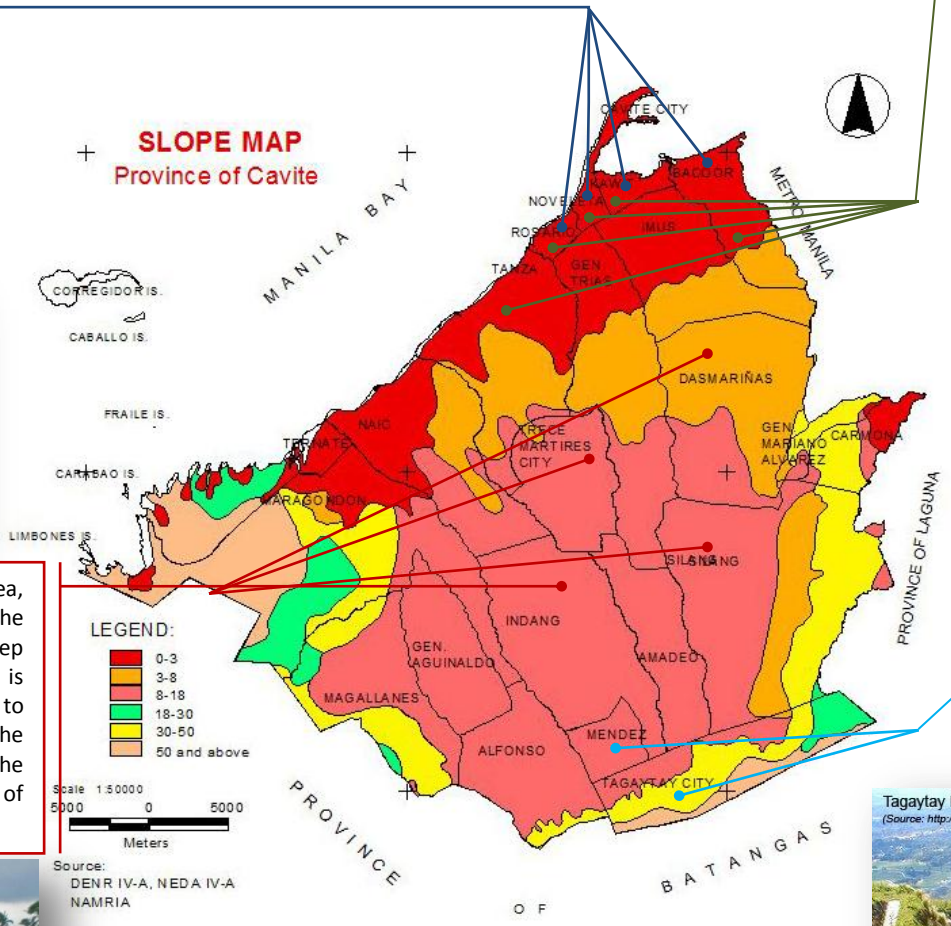
Chapter 3. *Physical Characteristics and Natural Resources*

TOPOGRAPHY

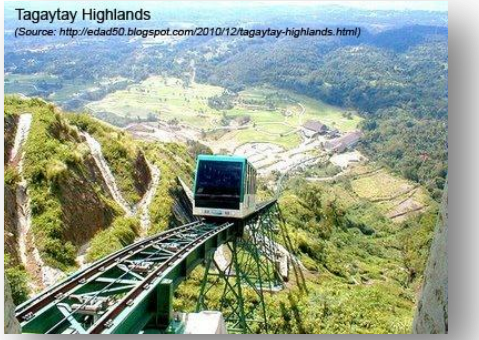
The **lowest lowland area** is the coastal plain in particular. These areas have extremely low ground level of EL. 0m to EL. 2m compared to the high tide level of about EL. 0.8m from the Mean Sea Level (MSL). These are the municipalities of Bacoor, Kawit, Noveleta and Rosario.



The **lowland area** consists of the coastal and alluvial plains. These areas have flat ground slope of less than 0.5% and low ground elevation of EL. 2m to EL. 30m. The alluvial plain can be found in the municipality of Imus and southern part of General Trias. Into these municipalities forms the transition area between the coastal plain and the central hilly area. It also covers some areas of Bacoor, Kawit, Noveleta, Rosario and Tanza.

The third topography type is the central hilly area, generally found on the mountain foot slope. It forms the rolling tuffaceous plateau. This topography includes steep hills, ridges and elevated inland valley. The plateau is characterized with ground elevation ranging from 30m to nearly 400m. Its ground slope ranges from 0.5 to 2%. The cities of Trece Martires and City of Dasmariñas, and the municipalities of Indang and Silang have this kind of topography.

The last topography type is upland mountainous area, found in Amadeo and Tagaytay City. They are situated at a very high elevation above EL. 400m with slopes of more than 2%. The Tagaytay ridge has a peak elevation of 650m.



