



Guam REPI Habitat Conservation Initiative
IMPLEMENTATION PLAN
2022 - 2027



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Cover photo credit: Top - Taguan Landscape; Bottom left - Limestone forest habitat Taguan; Bottom right - Fadang tree in Taguan (Tomas Quinata and Victor Torres)

Summary

The purpose of the Guam REPI Habitat Conservation Initiative (Program) is to protect, restore, and enhance targeted native limestone forest, ravine forest, and savanna habitats in Guam to support conservation and recovery of federally listed and at-risk species. Guam's native habitats face numerous threats from invasive plants, animals, introduced pests and disease, and habitat loss from development, human-caused wildfires, and extreme weather events. The Program recognizes that baseline habitat conditions in targeted areas must be improved before species-specific issues can successfully be addressed.

Through a cooperative partnership under the Department of Defense (DoD) Readiness and Environmental Protection Integration (REPI) Program, Joint Region Marianas, and the National Fish and Wildlife Foundation (NFWF), in collaboration with Guam Department of Agriculture (DOAG), the U.S. Fish and Wildlife Service (USFWS), and other partners, this five year implementation plan provides a roadmap of the strategies and resources required to improve baseline conditions of targeted native forest and habitat health. The initial conservation outcomes of the implementation plan will serve as a proof of concept and model for future deployment of large-scale habitat restoration actions throughout Guam. The long-term conservation benefits achieved through this cooperative program will support the objectives of the [Guam Forest Action Plan](#), Guam State Wildlife Action Plan, and the [Joint Region Marianas Integrated Natural Resources Management Plan](#). In the future, potential secondary phases of the Program may build upon the habitat improvements made in the initial five years to improve the conservation status of plant and animal species federally listed under the Endangered Species Act (ESA).

The strategies discussed in this plan do not solely represent NFWF's view of the actions necessary to achieve the identified conservation goals, but instead reflect the view of numerous federal, state, academic, and organizational experts who were consulted during plan development. The Program seeks to build trust, working relationships, and capacity with partners on Guam to ensure sustainable and durable conservation benefits beyond the life of the implementation plan. The goals and objectives of this plan are intended to complement ongoing conservation work performed by federal agencies, local government, and non-governmental organizations by synergizing efforts across the larger conservation community and investing in areas where gaps may exist.

Conservation Need

Guam, a U.S. territory, is the southernmost island in the Mariana Archipelago and the largest island in Micronesia, with a landmass of roughly 200 square miles and a population of 153,836 (US Census, 2020). Guam's tropical climate hosts rich and diverse terrestrial and aquatic species. The forests comprise over 600 species of vascular plants, with more than 100 species of trees (Guam Forest Action Plan, 2020-2030). The unique biodiversity found within Guam's forests support traditional practices such as agroforestry, preparation of traditional medicines, and the harvesting of timber for seafaring and wood carving practices. In addition to these significant cultural and intrinsic values, Guam's forests provide critical ecosystem services and habitats for native, endemic, and endangered species. The economic prosperity and preservation of the CHamoru culture are dependent on the successful recovery and sustainable use of the island's natural resources (Guam Forest Action Plan, 2020-2030).

As a tropical island, Guam is surrounded by a highly valued coral reef system that contributes to one of the most species-rich marine ecosystems in the United States (Guam Forest Action Plan, 2020-2030). Over 5,100 marine species have been identified in Guam's coastal waters, including 1,000 nearshore fish species and 300 species of reef-building corals (Guam Forest Action Plan, 2020-30). Coral reef resources

support numerous cultural and traditional uses, tourism, recreation, fisheries, and shoreline and infrastructure protection. Traditionally, coral reef fishery resources formed a substantial part of the local CHamoru community's diet, which included finfish, invertebrates, and sea turtles (Coral Reef Resilience Strategy, 2018). Guam's marine resources, however, are facing environmental and anthropogenic threats including land-based sources of pollution, sedimentation, soil erosion, overfishing, recreational use and misuse, marine debris, and impacts from climate change such as coral bleaching and ocean acidification (Coral Reef Resilience Strategy, 2018).

Over the past 50 years, Guam has experienced tremendous growth through development, resulting in considerable island-wide environmental degradation. Urban and rural development, in addition to historical and current military activities, are impacting Guam's natural resources. Availability of suitable habitat poses significant challenges for the recovery of Guam's native species. Extensively altered native forests have been converted to a mix of non-native vegetation, while others have transitioned into grasslands, savannas, and barren lands (Guam Forest Action Plan, 2020-2030). Native flora and fauna are negatively affected by the introduction of non-native invasive plants and animals, such as the brown tree snake (*Boiga irregularis*) that has driven nine of Guam's 11 native forest birds to extinction or extirpation, while causing significant population declines of several native lizards, bats and other bird species (USDA National Invasive Species Information Center, 2021). Non-native insects and pathogens brought to Guam by humans, human-caused grassland and forest fires, and unmanaged recreational use of natural resources also pose significant threats. Anthropogenic threats are further exacerbated by climate change and extreme weather events such as drought and typhoons.

This implementation plan targets three habitat types for protection and restoration that are critical to Guam's native wildlife and its people: 1) limestone forest, 2) ravine forest, and 3) savanna.

Limestone Forest

Limestone forests in Guam is primarily found in the northern half of the island built upon shallow limestone soils that are nutrient-poor, high in calcium carbonate, and highly permeable. These physical and chemical properties influence the types of plants that can establish in this unique ecosystem and are vital for Guam's native forest birds, two fruit bat species, lizards, snails, and insects, including some of those listed as endangered or threatened under the federal or Guam Endangered Species Act. Guam's native limestone forests are composed principally of old growth native trees and plants, with a moderately dense canopy 10-30 meters in height. There are limited openings within the canopy, and understory vegetation varies from open to dense. Limestone plant communities are further broken down into five classes: *Artocarpus-Ficus* forest, *Mammea* forest, *Cordia* forest, *Merrilliodendron-Ficus* forest, and *Pandanus* forest (Donnegan et al. 2002). Species of limestone forest trees include: nunu (*Ficus prolixa*), ifit (*Intsia bijuga*), dukduk (*Artocarpus mariannensis*), and yoga (*Elaeocarpus joga*). Forty-one percent of Guam has tree cover of which 22% is classified as native limestone forest (Guam Forest Action Plan, 2021). These forests are a priority for public water security through the groundwater recharge they promote. Over thousands of years, rainwater, carbon dioxide and limestone soils mix creating freshwater aquifers.

Unfortunately, the extent and health of limestone forests are declining. In recent years, approximately 1,000 forested acres have been cleared to support military buildup, including about 80 acres of high-quality native limestone forest (USFS State and Private Forestry Fact Sheet, Guam 2022). The structure of remaining forests is changing due to the presence of invasive Philippine deer (*Rusa mariannus*) and feral pigs (*Sus scrofa*) that browse on seeds and seedlings thereby impeding the natural regeneration of native forest plants (Wiles et al. 1999). This poor condition is further exacerbated by the loss of habitat

due to development, typhoons, a decline in pollinators and seed dispersers, introduction of aggressive invasive plant species, and plant diseases exacerbate this condition (Guam Wildlife Action Plan, 2019). Restoration of remaining forests through ungulate management, invasive plant removal, increased native vegetation cover, and improved forest composition is critical to ensure sufficient habitat remains available to support the conservation and recovery of protected species (Guam Wildlife Action Plan, 2019).

Ravine Forest

Ravine forests occur on steep slopes in river valleys and other topographic depressions. They are typically found in southern Guam supported by rich volcanic soils. Ravine forests are home to numerous native species including nunu, chosga (*Phyllanthus marianensis*), pago (*Hibiscus tiliaceus*), kafu (*Pandanus tectorius*), ahgao (*Premna serratifolia*), chiute (*Cerbera* sp.), ufa (*Heritiera littoralis*), puting (*Barringtonia asiatica*), and nonak (*Hernandia labyrinthica*). Ravine forests have been reduced in quality and quantity by damage from invasive ungulates, introduced plant species such as palma brava (*Heterospatha elata*), and wildfires (Guam Wildlife Action Plan, 2019).

Impacts from ungulates have resulted in severe erosion leaving arid and barren land where little natural revegetation occurs. In response, the Department of Agriculture's Forestry and Soil Resources Division (FSRD) began efforts in 1978 to stabilize the landscape and improve soil quality in southern Guam by planting non-native acacia trees (*Acacia* sp.) in these badlands. In 2005, FSRD began planting native species to transition the acacia forest to a native ravine forest. The efforts made thus far have been anecdotally successful at stabilizing the soil, and although work to transition to native plants is still in a trial phase and continues at a slow pace due to other competing priorities. The goal of this restoration effort is to restore the native plant community.

Savanna Habitat

On the island, savanna is a grassland habitat on volcanic soil that is primarily found in southern Guam. The volcanic-dominated geology of southern Guam has relatively low permeability, and therefore the hydrologic regime is dominated by surface water processes (Guam Forest Action Plan, 2021). Watersheds in the south that contain savanna habitat are priority regions for public surface water security. Currently, savanna habitat covers 20% of land area (WERI, 2021) in the southern region and is home to many native and/or endemic plants, including *Phyllanthus saffordii*, *hedyotis megalantha*, and is a key foraging habitat for the Mariana swiftlet (*Aerodramus vanikorensis bartschi*).

