CHECKLIST OF ALIEN PLANT SPECIES IN TUARAN, SABAH

Vanielie Terrence Justine[1,2*], Kate Kerycsia Juring[1], Hanafi Kasitah[1], and Monica Suleiman[2]

Research and Education Division, Sabah Parks, Lot 45 & 46, 1st - 5th Floor, Block H, Signature Office, KK Times Square, Coastal Highway, 88100 Kota Kinabalu, Sabah, Malaysia[1]
Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia[2]

[*]Corresponding Author: Vanielie.Justine@sabah.gov.my

ABSTRACT

Alien plant species (APS) pose a significant threat to native biodiversity and ecosystem functioning, particularly in tropical regions. This study presents a comprehensive checklist of APS in Tuaran, Sabah, based on field surveys conducted across multiple sites. A total of 123 specimens were collected, representing 82 species from 32 families. The most represented families were Asteraceae and Fabaceae, followed by Lamiaceae. Several species, including *Chromolaena odorata*, *Lantana camara*, *Miconia crenata*, *Mikania micrantha*, and *Sphagneticola trilobata*, are listed among the 100 worst invasive alien species globally, highlighting a high invasion risk. The distribution of APS varied across surveyed sites, with certain zones exhibiting higher species richness. The inclusion of the Sulaman area, Tuaran in the proposed Kinabalu UNESCO Global Geopark expansion underscores the need for targeted monitoring and management strategies to prevent further spread of APS, restore disturbed habitats, and protect native biodiversity. This checklist provides a baseline for future studies and conservation planning in the region.

Keywords: *Alien plant species, biosites, Borneo, Global Geopark, invasive alien species*

INTRODUCTION

Alien plant species (APS) are rapidly accumulating across regions worldwide, largely due to the expansion of global trade and transport, which promotes their introduction, dispersal and establishment in new environments (Pyšek et al., 2020). Their presence has become a major concern for biodiversity conservation, as APS can outcompete native flora, disrupt ecosystem processes and threaten ecological stability. In tropical regions such as Southeast Asia, the impacts of APS are of particular concern given the high levels of species richness and endemism, which make these ecosystems especially vulnerable to biological invasions (Bellard et al., 2014). Consequently, documenting and monitoring APS is a critical step toward protecting native biodiversity and mitigating the risks posed by biological invasions.

Biosites and nature sites are increasingly acknowledged as important areas for biodiversity conservation, ecological research, and sustainable development. A biosite refers to a defined area of land or water that supports important biological assets, including rare or threatened species of flora and fauna, habitats critical for their survival, or distinctive and endangered vegetation communities (Department of Sustainability and Environment, 2005). Nature sites, on the other hand, represent areas of land or water valued for its natural features and ecosystems, either formally protected (e.g., a nature reserve) or relatively undisturbed, and often designated for conservation, recreation, research, or education. Together, these areas provide refuge for native flora and fauna while contributing to ecological connectivity across landscapes. However, their accessibility and close interactions with human activities often increase their susceptibility to alien plant invasions.

The Sulaman area in Tuaran, located along the coast of Sabah, has been proposed as an expansion of the Kinabalu UNESCO Global Geopark (KUGGp). The KUGGp is officially designated as an important hub for geological research and education, anchored by Mount Kinabalu as its central feature and encompassing Kinabalu Park, a UNESCO World Heritage Site. Beyond its geological importance, the geopark is also a hub of biotic diversity and cultural heritage. The Sulaman biosites and nature sites play a vital role in supporting this ecological and socio-economic significance. However, despite their importance, the extent and diversity of APS in Sulaman remain poorly documented, creating a significant knowledge gap for conservation and management planning.

This study addresses that gap by developing the first checklist of APS in Tuaran, Sabah. The checklist provides a baseline for future ecological research and management, helps identify invasive species of concern and highlights potential hotspots of invasion. In doing so, it will serve as a valuable reference for local stakeholders, including policymakers, park managers, and surrounding communities, in designing strategies to mitigate the ecological risks posed by APS and to strengthen conservation within the proposed KUGGP expansion.

METHODOLOGY

The Sulaman area in Tuaran, Sabah, Malaysia, encompasses important mangrove ecosystems and forms part of the proposed expansion. The proposed expansion area in Sulaman was divided into five zones (Figure 1). All zones were successfully surveyed, except Zone 4, which could not be covered due to time limitations during the expedition. In Zone 1, two sites were surveyed: Lema'as (Penimbawan) and Lema'as (Loknunuk) Forest Reserves, both designated as Class III – Domestic Forest. In Zone 2, the survey was conducted in Kelawat Forest Reserve

(Class I – Protection Forest), while in Zone 3, the Sulaman Lake Forest Reserve was covered. Encompassing approximately 2,635 hectares, the latter was designated as a Class V Forest Reserve under the Forest Enactment of 1968 (Tangah et al., 2020). In Zone 5, surveys were conducted at Monggiland Waterfall Eco Tourism and Murug-Turug Eco Tourism, both ecologically important nature sites within the proposed expansion area (Table 1). Overall, the surveyed sites comprised biosites, nature sites, community areas, and disturbed landscapes connected by established routes.