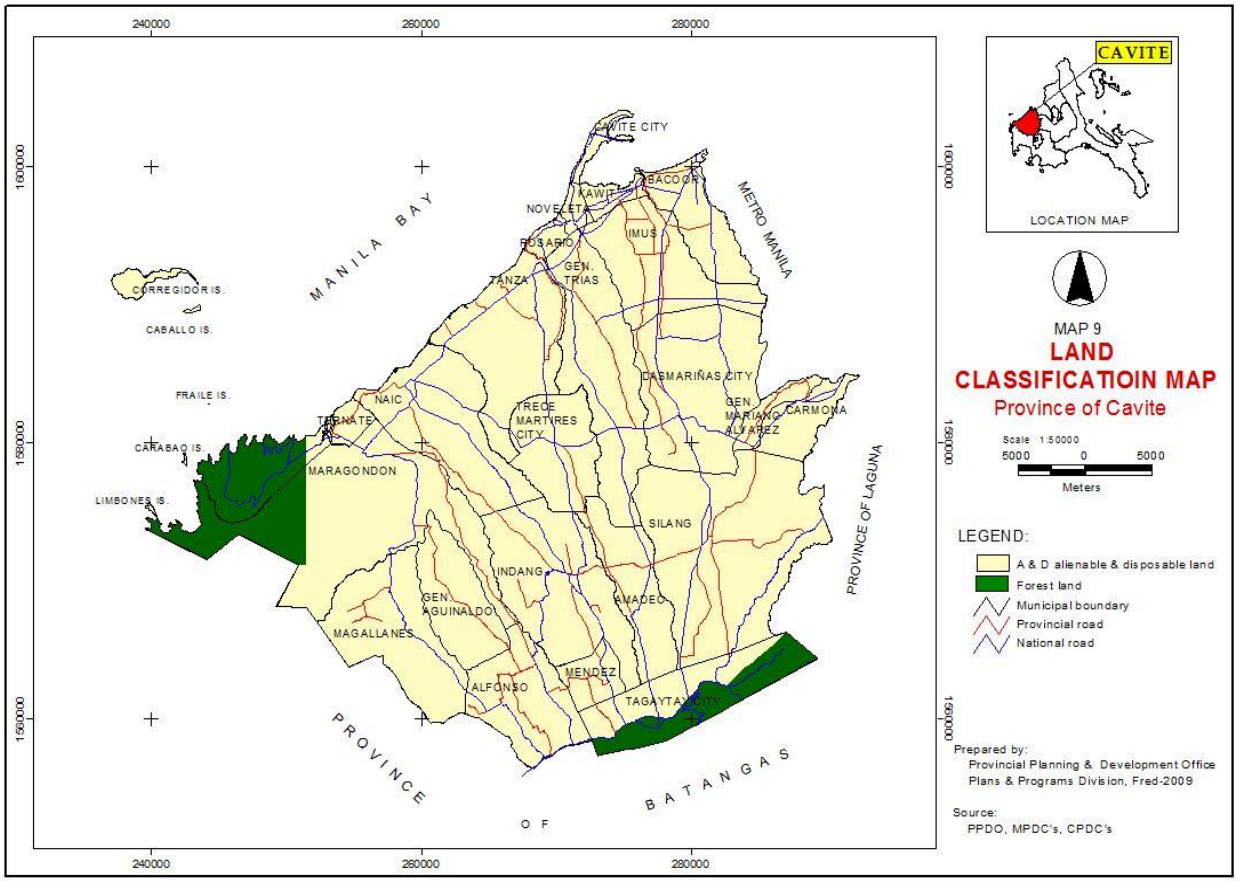
LAND AREA

The CALABARZON's 8.72% land area is being occupied by Cavite. This is relatively small considering that the Region is only comprised of five provinces. Likewise, this is equivalent to 0.48 percent of the total land area of the Philippines which is 299,404.00 hectares. The municipalities of Maragondon and Silang have the biggest land areas comprising 16,549 hectares and 15,641 hectares, respectively while the municipality of Noveleta has the smallest land area as indicated by 541 has. or 0.38 percent of the provincial total land area.(Table 3.1).

Land Resources and Distribution

Cavite is being comprised of only two land classifications. These are forest lands and alienable and disposable land. Forest lands are being maintained as they play a great role for the ecological balance of the Province. These are protected areas that are home to numerous floras and fauna that need to be guarded and preserved. Correspondingly, the alienable and disposable lands are further classified as built-up areas and production areas. These lands are intended for urban, economic and demographic developments (Figure 3.1).

Figure 3.1 Land Classification Map, Province of Cavite



Source: Provincial Planning and Development Office

Forest Lands

The Province of Cavite is home to rich forest lands. Cavite lies in the western monsoon forest zone. This location is very beneficial for the formation of tropical rain forests which are characteristically made through natural vegetation. In 2007, the existing forest area within the province totalled to 8,624.956 hectares. These forest areas were categorized as Protected Landscape under R.A.7586 otherwise known as National Integrated Protected Area System (NIPAS) and the unclassified forest (Non-NIPAS). By virtue of Proclamation No. 1594 on 26 October 1976, a total of 3,973.13 hectares located in Ternate and Maragondon, Cavite was proclaimed as national park. It is now known as the Mts. Palay-Palay and Mataas na Gulod Protected Landscape. The park lies in the border of Cavite and Batangas and has three peaks, Palay-Palay, Pico de Loro and Mataas na Gulod. Still, there were five (5) unclassified forests found along Tagaytay Ridge, Maragondon, Magallanes, Ternate and Alfonso (Table 3.2).With regards to the records of mountains, seven were named such as Pico de Loro, Mt. Palay-Palay, Mt. Buntis, Mt. Mataas na Gulod, Mt. Nagpatong, Mt. Hulog and Mt. Gonzales (Table 3.3).

The richness of Cavite's forest provides the abundance of different forest products (Table 3.4). Grass in nature, bamboo, is one of the most available forest products being found in the municipalities of Ternate, Magallanes, Maragondon and General Aguinaldo throughout the year.

Alienable and Disposable Lands

Generally, these lands are intended for economic activities broadly classified into production and built-up areas. Production lands can be in the field of *agriculture and other related industries.* Built-up areas are land intended for urban development activities.

Table 3.1. Land Area by City/Municipality, Province of Cavite: 2010

City/Municipality	Land Area (Hectares)	Percent Distribution
District I		
Cavite City	1,183	0.83
Kawit	1,340	0.94
Noveleta	541	0.38
Rosario	567	0.40
District II		
Bacoor	5,240	3.67
District III		
Imus	9,701	6.80
District IV		
City of Dasmariñas	8,234	5.77
District V		
Carmona	3,092	2.17
Silang	15,641	10.96
Gen. M. Alvarez	938	0.66
District VI		
TreceMartires City	3,917	2.74
Gen. Trias	11,768	8.25
Tanza	9,630	6.75
Amadeo	4,790	3.36
District VII		
Tagaytay City	6,615	4.64
Alfonso	6,460	4.53
Gen. Emilio Aguinaldo	5,103	3.58
Indang	8,920	6.25
Magallanes	7,860	5.51
Maragondon	16,549	11.60
Mendez	1,667	1.17
Naic	8,600	6.03
Ternate	4,350	3.05
TOTAL	**142,706**	**100.00**

Table 3.2. Area and Location of Forests

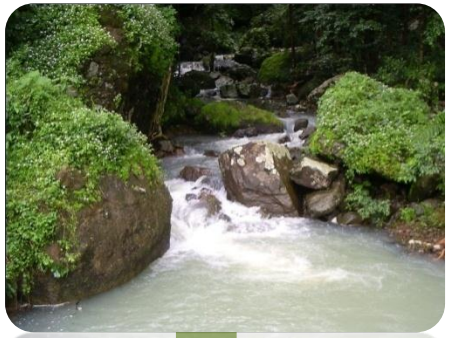
City/Municipality	Type of Forest	Area
Tagaytay City	Unclassified Forest	1,779.520 hectares
Alfonso	Unclassified Forest	432.092 hectares
Magallanes	Unclassified Forest	142.014 hectares
Ternate	Unclassified Forest	1,248.700 hectares
Maragondon	Unclassified Forest	5,022.630 hectares
	TOTAL	**8,624.956 hectares**

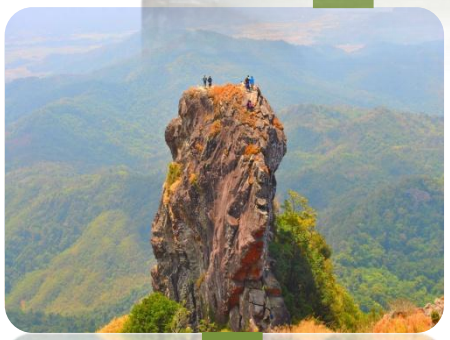
Table 3.3. Mountains in the Province of Cavite

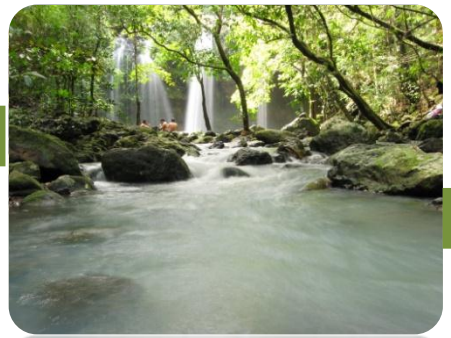
Name	Location
Pico de Loro	Maragondon
Mt. Palay-Palay	Ternate-Maragondon
Mt. Buntis	Maragondon
Mt. Mataas na Gulod	Maragondon
Mt. Nagpatong	Maragondon
Mt. Hulog	Maragondon
Mt. Gonzales	Tagaytay City

Table 3.4. Forest Products, Province of Cavite

Forest Products	Location
Almaciga, Timber, Bamboo rattan, vine, wild plants & animals	Ternate
Timber, Bamboo, Rattan firewood	Magallanes
Bamboo, Usiw, Buho, Rattan Firewood, lumber	Maragondon
Bamboo, Cogon, Rattan, Cabo-negro processed into rope	Gen. Aguinaldo







Random photos were taken at Mount Palay-Palay and Mataas na Gulod Protected Landscape in the municipalities of Maragondon and Ternate.