Frequent fires have reduced the number of native shrubs and sedges, with most areas now dominated by swordgrass (*Miscanthus* sp.) and invasive bluegrass (*Dicanthium* sp.). On average, 4.8% of Guam's total land area was burned by arson or unintentionally each year between 2015 and 2020, including the island's savannas (USFS State and Private Forestry Fact Sheet, Guam 2022). As a result, trees were killed and invasive grasses expanded their footprint by encroaching on surrounding forested areas (Stone, 1970). Exposed earth from fires and altered vegetation types result in increased erosion that degrades surface water quality, threatens domestic water supply, and damages fragile coral reef ecosystems downstream (Guam Forest Action Plan, 2021). Savanna habitat deterioration is further exacerbated by off-road vehicles that erode bare soil especially during the rainy season.

Current Conservation Context

The DOAG Division of Forestry and Soil Resources (DFSR) provides a critical role in improving forest

health on Guam through forest stewardship, fire prevention and control programs, and watershed-scale restoration efforts to address declining water quality issues impacting nearshore coral reefs. Given limited availability of resources, the DFSR has predominantly focused on erosion control and fire protection of savanna habitats utilizing local government appropriations and federal grants from the U.S. Forest Service (USFS). For the past 40 years, the primary strategy foresters have utilized is the outplanting of non-native acacia trees to mitigate erosion caused by the 400 wildfires that occur on average annually. Although acacia plantings have successfully stabilized soils, the process to convert large old acacia stands to native ravine forest or a savanna complex remains untested at large scales.

Given the scale of protection and restoration required for savanna habitats, coupled with limited funding, little to no forest enhancement work is currently conducted in the limestone and ravine forest habitats on Government of Guam lands. On lands under federal jurisdiction, the Department of the Navy supports forest enhancement efforts including invasive plant management, ungulate eradication in fenced enclosures, and experimental brown tree snake control. The USFWS and National Park Service also manages limestone forest habitat for listed species on National Wildlife Refuge and Park Service lands, and promotes native outplanting, invasive species control, and propagation of host plants for listed butterflies.

Funding made available through this Program will be leveraged to address gaps in current conservation strategies such as ungulate management, non-native plant control, native plant establishment, wildfire prevention, baseline data collection, and public education and engagement about targeted watersheds, all of which will protect limestone forest, ravine forest, and savanna habitats.

Geographic Focus

Program partners, including NFWF, Galaide Group, Department of the Navy (DON), USFWS, and the Guam Department of Agriculture, collaborated to identify focal geographies to target conservation investments through the Guam REPI Habitat Conservation Initiative. In addition, members of the local conservation community were asked to provide input for various sites which were then scored and ranked based on-site selection criteria. The site selection criteria included the following considerations:

- 1) legal protections in place or a high likelihood of long-term protection,
- 2) current presence of at least one federally listed species and potential benefit to the greatest number of listed species,
- 3) early habitat outcomes possible within one to five years,
- 4) connectivity to other managed conservation areas,
- 5) reasonable physical access for project implementer without posing undue risk to safety or requiring specialized transport,
- 6) existing or planned conservation work supported by partners,
- 7) long-term commitment by partners to support the Program's investments, and
- 8) other considerations such as importance of site for cultural resources, level of public support and community education opportunities.

The geographic focus of this implementation plan encompasses important limestone forest, ravine forest, and savanna habitats in undeveloped areas on Government of Guam lands. The limestone forest of Taguan (Figure 1) and the ravine forest and savanna habitat of Masso (Figure 2) were selected as initial focal geographies that meet site selection criteria. The sites identified have diverse ecosystems,

unique geographic features that support specialized native flora and fauna, and are likely to result in measurable outcomes through initial conservation actions within the five-year Program term. As focal geographies, these sites are deemed to have a higher likelihood of long-term protection than other sites considered, and broader opportunities for collaboration and cost-sharing among conservation practitioners in Guam.

Table 1 describes the two focal geographies, the anticipated conservation activities, and the potential habitat benefits for listed species that are either currently found within the site or have potential to benefit from habitat improvements. Surveys, assessments, and partner recommendations will inform the selection of focal project areas within these focal geographies. This implementation plan also includes prospective geographies (Figure 3) that are important and desirable areas for larger-scale limestone forest conservation (Table 2), but do not yet satisfy the site selection criteria for site protection. Projects may occur in these prospective geographies to assist with securing site protections and acquiring baseline site conditions to facilitate establishing habitat-specific objectives required to be considered a focal geography.

Taguan

Taguan is a 46-acre parcel along the northeastern coastline of Guam and includes an important portion of the remaining intact limestone forest that extends north toward Andersen Air Force Base (Figure 1). Taguan is a lone parcel bordered on three sides by privately owned property that has been or is in the process of being developed. Invasive species, ungulate damage, and the loss of seed dispersers pose the greatest threats to habitat recovery in Taguan. The site faces other, less impactful threats from public use, but due to its topography public visitation is thought to be low. Taguan hosts numerous native plant and animal species, is capable of supporting additional listed species (Table 1), and was selected as the only limestone forest owned and protected by the Government of Guam with relatively reasonable accessibility. Additionally, in 2016 the property was designated by Guam Public Law 33-210 as a Biodiversity Conservation Easement for the purpose of transplanting and cultivating medicinal plants, further solidifying the sites protection status.

Masso

Masso is a 29-acre site in central Guam located adjacent to a Naval Reservation and the Navy's fuel farm. The site contains ravine forest and savanna habitat, and a portion of the Masso River, including a constructed reservoir that supports endangered Mariana common moorhens (*Gallinula chloropus guami*) (Table 1). Fire, invasive species, excess sediment accumulating in the reservoir, and reservoir overflow events resulting in sedimentation to downstream coral habitat pose the greatest environmental threats. Since the site is relatively small, installation of exclusionary ungulate fencing could successfully mitigate ungulate damage and improve forest and habitat health.

The Masso River flowing through this site is a known contributor of nutrient and sediment transport, directly emptying into the Piti Bay Marine Preserve, impacting a shallow lagoon complex resembling a barrier reef that is the most diverse of the 10 territory and federal Marine Protected Areas in Guam (NOAA 2009). As one of the most active Guam conservation locations, Masso is currently undergoing regular forest management to mitigate threats and risks to its natural resources in support of the [Piti-Asan Watershed Management Plan](#) (2012). The site's ease of access and variety of species attracted to the reservoir make Masso a popular destination for school field trips and other educational outreach events. Conversion of large stands of invasive trees, removal of other invasive plants, and outplanting a wide variety of native plants would improve habitat quality, diversity, and water quality at this site.

Table 1: Focal Geographies by Habitat and Potential Species to Benefit

Focal Geography	Anticipated Conservation Action	Listed Species (Currently Found on Site)	Potential Species to Benefit (Not Currently Found on Site) ¹
Taguan	Limestone forest restoration	Mariana eight-spot butterfly (<i>Hypolimnas octucula mariannensis</i>); Fadang (<i>Cycas micronesica</i>)	Guam Micronesian kingfisher (<i>Todiramphus cinnamominus cinnamominus</i>) ko'ko'/Guam Rail (<i>Gallirallus owstoni</i>) fanihi/Mariana fruit bat (<i>Pteropus mariannus</i>) Mariana swiftlet (<i>Aerodramus vanikorensis bartschi</i>) <i>Tabernaemontana rotensis</i> <i>Serianthes nelsonii</i> <i>Tuberolabium guamense</i> <i>Bulbophyllum guamense</i> <i>Dendrobium guamense</i> <i>Maesa walkeri</i> <i>Heritiera longipetiolata</i> <i>Partula radiolata</i> <i>Partula gibba</i> <i>Samoana fragilis</i>
Masso	Ravine forest and savanna habitat restoration	Mariana common moorhen (<i>Gallinula chloropus guami</i>)	Guam Micronesian kingfisher (<i>Todiramphus cinnamominus cinnamominus</i>) ko'ko'/Guam rail (<i>Gallirallus owstoni</i>) Fanihi/Mariana fruit bat (<i>Pteropus mariannus</i>) Mariana swiftlet (<i>Aerodramus vanikorensis bartschi</i>) Fadang <i>Tuberolabium guamense</i> <i>Bulbophyllum guamense</i> <i>Dendrobium guamense</i> <i>Heritiera longipetiolata</i> <i>Phyllanthus saffordii</i> <i>Hedyotis megalantha</i> <i>Partula radiolata</i> <i>Samoana fragilis</i>

¹ “Potential Species to Benefit” is listed as an attribute of the focal geographies to provide a prospective outlook of the Threatened and Endangered species that could benefit from habitat enhancement.

