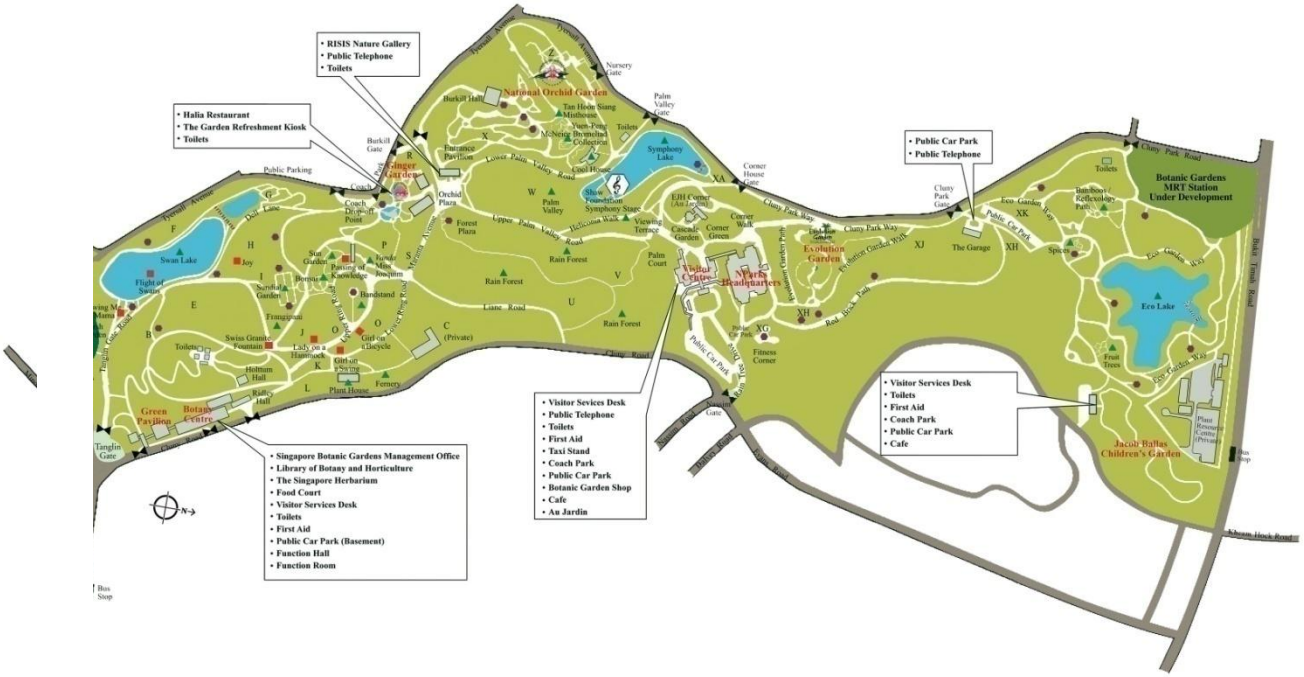
NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

A Visit to the Singapore Botanic Gardens

Pre-Learning Journey Worksheet: Singapore Botanic Gardens **Annex 1**

Did you know? The Singapore Botanic Gardens was founded in 1859.

A Map of Singapore Botanic Gardens



Research on the features of Singapore Botanic Gardens

Based on our research, make a list of the some features that you can find in Singapore Botanic Gardens.

Pre-Learning Journey Worksheet: Learning about Trees **Annex 1a**

Before setting off on our learning journey, let's do a research on some trees and their uses.

1. Penaga Laut (Calophyllum inophyllum)
2. Rubber Tree (Hevea brasiliensis)
3. Kapok Tree or White Silk-cotton Tree (Ceiba pentandra)
4. Tembusu (Fagraea fragrans)
5. Saga or Red-bead Tree (Adenanthera pavonina)
6. Malayan Terminalia or Jelawi (Terminalia subspathulata)

List down the information in the boxes below.

Trees with useful leaves	**Trees with useful seeds/fruits**
Trees with useful trunks	**Trees with useful barks**

Pre-Learning Journey Worksheet: Rainforests **Annex 1b**

Before setting off on our learning journey, let's do a research on rainforests around the world.

What is a Rainforest Ecosystem?

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Why are rainforests important?

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Factsheet: Singapore Botanic Gardens **Annex 2**

Singapore's first botanical and experimental garden was established by Sir Stamford Raffles (founder of Singapore) on Government Hill (now Fort Canning Hill) in 1822.

