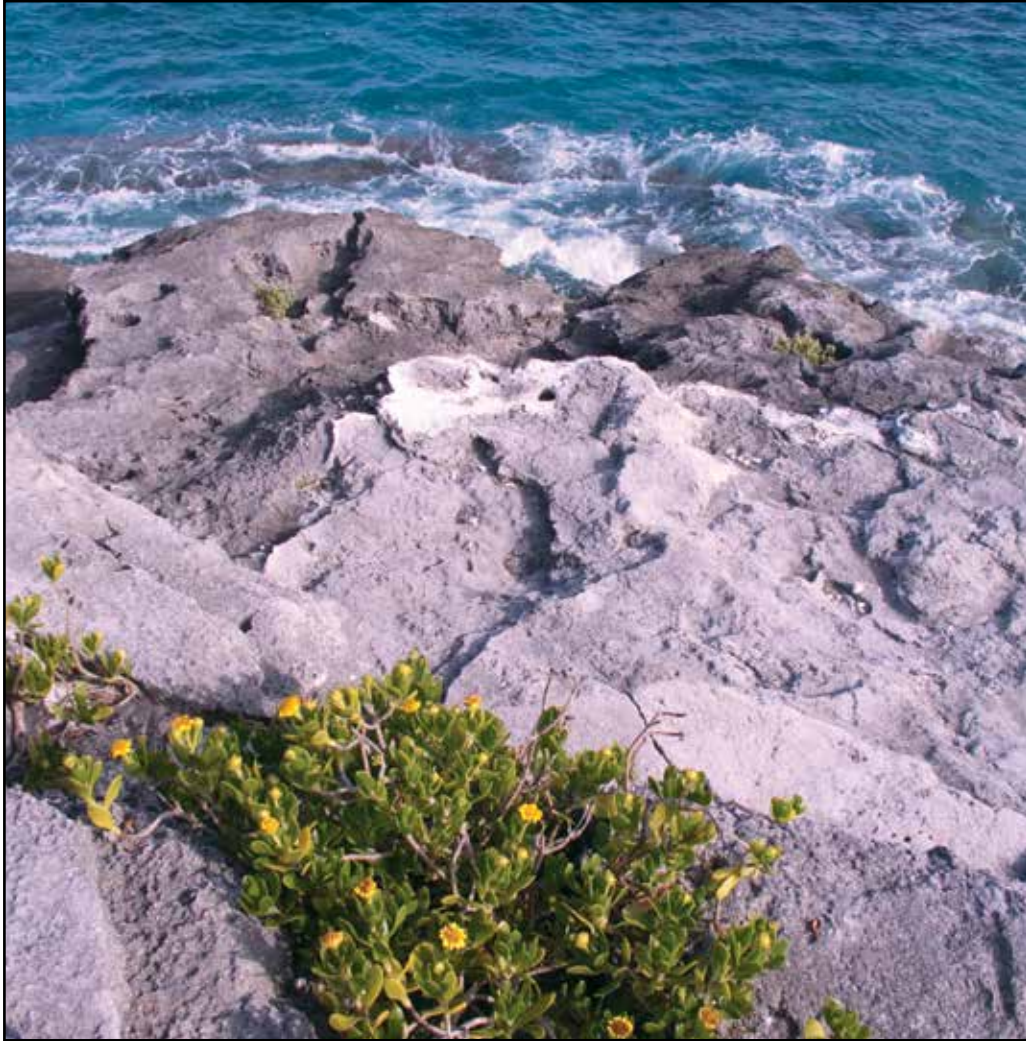
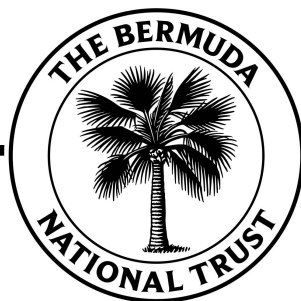


# **Spittal Pond**

## **NATURE RESERVE**



## **TEACHER RESOURCE GUIDE**



## **ACKNOWLEDGEMENTS**

The Bermuda National Trust thanks AXIS Capital Holding Limited for sponsoring this publication. Some of the images, illustrations and information used in this publication were provided by the following individuals and organizations; their work is greatly appreciated. The Bermuda Zoological Society, Alison Copeland, Lisa Greene, Richard Ground, Susan Harvey, Louise Lamphier, Don Lubin, Michelle Pasquin, J.P. Rouja, Dr. Wolfgang Sterrer, Craig Talbot, Dr. Martin Thomas, Dr. David Wingate and Sharna Yates.



*To protect and promote Bermuda's unique natural and cultural heritage for everyone, forever*

## **Learning with the Bermuda National Trust Education Programme**

The Bermuda National Trust's teacher resources focus on nature reserves and historic homes owned and maintained by the Trust, offering comprehensive resources and creative learning experiences for visitors, teachers and students. We provide first-hand experiences that cannot be re-created in the classroom. Guided tours can be scheduled with a member of our education staff for preschool, primary, middle and senior level classes.

