
Research Article

Floral survey of Laiban sub-watershed in the Sierra Madre Mountain Range in the Philippines

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ABSTRACT

The Laiban sub-watershed is part of the Kaliwa watershed nestled in the Sierra Madre Mountain Range in Luzon Island, Philippines. The watershed was identified as one of the 14 priority biodiversity conservation sites within the Sierra Madre Biodiversity Corridor. This study presents the results of the vegetation survey, which aimed to characterize various vegetation types and determine species richness and composition. Endangered, rare and endemic species were also identified. Land uses were surveyed and representative vegetation types were selected using patch and quadrat sampling techniques. Existing trail systems served as transect lines in conducting the rapid vegetation assessment during the transect walk. A total of 121 species belonging to 102 genera and 56 families were recorded during the survey. Of the 121 species recorded, 20% of these were endemics. Indigenous species

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comprised about 53% while exotic species was 27%. Many of the abundant and common plants were exotics and indigenous species, which comprised majority of the total species recorded. The endangered species consisted only 4% of the total species recorded. The vegetation types identified were: 1) secondary forests that are scattered in patches along the slopes; 2) grassland, which could be seen with distinct boundaries; 3) plantation forest; and 4) bamboo (*Schizostachyum lumampao*) that may be the dominant vegetation. The sub-watershed is degraded and characterized by the presence of *kaingin* areas, grasslands, Buho bamboo (*S. lumampao*) and fragmented patches of secondary forests and brushland mosaics.

INTRODUCTION

The Philippines is considered as one of the mega-biodiversity hotspots in the world (World Bank, 2004). A biodiversity hotspot is defined as “an area featuring exceptional

concentrations of endemic species and expressing exceptional loss of habitat” (Myers *et al.*, 2000). In the Philippines, there are over 6,000 endemic species with 80% of forest cover loss over the last century. It is no wonder that the country is a mega-biodiversity hotspot.

One of the major biogeographic regions in the country is the Sierra Madre Mountain Range. In the southeastern portion of the range, the Kaliwa Watershed forms part of the Sierra Madre Biodiversity Corridor (SMBC). This watershed including its microbasin, the Laiban sub-watershed, was recently identified as one of the 14 priority biodiversity conservation sites within the SMBC (Miriam College, 2004). On the other end, there has been increasing interest in this sub-watershed as an alternative water source for Metro Manila residents.

The Kaliwa Watershed has been widely studied, but previous studies have been devoted mainly in other sites. To date, there has been no documented survey conducted in the Laiban sub-watershed. This study was designed to generate baseline information on the vegetative types and composition of the sub-watershed; and to identify the conservation status of plant species in the area.

MATERIALS AND METHODS

The study site is the Laiban sub-watershed, which serves as an important microbasin of the bigger Kaliwa Watershed, nestled in the Sierra Madre Mountain Range. It is located in the east of Metro Manila in the district (*Barangay*) of Laiban, municipality of Tanay in the province of Rizal, the Philippines (Fig. 1). The village