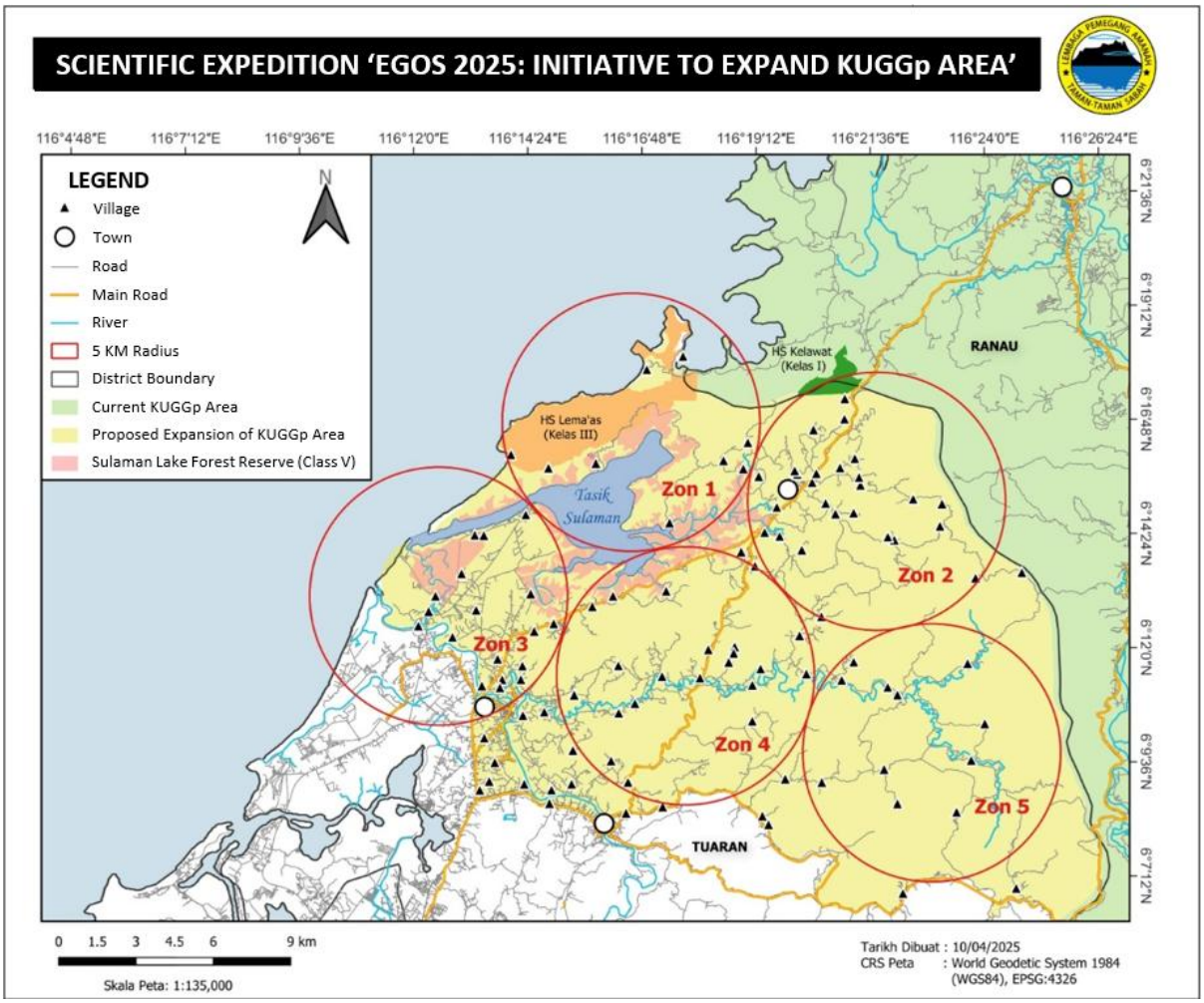

Figure 1. Proposed expansion areas of Kinabalu UNESCO Global Geopark (KUGGp).

Table 1. Surveyed sites in the Tuaran District, with corresponding coordinates and elevations.

