

# CONSERVING OUR BIODIVERSITY

Singapore's National  
Biodiversity Strategy and  
Action Plan

# CONTENTS

01 **INTRODUCTION**

03 **PRINCIPLES & GOALS**

## **STRATEGIES AND ACTIONS**

04 **STRATEGY 1**  
Safeguard Our Biodiversity

08 **STRATEGY 2**  
Consider Biodiversity Issues in Policy and Decision-making

10 **STRATEGY 3**  
Improve Knowledge of Our Biodiversity and the Natural Environment

14 **STRATEGY 4**  
Enhance Education and Public Awareness

18 **STRATEGY 5**  
Strengthen Partnerships with All Stakeholders and Promote International Collaboration

21 **MONITORING & EVALUATION**

23 **ADDENDUM**  
Singapore's National Targets Based on Aichi Biodiversity Targets 2011-2020



The development of the Garden City took root more than 40 years ago when then Prime Minister Lee Kuan Yew launched the Tree Planting Campaign in the 1960s. Since then, Singapore's greening efforts have transformed the island into a distinctively lush city that is almost 50% covered by greenery.

Going forward, our aim is to bring this to the next level – a city embraced in a garden of diverse flora and fauna. This vision is portrayed in many of the children's artwork featured inside. The drawings reflect the growing environmental awareness among our younger generation and underpin the need to safeguard our natural heritage.

# “Conserving Our Biodiversity”

maps out Singapore’s master plan for biodiversity. It aims to promote biodiversity conservation, keeping in mind that as a densely populated country with no hinterland, we would have to adopt a pragmatic approach to conservation and develop unique solutions to our challenges. It intends to establish both policy frameworks and specific measures to ensure better planning and co-ordination in the sustainable use, management and conservation of our biodiversity.

Biodiversity conservation cannot be achieved with only efforts from one agency. A holistic approach must be adopted and the inputs of various public sector agencies and nature groups have been taken into consideration in the preparation of this document. The master plan also fulfils our regional and international commitments, primarily the Convention on Biological Diversity (CBD)<sup>1</sup>.

## **Singapore Today – a Garden City, a Haven for Biodiversity**

Singapore’s green policies, beginning with the “Garden City” plan in the 1960s, and continuing into the next century as a “City in a Garden” vision, have transformed the city-state into a distinctive and vibrant global city. The clean and green environment mitigates the harsh concrete urban environment and improves our quality of life. This has allowed Singapore to meet the lifestyle and recreational needs of an increasingly sophisticated population, and enhanced Singapore’s attractiveness as a destination for foreign businesses and talents.

With careful planning, Singapore has been able to increase its green cover<sup>2</sup> from 35.7% to 46.5% between 1986 and 2007, despite the population growing by 68% from 2.7 million to 4.6 million. Currently, close to 10% of the total land area is set aside for parks and nature conservation. This sense of green

space in the city is further enhanced by integrating natural ecosystems into parks, clustering parks with complementary ecosystems and activities, and connecting them in an island-wide network of green links.

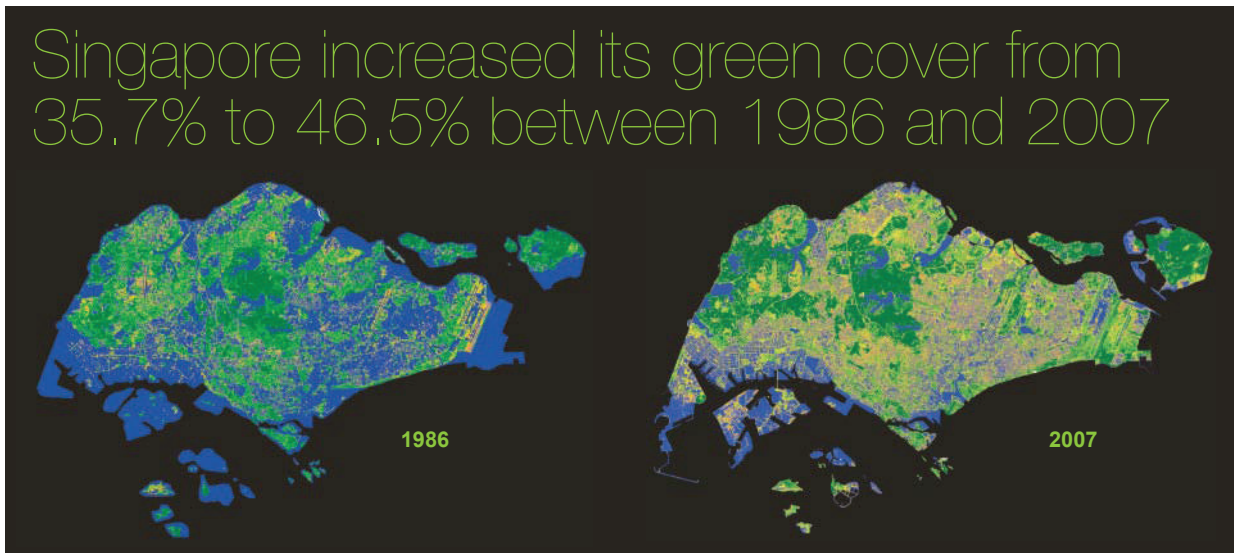
The lush green cover and warm tropical climate make Singapore a haven for rich biodiversity despite our small land mass. The island has more than 2,000 native vascular plant species, some 57 mammal species, 98 reptile species and 25 different amphibian species. Some 355 species of birds also soar through our skies, along with 282 over species of butterflies.