It is our hope that students will visit all the Trust properties, beginning at preschool or primary 1 - 2, and experience repeated visits throughout later primary, middle and senior years. Repeat visits help students build on their prior learning and develop a deeper understanding of the concepts and terms associated with each site. Senior students are encouraged to visit each site to learn about the care and preservation of nature reserves and historical homes. Opportunities are available for senior students to participate in our AIM Programme, allowing them to volunteer their time caring for Trust properties, which can be applied to required community service hours.



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# Arranging a Class Trip/Teacher Resources

## >Note to Teachers

Our goal is to make a visit to Spittal Pond Nature Reserve valuable and meaningful to children and to stimulate a lifelong interest in the environment, their surroundings and some of the features that make Bermuda so unique. This resource was created to provide background information on the reserve along with suggested activities that you can conduct with your students before your class visit to the reserve and afterwards, to enhance your students’ learning experience, and help you achieve your curriculum goals.

**There are a few options to support you before and after the field trip:**

### Teacher workshop

We can provide a “group teacher workshop” in our AXIS Education Classroom prior to a field trip with your students. A minimum of 10 teachers is required, maximum group size is 15. The time allotted for the work shop is 1.5 - 2 hours.

### The overall focus of the workshop is to:

- Obtain a copy of the Spittal Pond Nature Reserve resource booklet
- Review the history of the pond, resources and suggested activities
- Obtain materials to create a map of Bermuda and labels to show the location of the Bermuda National Trust properties and other local landmarks which can be used in a classroom introductory lesson before taking the class tour
- Network with other teachers to brainstorm ideas for additional activities that can be offered to promote student learning before and after the class tour

## Three-Part Learning Experience

We offer a three-part learning experience. After booking a field trip, a Bermuda National Trust educator can provide an introductory lesson for your students in your classroom, providing information about the site. This is an excellent preparation for the field trip which builds on students’ prior knowledge and is helpful for engaged learning during the field trip. After the site visit a follow-up lesson can also be scheduled. Students will be guided in a review of their field trip and summarise their new knowledge.

1	2	3
<b>PREPARATORY UNIT</b> Introduction to site and target of learning	<b>FIELD TRIP</b> Informal engaged learning	<b>SUMMARY</b> Students will use their field trip experience towards new learning

## Follow-up Visit

Teachers are welcome to schedule a follow-up visit for their class at our AXIS Education Classroom at our Waterville site after the tour, preferably within two to three weeks. The goal is to review what students learned about the pond and for them to share/highlight the work they have completed. The time allotted for this student follow-up visit at Waterville is approximately 1.5 hours.

## Tips for Using This Resource

Reading through the background information will assist teachers in answering the more probing questions from inquisitive students, and help create additional activities that extend the learning associated with Spittal Pond Nature Reserve.

The Spittal Pond Nature Reserve resource booklet and map of Bermuda are also available to download from our website.

The activities provided focus on the Cambridge International Curriculum Key Stages 1 and 2, Primary Stages 1–6 and Secondary 1, Middle Stages 7-9. Curriculum links to activities are provided for integrating the Bermuda Ministry of Education's Science and Social Studies. While looking through the activities provided, teachers may also think of ways to integrate all other subject areas. The teacher's method of preparation and delivery will vary with students' needs and interests.

We continue to seek ways to improve our educational programmes and welcome suggestions for enhancing this resource and the experience for the children. Please contact us with any suggestions or comments.

Enjoy yourselves,  
The Education Team  
Bermuda National Trust

education@bnt.bm  
236-6483

## Scheduling a field trip to Spittal Pond

To schedule a trip to Spittal Pond download and complete a school field trip booking form on our website, [www.bnt.bm](http://www.bnt.bm) (found under the school tours heading) or copy the form in the back of this book. Return the form via email to: [education@bnt.bm](mailto:education@bnt.bm).

The ratio of field trips is one adult for every ten children. Additional adults are welcome.

## Ensuring a Safe and Enjoyable Visit

Before teachers come with their students they should be aware that the path through the reserve is rugged and individuals with physical limitations will need assistance. To ensure that students and adults have a safe and enjoyable experience to the reserve, it is essential for teachers to know that:

- The main trails are relatively flat, with the exception of a few hills and can be enjoyed in comfortable walking shoes. To explore the cliffs and coastline, rugged climbing shoes are advised. Consider bringing binoculars and a camera
- Prepare and carry a register to include the names of all students with emergency and medical information
- Ensure that each student has a completed the Bermuda National Trust parent/guardian consent form to attend the tour, which includes our photo release policy. This form is included in the appendix. Teachers need to notify the Trust staff member leading the tour of any students who do not have prior consent to be photographed
- Provide necessary information for the Trust staff member about relevant student learning needs, behavioural support, allergies or health
- Bring a first aid kit and a cell phone to be used in the event of an emergency – teachers and other adults are to refrain from using cell phones and texting for personal use during the tour
- We ask that teachers support students in their learning before, during the tour and after their visit

## Before the Tour, Setting the Stage for Student Learning

After booking the tour, teachers are encouraged to review the information that follows:

- The history of Spittal Pond Nature Reserve and map showing the location of the reserve
- The definitions of key terms relating to plant and animal life
- The birds that inhabit the reserve and those classified as waders, water birds, shorebirds and land birds

In preparation for the tour, initial classroom activities are provided to assist students in recalling their prior knowledge of nature reserves and open spaces, and to learn specific information about Spittal Pond Nature Reserve. The scope of students' learning will depend on the grade level, their prior exposure to reserves, background knowledge and understanding of terms. Although the activities provided begin at the lower primary level, teachers of older students can modify the activities for the grade and developmental level of their students' abilities. We hope that teachers will generate new ideas for creating additional activities and share them with our education staff.

