DRAFT

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

STATE WILDLAND FIRE PLAN

2014-2024

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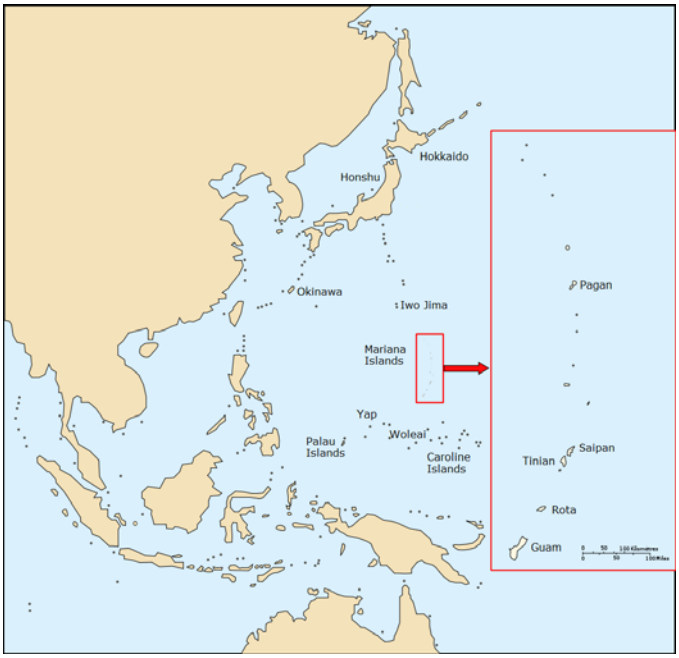
Table of Content:

Introduction..... 3
History of the CNMI Forest Condition 4
CNMI Forest Resource 5
Soil, Condition and Trends 6
Erosion Affecting the Soil 6
Wildfire (Definition) 6
Historically 7
Financial Assistance 8
Loss of Natural Resources 8
Grassland and Fires Prone Area 9
Badland 10
Threatened and Endangered Species 12
Forest Impact 13
Activities and Sustainability 14
Recognizing Native Species 14
Restoration Strategy 15
Other Challenges 15
Objectives of State Fire Assistance 15
Basic Assumption 16
Initiative Identification 16
Initiative 1: Wildland Urban Interface 17
Initiative 2: Training 17
Initiative 3: Vegetation Management 18
Initiative 4: Fire Equipments and Acquisition 18
Initiative 5: Information and Education 18
Initiative 6: Cost Effective Through Analysis and planning 18
Prioritization and Evaluation 19
Activities and Programs 19
Routing of Fire Funds and Direction 19
Failure factor 20
What is GIS in relation to Wildfire 20
Mitigating Fire prone Areas 20
Response Mapping 21
Recovery Using GIS 22
Potential Impacts 22
Fire Rating Notification 23
Fire Fighting Equipments 24
Hazard Intensity Rating 24
Addendum, Citation and References 25

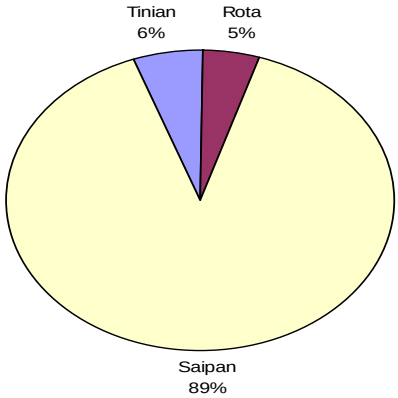
INTRODUCTION:

The Commonwealth of the Northern Mariana Islands (CNMI) is comprised of a chain of high volcanic islands located 1,000 miles south of the islands of Japan and 5,000 miles east of the islands of Hawaii or °1'2"N 145°4'5"E 15.01722°N 145.06806°E.



The CNMI is noted for its excellent climate, excellent beaches, friendly citizens, and close proximity to the major cities and markets of Asia. The population of the CNMI according to the 2010 Census is approximately 53,883. (http://commerce.gov.mp/2012/06/2010-cnmi-census-village-population-counts)

Only three of the fourteen islands, Saipan, Tinian and Rota, have a significant population. The islands of Agrihan, Pagan and Alamagan have fewer than ten residents, and the remaining eight islands are unpopulated. The preponderance of the population, 48,220 or 89% resides on the island of Saipan, which is the capitol and economic center of the CNMI. Being the capital of the CNMI, the island of Saipan has been impacted tremendously with the ailing economy due to its dramatic drop in tourism.



The single pillar of the economy is tourism industry continues to be uncertain as the cost of fuel and travel increases. The short-term elucidation is to develop collaborative efforts, forge partnerships, and aggressively seek means to generate funds to maintain operation through each fiscal year. These financial impasses left the CNMI government limited to no alternative but to find supplementary funding through federal programs and through aggressively collecting revenues from ongoing services provided by the government and private businesses.

History of the CNMI's Forest Conditions:

To understand the current condition of the Commonwealth's natural resources, it is necessary to be aware of the historic forces that have shaped the island landscape. The islands have experienced over 350+ years of domination by foreign governments. Moreover, throughout these dominations, the island's fragile and pristine landscapes have gone through major changes. Farming and copra production were encouraged, exotic animals and plants were introduced, and in some form or another, attempts were made to exploit more land through north. The German government encouraged coconut plantations to develop a copra industry. Subsequently clearing off native forest began a succession of events that would lead to the loss of almost all-native forest on Saipan and Tinian.

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. On Rota, Saipan and Tinian, most accessible areas were cleared and were put into agricultural production, primarily sugarcane. New forests of sosugi *(Acacia confusa)* were established to provide needed wood fuel. With the exception of inaccessible and unsuitable lands, these native forests were replaced with farms and plantations. World War II, with its heavy fighting in the Marianas, caused many farms to be abandoned, further damaging the existing / neighboring forest tree stand.

A notable exception was Rota, which was minimally invaded retaining most of its intact forest ecosystem. These two islands (Saipan and Tinian) was left almost tree-less, that's when the US Military made the decision to introduce legume plant called *Leucaena leucocephala* (Tagantangan) to combat soil erosion by replacing destroyed vegetative cover on open land, while replenishing soil nutrients. This plant was broadcasted through aerial seeding. However, *Leucaena l.* quickly establishes itself and became widely distributed throughout open fields where limestone (calcite and aragonite) are present. These trees now dominates much of Saipan and Tinian, forming pure *Leucaena* stands that shade out and competes with other vegetation found on non-rocky soils. Land parcels that have insufficient calcite and aragonite were unable to sustain the growth of Tagantangan, ultimately leaving the soil bare and prone to runoffs. These bare lands were soon covered by native sword grass (*Miscanthus sp. / Poaceae family)* that continues to claim its established acres. The inundation of these light fuel plants have leads right up to the border of the islands limestone forest, were seasonal fires continues to destroy its ability to reclaim open spaces.

An additional threat after the war was the major development of businesses and urban settings. All took place when the CNMI became more self-sufficient where developments and businesses are being encouraged in various ways. As a result, impacts on present resources are being felt. Tourism from the Asian countries (Japan, Korea, and China) was identified as the major industry, followed by the garment industry. However, the garment industry bailed out due to the open economic trade with Asian countries.

Another industry is the agriculture, where farming and ranching have the ability to improve its hold in the economic development, the challenges continues to put pressure throughout its development. Pressure such as limited land space, marketing avenues and quality produces. These challenges left leaders in the CNMI to explore other option for improvement.

However, with this limited land spaces, the population continues to increase at a gradual pace. With all these demands and activities, stresses on water supplies, land values, energy consumption remains constant on our fragile natural resources. The overall pursuit of development is causing the degradation of the natural resources of the CNMI. This degradation can be manages with proper tools, knowledge and technology when properly applied. Conservation, Preservation and Enhancement of our natural resources can be achieved through synergy of development and progress.

CNMI Forest Resources:

On tropical islands, forests serve as critical cover for fragile soils, cultural and traditional resource corridors. Where healthy forests are present, island life is enhanced by clean, fresh water, productive soil that stays in place, abundant wildlife, and healthy reefs and lagoons that provide seafood and countless resources for native islander's traditional needs. 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 of critical importance in maintaining all of the most necessary things that sustain human life: water; soil; food and many more. In addition, forests provide cool, beautiful places for people to enjoy nature. When carefully managed, forests also can provide a sustained yield of medicine, food, fuel, fiber, lumber, and poles to meet the needs of island people.

The history of the Commonwealth demonstrates that these resources have been subjected to fire damage, abuse, primarily due to intensive agriculture, and lack of comprehensive management. Today, the people of the Commonwealth are self-governing where developmental objectives are to achieve a level of income and quality of life that will meet minimum U.S. standards. This objective will be difficult to achieve without adequate planning to insure that the remaining natural resources of these beautiful islands are conserved, protected and enhanced.

Soil: Conditions and Trends

As indicated by islands in the trailing maps, shows acres of critically erodible land. The amount of land shown, estimated in 1984, is 1.7% of the total land area in the Commonwealth. Currently, land clearing methods often consist of piling up vegetation with a bulldozer so that it may be burned later. Valuable topsoil is included in the piles and may be lost during windy or rainy season. Removal of topsoil results in lost soil productivity.

Erosion Affecting the Soil

Soil erosion is affecting many local food sources. Not only is the loss of valuable topsoil decreasing agricultural productivity, but also ocean resources are affected as reef and lagoon areas are silted in. Erosion of topsoil not only affects productivity through loss of nutrients and organic matter, but the rooting zone in an eroded soil is usually denser, has less water holding capacity, and generally can be a more difficult environment for plant growth.

Wildfire is another serious concern for soil and forest conservation. Repeated fires in grasslands perpetuate the grassland condition, preventing trees both native and established species from reestablishing on the land. Long-term soil cover by grasslands may result in gradual soil loss and a decline in productivity. Most soils on the three main islands of the CNMI are of limestone origin with only a small percentage being volcanic in origin. Soils are shallow in many places, and as a result, productive areas for farming are limited. Erosion is a potential problem on most volcanic soils, and can be a problem in limestone areas, especially near roads or on recently cleared lands.

What is Wildfire? A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or a wilderness area. Other names such as brush fire, bushfire, forest fire, desert fire, grass fire, hill fire, peat fire, vegetation fire, and veldfire may be used to describe the same phenomenon depending on the type of vegetation being burned, and the regional variant of English being used. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and firebreaks. Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire.

Wildfires are a common occurrence in generally hot and dry climate; they pose a great risk to life and infrastructure during all times of the year, though mostly throughout the hotter months of summer and spring. In the United States, there are typically between 60,000 and 80,000 wildfires that occur each year, burning 3 million to 10 million acres of land depending on the year. Fossil records and human history contain accounts of wildfires, as wildfires can occur in periodic intervals. Wildfires can cause extensive damage, both to property and human life, but they also have various beneficial effects on wilderness areas. Some plant species depend on the effects of fire for growth and reproduction, although large wildfires may also have negative ecological effects.

