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PREFACE

The Mount Calavite Wildlife Sanctuary, located in Paluan municipality, Occidental Mindoro province, was formerly declared as a game refuge and bird sanctuary, by virtue of Executive Order No. 9 on 28 January 1920. This declaration became the main basis of the Department of Environment and Natural Resources to work out for the proclamation of the MCWS as a protected area, under the wildlife sanctuary category, in accordance with the National Integrated Protected Areas Systems Act, or RA 7586. Presidential Proclamation No. 292, issued on 23 April 2000, declared the MCWS covering a total land area of 18,016.19 hectares. The Congress has still to enact a law that would finally establish MCWS as a final component of the NIPAS.

The Resource and Socio-Economic Assessment aims to establish the baseline information on the biodiversity status of the MCWS and determine possible conservation interventions that shall be initiated in the area. The Mindoro Biodiversity Conservation Foundation, Inc, with funding assistance from the Foundation for the Philippine Environment, implemented this RSEA in 2013. MBCFI identified MCWS as one of its priority project sites.

This is the Final Report of the RSEA, which includes the profile of MCWS in terms of its physical and geo-political characteristics; terrestrial biological resources, aquatic vertebrates and macro-invertebrates; socio-cultural and economic conditions; and the institutional arrangement and governance. This report also provides analysis on the different conditions prevailing in MCWS, and the corresponding recommendations in ensuring its protection and conservation as a protected area and at the same as one of the Key Biodiversity Areas of the Philippines.

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The Adventist school in Sitio Ulasan where the survey team temporarily stationed their camps managed by Mr. and Mrs. Dario Benavidez together with Mr. Rudy Racasa.

The MCWS Survey Team headed by Lisa Marie J. Paguntalan, composed of researchers Philip Godfrey Jakosalem, Don Geoff E. Tabaranza, Kathy Lene S. Cielo, Mary Ann O. Cajano, Minerva G. Gonzales, Cristino L. Tiburan Jr., Virtito Natural Jr., Kim John Doble, and Field Technicians Marco Hispano, Jaime Getaruelas and Pedro Villarta.

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EXECUTIVE SUMMARY

Mount Calavite is located in Barangay Harrison in Paluan municipality in Occidental Mindoro province. It was declared as a game refuge and bird sanctuary, through Executive Order No. 9 on 28 January 1920. Presidential Proclamation No. 292, issued on 23 April 2000, placed the Mt. Calavite Wildlife Sanctuary as an additional component of the National Integrated Protected Areas System Act of the Philippines, or Republic Act 7586. The total declared protected area covers 18,016.19 hectares. However, when its technical description was plotted, the total area was found to be 16,344.37 ha only. For consistency purposes, the latter area will be used to describe the extent of MCWS in this report.

The Mindoro Biodiversity Conservation Foundation, Inc. has identified MCWS as one of its priority project sites. MCWS has been poorly studied with very limited information on the state of its biodiversity. Relative to this, MBCFI conducted a Resource and Socio-Economic Assessment in MCWS to generate baseline information on its biodiversity and determine possible conservation interventions that shall be initiated in the area, especially so that this is not only a PA, but also one of the Key Biodiversity Areas of the Philippines. The Foundation for the Philippine Environment has provided a grant for this RSEA, which included gathering, compilation and analysis of information on the physical and geo-political profile; biological resources; socio-cultural and economic conditions; and institutional and management arrangements and governance of MCWS.

This is the Final Report of the RSEA, which contains primary and secondary information secured on-site and off-site by the members of the assessment team. The results of the RSEA were subjected to public consultations with relevant stakehoders of MCWS in Paluan, and reviewed by the FPE and its Experts Advisory Panel. Outputs of public consultations and comments made by FPE and its EAP are already considered in this Final Report.

Majority of MCWS's land area has steep to very steep slopes. The highest peak in the area is almost 1,500 masl. The geology of MCWS is mainly comprised of Pre-Jurassic that belongs to sedimentary and metamorphic rock groups, estimated at 15,800 ha, or 97% of its total land area. Other rock formations found in MCWS are the Cretaceous-Palogene and Oligocene, while the remaining portions are already classified as recent rock formations, which are usually located in flat areas and/or near the shorelines. There are various mineral resources found in Mindoro, such as nickel and chromite. In Paluan, mineral deposits, like chromite, nickel, silica and talc, were reported.

About 9,088 ha or roughly 56% of the soil type in MCWS is classified as rough mountainous land. The recommended land use for this soil type is forest, or tree plantations. Another dominant soil in MCWS is the Luisiana clay. This soil type is best suited for permanent crops, such as coconut, coffee, cacao and other seasonal crops, that may be grown in areas with <10% slope, provided appropriate soil conservation measures are employed.

Major rivers identified in MCWS are the Binuangan River, Hinugasan River, Igmanukan River, Aglimasan River, Talahib River, Ekbo River, Cagiban River, Balacone River and Malugao River. These rivers were then used as focal points in the delineation of 19 sub-watersheds in the PA.

The Modified Corona System of Climate Classification placed the entire Paluan under Climate Type I. This climate type has two pronounced seasons, dry from November to April and wet during the rest of the year. Maximum rain-period was usually observed from June to September. In terms of temperature, the monthly average over the 30-year period was estimated at 23.3^0C and 31.3^0C for the minimum and maximum temperatures, respectively.

As a declared PA and component of the NIPAS, the MCWS's land classification is generally considered as a national park under the 1987 Philippines Constitution. However, using the land classification provided in the Revised Forestry Code of the Philippines, about 14,751 ha or 90% of MCWS are classified as forestland or timberland, and only 1,594 ha or 10% are considered as alienable and disposable land.

The land cover in MCWS is derived from the 2003 forest cover map generated by the Department of Environment and Natural Resources, using Landsat ETM satellite images. Based on the said map, a large portion, about 11,830 ha or roughly 72% of MCWS is still covered with forest. Brushlands can also be found in the western portion of the PA. Grasslands occupy a wide portion of the central region of MCWS. Agriculture cultivation is being done in the grassland.

Based on a 2011 satellite view from the Google Earth, the land cover classes of MCWS have been classified and these were verified, through groundtruthing. This activity resulted to the updated land cover map of MCWS, which shows, that the 72% (11,830 ha) forest cover in 2003 has increased to about 77% (12,505 ha). The grasslands significantly decreased from 2003 (22% or 3,581 ha) to the present (14% or 2,300 ha). Agricultural areas, however, increased from 27 ha in 2003 to approximately 33 ha at present.

One of the major geo-hazards in MCWS is the presence of active and offshore fault lines. Although these fault lines are quite distant from MCWS, historical records of earthquake events showed otherwise. Some earthquake records revealed that these shocks happened near the shorelines, thus signifying possible occurrence of tsunamis. Paluan's flat areas are also identified to be susceptible to subsidence, which is mainly situated at the southern parts of MCWS and near the coast of Paluan Bay. Subsidence normally happens when a large amount of groundwater have been excessively extracted from the aquifer. This may lead to changes in elevation, damage to structures and properties, and is known to increase potential of areas to flooding.

Some landslides in MCWS have been observed, particularly adjacent to the Hinugasan River, while others were found near the forest. These landslides are located along steep slopes and some of which are exposed, hence becoming more susceptible to such incidence. Kaingins are evident and mainly located in cogonal and some brushlands.

Paluan is bestowed with natural beauty and rich landscapes and seascapes. Some of the famous coastline spots are the Paluan Bay, Pamutusin Cove and Ignonok Bay on the south-southwestern portions of MCWS, and Cape Calavite, Calangignan Bay and Ekbo Bay on the north-northwestern parts. Some of the prominent mountains in Paluan are Mt. Calavite, Mt. Cabignayan, and the Anduyanan and Ilomano mountains. The Calawagan Mini Falls and River Resort are also known attractions in Poblacion and Alipaoy that are frequented by tourists.

The primary data gathering of the RSEA described the habitat types in MCWS based on its vegetation, and these are (a) tropical moist deciduous forest; (b) montane forest; (c) grasslands; (d) wetlands; and (e) agricultural areas. MCWS contains a forest classified as tropical moist deciduous forest, which is believed to occur in areas of seasonally drier climates and where water availability can be periodically limiting. The montane forest in MCWS is confined to elevations above 1,000 masl. Patches of clumps of stunted trees were observed along gullies, sides of ridges and along side streams, which form a network of montane forest vegetation.

The grasslands in MCWS are mainly composed of *Imperata cylindrica*, *Chrysopogon aciculatus* and *Ischaemum rugosum*. These areas are found in the western portions of the PA, and usually planted with rice throughout the year. The rice fields are generally confined in flat sections close to the coast and in between hills and mountains. Other agricultural areas are situated in gentle to moderate slopes.

The freshwater ecosystems in MCWS include ponds and numerous networks of rivers and streams. There are major river systems and creeks emanating from MCWS. One of the major rivers in the area is Calawagan River. A small pond close in MCWS was observed to be a roosting site for the threatened endemic Philippine Duck *Anas luzonica* and other species of waterbirds. The surrounding vegetation of the pond was already converted to rice paddies with few *Nauclea* trees left standing near the banks.

A total of 154 plant species were recorded in MCWS. Twenty-two species are grasses and weeds, and the rest are herbs and trees. Plant identification did not include lichens, mosses, ferns and orchids. Nineteen species of Philippine endemic were recorded in MWCS. Of these, three are threatened species (*Mitrephora lanotan, Polyalthia oblongifolia* and *Intsia bijuga)* and another three are endemic species (*Polyalthia mindorensis, Mussaenda magallanensis* and *Hypoetes mindorensis)*.

The Ipil tree *Intsia bijuga* is most sought after due to its ironwood quality. This tree can only be found in lowland areas, and is most vulnerable to timber poaching and habitat loss. A number of mature individuals (some were mother trees) were encountered in MCWS that would be good sources of seedlings for propagation. This tree grows well in semi-dry conditions and is a light-loving species, making it a good species for habitat rehabilitation.

Initial information secured by the RSEA pointed out the importance of MCWS in biodiversity conservation, particularly in faunal composition. The 'IUCN Critically Endangered' Mindoro Bleeding-heart Pigeon *Gallicolumba platenae,* 'IUCN Vulnerable' Spotted Imperial Pigeon *Ducula carola,* 'IUCN Endangered' Mindoro Hornbill *Penelopides mindorensis* and 'IUCN Vulnerable' Scarlet-collared Flowerpecker *Dicaeum retrocinctum* were collected in the eastern slopes of Mt. Calavite in the 1960's and close to the town of Paluan. In total, MCWS has two critically endangered, three endangered and three vulnerable species, while 24 others are classified as restricted-ranged species of fauna.

The RSEA primary data gathering recorded a total of 109 species of birds in MCWS. Of these, seven are Mindoro threatened endemic and 12 are migratory species. The most frequently encountered birds were the Philippine Bulbul, Balicassiao, White-eared Brown

Dove and Olive-backed Sunbird. Of the migratory species, the most significant observations were the recording of the Japanese Paradise Flycatcher, the Chinese Egret and the Changeable Hawk Eagle.

A total of 248 individuals from 12 confirmed and approximately nine unconfirmed bat species recorded from five families: Pteropodidae, Megadermatidae, Hipposideridae, Rhinolophidae, and Vespertilonidae were captured, through mist-netting and harp trapping, during the survey in MCWS. At total of 23 voucher specimens were collected for the unconfirmed or unidentified nine bat species.

Four of the twelve species (33%) of bats recorded in MCWS are endemic. Three species (*Hipposideros pygmaeus, Rhinolopus inops,* and *Ptenochirus jagori*) are endemic to the country, while one species (*Styloctenium mindorensis*) can only be found in Mindoro Island. The recently described *S. mindorensis* is relatively unknown and thus categorized as Data Deficient (DD) in the IUCN Red List of Threatened Species.

Three of the four (75%) large land mammal species recorded during the survey are also endemic threatened species. Of particular note are the Tamaraw and Mindoro Warty Pig, which are both island endemic species and categorized as critically endangered and endangered, respectively, in the IUCN Red List of Threatened Species.

The herpetofaunal survey in MCWS recorded a total of nine species that are Philippine endemic (43%), two Mindoro endemic (9.5%), five native species (24%) and one introduced (4.8%) species. Of these, eight are amphibians, four of which are Philippine endemic (50%), two are Mindoro endemic (25%), one is native (12.5%) and one introduced (12.5%). Among the 13 reptilian species observed, five are Philippine endemic (38%) and four are native (31%) species.

The municipality of Paluan has a population of 15,494 composed of 3,261 households based on the 2012 CBMS survey of the LGU. Out of the total population, 52% are males and the remaining 48% are females. Brgy. Harrison, where most of the MCWS's land areas are located, accounts the highest population (21.31%) among the different barangays of Paluan. The two other barangays, with land area covering MCWS, are similarly highly populated, and these are Alipaoy (9.54%%) and Mananao (10.59%). The total population of these three barangays situated in MCWS is about 41.44% of the entire population of Paluan.

Among the different barangays of Paluan, Harrison has the biggest population, but because of its large land area, it has low population density. At least three localities: Barangays Alipaoy, Tubili and Marikit were chosen to be the sites of housing programs and settlements due to the existence of vast public lands. The location of these barangays, especially accretion land along the seashore of Barangay Tubili and prime agricultural lands in Brgy. Alipaoy, makes it favorable for convertion into settlements.

About 28.32% of the total population lives in poblacion or urban barangays, and 71.68% is distributed in the rural barangays of Alipaoy, Mapalad, Mananao, Marikit, Tubili and Harrison. The farmers build their houses in the barangay centers while they work their lands in the upland.

Basic social services are also available in the municipality, ranging from transportation system, roads and bridges; power supply; communication facilities; water supply; solid waste and sanitation; to education, health and housing, among others.

The Paluan Municipal Electric Services (PAMES) provides electric power supply in Paluan. It sourced its power from the National Power Corporation (NAPOCOR). At present, 10 out of the 12 baragays in the municipality are already provided with 24-hour electricity. Based on the 2012 CBMS of Paluan, total of 1,606 households have access to electricity.

The Paluan Water System Association (PAWASA) used to be the water service provider in the municipality, but it has ceased to operate for a number of years already. Potable drinking water supply now comes from a deep well with a big water tank located at Brgy. IV (Pag-Asa ng Bayan). Residents bring their containers there to get water for free. In rural barangays, such as Harrison, water for household use comes from shallow tube wells, springs and rivers. Based on 2012 CBMS survey, almost 41.41% of the households in Paluan depends on protected spring for their water requirements, while another 39.42% rely from tube well or borehole. Only a few of the households in the municipalit sourced their water from faucets.

Out of the total households in the muncipality, about 422 households have no access to improved water sources, which account for almost 12.94%. Except for Brgy. Mapalad (Brgy. 1), all other poblacion barangays have access to improved water sources. On the other hand, all rural barangays, except Tubili, have households with no access to improved water sources. Brgys. Alipaoy, Mananao and Harrison, where MCWS is located, have the most number of households with no access to improved water sources, estimated at 49.94%, 34.35%, and 22.70%, respectively, out of their respective household population. No household in the municipality is using mineral or bottled water.

The municipality has one national high school, the Paluan National High School, located in the poblacion and an annex high school in Brgy. Tubili. There are 19 elementary schools in the municipality, including minority areas and school annexes. The only private pre-school in Paluan is the Shammah Christian Pre-school in Brgy. Alipaoy. The 10 Day Care Centers in the municipality is under the supervision of the Municipal Social and Development Office. There is also available Alternative Learning Center for out-of-school youth in Paluan.

The literacy rate in Palaun is estimated at 83.97% of the total 10 years old and above population. This is computed based on the illiteracy survey of 10 years old and above of the CBMS in 2012, which showed that, 1,814 persons or 16.03% of the 10 years old and above in the municipality are illiterate. An estimated 31.08% of the children from six to 11 years old in Paluan are not attending elementary education.

At present, Paluan has a Community Medicare Hospital that provides basic diagnostic and therapeutic services, such as pediatric, internal medicine, obstetric and minor surgical consultations and management. There are also laboratory activities and tests provided, like CBC, platelet count, urinalysis and stool examination.

The Rural Health Unit and eight Barangay Health Stations provide primary level of health services to the entire population. The ratio of existing number of health services personnel to

the population is within the ideal limit. Therefore, the health services provided are sufficient to cater the needs of the community.

A total of 212 children from zero to five years old are suffering from malnutrition based on 2012 CBMS survey of Paluan. This is roughly 8.57% of total population of children belonging to 0-5 years old (2,474) in the municipality. Except for Brgy. San Jose, all poblacion barangays have no incident of malnutrition.

Agriculture and fishery are the major economic activities in Paluan. A total land area of 2,869.13 ha is devoted for the cultivation of crops, such as rice, root crops and vegetables. A large portion of Paluan's land area is classified as forestlands and within MCWS. Pastureland occupies 10,427.75 ha of the classified forestland of the municipality. The Office of the Municipal Assessor of Paluan listed 2,587.153 ha of pastureland in Brgy. Harrison belonging to 11 owners.

Paluan has a small-scale poultry and livestock industry. Barangays closed to shorelines are engaged in fishing. Paluan has rich marine resources in the Paluan Bay and the other bodies of water surrounding the island of Mindoro. There are 32 ha of fishponds cultivating bangus or milkfish. Production in excess of local consumption is sold in neighbouring towns and municipalities, such as Batangas City and Manila. Except for milk, coconut and banana, the municipality has posted a surplus on its various agricultural production versus its consumption, including rice, fish, meat, root crops, nuts, mango and onions.

The agriculture, forestry and fishery sector accounts the largest number in terms of employment, estimated at 54.23% of the surveyed persons in 2012 CBMS of the municipality. Other service types of activities also posted a higher employment record at 22.32%. Other industries and commercial enterprises only provide ranging from one to almost six percent employment and there is also even less than one percent.

As an agriculture-based municipality, the employment and sources of income in Paluan also heavily relies from farming, fishing and to some extent forestry. Almost 52.77% of the employed labor forces in the municipality are farmers, fisherfolks and forestry workers. Laborers and unskilled workers account almost 16.39% of the total employed persons in the municipality. There are also uncategorized or special occupations that are accounted to 13.50%. Meanwhile, those who are working as officials of government and special interest organizations, corporate executives, managers and managing proprietors and supervisors are estimated at 7.25% of employed work forces in the municipality.

While the municipality is enjoying a high rate of employment, most of those who are employed are working as short-term, seasonal and/or casual employees, estimated at 68.44% of the labor force. Only 30.19% of the working forces have permanent employment

There are also under employed labor forces in the municipality, estimated at 29.34%. Two poblacion barangays, Mapalad and and Pag-asa ng Bayan, posted higher rates of underemployment, counted at 62.29% and 51.89%, respectively, ouf of their respective labor force population. Brgys. Mananao and Harrison, which are located in MCWS, have lower underemployment records, estimated only at 0.33% and 0.63%, respectively, of their work forces. The other barangay located in MCWS, Alipaoy, has 47.17% underemployed.

While it is true that majority of labor forces in Paluan are employed, the poverty threshold in the municipality is still very high. An estimated of 60.01% of the households in the Paluan are with income below poverty standard. This accounts to about 1,957 households in the municipality. Posted higher percentages of income below poverty are the three barangay covering MCWS, recorded at 78.83, 72.95% and 61% for Harrison, Mananao and Alipaoy, respectively, out of their respective total household population. This situation may trigger further pressures to the remaining natural resources in MCWS. Brgy. Pag-asa ng Bayan in Poblacion has the lowest record of income below poverty threshold at 22.43%.

Existing lands devoted to agriculture in the municipality are estimated at 13,351.23 ha, or roughly 23.99% of its total land area. Out of these, a total of 2,875 ha are devoted for rice production of which 1,392 ha are irrigated. Another 532.13 ha are planted with various crops, such as vegetables and rootcrops. About 10,124.10 ha are still uncultivated.

The built up areas of the municipality, which are usually the community centers and areas devoted for instrastructures, parks and open spaces, are mostly situated along road networks, coastal plains and poblacion barangays. An estimated of 113.32 ha of Paluan are built up sites – 31.74 ha are urban or poblacion barangays and 81.58 ha are rural barangays.

The estimated forestlands of the entire municipality are about 31,826.46 ha, or 56.29% of its total. Certain parts of this forestland cover MCWS. However, there are forestlands already planted with fruit bearing trees and upland field crops. The pastureland of the municipality is recorded at 10,427.75 ha and currently used for cattle production. Since there are still forestlands outside MCWS, it is necessary that the LGU shall also formulate its Forest Land Use Plan (FLUP), while PA management planning for MCWS is also wanting.

Although not officially declared as mineral lands, the municipality recognizes that some 121 ha of land may contain unquantified metallic and non-metallic mineral deposits. Out of these, 54 ha are being claimed for mining of metallic deposits (nickel chromites and copper chromites) and 67 ha for non-metallic deposits of talc asbestos, isle and ornamental stones.

There are eight Mangyan tribes in Mindoro, each with its own culture. Tweddell, however, suggests that the Ratagnon are not indigenous to Mindoro based on their spoken dialect of Cuyonon – a Visayan language spoken on Cuyo and nearby islands in the south. The seven tribes (excluding the Ratagnon) are already organized as Indigenous Peoples Organizations, and were formed as a federation known as the Kapulungan Para sa Lupang Ninuno, with support from Mangyan Mission and COMultidiversity. The KPLN works for the ancestral domain claims of the Mangyans and initiates activities for the unity of the different Mangyan Tribes.

The National Council for Indigenous People estimated the Mangyan population at 193,482 individuals, which is 16.7% of the total population (1,157,721) of Mindoro Island based on the 2007 Population Census of the National Statistics Office. The Mangyans are the original inhabitants of Mindoro, but the wave of civilization and the influx of migrants from other parts of the Philippines have pushed many of them towards the interior mountains, scattered throughout the different municipalities in the two provinces of the island. The Iraya tribe is

one of Mangyan tribes of Mindoro. Irayas who occupy the northwestern portion of Mindoro, particularly in the towns of Baco, San Teodoro, Puerto Galera, Abra de Ilog and Paluan. The estimated population of the Iraya-Mangyan was between 6,000 to 8,000 in the 1960s-70s and 10,689 in 1991 distributed in 141 settlements in the municipalities of Abra de Ilog, Mamburao and Paluan.

The National Integrated Protected Areas System Act is the main policy framework in the management of MCWS. The NIPAS sets aside specific portions of land and water that are of unique physical and biological significance to enhance their biological diversity and protect them against destructive human exploitation. The NIPAS is placed under the control and administration of the DENR. The other feature of the NIPAS is the organization of the multi-sectoral Protected Area Management Board in every designated protected area. The PAMB is the site-based policy and administrative body of a protected area. It is composed of representatives from relevant government offices, local government units, communities, and civil society groups. The concerned Regional Executive Director of the DENR chairs the PAMB.

While it is true that the NIPAS Act is the main policy framework of the PA, the authority of the LGUs in the management of protected areas, such as MCWS, could not be understated, as provided in the Local Government Code of 1991, or Republic Act No. 7160. Specifically, the Code provides in its General Welfare Clause (Sec. 16) that every LGU shall enhance the right of the people to a balanced ecology. This legislation is important in MCWS, because there are already occupants inside the protected area of which the local government has the responsibility to provide basic social and economic services.

The presence of the Indigenous People in MCWS makes the Indigenous People's Right Act very relevant to the project site. The IPRA was meant to address historical injustices perpetuated against indigenous peoples, and thus contained four significant aspects: (1) the articulation of the recognition of the right to self-governance; (2) the recognition of the bundle of rights held by indigenous peoples; (3) the establishment of a process for the formal recognition of land rights through the introduction of the Certificate of Ancestral Domain Title, or Certificate Ancestral Land Title; and (4) the establishment of the National Commission on Indigenous Peoples (NCIP), the agency mandated to protect the interest of indigenous peoples. The IPRA more importantly, recognized the legality of native titles. Some Mangyan Tribes are claiming ancestral domains rights in MCWS.

The Protected Area Superintendent serves as the secretariat to the PAMB and he/she is being appointed by the DENR as the chief operating officer in the area. Specifically, the PASu is tasked to enforce rules and regulations, issue permits for activities in the site, receive fees and other income for the PA, and recommends to the PAMB approval of the annual work and financial plans, among others.

The PAMB needs additional capacity building in managing the MCWS. Interviews with two members of the PAMB revealed their very scant knowledge of the NIPAS and their role in the management of the PA. They could not even recall a significant policy, plan or activity that they have formulated and approved as PAMB. The PAMB of MCWS meets once a year and is allocated a budget of Php 10,000 by the DENR. Aside from the Php10,000.00 budget for the PAMB, the DENR has no regular budget for the management and conservation of the

MCWS. Funds are made available only when there is a specific activity in the site, like reforestation under the National Greening Program. The LGU has not allocated funds for the MCWS management.

The Initial Protected Area Plan of MCWS has already been formulated, and it serves as the interim management plan of the area. The IPAP indicates that the strict protection zone of MCWS is located in Sitio Matingahan in Brgy. Harrison, where settlements are prohibited, but hunting by IPs is allowed. The multiple use zone, on the other hand, is located in Sitio Matingkaran, Brgy. Harrison going down to the coastal zone. A Protected Area Management Effectiveness Tracking Tool (METT) was administered in 2010. A Survey and Registration of Protected Area Occupants (SRPAO), covering 13 out of 20 sitios in the MCWS, was also undertaken in 2010.

The current PASU is Celso Almazan. Aside from being the PASU, he is also the chief FMS and PAWCZMS and Information Officer of the CENRO Mamburao. There is no other staff under the PASu. CENRO Mamburao has a total of 48 employees, but only 20% is functional. The remaining 80% is waiting for retirement or physically not able to do fieldwork. PASu Almazan was able to assign a full time casual as forest ranger for MCWS for the last two years.

President Benigno S. Aquino III issued Executive Order No. 26 ordering the implementation of the National Greening Program as a government priority. The program shall plant 1.5 billion trees covering about 1.5 million hectares by 2016. In Paluan, the target is 1,100 ha to be planted in 2013 and 600 ha in 2014. As of February 2013, 330 has has been reforested under the NGP according to the PASu Office. Trees to be planted are narra and calantas.

The Conditional Cash Transfer or 4Ps of the Department of Social Welfare and Development is being implemented in Paluan. The program provides cash monthly to families to ensure that their children attend school. The money is used to buy school supplies, food and uniform. Parents attend family development seminars to change or eliminate bad behavior, such as gambling or alcohol consumption.

The RSEA has accumulated numerous information showing some trends and challenges and associated recommendations on the status of MCWS as a protected area and a Key Biodiversity Area of the country.

The remaining patches of lowland forests of MCWS are very important habitats for threatened endemic species of wildlife. Between the two habitats, the lowland forests are most vulnerable of disappearing and are slowly being converted into grasslands and agricultural areas as well as pasturelands. The local DENR has initiated forest protection, but barely made a dent in curbing illegal disturbances in the area. The local government unit plays a strong role in conserving the wildlife sanctuary and should step up in its effort to protect the forests and wildlife. Support for locally based community members in forest patrolling and wildlife protection should be encouraged both at the local government level and at the DENR level. At present DENR has limited support for community forest rangers and volunteers in MCWS. The lack of strict monitoring and enforcement were evident by the rampant timber poaching, kaingin and intentional burning in MCWS.

The forests fragments within MCWS serve as watersheds - providing water for drinking, household use and agricultural production. Local communities already observed that the flow of spring water used for drinking is decreasing in volume, especially during the dry season. It is by this particular account that the watershed protection and restoration should be taken seriously in MCWS. The protection of the remaining forests of MCWS would be critical in the economic and agricultural development in the area. Watershed conservation strategies are closely inter-linked with forest protection activities, habitat restoration, regulation of water use, protection of wildlife and integrating the need for watershed and biodiversity conservation in the education and awareness activities at the community level.

The National Greening Program, the umbrella program for forest rehabilitation efforts of the national government should be seriously implemented with greater emphasis on the involvement of the local commmunities. As reported, most locals are aware but indifferent of the NGP, seeing it as another government reforestation project. The success of any reforestation project, including the NGP, relies on active participation of local communities.

A significant amount of time was spent for primary data gathering in the field, community consultations and compiling secondary information for MCWS. The team takes into account that there is still a need to survey the montane forest section of Mt. Calavite for a more comprehensive understanding of the biodiversity of the area.

The local communities surrounding MCWS are largely dependent on fuelwood for cooking (firewood and charcoal) and timber for building materials. Almost all of these resources are being sought from the remaining forests of MCWS. It is thus important to allocate land for timber production and use of the local communities to lessen the impact on the remaining forests habitats.

The PA management planning in MCWS needs to be initiated. The planning could be a good opportunity to integrate allocation of timber production areas and other purposes. On the other hand, the Protected Areas Management Board of MCWS, Local Government Units, together with DENR, should also help facilitate for the identification of such areas as well as in assisting in developing policies, practical and cost-effective mechanisms of plantation establishments as well as harvesting schemes that would be beneficial to all parties involved.

The presence of several threatened endemic species in MCWS warrants the protection and regular monitoring of the remaining population and their habitats. During the survey, evidences of hunting activities were observed in MCWS. Hunting targets larger species of wildlife, including wild pigs, deer, doves, hornbills as well as fruit-eating bats. Integrating evidence-based monitoring on wildlife and illegal activities would pose a huge challenge for MCWS. There is a need to establish agreed monitoring protocols using indicator species of each habitat to be monitored in MCWS. There is currently no activity related to regular gathering of information on bio-monitoring system.

One of the main concerns of farmers in the surrounding areas of MCWS was finding crops that are highly adaptive to rapidly changing and unstable climate. At present, rice production was limited to the rainy season and irrigation can no longer support for two season cropping. This is turn added pressure for locals to resort to charcoal production and timber poaching to augment shortage in funds and avoid food shortage. Appropriate and sustainable livelihood

activities are needed to augment the income of communities and prevent them from resorting and depending on forest resources.

The Protected Area Management Board of MCWS regularly meets to discuss issues relating to the conservation and management of MCWS. Currently, very limited information is available on MCWS, particularly on the biological side that could aid in developing strategies and programs for management of the area. It is anticipated that this study will provide the necessary information that would be useful in developing the management plan of the protected area.

It is very evident that local people are not aware of the importance of their native wildlife and barely took pride of the presence of restricted-range species in MCWS. It is therefore necessary that conservation education, using local species as examples, should be implemented in schools and communities.

There is a need to provide both technical and financial support for empowering PAMB, local government units, Iraya Tribe of Mangyans as well as the local communities in MCWS. Public consultations conducted in both Ulasan and Binagyuhan have shown that people are interested in protecting their watersheds and recognize the importance of maintaining intact forests. It was also very evident that the stakeholders are in need of both technical and financial assistance in developing and implementing conservation strategies in MCWS.

List of Acronyms and Abbreviations

Acronyms and abbreviations used throughout this report are as follows:

AMNH	American Museum of National History
ASTER GDEM	Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Digital Elevation Model
Brgy	Barangay
CADC	Certificate of Ancestral Domain Claim
CADT	Certificate of Ancestral Domain Title
CBFMA	Community-based Forest Management Agreement
CBMS	Community-based Monitoring System
CDA	Cooperative Development Authority
CIS	Communal Irrigation System
CI	Conservation International
CR	Critically Endangered
Dbh	diameter breast height
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DEM	Digital Elevation Model
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DOST	Department of Science and Technology
DOT	Department of Tourism
DSWD	Department of Social Welfare and Development
E	Endemic
EBA	Endemic Bird Area
EN	Endangered
ENRO	Environment and Natural Resources Officer
FGD	Focus Group Discussion
FLGMA	Forest Land Grazing Management Agreement
FPE	Foundation for the Philippine Environment
IBA	Important Bird Area
ICC	Indigenous Cultural Community
IFMA	Integrated Forest Management Agreement
IP	Indigenous People
IPO	Indigenous Peoples Organization
IPRA	Indigenous Peoples Rights Act
ISF	Integrated Social Forestry
IUCN	World Conservation Union (previously known as the International Union for the Conservation of Nature)
IV	importance value
KAPLANO	Kaunlarang Angkop Para sa Lupaing Ninuno (Ancestral Domain Management Plan)
KBA	Key Biodiversity Area
KII	Key Informant Interview
KPLN	Kapulungan para sa Lupaing Ninuno (Federation of Mangyan IPOs)

Lc	least concern
LGU	Local Government Unit
masl	meters above sea level
MBCFI	Mindoro Biodiversity Conservation Foundation, Inc.
MCWS	Mount Calavite Wildlife Sanctuary
MGB	Mines and Geosciences Bureau
MIPK	Mal-anggatan Iraya Paranawan Kakuyayan (Iraya IPO)
NAMRIA	National Mapping and Resources Information Agency
NCIP	National Commission of Indigenous People
NGP	National Greening Program
NIPAS	National Integrated Protected Areas System
NMP	National Museum of the Philippines
Nt	Near Threatened
PACBRMA	Protected Area Community Based Resource Management Agreement
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAMB	Protected Area Management Board
PASu	Protected Area Superintendent
PAWB	Protected Areas and Wildlife Bureau
PD	Presidential Decree
PENRO	Provincial Environment and Natural Resources Officer
PhilGIS	Philippine Geographic Information System Data Clearinghouse
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PMRB	Provincial Mining Regulatory Board
PO	People's Organization
PUJ	Public Utility Jeepney
RA	Republic Act
RD	relative density
RDB	Red Data Book
RDom	relative dominance
RF	relative frequency
RH	relative height
RR	Restricted Range
RSA	Rapid Site Assessment
SEARCA	South East Asia Regional Center for Agroforestry
SIFMA	Socialized Industrial Forest Management Agreement
So	Sitio
UPLB	University of the Philippines Los Baños
VU	Vulnerable
4Ps	Pantawid Pamilyang Pilipino Program

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Introduction

The island of Mindoro is the 7th largest island in the Philippines, with an estimated area of 10,244 km^2. It is located in the southwest of Luzon mainland and northeast of Palawan Island. A mountain range along its central axis divides the island into an eastern and a western half. Situated along this range are the two of the island's highest peaks: Mt. Halcon, with highest elevation at 2,597 meters above sea level (masl), is in the northeast portion and Mt. Baco, at 2,498 masl, is situated in the south-central portion of the island.

Mindoro Island has a total of 261 recorded bird species of which 12 are classified as threatened species. These species are the (a) Philippine Duck *Anas luzonica;* (b) Black-hooded Coucal *Centropus steeri;* (c) Indigo-banded Kingfisher *Ceyx melanurus;* (d) Scarlet-collared Flowerpecker *Dicaeum retrocinctum;* (e) Spotted Imperial Pigeon *Ducula carola;* (f) Mindoro Imperial Pigeon *Ducula mindorensis;* (g) Mindoro Bleeding-heart Pigeon *Gallicolumba platenae;* (h) Luzon Water-redstart *Rhyacornis bicolor;* (i) Philippine Hawk Eagle *Spizaetus philippensis;* (j) Ashy thrush *Zoothera cinerea;* (k) Philippine Cockatoo *Cacatua haematuropygia*; and (l) Mindoro Hornbill *Penelopides mindorensis*. There are also five known island endemic birds in Mindoro.

In addition to the avifaunal diversity, Mindoro is also noted for its diverse mammals, especially the presence of the largest endemic land mammal in the Philippines: the Tamaraw *Bubalus mindorensis.* Six species of mammals, two amphibians and one reptile are endemic to the island. Because of the high diversity and endemism in the island, the Department of Environment and Natural Resources, (DENR), along with other national institutions, recognizes 10 Key Biodiversity Areas (KBAs) in Mindoro, namely, (a) Mt. Halcon; (b) Mt. Siburan; (c) Mt. Calavite; (d) Apo Reef; (e) Mt. Iglit-Baco; (f) Naujan Lake; (g) Puerto Galera; (h) Malpalon; (i) Mt. Hitding; and (j) Mt. Hinunduang.

The high biodiversity value and conservation threats of Mindoro have prompted the attention of the global conservation community. The BirdLife International has identified Mindoro Island as an Endemic Bird Area (EBA) and Important Bird Area (IBA) (Stattersfield *et al.*, 1999). Collar, Mallari and Tabaranza's book (1999) on *Threatened Endemic Birds of the Philippines* identified five key sites for threatened endemic birds in Mindoro, namely, (a) Mt. Halcon; (b) Naujan Lake; (c) Mt. Iglit-Baco; (d) Siburan; and (e) Malpalon.

Mt. Calavite was declared as a game refuge and bird sanctuary, through Executive Order No. 9 on 28 January 1920, covering a total of 17,000 hectares. It is located in Barangay Harrison in the municipality of Paluan in the province of Occidental Mindoro. Presidential Proclamation (PP) No. 292, issued on 23 April 2000, declared the Mt. Calavite Wildlife Sanctuary (MCWS) as an additional component of the National Integrated Protected Areas System (NIPAS) Act of the Philippines, or Republic Act (RA) 7586. The total declared area covers about 18,016.19 hectares. The Congress has still to enact a law that would finally establish MCWS as a final component of the NIPAS. The DENR has organized the Protected Area Management Board (PAMB) as the site-based management body of MCWS.

The Mindoro Biodiversity Conservation Foundation, Inc. (MBCFI) has identified MCWS as one of its priority project sites. MCWS has been poorly studied with very limited available information on the state of its biodiversity. Relative to this, MBCFI conducted a Resource

and Socio-Economic Assessment (RSEA) in MCWS to generate baseline information on its biodiversity status and determine possible conservation interventions that shall be initiated in the area. The Foundation for the Philippine Environment (FPE) has provided a grant for this RSEA, which included gathering, compilation and analysis of baseline information on the physical and geo-political profile; biological resources; socio-cultural and economic conditions; and institutional and management arrangements and governance of MCWS.

This is the Final Report of the RSEA. The report contains primary and secondary information secured on-site and off-site by the members of the RSEA Team, using data gathering tools and methods purposely designed for this project. This Final Report includes the historical context of the project site, biogeography of Mindoro Island, the profile of MCWS, trends and situational analysis, and recommendations to further advance the conservation of the area. The design in implementing this RSEA is also presented in this report.

A. Historical Context of the Project Site

In the early 19th century, the island of Mindoro was still heavily forested and was long avoided by outsiders, because of an especially virulent strain of malaria. Little attention was given to the island until in 1888 when the scientific community was startled by the announcement of the discovery of the largest mammal native to the Philippines – the dwarf water buffalo, now better known as the Tamaraw *Bubalus mindorensis* (Linis, 2009).

Close to the turn of 19th century, the development in Mindoro hastened, as anti-malarial medications became available, and the island was getting more accessible to the people. Loggers cut the prime trees from lowland rainforests, while plantation owners brought in laborers and their families to clear the lowland for sugarcane and other crops. Later on, more subsistence farmers from mainland Luzon and other densely populated places moved to Mindoro in search of farmland. The local people, many of whom traditionally kept small herds of cattle, burned the degraded forest to encourage the spread of grass on which their cattle feed (Linis, 2009).

Ornithological exploration in Mindoro has been geographically restricted to the north and the east of the island. The most extensive collection was by the Yale Peabody Museum – Silliman University Mindoro Zoological Expedition in 1954 (Ripley and Rabor, 1958). About 48 days were spent collecting in the lowlands to the east of the Mt. Halcon range, at 25-200 ft (8-60meters) altitude, in Alcate, Victoria, San Luis, Naujan and Naujan Lake. In the same mountain range, 10 days were also spent collecting at 2,500 - 4,800 ft (760-1,460 m), particularly in Barawanan Peak and 14 days at 3,000-6,500 ft (910-1,980 m) in Ilong Peak.

Other collections listed in Dickinson *et al.* (1991) were mostly small and opportunistic in nature. Bourns and Worcester in 1891, Whitehead from 1895 to1896 and McGregor in 1906 attained more intensive coverage, including a major ascent at the Mt. Halcon range by Whitehead (Ogilvie, Grant, 1896). Several hundred of birds were taken for the American Museum of Natural History (AMNH) in the 1960s (Dickinson *et al.*, 1993). All collections were done around the northeast of the island, except for a small collection by Porter around Bulalacao, which only recorded one Mindoro endemic (Mindoro Hornbill) and Temmes's shorebird data from the west. Recent collections in Mt. Halcon and Baco have also been made by the National Museum of the Philippines (NMP).

The most studied species in Mindoro is the Tamaraw *Bubalus mindorensis* (Harrison, 1969b; Harper, 1945; Parker, 1990; Manuel, 1957; Alvarez, 1970; Popenoe, 1983; Sitwell, 1975; CRMFI, 1988; and Petocz, 1989b). Brown *et al.* (2009) recorded the collection of amphibians, reptiles, birds and mammals in Mt. Calavite.

A total of 11 specimens of Mindoro Bleeding-heart were collected from the western slopes of Mt. Calavite, at 120-180 m elevation, in 1964 and 1965 (Collar *et al.*, 1999). Nine specimens of Mindoro Hornbill were collected in relatively the same area on the same period. Specimens are deposited in AMNH and NMP.

Studies on plants in Mindoro are limited to a few areas, such as Mt. Halcon (Mandia, 1998); Mt. Iglit (Callo, 1983); the Tamaraw Gene Pool in Busuanga River Watershed (Catibog-Sinha, 1989) and the comprehensive study of Naujan Lake by SEARCA (1997). A rapid assessment of the flora on selected sites in Mindoro was conducted in 1998 (Gonzales *et al.*, 1998) and generated a total of 726 species in 475 genera and 121 families. Linis (2009) also came out with a comprehensive list of mosses found in Mindoro, including the collections from Mt. Calavite.

The importance of Mt. Calavite as a habitat of several wildlife species has long been recognized. It is the primary consideration why it has been declared as a game refuge and bird sanctuary as early as in 1920. That was the time when the national park system has not been fully established in the Philippines. Through time, however, Mt. Calavite has not been spared from destructive activities, and certain portion of its area is now converted into other purposes, particularly agriculture. In an attempt to secure this wildlife habitat, Presidential Proclamation 292 was issued declaring this site as the Mt. Calavite Wildlife Sanctuary.

The Mindoro's amazing biological diversity is associated with significant cultural value, due to the presence in the island of at least eight tribes of Indigenous People (IP), collectively known as the Mangyans. These Mangyan Tribes belong to (a) Alangan Tribe; (b) Bangon Tribe; (c) Buhid Tribe; (d) Hanunuo Tribe; (e) Iraya Tribe; (f) Tadyawan Tribe; (g) Tau-buid Tribe; and (h) Ratagnon Tribe.

The Iraya Tribe settles in the northwestern part of Mindoro, particularly within and in the periphery of Mt. Halcon, while the Alangan Tribe occupies the northwest central of the island. The Tadyawan Tribe is on the northeastern part, specifically within the area of Naujan Lake, and the Batangan Tribe stays at the central highlands of Mts. Iglit-Baco, Siburan and Hinunduang. The Buhid Tribe is occupying the central part, straddling within the eastern and western portions of Mindoro, while the Ratagnon Tribe is on the southernmost tip of the island. The Hanunuo Tribe is settled in the mountainous areas of Mindoro, mainly within the municipalities of Mansalay and Bulalacao in Oriental Mindoro and a certain portion of San Jose in Occidental Mindoro.

B. Mindoro Biogeography

1. Geologic History

Mindoro's mountainous interior, despite its varied physiographic attributes, is known to consist mainly of metamorphic rocks of continental crust origin uplifted since the mid-Eocene (Fernandez, 1982). Calcareous and volcanic rocks are not extensive and are mostly confined to small areas near and along the island's coasts. Geologically, Mindoro was part of the Tertiary micro-continent, the North Palawan Block. Together with North-Eastern Panay and Palawan, the block was reportedly had been positioned near the coast of China, forming part of the continuous continental shelf (Southeast Eurasian Margin), with Hainan and Taiwan during the Eocene some 50 million years ago (Holloway, 1982).

Because of the opening of the South China Sea in the Oligocene, Mindoro and North-Eastern Panay and Palawan were pushed to their present-day positions in the Philippine Archipelago. The arrival of North Palawan Block, from the pre-drift period to its present day position in the Philippines, has been postulated to be in the mid to late Pliocene (Hall, 1996, 1998). Others, such as Hamilton (1981), included only the southwestern part of Mindoro Island in the North Palawan Block, giving its northern portion a separate origin. However, Aurelio (2001) has suggested that this portion could have been formed by collision of the North Palawan micro continental plate and the Philippine Mobile Belt.

Tan *et al.* (1988) reported that the above events in Mindoro strongly influenced the evolution of modern Philippine biota. First, the resulting island chains between Borneo and Luzon provided the necessary land bridge habitats for the two-way migration of plants and animals between the two large islands. Secondly, the drifting of the ancient North Palawan Block across the South China Sea might have carried with it some continental Asiatic plants and animals that have been incorporated into the biota of the Philippines.

2. Biological Importance

The Birdlife International has considered Mindoro Island as an Endemic Bird Area (Stattersfield *et al.,* 1999). Similarly, the DENR and Conservation International, along with several other institutions, have declared several areas in Mindorto as Key Biodiversity Areas. The island has a broad and rugged central spine of mountains rising to about 2,500 m at Mt. Halcon in the north and Mt. Baco in the south. The Haribon Foundation and Birdlife International identified 10 Important Bird Areas (IBAs: PH037 to PH046) in Mindoro.

The entire island of Mindoro is also regarded as one of the five bio-geographical zones in the country. There are four declared protected areas in Mindoro – (a) Mt. Iglit-Baco National Park; (b) Naujan Lake National Park; (c) Apo Reef Natural Park; and (d) Mt. Calavite Wildlife Sanctuary.

Mt. Calavite is a mountainous headland at the northwestern tip of the island. Forests were reported to start from the beach until the 1990's when much of the lowlands were cleared for agriculture. Large tracts of cogonal areas, with second growth lowland forest patches confined in gullies and steep slopes, remain in the island.

II. RSEA Objectives, Scope, Limitations and Methods

MBCFI organized a multi-disciplinary team, comprising of wildlife biologists, botanists, GIS and mapping expert and socio-economic, cultural and governance expert, to implement the RSEA in MCWS. The team was supported with research and field assistants in primary and secondary data collection. The field survey was supervised by a team leader, which was chosen among the team members. MBCFI Executive Director served as the project director for this RSEA. A protected area management expert provided assistance in the preparation of the technical reports, including this final report of the project.