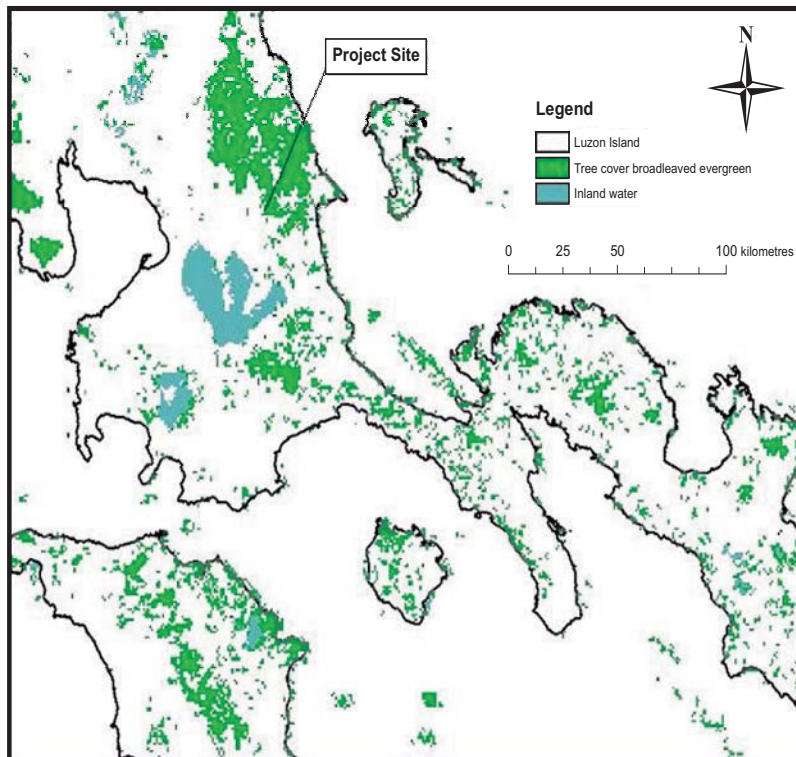


Figure 1: Location of the study site in Barangay Laiban

community in the site belongs to the indigenous people called the *Dumagats* and *Remontados*. The sub-watershed is a 180 ha area which is generally characterized by mountainous terrain with steep slopes in all sides. This consisted of cultivated land and forested hills with slash and burn cultivation (*kaingin*) areas present in the cup of the inverted U-shape (Fig. 2) and along the lower slopes of the study site. Some small creeks run through the lower slopes and connect to the main river beyond the village.

The Kaliwa Watershed was classified as a forest reserve and a portion of the watershed was declared as a National Park and Wildlife Sanctuary. At present, the Kaliwa Watershed is reclassified as a protected area under the National Integrated Protected Areas System (REECS, 1999 as cited in Miriam College, 2004). However, the area is considered degraded due to anthropogenic pressures. Upland farms or

kaingin areas were mainly established by the indigenous people.

The vegetation survey of the sub-watershed was conducted from February to May 2005. The Patch Sampling Technique (Ohsawa, 1991; Rice & Lamshead, 1994) was used based on identified land uses and survey objectives. This approach uses the selection of patches as a landscape element to determine the vegetation composition. Nested plots using the Quadrat Sampling Method (QSM) were laid out within patches of vegetation to gather biological data. Sampling plots measuring 20 m × 20 m were established to identify vegetation in the canopy stratum; 5 m × 5 m for the intermediate vegetation; and 1 m × 1 m quadrats for the ground vegetation. The transect walk method was also done for the rapid vegetation assessment using the existing trail system covering most of the area. The sampling plots and transect walk site are as shown in Figure 2.

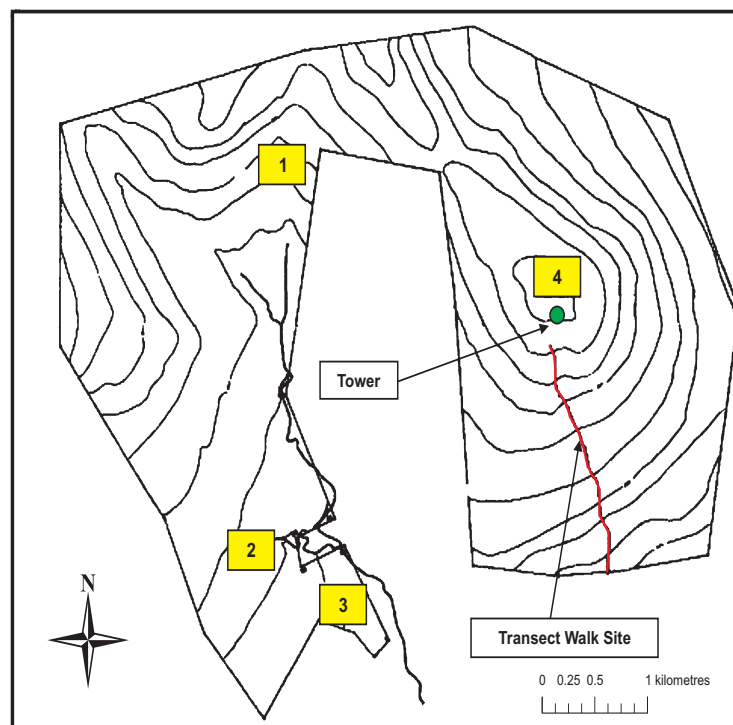


Figure 2: Location of sampling plots and transect walk in the sub-watershed

The identification of plant species was done through referral to literatures and specimen verification at the herbarium laboratory of the College of Forestry and Natural Resources in University of the Philippines Los Banos. The International Plant Name Index website (www.ipni.org) was consulted in verifying the names of plant taxa. In addition, the 2004 IUCN Red List of Threatened Species (www.iucnredlist.org) also served as an online information database in checking the conservation status of plants.