STATUS OF LAND USE (GENERAL)

Cavite lands are divided into two classifications, forest lands and alienable and disposable lands. These lands are being used in various ways, either for agriculture, residences, open areas, etc. These actual uses are termed as land-use.

Based on the Cavite Provincial Physical Framework Plan 2005-2010, Cavite's alienable and disposable lands are further classified into production lands and built-up areas. Production lands in Cavite are intended for agriculture, fishery and mining. On the other hand, built-up areas are mainly for residential areas, commercial, industrial and tourism areas.

Production Land-Use

The type of production lands depends on the man's activities on land. Of the total 71,830 hectares production land of Cavite, 71,474.91 hectares of it is having agricultural uses and is therefore classified as agricultural lands. This is around 50.09% of the total land area of the province. With these, it can be generalized that in spite of rapid urbanization in the province, Cavite remains to have an agricultural economy that makes food security attainable (Table 3.5). Some of the major crops being produced in the province are rice, corn, coffee, coconuts, cutflowers and vegetables.

> Of the total 71,830 hectares production land of Cavite, 71,474.91 hectares of it is having agricultural uses and is therefore classified as agricultural

Included in the agricultural land use are livestock farms that range from piggeries, poultries, goat farms and cattle farms. The climatic suitability of Cavite makes the province ideal for integrated farming, having crops and livestock rising in one farm.

Fishery is also another major component of the agricultural sector. Having rich marine resources and long coastlines, the province is home to numerous fishery activities. This industry has provided livelihood to many Caviteños. In some lowland and even upland areas, fishery, in the form of fishponds are also producing considerable amount of fish products. Some areas in Cavite are also engaged in fish processing and production of fish products like fish sauce.

Mining is the third component of production land-use in the province. Extraction includes filling materials, gravel and sand. Currently, there are 17 licensed quarry operators in Cavite (Table 3.6)

Built-up Areas

The built-up areas are being utilized for settlements and industrial sites. This also includes commercial and business areas where commerce is transpiring. According to the 2007 Census of Population and Housing by the National Statistics Office, there are 611,450 occupied housing units in Cavite and given the trend will continually increase gradually.

Moreover, according to the Housing and Land-Use Regulatory Board, there are around 1,224 housing subdivisions with issued license to sell in the province until 2009 which occupies an area of 9,471 hectares.

Meanwhile, the industrial sector also develops rapidly in the Province. In the year 2010, industrial estates cover around 3,078.041 hectares of land. Tourism establishments are also considered built-up areas such as golf courses, leisure farms, resorts and the likes.

Table 3.5. Land Area Classification by City/Municipality, Province of Cavite: 2010

City/Municipality	Total Area of Production Land (Hectares)	Total Area of Protection Land (Hectares)	Total Built-up Area (Hectares)	Total Area (Hectares)
District I				
Cavite City			1,183	1,183
Kawit	450		890	1,340
Noveleta	54		487	541
Rosario	27		540	567
District II				
Bacoor	604		4,636	5,240
District III				
Imus	2,057		7,644	9,701
District IV				
City of Dasmariñas	2,556		5,678	8,234
District V				
Carmona	609		2,483	3,092
Silang	9,732	57	5,852	15,641
Gen. M. Alvarez	336		602	938
District VI				
Trece Martires City	523		3,394	3,917
Gen. Trias	5,158		6,610	11,768
Tanza	1,897		7,733	9,630
Amadeo	4,550		240	4,790
District VII				
Tagaytay City	1,272	2,707	2,636	6,615
Alfonso	6,046	103	311	6,460
Gen. Emilio Aguinaldo	3,710	1,079	314	5,103
Indang	7,755		1,165	8,920
Magallanes	5,571	1,861	428	7,860
Maragondon	10,266	4,298	1,985	16,549
Mendez	1,055		612	1,667
Naic	7,290		1,310	8,600
Ternate	312	3,210	829	4,350
TOTAL	71,830	13,315	57,562	142,706