### Provide students with the following information:

- The significance of Spittal Pond Nature Reserve
- There are several habitats in this nature reserve including the pond, the salt marsh, upland hillside, upland coastal and rocky coast. These represent a diversity of plant and animal life
- Spittal Pond Nature Reserve is an important sanctuary for resident wetland birds and migratory shore birds
- Spittal Pond Nature Reserve is home to Bermuda's endemic bird – the Bermuda White-eyed Vireo, or Chick-of-the-village
- Nature reserves are important for our health and well-being
- The meaning of the terms native, endemic, introduced and invasive (see definition of terms)
- Ways that we can take care of nature reserves. Keep the areas free of trash, leave the walking paths, trees, plants and flowers and the overall area as you found them
- Whether you are visiting as a student, teacher, with family or friends, it is important to be respectful of this beautiful public space



# Bermuda National Trust

## STEWARDSHIP PROPERTIES

- NATURE RESERVES
- HISTORIC PROPERTIES
- HISTORIC CEMETERIES



## Directions

Spittal Pond Nature Reserve is located on South Shore Road in Smith's Parish. If traveling by public transportation, take the Number 1 bus leaving from the City of Hamilton or the Town of St. George's, about a 20 minute trip. See the current (season) schedule that provides the times. The bus stop close to the eastern end of Spittal Pond is a short walking distance to the east car parking area and is one of two entrances to the reserve.

# Spittal Pond NATURE RESERVE





**AN OCEANFRONT VALLEY ON THE SOUTH SHORE, THIS NATIONAL TRUST property forms the centre of a jointly owned nature reserve of 64 acres. The Bermuda National Trust owns almost 24 acres, the Spittal Pond Bird Sanctuary. The surrounding land, Spittal Pond National Park, is owned by the Bermuda Government, which leases part of it to a dairy farmer. While today it seems obvious that the public should have access to the Trust's portion of the reserve, the decision to create the first trail in 1966 came only after much debate.**

In the end, concern about a lack of open space, evident even at that early date, trumped the desire to retain the reserve as an undisturbed bird sanctuary. Balance was achieved by fencing off the core and laying out the trail so that visitors could see every part of the pond, without actually entering the protected area. The pond continues to be of environmental significance and was declared a Ramsar site in 1999 because it is 'Bermuda's most important wetland for wintering waterfowl'.

Spittal Pond Nature Reserve includes a variety of Bermuda ecosystems, ranging from upland forest to coastal shore line. It contains the only salt marsh ecosystem in Bermuda, unique in that it is a spillover marsh flooded by the sea in hurricanes and severe storms. This made it unappealing for development, and is why such a large piece of land in an otherwise desirable location has remained intact. The sea flooding maintains the habitat as open water and mudflats, creating a variation in salinity through the year. Few species can survive in such an environment, although those which can – such as **Wigeongrass** (*Ruppia maritima*) and **Mosquito Fish** (*Gambusia holbrooki*) – flourish due to the richness of the habitat. Some 20 bird species regularly winter at Spittal Pond, while a total of 200 species have been recorded as visitors there.

The reserve also contains some excellent Bermudian geological features. Most notable is the 'Checkerboard Formation', which effectively provides a record of sea level recession from the time of the last interglacial high sea stand around 120,000 years ago. To complete the picture, Spittal Pond boasts two important historic sites, Jeffrey's Cave, where an escaped slave concealed himself, and the well known Portuguese Rock.

In spite of the awareness of its value to the people of Bermuda, it took decades to actually protect Spittal Pond for the public. Original land grants in Bermuda were north/south oriented strips of land, so acquiring the property involved a complex process of buying the 10 strips that make up the area. The first piece, the eastern 4.2 acres was bought in 1946 by founder of the Bermuda Historical Monuments Trust, Dr Henry Wilkinson, and transferred to the Bermuda National Trust in 1973. In 1956, Government purchased the North's Point headland and turned it into a roadside park. Gradually over the years, additional land was added as it became available, and in 1976 the Government transferred the strip incorporating Portuguese Rock to the Trust.

The name Spittal Pond comes from its use as a hospital ('spital) for sick animals or indigent people. Used as a 'grazing commons' over the years, it has also been known as Mangrove Lake and Peniston's Pond. The reserve was badly damaged when it took a direct hit from Hurricane Fabian in 2003. A generous donation by Bermuda residents Richard and Helen Fraser enabled extensive restoration to take place in 2005. The management objectives require that Spittal Pond serves both as a recreation area and a bird sanctuary.