The 1st phase of the RSEA involved gathering and analysis of secondary information to determine the availability of data characterizing the project site. Based on the gathered information, the team identified data gaps, and prepared primary data gathering tools and methods. The next phase of the RSEA proceeded with the field survey at the project site. Secondary and primary data collected were collated, analyzed and presented in this Final Report of the RSEA.

A. Objectives

The main purpose of this assessment is to provide baseline information pertaining to the biodiversity and other features of MCWS as a protected area and KBA and determine possible conservation initiatives that shall be introduced in the site. Specific objectives of this project include the following:

a) To generate baseline and/or up to date inventory on the bio-physical characteristics, socio-cultural and economic conditions, and institutional arrangement and governance of the protected area;
b) To compare results of the inventory to any available information and to determine changes and modifications on the state of the protected area's environmental, socio-cultural and economic and governance situation; and
c) To provide science-backed recommendations to enhance and strengthen the management of the protected area, particularly in developing the management plan and other conservation interventions that shall be introduced in the area.

B. Approach, Scope and Limitations

Components and scopes of this RSEA included the profiling of the project site in terms of the following:

a) Physical and geo-political characteristics;
b) Terrestrial and aquatic biological resources;
c) Socio-cultural and economic conditions; and
d) Institutional arrangements and governance.

Prior to the conduct of primary data collection, information from published and unpublished literature was reviewed to understand the extent of information needed as well as the practicality of collecting the information. Gathering of primary data was conducted in

February and March 2013. Generally, the approaches and scope for this RSEA included the following:

a) Off-site and on-site secondary data gathering;
b) Review of available secondary information, evaluation of data in terms of requirements of this project, and identification of information gaps;
c) Development of specific tools and methodologies for primary data gathering;
d) Field surveys;
e) On-site secondary and primary data consolidation and analysis;
f) Preparation of draft report;
g) Presentation and validation of the report with relevant stakeholders; and
h) Preparation of final report.

C. Data Collection Methods and Analysis

The RSEA used both scientific and participatory approaches in data collection and analysis. Appropriate standard tools and methodologies for data gathering and analysis were used, in accordance with the requirements of the RSEA.

1. Physical and Geo-Political Profiling

The physical and geo-political profiling included spatial analysis of the physical attributes of the protected area, including the preparation of maps. Specific data sets required for this component are the following

a) Location and Area. Showing the relative location of MCWS, its boundaries with respect to administrative and political units. The barangays and municipalities covered by the project site shall be identified, particularly their estimated area of coverage;
b) Slope and Topography. The general topography of the area, which will include the slope, slope aspect and elevation;
c) Geology. Covering the major geological structures and land formations that indicate the slope stability, landslide potential, hazard potential and areas within or along fault lines;
d) Mineral Resources. Map indicating a general location of mineral resources found in the area;
e) Soil. Map showing the types of surface soils found in the area and their characteristics and area of coverage shall be presented;
f) Hydrology. A map showing the different river systems and their tributaries. The description would also include watershed areas and their specific features;
g) Climate. This section will show the climatic conditions of the area including parameters, like rainfall and temperatures;
h) Land Classification. Land classification shall be based on the legal definition as provided in the 1987 Constitution and the Revised Forestry Code of the Philippines or Presidential Decree (PD) 705, e.g. timberlands, mineral reservations, national parks and agricultural areas and/or alienable and disposable lands, including the estimated area of coverage;
i) Land Cover. Existing land cover and uses, including the extent of coverage will also be reflected in a map;
j) Geohazards. Details on natural hazards, but not limited to volcanic activities and fault lines, landslide, flashfloods and flooding prone areas;

k) Habitat types. Different habitat types in the area, including but not limited to cogonal grassland, second growth areas, secondary lowland forest, mixed plantations, exotic tree plantations, primary lowland forest, montane forest, pine forest, agricultural areas, etc will also be shown in a map; and
l) Natural Features and Attraction. These are areas potential for recreational, educational and ecotourism activities.

2. Biological Resources

Two sites in MCWS were selected and surveyed for this particular component of the RSEA. Site 1 was located at Camp Binagyuhan, Sitio Hinugasan, Brgy. Harrison, Paluan and was surveyed on 12-16 February 2013. Site 2 was located at Camp Matingkaran, Sitio Ulasan, Brgy. Harrison, Paluan and was surveyed on 19-25 February 2013. Specific sampling areas within each site were as follows:

a) Site 1 Binagyuhan (13^{O}24'59.70''N 120^{O}21'44"E) was at 300-400 masl in secondary tropical lowland rainforest adjacent to agricultural areas (rice paddies) and grasslands. Human disturbance is prevalent as annual and perennial agriculture (rice farming and chashew orchards) is practiced adjacent to the forest. Timber harvesting has also been noted with stumps of recently felled trees were observed in the area;
b) Site 2a Matingkaran (13^{O}27'54''N 120^{O}24'45"E) was at 900-950 masl in a mosaic of secondary tropical lower montane rainforest and grassland. Human disturbance is evident in the surrounding areas. Grasslands are used as pasture land for grazing domestic cattle (*Bos taurus/Bos primigenius*). Burnt grass stubbles are visible below recently grown blades of grass. A small 'kaingin' agricultural area (about 0.5 ha) for sweet potato managed by a family of Iraya-Mangyans was noted at 650 masl below and south east of the survey site;
c) Site 2b Balingbingan (13^{O}27'16''N 120^{O}25'38"E) was at 450-500 masl on the southeast ridgeline leading from Sitio Ulasan to Mt. Calavite peak. The site is surrounded by secondary tropical lowland rainforest. Evidence of timber harvesting, such as timber flitches, was observed; and
d) Site 2c Mary Ann's Trail (13^{O}26'59''N 120^{O}25'25"E) was at 200 masl along a stream northeast of Sitio Ulasan. The stream feeds into Balacone River that passes west and south of Sitio Ulasan draining to Paluan Bay. The site is surrounded by secondary tropical lowland rainforest.

2.a. Habitats and Ecosystems

The biological resources at the terrestrial level of the project were determined through the identification and description of the different terrestrial habitat types, including estimated area of coverage and translated into a habitat map. It also involved identification of different vegetation types and critical habitats. The survey included quantitative and qualitative description of vegetation based on the following:

a) Characterize the different habitat types e.g. dominant trees, emergent trees, canopy trees, canopy coverage, *Ficus* species, dominant understory plants, epiphytes;
b) Species richness and diversity;
c) Relative abundance; and

d) Species composition and community structure.

2.b. Flora

The survey listed plant species found in the project site, including identification of useful plants (in terms of ecological, medicinal and economic parameters, among others), endemism and conservation values (using the latest IUCN and DENR classification of threatened species), and alien and exotic plant species (and how they are impacting the vegetation of the project site). Based on available information, two types of ecosystems were identified for sampling: forest and grassland. Within the forest the following methods were used:

a) A 100 m transect line was established starting from the base camp. At every 10 m interval (alternating right and left of the main transect), a 10x10 m quadrat was laid out;
b) All plant species found in the quadrat were identified. Parameters, like diameter at breast height (dbh), number of individuals per species, and frequency, were also recorded. From these parameters, the relative density (RD), relative frequency (RF) and relative dominance (RDom) were calculated. The importance value (IV) of each species was calculated by summing up the three mentioned parameters;
c) Some plant samples were collected and brought to the botanical herbarium for further taxonomic identification;
d) Voucher specimens of the flora of MCWS were deposited at the botanical herbarium, Museum of Natural History (MNH) at the University of the Philippines in Los Banos (UPLB); and
e) Other parameters recorded/noted were the economic significance of the plant species and the conservation status.

As for the grassland/brushland ecosystem, the following methods were followed:

a) A 50 m transect line was established. At every 10 m interval (alternating right and left of the main transect), a 4x4 m quadrat was laid out;
b) All plant species found in the quadrat were identified. Parameters, like height, diameter at breast height (dbh), number of individuals per species, and frequency, were recorded. From these parameters, the relative density, relative frequency and relative height were calculated. The importance value of each species was calculated by summing up the three mentioned parameters;
c) Some plant samples were collected and brought to the botanical herbarium for further taxonomic identification;
d) Voucher specimens of the flora of MCWS were deposited at the botanical berbarium, Museum of Natural History, UPLB; and
e) Other parameters recorded/noted were the economic significance of the plant species and the conservation status.

2.c. Fauna

Birds

Presence and absence of the following restricted-range species across different habitat types was determined: (a) Mindoro Bleeding-heart Pigeon *Gallicolumba platenae*; (b) Mindoro

Imperial Pigeon *Ducula mindorensis*; (c) Black-hooded Coucal *Centropus steeri*; (d) Mindoro Scops Owl *Otus mindorensis*; (e) Mindoro Hawk Owl *Ninox mindorensis*; (f) Mindoro Hornbill *Penelopides mindorensis*; (g) Mountain Shrike *Lanius validostris* (h) Ashy Thrush *Zoothera cinerea*; (i) Luzon Water-Redstart *Rhyacornis bicolor*; (j) Green-backed Whistler *Pachycephala albiventris*; and (k) Scarlet-collared Flowerpecker *Dicaeum retrocinctum.*

For each habitat type, birds were surveyed using line transects (500 m and 1 km), that were randomly walked by trained observers from 5:30AM to 9:00AM. Bird observations continued throughout the day targeting threatened endemic species. The species accumulation curve was used in determining sampling efforts. Mistnetting across different habitat types (lowland forest, montane forest and grassland) was also conducted. Netting efforts target understory skulking species and fruit-eating birds as well as ground-dwelling birds.

Mammals

To assess both insectivorous and frugivorous bat species at MCWS, a combination of two sampling methods (mistnetting and harptrapping) were used following standardized methodologies described in Barlow (1999) and slightly modified to suit local conditions. Mist nets of varying lengths were set close to the ground level and across still portions of rivers to capture both fruit-eating and insectivorous bats. High nets were also erected along ridgetops and known flyways of flying foxes and fruit-eating bats. Net lines were opened just before dusk and checked regularly throughout the night.

Four-bank harp traps for capturing insectivorous bats were also placed along well-used trails and dried streams inside forest areas. Harp traps were positioned at least within 30 m intervals and monitored regularly. If few bats were captured within a short time, traps were relocated to a considerable distance. In addition, opportunistic survey was conducted for large and small non-volant mammals.

Species discovery curves were used to determine sufficient level of sampling effort. Biometrical measurements of captured bats were also taken and species were identified. The *Key to the Bats of the Philippine Islands* by Ingle and Heaney (1992), *A Guide to the Mammals of Borneo* by Payne and Francis (2005) and the *Bats of Krau Wildlife Reserve* by Kingston *et al.* (2006) were used to identify the bats. Collection of voucher specimens was conducted for unidentified species following stipulations in the Gratuitous Permit (GP) No. 2012-0003 issued by the DENR. The species diversity and abundance in different sites were compared using the following computations:

$$\text{Relative Density} = \frac{\text{number of individual for a species}}{\text{Total number of individuals for all species}}$$

Shannon-Weiner Index of Diversity

$$H = -\Sigma p_i (\ln p_i)$$

Where $p_{i=}$ proportion of total sample belonging to the species

Amphibians and Reptiles

The sampling sites selected were in Camp Matingkaran and Camp Binagyuhan. In each site, two transect lines, with approximately 1 km each, were established. Transects were marked at 100 m intervals and were sampled during day and night for a minimum of five days per site (Bennett, 1999). Opportunistic sampling using hand capture, searching microhabitat, such as rotten logs, leaf litter, tree holes, burrow and small ponds, was also performed (Bennett, 1999; Diesmos *et al.,* 2003). Body measurements of captured species were taken. Photographs of captured specimens were taken for documentation prior to release back to their original habitat (Ledesma, *unpublished;* Brown, 2000). Seen and heard species (uncaptured) were also recorded. The species diversity and abundance in different sites were compared using the same computations presented in mammals section.

The elevation, coordinates, time and weather condition during the time of capture were also recorded. Habitats and microhabitats, where the species were taken, were also described. Five different habitat and microhabitats were sampled during the survey: (a) Streams/rivers; (b) Rocks/boulders/rock crevices; (c) Leaf litter; (d) Soil; and (e) Tree branches.

Aquatic Resources

Rivers, streams, ponds and lake, within Camp Matingkaran and Camp Binagyuhan in MCWS, were surveyed. Freshwater fishes, crustaceans and insects were opportunistically sampled using varying techniques: handcapture and modified nets. The RSEA team attempted to provide information on species composition, new records, abundance, and ecological and economic importance of species, as well as the detailed description and analysis of freshwater conditions of the project site. Presence of exotic species and its effect or impact to native/endemic species and habitat were also presented.

D. Socio-Cultural and Economic Characterization

The socio-cultural and economic component of the survey included characterization of the project site in terms of the following:

a) Demographic characteristics and settlements. This covers the population parameters such as population size, distribution, density, and growth rate;
b) Economic characteristics and poverty levels;
c) Basic services and social indicators. These are the basic social services available in the area, which will include education, health, housing, water, power supply, communication, and transportation services, among others;
d) Land ownership and tenure. This is the presentation of the different land tenure systems prevailing in the area;
e) Resource use practices. This is the presentation of various practices in resource utilization and how these practices affect the area; and
f) Cultural profile.

E. Institutional Arrangements and Governance Assessment

The institutional arrangement and governance assessment of the project site involved the following:

a) Stakeholder profile and analysis;
b) Current management structure and capabilities of the PA management;
c) Working arrangements and relationships between the PAMB, LGUs and other relevant and concerned stakeholders;
d) Plans, programs and projects in the area related to environment and natural resources management; and
e) National and local policies governing and/or affecting the project site.

Data gathering methodologies for socio-economic and governance aspects of this RSEA consisted of secondary data gathering and analysis, key informant interviews (KII) and focused group discussions (FGD). Information from the secondary materials was supported by KIIs and FGDs in the site. KIIs were also conducted with key representatives of National Commission of Indigenous People (NCIP), municipal and barangay officials, tribal leaders, leaders of People's Organizations (POs), DENR, Department of Tourism (DOT) and Department of Agriculture (DA). FGDs were conducted with members of the PAMB, as well as representatives of the various groups and sectors in Brgy. Harrison.

During the FGD with the PAMB, a capacity assessment was undertaken to determine the capacity of the PAMB to fulfill their expected functions. Prior to the fieldwork, people to be interviewed were identified and informed of the tentative date and overall objective of the interview. With regards to the conduct of the FGD, participants were identified before the field trip and informed of the time and venue of the event. Identification of the participants in the FGD and KII was done in close coordination with the MBCFI staff.

III. Project Site Profile: Results and Discussions

This section contains the results and discussions on the profile of MCWS based on the primary and secondary information secured on-site and off-site by the members of the RSEA team. The profiling includes aspects related to the physical and geo-political characteristics, biological resources, socio-cultural and economic situation and institutional arrangements and governance of MCWS. Tables and figures are included in this section to support the narrative accounts of this RSEA report.

A. Biophysical Profile

1. Physical and Geo-Political Profile

The physical and geo-political profile in this report comes from different sources, most of which were acquired from the Philippine GIS Data Clearinghouse (PhilGIS) website. PhilGIS is a simple and single-access portal that is dedicated to promote and support the development and free distribution of geospatial data in the Philippines. Aside from PhilGIS, other information were sourced from maps produced by the Mines and Geosciences Bureau (MGB) and Forest Management Bureau (FMB) of the DENR; Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA); Philippine Institute of Volcanology and Seismology (PHIVOLCS); and from other pertinent institutions.

Some of the data presented in this section are already considered time-stable. It means the material under observation do not change appreciably, through time, like geology, soils, topography and slope. Hence for this type of information, additional secondary data are just

needed to improve or update the maps involved. But for those data, that are considered time-critical, ground-truth is indispensable. These data types imply that ground condition may change rapidly through time, such as land cover types. Possible means of updating and/or improving these data employed primary data collection, such as ground survey and inventory. This section integrates the primary and secondary data of the physical and geo-political profile of the MCWS.

1.a. Location and Area

Mindoro is located about 130 km south of Metro Manila and about 90 km from Busuanga Island in Palawan. It has an approximate total area of 10,159 km^2. In 1950, the island was divided into two provinces – Occidental Mindoro and Oriental Mindoro (**Figure 1**). The Calavite Passage and Verde Island Passage bound the entire island in the north, Tablas Strait on the east and the Mindoro Strait on the west. The name "Mindoro" is believed to have come from the Spanish word "Mina de Oro", which means "gold mine."

Based on the proclamation of MCWS, it has an approximate area of 18,016.19 ha **(Figure 2)**. However, when its technical description was plotted, the total area was found to be about 16,344.37 ha only. For consistency purposes, the latter area will be used to describe the extent of MCWS in this report.

The entire coverage of MCWS is within the municipality of Paluan in Occidental Mindoro province. Paluan is a 3rd class municipality situated at the northwestern tip of the Mindoro Island. It has an estimated area of about 55,777 ha and consists of seven barangays, namely, (a) Alipaoy; (b) Harrison; (c) Lumangbayan; (d) Mananao; (e) Marikit, (f) Poblacion; and (g) Tubili (**Table 1.** and **Figure 3**). Brgy. Poblacion is further subdivided into six smaller sub-barangays and these are Mapalad (Brgy. 1), Handang Tumulong (Brgy. 2), Silahis ng Pag-asa (Brgy. 3), Pag-asa ng Bayan (Brgy. 4), Bagong Silang (Brgy. 5) and San Jose (Brgy. 6).

Majority of MCWS's land area lies in Brgy. Harrison, but some its portions are also located in Brgys. Mananao, Alipaoy and Poblacion. Aside from Mt. Calavite, other important mountain ecosystems found in Paluan include Mt. Cabignayan, and Anduyanan and Ilomano mountains. Since MWCS falls entirely within the jurisdiction of Paluan, there was no issue of boundary conflicts over other neighboring municipalities of Occidental Mindoro.

Table 1. Barangays of Paluan, Occidental Mindoro

Barangay	Area (ha)
Alipaoy	1,863.47
Harrison	18,016.66
Lumangbayan	5,304.87
Mananao	8,644.28
Marikit	8,625.34
Mapalad Poblacion (Brgy. 1)	63.94
Handang Tumulong Poblacion (Brgy. 2)	34.91
Silahis ng Pag-asa Poblacion (Brgy. 3)	349.01
Pag-asa ng Bayan Poblacion (Brgy. 4)	92.56
Bagong Silang Poblacion (Brgy. 5)	287.93
San Jose Poblacion (Brgy. 6)	641.40

Tubili	11,852.85
Total	55,777.22

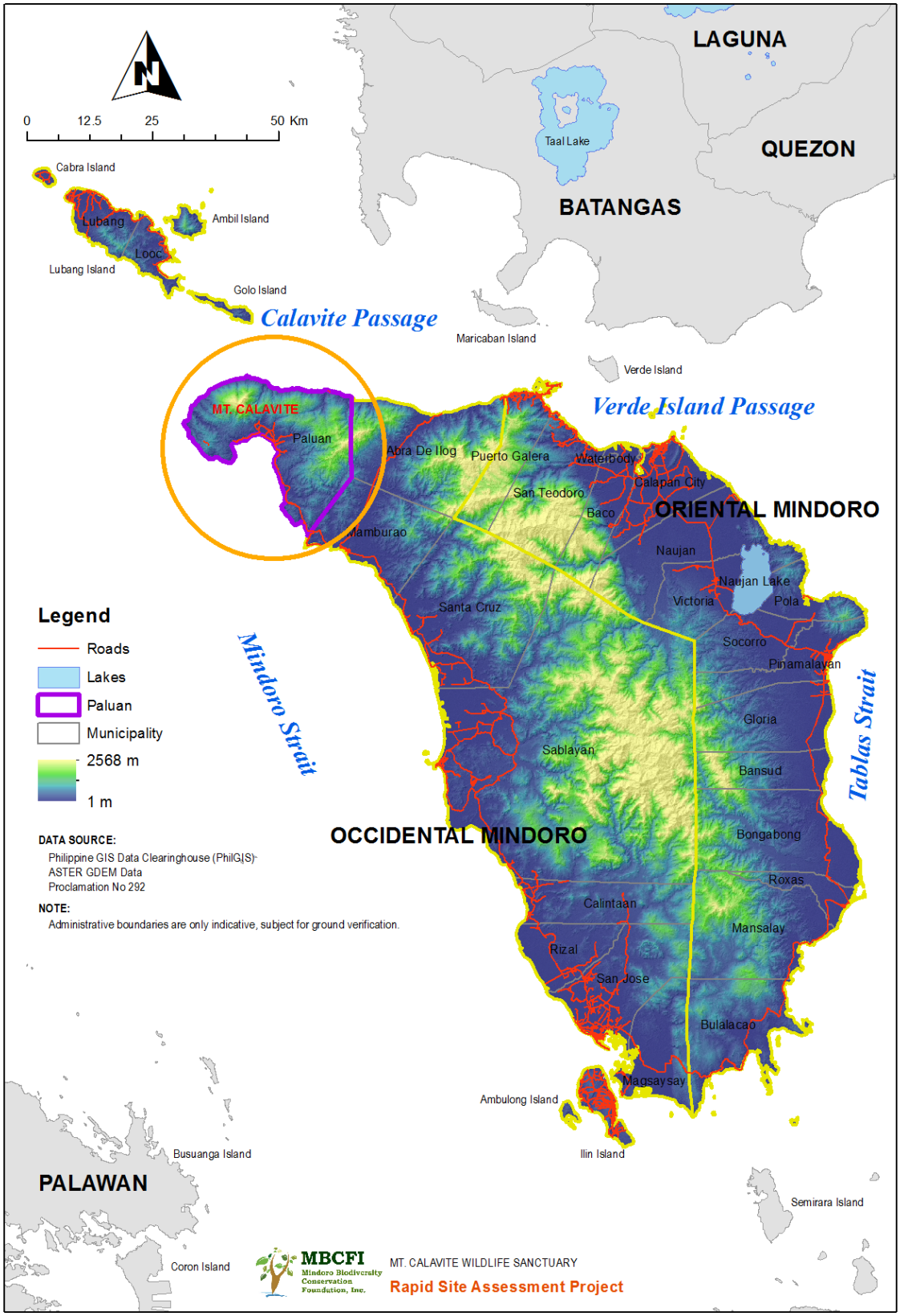

Figure 1. Mindoro Administrative Map

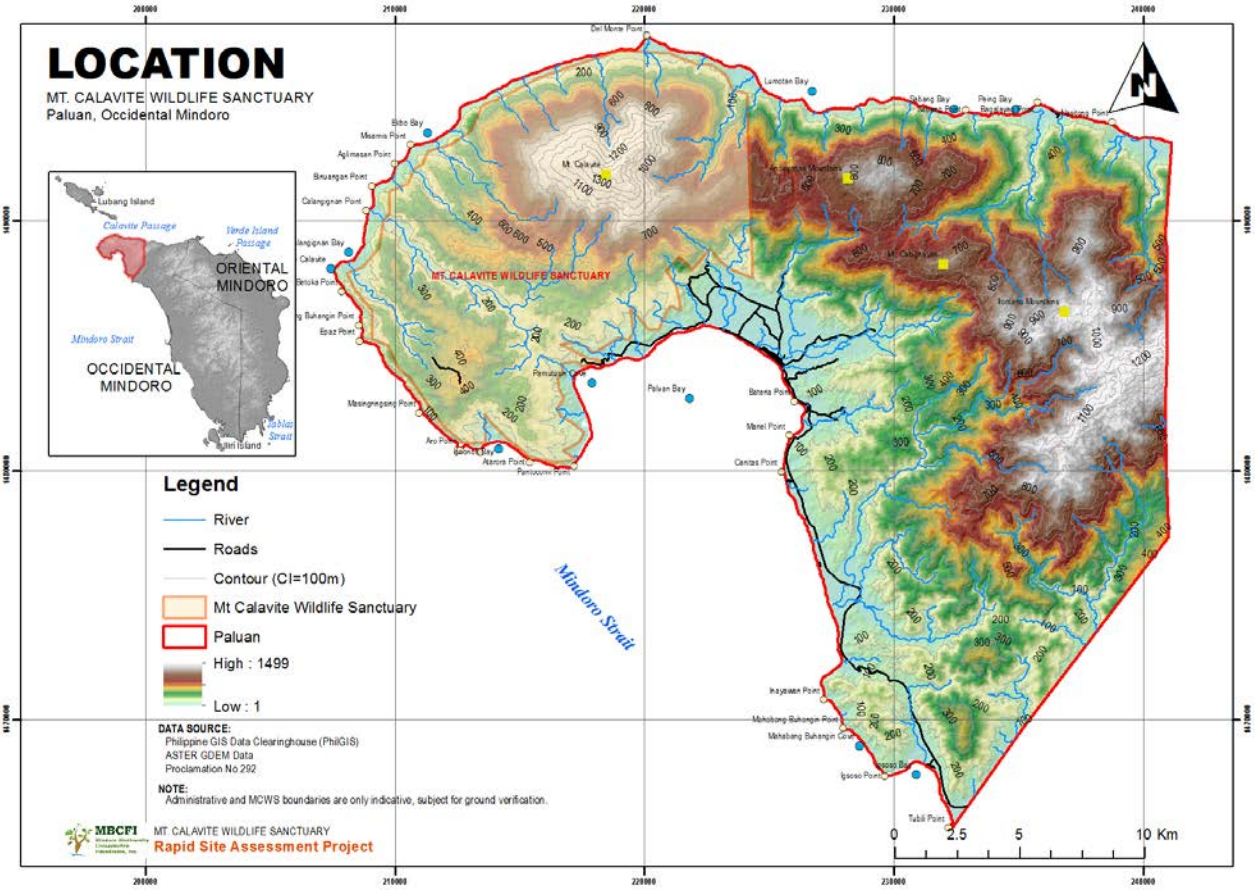

Figure 2. MCWS Location and Boundary Map

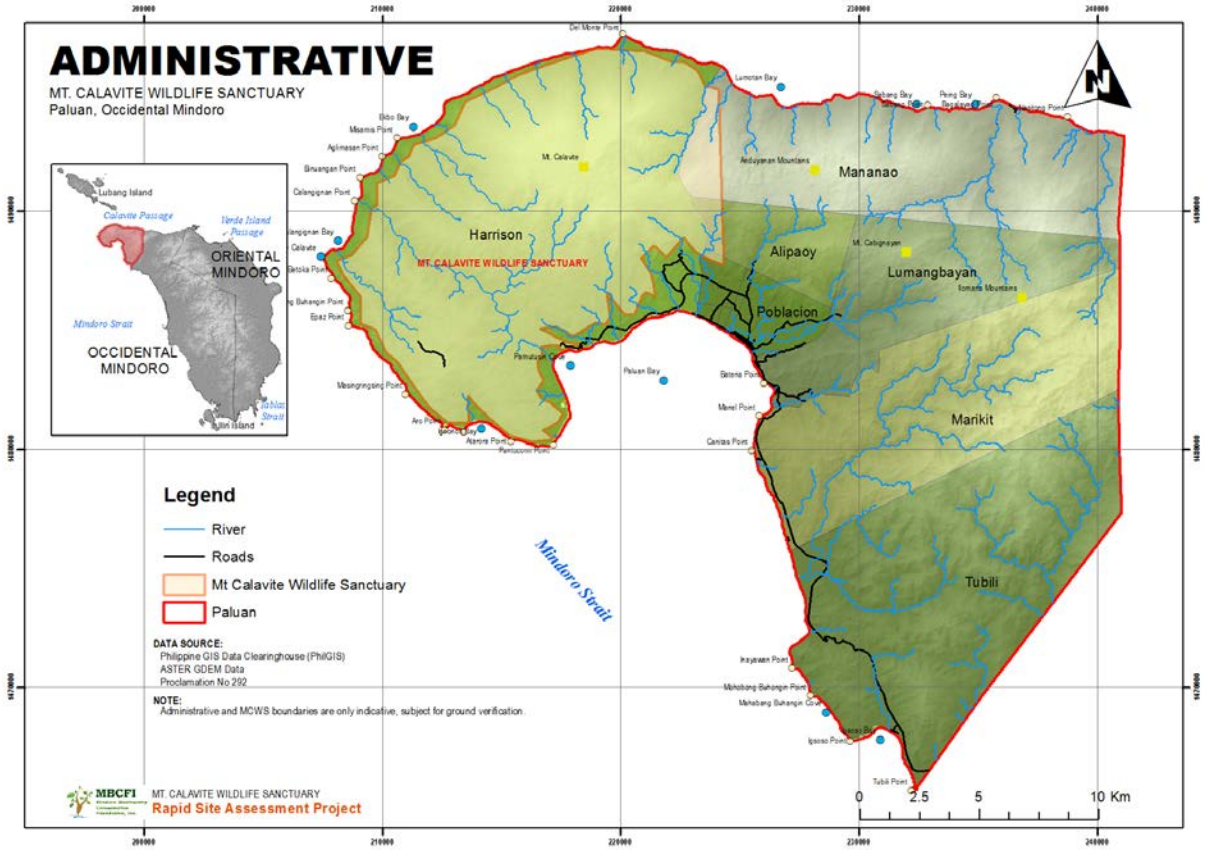

Figure 3. MCWS Administrative Boundary Map

1.b. Slope and Topography

The slope and topography of MCWS were generated using ASTER GDEM (Advanced Spaceborne Thermal Emission and Reflection Radiometer – Global Digital Elevation Model). The spatial resolution of these datasets is 30 m. This digital elevation model (DEM) established five slope classes (**Table 2**) in MCWS. It was found out that majority of MCWS's land area has steep to very steep slopes (**Figure 4**). Slope class of >40% has the highest coverage (5,822 ha or 36%) in MCWS, while the lowest coverage (697 ha or 4%) is situated in flat regions (0 – 8%).

Table 2. MCWS Slope Classes

Slope Class	Area (ha)	Percentage
0 – 8%	696.52	4.26%
8 – 15%	1,508.47	9.23%
15 – 25%	3,114.21	19.05%
25 – 40%	5,203.88	31.84%
> 40%	5,821.82	35.62%
Total	16,344.90	100.00%

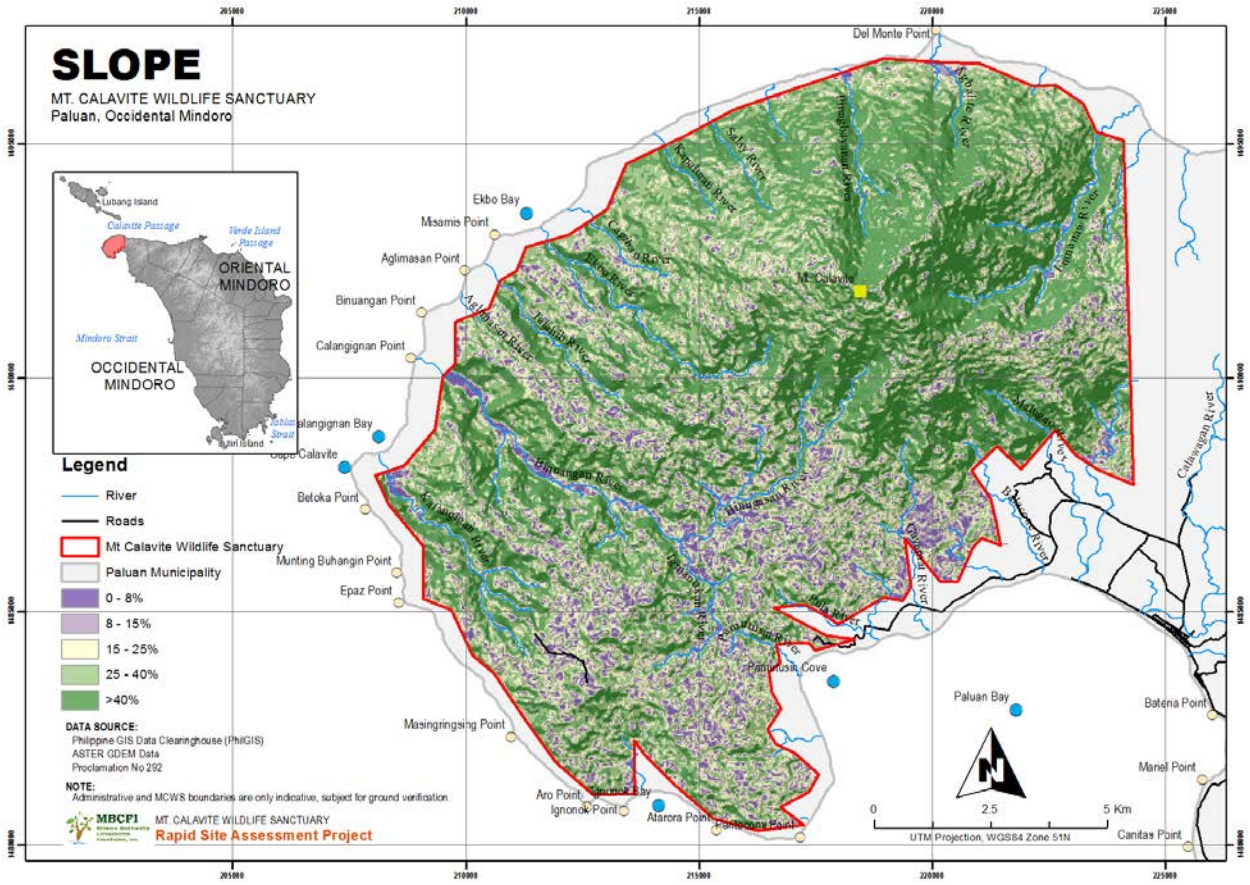

Figure 4. MCWS Slope Map

In terms of topography, the area is composed of rolling to mountainous terrain (**Figure 5**). Most parts of MCWS have elevations of <600 masl (**Table 3**). The highest peak in MCWS is almost 1,500 masl. Among the classes, an elevation range of 200-400 masl has the highest coverage (5,277 ha or 32%), while the lowest is found in areas with elevation of >1,400 masl (50 ha or <1%).

Table 3. MCWS Elevation Classes

Elevation Class (masl)	Area (ha)	Percentage
< 200	4,642.41	28.40%
200 – 400	5,277.10	32.29%
400 – 600	2,585.00	15.81%
600 – 800	1,650.43	10.10%
800 – 1,000	1,062.35	6.50%
1,000 – 1,200	677.66	4.15%
1,200 – 1,400	399.99	2.45%
> 1,400	49.96	0.30%
Total	16,344.90	100.00%

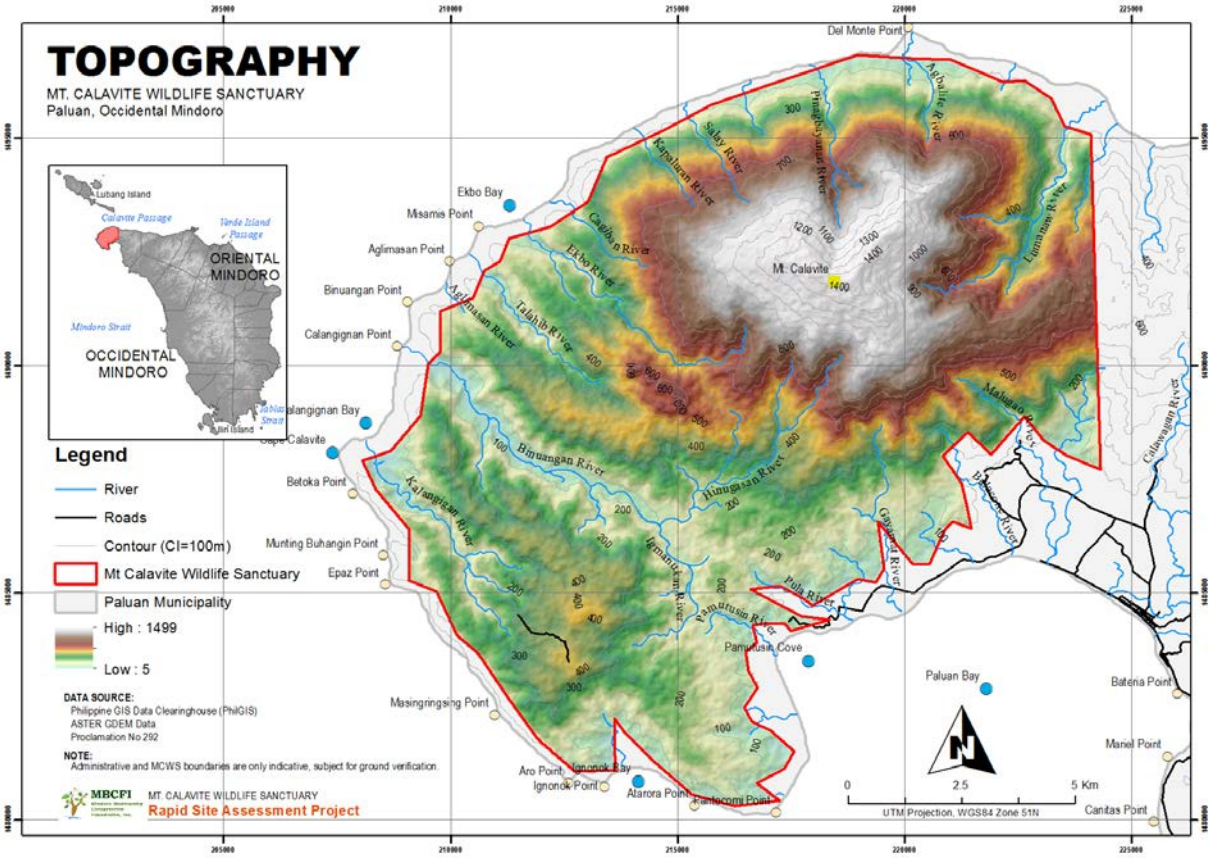

Figure 5. MCWS Topographic Map

1.c. Geology and Minerals

The geologic map produced by the MGB classified the geology of MCWS as mainly comprised of Pre-Jurassic (15,800 ha or 97%) that belongs to sedimentary and metamorphic rock groups (**Table 4** and **Figure 6**). This rock type is primarily composed of undifferentiated gneiss, quartzofeldspathic and mica schist, and phyllites-slates that are frequently associated with marble, limestone and arenite. Other rock formations found in the area are the Cretaceous-Palogene and Oligocene. Both rock types are igneous rocks, but the former belongs to the intrusive rock types, while the latter to volcanic. The Cretaceous-Palogene is comprised of undifferentiated ophiollites and ophiollitic rocks. It is also predominantly made up of peridolite that is associated with gabbro and/or diabase dikes, pillow and basalts. On the other hand, the Oligocene rock formations are essentially andesite flows, often with pyroclastics and cherts of volcanic origin. The remaining portions of MCWS are already classified as recent rock formations, and these are usually located in flat areas and/or near the shorelines.

Table 4. MCWS Geological Characteristics

Geology	Area (ha)	Percentage
Pre-Jurassic	15,799.98	96.67%
Cretaceous-Palogene	495.53	3.03%
Oligocene	35.95	0.22%
Recent	12.91	0.08%
Total	16,344.37	100.00%

There are also various types of mineral resources found in Mindoro. Some of the mineral ore deposits include nickel and chromite. These deposits have been found to be associated with ultramafic rocks in the area. Other metallic deposits present in the island are iron, copper and gold. Non-metallic mineral deposits, such as barite, marble, jade and coal, are also found in Mindoro. In Paluan, mineral deposits, such as chromite, nickel, silica and talc, were recorded (**Figure 7**).

Active and offshore fault lines are also found in Mindoro and its neighboring areas (**Figure 8**). Based on the maps from the PHIVOLCS, the Central Mindoro Fault and the Aglubang River Fault are the major active fault lines that traverse the entire island of Mindoro. The Lubang Fault bounds the island on the north and the Manila Trench on the western part.

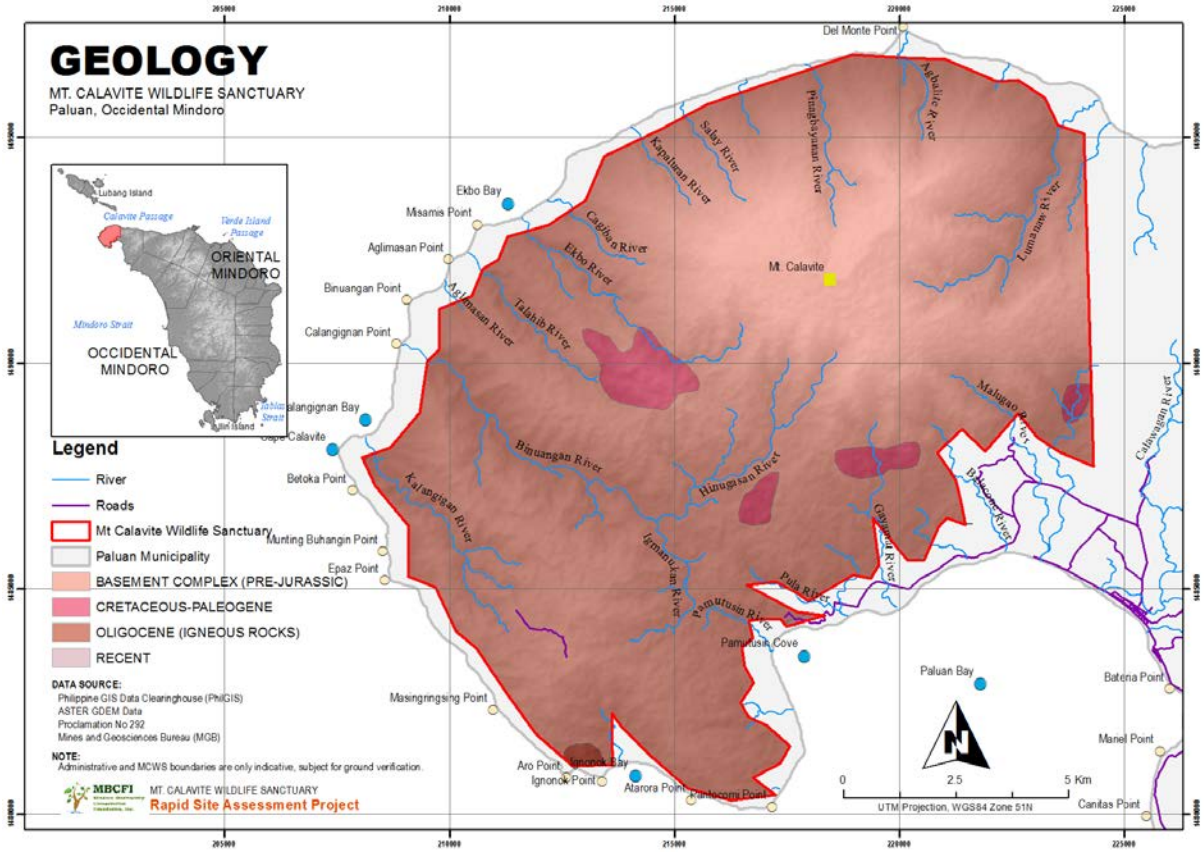

Figure 6. MCWS Geologic Map

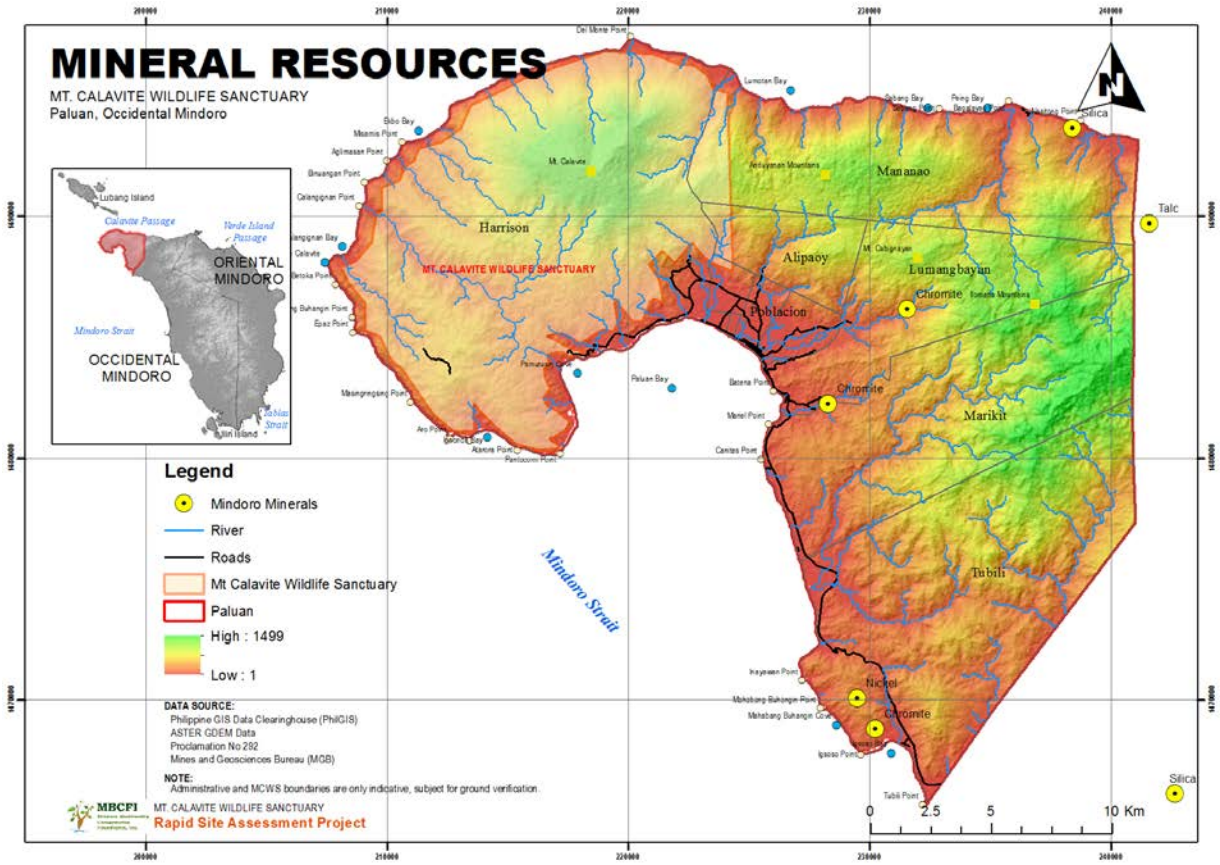

Figure 7. Mineral Resources in Paluan, Occidental Mindoro

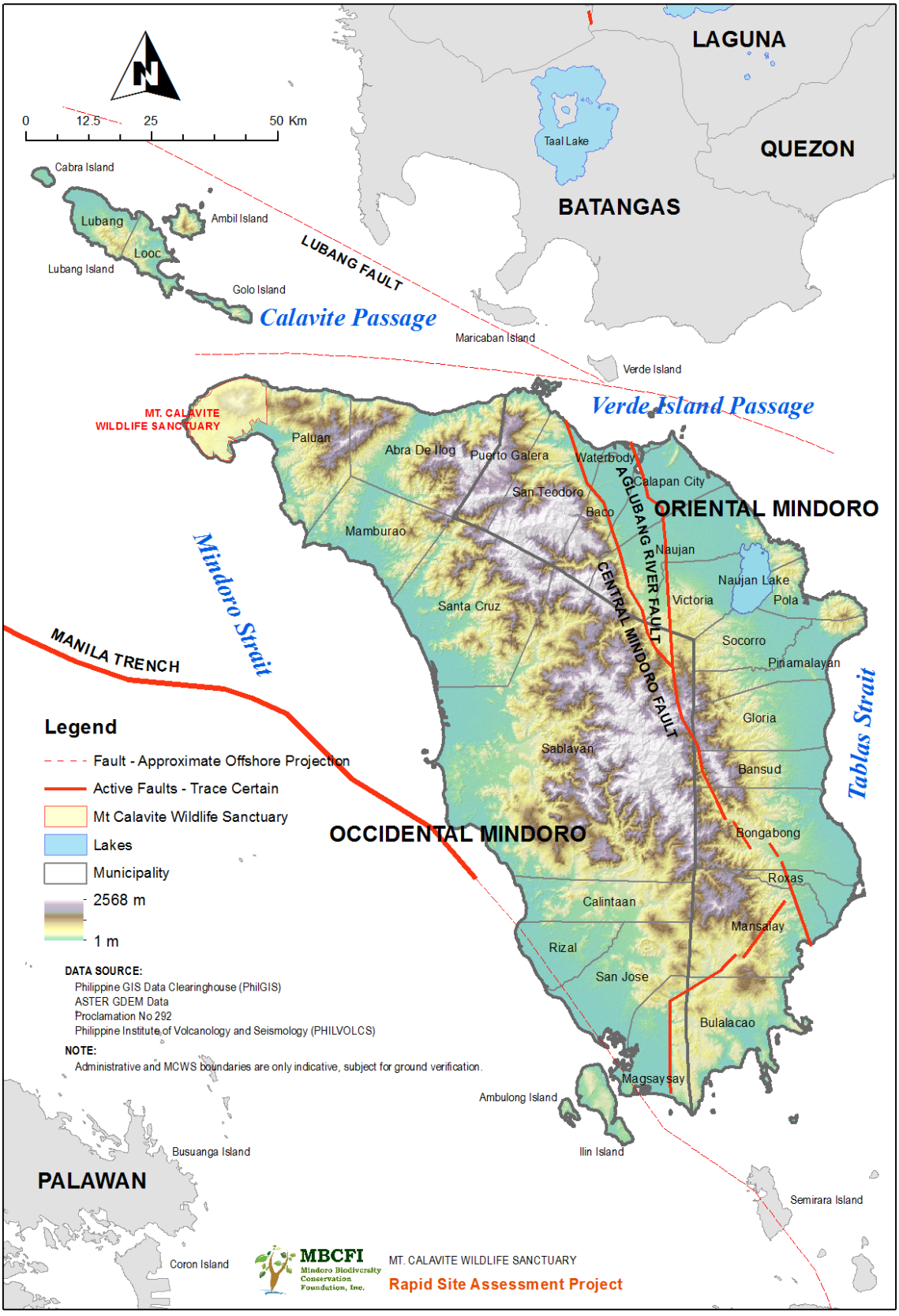

Figure 8. Active Faults in Mindoro Island

1.d. Soil

About 56% (9,088 ha) of the soil type in MCWS is classified as rough mountainous land (**Table 5**). This soil type is found in the northern and western portions of the protected area (**Figure 9**). Its distribution is generally located in very steep and rugged terrain. Although it is considered as a shallow soil, it has good drainage characteristic. The recommended land use for this soil type is forest or tree plantations. However, excessive cultivation in these areas may lead to severe erosions.