Source: Provincial Planning and Development Office

Figure 3.2 Existing Land Use Map, Province of Cavite

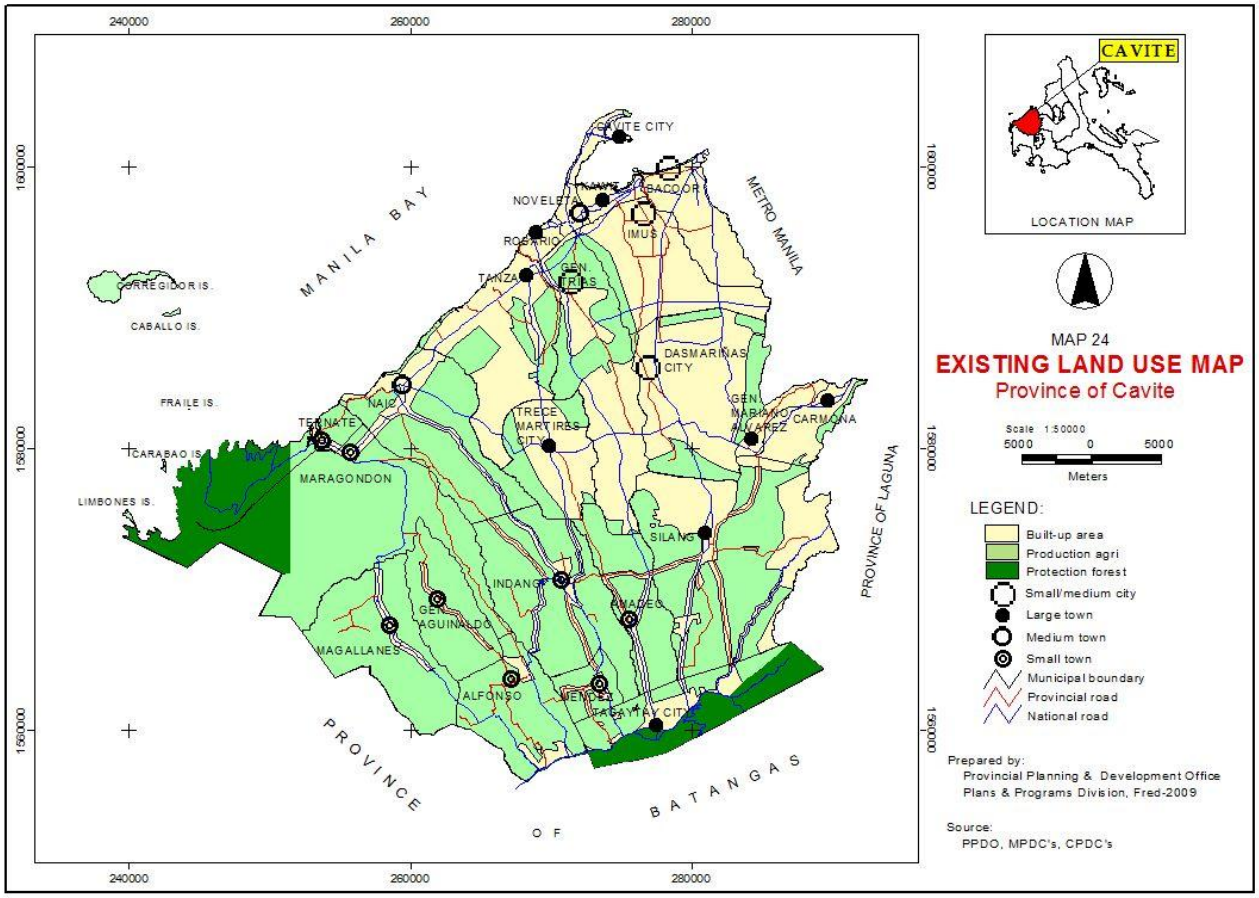


Table 3.6. List of Quarry Operators, Province of Cavite: 2010

	PERMITTEE	LOCATION
1	Pedro Romulo	Sapang, Ternate
2	Lamberto Lee, Jr.	Sapang, Ternate
3	Attari Corporation	Sapang, Ternate
4	Angel del Rosario	Sapang, Ternate
5	Sulpicio Baria	Sapang I, Ternate
6	Ismael Pakingan	Tres Cruses, Tanza
7	Roger Laguerder	Tres Cruses, Tanza
8	Fernando Aldeguer III	Sapang, Ternate
9	Emelita Cuenca	Salawag, City of Dasmariñas
10	Narciso Peji	Pinagsanhan, Maragondon
11	Lep Trading	Langkaan, City of Dasmariñas
12	Cipriano Poblete	Pooc, Silang
13	Beam Commercial	Tres Cruses, Tanza
14	Salome Madlangbayan	Pinagsanhan, Maragondon
15	Mac Gregor Gawaran	Salawag, City of Dasmariñas
16	Jenny Diones	Pinagsanhan, Maragondon
17	Boris Jonas Aldeguer	Sapang I, Ternate

Source: Provincial Government-Environment and Natural Resources Office

STATUS OF LAND AREA CLASSIFICATION

The Province is dominated with production area that accounts for 50.33% of its total land area. It is followed by built-up areas that cover 40.34% of Cavite. Lastly, 9.33% of the province is considered protection lands such as natural parks and forests (Table 3.5).

Maragondon and Silang are relatively agricultural municipalities with 10,266 and 9,732 hectares of production land, respectively. Tanza, Imus and Gen. Trias are the municipalities with most area intended for urbanization. Meanwhile, despite relatively small land area, Bacoor and Trece Martires City are dominated with built-up area with only 604 and 523 hectares considered as production land, respectively (Table 3.5).

SOIL CHARACTERISTICS

The soil surveys conducted by the Bureau of Soils and Water Management (BSWM) revealed that Cavite is composed of several soil types. Classification of soil types in a specific area is a very important consideration in identifying its most fitted land-use. This way, land productivity at its optimum can be achieved.

The lowland area of Cavite is generally composed of Guadalupe clay and clay loam. This soil type is characterized as coarse and granular when dry but sticky and plastic when wet. Its substratum is solid volcanic tuff. These types of soils are suited to lowland rice and corn while those in the upland are suited for orchard and pasture. Guadalupe clay adobes are abundant in the southern part of Bacoor and Imus bordering the City of Dasmariñas. The soil is hard and compact and

difficult to cultivate that makes it generally unsuitable for diverse cropping. It is very sticky when wet and granular when dry. Forage grass is advised for this type of soil. Hydrosol and Obando sand are found along Bacoor Bay. The shoreline of Rosario, Tanza, Naic and Ternate are lined with Guadalupe sand.

The central area principally consists of Magallanes loam with streaks of Magallanes clay loam of sandy texture. This is recommended for diversified farming such as the cultivation of upland rice, corn, sugarcane, vegetables, coconut, coffee, mangoes and other fruit trees. The steep phase should be forested or planted to rootcrops. The eastern side of Cavite is consists of Carmona clay loam with streaks of Carmona clay loam steep phase and Carmona sandy clay loam. This type of soil is granular with tuffaceaous material and concretions. It is hard and compact when dry, sticky and plastic when wet. This type of soil is planted to rice with irrigation or sugarcane without irrigation. Fruit trees such as mango, avocado and citrus are also grown in this type of soil. Guingua fine sandy loam is found along the lower part of Malabon and Alang-Ilang River at Noveleta.

The type of soils that dominate the upland areas are Tagaytay loam and Tagaytay sandy loam with mountain soil undifferentiated found on the south-eastern side bordering Laguna province. Also on the southern tip are Magallanes clay and Mountain soil undifferentiated with interlacing of Magallanes clay loam steep phase. The Tagaytay loam contains fine sandy materials, moderately friable, and easy to work on when moist. In an undisturbed condition, it bakes and becomes hard when dry. About one-half of this soil type is devoted to upland rice and upland crops. On the other hand, Tagaytay sandy loam is friable and granular with considerable amount of volcanic sand and underlain by adobe clay. Mountain soil undifferentiated is forested with bamboos found in the sea coast. Cavite also has the Patungan sand characterized by pale gray to almost white sand with substratum of marine conglomerates which are found at Sta. Mercedes in Maragondon and in some coastlines of Ternate.

FORESTRY

The Mounts Palay-Palay and Mataas na Gulod Protected Landscape

Cavite is very fortunate to have an area which is considered to be biologically rich. In 1976, by virtue of Presidential Proclamation No. 1594, the Mounts Palay-Palay and Mataas na Gulod were declared to be national parks. The declaration aims to preserve the natural biodiversity of the area as part of the advocacy to preserve the country's natural heritage. The national park was later named as the Mounts Palay-Palay and Mataas na Gulod Protected Landscape.

The entire landscape is composed of about 4,000 hectares. The preservation of its natural biodiversity is a strategic move considering the rapid urbanization happening in the province of Cavite and the nearby Metro Manila. Known to be a good source of water, it is of utmost importance to preserve and rehabilitate the damaged portions of the national park.

The national park is approximately located within the geographic coordinates of 14°12' to 14°17' north latitude and 120°38' to 120°42' east longitude. The park covers four (4) barangays (Sapang, Pinagsanhan, Patungan and Papaya) and seven (7) sitios (Malauyas, Caynipa, Caytako, Cacabay, Magabe, Murangdalig and Hamilo). Different portions of the park can be found in three municipalities (Ternate, Maragondon and Nasugbu) under two provinces (Cavite and Batangas).