RESULTS AND DISCUSSION

A study on floral diversity was previously conducted in other areas of the Kaliwa Watershed (DENR, 2005). This characterized the bigger watershed into various community types such as *Imperata* stand, *Saccharum* stand, bamboo thicket and shrubland vegetation. For this study, the vegetation type and composition of the Laiban sub-watershed were surveyed and characterized.

The Laiban sub-watershed was degraded and characterized by the presence of *kaingin* areas, grasslands, Buho bamboo (*S. lumampao*) and patches consisting of secondary forests and brushlands. The *kaingin* areas were mostly devoid of trees and made up of agricultural crops such as *Manihot esculenta*, *Arachis hypogaea*, *Zea mays* and *Citrus* sp. The plants outside the *kaingin* area were mostly grasses and small shrubs.

The vegetation types identified during the survey were: 1) secondary forests that are scattered in patches along the slopes; 2) grassland, which could be seen with distinct boundaries; 3) plantation forest; and 4) bamboo (*S. lumampao*) that may be the dominant vegetation.

The secondary forest is situated on the midslopes of the site just above the *kaingin* area tilled by the ‘Chieftain’ of the indigenous

people. The elevation is recorded at 290 m asl along a west-facing slope. Six medium-sized trees were recorded in the canopy vegetation of the sampling plot. These included *Ficus gul*, *Strombosia philippinensis*, *Ficus nota*, *Leucaena leucocephala*, *Artocarpus ovatus* and *Buchanania nitida*. All of these species usually thrive along slopes near tributaries, except for *L. leucocephala*, which could also persist in the other surrounding habitat types, e.g. brushlands. Ten species were identified in the intermediate vegetation. These were *Alphonsea arborea*, *Myristica philippinensis*, *S. philippinensis*, *Bridelia penangiana*, *Hedyachras philippinensis*, *Terminalia foetidissima*, *Pisonia umbellifera*, *Gomphandra luzoniensis*, *Dinochloa acutiflora* and *Leea aculeata*. There were only six species recorded at the ground level. These included the *Aglaonema* sp., *Curculigo capitulate*, *L. aculeata*, *Centrosema pubescens*, *Mikania cordata* and *Donax cannaeformis*. Other species were recorded during the transect walk within the secondary forest and brushland mosaic (Table 1).

The grassland vegetation (160 m asl) is dominated by the grass species, *Imperata cylindrica*. The tree species found in the area are sparse. However, there were still three species recorded such as *Antidesma ghaesembilia*, *Bauhinia malabaricum* and *Gmelina arborea*. The former two species are both indigenous and naturally growing in the area. They are quite common in grassland vegetation throughout the Sierra Madre Mountain Range. *Gmelira arborea*, on the other hand is introduced, as an attempt on reforesting the area. There were six species representing the intermediate stratum as follows: *Melastoma malabathricum*, *Cananga odorata*, *Cratoxylon formosum*, *A. ghaesembilia*, *B. malabaricum* and *Psidium guajava*. The ground vegetation consisted only of two species, *I. cylindrica* and *C. odorata*.

At almost 500 m asl, the grassland vegetation in the ridge is slightly different from the grassland found in the lower altitude. Different vegetative composition was observed except for the common presence of *I. cylindrica*. There were six tree species recorded which were the *Ficus septica*, *Ficus nota*, *Macaranga tanarius*, *Cordia dichotoma*, *F. gul* and *Acalypha stipulacea*. The presence of *Ficus* trees in this grassland is unusual, however, these species have also been recorded in high elevation mossy forest types in the Bicol Region (Pollisco, 2002). Other species included in the sampling plot were six pioneer species. These were the *Lantana camara*, *D. cannaeformis*, *C. odorata*, *Saccharum spontaneum* and two vine species. No species were recorded in the ground layer because honey gatherers sporadically burned the area. This demonstrated that anthropogenic pressures are being exerted aside from the *kaingin* activities found in the lower slopes.

