Commonwealth of the Northern Mariana Islands
Department of Lands and Natural Resources
Division of Agriculture – CNMI Forestry

MARPI 5-YEAR REFORESTATION PLAN

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US FISH AND WILDLIFE
DEPARTMENT OF PUBLIC LAND
DEPARTMENT OF LANDS AND NATURAL RESOURCES

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Site Description:

The Environmental Protection Agency ("EPA") awarded the Commonwealth of the Northern Mariana Islands ("CNMI"), through its Department of Public Lands ("DPL"), a Brownfields Assessment cooperative agreement in 2006, as well as a Brownfields Cleanup cooperative agreement in 2008 to assess and remove unexploded ordnance ("UXO") on three parcels of land in the Marpi area of Saipan .

EPA's award of the Brownfields cooperative agreements triggered compliance with the Endangered Species Act (ESA), 16 U.S.C. §1531 et seq., and DPL agreed to comply with the ESA under the terms of both agreements. The EPA conducted a formal consultation under Section 7 of the ESA with the U.S. Fish and Wildlife Service (USFWS) on the potential effects the UXO assessment and removal project may have on endangered and threatened species and their habitat in the project areas. The USFWS issued a Biological opinion on February 10, 2009 which included a number of conservation measures that DPL agreed to implement, including protecting 3 ha (8 acres) of pristine limestone forest to avoid impacts to the Micronesian Megapode (the "Avoidance Area") and protecting a 31.2 ha (77 acres) parcel for the conservation of the Nightingale Reed-Warbler (the "Nightingale Reed-Warbler Conservation Area").

Sometime on or before June 2009, DPL's contractor inadvertently cleared approximately 3 to 5 acres of the Avoidance Area. Such action was not in accordance with the requirements of the biological opinion. In response to this clearing of habitat, on September 10, 2009, the DPL agreed to set aside in perpetuity an additional 17.6 ha parcel of limestone forest for the conservation of the Micronesian Megapode (the "remediation Area") and to reforest the cleared area of the Avoidance Area to restore the habitat that was lost. This reforestation plan specifies how the Avoidance Area will be rehabilitated.

Definition: Reforestation is the restocking of existing forests and woodlands which have been depleted, an effect of deforestation. Reforestation can be used to improve the quality of human life by soaking up pollution and dust from the air, rebuild natural habitats and ecosystems, mitigate global warming since forests facilitate bio-sequestration of atmospheric carbon dioxide.

The term reforestation is similar to Afforestation, which is the process of restoring and recreating areas of woodlands or forests that may have existed long ago but were deforested or otherwise removed at some point in the past.

Factors to consider in Reforestation

A debatable issue in managed reforestation is whether the succeeding forest will have the same biodiversity as the original forest. If the forest is replaced with only one species of tree and all other vegetation is prevented from growing back, a monoculture forest similar to agricultural crops would be the result. However, most reforestations involve the planting of mix species of seedlings taken from the area close to the project site. Another important factor is the natural regeneration of a wide variety of plant and animal species that can re-occur from its surrounding vegetation. These diversities actually have an increased tree stand ages and species, promoting greater bio-diversity.

Reforestation as mitigation to Global Warming

Forests absorb carbon dioxide through their photosynthesis cycle, and by using this idea, increasing forests with reforestation and discouraging deforestation will help mitigate global warming. Forest ecosystems are especially important to the global carbon cycle in two ways. First, they are responsible for moving around three billion tons of anthropogenic carbon every year. This amounts to about 30% of all carbon dioxide emissions from fossil fuels. Second, forest ecosystems are terrestrial carbon sinks in that they store large amounts of carbon, which accounts for as much as double the amount of carbon in the atmosphere.

There are four major strategies available to mitigate carbon emissions through forestry activities: increase the amount of forested land through a reforestation process; increase the carbon density of existing forests at a stand and landscape scale; expand the use of forest products that will sustainably replace fossil-fuel emissions; and reduce carbon emissions that are caused from deforestation and degradation.

Understanding the History of the CNMI's Forest Conditions (CNMI Forestry Resource Plan of 1987)

To understand the current condition of the Commonwealth's natural resources, it is necessary to be aware of the historic forces, which have shaped them. The islands have experienced over 350 years of domination by foreign governments. Natural resources under the Spanish and German administrations experienced a gradual change, as farming and copra production were encouraged, exotic animals and plants were introduced, and attempts were made to exploit more land. The German government encouraged coconut plantations in an attempt to develop a copra industry. The subsequent clearing of native forest began a succession of events that would lead to the loss of almost all-native forest on Saipan.

The brief German administration of the early 20th century was replaced by a production oriented Japanese government, which proceeded to accomplish remarkable development in a short period. Most accessible areas were cleared of native forest tree stand and were put into agricultural production, primarily sugarcane. New forests of sosugi (Acacia confusa) were established to provide fuel wood. With the exception of inaccessible and unsuitable lands, the native forests were replaced with farms and plantations. World War II, with its heavy fighting in the Marianas, caused many farms to be abandoned and further damaged existing forests.

After the World War II, the widely disbursement of Leucaena leucocephala (Tagantangan) was used to combat soil erosion while replenishing vegetative cover on the land. This specie was selected for aerial seeding due to its fast growing leguminous tree. It quickly established itself and became widely distributed! This tree now dominates much of Saipan, forming pure stands that shade out and compete with most other vegetation found on non-rocky, calcium – coral structured soils.

In the early 80s, the Tagantangan showed signs of decline due to insect infestation. An insect known as a psyllids was discovered to be the caused of the Leucaena decline, thus initiated the introduction and release of the ladybug – the biological hosts of Leucaena psyllids. Other pressures on natural resources are the developments of businesses and homestead lots. These pressures resulted in awarding open land spaces to be occupied and developed as to meet the economic challenges. These impacts on changes and demands were felt throughout the CNMI.

Forest Inventory Analysis http://www.fs.fed.us/r5/spf/fhp/fhm/landcover/islands/CNMI_Report.pdf

In the year 2004, a team from the Pacific Northwest Research Station, Forest Inventory, and Analysis conducted surveys of the CNMI's existing forest vegetation to determine forested areas, volume of biomass and carbon stocks, tree damages and epiphytic loading and its biodiversity. Their findings determined that some areas allowed us to determine the collectively reassess and reevaluate the existing forest in the CNMI. With limited time, transportation, and access to some islands, the team collected only on the three most populated and resided islands (Rota, Tinian, and Saipan).

