

CHAPTER 10.

TERRESTRIAL BIOLOGICAL RESOURCES

10.1 AFFECTED ENVIRONMENT

This chapter describes the plant and animal species and habitats that occur in terrestrial and wetland environments potentially impacted by the proposed action. The region of influence (ROI) encompasses the lands that support terrestrial biological resources (i.e., individual species, their habitats, and areas of habitat connectivity) that may be affected directly or indirectly by the proposed action. The ROI varies depending on the type of disturbance and the resource being considered. Construction, operations, and/or training activities have the potential to impact biological resources. Potential activities that may cause impact include, but are not limited to, ground-disturbing activities, noise, operational movement (e.g. vehicle traffic), and bio-security mitigation. Consequently, the ROI is broadly defined for terrestrial biological resources. The entire Military Lease Area (MLA) of Tinian is included as the ROI for this project.

10.1.1 Definition of Resource

The analysis of terrestrial biological resources focuses on species and vegetation communities crucial to the functions of biological systems, of special public importance, or that are protected under federal or local law or statute. For the purposes of this document, terrestrial biological resources are divided into three categories: *vegetation communities*, *wildlife*, and *special-status species*. Special-status species include those species listed under the Endangered Species Act (ESA), candidates for ESA listing, and listed by the Commonwealth of the Northern Mariana Islands (CNMI). Species mentioned in this section are described using the common name when there is an accepted English common name (wildlife and some plants). Common names are cross-referenced to scientific names in Appendix G. If available, the Chamorro name is provided in parentheses when the species is first mentioned in the text.

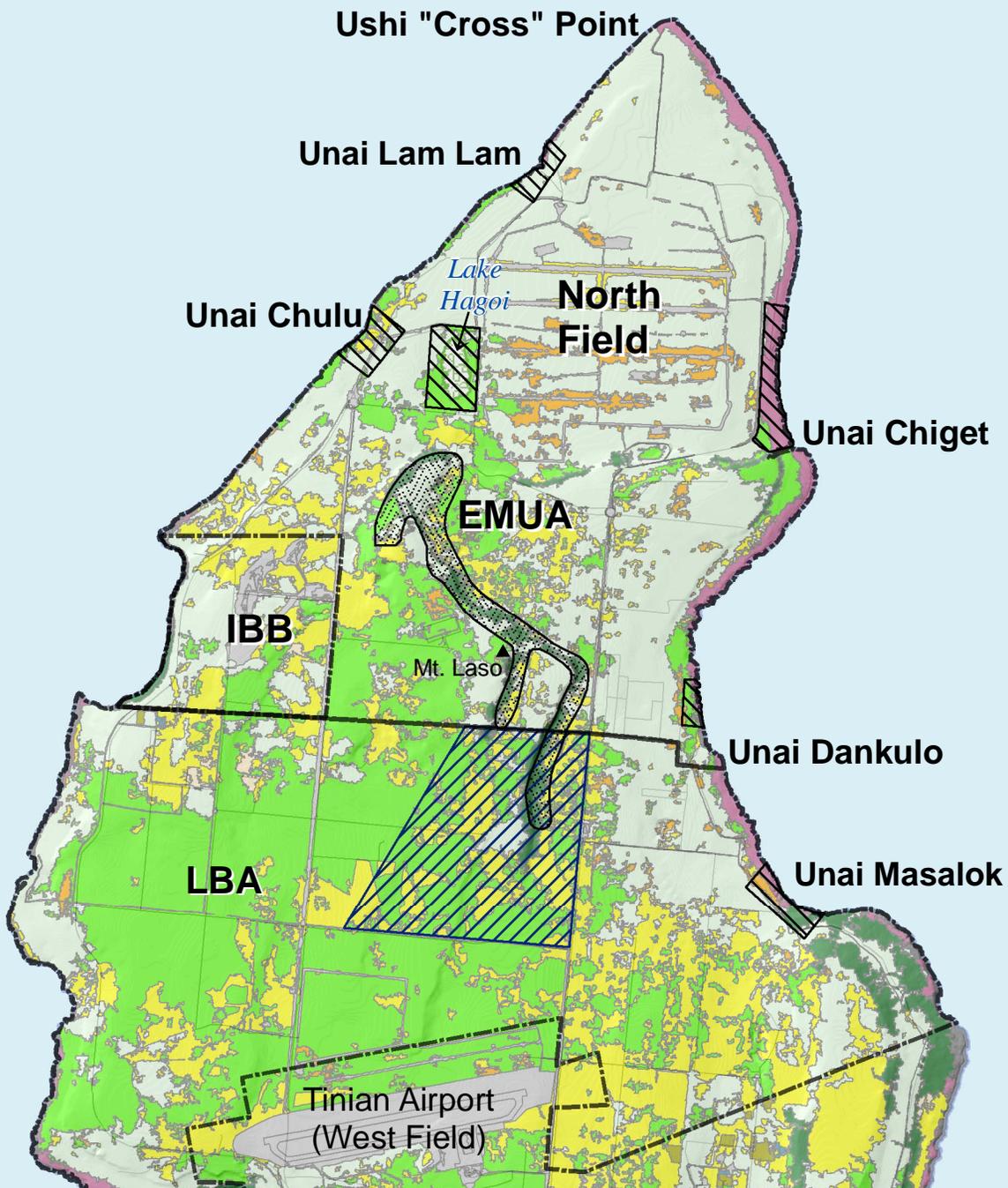
Key sources of information for this section include the Integrated Natural Resources Management Plan (INRMP) for Navy lands (Commander Navy Region [COMNAV] Marianas 2004); United States (U.S.) Fish and Wildlife Service (USFWS) (USFWS 2009b) report; Natural Resource Survey and Assessment Report (TEC Joint Venture [JV] 2007) and references therein; Environmental Impact Statements, Environmental Assessments, Biological Assessments, and resulting USFWS Biological Opinions for recent actions on military lands in Tinian. Site-specific natural resources data within the ROI was obtained from the COMNAV Marianas Geographic Information System as of January 2008.

10.1.2 Tinian

10.1.2.1 Vegetation Communities

The general physiography of Tinian is a series of five limestone plateaus, separated by escarpments. Vegetation on Tinian was described and mapped by Hawaiian Agronomics International, Inc. (1985). In the 1920s, the island was cleared for sugarcane production under Japanese occupation. Aerial photographs reveal that World War II bombing, fires, and military reconstruction significantly reduced the amount of native limestone forest on Tinian, and once-forested areas not under cultivation were susceptible to encroachment of non-native tangantangan. Vegetation mapping was updated island-wide by the U.S. Forest Service (USFS) (2006; based on 2000-2001 aerial photography) and this base mapping was subsequently updated by USFWS (2009a; based on 2006 aerial photography). Figure 10.1-1 depicts the vegetation types on Tinian based on the USFWS update; acreages are provided in Table 10.1-1.

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Legend

- LBA-IBB-EMUA Boundary
- No Military Training
- No Wildlife Disturbance
- FAA Mitigation Area

Vegetation

- Agroforest
- Agroforest -- Coconut
- Barren/Sandy Beach/Bare Rocks
- Casuarina Thicket
- Cropland
- Tangantangan
- Mixed Introduced Forest

- Native Limestone Forest
- Other Shrub and Grass
- Strand
- Urban and Built-up
- Wetland

Source: USFWS 2009a

**Figure 10.1-1
Vegetation Communities - Tinian MLA**

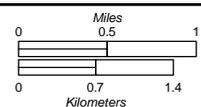


Table 10.1-1. Vegetation Types on Tinian within the MLA

<i>Vegetation Community</i>	<i>ac (ha)</i>
Native Limestone Forest	391 (158)
Mixed Introduced Forest	4,680 (1,894)
Casuarina Thicket	299 (121)
<i>Leucaena leucocephala</i> (Tangantangan)	5,998 (2,427)
Savanna Complex / Other Shrubs and Grass	2,934 (1,187)
Agroforest and Coconut groves	32 (13)
Wetlands	34 (14)
Strand and Barren/Sandy Beach/Bare Rock	460 (186)
Cropland	2.5 (1.0)
Urban and Urban Vegetation	483 (195)
Total	15,314 ac (6,197 ha)

Legend: ac = acres, ha = hectares.

Source: USFWS 2009a.

The USFWS (2009b) assessment of vegetation changes since the 1980s noted that coverage of open fields decreased 11.6% while coverage of secondary forest increased 10.3%, likely a result of succession over the last two decades as open areas are abandoned. Smaller changes included a decrease in tangantangan and an increase in urban land cover. Vegetation community descriptions that follow are summarized from Falanruw et al. (1989).

Native Limestone Forest

Few native limestone forests remain on Tinian. Within the MLA they occur along cliff lines near Mount Lasso and around the north escarpment of Maga. This forest community harbors native tree species such as *Cynometra ramiflora* (gulos), *Neisosperma oppositifolia* (fago), *Cerbera dilatata* (chute), *Psychotria* sp., *Eugenia* sp., *Guamia mariannae* (pai pai), pandanus, coral tree, *Ficus* spp., *Pisonia grandis* (umumu), and tropical almond. These species are important habitat and food sources for Mariana fruit bat, Micronesian megapode, and Tinian monarch.

Mixed Introduced Forest

Secondary growth forests contain a mixture of predominantly introduced trees, shrubs, and dense herbaceous plants. Introduced trees common in this vegetation community include siris tree, Formosan acacia, flame tree, and Madras thorn.

Casuarina thicket

Casuarina equisetifolia, commonly called ironwood or Australian pine, tolerates dry and salty conditions. It often grows in savanna habitat and in some locations forms a sparse woodland with little understory. *Casuarina* also occurs in exposed areas and along the coast at some locations in narrow bands.

Tangantangan

Tangantangan (*Leucaena leucocephala*) forests dominate much of the level and moderately sloping areas of lowland habitat areas, especially in the northern portions of the island. This habitat is nesting and foraging habitat for the Tinian monarch.

Savanna

These areas, dominated by grassy and low herbaceous vegetation, occur on both limestone and volcanic soils. *Pennisetum* spp. are common, as well as patches of Siam weed and areas of mixed ferns.

Agroforest and Coconut groves

The agroforest land class category is applied to areas of mixed growth including trees managed for fruit, food, wood, and other products.

Wetland

Wetland vegetation communities are areas of grasses, sedges, and herbs, or woody species growing in standing water or saturated soils most of the year. This type is most prevalent at Lake Hagoi.

Strand

Strand vegetation occurs on sandy beaches, and includes beach heliotrope, Portia tree, and beach naupaka. In rocky areas it includes *Pemphis acidula* (nigas).

Hawaiian Agronomics (1985) listed and mapped four terrestrial plant species of special concern on Tinian due to their status in the Southern Marianas. Those species and locations within the MLA are: *Heritiera longipetiolata* (Ufa halomtano) from coastal forests where it was reported growing with *Barringtonia asiatica* (puteng) near Unai Masalok on the east coast, and along the Lamanibot Bay escarpment of the MLA; *Canthium odoratum* (listed as variety *tinianense* in Raulerson 2006) where it was reported near the shrine at Mount Lasso and near Unai Masalok; *Callicarpa lamii*, a shrub reported from the north-south trending cliff area of Mount Lasso; and *Euphorbia sparrmannii* var. *tinianensis*, a small, semi-succulent herb reported from a single rock at Unai Masalok (not reported in Raulerson [2006]).

10.1.2.2 Wildlife - Native

Indigenous wildlife species on Tinian reported in the most recent INRMP (COMNAV Marianas 2004) include 46 birds, the majority are classified as migratory birds under the Migratory Bird Treaty Act (MBTA); one bat species (Mariana fruit bat); seven reptile species (two sea turtles, three geckos and two skinks); and two land crustaceans (coconut crab and land crab). Special-status species are addressed separately below. A 936 ac (379 ha) conservation area for wildlife has been designated in the Lease Back Area just south of the Exclusive Military Use Area (EMUA) boundary and is referred to as the Federal Aviation Administration (FAA) mitigation parcel. It was designated to compensate for the loss of Tinian monarch habitat during an airport expansion (COMNAV Marianas 2004).

A total of 18 land bird species were detected during one or more of the three surveys conducted between 1982 and 2008 on Tinian (USFWS 2009b). The most abundant native species were the bridled white-eye, rufous fantail, collared kingfisher, island-collared dove, white-throated ground-dove, Mariana fruit-dove, white tern, Tinian monarch (see additional discussion below under CNMI-listed species), Micronesian honeyeater, Micronesian starling, and yellow bittern. Monthly Navy monitoring has also been conducted and support these observations. Of these species, the bridled white-eye and rufous fantail were the most abundant. The collared kingfisher, white-throated ground-dove, rufous fantail, Micronesian starling, and yellow bittern abundance increased since 1982 while Tinian monarch, Mariana fruit dove, and Micronesian honeyeater abundance was reported as decreased since 1982 (USFWS 2009b).