Our inter-tidal mangroves and mudflats are home to hundreds of fish species, which live in the root systems of more than 31 true mangrove plant species. Seagrass meadows still remain, with 12 of the 23 Indo-Pacific species found within Singapore’s waters. More than 100 species of inter-tidal sponges have

<sup>1</sup> The Convention on Biological Diversity (CBD) is an international agreement established by the United Nations. The CBD currently has 191 Parties. Singapore signed the CBD on 12 June 1992 and subsequently became a Party on 21 December 1995. For more information on the CBD, please visit [www.cbd.int](http://www.cbd.int)

<sup>2</sup> This refers to the area covered by greenery. This is based on a study conducted by the Centre for Remote Imaging, Sensing and Processing (CRISP), National University of Singapore.

Singapore increased its green cover from 35.7% to 46.5% between 1986 and 2007



been recorded, and many more are likely to be observed in the sub-tidal areas, along with the 256 different species of hard corals.

Nestled in the midst of the Indo-Malayan rainforest (one of three last remaining rainforest blocs in the world), and at the focal point between the South China Sea and Indian Ocean, Singapore is well-placed to showcase the richness of the region's biodiversity in an easily accessible urban setting.

#### **Our Biodiversity — A Valuable and Precious Resource**

Some of us may take for granted how our survival depends on biodiversity. The tropical rainforests in the Central Catchment Nature Reserve protect our water catchment so that we can have clean water. Plants play important roles like cleaning our air through the capturing of carbon dioxide, lowering the ambient temperature by shading, and reducing soil erosion. Insects function as important pollinators so that we can enjoy fruits. Birds act as seed dispersal agents. Mangroves serve as nurseries for crabs, prawns, cockles, and many of our marine organisms. Coral reefs harbour several of our favourite seafood. The natural ecosystems found in Sungei Buloh, Bukit Timah, Pulau Ubin, etc., cater to our recreational, educational, and psychological needs.

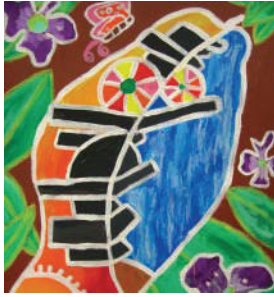
#### **A Holistic Approach to Nature Conservation**

Singapore has adopted the policy to legally protect representatives of key indigenous ecosystems within our Nature Reserves, namely, the Bukit Timah Nature Reserve (lowland dipterocarp forest), the Central Catchment Nature Reserve (including freshwater swamp forest), Sungei Buloh Wetland Reserve (mangroves) and Labrador Nature Reserve (coastal hill forest). In addition, one of the reserves, Sungei Buloh Wetland Reserve, holds the distinction of being an ASEAN Heritage Park, as well as an important link in the chain of stop-over sites for migratory birds from as far as

Siberia. Together, the four nature reserves cover more than 3,000 hectares or 4.5% of Singapore's land area. A network of green space, parks and park connectors, comprising an additional 4.5% of our land area, supports and buffers these Nature Reserves.

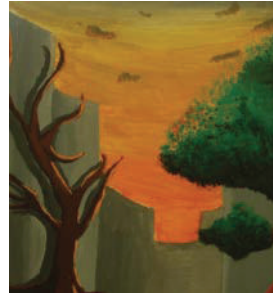
Looking forward, Singapore will need to continue to grow economically and demographically. But nature conservation need not necessarily suffer as a result if we can continue to find unique solutions to meet our set of challenges. For a city that is one of the most densely populated in the world, and which has no hinterland, the key challenge is to integrate nature without impeding economic growth. Hence, beyond developing infrastructure, Singapore has also paid due attention to conserving the natural biodiversity in the city. This requires a pragmatic approach in balancing development and biodiversity conservation, finding unique solutions to create a nature conservation model that champions environmental sustainability in a small urban setting. Projects like the plan to build a network of 300 km of park connectors, the promotion of skysrise greenery and the Active, Beautiful and Clean Waters Programme to softscape our waterbodies throughout the city provide exciting opportunities to weave nature deeper into the cityscape, and are illustrations of how we materialise the unique conservation model into reality.

Ultimately, our work in this area cannot be complete without the full and active support of the people. Community involvement is key to Singapore's long-term success in conserving our natural heritage. Already, there are many examples where the public, private and people sectors work hand-in-hand in successful projects to conserve our native flora and fauna. But to have a city where people and nature co-exist in harmony, we will need to press on to raise the appreciation of the wonders of nature within our urban setting.



**Beautiful Gardens make Beautiful Homes**  
**Zhang De Primary School:**  
 Chee Jia Yi, Teo Jing Yi,  
 Sandy Toh, Patricia Lim

In this piece, we are trying to portray a Garden City. Everywhere we go, we are bound to come across beautiful flowers and trees. We love the idea of having nature so close to us. This makes Singapore our lovely home.



**Concrete Forest**  
**Catholic High School:**  
 Tan Jie Qi, Han Jie Chou

This painting shows a city with a dead tree on one side and a live tree on the other. The message is that even though urbanisation is good, if we do not take care of the environment just as well, all the beautiful trees and plants will die.

# Principles & Goals

## PRINCIPLES

There is an increasing global awareness on the role of biodiversity conservation in improving the quality of life in cities. "Conserving Our Biodiversity" provides a framework that uses an integrated approach for the conservation of our natural heritage. It showcases Singapore's commitment to the conservation and sustainable use of its biodiversity resources. Our aim is to create a city biodiversity conservation model that champions environmental sustainability in an urban setting with well-endowed natural heritage.

The following principles guide its implementation:

- The biodiversity resources of Singapore are our natural heritage and should be conserved for future generations.
- Considerations on biodiversity and ecosystems are factored into the national planning process.
- A balanced view is adopted of national priorities and international and regional obligations.

## GOALS

The goals of Singapore's National Biodiversity Strategy and Action Plan mirror the objectives of the Convention on Biological Diversity.

