



MAINSTREAMING OF BIODIVERSITY CONSERVATION
INTO RIVER MANAGEMENT: BEST MANAGEMENT
PRACTICES FOR CRITICAL RIVERINE HABITATS
DEMONSTRATED AT KEY SITES OF NATIONAL
IMPORTANCE: UPPER KLANG BASIN.

COMMUNITY-BASED RIVERINE BIODIVERSITY GUIDEBOOK

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MAINSTREAMING OF BIODIVERSITY CONSERVATION INTO RIVER MANAGEMENT

The Mainstreaming of Biodiversity Conservation into River Management project is a project by Department of Irrigation and Drainage (DID), supported by United Nation Development Programme (UNDP) Malaysia and funded by Global Environment Facility (GEF) and implemented by Global Environment Centre (GEC). The project is focused on addressing the root causes and barriers to the conservation of riverine biodiversity through the development of strategies and promotion of best management practices and capacity building for key stakeholders. The problems range from rapid urbanisation, river pollution, over-extraction of natural resources and others. One common major problem at the proposed river basins is the rapid loss of riverine biodiversity due to habitat degradation and pollution.

The overall project objective is to mainstream biodiversity conservation into riverine landscapes through improved river planning and management practices in Malaysia. The specific objectives of the project are:

Objective 1:

To enhance institutional and technical capacity for riverine biodiversity conservation among key stakeholders.

Objective 2:

To establish pilot and demonstration sites to promote integration of riverine biodiversity conservation into river management.

GEC was engaged by DID Malaysia and UNDP to implement the GEF5 project – Objective 2 at Upper Kinta and Klang River Basin. The implementation at the Upper Klang River Basin carried out to integrate riverine biodiversity and habitat management into planning and implementation of urban river management programmes in the Upper Klang River Basin, Selangor and Kuala Lumpur.

INTRODUCTION TO COMMUNITY-BASED RIVERINE BIODIVERSITY GUIDEBOOK

One of the components to be included in the engagement at the Upper Klang River basin is to empower the communities through various initiatives. The community engagement was to include (i) hands-on environmental education (ii) participatory monitoring (iii) small-scale wetland habitat creation, and (iv) strengthening connectivity to enhance river corridors. In order to support the communities to learn how to carry out simple sampling and identification of the local biodiversity along the riverbank, this riverine guidebook was developed.

This guidebook is intended to be a reference designed for local community and public to learn simple biodiversity identification techniques for flora and fauna at local level. The identification guide includes both aquatic and terrestrial flora and fauna which covers the followings: fish, dragonflies, butterflies, birds, small mammals, aquatic and terrestrial plants.

Community-based Riverine Biodiversity Guidebook involves the sampling methods, brief description on the species and the list of identified species of flora and fauna at the respective sites; Upper stream of Klang River basin at Taman Melawati, urbanised Middle Stream (Rumah Pangsa AU2) and along the Gombak River, which is the main tributary of Klang River at P.A Seri Terengganu. This guidebook is to be used as reference for the communities along the Klang River basin to identify the biodiversity along the riverbank. The identified species are localised and specified to the three pilot sites of the project, where the species observed and identify can be found at any stretches of the Klang River. However, the species to be found and identified at other stretches of the river is not limited to the list of species identified in this guidebook.

INTRODUCTION TO KLANG RIVER BASIN & PROJECT SITES

In Malaysia, rivers play vital roles towards modernisation of main cities within Malaysia. Almost all major cities in Malaysia such as Kuala Lumpur, Ipoh, Melaka and others started with the settlements of humankind nearby the river. One of the most urbanised city in Malaysia is Kuala Lumpur. The main river flowing in the middle of Kuala Lumpur city is Klang River Basin, which is the fourth largest basin in Selangor. The alignment of Klang River is approximately 120km, of which 80km is in Selangor and 40km is in the Kuala Lumpur City Hall (DBKL) area. The estimated total area of Klang River Basin covers 1,290 km². The basin is located in the west coast of Peninsular Malaysia between N 54° 58' 23.1564", W 114° 53' 53.106". The river starts on the western slopes of the main range of Peninsular Malaysia at an altitude of about 1,200 meters and flows south-westwards before being joined by the Gombak River at the heart of Kuala Lumpur.

Klang River flows through Kuala Lumpur and Selangor and eventually flows into the Straits of Malacca. Klang River originates in the highlands, 25km northeast of Kuala Lumpur with headwater catchments still pristine; located between Genting Highlands and the Ampang Hills of the Main Range Ridge; part of the Selangor Heritage Park. There are 11 major tributaries i.e. the Gombak River, Batu River, Kerayong River, Damansara River, Keroh River, Kuyoh River, Penchala River and Ampang River. The two (2) main tributaries of the Klang are the Gombak and Batu rivers with basin areas of 260km² and 145 km² respectively. The upper portion of Klang River Basin provides water supply (with two major dams Batu Dam and Klang Gates Dam) to the people of Klang Valley. There are two (2) dams within Klang River Basin used as the main water source area and as flood retention ponds. The Klang Gates Dam is located at the upstream of Klang River, Batu Dam at the Batu River. The Klang Gates Dam was built in 1959 with the total coverage area of 77.16 km² and still provides a major water source area for Kuala Lumpur population. The Batu dam was built in 1987 at the downstream of the Batu River mainly for flood control with total coverage area of 50 km².

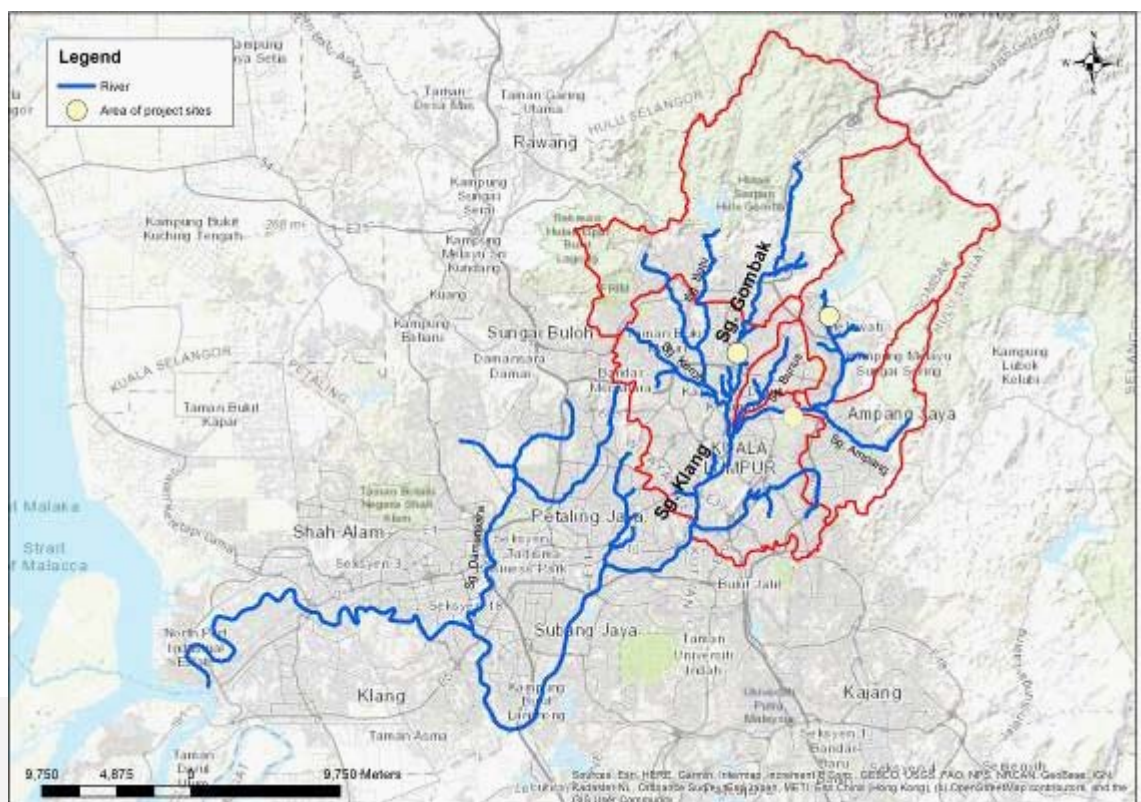
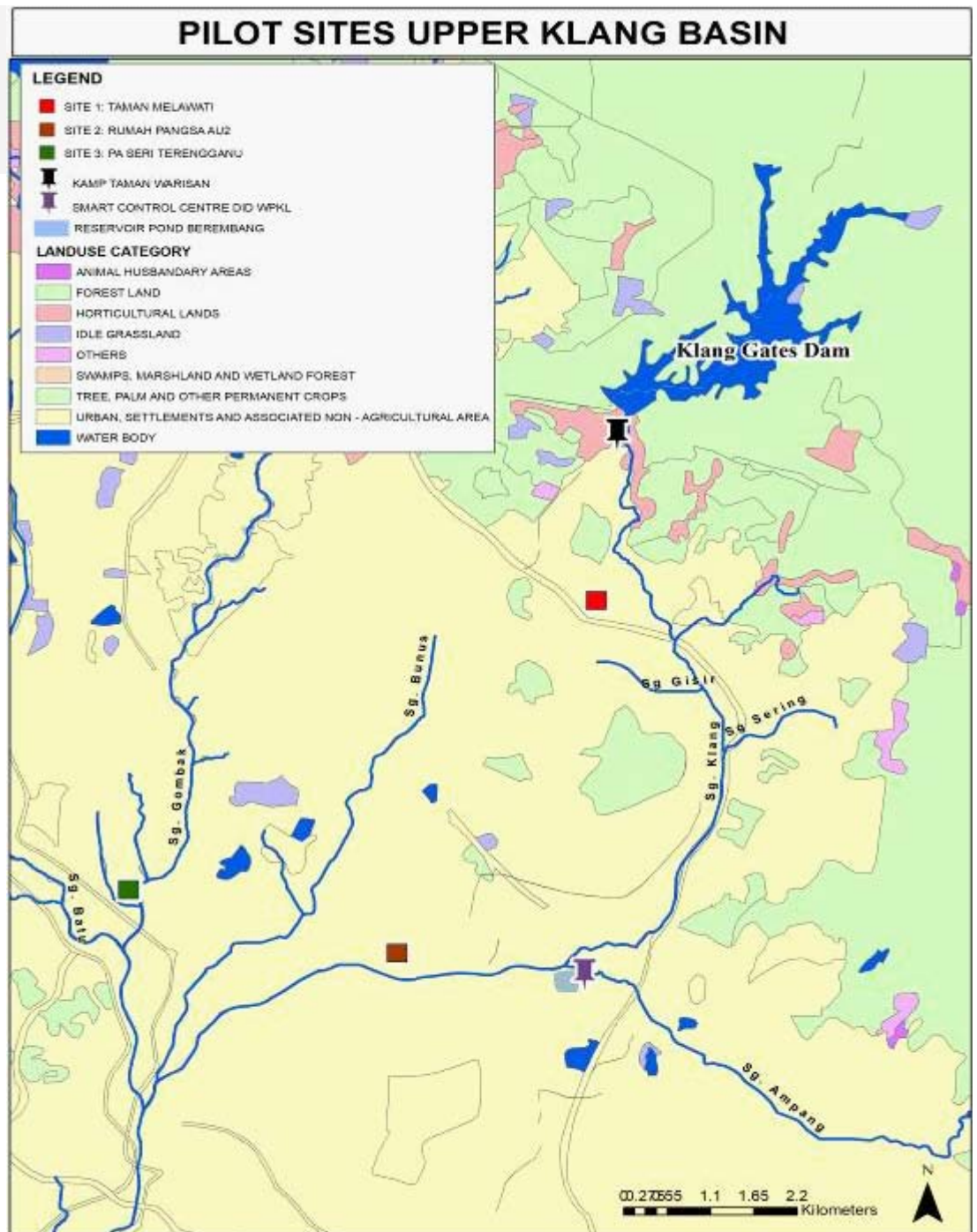


Figure 1 shows the Klang River Basin map.

Figure 2 highlights the location of the pilot projects where the sampling was conducted within the Upper Klang Basin.



This upper catchment area is largely forested and supports high levels of biodiversity. However, this pilot project is focused on the Klang River and its main tributary as they enter the human activity areas including urban development where some of the biodiversity values remain. The project is conducted at the following sites in the upper Klang River Basin, which are included in the ROL programme area: The (1) Upper Klang River below Klang Gates Dam, (2) Klang River flowing through the urbanised Klang Valley, and (3) parts of the Gombak River. These areas are within the respective community groups as stated below:

- 1) Kg Taman Warisan to Taman Melawati (Klang River)
- 2) Rumah Pangsa AU2 (Klang River)
- 3) PA Seri Terengganu (Gombak River)

With more than half of the Klang Basin urbanised, and much of this continuing urban development is taking place on land that is prone to flooding. Furthermore, construction has caused soil erosion and huge discharges of sediments into waterways. The increase in impervious surface area in the watershed further enhances flooding. The water quality in the basin has declined due to high sediment loads from construction and deforestation, river reserve encroachment, large quantities of litter and rubbish, and untreated sewage and industrial and commercial effluents.

The ecology of the river has suffered from the removal of vegetation from the riparian corridor and removal of snags from the watercourses, diminishing habitat for a variety of riparian and aquatic fauna. This has also reduced pollutant filtration capacity and increased the nutrients and other pollutants going into the rivers. The combined effect of poor water quality, high sediment load, and the removal of vegetation from the river corridor has caused a decline in the number and diversity of native flora and fauna. Loss of riverine biodiversity also observed due to channelisation/concretization of riverbed.

The biodiversity sampling focused on the urbanised portion of the Upper Klang Basin by integrating riverine biodiversity management into the implementation with the communities outreach engaged under the River of Life (ROL) Public Outreach Programme (POP). It focuses on both the communities and the initiatives undertaken, the connectivity and how that will benefit the riverine ecology and ecosystem.

SITE 1: KG. TAMAN WARISAN & TAMAN MELAWATI

Site 1 starts from the stretch of stream flowing out of the Klang Gate Dam passing through Kampung Taman Warisan until Taman Melawati (3km stretch of the Sg Klang). The stretch near the Klang Gates Dam before Kampung Taman Warisan is the most pristine stretch of the Klang River, as the it originates directly from the out-flow of the Klang Gates Dam. Habitats surrounding this area consist of a small patch of relatively intact secondary forest bordering the perimeter boundary (fence) of the dam compound, an open (formerly camping) area with scattered large trees and mature trees growing on both sides of the river bank. The stretch passes by the River Open Classroom, River Resource Centre that was established and used for hands-on environmental education and participatory monitoring activities at Kampung Taman Warisan and flows through the River Care Education Centre (RCEC) Taman Melawati, which is currently managed by the Friends of Sg Klang - Taman Melawati River Three (FoSK TMR3).