At that time, he aimed to introduce the cultivation of economic crops such as cocoa and nutmeg. Since then, the Singapore Botanic Gardens, at its present site since 1859, has evolved into a tropical botanical institution of international renown, a key tourist destination and a flagship park.

It offers tourists and locals a green sanctuary forrest and relaxation, and an excellent environment in which to learn about plants and nature.

Let's explore the Singapore Botanic Gardens **Annex 3**

Here We Go

As you walk into the Rain Forest, take a close look at what is around you.

What can you see as you enter the Rain Forest?

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……

Our Fascinating Trees

Rattan

Rattan (Myrialepis paradoxa), known as Rotan Kertong, is a ……. palm or rattan that is used in thatched basketry. Many rattans have ……. on their spines which act as ……. to aid in climbing over other plants and to ……. animals from eating them. Try to look out for other understorey plants along the boardwalk.

Tongkat Ali Tree (Eurycoma longifolia)

The Tongkat Ali Tree (Eurycoma longifolia) is also found in the understorey layer. It is known to many of us as an ……. What is not so commonly known is that it is also a general ……. and is known to help improve …….

Giants amongst Us in Singapore Botanic Gardens **Annex 3a**

Group Discussion Activity

Discuss the following questions with your group members and write down your answers in the spaces provided.

a. What are giants?

……

b. How tall are giants?

……

Meraga Tree

The Meraga Tree (Pertusadina euryncha) has an attractive latticed ……. The ……. timber is used for making tool handles and laminated boards.

Jelutong Tree

The Jelutong Tree (Dyera costulata) has a ……. trunk with distinct grooves. This hard timber tree is used to make …… and pencils. Its latex was used in the past to produce chewing gum. Many of these tall trees have thick buttress roots which help to support them.

Try to spot as many giants as you can as you explore the Rain Forest. List down the names of these giant trees in the spaces provided.

……

Of Shapes and Sizes **Annex 3b**

Trees and plants come in all shapes and sizes. Look out for the following interesting plants and trees along the Rain Forest.

Leaf-Litter Plants

Many species of Leaf-Litter Plants such as Agrostistachys longifolia can be seen here. They have an interesting way of gathering additional ..... by trapping falling leaves from surrounding trees between its own leaves. The dead leaves ..... to become additional nutrients for the leaf-litter plants.

White Gutta Tree (Palaquium obovatum)

The White Gutta Tree (Palaquium obovatum) is also known as the Nyatoh Putih. The leaves are a ..... coppery colour particularly on the underside and the tree can produce impressive spreading plank buttresses. With the spirally arranged ..... leaves, buttressed trunk and upward pointing limbs, this tree is fairly easy to recognise in the mid-canopy layer.

Common Red-stem Fig

The Common Red-stem Fig (Ficus variegata) is a ..... tree with many clusters of fruit-like bunches. These fruit-like bunches are in fact inflorescences known as '.....'.

Kempas

The Kempas (Koompassia malaccensis) can grow up to more than 45m tall and 100cm in diameter. It is a decorative hardwood that is commonly used as ..... It is compact and hardy, comparable to some heavy hardwoods and suitable for structural usage and has been widely used in the building industry.

Strangling Fig

The Strangling Fig (Ficus kerkhovenii) starts its life up in the tree canopy instead of on the ground. Its seeds, dispersed by fruit-eating birds and bats, germinate on the branches of rainforest trees, sending down numerous aerial roots to the ground. When they reach the ground, these roots ..... and eventually, the host tree dies of strangulation while the Strangling Fig stands in its place.

Meranti Laut

The Meranti Laut (Shorea gratissima) is another forest giant from the Dipterocarp family. Dipterocarps are the ..... trees in the rainforest, reaching more than 45m in height and 1.5m in diameter.

Tree Ferns

Tree ferns are aplenty here. They are the largest native ferns in Singapore, reaching around 3m tall. Tiny ..... dots, which are the spore cases, enclose thousand of spores and these are found under their leaflets.

Giant Mahang (Macaranga gigantea)

The Giant Mahang (Macaranga gigantea) can be recognised by its very..... leaves with three main ..... and two smaller ones near the leaf base. Its common name is Elephant's Ears because its leaves look somewhat like the elephant's ears. In some parts of the world, they are used as food wrapping.

Did you know?

Apart from giant trees, you will see plenty of lianas as well. These are climbing vines with thick woody stems. They are commonly referred to as Tarzan's vines.