A total of 58 species of migratory seabirds and shorebirds were detected in various studies summarized in the Mariana Islands Range Complex Environmental Impact Statement (EIS), of which 11 species are residents or species breeding on the island (Navy 2009). Most of the resident or breeding species have been observed at Lake Hagoi, a major bird area on Tinian. In surveys conducted in 1994 and 1995, a total of 9 different bird families including at least 12 species were recorded at Lake Hagoi wetlands, including 2 native forest birds and 10 migratory bird species (USFWS 1996). Specific birds identified at Lake Hagoi from the most recent studies include the black noddy, brown noddy, white tern, brown booby,

masked booby, red-faced booby, Pacific reef heron, yellow bittern, great frigatebird, red-tailed tropicbird, and white-tailed tropic bird (Navy 2009).

Numerous tattlers, reef herons, black noddies, and white terns (including one large colony of 30 plus birds), all protected under the MBTA, were recorded during 2008 shoreline surveys of Navy lands on Tinian (USFWS 2009b). No black noddy nesting areas were observed on Tinian during the survey. Most birds observed were along the western coastline that consists of flat coralline shelves along the water with large boulders in the bays and protection from the prevailing winds. White-tailed tropicbirds, black noddies, and white terns were noted in point transect surveys on Tinian and the white tern total population was estimated at approximately 18,000 birds (USFWS 2009b). Puntan Masalok and Puntan Tahgong are identified as potential habitat for pelagic birds including noddies and terns in Environmental Sensitivity Index Maps (National Oceanic and Atmospheric Administration [NOAA] 2005).

In a recent reptile survey several native species were found including the snake-eyed skink that was found adjacent to Unai Chulu and in the B29W total removal plot just northeast of North Field (USFWS 2009b). The tide-pool skink was reported as common in the *Pemphis acidula* vegetation zone north of Unai Chulu and thought likely to be present in similar habitat at other locations (USFWS 2009a). In 2008 surveys the blind snake was found in both mixed and limestone forest (USFWS 2009b). USFWS states that it is unquestionably native given that Pregill (1998) found it to be present in the Mariana Islands since at least early pre-human times.

In addition to being a highly-valued game species in the CNMI, the coconut crab serves important ecological functions such as dispersing seeds and as scavengers. Recently, coconut crabs densities have been estimated at 4.95 crabs/ha in native forest and 1.83 crabs/ha in tangantangan. Coconut crab size distribution was highly skewed to the lower sizes, possibly due to illegal poaching (USFWS 2009b).

10.1.2.3 Wildlife – Non-Native

Non-native species are common on Tinian. The most abundant non-native bird is the Eurasian tree sparrow (USFWS 2009b). Introduced mammals include rats, mice, shrews, cats and dogs. The musk shrew and roof rat are distributed throughout the island but other rats are uncommon (COMNAV Marianas 2004). Roof rat densities of up to 75/ha were found in native forest and musk shrew densities of up to 74/ha were found in tangantangan. Roof rat densities were higher than on many other tropical Pacific islands and it is likely these high densities are having a detrimental effect on flora and fauna that may include bird species (USFWS 2009b).

The oceanic gecko was reported from forested areas and constituted about half of lizard biomass in the limestone forest areas (USFWS 2009b). Monitor lizards have been observed at Lake Hagoi and they are considered a primary threat to the Mariana common moorhen chicks and eggs (USFWS 1996, Vogt 2008a). The marine toad is the only introduced amphibian and the mangrove crab, introduced as a potential food source (COMNAV Marianas 2004), is the only crustacean.

The brown tree snake (BTS) has the potential to impact the economy, human health, and island ecology in the CNMI. This species was most likely inadvertently introduced to Guam in military cargo after World War II around 1949 (Rodda and Savidge 2007). The BTS native range is coastal Australia, Papua New Guinea, and a large number of islands in northwestern Melanesia (Fritts and Leesman-Tanner 2008).

The BTS hunts and lives in trees, and is active at night. Brown treesnakes were known to occur on Guam in the 1950-1980s but they were not seen as a threat as this was the first instance of a predatory snake arriving on an isolated island. As a result of this introduction 17 of 18 native bird species were severely impacted (Wiles et al. 2003). Twelve of the 18 species were likely extirpated due to the brown tree snake.

As a result of these impacts, the Guam Department of Agriculture and Wildlife Resources (DAWR) took into captivity the endemic Guam flightless rail and Guam Micronesian kingfisher to form the basis of a captive breeding program (Brooke 2009).

The BTS has been determined to be the greatest limiting factor to reintroduction and/or recovery of both Guam Micronesian kingfishers and Micronesian crows on Guam (USFWS 1990a, 2005b). Although habitat exists for these species, until BTS levels are controlled recovery and/or reintroduction of ESA-listed bird species cannot occur. In addition, BTS numbers did not decrease after the loss of native birds because they eat a wide variety of prey. Now, the most abundant prey food is an introduced small skink that is common throughout the island.

Damage to the economy of Guam has been significant. Since the snakes were introduced, they have been known to climb power poles and short circuit transformers resulting in frequent and very significant power outages. Guam has experienced a snake-caused power outage about every other day on average, but many of the outages affect only a small area (Rodda and Savidge 2007). In addition, the BTS has impacted the poultry industry and small farmers because this snake is known to predate eggs and bird species (Fritts and Leasman-Tanner 2008). Regarding human health, the BTS is a mildly venomous species that is responsible for an estimated 1 in 1,000 emergency room visits (Fritts and Leasman-Tanner 2008), primarily involving infants.

Efforts to control the BTS are mostly limited to preventing BTS from leaving Guam in cargo, by ship or air. DoD has collaborated with other partners and participated in the development of BTS-specific trapping techniques, BTS detection using sniffer dogs, fence design, development of toxicants, and delivery methods. While these efforts have had success, brown treesnakes originating on Guam have been found in Kwajalein, Pohnpei, Hawaii (Oahu), Diego Garcia, Spain, Alaska, Texas, Oklahoma, and neighboring islands (Rota, Tinian, and Saipan).

The potential establishment of the BTS is of great concern on Tinian. There have been 75 confirmed BTS detections throughout the CNMI as of 2008 (N. Hawley, CNMI Department of Fish and Wildlife [DFW], unpublished data). There have been eight unconfirmed BTS sightings on Tinian: one in February 1990, four reported in 1994 (Fritts and Leasman-Tanner 2001), and three reported in 2003 (N. Hawley, CNMI DFW, personal communication, 2009). If BTS were to become established (without immediate suppression) on Tinian as a result of the proposed action, the impacts would likely be similar to those experienced on Guam.

Goats have been recently transported from Aguiuan to Tinian. A survey around the coast in October 2008 confirmed at least 20 goats at Puntan Kastiyu and there was some evidence they were already creating trails, accelerating erosion, and impacting the native vegetation (USFWS 2009b).

10.1.2.4 ESA-listed Species

Six federally-listed or candidate threatened and endangered species and 2 additional species that are only CNMI-listed have been observed or potential habitat for those species is present on Tinian (Table 10.1-2 and Figure 10.1-2). Another species, the Mariana swiftlet is presume extirpated on Tinian and is not evaluated further in this EIS. Sea turtles other than the green and hawksbill are extremely rare, or with only the potential to occur on Tinian. No nesting is known to have occurred on Tinian. These sea turtles are not evaluated in this EIS,

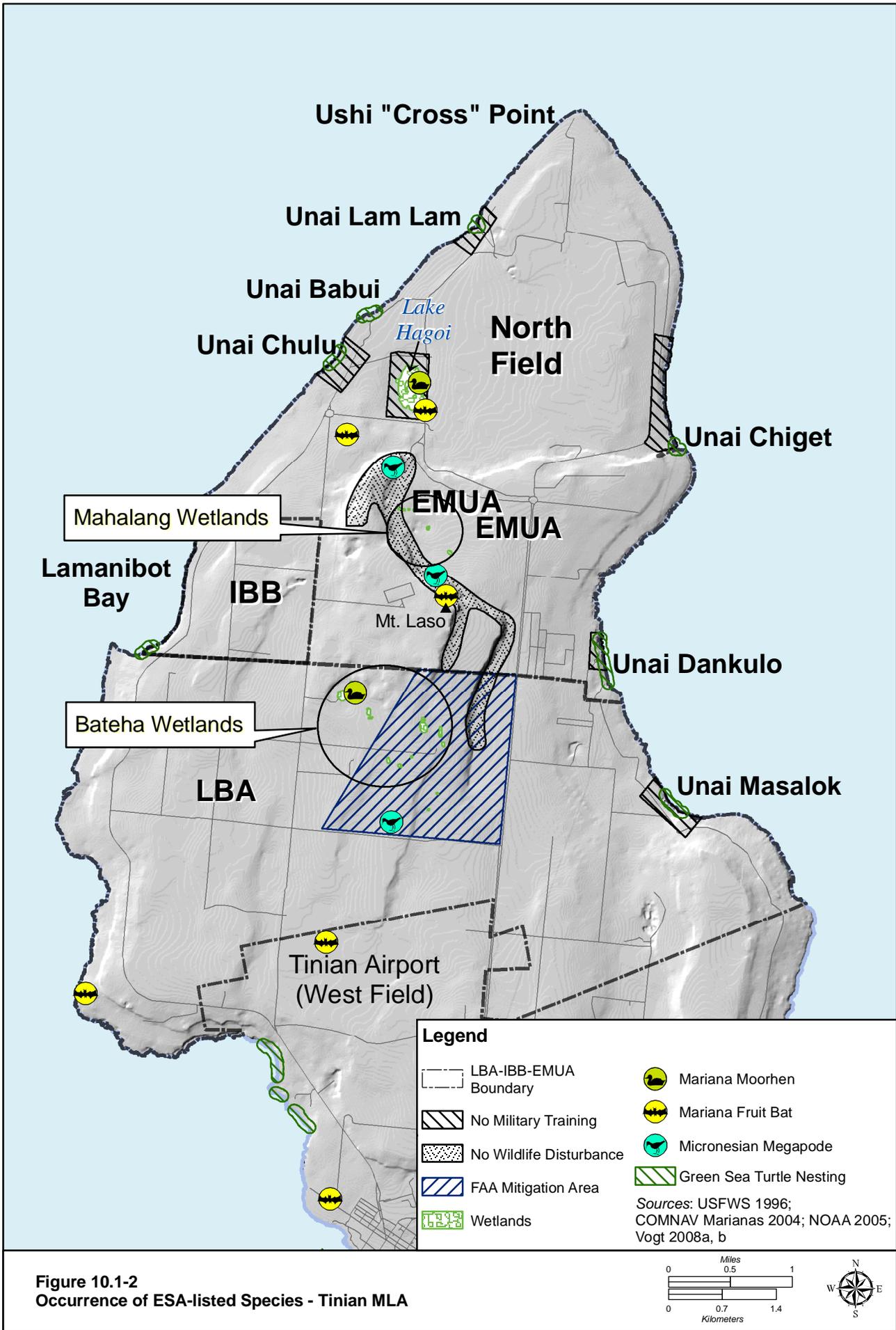
Table 10.1-2. Occurrence of Special-Status Species within the Tinian ROI

Common Name/Chamorro Name	Status		Habitat	Occurrence in ROI
	ESA	CNMI		
Mammals				
Mariana fruit bat/Fanihi	T	E	Limestone forest, coastal forest, and coconut plantations	Occasional sightings
Birds				
Mariana common moorhen/Palattat	E	E	Freshwater wetlands	Population up to 75 birds
Tinian monarch/Chichirikan	-	E	Limestone forests, tangantangan thickets	Thousands present but has declined
Micronesian megapode/Sasangat	E	E	Limestone forest and coconut groves	Reports of a few individuals in recent years but none in 2008 surveys
Mariana swiftlet/Chuchaguak	E	E	Nests in caves	Observed occasionally historically; no observations since 1970 and presumed extirpated
Reptiles				
Green turtle/Haggan bed'di	T	T	Suitable beaches for basking and nesting.	Nesting documented
Hawksbill turtle	E	E	Suitable beaches and strand for basking or nesting	No nesting known
Micronesian gecko/Guali'ek	-	E	Forested areas	Reported from Mt Lasso and Carolinas Plateau in 2008
Invertebrates				
Humped tree snail/Akaleha', Denden	C	-	Intact limestone forest	Not seen since 1970; possibly extirpated

Legend: C = candidate, E = endangered, T = threatened.

Sources: COMNAV Marianas 2004; CNMI Department of Land and Natural Resources (DLNR) 2005; TEC JV 2007; Vogt 2008a, b; Navy 2009; USFWS 2009b.

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Mariana Fruit Bat

Although Tinian once held a large number of fruit bats, after World War II it was estimated to retain only 5% of native forest cover (USFWS 1998), a primary reason, along with poaching, for the current near-absence of Mariana fruit bats on Tinian. No permanent fruit bat colony is believed to exist on Tinian. However, bats may fly between islands in the southern Marianas. Within the MLA, fruit bats have been observed historically in the vicinity of Mount Lasso, Puntun Diaplo, and Lake Hagoi (COMNAV Marianas 2004). Surveys were conducted for Mariana fruit bat on Tinian in 1994 and 1995 at five observation stations and fruit bats were not observed. However, there were two incidental observations, one near San Jose village and one near the south end of the island. No bat colonies were observed on Tinian so no direct colony counts were conducted (Kreuger and O'Daniel 1999). In 2008, eight separate station counts were conducted at seven locations on Tinian and no bats were observed (Brooke 2008).

