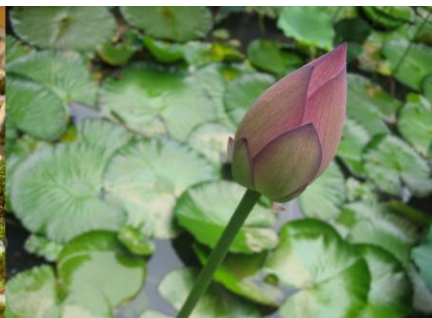


嘉道理農場暨植物園

Kadoorie Farm & Botanic Garden



A Practical Guide to Creating Wildlife Ponds in Hong Kong





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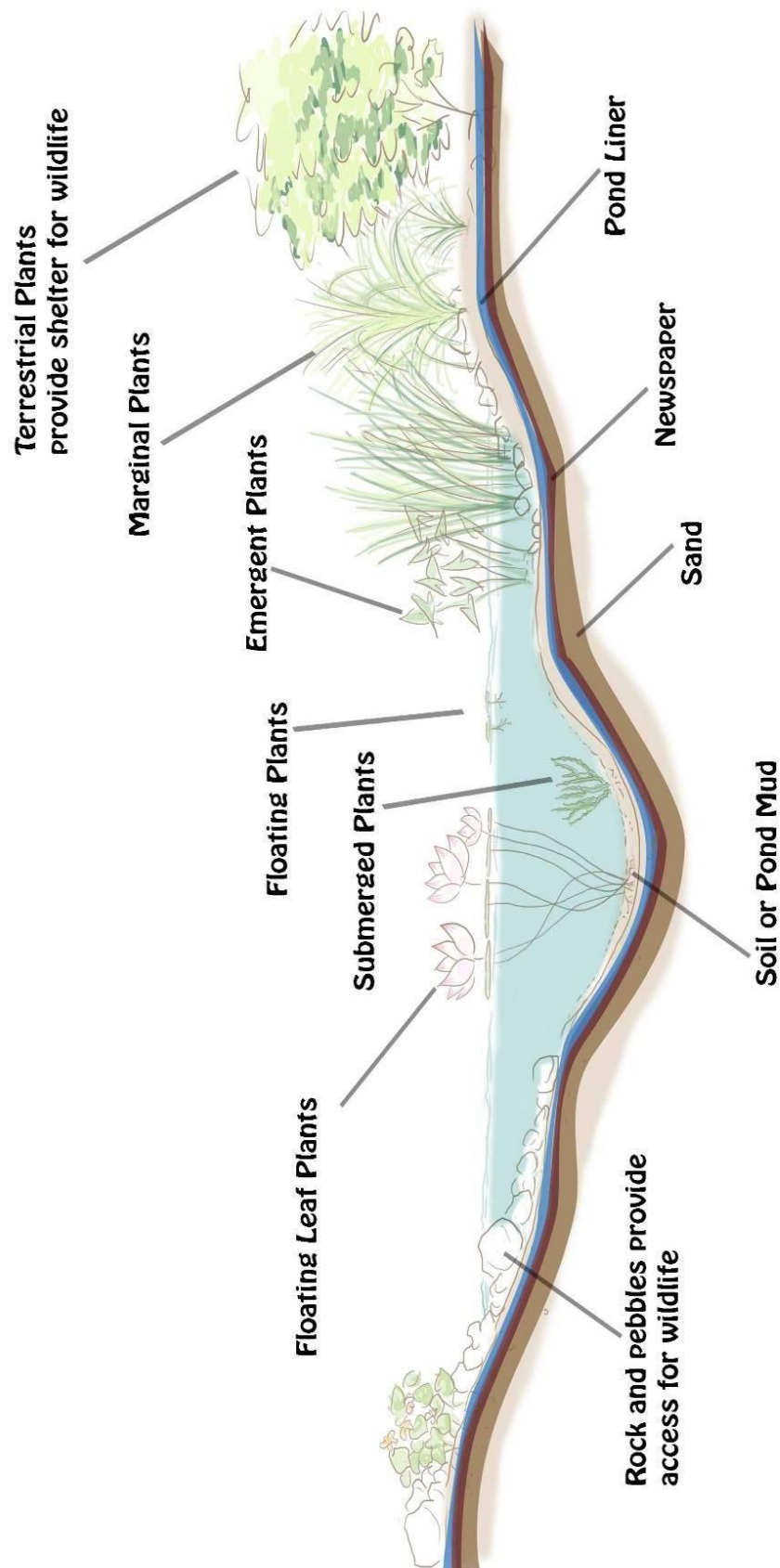
Overview

