, 2006). The observation of the Mariana eight-spot butterfly and behavior were reported to Andersen AFB and USFWS (Parsons, 2006).

Threats. Threats include habitat degradation and removal, ungulate browse pressure, competition from other introduced butterfly species (such as Euploea eunice hobsonii), disease, predation by ants and wasps, and typhoons.

Partulid Snails

Species Descriptions and Regulatogy Status. Three snails in the Partulid family are collectively known as "Akaleha" in Chamorro—the humped tree snail (Partula gibba), the Guam tree snail (Partula

radiolata), and the fragile tree snail (Samoanafi'agilis). The shell of the humped tree snail is described as somewhat enlarged resembling a hump in a conical shape with four to five whorls. The shell color is chestnut brown to whitish yellow, or occasionally purple with white or brown line along the suture between the whorls on the shell (USFWS, 2005c). The humped tree snail was added to candidate listing in 1994 by USFWS (USFWS, 2005c). The candidate status was reaffirmed in 2005 by USFWS (71 FR 53755 — 53835; USFWS, 2005c).

The shell of a Guam tree snail is described as somewhat oblong and having a conical shape with five whorls. The shell color is pale straw yellow with darker axial rays and brown lines (USFWS, 2005d). The Guam tree snail was added to candidate listing in 1994 by USFWS (USFWS, 2005d). The candidate status was reaffirmed in 2005 by USFWS (71 FR 53755 — 53835, USFWS, 2005d).

The shell of the fragile tree snail has four whorls and the background color of the shell is buff tinted by narrow darker maculations and whitish banding that are derived from internal organs of the animal that are visible through the shell. The fragile tree snail was added to candidate listing in 1994 by USFWS (USFWS, 2005d). The candidate status was reaffirmed in 2005 by USFWS (71 FR 53755 — 53835, USFWS, 2005d).

Life Histogy and Ecology. Like the other Partulid snails, the humped tree snail prefers to live on subcanopy vegetation in lower forest strata and is not found in the high forest canopy. The conditions favorable to Partulid snails are only found in intact limestone forests, mesic coastal strand vegetation, and forested river corridors.

Little is known about the breeding ecology of the Partulid tree snails of the Mariana Islands. Similar Partulid species, however, suggest that tree snails in the Marianas are hermaphroditic, like all other terrestrial pulmonate snails. In general, Partulids begin reproducing in less than 12 months, and may live as long as five years. Up to 18 young are produced each year. While most terrestrial pulmonate snails lay eggs, the Partulids give birth to fully developed young. The snails are generally nocturnal, living on bushes or trees and feeding on decaying plant material.

Population Status and Distribution. The humped tree snail is the most widely distributed tree snail in the Marianas Islands, and is known from Guam, Rota, Saipan, Tinian, Aguijan, Anatahan, Sarigan, Alamagan, and Pagan. The snail was once thought to be the most common tree snail on Guam. Now, however, the humped tree snail is considered extremely rare across its range (Hopper and

Smith, 1992), numbering under 2,600 individuals (USFWS, 2005c). On Guam and Rota, the humped tree snail has gone from being widely distributed and super abundant to being highly localized and rare. All current populations on Guam are found on the Guam intact forests of the Ordnance Annex, and probably number less than 1,000 individuals (USFWS, 2005c). The same number of snails probably persists on Rota (USFWS, 2005c). Because of the abundance of a predatory flat worm, coupled with land use before, during, and after World War II, in addition to intense warfare during the U.S. landings on Tinian, humped tree snails are thought to be extirpated from Tinian (USFWS, 2005c). A small population (<20 individuals) was found on a National Park Service parcel (War of the Pacific National Park) on Saipan.

In the Mariana Islands, the range of the fragile tree snail is considered to be restricted to Guam and Rota, and populations on Guam are believed to have been extirpated (USFWS, 2005d). Hopper and Smith (1992) estimated that the number of sites that support the Guam tree snail have decreased by 74 percent since surveys conducted in 1920 by Crompton (USFWS, 2005d). When discovered, the fragile tree snail

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was considered to be rare, but wide spread on Guam and Rota. Populations on Rota are estimated to not exceed 100 individuals (USFWS, 2005d).

Threats. Threats to the humped tree snail and other Partulid snails include habitat destruction and degradation; the presence of predatory Manokwar flat worms (Plalydemis manokwari) and rosy carnivore snails (Euglandina rosea); typhoons which open up canopy and may reduce mesic conditions in the lower forest strata; and wildfires. Manokwar flat worms, introduced to control the giant African snail, were observed in intact forested areas of the Northwest Field, along with shells of giant African snails (Parsons, 2006).