Mariana Common Moorhen

The Mariana common moorhen is an inhabitant of emergent vegetation of freshwater marshes, ponds, and placid rivers. In the Mariana Islands, its preferred habitat includes freshwater lakes, marshes, and swamps. The recovery plan for the Mariana common moorhen identifies Lake Hagoi (44 ac with 2.5 ac of open water (18 ha with 1 ha of open water) (Takano and Haig 2004) within Tinian's EMUA as primary habitat for the moorhen. Primary habitat is defined as the best current or potential remaining moorhen habitat and is considered essential to the recovery program (USFWS 1991).

The 1991 recovery plan estimated the moorhen population on Tinian to be between 20 and 125 birds (USFWS 1991). Based on previous reports and surveys from 1989, 1994-1995, and 2001 the Tinian moorhen population was estimated to be between 41 and 75 birds (Takano and Haig 2004). Yearly averages of a monthly monitoring program show that 2003 and 2007 were peak years for moorhen numbers at Hagoi (16.9 and 17.1, respectively), and lows during 1999 and 2005 (10.1 and 9.9, respectively). These numbers are the means for the year and are index surveys not an absolute population estimate. The number of birds observed appears to correlate to periodic dry conditions at the Hagoi wetland; Hagoi was completely dry in April 2005 (Vogt 2008a). Predation from rats and monitor lizards is likely impacting the moorhen population at Lake Hagoi, especially during peak nesting periods (USFWS 1996, Vogt 2008a).

The 27 ac (11 ha) Magpo wetland area that is identified as secondary moorhen habitat (USFWS 1991) is located over 1 mi (1.6 km) south of the MLA boundary in southeastern Tinian. In 1995, the estimated maximum numbers of moorhens using the smaller 32 ac (13 ha) Mahalang and 15 ac (6 ha) Bateha wetlands is three and four birds, respectively; however these wetlands are overgrown with vegetation (USFWS 1996, Takano and Haig 2004). The moorhen populations have declined due to habitat loss (vegetation encroachment), historical poaching, and predation by rats and monitor lizards (USFWS 2009b).

Micronesian Megapode

In 1902, the Micronesian megapode was noted as common on Tinian. However, by 1949 these birds were already becoming difficult to locate in surveys (Naval Facilities Engineering Command [NAVFAC] Pacific 1997). Its continued existence on Tinian was confirmed during a USFWS survey in 1995 where incidental sightings of single birds were reported at three separate locations including Mount Lasso, the Maga area (to the northeast of the International Broadcast Bureau), and a small section of native forest adjacent to Cross Island Road in the Bateha area (Kreuger and O'Daniel 1999). Extensive megapode surveys in 2001 resulted in a conservative estimate of at least two individual birds (Witteman 2001).

During monthly surveys from 1999-2005 three megapodes were detected on the Maga transect (Vogt 2006). In surveys conducted on seven transects in July and August 2006 no megapodes were documented (Vogt 2008b). This was also the only area where megapodes were documented in the 2001 surveys (Witteman 2001). Since 1995 biologists have detected megapodes 13 times on Tinian during 234 individual survey efforts (Vogt 2008b). Because some of these detections may be repeat observations of the same bird, it is not possible to determine a current population size for Tinian. Occasional sightings of megapodes may be a result of movement from Aguiguan. No Micronesian megapodes were detected in 2008 during point-transect and playback surveys on Tinian (USFWS 2009b).

Mariana Swiftlet

Mariana swiftlets have been detected on Tinian in the past (last documented in the 1970s); however current evidence indicates that it is likely an infrequent visitor from Saipan or Aguiguan (Cruz et al. 2008). Detailed surveys and mapping of 88 caves on Tinian (Stafford 2003, as cited in Cruz et al. [2008]) revealed no evidence of Mariana swiftlets and they are presumed extirpated from the island (USFWS 2009b).

Sea Turtles

The green sea turtle is known to nest on Tinian, and the hawksbill turtle has been sighted in the waters offshore, but is not known to nest on the island. Green sea turtle abundance and density are highest along the island's relatively uninhabited east coast. The most recent estimate of the number of green sea turtles occurring in the nearshore waters around Tinian was 832 turtles in 2001 (Kolinski et al. 2004). For successful nesting, green sea turtles require deep sand beaches with open ocean exposure and minimal disturbance. Beaches within the MLA where green sea turtles have nested include Unai Masalok, Unai Dankulo, Unai Lamlam, Unai Babui, Unai Chulu, Unai Dumpcoke, Unai Barcinas, and Leprosarium Beach (COMNAV Marianas 2004). Green sea turtle nesting activity occurs as early as late January and ends in mid-July on most of Tinian's sandy beaches (NAVFAC Pacific 1997). The beaches that occur within the MLA are surveyed monthly for sea turtle activity (i.e., crawls, nests, potential nests, body pits and hatchling tracks). Surveys between 1999 and 2005 were summarized by Vogt (2006). The highest number of beach crawls (13) and nests (6) were recorded in 2005 with activity occurring at Unai Dankulo (Long Beach), Chulu, and Masalok.

Tree Snails

The humped tree snail is a Federal Candidate species. It was historically present on Tinian but has not been observed since 1970 (CNMI DLNR 2005) and is thought to be extirpated (USFWS 2007). Recent surveys in likely habitat areas did not record this species (report in preparation).

Other Species

Recent surveys were conducted for ESA candidate butterfly species and none were found, although host plant species were present (USFWS 2009b).

No federally-listed plant species are known from Tinian.

10.1.2.5 CNMI-Listed Species

Ten CNMI-listed threatened and endangered species have been observed or potential habitat is present on Tinian (Table 10.1-2 and Figure 10.1-2). Those species that are also federally listed were discussed above.

Tinian Monarch

The Tinian monarch is an endemic species that nests in limestone forest, secondary forest, and tangantangan forest habitats. It was federally delisted in 2004 (USFWS 2004) but is still listed as threatened/endangered by the CNMI government. Although the Tinian monarch is no longer listed, the species is currently being monitored under the *Post-Delisting Monitoring Plan for the Tinian Monarch* (USFWS 2005).

Based on several sources, the USFWS (2004) estimated the monarch currently inhabits approximately 62% of the land area on Tinian of which approximately 93% is secondary and tangantangan vegetation and 7% is native limestone forest. The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population (USFWS 2004). An island-wide Tinian monarch survey in 1982 estimating a population of 35,846 was repeated in 1996 resulting in an estimated population of 55,721 (Lusk et al. 2000) and the same survey found a significant increase in forest density since 1982, indicating an improvement in monarch habitat quality.

The current population estimate for Tinian based on June 2008 surveys is 40,000 individuals. Based on the 2008 survey, the greatest monarch densities were observed in limestone forest, secondary forest, and tangantangan thicket, decreasing in that order but not statistically different. Territory densities ranged from 1.7 territory pairs per ha in tangantangan thickets to 7.8 pairs per ha in limestone forest. Native tree species are preferred monarch nesting sites, as evidenced by higher densities, nesting rates, and reproductive success in limestone forest (NAVFAC Pacific 1997).

Micronesian Gecko

This species is endemic to Micronesia and native to Tinian (USFWS 2009b) and it is the only CNMI-listed gecko in the CNMI. It was believed to be extirpated after 1946 but was again collected in 2003 on Tinian (CNMI DLNR 2005) and was sighted in 2007 and collected (a single specimen only) in limestone forest in 2008 studies (USFWS 2009b).

10.2 ENVIRONMENTAL CONSEQUENCES

10.2.1 Approach to Analysis

10.2.1.1 Methodology

Biological resource issues and concerns include the potential direct, indirect, and cumulative impacts of the proposed actions and alternatives during the construction and operation phases. Impacts may be either temporary (reversible) or permanent (irreversible). Direct and indirect impacts are distinguished as follows.

Direct impacts are associated with proposed construction activities (e.g., ground-disturbing activities) and operations (e.g., range use). Potential types of direct impacts include, but are not limited to:

- Loss of habitat due to vegetation removal during construction and potential wildfires from training activities.
- Temporary loss of habitat during construction from noise, lighting, and human activity.
- Potential loss of habitat due to increased noise from proposed aircraft activities and training range usage.
- Injury or mortality to wildlife or special-status species caused by the action that occur at the same time and place as the action.

Indirect impacts are caused by or result from project-related activities, are usually later in time, and are reasonably foreseeable (e.g., increased likelihood of non-native species moving into the area after disturbance). Potential indirect impacts include, but are not limited to:

- All disturbances from human activity, noise, and lighting that would potentially impact unoccupied suitable habitat for special-status species.
- Introduction of new non-native species or increased dispersal of existing non-native species on Tinian.
- Dispersal of existing non-native species from Tinian to other destinations.
- Increased threats from feral animals.
- Adverse effects from pollutants that are released from construction, military operations, or training.
- Adverse effects from wildfires.

Potential direct impacts of noise from small arms ranges were determined based on sound levels estimated from noise models. Potential direct and indirect impacts to species occupying habitat nearby to the ranges (e.g., from daily operations at facilities, and lighting disturbance) were assessed within 328 ft (100 m). This distance was selected because the impacts being considered for this analysis are for general noise and human activity, and there is no information available on the sensitivity of the species being evaluated.

General principles used to evaluate impacts are:

- The extent, if any, that the action would permanently lessen ecological habitat qualities that ESA-listed species depend upon, and which partly determines the species' prospects for conservation and recovery.
- The extent, if any, that the action would diminish population sizes, distribution, or habitat of regionally important native plant or animal species.
- The extent, if any, that the action would be likely to jeopardize the continued existence of any ESA-listed species.
- The extent, if any, that the action would be inconsistent with the goals of USFWS recovery plans, Navy INRMPs, or the CNMI CWCS.

10.2.1.2 Determination of Significance

Significance of impacts to vegetation, wildlife, and special-status species were determined using guidelines in the previous section. Special-status species are defined as ESA- and CNMI-listed species and species that are designated candidates for ESA listing. Specific significance criteria are discussed below. If significant impacts are determined, then mitigation may be proposed to offset the impacts. For this EIS/OEIS, a major consideration for mitigation is biosecurity. This issue is discussed in detail under mitigation measures after the evaluation of impacts.

Vegetation

Impacts would be determined significant if any primary limestone forest (mature forest dominated by native species) would be cleared, unless determined to be very minor in the context of the surrounding forest areas. Any loss of this forest vegetation community would be considered significant because of the large historical and continuing losses of this forest type on Tinian. Loss of wetland or mangrove vegetation would also be considered potentially significant.

Wildlife

Impacts would be determined significant if native wildlife species are present and the proposed project results in diminished population sizes or distributions of regionally important native animal species. These wildlife species include those designated in the CNMI CWCS. Non-native species impacts that exceed the criteria specified above are evaluated. A major concern for wildlife is if the BTS would be inadvertently introduced to Tinian. This concern is addressed comprehensively for all actions proposed in this EIS/OEIS with mitigation measures described in Volume 2, Section 10.2.2.6.

Migratory Birds

For migratory birds, the MBTA prohibits the taking, killing, or possession of migratory birds, with an exemption for military readiness activities (as defined in federal regulations) provided they do not result in a significant adverse effect on a population of a migratory bird species. Congress defined military readiness activities as all training and operations of the Armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Military readiness activities do not include: (A) routine operation of installation support functions such as administrative offices, military exchanges, water treatment facilities, schools, housing, storage facilities, and morale, welfare, and recreation activities; (B) the operation of industrial activities; and (C) the construction or demolition of facilities used for a purpose described in A or B (50 CFR Part 21).

The DoD must consult with the USFWS if it is determined that a military readiness activity would have a significant adverse effect on a population of a migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem.

Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding developed in accordance with EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. The Memorandum of Understanding between the DoD and USFWS was signed in July 2006 and DoD responsibilities included, but are not limited to: (1) incorporating conservation measures addressed in regional or state bird conservation plans and INRMPs; (2) managing military lands and activities other than military readiness in a manner that supports migratory bird conservation; and (3) avoiding or minimizing impacts to migratory birds, including incidental take and the pollution or detrimental alteration of the environments used by migratory birds.

Special-Status Species

The presence of Special-Status species in the project areas was described in Section 10.1. Background information is presented in the species profiles in Appendix G. Impacts would be determined significant if special-status species are present in the project area and any project action is likely to result in harassment or harm of an individual, population or species. Impacts to ESA-listed species would include vegetation clearing of habitat, unless it is determined that the removal of habitat or other affect is minor when considering all the remaining habitat and quality of habitat available to that species and considering USFWS recovery plan goals. Significant impacts would also include disturbing ESA- and CNMI-listed species due to noise, lighting, or human activity. If species are currently present in a proposed project area, noise, lighting, and general human activity are considered direct impacts for the purposes of this analysis, even though it is recognized that some of the impacts from the proposed actions may be indirect, rather than direct. If unoccupied but recognized habitat is affected by noise, lighting, or human activity, impacts would be considered indirect and would be determined significant unless the area affected is

considered minor when considering all the remaining habitat and quality of habitat available to that species.

For ESA-listed species, federal agencies are required to ensure that their actions do not jeopardize the continued existence of an endangered or threatened species or its critical habitat. Analyses of potential impacts are based on review of plans for the proposed action and the available current and historical distributional data for each species. In accordance with section 7 of the ESA, a BA is being prepared by the Navy to analyze the potential impacts on ESA-listed and candidate species and critical habitat under the jurisdiction of the USFWS.

