

## Conservation Status of the Plant Species in Selected Areas with Frequent Human Activities in Roosevelt Protected Landscape, Bataan, Luzon Island, Philippines

Liezl A. Mendoza<sup>1,2\*</sup> Arthur J. Lagbas<sup>3</sup> and Inocencio E. Buot Jr.<sup>1,4</sup>

<sup>1</sup>*Faculty of Management and Development Studies, University of the Philippines Open University, Los Baños, Laguna, Philippines*

<sup>2</sup>*Department of Education, Schools Division Office, 10th Avenue, Caloocan City, Philippines*

<sup>3</sup>*Integrated Research and Training Center, Technological University of the Philippines, Ermita, Manila, Philippines*

<sup>4</sup>*Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños, College, Laguna, Philippines*

**ABSTRACT:-** The Roosevelt Protected Landscape (RPL) in Dinalupihan and Hermosa, Bataan, Philippines, an initial component of the National Integrated Protected Areas System, was established in 1933. Since its establishment as a protected area, the ecological integrity and naturalness of RPL is threatened by land use change and unsustainable socio-economic activities. Fieldwork was conducted in 10 sites in RPL with frequent human activities on October 2014 to determine the plant species composition and to assess their conservation status using modified instrument of the Department of Environment and Natural Resources Administrative Order No. 2007-1 and IUCN. The plant resources surveyed were grasses, hardwood plants, softwood plants, weeds, and vines. A total of 52 plant species belonging to 26 families of introduced and native plant species were identified. Based on the modified conservation status assessment criteria, this study identified four critically endangered species, five endangered species, and 15 vulnerable species. Infrastructure projects, clandestine harvesting of forest resources, encroachment of local people, policy intervention, and management related issues such as meager funds and insufficient park personnel were the pressing problems of RPL. A site-specific policy intervention at the local and national level and management shift that encourages local people participation in shared management responsibilities could be viable strategies to ensure the ecological integrity and sustainable use of RPL.

**KEY WORDS:** Conservation status, DENR, IUCN, National Integrated Protected Areas System, Roosevelt Protected Landscape, Dinalupihan, Bataan

### INTRODUCTION

The Philippine forest is a habitat to several animal and plant species (Nueza *et al.*, 2015; Relox *et al.*, 2011; Rickart *et al.*, 2011; Aribal and Buot 2009; Sopsop and Buot, 2009; Lindstrom *et al.*, 2008; Langenberger *et al.*, 2006; Hamnn *et al.*, 1999) with some endemic and

rare species restricted and distributed only in specific locations e.g. Hoya (Kloppenburger *et al.*, 2013), rafflesia (Barcelona *et al.*, 2009) and pitcher plant (Amoroso and Aspiras, 2011). Moreover, the Philippine forest resources provide a multiple range of ecosystem goods such as fiber, food (David, 2011; Angagan *et al.*, 2010;), medicine, biologically

\*Corresponding author.

E-mail: liezlaguilar.mendoza@gmail.com

active compounds (Obico and Ragrario, 2014; Abe and Ohtani, 2013; Yu *et al.*, 2008), fuel, timber, wood (Angagan *et al.*, 2010) and ecosystem services (biocontrol of pest and diseases, climate regulation, maintenance of air and water quality, pollution control, flood control, nutrient cycling, and recreation) to many upland and lowland communities. However, despite their outstanding biodiversity composition and global importance to human welfare, the Philippine forests as one of the global biodiversity hotspot (Myers *et al.*, 2000) is continuously experiencing high levels of habitat disturbance and accelerated extinction (Sodhi *et al.*, 2010; Posa *et al.*, 2008) which are linked to socio-economic issues and policy interventions such as excessive timber harvesting, mining, urbanization, landscape modification (conversion to agro-ecosystem, agricultural expansion, human settlement areas and industrial zone), and encroachment of human communities that have high dependence on environmental income and natural resources.

Furthermore, forest fragmentation and habitat disturbance resulted to elevation of conservation status of native plant species (Buot, 2010; Aribal and Buot, 2009; Sopsop and Buot, 2009). Deforestation and habitat disturbance have been reported to have negative effects on forest birds, butterflies (Posa and Sodhi, 2006) and small mammals (Ricart *et al.*, 2007).

Establishment of protected areas has become a global policy approach to conserve and protect terrestrial biodiversity and wildlife (Owino *et al.*, 2012; Vedeld *et al.*, 2012; Tumusiime *et al.*, 2011). In the Philippines, protected areas were established to “conserve areas with biologically unique features to sustain human life and development, as well as to secure the perpetual existence of plant and animal life for the present and future generations” (Republic Act Number 7586 or

RA 7586). RA 7586 also known as the National Integrated Protected Areas System (NIPAS) Act of 1992 established a NIPAS which encompassed “outstanding remarkable areas and biologically important public lands that are habitats of rare and endangered species of plants and animals, biogeographic zones and related ecosystems, whether terrestrial, wetland or marine”. These include the initial components of NIPAS and other protected areas that will be created in the future. The initial components of NIPAS is defined in Section 5a of RA 7586 as “all areas or islands in the Philippines proclaimed, designated or set aside, pursuant to a law, presidential decree, presidential proclamation or executive order as national park, game refuge, bird sanctuary, natural and historical landmark, protected and managed landscape/seascape as well as identified virgin forests before the effectivity of RA 7586”.

The Roosevelt Protected Landscape (RPL, formerly Roosevelt National Park), an initial component of NIPAS in the Philippines was established as a national park in 1933 through Proclamation No. 567. On April 2000 it was reclassified as a protected landscape through Proclamation No. 273 (DENR-PAWB Technical Bulletin No. 2013-01). Since its establishment as a national park in 1933, RPL was reduced from its initial size of 1484 hectares to 786.04 hectares. RPL was further reduced on March 2006 by Proclamation No. 1040 by segregating 12,079 square meters of a parcel of land situated in Barangay Roosevelt and declaring it as civil reservations for public use of the local government unit of the Municipality of Dinalupihan in the province of Bataan. In the Philippines, a barangay is the smallest political unit.

Its proximity to Olongapo City, municipalities of Dinalupihan and Hermosa, as well as Metropolitan Manila, serves as an accessible educational, ecotourism, and recreational

park for tired metropolis people and nature adventurers. It is considered as one of the camp sites of the Boy Scout of the Philippines (Municipality of Dinalupihan, 2015). Its remnant old growth forest, secondary forest, biological and physical resources also offer social and educational laboratories for academic and research institutions. In fact, RPL serves as a venue for dendrology class for university students in Metro Manila and nearby provinces.

At present, the ecological integrity of RPL is challenged by natural and anthropogenic pressures such as forest fires during summer season, strong typhoons, human encroachment, illegal resource extraction, illegal occupancy, small scale farming, and policy interventions of the local and national government. Likewise, Gapan-Olongapo Road and Subic-Clark-Tarlac Expressway serves as easy access point for illegal resource extraction activities.

To the best of our knowledge, published data describing the plant species composition and conservation status of plant resources of RPL is lacking and limited. In the absence of published data, the findings of this study would serve as a baseline for in situ conservation of plant species in RPL. Thus, the present study aims to document the plant species in RPL and assess their conservation status. This study is limited to an elevation of 35 to 89 meters above sea level (masl) in 10 selected sites with frequent human activities within the Dinalupihan Nature Center in RPL.

## MATERIALS AND METHODS

### Description of the study area

The study was conducted in Dinalupihan Nature Center, a 30 hectare area within the recreational zone of Roosevelt Protected

Landscape (RPL) in Barangay Roosevelt, Municipality of Dinalupihan, Province of Bataan on October 2014. RPL (Fig. 1) is located at coordinates 14°51'11"N 120°16'57"E in the province of Bataan, Philippines and is within the political jurisdiction of the municipalities of Dinalupihan and Hermosa.

Bataan is a peninsular province located in the southwestern part of the central luzon region. It lies approximately at coordinates 120°15' to 120°40' and 14°20' to 14°50'. It is bounded in the north by Zambales, in the northeast by Pampanga and Bulacan, east by Manila Bay and in the west by West Philippine Sea (Bataan Coastal Care Foundation, Inc.; The Bataan Sustainable Development Strategy; Municipality of Dinalupihan, 2015).