Strategies of wildfire prevention, detection, and suppression have varied over the years, and international wildfire management experts encourage further development of technology and research. One of the more controversial techniques is controlled burning: permitting or even igniting smaller fires to minimize the amount of flammable material available for a potential wildfire. While some wildfires burn in remote forested regions, they can cause extensive destruction of homes and other property located in the wildland–urban interface: a zone of transition between developed areas and undeveloped wilderness. http://en.wikipedia.org/wiki/Wildfire

What is Wildfire Suppression? Wildfire suppression refers to the firefighting tactics used to suppress wildfires. Firefighting efforts in wildland areas requires different techniques, equipment, and training from the more familiar structure fire fighting found in populated areas. Working in conjunction with specially designed firefighting aircraft, these wildfire-trained crews suppress flames, construct firelines, and extinguish flames and areas of heat to protect resources and natural wilderness. Wildfire suppression also addresses the issues of the wildland–urban interface, where populated areas border with wildland areas. http://en.wikipedia.org/wiki/Wildfire

Historically

Historically fire has been a tool for the island natives, serving an important role in community and community functions. However, like any tool it must be used properly, for it can be destructive if not managed properly. Many users of fire in the CNMI today are unaware of the damages fires do to the environment. As a result, most wildfires are caused by unattended fires, or by fires set intentionally by hunters. The latter cause is the more serious of the two, for the hunters, the intend is to burn as many acres of grassland as possible. Clearing many acres of grass temporarily, as well as destroying a portion of the adjoining forest. The new grass sprouts are favored by deers and other wild ungulates. The temporarily cleared areas provide easy access for hunting. Many acres are burned annually for this reason. As a result, loss or destruction of native forest and its ecosystem increases by approximately 2% annually. 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 and inundation of non-native species.

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 move by wind and flowing water. The erosion hazard is quite real on certain areas because of the steep slopes that are greater than 2%. Because most of the soil fertility is located on the soil surface, it is imperative to prevent its erosion and the subsequent degradation of the property. Any conservation plan employed on these properties will be compromised if wildfires (arson) are not controlled. Fire is a real and present danger. As fire appears to be the greatest threat to the natural resources on this property, fire prevention and suppression should be a part of any conservation plan.

Financial Assistance:

Federal financial assistance has been availed by the United States Department of Agriculture Forest Service (USFS) to support the Commonwealth of the Northern Mariana Islands (CNMI) under the State Fire Assistance Program. This assistance is needed to continue the implementation of reducing rural and wildland fire incidences. These methodologies are thru effective education with emphasis on fire prevention, detection and protection. In addition to these projected activities, the CNMI is currently faced with the ever-growing forestland and urban interface developments. These developments pose more threat and hazards to the limestone forest and its ecosystem. As outlined, emphasis will be towards prevention, mitigation and hazard assessment of all forested area in the islands of Saipan, Tinian and Rota. These projects will support all forestry activities with respect to wildland fire plan.

In the absence of such financial assistance, not all plans and projects can be implemented or accomplished accordingly. The Cooperative Fire Assistance Plan of 2006 was the initial plan drafted to enable the funding continuation. However, these documents are working documents, thus updates and further improvements will be incorporated for all available federal financial assistance under the State Fire Assistance Grant Program.

The Fire Divisions under the Department of Public Safety (DPS) and the Department of Lands and Natural Resources – Forestry Section have the responsibility for preventing and suppressing fires within the Commonwealth of the Northern Mariana Islands. The Forestry Section cooperates by promoting fire prevention through the use of live fuel breaks on targeted areas. This project focuses on grassland and urban interface areas.

Currently, the Division of Fire under DPS is tasked in managing this federal programs coming into the department. In essence, the Department of Public Safety receives and implements specialized programs and grants outside the realm of local financial assistance. This department manages the financial and planning portion of the program concerning rural fire prevention and control objectives.

Several responsibilities tasked under the forestry-fire programs is to develop and implement an effective fire information, education and prevention outreach throughout the general public, implement fire protection and suppression activities, and to establish a fire incident reporting system.

Loss of Natural Resources

Wildfires are burning many acres annually in high prone areas within the CNMI. Although these intended fires creates temporary food for deer and ungulates', the perpetuation of grasslands fire on steep slopes contributes to soil erosion. Inclusive to the loss of fertile soil, are the loss, altered or reduced wildlife habitat is a reality. To minimize this impact, natural resource managers have put federal and local dollars into education and prevention measures.

However, in education and prevention has been and continues to be a challenge in many island developmental and / or social changes. The Department of Public Safety- Fire, CNMI Forestry and Non-Government groups continues to provide these necessary measures to curve the much anticipates increase in wildland fire incidence and activities. In addition to the "cultural" practice of burn and hunt, an additional challenge is the visible affect of Climate Change or Global Warming (http://www.livescience.com/topics/global-warming).

The most visible affect are throughout the shoreline (loss of trees and sand-bars), changes in tree diversity and dispersal (limited of native species), the volume of rainfall, decrease of humidity levels (during dry season between the month of March through August) and the outbreak of non-native invasive species (inundation of vines and grasses). These changes increase the potential loss of tree forest through expansion of fire prone areas and ultimately fire outbreaks.

In addition, many homeowners have relocated into these prone areas, increasing the risks of wildland fire exposures. These developments have shrunk the in-tacked forestland acreage through building houses; putting them at risk from wildland fire.

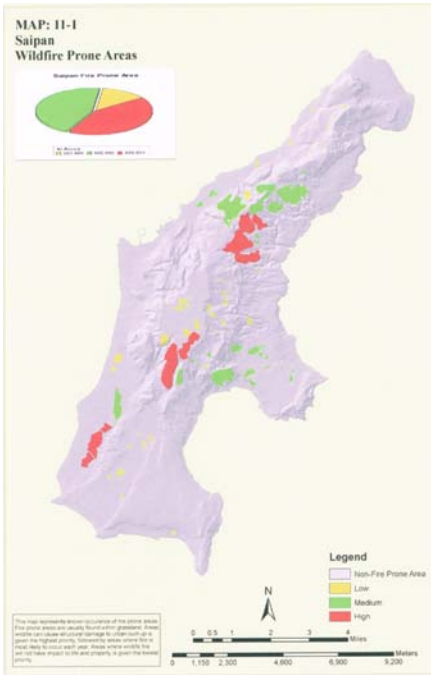
Grassland and Fire Prone Areas

As part of the fire, soil and water conservation, and reforestation programs, some grasslands and eroded areas will be converted into forest by interplanting pioneer species. Native species selected for Afforestation will and should be fast growing and hopefully fire resistant species. 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. Tree species are noted in Table III.

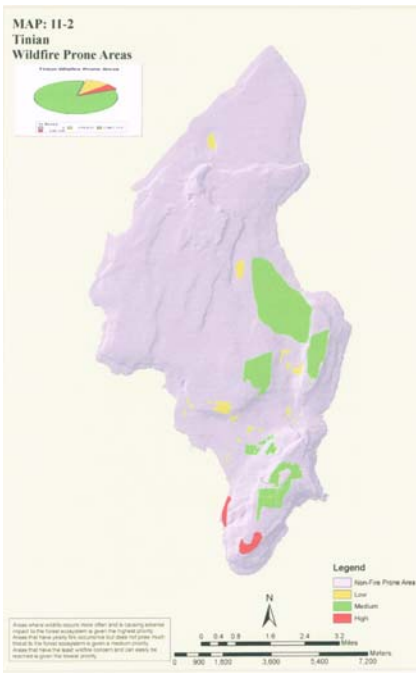
Currently, homeowners are frequently faced with minimal to no knowledge in effectively developing a workable vegetation management around their homes and their surrounding. With the continuous relocation and developments within rural settings around the islands, vegetation acreage has notably decreased due to such developments; however, live fuel remains to be present due to tradition and landscaping activities. These activities once unmanaged, will eventually turn into a fire hazard to each particular homeowner. Through this program, hazard fuel reduction and public education activities will be provided to homeowners in need, which will consist of prior site assessment and inspection that will be conducted by program personnel.

This assessment will be based on hazard criteria's and vulnerability of such homeowners to fire. Program personnel will target approximately 83 communities homeowners on the island of Saipan (http://commerce.gov.mp/wp-content/uploads/2012/12/2010-Census-Demographics-Profile-Summary-Saipan-Village-Tables.pdf), 14 communities on the island of Tinian (http://commerce.gov.mp/wp-content/uploads/2012/12/2010-Census-Demographics-Profile-Summary-Tinian-NI-VillageTables.pdf), and around 22 communities on the island of Rota (http://commerce.gov.mp/wp-content/uploads/2012/12/2010-Census-Demographics-Profile-Summary-Rota-Village-Tables.pdf). The assistance that will be

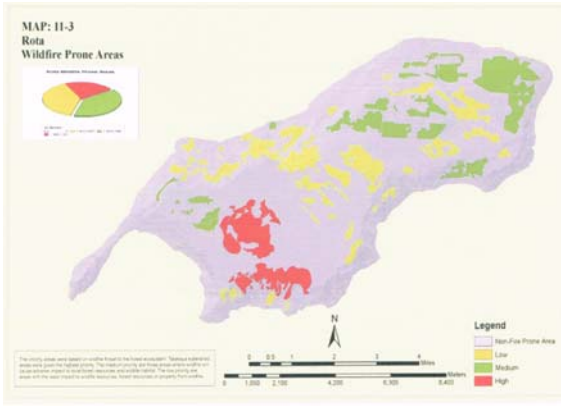
provided to these individuals in their efforts in establishing and maintaining a hazard fuel reduction and vegetation management program within their premises. This assistance will also be provided to other private landowners whom are in proximity to a critical infrastructure who are qualified and classed to be in an interface and/or inter-mix setting.



Saipan Wildfire Prone Area



Tinian Wildfire Prone Area



Rota Wildfire Prone Area

BADLAND

The vegetation on the Akina soils on Saipan and Rota is savannah dominated by sword grass. It is possible that trees once grew in these areas, but reforestation experience on Guam indicates that most trees grow very poorly on the Akina soils. The main reason seems to be the low content of calcium and high content of soluble aluminum in these soils. The low reaction, or acidity, of the Akina soils is an indicator of these adverse chemical conditions.... Forest plantations should not be located on Akina soils unless reforestation is the purpose for the plantation... Fire perpetuates the presence of savannah at the expense of the forest. Even the calcium poor Akina soils would probably develop a forest vegetation type if fires did not kill invading shrub and tree seedlings.... Prescribed burning can be a useful tool for clearing or managing land, but wildfire can quickly destroy a young forest plantation. Firebreaks, created by clearing and maintaining borders around new plantations, can be used to protect trees. Fires in mature forests do not occur in the northern Marianas because of the lack of dry, burnable material on the ground.

