AMBIENT APPRAISAL

Floristic Diversity of the Biodiversity Monitoring Plots and its Environs within Agata Mining Ventures, Inc., Tubay, Agusan del Norte, Philippines

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Study Area: Agusan del Norte, Philippines

Coordinates: 8°57'N; 125°32'E

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Abstract

Woody plant species are key components of the forest ecosystem and are responsible for forest architecture and the overall composition of forest communities. On the established permanent biodiversity monitoring plots (PBMP) inside an approved mineral production sharing agreement areas in Agusan del Norte, the species diversity and abundance of trees were assessed wherein a total of 123 individuals of 16 families, 28 genera, and 37 species were recorded. Transect walks were likewise done to list existing flora within MPSA and recorded a total of 251 vascular plant species belonging to 80 families and 203 genera. The mineral lands of AMVI hold a tremendous diversity of species to include critically endangered *Diospyros philippinensis* and *Camptostemon philippinense*, among others. During re-assessment, it was observed that most of the monitoring plots progressed positively. At present, the biodiversity of these monitoring plots is under threat due to the anthropogenic and upcoming mining activities.

Introduction:

The Philippines is one of the top mineralized countries in the world for gold, nickel, copper, and chromite (Quintans, 2017; Kay, 2018). In the southern part of the country-the Caraga Region, nickel mining has been a promising industry (Sarmiento & Demetillo, 2017) as 20 of the 48 registered metallic mines in the Philippines are found in the region and engaged in nickel mining (DENR-MGB, 2018). A number of these nickel mines were ordered shut down in early 2017 for several violations on environmental laws and resulted in the decline in nickel production worldwide. However, despite the issuance of closure orders, some companies continued to operate business as usual. Of the few law-abiding mining corporations in the region, Agata Mining Ventures, Inc. (AMVI) invested a substantial portion of its operational budget into research for crafting sound reforestation and rehabilitation plans. A good management plan guarantee sustainable use of existing natural resources such as soil, water, timber and biodiversity with the preparation and revision of this is a

very crucial process, thus, appropriate knowledge on these resources is vital. However, during mining activities where mineral ores were extracted by means of the open-pit method, many biota having ecological and scientific importance were still displaced (Sarmiento *et al.*, 2017). Plant communities are the foundation for terrestrial trophic webs and animal habitats, and their structure and species composition are a cumulative result of biological and physical processes (Gates, 1993; Davis, 1981) that are difficult to measure directly. However, with the establishment of permanent monitoring plots the biodiversity resources can be monitored and its variation and function can be determined space-wise in time (Malabrigo *et al.*, 2016). For this study, the main objective was to establish and maintain permanent biodiversity monitoring plots (PBMP) within the approved Mineral Production Sharing Agreement (MPSA) area of Agata Mining Ventures, Inc. in the province of Agusan del Norte. Specifically, it aimed to: i) determine the current composition and diversity of trees inside the established

monitoring plots; ii) gather information on the abundance and conservation status of the different species inside monitoring plots; iii) generate a near-comprehensive list of the existing floral species within the approved MPSA area.

Methodology:

Permanent biodiversity monitoring plots: permanent biodiversity monitoring plots (PBMP) are the defined areas to study various life forms that are geographically located and permanently gridded with markers (Malabrigo et al., 2016). The biodiversity resources inside PBMPs were monitored in place and time to determine variations structurally and functionally. The establishment of PBMPs will be very significant for monitoring long-term ecological research on biodiversity-functioning in relation to climate change and rehabilitation programs of any industry. A total of twelve (12) plots were established within the approved Mineral Production Sharing Agreement (MPSA) area of Agata Mining Ventures, Inc. (AMVI). Four (4) plots were located inside the active mining sites while the rest were outside but still within the approved MPSA area. The relative location of the permanent plots was recorded using a handheld GPS receiver taken on the southern left corner and plotted in a Google Earth (Map).

The sites were selected on the basis of previously conducted biodiversity surveys for AMVI. The comparison of information gathered from different periods can give a clearer picture of the dynamics of the ecosystem in time. The first fieldwork was conducted on June 6-9, 2017 for a series of activities such as i) the establishment of the PBMPs, ii) the initial assessment of existing flora species inside the monitoring plots, and finally iii) listing of other flora species outside monitoring plots but within the approved MPSA area. The second fieldwork was done on March 3-4, 2018 where the primary focus was to revisit and evaluate vegetation change and the diversity of species inside PBMPs. All tagged trees were assessed for presence/absence and other emerging tree species were recorded and noted.