Marianas Islands Military Training: Environmental Impact Statement, Volume 1 (Google Books)

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Figure 3-2
NATIONAL WILDLIFE REFUGE,

OVERLAY UNITS, AND CONSERVATION AREAS OF GUAM

FEIS: Military Training in the Marianas
Belt Collins Hawaii, June 1999

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FlNN. ENWRQNMENTAL IMPACT STATEMENT
MlLl'l'ARY TRAINING in THE MARIANAS

CHAPTER THREE ENVIRONMENTAL SETTING

Two bat species on Guam, the endangered little Mariana fruit bat (Pteropus tokudae) and the sheath-tailed bat (Emballonura semicaudata) (a species of concern), have not been sighted in approximately 20 years and are thought to be extinct on the island. If any colonies of these bats exist on Guam, it is likely that they would be in the limestone forest areas of the Ordnance Annex.29 The remaining extant species, the Mariana fi'uit bat, which is proposed for federal listing throughout the Marianas archipelago, including Guam, number fewer than 400 individuals.

Most of these bats aggregate at a roost site on Pati Point and Ordnance Annex.30 They forage along the northern cliffline between Ritidian and Pati points. A small number of bats (10 to 25 individuals) occur in the Ordnance Annex, foraging at night between Mount Almagosa and East

Tower. Preferred habitats for the bat include inaccessible cliffline and native limestone and ravine

forests.31 They are extremely sensitive to human disturbance and have been known to abandon their roosts at the slightest interference. Two of the most important reasons for the decline of these fruit bats have been poaching by local residents and predation by the BTS. Fruit bats are considered a gastronomic delicacy by the Chamorros and, although law protects these bats, illegal poaching still occurs. A 1991 poaching event at the last remaining bat roost on Guam reduced the population by 30 percent.32 BTS are capable of preying on young bats, which are particularly vulnerable to predation because they are not yet able to fly and are too large to be carried by their mothers during nighttime foraging.33 Several snakes have been captured or seen within approximately 325 feet (100 m) of the colony at Pati Point.

Endangered and threatened reptile species on Guam include two sea turtles, three geckos, and five skinks (see Table 3-1). Threatened green sea turtles use the beaches at the Waterfront Annex and AAFB for nesting. The green sea turtle nesting season is generally January through August. The hawksbill sea turtle nests sporadically in Guam, between the months of January and April.“ The sandy beach at Sumay Cove is a known hawksbill turtle-nesting site. The primary threat to green sea turtles is habitat

destruction, followed by poaching and nest predation by feral dogs and pigs. AAFB beaches and offshore areas have been protected from large-scale development and human activity. Current management programs include law enforcement, population surveys, tagging, and nesting studies. In the Ordnance Annex, the National Biological Survey and the USFWS have recently located the Pacific slender-toed geckos (Nactus pelagicus) and moth skink (Lipinia noctua).as Both occur in substantial numbers (200 to 800 per acre [500 to 2,000 per ha]).

Protected invertebrates on Guam considered to be rare are the endangered Mariana Islands fragile tree snail (Samoanafi'agilis), endangered threatened Pacific tree snail (Partula radiolata), and the rare Marianas eightspot butterfly, all of which occur in the Ordnance Annex. The Pacific Tree

[graphic]
2" Personal communication with Gary Wiles, Guam DAWR, May 16, 1996. 3° Wiles et al. (1995) The Status and Distribution of Endangered Animals and Plants in Northem Guam. Micronesia 28:31-49.

3' BioSystems Analysis, Inc. (September 1990) Natural Resources Management Plan: Naval Station, Guam. Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command.

"2 USFWS and USAF with Guam DAWR (November 1995). 33 Gary Wiles, DAWR (November 1990) Mariana Fruit Bat and Little Mariana Fruit Bat Recovery Plan. °' Karen L. Eckert, Ph.D. (September 1991) The Biology and Population Status of Marine Turtles in the North Pacific Ocean.

'5 USFWS (December 1996) Fauna! Survey for the Ordnance Annex, Naval Activities, Guam. Prepared for the Department of the Navy.

[graphic]
ENVIRONMENTAL SETTING MILITARY TRAINING IN THE MARIANAS

snail also occurs in the valley behind Haputo Beach in the Haputo ERA, along with the Mariana Islands tree snail Partula gibba, which occurs in only two locations on the island and is listed as Guam endangered. The three snail species are proposed by the USFWS for listing as endangered. The major impediment is the lack of a population location maps.