CNMI Forest Resources

On tropical islands, forests serve as critical cover for fragile soils, habitats for a diverse wildlife species, and corridors for various cultural and traditional resources. Where healthy forests are present, island life is enhanced by replenishment of clean fresh water, intact productive soil, abundant wildlife, healthy reefs, and lagoons that provide seafood and countless forest resources for native islander's traditional needs and uses. When island forests are destroyed, the soil is washed down slope by tropical rains. Fresh water becomes scarce, wildlife disappears and corals sicken and die from sediment and chemical changes caused by too much soil. Forests are thus a critical importance in maintaining all of the most necessary things that sustain life: water; soil and food. In addition, forests moderate temperature while balancing the islands ecosystem. When carefully managed, forests

also can provide a sustained yield of herbal medicine, food, fuel, fiber, and lumber to meet the needs of island people. The achievement of all of these things is made possible by the practice of forestry.

On the economic point of view, tourism is our number one industry next to farming and cattle ranching activities. Although limited in land space, these economic drives were implemented and demanded on all three major islands. As land space dwindle, the continued growth of our population increases the pressure of land for homesteads. All of these activities and modernization are stressors of water supplies, land values, and energy consumption. In short, the overall pursuit of development is causing the degradation of our limited natural resources of the Commonwealth.

Soil Characteristics According to Young (1989), the project site soil group can be generally characterized as either:

1. Takpochao-Chinen-Rock outcrop - shallow, well drained, strongly sloping to extremely steep soils and rock outcrop; on limestone escarpments and plateaus; or

2. Banaderu-Rock outcrop - shallow well-drained, nearly level to moderately steep soils, and rock outcrop; on limestone plateaus.

Four soil map units have been identified on the project site by Young (1989)

1. Banderu clay loam, 5 to 15% slopes (#6) - This is a shallow, well drained soil on uplifted limestone plateaus and formed in sediment over porous coralline limestone. Slopes are long and concave. Vegetation mainly associated with this soil type is secondary forest with elevations ranging from 150 to 250 meters. Surface soil layer is typically black clay loam approximately 18 centimeters thick. Subsoil, to a depth of 30 centimeters can be characterized as dusky red and dark red clay. Porous coralline limestone is found from 25 to 50 centimeters. The permeability of Banaderu soil is moderate; runoff is medium and the hazard of water erosion is moderate. Effective rooting depth is 25 to 50 centimeters and the available water capacity is low.

This soil unit is well sited for grazing and moderately suited to recreational, home site, urban development, commercial and subsistence farming. However, fruit trees and other deep-rooted plants are poorly suited. The underlying limestone does not properly filter the effluent from septic tank absorption fields. Approximately 88 hectares of this soil type is estimated to occur on Saipan, comprising 0.7% of the total soil types.

2. Banderu-Rock outcrop complex, 5 to 15% slopes (#7) - This is a shallow, well drained soil on uplifted limestone plateaus. Slopes are long and concave. Vegetation mainly associated with this soil type is native forest with elevations ranging from 150 to 250 meters. Surface soil layer is typically black clay loam approximately 18 centimeters thick. Subsoil, to a depth of 30 centimeters can be characterized as dusky red and dark red clay. Porous coralline limestone is found from 25 to 50 centimeters. Permeability of Banaderu soil is moderate; runoff is medium and the hazard of water erosion is moderate. Effective rooting depth is 25 to 50 centimeters and the available water capacity is low.

This soil unit is unsuitable for commercial farming and poorly suited for subsistence farming, grazing, home site, recreational development, and urban development. The underlying Marpi Point Village Homestead Project Biological Assessment, limestone does not properly filter the effluent from septic tank absorption fields. Approximately 23 hectares of this soil type was estimated to occur on Saipan, comprising 0.2% of the total soil types.

3. Banderu-Rock outcrop complex, 15 to 30% slopes (#8) - This is a shallow, well drained soil formed in sediment over porous coralline limestone. Slopes are long and plane. Vegetation mainly associated with this soil type is native forest with elevations ranging from 150 to 250 meters. Surface soil layer is typically black clay loam

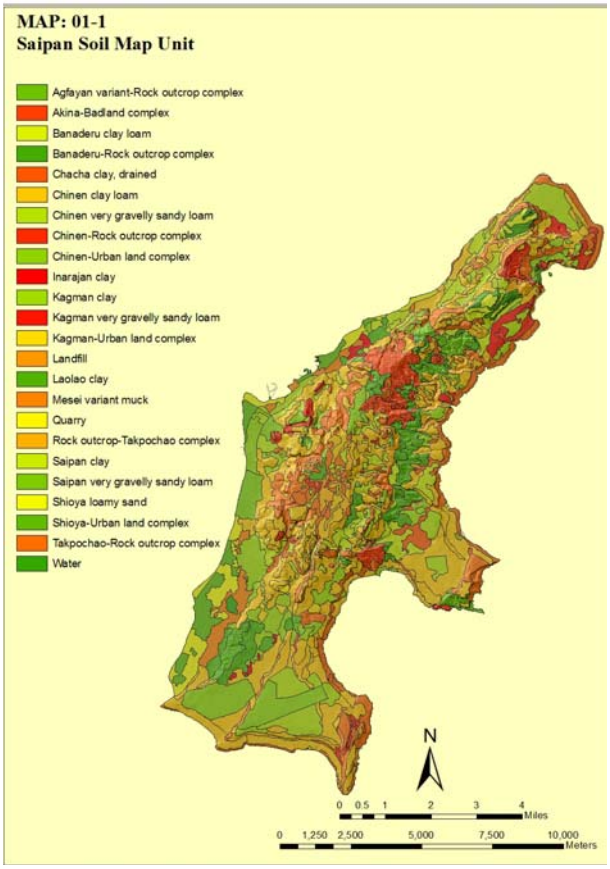
approximately 18 centimeters thick. Subsoil, to a depth of 30 centimeters can be characterized as dusky red and dark red clay.

Porous coralline limestone is found from 25 to 50 centimeters. Permeability of Banaderu soil is moderate; runoff is medium and the hazard of water erosion is severe. Effective rooting depth is 25 to 50 centimeters and the available water capacity is low.