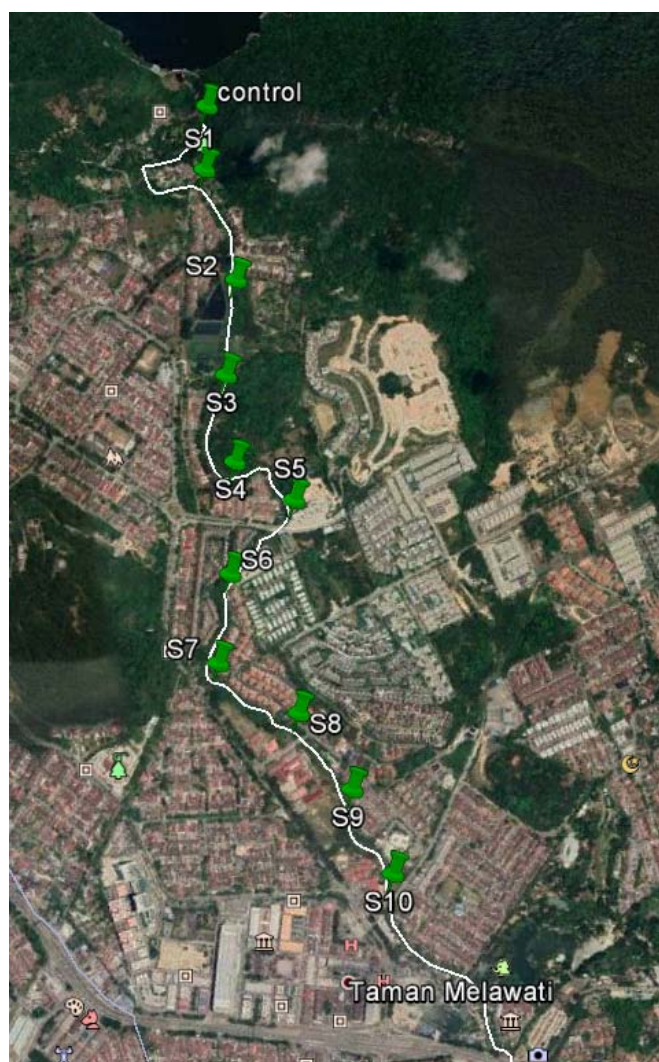
There are many large boulders and smaller rocks in the river, which controls the fast-flowing water released from the dam. The pool just down from the dam out-flow area, is lined with grasses and wetland plants. The lower riverine habitats slightly further down from Klang Gates Dam consisted of more disturbed areas, with housing and small-scale community gardens along the banks of the river. The disturbed habitat types is starting from the village area of Kampung Taman Warisan until the urban housing area of Taman Melawati. Most of the river bank were lined with tall grasses and small shrubs with some tall trees growing along the upper bank areas. At the middle stretch between the dam and Taman Melawati there is a secondary forest patch that looked intact. Along the Taman Melawati housing area, a concrete path has been developed along one side of the riverbank for public recreation and access to a community garden.

Sixty-six (66) species of birds were recorded during the Rapid Assessment Study, at Site 1 all within the least concern category under International Union for the Conservation of Nature (IUCN). Out of this, six (6) types species were migrant species and the remaining 60 other species are categorised as resident species. For the mammal assessment, six (6) species was recorded: three (3) species of monkeys, two (2) species of squirrels and one (1) species of treeshrew. The two (2) species of monkey identified White-thighed Surili *Presbytis siamensis* and Dusky Leaf Monkey; *Trachypithecus obscurus* are categorised as 'Near Threatened' (NT) under the IUCN Red List of Threatened Species (IUCN 2020).

Six (6) species of herpeto-fauna recorded during the survey were Paradise Tree Snake, Green-crested Lizard, Garden Fence Lizard, Common Sun Skink, Water Monitor and Red-eared Slider Turtle. Forty-one (41) butterfly species and fifteen (15) species of dragonfly species were recorded at Site 1.

A relatively higher diversity of fish (compared to other sites) was observed at Site 1, where four (4) out of the five (5) species from the total of 65 fish sampled were native i.e.: Hampala Barb (*Hampala macrolepidota*), Bonylip barb (*Osteochilus vittatus*), Snakehead Murrel (*Channa striatus*) and Marble Goby (*Oxyeleotris marmorata*). As for benthic macroinvertebrates, 289 individuals from 24 families were recorded. The most dominant family, identified are Platycnemididae (Common Damselfly), Euphaeidae (Balloon-tailed Damselfly) and Ampullariidae (Mystery Snail).

Overall of 40 species of wetlands plants from 15 families were recorded within Site 1. Among the species recorded were Alismataceae, Amaranthaceae, Araceae, Araliaceae, Ceratophyllaceae, Commelinaceae, Hydrocharitaceae, Onagraceae, Poaceae, Polygonaceae and Pontederiaceae. As for the riverine and terrestrial plants, 221 species of plants from 80 families were recorded at Site 1. The plant species at Site 1 has a diverse and mixed distribution of herbaceous, native and wild occurrence as well as introduced and planted species.



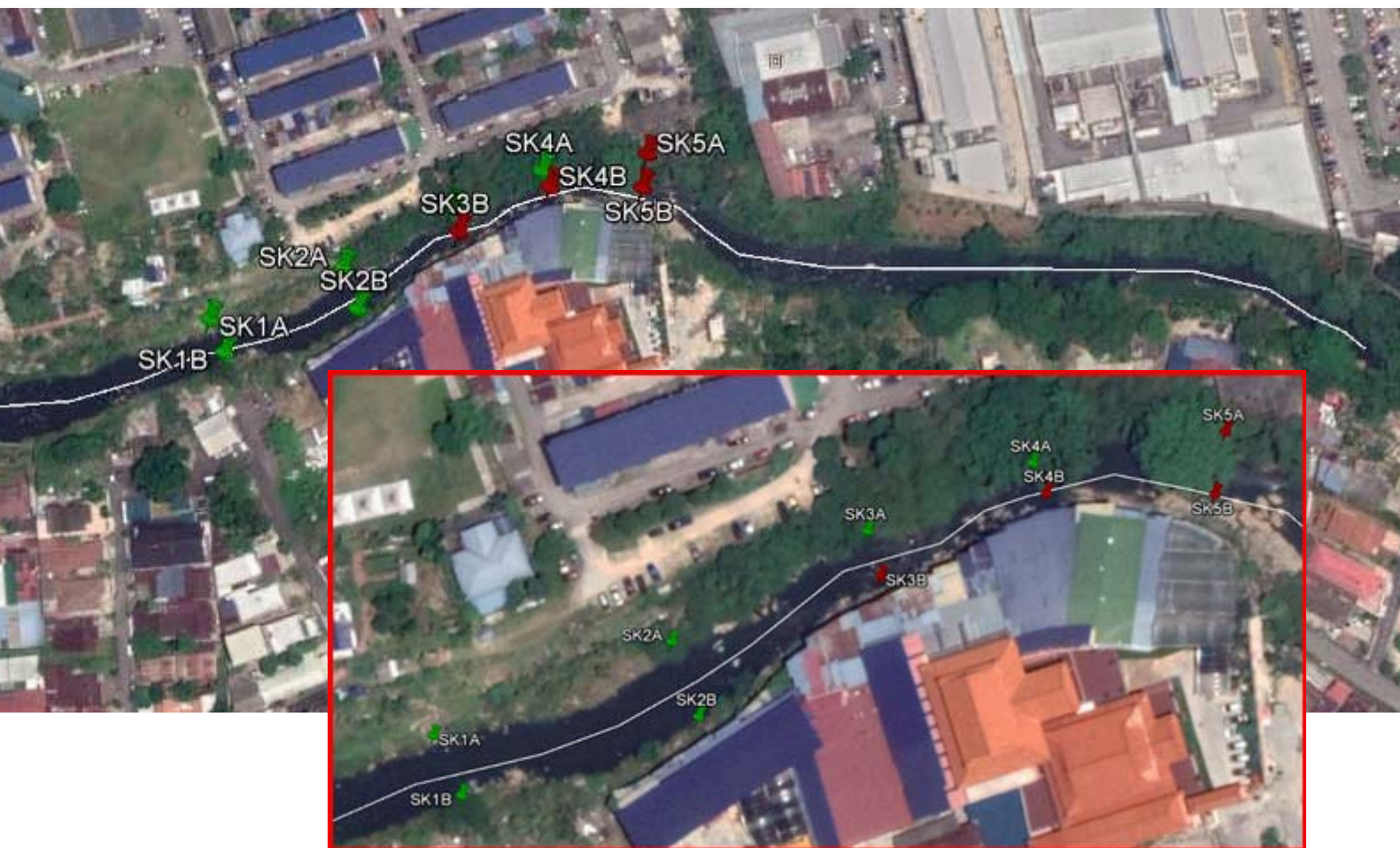
Picture 1: Map of sampling station distribution at Site 1.

SITE 2: RUMAH PANGSA AU2

Site 2 covers an 800m stretch of the Klang River along the AU2 Kebun Komuniti, Taman Keramat begun at the Texas Instruments Malaysia Sdn Bhd to the Surau A-Taqwa Taman Keramat. The stretch passes by the Kebun Komuniti AU2 which was established under the ROLPOP Consolidation Phase and is currently the most active urban community garden within the Klang basin. The riverine areas at this site is covered with tall grasses and shrubs covered most of the riverbanks. Small-scale community garden can be found along the bank on the Rumah Pangsa AU2 side. The opposite river bank is lined by commercial buildings of an industrial area.

Twenty-four (24) bird species was recorded where 21 species are the terrestrial species and three (3) species are the wetland species. Only one (1) mammal species, Plantain Squirrel and herpeto-fauna, water monitor lizard were recorded during the assessment. Two (2) butterfly species, Plain Tiger and Common Grass Yellow and two (2) species of dragonfly, Spine-legged redbolt and Yellow patch lieutenant were recorded at Site 2, categorised as least concern and native species.

The fish study conducted at Site 2 shows 53 fish recorded dominated by Tilapia (*Oreochromis niloticus*). For the benthic macroinvertebrates studies, 58 species from 12 families were observed at Site 2. Pond nail (Lymnaeidae) which have a broad foot with rounded tail tip dominated the site followed by Biting-midge Larvae (Ceratopogonidae). In total, eight (8) species from seven (7) families of wetland plants were recorded within Site 2. The identified species were Alismataceae, Amaranthaceae, Araceae, Araliaceae, Commelinaceae, Poaceae and Pontederiaceae. As for the terrestrial flora assessment, 146 species from 55 families were recorded.



Picture 2: Distribution of sampling station at Site 2.

SITE 3: P.A. SERI TERENGGANU

The third site at the Gombak River which is a main tributary of the Klang River, flows from the Titiwangsa Main Range in Selangor to Kuala Lumpur. Under ROLPOP Phase 5 project, the community have been empowered and actively involved in managing the riverbank and its surrounding area. GEC believe that this site will be a good location to showcase the riverine biodiversity of urban catchment within the limited timeframe under this project. The stretch along the Perumahan Awam (PA) Seri Terengganu covers from the Dewi Sree Karumariamman Temple Sentul to the DBKL (Enforcement Department)'s office. The 300m along Sg Gombak stretch appears to be the most disturbed of the three sites, being located in a high density urban and commercial area in Sentul.

A total of 27 bird species were recorded at Site 3 categorized as resident and least concern species by the IUCN. Five (5) species were wetland species while the rest are the terrestrial species. Three (3) small mammal species recorded at Site 3, were Grey-bellied Squirrel, Plantain Squirrel and Common Treeshrew. Two (2) herpeto-fauna species i.e. garden fence lizard and the water monitor was also recorded. The butterfly diversity recorded six (6) species, which are Plain Tiger, Peacock Pansy, Chocolate Pansy, Pale Grass Blue, Common Darlet and Towny Coster. Four (4) dragonfly species recorded i.e. Scarlet Basker, Orange Skimmer, Crimson Basker and Red-faced Skimmer. As for the fish diversity study, all the 161 fish caught at the site were invasive alien species; suckermouth catfish (2%) and tilapia species (98%).

A total of 108 macroinvertebrates' individuals from seven (7) families were collected at Site 3. The family of Thiaridae (Pagoda snail) makes up more than 70% of the macroinvertebrates found within Site 3. Another family that was found abundance within study area is Gordiidae (hairworm). Thiaridae and Gordiidae are both moderately tolerant to pollutants. Nine (9) species from six (6) families of wetland plants were recorded within Site 3. They are Alismataceae, Amaranthaceae, Araceae, Commelinaceae, Poaceae and Pontederiaceae. The terrestrial plants observed at Site 3 recorded 73 species from 38 families.



Picture 3: The distribution of sampling stations at Site 3.

COMMUNITY-BASED BIODIVERSITY GUIDE

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1.0 FAUNA GUIDE

1.1 AQUATIC FAUNA

a) Benthic Macroinvertebrates

INTRODUCTION

Benthic Macroinvertebrate are small animals living among stones, logs, sediments and aquatic plants on the bottom of the streams, rivers and lakes. They are large enough to see with the naked eye (macro) and have no backbone (invertebrate) Ruchita et al. (2016). Water quality is important to aquatic insects because they breed and live in water. Some terrestrial insects like dragonflies and mayflies lay their eggs in rivers and their young (larvae/nymphs) hatch and live in the water before they become adults. These invertebrates are sensitive and intolerant to poor water quality. Some invertebrates are highly tolerant species and can be found in polluted water. Some invertebrates cannot be used as indicators as they are not really affected by water quality and easily found everywhere. These invertebrates are known as 'non-indicator' species. Benthic macroinvertebrate used to identify the short term pollution effects.

COMMUNITY INVENTORY STUDY: METHODOLOGY

The macroinvertebrate samples were collected using three methods:

1. Netting

An aquatic net used with a combination of drag and kick sampling methods. The sampling techniques were modified and/or adjusted according to the local conditions (accessibility and terrain). The net was drag over along the vegetation and river substrate against the water current.

2. Sift Away

A sieve was used to dig the bottom of the river about 2 - 3cm deep to sift out the sand/soil. The organisms were gently separated from materials such as waste, soil and sand to facilitate the identification process.

3. Peek-A-Boo (Hide and seek)

Stones, leaves and driftwood by the river bank were carefully lifted to look for organism. Organisms found were taken with forceps or fingers gently as to not damage the sample.

All the samples collected were transferred into the sieve and sorted in the white tray at site. Debris, plant materials and small stones inside the sample were checked carefully for any macroinvertebrates attached to the substrates. Upon identification the samples were released back to the river.

Plate 1: The methodology of macrobenthic samplings: (1) Random sampling by rubbing stones and disturbing leaf litters and debris in forested river, (2) kick and random sampling method at accessible vegetated river, (3) drag sampling at widened and concreted river; (4) kick sampling in accessible channelised river; (5) samples were sorted at site; and (6) released back to the river.



BIOLOGICAL WATER QUALITY INDEX (BWQI)

This method uses a simple scoring system for each macroinvertebrate based on their sensitivity to polluted water. The benthic macroinvertebrates are divided under five categories: very sensitive, sensitive, moderate, tolerant and non-indicators.

HOW TO CALCULATE BWQI

1. Take the macroinvertebrates sample and identify the organisms found by referring to the RIVER Ranger 2.0: River Care Action Guidebook.
2. Cross check and record the scores of each macroinvertebrate species and the amount of each species found.
3. Each score represent different tolerant to the water quality.
4. The total score of all macroinvertebrates species and divides by total number of species to get the final score.