The avifauna of Guam once included many native forest birds, waterbirds, seabirds, and numerous migrant species. Today, however, many of the native birds are experiencing severe population declines due to both human activities, such as habitat destruction, and BTS predation. Native birds listed by the territory of Guam as endangered are the rufous fantail (Rhipidura rufifrons), Mariana fruit-dove (Ptilinopus roseicapilla), cardinal honeyeater (Myzomela rubrata saflordi), Micronesian starling (Aplonis opacus guami), white-throated ground-dove (Gallicolumba x. xanthonura), wedge-tailed shearwater (Pufiinus paczficus), and white-browed crake (Porzana cinerea). All of these species are presumed to be extinct on Guam with the exception of the Micronesian starling, which is found on AAFB in the southeastern section near the base housing and is also found in the Anao Conservation Area to the south.

Federally listed endangered native birds presumed to be extinct on Guam include the bridled white-eye (Zosterops c. conspicillatus), Micronesian megapode, Guam broadbill (Myiagra fi-eycineti), nightingale red-warbler (Acrocephalus Iuscinia), and Mariana mallard (Anas oustaleti). The Micronesian kingfisher (Halcyon cinnamomina) and Guam rail (Rallus owstoni) are probably extirpated from the wild but are the subjects of captive breeding programs.36 Experimental reintroduction of the Guam rail is ongoing within Area 50, a protected area within Northwest Field that is away from training areas.

Federally listed native birds still known to occur on the island are the endangered Mariana crow (Corvus kubaryi), island swifilet, and Mariana common moorhen. The Mariana crow (endemic to Guam and Rota) is estimated to have a current Guam population of fewer than 12 individuals restricted in distribution to AAF B, mostly occurring in the MSA and eastward to Pati Point. These include four birds that are survivors of a group of six captive crows that originated on Rota and were transferred to Guam from the National Zoo's Conservation and Research Center in Front Royal, Virginia, and the Houston Zoo and released into the wild.37 Crows have not been recorded from southern Guam since the 1960s or 1970s. The island swifllet occupies limestone caves in the

COMNAVMARIANAS Ordnance Annex, located southeast of Fena Reservoir near the Bonya River and the Maemong River drainage area, and also in the Talafofo River Valley. Swiftlets are found in the Fachi Cave, but the Mahlac Cave harbors the most significant colony of swiftlets on Guam. Approximately 300 to 350 individuals remain on the island."

The complex of marshes, ponds, and mangrove swamps near the entrance to Apra Harbor provides breeding, nesting, and foraging habitat for the Mariana common moorhen. No moorhens are found on the Atantano River, but approximately .25 mile (0.4 Ian) due east of Atantano River and Marine Drive,39 they are found in man-made wetlands at the Shell and Island Equipment

[graphic]
3° BloSystems Analysis, Inc. (September 1990) NRMP: Naval Station, Guam.

3' Personal communication with Robert Anderson, Guam DAWR, April 27, 1998. 3' Personal communication with Gary Wiles. Guam DAWR, July 1996.

3° Personal communication with Mike Ritter, Guam FWS. August 22, 1996.

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businesses. This area, one of Guam's three primary habitats for the Mariana common moorhen, is considered to have the highest habitat quality of the primary moorhen sites.'0 However, these wetlands dry out seasonally, forcing the birds to move to permanent water sources,'such as Fena Reservoir, the largest of four moorhen-supporting wetlands in the COMNAVMARIANAS Ordnance Annex. The southern half of the reservoir is a moorhen sanctuary and is also used by several species of migratory shorebirds and waterbirds. Moorhens also occasionally use two small wetlands to the east and one northwest of the reservoir. Both the Fena Reservoir and the Waterfront Annex marsh were identified in the 1992 Mariana Common Moorhen Recovery Plan as areas that should be secured and managed as primary moorhen habitat. The southern cliffline of Orote Peninsula is the Orote Ecological Reserve. This area is considered an essential habitat for fish and birds.

3.3.2.4 Brown Tree Snake

The introduced BTS has become a serious pest species on Guam. Native to the Solomon Islands, Papua New Guinea, and the northern coast of Australia, it is believed to have been introduced in the postwar years in cargo shipped from Papua New Guinea. Snakes became conspicuous throughout central Guam by the 1960s, and by 1968, they had probably dispersed throughout the island. Today, up to 12,000 snakes per square mile (4,633 per km') occur in some forested areas of Guam. In the absence of natural predators and other population controls, the snake population has reached very high densities, causing the decline and, in some cases, extinction, of many of the island's birds, lizards, and bats. The BTS is nocturnal and cryptic. Difficulty of detection is compounded by its natural camouflage, exceptional climbing ability, potential to survive for weeks without food, and propensity to seek dark, cool hiding places during the heat of the day. Due to their nocturnal habits and hiding ability, the snakes are fiequently accidental stowaways in cargo leaving Guam. Unless intercepted, the BTS could become established on Tinian, Rota, FDM, or Hawaii, causing ecological and economic problems similar to those found on Guam. The BTS has already been sighted on Oahu," Saipan, and Rota, but is not thought to be established on any of those islands. There have been five unconfirmed BTS sightings on Tinian: one in February 1990 and four reported in one sighting in November 1995.42

The October 1996 Brown Tree Snake (BTS) Control/Interdiction Plan for Military Training Exercises implements a Memorandum of Agreement (MOA) signed by the Department of Defense, the U.S. Department of Agriculture, the Government of Guam, and the State of Hawaii. The MOA states that these agencies will cooperate in BTS research, control, inspection, and eradication efforts. The BTS control and interdiction protocol is published in training orders for the Tandem Thrust series of exercises conducted about every two years. (See Appendix E for additional information regarding BTS interdiction and control.)