At 180 m asl, the plantation forest is characterized by more or less evenly spaced trees. There were only three dominant species of trees, *Swietenia macrophylla*, *Acacia auriculiformes* and *G. arborea*. The intermediate vegetation consisted of mostly indigenous species. These included *Buchanania arborescens*, *Semecarpus cuneiformis*, *Guioa koelreuteria*, *Pterospermum celebicum*, *Pittosporum pentandrum* and *Hibiscus tiliaceus*. In the undergrowth, only four species were recorded. These were the *Chromolaena odorata*, *Lygodium flexuosum*, *M. malabathricum* and *Leukosyke capitallata*. *Chromolaena odorata* and *M. malabathricum* are both exotics.

The Buho (*S. lumampao*) bamboo represents another vegetation type occupying a large portion of the site. On the other hand, they are subjected to the *kaingin* practice of the local people, hence, most of these are being cut down and burned to make way for cash crops. Being

a grass species, the Buho bamboo is able to reestablish during the period when the local people shift to another adjacent area and the cycle starts all over again.

A total of 121 species belonging to 102 genera and 56 families were recorded. Table 1 shows the checklist of vegetation found in Laiban sub-watershed.

The site harboured about eight plant habits or form. Out of 121 species documented, 69 were tree species, 17 shrubs, nine herbs, seven vines, six grasses, five palms and four species for both bamboo and fern. There were no large trees found in the area, however, there were tree species that belong to the large size category such as the *Koordersiodendron pinnatum* and *Shorea contorta*. Another large tree was the *Albizia acle*. All of three species belong to the endangered species list under the CITES (PAWB-DENR, 2000) and IUCN (2004), though with varying conservation status. Many of the shrubs were less than a metre tall which occupied the ground stratum. Most of these were found in open areas such as *Stachytarpheta jamacaensis*, *Moghania strobilifera* and *Mussaenda* sp. The fern plants were mostly located in the upper slopes adjacent to water sources or where there is high moisture and shade.

Endemicity is defined as the state of having limited geographic range, which could be confined to an area or to a country (Williams *et al.*, 1996). Some species in the watershed were classified as endemics, either within the Sierra Madre Mountain Range or as country endemic.

Of the 121 species recorded, 20% or 24 of these were endemics. The proportion of endemics to exotic and indigenous species is shown in Figure 3. Examples of these endemic species were *A. acle*, *Artocarpus blancoi*, *S. philippinensis* and *M. philippinensis*.