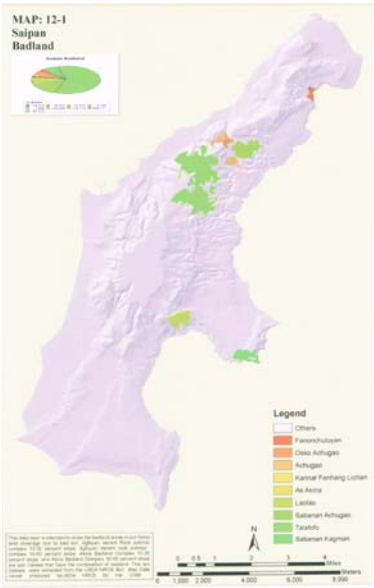
There is a severe erosion problem on the Akina soils on Saipan and Rota. The vegetation type on these soils is savannah dominated by swordgrass. Because of the generally steep slopes and poor plant cover, soil slumping occurs. The resulting badland is slow to become vegetated naturally and is subject to intense

erosion. Wildfires contribute to the problem by destroying the plant cover, leaving the soils particularly vulnerable to erosion and slumping.

The Commonwealth of the Northern Marianas Islands Department of Natural Resources is working to establish forests on the Akina soils. Once established, these forests are fire resistant and will reduce soil erosion from the sites. This will improve the watershed and provide better wildlife habitat. Prior to planting an area, prescribed burning is used to remove the existing sword grass. As the swordgrass re-sprouts, it is hand cleared or treated with herbicides. Trees are planted by hand on the steep slopes. Slow-release fertilizer should be placed in the planting hole. For 2 years after planting, competing vegetation must be controlled by mowing and ring weeding around the trees. Crown closure will suppress weeds after this.

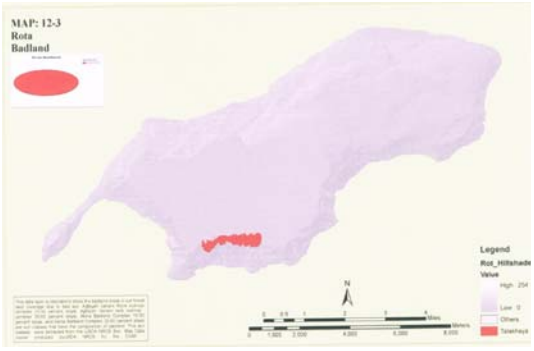
Three years after planting, planted species should exceed 7 meters in height and 15 centimeters in diameter at breast height. Suitable species for planting on Akina soils or other areas where quick forest cover is desired are sickle leaf acacia, broadleaved acacia, da'ok, gagu, Casuarinas Cunningham, and eucalyptus. Of these, the acacias, particularly sickle leaf acacia, are the best adapted to the Akina soils. This is the only tree that is suited to Badland areas. Da'ok can be planted on the Akina soils, but it grows more slowly than the other trees do. The casuarinas species grow quickly but are flammable and therefore vulnerable to wildfire even when mature. Fruit trees are poorly suited to the Akina soils."

The estimated Priority Area for wildfire objectives under Theme Two was developed by considering the need to protect values (a) existing infrastructure and a buffer of defensible space around it; (b) forest vegetation (c) critical habitat, and to address threats (d) areas that have historically burned, and (e) steep lands susceptible to rapid fire spread. See Appendix A for a complete description of map development. This map is likely to be revised with the development of Community Wildfire Protection Plans.



Saipan Badland

Tinian Badland



Rota Badland

THREATEN AND ENDANGERED SPECIES

The original vegetation on Rota was probably very simple. On the limestone terraces, a mixed forest existed. On the lower terraces, the forest was semixerophytic, that is, dry season deciduous, and on the highest terraces, it was moist forest. The indigenous Chamorros who have inhabited Rota for three thousand years unquestionably made major modifications to the island's native vegetation. Today, some areas on Rota show evidence of having been terraced in ancient times for the cultivation of rice and taro.

Rota has two tree species, *Serianthes nelsonii* and *Osmoxylon mariannense*, and a perennial herbaceous species, *Nesogenes rotensis*, which are federally listed as endangered. *Osmoxylon mariannense* and *Nesogenes rotensis* are both endemic to Rota. The FWS has also identified three plant species found on Rota, *Lycopodium phlegmaria, Coelogyne guamensis* and *Nervilia jacksoniae*, as species of concern. The CNMI has also classified *Serianthes nelsonii* and *Lycopodium phlegmaria* var. *longfolium* as threatened/endangered species. To date, only 121 specimens of *Serianthes* have been found on Rota. *Osmoxylon* is endemic to Rota where only about 20 specimens have been found. This small, unique population of *Osmoxylon* appears to be in decline as evidenced by the death of several previously mapped older trees and the lack of evidence of any new saplings being noted as new generation. The primary factors threatening these rare tree species are lack of regeneration probably caused by ungulate browsing and insect predation on seeds.

Native flora of the Northern Mariana Islands evolved in an environment free of ungulates making several species vulnerable to heavy browsing. Three species of ungulates, Philippine deer (*Cervus mariannus*), feral pig (*Sus scrofa*), and domestic cattle (*Bos taurus*) are likely involved in the destruction of these tree species. Attempts to propagate *Osmoxylon* from cuttings have so far been unsuccessful. Nesogenes rotensis is another specie found only on Rota, thriving within the salt spray zone of Pona Point and that population is believed to consist of less than 20 individuals. (http://www.nps.gov/pwrh/parkrota/pt4b.htm) Also, Rota provides habitat for several animal species listed by the FWS and the CNMI as threatened or endangered, or as candidates for listing. Three bird species, the Mariana crow (*Corvus kubaryi*), the Rota bridled white-eye (*Zosterops conspicillatus rotensis*), and the Mariana common moorhen (*Gallinula chloropus guami*) are federally listed as endangered. The Mariana fruit bat (*Pteropus m. mariannus*) is now listed as a threatened species. The Mariana crow and the Rota bridled white-eye populations have significantly declined in recent decades. The Mariana common moorhen is found at one location on Rota, the Rota Resort, where the island's only freshwater wetland habitat exists. Two species, the Mariana swiftlet (*Aerodramus bartschi*) and the Micronesian megapod (*Megapodius l. laperous*), were historically present on Rota, but have since been extirpated. A small population of the Mariana common moorhen has become established at the wastewater treatment ponds of the Rota Resort. Recent analysis conducted by the CNMI Division of Fish and Wildlife has shown that most other bird populations on Rota also have substantially declined over the past few decades.

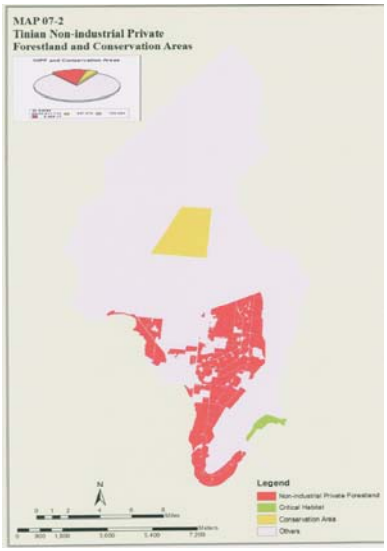
Lower Limestone Terraces. In drier northeastern Rota where the terrain is more level and less rocky, small to medium size *Intsia bijuga* is common. The forest here is relatively low and scrubby with *Hibiscus tiliaceus*

and *Pandanus* spp. being common. Other species here include *Guamia mariannae*, *Guettarda speciosa*, *Eugenia* spp., *Morinda citrifolia*, *Maytenus thompsonii*, *Triphasia trifolia*, *Polyscias grandifolia*, *Cycas circinalis*, *Flagellaria indica*, and *Caesalpinia major*.

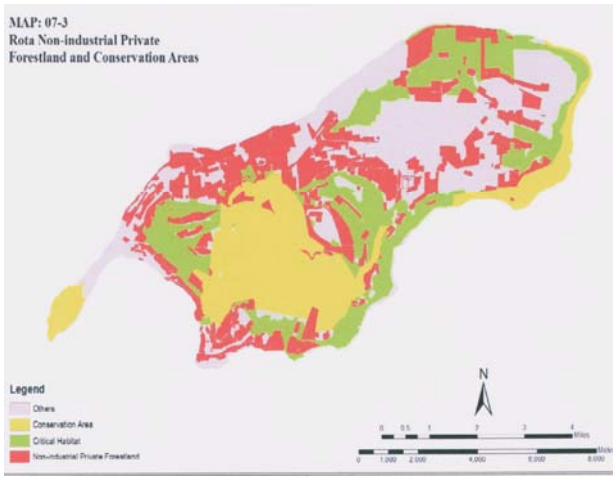
Mid-elevation Limestone Terraces. A substantial portion of the limestone terraces of the Sabana contain native forest in good condition. Species found here include: *Serianthes nelsonii*,*Heritiera longipetiolata*. *Artocarpus* spp., *Hibiscus tiliaceus*, and *Osmoxylon mariannese*. Understory species include *Macaranga thompsonii* and *Pipturus argentus*. Epiphytes are abundant and include *Freycinetia reineckei, Asplenium nidus, Davallia solida* and other ferns; *Coelogyne guamensis* and other orchids; and mosses.

Upper Limestone Terraces. At the higher altitudes, the forest changes to a wetter type which is very luxuriant and has a full canopy. In these wet parts the principal trees are *Elaeocarpus joga*, *Hernandia labyrinthica*, *Fagraea berteroana*, *Pandanus*, *Guettarda*, *Ficus prolixa, F. tinctoria, Artocarpus mariannensis, Pipturus, Laportea, Guamia, Claoxylon, Osmoxylon, Macaranga, Pisonia umbellifera* and others, with *Psychotria, Piper, Discocalyx, Maesa* and other shrubs and many ferns in the undergrowth. *Freycinetia* and *Alyxia* are common lianas. Epiphytic ferns and orchids are abundant.