The BA and the subsequent BO issued by the USFWS after their review of the BA would be the final determination of impacts to ESA-listed species that are being evaluated in this EIS/OEIS. Candidate species must also be evaluated in the BA, however if they are not formally listed by the time the BO is issued and the proposed action would not result in their listing, no determination for these species will be made in the BO. The BO would provide an Incidental Take Statement that would list the amount or extent of take anticipated. Based on that take, the BO would specify Terms and Conditions that the action proponent must comply with to be exempt from the prohibitions of Section 9 of the ESA. These are non-discretionary requirements. The BO would also specify Conservation Recommendations that are discretionary proponent activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The USFWS effects determinations from the BO would be incorporated into the Final EIS/OEIS.

10.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns related to terrestrial biological resources that were mentioned by the public, including regulatory stakeholders, during the public during scoping meetings were addressed. A general account of these comments includes the following:

- Concern that activities associated with the military expansion (i.e., construction, expansion, renovation projects, and military training activities) may result in habitat loss and physical disturbance of federally listed endangered species and other federal trust species.
- Potential for harm to fragile ecosystems on Guam and in the Marianas from the introduction of non-native species due to increased traffic among the islands from the movement of personnel and materials. Such species include the BTS, flatworms, various insects, and some plants. The EIS/Overseas Environmental Impact Statement (OEIS) should outline inspection and sanitary procedures to prevent this movement.
- Existing control and containment activities at air and sea ports for BTS are insufficient to deal with the risk associated with the increased cargo and personnel movement from Guam to other vulnerable destinations. The issue “of utmost concern” is BTS interdiction and an effective, enforceable, and fail-proof procedure for inspecting all military cargo, personnel, and equipment entering the CNMI. A sustainable 100% inspection rate of all cargo, vehicles, munitions, and household goods would be anticipated, and Guam regulation protocols 505 and 506 should be incorporated into a BTS control plan to be included as part of the EIS/OEIS.

10.2.2 Alternative 1 (Preferred Alternative)

10.2.2.1 Tinian

Construction

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is shown in Table 10.2-1 and Figure 10.2-1. Vegetation removed includes 173 ac (70 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. No limestone forest would be removed. The vegetation to be removed serves as potential habitat for all the Special-Status species addressed below. Impacts to vegetation would be less than significant.

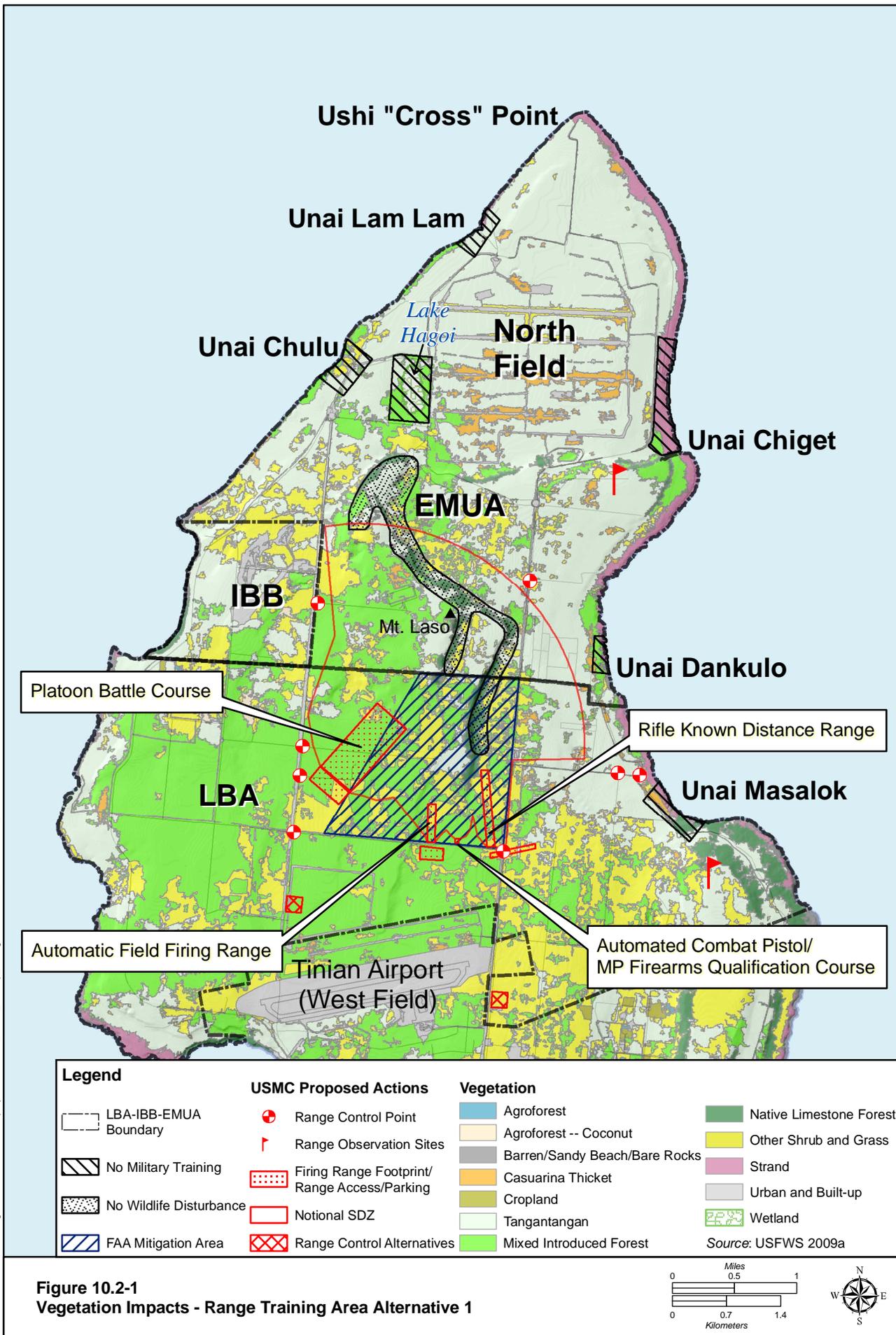
Table 10.2-1. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 1 (ac [ha])

<i>Parcel and Activity</i>	<i>Mixed Introduced Forest</i>	<i>Tangantangan</i>	<i>Shrub and Grass</i>	<i>Developed</i>
Construction Areas (vegetation removed)				
Platoon Battle Course	123 (50)	0	13 (5.3)	0
Ranges	13 (5.3)	0	25 (10)	0
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	28 (11)	0.8 (0.3)	19 (7.7)	0.4 (0.2)
Total area removed	173 (70)	0.8 (0.3)	67 (27)	1.4 (0.6)

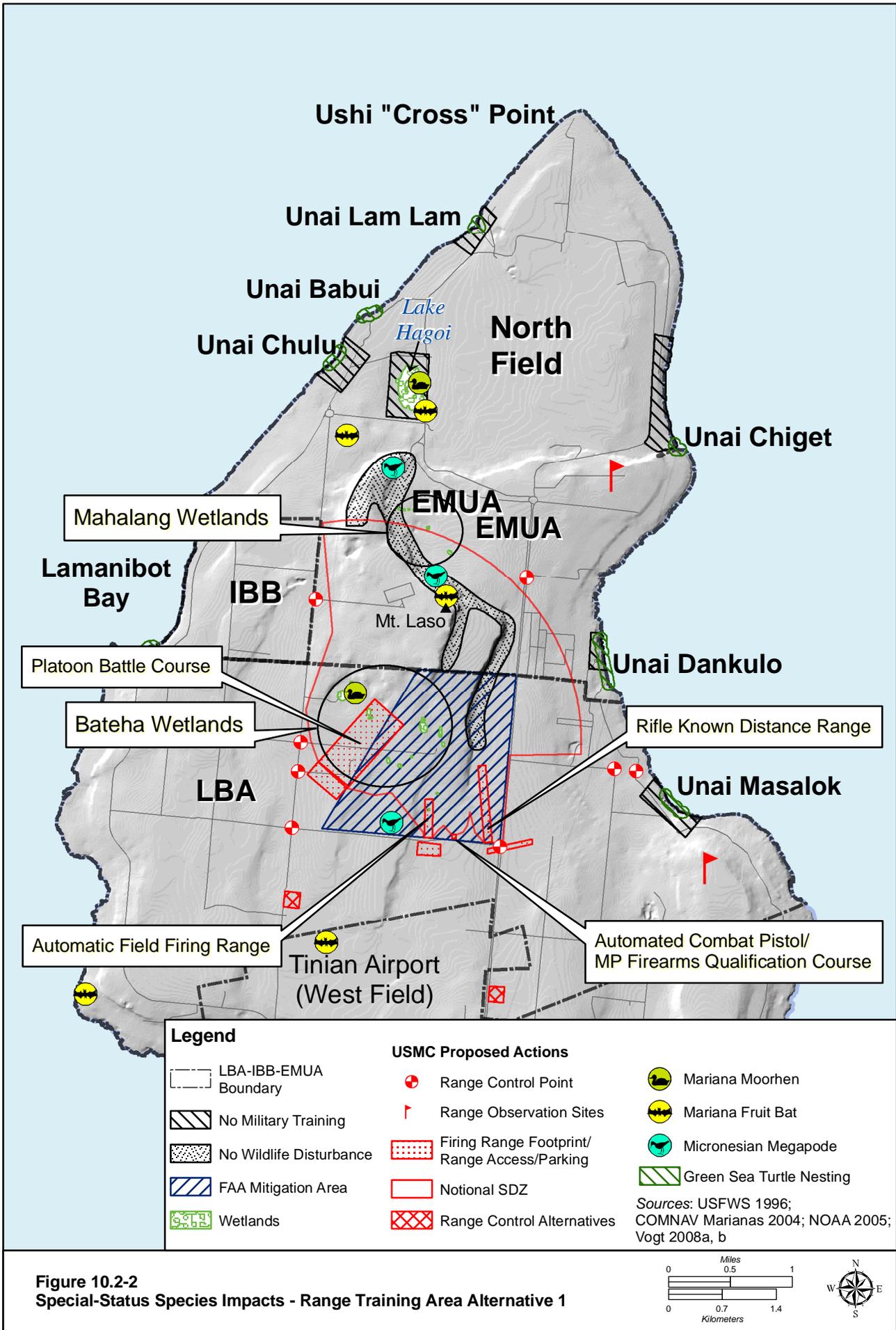
Wildlife

All the terrestrial bird species listed in Section 10.1.2 have the potential to be present in the proposed range area. Proposed construction activities would remove suitable habitat used by these species (Table 10.2-1) and displace them to other areas. Construction actions could inadvertently kill small species such as skinks and geckos. Approximately 70 ac (28 ha) of the 936 ac (379 ha) FAA Mitigation Area that was previously designated in the Lease Back Area (LBA) just south of the EMUA boundary would be removed (Figure 10.2-2). Of particular concern are the Micronesian honeyeater, a species known to be declining since 1982 and with a current estimated population of 4,156 on Tinian (USFWS 2009b) and the Mariana fruit dove, a Marianas endemic species with a current estimated population of 3,201 birds (USFWS 2009b). The honeyeater population density estimate by the USFWS (2009b) is 0.41 birds per ha so the loss of 70 ha (Table 10.2-2) would result in the loss of habitat for up to 29 birds. The fruit dove population density estimate by the USFWS (2009b) is 0.33 birds per ha so the loss of 70 ha (Table 10.2-2) would result in the loss of habitat for up to 23 birds. It is assumed that some birds would relocate to suitable adjacent habitat; however it is probable that a portion of these birds may be unable to successfully relocate. During construction activities, some of the birds may not immediately establish territories and/or breeding pairs that may result in reduced breeding activity and a temporary loss in potential reproduction. However, this loss in habitat and temporary loss in reproduction would not result in diminished population sizes or distributions.

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Other areas surrounding the cleared ranges would be directly impacted by disturbance from range construction and operation. Areas adjacent to the ranges, including portions of the FAA Mitigation Area, would be subject to disturbance from the range construction from noise and general human activity. However, construction would be for a relatively short period. Species sensitive to noise and activity would disperse to other areas that provide abundant habitat and could return to the area following construction. None of the species are rare based on survey results by USFWS (2009b). Long-term, permanent impacts to populations of wildlife would not likely result. Impacts to wildlife would be less than significant.

Table 10.2-2. Direct Impacts to the Tinian Monarch with Implementation of Alternative 1

<i>Habitat Type</i>	<i>Habitat Removed (ac [ha])</i>	<i>Monarch Density (# per ha)^a</i>	<i>Total Potential Birds in Removed Habitat</i>	<i>Max. Territories (# per ha)^a</i>	<i>Total Potential Territories in Removed Habitat</i>
Mixed Introduced Forest	173 (70)	5.82	407	2.9	203
Tangantangan	0.8 (0.3)	4.36	1	2.5	1
Totals	174 (70)	N/A	408	N/A	204

Legend: N/A – Not applicable.

Source: ^a USFWS 2009b.

Special-Status Species

Direct impacts to special-status species includes the removal of habitat. Figure 10.2-4 shows general locations of Special-Status Species in relation to the proposed ranges.