[graphic]
'° USFWS (September 1992) Recovery Plan: Mariana Common Moomen (Gallinula chloropus guami). '1 T. H. Frltts, G. H. Rodda, and E. F. Kosaka. Brown Tree Snake Update. Memorandum to Brown Tree Snake Cooperators dated July 1, 1995.

'2 T.H. Fritts, M.J. McCoid and D. Gomez (January 1997) "Assessing the Risk of Brown Tree Snakes on Saipan: Incidents of the Brown Tree Snake (Boigus irregulan's) Dispersing to Saipan and Other Islands in the Commonwealth of the Northern Mariana Islands."

[graphic]
ENVIRONMENTAL SETTING MILITARY TRAINING IN THE MARIANAS

3.3.3 Farallon de Medinilla Biological Resources

3.3.3.1 Habitat

FDM is an uninhabited island that has historically been used by the military as a bombing site since at least 1971. Steep, eroding sea cliffs make it virtually inaccessible except by helicopter. With the exception of sharp, irregular limestone outcroppings, the entire surface of the island is vegetated, mostly by herbaceous and shrubby vegetation, dominated by littoral species.43 The vegetation structure is not homogenous, but rather a mosaic of several types and lacking clear boundaries. Birds nest, forage, and shelter in the dense vegetation.

There are no known threatened or endangered plant species on the island. Nearly all the species encountered on the island are widespread, littoral plants. However, there are two plant species that are considered rare or uncommon: bunch grass Digitaria gaudichaudii (the only endemic species recorded from the island), and seaside cotton (Gossypium hirsutum var. taitense).

There are apparently no sensitive types of vegetation on FDM. The lone wetland area observed was too small and lacked some of the prerequisites to be considered an oflicial wetland. However, these areas may be a vital source of flesh water for land birds on the island, such as the endangered Micronesian megapode.

Eleven of the 40 plant species identified in a half-day botanical survey (Appendix D-3) were introduced. Two of these species, tangantangan and morning glory vine (Operculina ventricosa) pose a potential threat to the environment. Once established, they are difficult to eradicate.

3.3.3.2 Marine Environment

The emergent shoreline of FDM consists primarily of large boulders and rock outcroppings that have calved off of the island margin. There are two small beaches: one on the northern part of the eastern shoreline and one in the central area of the western shoreline (see Figure 3-3). These wave-swept beaches, composed of very coarse carbonate sand and small rubble/cobble fiagments, do not serve as good turtle nesting habitat." There is little shoal area around most of the island, with the exception of the northern and southern ends. Deep water surrounds much of FDM, and the submarine slope of the island is very steep. Unexploded ordnance (UXO) occurs in waters around the entire island, is concentrated primarily in the middle portion of the island and, in some cases, is colonized by living coral and algae.

The combination of steep vertical profiles of the submarine shoreline and the massive physical forces from breaking waves on the windward (eastern) side of the island results in a limited assemblage of benthic biota, at least to the depth of wave base. Marine resources are primarily concentrated on the leeward (western) side of the island, where substrate drops gradually seaward;

[graphic]
'3 Art Whistler (December 1996) Botanical Survey of Farallon de Medinilla, CNMI. Prepared for Belt Collins Hawaii.

" Marine Research Consultants (September 1997) Assessment of the Marine Environment, Farallon de Medinilla, CNMI, Military

coral growth of Pocillopora, Acropora, Porites, Montiport and Millepora is good, with approximately 50 percent coverage of the available substratum. Coconut crabs inhabit cracks in the rocks near the shoreline, and green sea turtles have been observed in the nearshore waters.

The nearshore fishery resources surrounding FDM are popular for commercial and subsistence fishermen; low numbers of commercially desirable reef fish in this area indicate fishing pressure. The greatest abundance and diversity of fish species are found primarily on the western side, particularly in the areas offshore of the central and northern portions of FDM.“

3.3.3.3 Rare, Threatened, and Endangered Species

Recent avifauna surveys of FDM (November 1996 and August 1997) have recorded a total of 17 avian species, including nine species of seabirds, five species of migratory birds, and three species of resident land birds. All of the avian species recently observed are native to the Marianas except for the Eurasian tree sparrow (Passer montanus). If survey reports since 1975 are compiled, the total number of avian species recorded at FDM is 24, which includes a second non-native species, the Philippine turtle dove (Streptopelia bitorquata). (See Appendix D-l, Tables 2 and 3 for a compilation of bird species and bird abundance estimates recorded since 1902.)