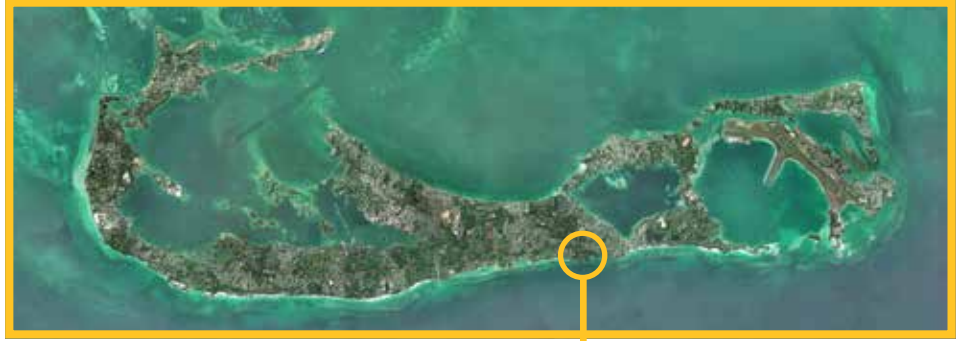
## History of the land

Prior to becoming a nature reserve the area was used for a number of activities: Agriculture – celery grew along the pond edge up until the 1920s; Hunting – ducks and other waterfowl were hunted until the 1930s; Military – used as a firing range in the late 1880s until WWI; Cattle – cattle grazing, dairy farm (still present in the western area).

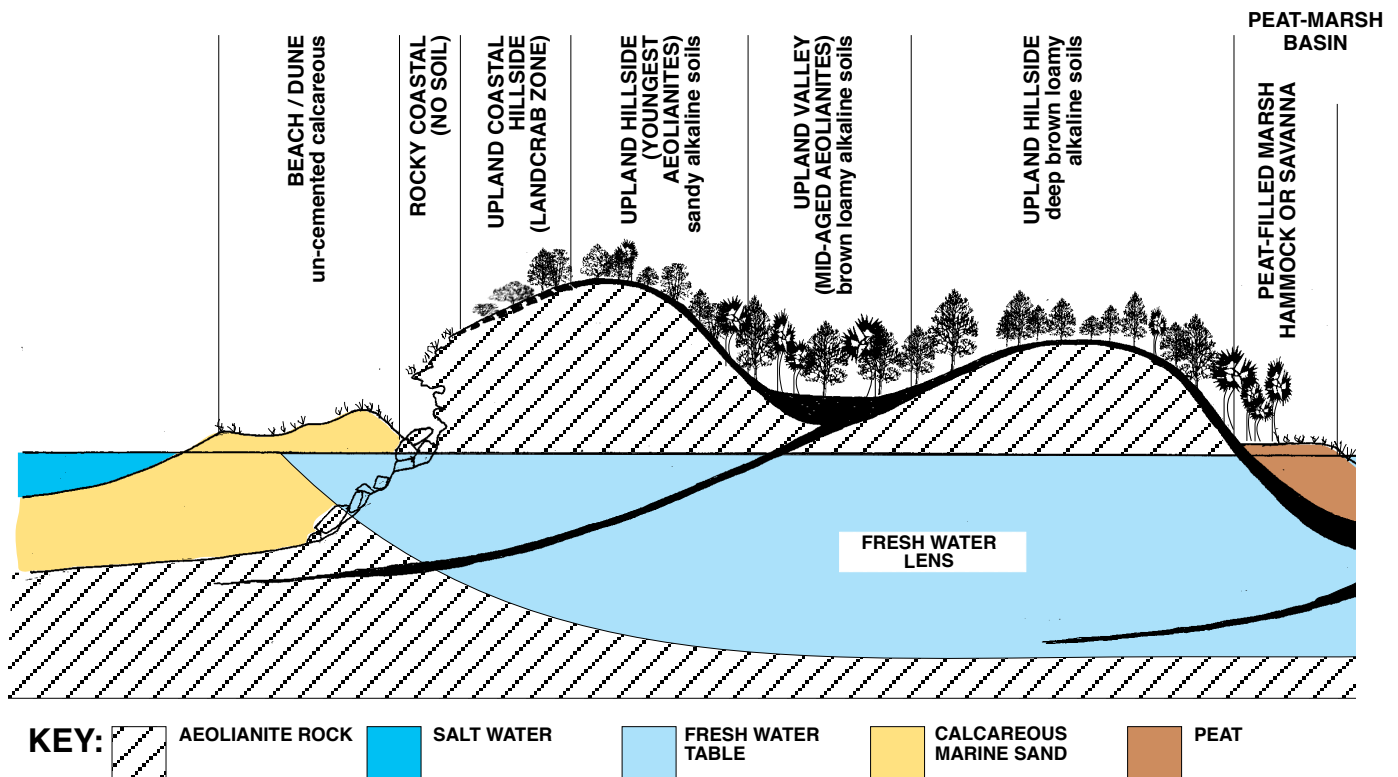
# Spittal Pond

## Reserve Trail

The reserve can be easily explored by following the well marked loop trail from either the east or west car parks. The trail provides a diverse view of the different habitats, from rocky coast and shoreline to brackish pond and upland forest. Allow at least 2 hours to tour the area. The entire loop is approximately 1.8 km (1.1 mi). Please remember that nature reserves are special areas – please keep your dogs on a leash and keep to the trail to avoid startling wildlife. Never remove plants or animals from a nature reserve.