The Mounts Palay-Palay and Mataas na Gulod Protected Landscape Management Zones

The Park is divided into 10 management zones that ensure a balanced land-use for the park. These are as follows:

1. **Strict Protection Zone – 250 hectares**

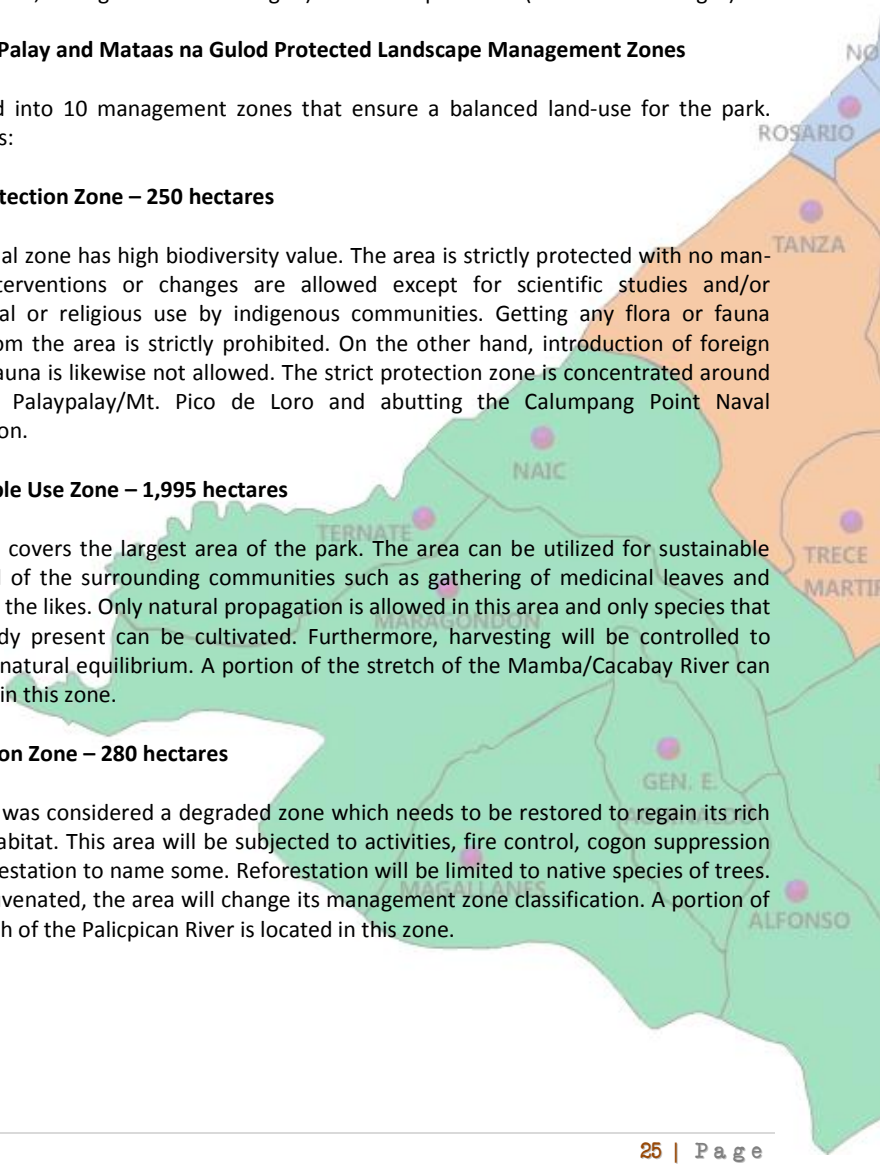
   This special zone has high biodiversity value. The area is strictly protected with no man-made interventions or changes are allowed except for scientific studies and/or ceremonial or religious use by indigenous communities. Getting any flora or fauna specie from the area is strictly prohibited. On the other hand, introduction of foreign flora or fauna is likewise not allowed. The strict protection zone is concentrated around the Mts. Palaypalay/Mt. Pico de Loro and abutting the Calumpang Point Naval Reservation.

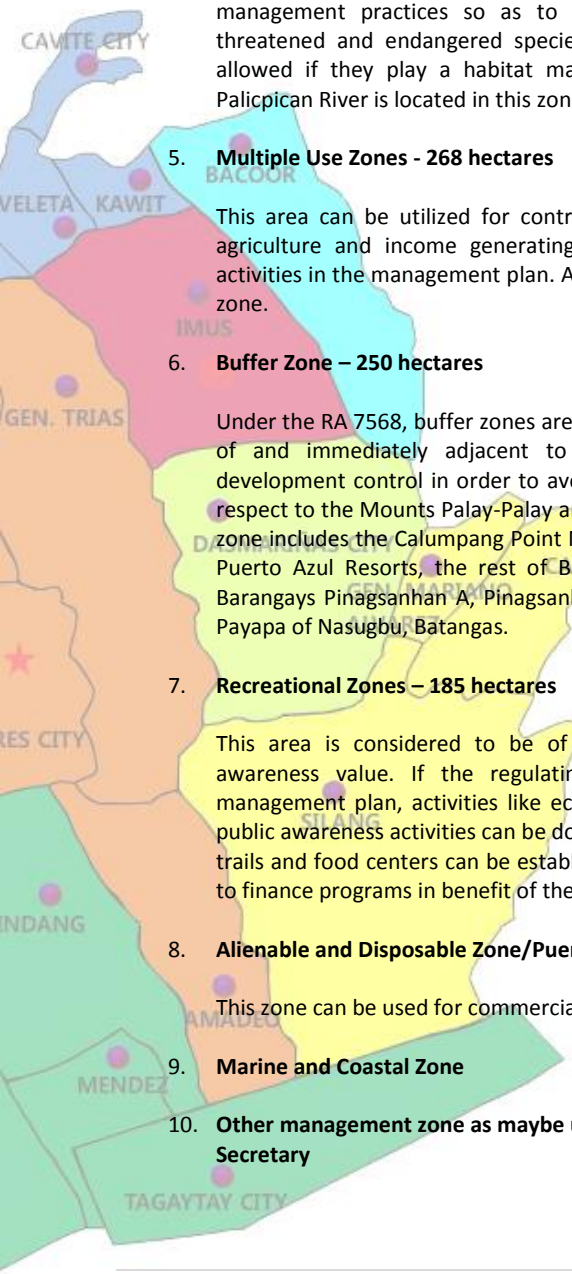
2. **Sustainable Use Zone – 1,995 hectares**

   This zone covers the largest area of the park. The area can be utilized for sustainable livelihood of the surrounding communities such as gathering of medicinal leaves and roots and the likes. Only natural propagation is allowed in this area and only species that are already present can be cultivated. Furthermore, harvesting will be controlled to maintain natural equilibrium. A portion of the stretch of the Mamba/Cacabay River can be found in this zone.

3. **Restoration Zone – 280 hectares**

   This area was considered a degraded zone which needs to be restored to regain its rich natural habitat. This area will be subjected to activities, fire control, cogon suppression and reforestation to name some. Reforestation will be limited to native species of trees. Once rejuvenated, the area will change its management zone classification. A portion of the stretch of the Palicpican River is located in this zone.