- 1 Conserve and enhance biodiversity at the genetic, species and ecosystem levels.  
 Singapore's habitats and ecosystems should be conserved for long-term sustainability of the ecosystems. The rates of decline in biodiversity should be slowed down as expressed in the World Summit on Sustainable Development target of reducing the rate of biodiversity loss by 2010. Concerted efforts should be made to conserve existing species, habitats and ecosystems, and to re-establish species known to have been present in the past.
- 2 Ensure sustainable use of Singapore's biodiversity resources.  
 The use of Singapore's biodiversity, including its benefits such as ecosystem services or by-products, should be sustainable. Multi-agency cooperation should be central to the assessment, monitoring and regulation of conservation processes.
- 3 Ensure fair and equitable sharing of benefits that result from the use of our genetic resources.  
 Policies on sharing of benefits derived from the use of our genetic resources are to be formulated and implemented, at the same time balancing the twin goals of biodiversity conservation and sustainable use.

Smooth Otters can often be spotted in Sungei Buloh Wetland Reserve.



## Strategy 1: Safeguard Our Biodiversity

Conserve Singapore's habitats and ecosystems for long-term sustainability, so that Singaporeans can benefit from their multiple functions. Concerted efforts should be made to protect existing native species, habitats and ecosystems, and to re-establish species which once existed.

### Actions:

- 1.1. Implement species conservation and recovery programmes
- 1.2. Rehabilitate areas that have previously been degraded
- 1.3. Extend green corridors to counter fragmentation
- 1.4. Utilise parks for ex-situ conservation and to house or re-create ecosystems that have been lost

# Concerted efforts are made to protect or re-establish native species, habitats and ecosystems

## Species Conservation and Recovery Programmes

Many activities are being carried out in Singapore, designed to conserve and recover native species. Current highlights include bird, dragonfly and plant conservation. Singapore's conservation work with Oriental Pied Hornbills has received national and international attention. Such work is now being extended to other species. With plants, we conserve rare species in their natural habitats; rescue plants from areas undergoing development; increase their numbers by seeds, cuttings and tissue culture, and plant them in secure areas. We established the Yishun Arboretum in 2008 for the ex-situ conservation of rare dipterocarp trees, and will continue with other tree conservation projects in different parks.

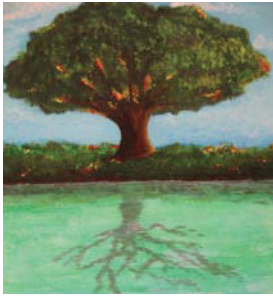
Dragonflies are important indicators of freshwater habitat quality. The 117 species found locally are being cultivated by enhancing waterbodies, such as ponds and streams, with plants important for dragonflies. The designs of parks such as Jurong Central Park, Admiralty Park and Gardens by the Bay are also being improved to enhance dragonfly habitats. All these improve the experience of park visitors, who can enjoy better surroundings and lively, colourful insects.

NParks also creates and enhances habitats, by replanting degraded areas, developing new grasslands for birds, and improving mangroves. These activities are carried out in conjunction with other agencies, in many parts of Singapore, so that sufficient habitat is available for the species we are striving to conserve.

## Marine Rehabilitation Programme: Coral Nursery Project

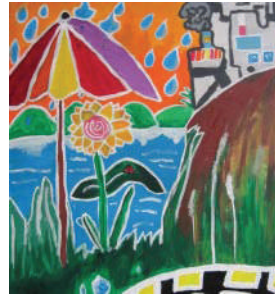
Coral reefs in Singapore, though small in size, boast a relatively high biodiversity. These reefs are, however, threatened by various human activities. In order to enhance and restore the current coral cover in Singapore, a coral nursery was established off Pulau Semakau in 2007. Unlike other commercial methods of harvesting corals, which breaks up healthy coral colonies for planting, the Pulau Semakau nursery is the first coral nursery in the region that uses "corals of opportunity" (i.e. coral fragments that lie free on the reef having been fragmented by some impact) as seed corals for growth and transplantation. This is akin to a horticultural nursery providing seedlings to be planted in forest sites that need to be reforested. Coral fragments that have been successfully grown in the coral nursery are being transplanted onto the degraded reef sites off the southern coast of Singapore.

NParks and National University of Singapore jointly champion this marine conservation project with sponsorship from Keppel Corporation and support from the National Environment Agency.



**The Ugly Truth**  
**Catholic High School:**  
Shi Cheng Zi Jing, Kenneth  
Teng, Liew Wai Yinn,  
Terence Szeto

The healthy tree by the river is dead in its reflection. Our environment is dying. The many wonderful sights of nature are just the minority. Much of nature on Earth is facing a crisis and we need to do something about it.



**The Smoke From  
The Factory**  
**Zhang De Primary School:**  
Sandy Toh, Patricia Lim,  
Chee Jia Yi, Teo Jing Yi

A factory emitting poisonous gas results in acid rain that destroys life. This painting was created to raise awareness of the bad effects of air pollution. The sunflower is lucky to have shelter from danger but not the rest of the world.

### **Terrestrial Rehabilitation Programme: Ketam Mountain Bike Park**

The Ketam Mountain Bike Park in Pulau Ubin is a good example of how land can be optimally used for different needs. The project demonstrated the sustainable co-existence of nature conservation and outdoor recreation.

When NParks took over management of the site in 1999, it had been highly impacted by past granite quarrying activities. The severely degraded land was devoid of greenery and biodiversity, and the ground was highly compacted with granite chips and dust.

To rehabilitate the site, about 350,000 cubic metres of soil were brought in for landscaping and over 1,500 trees and shrubs were planted. The Bike Park is now a lush habitat for a large number of open country wildlife, attracting even birds previously not found in Pulau Ubin e.g. the Red-wattled Lapwing, Baya Weaver and Lanceolated Warbler.