Building a wildlife pond is one of the most rewarding ways of helping to boost local populations of aquatic animals including amphibians and dragonflies, and a simple way to increase the natural value and visual appeal of the environment.

A well-designed pond will allow visitors to observe the life cycles of plants, amphibians and insects; and provides a place to relax, and enjoying a harmonious connection with nature.

CONTENTS

POND DESIGN	1
CONSTRUCTION MATERIALS & TOOLS.....	2
BUILDING THE POND	4
PLANTING THE POND.....	6
POND ANIMALS.....	8
POND CARE.....	9
ALTERNATIVE PONDS	10
SUGGESTED FURTHER READING	10
APPENDIX 1	11
APPENDIX 2	16



A schematic profile of a constructed wildlife pond

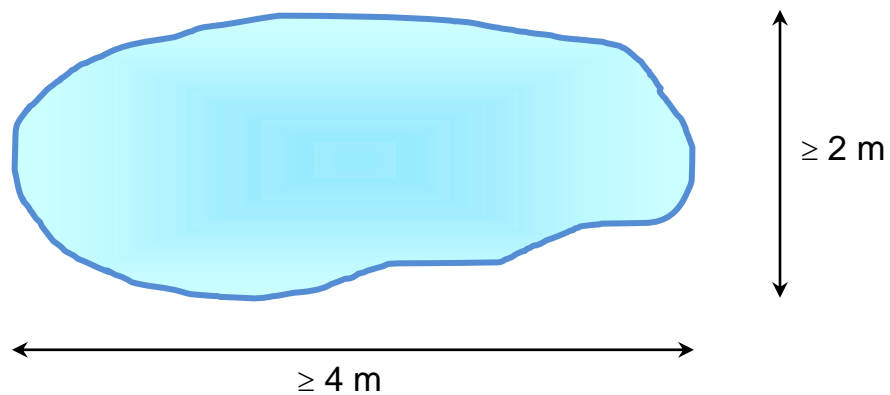
Pond Design

Site

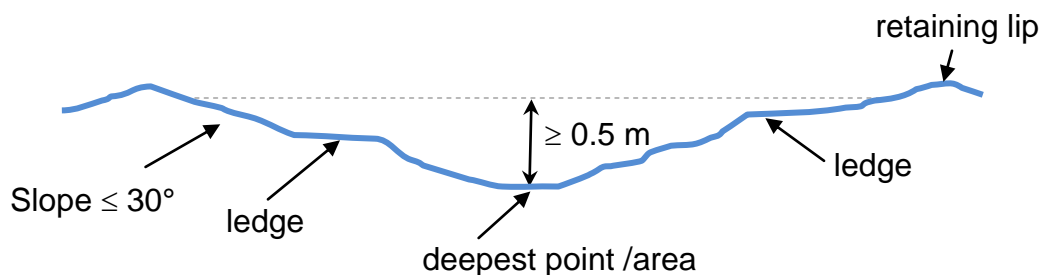
Find a sunny and partially sheltered area for the pond, as close to a naturally vegetated area as possible. Not too many overhanging trees as falling leaves will result in a lot of maintenance.

Shape

The pond should be at least 4 m long and at least 2 m wide at the widest point. If possible, design the shape to be without straight edges.