This soil unit is unsuitable for commercial farming and home site development and poorly suited for subsistence farming, grazing and recreational development. Approximately 93 hectares of this soil type was estimated to occur on Saipan, comprising 0.8% of the total soil types.

4. Saipan clay, 5 to 15 % slopes (#44) - This is a deep, well drained soil on limestone plateaus and formed in sediment over porous coralline limestone. Slopes are long and plane. Vegetation mainly associated with this soil type is secondary forest with elevations ranging from 10 to 400 meters. Surface soil layer is typically dark brown clay approximately 9 centimeters thick over dark reddish brown clay about 7 centimeters thick. Subsoil, to a depth of 120 centimeters can be characterized as reddish brown and yellowish red silt clay and clay. Limestone is found at a depth of 120 centimeters. Permeability of Saipan soil is moderate; runoff is medium and the hazard of water erosion is moderate. Effective rooting depth is more than 100 centimeters and the available water capacity is high.

This soil unit is well suited for grazing and moderately suited for commercial and subsistence farming, home site and recreational development. Additional non-developmental uses include watershed and wildlife habitat. Approximately 439 hectares of this soil type was estimated to occur on Saipan, comprising 3.6% of the total soil types.



Issues and Trends to reconsider if no action is taken

Soil Erosion

Soil erosion is one form of soil degradation along with soil compaction, low organic matter, and loss of soil structure, poor internal drainage, salinisation, and soil acidity problems. These other forms of soil degradation, serious in themselves, usually contribute to accelerated soil erosion. Soil erosion is a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from the project site may reflect in reduced tree stand regeneration, lower surface water quality, and damaged drainage networks.

Erosion by Water

Rainfall Intensity and Runoff

Both rainfall and runoff factors must be considered in assessing a water erosion problem. The impact of raindrops on the soil surface can break down soil aggregates and disperse the aggregate material. Lighter aggregate materials such as very fine sand, silt, clay, and organic matter can be easily removed by the raindrop splash and runoff water; greater raindrop energy or runoff amounts might be required to move the larger sand and gravel particles. Soil movement by rainfall (raindrop splash) is usually greatest and most noticeable during short-duration, high-intensity thunderstorms. Although the erosion caused by long-lasting and less-intense storms is not as spectacular or noticeable as that produced during thunderstorms, the amount of soil loss can be significant, especially when compounded over time. Runoff can occur whenever there is excess water on a slope that cannot be absorbed into the soil or trapped on the surface. The amount of runoff can be increased if infiltration is reduced due to soil compaction and crusting. Runoff from the agricultural land may be greatest during rainy season when the soils are usually saturated, and vegetative cover is minimal.

Soil Erodibility

Soil erodibility is an estimate of the ability of soils to resist erosion, based on the physical characteristics of each soil. Generally, soils with faster infiltration rates, higher levels of organic matter and improved soil structure have a greater resistance to erosion. Sand, sandy loam and loam-textured soils tend to be less erodible than silt, very fine sand, and certain clay-textured soils. Tillage and cropping practices, which lower soil organic matter levels, cause poor soil structure, and result of compacted contribute to increases in soil erodibility.

Decreased infiltration and increased runoff can be a result of compacted subsurface soil layers. A decrease in infiltration can also be caused by a formation of a soil crust, which tends to "seal" the surface. On some sites, a soil crust might decrease the amount of soil loss from sheet or rain splash erosion, however, a corresponding increase in the amount of runoff water can contribute to greater rill erosion problems.

Past erosion has an effect on a soils' erodibility for a number of reasons. Many exposed subsurface soils on eroded sites tend to be more erodible than the original soils were, because of their poorer structure and lower organic matter. The lower nutrient levels often associated with subsoil contribute to lower crop yields and generally poorer crop cover, which in turn provides less crop protection for the soil.

Slope Gradient and Length

Naturally, the steeper the slope of a field, the greater the amount of soil loss from erosion by water. Soil erosion by water also increases as the slope length increases due to the greater accumulation of runoff. Consolidation of small fields into larger ones often results in longer slope lengths with increased erosion potential, due to increased velocity of water, which permits a greater degree of scouring (carrying capacity for sediment).

Vegetation

Soil erosion potential is increased if the soil has no or very little vegetative cover of plants and/or crop residues. Plant and residue cover protects the soil from raindrop impact and splash, tends to slow down the movement of surface runoff, and allows excess surface water to infiltrate.

The erosion-reducing effectiveness of plant and/or residue covers depends on the type, extent, and quantity of cover. Vegetation and residue combinations that completely cover the soil, and which intercept all falling raindrops at and close to the surface and the most efficient in controlling soil (e.g. forests, permanent grasses). Partially incorporated residues and residual roots are also important as these provide channels that allow surface water to move into the soil.

The effectiveness of any crop, management system, or protective cover also depends on how much protection is available at various periods during the year, relative to the amount of erosive rainfall that falls during these periods. In this respect, plant/trees which provide a food, protective cover for a major portion of the year can reduce erosion much more than can crops which leave the soil bare for a longer period of time (e.g. row crops) and particularly during periods of high erosive rainfall (rainy season). However, most of the erosion can be reduced by leaving a residue cover greater than 30% after removal from the site, or by inter-seeding forage crop as temporary ground cover.

Invasive Plant Species

Invasive plants are introduced species that can thrive in areas beyond their natural range of dispersal. These plants are characteristically adaptable, aggressive, and have a high reproductive capacity. Their vigor combined with a lack of natural enemies often leads to outbreak populations. These non-native / introduced species can negatively affect the intended ecosystem.

Therefore, all species that are going to be planted must have a rating system to determine its ability to overtake other tree species instead of co-habitating for form an ideal forest ecosystem. One of the safest methodology when reforesting an area, is to mimic its neighboring less disturbed forest ecosystem.

Wildfires

Fire has historically been a tool for humankind, and serves important functions. However, like any tool it must be used properly, for it can be destructive if not controlled. Many users of fire in the Commonwealth today are unaware of the damage that uncontrolled fires do to the environment. As a result, most wildfires are caused by unattended fires escaping, or by fires set intentionally by hunters. The latter cause is the more serious of the two, for the hunter intends to burn as many acres of grassland as possible. This clears the areas of grass temporarily, as well as destroying a portion of the adjoining forest. The new grass sprouts are a favorite food for deer. The temporarily cleared areas provide easy access for hunting. Many acres are burned annually for this reason. As a result, wildlife and their natural habitat are reduced. Repeated burning of the grasslands perpetuates its standing condition. The removal of grass cover by burning, thus leaving the soil unprotected, increases the potential for soil erosion until the grass adequately recovers.