4. **Habitat Management Zone – 270 hectares**

   This is an area with significant habitat and specie value. This zone is subjected to management practices so as to maintain specific condition or habitat for rare, threatened and endangered species. Human habitation and sustainable use maybe allowed if they play a habitat management role. A portion of the stretch of the Palicpican River is located in this zone.

5. **Multiple Use Zones - 268 hectares**

   This area can be utilized for controlled settlement, traditional/sustainable land use, agriculture and income generating activities but should fall within the prescribed activities in the management plan. A portion of the Mamba/Cacabay River is part of this zone.

6. **Buffer Zone – 250 hectares**

   Under the RA 7568, buffer zones are defined as "identified areas outside the boundaries of and immediately adjacent to designated protected areas that need special development control in order to avoid or minimize harm to the protected area." With respect to the Mounts Palay-Palay and Mataas na Gulod Protected Landscape, its buffer zone includes the Calumpang Point Naval Reservation, Palicpican Bay, the Caylabne and Puerto Azul Resorts, the rest of Barangay Sapang A of Ternate, Cavite, the rest of Barangays Pinagsanhan A, Pinagsanhan B and Patungan of Maragondon and Barangay Payapa of Nasugbu, Batangas.

7. **Recreational Zones – 185 hectares**

   This area is considered to be of high recreational, educational or environmental awareness value. If the regulating bodies will allow, in consideration of their management plan, activities like eco-tourism, recreational, conservation education or public awareness activities can be done. In this area, facilities like visitor's center, nature trails and food centers can be established. The revenues generated from it can be used to finance programs in benefit of the Park.

8. **Alienable and Disposable Zone/Puerto Azul Zone – 502 hectares**

   This zone can be used for commercial activities as in the case of Puerto Azul Zone.

9. **Marine and Coastal Zone**

10. **Other management zone as maybe used in the management plan and approved by the Secretary**

Park Management Programs and Activities

The Department of Environment and Natural Resources engaged to the following activities in view of its Mounts Palay-Palay and Mataas na Gulod Protected Landscape protection, rehabilitation and preservation:

1. Biodiversity and Habitat Rehabilitation
   a. Scientific Researches
   b. Socio-Economic Studies Program
   c. Information and Education Campaign
   d. Conservation and Management Scheme
2. Park's Management
   a. Protection Management Scheme
   b. Disaster Management
   c. Realistic System of Economic Instruments

Reforestation Projects

In order to maintain and enhance the natural resources of the Province, the Department of Environment and Natural Resources in coordination with the Provincial Government-Environment and Natural Resources Office are conducting various reforestation projects.

Reforestation projects are concentrated in municipalities where protected areas currently exist like in Maragondon and Ternate. It is in these two municipalities where the Mts. Palay-Palay and Mataas na Gulod National Park can be found. These areas also made possible the presence of bulk-water resource in Cavite and thus, have to be maintained.

For 2009, the number of hectares of reforested land totalled to 46 hectares (Table 3.7).

Table 3.7. Reforestation Projects, Province of Cavite: 2010

Reforestation Project	Location	Land Area Covered (in hectares)
Upland Development Program	Brgy. Pinagsanhan, Maragondon	20
Upland Development Program	Brgy. Sapang, Ternate	14
Upland Development Program (Streambank Protection)	Brgy. Batas, Silang	12

Source: Provincial Environment and Natural Resources Office (PENRO), Trece Martires City

MINERAL RESOURCES AND RESERVES

Non-Metallic Resources

The greater parts of Cavite are composed of volcanic materials, tuff, cinders, basalt, breccias, agglomerate and interbeddings of shales, and sandstones. The dormant and active volcanoes (Taal) are within these volcanic areas and have been the sources of volcanic materials which form the Tagaytay Cuesta. The drainage systems are deeply entrenched in the tuffs, eroding thin interbedded sandstones and conglomerate rocks which are the sources of little reserves of sand and gravel in the larger stream. Adobe stone quarries also flourish in the tuff areas.

Cavite coastal areas have marl and conglomerate sedimentary rocks and some igneous rocks which are prominent in the high, mountainous regions of western part of the province. Black sands are found in Kawit while Noveleta has its own salt products. Magallanes has gravel deposits while reserves of sand and gravel materials are found in Alfonso, Carmona, Gen. Aguinaldo, Naic, Ternate, Maragondon and Silang (Table 3.8).

Table 3.8. Mineral Deposits, Province of Cavite

City/Municipality	Mineral Deposits	Location
Alfonso	Gravel, Sand	
Carmona	Gravel, Sand, Clay	Mabuhay, Ulong Tubig
Gen. Aguinaldo	Gravel, Sand	Batas-Dao, Lumipa
	Adobe, Boulders	Batas-Dao Kaymisas & Lumipa
Kawit	Black Sand	San Sebastian
Ternate	Gravel and Sand Boulders	Bucana, San Jose, San Juan, Poblacion
	Banda-Banda	Sapang
Magallanes	Gravel Deposit	Ramirez, Urdaneta
Maragondon	Manganese, Iron	Tulay, Mabato
	Gravel, Sand	Caingin
Naic	Sand	
Noveleta	Salt	San Rafael, Tibagan, Malaking Ilog, Matindig
Silang	Sand	

Source: Provincial Government-Environment and Natural Resources Office (PG-ENRO) Trece Martires City