Mariana Fruit Bat. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

Mariana Common Moorhen. One area of 0.3 ac (0.12 ha) identified as a potential wetland (Figure 10.2-2; also see Chapter 4) would be removed during construction of the platoon battle course. There is no evidence that this wetland is being used by the moorhen. A wetland approximately 1,000 ft (305 m) to the northwest of the battle course is used by up to 4 moorhens (USFWS 1996). Up to four Mariana common moorhens use the larger of the two Bateha wetlands located approximately 1,000 ft (305 m) to the northwest of the platoon battle course (USFWS 1996). There is no documented use of the other areas identified as potential wetlands, although one small wetland that would be removed may hold water for at least short periods (see Chapter 4 for an additional discussion of wetlands). Although construction would result in noise and activity, the distance to the wetland and a likely short construction period would result in impacts that are less than significant.

Micronesian Megapode. Although not observed in 2008 surveys, several birds have been documented on Tinian since 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. A single bird was detected just west of the proposed automatic field firing range in 1995. However, surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 7,500 ft (2,300 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. Impacts would be less than significant.

Tinian Monarch. The Tinian monarch is an endemic species that nests in limestone forest, secondary forest, and tangantangan forest habitats. It is likely to be present in all areas surrounding the ranges and range support areas to be constructed. Potential habitat for the species would be removed as summarized in Table 10.2-2. The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 408 birds (USFWS 2008). With a total population estimated at 40,000 birds, project construction would impact 1.0 % of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 204 (USFWS 2008). The placement of ranges under Alternative 1 does not meet the requirements set out in the “Dedication of Tinian Military Retention Area Land for Wildlife Conservation” (Government of CNMI and Navy 1999) whereby a 936 ac (379 ha) FAA Mitigation Area is established for the protection of “endangered and threatened wildlife, particularly the Tinian Monarch” with the provision that it is the right of the U.S. military to “use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch.” As discussed under wildlife above, approximately 70 ac (28 ha) of the 936 ac (379 ha) FAA Mitigation Area would be removed. In addition, a zone 328 ft (100 m) wide surrounding the perimeter of the range footprint areas is assumed to be directly impacted by noise and activity from construction. The amount of area is shown in Table 10.2-3.

As compensation for the removal of a portion of the FAA mitigation area, including the construction footprint and the surrounding zone impacted by noise and activity, additional mitigation area would be established and other conservation measures would be implemented, as described under mitigation in Section 10.2.2.3. The construction would result in direct significant impacts to the Tinian monarch, mitigated to less than significant.

Sea Turtles. There is no proposed action in Alternative 1 that occurs in beach areas. Impacts would be less than significant.

Micronesian Gecko. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Since no clearing would occur in limestone forest (except possibly unmapped small, isolated areas) and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

Tree Snails. The federal ESA candidate humped tree snail has occurred historically on Tinian but is now thought extirpated (USFWS 2007); recent surveys in likely habitat areas did not find this species (report in preparation). There would be no impact on this species.

Table 10.2-3. Habitat Surrounding Ranges under Alternative 1

<i>Project</i>	<i>Forested Habitat Affected - 100 m Buffer ac (ha)</i>
Platoon Battle Course	71 (29)
KD Range	44 (18)
Field Firing Range	42 (17)
Combat Pistol/Qual Course	12 (4.9)
Range Control/Bivouac Areas	24 (10)
Totals	193 (78)

Operation

Vegetation

Stray ammunition would have limited impact to surrounding vegetation. Impacts to vegetation would be less than significant.

Wildlife

Stray ammunition may fall within the Surface Danger Zones (SDZs); however, the likelihood of any single animal being struck is negligible. Assuming that 0.01% of ammunition fall outside the range and in the SDZ, the estimated number of bullets that would fall on land within the SDZ is approximately 328 over the course of a year. Impacts would be less than significant.

Areas surrounding the cleared ranges would be impacted by disturbance from training. Surrounding areas, including portions of the FAA Mitigation Area would be subject to disturbance from range operations. These periods of disturbance to species such as the Micronesian honeyeater and the Mariana fruit dove would not be continuous due to only periodic training. Information on the noise sensitivity of the bird species of concern is not available. However, there are other large areas of suitable habitat that could be utilized in adjacent areas. Based on this availability of habitat, impacts to migratory birds from operations are considered to be less than significant. Noise and activity impacts are discussed below.

Use of ammunition may result in increases contaminants in soil and runoff from the ranges, at least in some localized areas. Impacts to migratory bird species and other wildlife would be less than significant. However, range management procedures would minimize the amount of contaminants in soil and runoff (refer to section 4.2.2.1)

Special-Status Species

Stray ammunition may fall within the SDZs; however, the likelihood of any single animal being struck is negligible. As described above, the estimated number of bullets that would fall on land within the SDZ is approximately 328 bullets over the course of a year. Impacts would be less than significant.

Mariana Common Moorhen. Up to four Mariana common moorhens use the larger of the two Bateha wetlands located approximately 1,000 ft (305 m) to the northwest of the platoon battle course (USFWS 1996). There is no documented use of the other areas identified as potential wetlands, although one small wetland that would be removed may hold water for at least short periods (see Chapter 4 for an additional discussion of wetlands). No noise studies have been conducted to measure responses of Mariana common moorhens to noise. However, given the distance and the likely infrequent use of the wetland by moorhens, noise and activity from construction of the ranges and support areas would have a less than significant impact on the Mariana common moorhen.

Tinian Monarch. There would be immediate direct and longer-term indirect impacts from general noise and activity at the ranges in the surrounding forested areas. As discussed below, because there is no information available on the sensitivity of the species being evaluated for general noise and human activity, significant impacts were assumed possible in forested habitat within a surrounding zone of 328 ft (100 m) surrounding the ranges. Using this buffer area, the areas affected are as specified in Table 10.2-3. The Mariana fruit bat and Micronesian megapode are not present in the proposed training area based on the most recent studies (USFWS 2009b) so they would not be affected by noise and activity, therefore impacts would be less than significant.

Noise studies have been conducted for the proposed small arms firing ranges and a summary of the study and noise contours are provided in Chapter 6. Contours are based on a metric termed the PK15(met) which is the peak noise exceeded by 15% of firing events and is a linear peak sound pressure level of individual shots rather than a cumulative or average level; using this measure means the size of the contours would not change if the number of rounds fired increases. For the Tinian monarch, the surrounding forested areas are important. The area beyond the range within a PK15 (met) 104 db noise contour contains 577 ac (234 ha) of forest consisting of the following subtypes: limestone forest – 25 ac (10 ha); mixed introduced forest – 506 ac (205 ha); and tangantangan - 46 ac (19 ha).

No noise studies have been conducted specifically on the Tinian monarch; however, noise studies have been conducted on the effects of military noise on similar species in the Pacific. Vanderwerf et al. (2000) studied the effects of military noise on the elepaio, another endangered Pacific flycatcher in the same family as the Tinian monarch.

The study evaluated the responses of Oahu elepaio at the Schofield Barracks Range in Hawaii to 282 high explosive artillery (60-mm, 105-mm, and 155-mm) and demolition blasts located 328 to 3,281 ft (100 to 1,000 m) from elepaio nests, ranging in intensity from 81.4 to 116 dB. The effects of artillery blast noise were only detected in two instances. In both instances, an incubating male elepaio was preening his breast feathers with its head down when a blast occurred and it suddenly looked up and scanned immediately after the blast, as if attempting to visually locate the source of the sound. The response was minor and short-lived in both cases; the male lowered its head and resumed preening 1 to 2 seconds after each blast noise had subsided. In no case did an elepaio flush from the nest or pause when returning to the nest in response to artillery noise. This study suggests that Oahu elepaio reproductive success is not negatively impacted by noise associated with live-fire training, particularly artillery (VanderWerf et al. 2000). In addition to the elepaio study, coastal California gnatcatchers regularly occur and nest successfully within 400 ft (122 m) of the Sheriff's Training Range and a Trap and Skeet Range at Marine Corps Air Station Miramar (Navy 2001).

It should be noted the elepaio studied at Schofield Barracks Range may be habituated to the noise associated with live-fire training and since live-fire training has not been conducted on Tinian before, it may take some time for the birds on Tinian to habituate to the noise. Birds habituate to noises and may not respond to stimuli when they do not perceive a direct threat. In general, wildlife, particularly birds, react more to a visual stimulus associated with a noise rather than just a noise without an association to a visual source (Lamp 1989; Bowles 1995). The noise associated with the proposed small arms ranges may be heard at some distance from the range. However, due to the construction of the ranges and intervening vegetation, there would be no direct visual cue to the proposed weapons firing by a Tinian monarch or other bird, unless the bird was directly adjacent to the firing line of the range.

The VanderWerf et al. (2000) study provides some indirect evidence that the Tinian monarch may not be highly sensitive to noise, particularly small arms fire. However, given the limited amount of available information on the potential impacts to Tinian monarchs from small arms firing, monitoring of the species in areas surrounding the ranges would be conducted to determine potential noise impacts. If this monitoring determined that the Tinian monarchs are being affected, techniques to reduce noise generation, such as noise barriers, would be employed. With this mitigation, impacts would be less than significant.

All Special-Status Species. Potential indirect impacts to special-status species may result from pollutants, non-native species, fire, recreation, and potential termination of agricultural leases that are currently held within the LBA.

Use of ammunition would likely result in increases in heavy metal concentrations in soil and runoff from the ranges, at least in some localized areas. Incidental spills of petroleum used for vehicles or other power equipment would compound the problem. However, with BMPs to control and reduce generation and migration of contaminants from the range area and periodical monitoring for metals contamination in areas surrounding ranges, impacts would be less than significant.

Training activities would result in additional aircraft trips between Guam and Tinian with their associated personnel and equipment, associated with construction and with training. The BTS is the most serious of potential non-native species that might be brought to Tinian. In addition, several potentially non-native plant species in Micronesia (e.g., see Space and Falenruw 1999) present on Guam that are not known to be on Tinian could be introduced due to proposed training activities on Tinian. These and other species have the potential to degrade limestone forest habitat and other forested and shrub habitats that support Tinian monarch and other species. Impacts would be significant.

To prevent potentially non-native species, particularly BTS, from being imported to Tinian from Guam, a comprehensive non-native species program would be implemented on Guam and is addressed in Section 10.2.2.3 and in Volume 2 of this EIS/OEIS under terrestrial biological resources mitigation. With implementation of this plan, non-native species impacts would be less than significant.

Fire potential would be increased from firing range operations. Fire can result in direct effects to Special-status species and other species through mortality from smoke inhalation or direct mortality. Native plants, animals, and their habitats on Tinian are adapted to a humid, tropical climate and are not adapted to a fire driven ecosystem (USFWS 2008). Grass fires are regular occurrences on Tinian, and there is greater danger during the dry season. Data cited in the 1997 Tinian INRMP (NAVFAC Pacific 1997) shows that the worst fire hazard exists during the driest months (May through July) of the dry season and during this short time 200 or more acres may get scorched each year. Information was presented for 1991 that 33 fires burned, the largest occurring in the month of March and two-thirds of the fires burned between 1 and 8 ac (0.4 and 3.2 ha), and approximately one-third burned 9 to 20 ac (3.6 to 8.1 ha). The alteration or removal of habitats by fire could reduce food sources or prevent or inhibit breeding and create competition for feeding and sheltering, particularly for species that establish discrete territories. Impacts would be significant.

As a mitigation measure, a fire management program and plan would be developed for use in this area that would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system (see Section 10.2.2.2). With implementation of this mitigation, impacts would be less than significant.

Marines on recreation using the ranges could have a significant impact on threatened green sea turtles in coastal areas if no educational or enforcement program was in place. Impacts could be significant. As mitigation, a Marine Corps order would specify restrictions on use of beaches and institute a program for educating Marines who are training on Tinian on the island's natural resources.

There is currently 2,550 ac (1,032 ha) of land within the LBA being leased to residents on Tinian for agricultural use, primarily grazing. None of these areas are in the vicinity of the proposed ranges and none are in areas containing limestone forest. The potential termination of these leases may result in farmers moving their cattle to other areas of the island. This could result in improvement of forest health in the

areas terminated; however, the cattle could be moved to areas outside the LBA where new forest could be degraded. It cannot be determined where these farmers may move their cattle, or even if they would move them since they could choose not to continue the practice. Therefore, it is recognized as a potential significant impact. Once more details are developed for the training operations on Tinian, the Navy would review the decision to terminate leases and retain those that are determined compatible with military mission requirements for the area.

10.2.2.2 Summary of Alternative 1 Impacts

Table 10.2-4 summarizes Alternative 1 impacts.

Table 10.2-4. Summary of Alternative 1 Impacts

<i>Project Activities</i>	<i>Project Specific Impacts</i>
Construction	Mixed introduced forest, shrub habitat, and tangantangan would be removed that is habitat for numerous native birds, including the CNMI-listed Tinian monarch; approximately 1 % of the Tinian monarch population on Tinian would be affected resulting in a significant impact; a small amount of the previously designated FAA Mitigation Area would be removed.
Operation	The Mariana common moorhen and CNMI-listed Tinian monarch would not be significantly impacted by noise from small arms range firing; the potential for fire and non-native species are significant but would be mitigated to less than significant; indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time.