The only endangered species recorded on FDM was the Micronesian megapode. Although only up to four megapodes have been observed during any one survey, the USFWS estimates that less than 10 birds occur on the island.“ Three bristle-thighed curlews (Numenius tahitiensis), listed by the USFWS as a species of concern, were observed on FDM. Also observed were two Mariana fruit bats, which are proposed for federal listing. Already listed on the CNMI Endangered Species List, they are protected from hunting throughout the CNMI.

Of the species found nesting on FDM, the most widespread were seabirds, including three species of boobies (masked [Sula dactylatra], red-footed [Sula sula], and brown [Sula leucogaster plotus] boobies) and the white tern (Gygis alba). FDM is the site of the largest known masked-booby breeding colony in the Marianas and also represents one of only two small breeding populations of the great frigatebird (Fregata minor) in the Marianas. The other species of birds nesting on FDM are broadly distributed throughout the Pacific. Masked and brown boobies nest along the eastern (windward) side, where they can more easily take flight from their ground nests (see Figure 3-3). Red-footed boobies and great fiigatebirds breed on the western side of the island, where there is less wind and higher brush to support their nests. Tems and noddies use the limestone sea cliffs for roosting and nesting. Megapodes and doves inhabit densely vegetated areas where shelter and food are more readily available. Shorebirds, such as the plover, curlew, and turnstone, require open habitat and are found in barren or sparsely vegetated areas.

[graphic]
‘5 National Marine Fisheries Service letter dated Sept 11, 1997, “FDM Survey July 8-10 1997.‘

‘° USFWS (May 16, 1997) Biological Opinion of the U. 8. Fish and lM/dlife Service for Gunnery and Aerial Bombardment Practice at Farallon de Medinilla, CNMI.

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3.3.4 Rota Biological Resources

3.3.4.1 Habitat

Although the Japanese cleared some areas for sugar cane cultivation in the 1920s, Rota was much less disturbed during World War H than the other islands and no U.S. military bases were established there. Vegetation on Rota consists primarily of native forest with some secondary vegetation and minor stands of tangantangan.

The largest remaining limestone forest in the Marianas is found on Rota, where it covers 60 percent of the island. These areas are important refuges for endangered species, such as the Mariana fruit bat and the Mariana crow. Nine percent of the land area on Rota is covered by secondary vegetation, characterized as mixed brush and weeds, which developed after the removal of native forest. The secondary vegetation scattered throughout the island is mostly a remnant of formerly cultivated fields and coconut groves. Rota supports only minor stands of tangantangan, which are relatively homogeneous and make up less than one percent of the island's land area.

Three conservation areas were established on Rota in 1994: the Sasanhaya Marine Reserve, Puntan Taipingot (Wedding Cake) Conservation Area, and Sabana Heights Wildlife Conservation Area (see Figure 3-4). Additional conservation areas are proposed, including the Sasanlagu Marine Preserve, Paliii Medicinal Plant Reserve, Kantan Afiao Commonwealth Forest, and a conservation area between Saguagaga and Puntan Fina Atkos."7

3.3.4.2 Marine Environment

Coral reefs are found offshore around nearly the entire island. One seagrass variety, (Enhalus acoroides), occurs in limited distribution in a narrow band along the shore between West Dock and Anjota Island near Songsong Village. Other marine resources will not be discussed in detail since no training in offshore waters is proposed.

3.3.4.3 Rare, Threatened, and Endangered Species

Native species on Rota include the endangered Mariana crow (endemic to Rota), threatened green sea turtle, Mariana fruit bat (a species of concern on Rota), and the Rota bridled white-eye, which is a candidate for listing as a federally endangered species. According to a 1996 study,48 the population of the Mariana crow on Rota has decreased 56 percent between 1982 and 1995, most likely due to habitat loss. The remaining approximately 600 crows are widely distributed throughout the island, both in mature and secondary forests and coastal strand vegetation.49

[graphic]
'7 Juan C. Tenorio & Associates, Inc. (December 1995).
" Daniel J. Grout, Michael Lusk, and Steven Fancy (USFWS) (June 1996) Results of the 1996 Mariana Crow Survey on Rota.
'° USFWS (July 1996).