Species	Individuals (a)	Score (b)
River prawn	2	8
River Crab	2	3
Mayfly (Nymph)	1	10
Total	5	21
BWQI (B/A)	TOTAL SCORE / TOTAL NUMBER OF SPECIES = 21 / 3 = 7	

Table 1: Example of BWQI Calculation

5. Compare the final scores with the water quality categories as shown in Table 2.

BQWI	Water Quality
7.6 - 10	Very Clean Water
5.1 – 7.5	Rather Clean – Clean Water
2.6 – 5.0	Rather Dirty Water – Average Water
1.0 – 2.5	Dirty Water
0.0 – 0.9	Very Dirty Water

Table 2: BWQI scores with their respective water quality

COMMON GOOD INDICATOR (INTOLERANT SPECIES)



Local name: Damselfly (larvae)
Suborder: Zygoptera
Indicator: Very Sensitive



Local name: Dragonfly (Nymph)
Suborder: Eiprocta
Indicator: Sensitive



Local name: Caddisfly (larvae)
Scientific name: *Trichoptera spp.*
Indicator: Very Sensitive



Local name: Swan Mussel
Scientific name: *Anodonta cygnea*
Indicator: Sensitive



Local name: Stonefly nymphs
Scientific name: *Insecta plecoptera*
Indicator: Very Sensitive



Local name: Common Saucer Bug
Scientific name: *Ilyocoris cimicoides*
Indicator: Very Sensitive

COMMON BAD INDICATOR (TOLERANT SPECIES)



Local name: Red worm
Scientific name: *Eisenia fetida*
Indicator: Tolerant



Local name: Non-biting midge larva
Scientific name: *Chironomidae spp.*
Indicator: Tolerant



Local name: Freshwater hoglouse
Scientific name: *Asellus aquaticus*
Indicator: Tolerant



Local name: Pond snail
Scientific name: *Lymnaea stagnalis*
Indicator: Moderate



Local name: Leeches
Scientific name: *Hirudinea*
Indicator: Moderate



Local name: Pond skater
Scientific name: *Gerridae*
Indicator: Non-Indicator

1.0 FAUNA GUIDE

1.1 AQUATIC FAUNA

b) Fishes

INTRODUCTION

Fish are animals with the backbones. In the river, fish are the most abundant vertebrates. Since fish spend their whole lives in the water, fish are good indicators for water quality for long-term observation and research.

There are two (2) type of fishes; native and invasive species. Native fish species occurred within a river, stream or lake historically. Invasive fish species causes ecological harm in a new environment where it is not native. For example; Tilapia

(invasive species) has a wide range tolerance of water quality and habitat adaptability, with high breeding rate. This particular characteristic allows this species to dominate the ecosystem through overpopulation — hence posing an overwhelming competition for native species to survive, much less thrive. The existence of Amazon sailfin catfish (invasive species) indicates the thriving conditions for tolerant invasive species. Being a benthic species, their natural feeding habits cause slope erosion.

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Netting**

- o Place the net in and face against the water flow.
- o Place caught fish/es in a pail.
- o Record findings in notebook and release the fish/es once done.

- **Casting Net**

- o Throw the casting net against the water flow and wait until it reaches the bottom.
- o Slowly pull in the casting net and place caught fish/es in a pail.
- o Record findings in notebook and release the fish/es once done.

- **Fishing Rod**

- o Choose suitable bait.
- o Cast or pitch the bait and reel in the line.
- o Place caught fish in a pail.
- o Record findings in notebook and release the fish once done.

**This technique is suitable for low flowing water*

NATIVE SPECIES



IMAGE SOURCE: www.petesaquariums.com

Local name: *Lampam Sungai / Tinfoil Barb*

Scientific name: *Barbonymus schwanenfeldii*

IUCN Red List: Least Concern (LC)



IMAGE SOURCE: unknown

Local name: *Hangus Ekor / Bala Shark*

Scientific name: *Balantiocheilos melanopterus*

IUCN Red List: Vulnerable (VU)



IMAGE SOURCE: en.wikipedia.org

Local name: *Belida / Clown Knifefish*

Scientific name: *Chitala chitala*

IUCN Red List: Near Threatened (NT)



IMAGE SOURCE:

redwinebettas.weebly.com

Local name: *Sepilai Merah*

Scientific name: *Betta livida*

IUCN Red List: Endangered (EN)



IMAGE SOURCE: upload.wikimedia.org

Local name: *Temoleh*

Scientific name: *Probarbus jullieni*

IUCN Red List: Critically
Endangered (CE)



IMAGE SOURCE: alchetron.com

Local name: *Kelah / Thai Mahseer*

Scientific name: *Tor tambroides*

IUCN Red List: Data Deficient (DD)



IMAGE SOURCE:

gdetail.image-gmkt.com

Local name: *Ketutu / Goby*

Scientific name: *Oxyeleotris marmorata*

IUCN Red List: Least Concern (LC)



IMAGE SOURCE: cdn.umpan.com.my

Local name: *Puyu / Climbing Perch*

Scientific name: *Anabas testudineus*

IUCN Red List: Data Deficient (DD)



IMAGE SOURCE:

www.tropicalfishsite.com

Local name: *Kelisa / Dragonfish*

Scientific name: *Scleropages formosus*

IUCN Red List: Endangered (EN)



IMAGE SOURCE: upload.wikimedia.org

Local name: *Sebarau*

Scientific name: *Hampala macrolepidota*

IUCN Red List: Least Concern (LC)

INVASIVE SPECIES



IMAGE SOURCE: upload.wikimedia.org

Local name: Peacock Bass

Scientific name: *Cichla ocellaris*



IMAGE SOURCE: www.nobanis.org

Local name: Lee Koh /
Common Carp

Scientific name: *Cyprinus carpio*



IMAGE SOURCE: i.ytimg.com

Local name: Flowerhorn

Scientific name: *Vieja synspila*



IMAGE SOURCE: www.fao.org

Local name: Tilapia / Nile Tilapia

Scientific name: *Oreochromis niloticus*



IMAGE SOURCE: upload.wikimedia.org

Local name: Pacu / Blackfin Pacu

Scientific name: *Colossoma macropomum*



IMAGE SOURCE: upload.wikimedia.org

Local name: Keli Afrika /
African Catfish

Scientific name: *Clarias gariepinus*



IMAGE SOURCE: www.floridamuseum.ufl.edu

Local name: Mayan Cichlid

Scientific name: *Cichlasoma urophthalmus*



IMAGE SOURCE: res.cloudinary.com

Local name: Piranha

Genus: *Catoprin, Pristobrycon, Pygocentrus, Pygopristis, Serrasalmus, Megapiranha*



IMAGE SOURCE: fishroom.co.uk

Local name: Ikan Bandar Raya /
Suckermouth Catfish

Scientific name: *Hypostomus plecostomus*



IMAGE SOURCE: nature.mdc.mo.gov

Local name: Alligator Gar

Scientific name: *Atractosteus spatula*

1.0 FAUNA GUIDE

1.2 TERRESTRIAL FAUNA

a) Small Mammals

INTRODUCTION

Small mammals are mammal species weighing less than 500 grams. Small mammals commonly refer to everything smaller than the largest rodents (eg. capybara) or lagomorphs (rabbits) (Hoffmann et. al., 2010). Most mammals use their four extremities for terrestrial locomotion but some are adapted for life at sea, in the air, on the trees, underground or on two legs. All small mammals give birth to living young and have placenta which enables the feeding of the foetus during gestation. Even though terrestrial small mammals are often abundant, they are rarely observed and their tracks are rarely seen and hard to identify the species (Hoffmann et. al., 2010).

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Observation**
 - o By using naked eyes or binoculars, observe small mammals within the observation area.
 - o Avoid creating disturbance or noises during observation.
 - o Record findings in notebook.
- **Camera**
 - o Photograph the small mammals using a digital or phone camera within the observation area.
 - o Pictures or videos recorded can be used as identification and references purposes.

SMALL MAMMALS DIVERSITY

1. SQUIRREL



Local name: *Kenchong* /Common Treeshrews

Scientific name: *Tupaia glis*

IUCN Red List: Least Concern (LC)



Local name: *Tupai Ekor Pendek*

Scientific name: *Sundasciurus lowii*

IUCN Red List: Least Concern (LC)



Local name: *Tupai Merah* / Plantain Squirrel

Scientific name: *Callosciurus notatus*

IUCN Red List: Least Concern (LC)



Local name: *Tupai Tiga-warna Asia*

Scientific name: *Callosciurus prevostii*

IUCN Red List: Least Concern (LC)



Local name: *Tupai Dada Kelabu* / Grey-Bellied Squirrel

Scientific name: *Callosciurus caniceps*

IUCN Red List: Least Concern (LC)

2. RATS



Local name: *Tikus Belukar* /
Malaysian Field Rat

Scientific name: *Rattus tiomanicus*

IUCN Red List: Least Concern (LC)



Local name: *Tikus Lembah* / Muller
Giant Sunda Rats

Scientific name: *Sundamys muelleri*

IUCN Red List: Least Concern (LC)



Local name: *Tikus Pokok Ekor Hitam*

Scientific name: *Niviventer
cremoriventer*

IUCN Red List: Least Concern (LC)

3. BATS



Local name: *Kelawar* / Lesser-
Short Nosed Fruit Bat

Scientific name: *Cynopterus
brachyotis*

IUCN Red List: Least Concern (LC)



Local name: *Cecadu Sayap Bertitik* /
Spotted-winged Fruit Bat

Scientific name: *Balionycteris
maculata*

IUCN Red List: Least Concern (LC)

4. MONKEYS



Local name: *Lutong Ceneka* /
White-thighed Surili

Scientific name: *Presbytis siamensis*

IUCN Red List: Near Threatened
(NT)



Local name: *Lotong Cengkung* /
Dusky Langur

Scientific name: *Trachypithecus
obscurus*

IUCN Red List: Endangered (EN)



Local name: *Kera* / Long-tailed
Macaque

Scientific name: *Macaca fascicularis*

IUCN Red List: Vulnerable (VU)



Local name: *Lotong Kelabu* /
Silvered Leaf Monkey

Scientific name: *Trachypithecus
cristatus*

IUCN Red List: Vulnerable (VU)



Local name: *Beruk* / Sunda Pig-
Tailed Macaques

Scientific name: *Macaca
nemestrina*

IUCN Red List: Endangered (EN)

1.0 FAUNA GUIDE

1.2 TERRESTRIAL FAUNA

b) Butterflies and Dragonflies

INTRODUCTION

Butterflies are beautiful, flying insects with large scaly wings. Butterflies have six jointed legs, three body parts (head, thorax / chest and abdomen / tail end) covered by tiny sensory hairs, a pair of antennae, compound eyes and an exoskeleton. The four wings and the six legs of the butterfly are attached to the thorax that contains the muscles to make the legs and wings move. Another notable feature of butterflies is their generally short lives. The entire cycle from egg to adult may be only a month or two, and adults may live only a week (Scott, 1992).

Dragonflies are aquatic insects which belong to the insect Order Odonata, are excellent flyers and are characterised by a large head which is occupied by huge eyes and relatively large mouth, a thorax with four wings and six legs attached and an abdomen. Dragonflies can hover, fly at high speed and skillfully in the air in order to defend their territory, feed on live prey and mating (Akira et. al., 1984).

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Observation**
 - o By using binoculars, observe the butterflies and/or dragonflies within the observation area.
 - o Avoid creating disturbance or noises during observation.
 - o Record findings in notebook.
- **Digital Camera**
 - o Photograph the butterflies and/or dragonflies using a digital or phone camera within the observation area.
 - o Pictures or videos recorded can be used as identification and references purposes.
- **Net**
 - o Swing the net slowly at the butterflies and/or dragonflies.
 - o Record finding and release the butterflies and/or dragonflies once done.

BUTTERFLIES DIVERSITY



Local name: Common Grass Yellow

Scientific name: *Eurema hecabe*

IUCN Red List: Not Applicable (NA)



Local name: Common Mormon

Scientific name: *Papilio polytes*

IUCN Red List: Not Applicable (NA)



Local name: Common Palmfly

Scientific name: *Elymnias hypermnestra*

IUCN Red List: Not Applicable (NA)



Local name: Common Sailor

Scientific name: *Neptis hylas*

IUCN Red List: Not Applicable (NA)



Local name: Lesser Grass Blue

Scientific name: *Zizina otis*

IUCN Red List: Not Applicable (NA)



Local name: Magpie Crow

Scientific name: *Euploea radamanthus*

IUCN Red List: Not Applicable (NA)



Local name: Five-Bar Swordtail

Scientific name: *Graphium antiphates*

IUCN Red List: Not Applicable (NA)



Local name: Chocolate Pansy

Scientific name: *Junonia hedonia*

IUCN Red List: Not Applicable (NA)



Local name: Peacock Pansy

Scientific name: *Junonia almana*

IUCN Red List: Least Concern (LC)



Local name: Little Maplet

Scientific name: *Chersonesia peraka*

IUCN Red List: Not Applicable (NA)



Local name: Common Birdwing

Scientific name: *Troides helena*

IUCN Red List: Least Concern (LC)



Local name: Black and White Helen

Scientific name: *Papilio nephelus*

IUCN Red List: Not Applicable (NA)

 : Invasive / non-native species

DRAGONFLY DIVERSITY



Local name: Dark Mouth Dragonfly

Scientific name: *Brachydiplax farinosa*

IUCN Red List: Least Concern (LC)



Local name: Asian Amberwing

Scientific name: *Brachythemis contaminata*

IUCN Red List: Least Concern (LC)



Local name: Scarlet Chaser

Scientific name: *Crocothemis erythraea*

IUCN Red List: Not Applicable (NA)



Local name: Common Clubtail

Scientific name: *Ictinogomphus decoratus*

IUCN Red List: Least Concern (LC)



Local name: Longwinged Skimmer

Scientific name: *Lathrecista asiatica*

IUCN Red List: Least Concern (LC)



Local name: Coppertone Velvetwing

Scientific name: *Neurothemis fluctuans*

IUCN Red List: Least Concern (LC)



Local name: Common Blue Skimmer

Scientific name: *Orthetrum glaucum*

IUCN Red List: Least Concern (LC)



Local name: Orange Skimmer

Scientific name: *Orthetrum testaceum*

IUCN Red List: Least Concern (LC)



Local name: Asian Pintail

Scientific name: *Acisoma panorpoides*

IUCN Red List: Least Concern (LC)



Local name: Down Dropwing

Scientific name: *Trithemis stictica*

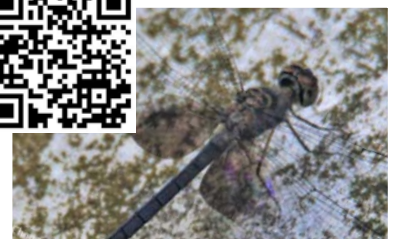
IUCN Red List: Least Concern (LC)



Local name: Indigo Dropwing

Scientific name: *Trithemis festiva*

IUCN Red List: Least Concern (LC)



Local name: Shaded Basker

Scientific name: *Tyriobapta torrida*

IUCN Red List: Least Concern (LC)

1.0 FAUNA GUIDE

1.2 TERRESTRIAL FAUNA

c) Reptiles and Amphibians

INTRODUCTION

The reptile species are crocodiles, alligators, turtles, geckos and chameleons with lizards and snakes species making up the majority of all reptiles. Reptiles are cold-blooded vertebrates and reproduce sexually with the female laying eggs which are covered with a shell. Reptiles have internal fertilisation, amniotic development and epidermal scales covering part or all of their body. Most reptiles have a continuous external covering of epidermal scales (Herndon, 1960).