Another dominant soil in MCWS is the Luisiana clay. The Luisiana series resembles the rolling upland soils belonging to the antipolo, alaminos and other reddish-brown to red soils, which have developed from basaltic rock material. The weathering and decomposition of the parent rock have gone so deep that the resulting soil has developed into indefinite depth. Except for the variation in color, structure and consistency, the profile from the surface down to the substratum of 200 cm, or more, exhibits a uniformity of texture. The soil type is best suited for permanent crops, such as coconut, coffee, cacao and other seasonal crops, that may be grown in areas with <10% slope, provided appropriate soil conservation measures are employed. Bare areas, with steep slopes, should be placed under permanent vegetation and the existing forest cover should be protected, to minimize if not prevent soil erosion.

Finally, a small portion of MCWS is comprised of San Manuel Silt, Silt Loam soils. San Manuel soils have level relief. They have good internal drainage. Soils of the series are found along the courses of rivers and the parent material consists of alluvium or soil materials deposited by water. The soils formed from such materials are usually fertile. San Manuel soils respond favorably to soil conservation practices. The series is free from coarse materials, like stones and gravels, either on the surface, or within the profile. It is suitable for the cultivation of diversified upland field crops, such as corn, rice, tobacco and legumes.

Table 5. MCWS Soil Types

Soil Type	Area (ha)	Percentage
Rough Mountainous Land	9,087.56	55.60%
Luisiana Clay	6,997.15	42.81%
San Manuel Silt, Silt Loam	259.66	1.59%
Total	16,344.37	100.00%

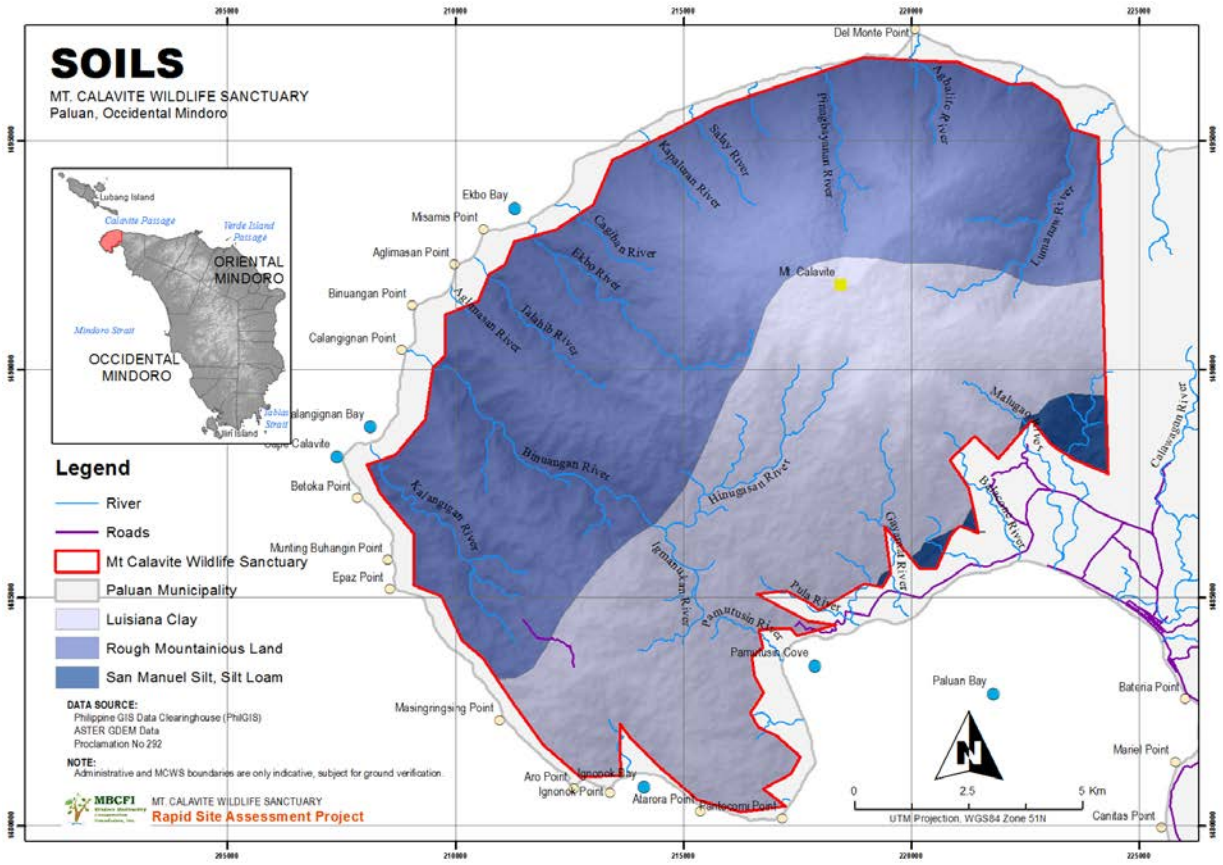

Figure 9. MCWS Soil Map

1.e. Hydrology

The drainage network in MCWS was generated using ASTER GDEM dataset. Major rivers identified in MCWS are the (a) Binuangan River; (b) Hinugasan River; (c) Igmanukan River; (d) Aglimasan River; (e) Talahib River; (f) Ekbo River; (g) Cagiban River; (h) Balacone River; and (i) Malugao River, among others (**Figure 10**). Local communities are tapping this network of rivers and creeks as their main sources of domestic water supply, like potable drinking water and other household uses. Local farmers also utilize some streams for irrigation of their agricultural farms.

The rivers mentioned above are used as focal points in the delineation of the different sub-watersheds in the protected area. Based on this dataset, 19 major sub-watersheds were generated (**Table 16**). The largest of which is sub-watershed 13 (4,189 ha) that is mainly located in the southwestern portion of the area. Its headwaters are found in Mt. Calavite and drains into the Binuangan River and finally into the Calangignan Bay. These delineated sub-watersheds can be utilized as effective management units, particularly in the conservation of various flora and fauna as well as in addressing environmental problems, such as erosion and landslides and watershed restoration and protection.

Table 6. MCWS Major Sub-Watersheds

Sub-watershed	Area (ha)	Sub-watershed	Area (ha)
1	742.03	11	417.62
2	410.10	12	1,194.83
3	1,485.21	13	4,189.39
4	1979.98	14	715.79
5	446.51	15	1,287.33
6	316.91	16	379.43
7	654.37	17	318.72
8	649.92	18	326.37
9	317.50	19	278.93
10	341.70		

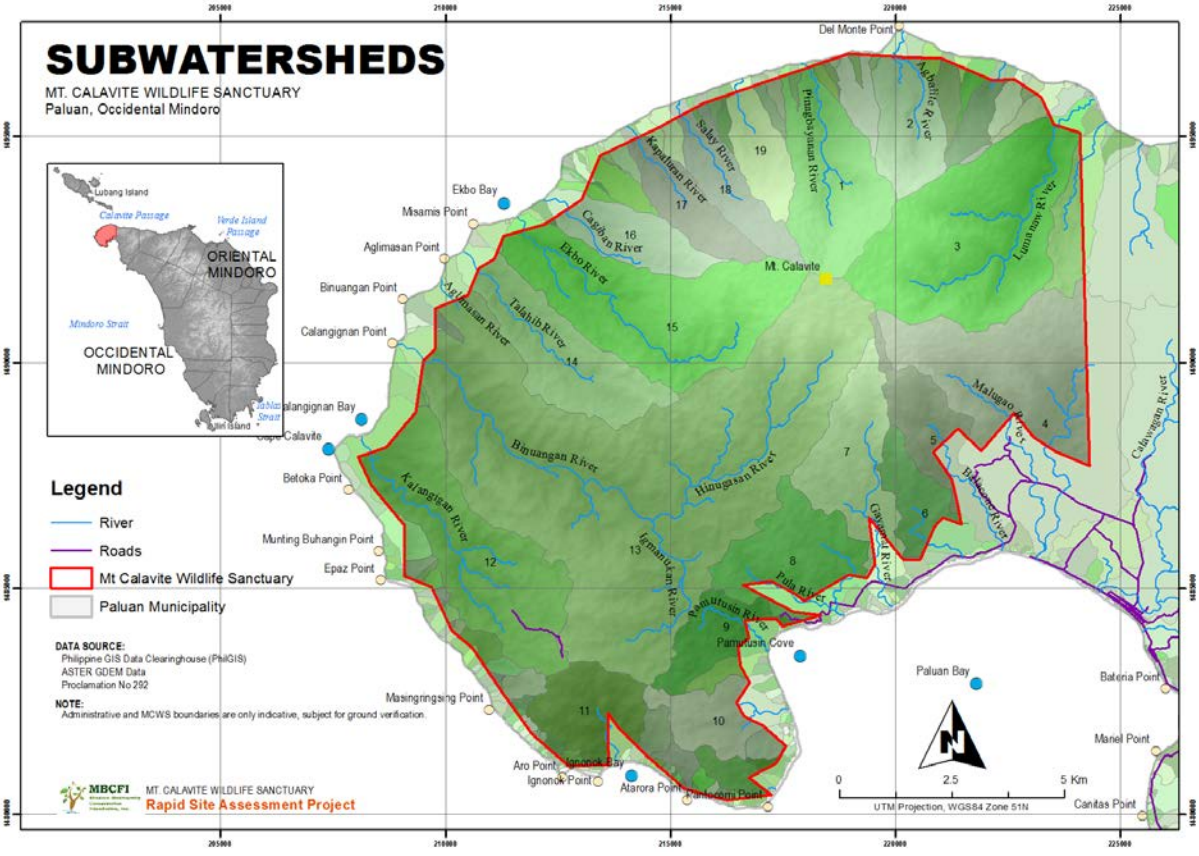

Figure 10. MCWS Sub-Watersheds Map

1.f. Climate

The PAG-ASA's Modified Corona Climate Classification placed the entire Paluan under Climate Type I (**Figure 11**). This climate type is generally described to have two pronounced seasons, dry from November to April and wet during the rest of the year. Maximum rain period is usually observed from June to September. Since there is a limitation in the distribution of PAGASA climate stations in the country, the climate data recorded in Calapan, Oriental Mindoro was used to describe the climate in Paluan. This is one of the closest climate stations in the area. Based on a 30-year data (1978-2007) recorded at this

station, the average annual rainfall was estimated at 2,240.1 mm. The highest annual rainfall was observed in 1995 (3,149.9 mm) while the lowest recorded was in 1997 (1,195.5 mm). **Figure 12** shows the monthly average rainfall over the said period. It can be observed that wet season started in May and peaked in October, then gradually decreased toward the end of the year. Low rainfall amounts were already evident from January to April.

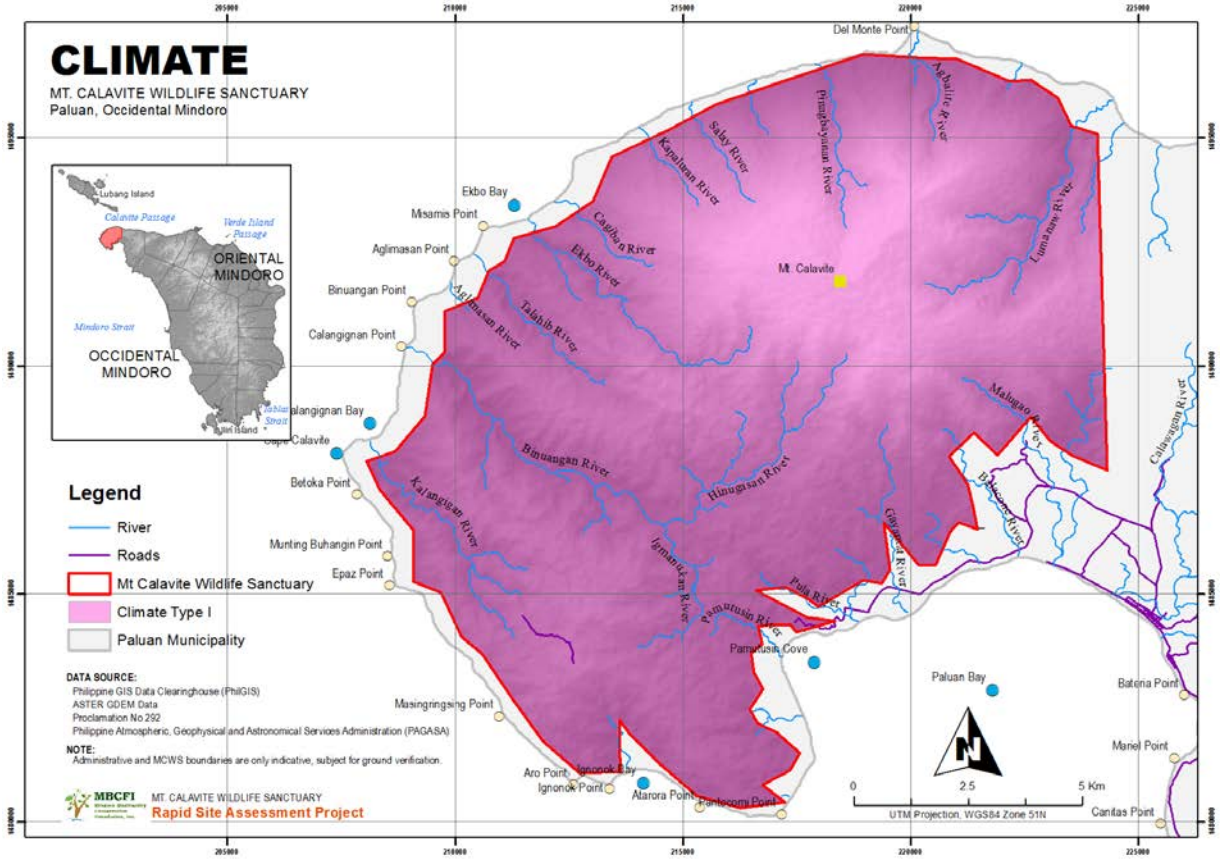

Figure 11. MCWS Climate Map

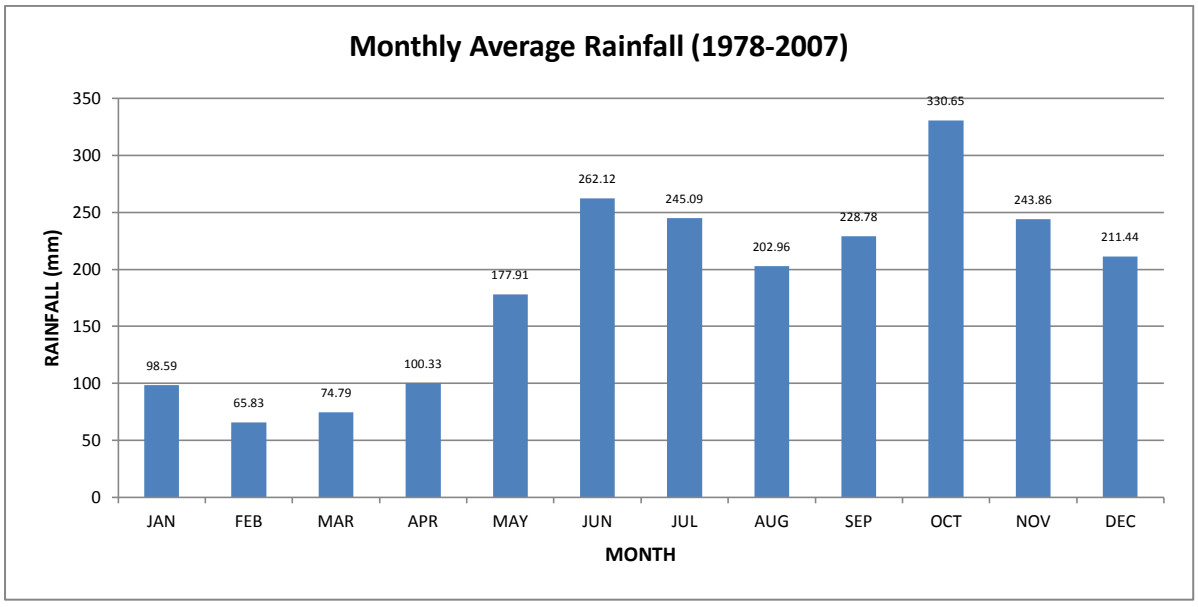

Figure 12. Monthly Average rainfall in Calapan, Or. Mindoro from 1978 to 2007

In terms of temperature, the monthly average over the 30-year period was estimated at 23.3^{0}C and 31.3^{0}C for the minimum and maximum temperatures, respectively. In addition, it can be observed in **Figure 13** that May was considered as the hottest month (33.0^{0}C) in the area while the coldest month (22.1^{0}C) was depicted in January.

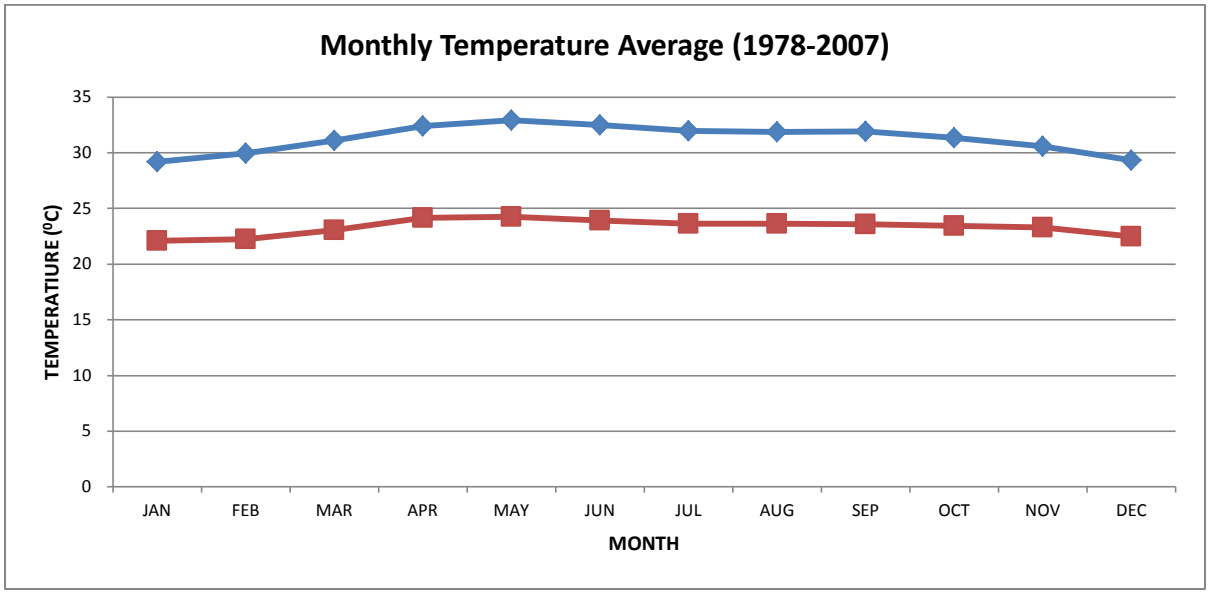

Figure 13. Monthly Average Temperature (maximum and minimum) in Calapan, Oriental Mindoro from 1978 to 2007

These various climatic factors should be continuously monitored due to the growing concerns in the international community on the impacts of climate change in biodiversity. Several studies (Jose and Cruz, 1999; Lasco *et al., undated;* and DOST-PAGASA, 2011) have shown evidences of the impacts of this phenomenon primarily on natural habitats. The DOST-PAGASA in 2011 projects the possible increase in temperatures to as high as 1.1^{O}C by 2020 and 2.1 ^{O}C by 2050, particularly during the summer season.

The same studies project seasonal rainfall fluctuations of $\pm$15% by 2020 and $\pm$25% by 2050, which Lasco *et al*'s (undated) projections show similar trends in both temperature and precipitation, adding further the forest types in Occidental Mindoro may shift from moist forest to wet forest and rain forest (Holdrige life zone types) in nine possible scenarios. Climate change impacts on the biodiversity of MCWS have not yet been studied. Impacts to MCWS' biodiversity can not be inferred with the data collected for this RSEA and more thorough investigative studies may be designed in succeeding surveys specific for climate change using the data presented here as baseline information.

Climate change impacts have also greatly affected several communities throughout the country, such as droughts, floods and occurrence of strong typhoons (Ramon in 2011, Ofel in 2012, Gorio and Yolanda 2013). Since Mindoro Island is also a perennial path of typhoons in the country, it is imperative that sufficient weather monitoring stations be established in the area.

1.g. Land Classification

As a declared protected area and component of the NIPAS, the land classification of MCWS is generally considered as a national park under the 1987 Philippines Constitution. It should be noted that the Constitution provides for four major land classifications and these are (a) Forest or Timberland; (b) Alienable and Disposable or Agricultural Lands; (c) Mineral Lands; and (d) National Park.

Using the land classification provided in the Revised Forestry Code or Presidential Decree (PD) 705 of the Philippines, about 14,751 ha, or 90%, of MCWS is classified as forest/timberland and only about 1,594 ha, or 10%, is considered as alienable and disposable land (**Table 7**). Most of the alienable and disposable lands are confined in the south-southeastern portion of MCWS (**Figure 14**).

Based on PD 705, forest/timberland is referred to lands of the public domain, which have been the subject of the present system of classification and determined to be needed for forest purposes. However, some of the forestlands in MCWS are already cogonal and agricultural areas. On the other hand, alienable and disposable lands are define as lands of the public domain, which have been the subject of the present system of classification and declared as not needed for forest purposes. These areas can be used for residential and agricultural purposes.

Table 7. MCWS Land Classification Based on PD 705

Land Classification	Area (ha)	Percentage
Forest/Timberland	14,750.76	90.25%
Alienable and Disposable	1,593.61	9.75%
Total	16,344.37	100.00%

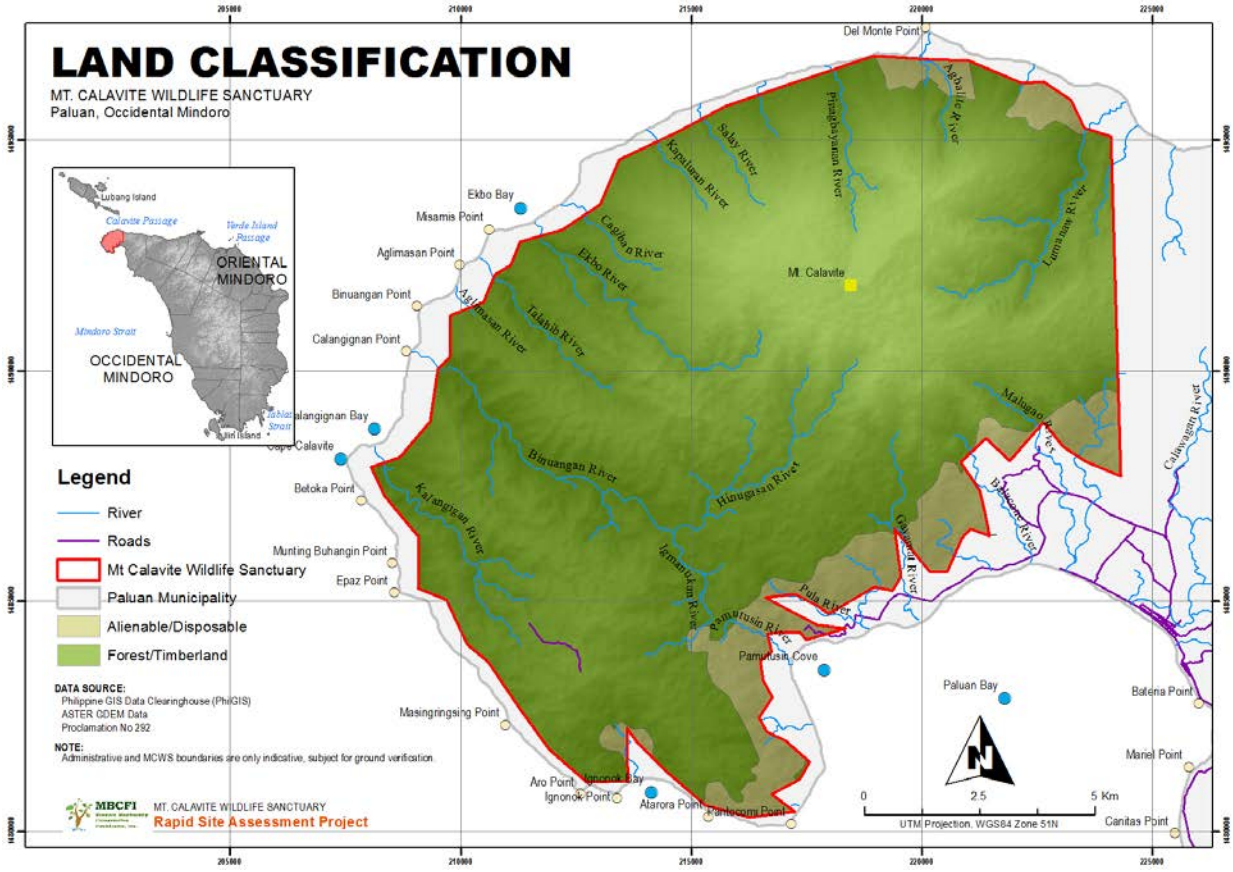

Figure 14. MCWS Land Classification Map Based on PD 705

1.h. Land Cover

The land cover in MCWS is derived from the 2003 forest cover map generated by the DENR using Landsat ETM satellite images (**Figure 15**). Based on this map, a large portion, about 72% (11,830 ha) of MCWS, is still covered with forest (**Table 8**). These forests are mainly distributed in the eastern and western parts of the protected area. Brushlands can also be found in the western portion of MCWS. However, grasslands are occupying a wide portion of the central region of MCWS that in turn, are slowly creeping towards Mt. Calavite. Cultivation, such as agricultural practices, is also being done in these grasslands, as indicated on the map.

Table 8. MCWS Land Cover Types (2003)

Land Cover	Area (ha)	Percentage
Open Forest, Broadleaves	11,830.28	72.38%
Wooded Lands, Shrubs	906.02	5.54%
Wooded Lands, Grasslands	832.01	5.09%
Grasslands	2,748.71	16.82%
Cultivated Perennial	27.05	0.17%
Inland Water	0.30	0.001%
Total	16,344.37	100.00%

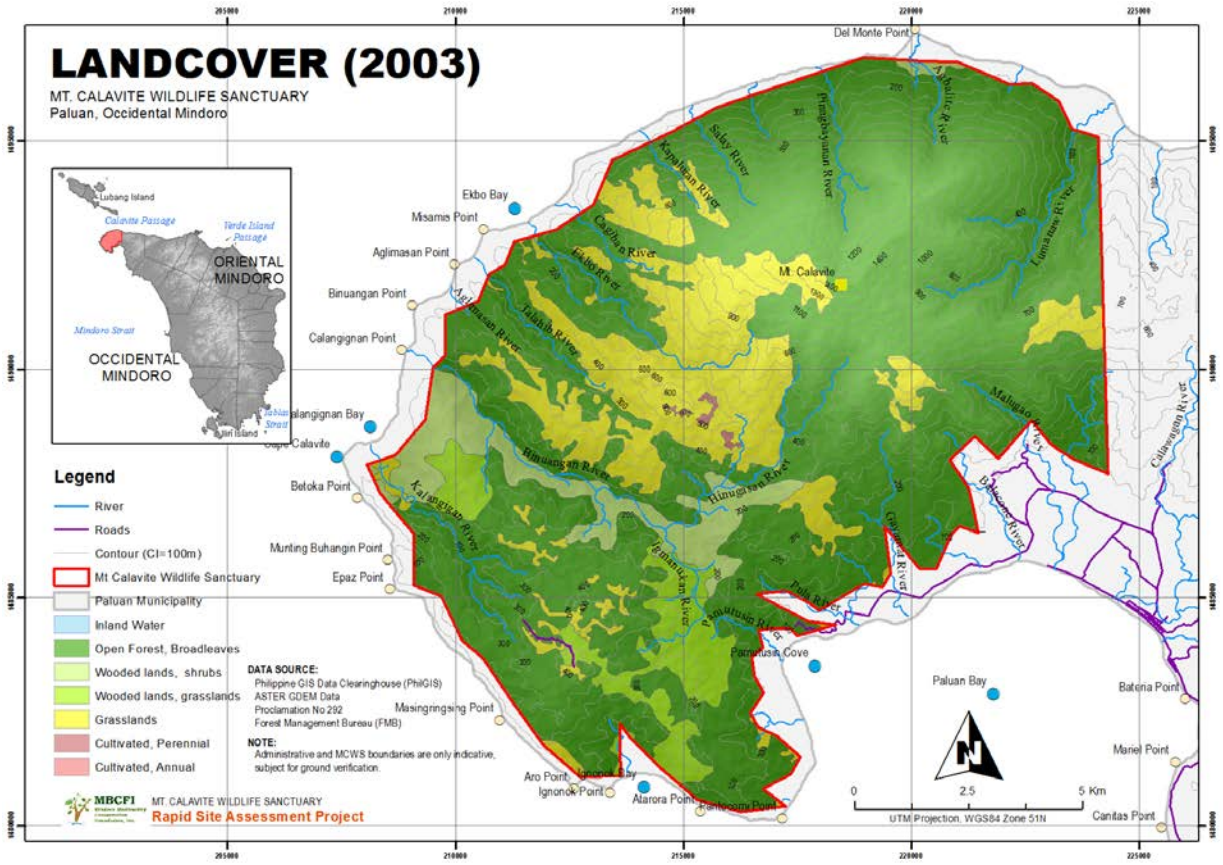

Figure 15. MCWS Land Cover Map

Based on a 2011 satellite view from the Google Earth, the land cover classes of MCWS have been classified and these were verified using groundtruthing (**Figure 16**). This activity resulted to the updated land cover map of MCWS (**Figure 17**). **Table 9** shows the updated distribution of major land cover classes in the area. From the 72% (11,830 ha) forest cover in 2003, the updated forest cover has increased to about 77% (12,505 ha). On the other hand, the grassland areas significantly decreased from 2003 (22% or 3,581 ha) to the present (14% or 2,300 ha). As for the agricultural area, it increased from 27 ha in 2003 to approximately 33 ha at present.

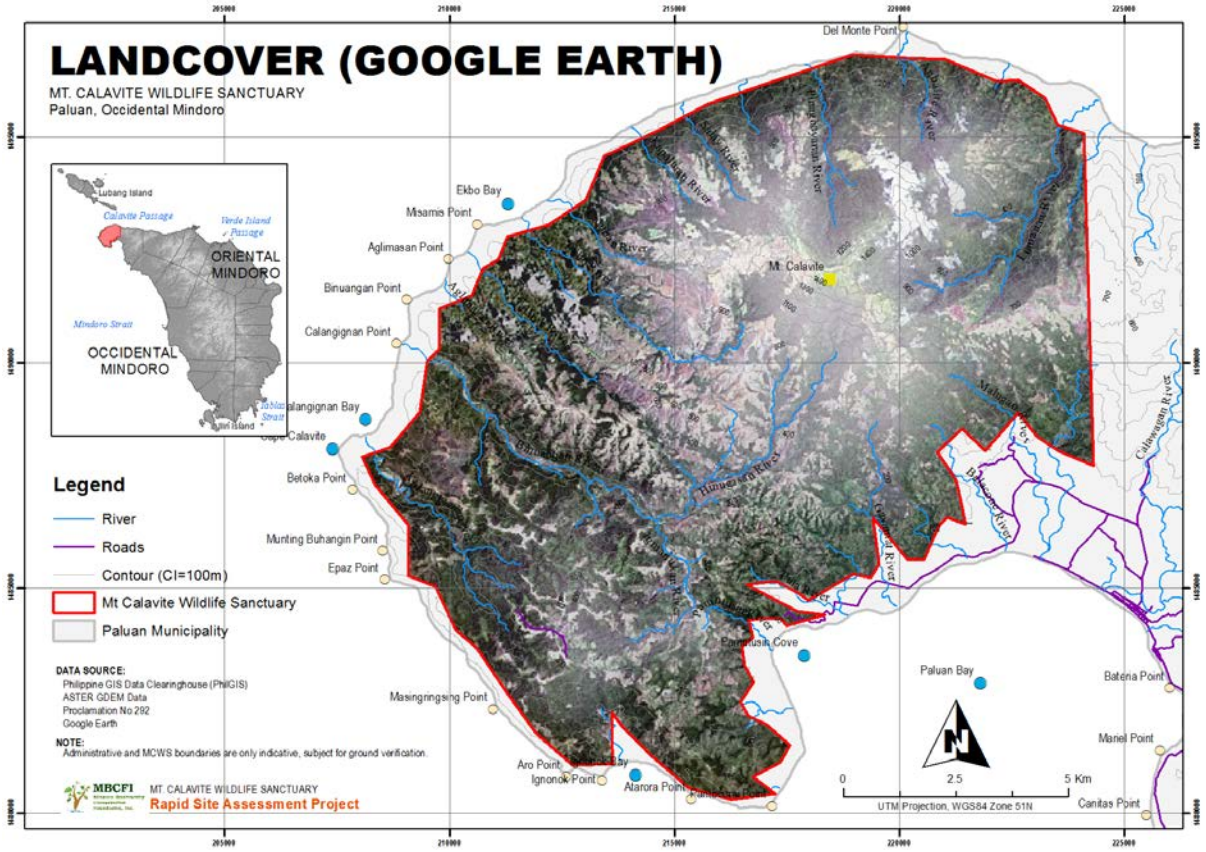

Figure 16. MCWS Google Earth Image

Table 9. Updated Land Cover Types of MCWS

Land Cover	Area (ha)	Percentage
Forest	12,504.64	76.51%
Brushland	1,507.14	9.22%
Grassland	2,299.69	14.07%
Agriculture	33.02	0.20%
Total	16,344.37	100.00%

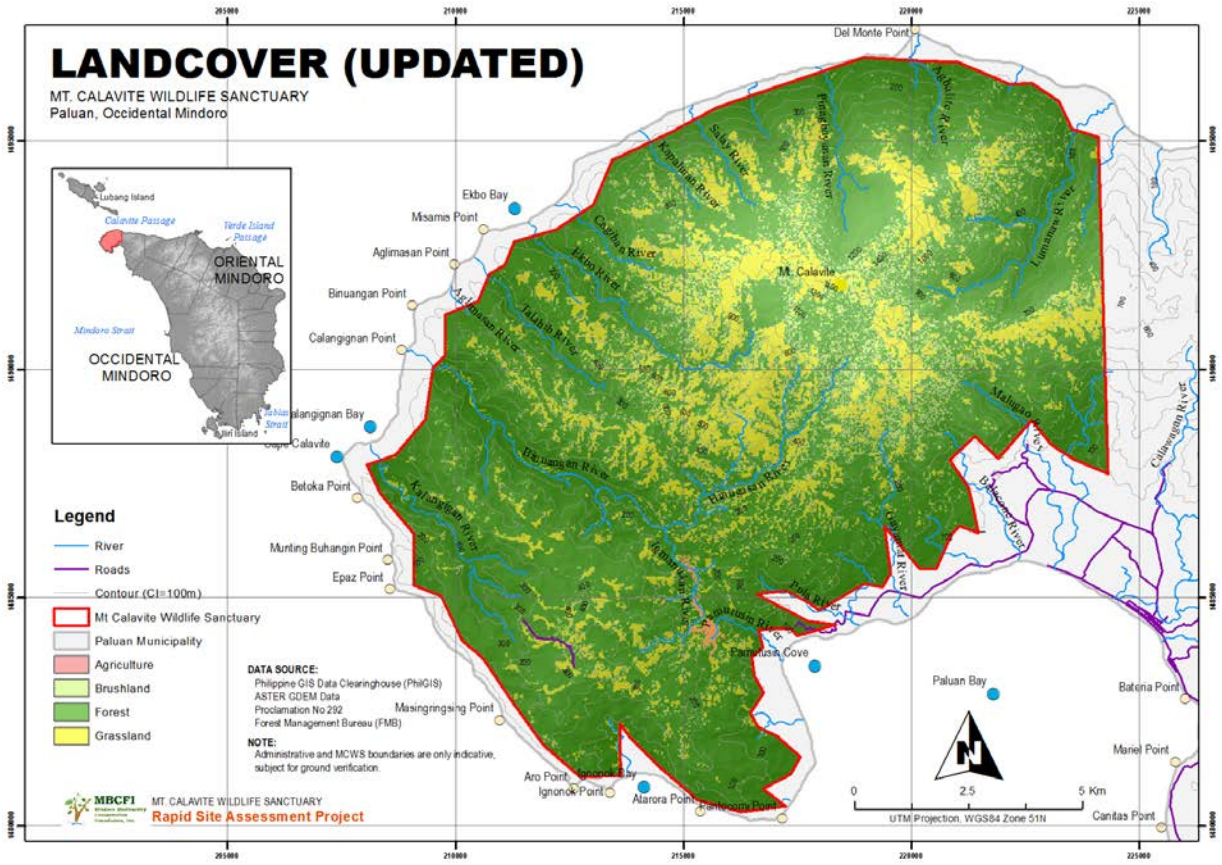

Figure 17. MCWS Updated Land Cover Map

1.i. Geo-Hazards

One of the major geo-hazards in MCWS is the presence of active and offshore fault lines surrounding it. The municipality of Paluan is bounded by the Lubang fault on the north, the Central Mindoro and Aglubang River fault lines on the southeast and the Manila Trench on the west (**Figure 18**). Though these fault lines are quite distant from MCWS, historical records of earthquake events showed otherwise. Since 1942, there were several earthquakes, with magnitude scale of >5.0, that were recorded in the area.

Two earthquakes, with magnitude scale of 6.0, happened in 1972 and 1994, one event, with magnitude scale of 6.7, in 1956, and two events, with magnitude scale of >7.0, were experienced in 1942 and 1994. In MCWS, there are two recorded earthquakes with both magnitude-scale of 5.2, one in 1968 and the other occurred in 1990. It can be observed in the figure that most of the earthquake data were located in Paluan, particularly along the Anduyanan and Ilomano mountains. Some earthquake records also show that these shocks happened near the shorelines of the area, thus signifying possible occurrence of tsunamis.

Aside from active fault lines, the flat areas of Paluan are also identified to be susceptible to subsidence. These areas are mainly situated at the southern parts of MCWS and near the coast of Paluan Bay. Problems on subsidence normally happen when large amount of groundwater have been excessively extracted, or withdrawn, from the aquifer. This may lead to many problems, such as changes in elevation, damage to structures and properties, and is known to increase potential of areas to flooding.

The groundtruthing activity also revealed some landslides in MCWS (**Figure 5.1.9.b**). These landslides were observed adjacent to the Hinugasan River, while others were found near the forest area. It was observed also that these events are located along steep slopes and some of which are exposed, hence becoming more susceptible to such incidence. Aside from landslide, kaingin areas were evident as well and these are mainly located in cogonal and some brushland areas.