Table 2: Prospective Geographies and Planned Actions

Prospective Geographies	Planned Actions
Anao and Pagat	<p>Support efforts to secure long-term legal conservation status for limestone forest sites, such as parcel surveys to identify property boundaries. DOAG and local partners are pursuing long-term legal conservation status for the sites. Once legal protection is secured, the sites would be eligible as a focal geography, although other site selection criteria may need to be considered such as access and partner support.</p> <p>Additional activities may include site preparation to inform habitat-specific objectives for the sites in anticipation of securing site protection, such as baseline forest health.</p>
Pilot project: site(s) to be determined	<p>Support a pilot project to assess the feasibility and methodology for transitioning non-native acacia forest to native vegetation at a landscape scale. Pilot project scope, goals, and location(s) will be developed through engagement and collaboration with Program partners.</p>

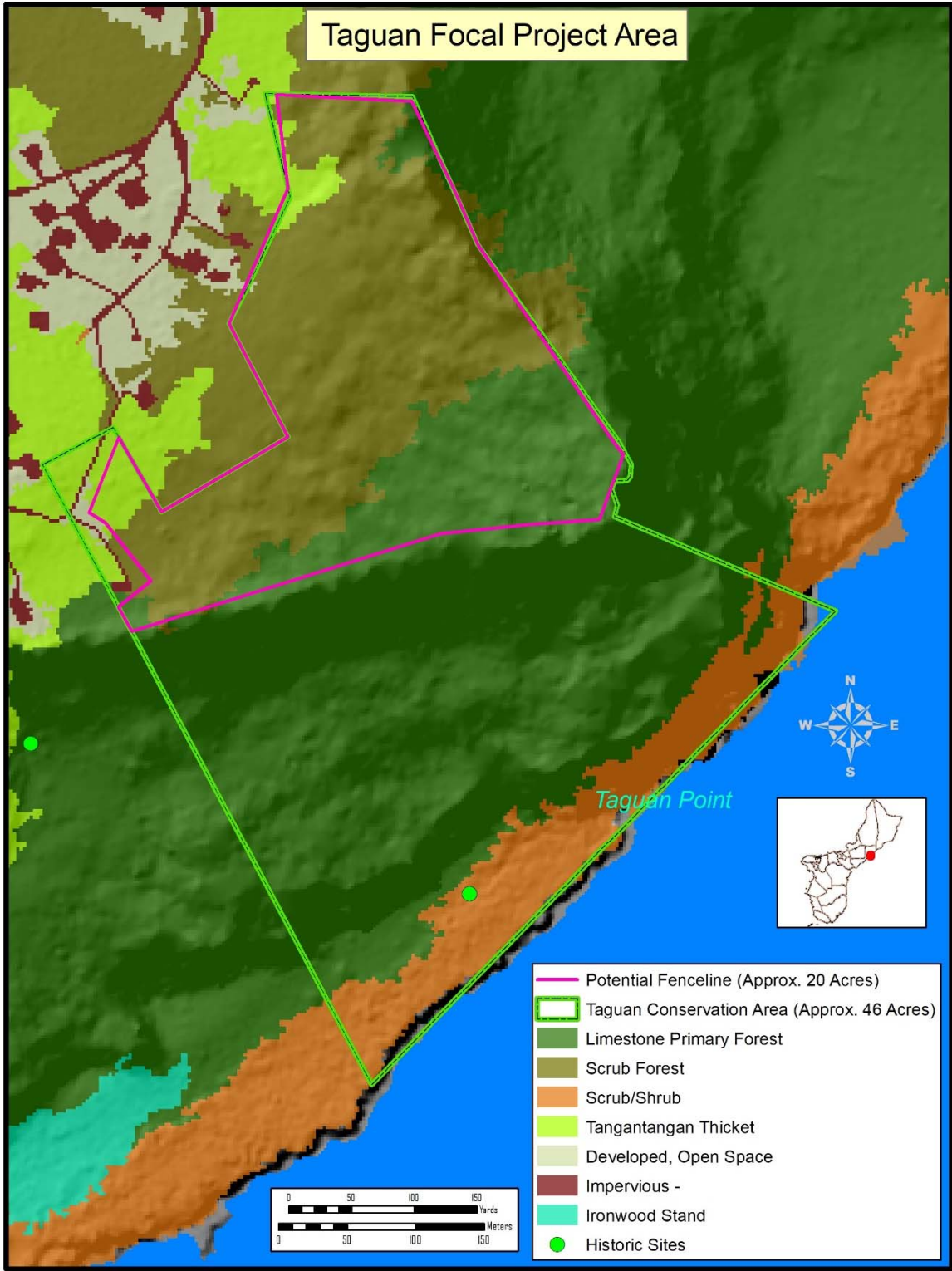


Figure 1: Taguan Focal Project Area

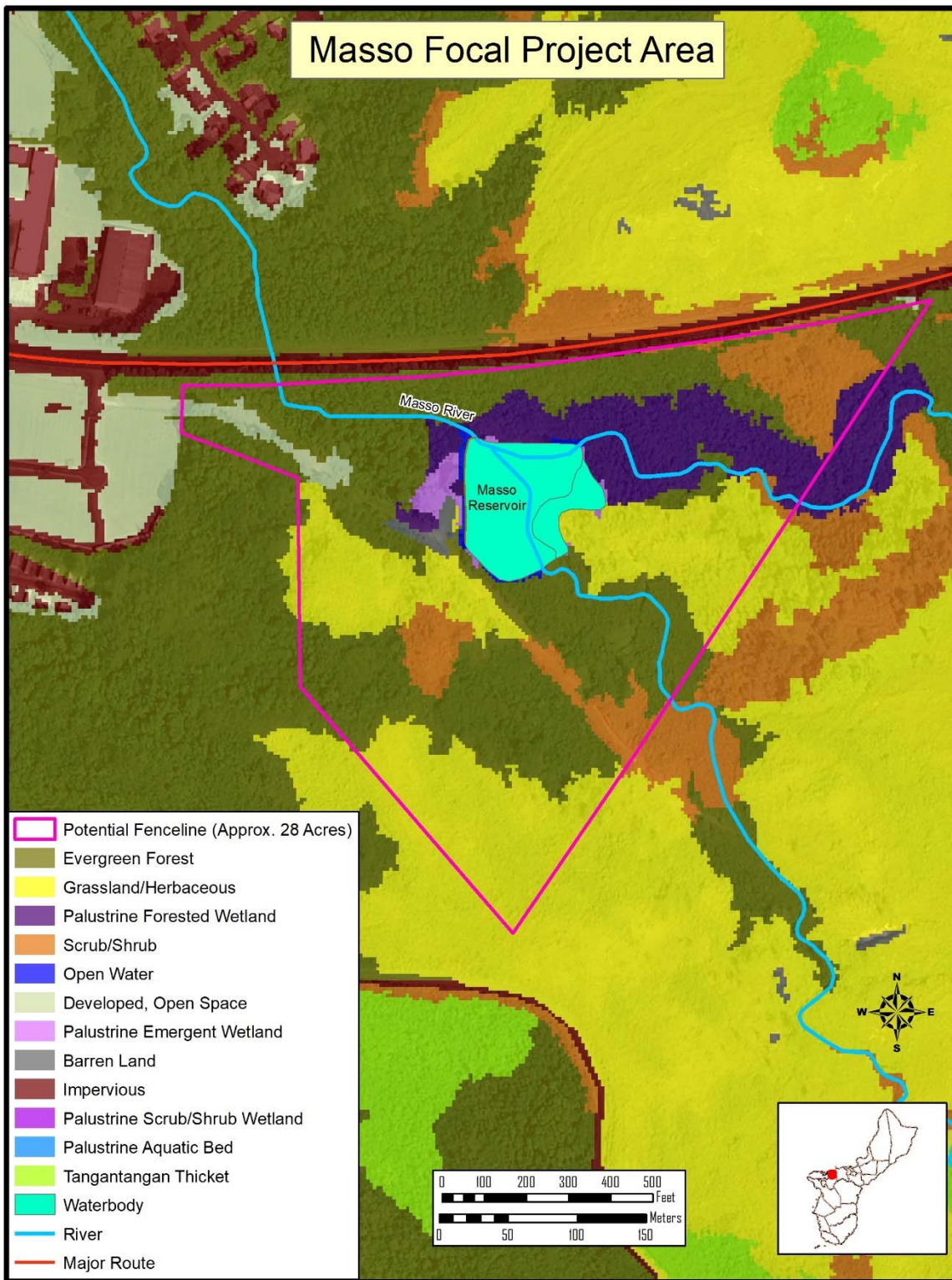


Figure 2: Masso Focal Project Area

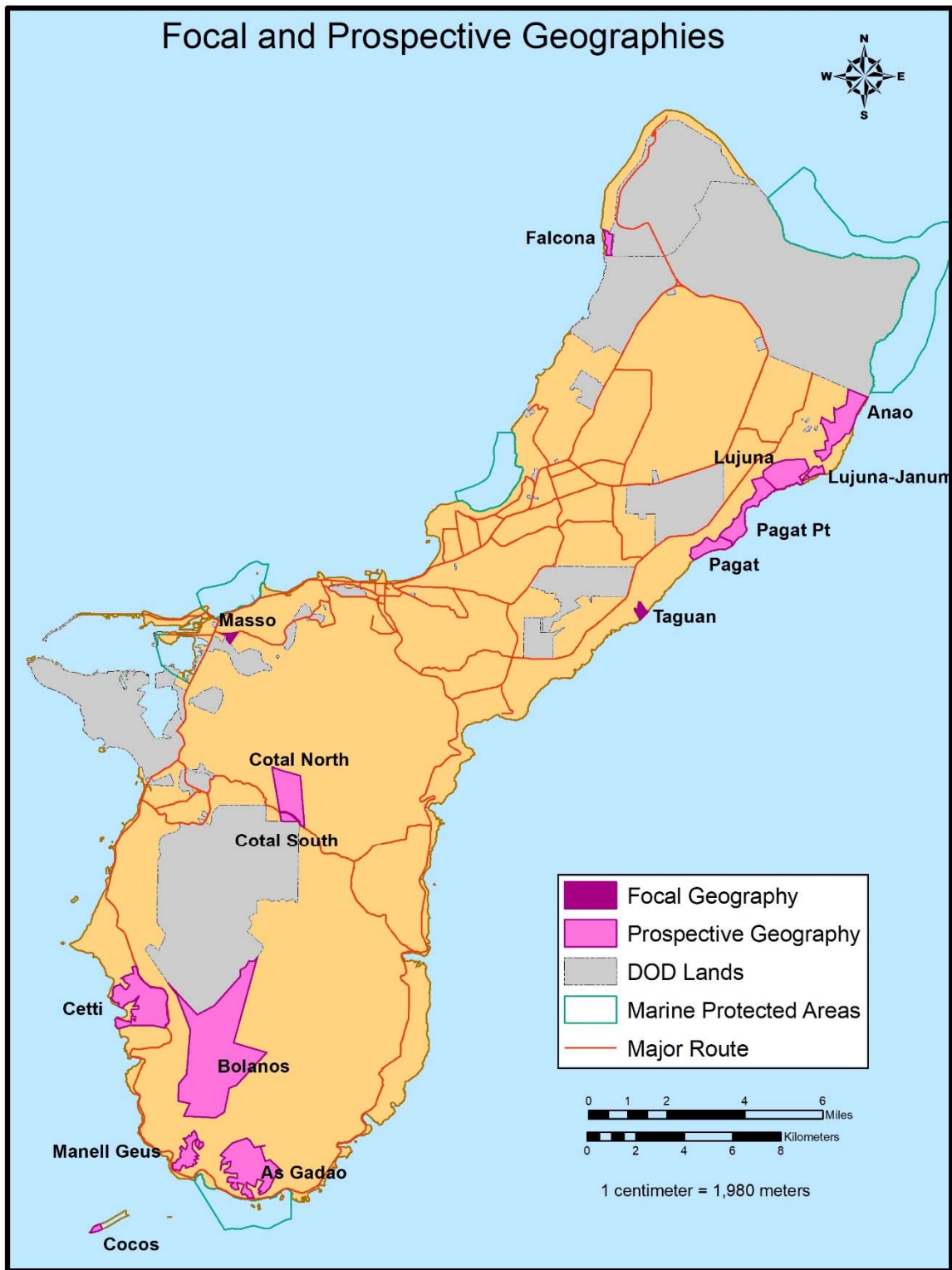


Figure 3: Focal and Prospective Geographies

Program Goals and Objectives

The vision of the Program's implementation plan is to **advance the conservation, restoration, and enhancement of Guam's forest and savanna habitats** to establish precursory conditions towards improving the baseline status of federally listed threatened and endangered species (T&E). This plan identifies habitat-specific objectives for limestone forest, ravine forest, and savanna habitat that can be achieved over the next five years. The focal and prospective geographies of this plan and their respective strategies will serve as a proof of concept providing a model for the future deployment of larger-scale restoration actions throughout Guam. The improvement of baseline ecological status of plant and animal species federally listed under the ESA is beyond the current scope of the Program².

The primary objectives of the Program are to improve native forest and habitat health while increasing habitat fragment sizes in 20 acres of old growth limestone forest in Taguan (Figure 1), 28 acres of ravine forest and savanna habitat in Masso (Figure 2). Activities anticipated to be performed within and surrounding future ungulate-proof fenced units include addressing habitat threats from non-native ungulates, invasive plants, and wildfire. Predator control of brown tree snake, cats, and rats, as well as biosecurity threats such as little fire ant (*Wasmannia auropunctata*), coconut rhinoceros beetle (*Oryctes rhinoceros*), cycad scale (*Aulacaspis yasumatsui*), and brown root rot (*Phellinus noxius*), are beyond the scope of the current Program. The Program aims to improve overall habitat conditions before targeting species-specific issues. Baseline information of general forest and habitat health for the focal geographies selected in this plan are limited or not available. The goals identified below are based on input from local experts and should be treated as preliminary. As projects progress, it is expected that baseline data will be gathered that may result in reassessment of goals and objectives.

The secondary goal of the Program is to address site selection criteria required for prospective sites to become focal geographies within this plan. The Program will support efforts to secure long-term legal conservation status for Anao and Pagat (Figure 3) which may include parcel surveys to identify property boundaries. The Program will seek to fund a pilot study to assess the feasibility and develop a process to transition non-native acacia forests to native forest habitat at a landscape scale.

- 1) **Objective:** Establish forest and habitat health baseline conditions to inform future management actions, support acquisition of environmental compliance permits necessary to implement the Program's strategies, and assist with securing site protection.
 - a) Conduct on-site surveys to determine the current baseline status of forest and habitat health within:
 - i) 28 acres in Masso
 - ii) 20 acres in Taguan