### Characteristics of RPL

The RPL falls under the climatic Type I with two pronounced seasons; dry from November to April and wet during the rest of the year. The terrain within RPL is rolling to hilly with an elevation ranging from 200-300 meters above sea level (masl). The soil type is La Paz silt and Antipolo clay with pH value of 7.8. The soil is generally low in nitrogen and phosphorous but high in potassium. The Pinulot River is the major river that traverses the RPL. RPL is predominantly grassland with 87% of the total area vegetated by cogon grass. The vegetation of the remaining 13% consists of the remnants of old growth forest and forest plantations like *Pterocarpus indicus* Willd. (narra), *Swietenia macrophylla* King (mahogany), *Tectona grandis* L.f. (teak), and other exotic species (Roosevelt Protected Landscape Profile, 2013)

### Survey of plant resources

A survey of plant resources was conducted on October 2014 with the help of two licensed

foresters and two forest rangers in 10 sites (Fig. 1) using 10 m x 10 m plot within the Dinalupihan Nature Center. The sites were chosen due to the presence of anthropogenic activities (recreational activities, vegetable farming, and wood gathering) and possibility of site development as an ecotourism destination. The plant resources surveyed were grasses, hardwood trees, softwood trees, weeds, vines, mature and wildlings (young plants). The eight sites were located between Jose Abad Santos Avenue and Subic-Clark Tarlac Expressway while the two sites were on the other side of Jose Abad Santos Avenue (Fig. 2). The coordinates of the sites are the following: a. Site 1 (14.85209°N, 120.36960°E, 89 masl) is near the Gapan-Olongapo road, b. Site 2 (14.85201°N, 120.36998°E, 43 masl) is sloping, c. Site 3 (14.85087°N, 120.36932°E, 82 masl) is sloping, d. Site 4 (14.85095°N, 120.36889°E, 60 masl) is along the nature park pathwalk, e. Site 5 (14.85066°N, 120.36813°E, 52 masl) is in the riverbank, f. Site 6 (14.85029°N, 120.36759°E, 64 masl) is near the pathwalk of the park, g. Site 7 (14.84954°N, 120.36733°E, 68 masl) is within the mixed tree plantation and remnant old growth forest consisting of *Shorea contorta* S. Vidal (white lauan trees), h. Site 8 (14.85181°N, 120.36810°E, 82 masl) is in the secondary growth mixed tree plantation, i. Site 9 (14.85233°N, 120.36786°E, 73 masl) is in the agroforest area and, j. Site 10 (14.85281°N, 120.37204°E, 35 masl) is located near a human community and river bank.

#### Assessment of conservation status

The scientific name, local name, and location (geographic coordinates) of the plant species were identified and recorded on-site. For plant species that are difficult to identify on-site, pictures of plants and sample of leaves were taken and were brought to the Botany Division of the National Museum for plant

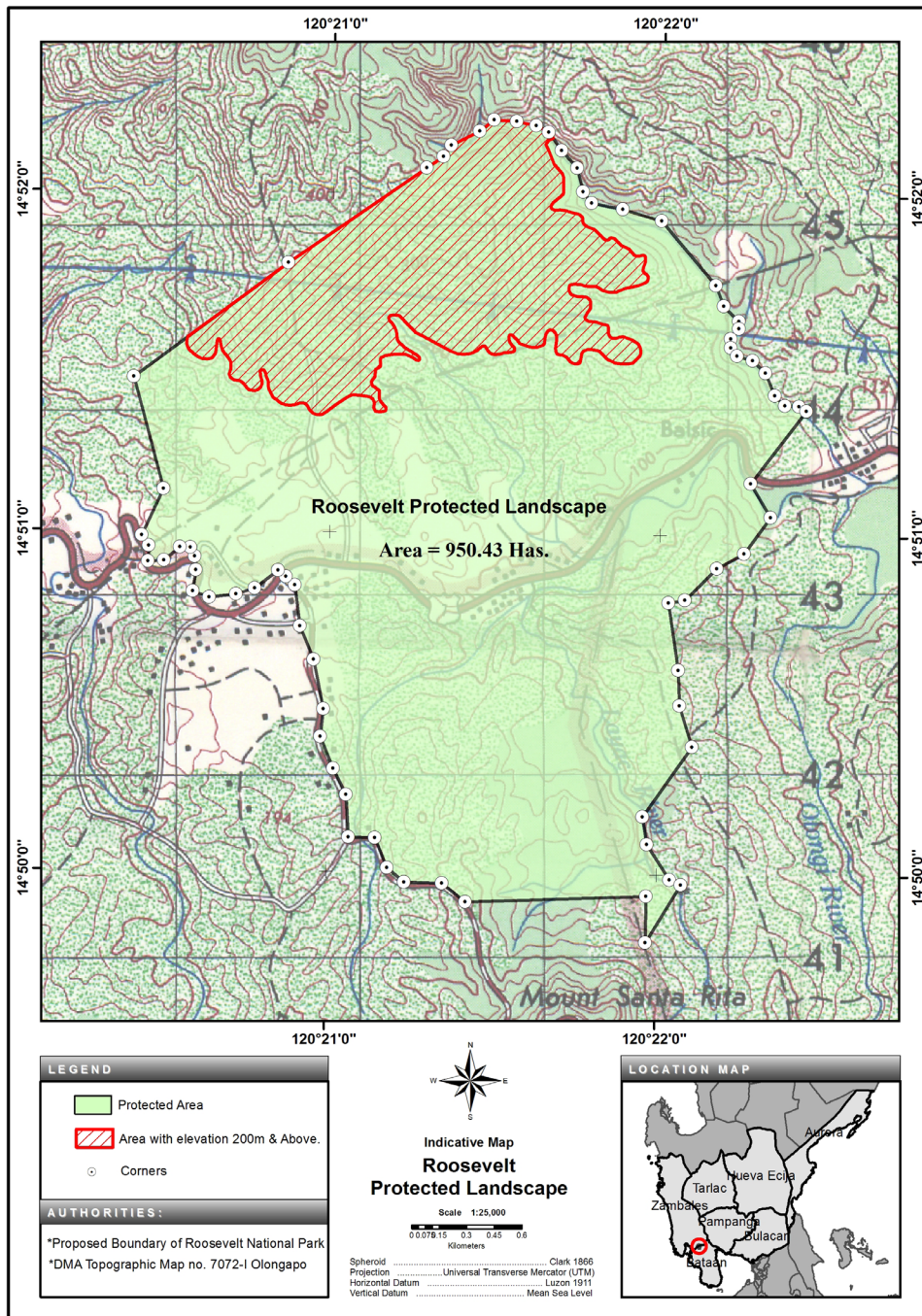
identification. Pictures of plants were compared to existing literatures and were consulted to plant enthusiasts and botanists. The plant species grouped according to families and their conservation status was assessed based on the combined criteria of Sopsop and Buot (2009), the Philippines' Department of Environment and Natural Resources Administrative Order No. 2007-1 (DAO No. 2007-1), and 2001 IUCN Red List Categories and Criteria Version 3.1.

In this study, the conservation status of the plant species were categorized as critically endangered, endangered and vulnerable if any of the criteria applies: critically endangered a. if the species is less than five in the study site, b. the location is near human activities, plantation, road, c. native species, d. found in limited sites, e. and listed as critically endangered by DAO 2007-1 or IUCN; endangered a. if inventory of species is 5 or less in the study area, b. near human activities, road, plantation, c. found in limited sites, d. and listed as Endangered in DAO 2007-1 or IUCN; vulnerable if a. concentration is within the old growth or secondary forest, b. located near human activity sites, c. and listed as Vulnerable in DAO 2007-1 or IUCN.