Zone	Sites	Coordinates	Elevation (m a.s.l.)
Zone 1	Lema'as (Penimbawan) Forest Reserve	6.27040278 N, 116.26991944 E	52
	Lema'as (Loknunuk) Forest Reserve	6.28427500 N, 116.28056111 E	76
Zone 2	Kelawat Forest Reserve	6.29346944 N, 116.34582222 E	357
Zone 3	Sulaman Lake Forest Reserve	6.23325833 N, 116.19270000 E	0
Zone 5	Monggiland Waterfall Eco Tourism	6.11683611 N, 116.36466667 E	593
	Murug-Turug Eco Tourism	6.12623889 N, 116.35495556 E	277

Samples of APS were collected through opportunistic sampling within the study sites. Herbarium specimens were prepared for each collected species to ensure accurate identification. Several approaches were employed, including reference to key taxonomic literature (Chen, 2008; Witt, 2017), the use of mobile identification applications (Pl@ntNet and Google Lens), and verification by Sabah Parks' botanists together with authenticated records from the Sabah Parks Herbarium (SNP). Scientific names were aligned with the World Flora Online (2025). Each specimen was processed using conventional herbarium techniques—plants were pressed, dried, and mounted on archival sheets, then labelled with essential metadata such as species name, collection site, and date. Finally, the specimens were accessioned into the SNP herbarium collection, where they remain as a permanent resource for future research and educational use.

RESULTS AND DISCUSSION

A total of 123 APS specimens were collected from Zones 1, 2, 3, and 5 within the Tuaran District. From these collections, a comprehensive checklist was established (Appendix 1), representing 82 species belonging to 32 families (Table 2). The most represented families were Asteraceae and Fabaceae (10 species), followed by Lamiaceae (six species). The Asteraceae family is globally identified as one of the largest and most successful in terms of invasive potential (Yu et al., 2025), and several studies in Sabah also have shown that Asteraceae species are widely distributed across various habitats (Justine et al., 2024; Justine et al., 2025).

Table 2. A checklist of alien plant species in Tuaran District.

Acanthaceae
Asystasia gangetica (L.) T.Anderson
Ruellia tuberosa L.
Sanchezia oblonga Ruiz & Pav.
Amaranthaceae
Alternanthera brasiliana (L.) Kuntze
Amaranthus blitum L.
Apocynaceae
Allamanda L.
Asclepias curassavica L.
Catharanthus roseus (L.) G.Don
Gomphocarpus physocarpus E.Mey.
Asparagaceae
Dracaena hyacinthoides (L.) Mabb.
Asteraceae
Ageratum conyzoides L.
Bidens pilosa L.
Centratherum punctatum Cass.
Chromolaena odorata (L.) R.M.King & H.Rob.
Crassocephalum crepidioides S.Moore
Elephantopus mollis Kunth
Emilia fosbergii Nicolson
Mikania micrantha Kunth

Sphagneticola trilobata (L.) Pruski
Synedrella nodiflora Gaertn.

Balsaminaceae

Impatiens walleriana Hook.f.

Boraginaceae

Heliotropium elongatum (Lehm.) Gürke

Campanulaceae

Hippobroma longiflora (L.) G.Don

Cannaceae

Canna glauca L.

Crassulaceae

Kalanchoe pinnata (Lam.) Pers.

Cyperaceae

Carex crus-corvi Shuttlew. ex Kunze
Cyperus bowmanni F.Muell. ex Benth
Cyperus esculentus L.

Euphorbiaceae

Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.
Jatropha gossypiifolia L.
Manihot carthaginensis subsp. glaziovii (Müll.Arg.) Allem
Ricinus communis L.

Fabaceae

Acacia mangium Willd.
Calliandra surinamensis Benth.
Centrosema pubescens Benth.
Crotalaria pallida Aiton
Delonix regia (Bojer ex Hook.) Raf.
Macroptilium lathyroides (L.) Urb.
Mimosa pudica L.
Senna tora (L.) Roxb.
Trifolium dubium Sibth.
Zornia latifolia Sm.

Lamiaceae

Clerodendrum thomsoniae Balf.f.
Coleus monostachyus (P.Beauv.) A.J.Paton
Hyptis capitata Jacq.
Isodon coetsa (Buch.-Ham. ex D.Don) Kudô
Karomia speciosa (Hutch. & Corbishley) R.Fern.
Mesosphaerum suaveolens (L.) Kuntze

Lythraceae

Cuphea hyssopifolia Kunth

Malvaceae

Hibiscus fragilis DC.
Hibiscus rosa-sinensis L.
Melochia melissifolia Benth.
Sida acuta Burm.f.