Fire has adverse effects on the land principally by exposing bare soil to the effects of water erosion. Soil aggregates can be easily detached and moved by flowing water. The erosion hazard is quite real on this property because of the steep slopes. Because most of the soil fertility resides in the topsoil, it is imperative to prevent its erosion and the subsequent degradation of the property. Any conservation plan employed on this property will be compromised if wildfires (arson) are not controlled. Fire is a real and present danger because of the accumulated fuel. As fire appears to be the greatest threat to the natural resources on this property, fire prevention and suppression should be a part of the conservation plan.

Reforestation Workload

Reforestation will focus on broadcasting seed and planting mix species of seedlings covering open spaces. After the seeds or seedlings become established, staff will gradually thinned out excess plants until the new trees become the dominant part of the forest. Not only will this reduce the large area occupied by undesired plants but will also generate alternative forest products, thus achieving a diverse forest improving an ideal forest ecosystem.

As part of the reforestation objectives, vulnerable areas from erosion will be converted to forest by planting pioneer species. Species selected for Afforestation will have to be fast growing and fire resistant, if possible. They should also provide additional benefits such as wildlife habitat or attractive flowers to improve scenery and honey production. All species selected for planting will be evaluated to avoid the creation of new problems.

An emphasis will be placed on identifying, collecting, and reintroducing native species · from one island to another where it can be shown that, the reintroduction is of value to people, to improve forest diversity, or to improve wildlife habitat. Certain rare, threatened, or endangered species may be reintroduced to the site to further protect them and increase their established range. The Forestry Section is capable of assisting in this important work by providing plant materials and technical advice.

Biological Site Assessment:
Prior to any clearing or extraction of unexploded ordnances, a Biological Assessment has been conducted and compiled by the SWCA Environmental Consultants and the Micronesian Environmental Services. See addendum page 17 for their report. These assessments was conducted and reported in June 2008. Such assessment depicted a secondary forest ecosystem due to the intense cattle grazing practices, which is currently relocated to other available public land.

Goals
1. Provide approved plant/tree species for an ideal reforestation, enhancing the sites current flora and fauna setting.

- A list of established trees/shrub species has been provided on Table 1 to address priority species for the reforestation project. On Table II is an additional list of species as secondary in the event that the priority species are not available during project implementation.

2. Protect, and if possible extend the range of the existing native plants species throughout the project area.

- Fencing is one of the intent strategies to protect planted species from wild and domesticated ungulates from grazing. The fencing should not be lower than 4 ft. as depicted on the diagram on page. 14
- Planting strategies should not only be limited to the project site but throughout the cleared areas or areas that needs planting/seeding. This will create a forest ecosystem that fuses into the main project site.

3. Promote opportunities that encourage the public to participate in the enhancement of the project.

- Other non-government agencies are available to assist during project implementation. These groups can be sourced as an additional avenue to assist in the outreach effort, educating neighboring communities in the value of reforestation. Other agencies are listed in the Strategy Matrix of the plan.

Objectives

- Seeds and seedlings species for the re-establishment of native tree and shrub species, mimicking past or an ideal forest ecosystem will be collected and prepared by CNMI-Forestry for one year or whenever seeds or seedlings become available.

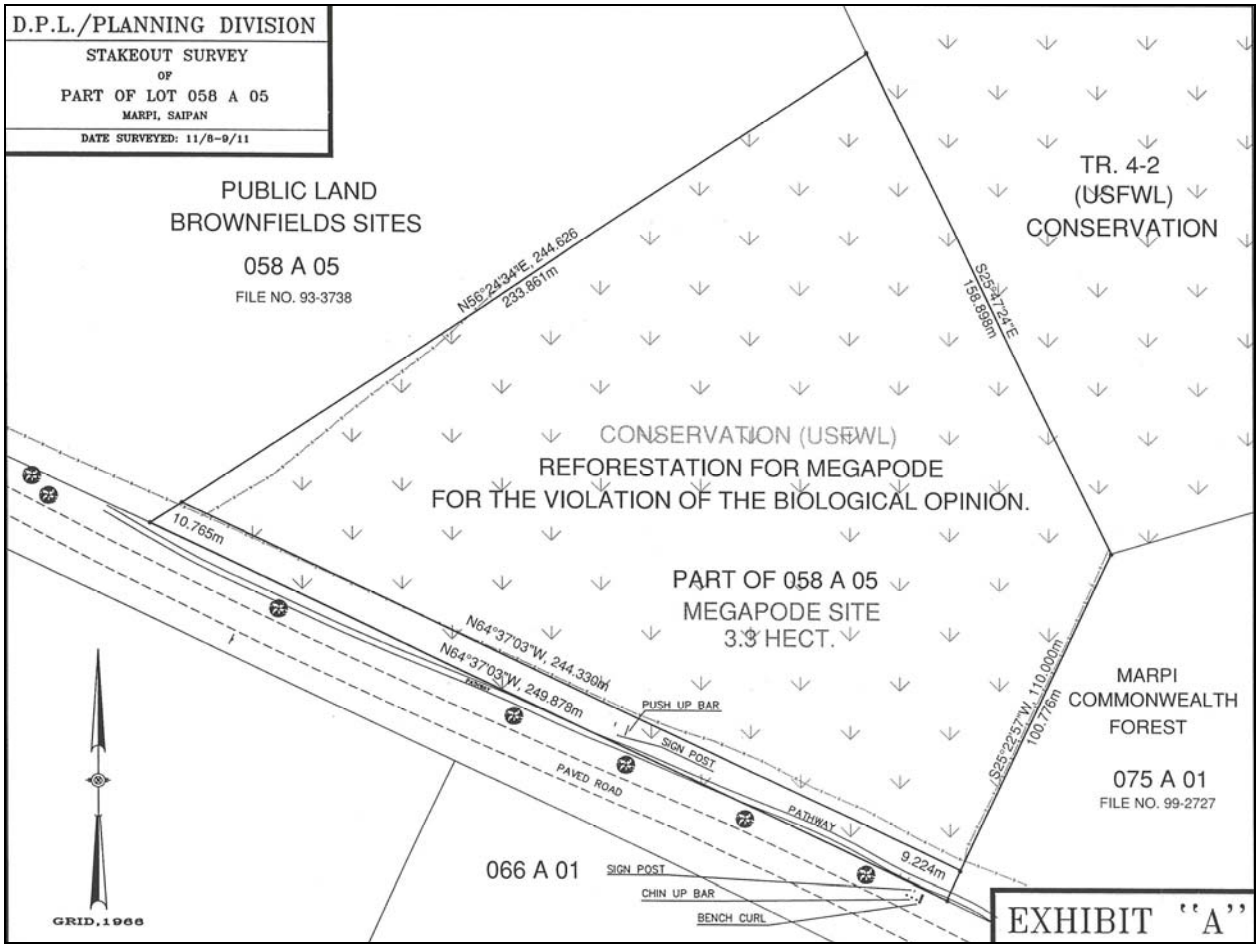
- Planting and replanting will be focused within the 3.3 hectares of land as fenced in for protection. Within the fenced area the most critical site should be where soil are more vulnerable to erosion; next to open spaces and then throughout the uncovered areas.