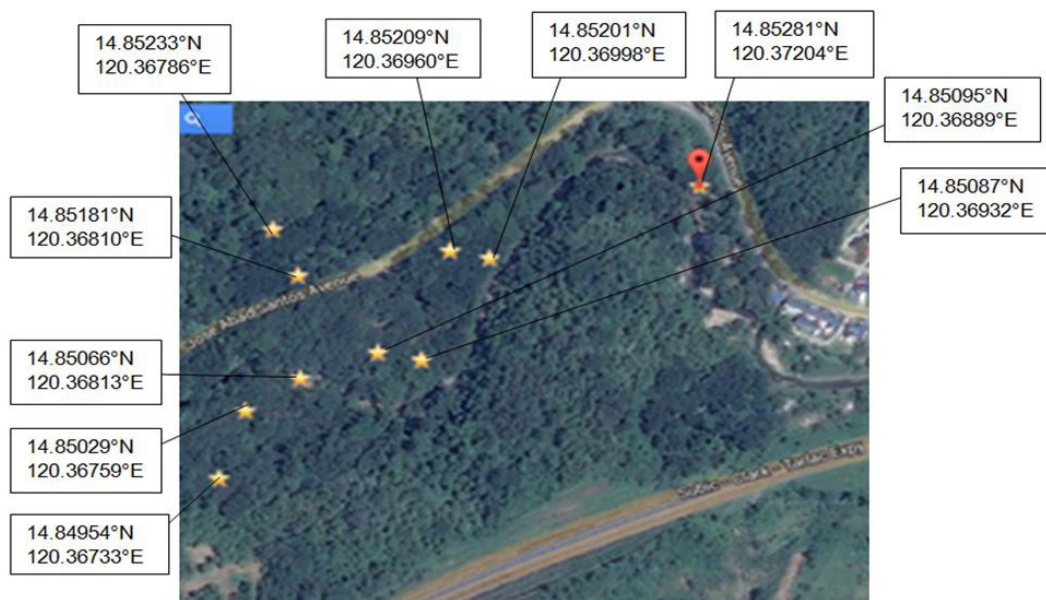
## RESULTS AND DISCUSSION

### Plant species composition

Table 1 shows the plant species and number of plant species per site. At the time of the study several plant species in the RPL were difficult to identify by its scientific name due to unavailability of expert botanist and as a result only 52 plant species were identified. From a total of 52 plant species that were identified in 10 sites, 9 were native plant species (*Koordersiodendron pinnatum* Merr., *Mangifera altissima* Blanco, *Canarium luzonicum* Miq., *Shorea contorta* S. Vidal,



**Figure 1.** Indicative map of Roosevelt Protected Landscape (from Department of Environment and Natural Resources, Biodiversity Management Bureau, Philippines)



**Figure 2.** Location of ten survey sites in Roosevelt Protected Landscape in the Municipality of Dinalupihan, Bataan, Philippines.

*Diospyros pilosanthera* Blanco, *Pterocarpus indicus* Willd., *Drynaria quercifolia* (L.) J.Sm., and *Vitex parviflora* Juss.) while the other plant species were introduced and/or exotic species. It was observed that there were abundant plant species in undisturbed areas and areas without any human structures. There were also wildlings (young plants) in the undergrowth of matured plants and grasses in those areas were taller. In reforested area where secondary growth forest is located, the fast growing exotic plant species dominate. Native tree species such as *Shorea contorta* S.Vidal (Fig. 3) grows well in areas where there is minimal or no presence of mature exotic tree species like *Swietenia macrophylla* King (mahogany) (Fig. 4).

### Conservation status

Table 2 shows the conservation status of the 52 plant species based on DENR AO No. 2007-1, 2001 IUCN Red List Categories and

Criteria Version 3.1, and this study. DENR AO 2007-1 gives a local perspective on the conservation status of the plant species while IUCN gives a global take on species conservation (Buot, 2010).

Based on DENR DAO No. 2007-1, this study identified 2 critically endangered plant species (*Pterocarpus indicus* Willd. and *Pterocarpus indicus* Willd.), 3 endangered species (*Diospyros pilosanthera* Blanco, *Intsia bijuga* Kuntze, and *Vitex parviflora* Juss), 4 vulnerable plant species (*Koordersiodendron pinnatum* Merr., *Mangifera altissima* Blanco, *Shorea contorta* S.Vidal, and *Drynaria quercifolia* (L.) J.Sm.), and 1 threatened plant species (*Canarium luzonicum* Miq.). Using the 2001 IUCN Red List Categories and Criteria Version 3.1, this study identified 1 critically endangered (*Shorea contorta* S.Vidal), and 8 vulnerable plant species (*Mangifera altissima* Blanco, *Canarium luzonicum* Miq., *Macaranga grandifolia* Merr.,



**Figure 3.** *Shorea contorta* S.Vidal (white lauan)



**Figure 4.** *Swietenia macrophylla* King (mahogany)



*Intsia bijuga* Kuntze, *Pterocarpus indicus* Willd., *Swietenia macrophylla* King, *Artocarpus blancoi* Merr. and *Vitex parviflora* Juss.).

On the other hand, based on the modified conservation status assessment criteria of this study, this study identified 4 critically endangered species (*Mangifera altissima* Blanco, *Pterocarpus indicus* Willd., *Pterocarpus indicus* Willd. and *Vitex parviflora* Juss.), 5 endangered species (*Shorea contorta* S.Vidal, *Diospyros pilosanthera* Blanco, *Derris elliptica* Benth., *Intsia bijuga* Kuntze, *Phanera* Lour.), and 15 vulnerable species (*Koordersiodendron pinnatum* Merr., *Mangifera indica* L., *Caryota mitis* Lour., *Livistona rotundifolia* Mart, *Canarium luzonicum* Miq., *Macaranga aleuretoides* F.Muell., *Macaranga grandifolia* Merr., *Acacia auriculiformis* A.Cunn. ex Benth., *Bauhinia monandra* Kurz, *Leucaena leucocephala* (Lam.) de Wit, *Parkia javanica* Merr., *Artocarpus blancoi* Merr., *Ficus nota* Merr., *Antidesma ghaesembilla* Gaertn., and *Drynaria quercifolia* (L.) J.Sm.).

*Mangifera altissima* Blanco was assessed as critically endangered in spite of being listed as a vulnerable species (IUCN and DAO 2007-1) because the two species were still wildlings and they grow beside the concrete pathwalk. Wildlings has the possibility of mortality once the dry season takes place (S.E. Fantone, personal communication), while the nearness to the pathwalk makes the wildlings vulnerable to human disturbance.

*Diospyros pilosanthera* Blanco and *Intsia bijuga* Kuntze were assessed as endangered. Both plant species were located in areas with frequent human activities. *Derris elliptica* Benth. has poisonous property and could become endangered once the local people exploit its toxic property. It was also seen near a pathwalk inside the Nature Center

compound. *Phanera* Lour. aside from being situated in the same plot area of *Derris elliptica* Benth., could be removed once it blocked the way of park visitors. *Shorea contorta* S.Vidal in spite of being listed as vulnerable both in DAO 2007-1 and IUCN was assessed as endangered due to the rarity of the species which can only be seen in the remnant old growth and secondary forest.

*Koordersiodendron pinnatum* Merr. was assessed as vulnerable. It has plenty of wildlings which can be spotted in different areas of the Nature Center as well as in the remnant and the secondary growth site. *Bauhinia monandra* Kurz was also assessed as vulnerable due to the presence of the species in other sites within RPL which was not covered by the study. It is also used as a reforestation species in RPL.

The conservation status of the 28 plant species were not assessed due to its exotic nature like that of *Gmelina arborea* Roxb., *Tectona grandis* L.f., and *Swietenia macrophylla* King which were found in the secondary forest. These plant species are fast growing exotic tree species which were planted in the area during the reforestation effort. *G. arborea* Roxb and *Swietenia macrophylla* King have been used by Ayta of Porac, Pampanga to drive off insects especially mosquitoes (Obico and Ragrario, 2014). Other plant species like *Chromolaena odorata* (L.) R.M. King & H. Rob. is known to be an invasive species in various areas of Zamboanga Peninsula (Codilla and Metillo, 2011).

### **Issues and problems related to the management and conservation of Roosevelt Protected Landscape**

Since the establishment of RPL as a protected area in 1933, it underwent reduction of land cover and vegetation as a result of policy

interventions and economic strategy of both local and national government. The socio-economic issues, global demand for forest products, and land use change due to development of recreational facilities, urbanization, agricultural expansion, and human habitation have implications in the ecological integrity and sustainability of RPL and forest reserves in the Philippines. Other issues in protected area management in the Philippines are overlapping and conflicting policies and legislation at the local and national levels, limited socio-economic information of protected area stakeholders and users, and insufficient number of conservation experts in the national government (La Viña *et al.*, 2010; Ong, 2002). The situation in RPL is also being experienced in protected areas in other countries such as Phou Phanang National Protected Area in Lao PDR (Sisongkham *et al.*, 2015), Gotjawal forests in Jeju Island, Korea (Kang *et al.* 2013), Mikumi National Park, Tanzania (Vedeld *et al.*, 2012), Oldoinyo Sapuk National Park in Kenya (2012) and Rwenzori Mountain National Park in Uganda (Tumusiime *et al.*, 2011). Based on the land use change model of Verburg *et al.* (2006) many protected areas in the Philippines will still be under severe pressure if there will be no change in the demand for agricultural land and timber. Furthermore, the protection of the important parks will cause a larger deforestation in the other parks as tradeoffs when these are not protected. From an economic perspective, the full protection of our national parks and forest protected areas would be unlikely as the needs of human population for forest products increased.