Melastomataceae
Miconia crenata (Vahl) Michelang.
Moraceae
Artocarpus heterophyllus Lam.
Myrtaceae
Psidium guajava L.
Oleaceae
Jasminum grandiflorum L.
Onagraceae
Ludwigia decurrens Walter
Oxalidaceae
Oxalis barrelieri L.
Passifloraceae
Passiflora foetida L.
Piperaceae
Peperomia pellucida (L.) Kunth
Plantaginaceae
Plantago major L.
Scoparia dulcis L.
Poaceae
Axonopus compressus (Sw.) P.Beauv.
Cenchrus purpureus (Schumach.) Morrone
Leersia virginica Willd.
Paspalum urvillei Steud.
Poa nemoralis L.
Polygalaceae
Senega paniculata (L.) J.F.B.Pastore & J.R.Abbott
Polygonaceae
Antigonon leptopus Hook. & Arn.
Persicaria lapathifolia (L.) Delarbre
Rubiaceae
Coptosperma graveolens (S.Moore) Degreef
Ixora chinensis Lam.
Richardia scabra L.
Spermacoce latifolia Aubl.
Smilacaceae
Smilax spinosa Mill.
Solanaceae
Physalis angulata L.
Solanum torvum Sw.
Verbenaceae
Lantana camara L.
Stachytarpheta jamaicensis (L.) Vahl
Stachytarpheta mutabilis (Jacq.) Vahl
Stachytarpheta urticifolia Sims

Five of the alien plant species identified in this study are included among the 100 worst invasive alien species globally (Luque et al., 2014). These are *Chromolaena odorata* (Asteraceae), *Lantana camara* (Verbenaceae), *Miconia crenata* (Melastomataceae), *Mikania micrantha* (Asteraceae), and *Sphagneticola trilobata* (Asteraceae). The presence of these species listed among the 100 worst invasive alien species globally highlights the significant invasion risk in the Sulaman area. Their occurrence underscores the need for targeted monitoring and management strategies to prevent further spread and mitigate potential impacts on native biodiversity.

The distribution of APS richness across the surveyed sites is presented in Table 4. Kelawat Forest Reserve and Sulaman Lake Forest Reserve each recorded the highest richness, with 30 species. Murug-Turug Eco Tourism recorded 25 species, while Monggiland Waterfall Eco Tourism recorded 18 species. Lema'as (Penimbawan) Forest Reserve recorded 11 species, and the lowest richness was observed in Lema'as (Loknunuk) Forest Reserve with nine species.

Table 4: Number of alien plant species recorded at surveyed sites in Tuaran District.

Zone	Sites	No. of APS
2	Kelawat Forest Reserve	30
3	Sulaman Lake Forest Reserve	30
5	Murug-Turug Eco Tourism	25
	Monggiland Waterfall Eco Tourism	18
1	Lema'as (Penimbawan) Forest Reserve	11
	Lema'as (Loknunuk) Forest Reserve	9

The findings underscore the importance of considering both ecological characteristics and human influences when assessing APS distribution. Effective management strategies should focus on monitoring high-risk zones, controlling the spread of APS, and restoring disturbed habitats to mitigate the impacts of APS on native biodiversity.

CONCLUSION

The study documented 82 APS in the Tuaran, Sabah, dominated by Asteraceae and Fabaceae. Species richness was highest in the Kelawat and Sulaman Lake Forest Reserves, and lowest in the Lema'as (Loknunuk) Forest Reserve. Notably, five species—*Chromolaena odorata*, *Lantana camara*, *Miconia crenata*, *Mikania micrantha*, and *Sphagneticola trilobata*—are listed among the 100 worst invasive alien species globally, highlighting a significant invasion risk. These findings are particularly significant in light of the proposed expansion of the Sulaman area within the KUGGp, as they underscore the need for proactive monitoring, management, and habitat restoration to prevent further spread of APS and safeguard native biodiversity.

ACKNOWLEDGEMENTS

We thank Sabah Parks for their support in organizing the EGOS 2025: KUGGP Territorial Expansion Initiative Scientific Expedition (April 14–30, 2025). Special thanks go to Brendon Benedict, Eiman Safwan, and the local guides for their invaluable assistance. We also

acknowledge the access license from the Sabah Biodiversity Council (Ref. JKM/SaBC.1000-2/14 JLD. 1 (173)).

REFERENCES

Bellard, C., Leclerc, C., Leroy, B., Bakkenes, M., Veloz, S., Thuiller, W., & Courchamp, F. (2014). Vulnerability of biodiversity hotspots to global change. *Global Ecology and Biogeography*, *23*(12), 1376-1386.