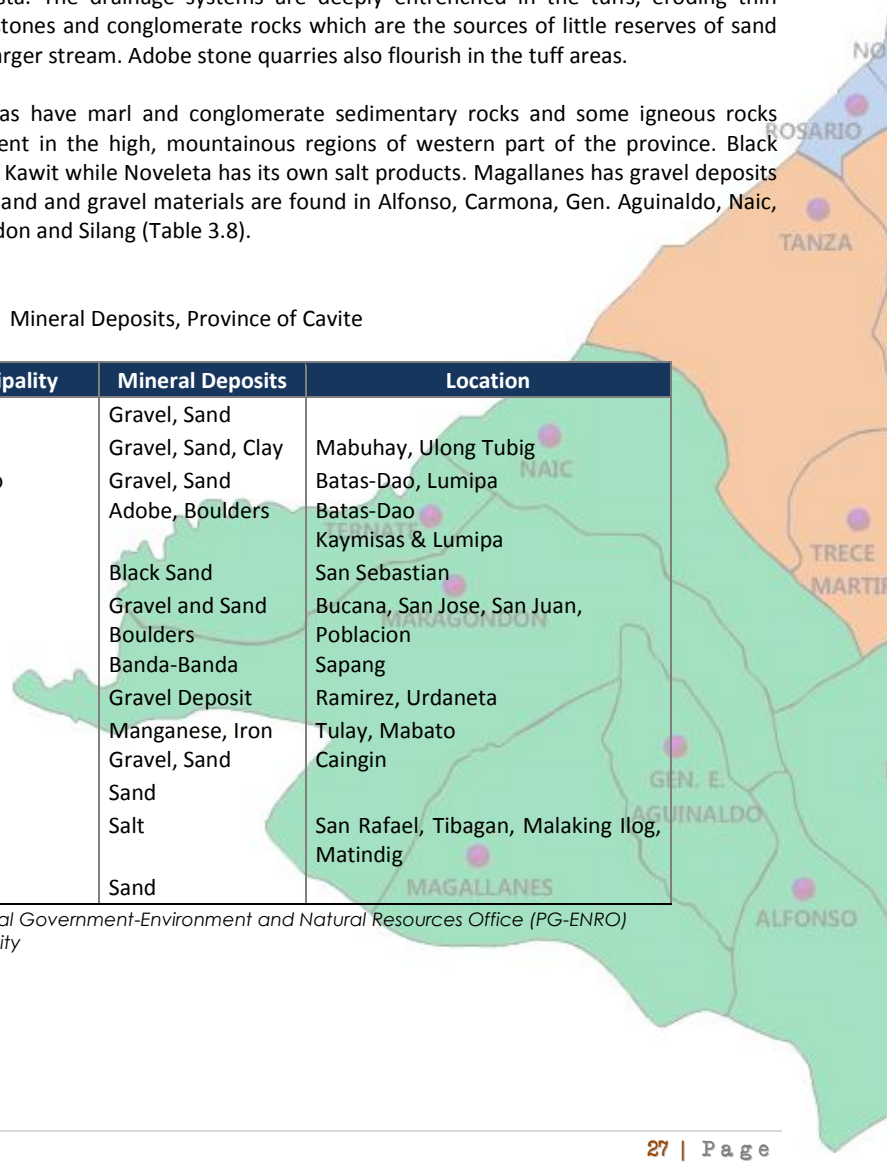


Figure 3.3 Highlights of Biodiversity Monitoring at Mts. Palay-Palay and Mataas na Gulod Protected Landscape

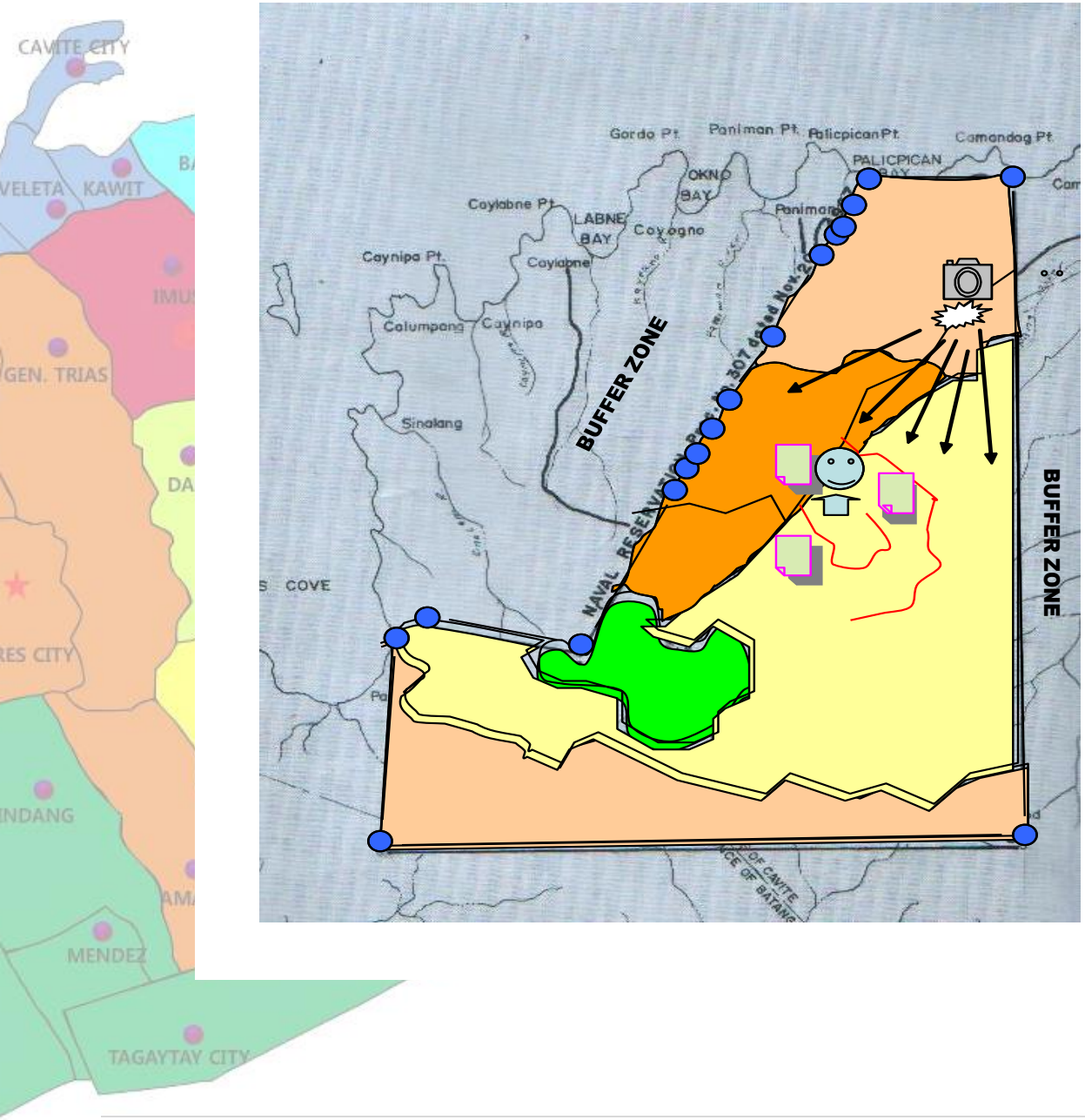


Figure 3.4 Location of Flora and Fauna (Transect Loop)