Key informant interviews revealed several management problems in RPL namely: policy intervention of local and national government on land use of RPL; illegal resource extraction; illegal occupancy of local people; meager budget allocation; delayed

release of Integrated Protected Area Fund (IPAF); and insufficient number of protected area personnel (S. E. Fantone, personal communication).

A large portion of RPL remained unexplored and understudied, while its flora and fauna composition is still poorly understood (S. E. Fantone, personal communication). Despite this, infrastructure developments, animal grazing, slash and burn agriculture, small scale farming inside RPL, illegal occupancy and illegal resource extraction remains unregulated and uncontrolled.

The size of RPL was further reduced due to the construction of Subic-Clark-Tarlac Expressway and Gapan-Olongapo Road widening project.

RPL is adjacent to human communities and a portion of it is being shared by Barangay Roosevelt, Barangay San Pablo and Barangay Tipo which is part of the Municipality of Hermosa. In 2010, informal settlers who were illegally occupying a portion of the mixed plantation site were evicted. However, due to insufficient number of park rangers to secure the boundaries of RPL, local people can still enter the restricted area to do small-scale farming, slash and burn agriculture, and animal grazing. In addition, the residents of Barangay Roosevelt want to own a portion of the RPL which they have occupied for many years. Under the Philippine law, reclassification of land within a protected area territory requires a congressional act. Two proposed laws (House Bill No. 695 and 851) that seeks to reclassify portions of RPL as alienable and disposable land were filed by two district lawmakers. According to the House Bill 695 “the parcel of RPL being applied for reclassification has been identified to be more suitable for commercial and residential purposes”. In addition, “since the area has become densely populated there

is a need to address the settlement problem of the inhabitants". House Bill 895 has been recommended for approval without amendment in the Senate of the Philippines (Senate Committee Report No. 471, 2012). Once the proposed laws become a national law, the parcel of land under contention will be reclassified as alienable and disposable land for commercial, residential and other purposes (S.E. Fantone, personal communication). This policy intervention could have ramifications to RPL's remnant old growth forest, biodiversity conservation and protection efforts.

To address the insufficient fund and delayed release of IPAF which hinders the implementation of park management, the local government of the Municipality of Dinalupihan and Community Environment and Natural Resources Office entered into a public-private partnership (PPP) management of a portion of RPL with Green Asia Construction and Development Corporation (GACDC). At the time of the study, the GACDC is in-charge of management of Dinalupihan Nature Center which is an ideal site for ecotourism, educational trip and recreational activities such as picnic, camping, swimming, hiking, and trekking.

In addition to the PPP management agreement with GACDC, the RPL Protected Area Management Board entered into a memorandum of agreement with Digital Mobile Philippines Inc, New Tribes School of Missions, Green Grass Resort, Filomeno Cucuenco and Marilou Antonio Agroforestry Farm, A. Escalona Agroforest Project, Digma-Tipo Fuel Station, R. V. Mountain and Agroforest Project and Dinalupihan Water District to lease the park resources. Total user fees of around 783,000 pesos per year which will be collected from park users will go to the IPAF (Roosevelt Protected Landscape Profile, 2013).

Another problem is the insufficient number of park personnel to guard and patrol the park from poachers. Only four park rangers who were involved in park monitoring were available. The meager budget for fence construction and the lack of funds to hire additional park patrol personnel hinder enforcement and implementation of park rules and regulations (F. E. Fantone, personal communication).

## CONCLUSION

This study showed that RPL is a habitat of native, endangered and threatened plant species. A number of plant species in isolated and undisturbed areas remains unidentified and needs to be documented. The results in this study can be used as a baseline data to monitor composition and structural changes if further development activities continue in RPL. A comprehensive resource inventory of endangered, threatened plant and animal species should be urgently conducted before they become extinct considering the existence of various anthropogenic pressures in the area.

## RECOMMENDATION

This study recommends the following:

1. Native plant species and species identified as endangered, threatened and vulnerable status should be propagated in disturbed areas of RPL. The seeds or wildlings of native species identified in the resource inventory of this study can be used as wildling stock for reforestation of disturbed areas of the park. Planting with different types of plant species instead of monospecies plantation will help preserve soil and litter arthropods which are important for decomposition and nutrient cycling (Sopsop and Lit, 2015).
2. To address the insufficient number

of park personnel and forest guards and to implement park rules and park conservation, the local government and park administration may sign an agreement with the local people to have a share of management responsibilities.

3. Having a physical structure like a fence to demarcate park territory and open access land is costly and would take years to be completed. As an alternative, a series of environmental awareness seminar should be done to educate the community within RPL emphasizing on the various ecosystem goods and services derived from RPL, sustainable forest management and community based natural resources management. Sign boards should be placed in conspicuous places to identify conservation status of plant species as critically endangered, endangered and vulnerable in areas where human activity is more frequent so that park visitors will be informed and educated.

4. Increased law enforcement alone and access restriction to park are unlikely to neither meet conservation objectives of the park nor warrant long-term legitimacy of resource conservation and biodiversity management (Tumusiime *et al*, 2011). It is imperative that the forest dependent people who clandestinely collect forest resources (woods, herbal medicines, crops) inside the RPL be still given a short term, scheduled, regulated access and sustainable harvesting in the park to reduce conflict. Likewise, livelihood opportunities outside the park should also be created to reduce reliance of local people to forest resources.

5. The local government of Dinalupihan and Hermosa should conduct a spatial and temporal assessment of land cover change of RPL, and land use change and resource use patterns of adjacent communities that might have social and environmental implications to RPL. The models can be used as an additional tool to inform planning, management and mitigating measures for RPL.

## REFERENCES

- Abe, R. and K. Ohtani. 2013. An ethnobotanical study of medicinal plants and traditional therapies on Batan Island, the Philippines. *Journal of Ethnopharmacology* 145; 554-565.
- Angagan, J.S., I.E. Jr. Buot., Relox, R.E. and C.M. Rebancos. 2010. Ethnobotany of the plant resources in Conner, Apayao, Northern Luzon, Philippines. *Journal of Nature Studies* 9(1): 31-38.
- Amoroso, V.B. and R.A. Aspiras. 2011. Hamiguitan Range: a sanctuary for native flora. *Saudi Journal of Biological Sciences* 18: 7-15.
- Aribal, L.G. and I.E. Jr. Buot. 2009. The threatened plants species in various regions in Mindanao island, Philippines. *Journal of Nature Studies* 8(2): 23-33.
- Bataan Coastal Care Foundation. 2008. *The coastal land- and sea-use zoning plan of the province of Bataan*. Downloaded from <http://pemsea.org/dev/sites/default/files/bataan-clsup.pdf>.
- Buot, I.E.Jr. 2010. Conservation status of the commonly collected plant species in selected Philippine mountain ecosystems. *The Journal of Tropical Biology* 8: 3-13.
- City Environment and Natural Resources Office, Dinalupihan. 2013. *Updated Profile: Roosevelt Protected Landscape*. Dinalupihan, Bataan.
- Codilla, L.T. and E.B. Metillo. 2011. Distribution and abundance of the invasive plant species *Chromolaena odorata* L. in the Zamboanga Peninsula, Philippines. *International Journal of Environmental Science and Development* 2(5): 406-410.
- Congress of the Philippines. 1992. *Republic Act No. 7586. An Act Providing for the Establishment and Management of National Integrated Protected Areas System, Defining its Scope and Coverage, and for Other Purposes*. Downloaded