Chen, S. H. (2008). Naturalized plants of eastern Taiwan. *National Hualien Univ. of Education, Hualien, Taiwan*. 422pp.

Department of Sustainability and Environment. 2005. Biosites Update Port Phillip Region.

Justine, V. T., Liew, T. S., Alphonsus, A., Kasmin, J., Mujih, H., Repin, R., & Suleiman, M. (2025). Species richness and distribution of alien plant species in Kinabalu Park, Malaysia. *Folia Geobotanica*, *59*(3), 257-287.

Justine, V. T., Juring, K. K., & Jimmy, H. (2024). Species richness and composition of alien plant species in Marai Parai, Kinabalu Park, Malaysia. *Sabah Parks Nature Journal*, *13*, 1-21.

Luque, G. M., Bellard, C., Bertelsmeier, C., Bonnaud, E., Genovesi, P., Simberloff, D., & Courchamp, F. (2014). The 100th of the world's worst invasive alien species. *Biological invasions*, *16*(5), 981-985.

Pyšek, P., Hulme, P. E., Simberloff, D., Bacher, S., Blackburn, T. M., Carlton, J. T., ... & Richardson, D. M. (2020). Scientists' warning on invasive alien species. *Biological Reviews*, *95*(6), 1511-1534.

Tangah, J., Chung, A. Y., & Chan, H. T. (2020). Rehabilitation of Mangroves in Sabah: The SFD-ISME Collaboration (2014-2019). International Society for Mangrove Ecosystems.

Witt, A. (Ed.). (2017). *Guide to the naturalized and invasive plants of Southeast Asia*. CABI.

World Flora Online (WFO). (2025). Available on http://www.worldfloraonline.org/. Accessed 07 Aug 2025

Yu, J., Li, L., Yu, H., Zhu, W., Hou, M., Yu, J., ... & Yu, Z. (2025). Modeling current and future distributions of invasive Asteraceae species in Northeast China. *Scientific Reports*, *15*(1), 8379.

APPENDIX

Appendix 1. A checklist of alien plant species in Tuaran, Sabah.

NO.	FAMILY	SPECIES	SNP NO.	ZONES	SITES	ORIGIN (CONTINENT/COUNTRY)
1	Acanthaceae	*Asystasia gangetica* (L.) T.Anderson	43522	5	Monggiland Waterfall Eco Tourism	Aisa-Tropical and Australasia
2	Acanthaceae	*Asystasia gangetica* (L.) T.Anderson	43536	5	Murug-Turug Eco Tourism	Aisa-Tropical and Australasia
3	Acanthaceae	*Ruellia tuberosa* L.	44330	3	Sulaman Lake Forest Reserve	Northern and Southern America
4	Acanthaceae	*Sanchezia oblonga* Ruiz & Pav.	43595	2	Kelawat Forest Reserve	Southern America
5	Amaranthaceae	*Alternanthera brasiliana* (L.) Kuntze	44333	3	Sulaman Lake Forest Reserve	Northern and Southern America
6	Amaranthaceae	*Amaranthus blitum* L.	43597	2	Kelawat Forest Reserve	Southern America
7	Apocynaceae	*Allamanda* L.	43552	5	Murug-Turug Eco Tourism	Southern America
8	Apocynaceae	*Asclepias curassavica* L.	43564	1	Lema'as (Loknunuk) Forest Reserve	Northern and Southern America
9	Apocynaceae	*Catharanthus roseus* (L.) G.Don	43596	2	Kelawat Forest Reserve	Africa (Madagascar)
10	Apocynaceae	*Gomphocarpus physocarpus* E.Mey.	43573	1	Lema'as (Loknunuk) Forest Reserve	Africa
11	Asparagaceae	*Dracaena hyacinthoides* (L.) Mabb.	43575	2	Kelawat Forest Reserve	Africa
12	Asteraceae	*Ageratum conyzoides* L.	43521	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
13	Asteraceae	*Ageratum conyzoides* L.	43547	5	Murug-Turug Eco Tourism	Northern and Southern America
14	Asteraceae	*Ageratum conyzoides* L.	43555	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
15	Asteraceae	*Ageratum conyzoides* L.	43590	2	Kelawat Forest Reserve	Northern and Southern America
16	Asteraceae	*Ageratum conyzoides* L.	44312	3	Sulaman Lake Forest Reserve	Northern and Southern America