Vegetation Sampling : the PBMPs were laid out with 20m x 20m dimensions. A GPS receiver was used to determine the coordinates of the plot using the southern left corner as the reference point. All plants (trees in particular) inside the quadrat with DBHH >5 cm were measured and recorded. A fabricated aluminum tag bearing a numbered species code was then pinned on the visible section of the tree for identification and monitoring.

Transect walks and walkthroughs were likewise done to record other vascular plants outside PBMPs but within the approved MPSA area to generate a near-comprehensive listing of vascular species in the mineral areas of AMVI. Vascular plants are such plants that possess specialized conducting tissues, particularly xylem and phloem to include all flowering plants and conifers such as trees and

other arborescent species, palms, herbaceous plants, vines to include woody and non-woody, as well as ferns. Species Identification and Nomenclature: identification of species was done on the field with the help of available literature. Some publications referring to the Philippine flora included Merrill (1912), Santos et al. (1986), Zamora and Co (1986), Madulid (2002), Primavera (2009) and online plant identification website *PhytoImages* (www.phytoimages.siu.edu/) were also utilized to compare photographed species. Some unfamiliar species were posted online through a social media group Co's Digital Flora of the Philippines (a public group of botanists, foresters, biologists and other plant enthusiasts) to confirm species identification. The scientific nomenclature and conservation status of species were crosschecked in the databases of The Plant List (www.theplantlist.org) and The IUCN Redlist of Threatened Species (www.iucnredlist.org), respectively.

Data analysis: it was encoded on a spreadsheet and analyzed using the vegetational analysis formula of density, relative density, frequency, relative frequency, dominance, relative dominance and the species importance value (SIV). The SIV was computed as the sum of the relative frequency, relative density and relative dominance of a species in a community or forest ($SIV = RFreq + RDom + RDen$). An SIV provides a better index than density alone regarding the importance or function of a species in habitat and also gives rank or order for a particular species within the community (Odum & Barret, 2005). Ecological parameters such as Simpson's Index of Diversity (1-D), Shannon-Wiener (H') diversity index, and species richness, on the other hand, were computed using the PAST Statistical Software. Fernando scale was used to know the levels of biodiversity.

Results and Discussion:

General description of the area: the general ground formation inside active mining sites ranges from gently rolling to undulating to steep slopes alongside higher grounds. Dominant ground vegetation usually composed of dense formations of Bracken ferns (*Pteridium aquilinum*), Pako (*Nephrolepis* spp.), Nito (*Lygodium flexuosum*), Cogon grass (*Imperata cylindrica*) and other associated ground species. The first plot (Plot-1) was established on a small valley between two very steep slopes in Python Creek. The valley was made up of loose soil materials formed through deposition and sedimentation resulted from land conversion and massive mining operations on the upper elevations. The area was predominantly covered by ground vegetations whilst large trees were also found forming sparse tree patches along habitually moist portions of the intermittent creek. Some large trees observed include Antipolo (*Artocarpus blancoi*), Mango (*Mangifera indica*), Dita (*Alstonia scholaris*) and Narra (*Pterocarpus indicus*). However, the general

vegetation canopy was composed of young growths typically still under the pole and sapling stage with <30cm dbh and reaching only 6-8 ft in height. Plots-2 & 3 were similarly covered with dense ground vegetation of ferns and associated species. Plot-2 was located along *E.morgado* creek alongside the sloping terrain where the company's settling pond was constructed. Unlike the first plot, only a few tree species were found and mostly were planted for reforestation purposes. Accordingly, Mangium (*Acacia mangium*) were planted to start initial rehabilitation programs of the company, however, closer examination of the trees shows noticeably inferior growth in height and girth compared to its age. Plot-3, on the other hand, was purely dominated by ferns and only a single Kakaag (*Commersonia bartramia*) tree was found. The terrain was relatively flat and wide. Adjacent to it was active excavation and hauling activities, wherein expansion could possibly reach the established plot location in the near future.

Plot-4 can be described as a secondary growth forest where large diameter trees are still found naturally. It is located along Sua creek and can be considered adequately stocked and intact by simply looking on its canopy. Several hardwood species such as Ipil (*Intsia bijuga*) and Tindalo (*Azelia rhoimboidea*) were encountered along the way together with natural fruit-bearing forest trees such as Bankoro (*Morinda citrifolia*), Antipolo (*A.blancoi*), and Marangbanguhan (*A.odoratissimus*) which can be a good food source of birds and other wildlife.