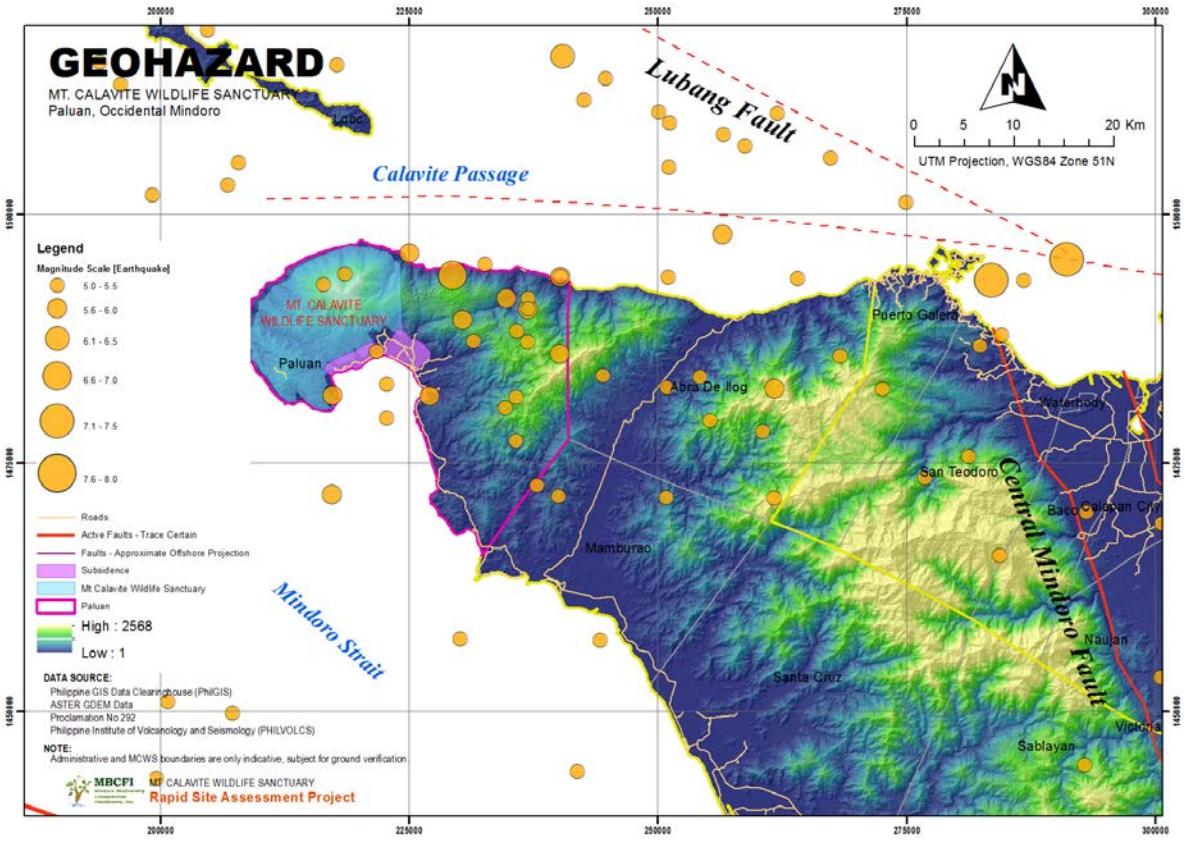

Figure 18. MCWS Geo-Hazard Map

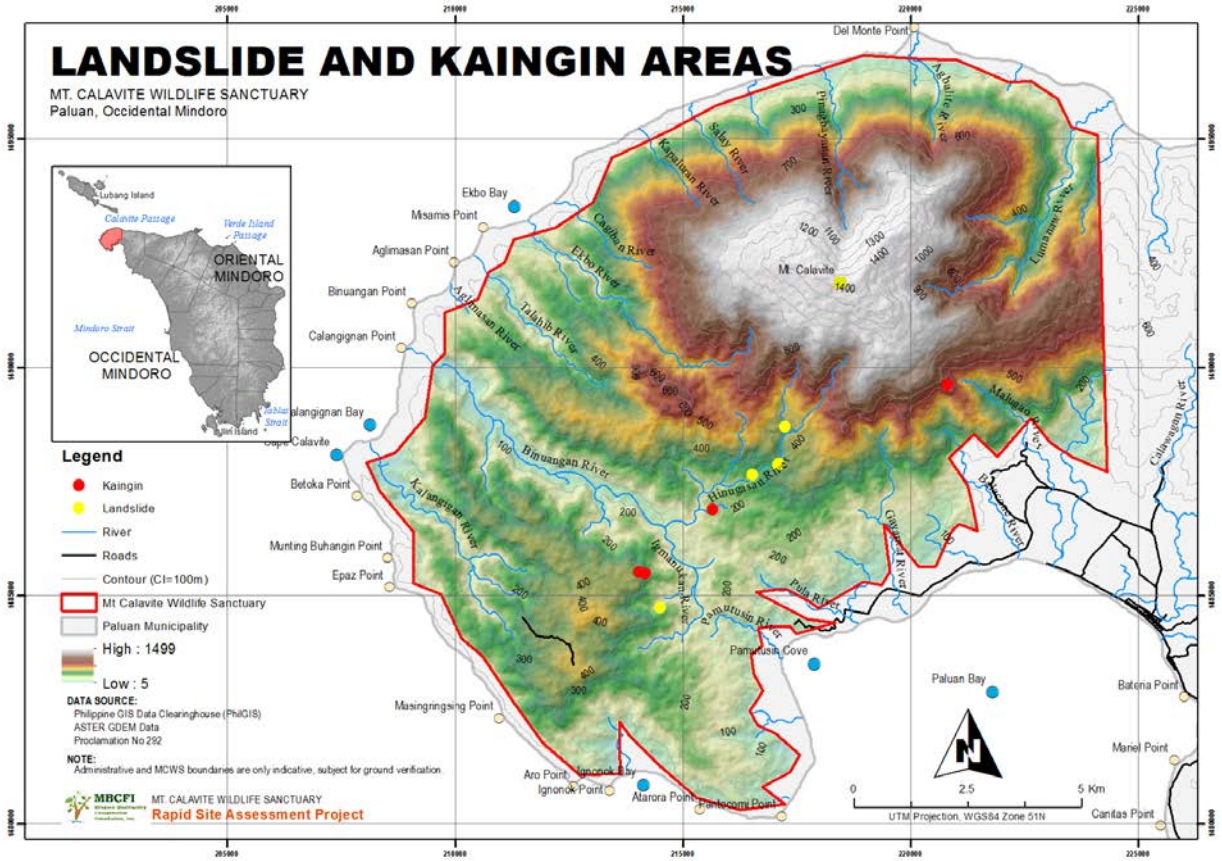

Figure 19. Landslide and Kaingin Areas Found in MCWS

1.j. Natural Attractions

The municipality of Paluan is bestowed with natural beauty and rich landscapes, ranging from its vast coasts to its lush mountain ecosystems. Some of the famous coastlines are the Paluan Bay, Pamutusin Cove and Ignonok Bay on the south-southwestern portions of MCWS, and Cape Calavite, Calangignan Bay and Ekbo Bay on the north-northwestern parts. On the other hand, some of the prominent mountains in Paluan are Mt. Calavite, Mt. Cabignayan, and the Anduyanan and Ilomano Mountains. In addition, the Calawagan Mini Falls and River Resort are also known attractions in Poblacion and Alipaoy that are frequented by tourists.

2. Biological Resources

This section of the RSEA presents the three components of the biological profiling – habitats and ecosystems, flora and fauna. The faunal component includes birds, mammals, amphibians and reptiles.

2.a. Habitats and Ecosystems

MCWS has several habitat types dominated basically by terrestrial habitats. The different forest types described in this section adopted the nomenclature used by Fernando *et al.* (2008). These habitats are the (a) tropical moist deciduous forest; (b) montane forest; (c) grassland; (d) freshwater ecosystems; and (e) agricultural areas.

Tropical Moist Deciduous Forest

Based on Fernando *et al*. (2008), the tropical moist deciduous forest is believed to occur in areas of seasonally drier climates and where water availability can be periodically limiting to plants and the forest. They further described that these forests are usually found in coastal hills, or at the leeward side of the mountains. The species found in this area are likely unbuttressed, low branching and form an uneven low canopy of often less than 30 m tall. Dipterocarp species are much less abundant here or even totally absent. This is also evident during the inventory in the site where only one Dipterocarp species was recorded, *Hopea acuminata*.

The remaining forests in MCWS are mostly regenerating and composed mostly of *Ochrosia oppositifolia* and *Leea indica*, both have the highest relative density in Binagyuhan and Ulasan, respectively. Other species that were found to have high relative density in MCWS are *Voacanga globosa*, *Lepisathes fruticosa*, *Knema glomerata*, *Premna cumingiana* and *Syzygium longiflorum*.

The local residents rely on the decidous forest for timber, may this be for household use, or for the temporary wooden bridges along roads connecting the barangays. Timber was illegally poached and was rampant in both Ulasan and Binagyuhan areas. Most of the residents use this domestically, but some individuals were rumored to sell timber in nearby places, such as Mamburao and Harrison. Many of the trees selectively poached were also important perching and nesting trees of canopy birds, such as theMindoro Hornbill, Green Imperial Pigeon and Blue-crowned Racquet-tail Parrot as well as mammals, like Long-tailed macaques.

The forest fragment also forms an integral source of water for the watersheds within MCWS. It serves as the main source of drinking water and water for agricultural production. The impacts of the loss of forests were already felt locally, with most of the rivers and streams have already dried up. Local residents are also aware that the flow of spring water is decreasing in volume, especially during dry period. In addition, the pond in Sitio Binagyuhan also serves as an important roosting site for the Vulnerable Philippine Duck *Anas luzonica* as well as wallowing grounds for carabaos of farmers.

Montane Forest

The montane forest in MCWS is confined to elevations above 1,000 masl. Patches of clumps of stunted trees, that were observed along gullies, sides of ridges and along side streams, form a network of montane forest vegetation. Lianas and climbing bamboo are dense while ferns and mosses are moderately dense. Clearings, created mostly from intentional burning of forest and grasslands, intersperse between patches of native vegetation. Due to bad weather condition during the time of the survey, the RSEA team was not able to sample the patches of montane forest above 1,100 m elevation, or visit the peak of the mountain.

Grassland

The grasslands in MCWS are mainly composed of *Imperata cylindrica, Chrysopogon aciculatus* and *Ischaemum rugosum*. In Binagyuhan area, *Imperata cylindrica* had the highest relative density, while in Ulasan area *Ischaemum rugosum* was found highest in terms of relative density. Other grasses that were observed in the MCWS are *Saccharum spontaneum, Axonopus compressus, Blumea balsamifera* and *Chromolaena odorata,* among others. These areas are mainly found along ridges near Mt. Calavite.

Grasslands appear to be important to a few individuals engaged in farming free-ranging cattle from the lowlands to the higher elevations of MCWS. Some communities, including the Iraya tribe of the Mangyan, practice small scale, or backyard farming, of free-ranging cattle. To a number of community members, cogon grass *Imperata cylindrica* appears to be an important local product as roof material for temporary shelters in the field and their homes. Most residents also burn the grass within their claim lots to initiate new growth of cogon grass for their goats, carabaos and cattle.

Agricultural Areas

Agricultural areas in MCWS are mainly found on its western portions and are usually planted with rice throughout the year. The rice fields are generally concentrated to flat sections close to the coast and in between hills and mountains. Other agricultural areas are confined in gentle to moderate slopes. These areas are planted with cassava *Manihot esculenta* and bananas. Some fruit trees, like jackfruit, mangoes and tubers, are also grown in backyard farms and orchards.

Freshwater Ecosystems

The freshwater ecosystems found in MCWS include ponds and numerous networks of rivers and streams. There are a number of major river systems and creeks emanating from MCWS. One of the major rivers in the area is Calawagan River. The water source of the river is the 50-meter high Batinglay falls.

A small pond – Igmanukan Lake close to Binagyuhan was observed to be a roosting site for the threatened endemic Philippine Duck *Anas luzonica* and other species of waterbirds. The surrounding vegetation of the pond is already converted to rice paddies with few *Nauclea* trees left standing close to the banks.

2.b. Flora

A total of 42 species, 39 genera, and 22 families were recorded in a forested area at Binagyuhan. *Ochrosia oppositifolia* (family Apocynaceae) has the highest number of individuals (RD=13.75%). *Knema glomerata* (family Myristicaceae) exhibited the highest frequency (4.68%) (**Table 10**).

Table 10. Relative Density, Relative Frequency, Relative Dominance, and Importance Value of Species (Forest at Binagyuhan, MCWS)

Family	Species	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Alangiaceae	*Alangium meyeri* Merr.	1.25	1.56	3.6	6.41
Anacardiaceae	*Buchanania arborescens* Blume	1.25	1.56	1.28	4.09
	Koordersiodendron pinnatum (Blco.) Merr.	3.75	3.12	1.74	8.61
	Mangifera indica L.	1.25	1.56	1.15	3.96
	Semecarpus cuneiformis Blco.	1.25	1.56	1.97	4.78
Annonaceae	*Mitrephora lanotan* (Blco.) Merr.	1.25	1.56	0.91	3.72
	Polyalthia mindorensis Merr.	1.25	1.56	3.52	6.33
	Polyalthia oblongifolia C.B. Rob	1.25	1.56	2.76	5.57
	Polyalthia suberosa (Roxb.) Thw	1.25	1.56	2.03	4.84
	Uvaria sorzogonensis Presl	1.25	1.56	3.54	6.35
Apocynaceae	*Ochrosia oppositifolia* (Lam.) K. Schum.	13.75	3.12	1.06	17.93
Caesalpinaceae	*Intsia bijuga* (Colebr.) O. Ktze.	1.25	1.56	4.07	6.88
Combretaceae	*Terminalia catappa* L.	1.25	1.56	2.87	5.68
Euphorbiaceae	*Antidesma montanum* Blume	1.25	1.56	1.3	4.11
	Bischofia javanica Bl.	1.25	1.56	4.2	7.01
	Glochidion album (Blco.) Boerl.	1.25	1.56	0.93	3.74
	Macaranga grandifolia (Blanco) Merr.	2.5	3.12	2.1	7.72
	Mallotus mollissimus	2.5	1.56	2.55	6.61
Icacinaceae	*Gomphandra cumingiana*	1.25	1.56	0.57	3.38
Lauraceae	*Cryptocarya glauca* Merr.	1.25	1.56	3.03	5.84
Lecythidaceae	*Barringtonia racemosa* (L.) Blume ex DC.	1.25	1.56	2.61	5.42
Meliaceae	*Chisocheton pentandrus* (Blco.) Merr.	1.25	1.56	4.18	6.99
Mimosaceae	*Archidendron clyperia*	1.25	1.56	0.75	3.56

Moraceae	*Artocarpus blancoi* (Elm.) Merr.	2.5	3.12	1.13	6.75
	Ficus merrittii Merr.	2.5	1.56	2.42	6.48
	Ficus septica Burm. f.	2.5	1.56	0.77	4.83
Myristicaceae	*Knema glomerata* (Blco.) Merr.	5	4.68	2.71	12.39
	Myristica philippinensis Lam.	1.25	1.56	4.99	7.8
Myrtaceae	*Syzygium longiflorum* Presl	1.25	1.56	4.42	7.23
Rhamnaceae	*Alphitonia zizyphoides*	1.25	1.56	1.88	4.69
Rhizophoraceae	*Carallia brachiata* (Lour.) Merr.	1.25	1.56	1.9	4.71
Sapindaceae	*Dimocarpus longan* Lour.	3.75	4.68	2.34	10.77
	Euphoria didyma Blco.	1.25	1.56	0.59	3.4
	Pometia pinnata Forst.	1.25	1.56	4.58	7.39
Sterculiaceae	*Herritiera littoralis* Ait.	1.25	1.56	2.32	5.13
	Pterospermum diversifolium Blume	2.5	3.12	3.18	8.8
	Pterospermum obliquum Blco.	3.75	4.68	0.89	9.32
	Tarrietia sylvatica (Vid.) Merr.	2.5	3.12	2.52	8.14
Ulmaceae	*Celtis luzonica* Warb.	3.75	4.68	3.24	11.67
Urticaceae	*Pipturus arborescens* (Link) C. B. Rob.	1.25	3.12	1.44	5.81
Verbenaceae	*Premna cumingiana* Schauer	5	3.12	1.97	10.09
	Vitex parviflora Juss.	2.5	3.12	1.95	7.57

Based on importance value, the 10 most important species are listed in **Table 11.** Importance value was computed by summing up the values for relative density, relative frequency and relative dominance.

Table 11. Ten Most Common Species in Forested Area in Brgy. Binagyuhan (MCWS) Based on Importance Value

Species	Family	Importance Value
1. Ochrosia oppositifolia	Apocynaceae	17.93
2. Knema glomerata	Myristicaceae	12.93
3. Celtis luzonica	Ulmaceae	11.67
4. Dimocarpus longan	Sapindaceae	10.77
5. Premna cumingiana	Verbenaceae	10.09
6. Pterospermum obliquum	Sterculiaceae	9.32
7. Pterospermum diversifolium	Sterculiaceae	8.80
8. Koordersiodendron pinnatum	Anacardiaceae	8.61

9. Tarrietia sylvatica	Sterculiaceae	8.14
10. Myristica philippinensis	Myristicaceae	7.80

The grassland community at Binagyuhan (**Table 12**) is an association of *Imperata cylindrica* (cogon) - *Chrysopogon aciculatus – Saccharum spontaneum* with scattered clumps of shrubs (*Blumea balsamifera*, *Mussaenda* sp.), herbaceous members of families Asteraceae, and weed species belonging to families Asteraceae, Lamiaceae, Mimosaceae, and Papilionaceae. Climbing ferns like *Lygodium circinatum* form part of the grassland community. A total of 17 species, 14 genera and 8 families were recorded for the 50 m transect in the grassland at Binagyuhan.

Table 12. Relative Density, Relative Height, Relative Frequency and Importance Value of Species (Grassland community in Binagyuhan, Mt. Calavite at 50 m Transect)

Family	Species	Relative Density	Relative Height	Relative Frequency	Importance Value	Rank
Monocots						
Poaceae	*Chrysopogon aciculatus*	14.76	4.73	7.89	27.38	3
	Imperata cylindrical	63.41	41.88	10.53	115.82	1
	Saccharum spontaneum	0.57	7.27	7.89	15.73	7
Dicots						
Apocynaceae	*Alstonia scholaris*	0.08	6.07	2.63	8.78	10
Asteraceae	*Blumea balsamifera*	0.73	4.9	7.89	13.52	8
	Blumea laciniata	10.85	2.56	13.16	26.57	4
	Chromolaena odorata	7.07	4.73	13.16	24.96	5
	Mikania cordata	0.08	1.51	2.63	4.22	15
Lamiaceae	*Hyptis brevipes*	0.16	1.51	2.63	4.3	16
	Hyptis spicigera	0.04	1.64	2.63	4.31	14
Mimosaceae	*Mimosa pudica*	0.04	3.79	2.63	6.46	13
Papilionaceae	*Crotalaria albida*	0.24	2.42	5.26	7.92	12
	Desmodium triflorum	0.41	0.83	2.63	3.87	17
Rubiaceae	*Morinda bracteata*	0.28	5.54	2.63	8.45	11
	Mussaenda sp.	0.04	10.36	2.63	13.03	9
Ferns						
Schizaeaceae	*Lygodium circinatum*	0.04	32.87	2.63	35.54	2
	Lygodium japonicum	1.18	5	10.53	16.71	6

The 10 most important species in the grassland at Binagyuhan in terms of importance value are presented in **Table 13**. Cogon grass has the highest importance value, being the most dominant species in the area. Of the top 10 species, three are favored for forage material (sprouts of Cogon grass after burning; *Saccharum spontaneum* and *Chrysopogon aciculatus*) to free-ranging ruminants, like cattle and goats.

Table 13. Ten Most Common Species in Grassland Ecosystem in Binagyuhan (MCWS) Based on Importance Value

Species	Family	Importance Value
1. Imperata cylindrical	Poaceae	115.82
2. Lygodium circinnatum	Schizaeceae	35.54
3. Chrysopogon aciculatus	Poaceae	27.38
4. Blumea laciniata	Asteraceae	26.57
5. Chromolaena odorata	Asteraceae	24.96
6. Lygodium japonicum	Schizaeceae	16.71
7. Saccharum spontaneum	Poaceae	15.73
8. Blumea balsamifera	Asteraceae	13.52
9. Mussaenda sp.	Rubiaceae	8.45
10. Alstonia scholaris	Apocynaceae	8.78

In the second site in Sitio Ulasan, a total of 44 species of flowering plants, 38 genera and 23 families were recorded (**Table 14**). The following species has the most number of individuals: *Leea indica* (13.2%), *Voacanga globosa* (9.9%), and *Lepisanthes fruticosa* (4.62%).

Table 14. Relative Frequency, Relative Density, Relative Dominance and Importance Value of Species (Forest at Ulasan, MCWS)

Family	Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value	Rank
Anacardiaceae	*Mangifera indica* L.	1.98	1.98	4.74	8.7	9
	Semecarpus cuneiformis Blco.	2.97	3.3	1.55	7.82	14
Annonaceae	*Goniothalamus dolichocarpus* Merr.	3.96	3.3	2.07	9.33	7
	Tabernaemontana mucronata Merr.	0.99	3.3	1.06	5.35	23
Apocynaceae	*Tabernaemontana subglobosa*	2.97	3.3	1.04	7.31	18
	Voacanga globosa (Blco.) Merr.	8.91	9.9	1.21	20.02	2
Boraginaceae	*Cordia dichotoma* Forst. f.	2.97	1.98	4.41	9.36	6
Crpyteroniaceae	*Crypteronia paniculata* Bl. *var. paniculata*	0.99	0.66	1.07	2.72	36
Dipterocarpaceae	*Hopea acuminata* Merr.	0.99	0.66	3.7	5.35	23
Euphorbiaceae	*Antidesma bunius* (L.) Spreng.	3.96	3.96	1.28	9.2	8
	Antidesma ghaesambilla Gaertn.	1.98	1.98	1.36	5.32	24

	Bischofia javanica Bl.	1.98	1.32	5.12	8.42	10
	Glochidion album (Blco.) Boerl.	1.98	3.3	2.16	7.44	17
	Macaranga bicolor Muell.- Arg.	0.99	0.66	2.53	4.18	29
	Securinega flexuosa Muell.-Arg.	0.99	0.66	2.88	4.53	27
	Macaranga tanarius (L.) Muell.-Arg.	0.99	0.66	1.86	3.51	33
Lauraceae	*Cryptocarya oblongata* Merr.	0.99	0.66	1.06	2.71	37
Leeaceae	*Leea indica* (Burm. f.) Merr.	9.9	13.2	1.52	24.62	1
Lecythidaceae	*Barringtonia racemosa* (L.) Spreng.	2.97	2.64	2.03	7.64	15
Moraceae	*Broussonetia luzonica*	0.99	0.66	3.74	5.39	22
	Ficus gul Laut. & K. Schum.	0.99	0.66	1.06	2.71	37
	Ficus merrittii Merr.	0.99	0.66	1.06	2.71	37
	Ficus septica Burm. f.	2.97	3.96	1.11	8.04	13
	Streblus ilicifolius (Vid.) Corner	2.97	1.98	1.68	6.63	20
Myristicaceae	*Horsfieldia merrillii* Warb.	0.99	0.66	0.72	2.37	40
Myrtaceae	*Syzygium longiflorum* Presl	4.95	6.6	1.74	13.29	5
Papilionaceae	*Milletia ahernii* Merr. & Rolfe	0.99	0.66	6.48	8.13	12
	Pongamia pinnata (L.) Merr.	0.99	3.3	2.29	6.58	19
Rhizophoraceae	*Carallia brachiata* (Lour.) Merr.	0.99	0.66	2.18	3.83	30
Rubiaceae	*Gardenia merrillii* Elm.	2.97	1.98	1.03	5.98	21
	Morinda bracteata Roxb.	1.98	1.32	1.46	4.76	26
	Psychotria luzoniensis (Cham. & Schlecht.) F. - Vill.	0.99	0.66	0.75	2.4	39
Sapindaceae	*Lepisanthes fruticosa* Roxb.	5.94	4.62	2.82	13.38	4
	Pometia pinnata J.R. & G. Forst.	0.99	0.99	0.7	2.68	35
Sapotaceae	*Mimusops parviflora* R. Br.	0.99	0.66	0.92	2.57	38
Sterculiaceae	*Pterocymbium tinctorium* (Blco.) Merr.	1.98	1.32	13.31	16.61	3
	Pterospermum	3.96	2.64	1.77	8.37	11

	diversifolium Bl.					
	Pterospermum obliquum Blco.	0.99	1.98	1.43	4.4	28
	Pometia pinnnata Forst.	0.99	0.66	1.06	2.71	37
Symplocaceae	*Symplocos polyandra* (Blco.) Brand	0.99	1.32	1.02	3.33	34
Ulmaceae	*Celtis luzonica* Warb.	0.99	0.66	3.27	4.92	25
Urticaceae	*Dendrochnide meyeniana* (Wedd.) Chew	0.99	0.66	1.88	3.53	32
Verbenaceae	*Premna nausea* Blco.	2.97	1.98	2.61	7.56	16
	Vitex parviflora Juss.	0.99	1.32	1.24	3.55	31

The lower slopes and gullies of the site in Ulasan are mostly composed of abandoned clearings (20-30 years old) that had regrown into second growth. The ridges are mostly regenerating secondary forest, too. In steep slopes, forest patches are mostly secondary forest. This is evident by looking at the 10 most important species in the forested area at Sitio Ulasan, as listed in **Table 15**. The *Leea indica* has the highest importance value, as this species is more characterize as second growth and regenerating secondary forest. This was followed by *Voacanga globosa, Pterocymbium tinctorium, Lepsanthes fruticosa* and *Sysygium longiforum.* All these species favor dry to semi-dry deciduous forests and mostly located in forest edges or regenerating habitats. The rest of the species also characterize as secondary forest and semi-dry deciduous types of habitats.

Table 15. Ten Most Important Species in Forested Area in Sitio Ulasan (MCWS) Based on Importance Value

Species	Family	Importance Value
Leea indica	Leeaceae	24.62
Voacanga globosa	Apocynaceae	20.02
Pterocymbium tinctorium	Sterculiaceae	16.61
Lepisanthes fruticosa	Sapindaceae	13.38
Syzygium longiflorum	Myrtaceae	13.29
Cordia dichotoma	Boraginaceae	9.36
Goniothalamus dolichocarpus	Annonaceae	9.33
Antidesma bunius	Euphorbiaceae	9.20
Mangifera indica	Anacardiaceae	8.70
Bischofia javanica	Euphorbiaceae	8.42

For the grassland ecosystem, a total of 24 species, 24 genera and 13 families were recorded (**Table 16**). The grassland community at Sitio Ulasan is an association of *Imperata cylindrica* (cogon)- *Chrysopogon aciculatus – Ischaemum rugosum* and patches of medium-sized, fire-resistant trees, like *Antidesma ghaesembilla*. More dicot weed families were recorded at Ulasan compared with Binagyuhan. In both sites, the commonest species is *Imperata cylindrica*, so common that these grasslands can be called "cogonales."

Table 16. The Grassland Community at Sitio Ulasan, MCWS

Family	Species	Relative Density	Relative Height (cm)	Relative Frequency	Importance Value	Rank
Poaceae	*Axonopus compressus*	0.19	1.77	1.82	3.78	23
	Chrysopogon aciculatus	3.94	3.42	7.27	14.63	7
	Imperata cylindrical	5.05	2.3	9.09	16.44	6
	Ischaemum rugosum	71.81	1.2	9.09	82.1	1
	Paspalidium flavidum	0.08	3.18	1.82	5.08	16
	Poa annua	0.08	4.22	1.82	6.12	14
Cyperaceae	*Fimbristylis dichotoma*	0.12	2.91	1.82	4.85	18
Asteraceae	*Blumea laciniata*	11.75	1.13	7.27	20.15	4
	Chromolaena odorata	2.55	5.14	9.09	16.78	5
	Elephantopus tomentosus	0.31	5.71	3.64	9.66	10
Asteraceae	*Vernonia cinerea*	0.16	0.97	1.82	2.95	24
Convolvulaceae	*Merremia tridentate*	0.16	3.15	1.82	5.13	15
Euphorbiaceae	*Antidesma ghaesambilla*	0.19	6.35	3.64	10.18	9
	Phyllanthus amarus	0.08	1.93	1.82	3.83	22
Malvaceae	*Sida rhombifolia*	0.08	2.88	1.82	4.78	19
Mimosaceae	*Mimosa pudica*	0.35	5.88	1.82	8.05	13
Myrtaceae	*Psidium guajava*	0.16	5.21	3.64	9.01	12
	Syzygium cumingii	0.19	14.89	5.45	20.53	3
Papilionaceae	*Alysicarpus nummularifolius*	0.55	0.83	3.64	5.02	17
	Crotalaria albida	0.16	2.36	1.82	4.34	21
	Desmodium triflorum	1.57	10.49	9.09	21.15	2
Rubiaceae	*Morinda citrifolia*	0.12	9.69	1.82	11.63	8
Verbenaceae	*Stachytarpheta jamaicensis*	0.23	3.67	5.45	9.35	11
Schizaeceae	*Lygodium japonicum*	0.12	0.69	3.64	4.45	20

The ten most important species in the grassland ecosystem of Sitio Ulasan based on importance value is shown in (**Table 17**).

Table 17. Ten Most Important Species in Grassland Ecosystem in Sitio Ulasan, MCWS Based on Importance Value

Species	Family	Importance Value
1.*Ischaemum rugosum*	Poaceae	82.10
2.*Desmodium triflorum*	Papilionaceae	21.15
3.*Syzygium cumingii*	Myrtaceae	20.53
4.*Blumea laciniata*	Asteraceae	20.15
5.*Chromolaena odorata*	Asteraceae	16.78
6. *Imperata cylindrical*	Poaceae	16.44
7. *Chrysopogon aciculatus*	Poaceae	14.63
8. *Morinda citrifolia*	Rubiaceae	11.63
9. *Antidesma ghaesambilla*	Euphorbiaceae	10.18
10.*Elephantopus tomentosus*	Asteraceae	9.66

For both forested areas (Binagyuhan and Ulasan combined), a total of 30 families, 62 genera and 73 species were recorded in the two sites. Species of *Hopea acuminata* (Dipterocarpaceae) was present at Ulasan site. The site should be protected to allow the survival, growth and reproduction of *Hopea.* *Carallia brachiata*, a mangrove species, was also observed in Binagyuhan. Majority of the tree species encountered within the quadrats and also those located outside of the quadrats have economic significance.

The forested areas in present study sites contribute to a great extent to the conservation of biodiversity by providing habitat for plants and food for animals and as sources of propagules for the expansion of the forest.

Among the fruit-bearing trees utilized by bats and birds are *Ficus septica, Ficus merilli, Ficus gul* and *Antidesma bunius*. These trees naturally attract wildlife that would in turn bring with them ingested seeds from other locality and could facilitate forest regeneration. These are the trees that would be more important to be included in the National Greening Program (NGP) of the government to encourage natural regenerataion.

Bayog or *Pterospernum diversifolium, Premna cumingiana, Metrephora lanotan, Polyalthia oblongifolia, Vitex parviflora, Occhrosia oppositifolia* and *Sysygium longiforum* are among the canopy and emergent tree species frequently econcountered in both areas. These trees, also to some extent, shape the structure of the regenerating deciduous forests. The changes in the canopy and emergent tree structure of MCWS would also be another means of monitoring changes in the forest quality and in the habitat types.

Among the more important trees for roosting and nesting are also trees that are heavily favored for timber use. These are species that are considered as framework species – trees that give shape and structure to the forests – as well as regulated by the law and should be protected. The protection and loss of these remaining trees would have detrimental effects to the remaining wildlife as well as to the quality of the forest.

The grassland communities in the two sites typically represent the most common type, locally called as "cogonales." Dominant stands of *Imperata cylindrica* have been observed in both sites. Typical of any tropical grassland are patches of fire-resistant trees and clumps of shrubs and herbs.

The indigenous communities use a variety of plants with medicinal properties. **Table 18** provides a list of plants frequently used for common ailments, as mentioned by FGD respondents from Sitios Ulasan, Binagyuhan and Pamuntusin.

Table 18. List of Medicinal Plants Recorded in MCWS

Growth Habit	Local Name	Uses
Tree	Baligtarin	Cough
	Kalingog	Cough, stomach ache
	Amuyong (seed from a tree)	Stomach ache, acidity
	Bayabas	Diarhea, disinfectant of wounds
	Tuay	Bark is used for burns
	Balite	Water (sap) used for sprains
	Putat	Cough
	Yapyap	Burned and put in wounds
	Kasoy	Diarhea
	Manga	Diarhea
	Abilo	Nausea
	Kalamansi	Cough
	Dayap	Cough
	Barokan	Dagta is used an antipyretic and analgesic like 'Medicol'
	Alamag	Chills
	Bayag ano	Pigsa (boil)
	Malungay	Rabies, snake bite
	Kaimito	Diarhea
	Duhat	Diarhea
	Awili	Head ache
	Anonang	Pasma
	Tuba	Head ache, sprain (nabalian)
	Sambong	Nalulula
Vine	Pugod	Cough
	Balingway (rattan)	Stops bleeding for women who have given birth
Shrub	Sibukaw (sapang)	Cough, pilay (sprain)
Herb	Luya (Ginger)	Stomach ache,
	Luyang dilaw (turmeric)	Boil, bukol
	Lubigan	Rabies, stomach ache, snake bite

Threatened Endemic Species

A total of 19 species of Philippine endemic species were recorded in MWCS. Of these, three species are threatened *Mitrephora lanotan, Polyalthia oblongifolia* and *Intsia bijuga* and three endemic species *Polyalthia mindorensis, Mussaenda magallanensis* and *Hypoetes mindorensis*.

The Ipil tree *Intsia bijuga* was the most sought after for its ironwood quality of timber. This tree can only be found in lowland areas - from beach to deciduous forest – and is most vulnerable to timber poaching and habitat loss. A number of mature individuals (some were mother trees) were encountered in MCWS that would be good sources of seedlings for propagation. This tree grows well in semi-dry conditions and is a light-loving species, making it also a good species for habitat rehabilitation.

2.c. Fauna

Adequacy of sampling

The species accumulation curve for both sites visited showed a gradual increase in the number of observed species on per day observation in site 1 (Binagyuhan). The graph presented in **Figure 20** showed a flat line in the first few days, largely due to the bad weather condition, thus limiting observations. The rapid increase in the number of species observed was attributed to change in sampling location. There were still new birds encountered even towards the end of the survey, indicating a need for additional sampling effort.

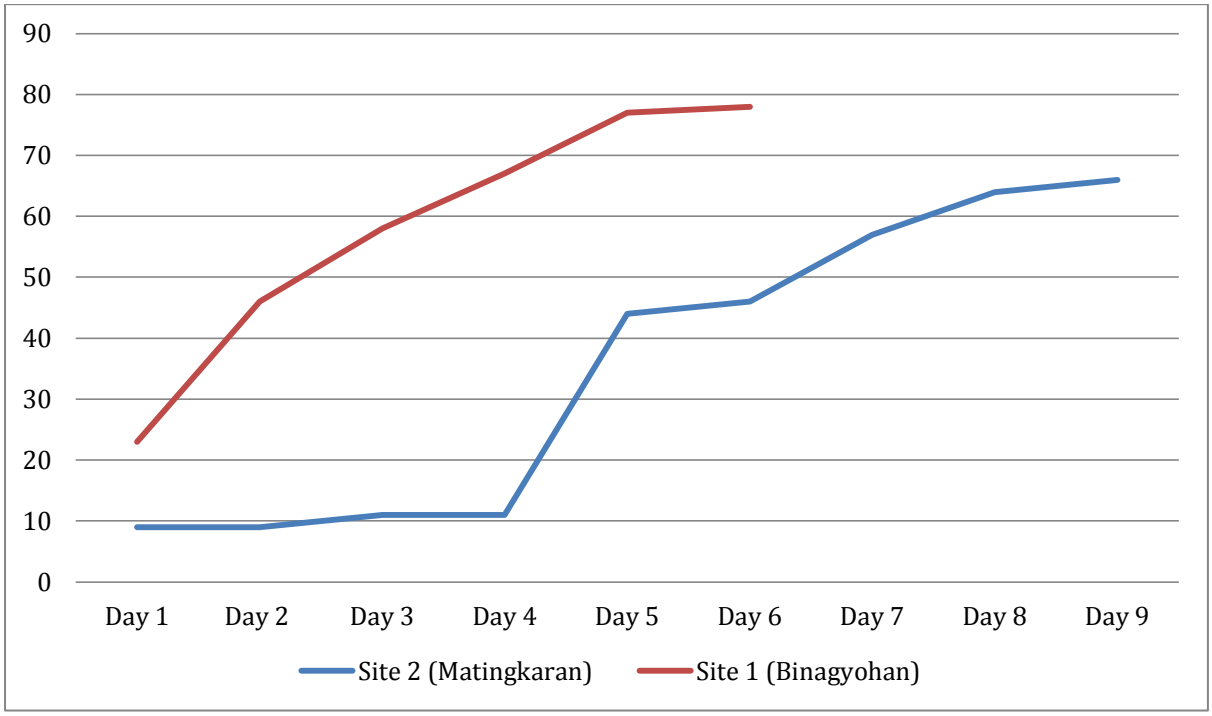

Figure 20. Species Accumulation Curve Based on Bird Observations Conducted in Two Sites in MCWS

2.c.1. Birds

Endemic and Threatened Birds of Mindoro and MCWS

A total of 261 species of birds (including migratory waterbirds) had been recorded in Mindoro (Kennedy *et al.,* 2000; Gonzales *et al.,* 1996; Dickinson *et al.,* 1991; Evans *et al.,* 1991) of which 15 species are threatened. Of the 15 threatened birds, 11 are restricted-range species and seven of which are endemic only to Mindoro (Collar *et al.,* 1999; Evans *et al.,* 1991; Dickinson *et al.,* 1990) (**Table 19**).

Table 19. Threatened Endemic Birds of Mindoro and MCWS

Species	Endemicity	Conservation Status	Main Habitat
Philippine Duck *Anas luzonica*	E	Vu	Wetlands
Philippine Hawk Eagle *Spizaetus philippensis*	E	Vu	Forest
Mindoro bleeding-heart pigeon *Gallicolumba platenae*	RR	Cr	Lowland forest
Mindoro Imperial-pigeon *Ducula* *mindorensis*	RR	Vu	Montane forest
Spotted Imperial pigeon *Ducula carola*	E	Vu	Forest
Philippine Cockatoo *Cacatua haematuropygia*	E	Cr	Lowland forest
Black-hooded Coucal *Centropus steerii*	RR	Cr	Lowland forest
Mindoro Scops Owl *Otus mindorensis*	RR	Nt	Montane forest
Mindoro Hawk Owl *Ninox mindorensis*	RR	Vu	Lowland forest
Mindoro Hornbill *Penelopides mindorensis*	RR	En	Lowland forest
Mountain Shrike *Lanius validirostris*	RR	Nt	Montane forest
Ashy Thrush *Zoothera cinerea*	RR	Vu	Lowland forest
Luzon Water-Redstart *Rhyacornis bicolor*	RR	Vu	Montane forest
Green-backed Whistler *Pachycephala albiventris*	RR	Lc	Forest
Scarlet-collared Flowerpecker *Dicaeum retrocinctum*	RR	Vu	Lowland forest

E – endemic; RR – restricted-range; CR – Critically Endangered; EN – Endangered; nt – near-threatened; lc – least concern. Species in bold are endemic to Mindoro.

Of the 12 threatened endemic species of Mindoro, seven were recorded in MCWS. These are the (a) IUCN Endangered Mindoro Hornbill (b) IUCN near-threatened Mindoro Hawk Owl; (c) IUCN Vulnerable Philippine Hawk Eagle; (d) IUCN Vulnerable Philippine Duck; (e)

IUCN Vulnerable Scarlet-collared Flowerpecker; (f) IUCN Critically Endangered Black-hooded Coucal; and (g) IUCN Vulnerable Mindoro Imperial-pigeon.

A total of 63 individuals of the Vulnerable Philippine Duck were observed on a small pond between Sitio Hinugasan and Sitio Pamutusin on the morning of 12 February 2013. Majority of the individuals observed are adults and apparently were utilizing the pond as a roosting area. Local residents have reported up to more than a 100 individuals of Philippine Duck and may at times be accompanied by other species during migratory season.

Calls of the skulking Critically Endangered Black-hooded Coucal were regularly heard near Sitio Ulasan. Four individuals were observed singly on different dates along the trail from Sitio Ulasan to Balingbingan. A deep call was also heard once near Sitio Hinugasan. One individual was observed searching for insect in a dense vegetation in a secondary forest at 220 meter elevation in Ulasan.

Subspecies Endemic to Mindoro

Mindoro also supports a number of endemic subspecies with the degree of distinctiveness varying from minor to major differences. Evans *et al. (*1991) listed a total of 15 endemic subspecies of birds. One of the species listed – Philippine Hawk Owl *Ninox philippensis mindorensis*– has been elevated into full species, Mindoro Hawk Owl *Ninox mindorensis* (Rasmussen *et al.*, 2012). **Table 20** lists the remaining 14 subspecies of birds endemic to Mindoro.

Table 20. Endemic Subspecies of Birds in Mindoro

English Name	Scientific Name
Blue-crowned Racquet-tail Parrot	*Prioniturus discurus mindorensis*
Philippine Hanging parakeet	*Loriculus philippensis mindorensis*
Philippine Coucal	*Centropus viridis mindorensis*
White-bellied Woodpecker	*Dryocopus javensis mindorensis*
Bar-bellied Cuckooshrike	*Coracina mindanensis elusa*
Philippine Bulbul	*Hypsipetes philippinus mindorensis*
White-browed Shortwing	*Brachypteryx montana mindorensis*
Island Thrush	*Turdus poliocephalus mindorensis*
Tawny Grassbird	*Megalurus timoriensis mindorensis*
Mangrove Blue Flycatcher	*Cyornis rufigastra mindorensis*
Green-backed Whistler	*Pachycephala plateni mindorensis*
Mountain Shrike	*Lanius validostris tertius*
Golden-yellow White-eye	*Zosterops nigrorum mindorensis*
Mountain White-eye	*Zosterops montanus halconensis*

Of the endemic subspecies of birds listed in Mindoro, a total of nine endemic subspecies were observed in MCWS. These includes the (a) Blue-crowned Racquet-tail parrot; (b) Philippine Hanging Parakeet; (c) Philippine Coucal; (d) White-bellied Woodpecker; (e) Bar-bellied Cuckooshrike; (f) Philippine Bulbul; (g) Tawny Grassbird; (h) Mangrove Blue Flycatcher; and (i) Golden-yellow White-eye. The most distinctive subspecies encountered was the Philippine Bulbul, whose morphological appearance and calls are very different from the rest

of the Philippine Bulbuls in the country. The Mangrove Blue Flycatcher also has a distinctive call and the coloration of the female is significantly different from the rest of the subspecies.

Mist-netted Birds in MCWS

A total of 11 species of birds were mist-netted in two sites in MCWS (**Table 21**). The low captures were largely due to the strong winds, bad weather condition and the areas visited were disturbed. Of the 11 species, Balicassiao was the most frequently captured species followed by the Philippine Bulbul. The rest of the other species were represented with single captures.

The RSEA team was not able to record presence of high elevation species, including the Mindoro endemic, such as the Mindoro Scops Owl and Mindoro Imperial Pigeon as well as Green-backed Whistler, Mountain Shrike and White-browed Shortwing. This was largely due to bad weather during the time of sampling at higher elevation.

Table 21. Mist-netted Birds in MCWS

Species Name	Site 1	Site 2	Total Individuals
Balicassiao	6		6
Besra	1		1
Common Emerald Dove	1		1
Elegant Tit		1	1
Mangrove Blue Flycatcher	1	1	1
Philippine Bulbul	3	2	5
Mindoro Hornbill	1		1
Scarlet-collared Flowerpecker	1		1
White-eared Brown Dove	1	1	2
White-throated Kingfisher	1	1	2
Yellowish White-eye		1	1
TOTAL	16	7	23

A total of 109 species of birds were observed in MCWS. Of these, seven are Mindoro threatened endemic and 12 are migratory species. Among the species, the most frequently encountered birds were the Philippine Bulbul, Balicassiao, White-eared Brown Dove and Olive-backed Sunbird. Of the migratory species, the most significant observations were the recording of the Japanese Paradise Flycatcher, Chinese Egret and the Changeable Hawk Eagle.

Threatened Birds of Mt. Calavite

The 'IUCN Critically Endangered' Mindoro Bleeding-heart Pigeon *Gallicolumba platenae,* 'IUCN Vulnerable' Spotted Imperial Pigeon *Ducula carola,* 'IUCN Endangered' Mindoro Hornbill *Penelopides mindorensis* and 'IUCN Vulnerable' Scarlet-collared Flowerpecker *Dicaeum retrocinctum* were collected in the eastern slopes of MCWS in the 1960's and close to the town of Paluan. In total, MCWS has two critically endangered, three endangered, and three vulnerable and 24 others are restricted-ranged species (*CI-Philippines, DENR-PAWB, Haribon, 2006)*.

Mindoro Bleeding-heart Pigeon
A total of five individuals of Mindoro bleeding-heart pigeon were collected in Mt. Calavite in the early 1900's. A single bird was flushed once in a secondary forest at 480-meter elevation. The bird was eight meters from the nearest trail and seen on the forest floor.

Mindoro Hornbill
A pair of Mindoro Hornbill was frequently observed close to the campsite in Binagyuhan feeding on a fruiting tree close to the river. The pair was also encountered about 500 meters from camp perched on a *Ficus* tree. Another pair was also observed in a degraded secondary forest in Ulasan.

Local residents have reported of a group composed of five individuals in 2011 in the area in site 1. The team only encountered a pair throughout the duration of sampling in Binagyuhan.

Scarlet-collared Flowerpecker
The species was uncommon and encountered singly or in pairs up to 780-meter elevation. A pair was observed regularly feeding on the fruits of mistletoe-like parasitic plants and in fruiting *Ficus* species.

Mindoro Hawk Owl
The Mindoro hawk owl was observed in both sites visited. At least eight separate individuals were responding to played back calls. A pair was observed within camp area in site 1, while another pair was encountered 500 meters away. The bird vocalizes early evening until dawn. A recording of its call was also made.

Mindoro Scops Owl
The RSEA team attempted to search for the species in MCWS but the strong winds and rain brought by the tropical depression and oncoming typhoon made it difficult for observers to hear and see the species. Members of the team suspect that the species may occur in the remaining forest patches along gullies and streams above 900 meter up to 1,200-meter elevation in Mt. Calavite.

Pink-bellied Imperial Pigeon
The species was recorded in Binagyuhan at 120-meter elevation. A single individual was feeding on the ripe fruits of *Ficus* close to the stream and the old tree nursery in site 1 along with Mindoro Hornbill. The bird was also heard calling just before dusk.

Mindoro Imperial Pigeon
The bird is a high elevation specialist and known to occur only in Mindoro. The attempt to search for this species in Mt. Calavite failed due to the strong winds and rain brought by the tropical depression. The oncoming typhoon made it difficult for observers to hear and see the species. It is suspected that the species may occur in the remaining forest patches along gullies and streams above 900 meter up to 1,200-meter elevation in MCWS.

The avifauna of MCWS showed a good representation of the endemic species of Mindoro and Philippines as well as migratory species utilizing forest habitats. These species barely survive in badly degraded and fragmented forest habitats. Many of the canopy dwelling birds

require large and tall canopy trees for survival. These are also the very same trees that are selectively cut by local residents for lumber. The loss of these canopy trees would largely impact populations of Mindoro Hornbill, Pink-bellied Imperial Pigeon, Green Imperial Pigeon, Blue-crowned Racquet-tail Parrots, two species of woodpeckers, Mindoro Hawk Owl and cuckooshrike as well as raptors.

There is a need to sample the upper montane forest habitats of Mt. Calavite. The presence of patches of native vegetation, including clumps of secondary forests along gullies, largely indicates the possible presence of montane forests Mindoro endemic species, such as Mindoro Imperial Pigeon, Mindoro Scops Owl and many other high elevation specialists endemic to the country.