Table 1: List of vegetation found during the survey in Laiban sub-watershed

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATIONTYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|---------------|--|--|--|--|--|
| Acanthaceae | <i>Pachystachys lutea</i> Nees | shrub | plantation forest | exotic | common |
| Agavaceae | <i>Cordylone fruticososa</i> (L.) A. Chev. | shrub | plantation forest | exotic | abundant |
| Anacardiaceae | <i>Koordersiodendron pimatum</i> (Blanco) Merr. <i>Buchanania arborescens</i> (Blume) Blume <i>Buchanania nitida</i> Engl. <i>Semecarpus cuneiformis</i> Blanco <i>Mangifera indica</i> L. | large tree medium to large tree small to medium tree small to medium tree large tree | plantation forest grassland, plantation forest plantation/secondary forest plantation/secondary forest/brushland mosaic plantation/secondary forest/brushland mosaic | indigenous indigenous indigenous indigenous exotic | depleted depleted rare depleted abundant |
| Annonaceae | <i>Platymitra arborea</i> (Blanco) Kesler <i>Cananga odorata</i> (Lamk.) Hook.f. & Thoms. | large tree medium tree | secondary forest secondary forest | endemic indigenous | rare endangered |
| Apocynaceae | <i>Alstonia parvifolia</i> Merr. | small tree | grassland, plantation forest | endemic | depleted |
| Araceae | <i>Aglaonema commutatum</i> Schott <i>Colocasia esculentum</i> (L.) Schott | herb herb | secondary forest secondary forest | indigenous exotic | common abundant |
| Araliaceae | <i>Polyscias nodosa</i> (Blume) Seem. | medium tree | plantation/secondary forest/brushland mosaic | indigenous | depleted |
| Areaceae | <i>Areca catechu</i> L. | palm | secondary forest/brushland mosaic | endemic | common |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|----------------|--|-------------|---|-------------------|---------------------|
| Areaceae | <i>Arenga pinnata</i> (Wurmb) Merr. | palm | secondary forest/ brushland mosaic | indigenous | common |
| | <i>Veitchia merrillii</i> Becc. | palm | plantation forest | endemic | abundant |
| | <i>Cocos nucifera</i> L. | palm | plantation/secondary forest brushland mosaic | exotic | abundant |
| | <i>Calamus merrillii</i> Becc. | rattan | plantation/secondary forest brushland mosaic | endemic | endangered |
| Aspleniaceae | <i>Asplenium musaeifolium</i> Mett. | fern | secondary forest | indigenous | common |
| Asteraceae | <i>Crassocephalum crepidioides</i> (Benth.) S. Moore | shrub | plantation forest | indigenous | common |
| | <i>Chromolaena odorata</i> (L.) R.M. King & M. Robinson | shrub | grassland/ridge grassland, plantation forest | exotic | common |
| | <i>Mikania cordata</i> (Burm. f.) B.L. Rob. | vine | secondary forest | exotic | common |
| Bombacaceae | <i>Ceiba pentandra</i> (L.) Gaertn. | large tree | ridge grassland | exotic | common |
| Boraginaceae | <i>Cordia dichotoma</i> G. Forst. | small tree | ridge grassland | indigenous | depleted |
| Burseraceae | <i>Canarium asperum</i> Benth. ssp. <i>asperum</i> var. <i>asperum</i> | large tree | plantation forest | indigenous | depleted |
| Clusiaceae | <i>Cratogeomys formosum</i> (Jack) Dyer ssp. <i>Formosum</i> | small tree | grassland, plantation forest | indigenous | depleted |
| Combretaceae | <i>Terminalia foetidissima</i> Griff. | large tree | plantation/secondary forest | endemic | depleted |
| Convolvulaceae | <i>Ipoemoea batatas</i> (L.) Lamk | vine | secondary forest | indigenous | abundant |
| Cyperaceae | <i>Cyperus rotundus</i> L. | sedge | plantation forest | indigenous | common |
| | <i>Cyperus</i> sp. | sedge | plantation forest | indigenous | common |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|------------------|--|----------------------|---|-------------------|-----------------------|
| Datiaceae | <i>Octomeles sumatrana</i> Miq. | large tree | ridge grassland | indigenous | indeterminate |
| Dipterocarpaceae | <i>Shorea contorta</i> Vidal | large tree | secondary forest/ brushland | endemic | critically endangered |
| Euphorbiaceae | <i>Homonoia riparia</i> Lour. | small tree | ridge grassland | indigenous | common |
| | <i>Neotrewia cumingii</i> (Muell.-Arg.) Pax & K. Hoffm. | small tree | secondary forest | endemic | depleted |
| | <i>Antidesma ghaesembilla</i> Gaertn. var. <i>ghaesembilla</i> | small tree | grassland, plantation/ secondary forest/ | indigenous | common |
| | <i>Macaranga tanarius</i> (L.) Muell.-Arg. | small tree | brushland mosaic | indigenous | abundant |
| | <i>Acalypha amentacea</i> Roxb. | small tree | ridge grassland | indigenous | common |
| | <i>Manihot esculenta</i> Crantz | shrub | plantation forest | exotic | abundant |
| | <i>Macaranga bicolor</i> Muell.-Arg. | small to medium tree | secondary forest | endemic | vulnerable |
| | <i>Aleurites moluccana</i> (L.) Willd. | large tree | plantation forest | exotic | abundant |
| | <i>Codiaeum variegatum</i> (L.) Blume | small tree | plantation forest | exotic | common |
| | <i>Bridelia penangiana</i> Hook. f. | small tree | secondary forest | indigenous | depleted |
| Fabaceae | <i>Bauhinia malabarica</i> Roxb. | small tree | grassland, secondary forest/brushland mosaic | indigenous | abundant |
| | <i>Centrosema pubescens</i> Benth. | vine | secondary forest | exotic | common |
| | <i>Calopogonium mucunoides</i> Desv. | vine | plantation forest | exotic | common |
| Fabaceae | <i>Pterocarpus indicus</i> Willd. Forma <i>indicus</i> | large tree | plantation forest | indigenous | endangered |
| | <i>Flemingia strobilifera</i> (L.) Roxb. ex W. Aiton | vine | plantation forest | indigenous | common |
| | <i>Samanea saman</i> (Jacq.) Merr. | large tree | plantation forest | exotic | abundant |
| Flacourtiaceae | <i>Flacourtia jangomas</i> (Lour.) Raeusch. | small tree | plantation forest | exotic | common |
| Heliconiaceae | <i>Heliconia psittacorum</i> L.f. | herb | plantation forest | exotic | abundant |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|-----------------|---|----------------------|--|-------------------|---------------------|
| Hypoxidaceae | <i>Curatigo capitulata</i> (Lour.) O. Kuntze | herb | secondary forest, ridge grassland | indigenous | common |