- from <http://www.gov.ph/1992/06/01/republic-act-no-7586/>
- Roman, H.B. and F.T. Matugas. *House Bill No. 851 An act classifying portions of the Roosevelt Protected Landscape located in the Municipalities of Dinalupihan and Hermosa Province of Bataan as alienable and disposable land*. Downloaded from <https://www.senate.gov.ph/lisdata/14448121171.pdf>
- David, N.D. 2011. Social acceptability of Ayta Magbukon indigenous food plants as alternative food sources. *Journal of Nature Studies* 10(2): 53-60.
- DENR Administrative Order 2007-01. *Quezon City, Philippines*. Downloaded from [http://server2.denr.gov.ph/files/dao-2007-01\\_200.pdf](http://server2.denr.gov.ph/files/dao-2007-01_200.pdf)
- DENR-PAWB Technical Bulletin No. 2013-01. *List of protected areas under the National Integrated Protected Areas System*. Downloaded from <http://www.bmb.gov.ph/>
- Hamann, A., E.B. Barbon, E. Curio and D. A. Madulid. 1999. A botanical inventory of a submontane tropical rainforest on Negros Island, Philippines. *Biodiversity and Conservation* 8: 1017-1031.
- IUCN. 2001. *Red List Categories and Criteria Version 3.1*. Downloaded from [http://www.iucnredlist.org/technical\\_documents/categories-and-criteria/2001-categories-criteria](http://www.iucnredlist.org/technical_documents/categories-and-criteria/2001-categories-criteria).
- Kang, H.G., C.S. Kim, and E.S. Kim. 2013. Human influence, regeneration, and conservation of the Gotjawal forests in Jeju Island, Korea. *Journal of Marine and Island Cultures* 2: 85-92.
- Kloppenburger, R.D., M.L.D. Guevarra, J.M. Carandang, G.K. Mendoza and U. Ferreras. 2013. New species and subspecies of *Hoya* (Apocynaceae) from Quezon Province, Philippines. *Journal of Nature Studies* 12(1): 18-29.
- Langenberger, G., K. Martin and J. Sauerborn 2006. Vascular plant species inventory of a Philippine lowland rain forest and its conservation value. *Biodiversity and Conservation* 15: 1271-1301.
- La Viña, A., J.L. Kho and M. J. Caleda. 2010. Legal framework for protected areas: Philippines. Downloaded from <http://cmsdata.iucn.org/downloads/philippines.pdf>
- Lindstrom, A.J., K.D. Hill and L.C. Stanberg. 2008. The genus *cycas* (cycadaceae) in the Philippines. *Telopea* 12(1): 119-145.
- Myers, N., Mittermeier, R.A., Mittermeier, C.G., da G.A.B. Fonseca and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858.
- Municipality of Dinalupihan. 2015. Downloaded from <http://www.dinalupihan.gov.ph/index.php/tourism/tourist-attraction> on 15 October 2016.
- Nueza, O.M., M.L. P. Non, R.C. Makiputin and E.P. Oconer. 2015. Species diversity of bats in Mt. Matutum protected landscape, Philippines. *Journal of Biodiversity and Environmental Sciences* 6(6): 377-390.
- Office of the President. 2000. *Proclamation Number 273. Declaring the Roosevelt National Park situated in the municipalities of Dinalupihan and Hermosa, Province of Bataan as a protected area pursuant to Republic Act 7586 (NIPAS Act of 1992) and shall be known as Roosevelt Protected Landscape*. Manila, Philippines. Downloaded from <http://www.gov.ph/2000/04/23/proclamation-no-273-s-2000/> on 15 October 2016
- Obico, J.J.A. and E.M. Ragrario. 2014. A survey of plants used as repellents against hematophagous insects by the Ayta people of Porac, Pampanga province, Philippines. *Philippine Science Letters* 7(1):179-186.
- Ong, P. 2002. Current status and prospects of protected areas in the light of the Philippine biodiversity conservation priorities. *Proceedings of IUCN/WCPA-EA-4 Taipei Conference*: PP 95-126.
- Owino, A.O., A.H. Jillo and M.L. Kenan.

2012. Socio-economics and wildlife conservation of a peri-urban national park in central Kenya. *Journal for Nature Conservation* 20: 384-392.
- Posa, M.R.C., Diesmos, A.C. Sodhi, N.S., and T.M. Brooks. 2008. Hope for threatened tropical biodiversity: lessons from the Philippines. *Bioscience* 58(3): 233-240.
- Relox, R.E., E.P. Leaño and F.A. Camino,. 2011. Avifaunal assemblage in Mt. Hamiguitan, Davao Oriental, Mindanao Island, Philippines. *Journal of Environmental Science and Management* 14(1): 1-11.
- Sisongkham, B., C. M. Rebanco, A.J. Alcantara. and M.V.O. Espaldon. 2015. Land cover changes and resource use patterns of selected communities in Phou Phanang National Protected Area, Sangthong District, Vientiane Capital, Lao PDR. *Journal of Environmental Science and Management* 18(2):33-43.
- Sodhi, N. S. *et al.* 2010. Conserving Southeast Asian forest biodiversity in human-modified landscapes. *Biological Conservation* 143: 2375-2384.
- Sopsop, G. and I.Jr. Lit. 2015. Soil-Litter Arthropod Assemblage in Dipterocarp Forest, Agroforestry Area and Mahogany Plantation in Makiling Forest Reserve, Laguna. *Journal of Nature Studies* 14(1): 47-65.
- Sopsop, L.B. and I.E.Jr. Buot. 2009. The endangered plants of Palawan Island, Philippines. *Asia Life Sciences* 18(2): 251-279.
- Tumusiime, D.M., P. Vedeld and W. Gombya-Ssembajjwe. 2011. Breaking the law? Illegal livelihoods from a protected area in Uganda. *Forest Policy and Economics* 13: 273-283.
- Rickart, E.A., L.R. Heaney, D.S. Balete. and B. R. Tabaranza. 2011. Small mammal diversity along an elevational gradient in northern Luzon, Philippines. *Mammalian Biology* 76:12-21.
- Vedeld, P., A. Jumane, G. Wapalila and A. Songorwa. 2012. Protected areas, poverty and conflicts. a livelihood case study of Mikumi National Park, Tanzania. *Forest Policy and Economics* 21: 20-31.
- Verburg, P. H., K.P. Overmar, M. G.A. Huigen, W.T. de Groot and A. Veldkampa. 2006. Analysis of the effects of land use change on protected areas in the Philippines. *Applied Geography* 26:153-173.
- Yu, G.F., V. Mulabagal, T. Diyabalanage, W. A. Hurtada, D.L. De Witt and M. G. Nair. 2008. Non-nutritive functional agents in rattan-shoots, a food consumed by native people in the Philippines. *Food Chemistry* 110: 991-996.

---

Received: 10 June 2016

Accepted: 1 November 2016

**Table 1.** List of plant species surveyed per site (scientific names are arranged in alphabetical order)

Site, geographic coordinates, description	Scientific name	Common name/local name	Number of species
Site 1, 14.85209°N, 120.36960°E, 89 masl, near the Gapan-Olongapo road	<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Anchuan dilao/ Acacia florida	1 mature
	<i>Alternanthera dentata</i> (Moench) Stuehl.	Purple Knight (weed)	many
	<i>Ananas comosus</i> (L.) Merr.	Pinya, pineapple	9 mature
	<i>Artocarpus heterophyllus</i> Lam.	Langka	4 mature
	<i>Bauhinia monandra</i> Kurz	Alibangbang	3 mature
	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Sili sili, hagonoy	1 mature
	<i>Colocasia esculenta</i> (L.) Schott	Gabi	10 mature
	<i>Cyrtococcum accrescens</i> Stapf	Rice-like grass/ lovegrass	many
	<i>Ficus nota</i> Merr.	Tibig	1 mature
	<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil Ipil	1 mature
	<i>Mangifera indica</i> L.	Mango, manggang pico	5 mature
	<i>Paspalum conjugatum</i> P.J. Bergius	Carabao grass	many
	<i>Saccharum spontaneum</i> L.	Talahib	2 mature
	<i>Sandoricum koetjape</i> Merr.	Santol	1 mature
	<i>Swietenia macrophylla</i> King	Mahogany	8 mature
Site 2, 14.85201°N, 120.36998°E, 43 masl, sloping	<i>Antidesma ghaesembilla</i> Gaertn.	Binayuyu	11 wildlings
	<i>Canarium luzonicum</i> Miq.	unknown	1 wildling
	<i>Eucalyptus globulus</i> Labill.	unknown	1 mature
	<i>Eucalyptus tereticornis</i> Sm.	unknown	2 mature

Table 1. (Continue)