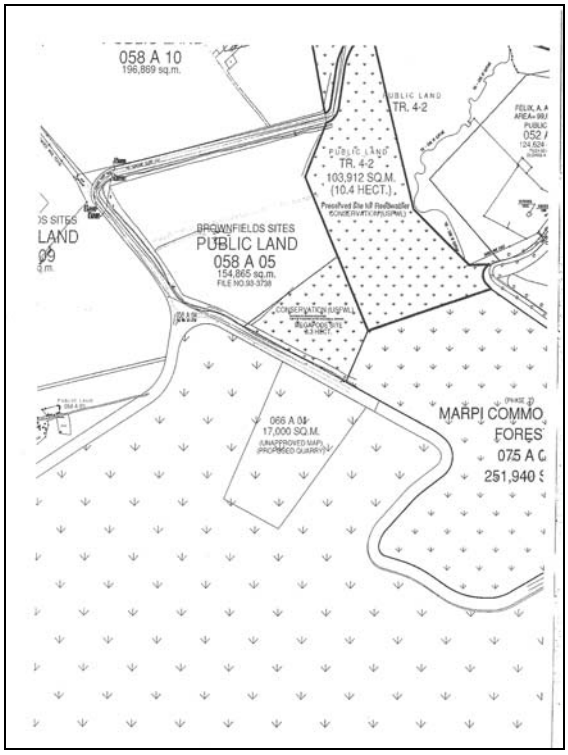
- Use any available methodology as depicted in the diagram on page 14 and 15 to lower mortality rate of planted or broadcasted species.

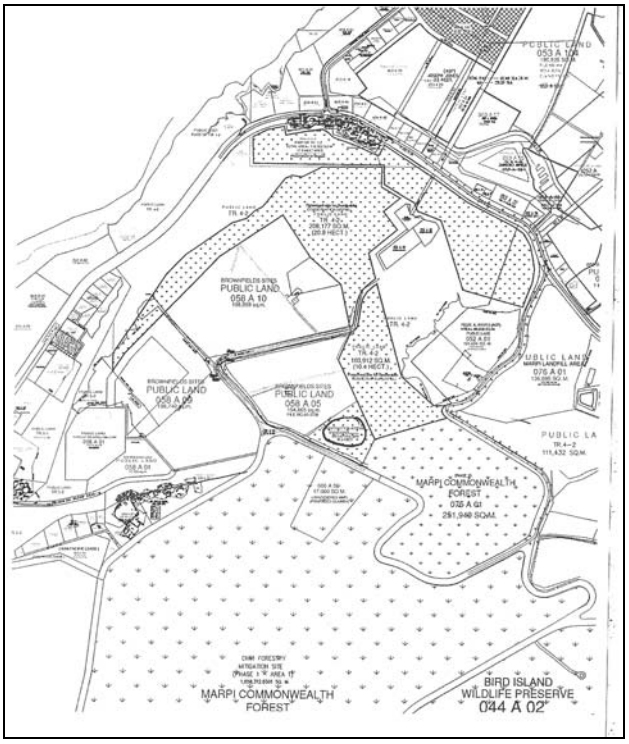
- Assure that the forest canopy is vibrant, diversified, and properly aged to provide a long-term manageable asset for soil stabilization improving its flora and fauna.

- Work with other agencies and volunteer groups to develop and enhance any mono forest stand or grassland into a healthier diversified forest while reducing bio-fuel content.

Implementation Plan
The site of 3.3 hectares was determined to be the target for the "Reforestation Project"… see Map exhibit A:







Plan 1: Establish Priority Planting Areas and identify them as Planting Phases

- These phases shall determine the load of work entails throughout the year.
- Phases will also lessen confusion of where previous plants were established
- Phase 1 should be the most critical area facing the steepest slope or closest waterway path, and then followed by Phase 2 and then Phase 3. (see map for further details)

Plan 2: Planting of selected species

- Clearly mark boundary of planting area to avoid confusion during the planting. Marking may be accomplished by using flagging tape with stakes or posts or by using another method, which is environmentally friendly.
- Measure the distance between trees to be planted in areas devoid of trees to ensure that there is a minimal of 5-foot distance between trees center to center.
- Avoid planting in areas that already have a sufficient number of trees to avoid competition of essential nutrients and water.
- Clear a space around existing seedlings and where new trees will go to avoid competition with weeds. With existing trees, clear the weeds carefully around the tree by hand to avoid damaging the tree with the brush cutter. For areas requiring a tree, use a brush cutter or shovel to clear the area of weeds down to the soil surface. Mulch the trees with available materials on site.
- Trees should be planted at the beginning of the rainy season to take advantage of the water. Avoid dry season planting where water could be a problem. For optimum survival , plantings should occur during cloudy, windless days, when weather is cool and damp with little to no wind to keep plant roots from drying

Plan 3: Follow up procedures

- Flagging tape, if used, should be removed when planting is completed. Many rocks exist at the site that might be painted as alternatives to flagging tape.
- Remove any competing weeds or plants from selected trees or shrub species.
- Follow thru with weed removal, using mechanical and chemical means.
    - See tables of listed materials needed for the project.