17	Asteraceae	*Bidens pilosa* L.	43511	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
18	Asteraceae	*Bidens pilosa* L.	43539	5	Murug-Turug Eco Tourism	Northern and Southern America
19	Asteraceae	*Centratherum punctatum* Cass.	43578	2	Kelawat Forest Reserve	Southern America
20	Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	43509	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
21	Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	43554	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
22	Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	43570	1	Lema'as (Loknunuk) Forest Reserve	Northern and Southern America
23	Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	44308	3	Sulaman Lake Forest Reserve	Northern and Southern America
24	Asteraceae	*Crassocephalum crepidioides* S.Moore	43507	5	Monggiland Waterfall Eco Tourism	Africa
25	Asteraceae	*Elephantopus mollis* Kunth	43515	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
26	Asteraceae	*Elephantopus mollis* Kunth	43561	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
27	Asteraceae	*Elephantopus mollis* Kunth	44302	2	Kelawat Forest Reserve	Northern and Southern America
28	Asteraceae	*Emilia fosbergii* Nicolson	43516	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
29	Asteraceae	*Mikania micrantha* Kunth	43550	5	Murug-Turug Eco Tourism	Southern America
30	Asteraceae	*Mikania micrantha* Kunth	43562	1	Lema'as (Penimbawan) Forest Reserve	Southern America
31	Asteraceae	*Mikania micrantha* Kunth	44309	3	Sulaman Lake Forest Reserve	Southern America
32	Asteraceae	*Sphagneticola trilobata* (L.) Pruski	44331	3	Sulaman Lake Forest Reserve	Northern and Southern America
33	Asteraceae	*Synedrella nodiflora* Gaertn.	44304	2	Kelawat Forest Reserve	Southern America

34	Balsaminaceae	*Impatiens walleriana* Hook.f.	43518	5	Monggiland Waterfall Eco Tourism	Africa
35	Boraginaceae	*Heliotropium elongatum* (Lehm.) Gürke	44322	3	Sulaman Lake Forest Reserve	Southern America
36	Campanulaceae	*Hippobroma longiflora* (L.) G.Don	43519	5	Monggiland Waterfall Eco Tourism	Southern America
37	Cannaceae	*Canna glauca* L.	44321	3	Sulaman Lake Forest Reserve	Northern and Southern America
38	Crassulaceae	*Kalanchoe pinnata* (Lam.) Pers.	43583	2	Kelawat Forest Reserve	Africa and Pacific
39	Cyperaceae	*Carex crus-corvi* Shuttlew. ex Kunze	43559	1	Lema'as (Penimbawan) Forest Reserve	Northern America
40	Cyperaceae	*Cyperus bowmanni* F.Muell. ex Benth	43545	5	Murug-Turug Eco Tourism	Australasia
41	Cyperaceae	*Cyperus esculentus* L.	43598	2	Kelawat Forest Reserve	Africa, Asia-Temperate, Asia-Tropical (Indian Subcontinent), Europe, Northern America and Southern America
42	Euphorbiaceae	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	43544	5	Murug-Turug Eco Tourism	Southern America
43	Euphorbiaceae	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	43574	1	Lema'as (Loknunuk) Forest Reserve	Southern America
44	Euphorbiaceae	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	43582	2	Kelawat Forest Reserve	Southern America
45	Euphorbiaceae	*Jatropha gossypiifolia* L.	43568	1	Lema'as (Loknunuk) Forest Reserve	Northern and Southern America
46	Euphorbiaceae	*Jatropha gossypiifolia* L.	44320	3	Sulaman Lake Forest Reserve	Northern and Southern America
47	Euphorbiaceae	*Manihot carthaginensis subsp. glaziovii* (Müll.Arg.) Allem	43534	5	Murug-Turug Eco Tourism	Southern America
48	Euphorbiaceae	*Ricinus communis* L.	43566	1	Lema'as (Loknunuk) Forest Reserve	Africa
49	Fabaceae	*Acacia mangium* Willd.	43538	5	Murug-Turug Eco Tourism	Asia-Tropical and Australasia (Maluku, New Guinea, Queensland)