Site, geographic coordinates, description	Scientific name	Common name/local name	Number of species
	<i>Ficus nota</i> Merr.	Tibig	1 mature
	<i>Heritiera sylvatica</i> S. Vidal	Dungon	2 wildlings
	<i>Koordersiodendron pinnatum</i> Merr.	Amugis	1 wildling
	<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil Ipil	21 wildlings
	<i>Macaranga grandifolia</i> Merr.	Takip-asin	1 mature
	<i>Pterocarpus indicus</i> Willd.	Narra	4 wildlings
	<i>Semecarpus cuneiformis</i> Blanco	Ligas, kamiling	2 wildlings
	<i>Swietenia macrophylla</i> King	Mahogany	25 wildlings
	<i>Tamarindus indica</i> L.	Sampaloc	2 wildlings
Site 3, 14.85087 <sup>0</sup> N, 120.36932 <sup>0</sup> E, 82 masl, sloping	<i>Acacia auriculiformis</i> A. Cunn. ex Benth.	Anchuan dilao, Acacia florida	1 mature
	<i>Lagerstroemia speciosa</i> (L.) Pers.	Banaba	1 mature
	<i>Delonix regia</i> (Bojer) Raf.	Fire tree	1 mature, 120 wildlings
	<i>Heritiera sylvatica</i> S. Vidal	Dungon	5 wildlings
	<i>Koordersiodendron pinnatum</i> Merr.	Amugis	1 wildlings
	<i>Swietenia macrophylla</i> King	Mahogany	7 mature, 50 wildlings
Site 4, 14.85095 <sup>0</sup> N, 120.36889 <sup>0</sup> E, 60 masl, along the nature park pathwalk	<i>Acacia auriculiformis</i> A. Cunn. ex Benth.	Anchuan dilao, Acacia florida	1 mature
	<i>Calamus usitatus</i> Blanco	Rattan	2 mature
	<i>Derris elliptica</i> Benth.	Tuba (poison vine)	1 mature
	<i>Diospyros pilosanthera</i> Blanco	Bolong-eta	1 mature
	<i>Heritiera sylvatica</i> S. Vidal	Dungon	3 wildlings
	<i>Jasminum sambac</i> (L.)	Sampaguita	30 mature



**Table 1.** (Continue)

Site, geographic coordinates, description	Scientific name	Common name/local name	Number of species
	Aiton		
	<i>Koordersiodendron pinnatum</i> Merr.	Amugis	1 mature, 224 wildlings
	<i>Livistona rotundifolia</i> Mart.	Anahaw	1 mature
	<i>Mangifera indica</i> L.	Manggang pico	2 mature
	<i>Phanera</i> Lour		1 mature
	<i>Semecarpus cuneiformis</i> Blanco	Ligas	4 wildlings
	<i>Spathodea campanulata</i> P.Beauv.	African Tulips	2 mature
	<i>Swietenia macrophylla</i> King	Mahogany	3 wildlings
Site 5, 14.85066°N, 120.36813°E, 52 masl, riverbank	<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Anchuan dilaw, Acacia florida	2 mature; wildling
	<i>Artocarpus blancoi</i> Merr.	Antipolo	2 wildlings
	<i>Ficus nota</i> Merr.	Tibig	1 wildling
	<i>Heritiera sylvatica</i> S. Vidal	Dungon	1 mature; 200 wildlings
	<i>Intsia bijuga</i> Kuntze	Ipil	1 mature, 1 wildling
	<i>Koordersiodendron pinnatum</i> Merr.	Amugis (mature)/(wildlings)	1 mature, 2 wildlings
	<i>Mangifera altissima</i> Blanco	Mangga/pahunan	2 wildlings
	<i>Pterocarpus indicus</i> Willd.	Narra	2 narra
	<i>Spathodea campanulata</i> P.Beauv.	African tulip	2 wildlings
Site 6, 14.85029°N, 120.36759°E, 64 masl, near the pathwalk of the park	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Sili sili, Hagonoy	8 mature
	<i>Cyperus rotundus</i> L.	Nut-grass	2 mature
	<i>Cyrtococcum accrescens</i> Stapf	Rice-like grass	Abundant
	<i>Delonix regia</i> (Bojer) Raf.	Fire tree	1 wildling

**Table 1.** (Continue)

Site, geographic coordinates, description	Scientific name	Common name/local name	Number of species
	<i>Ficus nota</i> Merr.	Tibig	1 mature, 1 wildling
	<i>Heritiera sylvatica</i> S. Vidal	Dungon	2 wildlings
	<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil ipil	5 wildlings
	<i>Macaranga grandifolia</i> Merr.	Takip-asin	2 wildlings
	<i>Murdannia nudiflora</i> (L.) Brenan	Soft body grass	1 mature
	<i>Parkia javanica</i> Merr.	Cupang, Kupang	2 wildlings
	<i>Paspalum conjugatum</i> P.J. Bergius	Carabao grass	Abundant
	<i>Pouteria campechiana</i> Kunth Baehni	Tesa, chessa	19 wildlings
	<i>Pterocarpus indicus</i> Willd.	Prickly narra	2 wildlings
	<i>Tamarindus indica</i> L.	Sampaloc	2 wildlings
	<i>Semecarpus cuneiformis</i> Blanco	Ligas	3 mature
Site 7, 14.84954 <sup>0</sup> N, 120.36733 <sup>0</sup> E, 68 masl, within the mixed tree plantation and remnant old growth forest consisting of <i>Shorea contorta</i> S.Vidal (white lauan trees)	<i>Diospyros pilosanthera</i> Blanco	Bolong –eta	14 wildlings
	<i>Heritiera sylvatica</i> S.Vidal	Dungon	3 wildlings
	<i>Livistona rotundifolia</i> Mart.	Anahaw	1 mature
	<i>Mangifera indica</i> L.	Mango, Manggang kalabaw	1 mature
	<i>Pterocarpus indicus</i> Willd.	Narra	1 mature
	<i>Swietenia macrophylla</i> King	Mahogany	3 mature, 5 wildlings
	<i>Vitex parviflora</i> Juss.	Molawin, molave	1 mature
Site 8, 14.85181 <sup>0</sup> N, 120.36810 <sup>0</sup> E, 82 masl, secondary growth mixed tree plantation	<i>Artocarpus blancoi</i> Merr.	Antipolo	1 mature
	<i>Caryota mitis</i> Lour.	Pugahan	2 mature
	<i>Cyrtococcum accrescens</i> Stapf	Rice-like grass, lovegrass	Abundant (tall)

**Table 1.** (Continue)

Site, geographic coordinates, description	Scientific name	Common name/local name	Number of species
	<i>Diospyros pilosanthera</i> Blanco	Bolong-eta	4 mature
	<i>Ficus nota</i> Merr.	Tibig	1 mature
	<i>Gmelina arborea</i> Roxb.	Gmelina, yemane	2 wildlings
	<i>Koordersiodendron pinnatum</i> (Blco.) Merr.	Amugis	2 mature
	<i>Livistona rotundifolia</i> Roxb.	Anahaw	1 mature
	<i>Lygodium flexuosum</i> (L.) Sw.	Nitong-puti (fern vine)	1 mature
	<i>Semecarpus cuneiformis</i> Blanco	Ligas	2 mature
	<i>Shorea contorta</i> S.Vidal	White lauan	2 mature, 2 wildlings
	<i>Tectona grandis</i> L.f.	Teak, tekla	1 mature
Site 9, 14.85233 <sup>0</sup> N, 120.36786 <sup>0</sup> E, 73 masl, agroforest area	<i>Amaranthus viridis</i> L.	Kolitis	5 buildup
	<i>Artocarpus blancoi</i> Merr.	Antipolo	4 wildlings
	<i>Cyrtococcum accrescens</i> Stapf	Rice-like grass, lovegrass	Abundant
	<i>Diospyros pilosanthera</i> Blanco	Bolong-eta	3 mature
	<i>Drynaria quercifolia</i> (L.) J.Sm.	Pakpak-lawin	3 mature
	<i>Ficus nota</i> Merr.	Tibig	2 wildlings
	<i>Gmelina arborea</i> Roxb.	Gmelina, yemane	2 wildlings
	<i>Mangifera indica</i> L.	Mango, manggang pico	2 mature
	<i>Semecarpus cuneiformis</i> Blanco	Ligas	1 mature
	<i>Shorea contorta</i> S. Vidal	White lauan	1 mature
	<i>Swietenia macrophylla</i> King	Mahogany	4 mature, 300 wildlings
Site 10, 14.85281 <sup>0</sup> N, 120.37204 <sup>0</sup> E, 35 masl, near a human community and river bank	<i>Amaranthus viridis</i> L.	Kolitis	Abundant
	<i>Ananas comosus</i> (L.) Merr.	Pinya, pineapple	1 mature
	<i>Artocarpus heterophyllus</i> Lam.	Langka	4 mature