The other eight (8) PBMPs were established along the coastal zones. These plots were classified as secondary growth forest however; recent survey revealed that most of the areas were already converted into agricultural purposes. Plot-5 located in Barangay Lawigan was cleared for growing Falcata (*Falcata moluccana*) along with Coconut (*Cocos nucifera*). Ground cover is clear and soil was so shallow, loose and rolling.

Plots-6, 7, 8, 9, 10 & 12 were similarly utilized as coconut grooves. Though several saplings of forest tree species can be observed along transect walks and walk troughs, they were intentionally cleared and burnt to favor the growth of coconut. Plot-11, on the other hand, is unique among the other coastal plots established. It was located on a rocky cliff beside a small waterfall overlooking the seafront of Sitio Tagpangahoy. The area was relatively small yet has a number of different species that have been recorded, mostly fruit-bearing species. *Ficus* species such as Balete (*F.balete*) and Tangisangbayawak (*F.variegata*) were prolific food providers for bats, birds and other wildlife species.

Diversity of tree species inside PBMPs: a total of 37 species belonging to 28 genera and 16 families were found in the permanent plots. Of the 37 identified species, 34 were found to be indigenous to the Philippines and of which 9 were endemic or exclusively found only in the country.

Three exotic species were also found inside the permanent plots and these were Mangium (*A.mangium*), Coffe (*Coffea arabica*), and Falcata (*F.moluccana*). The genera of *Ficus* and *Neonauclea* have the most number of species present each having two species.

The study area was evidenced to fulfill the composite Shannon Weiner diversity index (H') of 3.10 which can be considered "High" based on the relative diversity scale developed by Fernando *et al.* (2009). Of all plots, Plot-1 has the highest index value of 2.31 followed by Plot 12 with an index value of 2.21 (Table-1). This can be attributed to the number of different species equally present within a plot with no single species being dominant. Plot-3, on the other hand, has no diversity value because only one single individual was found present on the plot.

Table-1. Diversity Indices: Shannon's (H') and Simpson's ($1-D$) Index of diversity

PBMP No./ Parameters	Species Richness	Number of Individuals	Simpson's Index ($1-D$)	Shannon's Index (H')
PBMP 1	11	16	0.89	2.31
PBMP 2	3	6	0.50	0.87
PBMP 3	1	1	0.00	0.00
PBMP 4	9	12	0.83	2.02
PBMP 5	2	17	0.11	0.22
PBMP 6	2	6	0.44	0.64
PBMP 7	2	8	0.22	0.38
PBMP 8	2	5	0.32	0.50
PBMP 9	4	9	0.62	1.15
PBMP 10	3	6	0.67	1.10
PBMP 11	9	19	0.84	1.98
PBMP 12	11	18	0.86	2.21
Cumulative 37		123	0.93	3.10

The most abundant species recorded was Coconut with 24 individuals followed by Falcata with 16. As classified beforehand, most of the established plots outside the active mine sites were located on agriculture converted areas where Coconut and Falcata were primary planted as a commodity.

Stand and forest structure: a total of 123 individuals with a diameter at breast height of 5 cm or more were recorded from the 12 permanent plots. This account to a plot density of 256 stems per hectare or about 10 stems per 20m x 20m plot only. The stocking is considered very low or "understocked" and therefore needs immediate attention by doing enrichment planting to enhance the number of trees especially along waterways.

Table-1: Number of individuals per diameter class inside PBMP's.

Diameter class	Diameter range	Number of plants
Poles and Saplings	<10cm	37
Small trees	10cm to <30cm	78
Medium-size trees	30cm to <60cm	8
Larger trees	>60cm	0

The forest is generally classified as a stand of "small trees" with an average diameter of only 16.2 ± 1.5 cm for all

trees inside plots. Moreover, there is a big difference in the proportion of the different diameter classes of the trees. More than 63% (78/123) of the individual trees fall under the category small trees while the medium-size trees account for only 6.5% (8/123) with no large trees recorded inside the plots. The rest were classified as poles and samplings at 30.1% (37/123) as shown in Table-2. This variance can be attributed to the relatively young stand as older trees were cleared out due to mining activities if not converted into agricultural purposes. Trees with the largest diameter include *F.variegata*, *A.rhomboidea*, *Diplodiscus paniculatus*, and *A.blancoi* mostly found on beach forest patch in Sitio Tagpangahoy. A visual representation of the PBMPs was created using Stand Visualization Software (SVS) and image rendering was enhanced by employing vector tree images in the Microsoft PowerPoint environment (Fig.-1). The generated representations of all plots can be found in Table-2.