 - iii) A minimum of 10 acres in Anao
 - iv) A minimum of 10 acres in Pagat
 - b) Conduct parcel boundary surveys of Taguan, Anao, and Pagat
 - c) Conduct archaeological studies as required by the State Historic Preservation Office within Masso, Taguan, Anao and Pagat

- 2) **Objective:** Prevent forest and habitat degradation by invasive ungulates.

² Future iterations of the implementation plan may include T&E species-specific goal(s). Federally listed plant species are not required to be outplanted in the first 5-years of the Program.

- a) Install approximately 0.98 miles (5,170 linear feet) of ungulate-proof, access-friendly fencing in Masso and 0.9 miles (4,800 linear feet) in Taguan
 - b) Protect 28 acres from ungulates within fenced management units in Masso and 20 acres in Taguan
 - c) Remove 100% of ungulates within Masso and Taguan fenced management units
 - d) Maintain 0% signs of ungulate presence within Masso and Taguan fenced management units
- 3) **Objective:** Reduce invasive plant presence.
- a) Remove invasive plants from 28-acre fenced management unit in Masso
 - b) Remove invasive plants from 20-acre fenced management unit in Taguan
- 4) **Objective:** Improve native plant coverage and diversity.
- a) Increase native plant cover by 30% within fenced management units in Masso and Taguan
 - b) Increase native plant diversity by 25% within fenced management units in Masso and Taguan
- 5) **Objective:** Reduce risks of fire to forests and habitats.
- a) Establish and maintain approximately 0.53 miles (2,800 linear feet) of firebreaks in Masso
- 6) **Objective:** Conduct a proof of concept study to assess the feasibility and process to transition non-native acacia forest to native vegetation at a landscape scale.
- a) Develop 1 workplan
- 7) **Objective:** Increase community and agency engagement relating to management of focal project areas.
- a) Conduct 20 public education events (4 per year) to inform the community about focal project areas
 - b) Engage volunteer organization(s) to assist with 10 restoration events (2 per year) to solicit public participation at the focal project areas
 - c) Facilitate the engagement of 8 government agencies participating in the Program
- 8) **Objective:** Maintain improvements to environmental baseline conditions of focal project areas to preserve benefit to native species.
- a) Establish 1 program emergency contingency fund to be held in reserve to address unforeseen damage or destruction of Program investments from extreme weather events

Implementation Plan

The following strategies are expected to benefit limestone forest, ravine forest, and savanna habitats. NFWF will fund projects contributing to the goals and objectives described in this document. Only native plant species will be planted through restoration activities. The results chain in Figure 4 provides a model for how the collective strategies are predicted to contribute to the identified conservation objectives.

Strategy 1: Site Preparation

- 1.1 Forest and habitat health surveys** – Determine current forest and habitat conditions and trends, including resilience to disturbances, within focal project sites and prospective geographies. Information from surveys will inform priority management actions and be used

to measure Program progress and impact. There currently is insufficient information and data available to serve as a reference for measuring programmatic performance, and to support permit applications. Baseline forest and habitat health should be established before project implementation occurs and after project completion to document changes in site conditions. Utilization of remote imagery can be a cost-effective means to document habitat change. When practical and appropriate, baseline data collection should be done opportunistically when project implementors are at project sites to improve cost effectiveness. Types of surveys may include photographic documentation particularly from fixed positions, measurements of native and invasive plant species, size, density, and canopy cover; classification of vegetative types and structure; ungulate density and damage assessments; and invasive animal³, pest³, and plant disease³ types, occurrence, and distribution.