The sides of the pond must slope gently to the centre, to allow animals unrestricted movement. The addition of flat ledges or areas at different depths is very beneficial, especially for spawning amphibians and aids easy planting. The pond should be at least 0.5 m deep at the deepest point (usually somewhere near the middle).



Construction Materials & Tools

Shovels



For digging the pond

Sand



Acts as a protective liner between the pond and the surrounding land

Newspaper



Acts as a protective liner for the pond liner and sits on top of the sand

Pond liner



To prevent water leaking through the base of the pond; use butyl rubber or thick polythene to provide a waterproof layer

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Soil or mud



For the final natural pond lining;
if possible use low nutrient content
soils with a high clay content

Smooth pebbles or small rocks



To aid placement of plants, assist
wildlife access and give cover
to small animals

Hose



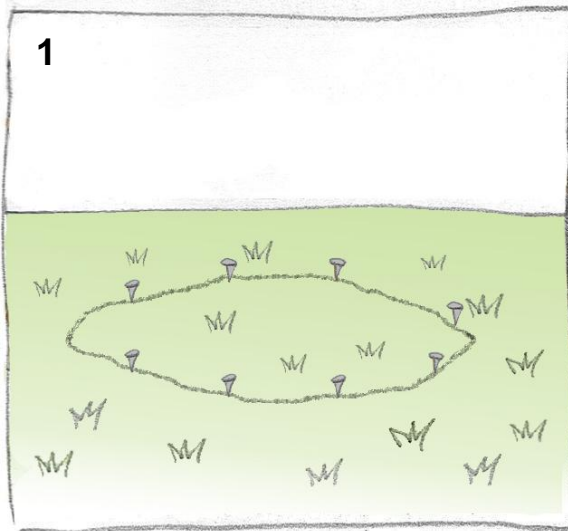
For filling the pond with water

Freshwater plants

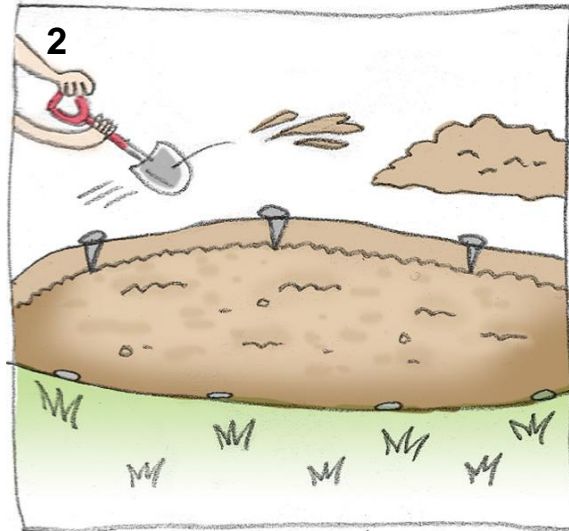


Use native species wherever
possible – food and cover for
animals and fish

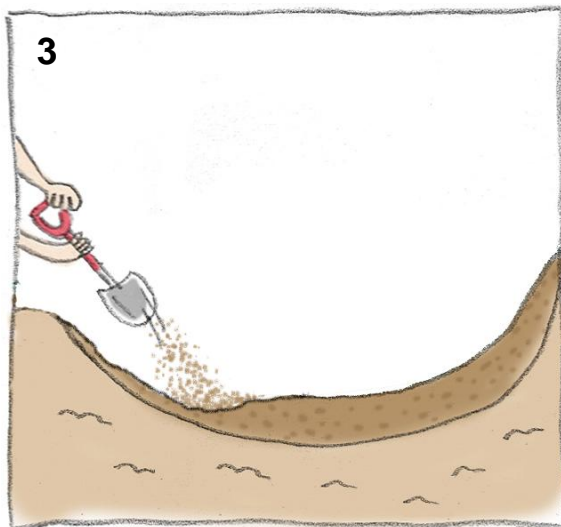
Building the Pond



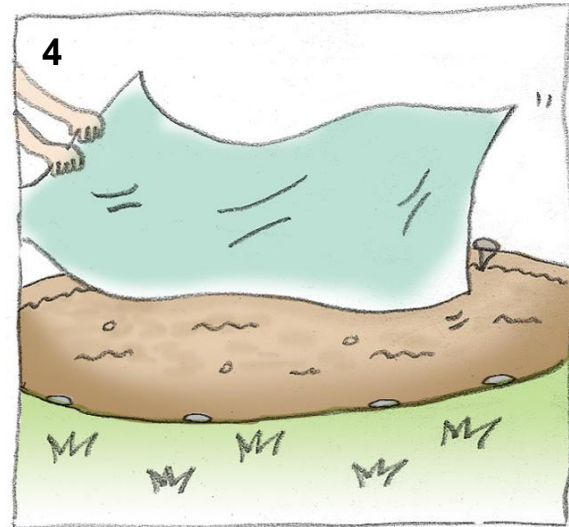
At the pond site, mark out the area to be dug using pegs.



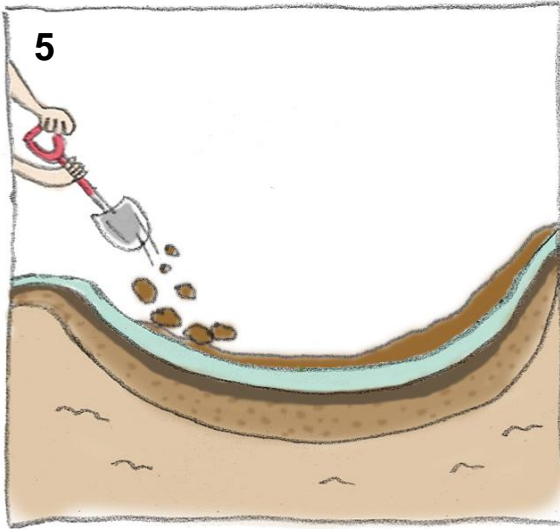
Dig out the material that will make way for the pond, digging 10 cm deeper than the final pond depth and making sure there is a retaining lip all around the edge of the pond.



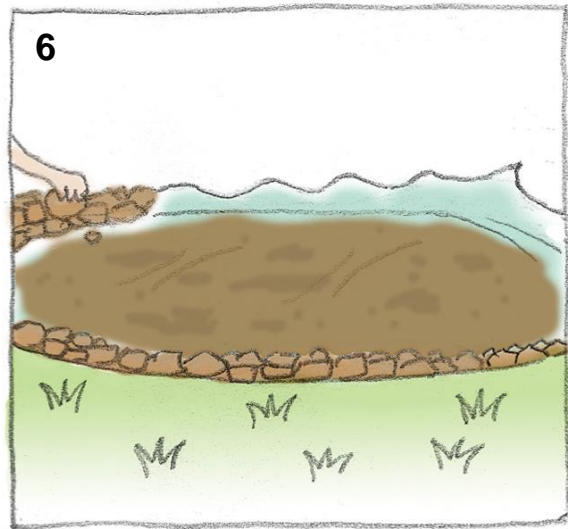
Line the hole with a 2 cm thick layer of sand followed by 1 cm thick layer of newspapers to protect the liner, which will be added later.



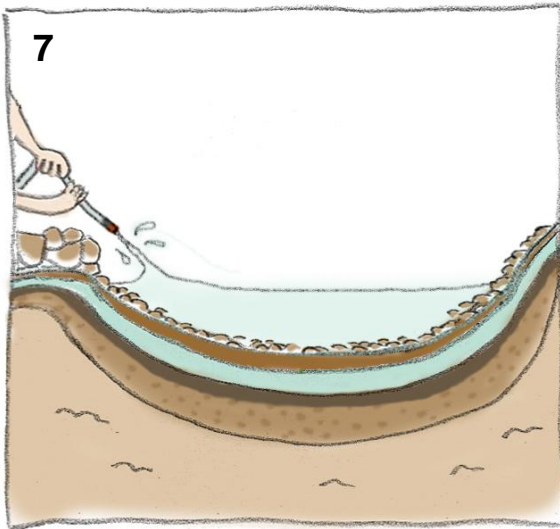
Place the pond liner into the hole. Pond liner can be butyl rubber or thick polythene.