50	Fabaceae	*Acacia mangium* Willd.	43553	1	Lema'as (Penimbawan) Forest Reserve	Asia-Tropical and Australasia (Maluku, New Guinea, Queensland)
51	Fabaceae	*Acacia mangium* Willd.	44313	3	Sulaman Lake Forest Reserve	Asia-Tropical and Australasia (Maluku, New Guinea, Queensland)
52	Fabaceae	*Calliandra surinamensis* Benth.	43588	2	Kelawat Forest Reserve	Southern America
53	Fabaceae	*Centrosema pubescens* Benth.	44328	3	Sulaman Lake Forest Reserve	Northern and Southern America
54	Fabaceae	*Crotalaria pallida* Aiton	43584	2	Kelawat Forest Reserve	Tropical & Subtropical Old World
55	Fabaceae	*Crotalaria pallida* Aiton	44325	3	Sulaman Lake Forest Reserve	Tropical & Subtropical Old World
56	Fabaceae	*Delonix regia* (Bojer ex Hook.) Raf.	44310	3	Sulaman Lake Forest Reserve	Africa
57	Fabaceae	*Macroptilium lathyroides* (L.) Urb.	44334	3	Sulaman Lake Forest Reserve	Northern and Southern America
58	Fabaceae	*Mimosa pudica* L.	43527	5	Murug-Turug Eco Tourism	Northern and Southern America
59	Fabaceae	*Mimosa pudica* L.	43560	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
60	Fabaceae	*Mimosa pudica* L.	43581	2	Kelawat Forest Reserve	Northern and Southern America
61	Fabaceae	*Senna tora* (L.) Roxb.	43528	5	Murug-Turug Eco Tourism	Southern America
62	Fabaceae	*Trifolium dubium* Sibth.	44336	3	Sulaman Lake Forest Reserve	Africa, Asia-Temperate and Europe
63	Fabaceae	*Zornia latifolia* Sm.	43585	2	Kelawat Forest Reserve	Northern and Southern America
64	Fabaceae	*Zornia latifolia* Sm.	44329	3	Sulaman Lake Forest Reserve	Northern and Southern America
65	Lamiaceae	*Clerodendrum thomsoniae* Balf.f.	43576	2	Kelawat Forest Reserve	Africa
66	Lamiaceae	*Coleus monostachyus* (P.Beauv.) A.J.Paton	44327	3	Sulaman Lake Forest Reserve	Africa
67	Lamiaceae	*Hyptis capitata* Jacq.	43510	5	Monggiland Waterfall Eco Tourism	Northern and Southern America

68	Lamiaceae	*Isodon coetsa* (Buch.-Ham. ex D.Don) Kudô	43524	5	Murug-Turug Eco Tourism	Asia-Temperate (China) and Asia-Tropical (Indian Subcontinent and Indo-China)
69	Lamiaceae	*Karomia speciosa* (Hutch. & Corbishley) R.Fern.	43593	2	Kelawat Forest Reserve	Africa
70	Lamiaceae	*Mesosphaerum suaveolens* (L.) Kuntze	43569	1	Lema'as (Loknunuk) Forest Reserve	Northern and Southern America
71	Lythraceae	*Cuphea hyssopifolia* Kunth	43537	5	Murug-Turug Eco Tourism	Northern and Southern America
72	Malvaceae	*Hibiscus fragilis* DC.	43600	2	Kelawat Forest Reserve	Africa
73	Malvaceae	*Hibiscus rosa-sinensis* L.	43525	5	Murug-Turug Eco Tourism	Pacific (Vanuatu)
74	Malvaceae	*Melochia melissifolia* Benth.	44332	3	Sulaman Lake Forest Reserve	Africa and Southern America
75	Malvaceae	*Sida acuta* Burm.f.	44337	3	Sulaman Lake Forest Reserve	Southern America
76	Melastomataceae	*Miconia crenata* (Vahl) Michelang.	43506	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
77	Melastomataceae	*Miconia crenata* (Vahl) Michelang.	43543	5	Murug-Turug Eco Tourism	Northern and Southern America
78	Melastomataceae	*Miconia crenata* (Vahl) Michelang.	43592	2	Kelawat Forest Reserve	Northern and Southern America
79	Moraceae	*Artocarpus heterophyllus* Lam.	43567	1	Lema'as (Loknunuk) Forest Reserve	Asia-Tropical (India)
80	Myrtaceae	*Psidium guajava* L.	44311	3	Sulaman Lake Forest Reserve	Southern America
81	Oleaceae	*Jasminum grandiflorum* L.	43589	2	Kelawat Forest Reserve	Africa, Asia-Temperate and Asia-Tropical (Indian Subcontinent)
82	Onagraceae	*Ludwigia decurrens* Walter	43530	5	Murug-Turug Eco Tourism	Northern and Southern America
83	Onagraceae	*Ludwigia decurrens* Walter	43557	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
84	Oxalidaceae	*Oxalis barrelieri* L.	43599	2	Kelawat Forest Reserve	Southern America