Ninety percent of all lianas are found in the tropics, mostly within rainforests. The Entada spiralis, a forest liana, can be found here.

We Are Not Alone **Annex 4**

Forest Animals

In the Rain Forest, there are actually more living things then we imagine. They can be easily spotted, if only we slow down and pay attention to our surroundings. The rainforest is not just a botanical wonder but also a showcase for some amazing tropical animals.

Common Treeshrew

The Common Treeshrew (Tupaia glis) is a ……., slender animal with a long snout and a longish tail. Its ……. is dense and could be in shades of olive, brown and grey with the underside being pale in colour. It has sharp ……. which are used for climbing.

Common Tree Frog

The Common Tree Frog (Polypedates leucomystax) can be found among the tree foliage. Its colour ranges from uniform green to olive brown with or without white dots and blotches. It is also called the Four-lined Tree Frog and is usually brown or grey with or without four dark longitudinal lines on its back. The Tree Frog has really long slender …….

Common Gliding Lizard

The Common Gliding Lizard (Draco sumatranus) is usually found ……. against the trees. It is a lizard with elongated ……. and skin flaps on the sides of its body. When opened, these skin flaps allow it to ……. between trees. It is primarily a tree dweller but the female comes down to the forest floor to lay eggs. These lizards feed on small insects.

Common Flameback

The Common Flameback (Dinopium javanense) has distinctive golden yellow wing coverts. Like other woodpeckers, this species has a straight pointed bill and a stiff ..... to provide support against the tree trunk. Its long tongue can dart forward to capture insects.

Pink-necked Green Pigeon

With its green ....., the pink neck of the Pink-necked Green Pigeon (Treron vernans) really stands out. This bird is usually found near the Tembusu trees as it is fond of the Tembusu fruit. It makes bubbling squeaking calls which sound like "ooo-ooo, cheweeo-cheweeoo cheweeoo".

Did you know?

There is a Reforested Area in the rainforest which is planted with saplings of rare native trees such as Shorea gratissima, Diospyros pilosanthera and Hopea ferruginea. This is to ensure that the next generation of trees is ready to take over some of the declining mature trees, with a bit of help from us humans.

Reflection Time **Annex 5**

What is one feature that you like most in the Singapore Botanic Gardens? Why?

How do you think the features in Singapore Botanic Gardens have benefited visitors to the park?

What other features would you like to see in the Gardens?

As students, what is one thing you can do to help make the Gardens a better place for the users?

Without NParks, what do you think Singapore will be like?

How do you feel about working in a group? What has your group done well? What can be improved?

Task **Annex 6**

Introduction:

We are part of a bigger world and our actions and decisions will affect the environment and upset the balance and well-being of the forest habitats. We need to do our part to minimise the disturbances to the rainforests by avoiding such activities. In doing so, we are helping to conserve this rich biodiversity, our ecological heritage, for future generations. As members of the school art club, you all have been asked by your teacher-in-charge to come up with a collage. The message here is to encourage students in the school to do their part to protect the rainforests.

Your Roles Are:

1. To understand and appreciate the need to conserve the rainforests.
2. To learn about the importance of rainforests towards this biodiversity of flora and fauna.
3. To generate awareness among the student population that their actions affect the environment and rainforests.
4. To promote to the school community about the need to protect the rainforests.

Your Task:

You are to visit the Singapore Botanic Gardens. At the end of your visit, your club members are to come up with a collage to encourage students in the school to do their part to protect the rainforests.

Some useful questions to guide your members:

1. What is the role and purpose of rainforests in Singapore and around the world?
2. Who is the organisation behind the management of the Singapore Botanic Gardens?
3. Why is the Singapore Botanic Gardens important in the history of Singapore as well as today?
4. Why should we visit the Singapore Botanic Gardens?
5. What are some of the possible problems (e.g. Littering, pollution) that are found in the Singapore Botanic Gardens which pose a threat to the biodiversity of flora and fauna found there?
6. What are the areas in Singapore Botanic Gardens that should be further conserved and preserved?
7. What can further be done for the future of the Singapore Botanic Gardens as an important garden in Singapore?

Process:

Assign specific roles for your club members.

E.g.