### **Active, Beautiful and Clean (ABC) Waters Programme**

Soft-scaping of our waterways has an important role to play in benefiting our biodiversity. Most streams, rivers and ponds in the built-up parts of Singapore had been given hard edges, created by masonry, walls or concrete, to prevent flooding and protect infrastructure. Now, the trend has been reversed: changes in water flow and water levels are managed rather than prevented, and the ABC Waters Programme engages the People, Public and Private (3P) sectors to take ownership of water resources. It includes initiatives to manage catchments and waterways for recreation and enjoyment. Our drains, canals and reservoirs are being transformed into beautiful streams, flowing rivers and vibrant lakes.

Soft edges, with a variety of native plants, help to merge the built and the natural environment. They encourage direct interaction between people and waterways. Projects such as the revitalisation of the Kolam Ayer riverside encourage dragonflies, kingfishers and local water plants to thrive. Planted edges create more habitat types, and more places for animals to seek shelter, rest and feed. The plants can also help in making the water cleaner.

More information about the ABC Waters Programme can be found at <http://www.pub.gov.sg/abcwaters/>



Some 355 species  
of birds soar through  
our skies



Stork-billed Kingfisher.



A sustainable management plan for Chek Jawa was developed in consultation with various nature groups.

## **Strategy 2:** Consider Biodiversity Issues in Policy and Decision-making

The government will take into account biodiversity issues when making decisions and adopt holistic approaches towards conserving our natural environment.

### **Actions:**

- 2.1. Incorporate biodiversity conservation considerations, including integrated coastal management principles, into existing administrative processes
- 2.2. Enhance biodiversity assessment capabilities
- 2.3. Strengthen the current processes on access and benefit sharing, to ensure that biodiversity conservation is considered when granting access to Singapore's natural genetic resources

# Singapore is a haven for rich biodiversity despite the small land mass

## Integrated Coastal Management

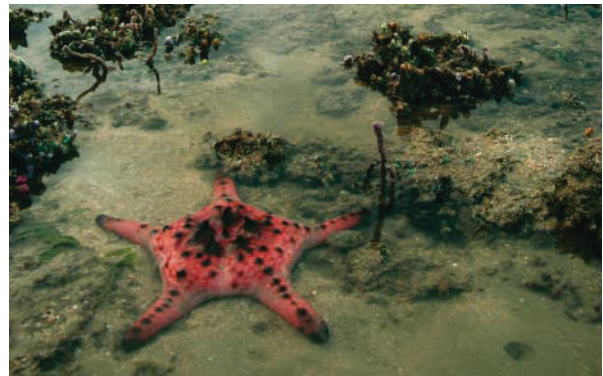
As Singapore progresses economically, the multi-sectoral use of Singapore's coastal and sea-space resources becomes increasingly more complex, requiring the balancing of development, navigation, public health and conservation goals. The Technical Committee on Coastal and Marine Environment, comprising members from different agencies with a stake in the marine environment, was set up to address these issues, and will adopt integrated coastal management principles as a holistic approach in managing our coastal and marine resources.

## Saving Chek Jawa

Do Singaporeans care about our biodiversity? In 2001, the public learnt about the rich biodiversity of Chek Jawa. Many visited the unique juxtaposition of at least 5 inter-tidal ecosystems in Chek Jawa. Visitors of all ages were fascinated by the various organisms seen only during low tides that occur during the early or late hours of the day. Even more flocked to experience Chek Jawa when they learnt that it was slated for reclamation. They were at first resigned to accept the planned reclamation. However, many felt so strongly about the natural heritage of Chek Jawa that they appealed to the Government to seek alternate solutions.

Does the Singapore Government take biodiversity considerations into decision-making and listen to citizens' feedback? After studying the numerous appeals, supported by documentation of the unique biodiversity found in Chek Jawa and views of the scientific experts, and ensuring that critical land use needs would not be unduly compromised, the Government decided that as long as it was not needed for development, Chek Jawa would be kept in its natural state.

Today, Chek Jawa, a jewel of our natural heritage, continues to be enjoyed by all who visit it.





A survey of Singapore's natural areas unearthed new records of species never before seen here.

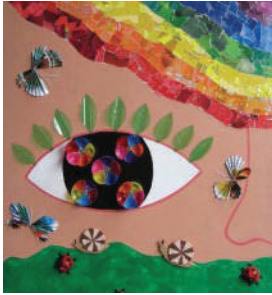


## **Strategy 3:** Improve Knowledge of Our Biodiversity and the Natural Environment

A keen knowledge of how the key ecosystems respond to our activities will enable us to conserve and use them in a sustainable manner. It is essential that we support taxonomic studies, document our biodiversity and conduct ecological research.

### **Actions:**

- 3.1. Encourage and facilitate research, in particular on ecosystem and species-specific biodiversity conservation, the interactions between the biological components and their physical environment, biodiversity valuation studies and the impact of climate change on biodiversity
- 3.2. Monitor the health of ecosystems and species as part of the management process
- 3.3. Develop and maintain a central information portal on biodiversity to facilitate more informed decision-making
- 3.4. Maintain a list of species with their conservation status (red data list)
- 3.5. Compile case studies on and assess best practices that have been implemented



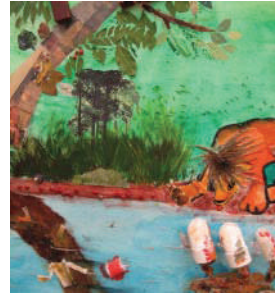
#### She's Beautiful

##### Pei Tong Primary School:

Gan Jia Ai, Bai Yu Xin, Ng Yi Shien, Ho Pei Xuan

*When I lift my head,  
I can see the clean  
opalescent sky.*

*When I take a deep breath,  
I inhale the clean pristine scent.  
The Earth I stand on  
Radiates serenity and beauty.*



#### Nature's Opposites

##### Raffles Institution:

See Yong Xin, John Kee Jia Liang, Daniel Siew Jihan

This collage shows the negative and positive impacts of man on nature in Singapore. The positive side shows beautiful greenery and a lion drinking from the water while the reflection shows the negative side with a vandalised tree and sewage.