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Proposed
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Note: The exact boundaries oi the conservation areas and
proposed conservation areas have not yet been established.
Source: Atlas ol the Heels and Beaches oi Saipan. llnlan, and Rota;
Physical and Economic Master Plan lor Rota; Letter irom Arnold Palaclos
LEGEND Figure 3-4
. Mariana crow distributed

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FINAL ENVIRONMENTAL IMPACT STATEMENT
MILITARY TRAINING IN THE MARIANAS

CHAPTER THREE ENVIRONMENTAL SETTING

There is also a fairly large roost of Mariana bats that depend on the native forest in the Sabana Heights area for habitat (see Figure 3-4). Some of these bats are known to migrate from Rota to Guam.

BTS are not established on Rota. The only confirmed BTS siting on the island was in October 1991 at a seaport: two dead snakes were found inside a cargo container that had been shipped from Guam?o Presumably the snakes died of dehydration or the high temperature inside the container.

The first permanent BTS barrier was installed in November 1997 around the Rota commercial port. Made of fine metal mesh that the snake cannot climb, it was attached to the existing port facility’s high fence. Any BTS arriving in cargo by boat or ship will be contained.51

3.4 CULTURAL RESOURCES

The history and cultural resources of Tinian, Guam, FDM, and Rota are discussed in this section. This historical overview spans from the time of initial human settlement to the present day and includes information on Charnorro, Spanish, German, Japanese, and U.S. influences. As each of these cultures took Runs in controlling the Marianas, they left behind many cultural artifacts that can still be seen today.

3.4.1 Brief History

The Mariana Islands are historically part of Micronesia and have been controlled by many different nations since their discovery by Ferdinand Magellan in 1521. The oldest dated archaeological remains indicate that humans first settled the Mariana Islands about 1500 BC. Early historical documents indicate that at the time of first European contact, the Charnorro people in the Mariana Islands exhibited a typical Oceanic economy consisting of farming and exploitation of marine resources.

The Spanish claimed the islands in 1565, but left them undisturbed until they established a Jesuit mission on Guam in 1668, significantly changing the lives of the Marianas Chamorros. By 1698, the Spanish resettled most of the Charnorros, except for those hiding on Rota, into church towns on Guam, leaving the northern Marianas virtually uninhabited. Religious activities were not Spain's only concern. The islands also served as a valuable port for the golden galleons and other Spanish merchantmen. Tinian was used by the Spanish as a store for supplying the Guam garrison, as noted in British reports from their first visit in 1742.

Guam became a possession of the United States in 1898 as a result of the Spanish-American War. Under the administration of the U.S. Navy, Guam became a coaling station and later a naval base for the Western Pacific. Spain sold the other (northern) Mariana Islands to the Germans in 1899.

[graphic]
°° T. H. Fritts (May 1996).
5' Pacific Daily News, Monday, December 1, 1997, page 3, "Snake-proof fencing will protect Rota.'

The short-lived (1899-1914) German administration was marked by little change, except for the reorganization of the Tinian cattle ranch established by the Spaniards. The Germans leased out Tinian in 1904, primarily to the Japanese for the purpose of copra cultivation.

The northern Mariana Islands came under Japanese military control at the outbreak of World War I and the League of Nations awarded the mandate over Micronesia to Japan in 1920. The Japanese then began economic exploitation of the Marianas. In 1926, Tinian was leased by Naniyo Kohatsu Kaisha (NKK or South Seas Development Company). The firm established sugar cane plantations and developed Tinian Town. Most of the indigenous forests and local vegetation on Tinian were bulldozed to make way for sugar cane and other crops.

The Japanese focused on developing Rota in 1930. NKK started its agricultural efi'orts in the Sinapalo area. Once the land was cleared of vegetation, sugar plantations were laid out and infi'astructure was constructed. A refining mill was built on the west side of Songsong village and a railroad was built to connect Songsong and Sinapalo. The Japanese also undertook small-scale mining on Rota. In 1939, the Japanese constructed an airfield at the north end of Tinian, using Korean slave labor.

The Japanese military government took control of Tinian in 1940; Guam was invaded on December 8, 1941. As discussed in Section 1.4.1, the Mariana Islands became battlegrounds during World War H. Tinian and Guam were eventually invaded and occupied by U.S. troops in mid-1944, but the US did not occupy either Rota or FDM. The B-29s carrying the atomic bombs dropped on Hiroshima and Nagasald departed from Tinian's North Field, which was designated a National Historic Landmark in 1987.