85	Passifloraceae	*Passiflora foetida* L.	44306	3	Sulaman Lake Forest Reserve	Northern and Southern America
86	Piperaceae	*Peperomia pellucida* (L.) Kunth	43548	5	Murug-Turug Eco Tourism	Africa, Northern and Southern America
87	Piperaceae	*Peperomia pellucida* (L.) Kunth	43587	2	Kelawat Forest Reserve	Africa, Northern and Southern America
88	Plantaginaceae	*Plantago major* L.	43526	5	Murug-Turug Eco Tourism	Africa, Asia-Temperate, Asia-Tropical and Europe
89	Plantaginaceae	*Scoparia dulcis* L.	43517	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
90	Plantaginaceae	*Scoparia dulcis* L.	43586	2	Kelawat Forest Reserve	Northern and Southern America
91	Poaceae	*Axonopus compressus* (Sw.) P.Beauv.	43520	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
92	Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	43529	5	Murug-Turug Eco Tourism	Africa and Asia-Temperate
93	Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	44305	3	Sulaman Lake Forest Reserve	Africa and Asia-Temperate
94	Poaceae	*Leersia virginica* Willd.	43502	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
95	Poaceae	*Paspalum urvillei* Steud.	43563	1	Lema'as (Penimbawan) Forest Reserve	Southern America
96	Poaceae	*Poa nemoralis* L.	43591	2	Kelawat Forest Reserve	Africa, Asia-Temperate, Asia-Tropical, Europe and Northern America
97	Polygalaceae	*Senega paniculata* (L.) J.F.B.Pastore & J.R.Abbott	43549	5	Murug-Turug Eco Tourism	Northern and Southern America
98	Polygonaceae	*Antigonon leptopus* Hook. & Arn.	43577	2	Kelawat Forest Reserve	Northern and Southern America
99	Polygonaceae	*Persicaria lapathifolia* (L.) Delarbre	43523	5	Murug-Turug Eco Tourism	Africa, Asia-Temperate, Asia-Tropical, Australasia, Europe and Northern America
100	Rubiaceae	*Coptosperma graveolens* (S.Moore) Degreef	44326	3	Sulaman Lake Forest Reserve	Africa and Asia-Temperate
101	Rubiaceae	*Ixora chinensis* Lam.	44318	3	Sulaman Lake Forest Reserve	Asia-Temperate (China) and Asia-Tropical (Indo-China)

102	Rubiaceae	*Richardia scabra* L.	44316	3	Sulaman Lake Forest Reserve	Northern and Southern America
103	Rubiaceae	*Spermacoce latifolia* Aubl.	43503	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
104	Rubiaceae	*Spermacoce latifolia* Aubl.	43546	5	Murug-Turug Eco Tourism	Northern and Southern America
105	Rubiaceae	*Spermacoce latifolia* Aubl.	43556	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
106	Rubiaceae	*Spermacoce latifolia* Aubl.	44303	2	Kelawat Forest Reserve	Northern and Southern America
107	Rubiaceae	*Spermacoce latifolia* Aubl.	44315	3	Sulaman Lake Forest Reserve	Northern and Southern America
108	Smilacaceae	*Smilax spinosa* Mill.	43579	2	Kelawat Forest Reserve	Northern and Southern America
109	Solanaceae	*Physalis angulata* L.	44323	3	Sulaman Lake Forest Reserve	Southern America
110	Solanaceae	*Solanum torvum* Sw.	43505	5	Monggiland Waterfall Eco Tourism	Southern America
111	Solanaceae	*Solanum torvum* Sw.	43532	5	Murug-Turug Eco Tourism	Southern America
112	Solanaceae	*Solanum torvum* Sw.	43580	2	Kelawat Forest Reserve	Southern America
113	Solanaceae	*Solanum torvum* Sw.	44319	3	Sulaman Lake Forest Reserve	Southern America
114	Verbenaceae	*Lantana camara* L.	43594	2	Kelawat Forest Reserve	Northern and Southern America
115	Verbenaceae	*Lantana camara* L.	44314	3	Sulaman Lake Forest Reserve	Northern and Southern America
116	Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl	43513	5	Monggiland Waterfall Eco Tourism	Northern and Southern America
117	Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl	43558	1	Lema'as (Penimbawan) Forest Reserve	Northern and Southern America
118	Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl	43572	1	Lema'as (Loknunuk) Forest Reserve	Northern and Southern America
119	Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl	44307	3	Sulaman Lake Forest Reserve	Northern and Southern America

120	Verbenaceae	*Stachytarpheta mutabilis* (Jacq.) Vahl	43533	5	Murug-Turug Eco Tourism	Northern and Southern America
121	Verbenaceae	*Stachytarpheta urticifolia* Sims	43512	5	Monggiland Waterfall Eco Tourism	Southern America
122	Verbenaceae	*Stachytarpheta urticifolia* Sims	43542	5	Murug-Turug Eco Tourism	Southern America
123	Verbenaceae	*Stachytarpheta urticifolia* Sims	44301	2	Kelawat Forest Reserve Eco Tourism	Southern America