### Singapore Red Data Book

The Red Data Book is a list, with photographs and descriptions, of the plant and animal species in Singapore which need improvement on their conservation status. It indicates the main reasons for rarity of these species, and gives positive guidance on actions that can be taken for improvement. Many countries have their own Red Data Book, complementing the global list of threatened species that is maintained by IUCN World Conservation Union. Singapore's first edition of the Red Data Book was produced in 1994 and a second updated edition was published in 2008.

The book is a resource for planners, researchers, students and agencies, to help plan conservation actions. It is also the basis for monitoring, so that the status of species can be tracked. Its contents highlight a number of cases where the status of a species in Singapore differs from the global picture. A species that is common overseas can be very rare in Singapore. Conversely, some species threatened elsewhere, such as the Great-billed Heron and the Straw-headed Bulbul, are doing well here. Local context is very important in planning local actions. This is where Singapore's own data sources and publications are essential.

In line with making information more readily accessible, the Red Data Book is being placed on-line.

### Documenting Our Marine Biodiversity

To better understand and assess the state of our marine biodiversity, NParks has embarked on a series of research projects in collaboration with different research institutions and interest groups to study, document and monitor our marine natural heritage.

The study on the biodiversity and distribution of the marine sponges (an animal that comes in various colours, shapes and sizes and is rooted to one spot, very much like a plant) of Singapore with NUS is one such example. These sponges play many important roles in the coral reef ecosystem such as serving as food and providing habitats for other marine organisms. They also possess potential chemical compounds that are of interest to pharmaceutical companies. The study has so far recorded over 100 species of inter-tidal sponges, of which more than 40 are new records for Singapore, and at least one is new to science. The project is now in its second phase, targeting sub-tidal species.

Another research programme that Royal Belgian Institute of Natural Sciences, NUS and NParks are currently working on is the Singapore Mangrove Insect Project. Eleven mangrove sites in Singapore were surveyed during a one-month sampling campaign in May 2009 to document the species richness and assess the quality of each site. The insect fauna of Singapore was found to be surprisingly rich and one of the best known in the world. During the one-month sampling, at least 10 new fly species for science were found, demonstrating that even in a densely populated country like Singapore, treasures can still be found.

The Singapore Hornbill Project  
studies the nesting ecology of  
the Oriental Pied Hornbill.

CONSERVING  
OUR BIODIVERSITY



Treasures can still  
be found even in a  
densely populated  
country like Singapore



Natural areas act as living classrooms to encourage greater nature appreciation.

## **Strategy 4:** Enhance Education and Public Awareness

Knowledge and awareness are pre-requisites for action hence communication on biodiversity issues is critical in driving public involvement. Effective communication will create greater awareness and interest in our natural heritage and instill a sense of national pride.

### **Actions:**

- 4.1. Increase appreciation, awareness and understanding of Singaporeans for nature through public seminars, road shows and events
- 4.2. Promote volunteerism through biodiversity interest groups
- 4.3. Incorporate elements of biodiversity conservation into the curricula of all levels of education



# Community involvement is key to Singapore's long-term success in conserving the natural heritage

## Volunteer And Outreach Programmes

A variety of programmes are available for anyone wanting to be involved in nature conservation. This includes volunteering as guides at our nature areas, participating in habitat monitoring and giving a hand in reforestation projects.

Guided walks are available in places such as Sungei Buloh Wetland Reserve, Central Catchment Nature Reserve, Bukit Timah Nature Reserve, Pulau Ubin, Kusu Island, and Pulau Semakau. These tours are run by NParks and various interest groups including The Blue Water Volunteers, Raffles Museum of Biodiversity Research and Nature Society of Singapore.

Those who prefer to get their hands dirty can volunteer to remove debris from our shoreline. The International Coastal Cleanup Singapore, which is coordinated by the Toddycats (volunteers of the Raffles Museum of Biodiversity Research), is one of Singapore's largest environmental conservation programme with an average annual participation of 1,500 volunteers.

The public can also participate in biodiversity-related seminars and educational workshops conducted by organisations and interest groups such as NParks, Nature Society of Singapore, Cicada Tree Eco-place and The Leafmonkey Workshop. These varied organisations also reach out to the community by showcasing their work in environment-related events, such as Earth Day, International Day for Biological Diversity, World Environment Day, and Envirofest.

## Wireless Learning Trail @ Sungei Buloh Wetland Reserve

The wireless learning trail at Sungei Buloh Wetland Reserve was inspired by the desire to enhance the learning experience for students at the reserve. It is a new way of reaching out and delivering educational programmes that will appeal to the young and technology-savvy Singaporeans. The first of its kind in the parks of Singapore, and possibly in the region, this is a public-private partnership initiative involving NParks, IDA, MOE and iCELL Network Pte Ltd.

Using webcams installed on Ultra Mobile PCs (UMPC), students are able to receive information by scanning the 2-D barcodes that are located strategically along the wireless learning trail. They can listen to birdcalls or observe behaviour of mudskippers. Students are also prompted with stimulating questions on what they can see along the trail and even participate in various educational activities provided on their UMPC.

There are 20 barcodes or stations along the Mangrove Boardwalk. It takes about 2 hours to finish the entire learning trail. After completion, students can include their thoughts and observations to build their own personal learning trail, and share the information with their classmates. This promotes learning in the 'outdoor classroom'.

For more information, visit [www.sbwr.org.sg/events/wirelesslearningtrail/](http://www.sbwr.org.sg/events/wirelesslearningtrail/)



**Future in Our Hands**  
Kranji Secondary School:  
Group of 5B and 5C  
art students

We used our fingers and handprints to create an image of a tulip flower. We want to present the idea, quite literally, that if we put our hands together, we will be able to make our world a better and more beautiful place.