- 1.2 Boundary surveys** – Conduct parcel boundary surveys to formally define and record the limits of focal and prospective Program sites. Install boundary survey monuments (as necessary) to clearly mark parcel boundaries. Land surveys will be particularly important for fence installation activities and perimeter firebreak establishment since these activities have the potential to encroach on neighboring parcels.
- 1.3 Archaeological studies** – In consultation with the Guam State Historic Preservation Office, obtain permits and clearances to implement restoration and protection strategies, such as the installation of ungulate-proof fencing and native outplantings.

Strategy 2: Ungulate depredation

- 2.1 Installation of ungulate-proof fencing** – Install site appropriate fencing designed primarily to exclude invasive deer and feral pigs that are impacting forest health conditions. Fences will be designed to allow human access and preserve public access while preventing reintroduction of invasive ungulates. Buffer zones along the fence perimeter will need to be established to aid in proper monitoring and maintenance⁴ of the fence.
- 2.2 Maintain public access** – Continue to provide public access for appropriate recreational, educational, cultural, and management use within fenced management units. Fencing will be designed to maintain public access via trap gates or other ingress and egress devices that ensure entry points cannot be left open to ungulate intrusion.
- 2.3 Invasive ungulate depredation** – When ungulate fencing is installed, subsequent removal of 100% of ungulates from within the fenced areas is required and must be accomplished within a short time frame. If fencing cannot be installed or is undesirable based on site-specific conditions, alternative methods for population management may be deployed such that there are minimal impacts to forest restoration activities. The development of monitoring and maintenance plans to achieve depredation goals, track progress, and ensure long-term sustainability will be necessary. Specific ungulate management activities may

³ Program objectives do not encompass addressing invasive animals (other than ungulates), pests and plant disease.

⁴ Funding support to maintain ungulate-proof fences built with Program funds is beyond the scope of this five-year program. DOAG is committed to the long-term maintenance of installed fences.

include: 1) promote and encourage safe public hunting of invasive deer and wild pigs, 2) controlled removal through traps for areas that are not suitable for public hunting activities or when hunters are unable to remove animals within a designated timeframe, and 3) contracting with a public or private sector wildlife control entity.

Strategy 3: Invasive plant management

3.1 Invasive plant removal – Removal of non-native plants that interfere with, or out-compete, native plants. In areas with a high population density of non-native trees, the strategy will require systematic conversion to native trees to avoid total deforestation. Strategies include mechanical and chemical removal of invasive trees, vines, and other non-native plants.

3.2 Maintain treated acres – Develop monitoring plans, monitor, and perform preventative maintenance activities to discourage reestablishment of non-native plants post-treatment. Project implementors will use the most current and available best practices to avoid accidental introduction(s) of new biosecurity threats and will monitor treated acres for current and emerging biosecurity threats such as little fire ant, coconut rhinoceros beetle, cycad scale, and brown root rot. If identified within focal project areas, Program implementors will promptly notify appropriate management agencies. Project implementors will be tasked with identifying and incorporating biosecurity threats into monitoring and maintenance plans that are developed to ensure long-term sustainability.

Strategy 4: Native plant establishment

4.1 Support native plant nursery operations – Support propagation of native tree species in controlled environments until they are large enough to survive transportation and outplanting in focal project areas. Activities may include seed collection, propagation, associated materials and supplies (pots, soil, fertilizer, irrigation systems), and maintenance of nursery facilities that are necessary to support propagation of plants that will be outplanted at focal project areas.

4.2 Native outplanting methods – Utilize site appropriate strategies for planting native plants at focal project areas that take into consideration environmental conditions, optimum timing, site preparation, and planting techniques.

4.2.1 Direct outplanting – Prepare areas in potentially five-acre increments where nursery grown native trees will be outplanted 10 feet apart throughout focal project areas. Tree spacing will aim to achieve canopy cover to naturally suppress invasive grasses and weeds that may require active vegetation management until the native canopy is established. Canopy cover is important to help retain soil moisture to facilitate the composting of fallen leaves and other biological material that will in turn produce nutrient rich soil suitable for natural native plant regeneration.

4.2.2 Raised bed tree planting – Minimize the impact to potential historic and archaeological resources by avoiding ground disruption from digging to outplant trees. Strategies include planting native seeds and seedlings in raised beds or mounds laid atop the existing ground surface.

- 4.2.3 Seed dispersal** – Strategies include selective broadcasting of native seeds on the forest floor by manual distribution.
 - 4.2.4 Stump overplanting** – Strategies includes boring a hole through the stump of a removed invasive tree and outplanting native species in the bore hole with backfilled soil.
 - 4.2.5 Epiphyte planting** – Strategies include planting native plants on the surface of native tree species outside the reach of ungulates.
- 4.3 Post-planting establishment period and maintenance** – Improve outplant survival and growth by reducing threats from competing plants and pests, invasive ungulates, poor soil quality, and limited water resources. Monitor native plant cover and diversity to track progress towards habitat health outcomes. Strategies may include weed control, maintenance of ungulate-proof fencelines and prompt removal of ungulates after intrusion, application of fertilizers and mulch to supplement soil conditions, installation of shelters and shading, and supplemental watering.

Strategy 5: Wildfire mitigation and prevention

- 5.1 Establish and maintain firebreaks** – In coordination with DOAG, establish new firebreaks and maintain existing firebreaks along designated perimeters of the focal geographies. Designated firebreak perimeters will consider topography, accessibility, common points of fire origin, wind, composition of tree and plant species within the conservation area, and other critical factors necessary to isolate fire and limit damage in the event of a fire within or near Program sites.

Strategy 6: Proof of concept study (acacia to native transition)

- 6.1 Removal of non-native trees** – Determine a safe, effective, and efficient process for removing non-native acacia trees in former badland areas without substantially increasing soil erosion. Strategies may include returning organic matter to the soil to improve conditions in badland areas while reducing soil erosion events.
- 6.2 Conduct native species trials** – Establish methods for seed collection, propagation and outplanting of native pioneer plant species that thrive in nutrient-depleted soils resulting from decades of wildfires and ungulate browsing. Trials may focus on varying site preparation strategies such as fertilization, mulching, and maintenance. Outplantings will be evaluated for survivorship and growth in site specific conditions in the field. Native species that consistently perform well and meet management objectives may be considered for larger landscape-level native reforestation. Trial species may include species such as aghao, lada (*Morinda citrifolia*), and screwpine (*Pandanus* spp.).
- 6.3 Workplan development** – Outline the goals, objectives, preferable site conditions, steps necessary, and sequencing of events to transition acacia dominant forests to native vegetation at a landscape scale. Workplan should include resource and cost estimates, best management practices, and implementation timelines.

Strategy 7: Community engagement and agency participation

7.1 Community education – Prepare public education materials describing the Program, its purpose, importance, projects, and ways in which the community can participate.

Communicate the detrimental impacts of wildfire, invasive plants, animals, pests, and disease on native ecosystem health. Educational topics may include fire prevention and safety, value of ungulate-proof fencing and removal, and best practices for biosecurity controls such as stopping the spread of invasive little fire ants and coconut rhinoceros beetle into focal project areas. Outreach approaches may include school presentations, training seminars, signage and informational plaques, public safety announcements, social media, and advertisements.

7.2 Community participation – Engage the community in site protection and restoration to establish a sense of ownership in conserving essential habitats within focal geographies, where successes can be celebrated with others. Encourage stakeholders to guard and protect focal project sites by reporting misuse, and by building community support of conservation strategies and sharing information of their importance. Prior to implementation of projects that could affect recreational or cultural activities, a Public Service Announcement through multiple media outlets and a 45-day review period shall be afforded to the public for consideration. Participating approaches may include community tree planting and invasive plant removal events, school field trips, and public hunting engagements.

7.3 Agency participation – Support relationship and partnership building among federal, territorial, and local government agencies, and between government agencies, non-profit organizations, indigenous-based organizations, educational institutions, businesses, landowners, and community members. Facilitate meetings with agency partners to establish clear and open lines of communication. Establish a collaborative advisory team to review and evaluate proposals submitted through the Program’s Request for Proposals (RFP) process. As more information becomes available throughout the life of the Program, work with agency partners to identify, revise, and prioritize strategies and projects for implementation. Leverage public and private funds to support both the Program’s strategies and complementary conservation and recovery efforts being implemented by partners for a coordinated response to addressing threats to Guam’s natural resources. Seek strong local partnerships that leverage additional funds to preserve habitat improvements and maintain Program investments in perpetuity.

Strategy 8: Preservation of habitat improvements

8.1 Program emergency contingency fund – The Program will work with partners to establish a Program Emergency Contingency Fund (PECF) that shall serve as a reserve fund and financial security for the Program funded conservation investments and improvements to habitat baseline conditions. Contingencies that may arise after implementation of Program strategies will be addressed using funds deposited into the PECF. Contingencies that may be addressed through funding from the PECF may include damage to ungulate-proof fencing caused natural disasters, destruction to native outplantings from wildfires, and other

unforeseen funding needs that arise. The use of these funds shall be subject to approval by DON and NFWF. The PECF shall be tracked separately from all other financial accounts associated with the Program.