Saipan Conservation Area



Tinian Conservation Area



Rota Conservation Area

FOREST IMPACTS

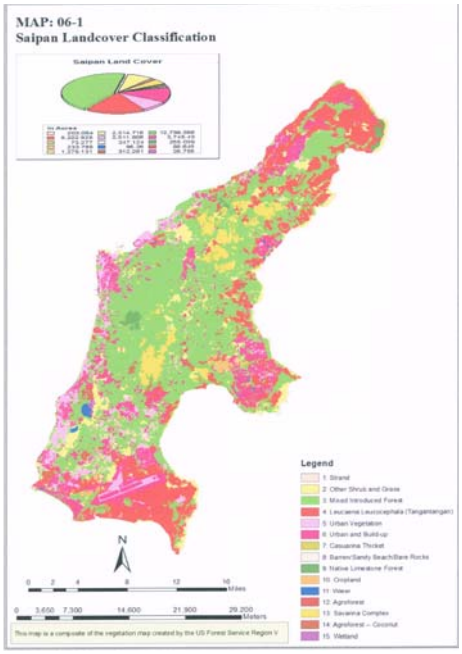
Climate change is expected to bring about immense changes in forest composition and health. Studies show that catastrophic wildfire in populated areas may be one of the most costly effects of climate change. These changes allow the unwanted pest to encroach and overtake pristine forest. This outbreak challenges the ability for the native forest species to regenerate and continue to flourish, as it should be.

ACTIVELY AND SUSTAINABILITY OF MANAGE FORESTS:

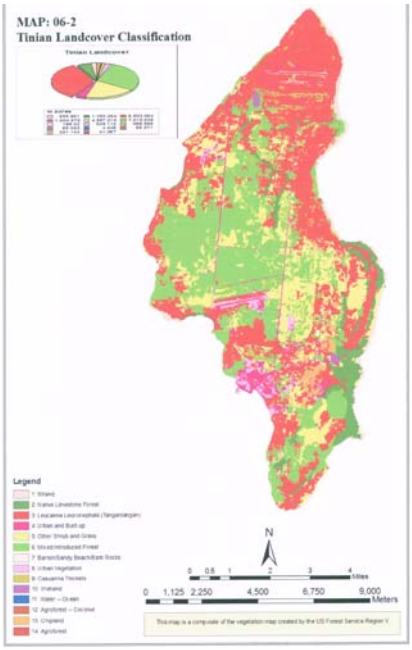
Much of the active and sustainable practices were driven by the idea and methodology of restoration, conversion and enhancement of flora and fauna species. These protected and conserved acreages host the majority of these native and values species [see table of species]. The initiative to continue species of interest that thrives in Limestone Forest encompasses the symbiosis of the limestone's true flora and fauna ecosystem.

Recognize Native Species:

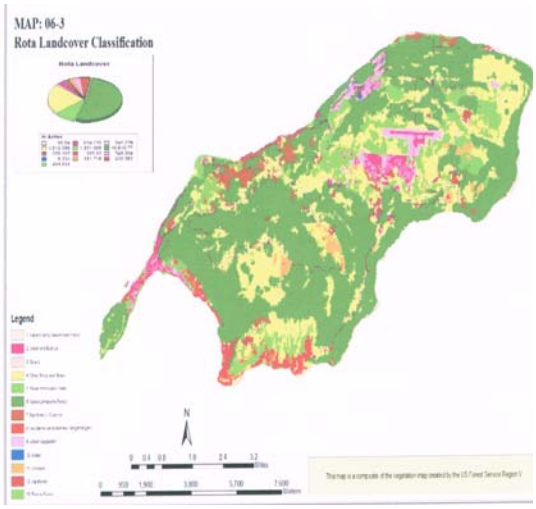
SPECIES	COMMON NAME (Chamorro)	ENGLISH NAME
Artocarpus altilis	Lemai	Seedless breadfruit
Artocarpus mariannensis	Dokdokt	Seeded breadfrui
Morinda citrifolia	Lada	Indian mulberry
Ficus tinctoria	Hodda	*Banyan*
Ficus prolixa	Nunu	Banyan, Strangler fig
Psycotria mariana	Aploghating	Psycotria
Pouteria obovata	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



Saipan Land Cover



Tinian Land Cover



Rota Land Cover

Restoration strategy:

Much of the forests flora setting is a mixture of native and introduced or established species throughout the Micronesia. Certain species thrives mainly on Rota, a 32.97 square miles landscape, and hosts endemic species known as *Serianthes nelsonii, Oxmoxyulum mariannensis and the Tabornea Montana*. These species are listed in the Threaten and Endangered lists, and is protected by Section 7(a)(2) of the Endangered Species Act of 1973,. With the listed "Protected and Conserved landscapes", monitoring efforts continues throughout the year for threats that may impose on the continuance of its intended ecosystem.

Other Challenges

As experience with other departments, one contributing factor is the employment status. The number of fire fighting forces versus the number of incidences and occurrences remains uneven. Due to the limited funding, the department is unable to meet the employment vs. incidence ratio. Another factor is the CNMI inability to provide sufficient water supply system and water pressure, improper storage of hazardous materials, and the lack of maintenance and access to homeowners. These issues are addressable with proper funding and planning.

THE OBJECTIVES OF THE STATE FIRE ASSISTANCE IN THE CNMI:

A. Provide the community with an increased awareness on rural fire protection and safe burning practices.

B. Maintain and improve fire protection effectiveness and efficiency on federal and nonfederal lands.

C. Provide a consistent information and education campaign on an annual basis to homeowners relating to fire prevention.

D. Maintain and update the Commonwealth of the Northern Mariana Islands Fire Prevention Assessment Plan.

E. Enhance communication capabilities with other State Cooperators relating to program needs.

F. Provide homeowner assistance relating to hazard fuel reduction and implementation of defensible spaces around structures.

G. Provide adequate rural fire protection and suppression services to interface and intermix settings.

H. Establish a working relation with the general community such as fanners, ranchers, and outdoor users on the importance of safeguarding our natural resources specifically forested areas.

I. Achieve higher funding benefits that exceed regular funding level earmarked for the Commonwealth of the Northern Mariana Islands (CNMI).

Basic Assumption

1. The Commonwealth of the Northern Mariana Islands (CNMI) will maintain consistent rural fire prevention and control program to reduce unwarranted wildland fires.

2. Upgrade wildland fire fighting capabilities and services particularly in the area of wildland-urban interface.

3. Provide fire protection to both State and individual landowners.

4. Establish a collaborative program with local and federal agencies in the area of forest-wildland fire prevention.

5. Increase acquisition activities through the Federal Excess Personal Property (FEPP) and the Department of Defense Firefighting programs.

6. Provide the community a stable and hazard free environment.

7. Avail to technical assistance concerning training offered.

Initiative Identification

The following are general areas of concern for the Commonwealth of the Northern Mariana Islands State Fire Program. This Fire State Plan will focus on stated issues as well as items detailing the needs as they relate to the efficient and effective fire protection and suppression activities. Itemized issues and subject

areas are interrelated and integrated. The Federal cooperative financial and technical support is considered the primary instrument and funding used to target and addresses issues achievable through the state objectives.

Initiative 1 – Wildland Urban Interface

The Commonwealth of the Northern Mariana Islands (CNMO, specifically the islands of Saipan, Tinian, and Rota are faced with an increased hazard of losses with regards to Wildland-Urban Interface (WUI) areas due to increasing relocation of homeowners from urban setting into rural settings. This problem continues to exist on a daily basis. Efforts are being made to address these issues in order to prevent major fire losses to these residents. The expected threat on these areas is considered between the months of March through July when the dry season comes in. However, weather conditions were able to disrupt the normalcy of the said season.

Public Safety officials' play a key role in leading, participating in, and supporting initiatives to reduce losses with respect to WUI. In spite of previous incidence successes, several issues will remain as a key factor for all levels of wildland fire protection and suppression. The following are considered a major initiative to effectively address the goals of this program and/or activity.

I. Expand public awareness activities regarding hazards and risks associated with unmanaged fuel mitigation practices to homeowners, developers, and outdoor goers.

II. Implement an effective management technique, development of strategies, and method when dealing with wildland fire emergencies.

III. Increase or enhance training capabilities of wildland fire personnel in areas of WUI settings.

IV. Update of modem fire fighting resources and technology relating to wildland urban interface.

V. Establish an effective understanding between urban and rural fire protection services.

VI. Delineation of jurisdiction of fire agencies involved at fire incidents.

VII. Emphasis to individual communities of their responsibilities as a citizen in safeguarding our resources and forested areas.

VIII. Work toward the introduction of legislation to enact laws or ordinances at all level of government with respect to conservation and protection of our forest.

Initiative 2 – Training

Training opportunities has always been considered by the Commonwealth of the Northern Mariana Islands (CNMI) to be a vital element in professional development and consistency of performance. The fire service personnel has avail to these training in the past, however, future training needs are still considered to be an important element to establish reinforcement of knowledge and skills.

The limiting factor with regards to wildland fire training is local funding and training schedules abroad. Presently, the CNMI is limited in finding needed training locally and must rely on either bringing instructors on-island or sending a limited number of personnel to off-island training centers. In addition, the CNMI is venturing into possible avenues to establish a an on-site cadre' of certified instructors or other "train-the-trainer" classes.

With the on-going participation by the CNMI fire personnel for on-the-job training in California, Florida or elsewhere, we believe that this opportunity should be maintain for it provides a first-hand experience to local fire fighters when assigned with stateside cooperators. With the continued financial assistance, the CNMI-DPS fire personnel will avail to these offered training opportunities whether on-island or off-island.

Initiative 3 – Vegetation Management

The Commonwealth of the Northern Mariana Islands (CNMI) recognizes the need for effective management in creating a healthy forest, reduce fuel accumulation and exposures, and create effective fuel breaks and fire protection measures in high-risk areas. The assistance provided to the CNMI will ensure an effective information and education program with respect to fuel management and implementing defensible spaces.

Initiative 4 – Firefighting Asset Acquisition

The Commonwealth of the Northern Mariana Islands (CNMI) expects to continue the acquisition of fire fighting equipment and fire apparatus to provide an effective and efficient fire protection and fire suppression services on the islands. The Federal Excess Personal Property (FEPP) Program and federal financial assistance are equally important for the CNMI in the acquisition of these properties. Inclusive of this program are the operational cost incurred for such maintenance performed and replacement of these equipment.

Initiative 5 – Information and Education

The Commonwealth of the Northern Mariana Islands (CNMI) have prioritized Information and Education Programs on the islands. As planned through this period, fire personnel will conduct presentations relating to fire safety to residents, business establishments, fanners, and outdoor goers. The program itself has been developed to target the islands educational system for both public and private organizations. This activity is anticipated to develop throughout the years. The goals of this campaign are to develop a fire safety

conscience to the public and emphasize the importance of preserving our natural resources, specifically our forestlands as well as its wildlife.