**Irony of Life**  
Zhang De Primary School:  
Sandy Toh, Patricia Lim,  
Chee Jia Yi, Teo Jing Yi

A lady takes great care of her garden yet the real world is dying. She seems to be someone who loves nature but on the other hand owns a car that contributes to air pollution. This is the irony of life. Do we see her in ourselves?

### SUN Club: Special Projects To Understand Nature

The SUN Club programme is founded on the idea of 'nature for everyone'. It aims to bring nature appreciation to students with special needs through tailor-made projects developed in consultation with special schools.

Initiated by NParks and launched on 3 October 2006, the SUN Club programme is supported by a sponsorship from Singapore Press Holdings Foundation (SPH Foundation). It is a community partnership project that also involves the National Council of Social Service (NCSS) and five special schools that pioneered the programme with NParks.

SUN Club participants get to visit some of Singapore's most fascinating nature areas with trained guides: the Sungei Buloh Wetland Reserve, Bukit Timah Nature Reserve, Pulau Ubin, Pasir Ris Park and East Coast Park. They will bring home fond memories of Singapore's biodiversity, and gain an understanding as to how they, themselves, are a critical link in the web of life.

### Wild Singapore Online!

The "Wild Singapore" website (<http://www.wildsingapore.com>) was created by Ria Tan, a nature enthusiast, to provide a one-stop resource portal for Singaporeans who want to learn more about our nature areas and do more for them. The website features news on biodiversity and environmental issues, and provides a listing of nature-related events in Singapore. Fact sheets for visitors on Singapore's nature areas are available, along with a listing of volunteer opportunities and other ways to make a difference for nature in Singapore. Nearly 7,000 photos of Singapore's wildlife are also available for free download. Singapore's marine biodiversity and related-issues form the focus of the affiliated "Wild Shores of Singapore" blog (<http://wildshores.blogspot.com>). Since it went online in 2007, the "Wild Singapore" website has attracted nearly 800,000 visitors, with 2,000 to 15,000 unique visitors each month.

In recent years, more Singaporeans are blogging about nature and environmental issues, a sign of growing awareness of nature conservation. This trend not only allows ordinary Singaporeans to take a deeper interest in our natural heritage, but also builds a community of people who care about and act on these issues.

# Volunteer guides help spread the word on nature conservation

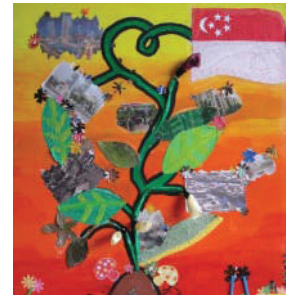
Leshon Lee started volunteering at the Nature Reserves when he was 10 years old.



Dr. Aaron Bernstein, co-author of "Sustaining Life", was the keynote speaker at the ASEAN Conference on Biodiversity 2009.

**Singapore's Success**  
**Zhang De Primary School:**  
Sandy Toh, Patricia Lim,  
Chee Jia Yi, Teo Jing Yi

Singapore has developed from a fishing village to a country sprouting with high-rise buildings. Nevertheless we have not forgotten nature and are known as a green city, setting a good example to the rest of the world.



## **Strategy 5:** Strengthen Partnerships with All Stakeholders and Promote International Collaboration

The most effective mode of operation for biodiversity conservation is to engage all stakeholders, including private, public and people sectors (government agencies, academia, schools, conservation groups, amateur naturalists and private corporations), in a comprehensive partnership.

Such partnerships should be pursued domestically and internationally as biodiversity issues cut across sectors and transcend national boundaries.

### **Actions:**

- 5.1. Encourage active participation in the stewardship of the environment for all sectors
- 5.2. Promote partnerships with regional and international organisations, in particular the ASEAN Centre for Biodiversity and the Secretariat of the Convention on Biological Diversity, as an indication of our commitment to biodiversity conservation at the global level



Singapore has 50% of seagrass species found in the Indo-Pacific region.

### TeamSeagrass

Seagrasses are flowering plants that live underwater and they play an essential role in the marine environment, being a nursery, food source and habitat to a variety of marine animals. Seagrasses also act as sentinels of coastal change and with regular monitoring, can provide early warnings on changes in the coastal environment.

Len McKenzie and Rudi Yoshida from Seagrass-Watch HQ (Seagrass-Watch is the largest scientific, non-destructive, seagrass assessment and monitoring programme in the world) witnessed for themselves a delectable spread of seagrass species when they visited Chek Jawa on Pulau Ubin with nature enthusiasts, Ria Tan and Siti Maryam Yaakub, on 8 October 2006. Their visit started the ball rolling for Seagrass-Watch here in Singapore and sparked off a strong partnership between Ria, Siti and NParks as well as the catchy name "TeamSeagrass".

Since its genesis in November 2006, TeamSeagrass, a volunteer-based seagrass monitoring programme, grew from strength to strength, both in volunteer numbers as well as the relationships fostered between various groups of people working towards a common vision and aspiration for the natural environment. NParks plays a vital role in this 3P (People-Public-Private sectors) project by working closely with the people, school students and private organisations, creating a synergistic collaboration for nature conservation.

An enthusiastic team of volunteers monitors the seagrass meadows at Chek Jawa, Pulau Semakau, Cyrene Reef and Tanjong Rimau on Sentosa once every three months. Schering-Plough, a pharmaceutical company based at Tuas runs the monitoring programme at the site adjacent to its premises as part of its Corporate Responsibility and Environmental

Stewardship. TeamSeagrass and NParks have also developed a partnership with Raffles Girls School to monitor the seagrass site at Labrador Nature Reserve and carry out scientific studies on seagrass as part of the school's science research programme.