A number of species observed in both sites surveyed may be used as indicator species for monitoring changes in biodiversity, wildlife/biodiversity protection as well as in looking at trends in the changes of species abundance. The following birds are selected as possible indicator species:

Understory/ground dwellers
- Mangrove Blue Flycatcher
- Black-hooded Pitta
- Red-bellied Pitta
- Red Junglefowl

Canopy/sub-canopy species
- Mindoro Hornbill
- Green Imperial Pigeon
- Pink-bellied Imperial Pigeon
- White-bellied Woodpecker
- Mindoro Hawk Owl

Water bodies
- Philippine Duck

These species were selected, since communities are familiar with the birds' vocalizations and physical appearance. Larger sized birds, such as junglefowl, hornbills and ducks, may be used for monitoring hunting activities in the area. In most parts of the country, hunters prefer larger birds, because of their size and consequent meat content of these species. The Philippine Duck, in particular, would be a good indicator of whether or not hunting is practiced in the area, since ducks are considered in many areas as a game bird, and the species is easily recognizable with juveniles and ducklings easily identifieable from the adults.

Results of ethnobiological survey with indigenous communities in MCWS reveal that traditional hunting is no longer regularly practiced, which may be due to the influence of lowlanders, particularly through religion. Many indigenous communities are now members of the Seventh-day Adventist sect, which discourages hunting and consumption of wildlife.

Indeed, the survey team encountered little or no evidence of animal traps, such as snares in both survey sites. The Philippine Ducks at Igmanukan Lake are also reportedly not hunted.

In fact, some residents reported that there is a caretaker guarding Igmanukan Lake from hunters.

2.c.2. Mammals

A total of 248 individuals from 12 confirmed and approximately 9 unconfirmed bat species recorded from five families: Pteropodidae, Megadermatidae, Hipposideridae, Rhinolophidae, and Vespertilonidae were captured through mist-netting and harp trapping. At total of 23 voucher specimens were collected for the unconfirmed or unidentified nine bat species. Bat species recorded during the survey are presented in **Table 22**.

Table 22. Volant Mammal (bat) Species Recorded in MCWS

FAMILY	Species Name	Common English Name	Diet	IUCN Conservation Status and Endemicity
Suborder Microchiroptera				
Hipposideridae	*Hipposideros ater*	Dusky Roundleaf Bat	Insects	LC
Hipposideridae	*Hipposideros pygmaeus**	Philippine Pygmy Roundleaf Bat	Insects	LC; PH endemic
Megadermatidae	*Megaderma spasma*	Common Asian Ghost Bat	Insects & small vertebrates	LC
Rhinolophidae	*Rhinolophus inops*	Philippine Forest Horseshoe Bat	Insects	LC; PH Endemic
Vespertilionidae	*Miniopterus tristis*	Greater Bent-winged Bat	Insects	LC
Vespertilionidae	*Pipistrellus javanicus*	Javan Pipistrelle	Insects	LC
Vespertilionidae	*Pipistrellus tenuis*	Least Pipistrelle	Insects	LC
Suborder Megachiroptera				
Pteropodidae	*Cynopterus brachyotis*	Common Short-nosed Fruit Bat	Fruits	LC
Pteropodidae	*Macroglossus minimus*	Dagger-toothed Flower Bat	Fruits, flowers & nectar	LC
Pteropodidae	*Ptenochirus jagori*	Greater Musky Fruit Bat	Fruits	LC; PH Endemic
Pteropodidae	*Rousettus amplexicaudatus*	Common Rousette	Fruits	LC
Pteropodidae	*Styloctenium mindorensis***	Mindoro Stripe-faced Fruit Bat	Fruits	DD; Mindoro Endemic

*** New island record; ** Second locality record for the species**

Species Accumulation Curve and Species Richness

Species accumulation curves for Site 1 - Binagyuhan, Site 2 – Ulasan and combined are presented in **Figures 21**, **22** and **23**, respectively. No plateaus were observed for species

accumulation curves of both sites, however, the trend for both sites generally follow a logarithmic curve ($R^2_{Binagyuhan}$=0.9824; R^2_{Ulasan} = 0.9978) indicating sufficient sampling effort has been exerted at each site.

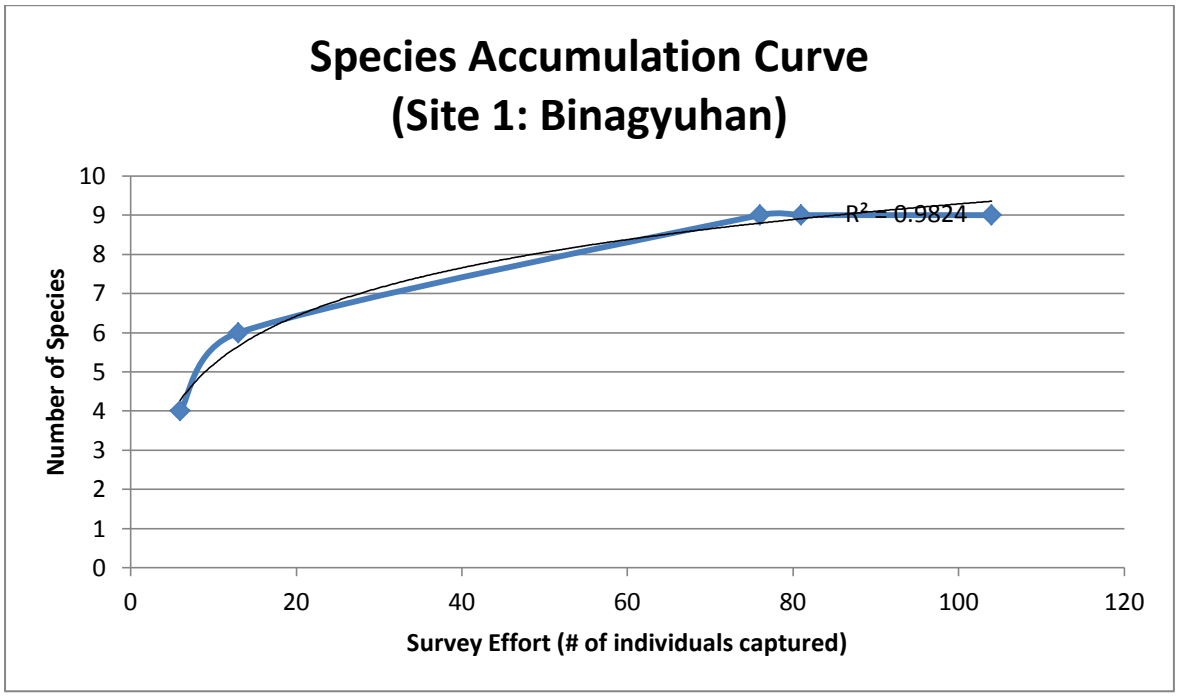

Figure 21. Species Accumulation Curve of Captured Bat Species at Site 1: Binagyuhan, Sitio Hinugasan, Brgy. Harrison, Paluan

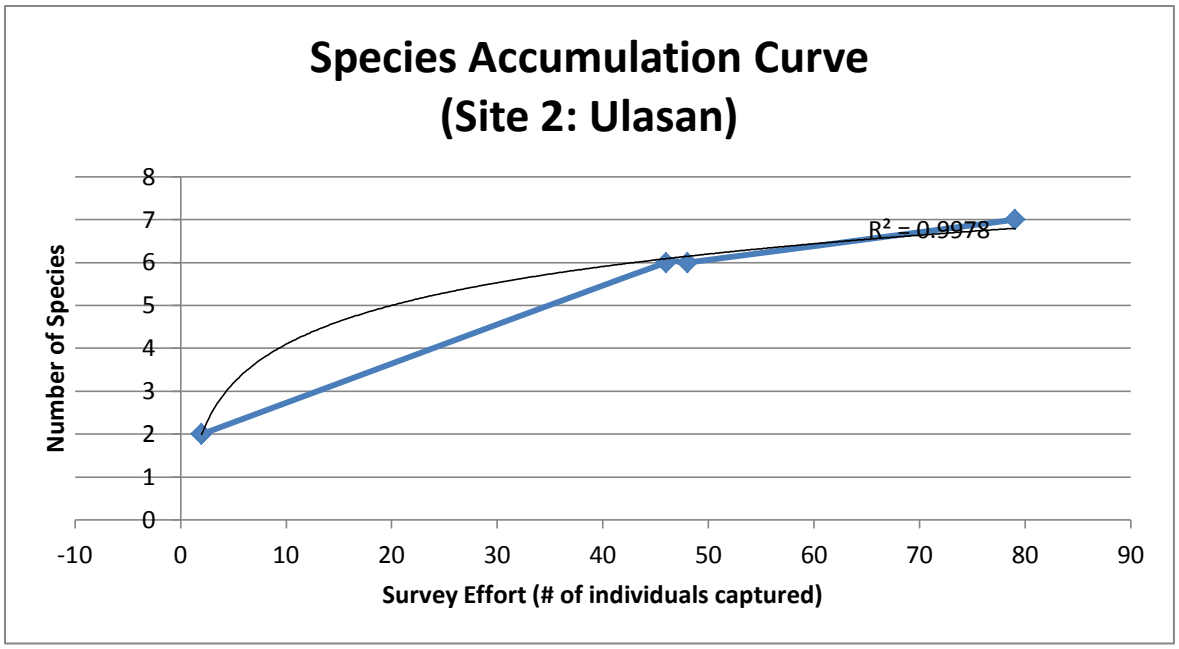

Figure 22. Species Accumulation Curve of Captured Bat Species at Site 2: Sitio Ulasan, Brgy. Harrison, Paluan

However, combining the data for both sites shows a more linear trend rather than following a logarithmic curve (R^2_{Linear}=0.9292 > $R^2_{Logarithmic}$ = 0.906). This could be an indication that there may still be higher bat species richness to be encountered on MCWS when exhaustive surveys are conducted at more sampling sites (**Figure 23**).

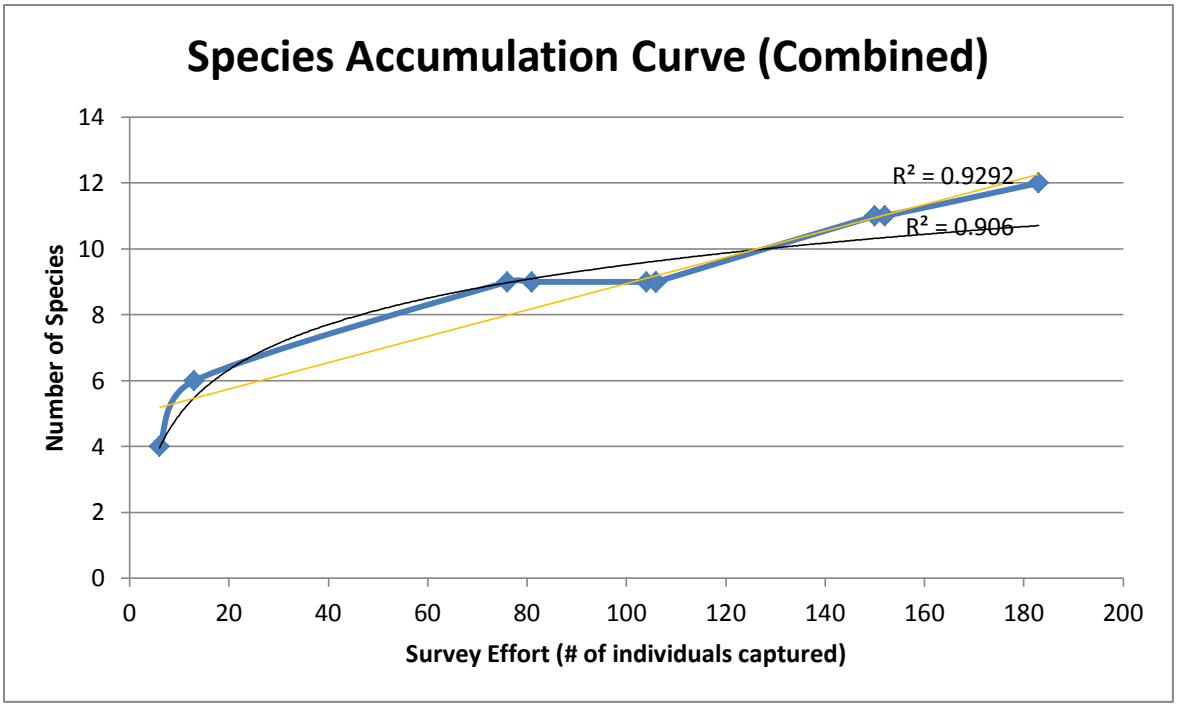

Figure 23. Species Accumulation Curve of Captured Volant Mammal (bat) at MCWS

Species Diversity, Relative Density and Species Evenness

A total of 104 individuals from nine species were captured in Site 1: Binagyuhan, while a total of 79 individuals from seven species were captured in Site 2: Matingkaran. In both sites, the three most abundant species were Greater Musky Fruit Bat *P.jagori*, Common Short-nosed Fruit Bat *C.brachyotis* and the Common Rousette *R.amplexicaudatus.* Site 1: Binagyuhan recorded a higher species diversity index value, but slightly lower species evenness ($H'_{Binagyuhan}$ = 1.4381; $J'_{Binagyuhan}$ = 0.6545) than Site 2: Ulasan (H'_{Ulasan} = 1.3019; J'_{Ulasan} = 0.6691).

Both sites Binagyuhan and Ulasan did not score very high on eveness index (J'), since a few species (*P.jagori, C.brachyotis* and *R.amplexicaudatus*) accounted for a large portion of the total number of species -- 87% and 94% in sites 1 and 2, respectively, while all the other species are not well represented as shown in **Tables 23** and **24**.

Table 23. Volant Mammal (bat) Species Diversity Indices Values for Site 1: Binagyuhan, Sitio Hinugasan, Brgy. Harrison, Paluan

Species Name	Common English Name	No of individuals	Relative Density (Pi)	ln Pi	Pi * ln Pi
Cynopterus brachyotis	Common Short-nosed Fruit Bat	40	0.3846	-0.9555	-0.3675

Macroglossus minimus	Dagger-toothed Flower Bat	2	0.0192	-3.9512	-0.0760
Miniopterus tristis	Greater Bent-winged Bat	1	0.0096	-4.6444	-0.0447
Pipistrellus javanicus	Javan Pipistrelle	2	0.0192	-3.9512	-0.0760
Pipistrellus tenuis	Least Pipistrelle	1	0.0096	-4.6444	-0.0447
Ptenochirus jagori	Greater Musky Fruit Bat	41	0.3942	-0.9308	-0.3670
Rhinolophus inops	Philippine Forest Horseshoe Bat	4	0.0385	-3.2581	-0.1253
Rousettus amplexicaudatus	Common Rousette	9	0.0865	-2.4472	-0.2118
Styloctenium mindorensis	Mindoro Stripe-faced Fruit Bat	4	0.0385	-3.2581	-0.1253
Total No. of Species (s)		9			
Total No. of Individuals		104			
Species Diversity Index (H')		1.4381			
Hmax = LN(s)		2.1972			
Eveness Index (J')		0.6545			

Table 24. Volant Mammal (bat) Species Diversity Indices Values for Site 2: Sitio Ulasan, Brgy Harrison, Paluan

Species Name	Common English Name	No of individuals	Relative Density (Pi)	ln Pi	Pi * ln Pi
Cynopterus brachyotis	Common Short-nosed Fruit Bat	20	0.2532	-1.3737	-0.3478
Hipposideros ater	Dusky Roundleaf Bat	1	0.0127	-4.3694	-0.0553
Hipposideros pygmaeus	Philippine Pygmy Roundleaf Bat	1	0.0127	-4.3694	-0.0553
Macroglossus minimus	Dagger-toothed Flower Bat	2	0.0253	-3.6763	-0.0931
Megaderma spasma	Common Asian Ghost Bat	1	0.0127	-4.3694	-0.0553
Ptenochirus jagori	Greater Musky Fruit Bat	36	0.4557	-0.7859	-0.3581
Rousettus amplexicaudatus	Common Rousette	18	0.2278	-1.4791	-0.3370
Styloctenium mindorensis	Mindoro Stripe-faced Fruit Bat				
Total No. of Species (s)		7			
Total No. of Individuals		79			
Species Diversity Index (H')		1.3019			
Hmax = LN(s)		1.9459			
Eveness Index (J')		0.6691			

Combining data from both sites, *P.jagori* (n=77; P*i*=0.4208), *C.brachyotis* (n=60; P*i*=0.3279) and *R.amplexicaudatus* (n=27; P*i*=0.1475) are the most abundant species accounting for 89.6% of all 183 captures. The nine other bat species *Hipposideros ater, H.pymaeus, Megaderma spasma, Miniopterus tristis, Pipistrellus javanicus, P.tenius, Rhinolophus inops*

and *Styloctenium mindorensis* were represented by less than four individuals per species (P*i* < 0.0219) and are considered here as uncommon to rare.

Table 25. Volant Mammal (bat) Species Diversity at MCWS

Species Name	Common English Name	No of individuals	Relative Density (Pi)	ln Pi	Pi * ln Pi
Cynopterus brachyotis	Common Short-nosed Fruit Bat	60	0.3279	-1.1151	-0.3656
Hipposideros ater	Dusky Roundleaf Bat	1	0.0055	-5.2095	-0.0285
Hipposideros pygmaeus	Philippine Pygmy Roundleaf Bat	1	0.0055	-5.2095	-0.0285
Macroglossus minimus	Dagger-toothed Flower Bat	4	0.0219	-3.8232	-0.0836
Megaderma spasma	Common Asian Ghost Bat	1	0.0055	-5.2095	-0.0285
Miniopterus tristis	Greater Bent-winged Bat	1	0.0055	-5.2095	-0.0285
Pipistrellus javanicus	Javan Pipistrelle	2	0.0109	-4.5163	-0.0494
Pipistrellus tenuis	Least Pipistrelle	1	0.0055	-5.2095	-0.0285
Ptenochirus jagori	Greater Musky Fruit Bat	77	0.4208	-0.8657	-0.3642
Rhinolophus inops	Philippine Forest Horseshoe Bat	4	0.0219	-3.8232	-0.0836
Rousettus amplexicaudatus	Common Rousette	27	0.1475	-1.9136	-0.2823
Styloctenium mindorensis	Mindoro Stripe-faced Fruit Bat	4	0.0219	-3.8232	-0.0836
Total No. of Species (s)		16			
Total No. of Individuals		183			
Species Diversity Index (H')		1.4546			
Hmax = LN(s)		2.7726			
Eveness Index (J')		0.5246			

Demographics (Sex, Age)

During biometric data collection, demographic data, such as sex and age, was also collected. Of the total captures, 39% are males while majority, or 61%, are females. Presence of 12 lactating, or pregnant, females have been observed. Among the captures, 75% are adults with the remaining 25% are juveniles and sub-adults.

Ecological and Economic Importance of Bats

Bats have long been thought to play important roles in insect population control, pollination and seed dispersal. However, the exact impacts of bat activities have not been thoroughly evaluated. Kunz *et al.* (2011) estimated over two-thirds of the world's 1,232 bat species as either obligate or facultative insectivores. Studies on rate of consumption of insect bats show that on the average bats consume up to 25% of their body mass per night. Consumption may however reach over 100% of body weight during critical periods of pregnancy and lactation (Kurta *et al.,* 1989, Kunz *et al.,* 2011). This insectivorous feeding behavior of bats

contributes in controlling populations of potential agricultural insect pests. Naylor and Ehrlich (1997) provide a global estimated value between $54 billion – $1 trillion to this natural pest control ecosystem service. Although very little or no information is available on impact of bats on agricultural insect pests in the Philippines, estimates would be very high, since the country's rural areas rely heavily on the agricultural industry. This also holds true for Mindoro Island and the municipality of Paluan.

As for importance of nectarivores, florivores and frugivores, an estimate of 168 plant species are pollinated by pteropodid bats (old world fruit bats). Pteropodid bats also feed on feed on the fruits and disperse seeds of atleast 139 plant species (Fleming *et al.*, 2009, Kunz *et al.*, 2011, Mickleburgh *et al.*, 1992). Among those listed are Cashew, Coconut, Mango and Banana – four of the 10 major agricultural products of the municipality of Paluan. Paluan has an approximate annual production of 130,000 kg and consumption of 110,000 kg for the four crops mentioned above. Garcia and Ramayla (2009) reported at least 60 plants species included in the diet of four pteropodid species in Mindoro (*D.microleucopterus,S.mindorensis, A.jubatus* and *P.vampyrus*) most of which were also highlighted in Kunz *et al.* (2011)'s list of economically and ecologically important plants pollinated and dispersed by bats.

Fruit bats are also hunted for food throughout Occidental Mindoro, including Paluan. Hunting is usually done with a compressed air rifle but fishnets, hook and line and spiny rattan (*Calamus* sp.) flagellum are also used occasionally for large bat aggregations. Residents consuming bats preferring larger flying foxes for larger meat content and ease of hunting, while small and medium sized fruit bats are preferred based on taste (Garcia and Ramayla, 2009).

Endemic and Threatened Mammal Species

Four of the twelve species (33%) of bats recorded in MCWS are endemic. Three species (*Hipposideros pygmaeus, Rhinolopus inops,* and *Ptenochirus jagori*) are endemic to the country while one species (*Styloctenium mindorensis*) can only be found in Mindoro Island. The recently described *S. mindorensis* is relatively unknown and thus categorized as Data Deficient (DD) in the IUCN Threatened Species List.

Three of the four (75%) large land mammal species recorded during the survey are also endemic threatened species. Of particular note are the Tamaraw and Mindoro Warty Pig, which are both island endemic species and categorized as critically endangered and endangered, respectively, in the IUCN List.

Accounts of Notable Mammal Species

Direct observations were noted for two of the six large terrestrial mammals recorded on Mindoro – Long-tailed Macaque and Philippine Brown Deer. Indirect evidence of the Mindoro Warty Pig and Tamaraw were collected from tracks and interviews. Additional observations are also provided for the recently described little-known Mindoro Stripe-faced Fruit Bat.

Mindoro Stripe-faced Fruit Bat *Styloctenium mindorensis*
IUCN Conservation Status: Data Deficient (DD)
Mindoro Endemic
Esselstyn (2007) described this mid-sized pteropodid, with distinctive facial markings, from four individuals captured in 2006 at an interface between an open field (with a few fruit trees) and selectively logged lowland forest in Sablayan, Occidental Mindoro. It is currently one of only two members of the genus *Styloctenium*. The genus was previously considered monotypic with only the Sulawesi Stripe-faced Fruit Bat (*S.wallacei*) from Sulawesi and Tongian Islands of Indonesia as its sole member.

In this study, four adult individuals (1 male and 3 females) of this poorly known species were captured, through mistnetting at a secondary lowland forest at Site 1 near Sitio Hinugasan, Brgy. Harrison, Paluan, Occ. Mindoro. Several individuals were observed feeding on large figs (*Ficus* sp.). During strong winds, the bat was observed hanging on the small branches in a fruiting tree. The species was identifiable by its color and also because the eye-shine reflects poorly, unlike the rest of the fruit bats. Biometric data were collected prior to release.

Long-tailed Macaque *Macaca fascicularis*
IUCN Conservation Status: Least Concern (LC)
Widespread throughout Asia
Small groups of five to 10 individuals were regularly observed in two sites - at the DENR-NGP nursery area near Sitio Hinugasan and on the ridge north east of the Sitio Ulasan leading to Mt Calavite peak.

Mindoro Warty Pig *Sus oliveri*
IUCN Conservation Status: Endangered (EN)
Mindoro Endemic
Personal observations of RSEA survey team and DENR forest rangers of the consumption of wild pig meat by some local residents at Brgy. Harrison. The wild pig was reportedly caught in MCWS. Guides and residents also reported that captures of wild pig have declined during recent years. Evidences of the presence of wild pigs, such as tracks and pig wallows, were noted in the two sites visited in MCWS. Observations of wild pig meat being consumed by some local residents in Brgy Harrison as well as numerous anecdotal evidences of encounters in forested areas indicate the presence of the Mindoro Warty Pig *Sus oliveri* on MCWS.

Tamaraw *Bubalus mindorensis*
IUCN Conservation Status: Critically Endangered (CR)
Mindoro Endemic
Informal interviews with local guides reveal that the species is still present in MCWS, but sightings have become very rare in recent years. Most sightings are of single individuals grazing on newly sprouted shoots of recently burned grass at higher elevations. Residents further reported that adult Tamaraws are charging aggressively at domestic cattle left to graze inside MCWS.

The Tamaraw was previously recorded in Mt Calavite through the DENR's 2004 Tamaraw Survey Report, which encountered only a single male, but estimated a total of 12 individuals on MCWS based on tracks and fecal evidence. Informal interviews with local guides reveal

that the Tamaraw *B.mindorensis* can still be found in MCWS but sightings have become very rare in recent years.

Philippine Brown Deer *Cervus mariannus barandanus*
IUCN Conservation Status: Vulnerable
Mindoro Endemic Subspecies
The Mindoro subspecies of the Philippine brown deer *Cervus mariannus* was encountered once in MCWS. A male individual was observed about 200 meters away in a secondary forest.

The subspecies *Cervus mariannus barnadanus* is endemic to Mindoro and has the most restricted range among the four recognized subspecies of the Philippine Brown Deer.

Mindoro Pallid flying fox *Desmalopex microleucopterus*
IUCN Conservation Status: Not Yet Assessed
Mindoro Endemic
The species was recorded in the localities of Mt. Halcon and Mt. Siburan in Mindoro. The RSEA team had established high nets along known bat flyways, near fruiting and flowering trees but the species was not encountered. Some residents have reported on the presence of a roosting colony of another fruit bat fitting the description of the Mindoro Pallid Flying Fox. The bats left the roosts more than three years ago when hunters regularly visited the site. The remaining forest in MCWS still qualifies as a suitable habitat of the Mindoro Pallid flying fox. The strong winds in the area may have influenced the capture rate of the species during the survey.

Philippine Pygmy Roundleaf Bat *Hipposideros pygmaeus*
IUCN Conservation Status: Least Concern (LC)
Philippine Endemic; New Record for Mindoro Island
This widespread but poorly known species is the smallest *Hipposideros* species in the Philippines. The species has been previously recorded from Bohol, Cebu, Luzon (Camarines Sur, Quezon, and Rizal provinces), Marinduque, Mindanao (Surigao Del Sur), Negros, Panay, Polillo and Samar. Specimens have been captured in caves, in or near primary and secondary lowland forests from sea level to at least 200 masl, over karst and ultramafic soils. (Heaney *et al*. 2010)

A single adult male was captured by harp trap on 25 February 2013 at Sitio Ulasan, Brgy Harrison at the base of MCWS and possibly represents the first record of this species on Mindoro Island.

2.c.3. Herpetofauna

Sampling effort for amphibians and reptiles in site 1 (**Figure 24**) shows that there is a flattening slope on the species effort curve, which indicates that the sampling efforts have been exhaustive. A steep slope is observed in the sampling effort curve of site 2, indicating incompleteness of sampling. This was largely due to bad weather condition during the survey in site 2, which resulted to lesser number of sampling days and search efforts (**Figure 25**).

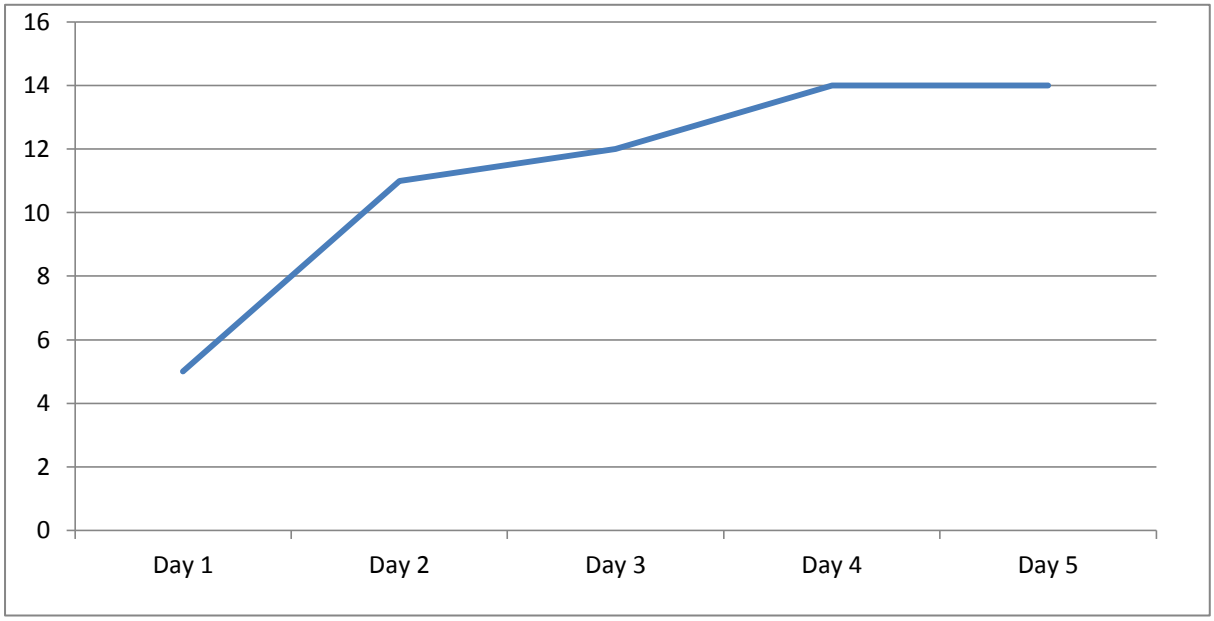

Figure 24. Species Effort Curve for Site 1, Camp Binagyuhan, Sitio Hinugasan, Brgy. Harrison, Paluan, Occidental Mindoro

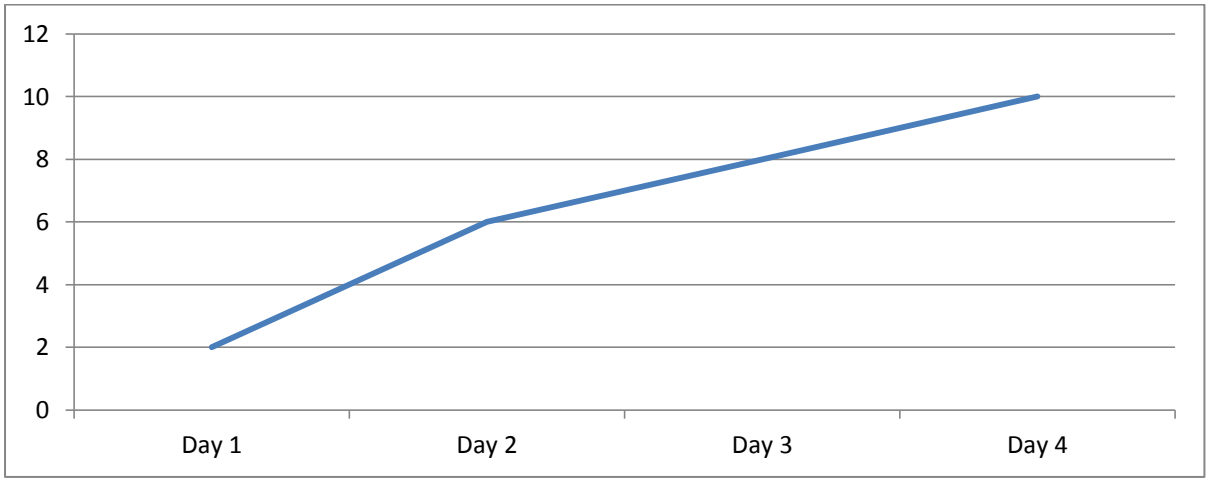

Figure 25. Species Effort Curve for Site 2, Camp Matingkaran, Sitio Ulasan, Brgy. Harrison, Paluan, Occidental Mindoro

A total of 21 species of herpetofauna (amphibians and reptiles) were recorded in MCWS (**Tables 26** and **27**). It is composed of eight species of amphibians (38%) and 13 species of reptiles (62%). In site 1, there were eight species of amphibians and seven species of reptiles recorded. In site 2, there were three species of amphibians and nine species of reptiles recorded.

Table 26. List of Amphibian Species Found in MCWS

Scientific Name	Common Name	Site Captures Site 1	Site 2	Total # of Individuals
*Rhinella marina**	Giant Marine Toad	1	2	NA
Kaloula conjucta	Philippine Narrow Mouth Frog	1	0	1
*Limnonectes cf acanthi***		12 (6)	4	16
Platymantis dorsalis	Common Forest Frog	21 (16)	5	26
Platymantis corrugatus	Corrugated Forest Frog	3 (2)	0	3
*Hylarana mangyanum****		10 (8)	0	10
Polypedates leucomystax	White-lipped Tree Frog	3	0	3
Leptobrachium mangyanorum		5 (1)	0	5
Total number of individuals		55 (33)	9	64

Numbers in parentheses refers to observed individuals while numbers outside parentheses refers to captured individuals. The symbol * means introduced species, ** means Vulnerable and * means Endangered.**

It is observed that there are more species found in Site 1 (Camp Binagyuhan) compared to Site 2 (Camp Matingkaran), which is shown in **Figure 26**. In addition, there are more amphibian species found in site 1 and more reptilian species found in site 2. This distribution may be influenced by prevailing habitat conditions of different sites. Site 2 is comparatively drier compared to site 1. Reptilian species could adapt more to dry environment compared to amphibians, which prefer a moister habitat.

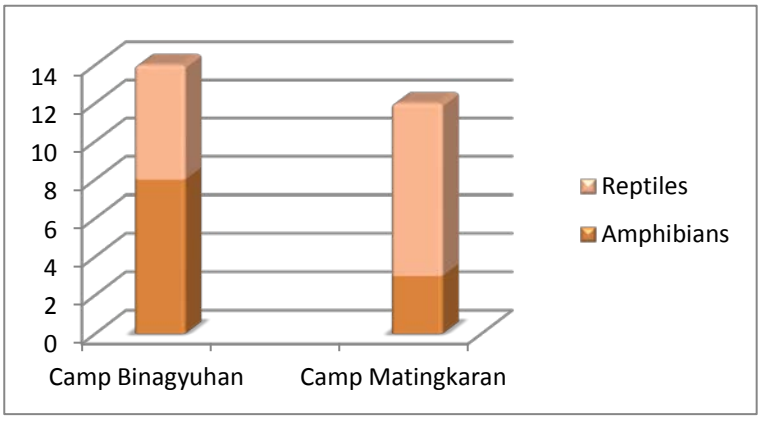

Figure 26. Comparison of Number of Species recorded in Two Sites at Brgy. Harrison, Paluan, Occidental Mindoro

Table 27. List of Reptile Species Observed in MCWS

Scientific Name	Common Name	Site Captures 1	2	Total # of Individuals	Residency Status
Gekko gecko	Tokay Gecko	0	12 (8)	12	Native
Gekko mindorensis	Mindoro Narrow-disked Gecko	1	2	3	Philippine Endemic
Hemidactylus frenatus	Common House Gecko	0	7	7	Native
Cyrtodactylus sp.	Bent-toed Gecko	3	6	9	NA
Eutropis cf. *multifasciata*		2 (1)	0	2	Native
Pinoyscincus jagori		0	2	2	Philippine Endemic
Sphenomorphus sp.		7 (2)	3	10	NA
Draco sp.	Flying Lizard	0	1 (1)	1	NA
Bronchocela sp.		0	1 (1)	1	NA
Python reticulatus	Reticulated Python	0	1 (1)	1	Native
Boiga cf. *philippina*		1	0	1	Philippine Endemic
Cyclocorus lineatus		3 (2)	0	3	Philippine Endemic
Rhabdophis spilogaster		6 (2)	0	6	Philippine Endemic
Total number of individuals		23 (7)	55 (3)	58	

Numbers in parentheses refers to observed individuals while numbers outside parentheses refers to captured individuals.

At least five microhabitat types were encountered in two sites. Availability of these microhabitats in MCWS affects distribution and species composition of herpetofauna.

Streams/Rivers. There are fast flowing streams found on both sites. In site 1, there is a narrow stream in the higher elevation with high density of plant species. On the lower elevation, there is a wider stream, with lower density of plants species along its banks, and probably with high mineral content. In site 1, there are wide streams with normal density of plant species along its banks. There are six species found in this microhabitat namely *Limnonectes* cf *acanthi, Platymantis dorsalis, Platymantis corrugatus, Hylarana mangyanum, Cyclocorus lineatus* and *Rhabdophis spilogaster.*

Rocks/Boulders/Rock crevices. In site 2, there are regular size boulders found in the streams on the higher elevation and these boulders have high density of moss while on the lower elevation in site 1, the boulders are relatively large and obviously these rocks have high mineral content. In site 1, rocks and boulders are smaller and the moss content is relatively low. *Hylarana mangyanum* and *Limnonectes* cf *acanthi* were found in this microhabitat during the survey.

Leaf Litter. In site 2, it is observed that the leaf litter density along transects is high, but the leaf litter in site 1 is comparatively denser. Eight species were found in this microhabitat during the survey, namely, *Platymantis dorsalis, Platymantis corrugatus, Leptobrachium mangyanorum, Eutropis* cf *multifasciata, Pinoyscincus jagori, Sphenomorphus* sp., *Cyclocorus lineatus and Rhabdophis spilogaster.*

Soil. The soil in Mt. Calavite is generally dry along the forest floor, grassland and agricultural areas. However, in site 1, the soil along the riverbanks is a little moist, which is good for some cryptic amphibian and reptilian species. Species found in this microhabitat are *Kaloula conjuncta* and *Sphenomorphus* sp.

Tree branch. This is one of the most common microhabitat for herpetofauna. Species found in this microhabitat preferred branches of fruit bearing trees. The following are *Polypedates leucomystax, Gekko gecko, Gekko mindorensis, Hemidactylus frenatus, Cyrtodactylus* sp., *Draco* sp., *and Bronchocela* sp.

Among the herpetofaunal species found in MCWS, nine species are Philippine endemic (43%), two species are Mindoro endemic (9.5%), five native species (24%) and one introduced (4.8%). Among the eight amphibian species, four were Philippine endemic (50%), two are Mindoro endemic (25%), one is native (12.5%) and one is introduced (12.5%). Among the thirteen reptilian species observed, five are Philippine endemic (38%) and four are native (31%) (**Figure 27**).

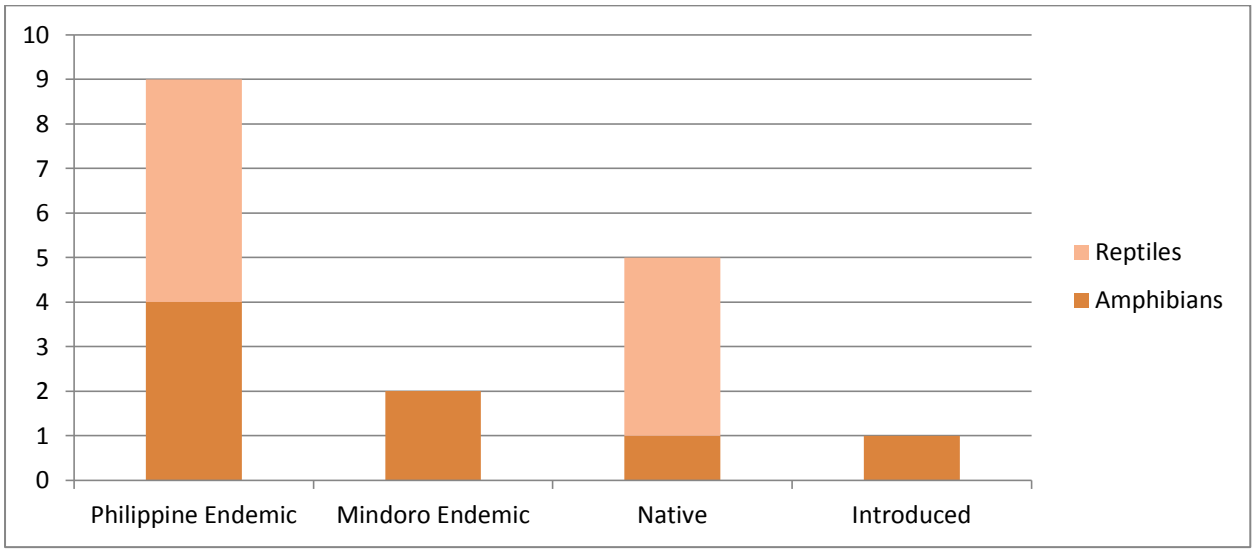

Figure 27. Residency Status of Observed and Captured Herpetofauna in MCWS

It is observed that the most dominant species in Site 1, Camp Binagyuhan, is *Platymantis dorsalis* with 27% dominance, followed by *Limnonectes* cf *acanthi* with 15% dominance. The least dominant species are *Kaloula conjuncta* and *Gekko mindorensis*, both with one percent dominance. In site 2, Camp Matingkaran, the most dominant species is *Gekko gecko* with 27% dominance followed by *Hemidactylus frenatus* with 16% dominance. The least dominant species are *Draco* sp., *Bronchocela* sp. and *Python reticulatus* with two percent dominance.

Average diversity index values were computed for Sites 1 and 2 in MCWS, with 2.11 and 2.26, respectively (**Tables 28** and **29**). There is no large difference between the computed values in both sites, which indicates that there is average complexity on both herpetofauna communities in sites 1 and 2. Similarity of species between Sites 1 and 2 is also computed. Result showed that there is 25% species similarity for the two sites in MCWS.

Table 28. Species Diversity Index Value of Herpetofauna for Site 1, Camp Binagyuhan, Sitio Hinugasan, Brgy. Harrison, Paluan, Occidental Mindoro

Species	No of Individuals	Pi	ln Pi	Pi * ln Pi
Kaloula conjucta	1	0.01282	-4.356708827	-0.055855241
Limnonectes cf acanthi	12	0.15385	-1.871802177	-0.287969566
Platymantis dorsalis	21	0.26923	-1.312186389	-0.353280951
Platymantis corrugatus	3	0.03846	-3.258096538	-0.125311405
Hylarana mangyanum	10	0.12821	-2.054123734	-0.263349197
Polypedates leucomystax	3	0.03846	-3.258096538	-0.125311405
Leptobrachium mangyanorum	5	0.06410	-2.747270914	-0.17610711
Gekko mindorensis	1	0.01282	-4.356708827	-0.055855241
Cyrtodactylus sp.	3	0.03846	-3.258096538	-0.125311405
Eutropis cf multifasciata	2	0.02564	-3.663561646	-0.093937478
Sphenomorphus sp.	7	0.08974	-2.410798678	-0.216353727
Boiga cf. philippina	1	0.01282	-4.356708827	-0.055855241
Cyclocorus lineatus	3	0.03846	-3.258096538	-0.125311405
Rhabdophis spilogaster	6	0.07692	-2.564949357	-0.197303797
Total Number of Individuals	78			
Total Number of Species	14			
H	2.257113171			

Table 29. Species Diversity Index Value of Herpetofauna for Site 2, Camp Matingkaran, Sitio Ulasan, Brgy. Harrison, Paluan, Occidental Mindoro

Species	No of Individuals	Pi	ln Pi	Pi * ln Pi
Limnonectes cf acanthi	4	0.09091	-2.397895273	-0.217990479
Platymantis dorsalis	5	0.11364	-2.174751721	-0.247130877
Gekko gecko	12	0.27273	-1.299282984	-0.354349905
Gekko mindorensis	2	0.04545	-3.091042453	-0.14050193
Hemidactylus frenatus	7	0.15909	-1.838279485	-0.292453554
Cytodactylus sp.	6	0.13636	-1.992430165	-0.271695022
Pinoyscincus jagori	2	0.04545	-3.091042453	-0.14050193
Sphenomorphus sp.	3	0.06818	-2.685577345	-0.183107546
Draco sp.	1	0.02273	-3.784189634	-0.08600431
Bronchocela sp.	1	0.02273	-3.784189634	-0.08600431
Python reticulatus	1	0.02273	-3.784189634	-0.08600431
Total Number of Individuals	44			
Total Number of Species	11			
H				2.105744174

Endemic Species

Kaloula conjuncta is endemic to the Philippines, and the subspecies *Kaloula conjucta* conjucta can only be found in Polillo Islands and Mindoro. There is only one representative individual found during the survey. It was found in soil microhabitat, the burrowing and secretive behaviour of this species makes it hard to document.

There are 26 individuals of *Platymantis dorsalis* observed along streams and leaf litter. Most of the observed individuals are from juvenile to sub adult, which indicates that during the survey is their breeding season. This frog species is comparatively common compared to its relative species *Platymantis corrugatus* with only three individuals observed. Both species are Philippine endemic.

Leptobrachium mangyanorum was a newly described species, separated from *Leptobrachium hasselti*, which occurs in the Philippines. *L. mangyanorum* is endemic only to Mindoro and individuals of this species were found in leaf litter near streams. There were 10 individuals of *Hylarana mangyanum* observed in site 1 and none were observed in site 2. It was found along

streams, small rocks and rock crevices. This species endemic to Mindoro is considered endangered (IUCN) and understudied. This species is a bio-indicator of good water quality, thus, the number of individuals observed in the area indicates that the quality of water in MCWS is still in good condition.

There are 12 individuals and four individuals of *Limnonectes* cf *acanthi* observed along streams in sites 1 and 2, respectively. This species is considered vulnerable by the IUCN.

New Species Records

Individuals under *Cyrtodactylus annulatus, C. philippinicus and C. tautbatorum* were placed under *Cyrtodactylus* sp. due to species complexes. Any of the three can be interchanged with each other. Identification on species level could possibly provide new records for Mindoro. Individuals observed from the Genus Sphenomorphus were placed under *Sphenomorphus* sp. This group also has complexes and could have possible interchange. Identification on species level could provide new records for Mindoro.

A representative individual of young *Boiga* cf *philippina* was observed in site 1. It was found in fern along the side of the stream. There has been no record of *Boiga philippina* in Mindoro. Further verification of this species could result to new record in Mindoro.

Importance of Herpetofaunal Species

Amphibians and reptiles play a major role in ecological balance. They serve as both predator and prey. The climate in Occidental Mindoro, including MCWS, is Type I with only two seasons, pronounced dry and wet season. Due to this, there are only few fruiting trees that can be found in the area and the scarcity of food could result to the decline of the number of individuals of different species in the wild that are reliant on fruit bearing trees, which are mostly birds. However, the large number of amphibians and reptiles in the area could serve as food source of birds, especially raptors.