PHOTOS: © BERMUDA ZOOLOGICAL SOCIETY



## History of Woodland Management at Spittal Pond

As late as the 1940s, the hills surrounding Spittal Pond supported a monoculture forest of Bermuda Cedar with Sage Bush as understorey and Buttonwood on the coast.

The invasive cedar scale killed the forest completely by 1953 and exposed the Sage Bushes. Most died out leaving only grass cover and dead trees taken for timber by a contingent from the British Military Garrison at Prospect about 1954-55. A Casuarina forest was planted in their place on hills on the south-east of the pond.

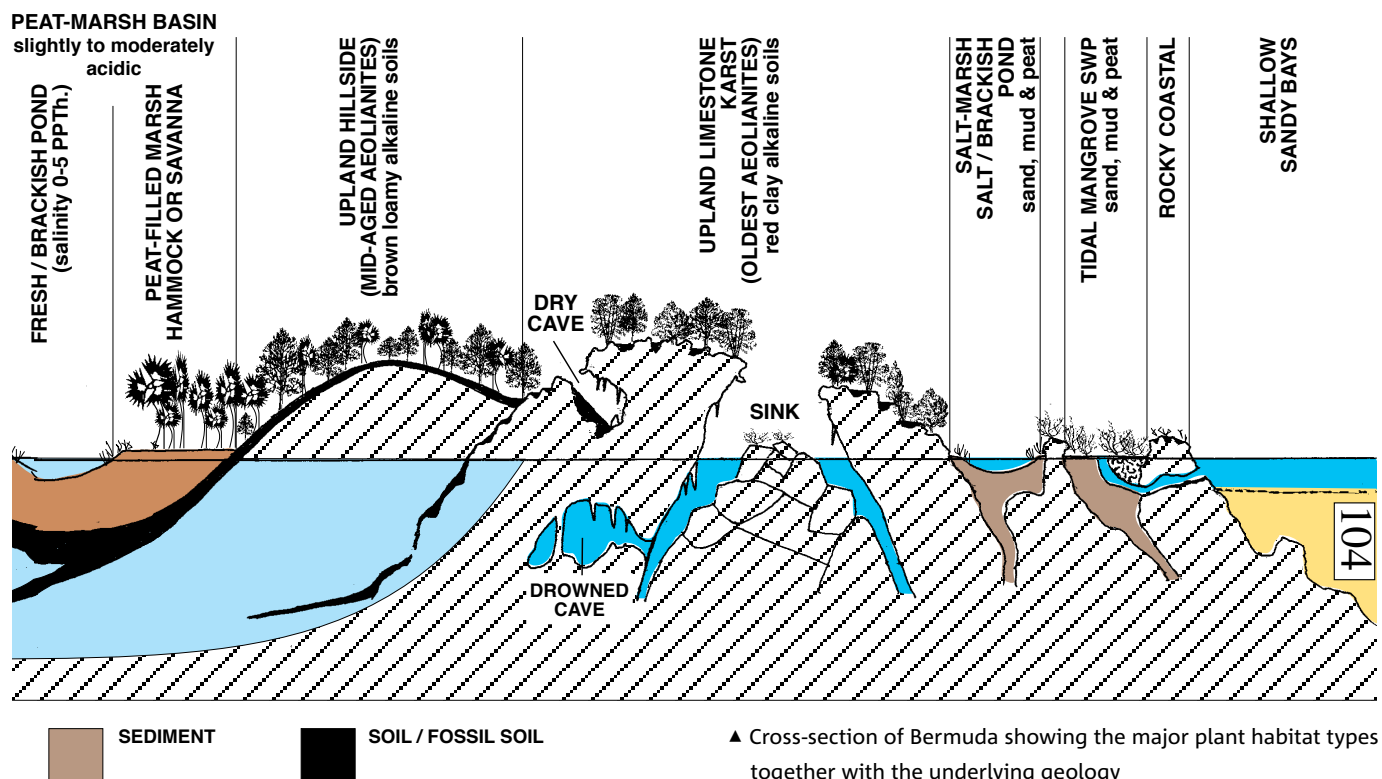
Late in the mid 1960s a wide variety of exotic trees from Tulo Valley nursery stocks were planted on the big western hill, notably Olives, additional Casuarina trees, palms and Indian Almond.

By this time invasive flora like Fiddlewood, Allspice, Brazil Pepper and Chinese Fan Palm was invading throughout, forming new broadleaf woodland.

Following Hurricane Emily in 1987, when tornadoes felled swaths of Casuarinas, two areas of the reserve, notably the deep valley between woodland pond and Portuguese Rock and the east end of the pond below the car park of north point, were cleared of invasives and restored to native woodland with mainly Bermuda Cedar, Bermuda Palmetto, Hackberry, Olivewood and Forestiera.

Additional block clearings and native woodland restoration are planned for the future.