**Table 1.** (Continue)

<b>Site, geographic coordinates, description</b>	<b>Scientific name</b>	<b>Common name/local name</b>	<b>Number of species</b>
	<i>Cocos nucifera</i> L.	Coconut	2 mature
	<i>Cyrtococcum accrescens</i> (Trin.) Stapf		Abundant
	<i>Ficus nota</i> Merr.	Tibig	3 mature
	<i>Gmelina arborea</i> Roxb.	Gmelina	1 mature
	<i>Mangifera indica</i> L.	Mango, mangga	2 mature
	<i>Pterocarpus indicus</i> Willd.	Narra	1 mature
	<i>Swietenia macrophylla</i> King	Mahogany	10 mature
	<i>Vitex parviflora</i> Juss.	Molawin, molave	3 mature

**Table 2.** List of plants surveyed in selected areas with frequent human activities in Dinalupihan Nature Center in Roosevelt Protected Landscape, Bataan (Note: Family and scientific name are arranged alphabetically. NA means 'not applicable').

Family and scientific name	Common Name/local name	Coordinates/altitude/ masl (near houses & riverbank)	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Amaranthaceae</b>						
<i>Alternanthera dentata</i> (Moench) Stuehl.	Purple Knight	14.85281°N 120.37204°E 35 masl (near houses & riverbank)	Abundant	NA	NA	NA
<i>Amaranthus viridis</i> L.	Kolitis	14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation) 14.85233°N 120.36786°E 73 masl (agro-forest area)	5 build up sites/ Abundant	NA	NA	NA
<b>Anacardiaceae</b>						
<i>Koordersiodendron pinnatum</i> Merr.	Amugis	14.85209°N 120.36960°E 89 masl (near the highway) 14.85201°N 120.36998°E 43 masl (sloping) 14.85087°N 120.36932°E 82 masl (sloping near pathwalk) 14.85095°N 120.36889°E 60 masl (along the park pathwalk) 14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan)	4 mature/ 228 wildlings	NA	Vulnerable	Vulnerable

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<i>Mangifera altissima</i> Blanco	Pahutan	14.85095°N 120.36889°E	2 wildlings	Vulnerable	Vulnerable	Critically Endangered
		60 masl (along the park pathwalk)		A1d ver 2.3 needs updating		
<i>Mangifera indica</i> L.	Mango, manggang kalabaw	14.85029°N 120.36759°E	1 mature	Data Deficient ver 2.3 needs updating	NA	Vulnerable
		64 masl (near pathwalk)				
<i>Semecarpus cuneiformis</i> Blanco	Manggang pico	14.85087°N 120.36932°E	11 mature			
		82 masl (sloping near pathwalk)				
		14.85181°N 120.36810°E				
		82 masl (secondary growth mixed plantation)				
		14.85233°N 120.36786°E				
<i>Semecarpus cuneiformis</i> Blanco	Ligas, kamiling	73 masl (agro-forest area)				
		14.85281°N 120.37204°E				
		35 masl (near houses and riverbank)				
<i>Semecarpus cuneiformis</i> Blanco	Ligas, kamiling	14.85201°N 120.36998°E	6 mature/ 6 wildlings	NA	NA	NA
		43 masl (sloping)				
<i>Semecarpus cuneiformis</i> Blanco		14.85087°N 120.36932°E				

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/ Relative Cover (%)	Conservation status		
			IUCN	DAO 2007-1	This study
		82 masl (sloping near pathway) 14.85066°N 120.36813°E 52 masl (riverbank) 14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan) 14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation)			
<b>Araceae</b>					
<i>Colocasia esculenta</i> (L.) Schott	Gabi	14.85281°N 120.37204°E 35 masl (near houses and riverbank)	Low Risk Least concern ver 3.1	NA	NA
<b>Arecaceae/Palmae</b>					
<i>Calamus usitatus</i> Blanco	Rattan	14.85087°N 120.36932°E 82 masl (sloping near pathway)	Low Risk Least concern ver 3.1	NA	NA

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<i>Caryota mitis</i> Lour.	Pugahan	14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan)	2 wildlings	NA	NA	Vulnerable
<i>Cocos nucifera</i> L.	Coconut, niyog	14.85233°N 120.36786°E 73 masl (agro-forest area)	2 seedlings	NA	NA	NA
<i>Livistona rotundifolia</i> Mart.	Anahaw	14.85087°N 120.36932°E 82 masl (sloping near pathwalk) 14.85029°N 120.36759°E 64 masl (near pathwalk) 14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan)	3 wildlings	NA	NA	Vulnerable
<b>Asteraceae</b>						
<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Sili-sili, Hagonoy	14.85066°N 120.36813°E 52 masl (riverbank) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	9 mature (grass)	NA	NA	NA
<b>Bignoniaceae</b>						



Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/ Relative Cover (%)	Conservation status		
			IUCN	DAO 2007-1	This study
<i>Spathodea campanulata</i> P. Beauv.	African tulips	14.85087°N 120.36932°E 82 masl (sloping near pathway) 14.85095°N 120.36889°E 60 masl (along the park pathway)	NA	NA	NA
<b>Bromeliaceae</b>					
<i>Ananas comosus</i> (L.) Merr.	Pineapple, pinya	14.85233°N 120.36786°E 73 masl (agro-forest area) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	NA	NA	NA
<b>Burseraceae</b>					
<i>Canarium luzonicum</i> Miq.		14.85201°N 120.36998°E 43 masl (sloping)	-Vulnerable A1cd ver 2.3	- Other Threatened species - Other Threatened species	Vulnerable
			1 wildling		
					needs updating

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Commelinaceae</b>						
<i>Murdannia nudiflora</i> (L.) Brenan		14.85066°N 120.36813°E 52 masl (riverbank)	1 wildling (weed)	NA	NA	NA
<b>Cyperaceae</b>						
<i>Cyperus rotundus</i> L.	Nut grass/ Mutha	14.85066°N 120.36813°E 52 masl (riverbank)	2 mature	Low Risk Least concern ver 3.1	NA	NA
<b>Dipterocarpaceae</b>						
<i>Shorea contorta</i> S.Vidal	White lauan	14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan) 14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation)	3 mature/ 2 wildlings	Critically Endangered A1cd ver 2.3 needs updating	Vulnerable	Endangered
<b>Ebenaceae</b>						
<i>Diospyros pilosantha</i> Blanco	Bolong-eta	14.85087°N 120.36932°E 82 masl (sloping near pathwalk)	8 mature/ 14 wildlings	NA	Endangered	Endangered

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/ Coordinates	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
		14.85029°N 120.36759°E				
		64 masl (near pathway)				
		14.84954°N 120.36733°E				
		68 masl (mixed plantation and remnant old growth white lauan)				
		14.85181°N 120.36810°E				
		82 masl (secondary growth mixed plantation)				
<b>Euphorbiaceae</b>						
<i>Antidesma ghaesembilla</i> Gaertn.	Binayuyu	14.85201°N 120.36998°E 43 masl (sloping)	11 wildlings	NA	NA	Vulnerable
<i>Macaranga aleuretoides</i> F. Muell.		14.85201°N 120.36998°E 43 masl (sloping)	1 mature	NA	NA	Vulnerable
<i>Macaranga grandifolia</i> Merr.	Takip-asin	14.85066°N 120.36813°E 52 masl (near river)	2 wildlings	Vulnerable A1cd ver 2.3	NA	Vulnerable needs updating

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007- 1	This study
<b>Fabaceae/</b>						
<b>Leguminosae</b>						
<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Anchuan dilao/ Acacia florida	14.85209°N 120.36960°E 89 masl (near the highway) 14.85201°N 120.36998°E 43 masl (sloping) 14.85095°N 120.36889°E 60 masl (along the park pathwalk) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	5 mature/ 1 wildling	Low Risk Least concern ver 3.1	NA	Vulnerable
<i>Bauhinia monandra</i> Kurz	Alibangbang	14.85281°N 120.37204°E 35 masl (near houses and riverbank)	3 mature	NA	NA	Vulnerable
<i>Delonix regia</i> (Bojer) Raf.	Fire Tree	14.85209°N 120.36960°E 89 masl (near the highway) 14.85066°N 120.36813°E 52 masl (riverbank)	1 mature/ 121 wildlings	Low Risk Least concern ver 3.1	NA	NA
<i>Derris elliptica</i> Benth.	Tuba (poison vine)	14.85087°N 120.36932°E 82 masl (sloping near pathwalk)	1 mature	NA	NA	Endangered