Floristic diversity of the MPSA: with transect walks and walkthroughs, a total of 251 vascular plants belonging to 203 genera and 80 families were encountered and identified. The dominant families with the most number of species enumerated were Fabaceae with 26 species, followed by Moraceae (16), Euphorbiaceae and Poaceae (both 13), and Malvaceae (12), while for the genera were *Ficus* (with 9 species), *Artocarpus* (6) and *Cyperus* (5). The top ten families with the most number of species encountered and identified were presented in Fig.-1 while the full list of encountered species can be found in Table-5.

Based on growth habit, more than 54% of the identified species were classified as trees and other arborescent species, 24% were accounted as herbaceous species (annuals and perennials), 9% were shrubs, 5% for vines both woody and non-woody, while palms and palm-like species (4%), as well as ferns and fern allies (4%), comprise only a small portion of the entire flora Fig.-1.

Figure-1: Top ten families with the most number of species encountered and identified in the MPSA

Figure-2: Percentage distribution of vascular plants found within the MPSA according to their growth habit.

Table-3: Distribution of species as per IUCN Conservation Status.

IUCN Category	Number of Species	Percent
Not Assessed	199	79%
Least Concern	26	10%
Vulnerable	12	5%
Lower Risk	7	3%
Data Deficient	3	1%
Endangered	2	1%
Near Threatened	2	1%
Totals	251	100%

Table-4: Notable changes observed in the monitoring plots

PBMP No.	Changes observed
1	Tagged trees were still present; however, the ground elevation was slightly altered by the accumulation of sediments from the recently constructed roadway in the upper elevation North side of the plot. Ground vegetations such as Bracken fern and Cogon have grown denser than the previous visit.
2	Tagged trees were still present and no significant change was observed except for the rapid growth of Bracken ferns on the ground.
3	The entire plot was already mined out and the solitary tagged tree was already gone.
4	About 2 tagged trees were felled and ground vegetations were cleared due to expansion of rubber plantation from the upper elevation.
5	All tagged trees were still present and no significant change was observed. The ground cover is still open since the area was utilized for growing <i>F. moluccana</i> .
6	All tagged trees were still present and no significant change was observed except for the continuous growth of ground vegetation such as Talahib and Cogon.
7	All tagged trees still present and new emergent species were recorded such as <i>F. gigantifolia</i> and <i>Musa spp</i> which were not found on the previous visit. The ground vegetation has grown much thicker; however, the threat of being cleared is high since quarrying operation for limestone was active in the adjacent area.
8	All tagged trees still present and no significant change was noted. Ground was cleared as the previous visit since the area was utilized for growing <i>C. nucifera</i> .
9	Two of the tagged trees were cut, however new trees have grown as coppice. The stand has grown denser and access trails were already covered.
10	Tagged trees were still present and new trees were recorded. The stand was composed of thick juvenile trees during the previous visit and now the trees have grown larger than before.
11	All tagged trees were present and no significant change was observed. The plot location was hard to accessible thus no sign of disturbance was noted.
12	Three of the tagged trees were cut and 2 coppiced. Stand has grown thicker as ground vegetation becomes denser.

Ecologically important species: about sixteen (16) species recorded from the area are listed threatened under the IUCN Red List of Threatened Species (IUCN 2017). Noteworthy among the list, Kamagong (*Diospyros philippinensis*) and Gapas-gapas (*Camptostemon philippinense*) were the critically endangered species. Other threatened species categorized as "Vulnerable" include Molave (*Vitex*

Figure-3: Observed changes in the PBMPs inside AMVI-MPSA area. A) Emergent species *E.gigantifolia* in Plot-7; B) Cleared ground vegetation in Plot-4 for Rubber farm expansion; C) Plot-3 taken June 2017, D) Plot-3 taken March 2018.

parviflora), Tindalo (*A.rhomboidea*), Ipil (*I.bijuga*), Anislag (*Securinega flexuosa*), Balobo (*Diplodis cuspaniculatus*), Hamindang (*Macaranga bicolor*) and Antipolo (*A.blancoi*) among others.

Species are classified by the IUCN Red List into nine groups, specified through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation. Table-3 shows the distribution of identified species according to IUCN groups where largely are categorized under “NOT ASSESSED” category. Only 6% of the identified species (Vulnerable and Endangered) are classified as threatened.

General observation of PBMPs during reassessment: the 12 PBMPs were revisited on March 2018 to reassess the conditions of the stand and the existing flora species therein. The tagged trees were checked (presence/absence) as well as emerging species were noted on the data tally. Changes in the general form of the stand whether cleared, disturbed or mined out were likewise noted. After a 9-month elapsed period from the first survey, it was observed that the majority of the PBMPs experienced significant changes either naturally or artificially. The following notes illustrate the observed changes on the stands.