Source: Dr. David B. Wingate, 2012



# Definition of Terms

**Native:** A species which colonised Bermuda naturally without human help. Most arrived long before human settlement and are found in other countries too

**Endemic:** A native species which has been isolated in Bermuda long enough to have evolved into a unique species

**Introduced:** A species which is not found naturally in Bermuda, but has been brought here either accidentally or intentionally by humans

**Invasive:** An introduced self-propagating species which has a tendency to spread rapidly, overwhelming the native and endemic species and/or causing economic damage

**Resident:** A bird that nests in Bermuda and does not make seasonal journeys off-island

**Migrant:** A bird that makes regular seasonal journeys to Bermuda from elsewhere for the purpose of feeding or breeding

**Vagrant:** A bird very rarely seen in Bermuda, probably blown off course

**Abiotic Factors:** are the non-living factors in an ecosystem that affect the population growth of a species. Such factors include:

- Water (e.g. salinity, oxygen content, level, pollution)
- Soil (e.g. pH, humus content, moisture, depth)
- Sunlight (e.g. light intensity)
- Wind exposure
- Temperature

**Biotic Factors:** are the living components in an ecosystem. These include members from all five kingdoms – plants, animals, bacteria, fungi and protists. The members of an ecosystem live in dynamic interaction with each other and with their environment. Hence, one species may affect the population growth of another species through:

- Competition with other species
- Predation
- Grazing by herbivores
- Food supply
- Population density
- Symbiotic relationships (e.g. where several organisms depend on each other)

Symbiotic relationships include:

**Mutualism:** in which each organism benefits

**Parasitism:** in which one organism benefits and the other is generally harmed

**Commensalism:** in which one organism benefits whilst causing little or no harm to the other

**Disease**

# Appreciating Our Open Spaces

In order to appreciate and take care of our open space, we need to understand what space is available, how it is being used, why it is important to maintain open space and what threats impact the environment.

## Land usage in Bermuda as of 2008

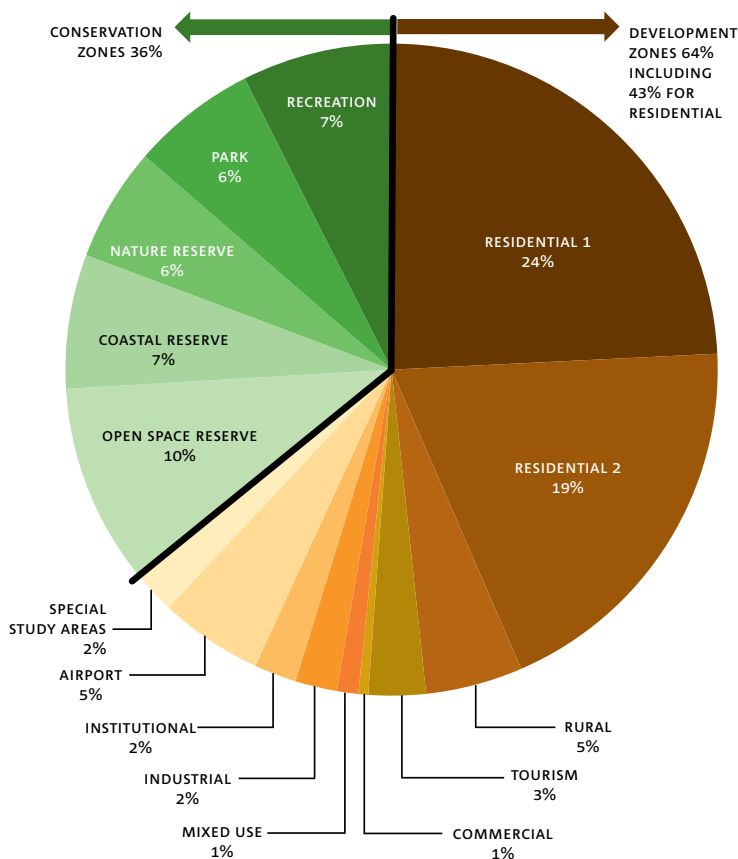
The chart below shows a breakdown of how Bermuda's land is used.

### Conservation Zones totalled = 36%

10%	Open space reserve
6%	Parks
7%	Reserves - coastal
6%	Reserves - nature
7%	Recreation

### Development Zones totalled = 64%

5%	Airport	5%	Rural
1%	Commercial	2%	Special studies
2%	Industrial	1%	Mixed use
2%	Institutional	3%	Tourism
43%	Residential		



## Open Space is Important Because

- Natural beauty attracts visitors and encourages tourism
- It provides recreational areas such as sports and playgrounds
- As amenity space, it enhances our psychological well-being
- It maintains our unique biodiversity

## Threats to Terrestrial Habitats

The key threats to terrestrial habitats in Bermuda are:

- Domination of existing open space by invasive species
- Loss of open space through development

The reasons for development include:

- Economic growth
- Housing
- Other individual requests – pools, large houses, upscale condos, driveways

Other threats to the environment include:

- Pollution
- Littering
- Vandalism
- Natural causes such as erosion and storm damage

It is every citizen's responsibility to protect the natural environment wherever we are in the world so that future generations will have clean air to breathe, unpolluted and abundant food, and water and energy sources

Sources: The Bermuda Zoological Society and the Bermuda Aquarium, Museum and Zoo, *Bermuda Biodiversity Country Study*, Bermuda, 2001, Bermuda Department of Planning – Forward Planning Branch, 2008



# Spittal Pond's Habitats

Spittal Pond Nature Reserve contains unique habitats. Bodies of water include a large brackish pond combined with a salt marsh, a freshwater pond, and a brackish woodland pond. The freshwater and woodland pond are man-made. Upland and coastal hillside areas are dispersed throughout along both sides of the ponds. The rocky coast with its cliffs and tidal pools represents another distinctive habitat. Small mangrove areas are beginning to grow in at the east end of the pond.