The U.S. military essentially abandoned Tinian within a year of the end of World War H and, in 1947, the U.S. and the United

Nations reached a trusteeship agreement establishing the Trust Territory of the Pacific Islands. Guam remained under the jurisdiction of the U.S. Navy until 1950, when President Harry S Truman signed the Organic Act, which ended military control and made Guam a U.S. territory. Negotiations in the 1970s resulted in the signing of a Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America. The covenant included an agreement to lease approximately 71 percent (28 square miles [72 km']) of Tinian's land area to the Department of Defense (DoD) for military training use and as a contingency base, should future conditions require significant forward deployment in the Western Pacific. The amount of land leased by DoD has since been reduced to approximately 60 percent of the island.

Significant historic and prehistoric sites remain from the different cultures that have occupied the Mariana Islands. The most notable artifacts of the ancient Chamorro culture are sets of latte stones. These are upright pyramidal stone pillars topped by semispherical capstones, set in two parallel rows in groups of 6 to 12 (see cover of Executive Summary). Numerous latte sites, complexes, and remnants can be found throughout Guam and Tinian. In fact, latte sets are still being identified and discovered. The most famous is Tinian's House of Taga in the village of San Jose. Its twelve columns once supported a structure at least 54 feet by 10 feet (16.5 m by 3.0 m).

[graphic]
–'––

Other Chamorro artifacts that can be found on Guam and Tinian include pottery scatters and stone adzes.

Many cultural resources are located on DoD land on both Guam and Tinian. These cultural resources include buildings, structures, objects, sites, districts, and archaeological resources. Because access to areas under DoD control, such as the Ordnance Annex, is restricted, the cultural resources have been left undisturbed and are well preserved. Detailed information on sites within military lands and training areas is provided in Chapter 4.

3.4.2 Tinian Cultural Resources

Tinian's cultural resources include pre-contact Chamorro sites and many World War II-era sites and artifacts associated with island development by the Japanese and the subsequent US. invasion and development. The House of Taga, with the largest latte stones in the Marianas, is in a park setting near Tinian Harbor. A large latte complex is adjacent to Unai Chulu; other latte habitat sites with surface and sub-surface deposits are found near Unai Babui, Unai Dankulo, and Tachogna Beach.

The North Field National Historic Landmark was designated as such by the National Park Service in 1987. The area was a B-29 airbase with four runways, and includes the sites used to assemble and load the two atomic bombs used to end the war. The two bomb—loading pits, many former Japanese military structures, coastal gun emplacements and unit memorial plaques are some of the features in the Landmark District visited by Tinian's tourists.

Cultural resources in the LEA were identified in a series of surveys (see Figure 3-5) and motivated the Navy to implement various measures, such as a Memorandum of Agreement signed in 1994 prior to the Tandem Thrust 95 training exercise. To supplement these agreements, the Navy also developed an interpretive program and trail (see Figure 3-6) for north Tinian, the purpose of which is to inform the public of Tinian's cultural and natural resources and to instill an ethic that emphasizes preservation and protection.

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Figure 3-5

TINIAN ARCHAEOLOGICAL SURVEYS FEIS: Military Training in the Marianas

Belt Collins Hawaii, June 1999

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Fwd ” i __ / \ i i it? LEGEND so . 1 S be; _ Auto route defined in _ , tounst brochure west ‘l’rnian Airport 8 [3 Location of Site or Trail ” g m Not Open to Public \ SOIIOBI Sell-Glided Tour of Historic North Tnian, 1995 . 0 .5 1 2 Figure 3-6 —I_ (Km) TINIAN HISTORIC SITES - :—:l (Miles) FEIS: Military Training in the Marianas ENVIRONMENTAL SE‘I‘I’ING MILITARY TRAINING iN THE MARIANAS

[graphic]
[graphic]
3.4.3 Guam Cultural Resources

Guarn’s oldest archaeological sites are from the Chamorro period, prior to Western contact in 1521. Other sites show evidence of Guam’s status as a former possession of Spain, while numerous structures and relics attest to the island’s major role in World War H. Many of the known historically significant sites are located on DoD land and are described in detail in Appendix J. Complete inventory surveys for all Guam training areas have not been performed; Figures 3-7 through 3-9 show locations surveyed to date. Surveys are currently being performed on portions of AAFB and areas of the Ordnance Annex. Surveys are ongoing at the Waterfront Annex and Ordnance Annex. A complete survey of the sub-plateau region at the F inegayan annex and predictive surveys of the plateau regions of both Finegayan and Barrigada annexes were recently completed. 52

The proposed training areas on Guam where activities could be constrained due to known or potentially significant cultural sites include: 53

0 Southern and western portions of Ordnance Annex (numerous latte sites) 0 Orote Airfield (World War 11 site)

0 Outer Apra Harbor (submerged World War I and H shipwrecks)

Q Haputo Beach (remains of 20 latte structures in the Haputo embayment) 0 Northwest Field at AAF B (World War H site)

Although most of the known cultural resources within the training areas are not vulnerable to training activities, there is a potential for impacts to some important sites on Guam which are listed or eligible for listing on the Guam Register and/or the National Register of Historic Places

(NRHP).