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/ 60 masl (along the park pathwalk)	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<i>Intsia bijuga</i> Kuntze	Ipil	14.85095°N 120.36889°E 60 masl (along the park pathwalk)	1 mature/ 1 wildling	Vulnerable A1cd ver 2.3 needs updating (Intsia bijuga)	Endangered	Endangered
<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil-ipil	14.85201°N 120.36998°E 43 masl (sloping) 14.85066°N 120.36813°E 52 masl (riverbank) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	1 mature/ 26 wildlings	NA	NA	Vulnerable
<i>Parkia javanica</i> Merr.	Cupang/ Kupang	14.85066°N 120.36813°E 52 masl (riverbank)	2 wildlings	NA	NA	Vulnerable
<i>Phanera</i> Lour.		14.85087°N 120.36932°E 82 masl (sloping near pathwalk)	1 mature	NA	NA	Endangered
<i>Pterocarpus indicus</i> Willd.	Smooth narra	14.85201°N 120.36998°E 43 masl (sloping)	4 mature/ 4 wildlings	Vulnerable A1d ver 2.3	Critically Endangered	Critically Endangered

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
		14.85095°N 120.36889°E				
	60 masl (along the park pathway)	14.85029°N 120.36759°E				
	64 masl (near pathway)	14.85233°N 120.36786°E				
	73 masl (agro-forest area)					
<i>Pterocarpus indicus</i> Willd.	Prickly narra	14.85066°N 120.36813°E 52 masl (riverbank)	2 wildlings	Vulnerable A1d ver 2.3 needs updating ( <i>Pterocarpus indicus</i> )	Critically Endangered	Critically Endangered
<i>Tamarindus indica</i> L.	Tamarind, sampiloc	14.85201°N 120.36998°E 43 masl (sloping) 14.85066°N 120.36813°E 52 masl (riverbank)	4 wildlings	NA	NA	NA
<b>Gramineae/ Poaceae</b>						
<i>Cyrtococcum accrescens</i> Stapf		14.85066°N 120.36813°E 52 masl (riverbank) 14.84954°N 120.36733°E	5 build up sites	NA	NA	NA

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
		68 masl (mixed plantation and remnant old growth white lauan) 14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation) 14.85233°N 120.36786°E 73 masl (agro-forest area) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)				
<i>Paspalum conjugatum</i> P.J. Bergius	Carabao grass	14.85066°N 120.36813°E 52 masl (riverbank) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	2 build up sites	Low Risk Least concern ver 3.1	NA	NA
<i>Saccharum spontaneum</i> L.	Talahib	14.85281°N 120.37204°E 35 masl (near houses and riverbank)	2 mature	Low Risk Least concern ver 3.1	NA	NA

Table 2.(Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Lamiaceae</b>						
<i>Gmelina arborea</i> Roxb.	Gmelina, Yemane	14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan) 14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation) 14.85233°N 120.36786°E 73 masl (agro-forest area)	1 mature/ 4 wildlings	NA	NA	NA
<i>Tectona grandis</i> L. f.	Teak, tekla	14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan)	1 mature	NA	NA	NA
<b>Lygodiaceae</b>						
<i>Lygodium flexuosum</i> (L.) Sw.	Nitong-puti	14.84954°N 120.36733°E 68 masl (mixed plantation and remnant old growth white lauan)	1 mature	NA	NA	NA
<b>Lythraceae</b>						



Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/ Coordinates	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<i>Lagerstroemia speciosa</i> (L.) Pers.	Banaba	14.85209°N 120.36960°E 89 masl (near the highway)	1 mature	NA	NA	NA
<b>Meliaceae</b>						
<i>Sandoricum koetjape</i> Merr.	Santol	14.85281°N 120.37204°E 35 masl (near houses and riverbank)	1 mature	NA	NA	NA
<i>Swietenia macrophylla</i> King	Mahogany	14.85209°N 120.36960°E 89 masl (near the highway) 14.85201°N 120.36998°E 43 masl (sloping) 14.85087°N 120.36932°E 82 masl (sloping near pathwalk) 14.85029°N 120.36759°E 64 masl (near pathwalk) 14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation) 14.85233°N 120.36786°E 73 masl (agro-forest area) 14.85281°N 120.37204°E 35 masl (near houses and riverbank)	22 mature/ 393 wildlings	Vulnerable A1cd + 2cd ver 2.3	NA	NA

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Moraceae</b>						
<i>Artocarpus blancoi</i> Merr.	Antipolo	14.85095°N 120.36889°E	1 mature/	Vulnerable	NA	Vulnerable
		60 masl (along the park pathwalk)	6 wildlings	A1d ver 2.3 needs updating (Artocarpus blancoi)		
		14.84954°N 120.36733°E				
		68 masl (mixed plantation and remnant old growth white lauan)				
		14.85181°N 120.36810°E				
		82 masl (secondary growth mixed plantation)				
<i>Artocarpus heterophyllus</i> Lam.	Langka	14.85233°N 120.36786°E	8 mature	NA	NA	NA
		73 masl (agro-forest area)				
		14.85281°N 120.37204°E				
		35 masl (near houses and riverbank)				
<i>Ficus nota</i> Merr.	Tibig	14.85201°N 120.36998°E	4 mature/	NA	NA	Vulnerable
		43 masl (sloping)	7 wildlings			
		14.85095°N 120.36889°E				
		60 masl (along the park pathwalk)				
		14.85066°N 120.36813°E				

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
		52 masl (riverbank)				
		14.84954°N 120.36733°E				
		68 masl (mixed plantation and remnant old growth white lauan)				
		14.85181°N 120.36810°E				
		82 masl (secondary growth mixed plantation)				
		14.85233°N 120.36786°E				
		73 masl (agro-forest area)				
		14.85281°N 120.37204°E				
		35 masl (near houses and riverbank)				
		14.85201°N 120.36998°E				
		43 masl (sloping)				
		14.85201°N 120.36998°E				
		43 masl (sloping)				
		14.85087°N 120.36932°E				
		82 masl (sloping near pathwalk)				
<b>Myrtaceae</b>						
<i>Eucalyptus globules</i> Labill.			1 mature	NA	NA	NA
<i>Eucalyptus tereticornis</i> Sm.			2 mature	NA	NA	NA
<b>Oleaceae</b>						
<i>Jasminum sambac</i> (L.) Aiton	Sampaguita		30 mature	NA	NA	NA

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Polypodiaceae</b>						
<i>Drynaria quercifolia</i> (L.) J.Sm.	Pakpak-lawin	14.85181°N 120.36810°E 82 masl (secondary growth mixed plantation)	3 mature	NA	Vulnerable	Vulnerable
<b>Sapotaceae</b>						
<i>Pouteria campechiana</i> Kunth Baehni	Tesa/ Chessa	14.85066°N 120.36813°E 52 masl (riverbank)	19 wildings	NA	NA	NA
<b>Sterculiaceae</b>						
<i>Heritiera sylvatica</i> S.Vidal	Dungon	14.85209°N 120.36960°E 89 masl (near the highway) 14.85201°N 120.36998°E 43 masl (sloping) 14.85087°N 120.36932°E 82 masl (sloping near pathwalk) 14.85095°N 120.36889°E 60 masl (along the park pathwalk) 14.85066°N 120.36813°E 52 masl (riverbank) 14.85029°N 120.36759°E 64 masl (near pathwalk)	1 mature/ 220 wildings	NA	NA	NA

Table 2. (Continue)

Family and scientific name	Common Name/local name	Coordinates/altitude/	Relative Cover (%)	Conservation status		
				IUCN	DAO 2007-1	This study
<b>Verbenaceae</b>						
<i>Vitex parviflora</i> Juss.	Molawin/	14.85029°N 120.36759°E	4 mature	Vulnerable A1cd ver 2.3 needs updating	Endangered	Critically Endangered
	Molave	64 masl (near pathway)				
		14.85233°N 120.36786°E				
		73 masl (agro-forest area)				