# Know Your Terms

**NATIVE:** Species which colonised Bermuda naturally without human help. Most arrived long before human settlement and are found in other countries too

**ENDEMIC:** A native species which has been isolated in Bermuda long enough to have evolved into a unique species

**INTRODUCED:** A species which is not found naturally in Bermuda, but has been brought here either accidentally or intentionally by humans

**INVASIVE:** An introduced self-propagating species which has a tendency to spread rapidly, overwhelming the native and endemic species and/or causing economic damage

**RESIDENT:** A bird that nests in Bermuda and does not make seasonal journeys off-island

**MIGRANT:** A bird that makes regular seasonal journeys to Bermuda from elsewhere for the purpose of feeding or breeding

**VAGRANT:** A bird very rarely seen in Bermuda, probably blown off course

## Brackish & Freshwater Ponds

Bermuda does not have extensive freshwater habitats. There are several reasons for this. First the islands are just too small, secondly the soil and underlying rocks are very porous, allowing quick drainage and thirdly saltwater is likely to enter any freshwater as saline rain, splash, spray or percolation through underlying rocks. This means that most freshwater bodies have some salt content at least at times. Freshwater with small additions of salt is termed brackish. Permanent or temporary brackish conditions exclude many freshwater organisms.

## The Main Pond

The submerged valley of Spittal Pond is filled to within one foot or so of water surface with sandy sediment and diatomaceous mud that essentially seals off the pond from saltwater seepage through the porous limestone from the adjacent seashore. Hence, it is almost non-tidal and tends to become less and less brackish with rainwater and rain runoff in between periods of flooding from storm surge and waves in hurricanes and winter storms. Hurricanes can turn it temporarily into a saltwater bay. At the other extreme, summer droughts can lower the pond level by evaporation, exposing the sediment as extensive mudflats. These mudflats then attract a host of migrating shorebirds or sandpipers from July through September.

Most ponds are brackish at some time, but some are permanently so. The best example of a brackish pond is the large pond at Spittal Pond Nature Reserve. It is the most important wildfowl habitat in Bermuda. This body of water is intermediate between fresh and saltwater ponds. A sluice gate was installed in 1979 to control the level of pond pollution from the runoff of the nearby dairy farm, allowing flushing of the pond with new oxygen-containing water. Salinity levels fluctuate because heavy rains dilute the salt, while storms bring new sea water in. Evaporation and opening of the gate increased salinity. Since 1990 the gates have not been in operation and the dairy farm

is managed differently, keeping the cows away from the pond edge. The **Mosquito Fish** (*Gambusia holbrooki*), which were introduced to Bermuda in the 1928 to combat the mosquito population which had spread yellow fever, can tolerate high salinity. Stress from organic pollution is derived from the dairy farm along the pond's north shore. Spittal Pond is a very unstable, stressed location and in consequence its biodiversity is very low and mass mortalities of some resident organisms are common.

In the water are masses of **Widgeon Grass** (*Ruppia maritima*), a submerging flowering plant typical of brackish water and the pond is surrounded by a border of **Sheathed Paspalum** (*Paspalum vaginatum*). Aside from the large numbers of Mosquito Fish, little else in the way of higher organisms can be seen although **American Eels** (*Anguilla rostrata*) are present in winter and species of snails are periodically abundant. Aquatic insects such as the **Water Strider** (or pond skaters) can be seen 'walking on water' in search of other insects. Beneath the surface small **Water Boatman** (*Trichocorixa reticulata*) are highly active and swimming in large clusters. The sediment contains countless shells of small brackish water ostracods, which attest to their occasional abundance.

In warm weather large pink, grey or bright blue patches of the **Sulphur-Reducing Bacteria** are very common and a sulphurous smell may be present. Whenever you detect a sulphurous smell in nature, you can safely assume that the oxygen content in that environment is very low. Since almost all living organisms need oxygen, this makes life difficult. Mosquito Fish can handle this situation because they can breathe atmospheric air. Sulphur-Reducing Bacteria are an example of a life-form that does not require oxygen – they use anaerobic respiration. The pond is very unstable and this makes it difficult for marine organisms to colonise it. It shows the lowest biodiversity among Bermuda saltwater ponds.



**Eastern Mosquito Fish**  
*Gambusia holbrooki*  
**INTRODUCED**



**American Eel**  
*Anguilla rostrata*  
**NATIVE**



**Sheathed Paspalum Grass**  
*Paspalum vaginatum*  
**NATIVE**



**Sulphur-Reducing Bacteria at the pond's edge**

# Fringing Salt Marsh

A salt marsh fringes the large pond and is different from other salt marshes in that it does not have a tidal connection with the sea. Instead it gets seawater from spillover during storms. The salinity of the pond averages about half that of seawater, but, as already explained, it is very variable, ranging from almost fresh to saltier than the sea at different times, depending on the weather. It can show higher salinity than the sea if an incident of marine inundation is followed by a hot, dry period that causes high rates of evaporation.