Reptiles and amphibians are very important in maintaining insect density in an area, since insects are the food source of this group of animals. Possible diseases brought by insects could be limited with the help of these amphibian and reptilian species.

Reptiles and amphibians are also good indicators of environmental conditions, since this group of animals is very susceptible to disturbances. *Hylarana mangyanum* is a selective species. This species is a bio-indicator of good water quality, thus, the number of individuals observed in the area indicates that the quality of water in MCWS is still in good condition. According to ethnobiological interview, reptiles and amphibians are not considered important for human consumption and use in MCWS. Mangyan communities in the area do not have specific use for this group of animals. Most, if not all of them, believe that reptiles, especially snakes are venomous.

Species Monitoring

The results have shown that *Platymantis dorsalis* was the most frequently encountered species in the sites visited. This is also smallest of the group and distribution range of the

species is from lowland to lower montane forests inhabiting the forest floor. Ideally, this should be one of the species targeted for monitoring, however, estimating abundance, presence and absence of the species might be a bit challenging for a local community participant.

The RSEA team therefore suggests monitoring the two threatened endemic species of Mindoro *Hylarana mangyanum* and *Leptobrachium mangyanorum.* Both species are highly identifiable by local communities.

No reptile species were selected for monitoring, as these are more skulking species and are most active at night. Most of the residents are also confused with the species and are not familiar with the calls, habits and physical appearance.

Rhinella marina (*Bufo marinus*) also known as the cane toad can be found in wide distribution across the world. It is also introduced in some countries, including the Philippines and used as pest control in agricultural areas. This species is considered least concern by the IUCN due to its increasing population and very adaptive ability. It could inhabit from urban areas, agricultural areas to dry and moist areas. There are no conservation actions for this species, but for those species that are greatly affected by this invasive species.

Kaloula conjuncta also known as the Philippine Narrow Mouth Frog is endemic to the Philippines. This is widespread in the Philippines and no conservation actions have been established for this species due to its stable population and its tolerance to different kinds of habitats.

Limnonectes cf *acanthi* is endemic to the Philippines and can be found in Palawan and Mindoro Faunal Region. It inhabits rivers and streams in lowland forest even in lower montane forest. This species is quite adaptable to changing environment and could also inhabit wetlands.

Platymantis dorsalis is endemic to the Philippines. Individuals observed under this species should be further verified due to close resemblance of species under the dorsalis group. This is a very common species and categorized as least concern by the IUCN. However, its population trend is decreasing due to different threats to its habitat.

Platymantis corrugatus is endemic to the Philippines. It is also a very common species and under least concern by the IUCN.

Hylarana mangyanum is endemic to Mindoro. It is a newly separated species from *Rana siganata* or the variable backed frog. It is considered endangered by the IUCN due to its small population. However, further studies on the population of this species are still needed.

Polypedates leucomystax is native in the Philippines and can be found in Southeast Asia. This is a common species and considered least concern by the IUCN due to its wide distribution and tolerance to different habitat disturbances.

Leptobrachium mangyanorum is a newly separated species from *Leptobrachium hasselti*. This species is endemic to Mindoro and considered least concern by the IUCN. This species still data deficient and its ecology and population should be further studied.

Gekko gecko is native to the Philippines and widely distributed in Asia. It has become a threatened species in the Philippines due to hunting of large individuals. It has been reported that Chinese buyers pay thousands of pesos for this species, which allegedly used for treating different ailments. However, it is not assessed by the IUCN red list of species.

Gekko mindorensis is endemic to the Philippines. It is considered least concern by the IUCN due to its wide distribution and stable population trend.

Hemidactylus frenatus is native to the Philippines and can be found throughout the globe. This species is considered least concern by the IUCN due to its wide distribution and could inhabit diverse types of habitats.

Cyrtodactylus sp. is the complex of *C. philippinicus, C. annulatus* and *C. tautbatorum,* which could possibly interchange with each other. These three species are Philippine endemics. *Cyrtodactylus tautbatorum* said to be found only in Palawan. This species is recently separated from the *C. annulatus* complex. However, its morphological features can still be interchanged with *C. annulatus* and juvenile *C. philippinicus.* And since this is a newly studied species, population of this species can also be found in Mindoro.

Cyrtodactylus annulatus is said to be found in Mindanao and the Visayas faunal region and *Cyrtodactylus philippinus* can be found in the northern part of the Philippines (Luzon, Visayas).

Eutropis cf *multifasciata* is a common mabuya, which is native to the Philippines. It has been considered least concern by the IUCN due to its wide distribution range.

Pinoyscincus jagori is recently separated from the group five of *Sphenomorphus* sp. It is Philippine endemic and can be found in Mindanao, Visayas and Luzon, including Mindoro.

Sphenomorphus sp. is the complex of *Sphenomorphus* species found during the survey. This is considered as the "wastebin taxon" for unidenfied species, or undescribed species of skinks.

Draco sp. had been observed only and not captured during the survey. Its possible identity is *Draco quadrasi,* which has been recorded before in Mindoro.

Python reticulatus is native to the Philippines. It is widely distributed throughout Southeast Asia. Its conservation status is not yet assessed by the IUCN.

Boiga cf *philippina* is endemic to the Philippines and populations can be found in Northern Luzon. This species is said to be understudied and least concern by the IUCN.

Cyclocorus lineatus is endemic to the Philippines and considered least concern by the IUCN. This is widely distributed in Luzon, Lubang, Mindoro, Marinduque, Polillo, Catanduanes, Guimaras, Cebu, Panay and Negros.

Rhabdophis spilogaster is endemic to the Philippines and considered least concern by the IUCn due to its wide distribution and large population in its habitat. It has been recorded from the islands of Bataan, Luzon, Polillo, Catanduanes and Calayan Island.

B. Socio-Cultural and Economic Situation

This component of the RSEA provides details on the social, cultural and economic conditions of MCWS and the municipality of Paluan, in general. The primary source of data in this section is the census/survey of the Community Based Monitoring System (CBMS) initiated by the local government unit in 2012, including the different tables that are presented to support the narrative accounts. In addition, information was also secured through Focus Group Discussions and Key Informant Interviews with relevant stakeholders in the municipality. It should be undertand that the LGU of Paluan is still preparing its Comprehensive Land Use Plan (CLUP), which could be a very good source for additional information on socio-economic and cultural conditions of the project site. Nevertheless, the data presented in this report is sufficient enough to characterize the socio-cultural and economic situation of the project site.

1. Demograpic Characteristics and Settlement

The municipality of Paluan has a population of 15,494 composed of 3,261 households based on the 2012 CBMS survey of the LGU (**Table 30**). Out of the total population, 52% are males and the remaining 48% are females. Brgy. Harrison, where most of the MCWS's land areas are located, accounts the highest population (21.31%) among the different barangays of Paluan. The two other barangays, with land area covering MCWS, are similarly highly populated, and these are Alipaoy (9.54%%) and Mananao (10.59%). The total population of these three barangays situated in MCWS is about 41.44% of the entire population of Paluan.

This means that the residents of these three barangays may tend to rely on MCWS for wood and timber requirements and other natural resources. More than half of the Paluan's land area is forestland, making it the municipality in Occidental Mindoro with the lowest density of 0.24 person-per-hectare. There are 81 residents of the municipality who are in overseas, 50 of which are Overseas Filipino Workers (OFWs) and 31 non-working individuals.

Table 30. Paluan Total Households, Members, Males and Females

Barangay	Households	Population	Male	Female
Alipaoy	276	1478	777	701
Harrison	652	3302	1728	1574
Lumangbayan	166	755	405	350
Mananao	329	1641	877	764
Marikit	371	1696	860	836

Mapalad Pob. (Bgy 1)	405	1932	985	947
Handang Tumulong Pob. (Bgy 2)	98	419	214	205
Silahis Ng Pag-Asa Pob. (Bgy 3)	152	652	341	311
Pag-Asa Ng Bayan Pob. (Bgy 4)	107	430	206	224
Bagong Silang Pob. (Bgy 5)	56	243	113	130
San Jose Pob. (Bgy 6)	140	602	297	305
Tubili	509	2344	1245	1099
Total	3261	15494	8048	7446

Based on interviews, Mangyan households tend to have more children, sometimes reaching up to 12. In recent years, some Mangyan mothers have availed of injectible contraceptives to limit the number of their children. According to the survey conducted during the RSEA, about 16.11% of the total population are migrants to Sitios Hinugasan, Binagyuhan and Pamuntusin in Brgy. Harrison.

Among the different barangays of Paluan, Harrison has the biggest population, but because of its large land area, it has low population density. At least three localities: Barangays Alipaoy, Tubili and Marikit were chosen to be the sites of housing programs and settlements due to the existence of vast public lands. The location of these barangays, especially accretion land along the seashore of Barangay Tubili and prime agricultural lands in Brgy. Alipaoy, makes it favorable for convertion into settlements.

About 28.32% of the total population lives in poblacion or urban barangays, and 71.68% is distributed in the rural barangays of Alipaoy, Mapalad, Mananao, Marikit, Tubili and Harrison. The farmers build their houses in the barangay centers while they work their lands in the upland.

2. Basic Services and Social Indicators

2.a. Transportation System, Roads and Bridges

Paluan is linked to other neighbouring towns by a network of roads and bridges within the island of Mindoro. The common modes of transport in the locality are bicycles, motorbikes, tricycles, public jeepneys, private cars and jeeps, caretela, trucks, motorboats and bancas. The total number of vehicles registered in CY 2012 reached 230 units (**Table 31)**. Public utility jeepnes in Paluan are quite limited, with only 15 units are available. The most common modes of transportation in the municipality are bicycles (39.60%) and tricycles (30.40%), followed by motorboats (6.96%) and public utility jeepneys (6.50%).

Table 31. Inventory of Tansport Vehicles

Types of Vehicles	Number
Public Utility Jeepneys	15
Private Cars	9
Motorcycles	16

Bike/bicycle	91
Tricycle	70
Van	9
Trucks	3
Motorboats	16
Tractors	1
TOTAL	**230**

A total of 159 kms of interconnected roads are in place, 19.5 kms of which are concrete, 69 kms are gravel and 70.5 km are dirt roads. The list of existing bridges by construction type is presented in **Table 32**.

Table 32. Existing Bridges by Construction Type

Name of Bridge	Length (m)	Location	Construction Type
Mariil Bridge	34.24	Marikit	Concrete
Tubili Bridge	135	Tubili	Concrete
Tikian Bridge	105	Tubili	Concrete
Bulalakao Bridge	27.7	Tubili	Steel / Concrete
Maslud Bridge	16	Tubili	Box Culvert
Pob. Anduyanan	30	Brgy VI	Steel
Maduron Bridge		Brgy Alipaoy	Steel
Palikayan Bridge		Brgy Harrison	Steel
Katanlawan Bridge	6	Brgy Alipaoy	Timber
Spillway Bridge	18	Tubili	Concrete
Tinangra Bridge		Tubili	Concrete
Mamara Bridge	100	Tubili	RCDG
Apnikian Bridge	68.6	Tubili	Concrete
Camias Bridge	30.0	Tubili	Concrete
Binuhangin Bridge	30.0	Tubili	Steel
Tubigan Bridge		Alipaoy	Steel
Baluga Bridge		Alipaoy, I-Mapalad	Timber
Pula 1		Harrison	Box Culvert
Pula II		Harrison	Box Culvert
Patompon Bridge		Alipaoy	Steel

2.b. Power Supply

The Paluan Municipal Electric Services (PAMES) provides electric power supply in Paluan. It sourced its power from the National Power Corporation (NAPOCOR). At present, 10 out of the 12 baragays in the municipality are already provided with 24-hour electricity. Only Brgys. Mananao and Harrison have not been connected to the main grid. Subscribers are charged at the minimum of P 60.00 for the first 10 KWH. A few households in Brgy Harrison have their own electric generators, while some households have rechargeable solar lamps. Some households use other fuel sources, like kerosene. Most use LPG for cooking and others still use wood and charcoal.

Based on the 2012 CBMS of Paluan, total of 1,606 households have access to electricity. Some 1,263 (78.64%) households rely on electric company, 336 (20.92%) households are using generator, 37 (2.30%) households make use of solar power and only 30 (1.87) households depend on battery.

2.c. Communication Facilities

Newspapers, magazines, comics and other bulletins available in Metro Manila reach Paluan via the two shipping lines plying Batangas City to Abra de Ilog. Usually, these print information sources are only available at the town proper. Television and radio broadcasts can be viewed from 12 noon to 12 midnight.

Battery powered radio sets can be used all day. A cable TV service provider is now in operation. DIGITEL, BAYANTEL and BUTEL provide telephone booths located at the Poblacion. Smart Communications and Globe Telecom provide services to mobile phone subscribers in the municipality. A PhilPost Office is situated within the municipal compound, occupying more or less 20 sq. m. of space. It has two (2) personnel, one receives the mail and the other one delivers to the recipients in the municipality on foot since there is no available delivery vehicle. Postal money order service is available.

2.d. Water Supply

The Paluan Water System Association (PAWASA) used to be the water service provider in the municipality, but it has ceased to operate for a number of years already. Potable drinking water supply now comes from a deep well with a big water tank located at Brgy. IV (Pag-Asa ng Bayan). Residents bring their containers there to get water for free. In rural barangays, such as Harrison, water for household use comes from shallow tube wells, springs and rivers. The sources of drinking water in the municipality are presented in **Table 33**.

Based on 2012 CBMS survey, almost 41.41% of the households in Paluan depends on protected spring for their water requirements, while another 39.42% rely from tube well or borehole. Only a few of the households in the municipality sourced their water from faucets.

Table 33. Sources of Drinking Water in Paluan

Source of Drinking Water	Number of Households	
	Magnitude	Proportion
Own faucet water inside the house	22	0.68
Own faucet water inside the yard	159	4.88
Public tap/stand pipe	20	0.61
Tube well or borehole	1285	39.42
Protected dug well	2	0.06
Semi-protected dug well	0	0.00
Unprotected dug well	2	0.06
Protected spring water	1350	41.41
Unprotected spring water	370	11.35
Rainwater	0	0.00
Tanker truck/peddler	0	0.00

Cart with small tank	0	0.00
River, stream and dam	49	1.50
Bottled/mineral water	0	0.00
Others	1	0.03
TOTAL	3260	100.00

Note: There is a discrepancy of one household on this table compared with the total household population counted in 2012 CBMS survey.

Out of the total households in the muncipality, about 422 households have no access to improved water sources, which account for almost 12.94% **(Table 34)**. Except for Brgy. Mapalad (Brgy. 1), all other poblacion barangays have access to improved water sources. On the other hand, all rural barangays, except Tubili, have households with no access to improved water sources. Improved water sources are classified in CBMS as faucets, public tap/stand pipe, tube well, protected dug well, semi-protected dug well, protected spring water, rainwater and bottled/mineral water. Brgys. Alipaoy, Mananao and Harrison, where MCWS is located, have the most number of households with no access to improved water sources, estimated at 49.94%, 34.35%, and 22.70%, respectively, out of their respective household population. No household in the municipality is using mineral or bottled water.

It should be noted that the MCWS is the major watershed of Palaun and therefore, it is paramount importance in sustaining the water supply of the municipality. Most of the residents in rural barangays rely on springs for their water requirements.

Table 34. Households Without Access to Improved Water Sources

Barangay	Total Households	Household Without Access to Improved Water Sources	
		Magnitude	Proportion (By Total Household Per Brgy.)
Alipaoy	276	136	49.94
Harrison	652	148	22.70
Lumangbayan	166	0	0.00
Mananao	329	113	34.35
Marikit	371	17	4.58
Mapalad Pob. (Bgy 1)	405	2	0.49
Handang Tumulong Pob. (Bgy 2)	98	0	0.00
Silahis Ng Pag-Asa Pob. (Bgy 3)	152	0	0.00
Pag-Asa Ng Bayan Pob. (Bgy 4)	107	0	0.00
Bagong Silang Pob. (Bgy 5)	56	0	0.00
San Jose Pob. (Bgy 6)	140	0	0.00
Tubili	509	6	1.18
Total	3261	422	

2.e. Solid Waste and Sanitation

Paluan has existing ordinance on Ecological Solid Waste Management, relative to its vision of becoming a municipality with zero waste. Based in 2012 CBMS, only about three metric

tons of garbage is collected, specifically in the town proper. This garbage is directed to temporary Materials Recovery Facility (MRF) of the municipality.

According to the CBMS report, the Rural Health Unit (RHU) maintains a sealed disposal area for infectious waste as compliance to the National Sanitary Regulations (NSR). There are also junkshops in the town that are buying recyclable scraps. The report added that most of the refuse from the kitchen is used to feed pets, while farmers are converting agricultural wastes into compost to serve as organic fertilizer. The municipal government is not considering the solid waste as a major environment concern in Paluan.

Most households in the poblacion are using the water-sealed flush type of toilets. On the contrary, majority of households in rural barangays are still utilizing pit direct and open pit types for their human waste disposal. More than one third (35.45%) of the population in the municipality have no toilet at all (**Table 35**). Most of the barangays within MCWS have no access to sanitary toilet facilities **(Table 36)**.

Table 35. Types of Toilet Facility

Toilet Types	Number of Households	
	Magnitude	Proportion
Water-sealed flush to sewerage/septic tank-own	1504	46.13
Water-sealed flush to sewerage/septic tank-shared	526	16.14
Closed pit	25	0.77
Open pit	49	1.50
No toilet	1156	35.45
TOTAL	3260	100

Discrepancy of one household based on the total household population counted in 2012 CBMS survey.

Table 36. Households Without Access to Sanitary Toilet Facility

Barangay	Total Household	No. of Households Without Access to Sanitary Toilet Facility	
		Magnitude	Proportion (By Total Household Per Brgy.)
Alipaoy	276	118	42.75
Harrison	652	409	62.73
Lumangbayan	166	0	0.00
Mananao	329	220	66.87
Marikit	371	152	40.97
Mapalad Pob. (Bgy 1)	405	22	5.43
Handang Tumulong Pob. (Bgy 2)	98	0	0.00
Silahis Ng Pag-Asa Pob. (Bgy 3)	152	1	0.66
Pag-Asa Ng Bayan Pob. (Bgy 4)	107	0	0.00
Bagong Silang Pob. (Bgy 5)	56	0	0.00
San Jose Pob. (Bgy 6)	140	1	0.71

Tubili	509	282	55.40
TOTAL	3261	1205	

The municipality has two cemeteries. One cemetery is situated in Brgy. Mapalad, with an area of about 2,772 square meters, while the other one is located in Brgy. Lumangbayan. Reportedly, these cemetaries are almost full to accommodate additional burials. The LGU is now planning to purchase a lot for this purpose.

The municipality has constructed a shallow cemented open canal drainage system. Domestic household wastewater flows untreated into these open canals and out into the sea. Paluan maintains its canals to prevent clogging even in the scattered small commercial areas. The streets of the poblacion are litter-free and canals are not obstructed.

2.f. Education Status and Services

The municipality has one national high school, the Paluan National High School, located in the poblacion and an annex high school in Brgy. Tubili. There are 19 elementary schools in the municipality, including minority areas and school annexes. The only private pre-school in Paluan is the Shammah Christian Pre-school in Brgy. Alipaoy. The 10 Day Care Centers in the municipality is under the supervision of the Municipal Social and Development Office. There is also available Alternative Learning Center for out-of-school youth in Paluan.

The Paluan Central School, located in a 10,000-sq.m. area in the poblacion, is the main elementary school in the municipality. It houses nine buildings, with a total enrolled students of 2,190 based on the 2012 CBMS of Paluan. The entire elementary district in Paluan has 72 permanent teachers under the supervision of one district supervisor, one coordinating principal and five head teachers. Tertiary and/or vocational schools are not yest available in the municipality. Most of the residents took their tertiary education from other towns and cities, such as San Jose, Batangas and Metro Manila.

The literacy rate in Palaun is estimated at 83.97% of the total 10 years old and above population. This is computed based on the illiteracy survey of 10 years old and above of the CBMS in 2012, which showed that, 1,814 persons, or 16.03% of the 10 years old and above in the municipality, are illiterate. Of these, 16.47% are females and 15,63% are males (**Table 37**). Brgy. Silang in Poblacion has the most number of illiterate persons, counted at 41.50% of the total 10 years old and above of its population. The three barangays within MCWS also similarly posted a higher illiteracy rate, estimated at 25.26% for Harrison, 34.14% for Mananao and 18.64 for Alipaoy. Illiterate person is one who is not able to read and write.

Table 37. Literacy Rate in Paluan

Barangay	**No. of Persons 10 Years Old and Above**			**Illiterate Persons 10 Years Old and Above**					
				Magnitude			***Proportion***		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*	*Total*	*Male*	*Female*
PALUAN	11317	5930	5387	1814	927	887	16.03	15.63	16.47
Alipaoy	1057	555	502	197	102	95	18.64	18.38	18.92

Harrison	2201	1171	1030	556	281	275	25.26	24.00	26.70
Lumang-bayan	584	312	272	228	119	109	39.04	38.14	40.07
Mananao	1147	621	526	414	212	202	36.09	34.14	38.40
Marikit	1283	670	613	121	58	63	9.43	8.66	10.28
Mapalad Pob. (Brgy. 1)	1508	780	728	18	10	8	1.19	1.28	1.10
Handang Tumulong Pob. (Brgy. 2)	341	168	173	8	6	2	2.35	3.57	1.16
Silahis Ng Pag-Asa Pob. (Brgy. 3)	506	270	236	18	10	8	3.56	3.70	3.39
Pag-Asa Ng Bayan Pob. (Brgy. 4)	347	172	175	3	2	1	0.86	1.16	0.57
Bagong Silang Pob. (Brgy. 5)	200	92	108	83	37	46	41.50	40.22	42.59
San Jose Pob. (Brgy. 6)	488	247	241	44	23	21	9.02	9.31	8.71
Tubili	1655	872	783	124	67	57	7.49	7.68	7.28

An estimated 31.08% of the children from six to 11 years old in Paluan are not attending elementary education (**Table 38**). The worst figure was counted at Brgy. San Jose in Poblacion, which accounts almost 94.57% of its children from six to 11 years are not in school, followed by Lumang Bayan and Bagong Silang, both in Poblacion, at 74.77% and 67.86%, respectively.

Barangays covering MCWS also posted higher percentages of children from six to 11 years old who are not attending elementary education, counted at 45.62% for Harrison, 41.15% for Mananao and 18.34% for Alipaoy.

Table 38. Children 6-11 Years Old Not Attending Elementary Education

Brgy.	No. of Children 6-11 Years Old			Children 6-11 Years Old Not Attending Elementary					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	229	127	102	42	22	20	18.34	17.32	19.61
Harrison	605	299	306	276	142	134	45.62	47.49	43.79
Lumang-bayan	107	57	50	80	42	38	74.77	73.68	76.00

Mananao	260	145	115	107	61	46	41.15	42.07	40.00
Marikit	245	122	123	43	25	18	17.55	20.49	14.63
Mapalad Pob. (Brgy. 1)	261	126	135	25	10	15	9.58	7.94	11.11
Handang Tumulong Pob. (Brgy. 2)	61	33	28	3	2	1	4.92	6.06	3.57
Silahis Ng Pag-Asa Pob. (Brgy. 3)	81	37	44	4	1	3	4.94	2.70	6.82
Pag-Asa Ng Bayan Pob. (Brgy. 4)	52	26	26	9	3	6	17.31	11.54	23.08
Bagong Silang Pob. (Brgy. 5)	28	18	10	19	11	8	67.86	61.11	80.00
San Jose Pob. (Brgy. 6)	92	36	56	87	35	52	94.57	97.22	92.86
Tubili	366	193	173	47	28	19	12.84	14.51	10.98
Total	2387	1219	1168	742	382	360	31.08	31.34	30.82

Population, with age bracket from 12 to 15, not attending high school is relatively high in the municipality, estimated at about 58.96% of the said age group. Most of them are males, counted at 62.63%, and 57.65% are females.

Brgy. San Jose in Poblacion has the worst record with all (100%) of its population at the age group from 12 to 15 years old are not attending secondary education, followed by Brgys. Harrison (85.26%), Lumangbayan (83.75%) and Mananao (65.56%). The other barangay covering MCWS, Alipaoy, posted a record of 59.48% of its population with age group at 12 to 15 years old (**Table 39**).

Table 39. Children 12-15 Years Old Not Attending High School Education

Brgy.	No. of Children 12-15 Years Old			Children 12-15 Years Old Not Attending High School					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	153	68	85	91	42	49	59.48	61.76	57.65
Harrison	346	190	156	295	166	129	85.26	87.37	82.69
Lumang-bayan	80	42	38	67	35	32	83.75	83.33	84.21
Mananao	180	97	83	118	73	45	65.56	75.26	54.22

Marikit	164	84	80	79	42	37	48.17	50.00	46.25
Mapalad Pob. (Brgy. 1)	193	89	104	68	27	41	35.23	30.34	39.42
Handang Tumulong Pob. (Brgy. 2)	35	20	15	8	6	2	22.86	30.00	13.33
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	63	35	28	20	14	6	31.75	40.00	21.43
Pag-Asa Ng Bayan Pob. (Brgy. 4)	37	17	20	10	8	2	27.03	47.06	10.00
Bagong Silang Pob. (Brgy. 5)	24	12	12	15	7	8	62.50	58.33	66.67
San Jose Pob. (Brgy. 6)	43	20	23	43	20	23	100.00	100.00	100.00
Tubili	217	118	99	91	56	35	41.94	47.46	35.35
Total	1535	792	743	905	496	409	58.96	62.63	55.05

In summary, age bracket, from six to 15 years that are not in school in Paluan, is estimated at 24.68% of the said age grouping (**Table 40**), for a total of 968 individuals, of which 510 are males and 458 are females. Brgy. Handang Tumulong in poblacion has more of its population aging six to 15 years that are attending elementary and secondary education, followed by Brgys. Pag-asa ng Bayan and Silahis ng Pag-asa, both in poblacion.

Table 40. Children 6-15 Years Old Not Attending School

Brgy.	No. of Children 12-15 Years Old			Children 6-15 Years Old Not Attending School					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	382	195	187	74	44	30	19.37	22.56	16.04
Harrison	951	489	462	312	161	151	32.81	32.92	32.68
Lumang-bayan	187	99	88	135	72	63	72.19	72.73	71.59
Mananao	440	242	198	151	83	68	34.32	34.30	34.34
Marikit	409	206	203	54	33	21	13.20	16.02	10.34
Mapalad Pob. (Brgy. 1)	454	215	239	26	13	13	5.73	6.05	5.44
Handang	96	53	43	1	1	0	1.04	1.89	0.00

Tumulong Pob. (Brgy. 2)									
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	144	72	72	8	5	3	5.56	6.94	4.17
Pag-Asa Ng Bayan Pob. (Brgy. 4)	89	43	46	5	2	3	5.62	4.65	6.52
Bagong Silang Pob. (Brgy. 5)	52	30	22	27	16	11	51.92	53.33	50.00
San Jose Pob. (Brgy. 6)	135	56	79	128	53	75	94.81	94.64	94.94
Tubili	583	311	272	47	27	20	8.06	8.68	7.35
Total	3922	2011	1911	968	510	458	24.68	25.36	23.97

2.g. Health Services and Conditions

At present, Paluan has a Community Medicare Hospital that provides basic diagnostic and therapeutic services, such as pediatric, internal medicine, obstetric and minor surgical consultations and management. There are also laboratory activities and tests provided, like CBC, platelet count, urinalysis and stool examination.

The Rural Health Unit and eight Barangay Health Stations provide primary level of health services to the entire population. The ratio of existing number of health services personnel to the population is within the ideal limit. Therefore, the health services provided are sufficient to cater the needs of the community.

Specific programs and projects being undertaken by the Municipal Health Office of Paluan that can be availed by communities are (a) Monthly immunization for infants and tetanus toxoid for mothers; (b) Garantisadong pambata, which provides different health services for children- vitamins, deworming and education campaign; (c) Operation timbang to monitor number of malnourished children; (d) Health campaign on TB; and (e) Fogging activities. Other health services provided to the communities are maternal and child care, family planning, dental services and health promotion programs.

Ambulances are present for emergency purposes, and trained medical aides and health workers are deployed to the barangays for first aid treatment. Meanwhile, people seek treatment in the Paluan town proper. In some cases of childbirth, midwives are summoned from the town proper for assistance. From time to time, the bantay dagat boat is borrowed and used for medical transport.

Medical missions from time to time enhance the health services given to the communities. Some of the residents turn to local practices and beliefs in healing and use of medicinal plants. Whenever health complications occur, patients are brought to Mamburao and/or in Batangas.

A total of 212 children from zero to five years old are suffering from malnutrition based on 2012 CBMS survey of Paluan (**Table 41**). This is roughly 8.57% of total population of children belonging to 0-5 years old (2,474) in the municipality. Except for Brgy. San Jose, all poblacion barangays have no incident of malnutrition. Two barangays covering MCWS, Alipaoy and Harrison, account for the largest record in malnutrition, at 46.33% and 9.24%, respectively, of their respective total children 0-5 years old. The other barangay in MCWS, Mananao, posted 2.25% malnutrition rate. Poverty is the main consideration for the high rate of malnutrition in rural barangays of Paluan. During the 2012 CBMS survey, it was found out that three children below five years died in the municipality. There was only one death related to pregnancy. The leading causes of death, in the municipality, are related to heart diseases, with 17 reported cases, followed with seven cases of unidentified causes (**Table 42**).

Table 41. Malnourished Childred in Paluan

Brgy.	No. of Children 0-5 Years Old			Malnourished Children 0-5 Years Old					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	259	132	127	120	64	56	46.33	48.48	44.09
Harrison	671	357	314	62	38	24	9.24	10.64	7.64
Lumang-bayan	85	42	43	4	3	1	4.71	7.14	2.33
Mananao	311	159	152	7	3	4	2.25	1.89	2.63
Marikit	227	105	122	5	4	1	2.20	3.81	0.82
Mapalad Pob. (Brgy. 1)	239	115	124	0	0	0	0.00	0.00	0.00
Handang Tumulong Pob. (Brgy. 2)	35	19	16	0	0	0	0.00	0.00	0.00
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	91	47	44	0	0	0	0.00	0.00	0.00
Pag-Asa Ng Bayan Pob. (Brgy. 4)	38	15	23	0	0	0	0.00	0.00	0.00
Bagong Silang Pob. (Brgy. 5)	24	10	14	0	0	0	0.00	0.00	0.00

San Jose Pob. (Brgy. 6)	51	23	28	4	2	2	7.84	8.70	7.14
Tubili	443	235	208	10	7	3	2.26	2.98	1.44
Total	2474	1259	1215	212	121	91	8.57	9.61	7.49

Table 42. Causes of Death in Paluan

Causes	No. of Death					
	Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female
Heart Diseases	17	7	10	0.11	0.09	0.14
Vascular System Diseases	1	1	0	0.01	0.01	0.00
Pneumonia	2	2	0	0.01	0.03	0.00
Tuberculosis	3	1	2	0.02	0.01	0.03
Cancer	3	2	1	0.02	0.03	0.01
Diarrhea	0	0	0	0.00	0.00	0.00
Pregnancy or Childbirth Complication	0	0	0	0.00	0.00	0.00
Accident	3	2	1	0.02	0.03	0.01
Diabetes	0	0	0	0.00	0.00	0.00
Lungs Diseases	2	1	1	0.01	0.01	0.01
Kidney Diseases	6	4	2	0.04	0.05	0.03
Drowning	0	0	0	0.00	0.00	0.00
Landslide	1	1	0	0.01	0.01	0.00
Eletrocuted	0	0	0	0.00	0.00	0.00
Others	0	0	0	0.00	0.00	0.00
Total	7	4	3	0.05	0.05	0.04

2.h. Peace and Order

There are 13 policemen maintaining the peace and order in municipality. The crime rate in Paluan in 2012 is reportly zero. Some residents in Brgy. Harrison have shared stories of carabao and cattle stealing. A military task force is deployed in the area to assist in quelling the insurgency problem. In September 2012, there was an NPA-military encounter in Sitio Dapdap, which caused the evacuation of about 20 Mangyan families to Sitios Wawa Binuwangan and Ignonok. Bantay Gubat and Bantay Dagat volunteers continue to assist in the protection of the natural resources of the municipality.

2.i. Religious Churches and Practices

Majority of the residents in Paluan are Roman Catholics, including those in barangays within MCWS. The ruins of Pinagbayanan church, located at Brgy. Harrison, is considered a heritage site. The Seventh Day Adventist Church is also an active religion in the area, particularly in Sitio Ulasan where a church was established. Members of the congregation also directly manage the local school.

Different religious festivities and traditions are also being practiced in Paluan, including indigenous traditions and rituals. The town fiesta is celebrated every March 19 in honor of Saint Joseph, the Patron Saint of the municipality. There are also Santacruzan De Mayo in May, reenactment of the passion and death of Jesus Christ, Pabasa ng Pasyon and Penitensiya during Lenten season.

3. Local Economy, Employment and Poverty

3.a. Agriculture and Fishery

Agriculture and fishery are the major economic activities in Paluan. A total land area of 2,869.13 ha is devoted for the cultivation of crops, such as rice, root crops and vegetables. A large portion of Paluan's land area is classified as forestlands and within MCWS. Pastureland occupies 10,427.75 ha of the classified forestland of the municipality. The Office of the Municipal Assessor of Paluan listed 2,587.153 ha of pastureland in Brgy. Harrison belonging to 11 owners.

Paluan has a small-scale poultry and livestock industry. Barangays closed to shorelines are engaged in fishing. Paluan has rich marine resources in the Paluan Bay and the other bodies of water surrounding the island of Mindoro. There are 32 hectares of fishponds cultivating bangus or milkfish. Production in excess of local consumption is sold in neighbouring towns and municipalities, such as Batangas City and Manila. **Table 43** presents the agriculture production and consumption in Paluan in 2010. Except for milk, coconut and banana, the municipality has posted a surplus on its various agricultural production versus its consumption, including rice, fish, meat, root crops, nuts, mango and onions.

Table 43. Agriculture Production and Consumption in Paluan, 2010

Crops	Production	Consumption	Surplus
Rice	3,744 M.T	1,250 M.T	2,494 M.T
Fish	70,000 kgs.	32,500 kgs.	37,500 kgs.
Meat	64,400 kgs.	32 250 kgs.	32,150 kgs.
Milk	450 gals.	450 gals.	-
Root crops	4,000 kgs.	2,500 kgs.	1,500 kgs.
Cashew Nuts	8,500 kgs.	3,250 kgs.	5,250 kgs.
Coconut	40,000 nuts	40,000 nuts	-
Mango	18,300 kgs.	7,000 kgs.	11,300 kgs.
Banana	64,000 kgs.	64,000 kgs.	-
Onions	21,000 kgs.	2,350 kgs.	18,650 kgs.

3.b. Commerce and Industry

The commerce and industry in the municipality are basically agriculture based. A total of 1,191 business establishments are operating in Paluan composed mostly of retail establishment, commercian and industrial shops and rice mills. Pastillas (carabao milk candy) making is a booming industry in the town. Other economic activities in the municipality are apiary, carpentry, pebbles quarrying, orchards, fish drying and bagoong making.

Table 44 presents in details the different industries and business enterprises in Paluan and the corresponding workforce. The agriculture, forestry and fishery sector accounts the largest number in terms of employment, estimated at 54.23% of the surveyed persons in 2012 CBMS of the municipality. Other service types of activities also posted a higher employment record at 22.32%. Other industries and commercial enterprises only provide ranging from one to almost six percent employment and there are also even less than one percent.

Table 44. Types of Business and Industry in Paluan

Tape of Industries/ Business	Persons Employed					
	Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female
Agriculture, Forestry and Fishing	1667	1595	72	54.23	64.86	11.71
Mining and Quarrying	9	7	2	0.29	0.28	0.33
Manufacturing	28	18	10	0.91	0.73	1.63
Electricity, Gas, Steam and Air Conditioning Supply	8	8	0	0.26	0.33	0.00
Water Supply, Sewerage, Waste Management and Remediation Acivities	11	7	4	0.36	0.28	0.65
Construction	183	177	6	5.95	7.20	0.98
Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcyles	63	29	34	2.05	1.18	5.53
Transportation and Storage	93	89	4	3.03	3.62	0.65
Accommodation and Food Services Activities	120	80	40	3.90	3.25	6.50
Information and Communication	15	5	10	0.49	0.20	1.63
Financial and Insurance Activities	10	3	7	0.33	0.12	1.14
Real Estate Activities	7	4	3	0.23	0.16	0.49
Professional, Scientific and Technical Activities	10	2	8	0.33	0.08	1.30
Administrative and Support Services	26	14	12	0.85	0.57	1.95
Public Administration and Defense, Compulsory Social Security	42	33	9	1.37	1.34	1.46
Education	84	21	63	2.73	0.85	10.24
Human Health and Social Work Activities	28	3	25	0.91	0.12	4.07
Arts, Entertainment and Recreation	2	2	0	0.07	0.08	0.00
Other Service Activities	686	362	324	22.32	14.72	52.68
Activities of Households as Employers, Undifferentiated Goods-and-Services	18	11	7	0.59	0.45	1.14
Activities of Extra-Territorial Organizations and Bodies	14	8	6	0.46	0.33	0.98

Tourism is fast emerging as a money-earner for Paluan. Foreign and domestic back-packers frequent Calawagan Mountain Resort and other tourist attractions. In the near future, it is expected that ecotourism will be Paluan's premier economic activity. Existing tourist resorts are the Calawagan Mountain Resort, Milmak Mountain Resort and Bulalacao Spring Ridge. Existing and potential tourist attractions include Bisay Falls, Mainit Spring, Batinglay Falls, Agbokbok Falls (Brgy Harrison), Mananao Beach and Mount Calavite Peak. Currently, the most popular route going to the peak is through Ulasan, passing through the Mangyan community. The planned increase in tourism activities would have bearing on the socio-cultural influence on the Iraya tribe. Although recognized as a potential source of income, this would need to be studied further as to whether or not activities or infrastructure development in the mountain would not have detrimental effects on the environment, particularly in water, forests and wildlife as well as on the aesthetic value of the area.

A tourism master plan is being prepared in preparation for the declaration of Paluan as a tourist area pursuant to the passage of the proposed House Bill No. 9792. The LGU and the community of Paluan have seen the importance of the environment and launched a festival entitled "Saknungat at Paluan '97", which is now an annual event to increase the awareness of people on the importance of securing and protecting the environment.

3.c. Employment and Income

As an agriculture-based municipality, the employment and sources of income in Paluan also heavily relies from farming, fishing and to some extent forestry. Almost 52.77% of the employed labor forces in the municipality are farmers, fisherfolks and forestry workers. Laborers and unskilled workers account almost 16.39% of the total employed persons in the municipality. There are also uncategorized or special occupations that are accounted to 13.50%. Meanwhile, those who are working as officials of government and special interest organizations, corporate executives, managers and managing proprietors and supervisors are estimated at 7.25% of employed work forces in the municipality. **Table 45** lists the different types of occupation in Paluan.

Table 45. Types of Occupation in Paluan

Occupation	No. of Employed Persons					
	Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female
Officials of Government and Special Interest Organizations; Corporate Executives; Managers; Managing Proprietors and Supervisors	223	130	93	7.25	5.29	15.12
Physical, Mathematical and Engineering; Science Professionals	71	25	46	2.31	1.02	7.48
Technician and Associate Professionals	27	14	13	0.88	0.57	2.11
Clerk	22	8	14	0.72	0.33	2.28
Service Workers; Shop and Market	126	71	55	4.10	2.89	8.94

Sales Workers						
Farmers; Forestry Workers; Fishermen	1622	1557	65	52.77	63.32	10.57
Trades and Related Workers	74	48	26	2.41	1.95	4.23
Plant Operators and Assemblers	29	24	5	0.94	0.98	0.81
Laborers; Unskilled Workers	515	403	112	16.75	16.39	18.21
Special Occupations	415	198	217	13.50	8.05	35.28

Interestingly, almost all (99%) the labor forces in Palaua are employed. Except for Brgys. Mapalad and Silahis ng Pag-asa, both in poblacion, all poblacion barangays have 100% of their respective labor forces are employed (**Table 46)**. In the same manner, all work forces in barangays covering MCWS are also employed. Brgy. Lumang Bayan posted a lowest record of its labor forces that are employed (87.20%).

Table 46. Employed Labor Force in Paluan

Brgy.	Total No. of Labor Force			Employed Labor Force					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	53	34	19	53	34	19	100.00	100.00	100.00
Harrison	478	443	35	478	443	35	100.00	100.00	100.00
Lumang-bayan	125	84	41	109	77	32	87.20	91.67	78.05
Mananao	304	262	42	304	262	42	100.00	100.00	100.00
Marikit	383	314	69	378	311	67	98.69	99.04	97.10
Mapalad Pob. (Brgy. 1)	543	397	146	541	396	145	99.63	99.75	99.32
Handang Tumulong Pob. (Brgy. 2)	114	76	38	114	76	38	100.00	100.00	100.00
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	160	117	43	154	115	39	96.25	98.29	90.70
Pag-Asa Ng Bayan Pob. (Brgy. 4)	106	70	36	106	70	36	100.00	100.00	100.00
Bagong Silang Pob. (Brgy. 5)	50	30	20	50	30	20	100.00	100.00	100.00
San Jose Pob.	155	101	54	155	101	54	100.00	100.00	100.00

(Brgy. 6)									
Tubili	634	546	88	632	544	88	99.68	99.63	100.00
Total	3105	2474	631	3074	2459	615	99.00	93.39	97.46

While the municipality is enjoying a high rate of employment, most of those who are employed are working as short-term, seasonal and/or casual employees, estimated at 68.44% of the labor force. Only 30.19% of the working forces have permanent employment (**Table 47**)

Table 47. Nature of Employment in Paluan

Nature	Number of Employed Labor Force					
	Magnitude			Proportion		
	Total	Males	Females	Total	Males	Females
Permanent	928	644	284	30.19	26.19	46.18
Short-term, seasonal, casual	2011	1683	328	65.42	68.44	53.33
Worked on different jobs on day-to-day or week-to-week	185	151	34	6.02	6.14	5.53

Majority of those who been classified as workers, estimated at 76.61%, are working for private establishments (**Table 48**), while 20.53% of workers are employed in households.

Table 48. Classes of Workers in Paluan

Class	Number of Workers by Class					
	Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female
Working for a household	631	507	124	20.53	20.62	20.16
Working for a private establishment	2355	1875	480	76.61	76.25	78.05
Working for government/ government corporation	42	25	17	1.37	1.02	2.76
Self-employed	27	18	9	0.88	0.73	1.46
Employer in own family operated farm or business	8	6	2	0.26	0.24	0.33
Working with pay on own family operated farm or business	14	12	2	0.46	0.49	0.33
Working without pay on own family operated farm or business	38	31	7	1.24	1.26	1.14
Working for government of another country	9	4	5	0.29	0.16	0.81

There are also under employed labor forces in the municipality, estimated at 29.34% (**Table 49)**. Two poblacion barangays, Mapalad and and Pag-asa ng Bayan, posted higher rates of underemployment, counted at 62.29% and 51.89%, respectively, ouf of their respective labor force population. Brgys. Mananao and Harrison, which are located in MCWS, have lower underemployment records, estimated only at 0.33% and 0.63%, respectively, of their work forces. The other barangay located in MCWS, Alipaoy, has 47.17% underemployed.

Table 49. Underemployment in Paluan

Brgy.	Total No. of Labor Force			Employed Labor Force					
				Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Alipaoy	53	34	19	25	20	5	47.17	58.82	26.32
Harrison	478	443	35	3	2	1	0.63	0.45	2.86
Lumang-bayan	109	77	32	53	42	11	48.62	54.55	34.38
Mananao	304	262	42	1	1	0	0.33	0.38	0.00
Marikit	378	311	67	30	24	6	7.94	7.72	8.96
Mapalad Pob. (Brgy. 1)	541	396	145	337	252	85	62.29	63.64	58.62
Handang Tumulong Pob. (Brgy. 2)	114	76	38	54	40	14	47.37	52.63	36.84
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	154	115	39	36	29	7	23.38	25.22	17.95
Pag-Asa Ng Bayan Pob. (Brgy. 4)	106	70	36	55	36	19	51.89	51.43	52.78
Bagong Silang Pob. (Brgy. 5)	50	30	20	7	4	3	14.00	13.33	15.00
San Jose Pob. (Brgy. 6)	155	101	54	28	20	8	18.06	19.80	14.81
Tubili	632	544	88	273	248	25	43.20	45.59	28.41
Total	3074	2459	615	902	718	184	29.34	29.20	29.92

Majority of the respondents in 2012 CBMS of Paluan cited that unemployment was primarily because they are still waing for the results of their previous applications. This is about 42.74% of the total unemployed persons in the municipality (**Table 50**). Another 23.60% reasoned out that they are still in school and 12.95% are engaged in housekeeping.

The low food/agricultural production could be linked to the limited access to infrastructure and facilities for agriculture (irrigation and post-harvest facilities) resulting to high cost agricultural production and low income of the community.

Table 50. Reasons of Unemployment

Reasons	No. of Reasons					
	Magnitude			Proportion		
	Total	Male	Female	Total	Male	Female
Believing no work available	21	11	10	0.21	0.25	0.17
Await results of previous application	4368	1915	2453	42.74	42.91	42.61
Temporary illness/disability	32	16	16	0.31	0.36	0.28
Bad weather	32	17	15	0.31	0.38	0.26
Waiting for rehiring	68	25	43	0.67	0.56	0.75
Too young/old, retired or permanently disabled	861	381	480	8.42	8.54	3.34
Housekeeping	1323	229	1094	12.95	5.13	19.00
Schooling	2412	1209	1203	23.60	27.09	20.90
Seasonal work and it's off season	16	14	2	0.16	0.31	0.03
Others	0	0	0	0.00	0.00	0.00

3.d. Poverty Levels and Hunger Incidence

While it is true that majority of labor forces in Paluan are employed, the poverty threshold in the municipality is still very high. An estimated of 60.01% of the households in the Paluan are with income below poverty standard. This accounts to about 1,957 households in the municipality. Posted higher percentages of income below poverty are the three barangay covering MCWS, recorded at 78.83, 72.95% and 61% for Harrison, Mananao and Alipaoy, respectively, out of their respective total household population. This situation may trigger further pressures to the remaining natural resources in MCWS. Brgy. Pag-asa ng Bayan in Poblacion has the lowest record of income below poverty threshold at 22.43%. **Table 51** presents the number of households per barangay with income below poverty threshold in Paluan.