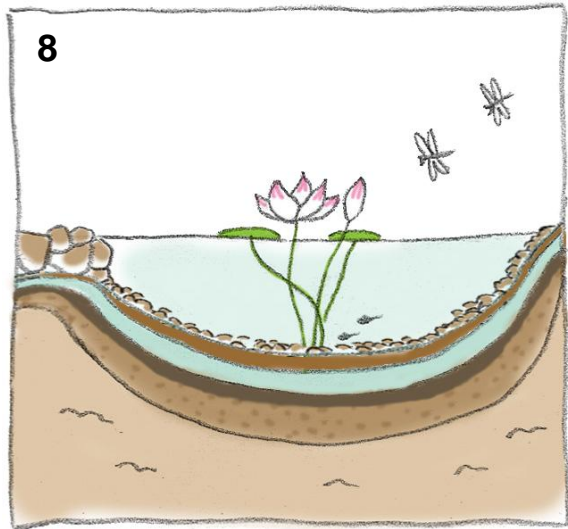
Line the pond with up to 5 cm thick layer of soil and mud.



Place smooth pebbles and a few rocks to line some the shallower slopes and edges of the pond, and also along the outer edges of ledges so as to retain soil and mud for plants.



Fill the pond to about 85% of its volume. The best source of pond water is rain. Tap water can also be used, but it may contain a lot of nutrients that encourage algal growth. Also, because of the chlorine content of tap water, it needs to be left standing for a few days before adding plants.



Add plants. Dead wood or a branch is good for animals to get in and out of the pond, and as a perch for birds and dragonflies.

Planting the Pond

1. Where possible, use native freshwater plants, in line with the Convention on Biological Diversity (see *Suggested Further Reading*). Appendix 1 lists some suggested freshwater plants in Hong Kong. Exotic plants will prevent native animals colonizing the pond and may cause problems if they escape into our native streams and rivers and should be avoided.
2. There are four types of water plants - submerged plants, floating leaf plants, emergent plants and marginal plants. Each type of plant performs different functions (see Appendix 1) in the pond, so it is preferable to include all types of freshwater plants in one pond.