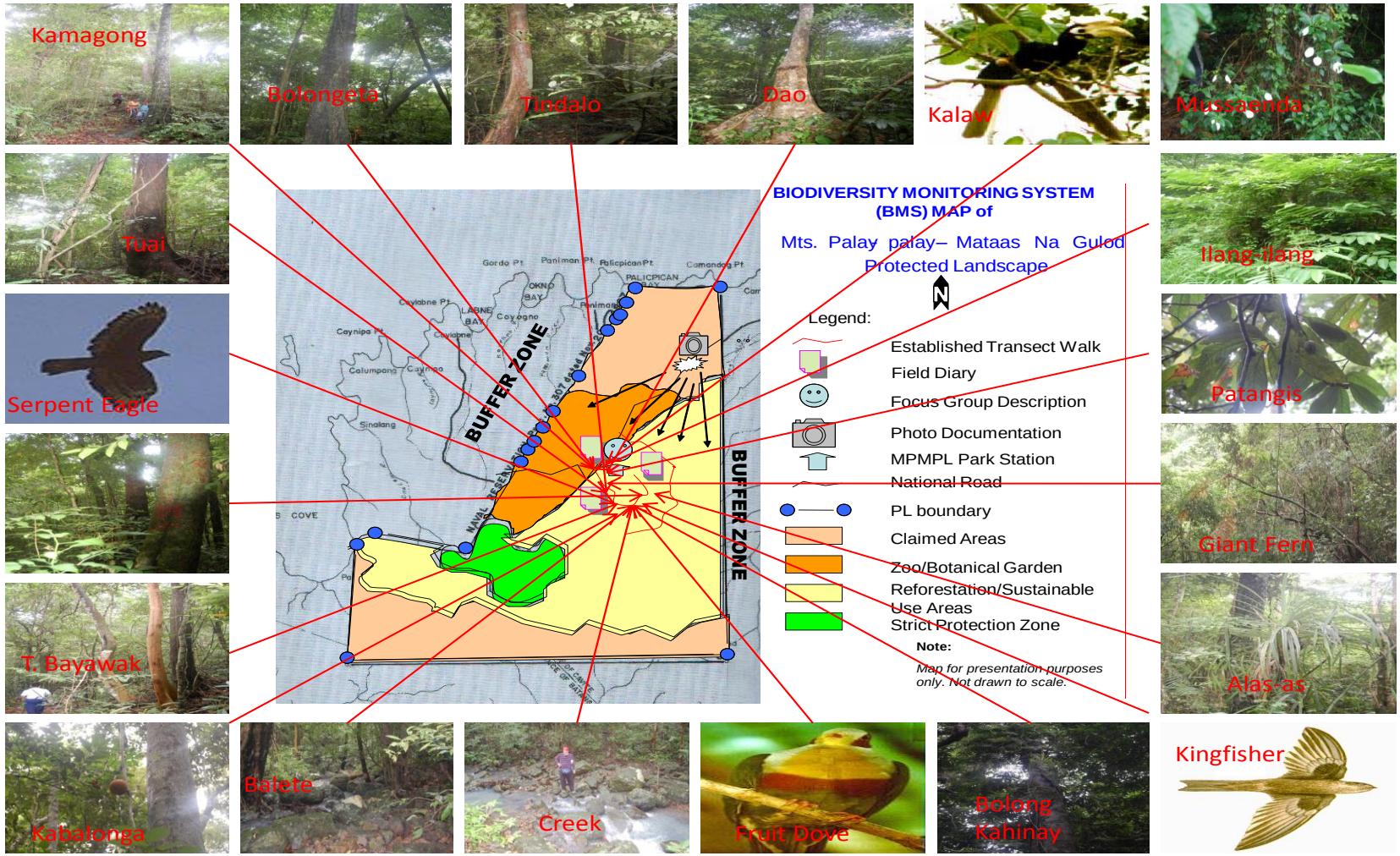
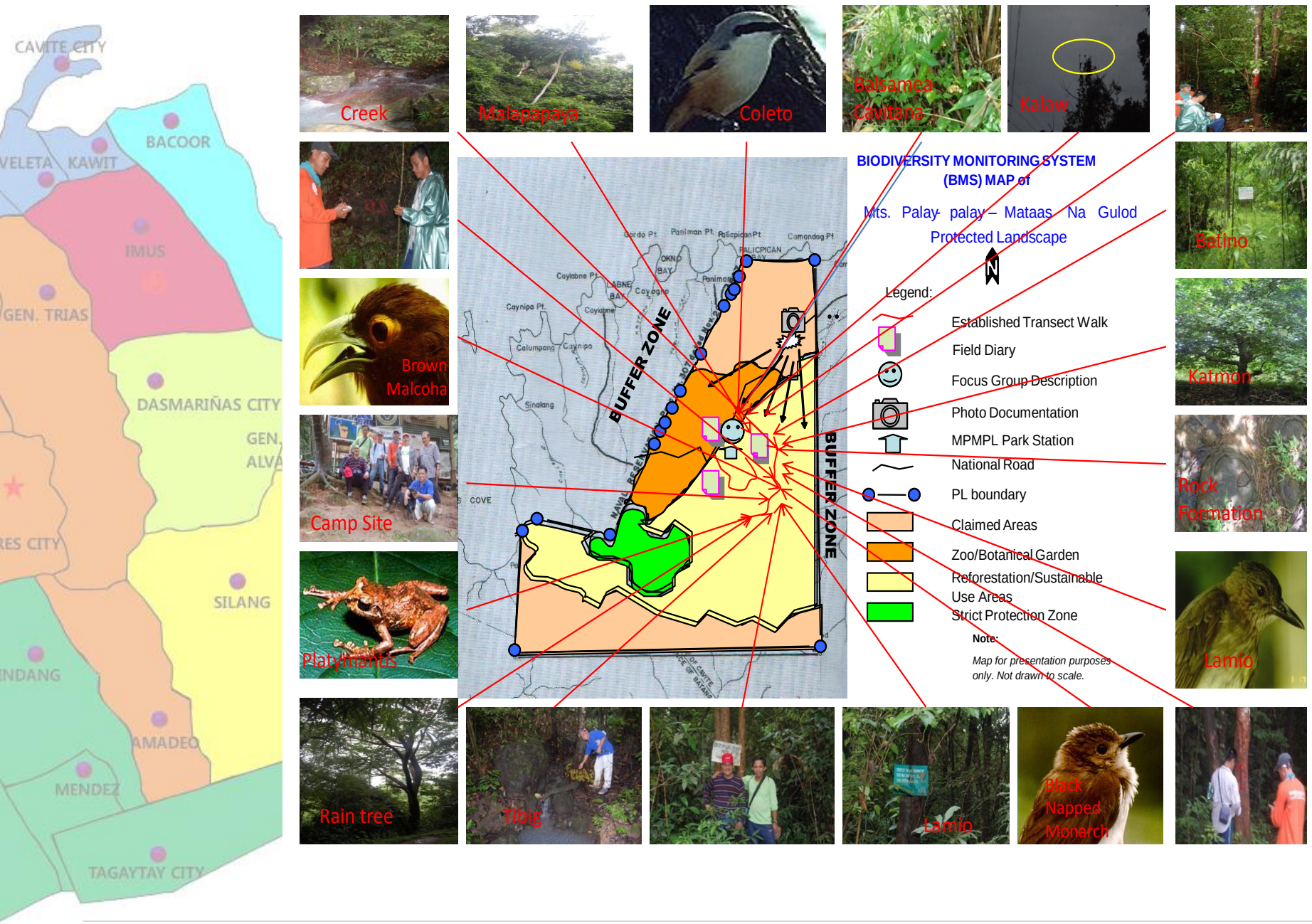


Figure 3.5 Location Map of Flora and Fauna in Transect Line (Mt. Pico De Loro)



CLIMATE

Cavite belongs to Type 1 climate based on the Climate Map of the Philippines by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). Being a Type 1, Cavite has two pronounced seasons: dry from November to April and wet during the rest of the year. In the year 2009, the average temperature of the province is at 27.6°C. January and February are the coolest months with an average of 25.15°C. The province has received a total of 2,056.1mm of rainfall in 2010. August and October are the rainiest months while there is no rainfall experienced during the month of February.

Table 3.9. Average Temperature and Rainfall by Month, Province of Cavite 2010

Month	Average Temperature (°C)	Average Rainfall (millimeters)
January	24.45*	5.8
February	25.85*	0
March	26.7*	10.4
April	27.3*	45.4
May	27.85*	36.8
June	27.2	151.2
July	29.9	355.9
August	26.5	375.2
September	29.6	291.8
October	29.1	444.7
November	28.8	240.9
December	28.0	98.0

*Source: *PAG-ASA CvSU Agromet Research Station, PAG-ASA, Sangley Point Field Office*