Amphibians are small vertebrates that need water, or a moist environment to survive. Reliance on the freshwater systems varies significantly among amphibian species and over the life cycle of individual species. The species in this group include frogs, toads, salamanders and newts. Amphibians are ectothermic; the heat they require to maintain physiological processes is derived externally, directly or indirectly from the sun (Lowe, 2009).

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Observation**

- o By using binoculars, observe the reptiles and/or amphibians within the observation area.
- o Avoid creating disturbance or noises during observation.
- o Record findings in notebook.

- **Camera**

- o Photograph the reptiles and/or amphibians using a digital or phone camera within the observation area.
- o Pictures or videos recorded can be used as identification and references purposes.

REPTILE DIVERSITY



Local name: Red-eared Slider Turtle

Scientific name: *Trachemys scripta*

IUCN Red List: Least Concern (LC)



Local name: Paradise Tree Snake

Scientific name: *Chrysopelea paradisi*

IUCN Red List: Least Concern (LC)



Local Name: Green Crested Lizard

Scientific Name: *Bronchocela cristatella*

IUCN Red List: Least Concern (LC)



Local Name: Garden Fence Lizard

Scientific Name: *Calotes versicolor*

IUCN Red List: Least Concern (LC)



Local Name: Water Monitor

Scientific name: *Varanus salvator*

IUCN Red List: Least Concern (LC)

AMPHIBIA DIVERSITY



IMAGE SOURCE: www.majalahsains.com

Local name: Katak Rumput Asia/
Asian Grass Frog

Scientific name: *Fejervarya limnocharis*



IMAGE SOURCE: 4.bp.blogspot.com

Local name: Kodok Buduk Sungai/
Malaysian Asian Toad

Scientific name: *Leptobrachella heteropus*

IUCN Red List: Least Concern (LC)

1.0 FAUNA GUIDE

1.2 TERRESTRIAL FAUNA

d) Birds

INTRODUCTION

Birds are warm-blooded vertebrates with wings and skins covered with feathers. Vertebrates are characterised by having a spinal column and a skull. Warm blooded or homoiothermic (constant temperature) means that their body temperature is kept more or less constant and above that of their surroundings. The wings give birds the power of flight although there are some flightless birds. All birds reproduce by laying eggs which are fertilised internally before laying. The skull and lower jaw are extended forward into mandibles which make a beak. The bird's legs and toes are covered with overlapping scales.

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Observation**

- o By using binoculars, observe the birds within the observation area.
- o Avoid creating disturbance or noises during observation.
- o Record findings in notebook.

- **Camera**

- o Photograph the birds using a digital or phone camera within the observation area.
- o Pictures or videos recorded can be used as identification and references purposes.



Local name: *Helang Hindek/*
Changeable Hawk Eagle

Scientific name: *Nisaetus cirrhatus*

IUCN Red List: Least Concern (LC)



Local name: *Cencala Hitam Putih/*
Pied Fantail

Scientific name: *Rhipidura javanica*

IUCN Red List: Least Concern (LC)



Local name: *Pekaka Belukar/*
White Throated Kingfisher

Scientific name: *Halcyon*
smyrnensis

IUCN Red List: Least Concern (LC)

 : Invasive / non-native species



Local name: *Pucong Kecil*/Little Heron

Scientific name: *Butorides striatus*

IUCN Red List: Least Concern (LC)



Local name: *Ciak Pokok* / Eurasian Tree Sparrow

Scientific name: *Passer montanus*

IUCN Red List: Least Concern (LC)



Local name: *Belatuk Belacan Kecil* / Sunda Pygmy Woodpecker

Scientific name: *Yungipicus moluccensis*

IUCN Red List: Least Concern (LC)



Local name: *Gagak Paruh Lampai*/ Slender-billed Crow

Scientific name: *Corvus enca*

IUCN Red List: Least Concern (LC)



Local name: *Perling Mata Merah*/ Asian Glossy Starling

Scientific name: *Aplonis panayensis*

IUCN Red List: Least Concern (LC)



Local name: *Merbuk*/ Zebra Dove

Scientific name: *Geopelia striata*

IUCN Red List: Least Concern (LC)

2.0 FLORA GUIDE

2.1 AQUATIC FLORA

a) Aquatic Plants / Algae

INTRODUCTION

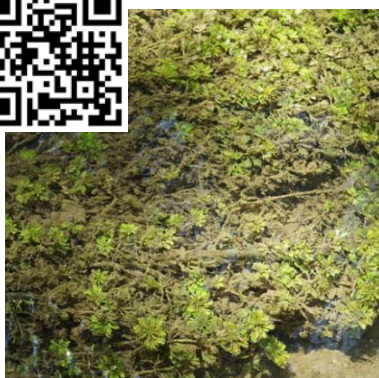
Aquatic plants have adapted to living in aquatic environment (saltwater or freshwater). They are referred to as hydrophytes or macrophytes to distinguish them from algae and other microphytes. A macrophytes is a plant that grows in or near water and is either emergent, submergent or floating. Most aquatic plants live in freshwater such as in lakes, rivers, reservoirs, canals, ponds and streams. They improve the water quality by absorbing nutrients with their effective root system, which makes them important in bioremediation using phytoremediation as a natural and cost-effective way to treat wastewater. They not only retain nutrients by biomass uptake, but also increases sedimentation. These are utilised for nutrient and metal removal from water in the forms of Constructed Wetland or retention ponds because of their fast growth rates, simple requirements, and ability to accumulate biogenic elements and toxic substance (Gupta *et al.*, 2012).

Most suitable aquatic plants for the bioremediation are water hyacinth, water lettuce and vetiver grass as they show potential in the removal of total suspended solid, dissolved solids, electrical conductivity, biochemical oxygen demand, chemical oxygen demand, nitrogen, phosphorus, heavy metals and many other contaminants (Rezania *et al.*, 2015).

COMMUNITY INVENTORY STUDY: METHODOLOGY

• Methodology

- o Observe and identify the aquatic plants/algae within the observation area.
 - o Record characteristics and location of the aquatic plants/algae in notebook.
 - o Photograph the aquatic plants/algae and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.*



Local name: Coontail

Scientific name: *Ceratophyllum demersum*

IUCN Red List: Least Concern (LC)



Local name: Rumpai Air/Water-Thyme

Scientific name: *Hydrilla verticillata*

IUCN Red List: Least Concern (LC)

 : Invasive / non-native species

2.0 FLORA GUIDE

2.1 AQUATIC FLORA

b) Wetland Plants

INTRODUCTION

Wetland plants specifically grow in water or adapted to grow in soil that is periodically flooded with water. They are referred to as “hydrophytes”. Wetland plants provide food and critical habitat for organisms that live in or near water resources, such as algae, macroinvertebrates, amphibians, fishes and birds. Wetland plants can also improve water quality through the uptake of nutrients, metals and other contaminants. These plants are important in stabilising the shorelines from erosion and mitigating the impacts of flooding events (Ralph, 1993).

COMMUNITY INVENTORY STUDY: METHODOLOGY

• Methodology

- o Observe and identify the wetland plants within the observation area.
 - o Record characteristics and location of the wetland plants in notebook.
 - o Photograph the wetland plants and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.



Local name: *Selada Sawah / Air*
Scientific name: *Halimeda discoidea*
IUCN Red List: Not Applicable (NA)



Local name: *Kiambang / Water Lettuce*
Scientific name: *Pistia stratiotes*
IUCN Red List: Least Concern (LC)



Local name: *Greater Kyllinga*
Scientific name: *Kyllinga polyphylla*
IUCN Red List: Not Evaluated (NE)



Local name: *Taro Gergasi*
Scientific name: *Colocasia esculenta*
IUCN Red List: Not Evaluated (NE)



Local name: *Teratai/Lotus*
Scientific name: *Nelumbo nucifera*
IUCN Red List: Not Evaluated (NE)



Local name: *Ekor Kucing*
Scientific name: *Utricularia punctata*
IUCN Red List: Least Concern (LC)

2.0 FLORA GUIDE

2.2 SEMI AQUATIC FLORA

a) Riverine Trees

INTRODUCTION

Riverine flora is a type of forest ecology that are most dominant along waterways. They are found on the lower flood plains along the river's edge. The dominant species of the riverine flora are Poaceae, Euphorbiaceae, Rubiaceae, Cyperaceae and Fabaceae. They are deciduous species that can tolerate high volume of moisture and flooding. They are distinguishable by their thick and larger pointed leaves.

COMMUNITY INVENTORY STUDY: METHODOLOGY

• Methodology

- o Observe and identify the riverine trees within the observation area.
 - o Record characteristics and location of the riverine trees in notebook.
 - o Photograph the riverine trees and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.*



Local name: *Pokok Kacang Pinang*

Scientific name: *Areca catechu*

IUCN Red List: Not Evaluated (NE)



Local name: *Pokok Nipah*

Scientific name: *Nypa fruticans*

IUCN Red List: Least Concern (LC)



Local name: *Pokok Kundoh*

Scientific name: *Macaranga tanarius*

IUCN Red List: Least Concern (LC)



Local name: *Pokok Buah Salak*

Scientific name: *Salacca zalacca*

IUCN Red List: Not Evaluated (NE)



Local name: *Pokok Buluh*

Scientific name: *Gigantochloa ligulata*

IUCN Red List: Not Evaluated (NE)

 : Invasive / non-native species

2.0 FLORA GUIDE

2.3 TERRESTRIAL TREES

a) Fruit Trees

INTRODUCTION

Fruit trees are flowering plants that produce edible fruit (for humans and some animals) which are the ripened ovaries of flowers containing one or more seeds. Fruit trees can withstand the variability of rainfall better than annual crops due to their deep root systems and the perennial growth habit. Diversification into fruit tree-based systems generates high returns to the farmer and creates opportunities for value addition (Fereres and Evans, 2006).

COMMUNITY INVENTORY STUDY: METHODOLOGY

• Methodology

- o Observe and identify the fruit trees within the observation area.
 - o Record characteristics and location of the fruit trees in notebook.
 - o Photograph the fruit trees and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.



Local name: *Nangka / Jackfruit*

Scientific name: *Artocarpus heterophyllus*

IUCN Red List: Not Evaluated (NE)



Local name: *Jambu Batu / Guava*

Scientific name: *Psidium guajava*

IUCN Red List: Not Evaluated (NE)



Local name: *Sukun*

Scientific name: *Artocarpus altilis*

IUCN Red List: Not Evaluated (NE)



Local name: *Pisang Tandok*

Scientific name: *Musa paradisiaca*

IUCN Red List: Not Evaluated (NE)



Local name: *Jambu Air / Watery Rose Apple*

Scientific name: *Syzygium aqueum*

IUCN Red List: Not Evaluated (NE)



Local name: *Kedondong*

Scientific name: *Spondias dulcis*

IUCN Red List: Not Evaluated (NE)



Local name: *Durian Kampung*

Scientific name: *Durio zibethinus*

IUCN Red List: Not Evaluated (NE)

■ : Invasive / non-native species

2.0 FLORA GUIDE

2.3 TERRESTRIAL TREES

b) Herbs

INTRODUCTION

Herbs are commonly found growing in our midst as a source of food / seasoning or medical use as they have nutritious elements in treating diseases (Jones, 1996), or for spiritual reasons. Herbs are small plants that have a fleshy or juicy stem when they are young. The stems of some herbs will develop hard, woody tissues when they grow old. Most of them are perennials species that can live more than two years instead of every season change.

COMMUNITY INVENTORY STUDY: METHODOLOGY

• Methodology

- o Observe and identify the herbs within the observation area.
 - o Record characteristics and location of the herbs in notebook.
 - o Photograph the herbs and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.



Local name: *Kanching Baju*

Scientific name: *Corchorus capsularis*

IUCN Red List: Not Evaluated (NE)



Local name: *Rumput Siam*

Scientific name: *Scleria sumatrensis*

IUCN Red List: Not Evaluated (NE)



Local name: *Bias-bias*

IUCN Red List: Not Applicable (NA)



Local name: *Asma*

IUCN Red List: Not Applicable (NA)



Local name: *Monkey's Potato*

Scientific name: *Plectranthus monostachyus*

IUCN Red List: Not Evaluated (NE)



Local name: *Rumput Israel*

Scientific name: *Asystasia gangetica*

IUCN Red List: Not Evaluated (NE)

2.0 FLORA GUIDE

2.3 TERRESTRIAL TREES

c) Ferns

INTRODUCTION

Fern (class Polypodiopsida) is a non-flowering vascular plant that possesses true roots, stems, and complex leaves and can reproduce by spores. The ferns are extremely diverse in habitat, form, and reproductive methods. Their size range from minute, filmy plants that are 1-1.2 cm tall to huge tree ferns that grow to 10-25 metres in height. Some are twining and vinelike; others float on the surface of ponds.

COMMUNITY INVENTORY STUDY: METHODOLOGY

- **Methodology**

- o Observe and identify the ferns within the observation area.
 - o Record characteristics and location of the ferns in notebook.
 - o Photograph the ferns and its surrounding using a digital or phone camera.
 - o For unknown species, search and compare using/through relevant apps or websites.
 - o Pictures or videos recorded can be used as identification and references purposes.
- * Collect samples as and when needed only.



Local name: *Paku Tertutup* /
Rabbit Foot Fern

Scientific name: *Davallia denticulata*

IUCN Red List: Least Concern (LC)



Local name: *Daun Semun* / Bird's
Nest Fern

Scientific name: *Asplenium nidus*

IUCN Red List: Not Evaluated (NE)



Local name: *Paku Halberd*

IUCN Red List: Not Applicable



Local name: *Paku Pedang Gergasi*

IUCN Red List: Not Applicable

ANNEX

The inventory reports for the biodiversity presented at the Upper Klang Basin were derived from three (3) different sites. The first site was from Kampung Taman Warisan until Taman Melawati (Klang River); the second site was from Rumah Pangsa AU2 (Klang River) and the third Site at Perumahan Awam Seri Terengganu (Gombak River). The sampling and survey conducted at the source of Klang River after the Klang Gates Dam were labelled as control sampling stations.

The Biodiversity Survey at Upper Klang River Basin has been carried out by GEC teams and with the support from the experts of the respective fields. The community representatives too have supported in the sampling and inventory study. The study team, their roles and sampling details are as the following:

Type	Team members	Date
Small Mammals, birds and herpetofaunas	Mike Chong , Jason Tan and GEC team	18-20 May 2020
Habit, habitats and occurrence of flora diversity	Dr. Khatijah Rambe and GEC team	18-19 May and 21-22 May 2020
Benthic biodiversity study	GEC team	18-21 and 28 May and on 4 June 2020
Fish study	GEC team and Local Communities	18-20, 22, 27 May and 4 June 2020

The informations provided in this Community-based Riverine Biodiversity Guidebook is only for use to the local communities for their practices monitoring the biodiversity flora and fauna. No part of the publication can be reproduced or used for any means without prior permission from Department of Irrigation and Drainage, Malaysia (DID).



Picture 1: Site 1 (Zone 1) Kampung Taman Warisan to Jalan Melawati 4 (Nadaya Residential).



Picture 2: Site 1 (Zone 2) Melawati Hillside Apartment to RCEC Taman Melawati.