Ordnance Annex. The COMNAVMARIANAS Ordnance Annex has many ancient Chamorro habitation sites, some with latte stones, World War resources including structures, former fighting positions in fields and caves, and former gun emplacements. The Alifan Ridge Complex, and recently discovered large latte village are located within training areas. The village consists of more than 40 latte sets and may be the largest and best preserved of such sites on Guam. A second latte complex consists of 12 latte sets and is in the vicinity of the breaching house. The Chamorro habitat and many World War II sites are determined to be historically significant under the National Historic Preservation Act (NI-IPA).

[graphic]
52 IARII (April 1999). Draft Final Report, Phase 1! Archaeological Survey and Detailed Recording at COMNA VMARIANAS Communications Annex, Tem’tory of Guam, Mariana Islands.

5’ Significant sites are defined as those eligible for listing on the National Register of Historic Places.

The Little Red House

Father November 27, 2020

Hansongate November 26, 2020

Hesus November 25, 2020

They don't have a lot of fun, do they? November 24, 2020

Father God November 23, 2020

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February 2020 (453)

January 2020 (463)

December 2019 (380)

November 2019 (504)

October 2019 (493)

September 2019 (687)

August 2019 (414)

July 2019 (407)

June 2019 (453)

May 2019 (382)

April 2019 (1221)

March 2019 (1284)

February 2019 (754)

January 2019 (671)

December 2018 (916)

November 2018 (462)

October 2018 (470)

September 2018 (922)

August 2018 (1632)

July 2018 (1737)

June 2018 (736)

May 2018 (300)

April 2018 (420)

March 2018 (322)

February 2018 (290)

January 2018 (437)

December 2017 (1115)

November 2017 (622)

October 2017 (310)

September 2017 (354)

August 2017 (501)

July 2017 (489)

June 2017 (560)

May 2017 (420)

April 2017 (114)

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The Little Red House

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We show that bird abundance and diversity increase with salmon biomass and that watershed size and forest composition are less important predictors. This work provides new evidence for the importance of salmon to terrestrial ecosystems and information that can inform ecosystem-based management. We detected 55 species of birds across our point-count surveys over both years, of which 35 were retained for final analyses (S4 Table). The six most commonly detected species were, in order of decreasing abundance; Pacific-slope Flycatcher (Empidonax difficilus), Pacific Wren (Troglodytes pacificus), Golden-crowned Kinglet (Regulas satrapa), Townsend's Warbler (Dendroica townsendi), Varied Thrush (Ixoreus naevius), and Swainson's Thrush (Catharus usulatus). Recent papers in Forest Ecology and Bird Conservation. Papers. People. This work compliments Forest Birds of Connecticut and Rhode Island by providing maps of forest habitat parameters, maps of bird community parameters and maps of density distributions for each species found within the forest environment. Save to Library. Download. This 255-page book describes the population densities, distributions and habitat use of 88 breeding and 51 wintering forest bird species of Connecticut and Rhode Island. It is presently available for download from more. This 255-page book describes the population densities, distributions and habitat use of 88 breeding and 51 wintering forest bird species of Connecticut and Rhode Island. Distribution and abundance of the forest birds of Guam : results of a 1981 survey / by John Engbring and Fred L. Ramsey (Department of Statistics, Oregon State University) ; performed for National Coastal Ecosystems Team, Division of Biological Services, Research and Development, Fish and Wildlife Service, U.S. Department of the Interior. Distributed to depository libraries in microfiche. Partially funded through the Federal aid in fish and wildlife restoration act. "Conducted in cooperation with Guam Aquatic and Wildlife Resources Division." Physical Description: x, 54 p. : maps ; 28 cm. Locate a Print Version: Find in a library. Viewability. Item Link. Distribution and Abundance of the Forest Birds of Guam: Results of a 1981 Survey. US Fish and Wildlife Service, Washington, DC. Feduccia, A. (1996). The Origin and Evolution of Birds. Yale University Press, New Haven, CT, USA. Proceeding of the Royal Society London B 267: Rabinowitz, D. (1981). Seven forms of rarity. In The Biological Aspects of Rare Plant Conservation (H. Synge, Editor). Wiley & Sons, Chichester, UK. Rando, J. C., and J. A. Alcover (2010). On the extinction of the Dune Shearwater (Puffinus holeae) from the Canary Islands. Journal of Ornithology 151: Restani, M., and J. M. Marzluff (2002). We studied bird diversity and abundance during 546 point counts in the Sooretama/Linhares reserve, 200 point counts in 31 forest fragments (10–150 h), and 50 point counts in <30-year-old Eucalyptus pl
so