Initiative 6 – Cost Effective through Analysis and Planning

The Commonwealth of the Northern Mariana Islands (CNMI) will establish and continue identifying issues affecting rural and wildland fire protection and suppression programs as well as delineate areas for program improvement and effectiveness. The continuity of efforts and support from various fire protection and local agencies are needed to meet the ever-growing approach to rural fire protection. This activity shall focus on concepts, emphasizing interagency assistance and involvement in response phases. In addition, analysis and planning activities should be construed to various high-risk or probable areas. Effective management and monitoring of this activity will go a long ways in refining rural fire protection issues and reducing the threat of wildland fire incidents.

Prioritization and Evaluation

The Commonwealth of the Northern Mariana Islands (CNMI) requires a different fire protection need as compared to our US counterparts. Aside from island setup and area, organizational variations and differences in fire protection needs tailored to an island setting creates difficulty in establishing a solid prioritization lists. Issues influencing the programs are the same; however, priorities are drawn up on a year-to-year basis for each project and application.

This issue is entirely considered as a high priority on a yearly basis due to lives involved. Other initiatives and activities will vary in priority dependant on community activities and infrastructure developments in relations to interface settings. All program priorities will be re-evaluated and identified on annual basis per each fiscal project agreement submission.

The activities and programs that are considered as a priority throughout this period are:

- Federal Excess Personal Property (FEPP), to enables the *CNMI* to acquire and use equipment on a loaner basis from the Forest Service from various State Cooperators and Military Surplus (DRMO).

- Wildland-Urban Interface (WUI) developments are considered as a growing threat to the CNMI. This activity has placed fire protection and its services to its minimum. WUI activities have doubled for the past years and are still anticipated to climb in numbers.

- Improve our firefighters capabilities engaged in forest or wildland fires by expanding wildland firefighting training opportunities to our seasoned firefighters at home; enhance their wildland firefighting knowledge, skills, abilities through on-the-job training or deployment abroad, open opportunities for career advancement by obtaining professional education degrees through distant learning all of which to enhance our response compatibilities' within our jurisdiction.

Routing of Cooperative Fire Funds:

Through the collaboration between the two Departments (Lands and Natural Resources and Public Safety), it is recommended that any applicable fire funds be reverted and routed back to DLNR – CNMI Forestry. It is the responsibility of the CNMI State Forester to ensure that administrative tasks under the Cooperative Fire Assistance and its programs be met as agreed under the financial assistance act of 1978. Impart of these agreement is to ensure that all program activities and expenditures be accounted and reported accordingly.

However, the fire programs and its funds will remain in with the Department of Public Safety, until such time that the CNMI Forester determine that Fires is unable to meet its obligation to the State and / or the Federal Granting Agencies.

Failing Factor:

- Loss of program due to mismanagement of funds and program direction
- Lack of action on intended objectives
- No action taken to adhere the Cooperative Forestry Assistance Act of 1978, Public Law 95-313; 92 Stat.365, 16 U.S.C., 2101 et seq. (as amended through P.L. 171-108, June 16, 2002, and the 1996 Farm Bill) and the Federal Fire Prevention and Control Act of 1974 state that federal financial assistance is provided to eligible States, Territories, and the Freely-Associated States

Mapping using GIS and GPS

Maps are a part of the tracking mechanism when dealing with wildland fire. It provides essential pre and post planning strategy as to the fire behavior, fire disaster, acres destroyed, location and spread direction. These basic questions will make future planning more effectively when combating wildland fire. Various software will have to be purchased to equip staff and the department before moving into this phase. The software alone is costly and will be requiring updates from the manufacturer. Planning GIS technology provides easy-to-use tools for maximizing all types of information and data for planning requirements. GIS stores spatial information in a digital mapping environment that allows fire managers to quickly select and view data that can influence fire behavior. Factors such as vegetation types, slopes, aspects, natural or manufactured barriers, and historical weather patterns can be overlaid to determine fire hazards based on modeling potential fire behavior. The likelihood of wildfire ignitions can be predicted by locating historical fire locations and identifying potential ignition sources (e.g., power lines, roads, industrial areas, housing areas). Additional actions, such as vegetation modification, fire prevention programs, and code compliance, can be planned and modeled using GIS.

What is GIS in relation to Wildfire?

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. A GIS helps you answer questions and solve problems by looking at your data in a way that is quickly understood and easily shared. GIS technology can be integrated into any enterprise information system framework. (http://www.esri.com/what-is-gis/overview#overview_panel)

Mitigating fire prone area (http://www.esri.com/industries/public-safety/~/media/Files/Pdfs/library/brochures/pdfs/wildland-fire-suppression.pdf)

GIS allows you to analyze, visualize, and prioritize values at risk, such as housing developments, utility infrastructure, wildlife, and natural or cultural resources. Many communities use GIS to analyze their vulnerability to wildfire. Information-rich maps help determine the actions necessary for developing effective wildfire protection. Essential for fighting wildfires you must be able to quickly answer questions such as:

- Where is the fire and how fast is it spreading
- What are the priority values to protect; and what are the risks to firefighters and the community? GIS produces maps that answer these and other questions. Yet that is only the beginning. GIS provides the capability for fast, efficient analysis, and data dissemination.

Fire planning, preparedness, mitigation, incident response , and recovery are vital functions for managing effective wildland fire programs. ArcGIS helps wildfire agencies:

- Develop fire management plans
- Enhance situational awareness and improve firefighter safety
- Access real-time fire status and control efforts
- Develop budget requirements
- Optimize resource placement and allocation
- Support incident management mapping and analysis requirement

Response Mapping

Successful response starts with a map. Today, first responders have access to intelligent maps—maps built using databases and powerful modeling capabilities. GIS provides first responders with detailed information when and where they need it for a faster and safer response.

For example, with little technical skill required from fire personnel, a GIS application on a dispatcher's console, vehicle-mounted computer, or handheld PDA will provide detailed information to answer questions such as the following:

- Where is the fire located?
- What is the best way to access the fire?
- What is the terrain and fuel type?
- Where are the evacuation routes?
- What are the hazards to responding units?
- What are the values at risk?
- Whose jurisdiction is the incident within?

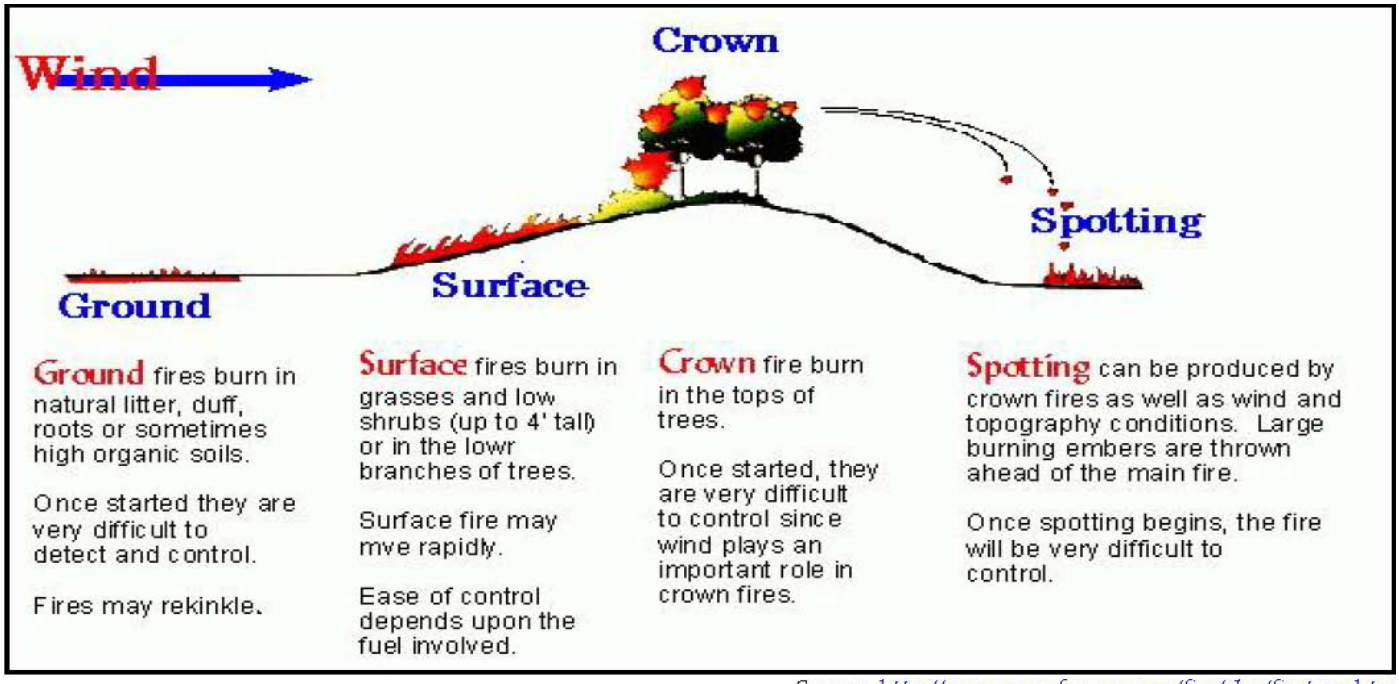
In addition to providing first responders with detailed initial response information, GIS supplies incident commanders with overall situational awareness including:

- Current weather conditions
- Location of on-scene and responding units
- Vegetation conditions
- Predeterminedprotection priorities
- Evacuation requirements
- Suitable locations for staging and incident command posts

Incident commanders use dynamic, real-time data combined with incident data to expand operations and respond to changing conditions

Recovery using GIS

GIS enables fire personnel to conduct rapid and accurate damage assessment and rehabilitation requirements after an emergency. Wildfire staff members use GIS integration platforms for the collection, analysis, and display of various types of post incident data. GIS and GPS-enabled laptops and PDAs can be used to collect accurate damage information from the field. This data is integrated into a central GIS database for comprehensive analysis and display.