- Broad-Leaf-Herbicide should be used, after the first planting. Applicators should follow the product instruction. This application should maintain the weed growth for a couple of weeks allowing planted seedling to establish. See available Herbicide tables:
- Perform a Tree Stand Improvement technique where the dead branches should be removed to minimize fire hazard and vine over-crowing.

Recommended Herbicides:

Table 1. The Relative Toxicity of Commonly Used Silvicultural Herbicides

Trade Name	Active Ingredient	LD50* of the Active Ingredient mg/kg
Arsenal	imazypyr	5,000
Garlon	triclopyr	630
Oust	sulfometuron methyl	5,000
Roundup	glyphosate	4,320
Tordon	picloram	8,200
Velpar	hexazinone	1,690
Weedone	2,4-D	375
For Comparison:	Table Salt	3,750
	Aspirin	1,700
	Malathion (insecticide)	370
	Caffeine	200

*LD50 is the dose that is lethal to 50 percent of a test animal population, expressed as milligrams (mg) of chemical per kilogram (kg) of body weight.

Facts on Herbicide Uses and Effect on Wildlife:

Given the low toxicity and application rates of forestry herbicides, game or non-game animals would have to consume a great deal of treated biomass for a toxic effect. In an area sprayed with hexazinone, for example, a deer weighing 150 pounds would have to ingest all the chemical applied to an area 54 feet by 54 feet to consume enough herbicide to reach the LD50 level (application rate of 2 gallons of product per acre). This consumption would have to occur within a few hours and before natural elements begin to breakdown the herbicide. This is assuming, of course, that the deer would consider herbicide-treated foliage to be palatable.

Not only are silvicultural herbicides very non-toxic to wildlife, they also do not bioaccumulate (accumulate in the food chain). These chemicals pass very quickly through the body when ingested and are eliminated through urine and feces. Laboratory studies have shown that 95 percent of ingested glyphosate is eliminated within 5 days, 93 percent of hexazinone is eliminated in 24 hours, and 93 percent of 2,4-D is eliminated within 2 hours. In this respect, forestry herbicides are substantially different from some of the older pesticides, such as the insecticide DDT, which would accumulate in fatty body tissue. Silvicultural herbicides belong to a class of compounds that do not remain in the body and are eliminated within a short period of time. Therefore, herbicides show no tendency to accumulate in the food chain.

Although the danger to wildlife from toxic herbicide effects are virtually non-existent, there is a real--although indirect--effect on wildlife through habitat modification. A large diversity of plant and animal species quickly move in to occupy the site after a forest tract is harvested. Herbicides are used to delay plant succession so crop trees can get a good start and effectively compete with the many other plant species present. Chemical site preparation normally increases the amount and diversity of herbaceous plants (forage) like grasses and forbs, because residual pine and hardwood sprouts are reduced. And, when larger hardwoods are killed and left in place they may improve habitat for bird species that nest and feed in dead standing trees. While herbaceous weed control results in a significant reduction in wildlife forage and cover species during the first growing

season after application, research has shown that this effect is temporary, and many species begin to reappear in the first year. By the end of the second growing season, the diversity and quantity of herbaceous plants are comparable to untreated areas.

Reforestation Plan One-Year Schedule (This should be initiated when all parties agree) the period is flexible and applicable throughout the year.

January – May 2012 > Phase 1 – Seeds / Seedlings / Cutting collection

- Initiate collection of plant resources or plant species as listed on table I and table II. This should be prep for out planting in the next quarter as schedule.
- Initiate planting in Quadrants: within the fenced area, starting with
- 50% of the seeds collected will be broadcasted on open area within the project site (Phase 1 project site)
- 50% of the seeds collected will germinated and prepared for out-planting as seedlings, recovering "failed" germination of broadcasted methodology.

May – June 2012> Phase 2 - Public Awareness and Neighborhood Engagement

- Upon the execution of phase 1, the public must be informed to avoid any trampling or vandalism of planted trees.
- The Public Information Officer for the Department should initiate posting of signage and press release to ensure public awareness
- Continue with planting projects (planting in quadrant 2-3-etc), as approved by Fish and Wildlife, while involving volunteers from different agencies, groups, and or organization.
- Clearing of two feet around new plants should be performed during planting. The removed vegetation (weeds) should be use for mulch, suppressing other weeds from growing over.
- Maintenance should follow every two weeks for three-month period. DLNR staff and volunteers will be needed to partake in the project.

June –September 2012 > Phase 3 – Continue with Seeds / Seedlings / Cutting collection and weeding. Replace any lost or dead seedlings at anytime. Backup seedling should be pre harden within the Forestry Plant Nursery.

September-December > Phase 4 – Public Awareness and Neighborhood Engagement – re-enforcement of Phase 1, 2 and 3.

NOTE
The planting schedule would continue on an annual rotating basis through all 4 phases of the projects. The sequence would be repeated until all available tree-planting sites in the project area were planted. The total schedule will be subjected to variations based on the number of potential tree plantings per quadrant. DLNR might be required to suspend ongoing tree-planting project at anytime due to unforeseen circumstances. In the event that such directive is ordered, the project may then be handled "with approval" by other agencies or organization.

Furthermore, since this site has been identified to have contained unexploded ordnances, methodology of reforesting the area may be subjected to seeding / broadcasting of seeds from selected and approved tree species. Otherwise, planting of seedlings should not be deeper than 6 inches into the soil. This may require a smaller planting bags or dibble tubes with 6 inch planting pole. See diagram for dibble tube and planting pole.

((Table I Primary Plant Species))

Established Tree/Shrub Species:

SPECIES*	COMMON NAME (Chamorro)	ENGLISH NAME

Artocarpus altilis	Lemai	Seedless breadfruit
Artocarpus mariannensis	Dokdok	Seeded breadfruit
Morinda citrifolia	Lada	Indian mulberry
Ficus tinctoria	Hodda	Banyan
Ficus prolixa	Nunu	Banyan, Strangler fig
Psychotria mariana	Aploghating	Psycotria
Pouteria obovata	Lalaha	Pouteria
Neisosperma oppositifolia	Fagot	Neisosperma
Guamia mariannae	Peipei	Guamia
Premna obtusifolia	Ahgao	False elder
Eugenia palumbis	Agatelang	Eugenia
Terminalia catappa	Talisai	Pacific almond
Ochrosia mariannensis	Langiti	Lipstick tree
Pipturus argenteus	Amahadyan	Silvery pipturus
Melanolepis multiglandulosa	Alum	Melanolepis