| Icacinaceae | <i>Gomphandra luzoniensis</i> (Merr.) Merr. | medium tree | secondary forest | endemic | indeterminate |
| Leeaceae | <i>Leea aculeata</i> Blume ex Spreng. | small tree | secondary forest/ brushland mosaic | indigenous | common |
| Malvaceae | <i>Hibiscus rosasinensis</i> L. | small tree | plantation forest | exotic | abundant |
| | <i>Urena lobata</i> L. | shrub | plantation forest | exotic | common |
| | <i>Hibiscus tiliaceus</i> L. | small tree | plantation forest | indigenous | common |
| | <i>Rubus</i> sp. | small tree | ridge grassland | indigenous | depleted |
| Marantaceae | <i>Donax cannaeformis</i> (Forst.) K. Schum | herb | secondary forest/brushland mosaic, ridge grassland | indigenous | rare |
| Melastomataceae | <i>Melastoma malabathricum</i> L. | shrub | grassland, plantation forest | indigenous | common |
| Meliaceae | <i>Swietenia mahogani</i> (L.) Jacq. | large tree | plantation/secondary forest/brushland mosaic | exotic | endangered |
| | <i>Dysoxylum cumingianum</i> C. DC. | small to medium tree | secondary forest | indigenous | depleted |
| | <i>Albizia acle</i> (Blanco) Merr. | medium to large tree | plantation forest | endemic | depleted |
| Mimosaceae | <i>Acacia auriculiformis</i> A. Cunn. ex. Benth | small to medium tree | plantation forest | exotic | abundant |
| | <i>Leucaena leucocephala</i> (Lam.) de Wit | small tree | secondary forest | exotic | abundant |
| | <i>Mimosa pudica</i> L. | shrub | plantation forest | exotic | common |
| Moraceae | <i>Artocarpus Blancoi</i> (Elmer) Merr. | large tree | plantation/secondary forest | endemic | vulnerable |
| | <i>Artocarpus ovatus</i> Blanco | small tree | secondary forest | endemic | abundant |
| | <i>Ficus gul</i> Laut. et K. Schum. var. <i>gul</i> | small tree | secondary forest, ridge grassland | indigenous | depleted |
| | <i>Ficus septica</i> Burm. F. var. <i>septica</i> | small tree | secondary forest, ridge grassland | indigenous | common |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|----------------------------------|--|--|--|-------------------|---------------------|
| Moraceae | <i>Ficus ulmifolia</i> Lam. | small tree | secondary forest | endemic | vulnerable |
| | <i>Artocarpus heterophyllus</i> Lamk. | small to medium tree | plantation forest | exotic | abundant |
| | <i>Ficus congesta</i> Roxb. var. <i>congesta</i> | medium tree | plantation forest | indigenous | depleted |
| | <i>Ficus pseudopalma</i> Blanco | small tree | grassland, secondary forest | endemic | common |
| | <i>Ficus odorata</i> (Blanco) Merr. | small to medium tree | secondary forest | endemic | depleted |
| | <i>Artocarpus communis</i> J.R. & G. Forst. | large tree | plantation forest | exotic | common |
| | <i>Ficus variegata</i> Blume var. <i>variegata</i> | large tree | plantation forest | indigenous | common |
| <i>Ficus nota</i> (Blanco) Merr. | small tree | plantation/secondary forest, ridge grassland | indigenous | common | |
| Moringaceae | <i>Moringa oleifera</i> Lamk. | small tree | plantation forest | exotic | abundant |
| Musaceae | <i>Musa textiles</i> Nees | herb | secondary forest | indigenous | abundant |
| | <i>Musa sapientum</i> L. | herb | plantation forest | exotic | abundant |
| Myristicaceae | <i>Myristica philippinensis</i> Lam. | medium tree | secondary forest | endemic | vulnerable |
| Myrsinaceae | <i>Ardisia squamulosa</i> Presl | small tree | plantation/secondary forest | endemic | vulnerable |
| Myrtaceae | <i>Psidium guajava</i> L. | small tree | grassland | exotic | abundant |
| | <i>Syzygium cumini</i> (L.) Skeels | medium tree | ridge grassland | indigenous | abundant |
| | <i>Syzygium calubcob</i> (C.B.Rob) Merr. | medium tree | secondary forest/ grassland mosaic | indigenous | indeterminate |
| Nyctaginaceae | <i>Pisonia umbellifera</i> (Forst.) Seem. | small tree | secondary forest | indigenous | indeterminate |
| Oleaceae | <i>Strombosia philippinensis</i> (Baill.) Rolfe | medium tree | secondary forest | endemic | depleted |
| Passifloraceae | <i>Passiflora foetida</i> L. | vine | ridge grassland | exotic | common |
| Pittosporaceae | <i>Pittosporum pentandrum</i> (Blanco) Merr. | small tree | plantation/secondary forest/brushland mosaic | indigenous | indeterminate |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|--------------|---|-------------------------------------|--|---|--------------------------------------|
| Poaceae | <i>Dinchoia acutiflora</i> (Munro) S. Dransf. <i>Schizostachyum lumampao</i> (Blanco) Merr. <i>Bambusa merrilliana</i> (Elmer) Rojo & Roxas <i>Imperata cylindrica</i> (L.) Beauv. | bamboo bamboo bamboo grass | secondary forest plantation forest secondary forest/ brushland mosaic grassland/ridge grassland, plantation forest | indigenous endemic indigenous indigenous | common common rare abundant |
| Polygalaceae | <i>Zea mays</i> L. <i>Saccharum spontaneum</i> L. | grass grass | plantation forest grassland/ridge grassland | exotic indigenous | abundant abundant |
| Polyodiaceae | <i>Xanthophyllum vitellinum</i> (Blume) Dietr. <i>Diplazium exculentum</i> (Retz.) Sw. <i>Nephrolepis</i> sp. | small tree fern fern | ridge grassland secondary forest, ridge grassland plantation/secondary forest/brushland mosaic, ridge grassland secondary forest | indigenous indigenous indigenous | indeterminate common common |
| Rosaceae | <i>Prunus grisea</i> (Blume) Kalkm. var. <i>grisea</i> | small to medium tree | secondary forest | indigenous | indeterminate |
| Rubiaceae | <i>Nauclea orientalis</i> (L.) L. <i>Neonauclea auriculata</i> Quis. & Merr. <i>Mussaenda philippica</i> A. Rich. var. <i>aurorae</i> Sul. | medium to large tree small tree | plantation forest plantation forest | indigenous indigenous | depleted common |
| Rubiaceae | <i>Psychotria luzoniensis</i> (Cham. & Schlecht.) F. - Vill. | small tree | secondary forest | indigenous | common |
| Rutaceae | <i>Micromelum inodorum</i> (Blanco) Tan. <i>Micromelum compressum</i> (Blanco) Merr. | small tree small tree | secondary forest secondary forest/ brushland mosaic | indigenous indigenous | indeterminate indeterminate |