These volunteers come from all walks of life with the common goal of caring for Singapore's intertidal habitats. The popularity and success of the Seagrass-Watch programme in Singapore highlights the importance of natural environments in an urban society where people are not directly dependent on natural resources for their livelihoods. It also underscores the increasing trend of public awareness and the community's desire to play an active role in the protection of their natural heritage.

### ASEAN Centre For Biodiversity

The ASEAN Centre for Biodiversity (ACB) is an inter-governmental regional centre of excellence, which facilitates cooperation among members of the Association of Southeast Asian Nations (ASEAN) and its partners for the conservation and sustainable use of biological diversity and fair sharing of benefits arising from such use.

Singapore, a member of the Governing Board of the Centre, contributes to the Centre in terms of co-organising and hosting activities with the ACB, for example, the ASEAN Urban Biodiversity Workshop in April 2008 and the inaugural ASEAN Conference on Biodiversity 2009. Singapore benefits from the sharing of information, experiences and best practices among its members and in particular capacity building activities. These programmes include the development of biodiversity indicators conducted by the ACB with the support of regional and international partners such as the Secretariat of the Convention on Biological Diversity and World Conservation Monitoring Centre. For more information, visit [www.aseanbiodiversity.org](http://www.aseanbiodiversity.org)

# Singapore is well-placed to showcase the richness of the region's biodiversity in an accessible urban setting

## Singapore Index On Cities' Biodiversity

In 2008, more than half of the world's population lived in cities. Global demographic trends indicate that there will be more cities emerging and the number of megacities will increase. However, biodiversity, which is important for sustaining human health, is disappearing at an unprecedented rate. The key to the success of biodiversity conservation, hence, lies in the hands of city dwellers. However, we cannot act appropriately unless we know where we stand in terms of our biodiversity conservation status.

As a city-state, Singapore, with a rich legacy of biodiversity, is in an advantageous position to develop an innovative way to address this global issue. In May 2008, Singapore proposed the establishment of an index to measure biodiversity in cities at the 9th Meeting of the Conference of the Parties to the Convention on Biological Diversity.

Seventeen technical experts, comprising representatives from the Global Partnership on Cities and Biodiversity, convened at a workshop in Singapore in February 2009, to design the Singapore Index on Cities' Biodiversity. The Singapore Index comprises three components; a) Biodiversity in the City, b) Ecosystem Services provided by the Native Biodiversity in the City, and c) Governance and Management of Biodiversity in the City. In this form, it would function as a monitoring tool.

The global responses from city officials, scientists, conservation managers, academics, etc. have been positive, and various cities are now testing out the draft index to validate its usefulness. The Users' Manual for the Singapore Index on Cities' Biodiversity is posted on the website of the Convention on Biological Diversity, (<http://www.cbd.int/doc/groups/cities/cities-draft-user-manual-singapore-index-2009-07-01-en.pdf>).

## Monitoring & Evaluation

Regular monitoring and evaluation of the implementation of the NBSAP is essential. This ensures that our national objectives and international obligations are met. Singapore's overall conservation agenda will be reviewed every 5 years, in tandem with the Master Planning process. We shall track the achievements of specific actions and projects, as well as assess the progress of the implementation of the initiatives of "Conserving Our Biodiversity".

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### Picture Credit

Cover: Lee Meng Hai  
Pg 2 : Centre for Remote Imaging, Sensing and Processing  
Pg 4 : Mendis Tan  
Pg 7 : Lin Yangchen  
Pg 9 : Ria Tan  
Pg 13: Wong Tuan Wah  
Pg 14: Tan Choon Lai  
Pg 20: TeamSeagrass

The burrowing giant clam (*Tridacna crocea*), native to Singapore's marine areas.



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# Singapore's National Targets

The Tenth Meeting of the Conference of Parties to the Convention on Biological Diversity (COP-10) in 2010 adopted the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets<sup>3</sup> (<https://www.cbd.int/sp/targets/>). COP-10 called on Parties "to develop national and regional targets, using the Strategic Plan and its Aichi Targets, as a flexible framework, in accordance with national priorities and capacities ...". Singapore's national targets have been developed in the context of its unique circumstances as a highly urbanised city-state of 724.2 km<sup>2</sup> (2018) and one of the most densely populated countries in the world.



## Aichi Biodiversity Target 1 Awareness increased

By 2020, there will be a 30% increase in the number public and private organisations that participate in biodiversity conservation activities.

By 2020, Singapore will achieve a 5% increase in the total number of citizen scientists.



## Aichi Biodiversity Target 2 Biodiversity values integrated

Apply science and ecological principles into land use planning.



## Aichi Biodiversity Target 3 Incentives reformed

No target will be tracked as this target is aimed at larger countries with substantive natural resources and have extractive industries or large scale agriculture.



## Aichi Biodiversity Target 4 Sustainable consumption and production

Achieve overall national recycling rate of 65% in 2020.



## Aichi Biodiversity Target 5 Habitat loss halved or reduced

By 2020, 7.5% of Singapore will remain as natural areas.



## Aichi Biodiversity Target 6 Sustainable management of marine living resources

No target will be tracked as fisheries is not significant in Singapore's context. Singapore shares its current practices for fisheries in Box A.

<sup>3</sup> Aichi Biodiversity Targets 3, 6, 13, 14, 18 and 20 are not applicable to Singapore due to our unique circumstances.

**Box A: Current practices in Singapore's fisheries**

*On implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*

The National Parks Board (NParks) is the national CITES authority responsible for the implementation and enforcement of CITES in Singapore. NParks administers the Endangered Species (Import and Export) Act (ESA), which is the national legislation to give effect to CITES in Singapore. NParks regulates trade in all CITES species, including any CITES-listed marine fish and invertebrates, through issuance of CITES permits and certificates. Under the ESA NParks is empowered to take enforcement action against any illegal CITES shipment traded (including transit) through Singapore.