Picture 3: Site 1 (Zone 3) Jalan Melawati 5 to Masjid Al-Hidayah (Jalan Melawati).



Picture 4: The aerial view of Site 2 located at Rumah Pangsa AU2.



Picture 5: The white stripes shows the secondary forest located at Site 3.

BENTHIC MACROINVERTEBRATES

CONTROL SITES:

KG. TAMAN WARISAN

Family	Common Name	Total Individuals
Atyidae	Freshwater shrimp	14
Lymnaeidae	Pond snail	2
Ampullariidae	Mystery snail	5
Leibellulidae	Common dragonfly	2
Aeshnidae	One-tailed dragonfly	1
Coenap. A Seri Terengganuionidae	Common damselfly	8
Nepidae	Water stick insect	2
Gerridae	Pond skater	1
Hydrometridae	Water measurer	1
TOTAL: 9		36

Table 3: List of aquatic macroinvertebrates collected for biological indicator study at Control Site (Taman Warisan)

SITE 1: TAMAN MELAWATI (ZONE 1)

Family	Common Name	Total Individuals
Leibellulidae	Common dragonfly	12
Platycnemididae	Common damselfly	54
Ampullariidae	Mystery snail	13
Atyidae	Freshwater shrimp	2
Dugesiidae	Flatworm	3
Lymnaeidae	Pond snail	16
Thiaridae	Pagoda snail	2
Planorbidae	Ramshorn snail	6
Chironomidae	Non-biting midge larvae	2
Heptageniidae	Flattened mayfly	1
Baetidae	Swimming mayfly	1
Hirudinidae	Leech	1
TOTAL: 12		113

Table 4: List of aquatic macroinvertebrates collected for biological indicator study at Zone 1 of Site 1 (Taman Melawati)

SITE 1: TAMAN MELAWATI (ZONE 2)

Family	Common Name	Total Individuals
<i>Ampullariidae</i>	Mystery snail	26
<i>Baetidae</i>	Swimming Mayfly	3
<i>Ephemeridae</i>	Burrowing Mayfly	1
<i>Ceratopogonidae</i>	Biting Midge Larvae	3
<i>Lymnaeidae</i>	Pond snail	32
<i>Leibellulidae</i>	Common dragonflies	2
<i>Euphaeidae</i>	Balloon-tailed damselfly	26
<i>Hirudinidae</i>	Leech	2
<i>Culicidae</i>	Mosquito larva	4
<i>Planorbidae</i>	Ramshorn snail	4
<i>Thiaridae</i>	Pagoda snail	4
<i>Platycnemididae</i>	Common damselfly	4
<i>Elmidae</i>	Riffle beetle larva	2
<i>Tipulidae</i>	Cranefly larva	3
<i>Simuliidae</i>	Blackfly larva	1
TOTAL: 15		117

Table 5: List of aquatic macroinvertebrates collected for biological indicator study at Zone 2 of Site 1 (Taman Melawati).

SITE 2: RUMAH PANGSA AU2

Family	Common Name	Total Individuals
<i>Leibellulidae</i>	Common dragonflies	4
<i>Euphaeidae</i>	Balloon-tailed damselfly	2
<i>Lymnaeidae</i>	Pond snail	18
<i>Planorbidae</i>	Ramshorn snail	1
<i>Ampullariidae</i>	Mystery snail	1
<i>Tubificidae</i>	Worm	4
<i>Gordiidae</i>	Hairworm	4
<i>Hirudinidae</i>	Leech	2
<i>Ceratopogonidae</i>	Biting-midge larva	13
<i>Simuliidae</i>	Blackfly larva	1
<i>Chironomidae</i>	Non-biting midge larva	3
<i>Dugesidae</i>	Flatworm	6
TOTAL: 12		58

Table 7: List of aquatic macroinvertebrates collected for biological indicator study at Site 2 (Rumah Pangsa AU2).

SITE 1: TAMAN MELAWATI (ZONE 3)

Family	Common Name	Total Individuals
<i>Euphaeidae</i>	Balloon-tailed damselfly	17
<i>Ampullariidae</i>	Mystery snail	23
<i>Lymnaeidae</i>	Pond snail	7
<i>Thiaridae</i>	Pagoda snail	3
<i>Platycnemididae</i>	Common damselfly	1
<i>Leibellulidae</i>	Common dragonflies	3
<i>Ceratopogonidae</i>	Biting-midge larva	4
<i>Ephemeridae</i>	Burrowing mayfly	1
TOTAL: 8		59

Table 6: List of aquatic macroinvertebrates collected for biological indicator study at Zone 3 of Site 1 (Taman Melawati).

SITE 3: P.A SERI TERENGGANU

Family	Common Name	Total Individuals
<i>Thiaridae</i>	Pagoda snail	77
<i>Lymnaeidae</i>	Pond snail	4
<i>Planorbidae</i>	Ramshorn snail	1
<i>Ampullariidae</i>	Mystery snail	4
<i>Gordiidae</i>	Hairworm	15
<i>Dugesidae</i>	Flatworm	2
<i>Chironomidae</i>	Bloodworm	5
TOTAL: 7		108

Table 8: List of aquatic macroinvertebrates collected for biological indicator study at Site 3 (P.A Seri Terengganu).

FISHES

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family	Species	Common Name	No. of Fishes	Percentage (%)	Area
Cyprinidae	<i>Hampala macrolepidota</i>	Hampala Barb	2	0.7	SITE 1
	<i>Osteochilus vittatus</i>	Bonylip barb	1	0.3	SITE 1
Channidae	<i>Channa striatus</i>	Snakehead Murrel	2	0.7	SITE 1
Butidae	<i>Oxyeleotris marmorata</i>	Marble Goby	1	0.3	SITE 1
Cichlidae	<i>Oreochromis niloticus</i>	Nile Tilapia <i>Breakdown: Site 1: 77 (Zone 1: 59, Zone 2: 11 and Zone 3: 7), Site 2: 53, Site 3: 159</i>	289	97.3	SITE 1, SITE 2, SITE 3
Loricariidae	<i>Pterygoplichtys pardalis</i>	Amazon sailfin catfish	2	0.7	SITE 3

Table 9: Summary of fish diversity sampled at each sites.

SMALL MAMMALS

Site 1: Taman Melawati, Sg Klang	6 species
Site 2: Rumah Pangsa AU2, Sg Klang	1 species
Site 3: Perumahan Awam Seri Terengganu, Sg Gombak	3 species

Table 10: Summary of small mammals diversity sampled at all three sites.

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family and species common name	Scientific name	Status	IUCN	Area
CERCOPITHECIDAE: OLD WORLD MONKEYS				
White-thighed Surili (formerly Banded Leaf Monkey)	<i>Presbytis siamensis</i>	R	NT	SITE 1
Dusky Leaf Monkey	<i>Trachypithecus obscurus</i>	R	NT	SITE 1
Long-tailed Macaque	<i>Macaca fascicularis</i>	R	LC	SITE 1
SCIURIDAE: SQUIRRELS				
Red-Bellied Tree Squirrel	<i>Callosciurus erythraeus</i>	R	LC	SITE 1, SITE 3
Plantain Squirrel	<i>Callosciurus notatus</i>	R	LC	SITE 1, SITE 2, SITE 3
TUPAIDAE: TREESHREWS				
Common Treeshrew	<i>Tupaia glis</i>	R	LC	SITE 1, SITE 3

Table 11: Small mammals recorded at Klang River and Gombak River from 18 - 20 May 2020.

R: RESIDENT SPECIES

LC: LEAST CONCERN
NT: NEAR THREATENED

BUTTERFLY

A total of 45 butterfly species from 11 families were recorded during the surveys at Klang and Gombak Rivers. The total number of species of butterflies and families are shown in Table 13.

Site 1: Taman Melawati, Sg Klang	41 species
Site 2: Rumah Pangsa AU2, Sg Klang	2 species
Site 3: Perumahan Awam Seri Terengganu, Sg Gombak	3-4 species

Table 12: Summary of butterfly diversity sampled at all three sites.

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family, subfamily and species common name	Scientific name	Status	IUCN	Area
PAPILLIONIDAE: PAPILLIONINAE				
Tailed Jay	<i>Graphium agamemnon</i>	N	LC	SITE 1
Common Jay	<i>Graphium doson evemonides</i>	N	LC	SITE 1
Lesser Jay	<i>Graphium evemon eventus</i>	N	LC	SITE 1
Common Bluebottle	<i>Graphium sarpedonluctatus</i>	N	LC	SITE 1
Lime Butterfly	<i>Papilio demoleus malayanus</i>	N	LC	SITE 1
Black & White Helen	<i>Papilio nephelus sunatus</i>	N	LC	SITE 1
Common Mormon	<i>Papilio polytes romulus</i>	N	LC	SITE 1
Five-bar Swordtail	<i>Graphium antiphates itamputi</i>	N	LC	SITE 1
Common Birdwing	<i>Troides helena cerberus</i>	N	LC	SITE 1
PIERIDAE: COLIADINAE				
Common Emigrant	<i>Catopsilia pomona pomona</i>	N	LC	SITE 1
No Brand Grass Yellow	<i>Eurema brigitta senna</i>	N	LC	SITE 1
Common Grass Yellow	<i>Eurema hecabe contubernalis</i>	N	LC	SITE 1, SITE 2
Chocolate Grass Yellow	<i>Eurema sari sodalis</i>	N	LC	SITE 1
PIERIDAE: PIERINAE				
Striped Albatross	<i>Apias libythea olferna</i>	N	LC	SITE 1
Chocolate Albatross	<i>Apias lyncida vasava</i>	N	LC	SITE 1
NYMPHALIDAE: DANAINAE				
Plain Tiger	<i>Danaus chrysippus</i>	N	LC	SITE 2, SITE 3
Blue Glassy Tiger	<i>Ideopsis vulgaris macrina</i>	N	LC	SITE 1
Magpie Crow	<i>Euploea radamanthus</i>	N	LC	SITE 1
NYMPHALIDAE: LIMENITIDINAE				
Common Sailor	<i>Neptis hylas papaja</i>	N	LC	SITE 1
Chocolate Sailor	<i>Neptis harita</i>	N	LC	SITE 1
Knight	<i>Lebadea martha parkeri</i>	N	LC	SITE 1
NYMPHALIDAE: NYMPHALINAE				
Jacintha Eggfly	<i>Hypolimnas bolina jacintha</i>	N	LC	SITE 1
Peacock Pansy	<i>Junonia almana javana</i>	N	LC	SITE 1, SITE 3
Chocolate Pansy	<i>Junonia hedonia ida</i>	N	LC	SITE 1, SITE 3
HELICONINAE				
Tawny Coster	<i>Acraea terpsicore</i>	N	LC	SITE 3

Family, subfamily and species common name	Scientific name	Status	IUCN	Area
NYMPHALIDAE: SATYRINAE				
Common Palmfly	<i>Elymnias hypermnestra agina</i>	N	LC	SITE 1
Green Oakblue	<i>Arhopala eumolpus maxwelli</i>	N	LC	SITE 1
Burmese Bushbrown	<i>Mycalesis perseoides</i>	N	LC	SITE 1, SITE 2
Common Bushbrown	<i>Mycalesis janardana sagittigera</i>	N	LC	SITE 1
Purple Bushbrown	<i>Mycalesis orseis nautilus</i>	N	LC	SITE 1
Dark Brand Bushbrown	<i>Mycalesis mineus macromalayana</i>	N	LC	SITE 1
Malayan Five Ring	<i>Ypthima horsfieldi humei</i>	N	LC	SITE 1
LYCAENIDAE: LYCAENINAE				
Common Posy	<i>Drupadia ravindra moorei</i>	N	LC	SITE 1
Plush	<i>Sithon nedymond nedymond</i>	N	LC	SITE 1
Indian Cupid	<i>Everus lacturnus rileyi</i>	N	LC	SITE 1
Pale Grass Blue	<i>Zizeeria maha selica</i>	N	LC	SITE 3
RIODINIDAE: RIODININAE				
Malay Punchinello	<i>Zemeros emesoides emesoides</i>	N	LC	SITE 1
Punchinello	<i>Zemeros flegyas</i>	N	LC	SITE 1
HESPERIIDAE: HESPERIINAE				
Starry Bob	<i>Iambrix stellifer</i>	N	LC	SITE 1
Full Stop Swift	<i>Caltoris cormosa</i>	N	LC	SITE 1
Shiny Velvet Bob	<i>Koruthaialos rubecula sindu</i>	N	LC	SITE 1
Lesser Dart	<i>Potanthus omaha omaha</i>	N	LC	SITE 1, SITE 3
Large Dart	<i>Potanthus serina</i>	N	LC	SITE 1
Spotted Grass Dart	<i>Taractrocera ardonia lamia</i>	N	LC	SITE 1
Common Dartlet	<i>Oriens gola pseudolus</i>	N	LC	SITE 3

Table 13: Butterflies recorded at the Klang and Gombak Rivers from 18 – 20 May 2020.

N: NATIVE SPECIES

LC: LEAST CONCERN

DRAGONFLY

A total of 20 dragonfly species were recorded at the Klang and Gombak Rivers during the surveys. The dragonfly species diversity is shown in Table 15.

Site 1: SITE 1, Sg Klang	15 species
Site 2: SITE 2, Sg Klang	2 species
Site 3: Perumahan Awam Seri Terengganu, Sg Gombak	4 species

Table 14: Summary of dragonfly diversity sampled at all three sites.

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family, subfamily and species common name	Scientific name	Status	IUCN	Area
GOMPHIDAE				
Common flangetail / Indian common clubtail	<i>Ictinogomphus decoratus</i> (<i>decorates malaenops</i>)	N	LC	SITE 1
LIBELLULIDAE				
Trumpet tail (Asian pintail)	<i>Acisoma panorpoides</i>	N	LC	SITE 1

Family, subfamily and species common name	Scientific name	Status	IUCN	Area
Blue dasher (Yellow patch lieutenant)	<i>Brachydiplax chalybea</i>	N	LC	SITE 2
Black-tailed dasher (Hyaline lieutenant)	<i>Brachydiplax farinosa</i>	N	LC	SITE 1
Common amberwing / Asian amberwing	<i>Brachythemis cantaminata</i>	N	LC	SITE 1
Common scarlet / Eastern scarlet darter	<i>Crocothemis servilia</i>	N	LC	SITE 1
Scarlet P.A Seri Terengganuenadier / Longwinged skimmer	<i>Lathrecista asiatica</i>	N	LC	SITE 1
Crimson basker / Coastal glider	<i>Macrodiplax cora</i>	N	LC	SITE 3
Coppertone velvetwing / Common parasol	<i>Neurothemis fluctuans</i>	N	LC	SITE 1
Broad red skimmer / Variable sentinel	<i>Orchithemis pulcherrima</i>	N	LC	SITE 1
Spine-tufted skimmer / Redfaced skimmer	<i>Orthetrum chrysis</i>	N	LC	SITE 3
Common blue skimmer	<i>Orthetrum glaucum</i>	N	LC	SITE 1
Variegated P.A Seri Terengganueen skimmer (Sober skimmer)	<i>Orthetrum Sabina</i>	N	LC	SITE 1
Scarlet skimmer / Orange skimmer	<i>Orthetrum testaceum</i>	N	LC	SITE 3
Common redbolt / Rufous marsh glider	<i>Rhodothermis rufa</i>	N	LC	SITE 1, SITE 2
Yellow-barred flutterer	<i>Rhyothemis phyllis</i>	N	LC	SITE 1
Crimson dropwing / Down dropwing	<i>Trithemis aurora</i>	N	LC	SITE 1
Indigo dropwing	<i>Trithemis festiva</i>	N	LC	SITE 1
Shaded basker	<i>Tyriobapta torrida</i>	N	LC	SITE 1
Scarlet basker	<i>Urothemis signata insignata</i>	N	LC	SITE 3

Table 15: Dragonflies recorded at the Klang and Gombak Rivers from 18 – 20 May 2020.