Table 51. Household Income Below Poverty Threshold in Paluan

Brgy.	No. of Households	No. of Households with Income Below Poverty Threshold	
		Magnitude	Proportion
Alipaoy	276	169	61.23
Harrison	652	514	78.83
Lumang-bayan	166	89	53.61
Mananao	329	240	72.95
Marikit	371	193	52.02
Mapalad Pob. (Brgy. 1)	405	242	59.75
Handang Tumulong Pob. (Brgy. 2)	98	32	32.65
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	152	82	53.95
Pag-Asa Ng Bayan Pob. (Brgy. 4)	107	24	22.43
Bagong Silang Pob. (Brgy. 5)	56	24	42.86

San Jose Pob. (Brgy. 6)	140	59	42.14
Tubili	509	289	56.78
Total	3261	1957	60.01

Aside from high number of households with income below poverty threshold in Paluan, some households are even receiving income under food threshold. This means that the income received by the households are not enough for food requirements alone. An estimated 45.78% of the households in the municipalty are receiving income below food threshold (**Table 52**). Brgys. Harrison, Mananao and Alipaoy, where MCWS is located, recorded higher percentages in terms of households with income below food threshold, estimated at 65.49% for Harrison, 53.80% for Mananao and 48.91% for Alipaoy.

Table 52. Household Income Below Food Threshold in Paluan

Brgy.	No. of Households	No. of Households with Income Below Food Threshold	
		Magnitude	Proportion
Alipaoy	276	135	48.91
Harrison	652	427	65.49
Lumang-bayan	166	67	40.36
Mananao	329	177	53.80
Marikit	371	150	40.43
Mapalad Pob. (Brgy. 1)	405	187	46.17
Handang Tumulong Pob. (Brgy. 2)	98	21	21.43
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	152	47	30.92
Pag-Asa Ng Bayan Pob. (Brgy. 4)	107	15	14.02
Bagong Silang Pob. (Brgy. 5)	56	22	39.29
San Jose Pob. (Brgy. 6)	140	46	32.86
Tubili	509	199	39.10
Total	3261	1493	45.78

The poverty level in Paluan is relatively high with statistics showing some households experiencing food shortage. These are the families who actually experienced hunger because of lack of food. Although in general the figure is very low, at 5.9% of the households in the municipality, it still covers about 193 households. Three barangays in Paluan has this kind of record and two of which are barangays located in MCWS. The hunger incidence in Brgy. Alipaoy is quite high at 34.78% of its household population and 13.50% for Brgy. Harrison. Brgy. Tubili accounts 1.77% of households that have experienced food shortage (**Table 53**).

The high incidence of poverty indicates the difficulty the people of Harrison and Palauan faces everyday in meeting their basic needs. This was one of the main reasons identified during the FGD why people resort to timber poaching and engaging in other illegal activities. They are fully aware of the possible consequences of what they are doing, but proceeded with full knowledge, as they need to provide food on the table for their families.

Table 53. Households Experiencing Food Shortage in Paluan

Brgy.	No. of Households	No. of Households Experiencing Food Shortage	
		Magnitude	Proportion
Alipaoy	276	96	34.78
Harrison	652	88	13.50
Lumang-bayan	166	0	0.00
Mananao	329	0	0.00
Marikit	371	0	0.00
Mapalad Pob. (Brgy. 1)	405	0	0.00
Handang Tumulong Pob. (Brgy. 2)	98	0	0.00
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	152	0	0.00
Pag-Asa Ng Bayan Pob. (Brgy. 4)	107	0	0.00
Bagong Silang Pob. (Brgy. 5)	56	0	0.00
San Jose Pob. (Brgy. 6)	140	0	0.00
Tubili	509	9	1.77
Total	3261	193	5.92

3.e. Housing

A total of 42.23% households in Paluan are enjoying rightful owner of houses and lots they are occupying, or they are owner-like possession. Some households, estimated at 31%, own their houses, but they are not renting the lots, with consent, however, from lot owners. About 10.64% of the households in the municipality are renting-free house and lot with consent from owners. There are also households that live in public spaces with rent and without renting. **Table 54** provides details of the housing tenure in Paluan.

Table 54. Housing Tenure in Paluan

Types of Tenure	Total Number	
	Magnitude	Proportion
Owner, owner-like possession of house and lot	1377	42.23
Rent house/room including lot	292	8.95
Own house, rent lot	18	0.55
Own house, rent lot with consent of owner	1011	31.00
Own house, rent lot without consent of owner	86	2.64
Rent-free house and lot with consent of owner	347	10.64
Rent-free house and lot without consent of owner	1	0.03
Living in a public space with rent	5	0.15
Living in a public space without rent	121	3.71
Others land tenure status	2	0.06

There are also informal settlers in the municipality, estimated at 6.53% of the total households. Brgy. Harrison accounts the largest number of informal settlers, at about 123

households, which is equivalent to 18.86% of the entire household population in Paluan. This might be attributed to the large area of Brgy. Harrison that are within MCWS **(Table 55)**.

Table 55. Informal Settlers Households in Paluan

Barangay	No of Households	Total Number	
		Magnitude	Proportion
Alipaoy	276	6	2.17
Harrison	652	123	18.86
Lumang-bayan	166	0	0.00
Mananao	329	13	3.95
Marikit	371	46	12.49
Mapalad Pob. (Brgy. 1)	405	7	1.73
Handang Tumulong Pob. (Brgy. 2)	98	0	0.00
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	152	1	0.66
Pag-Asa Ng Bayan Pob. (Brgy. 4)	107	1	0.93
Bagong Silang Pob. (Brgy. 5)	56	0	0.00
San Jose Pob. (Brgy. 6)	140	0	0.00
Tubili	509	16	3.14
Total	3261	213	6.53

Households living in makingshift houses are counted at 132 households, or 4.05% of the entire householdes in Paluan. Brgys. Alipaoy and Harrison, that are both located in MCWS, posted higher percentages of households living in makeshift houses, estimated at 22.46% and 7.36%, respectively, out of their respective total household population (**Table 56**). This condition may also put additional pressures to trees and other natural resources in MCWS since households in barangays within MCWS tend to secure housing materials in the protected area.

Table 56. Households Living in Makeshift Housing in Paluan

Barangay	No of Households	Total Number	
		Magnitude	Proportion
Alipaoy	276	62	22.46
Harrison	652	48	7.36
Lumang-bayan	166	11	6.63
Mananao	329	0	0.00
Marikit	371	6	1.62
Mapalad Pob. (Brgy. 1)	405	1	0.25
Handang Tumulong Pob. (Brgy. 2)	98	0	0.00
Silahis Ng Pag-Asa Pob. 17(Brgy. 3)	152	0	0.00
Pag-Asa Ng Bayan Pob. (Brgy. 4)	107	0	0.00
Bagong Silang Pob. (Brgy. 5)	56	0	0.00
San Jose Pob. (Brgy. 6)	140	1	0.71
Tubili	509	3	0.59
Total	3261	132	4.05

4. Land and Other Natural Resource Uses and Practices

The existing land cover and uses of MCWS are already provided in the physical and geopolitical section of this RSEA Final Report. This part of the report will provide elaboration on the different land uses of the municipality and resource uses and practices both in Paluan and MCWS.

Existing lands devoted to agriculture in the municipality are estimated at 13,351.23 ha, or roughly 23.99% of its total land area. Out of these, a total of 2,875 ha are devoted for rice production of which 1,392 ha are irrigated. Another 532.13 ha are planted with various crops, such as vegetables and rootcrops. About 10,124.10 ha are still uncultivated.

The built up areas of the municipality, which are usually the community centers and areas devoted for instrastructures, parks and open spaces, are mostly situated along road networks, coastal plains and poblacion barangays. An estimated of 113.32 ha of Paluan are built up sites – 31.74 ha are urban or poblacion barangays and 81.58 ha are rural barangays.

The estimated forestlands of the entire municipality are about 31,826.46 ha, or 56.29% of its total. Certain parts of this forestland cover MCWS. However, there are forestlands already planted with fruit bearing trees and upland field crops. The pastureland of the municipality is recorded at 10,427.75 ha and currently used for cattle production. Since there are still forestlands outside MCWS, it is necessary that the LGU shall also formulate its Forest Land Use Plan (FLUP), while PA management planning for MCWS is also wanting.

Although not officially declared as mineral lands, the municipality recognizes that some 121 ha of land may contain unquantified metallic and non-metallic mineral deposits. Out of these, 54 ha are being claimed for mining of metallic deposits (nickel chromites and copper chromites) and 67 ha for non-metallic deposits of talc asbestos, isle and ornamental stones.

It is known that mining activities could bring economic advantage to the community but in turn could damage the environment, thus the move done by the Sangguniang Bayan of Paluan in passing a resolution declaring a twenty-five years moratorium on large-scale mining in the municipality is very helpful in maintaining the integrity of environment in Paluan.

Another 32 ha of the municipality's land area are utilized for fishponds of bangus and tilapia, while 48 ha have been identified as tourism site, which basically covers the entire Calawagan River Mountain Resort. The Calawagan River has been elevated to the Hall of Fame of the Cleanest Inland Body of Water in the Philippines, having won three consecutive years at the regional and national levels. The Department of Science and Technology (DOST) has tested the water quality of the river and no Coli form was found. The heterotrophic plate count in the water is 65 ml, which indicates that the water in the river is cleaner than the water in the household tap. Other land uses in Paluan are estimated at 170.95 ha, covering open spaces, roads and some infrastructures.

The OIC Municipal Assessor of Paluan, Melody V. Paglicawan, gave a list of property with annotated titles for Brgy. Harrison, as of February 14, 2013. The list contains 82 names that own 394.153 ha of land. Out of the 394.153 ha, 224.99 ha are considered as pastureland

distributed to 38 persons. The Department of Agrarian Reform (DAR) reportedly distributed some 32.09 ha under the Certificate of Land Occupancy Agreement (CLOA) distributed to 11 owners. At the same time, the OIC Municipal Assessor gave a separate list of property classified as pastureland in Brgy. Harrison covering 2,587.15 ha and owned by 11 individuals.

Brgy. Captain Benito Cababay said that 204 ha of land were distributed by DENR under the Integrated Social Forestry (ISF) program to 106 beneficiaries in 1994. This was undertaken to help conserve the remaining forest. The area covered by the ISF is located in So. Hinugasan up to So. Ignonokan and So. Balimbing. The ISF agreement, known as the Certificate of Stewardship Contract (CSC), spans 25 years and is renewable for another 25 years.

As stated in the other sections of this report, the main livelihood activities in Paluan are agriculture and fisheries. Some locals still undertake hunting of animals for food. Some of the animals being hunted include wild pig, deer, labuyo (native chicken), papan (wild duck), giant fruit bat, bayawak, imperial pigeons (ballot), punay, hornbill, lintoy, tiktik and pugo, among others. Rivers and streams are also sources of food, such as shrimps, palos, igat, kayapaan (parang talangka), native hito, baglaw, pulaleng, barongis, yatip, baligwang (susung malaki). The Mangyans also gather honey from the forest. Burning of pukyutan to gather the honey sometimes causes forest fire.

An informant said that there is a wide coconut plantation in So. Pinagbayanan. Cashew trees can be found in So. Ulasan, Hinugasan and Ignonok. Former forest areas that have been subjected to kaingin have been converted into grassland for cattle ranching. A mangyan leader said that cattle ranching in Paluan started in the 1960s.

There are about 100 individuals, both IPs and non-IPs, gathering pebbles from the coastal areas of Paluan. Outsiders buy the pebbles per sack. PASU Almazan said that the pebble gatherers have a permit from the Provincial Mining Regulatory Board (PMRB) chaired by the PENRO and co-chaired by the governor. The pebble gatherers are being encouraged by the DENR and the LGU to form themselves into a cooperative and register with the Cooperatives Development Authority (CDA).

Majority of the residents in Barangay Harrison use wood for fuel. Wood is also used to build houses. This popular practice by the locals add pressures to the remaining natural resources in MCWS, since tree plantation for commercial purpuses is not yet popular in the area.

There are many plants from the forest that the Mangyans use for medicinal purposes. Some of these plants are listed in **Table 18**.

Indigenous peoples and non-IPs have varying perception of the various threats to conservation. One barangay captain even claimed that mangyans are against conservation. Some of resource uses and practices in MCWS and Paluan, in general are enumerated below.

- Timber poaching. Interviewees said that some LGU officials own chain saws and you can hear the sound of chain saws often. Chain saws are silent only when DENR employees have activities in the area. There is also an allegation that there is a secret mini

sawmill in Paluan. One interviewee said that there is a noticeable decrease in forest cover since 1986. River has also widened and flooding occurs more often now. Springs that are used by the people for drinking are drying up. Trees that are being cut and logged include ipil, amugin, anabitan, mulawin, lawaan, and kabolo for banca making. There was a banca being made in So. Pamutusin during the field survey for this RSEA.

- Slash and burn (Kaingin). Mangyans consider kaingin as their indigenous farming practice because of their nomadic existence. However, kaingin contributes to the reduction of forest area. An informant said that there are kaingin farms in So. Ignonok and nearby areas.
- Burning of honeycombs to gather honey. Honey gatherers are mostly Mangyans. Sometimes, this activity leads to forest fires.
- Charcoal production. Interviewees said that there are many charcoal makers in the area. The trees that are made into charcoal are ipil, ananapla, batino, guyog guyog, banaba and bangkal, among others.
- Illegal fishing. There is a decrease in the fish catch due to destructible methods of fishing such as dynamite and cyanide fishing.

A mangyan leader said that in the early 1960s, a migrant settler in Paluan claimed more than 100ha at the foot of Mt Calavite for ranching purposes. He agreed to some of the listed threats to forest conservation above such as illegal logging and burning of honeycombs. He didn't mention kaingin as a threat to forest reduction.

5. Cultural Profile

The term "iraya" is said to mean "man" or "human being." The Irayas are the Mangyans of Mindoro who occupy the northwestern part of Mindoro Island. The estimated population of the Iraya-Mangyan is 10, 689 (1991) distributed around 141 settlements in the Municipalities of Abra de Ilog, Mamburao and Paluan.[1] Some Iraya mangyan can also be found in the municipalities of Puerto Galera, San Teodoro and Baco in Oriental Mindoro. The Iraya has curly or deep wavy hair and dark skin but not as dark as that of the Negrito.[2]

The Mangyans are simple people. They were once coastal dwellers driven into the mountains to avoid religious conversion by the Spaniards, raids by Moro pirates, and the influx of recent migrants. They now lead a semi-nomadic existence. Mangyans live in loose clusters of up to 20 bamboo huts with thatched roofs and raised floors. They sometimes are away from their families for many weeks in search of food.

According to the Iraya customs and traditions, the family is considered as the basic unit of production and consumption. Their kindred system is traced to both the father and mother's links, which their system refer to us guruan. The nuclear family is referred to us talnakan wherein their already exists a social order. The eldest takes the place of the parents during

[1] http://phch.eccmanila.org/tribal.html

[2] http://www.mangyan.org/content/iraya

their absence and is one considered the second parent. He/She is likewise considered the intermediary between the parents and the younger siblings.

During ancient times, the Iraya traditional attire was made of dry tree bark, pounded to make it flat and soft. The women usually wore a blouse and a skirt and the men wore g-strings made of cloth. Today, however, the Iraya are dressed just like the lowland people. Ready-to-wear clothes are easier to find than their traditional costume.

The Irayas are also skilled in nito-weaving. Handicrafts such as jars, trays, plates and cups of different sizes and design are being marketed to the lowlanders. During Christmas season, they go down to lowlands with some of their handicrafts to sell or exchange for consumer items such as clothes, foods and others. A mangyan is very much willing and happy to give their live chicken in exchange for a can of sardines, which they consider as a very special food. They subsist on rice, banana, sweet potato, and other root crops.

Some Mangyans in remote areas have conserved their traditional lifestyle - hunting with bows and arrows and gathering food. The majority though practices small-scale and self-supporting agriculture. Tagalog settlers employ them for "dirty work", such as cleaning the plantations from unwanted plants or even converting forests into plantations - which contributes to further reduction of their habitats. Most of them rely on planting rice, corn, vegetables and hunting wild animals to support their daily existence. A male at age 16 can become a family man if he can build his own house, which is made up of coconut leaves, bamboo, tree for its pillar, and other materials.

Among the Iraya, leadership is provided by the puon-balayan, in the local group referred to as sanguraan composed of closely related families. Moral and legal problems are referred to the puon-balayan for decision. Any criminal act, or offense done, is corrected with the use of either the pangaw or tige. Pangaw is the Iraya's version of the detention cell. Tige, on the other hand, is a punishment wherein the suspects of a particular offense are called and are ordered to immerse their right hand in a pot of boiling water to pick up the white stone at the bottom of the pot. Anyone of the suspects, whose right hand gets burned, is considered to be the guilty party. It is believed that the innocent parties will not get burned in this particular test because Apo Iraya will protect them from harm.

Traditionally, the Mangyans are animists and are known to be superstitious. Today, however, many Irayas are Roman Catholic, Evangelical Christian, and Iglesia ni Cristo. The Iraya language is an Austronesian language belonging to the northern Mindoro group. The known dialects of Iraya are Abra-de-Ilog, Alag-Bako, Pagbahan, Palauan-Calavite, Pambuhan, and Santa Cruz. Each dialect is distinct, but the basic vocabulary and grammar of everyday speech are the same. Tagalog slowly replacing their native language and few show interest in preserving their language, as perhaps it is no longer useful to them.[3]

The Mangyans in Binagyuhan live in a cluster of about 50 wooden houses and bamboo huts with thatched roofs. Some families still lead a semi-nomadic existence living in bamboo huts with thatched roofs and raised floors. The Mangyans in Ulasan are also clustered but with a

[3] Ethnic Groups Philippines http://www.ethnicgroupsphilippines.com/people/ethnic-groups-in-the-philippines/iraya/

more structured two to three room house made of wood, either thatched roofs or galvanized iron roof. The Iraya are dressed just like the lowland people but most men still prefer to walk barefoot.

The Irayas are skilled in nito-weaving and women were still observed doing this and some household items were made of woven nito. Handicrafts such as jars, trays, plates and cups of different sizes and design are being marketed to the lowlanders.

The communities subsist on rice, banana, sweet potato, and other root crops. Some work in cashew and coconut plantations and shelling cashew were one of the activities women and older children do in Ulasan.

Some Mangyans in both Ulasan and Binagyuhan still hunt, and gather food from the forests. Most would look for freshwater fish, crabs, snails, frogs and edible plants and fruits. The majority practices small-scale and shifting agriculture or kaingin. This practice has converted most of the remaining forests into grasslands, which contributes to further reduction of their habitats.

Among the Irayas, leadership is provided by the puon-balayan, in the local group referred to as sanguraan, composed of closely related families. Moral and legal problems are still referred to or discussed with the puon-balayan for decision. In Ulasan, almost all of the Iraya are members of the Seventh Day Adventist.

Random interview, with at least eight individuals of the Iraya tribe of Mangyans, in both Ulasan and Binagyuhan communities, was conducted during the field survey. A focus group discussion was also done on both Ulasan and Binagyuhan communities with representatives from the tribal communities. The team took the opportunity to ask individuals about traditional beliefs, sacred places, practices and rituals. All eight respondents shared that they no longer follow their traditional beliefs and practices. At least three of the key persons of the Mangyan group interviewed mentioned that they are no longer interested in following the traditions of their ancestors. When asked if there are sacred places that we need to respect, most would not understand the question or would just say that they no longer follow the beliefs of the older generations.

The lost of these practices may have also contributed to the changed in attitude and outlook of these particular tribe in terms of protecting the environment. A number of the local communities are involved in illegal timber poaching and slash and burn farming practices. There are two Mangyan settlements located at Sitio San Pablo, Barangay Alipaoy and Sitio Igsuso, Barangay Tubili, considered as heritage sites.

C. Institutional Arrangement and Governance

This section of the RSEA Final Report details the different institutional arrangements for the management and governance of MCWS as a protected area. This includes policies and legislations affecting the site, stakeholders and programs and projects proposed and implemented in the PA.

1. Policies and Legislations Affecting the Project Site

Mount Calavite Wildlife Sanctuary is a declared protected area and therefore a component of the National Integrated Protected Areas System of the Philippines, as provided in RA 7586. The NIPAS pursues the policy of the State to secure for the present and future generations of Filipinos the perpetual existence of all native plants and animals. It sets aside specific portions of land and water that are of unique physical and biological significance to enhance their biological diversity and protect them against destructive human exploitation.

The 1987 Philippine Constitution

The Philippine Constitution is hailed by many for its categorical commitment to promoting and protecting the right of a sound and healthful environment in accord with the rhythm and harmony of nature. This, however, should be read alongside the constitutional provisions on national patrimony, for doing so will show the economic facet of ensuring a healthful environment. This is heavily implied in the statement that the goals of the national economy are a more equitable distribution of opportunities, income, and wealth; a sustained increase in the amount of goods and services produced by the nation for the benefit of the people; and an expanding productivity as the key to raising the quality of life for all, especially the underprivileged. In line with this, all natural resources, including forest and minerals, are owned by the State and exploitation thereof is subject to the control and supervision of the State. Be that as it may, the Congress may, by law, allow small-scale utilization of natural resources by Filipino citizens. One important declaration in the Constitution is the inclusion of national park as one major land classification in the Philippines. The three others are agricultural lands, mineral lands and forestlands. Boundaries of national parks could not be altered, except by law, which shall be passed by the Congress.

The NIPAS Act of 1992

The National Integrated Protected Areas System Act of 1992 (Republic Act No. 7586) pursues the policy of the State to secure for the present and future generations of Filipinos the perpetual existence of all native plants and animals. It sets aside specific portions of land and water that are of unique physical and biological significance to enhance their biological diversity and protect them against destructive human exploitation. The NIPAS Act applies to practically all types of especially designated areas that require conservation or protection, whether they are simple parks for the recreational use of Filipino citizens, or natural habitats of all native flora and fauna.

This pioneering law provides for the basic framework for the establishment and management of protected areas in the country. Thus, despite the distinct characteristics of each protected area, the law recognizes common ecological values among them that may be incorporated into a holistic plan representative of our natural heritage. The System encourages cooperation among national government, local governments and concerned private organizations without which the effective administration of these areas will not be possible; and is guided by the universal principles of biological diversity and sustainable development.

The NIPAS is placed under the control and administration of the DENR through the DENR Secretary and the Biodiversity Management Bureau (BMB), formerly the Protected Areas

and Wildlife Bureau (PAWB). Under the law, the Secretary is authorized to, among others, adopt and enforce an environmental plan in the protected areas, prescribe reasonable fees for use of any portion of the site, accept any form of donation for the NIPAS, update the Congress and the President on the status of protected areas, and control occupancy in the sites as well as constructions therein. However, at the site level, the DENR is required to organize the multi-sectoral Protected Area Management Board (PAMB) to act as the management body. By majority vote, the PAMB is authorized to decide the alllocations of budget, approve proposals for funding, decide matters relating to planning, peripheral protection and general administration of the area in accordance with the general management strategy.

The BMB, meanwhile, is the lead bureau for the system-wide planning, coordination, policy development, monitoring and evaluation, and technical assistance on protected area programs and projects. It is tasked to develop and implement an information, education and communications program to inform the general public of the NIPAS, its significance, goals and objectives. It will be worthwhile to note that the NIPAS law is also process legislation. It provides a process for the establishment and/or disestablishment of a NIPAS site, the end of which is a site-specific legislation.

Also a noteworthy feature of the NIPAS Act is the establishment of the Integrated Protected Areas Fund (IPAF) for purposes of financing projects of the System. The IPAF shall consist of revenues generated by the sites, donations, grants, endowments, gifts, taxes, fees, and other incomes. The IPAF shall be used solely for the protection, maintenance, administration, and management of the System.

Wildlife Act of 2001

The NIPAS Act is complemented by the Wildlife Resources Conservation and Protection Act (Republic Act No. 9147), which applies to all wildlife species found in all areas of the country. This law seeks to conserve the country's wildlife resources and their habitats to promote ecological balance and enhance biological diversity by regulating wildlife collection and trade, ensuring compliance with the country’s international commitments regarding wildlife and their habitats, and supporting scientific studies on the conservation of biological diversity.

A notable feature of this law is the establishment of critical habitats outside of NIPAS sites where threatened species are found, based on the best scientific data taking into consideration species endemicity and/or richness, presence of man-made pressures/threats to the survival of wildlife living in the area, among others. All designated critical habitats shall be protected in coordination with the LGUs and other concerned groups from any form of exploitation or destruction, which may be detrimental to the survival of the threatened species dependent therein.

Protection of wildlife and their habitats shall be the task of deputized wildlife enforcement officers who shall be named from non-government organizations, citizens groups, community organizations and other volunteers who have undergone necessary training for this purpose. The PNP, the AFP, the National Bureau of Investigation (NBI) and other law enforcement agencies shall also designate wildlife enforcement officers.

Similar to the IPAF under the NIPAS Act, a Wildlife Management Fund was also established by the Wildlife Act as a special account in the National Treasury to finance rehabilitation or restoration of habitats and support scientific research, enforcement and monitoring activities, as well as enhancement of capabilities of relevant agencies. The Fund shall be derived from fines imposed and damages collected, fees, charges, donations, endowments, administrative fees or grants in the form of contributions.

Under the NIPAS Act, it is required that each protected area should have a management plan. Activities ouside the scope of the PA management are subject to Environmental Impast Assessment (EIA), and subsequently, the corresponding issuance of DENR with Enviornmental Compliance Certificate (ECC).

Local Government Code of 1991

The Local Government Code of 1991 (Republic Act No. 7160) pursues the policy of local autonomy as enshrined in the Philippine Constitution through the devolution of some powers to LGUs. Specifically, the Code provides in its General Welfare Clause (Sec. 16) that every LGU shall enhance the right of the people to a balanced ecology.

Among these measures shall be the protection of the environment and community forests – "Pursuant to national policies and subject to supervision, control and review of the DENR, implementation of community-based forestry projects which include integrated social forestry programs and similar projects; management and control of communal forests with an area not exceeding fifty (50) square kilometers; establishment of tree parks, greenbelts, and similar forest development projects."

The Executive-Legislative setup at the national government is reflected in the local governments, especially at the provincial and the municipal and city levels. As such, the Executive is represented by the Governor at the province, and the Mayor at the city or municipality. The Legislative is assumed by the Sangguniang Panlalawigan at the province, and the Sangguniang Panlungsod/Panlalawigan at the city/municipality. All these are mandated or empowered to take measures to protect the environment.

Additionally, the Code provides for local development bodies and positions that can further pursue land use and resource management at the local government level. The most prominent among these bodies would be the Local Development Council tasked to initiate the LGU's comprehensive multi-sectoral development plan. The local development plan shall necessarily include the management of upland resources. The Council is supported by the LGU's Planning and Development Office, which shall integrate and coordinate all sectoral plans and studies, monitor and evaluate the implementation of the different development programs and projects, and prepare comprehensive plans and other development planning documents for the consideration of the local development council, among other functions.

More in point would be the appointment of an Environment and Natural Resources Management Officer (ENRO) who shall provide support to the sanggunian and the Local Chief Executive by formulating measures to ensure the delivery of basic services and provision of adequate facilities relative to environment and natural resources services, develop and implement plans and strategies on environment and natural resources. It will be

noted though that the enumeration of the powers and functions of this position is geared more towards terrestrial resources (including promotion of small-scale mining. Second, this position is only an optional position for city and municipal governments.

Indigenous Peoples Rights Act (IPRA) of 1997

The presence of the Indigenous People in MCWS makes this particular legislation relevant to the project site. In 1997, the Indigenous Peoples Rights Act (IPRA) was passed by the Philippine Congress. The IPRA was meant to address historical injustices perpetuated against indigenous peoples, and thus contained four significant aspects: (1) the articulation of the recognition of the right to self- governance; (2) the recognition of the bundle of rights held by indigenous peoples, (3) the establishment of a process for the formal recognition of land rights through the introduction of the Certificate of Ancestral Domain Title (CADT) or Certificate Ancestral Land Title (CALT); and, (4) the establishment of the National Commission on Indigenous Peoples (NCIP), the agency mandated to protect the interest of indigenous peoples. The IPRA more importantly, recognized the legality of native titles.

IPRA afforded to indigenous peoples the following rights: right of ownership over land and natural resources, right to develop lands and natural resources, right to stay in territories, right in case of displacement, right to regulate the entry of migrants, right to safe and clean air and water, right to claim parts of reservations, right to resolve conflicts, right of redemption, freedom from discrimination in labor, and many more. IPRA was also the only legislation that specifically provided for the right of indigenous peoples to determine their own development. The law specifically states "The State recognizes the inherent right of ICCs/IPs to self-governance and self-determination and respects the integrity of their values, practices and institutions. Consequently, the State shall guarantee the right of ICCs/IPs to freely pursue their economic, social and cultural development."

The IPRA created the National Commission on Indigenous Peoples or NCIP to protect and promote the rights of communities. It has the power to formulate policies and regulations for the proper implementation of the PRA. It was supposed to be an independent agency whose members were representatives of indigenous peoples themselves. It also had the power to determine cases that involved indigenous peoples.

DENR-DILG Joint Memorandum Circular No. 98-01

The Joint Circular is a Manual of Procedures for DENR-DILG-LGU Partnership on devolved and other forest management functions. It was aimed to effectively implement devolution of forest management functions and enhance partnership between the LGUs and the DENR pursuant to Republic Act 7160, otherwise known as the Local Government Code of 1991, Presidential Decree 705 as amended, otherwise known as the Forestry Reform Code of the Philippines; Executive Order No. 192 defining the mandates, organization, and functions of the DENR, DENR Administrative Order No. 30, Series of 1992 prescribing the guidelines for the transfer and implementation of DENR functions.

The Joint Circular affirms that DENR shall be the primary government agency responsible for the conservation, management, protection, proper use and sustainable development of the country's environment and natural resources but the LGUs shall share with DENR the

responsibility in the sustainable management and development of the forest resources within their territorial jurisdiction. Toward this end, the DENR and the LGUs shall endeavor to strengthen their collaboration and partnership in forest management.

The DENR and the LGUs together with other government agencies shall undertake forest land use planning as an integral activity of comprehensive land use planning to determine the optimum and balanced use of natural resources to support local, regional and national growth and development. To further the ends of local autonomy, the DENR in consultation with the LGUs shall devolve additional functions and responsibilities to the local government units, or enter into agreements with them for enlarged forest management and other ENR-related functions. With regards to forest protection and forest law enforcement, joint DENR-LGU forest protection teams shall be created in the regional, provincial, municipal and barangay levels, DENR shall train and deputize LGU officers as DENR officers. This is particularly important for Paluan given that it has classified forestlands, in addition to MCWS.

For sustainable land management, the Revised Master Plan for Forestry Development in the Philippines (RMPFD, 2003), Community-Based Forest Management (CBFM) is the national crosscutting strategy pursuant to EO 263 (1995) adopting CBFM as the national strategy to ensure the sustainable development of the country's forestlands resources.

Joint DENR-NCIP Memorandum Circular No. 01-07

The subject of this policy is the management of Overlapping PAs and/or their Buffer Zones and Ancestral Domains of the IPs. This is also relevant to MCWS, because of the presence of the IPs in the area. This joint circular of the DENR and NCIP refers to the management of overlapping areas between protected areas and ancestral domain of the IPs. The Joint Memorandum Circular (2007-01) stated that DENR should closely coordinate with local IPs in the delineation of PA boundaries that overlap with ancestral domain claims. The circular also facilitates the harmonization of the PA maintain, develop protect, and conserve such overlapped areas" with assistance from DENR. IPs may decide to transfer management responsibility to "concerned government agencies" (there is no specific reference to the PAMB), but this is only for a temporary period and the primary management responsibility will eventually revert back to the IP claimants.

The joint circular is the latest product of a decade of negotiations between the DENR and NCIP on how to deal with the PA-ancestral domain overlap. Harmonization is going on in several key sites including Mt. Apo Natural Park where almost 80% of the PA is covered by ancestral domain titles already recognized by NCIP. Other areas facing similar concerns are Mt. Kitanglad Range Natural Park and Quirino Protected Landscape.

2. Stakeholder Profile and Analysis

Table 57 discusses the role of key stakeholders in the management of MCWS. In a situation where protected area management and governance is almost non-existent and awareness of the existence of the protected area is low, it is difficult to frame the stakeholder analysis in terms of positively or negatively affected by the establishment of the protected area. Nevertheless the matrix attempts to show the role of each of the stakeholder group and how they can be engaged in the protection and conservation of MCWS. There are potential

resource use conflicts among key stakeholders that need to be addressed to be able to effectively conserve the unique biodiversity and attributes of the area. Among the various government agencies present in the area, there are overlapping jurisdictional and operational concerns that need to be addressed to mitigate conflicts and problems that may arise.

Table 57. MCWS Stakeholders Profile and Analysis

Stake-holders	Current role in MCWS	Positively Affected	Negatively Affected	Proposed Strategies for Stakeholder Engagement
PAMB	Policy making body for MCWS	There is a need to capacitate the members on their role for them to become effective	Some PAMB members are allege gedly own chain saws	Capacity development and provision of budget for PAMB operation
LGU	Provincial, municipal and brgy officials sit in the PAMB	Provincial and municipal development plans can become more sustainable if protected area dimensions are included	Low environmental awareness among the public can lessen votes for elected officials who are for conservation	Environmental awareness raising and capacity building on the rich biodiversity and natural resource attributes of Paluan and Mt Calavite.
IP Groups	Important partner in conservation and management of MCWS	Involved in reforestation activities, serve as guides to mountain trekkers	Strict protection zones will be off limits IP activities Conflicts between IPRA and NIPAS laws; Kaingin activities will be discouraged	Capacity building of IP communities and their leaders; Assistance in the processing of their ancestral domain claims; Capacity building of DENR and LGUs on IPRA
ISF holders	Can be engaged in forest protection	Forest conservation can lessen floods and land degradation	They may be targeted by illegal loggers and violators of forest protection and wildlife laws	Can be deputized as forest guards
Pasture land owners	Properties might be located with in the area covered by the MCWS		Some pasture lands might need to be reverted back to forest land	Target for IEC on MCWS
Non IP farmers			Potential resource use conflicts with IP groups	Target for IEC on MCWS
CLOA holders			Resource use conflicts may arise if the CLOAs are within the MCWS	Joint DAR-DENR-LRA-NCIP Administrative Order No. 01-12 can be used

			or within the ancestral domain of the IPs	to settle conflicting jurisdiction and policy implementation; Coordination and harmonization of roles among the various government agencies present in the area
NCIP	Protects the interest of IPs including ancestral domain claims in protected areas	Conservation of IP culture and practices contribute to conservation of biodiversity and vice versa.	Potential conflicts with DENR and LGUs	
DENR	Primary executor of the NIPAS law and Wildlife Act	Fulfills its mandate and responsibilities when NIPAS and Wildlife Act are effectively implemented	Jurisdictional conflicts with NCIP and IP groups	
MBCFI	Assist in the assessment of MCWS and in strengthening PA governance	Provides an opportunity to engage with the key stakeholders in the area on PA management and development	Conflicts with IPs and NCIP on FPIC concerns	Coordination and harmonization of roles with DENR, NCIP, DOT, DILG, LGU, etc
Tourism planners	Should be actively engaged in PA planning and implement-ation	Conservation of unique PA attributes and wildlife can attract more tourists to the site and can generate more livelihood for the people in the area		Coordination and harmonization of roles with DENR, NCIP, DOT, DILG, etc

Institutional Arrangements/Governance

Each NIPAS site is managed by a Protected Area Management Board, in accordance with a management plan formulated specifically for the site. The PAMB is multi-sectoral – composed of representatives from relevant government offices, local government units, communities, NGOs and the private sector. Despite the multi-sectoral character of the PAMB, the DENR-centric model remains. The Regional Executive Director (RED) and the Regional Technical Director (RTD) for Protected Areas, Wildlife and Coastal Zone Management Service provide technical guidance in the management of the protected areas in their region. The RED also chairs the PAMB. The PAMB functions as the policymaking body of the site, and as such decides on policies and plans and similar documents, facilitates the delineation and demarcation of the site's boundaries, ensures and monitors the implementation of the management plan as well as the performance of the protected area staff, and recommends fees and other charges to the Secretary for the use of the protected area.

The PAMB is supported by the Office of the Protected Area Superintendent (PASu), which does day-to-day management of the site. Appointed by the RED, the PASu is primarily accountable to the PAMB and the DENR for the implementation of the management plan and operations of the protected area. Specifically, s/he is tasked to enforce rules and regulations, issue permits for activities in the site, head the Secretariat of the PAMB, receive fees and other income for the protected area, recommends to the PAMB approval of the annual work and financial plans. In general, the above institutional arrangement shall prevail in the sites until a site-specific law is passed by Congress, which may redefine the management arrangements for each site.

The PAMB lacks the necessary knowledge and skills to perform its function. Interviews with two members of the PAMB revealed their very scant knowledge of the NIPAS law and their role in the management of the protected area. They could not even recall a significant policy, plan or activity that they have formulated or approved as a PAMB. The PAMB of MCWS meets once a year and is allocated a budget of Php 10,000 by the DENR according to the PASU. Aside from the Php 10,000 budget for the PAMB, the DENR has no regular budget for the management and conservation of MCWS. Funds are made available only when there is a specific activity in the site, like reforestation under the National Greening Program. The LGU has not allocated funds for the MCWS management and conservation.

An initial protected area management plan has been formulated for MCWS. Based on the interim protected area management plan, the strict protection zone is located in So. Matingahan going up, where settlements are prohibited but hunting by IPs is allowed. The multiple use zone on the other hand is located in So. Matingkaran going down to the coastal zone. A protected area management effectiveness tracking tool (METT) was administered in 2010.

The current PASU is Celso Almazan. Aside from being the PASU, he is also the chief FMS and PAWCZMS and information officer of the CENRO Mamburao. There is no other staff under the PASU. CENRO Mamburao has a total of 48 employees but only around 20% is functional. The remaining 80% is waiting for retirement or physically not able to do field work. PASU Almazan was able to assign a full time casual (Boy Tudalan) as forest ranger for MCWS for the last two years.

3. Plans, Programs and Projects

President Benigno S. Aquino III issued Executive Order No. 26 ordering and declaring the implementation of a National Greening Program as a government priority. The program shall plant 1.5 billion trees covering about 1.5 million ha by 2016. In Paluan, the target is 1,100 ha to be planted in 2013 and 600 ha in 2014. As of Feb 2013, 330 ha are reportedly reforested under the NGP. Trees to be planted are narra and calantas.

The national thrust on Conditional Cash Transfer has also been implemented in Palauan. A total of 520 households participated on this program, or roughly 15.95% of the entire household population of the municipality. The Food for School is the next program with more beneficiaries, counted 1t 126 households or 3.86%. The list of programs and projects in Paluan is presented in **Table 58.**

Table 58. Programs and Projects in Paluan

Types of Programs/Projects	No. of Project/Program Household Participants	
	Magnitude	**Proportion**
Pantawid Pamilyang Pilipino Program (4Ps – Conditional Cash Trasfer)	520	15.95
National Food Authority Rice Program	10	0.31
Comprehensive Agrarian Reform Program	0	0.00
Philhealth – OFW	5	0.15
Philhealth – Employed	0	0.00
Philihealth – Individually Paying	13	0.40
Philhealth - Sponsored	9	0.28
Philhealth – Lifetime	23	0.71
Food for School	126	3.86
Food for Work	48	1.47
Self-Employment Assistance – Kaunlaran (SEA – K)	59	1.81
Day Care Center Services	45	1.38
Others	0	0.00

During the validation meeting and FGD, male group dominated the discussions but women were well represented. In Ulasan, women were also well represented in the community meetings where at least five were holding decision-making positions in the barangay and in the tribal community.

Women were represented in almost all sectors and most specially in agriculture, wholesale and trade, social services and public administration. Paluan is primarily an agricultural town where most of the products produced were rice, coconut, onions, and cashew nuts. Women play a significant role in the local production and trading of these agricultural products.

The LGU have a Women Welfare Program. This provides trainings and education for women and mothers in skills capability building and nutrition. There is also part of the program regarding maternal and childcare.

IV. Situational Analysis: Trends, Challenges and Recommendations

The RSEA has accumulated numerous information showing some trends and challenges and associated recommendations on the status of MCWS as a protected area and a Key Biodiversity Area of the Country. Some of these noteworthy findings are as follows:

a) The remaining patches of lowland forests of MCWS are very important habitats for threatened endemic species of wildlife. Between the two habitats, the lowland forests are most vulnerable of disappearing and are slowly being converted into grasslands and agricultural areas as well as pasturelands. Minimal support for forest protection initiatives was initiated by local DENR. Even this barely made a dent in curbing illegal disturbances in the area. The Local Government Units plays a strong role in conserving the wildlife sanctuary and should step up in its effort to protect the forests and wildlife.

b) The forests fragments within MCWS serve as watersheds - providing water for drinking, household use and agricultural production. Communities already felt the results of the loss of forests. They observed that the flow of spring water used for drinking is decreasing in volume, especially during dry periods.
c) The National Greening Program, the umbrella program for forest rehabilitation efforts of the national government should be seriously implemented with greater emphasis on the involvement of the local commmunities. Most locals are aware but indifferent to the NGP, seeing it as another government reforestation project. The success of any reforestation project, including the NGP, relies on active participation of local communities.
d) A total of 73 plant species from 30 families were recorded in forested areas of two sites. The critically endangered dipterocarp species *Hopea acuminata* (Dipterocarpaceae) was present at Ulasan site. Protection and management should be allocated to allow the survival and proliferation of this tree species. *Carallia brachiata* was also observed in Binagyuhan. This highly adaptable species is growing in a variety of habitats, from lowlands to montane forest unique from most mangrove species, which prefer coastal and riverine ecosystems.
e) The 109 avifaunal species recorded during this survey at MCWS accounts for 41.8% of all bird species recorded in Mindoro. It also shows a good representation of Philippine endemic species and species restricted to Mindoro Island.
f) There is a need to sample the upper montane forest habitats of Mt. Calavite. The presence of patches of native vegetation including clumps of secondary forests along gullies largely indicates the possible presence of montane forests Mindoro endemics, such as Mindoro Imperial Pigeon, Mindoro Scops Owl and many other high elevation specialists endemic to the country.
g) Creating clearings and gaps in the canopy destroys microhabitats for reptiles and amphibians that are also food sources for many of the canopy dwelling wildlife. It is thus important to keep the quality of the remaining forest patches and maintain the diversity of wildlife. Reptiles and amphibians also are very important in maintaining insect density in an area, since these are their source of food. Reptiles and amphibians also play a very important role in maintaining insect populations. They also help limit the spread of diseases brought by insects as they significantly control populations of insects.
h) A number of endemic subspecies of birds in Mindoro are also morphologically distinct and shows significantly different vocalizations from the rest of the geographic population. This includes the Philippine Bulbul subspecies in Mindoro H.philli.
i) A study by Heaney (1991) on the biogeography of Philippine fruitbats listed only 10 known fruit bat species from Mindoro and considered that Mindoro fauna to be too poorly studied. More recent studies increased the number of fruit bat species on Mindoro to 13 species and the total number of bats to 38 species (Heaney et al., 1998) show the 38 bat species recorded on Mindoro Island from 7 families: Pteropididae (13species), Emballonuridae (2spp), Megadermatidae (1sp), Hipposideridae (6spp), Rhinolophidae (6spp), Vespertilonidae (9spp) and Mollosidae (1sp). Fourteen of the 38 (3%) are endemic to the Philippines and 2 are endemic to Mindoro Island. This study recorded additional new records of insect-eating bats in the island including *Kerivoula hardwickii, Myotis muricola* and *Hipposideros pygmaeus.*
j) Of the two recently described Mindoro endemic bat species, the Mindoro Pallid Flying Fox (*Desmalopex microleucopterus*) and the Mindoro Stripe-faced Fruit Bat (*Styloctenium mindorensis*) (Esselstyn, 2007 and Esselstyn *et al.*, 2008), only the

Mindoro Stripe-faced Fruit Bat was encountered during sampling. This species appear to be tolerant to habitat disturbances and survives in badly degraded habitats.

k) Interviews by Garcia and Ramayla (2009) in Occidental Mindoro reveal that a few local residents – migrant and indigenous who engage in subsistence hunting of bats positively identified the Mindoro Stripe-faced Fruit Bat. This was also confirmed during sampling that a few local non-IP residents were also engaged in hunting of bats including this species.
l) Hunting appears to be a major concern for larger species of mammals, including the Philippine Brown Deer, Mindoro Warty Pig and larger species of birds. Only one male individual of Philippine Brown Deer was encountered during sampling. The presence of Mindoro Warty Pig was made evident through presence of tracks, pig wallows and reports from hunting incidences. One adult male warty pig was reportedly caught by the local days before the survey in Binagyuhan.
m) A single individual of the rare Philippine endemic *Kaloula conjuncta* was encountered. The subspecies *K.c.conjucta* is endemic to Polillo and Mindoro. This species is semi-arboreal but is mostly found in soil microhabitat exhibiting burrowing and secretive behavior.
n) Juveniles and sub-adults of Philippine endemic Common Forest Frog *Platymantis dorsalis* were observed along streams and leaf litter. The encounters with individuals in those life stages indicate that the survey period coincides with their breeding season.
o) The threatened (IUCN: EN) Mindoro Island endemic species *Hylarana mangyanum* was observed in MCWS. This species is a bio-indicator of good water quality, thus, the number of individuals observed in the area indicates that the quality of water in MCWS is still in good condition.
p) Lizards collected and initially identified as under the *Cyrtodactylus* sp. and *Sphenomorphus* sp. complexes require more detailed examination for further identification to species level. These could possibly prove to be new species records for Mindoro.
q) A young cat snake – genus *Boiga* specimen was collected in site 1 and initially identified as *philippina* subspecies. If species identification is verified this would serve as the first record of the species on Mindoro Island.
r) Dependency of local communities and IPs to the remaining natural resources in MCWS is very evident. Local timber needs for housing and fuel are expressed in different areas.
s) High incidence of poverty in barangays covering MCWS is one of the fundamental issues in the management of the PA. Poverty drives residence to exploit natural resources to earn for food. The reported food shortage in the area is disturbing issue. Economic activities, particularly livelihood that is sustainable, are very limited in these barangays.
t) Communities are not fully engaged in the protection and overall management of MCWS. The support of communities for PA management is wanting. They also lack necessary information, knowledge and skills in biodiversity conservation.
u) While the PAMB has already been organized, there is an urgent need to capacitate all members in various aspects of PA management. The conservation awareness of the PAMB is quite limited. The PA management is not yet available for MCWS.