Source: http://www.seawfo.noaa.gov/fire/olm/firetype.htm

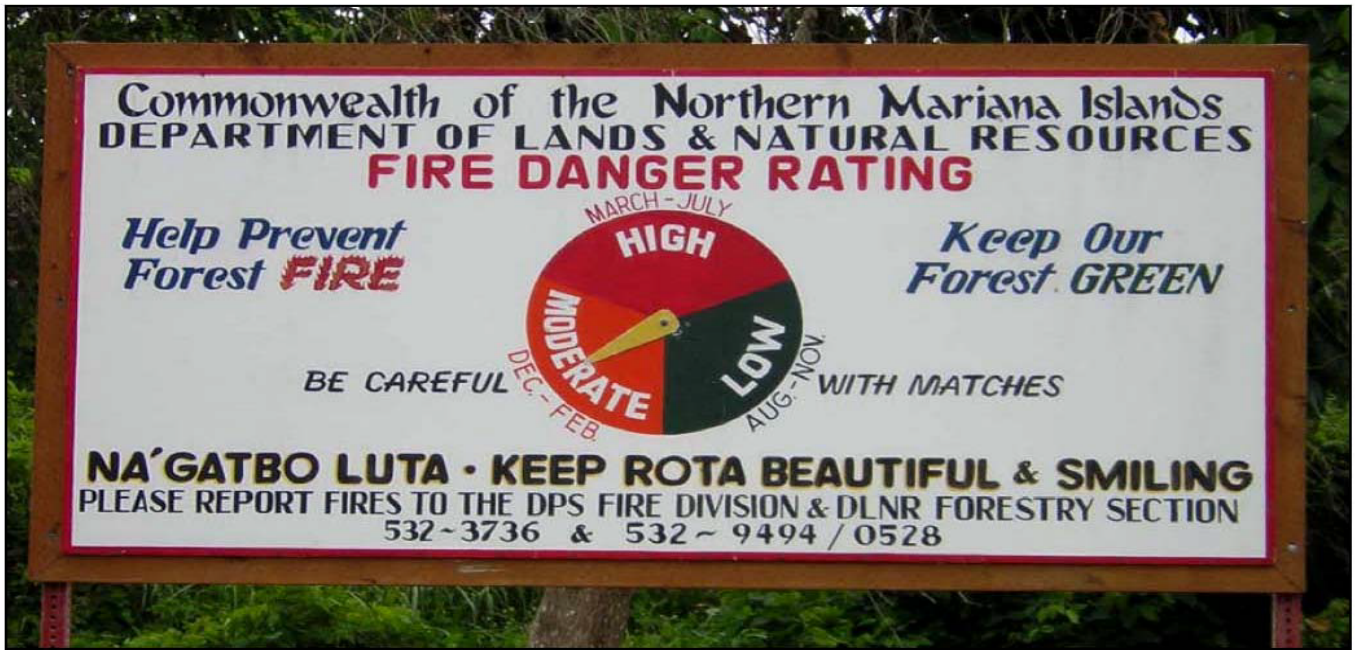
Figure 5-5

Potential Impacts: *(2007 Standard State Mitigation Plan EMO – page 122 (section 5-34/36)*

All of the Mariana Islands are susceptible to wildfires, especially during prolonged drought and high winds. The greatest danger of fire is where the wildland borders urban areas. The fundamental influences on the spread of a wildfire include the fuel type and its characteristic, weather conditions in the area, and the terrain. The amount of natural fuel (trees and brush) in close proximity to human populations contributes to increasing the risk to life and property. Other threatened locations include agricultural areas that are adjacent to wildland where downed tress and flammable brush are prevalent.

According to a report by the U.S. Forest Service and the State of the CNMI, a cooperative fire protection program is administered and implemented at an annual shared cost of $419,000. Each year, the Mariana Islands are endangered by hundreds of wildfires. Wildfires are associated with periods of little or no rainfall and are typically the highest with the months associated with severe drought conditions in the CNMI. Historically, approximately 90% of wildfires in the last decade have been directly caused by humans, either through negligence, accident, or intentional arson. Accidental and negligent acts include unattended campfires, sparks, burning debris, and irresponsibly discarded cigarettes. The remaining 10% of fires are mostly caused by lightning, but may also be caused by other acts-of-nature such as volcanic eruptions or earthquakes. The risks of these fires are varied, but the greatest risk to property is in situations where wild brush fires is ablaze in areas that traditional firefighting equipment can not be utilized, (i.e. mountaintops, steep ridges and valleys). In general, wild fire dangers are not as great on the islands of Tinian and Rota but in the denser and more developed areas on the island of Saipan.

Figure 5-6 illustrates the current public awareness and community outreach campaign utilized to inform the community of existing seasonal potential of wildfire hazards occurring.



Fire Rating Notification Board (Rota)

Fortunately, wildland fires have not caused extensive damage or destruction to buildings nor injury to people. However, as residential development expands or encroaches into relatively untouched wildland, people living in these communities will be at greater risk of encountering a wildland fire. For the CNMI, areas that were comprised of dry savanna lands were considered high-risk hazard zones for wildfires.

Savannas are areas where grasses, including Miscanthus floridulus (sword grass), are the primary vegetative coverage. By definition, savannas commonly have scattered trees interspersed in the landscape. In general, the savannas of the Mariana Islands occur on steep slopes and comprise approximately 17% of the lands on Saipan, 1% on Tinian, and approximately 2% on Rota. Additionally, there are sword grass savannas growing on the peaks of several of the northern islands. Along the southern portion of Mount Tagpochau on the island of Saipan, there is a sword grass savanna that grows in Chinen soils, which develops over limestone instead of volcanic rock like the Akina and Laolao soils. Savanna lands that are comprised of Chinen soils frequently burn during the dry season.

With the continuing growth of the tourist industry and the resident population within the CNMI, the potential of fire impacts becomes a greater risk. There is limited capability to deal with major wildfires in the CNMI. If such an incident should occur, assistance from some outside source would be necessary. Table 5-16 illustrates the firefighting resources that are available on each major island. *Table 5-17* provides the criteria of defining hazard intensity ratings for wildfire activity.

Firefighting Equipments within the CNMI:

CNMI Government Department or Agency	Type of Equipment	Number of Vehicles or Pieces of Equipment Available
DPS Division of Fire, Saipan	Fire Truck	4

	Tower Truck Pump Truck Rescue Utility Truck	1 2 2
Commonwealth Ports Authority (CPA), Aircraft Rescue & Firefighting (ARFF), Saipan	Rescue Vehicle Fire Engine	1 4
DPS Division of Fire, Rota	Fire Engine	3
CPA ARFF, Rota	Fire Engine	1
DPS Division of Fire, Tinian	Fire Truck Pump Truck (300 gallon) Pump Truck (800 gallon)	2 1 1
CPA ARFF, Tinian	Fire Truck w/ generator	1

Source: CNMI Emergency Operation Plan, 2000

Note: Several public and private agencies do have earthmovers and water pumps, which could be utilized in the event of fire hazard.

Table 5-17
Hazard Intensity Rating Definitions for Wildfires

Hazard	Low	Moderate	High
Wildfires	Highest elevations on the island with high incidence of rainfall	Mid-elevations with wet climate and the windward side of the island	Dry lowlands; savannah lands, identified chinen soil type areas with no access to water source Areas with dry overgrowth that can serve as flash fuel

Appendix *provides* a series of hazard maps that identifies potential hazard areas that are susceptible to wildfires.

Citation and Reference:

The initial write up of this documents stem from the 2011 Forest Action Plan formally known as the CNMI Statewide Assessment and Resources Strategy (SWARS). Other information were taken collectively from various approved Wildland Fire Plan, and tailored to our situation and landscape condition.

- Department of Lands and Natural Resources - CNMI Forestry 2010-2015. Statewide Assessment and Resource Strategy
- Department of Public Safety 2014-2018. Cooperative Fire Protection Plan
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Portable Document Format (PDF)

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS (CNMI)
STATEWIDE ASSESSMENT AND RESOURCE STRATEGY
2010-2015+

June 2010

Developed by: CNMI SWARS Council

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Cooperative Fire Protection Plan

Fiscal Year 2014-2018

"The Department of Public Safety is an equal opportunity provider and employer"

Northern Marianas Islands: 2010 Census Summary Report

TBL#		Commonwealth of the Northern Mariana Islands	Saipan Municipality						Rota Munic. (District 7)	Tinian Muni. (District 6)	Northern Islands Muni. (District 4)
			Total	District 1	District 2	District 3	District 4	District 5			
MP1	SEX BY AGE (57)										
	Universe: Total population										
	Total:	**53,883**	**48,220**	**15,160**	**6,382**	**15,624**	**5,847**	**7,207**	**2,527**	**3,136**	**0**
	Under 5 years	4,827	4,349	1,441	578	1,378	334	618	203	275	0
	5 to 9 years	4,613	4,139	1,404	519	1,240	323	653	227	247	0
	10 to 14 years	4,921	4,407	1,428	533	1,210	379	857	257	257	0
	15 to 19 years	4,250	3,835	1,207	450	1,044	311	823	192	223	0
	20 to 24 years	2,670	2,436	814	305	727	195	395	84	150	0
	25 to 29 years	3,027	2,711	832	353	947	234	345	115	201	0
	30 to 34 years	3,898	3,429	1,076	462	1,250	245	396	186	283	0
	35 to 39 years	5,057	4,458	1,317	630	1,642	277	592	247	352	0
	40 to 44 years	5,766	5,105	1,472	755	1,745	410	723	277	384	0
	45 to 49 years	5,009	4,482	1,397	614	1,486	365	620	220	307	0
	50 to 54 years	4,123	3,725	1,164	529	1,231	297	504	203	195	0
	55 to 59 years	2,612	2,339	729	324	790	214	282	147	126	0
	60 to 64 years	1,544	1,389	455	158	449	116	211	80	75	0
	65 to 69 years	699	634	191	76	216	60	91	41	24	0
	70 to 74 years	440	403	112	45	152	44	50	17	20	0
	75 to 79 years	250	225	71	27	71	28	28	17	8	0
	80 to 84 years	120	107	32	14	35	13	13	9	4	0
	85 years and over	57	47	18	10	11	2	6	5	5	0
	Male:	**27,748**	**24,735**	**7,770**	**3,398**	**7,963**	**1,996**	**3,608**	**1,337**	**1,676**	**0**
	Under 5 years	2,476	2,216	717	290	729	163	317	105	155	0
	5 to 9 years	2,339	2,090	697	259	658	161	315	118	131	0
	10 to 14 years	2,589	2,350	790	296	600	211	453	114	125	0
	15 to 19 years	2,199	1,983	621	236	531	162	433	103	113	0
	20 to 24 years	1,321	1,204	414	163	332	100	195	45	72	0
	25 to 29 years	1,321	1,172	362	164	389	106	151	46	103	0
	30 to 34 years	1,846	1,627	506	230	575	129	187	95	124	0
	35 to 39 years	2,481	2,149	629	348	785	131	256	127	205	0
	40 to 44 years	2,978	2,594	747	414	861	221	351	167	217	0
	45 to 49 years	2,756	2,458	783	329	826	193	325	130	168	0
	50 to 54 years	2,288	2,060	623	312	713	156	256	113	115	0
	55 to 59 years	1,435	1,282	397	175	443	119	148	80	73	0
	60 to 64 years	882	785	249	92	263	59	122	49	48	0
	65 to 69 years	387	354	112	45	115	40	42	23	10	0
	70 to 74 years	251	237	65	25	90	23	34	9	5	0
	75 to 79 years	114	101	28	12	33	15	13	8	5	0
	80 to 84 years	60	54	18	8	16	6	8	4	2	0
	85 years and over	23	19	10	2	4	1	2	1	3	0
	Female:	**26,137**	**23,485**	**7,390**	**2,984**	**7,661**	**1,851**	**3,599**	**1,190**	**1,462**	**0**
	Under 5 years	2,351	2,133	724	288	649	171	301	98	120	0
	5 to 9 years	2,274	2,049	707	260	582	162	338	109	116	0
	10 to 14 years	2,332	2,057	638	237	610	168	404	143	132	0
	15 to 19 years	2,051	1,852	586	214	513	149	390	89	110	0
	20 to 24 years	1,349	1,232	400	142	395	95	200	39	78	0
	25 to 29 years	1,706	1,539	470	189	558	128	194	69	98	0
	30 to 34 years	2,052	1,802	570	232	675	116	209	91	159	0
	35 to 39 years	2,576	2,309	688	282	857	146	336	120	147	0
	40 to 44 years	2,788	2,511	725	341	884	189	372	110	167	0
	45 to 49 years	2,253	2,024	614	285	660	172	295	90	139	0
	50 to 54 years	1,835	1,665	541	217	518	141	248	90	80	0
	55 to 59 years	1,177	1,057	332	149	347	95	134	67	53	0
	60 to 64 years	662	604	206	66	186	57	89	31	27	0
	65 to 69 years	312	280	79	31	101	20	49	18	14	0
	70 to 74 years	189	166	47	20	62	21	16	8	15	0
	75 to 79 years	136	124	43	15	38	13	15	9	3	0
	80 to 84 years	60	53	14	8	19	7	5	5	2	0
	85 years and over	34	28	8	8	7	1	4	4	2	0