N: NATIVE SPECIES

LC: LEAST CONCERN

REPTILES

Site 1: SITE 1, Sg Klang	6 species
Site 2: SITE 2, Sg Klang	1 species
Site 3: Perumahan Awam Seri Terengganu, Sg Gombak	2 species

Table 16: Summary of reptile diversity sampled at all three sites.

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family, subfamily and species common name	Scientific name	Status	IUCN	Area
AGAMIDAE: AGAMID LIZARDS				
Green Crested Lizard	<i>Bronchocela cristatella</i>	N	LC	SITE 1
Garden Fence Lizard	<i>Calotes versicolor</i>	N	LC	SITE 1, SITE 3
SCINCIDAE: SKINKS				
Common Sun Skink	<i>Eutropis multifasciata</i>	N	LC	SITE 1
COLUBRIDAE: REAR-FANGED SNAKES				
Paradise Tree Snake	<i>Chrysopelea paradisi</i>	N	LC	SITE 1
EMYDIDAE: AMERICAN WATER TURTLES				
Red-eared Slider Turtle	<i>Trachemys scripta elegans</i>	EX	LC	SITE 1

Table 17: Dragonflies recorded at the Klang and Gombak Rivers from 18 – 20 May 2020.

N: NATIVE SPECIES

EX: EXOTIC / INTRODUCED SPECIES

LC: LEAST CONCERN

BIRDS

Site 1: Taman Melawati, Sg Klang	66 species
Site 2: Rumah Pangsa AU2, Sg Klang	24 species
Site 3: Perumahan Awam Seri Terengganu, Sg Gombak	27 species

Table 18: Summary of bird diversity sampled at all three sites.

SITE 1: TAMAN MELAWATI,
SITE 2: RUMAH PANGSA AU2,
SITE 3: P.A SERI TERENGGANU

Family, subfamily and species common name	Scientific name	Status	T/W	IUCN	Area
ARDEIDAE: HERONS, EP.A SERI TERENGGANUETS & BITTERNS					
Purple Heron	<i>Ardea purpurea</i>	R, M	W	LC	SITE 1, SITE 3
Little Heron (Striated Heron)	<i>Butorides striatus</i>	R, M	W	LC	SITE 2, SITE 3
Little Egret	<i>Egretta garzetta</i>	R, M	W	LC	SITE 1, SITE 3
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	R	W	LC	SITE 1
CICONIIDAE – STORKS					
Painted Stork	<i>Mycteria leucocephala</i>	R	W	LC	SITE 1
ACCIPITRIDAE – KITES, HAWKS, EAGLES & VULTURES					
Changeable Hawk Eagle	<i>Spizaetus cirrhatus</i>	R	T	LC	SITE 1
RALLIDAE: RAILS, CRAKES & COOT					
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R, M	W	LC	SITE 1, SITE 2, SITE 3
COLUMBIDAE: PIGEONS & DOVES					
Pink-necked Green Pigeon	<i>Treron vernans</i>	R	T	LC	SITE 3
Rock Pigeon	<i>Columba livia</i>	R	T	LC	SITE 2
Spotted Dove	<i>Stigmatopelia (Streptopelia) chinensis</i>	R	T	LC	SITE 1, SITE 2, SITE 3
Peaceful Dove	<i>Geopelia striata</i>	R	T	LC	SITE 1, SITE 2, SITE 3
Common Emerald Dove	<i>Chalcophaps indica</i>	R	T	LC	SITE 1
COLUMBIDAE: PIGEONS & DOVES					
Banded Bay Cuckoo	<i>Cuculus sonneratii</i>	R	T	LC	SITE 1
Plaintive Cuckoo	<i>Cacomantis merulinus</i>	R	T	LC	SITE 1
Rusty-breasted Cuckoo	<i>Cacomantis sepulcralis</i>	R	T	LC	SITE 1
Little Bronze Cuckoo	<i>Chrysococcyx minutillus</i>	R	T	LC	SITE 1
Asian Koel	<i>Eudynamis scolopacea</i>	R, M	T	LC	SITE 1, SITE 3
STRIGIDAE: TYPICAL OWLS					
Buffy Fish Owl	<i>Ketupa ketupu</i>	R	W	LC	SITE 1
CAPRIMULGIDAE: NIGHTJARS					
Large-tailed Nightjar	<i>Caprimulgus macrurus</i>	R	T	LC	SITE 1
APODIDAE: SWIFTS					
Swiftlet species	<i>Aerodramus sp.</i>	R	T	LC	SITE 1, SITE 2
Glossy Swiftlet	<i>Collocalia esculenta</i>	R	T	LC	SITE 1

Family, subfamily and species common name	Scientific name	Status	T/W	IUCN	Area
Fork-tailed Swift / Pacific Swift	<i>Apus pacificus</i>	M	T	LC	SITE 3
HEMIPROCNIDAE: TREESWIFTS					
Grey-rumped Treeswift	<i>Hemiprocne longipennis</i>	R	T	LC	SITE 1
ALCIDINIIDAE: KINGFISHERS					
Blue-eared Kingfisher	<i>Alcedo meninting</i>	R	W	LC	SITE 1
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	R	W	LC	SITE 1, SITE 2, SITE 3
MEROPIDAE: BEE-EATERS					
Blue-throated Bee-eater	<i>Merops viridis</i>	R, M	T	LC	SITE 1, SITE 2
MEGALAIMIDAE: BARBETS					
Gold-whiskered Barbet	<i>Megalaima chrysopogon</i>	R	T	LC	SITE 1
Blue-eared Barbet	<i>Megalaima australis</i>	R	T	LC	SITE 1
Coppersmith Barbet	<i>Megalaima haemacephala</i>	R	T	LC	SITE 1
PICIDAE: WOODPECKERS					
Sunda Pygmy Woodpecker	<i>Dendrocopus moluccensis</i>	R	TT	LC	SITE 1, SITE 3
Banded Woodpecker	<i>Picus miniaceus</i>	R	T	LC	SITE 1
Crimson-winged Woodpecker	<i>Picus puniceus</i>	R	T	LC	SITE 1
Common Flameback	<i>Dinopium javanense</i>	R	T	LC	SITE 1
Rufous Woodpecker	<i>Celeus brachyurus</i>	R	T	LC	SITE 1
HIRUNDINIDAE: SWALLOWS & MARTINS					
Pacific Swallow	<i>Hirundo tahitica</i>	R	T	LC	SITE 1, SITE 3
CAMPEPHAGIDAE: CUCKOO-SHRIKES, PIED TRILLER, FLYCATCHER-SHRIKES & WOODSHRIKES					
Black-winged Flycatcher-Shrike	<i>Hemipus hirundinaceus</i>	R	T	LC	SITE 1
Pied Triller	<i>Lalage nigari</i>	R	T	LC	SITE 1, SITE 3
Large Wood shrike	<i>Tephrodornis gularis</i>	R	T	LC	SITE 1
CHLOROPSEIDAE: IORAS & LEAFBIRDS					
Common Iora	<i>Aegithina tiphia</i>	R	T	LC	SITE 1, SITE 2, SITE 3
PYCNONOTIDAE: BULBULS					
Stripe-throated Bulbul	<i>Pycnonotus finlaysoni</i>	R	T	LC	SITE 1
Yellow-vented Bulbul	<i>Pycnonotus goiavier</i>	R	T	LC	SITE 1, SITE 2, SITE 3
ORIOLIDAE – ORIOLES					
Black-naped Oriole	<i>Oriolus chinensis</i>	R	T	LC	SITE 1, SITE 2, SITE 3
CORVIDAE - JAYS, MAGPIES & CROWS					
House Crow	<i>Corvus splendens</i>	R	T	LC	SITE 1, SITE 2, SITE 3

Family, subfamily and species common name	Scientific name	Status	T/W	IUCN	Area
Slender-billed Crow	<i>Corvus enca</i>	R	T	LC	SITE 1
TIMALIIDAE- BABBLERS					
Pin-striped Tit-Babbler	<i>Macronous gularis</i>	R	T	LC	SITE 1
SILVIIDAE – OLD WORLD WARBLERS					
Rufescent Prinia	<i>Prinia rufescens</i>	R	T	LC	SITE 1
Yellow-bellied Prinia	<i>Prinia flaviventris</i>	R	T		SITE 1, SITE 2, SITE 3
Common Tailorbird	<i>Orthotomus sutorius</i>	R	T	LC	SITE 1, SITE 2, SITE 3
Dark-necked Tailorbird	<i>Orthotomus atrogularis</i>	R	T	LC	SITE 1
Rufous-tailed Tailorbird	<i>Orthotomus sericeus</i>	R	T	LC	SITE 1
Ashy Tailorbird	<i>Orthotomus sepium</i>	R	T	LC	SITE 1, SITE 2
Black-browed Reed Warbler	<i>Acrocephalus bistrigiceps</i>	M	W	LC	SITE 1
Leaf warbler species	<i>Phylloscopus sp.</i>	M	T	LC	SITE 1
MUSCICAPIDAE – CHATS, ROBINS, SHAMAS, FORKTAILS, NILTAVAS & FLYCATCHERS					
Oriental Magpie Robin	<i>Copsychus saularis</i>	R	T	LC	SITE 1, SITE 2, SITE 3
RHIPIDURIDAE – FANTAILS					
Pied Fantail	<i>Rhipidura javanica</i>	R	T	LC	SITE 1, SITE 2, SITE 3
EURLAIMIDAE – BROADBILLS, ASIAN FAIRY BLUEBIRD & LEAFBIRDS					
Black-and-Red Broadbill	<i>Cymbirhynchus macrorhynchus</i>	R	T	LC	SITE 1
Black-and-Yellow Broadbill	<i>Eurlaimus ochromalus</i>	R	T	LC	SITE 1
LANIIDAE – SHRIKES					
Brown Shrike	<i>Lanius cristatus</i>	M	T	LC	SITE 1
DICRURIDAE – DRONGOS					
Greater racket-tailed drongo	<i>Dicrurus paradiseus</i>	R	T	LC	SITE 1
STURNIDAE – STARLINGS & MYNAS					
Asian Glossy Starling	<i>Aplonis panayensis</i>	R	T	LC	SITE 1, SITE 2, SITE 3
Common Myna	<i>Acridotheres tristis</i>	R	T	LC	SITE 1, SITE 2
	<i>Orthotomus sutorius</i>	R	T	LC	SITE 1, SITE 2, SITE 3
Jungle Myna	<i>Acridotheres fuscus</i>	R	T	LC	SITE 1, SITE 3
Javan Myna	<i>Acridotheres javanicus</i>	R	T	LC	SITE 1, SITE 2, SITE 3
NECTARINIIDAE – SUNBIRDS & SPIDERHUNTERS					
Brown-throated Sunbird	<i>Anthreptes malaccensis</i>	R	T	LC	SITE 1, SITE 2, SITE 3

Family, subfamily and species common name	Scientific name	Status	T/W	IUCN	Area
Olive-backed Sunbird	<i>Nectarinia jugularis</i>	R	T	LC	SITE 1
Little Spiderhunter	<i>Arachnothera longirostris</i>	R	T	LC	SITE 1
Spectacled Spiderhunter	<i>Arachnothera flavigaster</i>	R	T	LC	SITE 1
DICAEDAE – FLOWERPECKERS					
Orange-bellied Flowerpecker	<i>Dicaeum trigonostigma</i>	R	T	LC	SITE 1
Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>	R	T	LC	SITE 1, SITE 2
PASSERIDAE – SPARROWS					
Eurasian Tree-Sparrow	<i>Passer montanus</i>	R	T	LC	SITE 2, SITE 3
PLOCEIDAE – WEAVERS					
Baya Weaver	<i>Ploceus philippinus</i>	R	T	LC	SITE 1
ESTRILDIDAE - PARROTFINCHES & MUNIAS					
White-rumped Munia	<i>Lonchura striata</i>	R	T	LC	SITE 1
Scaly-breasted Munia	<i>Lonchura punctulata</i>	R	T	LC	SITE 1, SITE 2

Table 19: Birds recorded at the Klang and Gombak Rivers from 18 – 20 May 2020.

M: MIGRANT SPECIES
N: NATIVE SPECIES
R: RESIDENT SPECIES

T: TERRESTRIAL SPECIES
W: WETLAND SPECIES

LC: LEAST CONCERN

AQUATIC AND TERRESTRIAL FLORA

TERRESTRIAL FLORA INVENTORY

		Site 1 (Zone 1)	Site 1 (Zone 2)	Site 1 (Zone 3)	Site 2	Site 3	Overall
Family		77	55	57	56	37	88
Species		221	108	129	146	73	303
Habit	Bamboo	1	1	0	1	0	1
	Creeping	24	16	12	20	11	34
	Ferns	14	6	7	5	6	20
	Grass	7	4	7	7	4	10
	Herbaceous	64	40	37	42	20	84
	Palm	4	5	5	5	5	10
	Shrub	41	14	27	31	10	54
	Tree	65	22	34	34	17	89
	Tree Fern	1	0	0	0	0	1
Habitat	Aquatic / Riverbank	11	8	9	5	6	12
	Aquatic / Water	7	7	1	3	3	8
	Climber	17	14	8	18	7	27
	Epiphyte	7	1	3	4	5	13
	Terrestrial	179	78	109	116	52	243
Occurrence	Planted	88	20	59	61	18	125
	Regenerated	3	4	0	8	2	10
	Wild	130	83	69	77	52	167
	Wild/ planted	1	1	1	0	0	1

Table 20: List of Species per Habit, Habitat and Occurrence Following the Sites.