Conclusion:

The effort of management on biodiversity has become a major consideration for resource managers (Burton *et al.*, 1992) especially in mining industries where subsequent operations likely cause adverse impacts on the ecosystem.

Biodiversity is necessary to make ecosystem healthy (Naidu, 2016) and which is difficult to measure directly (Davis, 1981). With the establishment of PBMPs in the mineral land of AMVI, biodiversity resources can be monitored effectively on time. The results of the recent survey showed that the MPSA of AMVI holds a remarkable diversity of trees and other vascular species in contrast to most serpentine areas (Weerasinghe *et al.*, 2016).

The monitoring plots in coastal areas of MPSA were already converted into agriculture purposes and therefore prone to physical and anthropological disturbances, whilst those inside active mining sites were affected by management developmental activities. After a 9-month elapsed period, most of the plots were noted with significant changes structurally and physically. The documentation of these patterns such as tree diversity and their distribution provides a good database, useful for management measures on the remaining resources.

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Table-5: List of encountered vascular species in the MPSA of Agata Mining Ventures, Inc.

No.	Family Name	Scientific Name	Common Name
Ferns and Fern allies			
1	Adiantaceae	<i>Adiantum capillus-v</i>	C o m m o n Maidenhair
2	Aspleniaceae	<i>Asplenium nitidum</i>	Pakpak Lawin
3		<i>Drynaria quercifolia</i>	Kabkab
4	Blechnaceae	<i>Stenochlaena palustris</i>	Diliman
5	Cyatheaceae	<i>Cyathea contaminans</i>	Pakongbuwaya
6		<i>Cycas rumphii</i>	Pitogo
7	Gleicheniaceae	<i>Dicranopteris linearis</i>	Agsam
8	Polypodiaceae	<i>Acrostichum aureum</i>	Lagolo
9	Pteridaceae	<i>Pteridium aquilinum</i>	Bracken fern
10	Schizaeaceae	<i>Lygodium flexuosum</i>	Nito
11	Selaginellaceae	<i>Selaginella laplana</i>	Kamariang Gubat
Herbs and other herbaceous species			
1	Acanthaceae	<i>Pseuderanthemum reticulatum</i>	Moradong Dilaw
2	Agavaceae	<i>Cordyline fruticosa</i>	Bastoni San Jose
3		<i>Cordyline terminalis</i>	Sagilala
4		<i>Dracaena fragrans</i>	Fragrant dracaena
5		<i>Dracaena reflexa</i>	Song of India
6	Amaranthaceae	<i>Amaranthus spinosus</i>	Urai
7		<i>Amaranthus viridis</i>	Urai Lalaki
8	Apiaceae	<i>Centella asiatica</i>	Takip Kuhol
9	Araceae	<i>Alocasia macrorrhizos</i>	Biga
10		<i>Caladium bicolor</i>	Corazon de Maria
11		<i>Colocasia esculenta</i>	Gabi
12		<i>Cyrtosperma merkusii</i>	Palawan
13		<i>Dieffenbachia amoena</i>	Bakya
14		<i>Syngonium hofmannii</i>	Goosefoot
15	Asparagaceae	<i>Sansevieria oxburghiana</i>	Buntot ng Tigre
16	Asteraceae	<i>Ageratum conyzoides</i>	Bulak-manok
17		<i>Blumea balsamifera</i>	Sambong
18		<i>Chromolaena odorata</i>	Hagonoy
19		<i>Cosmos caudatus</i>	Cosmos
20		<i>Eclipta alba</i>	Tuhod-manok
21		<i>Gerbera jamesonii</i>	African daisy
22		<i>Pseudelephantopus spicatus</i>	Malatabako
23		<i>Wedelia biflora</i>	Wedelia
24	Balsaminaceae	<i>Impatiens balsamina</i>	Kamantigi
25	Bromeliaceae	<i>Ananas comosus</i>	Pinya
26	Capparidaceae	<i>Cleome viscosa</i>	Apoy-Apoyan
27	Caricaceae	<i>Carica papaya</i>	Papaya
28		<i>Cyperus digitatus</i>	Balayang
29		<i>Cyperus flabelliformis</i>	Umbrella plant
30		<i>Cyperus iria</i>	Gumi
31		<i>Cyperus rotundus</i>	Tarugog
32	Euphorbiaceae	<i>Jatropha curcas</i>	TubangBakod
33		<i>Manihot esculenta</i>	Cassava
34		<i>Phyllanthus niruri</i>	Sampasampalukan
35		<i>Ricinus communis</i>	Castor Oil Plant
36	Goodeniaceae	<i>Scaevola accada</i>	Beach cabbage
37	Lamiaceae	<i>Hyptis suaveolens</i>	Suag-kabayo
38	Musaceae	<i>Musa acuminata</i>	Sagingmatsing
39		<i>Musa paradisiaca</i>	Sagingsaba
40		<i>Musa sapientum</i>	Saging