((Table II – Secondary Plant Species))

Other plant species that can be considered for Reforestation

Botanical Name	Common Name	Local Name
Acacia confusa	Acacia	Sosugi
Hibiscus tiliaceus	Hibiscus tree	Pago
Pandanus tectorius	Pandanus	Kafu
Muntingia calabura	Panama cherry	Mansanita
Ceiba pentandra	Kapok	Tronkon Atgidon
Cerbera dilatata	Milk-wood	Chi'uti
Hernandia labyrinthica (ovigera)	Lantern tree	Nonak halom tano
Mammea odorata	Mammea	Chopak
Intsia bijuga	Ifil	Ifit
Pithecellebium dulce	Madras thorn	Kamachili
Erythrina variegate	Cat-claw tree	Gaogao
Barringtonia asiatica	Fishkill tree	Putting
Pisonia grandis	Pisonia	Umumu
Triphasia trifolia	Lime-berry	Lemondichina
Heritiera littoralis	Looking glass tree	Ufa
Heritiera longipetiolata	Looking glass tree	Ufa halom tano
Elaeocarpus joga	Blue marble	Yoga

Cost Factor

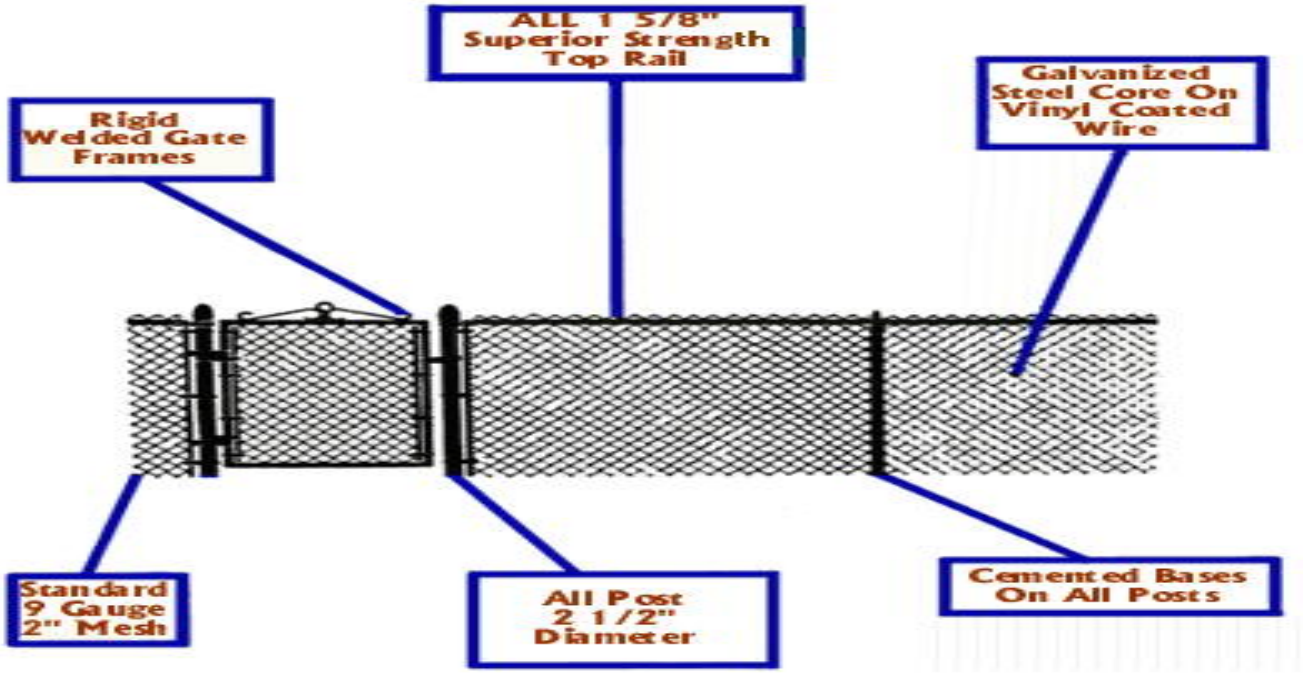
Staffing, Supplies, Site prep and Plant prep:		Per unit cost
Labor	Man-hours to perform the work- minimal of 5 hours a day (formula: staff X hours worked X minimum wage) Seed/Seedling Collection – (local source only) Planting and Broadcasting – (local source only) Maintenance (watering, weeding)	$5.25/hr

Supplies and Materials	Fuel (Gas)		$ 4.00/gal
	Planting Bags (poly cell - One quart capacity or less)		$ .50 ea
	Lubrication (2-Cycle Oil)		$ 2.00 ea
	Potting Soil		$ 9.00 ea
	Peat Moss		$ 31.00 ea
	Small Shovels – Little pal		$ 14.00 ea
	Pruning Saw		$ 24.00 ea
	Hand Pruner		$ 21.00 ea
	Machete		$ 35.00 ea
	Sickle		$ 4.00 ea
	Shade Cloth (20% filter)		$419.00 ea
	Garden Hose		$ 55.00 ea
	Water Container (300 gal capacity)		$580.00 ea
	Herbicide Sprayer		$ 24.00 ea
	Herbicide (Roundup)		$ 33.00 ea
	Working Gloves		$ 6.00 ea
	Brush-Cutter Blade		$ 13.00 ea
	Brush-Cutter Trimmer line		$80.00 ea
Primary Plants Species (harden stage)	Botanical Name	Local Name	Harden stage
	Artocarpus altilis	Lemai	$8.00 ea
	Artocarpus mariannensis	Dokdok	$8.00 ea
	Morinda citrifolia	Lada	$8.00 ea
	Ficus tinctoria	Hodda	$8.00 ea
	Ficus prolixa	Nunu	$8.00 ea
	Psycotria mariana	Aploghating	$8.00 ea
	Pouteria obovata	Lalaha	$8.00 ea
	Neisosperma oppositifolia	Fagot	$8.00 ea
	Guamia mariannae	Paipai	$8.00 ea
	Premna obtusifolia	Ahgao	$8.00 ea
	Eugenia palumbis	Agatelang	$8.00 ea
	Terminalia catappa	Talisai	$8.00 ea
	Ochrosia mariannensis	Langiti	$8.00 ea
	Pipturus argenteus	Amahadyan	$8.00 ea