| FAMILY NAME | SCIENTIFIC NAME | PLANT HABIT | VEGETATION TYPE ENCOUNTERED | ECOLOGICAL STATUS | CONSERVATION STATUS |
|---------------|--|--|--|--|--|
| Sapindaceae | <i>Guioa koelreuteria</i> (Blanco) Merr. <i>Glennia philippinensis</i> (Radlk.) Leenh. | small tree small to medium tree | plantation/secondary forest secondary forest | endemic endemic | rare rare |
| Sapotaceae | <i>Chrysophyllum cainito</i> L. | medium tree | plantation forest | exotic | common |
| Schizaeaceae | <i>Lygodium japonicum</i> Sw. <i>Lygodium circinnatum</i> (Burm. f.) Sw. | fern fern | secondary forest/ brushland mosaic plantation/secondary forest/brushland mosaic | indigenous indigenous | common common |
| Sterculiaceae | <i>Pterospermum niveum</i> Vidal <i>Pterospermum obliquum</i> Blanco | small tree small tree | plantation/secondary forest/brushland mosaic secondary forest/ brushland mosaic | indigenous indigenous | depleted depleted |
| Tiliaceae | <i>Diplodiscus paniculatus</i> Tutcz. | medium tree | secondary forest | endemic | vulnerable |
| Ulmaceae | <i>Celtis luzonica</i> Warb. | large tree | secondary forest | endemic | vulnerable |
| Urticaceae | <i>Leucosyke capitata</i> (Poir.) Wedd. | small tree | plantation forest | indigenous | indeterminate |
| Verbenaceae | <i>Premna odorata</i> Blanco <i>Gmelina arborea</i> Roxb. <i>Stachytarpheta jamaicensis</i> (L.) Vahl. <i>Lantana camara</i> L. | small tree large tree shrub shrub | plantation forest grassland, plantation forest plantation forest plantation/secondary forest/brushland mosaic, ridge grassland ridge grassland | indigenous exotic exotic exotic | abundant abundant common common |
| Zingiberaceae | <i>Clerodendrum bethunianum</i> <i>Kolowratia elegans</i> Presl. | small tree herb | secondary forest, ridge grassland | indigenous endemic | common common |