41	Poaceae	<i>Arundo donax</i>	Tambo
42		<i>Bambusa vulgaris</i>	Kawayangkilig
43		<i>Chyrosopogon aciculatus</i>	Amorseco
44		<i>Cymbopogon citratus</i>	Tanglad
45		<i>Dendrocalam usmerrillianus</i>	Bayog
46		<i>Digitaria ciliaris</i>	Crab grass
47		<i>Imperata cylindrica</i>	Cogon
48		<i>Oryza sativa</i>	Rice
49		<i>Paspalum conjugatum</i>	Kulape
50		<i>Pennisetum polystachyon</i>	Buntot-pusa
51		<i>Saccharum officinarum</i>	Sugar cane
52		<i>Saccharum spontaneum</i>	Talahib
53		<i>Zea mays</i>	Mais
54	Pontederiaceae	<i>Eichornia crassipes</i>	Water hyacinth
55	Solanaceae	<i>Solanum torvum</i>	Talong-talongan
56	Sphaenocleaceae	<i>Sphaenoclea zylanica</i>	Mais-mais
57	Zingiberaceae	<i>Alpinia zerumbet</i>	Red ginger
58		<i>Costus speciosus</i>	Spiral ginger
59		<i>Etlingera aelatio</i>	Torch ginger
60		<i>Hedychium coronarium</i>	Camia
Palms			
1	Areaceae	<i>Areca catechu</i>	Bunga
2		<i>Arenga pinnata</i>	Kaong
3		<i>Calamus spp.</i>	Rattan
4		<i>Caryota cumingii</i>	Pugahan
5		<i>Cocos nucifera*</i>	Niog
6		<i>Dyopsis lutescens</i>	Palmera
7		<i>Heterospatha elata</i>	Saguisi
8		<i>Metroxylon sagu</i>	Sago
9		<i>Nypa fruticans</i>	Nipa
Shrubs			
1	Apocynaceae	<i>Ervatamia adivaricata</i>	Pandakaki
2	Asclepiadaceae	<i>Calotropis gigantea</i>	Kapal-kapal
3	Euphorbiaceae	<i>Phyllanthus reticulatus</i>	Malatinta
4	Fabaceae	<i>Caesalpinia pulcherrima</i>	Caballero
5		<i>Cassia occidentalis</i>	Balatongaso
6		<i>Desmodium pulchellum</i>	Payang-payang
7		<i>Desmodium umbellatum</i>	Mani-mani
8		<i>Mimosa invisa</i>	Aroma
9		<i>Mimosa pudica</i>	Makahiya
10		<i>Pueraria phaeoloides</i>	Kudzu
11		<i>Sidarrhombifolia</i>	Walis-walisan
12	Malvaceae	<i>Hibiscus rosa-sinensis</i>	Gumamela
13		<i>Urena lobata</i>	Kollo-kollot
14	Nyctaginaceae	<i>Bougainvillea spectabilis</i>	Bougainvillea
15	Ochnaceae	<i>Ochna serrulata</i>	Bird's Eye Bush
16	Rubiaceae	<i>Ixora chinensis</i>	Santan
17		<i>Mussaenda philippica</i>	Kahoidalaga
18	Solanaceae	<i>Capsicum frutescens</i>	Sili
19	Thymelaeaceae	<i>Wikstroemia indica</i>	Salagongliitan
20	Verbenaceae	<i>Clerodendrum quadriloculare</i>	Bagauakna pula
21		<i>Duranta repens</i>	Duranta
22		<i>Lantana camara</i>	Coronitas
Trees and Arborescent species			
1	Anacardiaceae	<i>Buchanania arborescens</i>	Balinghasai
2		<i>Buchanania nitida</i>	Anitap
3		<i>Mangifera altissima</i>	Pahunan
4		<i>Mangifera indica</i>	Mango
5		<i>Rhus itensis</i>	Bino