Long-Term Sustainability

The implementation strategies described in this plan will require adequate long-term maintenance and management of the Program’s investments to ensure benefits are achieved and sustained over time. DOAG is committed to the long-term maintenance of all investments associated with this Program. Existing efforts by DOAG include ungulate control, fire prevention and active fire suppression, invasive plant removal, replacement of diseased and damaged trees, reforestation, and proactive prevention of new introduced invasives. While all activities are dependent on unsecured funding, DOAG will continue its ongoing workplans for Masso, incorporate the maintenance of new ungulate-proof fencing, and expand management into Taguan. As funding and staff allow, all work completed through this Program will be maintained in perpetuity.

For the Program and its partners to better understand the extent of resources needed to support long-term maintenance, project implementors will be asked to describe the required maintenance activities as part of their proposal. In addition, project implementors may be asked to provide estimated maintenance costs, a list of long-term partners, parties responsible for implementation and oversight, and plans to secure resources for long-term maintenance. Implementation strategies may further be informed by grantee analysis and can be used to refine workplans, approaches, and budgets to ensure cost effectiveness and programmatic success.

Permits

The following permits and approvals may be required to complete the strategies outlined in this implementation plan.

Permit Type	Approval Authority	Statute	Estimated Time Required	Submitted by	Awarded to
Historic Preservation	Guam State Historic Preservation Office (GSHPO)	National Historic Preservation Act, Section 106 Historical & Cultural	6 Months	Grantee	Grantee
Federal Consistency	Bureau of Statistics and Plan - Guam Coastal Management	Coastal Zone Management Act Section 307(c)(1) and 15 CFR Part 930	2 Weeks	Grantee	Grantee

Permit Type	Approval Authority	Statute	Estimated Time Required	Submitted by	Awarded to
National Environmental Policy Act (NEPA)	U.S. Environmental Protection Agency (EPA)	83 Stat. 852	2 Months	DON	DON
Guam Environmental Protection Agency (GEPA)	GEPA	10 Guam Code Annotated (GCA) Chapters 45-54B, 76, 76A, 90	1 Month	Grantee	Grantee
Guam Seashore Protection Commission (GSPC)	GSPC	21 GCA Chapter 63 Guam Territorial Seashore Protection Act of 1974	2 Weeks	Grantee	Grantee
Tree cutting/ Depredation	Guam Department of Agriculture (DOAG)	5 GCA Chapter 60	1 Week	Grantee	Grantee
Section 7 Consultation	U.S. Fish and Wildlife Service	Section 7, Rare, Threatened & Endangered	2 to 4.5 Months	DON	DON

Grantees will be required to secure any and all applicable permits required for each proposed action prior to the execution of the proposed action and prior to incurring any associated costs.

Monitoring & Evaluating Performance

Performance of the Program will be assessed at both project and program scales. At the project scale, individual grants will be required to track relevant metrics from Table 3 for demonstrating progress on project activities and objectives and to report out on them in their interim and final programmatic reports. At the program scale, broader habitat objectives will be monitored through targeted grants, existing external data sources, and/or aggregated data from relevant grant projects, as appropriate. In some cases, course corrections, in coordination with partners, may be warranted as new information becomes available and as funding support fluctuates.

Table 3. Program Metrics

Objective	Focal Habitat	Metrics	Baseline (2021)	Goal (2026)	Data source(s)
Site preparation	Limestone forest	# of acres with baseline forest and habitat health conditions established	0	40 acres	Grantees
		# of archeological surveys completed	0	3	Grantees
		# of boundary surveys completed	0	3	Grantees
	Ravine forest and savanna habitat	# of acres with baseline forest and habitat health conditions established	0	28 acres	Grantees
		# of archeological surveys completed	0	1	Grantees
Ungulate depredation	Limestone forest	# of miles of ungulate-proof fencing installed	0	0.9 miles	Grantees
		# of acres protected (by installing ungulate-proof fencing)	0	20 acres	Grantees
		% of ungulates removed	0	100%	Grantees
		Reduce signs of ungulate presence to 0	TBD ⁵	0	Grantees
	Ravine forest and savanna habitat	# of miles of ungulate-proof fencing installed	0	0.98 miles	Grantees
		# of acres protected (by installing ungulate-proof fencing)	0	28 acres	Grantees
		% of ungulates removed	0	100%	Grantees
		Reduce signs of ungulate presence to 0	TBD ⁵	0	Grantees

⁵ The current percentage of signs of ungulate presence at these locations are not yet know, and will be informed by assessment of baseline site conditions.

Table 3. Program Metrics (Continued)

Objective	Focal Habitat	Metrics	Baseline (2021)	Goal (2026)	Data source(s)
Invasive plant management	Limestone forest	# of acres of restored (invasive plants removed)	0	20 acres	Grantees
		% of restored acres maintained annually	0	50%	Grantees
	Ravine forest and savanna habitat	# of acres of restored (invasive plants removed)	0	28 acres	Grantees
		% of restored acres maintained annually	0	50%	Grantees
Native plant cover and diversity	Limestone forest	# of acres restored (native plants planted)	0	20 acres	Grantees
		Increase native plant cover by 30%	0	30%	Grantees
		Increase native plant diversity by 25%	0	25%	Grantees
	Ravine forest and savanna habitat	# of acres restored (native plants planted)	0	28 acres	Grantees
		Increase native plant cover by 30%	0	30%	Grantees
		Increase native plant diversity by 25%	0	25%	Grantees
Wildfire mitigation and prevention	Ravine forest and savanna habitat	# of miles of firebreaks established	0	0.53 miles	Grantees
		# of miles of firebreaks maintained	0	0.53 miles	Grantees
Proof of concept study	Acacia to native vegetation transition	# of studies completed	0	1 study	Grantees
		# of workplans created	0	1 workplan	Grantees
Community engagement and agency participation	Limestone forest	# of public education events	0	10 events	Grantees
		# of volunteer events	0	5 events	Grantees
	Ravine forest and savanna habitat	# of public education events	0	10 events	Grantees
		# of volunteer events	0	5 events	Grantees
	All focal geographies	# of governmental entities participating	0	8 entities	NFWF/ Grantees
Preservation of habitat improvements	All focal geographies	# of Program Emergency Contingency Fund	0	1 fund	NFWF

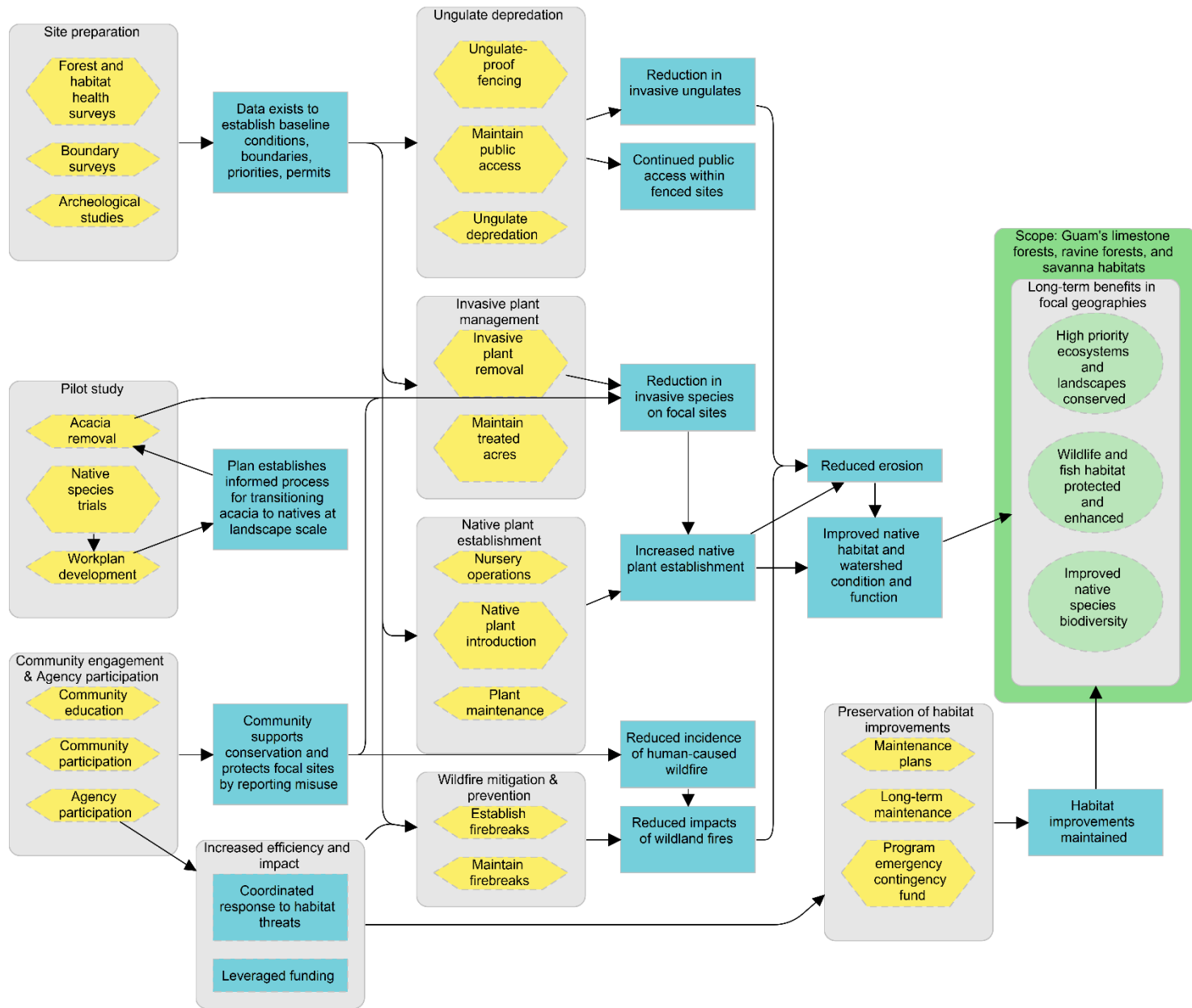
Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could negatively affect a plan’s objectives. Seven risk categories were assessed to determine the extent to which they could impede progress towards the strategies and goals over the next five years. The following table identifies primary risks to success and describes strategies that will be implemented to minimize or avoid those risks, where applicable.