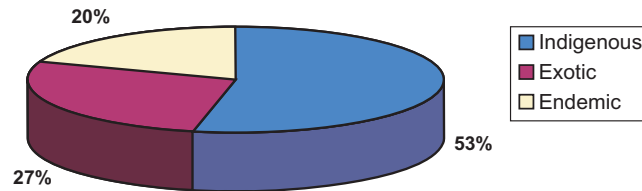


Figure 3: Proportion of ecological status of species in the Laiban sub-watershed

The endangered species consisted only 4% of the total species listed in the sampling area (Table 2). These endangered species were *C. odorata*, *Pterocarpus indicus*, *Calamus merrillii*, *S. contorta* and *S. macrophylla*. Most of these are listed in the IUCN Red List of Threatened Species while the others are listed under the Convention on International Trade of Endangered Species (CITES). The tree, *S. macrophylla*, though classified as exotic is quite common, but also listed under both CITES and IUCN because of its high value in the international trade. Vulnerable species, on the other hand, comprised 6% of the total species recorded. Some of these were *A. blancoi*, *Diplodiscus paniculatus*, *Macaranga bicolor*, *F. ulmifolia*, and *M. philippinensis*.

Table 2: Conservation status of plant species

| Conservation Status | Number of Species | Percentage (%) |
|---------------------|-------------------|----------------|
| Abundant | 27 | 22 |
| Common | 44 | 36 |
| Depleted | 22 | 18 |
| Vulnerable | 7 | 6 |
| Rare | 6 | 5 |
| Endangered | 5 | 4 |
| Indeterminate | 10 | 8 |
| Total | 121 | 100 |

Many of the abundant and common plants consisted of exotics and indigenous species. This comprised majority of the total species recorded. Men often introduce exotic species due to their aesthetic value, whereas wildlife disperses the indigenous ones. The complete list of the conservation status of species is found in Table 1.

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