*On prevention of import and transshipment of illegal fish products in relation to Illegal, Unreported and Unregulated Fishing (IUUF)*

Singapore has only one fish carrier that carries out transshipment of fish products in the seas managed by Regional Fisheries Management Organisations (RFMOs) and all Singapore-flagged

fish carrier transshipment reports on transshipment of fish products in the seas managed by RFMOs, are monitored by the Singapore Food Agency (SFA) to ensure that no illegal fish products in relation to IUUF are transhipped. SFA also works with seafood traders to comply with RFMOs that Singapore is cooperating with, so as to ensure that no illegal fish products in relation to IUUF are imported.

*On monitoring of local fisheries*

Commercial fishing vessels licensed by SFA are allowed to conduct fishing activities within territorial waters only. All catch by the commercial fishing vessels is reported and data is collated.



**Aichi Biodiversity Target 7**  
 Sustainable agriculture, aquaculture and forestry

No target will be tracked as these sectors are not significant in Singapore. Singapore shares its current practices for agriculture and aquaculture in Box B. There is no forestry sector in Singapore.

**Box B: Current practices in Singapore's agriculture/aquaculture sector**

*Current practices for agriculture*

Land is a scarce resource in Singapore and has to be sustainably. For agriculture land, the allowable farming activities are tagged to licences and licensing conditions. SFA ensures that farmers comply to our licensing conditions through a routine surveillance programme. These policies and practices help to ensure that the farmland is put to proper use.

During the planning phase, SFA consults agencies such as NParks to ensure that the farming activities do not result

in negative externalities and are sustainable (i.e. do not encroach into nature reserves, minimising the impact on natural ecosystems). Where deemed necessary, an environmental impact assessment may be required or effected.

*Current practices for aquaculture*

For aquaculture, a study to determine the carrying capacity of Singapore's aquaculture sites in the Straits of Johor has been completed. SFA will also be initiating studies to assess the suitability of aquaculture in southern waters. These studies would assist SFA to develop policy measures to optimise and manage the aquaculture industry in a more sustainable manner.



**Aichi Biodiversity Target 8**  
 Pollution reduced

By 2020, annual mean of PM2.5 to reduce to 12µg/m<sup>3</sup>.

By 2020, set ambient SO<sub>2</sub> levels at annual mean of 15µg/m<sup>3</sup>.

By 2020, set ambient SO<sub>2</sub> levels at 24-hour mean of 50µg/m<sup>3</sup>.



**Aichi Biodiversity Target 9**  
 Invasive alien species prevented and controlled

By 2020, a potentially invasive alien species list for Singapore will be compiled.



**Aichi Biodiversity Target 10**  
 Pressures on vulnerable ecosystems reduced

Singapore will assess and enhance Singapore's resilience to climate change through the development of climate change adaptation strategies across multiple government agencies.



**Aichi Biodiversity Target 11**  
Protected areas increased and improved

By 2020, 7% of terrestrial and inland water, and 0.5% of coastal and marine areas will remain as natural areas.

By 2020, Singapore will develop a total of 360km of park connectors and 100km of Nature Ways to enhance ecological connectivity.



**Aichi Biodiversity Target 12**  
Extinction prevented

By 2020, Singapore will establish populations of 11 locally endangered species in a number of new habitats, as shown in the table below:

Target Species	Targeted sites for reintroduction (by 2020)
<i>Johora singaporensis</i> (Singapore freshwater crab)	2
<i>Nyctixalus pictus</i> (Cinnamon bush frog)	3
<i>Cliona patera</i> (Neptune's cup sponge)	3
<i>Gardineroseris planulata</i> (Honeycomb coral)	3
<i>Madracis kirbyi</i> (Hard coral)	3
<i>Fagraea splendens</i> (Epiphyte)	5
<i>Ficus stricta</i> (Strangling Fig)	5
<i>Margaritaria indica</i> (Tree)	5
<i>Ormocarpum cochinchinense</i> (Tree)	5
<i>Scolopia macrophylla</i> (Tree)	5
<i>Tetrastigma rafflesiae</i> (Climber)	5



**Aichi Biodiversity Target 13**  
Genetic diversity maintained

Target is more relevant to Parties with significant agricultural sector.



**Aichi Biodiversity Target 14**  
Ecosystems and essential services safeguarded

More relevant to Parties where women, indigenous and local communities and the poor and vulnerable rely on ecosystem services for their daily needs.



**Aichi Biodiversity Target 15**  
Ecosystems restored and resilience enhanced

Singapore will report on the accounting of carbon stock and carbon flux in vegetation and land use every 2 years.

By 2020, natural ecosystems will be enhanced or restored within 3 selected parks.

By 2020, the habitats of 3 coastal areas would be restored and enhanced, by incorporating design elements that are suitable for coastal substrates.

By 2020, 25,000 trees and shrubs will be planted across the nature parks and nature reserves as part of the Forest Restoration Action Plan 2019-2029.



**Aichi Biodiversity Target 16**  
Nagoya Protocol in force and operational

By 2020, preliminary policy and guideline on Access and Benefit Sharing.



**Aichi Biodiversity Target 17**  
NBSAPs adopted as policy instruments

By 2019, Singapore has updated the National Biodiversity Strategy and Action Plan (NBSAP, 2009) to include national targets to guide its efforts in biodiversity conservation in the country.



**Aichi Biodiversity Target 18**  
Traditional knowledge respected

Singapore does not have indigenous and local communities.



**Aichi Biodiversity Target 19**  
Knowledge improved, shared and applied

By 2020, Singapore will put in place an updated national database system with biodiversity related information to be used to aid decision making within government and sharing of biodiversity information with the public.



**Aichi Biodiversity Target 20**  
Financial resources from all sources increased

No target will be tracked as generally Singapore is able to source its funding internally for biodiversity related projects.





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# CONSERVING OUR BIODIVERSITY

**Singapore's National  
Biodiversity Strategy and  
Action Plan**