Source: 2010 Census of Population and Housing

1

TBL#	Rota Villages	Rota Villages	Rota Villages															
		Rota Villages	Afatung village	Agatasi (Payapai) village	Agusan village	Alaguan village	Annex F village	Apanon village	As Akoddo village	As Dudo village	As Nieves (Nieves) village	Dugo village	Fenlagon village	Finata village	Gagani village	Gampapa village	Gaonan village	Gayuugan (Kaan) village	Ginalangan (Chudan) village
MP1	SEX BY AGE [57]																		
	Universe: Total population																		
	Total:	2,527	0	2	0	0	154	0	0	0	12	0	0	0	1	12	0	1	59
	Under 5 years	203	0	0	0	0	9	0	0	0	3	0	0	0	0	1	0	0	6
	5 to 9 years	227	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	4
	10 to 14 years	257	0	0	0	0	23	0	0	0	2	0	0	0	0	0	0	0	9
	15 to 19 years	192	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	6
	20 to 24 years	84	0	0	0	0	5	0	0	0	0	0	0	0	0	3	0	0	4
	25 to 29 years	115	0	0	0	0	11	0	0	0	2	0	0	0	0	0	0	0	1
	30 to 34 years	186	0	0	0	0	11	0	0	0	1	0	0	0	1	3	0	0	1
	35 to 39 years	247	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	1	3
	40 to 44 years	277	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	3
	45 to 49 years	220	0	0	0	0	8	0	0	0	2	0	0	0	0	1	0	0	9
	50 to 54 years	203	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	5
	55 to 59 years	147	0	1	0	0	11	0	0	0	2	0	0	0	0	1	0	0	2
	60 to 64 years	80	0	0	0	0	9	0	0	0	0	0	0	0	0	1	0	0	1
	65 to 69 years	41	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	5
	70 to 74 years	17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	75 to 79 years	17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	80 to 84 years	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	85 years and over	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Male:	1,337	0	1	0	0	67	0	0	0	7	0	0	0	1	8	0	1	25
	Under 5 years	105	0	0	0	0	7	0	0	0	2	0	0	0	0	0	0	0	2
	5 to 9 years	118	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
	10 to 14 years	114	0	0	0	0	6	0	0	0	2	0	0	0	0	0	0	0	3
	15 to 19 years	103	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	2
	20 to 24 years	45	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	0	2
	25 to 29 years	46	0	0	0	0	5	0	0	0	1	0	0	0	0	0	0	0	1
	30 to 34 years	95	0	0	0	0	4	0	0	0	0	0	0	0	1	2	0	0	0
	35 to 39 years	127	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	1	1
	40 to 44 years	167	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
	45 to 49 years	130	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	5
	50 to 54 years	113	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2
	55 to 59 years	80	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	2
	60 to 64 years	49	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	1
	65 to 69 years	23	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
	70 to 74 years	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 to 79 years	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	80 to 84 years	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	85 years and over	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Female:	1,190	0	1	0	0	87	0	0	0	5	0	0	0	0	4	0	0	34
	Under 5 years	98	0	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	4

TBL#	Saipan Villages	Saipan Total	Saipan Villages															
			Achugao village	Afetnas village	Agingan village	Agrihan village	Alamagan village	American Memorial Park village	As Akina village	As Falipe village	As Gonna village	As Lito village	As Mahetog village	As Metuis village	As Palacios village	As Perdido village	As Rabagau village	As Teo village
MP1	SEX BY AGE (57)																	
	Universe: Total population																	
	Total:	**48,220**	**208**	**1,466**	**308**	**0**	**0**	**0**	**99**	**6**	**157**	**920**	**304**	**596**	**718**	**238**	**677**	**317**
	Under 5 years	4,349	18	142	29	0	0	0	8	1	17	81	28	49	74	17	59	30
	5 to 9 years	4,139	18	128	31	0	0	0	7	0	11	80	21	42	55	15	53	33
	10 to 14 years	4,407	31	115	20	0	0	0	12	0	14	105	42	74	62	22	47	27
	15 to 19 years	3,835	21	108	13	0	0	0	9	0	12	87	18	74	40	19	71	29
	20 to 24 years	2,436	5	82	14	0	0	0	4	0	10	51	16	43	15	19	30	18
	25 to 29 years	2,711	13	59	19	0	0	0	6	0	8	47	20	39	48	8	48	17
	30 to 34 years	3,429	15	91	29	0	0	0	2	0	11	72	17	26	62	15	43	22
	35 to 39 years	4,458	14	151	24	0	0	0	4	0	13	82	26	33	80	14	63	21
	40 to 44 years	5,105	13	153	26	0	0	0	8	1	23	86	43	57	87	25	57	20
	45 to 49 years	4,482	23	177	32	0	0	0	15	2	9	68	28	63	67	22	57	23
	50 to 54 years	3,725	18	136	23	0	0	0	5	1	9	75	13	43	51	31	52	29
	55 to 59 years	2,339	7	75	22	0	0	0	6	1	12	37	12	23	29	16	30	19
	60 to 64 years	1,389	7	37	16	0	0	0	9	0	7	30	9	12	24	12	27	9
	65 to 69 years	634	3	12	4	0	0	0	2	0	2	10	6	10	12	1	17	7
	70 to 74 years	403	1	14	3	0	0	0	1	0	0	4	4	8	8	1	12	3
	75 to 79 years	225	3	3	3	0	0	0	0	0	1	2	1	0	3	1	7	4
	80 to 84 years	107	0	3	0	0	0	0	0	0	2	2	0	1	1	0	2	4
	85 years and over	47	1	0	0	0	0	0	1	0	0	1	0	0	0	0	2	1
	Male:	**24,735**	**111**	**809**	**167**	**0**	**0**	**0**	**49**	**3**	**79**	**459**	**163**	**285**	**383**	**129**	**356**	**170**
	Under 5 years	2,216	10	83	13	0	0	0	6	0	6	36	14	22	40	9	32	18
	5 to 9 years	2,090	10	62	14	0	0	0	2	0	4	38	15	18	27	9	31	10
	10 to 14 years	2,350	14	66	13	0	0	0	9	0	6	51	23	42	32	13	25	16
	15 to 19 years	1,983	15	63	10	0	0	0	1	0	8	44	7	39	21	10	32	10
	20 to 24 years	1,204	2	38	8	0	0	0	1	0	4	29	7	20	8	9	17	11
	25 to 29 years	1,172	5	23	7	0	0	0	2	0	4	20	13	14	24	6	25	5
	30 to 34 years	1,627	8	51	14	0	0	0	1	0	5	29	9	15	32	6	18	13
	35 to 39 years	2,149	9	75	8	0	0	0	2	0	7	36	13	9	43	5	34	6
	40 to 44 years	2,594	6	87	19	0	0	0	2	0	12	52	20	23	46	11	30	15
	45 to 49 years	2,458	10	98	22	0	0	0	9	2	5	41	11	28	36	11	28	9
	50 to 54 years	2,060	11	79	11	0	0	0	4	0	4	40	10	26	33	21	31	16
	55 to 59 years	1,282	4	47	14	0	0	0	3	1	8	20	10	12	13	8	17	14
	60 to 64 years	785	4	22	8	0	0	0	3	0	3	13	4	5	16	9	14	8
	65 to 69 years	354	0	8	3	0	0	0	2	0	2	7	5	8	7	1	8	4
	70 to 74 years	237	0	5	3	0	0	0	1	0	0	0	2	4	5	1	8	0
	75 to 79 years	101	3	0	1	0	0	0	0	0	0	1	0	0	0	0	2	2
	80 to 84 years	54	0	2	0	0	0	0	0	0	1	1	0	0	0	0	1	1
	85 years and over	19	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0
	Female:	**23,485**	**98**	**677**	**141**	**0**	**0**	**0**	**50**	**3**	**78**	**461**	**141**	**311**	**335**	**109**	**321**	**147**
	Under 5 years	2,133	8	59	16	0	0	0	2	1	11	45	14	26	34	8	27	12