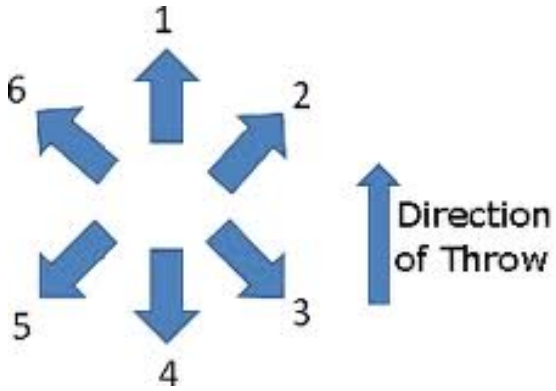
	Melanolepis multiglandulosa	Alum	$8.00 ea
	Cynometra ramiflora	Gulus	$8.00 ea
	Pandanus dubius	Pahong	$8.00 ea

Fencing Diagram:

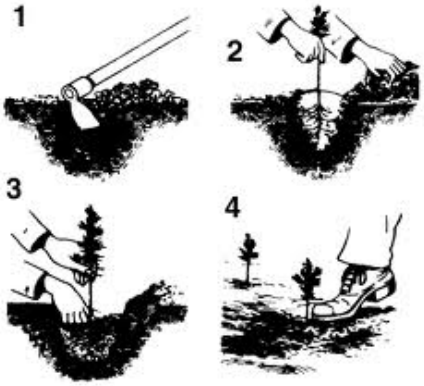
With optional gages, the 2" Galvanized mesh is preferred due to the longevity of the project that can withstand the natural elements. The height of the fence should be no less than 4 feet high, to ensure that ungulates are kept out as well as other unwanted squatters. In addition, the height of the fence should not be the focus point of the project site but should be enough to protect the regeneration of native species. See diagram:



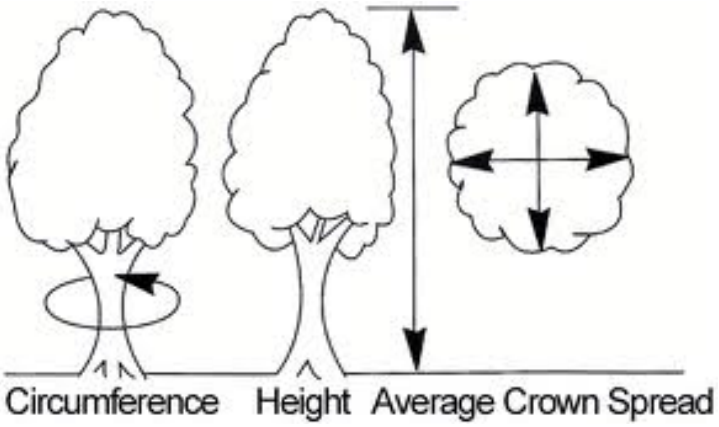
Planting Diagram and Methodology:



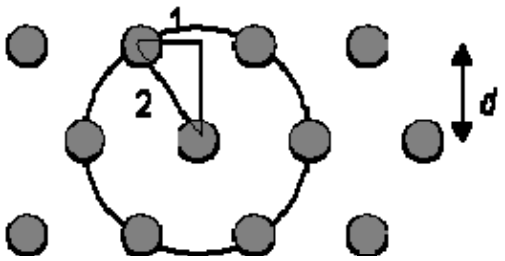
Broadcasting



Planting of Seedling

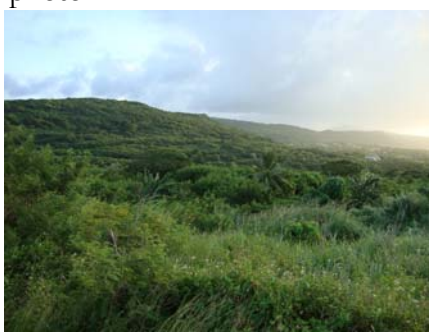


Consideration when planting seedlings of large trees



This can be done with more than 3 species. The same species should be planted so diversity can be kept and different species will have different growth rates.

Site photo






Present vegetation after the land clearing in 2010

Noted Invasive Species dominant throughout the cleared area: These species are annual, when dormant period occurs – mechanically removing them is relatively easy… follow thru with herbicide "Pre-emergent" is highly advisable.

Botanical Name	Common Name	Chamorro Name
Pennisetum purpureum	Elephant grass	Bokso
Mimosa diplotricha	Giant false sensitive plant	Sobetbion chosa
Operculina ventricosa	Paper rose	Alalag
Lantana camara	Lantana	Lantana
Leucaena leucocephala	False koa	Tagantangan
Bidens pilosa	Beggars tick	Chaguan Guam
Coccinia grandis	Ivy gourd	Pipinon maka

Mikania scandens	Mikania	Malait

Other species that have been spared by contractor

Botanical Name	Common Name	Chamorro Name
Acacia confusa	Formosan koa	Sosugi
Samanea saman	Rain tree	Tronkon mames
Albizia lebbeck	Woman's tongues	Kalas'kas
Guamia mariannae	Guamia	Paipai

Strategy matrix for Reforestation

Collaboration of possible agencies and Stakeholders (Local Level)	Resource Required	Performance Measured	Priority Area	Purpose
DLNR DPL CRMO DEQ DPS – Fire NGO	Staff Volunteers Funding Plant materials Plant Nursery Supplies	Number of Plants available Acres planted Acres restored No. volunteers	As agreed by Stakeholders (150 Acres total)	Reforest Reduction of wildfire Enhancement of Flora Enhancement of Fauna Reduction of soil erosion
Federal Level				
NRCS US-Fish and Wildlife US-Forest Service	Funding Staff Volunteers	Acres planted Acres Restored No. volunteers	As agreed and approved	Reforest Reduction of wildfire Enhancement of Flora Enhancement of Fauna Reduction of soil erosion

Acronyms

DLNR : Department of Lands and Natural Resources
DPL : Department of Public Land
CRMO : Coastal Resource Management Office
DEQ : Division of Environmental Quality
DPS : Department of Public Safety
NRCS : Natural Resource Conservation Services
US-FWS : Us Fish and Wildlife
US-SPF : Us State and Private Forestry

References

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- Herbicide use and safety facts
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Addendum 1:

2008 Biological Assessment of the Marpi Point Village Homestead Site, Saipan CNMI