Family	Species	Habit	Habitat	Occurrence	Area
Acanthaceae	<i>Asystasia gangentica</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2, SITE 3
Acanthaceae	<i>Asystasia nemorum</i>	herbaceous	terrestrial	wild	SITE 1 (zone 3)
Acanthaceae	<i>Clinacanthus nutans</i>	herbaceous	terrestrial	planted	SITE 2
Acanthaceae	<i>Ruellia simplex</i>	herbaceous	terrestrial	regenerated	SITE 1, SITE 2
Acanthaceae	<i>Strobilanthes alternata</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Acanthaceae	<i>Strobilanthes glaucescens</i>	herbaceous	terrestrial	regenerated	SITE 1, SITE 2, SITE 3
Alismataceae	<i>Echinodorus palaefolius</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1 & 2), SITE 3
Alismataceae	<i>Limnocharis flava</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Amaranthaceae	<i>Alternanthera poronychioides</i>	creeping	aquatic/ riverbank	wild	SITE 1, SITE 2, SITE 3
Amaranthaceae	<i>Alternanthera sissoo</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Amaranthaceae	<i>Amaranthus blitum</i>	herbaceous	terrestrial	wild	SITE 2, SITE 3
Amaranthaceae	<i>Celosia argentea</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Amaranthaceae	<i>Cyathula prostrata</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Amaryllidaceae	<i>Hymenocallis litoralis</i>	herbaceous	terrestrial	planted	SITE 2
Anacardiaceae	<i>Anacardium occidentale</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 2), SITE 2
Anacardiaceae	<i>Bouea oppositifolia</i>	tree	terrestrial	planted	SITE 1 (zone 1),
Anacardiaceae	<i>Mangifera indica</i>	tree	terrestrial	planted	SITE 1, SITE 2, SITE 3
Anacardiaceae	<i>Spondias dulcis</i>	tree	terrestrial	planted	SITE 2,
Annonaceae	<i>Annona muricata</i>	shrub	terrestrial	planted	SITE 1 (zone 1), SITE 2
Annonaceae	<i>Polyathia cauliflora</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Apocynaceae	<i>Alstonia angustiloba</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 2),
Apocynaceae	<i>Alstonia scholaris</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Apocynaceae	<i>Willughbeia coriacea</i>	creeping	climber	wild	SITE 1 (zone 1)
Apocynaceae	<i>Wrightia religiosa</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Araceae	<i>Aglonema crispum</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Araceae	<i>Alocasia macrorrhizos</i>	herbaceous	aquatic/ riverbank	wild	SITE 1, SITE 2, SITE 3
Araceae	<i>Amorphophalus paeoniifolius</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Araceae	<i>Anthurium sp.</i>	herbaceous	terrestrial	planted	SITE 1 (zone 3)
Araceae	<i>Caladium bicolor</i>	herbaceous	terrestrial	planted	SITE 1 (zone 2)
Araceae	<i>Colocasia esculenta</i>	herbaceous	aquatic/ riverbank	wild	SITE 1, SITE 2, SITE 3
Araceae	<i>Dieffenbachia seguine</i>	herbaceous	terrestrial	planted	SITE 1, SITE 2, SITE 3
Araceae	<i>Epiprenum aureum</i>	herbaceous	climber	epiphyte	SITE 1 (zone 3)
Araceae	<i>Lasia spinosa</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1)
Araceae	<i>Raphidophora korthalsii</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Araceae	<i>Schismatoglottis calyptrata</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Araceae	<i>Syngonium podophyllum</i>	creeping	epiphyte	wild	SITE 1, SITE 2

Family	Species	Habit	Habitat	Occurrence	Area
Araceae	<i>Typhonium trilobium</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Araliaceae	<i>Arthophyllum diversifolium</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Araliaceae	<i>Hydrocotyle verticillata</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1 & 2), SITE 2
Araliaceae	<i>Polyscias fruticosa</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Araliaceae	<i>Polyscias sp.</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Arecaceae	<i>Areca catechu</i>	palm	terrestrial	planted	SITE 1 (zone 1), SITE 3
Arecaceae	<i>Arenga pinnata</i>	palm	terrestrial	wild	SITE 1 (zone 2)
Arecaceae	<i>Caryota mitis</i>	palm	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Arecaceae	<i>Caryota neo</i>	palm	terrestrial	planted	SITE 1 (zone 2)
Arecaceae	<i>Cocos nucifera</i>	palm	terrestrial	planted	SITE 1, SITE 2, SITE 3
Arecaceae	<i>Dypsis lutescens</i>	palm	terrestrial	planted	SITE 2
Arecaceae	<i>Elaeis guineensis</i>	palm	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Arecaceae	<i>Licuala grandis</i>	palm	terrestrial	planted	SITE 1 (zone 3)
Arecaceae	<i>Ptychosperma macarthurii</i>	palm	terrestrial	planted	SITE 1, SITE 3
Arecaceae	<i>Salacca zalacca</i>	palm	terrestrial	planted	SITE 1 (zone 3)
Asparagaceae	<i>Cordyline fruticosa</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2)
Asparagaceae	<i>Dracaena angustifolia</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Asparagaceae	<i>Dracaena fragrans</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Asparagaceae	<i>Dracaena surculosa</i>	herbaceous	terrestrial	planted	SITE 2,
Aspleniaceae	<i>Asplenium nidus</i>	fern	epiphyte	wild	SITE 1 (zone 1), SITE 3
Athyriaceae	<i>Diplazium esculentum</i>	fern	terrestrial	wild	SITE 1
Basellaceae	<i>Anredera cordifolia</i>	herbaceous	climber	planted	SITE 2
Bignoniaceae	<i>Oroxylum indicum</i>	tree	terrestrial	wild	SITE 1 (zone 1 & 3)
Bignoniaceae	<i>Spathodea campanulata</i>	tree	terrestrial	wild	SITE 1 (zone 3)
Bignoniaceae	<i>Tabebuia pallida</i>	tree	terrestrial	regenerated	SITE 1 (zone 3)
Boraginaceae	<i>Carmona retusa</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Blechnaceae	<i>Blechnum finlaysonianum</i>	fern	terrestrial	wild	SITE 1 (zone 1)
Blechnaceae	<i>Stenochlaena palustris</i>	fern	climber	wild	SITE 1 (zone 1 & 2)
Boraginaceae	<i>Carmona retusa</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Bromeliaceae	<i>Ananas comosus</i>	herbaceous	terrestrial	planted	SITE 1 (zone 3), SITE 2
Cactaceae	<i>Pereskia bleo</i>	shrub	terrestrial	planted	SITE 1 (zone 3), SITE 2, SITE 3
Calophyllaceae	<i>Mesua ferrea</i>	tree	terrestrial	planted	SITE 1 (zone 2)
Caricaceae	<i>Carica papaya</i>	herbaceous	terrestrial	planted	SITE 1, SITE 2, SITE 3
Ceratophyllaceae	<i>Ceratophyllum demersum</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1 & 2)
Cleomaceae	<i>Cleome rutidosperma</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2, SITE 3
Clusiaceae	<i>Garcinia atroviridis</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3)

Family	Species	Habit	Habitat	Occurrence	Area
Clusiaceae	<i>Garcinia hombroniana</i>	tree	terrestrial	planted	SITE 1 (zone 1)
Clusiaceae	<i>Garcinia mangostana</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3)
Combretaceae	<i>Bucida molonetii</i>	tree	terrestrial	planted	SITE 1 (zone 3), SITE 3
Combretaceae	<i>Terminalia cattapa</i>	tree	terrestrial	wild	SITE 1 (zone 3), SITE 2, SITE 3
Commelinaceae	<i>Amyschotolype griffithii</i>	creeping	terrestrial	wild	SITE 1 (zone 2),
Commelinaceae	<i>Commelina benghalensis</i>	creeping	aquatic/ riverbank	wild	SITE 1 (zone 2 & 3), SITE 3
Commelinaceae	<i>Commelina diffusa</i>	creeping	aquatic/ riverbank	wild	SITE 1, SITE 2
Compositae	<i>Ageratum conyzoides</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2, SITE 3
Compositae	<i>Bidens alba</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2, SITE 3
Compositae	<i>Blumea balsamifera</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2, SITE 3
Compositae	<i>Chromolaena odorata</i>	herbaceous	terrestrial	wild	SITE 1, SITE 3
Compositae	<i>Cosmos caudatus</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Compositae	<i>Cyanthilium cinereum</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2
Compositae	<i>Eclipta prostrata</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Compositae	<i>Eleutheranthera ruderalis</i>	herbaceous	terrestrial	wild	SITE 1 (zone 2 & 3), SITE 2
Compositae	<i>Eupatorium capilifolium</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2)
Compositae	<i>Mikania micrantha</i>	creeping	climber	wild	SITE 1, SITE 2, SITE 3
Compositae	<i>Synedrella nodiflora</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Compositae	<i>Tridax procumbens</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1), SITE 2, SITE 3
Convolvulaceae	<i>Ipomea aquatica</i>	creeping	aquatic/ riverbank	planted	SITE 1 (zone 3)
Convolvulaceae	<i>Ipomea batatas</i>	creeping	terrestrial	planted	SITE 2
Convolvulaceae	<i>Ipomea cairica</i>	creeping	climber	wild	SITE 2
Convolvulaceae	<i>Merremia umbellata</i>	herbaceous	climber	wild	SITE 1 (zone 2 & 3), SITE 2
Costaceae	<i>Costus woodsonii</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Cucurbitaceae	<i>Coccinia grandis</i>	creeping	climber	wild	SITE 1 (zone 2 & 3), SITE 2
Cucurbitaceae	<i>Cucurbita moschata</i>	creeping	terrestrial	planted	SITE 1 (zone 3)
Cucurbitaceae	<i>Melothria pendula</i>	creeping	climber	wild	SITE 3
Cyatheaceae	<i>Cyathea latebrosa</i>	tree fern	terrestrial	wild	SITE 1 (zone 1)
Cyperaceae	<i>Cyperus compactus</i>	grass	aquatic/ riverbank	wild	SITE 1, SITE 2
Cyperaceae	<i>Hypolytrum nemorum</i>	grass	terrestrial	wild	SITE 1 (zone 1), SITE 2, SITE 3
Cyperaceae	<i>Kyllinga nemoralis</i>	grass	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2
Cyperaceae	<i>Kyllinga polyphylla</i>	grass	terrestrial	wild	SITE 1 (zone 1 & 3)
Davaliaceae	<i>Davalia denticulata</i>	fern	epiphyte	wild	SITE 3

Family	Species	Habit	Habitat	Occurrence	Area
Dilleniaceae	<i>Tetracera indica</i>	creeping	terrestrial	wild	SITE 1, SITE 2
Dioscoridaceae	<i>Dioscorea sensibarensis</i>	creeping	climber	wild	SITE 1 (zone 1 & 2)
Dioscoridaceae	<i>Tacca integrifolia</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2
Dipterocarpaceae	<i>Hopea odorata</i>	tree	terrestrial	planted	SITE 1, SITE 2
Dipterocarpaceae	<i>Shorea sp.</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Dryopteridaceae	<i>Tectaria incisa</i>	fern	terrestrial	wild	SITE 1 (zone 1)
Euphorbiaceae	<i>Acalypha siamensis</i>	shrub	terrestrial	planted	SITE 2,
Euphorbiaceae	<i>Codiaeum variegatum</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Euphorbiaceae	<i>Elateriospermum tapos</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Euphorbiaceae	<i>Euphorbia hirta</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1 & 2)
Euphorbiaceae	<i>Hevea brasiliensis</i>	tree	terrestrial	regenerated	SITE 1 (zone 1)
Euphorbiaceae	<i>Macaranga gigantea</i>	tree	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2
Euphorbiaceae	<i>Macaranga griffithiana</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Euphorbiaceae	<i>Macaranga tanarius</i>	tree	terrestrial	wild	SITE 1
Euphorbiaceae	<i>Manihot carthaginensis</i>	shrub	terrestrial	wild	SITE 1 (zone 1 & 3)
Euphorbiaceae	<i>Manihot esculenta</i>	shrub	terrestrial	planted	SITE 1, SITE 2, SITE 3
Euphorbiaceae	<i>Ricinus communis</i>	shrub	terrestrial	wild	SITE 3
Euphorbiaceae	<i>Suregada multiflora</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Gentianaceae	<i>Fagraea fragrans</i>	tree	terrestrial	planted	SITE 1, SITE 3
Gleicheniaceae	<i>Dicranopteris linearis</i>	fern	terrestrial	wild	SITE 1 (zone 1)
Heliconiaceae	<i>Heliconia psittacorum</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2)
Heliconiaceae	<i>Heliconia rostrata</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 3)
Hydrocharitaceae	<i>Hydrilla verticillata</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 1 & 2)
Hypoxidaceae	<i>Molinera latifolia</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1)
Lamiaceae	<i>Plectranthus monostachyus</i>	herbaceous	terrestrial	wild	SITE 1, SITE 2
Lamiaceae	<i>Vitex negundo</i> var. <i>canabifolia</i>	shrub	terrestrial	wild	SITE 1 (zone 2)
Lauraceae	<i>Cinnamomum iners</i>	tree	terrestrial	planted	SITE 1 (zone 3), SITE 2, SITE 3
Lauraceae	<i>Litsea elliptica</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Lauraceae	<i>Litsea sp.</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Lecythidaceae	<i>Barringtonia racemosa</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Lecythidaceae	<i>Lagerstroemia speciosa</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Leguminosae	<i>Acacia auriculiformis</i>	tree	terrestrial	wild	SITE 1 (zone 2 & 3)
Leguminosae	<i>Acacia mangium</i>	tree	terrestrial	wild	SITE 1 (zone 3)
Leguminosae	<i>Adenanthera pavonina</i>	tree	terrestrial	planted	SITE 1 (zone 3)
Leguminosae	<i>Calopogonium mucunoides</i>	creeping	climber	wild	SITE 1, SITE 2
Leguminosae	<i>Centrosema molle</i>	creeping	climber	wild	SITE 1, SITE 2
Leguminosae	<i>Clitoris ternatea</i>	creeping	climber	planted	SITE 1, SITE 2, SITE 3
Leguminosae	<i>Cynometra cauliflora</i>	shrub	terrestrial	planted	SITE 1 (zone 3),
Leguminosae	<i>Falcataria moluccana</i>	tree	terrestrial	planted	SITE 3

Family	Species	Habit	Habitat	Occurrence	Area
Leguminosae	<i>Gliricida sepium</i>	tree	terrestrial	planted	SITE 1 (zone 2),
Leguminosae	<i>Leucaena leucocephala</i>	tree	terrestrial	wild	SITE 1 (zone 2 & 3), SITE 2, SITE 3
Leguminosae	<i>Mimosa diplotricha</i>	shrub	terrestrial	wild	SITE 2
Leguminosae	<i>Mimosa pigra</i>	shrub	terrestrial	wild	SITE 1 (zone 3)
Leguminosae	<i>Mimosa pudica</i>	creeping	terrestrial	wild	SITE 1, SITE 2
Leguminosae	<i>Peltophorum pterocarpum</i>	tree	terrestrial	regenerated	SITE 1 (zone 2), SITE 2
Leguminosae	<i>Phaseolus lunatus</i>	herbaceous	climber	planted	SITE 2
Leguminosae	<i>Pithecellobium dulce</i>	tree	terrestrial	planted	SITE 1 (zone 3)
Leguminosae	<i>Pongamia pinnata</i>	tree	terrestrial	regenerated	SITE 2
Leguminosae	<i>Psophocarpus tetragonolobus</i>	creeping	climber	planted	SITE 2
Leguminosae	<i>Pterocarpum indicus</i>	tree	terrestrial	regenerated	SITE 1 (zone 2), SITE 2
Leguminosae	<i>Sesbania grandiflora</i>	tree	terrestrial	planted	SITE 1 (zone 3)
Leguminosae	<i>Vigna unguiculata</i>	creeping	climber	planted	SITE 1, SITE 2
Loganiaceae	<i>Spigelia anthelmia</i>	herbaceous	terrestrial	wild	SITE 1 (zone 3)
Lygodiaceae	<i>Lygodium longifolium</i>	fern	climber	wild	SITE 1 (zone 2)
Lygodiaceae	<i>Lygodium microphyllum</i>	fern	climber	wild	SITE 1 (zone 3)
Lythraceae	<i>Lagerstroemia speciosa</i>	tree	terrestrial	planted	SITE 1 (zone 3), SITE 2
Lythraceae	<i>Lawsonia inermis</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Malvaceae	<i>Durio zibethinus</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Malvaceae	<i>Hibiscus rosa-sinensis</i>	shrub	terrestrial	planted	SITE 1
Malvaceae	<i>Pterospermum sp.</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Malvaceae	<i>Sida acuta</i>	herbaceous	terrestrial	wild	SITE 1 (zone 3), SITE 2
Malvaceae	<i>Urema lobata</i>	shrub	terrestrial	wild	SITE 2
Mapighiaceae	<i>Malpighia emarginata</i>	shrub	terrestrial	planted	SITE 2
Maranthaceae	<i>Calathea lutea</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2),
Maranthaceae	<i>Donax grandis</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Melastomaceae	<i>Clidemia hirta</i>	shrub	terrestrial	wild	SITE 1,
Melastomaceae	<i>Melastoma malabathricum</i>	shrub	terrestrial	wild	SITE 1, SITE 2, SITE 3
Melastomaceae	<i>Pternandra echinata</i>	shrub	terrestrial	wild	SITE 1 (zone 1)
Meliaceae	<i>Aphanamixis polystachya</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Meliaceae	<i>Azadirachta indica</i>	tree	terrestrial	planted	SITE 1, SITE 3
Meliaceae	<i>Khaya ivorensis</i>	tree	terrestrial	planted	SITE 1 (zone 2)
Meliaceae	<i>Lansium parasiticum</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3)
Menispermaceae	<i>Arcangelisia flava</i>	creeping	climber	wild	SITE 1 (zone 1)
Menispermaceae	<i>Cissampelos peraira</i>	creeping	climber	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Moraceae	<i>Artocarpus altilis</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2