10.2.2.3 Alternative 1 Potential Mitigation Measures

Mitigation measures are described in this section. Specific protection measures and general conservation measures that would be implemented are described as well as existing conservation measures that are relevant to the terrestrial natural resources that may be affected. Final mitigation measures are subject to pending ESA Section 7 consultation with the USFWS. Best Management Practices (BMPs) are mentioned although they are not generally considered mitigation because they are actions, plans or standard operating procedures that would be implemented as part of the proposed action regardless of impacts or project. A detailed description of BMPs and resource protection measures required by regulatory mandates can be found in Volume 1, Chapter 4. A more detailed explanation of regulatory permitting requirements may also be available in Volume 8.

Existing Conservation Measures

Environmental restrictions and requirements for training operations are included in the COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000). The instruction contains the following components: guidance for developing an Environmental Protection Annex in support of a major military exercise plan; training requirements; BTS control and interdiction; monitoring and monitoring reports; emergency procedures; environmental monitor checklists; and an environmental awareness pocket card.

Project-Specific Protection Measures

The following are measures that would be taken to minimize potential impacts to special-status species:

- The COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000) would be updated and include all avoidance, minimization, monitoring requirements,

- and reporting requirements applicable to the actions described in this EIS; these would include reporting procedures for observations of special-status species.
- To prevent the spread of non-native species, a training SOP would be implemented; troops would receive awareness training and would inspect all gear and clothing (e.g. boots, bags, weapons, pants) for soil accumulations, seeds, invertebrates, and possible inconspicuous stow away BTS.
 - Approximately 1 week prior to clearing vegetation a qualified biologist would survey to determine if ESA-listed species are present. If ESA-listed species are within the project site the work would be postponed.
 - Construction personnel would receive a briefing on special-status species potentially present, to include avoidance measures and reporting requirements.
 - Monitoring would be conducted for the Tinian monarch and Mariana common moorhen (Alternative 1 only for the moorhen) in areas surrounding the ranges to determine potential, disturbance impacts and, if impacted, noise reduction techniques would be employed.
 - BTS interdiction and control measures would be implemented to address new training and transport to Tinian from Guam. These measures are described in Volume 2, Chapter 10, Section 10.2.2.6.

Potential Conservation Measures

Mitigation measures are described in this section. Specific protection measures and general conservation measures that would be implemented are described as well as existing conservation measures which are relevant to the terrestrial natural resources that may be affected. BMPs are mentioned although they are not generally considered mitigation because they are actions, plans or standard operating procedures that would be implemented as part of the proposed action regardless of impacts or project. A detailed description of BMPs and resource protection measures required by regulatory mandates can be found in Volume 7. A more detailed explanation of regulatory permitting requirements may also be available in Volume 8.

Bird Surveys

To monitor the status of forest birds in the MLA, Tropical Monitoring of Avian Productivity and Survival surveys would be conducted.

Tinian Monarch Management Plan

A Management Plan that includes monitoring would be developed and implemented to reduce the decline in population of this recently delisted (from the ESA) species. Data would also help meet the requirements of the USFWS delisting monitoring plan for the species (USFWS 2005).

Reforestation

Reforestation with native vegetation important for wildlife would be initiated in designated areas that are determined to be potential high-quality habitat that would benefit special-status species.

Establish a Forest Mitigation Area

The existing designated FAA Mitigation Area would be reconfigured to include important limestone forest habitat associated with the eastern escarpment of Mt Lasso and possibly other areas. It would include portions of the area currently designated the “no wildlife disturbance” area and would be designated in areas where future encroachment is unlikely if future expansion of training on Tinian were

deemed necessary. The amount of new mitigation area added would be a minimum of twice the area removed as a result of placement of range footprints and a surrounding buffer zone 328 ft (100 m) wide.

Wildland Fire Management Plan and Resources

A Wildland Fire Management Plan similar to or as an addendum to the recent plan developed for Guam (USFS 2008) would be developed and implemented. As in that plan it would include existing conditions, fire management strategies, suppression methods, preparedness, impacts, and management techniques. The Wildland Fire Management Plan would be implemented to develop and implement an effective wildland fire management program in the general areas of staffing, equipment, training, and development and implementation of specific procedures. Any impacts related to fire breaks, fire fighting roads, or other land disturbance related to fire management would be addressed in subsequent National Environmental Policy Act documentation.

Currently identified as required is a fire fighting water refill tank of approximately 5,000 to 10,000 gallons (18,927 to 37,854 liters) that would be put into service. The Tinian Fire Department maintains a 300-gallon pump truck and fire crew to respond to wildland fires that would augment military fire response efforts. The Tinian Fire Department also maintains a 750 gallon pumper truck and crew in San Jose to respond to and provide fire service for the southern, more developed portion of the island, and backup support to West Field. A military request for the use of these assets would be made through the West Field command post during major exercises.

Although this plan is considered a conservation measure overall, some elements in the plan would be project-specific protection measures.

Micronesian Biosecurity Plan (BSP)

A BSP with Risk Analysis is currently being developed by the National Non-native Species Council in conjunction with USFWS, U.S. Department of Agriculture, Guam Division of Aquatic and Wildlife Resources, CNMI Department of Fish and Wildlife, and other interested parties to facilitate a comprehensive approach to control non-native species export, import, and spread. The plan would be comprehensive for all Marine Corps and Navy Actions on Guam and Tinian. See Volume 2, Chapter 10, Section 10.2.2.6 for additional description of this plan. Although this plan is considered a conservation measure overall, some elements in the plan would be project-specific protection measures.

10.2.3 Alternative 2

10.2.3.1 Tinian

Construction

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is shown in Table 10.2-5 and Figure 10.2-3. Vegetation removed includes mixed introduced forest, tangantangan (*Leucaena leucocephala*), and shrub/grassland. No limestone forest would be removed. Impacts to vegetation would be less than significant. The vegetation to be removed serves as potential habitat for all the sensitive animal species that are addressed under the Special-Status Species section below.

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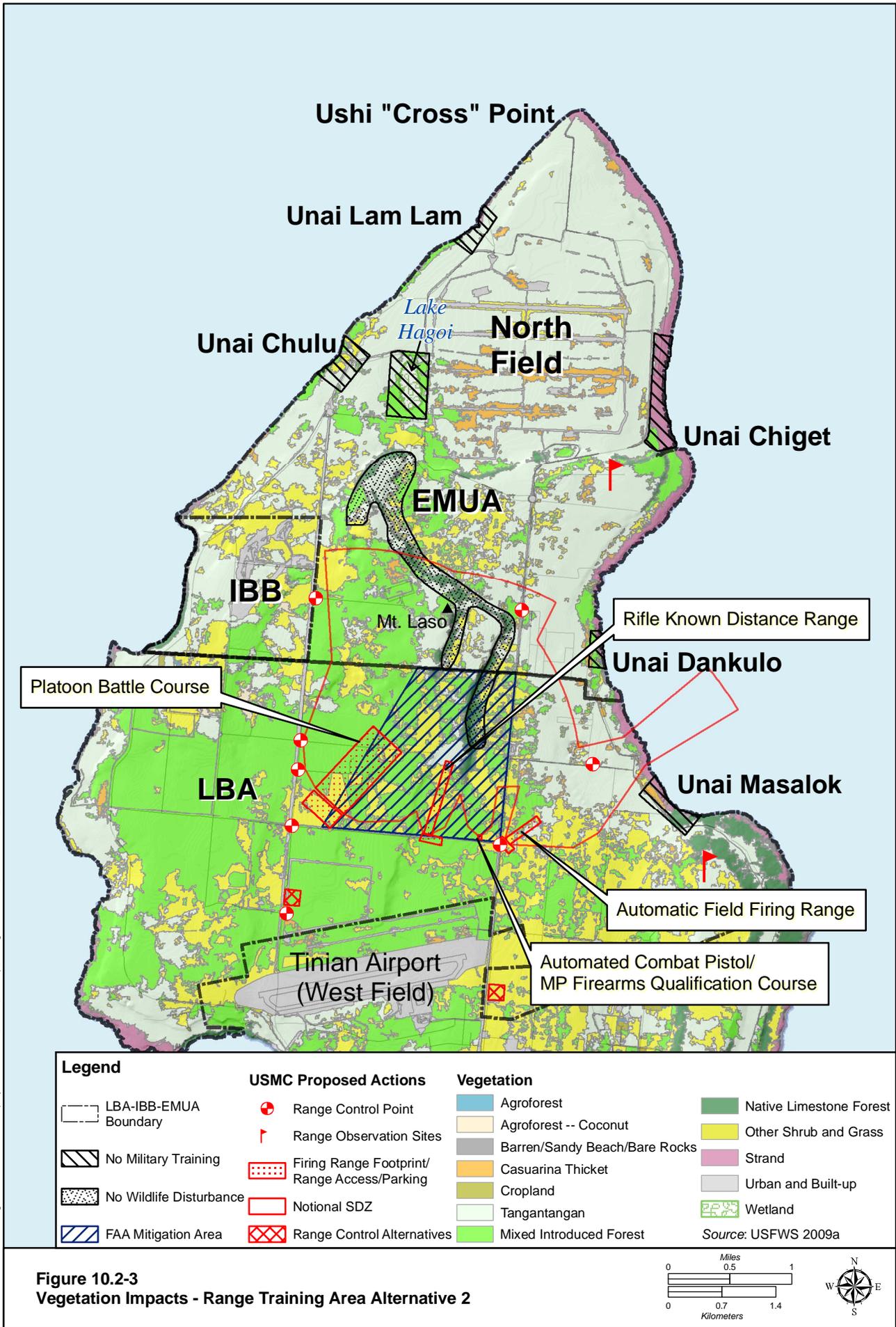


Figure 10.2-3
Vegetation Impacts - Range Training Area Alternative 2

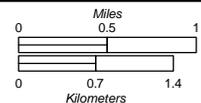


Table 10.2-5. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 2 (ac [ha])

<i>Parcel and Activity</i>	<i>Mixed Introduced Forest</i>	<i>Tangantangan</i>	<i>Other Shrub and Grass</i>	<i>Developed</i>
Construction Areas (vegetation removed)				
Platoon Battle Course	93 (38)	0	44 (18)	0
Ranges	9.6 (3.9)	6.9 (2.8)	22 (8.9)	0
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	9.1 (3.7)	0	30 (12)	1.4 (0.6)
Total area removed	121 (49)	6.9 (2.8)	106 (43)	1.4 (0.6)

Wildlife

Approximately 108 ac (44 ha) of the 936 ac (379 ha) FAA Mitigation Area that was previously designated in the Lease Back Area (LBA) just south of the EMUA boundary would be removed (Figure 10.2-2).

Based on the honeyeater population density estimate by the USFWS (2009b) of 0.41 birds per ha and the loss of 52 ha (see Table 10.2-2) there would be a loss of habitat for up to 21 birds. Based on the fruit dove population density estimate by the USFWS (2009b) of 0.33 birds per ha and the loss of 52 ha (see Table 10.2-2) there would be a loss of habitat for up to 17 birds.

Other impacts from construction would be the same as for Alternative 1. Long-term, permanent impacts to populations or distributions of wildlife from construction would not likely result. Impacts to wildlife would be less than significant.

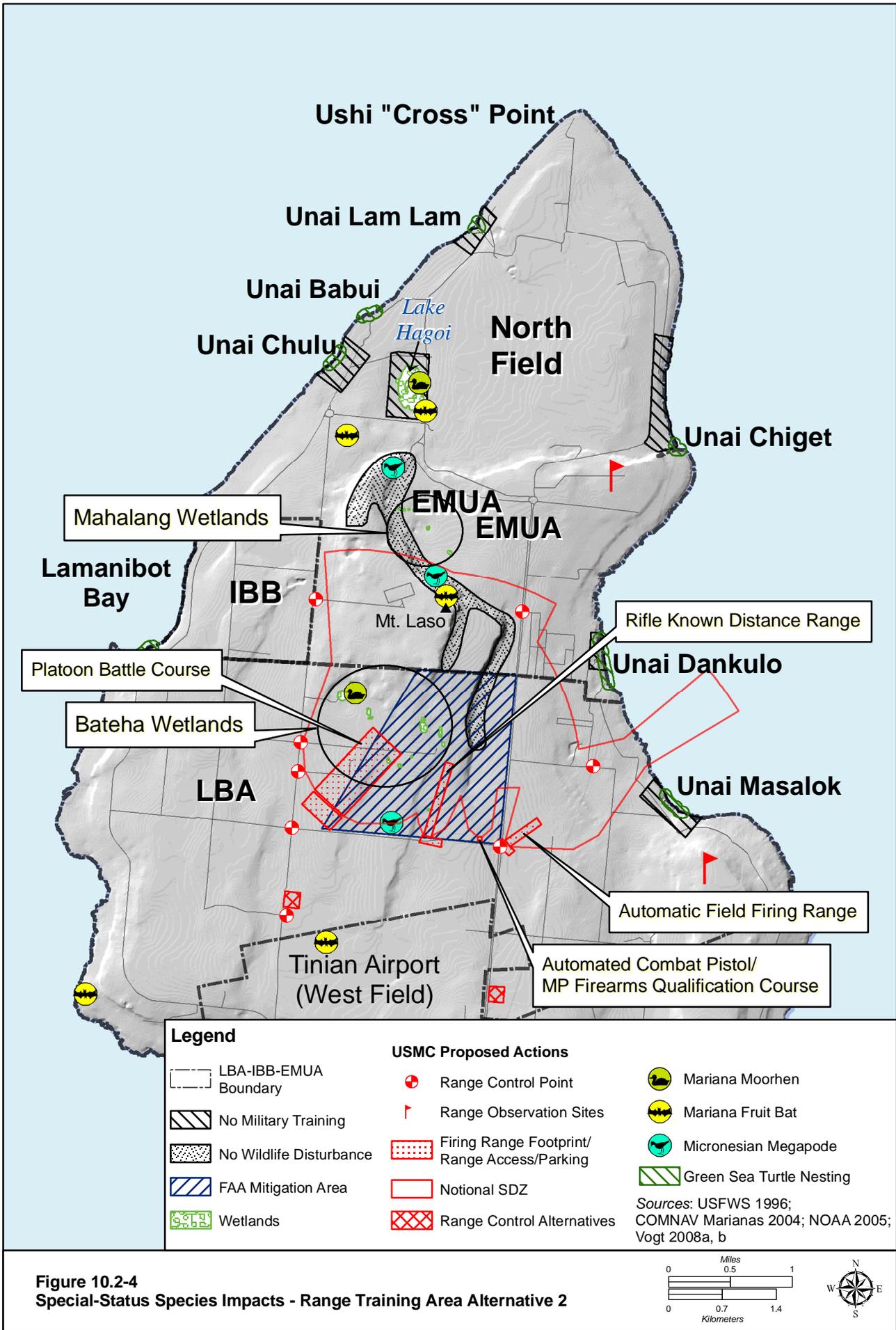
Special-Status Species

Impacts for potentially affected species are discussed below. Figure 10.2-4 shows general locations of special-status species in relation to the proposed ranges.