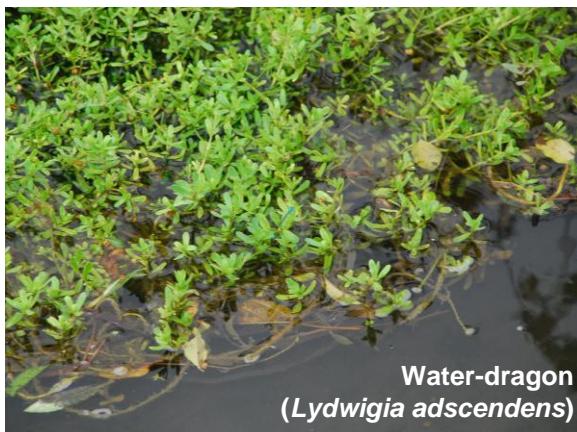
Submerged plants



Floating leaf plants/ Floating plants



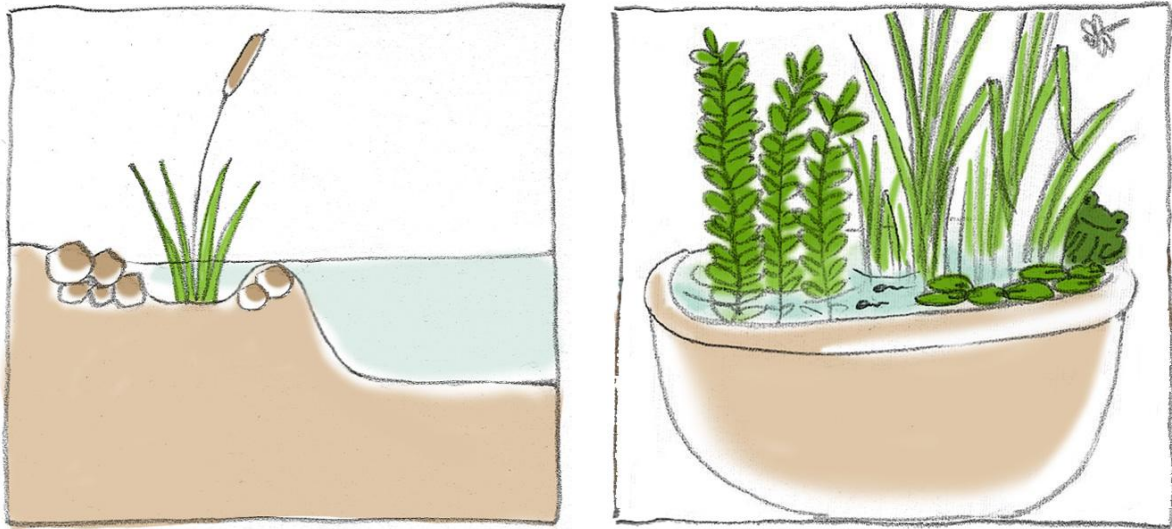
Emergent plants



Marginal plants



3. Plant your freshwater plants directly into the soil covering the liner, though note that some species could be retained in plastic baskets with a hessian lining to retain soil submerged in the pond (e.g. good for water lilies).



4. Buy freshwater plants from local markets or get assistance from a local conservation organization in sourcing plants. Appendix 2 shows the list of freshwater plant suppliers in Hong Kong.

Pond Animals

1. Many aquatic animals such as water beetles, pond skaters, frogs, newts and toads live and breed in water. Many species will arrive naturally once the pond is completed.
2. In Hong Kong, most amphibians generally breed between March and August. Frogs may lay thousands of eggs in the pond during this period.
3. Dragonflies, damselflies and mayflies will visit the pond during the summer.
4. Be careful if you put fish into the pond because some fishes may eat frogs and tadpoles. Again only use native species.



Pond Care

General

Check the water level of the pond and top up when necessary. If using tap water make sure it has been standing for 48 hours before adding to the pond.

Summer (Wet season)

1. Leave the plants alone during the summer. Remove excess vegetation in the autumn when most amphibians have left the pond.
2. All ponds will have algae and this is a natural component. Do not treat the pond with chemicals and algicides to clear up an algae problem. A lot of algae indicates a high nutrient content – there may be too much soil (a small amount can be removed) or the water source may be polluted. Water snails and tadpoles will eat algae. Algae can also be removed using a fine net; but check carefully for any wildlife that might be accidentally removed with the algae these should be returned to the pond.

Winter (Dry season)

Clear fallen leaves and top up the water in the pond if there is significant evaporation.

Mosquito control

1. If mosquitoes become a problem, their larvae should be visible swimming near the surface of the pond. Do not use insect spray to control adult mosquitoes.
2. Several native fish such as the Chinese Barb, help control mosquito larvae (see Lee & Ng, 2009, under suggested further reading), but note that fish species may also feed on other wildlife!
3. The use of Bti (*Bacillus thuringiensis israelensis*) granules targets only mosquito larvae and blackfly larvae. Bti granules should be applied as directed by the manufacturer's instructions. Suppliers can be found in Appendix 2.

Alternative Ponds

If there is not enough space to build a pond, a large waterproof glazed pot can be used to create a wildlife container pond for amphibians, dragonflies and water plants. Care must be taken not to turn the pot into a mosquito breeding pond. A mix of fish and predating invertebrates will control mosquito numbers.