RISK CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Regulatory Risks	High	Impacts to project schedules from delayed compliance processes. Public law protects Taguan from future development, but landowner could exercise right to farm medicinal plants that may conflict with conservation strategies.	Early coordination with relevant federal and state agencies to ensure permitting applications are complete and ready for review including required data and site information. Build sufficient time into project schedules. Communicate with CHamoru Land Trust Commission to better understand future plans in Taguan.
Financial Risks	Moderate	No current conservation work being done at Taguan by DOAG. Limited local funding to maintain sites after project completion. Fires could divert resources. High demand for building materials could impact fence costs and delay construction.	Once investments are made, DOAG pledges to commit to maintaining investments long term. Seek alternate funding sources. Establish long-term maintenance fund.
Environmental Risks	Moderate	Climate change impacts and long-term threats: <ul style="list-style-type: none"> - extended dry season affects survivorship of outplantings and overall ecosystem health - increased wildfire risk - damage from extreme storm events - accidental and deliberate introduction of new invasive plants and pests 	Provide supplemental irrigation for native outplantings for establishment period, when necessary. Support wildfire prevention and response. Support wildfire and biosecurity education and outreach. Establish contingency fund to protect habitat improvements made through Program investments from extreme weather events.
Scientific Risks	Low	Limited or non-existing baseline information (e.g., T&E species, volume of invasive plants) could impact objectives, strategies, and project locations.	Establish environmental baseline conditions through surveys. Support opportunistic data collection.
Social Risks	Moderate	Competing land use conflicts. Public opposition to fence installations, ungulate depredation, and access to sites.	Support community outreach, engagement, and education.

RISK CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Economic Risks	Low	Focal geographies of this plan are unlikely to face pressure to change public law to allow development, but land surrounding sites could be developed, degrading habitat corridors. Ancestral property right claims have been granted on portions of Taguan. Masso is under the jurisdiction of DOAG.	Development outside of focal sites will not impact program implementation.
Institutional Risks	Moderate	Project implementors may not have enough labor resources to support multiple concurrent projects. Limited qualified contractors and archaeological firms on-island. Conflicting perspectives among Program partners on best practices and priority actions.	Support capacity building and training. Utilize subcontractors to increase capacity. Continue to work closely and engage regularly with agency partners. Transparency on the influence and roles Program partners have relating to key topics of consideration including program strategy/prioritization (DON), project planning/scope development (NFWF), optimization of and metrics for quantitative benefit to listed species (USFWS), and land use/long-term maintenance (DOAG).

Figure 4. Results chain depicting the relationship of various strategies (yellow hexagons) within the implementation plan to each other, to the intermediate results (blue boxes) and ultimately to the Program goal to conserve, restore, and enhance Guam’s limestone forest, ravine forest, and savanna habitat (green ovals).



Budget

The following budget shows the estimated costs to implement the implementation plan activities. This budget reflects NFWF’s overall anticipated engagement for the implementation plan period of performance and it is not an annual or even cumulative commitment by NFWF to invest. This budget assumes that current activities funded by others will, at a minimum, continue. The budget categories and amounts identified are estimates and subject to change.

Budget Category	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Strategy 1: Site preparation						
1.1 Forest and habitat health surveys	\$10,000	\$80,000	\$0	\$0	\$0	\$90,000
1.2 Boundary surveys	\$300,000	\$0	\$0	\$0	\$0	\$300,000
1.3 Archaeological studies	\$200,000	\$0	\$200,000	\$0	\$0	\$400,000
Strategy 2: Ungulate depredation						
2.1-2.2 Installation of ungulate-proof fencing and maintain public access	\$0	\$0	\$1,116,700	\$0	\$0	\$1,116,700
2.3 Invasive ungulate depredation	\$0	\$0	\$0	\$264,000	\$25,000	\$289,000
Strategy 3: Invasive plant management						
3.1-3.2 Invasive plant removal and maintenance	\$215,000	\$375,000	\$280,000	\$350,000	\$420,000	\$1,640,000
Strategy 4: Native plant establishment						
4.1-4.3 Outplant natives and associated support/maintenance	\$0	\$0	\$0	\$310,000	\$310,000	\$620,000
Strategy 5: Wildfire mitigation and prevention						
5.1 Establish and maintain firebreaks	\$ 65,000	\$40,000	\$ 40,000	\$ 40,000	\$40,000	\$225,000
Strategy 6: Proof of concept study						
6.1-6.3 Proof of concept at scale	\$ 200,000	\$0	\$0	\$0	\$0	\$200,000
Strategy 7: Community engagement and agency participation						
7.1-7.3 Community education and agency participation	\$ 20,000	\$20,000	\$ 20,000	\$ 20,000	\$20,000	\$100,000
Strategy 8: Preservation of habitat improvements						
8.1 Program emergency contingency fund	\$ 45,014	\$45,014	\$ 45,014	\$ 45,014	\$45,014	\$225,070
Total Budget	\$1,055,014	\$560,014	\$1,701,714	\$1,029,014	\$860,014	\$5,205,770

Proposed Timeline

Calendar Year	2022				2023				2024				2025				2026				2027	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Strategy 1: Site preparation																						
1.1 Forest and habitat health surveys			█	█	█	█	█	█	█	█	█	█										
1.2 Boundary surveys			█	█	█	█	█															
1.3 Archaeological studies			█	█	█	█	█				█	█	█	█	█							
Strategy 2: Ungulate depredation																						
2.1 Installation of ungulate-proof fencing	█	█	█	█	█	█	█	█	█	█	█	█										
2.3 Invasive ungulate depredation											█	█	█	█	█	█						
Strategy 3: Invasive plant management																						
3.1 Invasive plant removal			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█		
3.2 Maintain treated acres									█	█	█	█	█	█	█	█	█	█	█	█		
Strategy 4: Native plant establishment																						
4.1-4.3 Outplant natives and associated support and maintenance	█	█	█	█	█	█					█	█			█	█	█	█	█	█	█	█
Strategy 5: Wildfire mitigation and prevention																						
5.1 Establish and maintain firebreaks			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█		
Strategy 6: Proof of concept study																						
6.1-6.3 Proof of concept at scale	█	█	█	█	█	█			█	█	█	█	█	█	█	█	█	█	█	█	█	█
Strategy 7: Community engagement and agency participation																						
7.1-7.2 Community education and agency participation			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Strategy 8: Preservation of habitat improvements																						
8.1 Program emergency contingency fund	█	█	█	█				█				█				█				█		
NFWF Reporting																						
			█				█				█				█				█		█	█

Legend:

- Grant Contracting █
- Planning █
- Environmental Compliance/Permitting █
- Implementation █
- NFWF Reporting █

Notes:

- The timeline assumes first grant awards are announced by August 2022.
- NFWF grant compliance review and contracting typically takes 3-4 months to complete after awards are announced.