Mariana Fruit Bat. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

Mariana Common Moorhen. One area of 0.3 ac (0.12 ha) identified as a wetland (Figure 10.2-4; also see Chapter 4) is located approximately 375 ft (114 m) north of the proposed platoon battle course. There is no evidence that this potential wetland is being used by the moorhen. A wetland approximately 1,800 ft (549 m) to the northwest is used by up to four moorhens (USFWS 1996). The estimated maximum numbers of moorhens using the Bateha wetlands is four birds (USFWS 1996). Although construction would result in noise and activity, the distance to this wetland and the temporary nature of the work would result in impacts that are less than significant.

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Micronesian Megapode. Although not observed in 2008 surveys, several individual birds have been documented on Tinian since 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. A single bird has been detected just west of the proposed rifle known distance range in 1995. However, surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 8,500 ft (2,591 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. Impacts would be less than significant.

Tinian Monarch. The Tinian monarch is likely to be present in all areas surrounding the ranges and range support areas to be constructed. Potential habitat for the species would be cleared including 121 ac (49 ha) of mixed introduced forest and lesser amounts of shrub and tangantangan (Table 10.2-6). The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 297 birds. With a total population estimated at 40,000 birds, project construction would impact 0.7% of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 149 (Table 10.2-4).

The placement of ranges under Alternative 2 does not meet the requirements set out in the “Dedication of Tinian Military Retention Area Land for Wildlife Conservation” (Government of CNMI and U.S. Navy 1999) whereby a 936 ac (379 ha) FAA Mitigation Area is established for the protection of “endangered and threatened wildlife, particularly the Tinian Monarch” with the provision that it is the right of the U.S. military to “use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch.” As discussed above for wildlife, approximately 108 ac (44 ha) of the 936 ac (379 ha) FAA Mitigation Area would be removed. In addition, a zone 328 ft (100 m) wide surrounding the perimeter of the range footprint areas is assumed to be directly impacted by noise and activity from construction. The amount of area is shown in Table 10.2-7.

As compensation for the removal of a portion of the FAA mitigation area, including the construction footprint and the surrounding zone impacted by noise and activity, additional mitigation area would be established and other conservation measures would be implemented, as described under mitigation in Section 10.2.2.3. The construction would result in direct significant impacts to the Tinian monarch, mitigated to less than significant.

Sea Turtles. There is no proposed action in Alternative 2 that occurs in beach areas. Impacts would be less than significant.

Micronesian Gecko. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Since no clearing would occur in limestone forest (except possibly unmapped small, isolated areas) and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

Tree Snails. The Federal ESA candidate humped tree snail has occurred historically on Tinian but is now thought extirpated (USFWS 2007); recent surveys in likely habitat areas did not find this species (report in preparation). There would be no impact on this species.

Table 10.2-6. Potential Direct Impacts to the Tinian Monarch with Implementation of Alternative 2

<i>Habitat Type</i>	<i>Habitat Removed (ac [ha])</i>	<i>Monarch Density (# per ha)*</i>	<i>Total Potential Birds in Removed Habitat</i>	<i>Max. Territories (# per ha)*</i>	<i>Total Potential Territories in Removed Habitat</i>
Mixed Introduced Forest	121 (49)	5.82	285	2.9	142
Tangantangan	6.9 (2.8)	4.36	12	2.5	7
Totals	128(52)	N/A	297	N/A	149

Legend: N/A – Not applicable.

Source: *USFWS 2009b.

Table 10.2-7. Ranges Surrounding Habitat with Implementation of Alternative 2 (ac [ha])

<i>Project</i>	<i>Forested Habitat Affected - 100 m Buffer</i>
Platoon Battle Course	71 (29)
KD Range	49 (20)
Field Firing Range	25 (10)
Combat Pistol/Qual Course	8.5 (3.4)
Range Control/Bivouac Areas	24 (10)
Totals	178 (72)

Operation

Vegetation

Impacts would be the same as for Alternative 1.

Wildlife

Impacts would be the same as for Alternative 1.

Special-Status Species

Stray ammunition would have the same effect as described in Alternative 1.

Mariana Common Moorhen. Impacts would be the same as for Alternative 1.

Tinian Monarch. Direct and indirect impacts from general noise and activity at the ranges would affect surrounding forested areas. As under Alternative 1, significant impacts to the Tinian monarch were assumed possible within a buffer area of 328 ft (100 m) surrounding the ranges, affecting the forested habitat acreages specified in Table 10.2-7. Noise impacts to Tinian monarch from the proposed small arms ranges would be the same as for Alternative 1.

All Special-Status Species. Other indirect impacts would be the same as for Alternative 1.

10.2.3.2 Summary of Alternative 2 Impacts

Table 10.2-8 summarizes Alternative 2 impacts.

Table 10.2-8. Summary of Alternative 2 Impacts

<i>Activity</i>	<i>Project Specific Impacts</i>
Construction	Mixed introduced forest, shrub, and tangantangan would be removed that is habitat for numerous native birds, including the CNMI-listed Tinian monarch. Approximately 0.7% of the Tinian monarch population on Tinian would be impacted. A small amount of the previously designated FAA Mitigation Area would be removed.
Operation	The CNMI-listed Tinian monarch would not be significantly impacted by noise from range small arms firing; the potential for fire and non-native species are significant but would be mitigated to less than significant: indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time.

10.2.3.3 Alternative 2 Potential Mitigation Measures

Proposed mitigation measures would be the same as described for Alternative 1.

10.2.4 Alternative 3

10.2.4.1 Tinian

Construction

Impacts from Alternative 3 would be identical to Alternative 2 with the following exceptions.

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is listed in Table 10.2-9 and shown in Figure 10.2-5. Vegetation removed includes mixed introduced forest and tangantangan, as well as some shrub/grassland and Casuarina thicket. No limestone forest would be removed. The vegetation to be removed serves as potential habitat for wildlife species that are addressed under the Special-Status Species section below.

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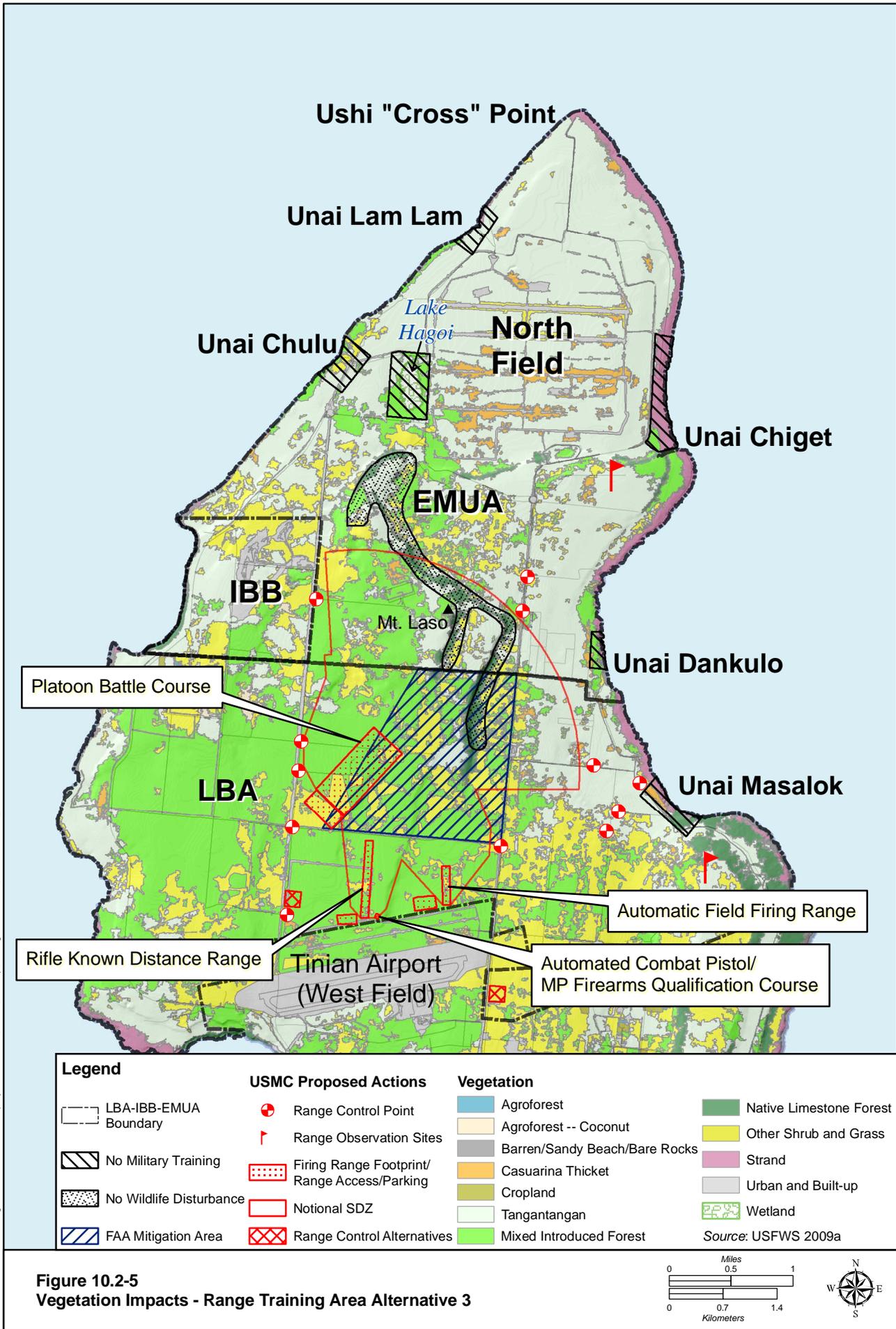


Table 10.2-9. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 3 (ac [ha])

<i>Parcel and Activity</i>	<i>Mixed Introduced Forest</i>	<i>Tangantangan</i>	<i>Shrub and Grass</i>	<i>Developed</i>
Construction Areas (vegetation removed)				
Platoon Battle Course	93 (38)	0	44 (18)	0
Ranges	34 (14)	6.9 (2.8)	8.7 (6.9)	1.4 (0.6)
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	19 (7.7)	0	26 (11)	2.3 (0.9)
Total area removed	155 (63)	6.9 (2.8)	89 (36)	4.7 (1.9)

Wildlife

Approximately 82 ac (33 ha) of the 936 ac (379 ha) FAA Mitigation Area that was previously designated in the Lease Back Area (LBA) just south of the EMUA boundary would be removed (see Figure 10.2-2).

Based on the honeyeater population density estimate by the USFWS (2009b) of 0.41 birds per ha and the loss of 66 ha (see Table 10.2-2) there would be a loss of habitat for up to 27 birds. Based on the fruit dove population density estimate by the USFWS (2009b) of 0.33 birds per ha and the loss of 66 ha (see Table 10.2-2) there would be a loss of habitat for up to 22 birds.

Other impacts from construction would be the same as for Alternative 1. Long-term, permanent impacts to populations or distributions of wildlife would not likely result. Impacts to wildlife would be less than significant.