Suggested Further Reading

Agate, E. & A. Brooks. 2001. Waterways & wetlands: a practical handbook. British Trust for Conservation Volunteers. Doncaster, England.

BBC Gardening. Retrieved 24 May 2011 (www.bbc.co.uk/gardening).

Bridgewater, A & G. 2004. The pond specialist: the essential guide to designing, building, improving and maintaining ponds and water features. New Holland Publishers, Australia.

Convention on Biological Diversity. Retrieved 27 September 2011 (www.cbd.int/convention/about.shtml).

Froglife.org. Retrieved 20 May 2011 (www.froglife.org).

Lee, L.F. & S.P. Ng. 2009. Preliminary study on the effectiveness of using native freshwater fish for mosquito control in Hong Kong. *Hong Kong Biodiversity* **17**: 18-20.

Natural England. Retrieved 18 Apr. 2011 (www.naturalengland.org.uk).

Roberts, D. & I. Smith. 2001. Creating garden ponds and water features. Collins, London.

Steel, J. 2004. Gardening with nature, wildlife ponds: how to create a natural looking pond to attract wildlife to your garden. Webbs Barn Design, United Kingdom.

Appendix 1

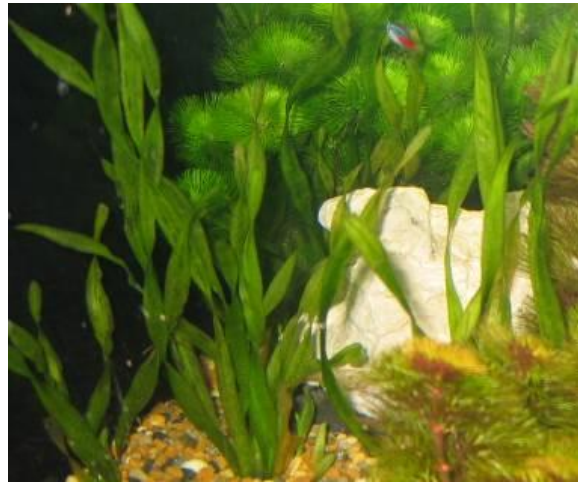
List of some suitable freshwater plants that can be found in Hong Kong.

Submerged plants

Provide a valuable habitat for animal species in deeper water and help remove surplus nutrients. Frogs and toads like to hide their eggs among submerged plants.



Bladderwort
黃花狸藻
(*Utricularia aurea*)
NATIVE



Eel Grass
苦草
(*Vallisneria natans*)
NATIVE



Stonewort
輪藻屬
(*Chara spp.*)
NATIVE

Emergent plants

Are rooted below water level and have their leaves above water level. They prefer shallow water. Dragonflies like these plants when emerging from the water before metamorphosis.



Celery-leaved Crowfoot
石龍芮
(*Ranunculus sceleratus*)
NATIVE



Common Rush
燈心草
(*Juncus effusus*)
NATIVE



Diffuse Dayflower
節節草
(*Commelina diffusa*)
NATIVE



Floscopa
聚花草
(*Floscopa scandens*)
NATIVE



Interrupted Tri-vein Fern
間斷毛蕨
(*Cyclosorus interruptus*)
NATIVE



Lizard's Tail
三白草
(*Saururus chinensis*)
NATIVE



Malacca Galingale
茳芏
(*Cyperus malaccensis*)
NATIVE



Short-leaved Malacca Galingale
鹹水草
(*Cyperus tegetiformis*)
NATIVE



Water-dragon
水龍
(*Ludwigia adscendens*)
NATIVE



南國田字草
(*Marsilea crenata*)
NATIVE

Floating leaf plants & Floating plants

Are important in providing shade on the water during warm, sunny weather. They help to keep the pond cool and prevent the spread of blanket weed and other algae.