6		<i>Semecarpus cuneiformis</i>	Ligas	61	<i>Premna odorata</i>	Alagau
7	Annonaceae	<i>Alphonsea arborea</i>	Bolon	62	<i>Vitex parviflora</i>	Molave
8		<i>Annona muricata</i>	Guyabano	63	<i>Vitex quinata</i>	Kulipapa
9		<i>Annona reticulata</i>	Anonas	64	<i>Vitex trifolia</i>	LagundingDagat
10		<i>Cananga odorata</i>	Ilang-ilang	65	Lauraceae	Marang
11		<i>Polyalthia oblongifolia</i>	Lapnisan	66	<i>Neolitsea aavidalii</i>	Puso-puso
12	Apocynaceae	<i>Alstonia angustiloba</i>	Silhigan	67	Lecythidaceae	Himbabalud
13		<i>Alstonia macrophylla</i>	Batino	68	<i>Barringtonia asiatica</i>	Botong
14		<i>Alstonia scholaris</i>	Dita	69	<i>Barringtonia racemosa</i>	Putat
15		<i>Cerbera manghas</i>	Baraibai	70	Loganiaceae	BalatBuaya
16		<i>Plumeria acuminata</i>	Calachuchi	71	Lythraceae	Banaba
17		<i>Voacanga globosa</i>	Bayag-usa	72	Malvaceae	Anilao
18	Araliaceae	<i>Polyscias nodosa</i>	Malapapaya	73		Kakaag
19	Bixaceae	<i>Bixa orellana</i>	Achuete	74	<i>Commersonia abartramia</i>	Balobo
20	Bombacaceae	<i>Camptostemon philippinense</i>	Gapas-gapas	75	<i>Diplodiscus paniculatus</i>	Dungon-late
21		<i>Ceiba pentandra</i>	American Kapok	76	<i>Heritiera littoralis</i>	Malubago
22	Boraginaceae	<i>Cordia dichotoma</i>	Anonang	77	<i>Hibiscus tiliacius</i>	Tan-ag
22	Burseraceae	<i>Canarium asperum</i>	Pagsahingin	78	<i>Kleinhovia hospita</i>	Kamuling
23	Casuarinaceae	<i>Casuarina equisetifolia</i>	Agoho	79	<i>Microcos stylocarpa</i>	Bayok-bayokan
24		<i>Gymnostoma rumphianum</i>	Agoho del Monte	80	<i>Pterospermum celebicum</i>	Bayok
25	Celastraceae	<i>Euonymus javanicus</i>	Malasangki	81	<i>Pterospermum diversifolium</i>	Cacao
26	Clusiaceae	<i>Calophyllum blancoi</i>	Bitanghol	82	Meliaceae	Bagalunga
27		<i>Calophyllum inophyllum</i>	Bitag	83		Santol
28		<i>Cratoxylum formosum</i>	Salinggogon	84	<i>Sandoricum koetjape</i>	LL Mahogany
29		<i>Cratoxylum sumatranum</i>	Paguringon	85	<i>Swietenia acrophylla</i>	Piagau
30		<i>Garcinia venulosa</i>	Gatasan	86	Moraceae	Antipolo
31	Combretaceae	<i>Terminalia catappa</i>	Talisai	87	<i>Artocarpus blancoi</i>	Kamansi
32	Dipterocarpaceae	<i>Anisoptera mindanensis</i>	Mindanao	88	<i>Artocarpus communis</i>	Nangka
33	Ebenaceae	<i>Diospyros philippinensis</i>	Palosapis	89	<i>Artocarpus eterophylla*</i>	Marang
34	Euphorbiaceae	<i>Excoecaria agallocha</i>	Kamagong	90	<i>Artocarpus odoratissimus</i>	Banguhan
35		<i>Glochidion littorale</i>	Buta-buta	91	<i>Artocarpus ovatus</i>	Anubing
36		<i>Homalanthus populneus</i>	Kayong	92	<i>Artocarpus rubrovenius</i>	Kalulot
37		<i>Jatropha gossypifolia</i>	Balanti	93	<i>Ficus amelas</i>	UplingGubat
38		<i>Macaranga bicolor</i>	TubangMorado	94	<i>Ficus balete</i>	Balete
39		<i>Macaranga tanarius</i>	Hamindang	95	<i>Ficus botryocarpa</i>	Basikong
40		<i>Melanolepis uliginosa</i>	Binunga	96	<i>Ficus gigantifolia</i>	Kapadak
41		<i>Securinega flexuosa</i>	Alim	97	<i>Ficus minahassae</i>	Hagimit
42	Fabaceae	<i>Acacia auriculiformis</i>	Anislag	98	<i>Ficus odorata</i>	Pakiling
43		<i>Acacia mangium</i>	Auri	99	<i>Ficus psuedopalma</i>	Niog-niog
44		<i>Adenanthera pavonina</i>	Mangium	100	<i>Ficus septica</i>	Hauili
45		<i>Azadirachta indica</i>	Malatanglin	101	<i>Ficus variegata</i>	Tangisang
46		<i>Archidendron concolor</i>	Tindalo	102		bayawak
47		<i>Cassia fistula</i>	Anagap	103	Moringaceae	Kalios
48		<i>Erythrina orientalis</i>	Golden shower	104	<i>Moringa oleifera</i>	Malunggay
49		<i>Falcataria moluccana</i>	Dapdap	105	Myricaceae	Hindang
50		<i>Gliricidia sepium</i>	Moluccan Sau	106	Myrsinaceae	Saging-saging
51		<i>Intsia bijuga</i>	Kakawate	107	<i>Aegiceras corniculatum</i>	Tagpo
52		<i>Leucaena leucocephala</i>	Ipil	108	<i>Ardisia quamulosa</i>	Bagras
53		<i>Ormosia calavensis</i>	Ipil-ibil	109	<i>Eucalyptus deglupta</i>	Payuspos
54		<i>Pongamia pinnata</i>	Bahai	110	<i>Leptospermum amboinense</i>	Bayabas
55		<i>Pterocarpus indicus</i>	Bani	111		Red lip tree
56		<i>Tamarindus indica</i>	Narra	112	<i>Psidium guajava</i>	Macopa
57	Flacourtiaceae	<i>Casearia fuliginosa</i>	Sampalok	113	<i>Syzygium myrtifolium*</i>	Sagimsim
58	Hernandiaceae	<i>Hernandia ovigera</i>	Talitan	114	<i>Syzygium spp</i>	Mangkono
59	Lamiaceae	<i>Gmelina arborea</i>	Koron-koron		<i>Xanthostemon verduonianus</i>	Tamayuan
60		<i>Premna integrifolia</i>	Yemane		<i>Strombosia philippinensis</i>	Kamias
			AlagauDagat		<i>Averrhoa bilimbi</i>	