Special-Status Species

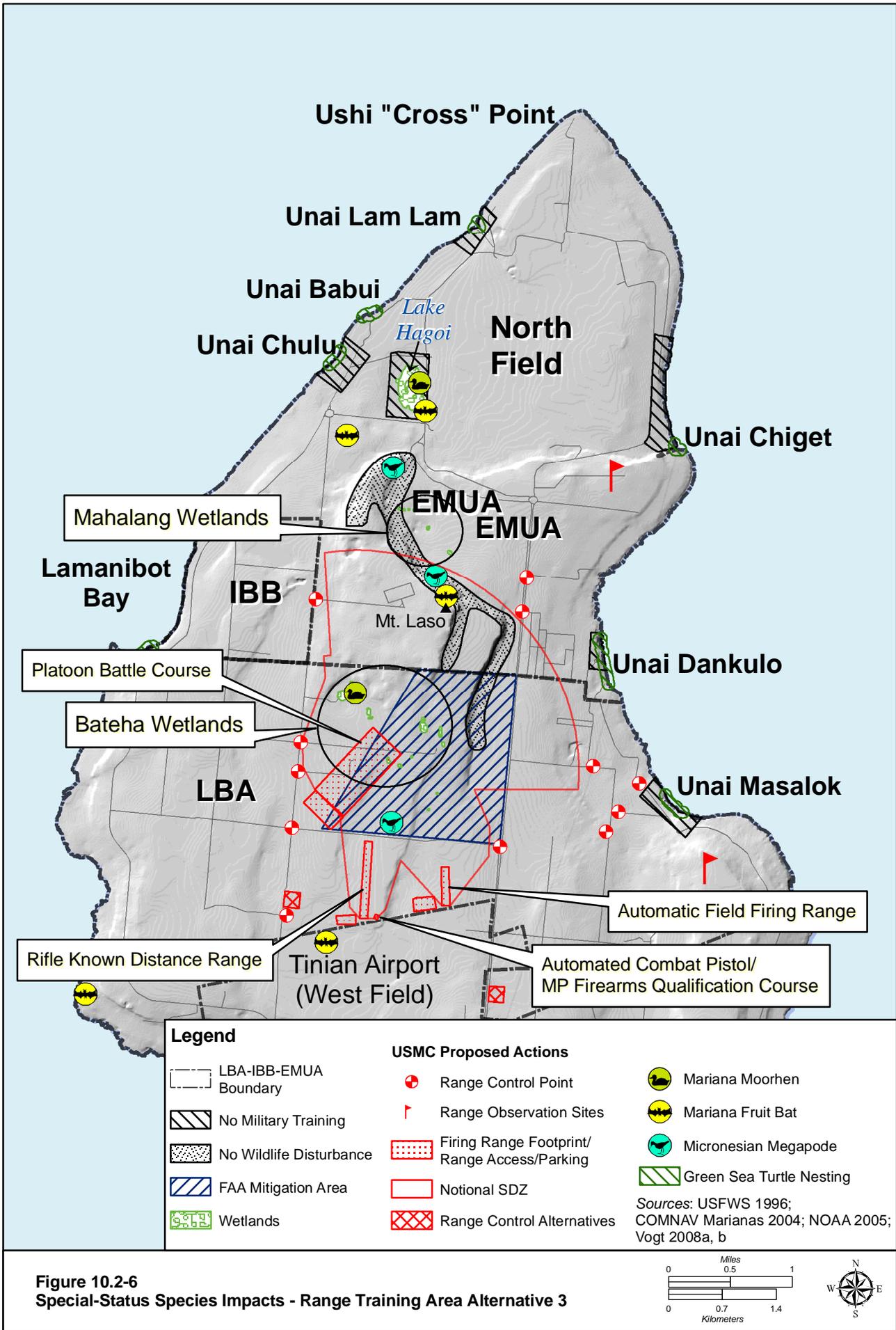
Impacts for species are discussed below. Figure 10.2-6 shows general locations of special status species in relation to the proposed ranges.

Mariana Fruit Bat. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

Mariana Common Moorhen. One area 0.3 ac (0.12 ha) identified as a potential wetland (see Figure 10.2-4; also see Chapter 4) is located approximately 375 ft (114 m) north of the proposed platoon battle course. There is no evidence that this potential wetland is being used by the moorhen. A wetland approximately 1800 ft (549 m) to the northwest is used by up to four moorhens (USFWS 1996). The estimated maximum numbers of moorhens using the Bateha wetlands is four birds (USFWS 1996). Although construction would result in noise and activity, the distance to the wetland and the temporary nature of the work would result in impacts that are less than significant.

Micronesian Megapode. Although not observed in 2008 surveys, several individual birds have been documented on Tinian since 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. One bird was detected in 1995 approximately 1,300 ft (396 m) northeast of the proposed rifle known distance range. Surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 8,500 ft (2,591 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. Impacts would be less than significant.

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Tinian Monarch. The Tinian monarch is likely to be present in all areas surrounding the ranges and range support areas to be constructed. Potential habitat for the species would be removed including 155 ac (63 ha) of mixed introduced forest and lesser amounts of shrubs and tangantangan (Figure 10.2-6 and Table 10.2-10). The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 379 birds (Figure 10.2-6 and Table 10.2-10). With a total population estimated at 40,000 birds, project construction would impact 0.9% of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 190 (refer to Figure 10.2-6 and Table 10.2-8). The placement of ranges under Alternative 2 does not meet the requirements set out in the “Dedication of Tinian Military Retention Area Land for Wildlife Conservation” (Government of CNMI and U.S. Navy 1999) whereby a 936 ac (379 ha) FAA Mitigation Area is established for the protection of “endangered and threatened wildlife, particularly the Tinian Monarch” with the provision that it is the right of the U.S. military to “use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch.” As discussed above for wildlife, approximately 82 ac (33 ha) of the 936 ac (379 ha) FAA Mitigation Area would be removed. In addition, a zone 328 ft (100 m) wide surrounding the perimeter of the range footprint areas is assumed to be directly impacted by noise and activity from construction. The amount of area is shown in Table 10.2-11.

As compensation for the removal of a portion of the FAA mitigation area, including the construction footprint and the surrounding zone impacted by noise and activity, additional mitigation area would be established and other conservation measures would be implemented, as described under mitigation in Section 10.2.2.3. The construction would result in direct significant impacts to the Tinian monarch, mitigated to less than significant.

Sea Turtles. There is no proposed action in Alternative 3 that occurs in beach areas. Impacts would be less than significant.

Micronesian Gecko. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Since no clearing would occur in limestone forest (except possibly unmapped small, isolated areas) and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

Tree Snails. The Federal ESA candidate tree snail *Partula gibba* has occurred historically on Tinian but is now thought extirpated (USFWS 2007); recent surveys in likely habitat areas did not find this species (report in preparation). Impacts would be less than significant.

Table 10.2-10. Potential Direct Impacts to the Tinian Monarch with Implementation of Alternative 3

<i>Habitat Type</i>	<i>Habitat Removed (ac [ha])</i>	<i>Monarch Density (# per ha)*</i>	<i>Total Potential Birds in Removed Habitat</i>	<i>Max. Territories (# per ha)*</i>	<i>Total Potential Territories in Removed Habitat</i>
Mixed Introduced Forest	155 (63)	5.82	367	2.9	183
Tangantangan	6.9 (2.8)	4.36	12	2.5	7
Totals	162 (66)	NA	379	NA	190

Note: NA- not applicable.

Source: USFWS 2009b.

Table 10.2-11. Range Surrounding Habitat with Implementation of Alternative 3

<i>Project</i>	<i>Forested Habitat Affected - 100 m Buffer ac (ha)</i>
Platoon Battle Course	69 (28)
KD Range	65 (26)
Field Firing Range	44 (18)
Combat Pistol/Qual Course	11 (4.5)
Range Control/Bivouac Areas	24 (10)
Totals	213 (86)

Operation

Vegetation

Impacts would be the same as for Alternative 1.

Wildlife

Impacts would be the same as for Alternative 1.

Special-Status Species

Stray ammunition would have the same effect as described in Alternative 1.

Mariana Common Moorhen. The Mariana common moorhen may use the Bateha wetland approximately 1,800 ft (549 m) to the northwest of the platoon battle course. This location is outside the PK15 (met) 104 db noise contour determined for small arms firing. Based on the distance from the firing ranges, impacts would be less than significant.

Tinian Monarch. Direct and indirect impacts from general noise and activity at the ranges would affect surrounding forested areas. As under Alternative 1, significant impacts to the Tinian monarch were assumed possible within a buffer area of 328 ft (100 m) surrounding the ranges, affecting the forested habitat acreages specified in Table 10.2-11. Noise impacts to Tinian monarch from the proposed small arms ranges would be the same as for Alternative 1.

All Special-Status Species. Other indirect impacts would be the same as for Alternative 1.

10.2.4.2 Summary of Alternative 3 Impacts

Table 10.2-12 summarizes Alternative 3 impacts.

Table 10.2-12. Summary of Alternative 3 Impacts

<i>Area</i>	<i>Project Activities</i>	<i>Project Specific Impacts</i>
Tinian	Construction	Mixed introduced forest, shrub, and tangantangan would be removed that is habitat for numerous native birds, including the CNMI-listed Tinian monarch. Approximately 0.9 % of the Tinian monarch population on Tinian would be impacted. A small amount of the previously designated FAA Mitigation Area would be removed.
	Operation	The CNMI-listed Tinian monarch would not be significantly impacted by noise from range small arms firing; the potential for fire and non-native species are significant but would be mitigated to less than significant; indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time.

10.2.4.3 Alternative 3 Potential Mitigation Measures

Proposed mitigation measures would be the same as described for Alternative 1.

10.2.5 No-Action Alternative

Under the no-action alternative, Marine Corps units would remain in Japan and not conduct additional training on Tinian. No construction, dredging, training, or operations associated with the military relocation would occur. Existing operations on Tinian would continue. Therefore, the no-action alternative would not have significant impacts to terrestrial biological resources.

10.2.6 Summary of Impacts

Table 10.2-13 summarizes the potential impacts with implementation of each action alternative and the no-action alternative.

Table 10.2-13. Summary of Impacts

<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>	<i>No-Action Alternative</i>
Vegetation			
LSI <ul style="list-style-type: none"> No primary limestone forest would be removed 	LSI <ul style="list-style-type: none"> No primary limestone forest would be removed 	LSI <ul style="list-style-type: none"> No primary limestone forest would be removed 	NI
Wildlife			
SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for native birds 	SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for native birds 	SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for native birds 	NI
Special-Status Species			
SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for the CNMI-listed Tinian monarch; approximately 1% of the Tinian monarch population on Tinian would be impacted; no significant indirect impact from small arms range noise on the Mariana common moorhen and Tinian monarch; indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time 	SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for the CNMI-listed Tinian monarch; approximately 0.7 % of the Tinian monarch population on Tinian would be impacted; no significant indirect impact from small arms range noise on the Tinian monarch; indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time. 	SI <ul style="list-style-type: none"> Significant direct impact due to removal of habitat for the CNMI-listed Tinian monarch; approximately 0.9% of the Tinian monarch population on Tinian would be impacted; no significant indirect impact from small arms range noise on the Tinian monarch; indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas are possible, however, specific impacts cannot be determined at this time 	NI

Legend: LSI = Less Than Significant Impact; SI = Significant impact, SI-M = Significant impact mitigable to less than significant, NI = No impact.

10.2.7 Summary of Potential Mitigation Measures

Table 10.2-14 summarizes potential mitigation measures.

Table 10.2-14. Summary of Potential Mitigation Measures

<i>Alternatives 1, 2, and 3</i>	<i>No-Action Alternative</i>
Vegetation	
<ul style="list-style-type: none"> None specifically for vegetation 	None
Wildlife and Special-Status Species	
<ul style="list-style-type: none"> The COMNAV Marianas Training Handbook would be updated to incorporate avoidance, minimization, and monitoring requirements applicable to actions described in this EIS 	None
<ul style="list-style-type: none"> Hazard Analysis and Critical Control Point (HACCP) planning would be used for high-risk activities and construction 	
<ul style="list-style-type: none"> Non-native species would be controlled with procedures in the updated Training Handbook, Military BTS Instructions, and DoD transportation regulations 	
<ul style="list-style-type: none"> Approximately 1 week prior to clearing vegetation a qualified biologist would survey to determine if ESA-listed species are present and if so the work would be postponed 	
<ul style="list-style-type: none"> Natural resource awareness briefings would be conducted for construction personnel 	
<ul style="list-style-type: none"> Monitoring of the Tinian monarch and Mariana common moorhen (Alternative 1 only for the moorhen) would be conducted in areas surrounding the ranges to determine potential disturbance impacts and, if impacted, noise reduction techniques would be employed. 	
<ul style="list-style-type: none"> BTS interdiction and control measures would be implemented to address new training and transport to Tinian from Guam. These measures are described in Volume 2, Chapter 10, Section 10.2.2.6. 	
<ul style="list-style-type: none"> Birds would be monitored using “Tropical Monitoring of Avian Productivity and Survival” survey methodology 	
<ul style="list-style-type: none"> A Tinian monarch management plan would be developed and implemented 	
<ul style="list-style-type: none"> Reforestation would be conducted in plots to improve habitat 	
<ul style="list-style-type: none"> New mitigation areas would be designated to compensate for the use of some the existing designated FAA Mitigation Area and the removal of other habitat occupied by the Tinian monarch and other birds 	
<ul style="list-style-type: none"> The existing Guam Navy Wildfire Management Plan would be updated to include Tinian or a new plan developed that would include new lands to be used for training and additional project-specific actions that would be necessary to ensure sensitive ecological resources are protected 	

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