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Appendix I – Guam Species of Greatest Conservation Need and Habitat Preferences

Species Type	CHamoru Name	Common Name	Scientific Name	Listing Status	Habitat Preferences
Bird ²	Koko	Guam rail	<i>Rallus owstoni</i>	Federal-Endangered	Limestone/Ravine/Savanna
Bird ²	Pulattat	Mariana common moorhen	<i>Gallinula chloropus guami</i>	Federal-Endangered	Near freshwater
Bird	Totot	Mariana fruit-dove	<i>Ptilinopus roseicapilla</i>		Limestone/Ravine
Bird	Puluman apaka/fache	White-throated ground dove	<i>Gallicolumba x. xanthonura</i>		Limestone/Ravine
Bird ²	Yayaguak	Mariana gray swiftlet	<i>Aerodramus vanikorensis bartschi</i>	Federal-Endangered	Limestone (Cave)
Bird	Sihek	Micronesian kingfisher	<i>Halcyon c. cinnamomina</i>		Limestone/Ravine
Bird ²		Guam kingfisher	<i>Todiramphus cinnamominus</i>	Federal-Endangered	
Bird ²	Aga	Mariana crow	<i>Corvus kubaryi</i>	Federal-Endangered	Limestone/Ravine
Bird	Chuguanguang	Guam flycatcher	<i>Myiagra freycineti</i>		Extinct
Bird	Chichirika	Rufous fantail	<i>Rhipidura rufifrons uraniae</i>		Extinct
Bird	Sali	Micronesian starling	<i>Aplonis opaca guami</i>		Limestone/Ravine/Savanna
Bird	Egigi	Micronesian honeyeater	<i>Myzometa rubratra saffordi</i>		Limestone/Ravine/Savanna
Bird ²	Nossa	Bridled white-eye	<i>Zosterops conspicillatus conspicillatus</i>	Federal-Endangered	Extinct
Bird ²	Ga' kaliso/Ga'karriso	Nightingale reed-warbler	<i>Acrocephalus luscini</i>	Federal-Endangered	Near fresh and brackish water marshes
Bird	Utak or Fakpe	White-tailed tropicbird	<i>Phaethon lepturus</i>		Limestone (Cave walls)
Bird	Chuchuko'	Pacific reef heron	<i>Egretta sacra</i>		Reef flats, coastal strands and islets
Bird	Lu'ao	Brown booby	<i>Sula leucogaster</i>		Ground or cliff walls
Bird ²		Micronesian scrubfowl	<i>Megapodius laperouse</i>	Federal-Endangered	
Bat ²	Fanihi	Marianas fruit bat	<i>Pteropus mariannus mariannus</i>	Federal-Threatened	Limestone/Ravine
Bat ^{1, 2}	Payeyi	Pacific sheath-tailed bat	<i>Emballonura semicaudata rotensis</i>	Federal-Endangered	Limestone/ Ravine

Reptile ^{1,2}	Gualik halumtanu	Slevin's skink, Marianas Emoia, Marianas skink	<i>Emoia slevini</i>	Federal-Endangered	Limestone/Ravine/Savanna
Reptile	Guali'ek halom tano'	Snake-eye skink	<i>Cryptoblepharus poecilopleurus</i>		Coastal strands
Reptile	Guali'ek halom tano'	Azure-tailed skink	<i>Emoia cyanura</i>		Coastal strands
Reptile	Guali'ek halom tano'	Moth skink	<i>Lipinia noctua</i>		Limestone/Ravine
Reptile	Guali'ek halom tano'	Micronesian gecko	<i>Perochirus ateles</i>		Limestone and beach strands
Invertebrate	Akaleha'	Guam tree snail	<i>Partula salifana</i>		Limestone/ Ravine
Invertebrate ^{1,2}	Akaleha'	Mariana Islands tree snail, humped tree snail	<i>Partula gibba</i>	Federal-Endangered	Limestone/ Ravine
Invertebrate ^{1,2}	Akaleha'	Guam tree snail	<i>Partula radiolata</i>	Federal-Endangered	Limestone/ Ravine
Invertebrate ^{1,2}	Akaleha'	Mariana islands fragile Tree snail	<i>Samoana fragilis</i>	Federal-Endangered	Limestone/ Ravine
Invertebrate	No CHamoru Name	No Common Name	<i>Succinea guamensis</i>		Limestone/ Ravine
Invertebrate	No CHamoru Name	No Common Name	<i>Succinea piratarum</i>		Limestone/ Ravine
Invertebrate	No CHamoru Name	No Common Name	<i>Succinea quadrasi</i>		Limestone/ Ravine
Insect	No CHamoru Name	Guam bronze boony bug	<i>Catacanthus sp. nov.</i>		Limestone/ Ravine
Insect ¹	Ababbang	Marianas eight spot butterfly	<i>Hypolimnas octocula marianesis</i>	Federal-Endangered	Limestone (where host plant <i>Procris pedunculata</i> , occurs)
Insect ^{1,2}	Ababbang	Mariana wandering butterfly / Marianas rusty	<i>Vagrans egestina</i>	Federal-Endangered	Limestone (where host plant <i>Maytenus thompsonii</i> , occurs)
Plant	Tsatsa	Tree fern	<i>Cyathea lunulata</i>		Ravine
Plant ²	Hayun-lagu, Tronkon guafi	Fire Tree	<i>Serianthes nelsonii</i>	Federal-Endangered	Limestone/Ravine
Plant ^{1,2}	Ufa halumtanu, Ufa-halomtano		<i>Heritiera longipetiolata</i>	Federal-Endangered	Limestone
Plant ^{1,2}	No CHamoru Name	No Common Name	<i>Phyllanthus saffordii</i>	Federal-Endangered	Savanna
Plant ^{1,2}	Pao Dedu, Paodedo, Paodedo	No Common Name	<i>Hedyotis megalantha</i>	Federal-Endangered	Savanna
Plant ^{1,2}	Siboyas halumtanu	No Common Name	<i>Bulbophyllum guamense</i>	Federal-Threatened	Limestone/ Ravine
Plant ^{1,2}	No CHamoru Name	No Common Name	<i>Dendrobium guamense</i>	Federal-Endangered	Limestone/ Ravine

Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Eugenia bryanii</i>	Federal-Endangered	Limestone
Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Tinospora homosepala</i>	Federal-Endangered	Limestone and Forest edge
Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Maesa walkeri</i>	Federal-Threatened	Limestone
Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Nervilia jacksoniae</i>	Federal-Threatened	Limestone/ Ravine
Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Tabernaemontana rotensis</i>	Federal-Threatened	Limestone/Ravine
Plant ^{1, 2}	Fadang	No Common Name	<i>Cycas micronesica</i>	Federal-Threatened	Limestone/Ravine/Savanna
Plant ^{1, 2}	Aplokating palaoan	No Common Name	<i>Psychotria malaspinae</i>	Federal-Endangered	Limestone
Plant ^{1, 2}	No CHamoru Name	No Common Name	<i>Tuberolabium guamense</i>	Federal-Threatened	Limestone/ Ravine
Plant ^{1, 2}	Biringenas halumtanu, Berenghenas Halomtano	No Common Name	<i>Solanum guamense</i>	Federal-Endangered	Limestone
Plant	Faniok	No Common Name	<i>Merrilliodendron megacarpum</i>		Limestone/Ravine

¹ Endangered Species Act, “The 23 Micronesian Species” (Guam state listing)

² Federal Register / Vol. 84, No. 88 / Monday, May 7, 2018

Sources: Assessment of Need Forest Legacy Program for Guam, 2008; Guam National Wildlife Refuge Comprehensive Conservation Plan, 2009; Guam Comprehensive Wildlife Conservation Strategy, 2006; U.S. Fish & Wildlife Service Environmental Conservation Online System, 2021

Appendix II – Program Partners

Joint Region Marianas

Joint Region Marianas oversees the installation management functions of Marine Corps Base Camp Blaz, U.S. Naval Base Guam and Andersen Air Force Base on the island of Guam. The commander of Joint Region Marianas also serves as Commander, U.S. Naval Forces Marianas and Defense Representative to Guam, Commonwealth of the Northern Mariana Islands, Republic of Palau, and Federated States of Micronesia.

National Fish and Wildlife Foundation

Chartered by Congress in 1984, the National Fish and Wildlife Foundation (NFWF) protects and restores the nation’s fish, wildlife, plants and habitats. Working with federal, corporate and individual partners, NFWF has funded more than 5,000 organizations and generated a total conservation impact of \$6.8 billion. Learn more at www.nfwf.org.

Galaide Group LLC

Galaide Group is a woman-owned small business and HUBZone certified communications, public relations and program management firm that was established in 1998. As a locally owned, locally based, and locally networked firm, Galaide Group understands the nuances of doing business in Guam and around the region. Galaide Group has provided its services to various private businesses, nonprofit organizations and institutions as well as local and federal government agencies ranging from strategic planning and facilitation to island-wide outreach and communications efforts for major community impact programs.

U.S. Fish and Wildlife Service

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service. For more information on our work and the people who make it happen, visit www.fws.gov.

Guam Department of Agriculture

The Guam Department of Agriculture was established under Public Law 3-103, effective August 1, 1956. The Department was established to protect and promote the agricultural resources and economy of the Territory of Guam by research, quarantine, control and conservation.

Forestry and Soil Resources Division

The mission of the Forestry & Soil Resources Division (Guam Forestry) is to conserve, protect and enhance Guam’s vegetative environment and sustain the natural resources which are depended on healthy forests. The agency works with stakeholders to promote healthy productive forests in both rural and urban areas throughout the island in partnership with the USDA Forest Service and other key stakeholders through a variety of programs – Urban and Community Forestry, Forest Stewardship, Forest Health and Fire Management Programs.

Division of Aquatic and Wildlife Resources

Division of Aquatic and Wildlife Resources, Fisheries Section are tasked with protecting Guam's varied aquatic resources including coral reefs, marine life and freshwater flora and fauna.