115 Pandanaceae	<i>Pandanus tectorius</i>	Pandandagat
116 Pittosporaceae	<i>Pittosporum pentandrum</i>	Mamalis
117 Rhizophoraceae	<i>Ceriop stagal</i>	Tangal
118	<i>Rhizophora mucronata</i>	Bakauanlalake
119 Rubiaceae	<i>Morinda citrifolia</i>	Bangkoro
120	<i>Nauclea orientalis</i>	Bangkal
121	<i>Neonauclea bartlingii</i>	Lisak
122	<i>Neonauclea media</i>	Wisak
123 Rutaceae	<i>Citrus grandis</i>	Pomelo
124	<i>Citrus madurensis</i>	Kalamansi
125	<i>Clausena brevistyla</i>	Kalomata
126	<i>Evodia confusa</i>	Bugauak
127	<i>Evodia monophylla</i>	Kamal
		bugtongin
128 Santalaceae	<i>Exocarpos latifolius</i>	Tulisan
129 Sapindaceae	<i>Guioakoel reuteria</i>	Alahan
130 Sapotaceae	<i>Chrysophyll lumcainito</i>	Kaimito
131	<i>Pouteria rivicoa</i>	Tiesa
132 Ulmaceae	<i>Trema orientalis</i>	Anabiong
133 Urticaceae	<i>Leucosyke capitellata</i>	Alagasi
134	<i>Pipturus arborescens</i>	Dalunot
Vines and other scandent species		
1 Apocynaceae	<i>Dischidia major</i>	Lobo-lobo
2 Convolvulaceae	<i>Ipomoea pes-caprae</i>	Beach morning glory
3	<i>Ipomoea batatas</i>	Camote
4	<i>Merremiapeltata</i>	Burakan
5 Dioscoreaceae	<i>Dioscore aalata</i>	Ubi
6	<i>Dioscore ahispida</i>	Nami
7 Fabaceae	<i>Calopogonium mucunoides</i>	Nipay-nipay
8	<i>Centrosema pubescens</i>	Centro
9	<i>Clitoriat ernatea</i>	Pukinggan
10 Flacourtiaceae	<i>Flagellaria indica</i>	Baling-uai
11 Pandanaceae	<i>Freycinetia maxima</i>	Pandan-baging
12 Passifloraceae	<i>Passiflor afoetida</i>	Kurombot
13 Piperaceae	<i>Piper betle</i>	Buyo

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