Family	Species	Habit	Habitat	Occurrence	Area
Moraceae	<i>Artocarpus elasticus</i>	tree	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2
Moraceae	<i>Artocarpus heterophyllus</i>	tree	terrestrial	planted	SITE 1, SITE 2, SITE 3
Moraceae	<i>Artocarpus integer</i>	tree	terrestrial	planted	SITE 1, SITE 2
Moraceae	<i>Ficus benjamina</i>	shrub	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Moraceae	<i>Ficus caulocarpa</i>	tree	terrestrial	wild	SITE 1 (zone 1), SITE 2
Moraceae	<i>Ficus delosyce</i>	tree	terrestrial	wild	SITE 1 (zone 1), SITE 3
Moraceae	<i>Ficus fistulosa</i>	shrub	terrestrial	wild	SITE 1
Moraceae	<i>Ficus glandulifer</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Moraceae	<i>Ficus globosa</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Moraceae	<i>Ficus hispida</i>	tree	terrestrial	wild	SITE 1, SITE 2, SITE 3
Moraceae	<i>Ficus lyrata</i>	tree	terrestrial	planted	SITE 1 (zone 1)
Moraceae	<i>Ficus microcarpa</i>	tree	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Moraceae	<i>Ficus religiosa</i>	tree	terrestrial	wild	SITE 1 (zone 1), SITE 2
Moraceae	<i>Ficus sagittata</i>	creeping	epiphyte	wild	SITE 1 (zone 1)
Moraceae	<i>Ficus tinctoria</i> var. <i>gibbosa</i>	shrub	terrestrial	wild	SITE 1, SITE 2, SITE 3
Moraceae	<i>Ficus Villosa</i>	creeping	epiphyte	wild	SITE 1 (zone 1)
Moraceae	<i>Ficus virens</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Moraceae	<i>Morus alba</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2, SITE 3
Moringaceae	<i>Moringa olifera</i>	shrub	terrestrial	planted	SITE 1, SITE 2
Muntingiaceae	<i>Muntingia calabura</i>	shrub	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2
Musaceae	<i>Musa acuminata</i>	herbaceous	terrestrial	wild/planted	SITE 1, SITE 2, SITE 3
Myristicaceae	<i>Knema latericia</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Myristicaceae	<i>Myristica maxima</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Myrtaceae	<i>Leptospermum brachyandrum</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 2)
Myrtaceae	<i>Melaleuca cajuputi</i>	tree	terrestrial	planted	SITE 1 (zone 2)
Myrtaceae	<i>Psidium guajava</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Myrtaceae	<i>Rhodomyrtus tomentosa</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Myrtaceae	<i>Syzygium aqueum</i>	tree	terrestrial	planted	SITE 1, SITE 2
Myrtaceae	<i>Syzygium grande</i>	tree	terrestrial	wild	SITE 1 (zone 1), SITE 3
Myrtaceae	<i>Syzygium malaccense</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3)
Myrtaceae	<i>Syzygium myrtifolium</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3)
Myrtaceae	<i>Syzygium polyanthum</i>	tree	terrestrial	planted	SITE 1 (zone 3), SITE 2
Nephrolepidaceae	<i>Nephrolepis acutifolia</i>	fern	epiphyte	wild	SITE 2
Nephrolepidaceae	<i>Nephrolepis biserrata</i>	fern	terrestrial	wild	SITE 1 (zone 1), SITE 2, SITE 3

Family	Species	Habit	Habitat	Occurrence	Area
Nictagynaceae	<i>Bougainvillea glabra</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3),
Olacaceae	<i>Strombosa javanica</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Onagraceae	<i>Ludwigia hyssopifolia</i>	herbaceous	aquatic/ riverbank	wild	SITE 1
Oxalidaceae	<i>Averrhoa bilimbi</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Oxalidaceae	<i>Averrhoa carambola</i>	shrub	terrestrial	planted	SITE 2
Oxalidaceae	<i>Oxalis barrelieri</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1), SITE 2, SITE 3
Pandanaceae	<i>Pandanus amaryllifolius</i>	herbaceous	terrestrial	planted	SITE 1, SITE 2
Pandanaceae	<i>Pandanus tectorius</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2)
Passifloraceae	<i>Passiflora edulis</i>	creeping	climber	planted	SITE 1 (zone 1 & 2)
Passifloraceae	<i>Passiflora foetida</i>	creeping	climber	wild	SITE 2
Passifloraceae	<i>Passiflora suberosa</i>	creeping	climber	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Phyllanthaceae	<i>Bridellia stipularis</i>	shrub	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2
Phyllanthaceae	<i>Bridellia tomentosa</i>	shrub	terrestrial	wild	SITE 1, SITE 2, SITE 3
Phyllanthaceae	<i>Glochidion obscurum</i>	tree	terrestrial	wild	SITE 1, SITE 2, SITE 3
Phyllanthaceae	<i>Phyllanthus acidus</i>	tree	terrestrial	planted	SITE 1 (zone 1)
Phyllanthaceae	<i>Phyllanthus niruri</i>	herbaceous	terrestrial	wild	SITE 1 (zone 3)
Phyllanthaceae	<i>Sauropus androgenus</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Piperaceae	<i>Peperomia pellucida</i>	herbaceous	terrestrial	wild	SITE 1 (zone 2 & 3), SITE 2
Piperaceae	<i>Piper aduncum</i>	herbaceous	terrestrial	wild	SITE 1
Piperaceae	<i>Piper betle</i>	creeping	climber	planted	SITE 1 (zone 1 & 2), SITE 2
Piperaceae	<i>Piper porphyrophyllum</i>	creeping	epiphyte	wild	SITE 1 (zone 1)
Piperaceae	<i>Piper ribesoides</i>	creeping	epiphyte	wild	SITE 1 (zone 1)
Piperaceae	<i>Piper sarmentosum</i>	creeping	terrestrial	planted	SITE 1
Poaceae	<i>Coix lacryma-jobi</i>	grass	terrestrial	wild	SITE 1 (zone 2)
Poaceae	<i>Cymbopogon citratus</i>	grass	terrestrial	wild	SITE 1 (zone 3), SITE 2
Poaceae	<i>Imperata cylindrica</i>	grass	terrestrial	wild	SITE 1 (zone 1), SITE 2, SITE 3
Poaceae	<i>Pennisetum purpureum</i>	grass	aquatic/ riverbank	wild	SITE 1, SITE 2, SITE 3
Poaceae	<i>Saccarum officinarum</i>	grass	terrestrial	planted	SITE 1 (zone 3), SITE 2, SITE 3
Poaceae	<i>Schizostacyum brachycladum</i>	Bambu lemang	terrestrial	planted	SITE 1, SITE 2
Poaceae	<i>Setaria barbata</i>	grass	aquatic/ riverbank	wild	SITE 1 (zone 1 & 3)
Polygonaceae	<i>Persicaria barbata</i>	herbaceous	aquatic/ riverbank	wild	SITE 1 (zone 1)
Polygonaceae	<i>Persicaria chinensis</i>	herbaceous	aquatic/ riverbank	wild	SITE 1 (zone 1 & 2)
Polypodiaceae	<i>Drynaria quercifolia</i>	fern	epiphyte	wild	SITE 1 (zone 2), SITE 3

Family	Species	Habit	Habitat	Occurrence	Area
Polypodiaceae	<i>Phymatosorus scolopendria</i>	fern	epiphyte	wild	SITE 1 (zone 1), SITE 3
Polypodiaceae	<i>Pyrrosia lanceolata</i>	fern	epiphyte	wild	SITE 1 (zone 3), SITE 2, SITE 3
Polypodiaceae	<i>Pyrrosia longifolia</i>	fern	epiphyte	wild	SITE 2
Pontederiaceae	<i>Eichhornia crassipes</i>	herbaceous	aquatic/ water	wild	SITE 1 (zone 2)
Pontederiaceae	<i>Monochoria hastata</i>	herbaceous	aquatic/ water	wild	SITE 1, SITE 2, SITE 3
Primulaceae	<i>Ardisia elliptica</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Pteridaceae	<i>Adiantum latifolium</i>	fern	terrestrial	wild	SITE 1
Pteridaceae	<i>Pteris vittata</i>	fern	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2
Rosaceae	<i>Eriobotrya japonica</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Rosaceae	<i>Rosa sp.</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Rubiaceae	<i>Chassalia curviflora</i>	shrub	terrestrial	wild	SITE 1 (zone 1)
Rubiaceae	<i>Ixora chinensis</i>	shrub	terrestrial	planted	SITE 1 (zone 1), SITE 2
Rubiaceae	<i>Morinda citrifolia</i>	shrub	terrestrial	wild	SITE 1 (zone 3), SITE 2, SITE 3
Rubiaceae	<i>Mytragyna speciosa</i>	shrub	terrestrial	planted	SITE 2
Rubiaceae	<i>Nauclea officinalis</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Rubiaceae	<i>Quisqualis indica</i>	herbaceous	climber	planted	SITE 2
Rubiaceae	<i>Urophyllum blumeum</i>	shrub	terrestrial	wild	SITE 1 (zone 1)
Rutaceae	<i>Citrus aurantifolia</i>	shrub	terrestrial	planted	SITE 2, SITE 3
Rutaceae	<i>Citrus limon</i>	shrub	terrestrial	planted	SITE 1 (zone 1), SITE 2
Rutaceae	<i>Citrus maxima</i>	shrub	terrestrial	planted	SITE 1 (zone 1), SITE 2
Rutaceae	<i>Citrus microcarpa</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Rutaceae	<i>Citrus hystrix</i>	shrub	terrestrial	wild	SITE 1 (zone 3), SITE 2
Rutaceae	<i>Murraya koenigii</i>	shrub	terrestrial	planted	SITE 1 (zone 1), SITE 2
Sapindaceae	<i>Allophylus cobbe</i>	shrub	terrestrial	wild	SITE 1 (zone 3)
Sapindaceae	<i>Dimocarpus longan</i>	tree	terrestrial	planted	SITE 1 (zone 1), SITE 2
Sapindaceae	<i>Nephelium lappaceum</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Sapindaceae	<i>Nephelium ramboutanake</i>	tree	terrestrial	planted	SITE 1 (zone 1)
Sapindaceae	<i>Pometia pinnata</i>	tree	terrestrial	wild	SITE 1
Sapotaceae	<i>Manilkara zapota</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Sapotaceae	<i>Mimusops elengi</i>	tree	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Selaginellaceae	<i>Selaginella plana</i>	fern	terrestrial	wild	SITE 1 (zone 1)
Selaginellaceae	<i>Selaginella Willdenowii</i>	fern	terrestrial	wild	SITE 1 (zone 1 & 2)

Family	Species	Habit	Habitat	Occurrence	Area
Solanaceae	<i>Capsicum annum</i>	shrub	terrestrial	planted	SITE 1
Solanaceae	<i>Capsicum frutescens</i>	shrub	terrestrial	planted	SITE 1, SITE 2
Solanaceae	<i>Cestrum nocturnum</i>	shrub	terrestrial	planted	SITE 1 (zone 1)
Solanaceae	<i>Physalis minima</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1), SITE 2
Solanaceae	<i>Solanum diphyllum</i>	herbaceous	terrestrial	wild	SITE 2
Solanaceae	<i>Solanum lasiocarpum</i>	shrub	terrestrial	wild	SITE 1 (zone 1)
Solanaceae	<i>Solanum melongena</i>	shrub	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Solanaceae	<i>Solanum torvum</i>	shrub	terrestrial	wild	SITE 1 (zone 1 & 2), SITE 2
Theaceae	<i>Eurya acuminata</i>	tree	terrestrial	wild	SITE 1 (zone 1)
Thelypteridaceae	<i>Cyclosorus dentatus</i>	fern	terrestrial	wild	SITE 1 (zone 3), SITE 2
Thelypteridaceae	<i>Cyclosorus denticulata</i>	fern	terrestrial	wild	SITE 1 (zone 1)
Thymeleaceae	<i>Aquilaria malaccensis</i>	tree	terrestrial	planted	SITE 1 (zone 1)
Verbenaceae	<i>Stachytarpheta jamaicensis</i>	herbaceous	terrestrial	wild	SITE 1 (zone 1 & 3), SITE 2
Vitaceae	<i>Cayratia mollissima</i>	creeping	climber	wild	SITE 1 (zone 1 & 2), SITE 2
Vitaceae	<i>Cissus repens</i>	creeping	climber	wild	SITE 1 (zone 1)
Vitaceae	<i>Leea indica</i>	shrub	terrestrial	wild	SITE 1 (zone 1), SITE 2
Vitaceae	<i>Tetrastima leucostaphyllum</i>	creeping	climber	wild	SITE 1 (zone 1 & 2), SITE 2, SITE 3
Zingiberaceae	<i>Alipina galanga</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 3), SITE 2
Zingiberaceae	<i>Elettaria cardamomum</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1)
Zingiberaceae	<i>Etlingera elatior</i>	herbaceous	terrestrial	planted	SITE 1 (zone 1 & 2), SITE 2

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This guidebook is an important milestone in our conservation efforts of Sungai Klang particularly on biodiversity of the flora and fauna. The riverine guidebook documents and highlights a variety of flora and fauna in Taman Melawati, Rumah Pangsa AU2 and P.A Seri Terengganu. This activity was carried out under the Project of Mainstreaming Biodiversity Into River Management under Department of Irrigation and Drainage, Malaysia (DID) supported by United Nation Development Programme (UNDP), funded by Global Environment Facility (GEF5) and Global Environment Centre (GEC) as implementation partner.

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 - ii) Dr. Khatijah Rambe (Field Expert Habit, Habitats and Occurrence of Flora Diversity)
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Copperstone Velvetwing (*Neurothemis fluctuans*)