Standard State Mitigation Plan

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

JUNE 2007

EMERGENCY MANAGEMENT OFFICE

apec
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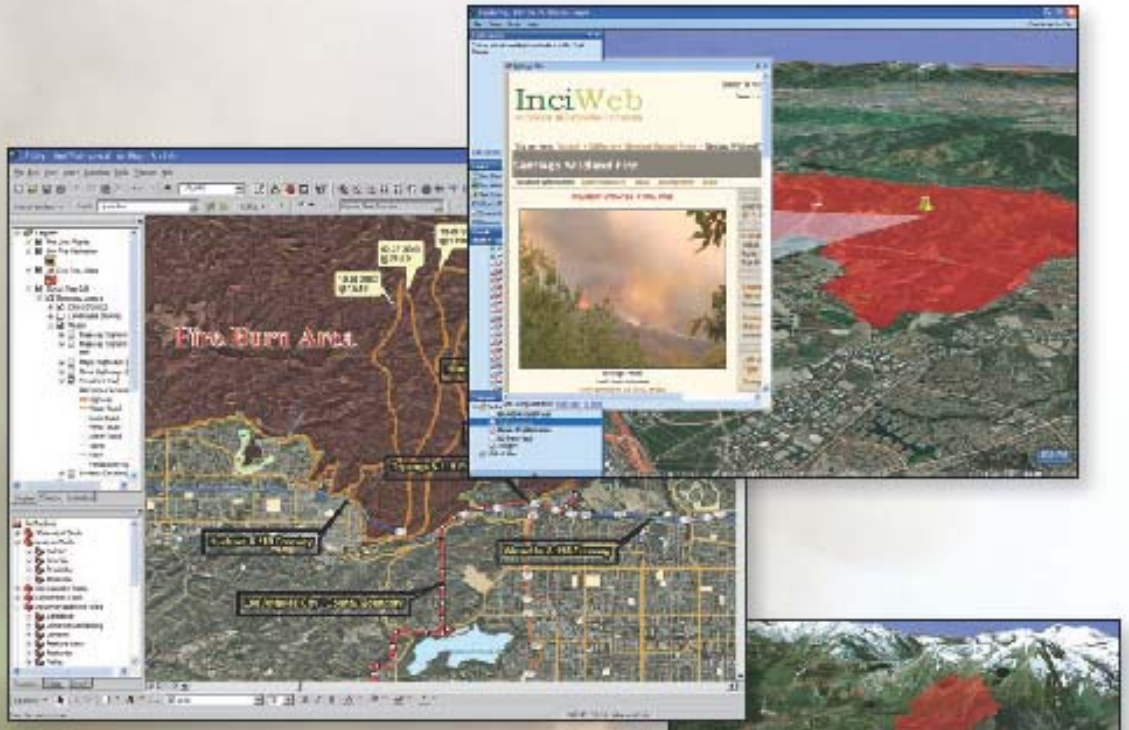
Wildland Fire

GIS Solutions for Wildland Fire Suppression



NATURAL RESOURCES

Strategic Plan for Wildland Fire Protection

Phase I

April 2006

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

An Introduction to the National Fire Plan

History, Structure, and Relevance to Communities

March 29, 2002

Prepared by:
Pinchot Institute for Conservation
1616 P Street, NW Suite 100
Washington, D.C. 20036
(202) 797-6580
www.pinchot.org

National Wildland Fire Management Cohesive Strategy
Western Region Strategy Assessment

Phase II Outreach and Content Analysis

Prepared by:

METI
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Management and Engineering Technologies International, Inc.
8600 Boeing Drive, El Paso, Texas 79925

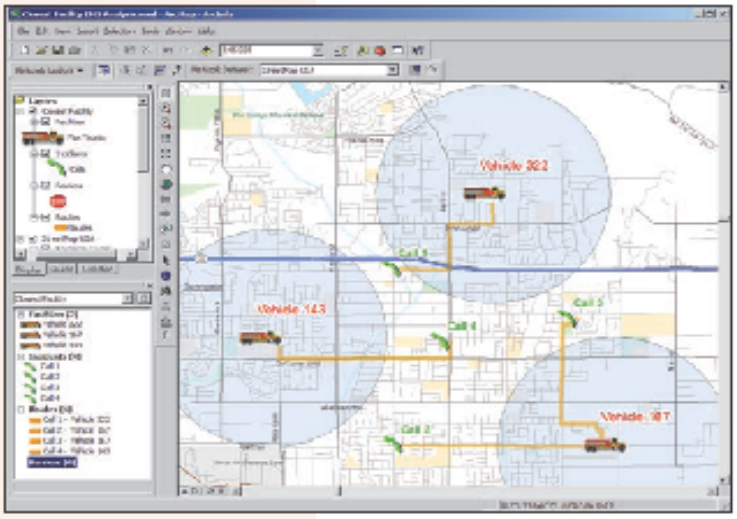
Contract: AG-3187-C-09-0028
Order Number: AG-3187-D-11-0203

September 1, 2011

GIS Provides the Geographic Advantage

For Informed Response

The mission of the fire service is to protect life, property, and natural resources from fire and other emergencies. With increasing demands, the fire service must utilize the best tools, techniques, and training methods to meet public expectations. Risk management, preparedness, and mitigation have taken on new importance with challenges facing the fire service today. Effective response requires adequate planning and preparedness. One of the emerging tools that is helping the fire service optimize its emergency services delivery is geographic information system (GIS) technology. GIS supports planning, preparedness, mitigation, response, and incident management. GIS extends the capability of maps—intelligent, interactive maps with access to all types of information, analysis, and data. More important, GIS provides the required information when, where, and how it is needed.

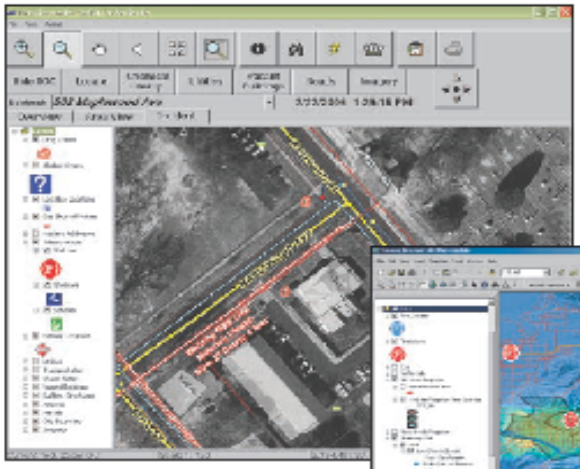


EMS call routing using "as the crow flies" buffer circles does not always equate to the closest unit. Using GIS, drive time, distance, and street impedances are interpreted to determine the unit closest to the call.

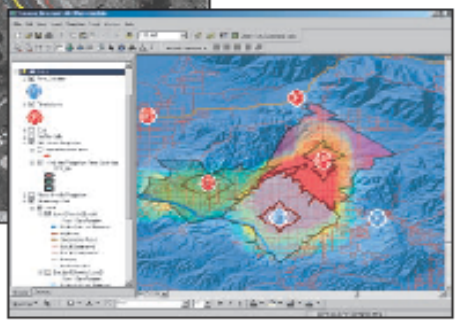
Fire departments are responsible for protecting lives and property, but they have limited resources. Resources must be deployed effectively and efficiently. Optimal deployment is influenced by fire demand, effective firefighting force size, type of occupancy, historical occurrence of fires, and response time.

Keeping firefighters safe is critical. GIS provides the tools to work with tactical, location-based information such as floor plans, utility control points, prefire plans, hazardous material contents and locations, surrounding exposures, aerial imagery, and hydrant locations. Access to

GIS provides a visual, spatial means of displaying data, allowing first responders to integrate and leverage their data for more informed decision making.



In-vehicle application with various views gives first responders access to critical information prior to arriving on scene.



Call density hot spot and response time analysis polygons are used to determine optimal station location.

DEVELOPMENT OF FOREST FIRE RISK INFORMATION MANAGEMENT SYSTEM USING GIS TECHNOLOGY

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KEY WORDS: Forest Fire, GIS, Remote Sensing, Management System, Statistics, Probability, Wave Length

ABSTRACT:

This study is aimed to develop forest fire risk information management system using GIS, remote sensing, statistics and computer techniques. This system can be used by forest managers in each province to plan extinguishment of a fire and to mange comprehensive forest fires work. Thus in order to develop the system, we first, constructed the geographic information related to a forest fire, and next, developed spatial analysis techniques using likelihood ratio and conditional probability. for analyze forest fire hazardous area. The forest fire information management system will be use to for manage and utilize the constructed information related to a forest fire. risk analysis technology so that those in charge of forest fire control in cities and counties particularly in the Yeongdong Province of Gangwon-do, Korea where the frequency and damages of forest fires are quite high can carry out forest fire prevention, forest fire fighting and resource management efficiently.

1. INTRODUCTION

Forest fire is one of natural phenomena that has been occurring unceasingly on earth since much earlier than the birth of human culture using fire. Forest fire burns various light and heavy fuels including fallen leaves, fallen branches, withered trees, grass and woods. There are various causes of forest fire. Although different depending on local custom, practice and economic level, most of causes are directly or indirectly related to human acts particularly human faults. The United States, which has vast wild forest areas, planned Joint Fire Science Program centering on USDA (U.S. Department of Agriculture) Forest Service and USGS (U.S. Geological Survey), and is conducting joint researches together with relevant specialists and research institutes [1]. FARSITE (Fire Area Simulator) [2] developed by USDA Forest Service is a forest fire simulation application programs based on GIS technology. It can calculate the intensity of forest fires, expected routes of fire development, the speed of spread, etc. using data such as topographical information (altitude, gradient and exposure), spatial information such as fuel distribution maps, water maps and soil maps, and property data such as weather, wind velocity, wind direction and fuel humidity. In Canada as well, research on forest fire has been made systematically, and currently an integrated system for forest fire risk forecasting has been developed and being operated. Recently, Canada developed Spatial Fire Management System (SFMS) based on 75-year-long researches on forest ecosystem and forest fires [3, 4]. In Australia, Stephen R. Kssel, et al. developed a model of forest fire risk areas using data on forest fires in the past and the model is providing various types of information for forest fire forecasting, fire prevention policy making, environmental influence evaluation, forest fire pattern analysis, etc. [5]. S. Sauvagnargues-Lesage, et al. proposed a methodology for the application of GIS in forest fire fighting [6]. In Korea, the history of forest fire research is short and the importance of the research is not recognized properly and, as a result, there have been few systematic researches on forest fire.

Recently, research has been made on factors related to the occurrence and spread of forest fires but it has been merely based on weather information and data on forest fires in the past. That is, it has not considered GIS materials including topographical information and stock maps, which are major factors of forest fire occurrence and development.

This study designed and implemented GIS-based forest fire risk information management system that can establish geographic information related to forest fires and integrate established databases so that those in charge of forest fire control in cities and counties particularly in the Yeongdong Province of Gangwon-do, Korea where the frequency and damages of forest fires are quite high can carry out forest fire prevention, forest fire fighting and resource management efficiently.

2. ESTABLISHING GEOGRAPHIC INFORMATION DATABASE RELATED TO FOREST FIRES

We established GIS-based database related to forest fires for the analysis of forest fire risk areas and forest fire risk information management system, centering on six cities/counties in the Yeongdong Province of Gangwon-do where the frequency and damages of forest fires are highest in Korea. Geographic information related to forest fires was built up using Arc/Info, ArcView and PCI software, and the constructed materials are listed in <Figure 1>. For this, we used 1:25000 digital topographical maps published by National Geographic Information Institute. From the digital topographical maps, administrative maps were derived in the detail of cities, counties and sub-counties. In addition, using contour lines extracted from the topographical maps, we made 10m-resolution DEM, slope maps, slope exposition maps and shaded relief maps.

Furthermore, we extracted road networks (ordinary roads, village/town roads, and narrow paths), residential areas, farmlands, the locations of public offices, etc.