1. Group Leader (Lead and co-ordinate, conceptualise idea)
2. Scribe (Record information, preparing the resources and ediing)
3. Photographer (To take and edit photos)
4. Researcher (Search for information on the history, flora and fauna and what to look out for at the gardens etc.)
5. Designer (To conceptualise and come up with the photo collage)

Websites:

1. http://www.nparks.gov.sg/cms/index.php?option=com_visitorsguide&task=parks&id=33&Itemid=73

2. http://www.sbg.org.sg/
3. http://www.wildsingapore.com/places/sbg.htm

Project Rubrics **Annex 7**

Group Members: .....

.....

.....

.....

CATEGORY	4	3	2	1
Quality of Construction	The collage shows considerable attention to construction. The items are neatly trimmed. All items are carefully and securely attached to the backing. There are no stray marks, smudges or glue stains. Nothing is hanging over the edges.	The collage shows attention to construction. The items are neatly trimmed. All items are carefully and securely attached to the backing. A few barely noticeable stray marks, smudges or glue stains are present. Nothing is hanging over the edges.	The collage shows some attention to construction. Most items are neatly trimmed. All items are securely attached to the backing. A few barely noticeable stray marks, smudges or glue stains are present. Nothing is hanging over the edges.	The collage was put together sloppily. Items appear to be just \"slapped on\". Pieces may be loose or hanging over the edges. Smudges, stains, rips, uneven edges, and/or stray marks are evident.
Understanding of Media	The student can define the term \"collage\" and tell how it differs from two other media. S(he) can also name at least 5 things that make a collage more powerful or attractive.	The student can define the term \"collage\" and tell how it differs from two other media. S(he) can also name at 3-4 things that make a collage more powerful or attractive.	The student can define the term \"collage\" and tell how it differs from two other media. S(he) can also name at least 1-2 things that make a collage more powerful or attractive.	The student has trouble defining the term \"collage\" and describing how it differs from other media AND/OR the student cannot describe how to make a collage more powerful or attractive.
Creativity	Several of the graphics or objects used in the collage reflect an exceptional degree of student creativity in their creation and/or display	One or two of the graphics or objects used in the collage reflect student creativity in their creation and/or display.	One or two graphics or objects were made or customized by the student, but the ideas were typical rather than creative (.e.g, apply the emboss filter to a drawing in Photoshop).	The student did not make or customize any of the items on the collage.

Design	Graphics are trimmed to an appropriate size and interesting shape and are arranged well, some in front and some behind. Care has been taken to balance the pictures across the canvas.	Graphics are trimmed to an appropriate size and interesting shape and are arranged with some items in front and others behind. The canvas, however does not appear balanced.	Graphics have been trimmed to an appropriate size and shape, but the arrangement of items is not very attractive. It appears there was not a lot of planning of the item placement.	Graphics are untrimmed OR of inappropriate size and/or shape. It appears little attention was given to designing the collage.
Attention to Theme	The student gives a reasonable explanation of how every item in the collage is related to the assigned theme. For most items, the relationship is clear without explanation.	The student gives a reasonable explanation of how most items in the collage are related to the assigned theme. For many of the items, the relationship is clear without explanation.	The student gives a fairly reasonable explanation of how most items in the collage are related to the assigned theme.	The student\'s explanations are weak and illustrate difficulty understanding how to relate items to the assigned theme.
Number of Items	The collage includes 15 or more items, each different.	The collage includes 10-14 different items.	The collage includes 9 different items.	The collage contains fewer than 9 different items.
Time and Effort	Class time was used wisely. Much time and effort went into the planning and design of the collage. It is clear the student worked at home as well as at school.	Class time was used wisely. Student could have put in more time and effort at home.	Class time was not always used wisely, but student did do some additional work at home.	Class time was not used wisely and the student put in no additional effort.
Titles and Text	Titles and text were written clearly and were easy to read from a distance. Text varied in color, size and/or style for different text elements.	Titles and text were written clearly and were easy to read close-up. Text varied in color, size and/or style for different text elements.	Titles and text were written clearly and were easy to read close-up. There was little variation in the appearance of text.	Titles and/or text are hard to read, even when the reader is close.

Copyright Acknowledgement

- Some information in Annex 1b is taken from http://www.globio.org/glossopedia/article.aspx?art_id=6
- Some information in Annex 1b is taken from http://www.rainforest-facts.com/rainforest-ecosystem.html
- Cliparts and graphics found in the worksheet are taken from http://office.microsoft.com/en-us/images/
- All other information, resources, pictures and photographs are adapted from the National Parks Board and NParks Flora and Fauna websites.
- Rubrics found in Annex 7 is adapted from rubistar.4teachers.org