A significant amount of time was spent for primary data gathering in the field, community consultations and compiling secondary information for MCWS. The team takes into account that there is still a need to survey the montane forest section of Mt. Calavite for a

more comprehensive understanding of the biodiversity of the area. Based on the results, several recommendations as listed below:

Watershed Protection

The surrounding lands of MCWS are all dependent on agriculture as their main source of livelihood and food supply. Mindoro as a province ranks number one in the Philippines in terms of rice and corn production. This translates into the increase need for water for agricultural services particularly for rice fields. The main sources of water for irrigation come from the rivers that drain from Mt. Calavite.

Over the years, the demands for clean water and water for agriculture increases as population also increase thus posing an imminent threat to the watersheds of MCWS. Almost all the surrounding lowlands of MCWS were dedicated to agriculture and about 80% of it was into rice production. Corn was also a major agricultural product while a small percentage of the agricultural sector dedicated to high value crop production e.g. onions and vegetables. All of these demands water and local initiatives cater to developing irrigation canals to facilitate agricultural production. This poses an increase risk in further depleting the rivers and in turn the watersheds of MCWS.

Majority of the rivers and streams were already dried up (more than 10 rivers and streams were encountered along the road that had been dried up for a long time. Locals have also reported that most of the sources of drinking water for the community have also significantly dropped in volume, especially during the dry season.

The protection of the remaining forests of MCWS would be critical in the economic and agricultural development in the area. Watershed conservation strategies are closely inter-linked with forest protection activities, habitat restoration, regulation of water use, protection of wildlife and integrating the need for watershed and biodiversity conservation in the education and awareness activities at the community level.

Biodiversity Protection

Timber poaching and carabao logging activities were an everyday affair in both Binagyuhan and Ulasan areas. Sawed lumber, traces of carabao logging, chainsaw activities at night and local people manually transporting lumber from the forests had been observed in several occasions in Ulasan and Binagyuhan. Large species of trees and economically important timbers were either deliberately burn or cut for their lumber by the locals. Lumber were illegally brought and sold to nearby towns and areas. Locals are very much aware of this but choose to look the other way as many considered this as additional income and livelihood.

Support for locally based community members in forest patrolling and wildlife protection should be encouraged both at the local government level and at the DENR level. At present, DENR has limited support for community forest rangers and volunteers in Binagyuhan and Ulasan. The lack of strict monitoring and enforcement were made evident by the rampant timber poaching, kaingin and intentional burning happening in MCWS.

The role of Local Government and PAMB in strengthening policies and a strong will to enforce protection of the biodiversity of the area would significantly reduce illegal activities. This should be coupled with a pro-active awareness and information campaign at the community level with materials translated in the local dialect for easier understanding of the locals.

Addressing the issue on forest fires and burning of grasslands for pastureland should be controlled and confined in areas outside of the MCWS and remaining forest patches surrounding MCWS.

The National Greening Program was one of the few programs implemented in MCWS that has direct link to biodiversity and watershed protection. Previous initiatives on forest rehabitation has established two tree nurseries in Binagyuhan but had been abandoned as the project was moved to another locations. There were still hundreds of seedlings and potted bags left in the nurseries that could still be used. The nurseries were also strategically located close to existing water sources and rivers. Local government units (both at the barangay and municipal level) should look into investing in watershed and biodiversity protection, as they are highly dependent in an agricultural economy.

Timber Production

The local communities surrounding MCWS were largely dependent on fuelwood for cooking (firewood and charcoal) and timber for building materials. Almost all of these resources were sought from the remaining forests of MCWS. It is thus important to allocate land for timber production and use of the local communities to lessen the impact on the remaining forests habitats.

The Protected Area Management Planning in MCWS and Forest Land Use Planning of the municipality of Paluan need to be initiated. These plans could be good opportunities to integrate allocation of timber production areas for this purpose. On the other hand, the Protected Areas Management Board of MCWS, Local Government Units together with DENR should also help facilitate for the identification of such areas as well as in assisting in developing policies, practical and cost-effective mechanisms of plantation establishments as well as harvesting schemes that would be beneficial to all parties involved.

Biodiversity Monitoring

The presence of several threatened endemic species in MCWS warrants the protection and regular monitoring of the remaining population and their habitats. During the survey, evidences of hunting activities were observed in MCWS. Hunting targets larger species of wildlife including wild pigs, Philippine Brown Deer, doves, hornbills as well as fruit-eating bats.

Integrating evidence-based monitoring on wildlife and illegal activities would pose a huge challenge for MCWS. There is a need to establish agreed monitoring protocols using indicator species of each habitat to be monitored in MCWS. There is currently no activity related to regular gathering of information on bio-monitoring system.

Establishment of regular bio-monitoring system should take into consideration the participation of key local community members who are familiar with wildlife and are strategically located close to the habitats to be monitored. A system of community-based monitoring as well as field-based training on wildlife identification should also be provided prior to the implementation of such activities. Results of the monitoring activities should be verified and presented to PAMB and Local Government Units.

Support for Agricultural Production and Livelihood

One of the main concerns of farmers in the surrounding areas of MCWS was finding crops that are highly adaptive to rapidly changing and unstable climate. At present, rice production was limited to the rainy season and irrigation can no longer support for two season cropping. This is turn added pressure for locals to resort to charcoal production and timber poaching to augment shortage in funds and avoid food shortage. In addition, support for the following items was also seen as important to communities in addressing issues related to livelihood:

a) Electricity and storage – the town heavily relies on generators for power and are therefore has limited capacity to store agricultural products.
b) Transportation – transporting agricultural products from the farms to the nearest markets were hampered by the limited options of transportation, the long time it takes the products to reach the nearest market (all were unpaved roads with majority of the bridges still to be constructed or has been recently destroyed from the recent flooding or typhoon). Farmers were discouraged by the added costs of transport that leaves them with limited options to sell their products in a more marketable price.
c) Development of small business enterprise – Some locals has already ventured into producing crops that would support them at times when they are still waiting for harvests. These were cashew nuts production, gathering wild honey and tending goats and cows. There is a need to revisit these initiatives and explore options of translating these into a more sustainable and biodiversity-friendly livelihood for communities.
d) Tourism – Mt, Calavite is also gaining popularity with local mountaineering groups. Local guides and porters from access points were already experienced in bringing groups up and down the mountains.

Research

The results of the survey show an outstanding diversity of bat species at lower elevations. However, the RSEA team was not able to conduct a thorough investigation at the higher elevations due to weather disturbance during the survey period. Based on the results obtained from the field, it is recommended to survey the higher elevations of Mt. Calavite. For the limited time due to weather restrictions, the team still obtained a large number of recorded species from secondary montane forest. It is possible that a much higher number of species would have been recorded if the survey was unhampered at higher elevation and more intact forest of Mt. Calavite.

The high number of (n=9) unidentified microchiropteran species recorded in this survey warrant detailed taxonomic studies. Locating significant cave roost sites of the bats may help identify critical sites for conservation.

An in-depth study on the little-known endemic Mindoro Stripe-faced Fruit Bat *S.mindorensis* is also recommended to determine ecological requirements such as roosting sites, preferred feeding trees of the species as well as an estimate of its population.

Studies to determine extent or severity of hunting pressures and impacts of domestic cattle grazing on large mammal species such as Tamaraw, Mindoro Warty Pig and Philippine Brown Deer are also recommended.

A study on the Mindoro Warty Pig is highly recommended as *S.oliveri* not yet fully understood as a species. No body measurements are available for the species and its description was based only on the skulls of three male species (Meijaard *et al* 2011). Inspection of pigs supposedly caught from the wild in Mindoro reveal hybridization with feral domestic pigs. Severity and extent of hybridization between wild and feral pig populations has not been assessed. William Oliver (pers.comm.).

Further sampling should be carried out in order to fully assess the floristic diversity of Mt. Calavite. Sampling should be done at different altitudes in order to correlate vegetation structure with gradients in altitude. Inasmuch as Mt. Calavite is part of the Mindoro Island, it is expected that there are still endemic species and new records/species, thus the need for a thorough sampling.

In addition, a more intensive study on the population of *Limnonectes acanthi* and *Hylarana mangyanum* in Mindoro is recommended. It is possible that there is still large number of individuals can be found in the area. On the species that have complexes (e.g. *Cyrtodactylus* and *Sphenomorphus*), it is highly recommended to further study their population in Mindoro to identify different species which are possibly present in Mindoro and to further separate individual species from the complex.

Protected Area Management

The Protected Area Management Board of MCWS regularly meets to discuss issues relating to the conservation and management of MCWS. Currently, very limited information is available on MCWS particularly on the biological side that could aid in developing strategies and programs for management of the area. It is anticipated that this study will provide the necessary information that would be useful in developing the management plan of the protected area.

Conservation Education and Awareness Activities

It is very evident that local people are not aware of the importance of their native wildlife and barely took pride of the presence of restricted-range species in their areas. During one of the school visits the team conducted in Ulasan, teachers and elementary students were all in awe of how the local wildlife looked like and moreso when the team discussed their global and national importance.

Translation of information from the field into information materials would greatly help in generating pride and awareness of the different wildlife and importance of remaining habitats in MCWS or Mindoro Island.

Capacity Building

There is a need to provide both technical and financial support for empowering PAMB, local government units, Iraya tribe of Mangyans as well as the local communities of the area. Public consultations conducted in both Ulasan and Binagyuhan have shown that people were interested in protecting their watersheds and recognize the importance of maintaing intact forests. It was also very evident that the stakeholders are in need of both technical and financial assistance in developing and implementing conservation strategies in MCWS.

Information on the global importance of the wildlife and forests of MCWS are new information to the people and stakeholders of MCWS. Simple presentations on biodiversity importance of the area, the role of the forests in replenishing water in the watersheds, importance of wildlife to both agriculture and biodiversity conservation, role of the different stakeholders especially PAMB in protecting MCWS are information that needs to be translated to the local communities. .

Extending technical assistance in protected area management, watershed protection and rehabilitation, development of policies, developing management plans, etc. was also among the many topics that needed technical assistance.

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Appendices

Appendix 1: Checklist of birds in Mindoro (following Inskipp *et al.*, 1996) with notes and comments on some species.

STRUTHIONIFORMES	
Megapodiidae	
Megapodius cumingii	Philippine Scrubfowl
GALLIFORMES	
Phasianidae	
Coturnix coturnix	Common Quail
Coturnix chinensis	Blue-breasted Quail
Gallus gallus	Red Junglefowl
ANSERIFORMES	
Dendrocygnidae	
Dendrocygna arcuata	Wandering Whistling-duck
Anatidae	
Anatini	
Anas luzonica	Philippine Duck
Anas clypeata	Northern Shoveler
TURNICIFORMES	
Turnicidae	
Turnix sylvatica	Small Buttonquail
Turnix suscitator	Barred Buttonquail
PICIFORMES	
Indicatoridae	
Dendrocopos maculatus	Philippine Pygmy Woodpecker
Dryocopus javensis	White-bellied Woodpecker
Megalaimidae	
Megalaima haemacephala	Coppersmith Barbet
BUCEROTIFORMES	
Bucerotidae	
Penelopides mindorensis	Mindoro Hornbill
CORACIIFORMES	
Coraciidae	
Eurystomus orientalis	Dollarbird
Alcedinidae	
Alcedo atthis	Common Kingfisher
Alcedo cyanopecta	Indigo-banded Kingfisher
Halcyonidae	
Halcyon capensis	Stork-billed Kingfisher
Halcyon smyrnensis	White-throated Kingfisher
Todiramphus chloris	Collared Kingfisher
Meropidae	
Merops viridis	Blue-throated Bee-eater
Merops philippinus	Blue-tailed Bee-eater
CUCULIFORMES	
Cuculidae	

Hierococcyx sparverioides	Large Hawk Cuckoo
Hierococcyx fugax	Hodgson's Hawk Cuckoo
Cuculus saturatus	Oriental Cuckoo
Cacomantis merulinus	Plaintive Cuckoo
Cacomantis sepulcralis	Rusty-breasted Cuckoo
Chrysococcyx basalis	Horsfield's Bronze Cuckoo
Eudynamys scolopacea	Asian Koel
Centropodidae	
Centropus steerii	Black-hooded Coucal
Centropus viridis	Philippine Coucal
Centropus bengalensis	Lesser Coucal
PSITTACIFORMES	
Psittacidae	
Cacatua haematuropygia	Philippine Cockatoo
Prioniturus discurus	Blue-crowned Racquet-tail
Tanygnathus lucionensis	Blue-naped Parrot
Loriculus philippensis	Philippine Hanging Parrot
APODIFORMES	
Apodidae	
Collocalia esculenta	Glossy Swiftlet
Collocalia troglodytes	Pygmy Swiftlet
Collocalia mearnsi	Philippine Swiftlet
Collocalia brevirostris	Himalayan Swiftlet
Collocalia fuciphaga	Edible-nest Swiftlet
Hirundapus celebensis	Purple Needletail
Cypsiurus balasiensis	Asian Palm Swift
Hemiprocnidae	
Hemiprocne comata	Whiskered Treeswift
TROCHILIFORMES	
STRIGIFORMES	
Tytonidae	
Tyto capensis	Grass Owl
Otus mindorensis	Mindoro Scops Owl
Ninox scutulata	Brown Hawk Owl
Ninox mindorensis	Mindoro Hawk Owl (split in Rasmussen *et al.*, 2012)
Asio flammeus	Short-eared Owl
Aegothelidae	
Eurostopodidae	
Eurostopodus macrotis	Great Eared Nightjar
Caprimulgidae	
Caprimulgus indicus	Grey Nightjar
Caprimulgus manillensis	Philippine Nightjar
Caprimulgus celebensis	Sulawesi Nightjar
Caprimulgus affinis	Savanna Nightjar
COLUMBIFORMES	
Columbidae	

Columba vitiensis	Metallic Pigeon
Streptopelia chinensis	Spotted Dove
Streptopelia tranquebarica	Red Collared Dove
Streptopelia bitorquata	Island Collared Dove
Chalcophaps indica	Emerald Dove
Gallicolumba platenae	Mindoro Bleeding-heart
Phapitreron leucotis	White-eared Brown Dove
Treron vernans	Pink-necked Green Pigeon
Treron pompadora	Pompadour Green Pigeon
Treron curvirostra	Thick-billed Green Pigeon
Ptilinopus occipitalis	Yellow-breasted Fruit Dove
Ptilinopus leclancheri	Black-chinned Fruit Dove
Ducula poliocephala	Pink-bellied Imperial Pigeon
Ducula mindorensis	Mindoro Imperial Pigeon
Ducula carola	Spotted Imperial Pigeon
Ducula aenea	Green Imperial Pigeon
Ducula bicolor	Pied Imperial Pigeon
Rallina fasciata	Red-legged Crake
Rallina eurizonoides	Slaty-legged Crake
Gallirallus torquatus	Barred Rail
Gallirallus philippensis	Buff-banded Rail
Gallirallus striatus	Slaty-breasted Rail
Amaurornis olivaceus	Plain Bush-hen
Amaurornis phoenicurus	White-breasted Waterhen
Porzana porzana	Spotted Crake
Porzana fusca	Ruddy-breasted Crake
Porzana tabuensis	Spotless Crake
Porzana cinerea	White-browed Crake
Gallicrex cinerea	Watercock
Porphyrio porphyrio	Purple Swamphen
Gallinula chloropus	Common Moorhen
Fulica atra	Common Coot
CICONIIFORMES	
Scolopacidae	
Scolopacinae	
Gallinago megala	Swinhoe's Snipe
Gallinago gallinago	Common Snipe
Tringinae	
Limosa limosa	Black-tailed Godwit
Numenius phaeopus	Whimbrel
Numenius arquata	Eurasian Curlew
Numenius madagascariensis	Eastern Curlew
Tringa totanus	Common Redshank
Tringa nebularia	Common Greenshank
Tringa glareola	Wood Sandpiper
Actitis hypoleucos	Common Sandpiper
Heteroscelus brevipes	Grey-tailed Tattler

Arenaria interpres	Ruddy Turnstone
Calidris canutus	Red Knot
Calidris ruficollis	Red-necked Stint
Calidris temminckii	Temminck's Stint
Calidris subminuta	Long-toed Stint
Calidris ferruginea	Curlew Sandpiper
Phalaropus lobatus	Red-necked Phalarope
Rostratulidae	
Rostratula benghalensis	Greater Painted-snipe
Jacanidae	
Hydrophasianus chirurgus	Pheasant-tailed Jacana
Burhinidae	
Esacus recurvirostris	Great Thick-knee
Charadriidae	
Recurvirostrinae	
Recurvirostrini	
Himantopus himantopus	Black-winged Stilt
Recurvirostra avosetta	Pied Avocet
Charadriinae	
Charadrius hiaticula	Common Ringed Plover
Charadrius dubius	Little Ringed Plover
Charadrius alexandrinus	Kentish Plover
Charadrius peronii	Malaysian Plover
Charadrius mongolus	Lesser Sand Plover
Charadrius leschenaultii	Greater Sand Plover
Glareolidae	
Glareolinae	
Glareola maldivarum	Oriental Pratincole
Rynchopini	
Larini	
Larus ridibundus	Black-headed Gull
Sternini	
Sterna bergii	Great Crested Tern
Sterna sumatrana	Black-naped Tern
Sterna albifrons	Little Tern
Sterna anaethetus	Bridled Tern
Chlidonias hybridus	Whiskered Tern
Chlidonias leucopterus	White-winged Tern
Accipitridae	
Pandioninae	
Pandion haliaetus	Osprey
Accipitrinae	
Pernis ptilorhyncus	Oriental Honey-buzzard
Pernis celebensis	Barred Honey-buzzard
Elanus caeruleus	Black-shouldered Kite
Haliastur indus	Brahminy Kite
Spilornis holospilus	Philippine Serpent Eagle
Accipiter soloensis	Chinese Sparrowhawk

Accipiter virgatus	Besra
Butastur indicus	Grey-faced Buzzard
Hieraaetus kienerii	Rufous-bellied Eagle
Spizaetus cirrhatus	Changeable Hawk Eagle
Spizaetus philippensis	Philippine Hawk Eagle
Falconidae	
Microhierax erythrogenys	Philippine Falconet
Falco severus	Oriental Hobby
Falco peregrinus	Peregrine Falcon
Podicipedidae	
Tachybaptus ruficollis	Little Grebe
Sulidae	
Sula dactylatra	Masked Booby
Anhingidae	
Anhinga melanogaster	Darter
Ardeidae	
Egretta garzetta	Little Egret
Egretta eulophotes	Chinese Egret
Egretta sacra	Pacific Reef Egret
Ardea purpurea	Purple Heron
Casmerodius albus	Great Egret
Bubulcus ibis	Cattle Egret
Ardeola bacchus	Chinese Pond Heron
Butorides striatus	Little Heron
Nycticorax nycticorax	Black-crowned Night Heron
Nycticorax caledonicus	Rufous Night Heron
Gorsachius melanolophus	Malayan Night Heron
Ixobrychus minutus	Little Bittern
Ixobrychus sinensis	Yellow Bittern
Ixobrychus eurhythmus	Von Schrenck's Bittern
Ixobrychus cinnamomeus	Cinnamon Bittern
Dupetor flavicollis	Black Bittern
Threskiornithidae	
Platalea minor	Black-faced Spoonbill
Ciconiidae	
Ciconia episcopus	Woolly-necked Stork
Procellariidae	
PASSERIFORMES	
Pittidae	
Pitta sordida	Hooded Pitta
Pitta erythrogaster	Red-bellied Pitta
Pardalotidae	
Gerygone sulphurea	Golden-bellied Gerygone
Irenidae	
Irena puella	Asian Fairy Bluebird
Chloropsis palawanensis	Yellow-throated Leafbird
Laniidae	

Lanius cristatus	Brown Shrike
Lanius schach	Long-tailed Shrike
Lanius validirostris	Mountain Shrike
Pachycephalinae	
Pachycephala grisola	Mangrove Whistler
Pachycephala albiventris	Green-backed Whistler
Corvinae	
Corvini	
Corvus enca	Slender-billed Crow
Corvus macrorhynchos	Large-billed Crow
Artamini	
Artamus leucorynchus	White-breasted Woodswallow
Oriolini	
Oriolus xanthonotus	Dark-throated Oriole
Oriolus chinensis	Black-naped Oriole
Coracina striata	Bar-bellied Cuckooshrike
Coracina mindanensis	Black-bibbed Cicadabird
Lalage melanoleuca	Black-and-white Triller
Lalage nigra	Pied Triller
Pericrocotus cinnamomeus	Small Minivet
Dicrurinae	
Rhipidurini	
Rhipidura javanica	Pied Fantail
Dicrurini	
Dicrurus leucophaeus	Ashy Drongo
Dicrurus balicassius	Balicassiao
Monarchini	
Hypothymis azurea	Black-naped Monarch
Terpsiphone atrocaudata	Japanese Paradise-flycatcher
Terpsiphone cinnamomea	Rufous Paradise-flycatcher
Terpsiphone cyanescens	Blue Paradise-flycatcher
Aegithininae	
Aegithina tiphia	Common Iora
Malaconotinae	
Muscicapidae	
Turdinae	
Monticola solitarius	Blue Rock Thrush
Zoothera cinerea	Ashy Thrush
Zoothera andromedae	Sunda Thrush
Zoothera dauma	Scaly Thrush
Turdus poliocephalus	Island Thrush
Turdus chrysolaos	Brown-headed Thrush
Brachypteryx montana	White-browed Shortwing
Muscicapinae	
Muscicapini	
Rhinomyias gularis	Eyebrowed Jungle Flycatcher
Muscicapa griseisticta	Grey-streaked Flycatcher
Muscicapa ferruginea	Ferruginous Flycatcher

Ficedula narcissina	Narcissus Flycatcher
Ficedula hodgsonii	Slaty-backed Flycatcher
Ficedula hyperythra	Snowy-browed Flycatcher
Ficedula westermanni	Little Pied Flycatcher
Eumyias panayensis	Island Flycatcher
Cyornis lemprieri	Palawan Blue Flycatcher
Cyornis rufigastra	Mangrove Blue Flycatcher
Saxicolini	
Copsychus saularis	Oriental Magpie Robin
Rhyacornis bicolor	Luzon Water Redstart
Saxicola caprata	Pied Bushchat
Sturnidae	
Aplonis panayensis	Asian Glossy Starling
Sturnus philippensis	Chestnut-cheeked Starling
Sarcops calvus	Coleto
Gracula religiosa	Hill Myna
Parinae	
Parus elegans	Elegant Tit
Hirundinidae	
Hirundininae	
Hirundo rustica	Barn Swallow
Hirundo tahitica	Pacific Swallow
Hirundo daurica	Red-rumped Swallow
Hirundo striolata	Striated Swallow
Pycnonotidae	
Pycnonotus atriceps	Black-headed Bulbul
Pycnonotus goiavier	Yellow-vented Bulbul
Pycnonotus plumosus	Olive-winged Bulbul
Ixos palawanensis	Sulphur-bellied Bulbul
Ixos philippinus	Philippine Bulbul
Cisticolidae	
Cisticola juncidis	Zitting Cisticola
Cisticola exilis	Bright-headed Cisticola
Zosteropidae	
Zosterops everetti	Everett's White-eye
Zosterops montanus	Mountain White-eye
Sylviidae	
Acrocephalinae	
Locustella naevia	Grasshopper Warbler
Locustella ochotensis	Middendorff's Warbler
Acrocephalus orientalis	Oriental Reed Warbler
Acrocephalus stentoreus	Clamorous Reed Warbler
Phylloscopus griseolus	Sulphur-bellied Warbler
Phylloscopus inornatus	Yellow-browed Warbler
Phylloscopus borealis	Arctic Warbler
Phylloscopus trivirgatus	Mountain Leaf Warbler
Seicercus montis	Yellow-breasted Warbler

Megalurinae	
Megalurus timoriensis	Tawny Grassbird
Megalurus palustris	Striated Grassbird
Sylviinae	
Alaudidae	
Mirafra javanica	Australasian Bushlark
Nectariniidae	
Nectariniinae	
Dicaeini	
Dicaeum agile	Thick-billed Flowerpecker
Dicaeum aeruginosum	Striped Flowerpecker
Dicaeum bicolor	Bicolored Flowerpecker
Dicaeum retrocinctum	Scarlet-collared Flowerpecker
Dicaeum trigonostigma	Orange-bellied Flowerpecker
Dicaeum pygmaeum	Pygmy Flowerpecker
Dicaeum erythrothorax	Flame-breasted Flowerpecker
Nectariniini	
Nectarinia sperata	Purple-throated Sunbird
Nectarinia calcostetha	Copper-throated Sunbird
Nectarinia jugularis	Olive-backed Sunbird
Anthreptes malacensis	Plain-throated Sunbird
Aethopyga shelleyi	Lovely Sunbird
Passeridae	
Passerinae	
Passer montanus	Eurasian Tree Sparrow
Motacillinae	
Motacilla flava	Yellow Wagtail
Motacilla cinerea	Grey Wagtail
Anthus richardi	Richard's Pipit
Anthus rufulus	Paddyfield Pipit
Anthus trivialis	Tree Pipit
Anthus hodgsoni	Olive-backed Pipit
Anthus gustavi	Pechora Pipit
Prunellinae	
Estrildinae	
Erythrura hyperythra	Tawny-breasted Parrotfinch
Lonchura molucca	Black-faced Munia
Lonchura punctulata	Scaly-breasted Munia
Lonchura leucogastra	White-bellied Munia
Lonchura malacca	Black-headed Munia

Appendix 2: Checklist of Non-volant Mammals of Mindoro.

Scientific Name	English Name
Anonymomys mindorensis	Mindoro Climbing Rat
Apomys gracillirostris	Large Mindoro Forest Mouse
Apomys musculus	Least Forest Mouse
Apomys sp. A	Lesser Mindoro forest mouse
Apomys sp. B	(unknown forest mouse)
Chrotomys mindorensis	Mindoro Striped Rat
Crateromys paulus	Ilin Island Cloudrunner
Crocidura grayi	Luzon shrew
Crocidura mindorus	Mindoro Shrew
Macaca fascicularis	Crab-eating Macaque
Maxomys sp.	Mindoro Spiny Rat
Rattus exulans	Polynesian Rat
Rattus mindorensis	Mindoro Black Rat
Rattus norveglicus	Brown Rat
Rattus tanezumi	Tanezumi Rat
Suncus murinus	Asian House Shrew
Sus mindorensis	Mindoro Warty Pig
Bubalus mindorensis	Mindoro Dwarf Buffalo
Cervus mariannus	Philippine Deer
Paradoxurus philippensis	Asian Palm Pivet
Viverra tangalunga	Malay Civet

Appendix 3: Checklist of Volant Mammals of Mindoro.

Scientific Name	Common English Name	IUCN Conservation Status
Family Pteropodidae		
*Acerodon jubatus**	Golden-crowned Flying Fox	EN
Cynopterus brachyotis	Common Short-nosed Fruit Bat	LC
*Desmalopex microleucopterus***	Mindoro Pallid Flying Fox	Not Yet Assessed
*Eonycteris robusta**	Phil Nectar Bat; Phil Dawn Bat	NT
Eonycteris spelaea	Common Nectar/Dawn Bat	LC
*Haplonycteris fischeri**	Phil Pygmy Fruit Bat	LC
*Harpyionycteris whiteheadi**	Harpy Fruit Bat	LC
Macroglossus minimus	Dagger-toothed flower bat; Lesser Long-tongued Fruit Bat	LC
*Ptenochirus jagori**	Greater Musky Fruit Bat	LC
*Pteropus pumilus**	Little Golden-mantled Fying Fox	NT
Pteropus vampyrus	Giant Flying Fox	NT
Rousettus amplexicaudatus	Common Rousette; Geoffroy's Rousette	LC
*Styloctenium mindorensis***	Mindoro Stripe-faced Fruit Bat	DD
Family Emballonuridae		
Saccolaimus saccolaimus	Pouched Bat; Bare-rumped Sheathtail-bat	LC
Taphozous melanopogon	Black-bearded Tomb Bat	LC
Family Megadermatidae		
Megaderma spasma	Common Asian Ghost Bat; Lesser False Vampire Bat	LC
Family Hipposideridae		
*Coelops hirsutus**	Philippine Tailless Roundleaf Bat	DD
Hipposideros ater	Dusky Roundleaf Bat	LC
Hipposideros bicolor	Bicolored Roundleaf Bat	LC
Hipposideros diadema	Diadem Roundleaf Bat	LC
Hipposideros lekaguli	Large Asian Roundleaf Bat	NT
*Hipposideros obscurus**	Philippine Forest Roundleaf Bat	LC
Family Rhinolophidae		
Rhinolophus arcuatus	Arcuate Horseshoe Bat	LC
*Rhinolophus inops**	Philippine Forest Horseshoe Bat	LC
Rhinolophus philippinensis	Enormous-eared Horseshoe Bat	LC
*Rhinolophus rufus**	Large Rufous Horseshoe Bat	NT
*Rhinolophus subrufus**	Small Rufous Horseshoe Bat	DD
*Rhinolophus virgo**	Yellow-faced Horseshoe Bat	LC
Family Vespertilionidae		

Kerivoula whiteheadi	Whitehead's Wooly Bat	LC
Miniopterus australis	Little Bent-winged Bat	LC
Miniopterus schreibersii	Common Bent-winged Bat	NT
Miniopterus tristis	Greater Bent-winged Bat	LC
Myotis horsfieldii	Common Asiatic Myotis; Horsfield's Myotis	LC
Myotis macrotarsus	Philippine Large-footed Myotis; Pallid Large-footed Myotis	NT
Pipistrellus javanicus	Javan Pipistrelle	LC
Scotophilus kuhlii	Lesser Asian House Bat	LC
Tylonycteris robustula	Greater Flat-headed Bat; Greater Bamboo Bat	LC
Family Molossidae		
Cheiromeles parvidens	Lesser Naked Bat	LC

* Philippine Endemic = 12 species
** Mindoro Island Endemic = 2 species

Appendix 4: Checklist of Herpetofauna of Mindoro Island.

English Name	Scientific Name	IUCN Conservation Status
AMPHIBIANS		
Mindoro Tree Frog	*Philautus schmackeri*	Endangered
Mindoro Forest Frog	*Platymantis sp.*	Undescribed
Com Forest Ground Frog	*Platymantis dorsalis*	Least Concern
Corrugated Forest Frog	*Platymantis corrugates*	Least Concern
Hasselt's Pelobatid Frog	*Leptobrachium hasselti*	Least Concern
Mindoro Variable-backed Frog	*Hylarana mangyanum*	Endangered
Common toad	*Bufo marinus*	Least Concern
Asian Brackish Frog	*Fejervarya cf. cancrivora*	Least Concern
East Asian Bullfrog	*Hoplobatrachus cf. rugulosus*	Least Concern
	Kaloula sp.	
	Limnonectes cf acanthi	Vulnerable
White-lipped Tree Frog	*Polypedates leucomstax*	Least Concern
Common Green Frog	*Hylarana erythraea*	Least Concern
REPTILES		
Mindoro Anglehead	*Gonocephalus interruptus*	Data Deficient
Reticulated Python	*Python reticulates*	Not Assessed
White-spotted Anglehead	*Gonyocephalus semperi*	Not Assessed
Dark-spotted Anglehead	*Gonyocephalus sophiae*	Not Assessed
Philippine Crocodile	*Crocodylus mindorensis*	Critically endangered
Saltwater Crocodile	*Crocodylus porosus*	Least Concern
Malay Monitor Lizard	*Varanus salvator*	Least Concern
Philippine Sail-fin Lizard	*Hydrosaurus pustulatus*	Vulnerable
Mindoro Flying Lizard	*Draco sp.*	
Quadra's Flying Lizard	*Draco quadrasi*	Least Concern
Mindoro Burrowing Skink	*Brachymeles gracilis mindorensis*	Not Assessed
Philippine Bent-toed Gecko	*Cyrtodactylus philippinicus*	Least Concern
Common House Gecko	*Hemidactylus frenatus*	Least Concern
Mindoro Narrow-disked Gecko	*Gecko mindorensis*	Least Concern
	Spenomorphus sp.	
	Calamaria sp.	
	Mabuya sp.	
	Bronchocela sp.	

Appendix 5: Natural Features and Attractions at MCWS.

A view of Paluan Bay where the Pamutusin Cove is also located.

The Binuangan River is one of the major perennial streams in Mt. Calavite that drains into the Calangignan Bay.

A trail along the ridge of Sitio Binagyuhan that provides great vantage point of both the coastal area of Paluan and the vast landscape of Mt. Calavite.

The Mt. Calavite landscape traverses the northwestern portion of Paluan's mountain range. Other major mountains in this mountain range are Mt. Cabignayan, Mt. Anduyanan and Mt. Ilomano.

Lush green vegetation with some grassland areas at the foot of Mt. Calavite.

Appendix 6: Sample Socio-Economic Survey Questionnaire

SOCIO-ECONOMIC SURVEY QUESTIONNAIRE

1) Basic Information

a) Populasyon
- I. Kabuuang Populasyon
- II.Lalaki
- III.Babae
- IV. Matanda
- V. Bumoboto
- VI. Edad
  - (1) 0-10
  - (2) 11-20
  - (3) 21-30
  - (4) 31-40
  - (5) 41-50
  - (6) 51-60
  - (7) 61-70
  - (8) 71-80
  - (9) 81-90
  - (10) 91 & above
- VII. No. of Families
- VIII. Pursyento ng Naninirihan
  - (1) Dati ng Naninirihan
  - (2) Dayo

b) Edukasyon
- I. Antas
  - (1) Elementarya
  - (2) High School
  - (3) College
  - (4) Hindi Nakapag-aral
- II. Pursyanto ng marunong magbasa
- III. Pursyento ng marunong magsulat

c) Relihiyon
- I. Types
  - (1) Seven Day Adventist
  - (2) Jehovah's Witnesses
  - (3) Born Again
  - (4) Roman Catholic
  - (5) Latter Day Saints
  - (6) Others
- II. Religious Rites
- III. Religious Schedule
  - (1) Lunes
  - (2) Martes
  - (3) Miyerkules
  - (4) Huwebes
  - (5) Biyernes
  - (6) Sabado
  - (7) Linggo
- IV. Beliefs
- V. Limitations

d) Birth Rate

e) Death Rate
I. Causes of death
f) Kalimitang kinakain at saan kayo kumukuha ng pagkain

2) Sources of Livelihood

a. Main Source (Pangunahing Pnagkukunan)
I. Pagsasaka
(1) Panahon ng Pagtatanim
(2) Panahon ng Ani
(3) Nakakailang ani kayo sa isang taon
(4) Saan kayo kumukuha ng tubig
(5) Bukod sa palay, ano pa ang inyong tinatanim
(6) Saan kayo nagtatanim
(7) Saan kayo kumukuha ng pananim
(8) Paraan ng Pagtatanim
a.) Natural
b.) May Pataba
c.) Iba pa
(9) Kalakasa ng ani
(10) Kahinaan ng ani
(11) Karaniwang problema pag nagsasaka
II. Pangingisda
(1) Saan kayo nangingisda
(a) Dagat
(b) Ilog
(c) Fish Pond
(d) Others
(2) Ano ang inyong pamamaraan ng pangingisda
(3) Nangingisda kayo upang
(a) Kainin
(b) Ibenta
(c) I-process (tuyo/daing)
(4) Kalakasan ng huli
(5) Kahinaan ng huli
(6) Karaniwang problema sa pangingisda

III. Pangangalakal
(1) Anu-ano ang inyong kinakalakal?
(2) Saan ninyo kalimitang dinadala ang inyong kalakal?
(3) Paano niyo dinadala ang inyong kalakal?
(4) May panahon ba kayong sinusuong sa pangangalakal at kalian?
(5) Kayo ba ay deretso ng nagbebenta ng iyong kalakal o may kumukuha pang iba?
(6) Kalakasan ng pangangalakal?
(7) Kahinaan ng pangangalakal
(8) Karaniwang problema sa pangangalakal

IV. Employment (Pamamasukan)
(1) Kalimitang Pinapasukas
(a) Opisina
(b) Simbahan
(c) Kasambahay
(d) Iba pa
(2) Inaasahang sahod
(3) Sino ang kalimitang namamasukan
(4) Sila ba ay namamasukan sa

(a) Lokal
(b) Maynila/ Loob ng Pilipinas
(c) Ibang bansa

(5) Gaano katagal kung namamasukan/Average years
(6) Ano ang karaniwang dahilan kung bakit di matanggap sa trabaho

V. Pagpapastol

(a) Anong uri ng hayop?
(b) Saan kalimitang nagpapastol
(c) Kayo ba ay nagmamay-ari ng pinapastol o ipinapapastol lamang
(d) Karaniwang problema sa pagpapastol
(c) Prutas
(d) Bungang Kahoy
(e) Uling
(f) Pulot
(g) Kugon
(h) Gulay
(i) Nagbebenta po ba kayo ng hayop na mula sa gubat?
(j) Tour guide/mountaineering guide
(k) Porter

(2) Iba pang pinagkakakitaan na umaasa sa katawang tubig at magkano?

(a) Paggawa ng Bangka
(b) Paggawa ng lambat
(c) Perlas
(d) Pagbebenta ng seashells
(e) Iba pa

(3) Iba pa Pinagkakakitaan

(a) Backyard farming
(b) Backyard piggery
(c) Poultry
(d) Pagtitinda
(e) Parlor/ Manicure/ Pagugupit
(f) Namamasada
(g) Naglalaba/namamalantsa
(h) Iba pa

(4) Ilang pursyento ang

(a) Nagsasaka
(b) Nangingisda
(c) Nangangalakal
(d) Namamasukan
(e) Nagpapastol

(5) Sa inyong araw-araw na pamumuhay, magkano sa palagay nyo ang inyong kailangan upang matutustusan ito?
(6) Nakakapagtago pa ba kayo sa inyong kinikita at magkano? O talagang wala?
(7) Kung kayo ay may naipon, saan niyo ito nilalaan?

(a) Pagkain
(b) Pag-aaral
(c) Pambili ng gamit/ damit
(d) Puhunan
(e) Iba pa

(8) Upang makapag-umpisa, saan kayo kumukuha ng puhunan

(a) Humihiram sa magulang
(b) Humihiram sa bangko
(c) Humihiram sa 5/6

Iba pang pinagkukunan

3) Level of Environmental Awareness /Antas ng inyo kaalaman tungkol sa Kalikasan

I. General

(1) Sa palagay nyo po ba,ilang pursyento na lang ang natitirang kagubatan

(2) ito po ba ay dumadami o kumokonti?

(3) Sa ano po kayang kadahilanan ng pagdami. Pagkonti ng nilalalaman ng kagubatan?

(4) Sa tingin nyo po ba, ano ang epekto nito sa ating buhay at pamuuhay?

(5) Kung kayo po ay may kakayahang makatulong para mapangalagaan ito, anu ano po?

(a) Magtatanim
(b) Magbabantay
(c) Alamin kung sino nagmamay-ari ng lupa
(d) Alamin ang karapatan sa lupa

(6) Ano po sa palagay nyo ang kalagayan ng ating kagubatan?

(a) 30 taon na lumipas
(b) 15 taon na lumipas
(c) 5 taon na lumipas
(d) Kasalukukuyan
(e) 5 taon pasimula ngayon

(7) Anu ano po ba ang nilalaman ng inyong kagubatan

(a) Kweba
(b) Ilog
(c) Lawa
(d) Puno
(e) Sapa
(f) Bukal
(g) Iba pa

(8) Ano po ba ang silbi ng mga nilalaman at makikita sa kagubatan

(9) Ano po ba ang mga alam ninyong nangyayari sa loob ng gubat

(10) Ano po sa palagay nyo ang problema sa ating kagubatan

II. Protected Area

(a)Ano po ba ang ibig sabihin nito?
(b)Sino po ang bumubuo sa pag protekta nito?
(c)Bakit po ito tinawag na protected area?
(d)Ano po ang inyong tungkulin kung ikaw ay naninirahan sa sakop ng protected area
(e)Alam nyo po ba ang boundary ng protected area
(f)Alam nyo po po ang PAMB
(g) Sino po ba ang bumubuo ng PAMB?
(h) Alam nyo po ba ang bantay gubat / Forest ranger at sino sino ito

4. Government Services

(1) Paaralan
  (a) Bilang ng Paaralan
  (b) Bilang ng guro
(2) Kalusugan
  (a) Health Care Center/Clinic
  (b) Barangay Health Worker
  (c) Doktor
  (d) Medical Mission
  (e) Pangunahing gamot/ First Aid
  (f) Immunization/Bakuna
  (g) Dental
  (h) Palikuran
  (i) Libreng Konsultasyon

(j) Health Card/PhilHealth

(3) Safety and Security (Seguridad at Kaligtasan)

(4) Registration

(a) Census

(b) Birth Reigstration

(c) Voter's Registration

(5) Daycare

(6) Palaruan

(7) Barangay Hall

(8) Cemetery

(9) Lugar ng pagsamab/ pananampalataya

(10) Infrastracture

(a) Tulay

(b) Kalsada

(11) Pagsasanay(TESDA)

(12) Iba pang program ng pamahalaan na nakakaabot sa inyo

5. Governance o pamamahala

(a) Sino po ang inyong mayor?

(b) Ano po ang pangalan ng inyong Barangay Captain?

(c) Kanino po kayo lumalapit upang humingi ng tulong o kailangan? Sino po ang inyong focal point?

(d)Paano nyo po pinapaabot sa Mayor/Leader ang inyong mga kahilingan?

6. General Questions/ Pangkalahatang Pagtatanong

(a)Mode of transportation

(b)Ano ang kalimitang sakit at lunas

(c) Ano ang panahon ng tag lakas?

(d) Ano ang panahon ng taghina/ taggutom?

(e) Ano ang karaniwang kinakain ng tao?

(f) Sino ang kalimitang tumutulong sa inyo?

(1) Simbahan/religious groups

(2) NGO

(3) Government

(4) Dayuhan

(5) Pribadong Tao

(6) Iba pa

(g) May kuryente bas a inyong lugar?

(h) Saan ang source ng kuryente?

(1) Solar

(2) Generator

(3) Linya

(4) 24 oras

(5) May schedule

(i) Tubig

(1) Panlaba

(2) Inumin

(3) Pandilig

(4) Panglinis ng bahay/Sasakyan

(j) Espesyal na okasyon para inyo ?

(1) Fiesta

(2) Ani

(3) Pasko

(4) Iba pa

(k) Anu –ano ang teknolohiyang inyong ginagamit? Ilan ang mayroon?

(1) TV

(2) Refrigerator
(3) Computer
(4) Cellphone

(l) Anu ano ang kalimitang hayop ang nakikita nyo sa inyong lugar?

(m) Saan kayo interesadong tumulong para sa ika uunlad ng inyong pamayanan?

(n) Ano po sa palagay nyo ang ideal na kinabukasan ng pamayanan ito?

(o) Ano po ang inyong mga kahilingan para sa ikabubuti ng inyong pamayanan?

7. Samahang Katutubo

(a) Ano po ang inyong tribo?

(b) Anu ano po ang inyong ritual

(1) Kasal
(2) Paghingi ng pagsang ayon
(3) Paghingi ng pahintulot upang pumasok sa sagradong lugar
(4) Pagtatanim
(5) Namatayan
(6) Paglilibing

(c) Anu ano po ba para sa inyo ang sagrado?

(1) Lugar
(2) Hayop
(3) Iba pa

(d) Kalimitang eded ng pagpapakasal

(e) Kalimitang bilang ng pamilya

(f) Kanino po kayo kadalasang humihingi ng tulong:

(1) Mga nakakatanda
(2) Tribal leader
(3) Community leader (Brgy. Captain)
(4) Organization (Church/NGO)
(5) Iba pa

(g) Pursyento ng

(1) Marunong magsalita ng wikang katutubo
(2) Marunong magsulat ng wikang katutubo
(3) Marunong magbasa ng wikang katutubo
(4) Marunong magtagalog

(h) Tuwing kalian po kayo naghahalal ng bagong tribal leader?

(I) Ang inyo pong tribal leader ay kumakatawan sa anong samahan?

(1) PAMB
(2) NCIP
(3) SAKAMAIMO
(4) Provincial Consultative Body
(5) Iba pa

(j) Sino po ang inyong kakilala sa

(1) PAMB
(2) NCIP
(3) SAKAMAIMO
(4) Provincial Consultative Body

(k) Paano nyo po naipaparating sa gobernador/ Mayor ang pangkalahatang hinaing ng mga katutubo? At kannino kayo lumalapit?

(l) Mayroon po ba kayong kakilalang Mangyan Affair focal point sa local/ probinsya?

(m) Anu ano po ang kadalasang sakit at gamut para dito?

(1) Lagnat
(2) Sakit ng ulo
(3) Sipon
(4) Ubo

(5) Kagat ng hayop
(6) Sakit ng tyan
(7) Sakit sa ngipin
(8) Bali
(9) Sakit sa balat
(10) Panganganak

(n) Bilang katutubo, ano po sa palagay nyo ang maitutulong nyo upang mapangalagaan an gating kapaligiran?

(o) Ano po ang inyong mga kahilingan para sa ikabubuti ng inyong pamayanan?