Water Lettuce
大藻
(*Pistia stratiotes*)
NATIVE

Marginal plants

Provide important habitat for wildlife around the margins of the pond. Frogs and toads may hide in the marginal plants.



Bog Bulrush
水毛花
(*Schoenoplectus mucronatus*)
NATIVE



Hairy Knotweed
毛蓼
(*Polygonum barbatum*)
NATIVE



Umbrella Grass
芙蘭草
(*Fuirena umbellata*)
NATIVE



Taro
芋
(*Colocasia esculenta*)
NATIVE

Appendix 2

List of some suggested Hong Kong freshwater plants and Bti (mosquito control agent) suppliers

(Disclaimer: The list is purely for reference. KFBG has ensured details are correct at the time of publication)

<u>Company Name</u>	<u>Contact</u>
<i>Freshwater Plants</i>	
Toyo Greenland Co., Ltd.	58 South Section, Wah Shan Village Sheung Shui, N.T., Hong Kong Tel: 852-2639 9312 Fax: 852-2377 2150 http://www.toyogreen.com/
Asia Pacific International Development Ltd.	Guangzhou Conghua Tree Farm (廣州從化苗木養殖場) Conghau City, Guangzhou Tel: (852) 8200 2213 Fax: (852) 2728 1822
Yee Sun Garden Ltd.	Shop G903, Tung Hoi Mansion, 8 Taikoo Shing Road, Hong Kong Tel: (852) 2568 6505 Fax: (852) 2885 1911
Tung Kee Garden Horticulture Limited	500 Tai Hang, Tai Po, N.T., Hong Kong Tel: (852) 2653 6797 / 2656 1609 Fax: (852) 2650 3808
<i>Bti</i>	
Gorich Technology Limited	Unit 703-707, 7/F, Tower 1, Millennium City 1, 388 Kwun Tong Road, Kwun Tong, Kln., Hong Kong. Tel: (852) 2889 0637 Fax: (852) 2590 0255 http://www.ghgroup.com.hk/gorich/english/category.asp?typeid=1

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The Wildlife Pond at Kadoorie Farm & Botanic Garden

About KFBG

Kadoorie Farm and Botanic Garden (KFBG) is situated in the rural New Territories, on the northern slopes of Tai Mo Shan, Hong Kong's highest mountain. Two steep spurs enclose its deep-set valley. Within KFBG are streams, woodlands, orchards, vegetable gardens, walking trails, live animal exhibits, floral exhibits, sustainable agriculture demonstration plots, art exhibits, a wild animal rescue centre, a native tree nursery, and, other conservation and education facilities.

In the post-war years, Hong Kong was flooded with destitute refugees. Many had traditional knowledge of crop production and livestock farming but no stock, others had land but no experience. They required support to rebuild their lives. The farm site at Pak Ngau Shek was established in 1956 as a base for livestock breeding and distribution, agricultural research, farmers training, public education and recreation. The barren slopes were terraced and planted with orchards and vegetable gardens. The development of the botanic garden began in 1963 and the plant conservation programme from 1972.

On 20th January, 1995, the Legislative Council of Hong Kong passed an Ordinance (Chapter 1156) incorporating KFBG as a non-profit corporation designated as a conservation and education centre. It is a unique public-private partnership, for while the KFBG Corporation is a public organisation, it is privately funded by the Kadoorie Foundation.

Since 1995, KFBG has been conducting a wide range of nature education, nature conservation and sustainable living programmes both on-site, and, throughout Hong Kong and South China.

In this time of severe global crisis KFBG raises awareness, undertakes rigorous science-based species conservation and ecosystem restoration, and offers new ways of thinking and living to respond to the world's problems. Hence, our work brings hope and improvement by focusing on nature conservation, sustainable living and holistic education that re-connects people with nature. By working together with the public, Governments, academia, NGOs and businesses, we can protect our common future.

Our mission is to harmonise our relationship with the environment. Our vision is a world in which people live sustainably with respect for each other and nature.



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