## Mangroves



**Black Mangrove** *Avicennia germinans* **NATIVE**

Small areas of **Black Mangroves** (*Avicennia germinans*) are growing along the edge of the large pond on the eastern side. The Black Mangrove looks more like a tree than the spidery **Red Mangrove** (*Rhizophora mangle*). It has silvery green leaves and a dark trunk and can grow to 30-40 ft tall. If you look closely at the leaves of the Black Mangrove, you may see crystals of salt on the surface. This is one of the ways the Black Mangrove has adapted to live in a saltwater environment that would kill other plants. The trees are able to take up saltwater, use the water, and expel the salt out onto their leaves. Another way the Black Mangrove has adapted to its environment is by having roots that poke up out of the sediment instead of growing into it. These roots are called pneumatophores, which mean ‘air breathing roots’. All plants need to breathe, so the Black Mangrove has developed these roots that act like snorkels, allowing the tree to get air, even though it is standing in seawater or soggy mud.

Black Mangroves have white flowers in spring and summer, followed by green lima bean-like shaped seeds. The seeds fall off the plant and float on the surface of the ocean and sprout when they are washed up on suitable a shoreline. Unlike the Red Mangrove, Black Mangrove seeds do not grow in the water, so Black Mangroves are usually found higher up the shore than Red Mangroves. Black Mangroves are native to Bermuda, the Southern United States and the West Indies. Bermuda is the northern-most place on the Atlantic Ocean where this species is found. Other plants in the salt marsh include: **Sheathed Paspalum** (*Paspalum vaginatum*), **Sand Spurry** (*Spergularia marina*), **Seaside Heliotrope** (*Heliotropium curassavicum*), **Seaside Purslane** (*Sesuvium portulacastrum*), and the invasive **New Zealand Spinach** (*Tetragonia tetragonioides*).



Black mangrove seed



Leaf & flower



Pneumatophores



Salt crystals on leaf

## Freshwater & Woodland Ponds

Spittal Pond Nature Reserve contains two small man-made ponds in depressions between the main pond and the shore. One is a freshwater pond and the other is referred to as the woodland pond and has a connection with ocean water. The western pond is freshwater and the eastern or woodland pond is brackish. Both ponds are a very important habitat for resident and migratory waterfowl; compared to ponds elsewhere, species diversity is very low.

## Forests

### History of Upland Forest (Hillside)

Very little is known about the composition of the first forests in Bermuda. They were likely to have developed under different climatic conditions than experienced today. The trees of upland forests left little fossil remains, except perhaps the pollen deposited in swamps and ponds and preserved in sediments. Unfortunately, little of this 'pollen record' has been investigated to date. The records of the first explorers and settlers provide the best possible information available. What is known is that with the arrival of man the forests went into a rapid decline. There were several reasons for this.

- Pigs released by New World explorers on many of the larger islands rooted through the forests for food, disrupting natural regeneration and decimating the ground layer of delicate herbs, ferns and mosses.
- Rats from vessels also invaded most of the islands and started eating the seeds of forest species.
- Man contributed to the decline by clearing and burning for agriculture and harvesting several useful tree species for timber and later cutting huge areas of forest for housing and business.
- Ornamental gardens were planted and a further destructive series of changes happened due to competition and displacement by invasive plants, insects, pests and diseases.

The end result of all this is that out of all the natural habitats in Bermuda, the upland forest is the most changed. Little remains of the original forest and there are only scattered remnants that are richer in the original species than others. Not surprisingly, these remnants are in difficult terrain or on islands where pigs and rats did not become established.

Some of the original trees reaching Bermuda evolved into distinct new species after they started to grow and reproduce here; these are the endemic species that occur naturally nowhere else but Bermuda. Two examples are the **Bermuda Cedar** (*Juniperus bermudiana*) and the **Bermuda Palmetto** (*Sabal bermudana*). There is little doubt that these two trees dominated the original forest. Both were useful to man and their presence was therefore well documented. Another tree, the **Bermuda Olivewood** (*Cassine laneana*) also evolved in the Bermudian forests. This tree was probably never dominant in any forest but scattered among the cedars, palmettos and native trees; its bark was used for tanning by early settlers. As the forest became established, a unique new habitat was created under the trees and other species evolved in this damp, stable environment. Examples of these are the **Bermuda Sedge** (*Carex bermudiana*), the moss **Bermuda Trichostoma** (*Trichostomum bermudanum*), the **Bermuda Maidenhair Fern** (*Adiantum bellum*) and the shrub **Bermuda Snowberry** (*Chiococca bermudiana*).





**Bermuda Cedar** **ENDEMIC**  
*Juniperus bermudiana*



**Male Cedar showing pollen**



**Female Cedar showing berries**

PHOTOS: DEPARTMENT OF CONSERVATION SERVICES



**Palmetto** **ENDEMIC**  
*Sabal bermudana*



**Palmetto leaf & seeds**



**Olivewood** **ENDEMIC**  
*Cassine laneana*



**Bermuda Sedge** **ENDEMIC**  
*Carex bermudiana*



**Bermuda Maiden-Hair Fern** **ENDEMIC**  
*Adiantum bellum*



**Bermuda Snowberry** **NATIVE**  
*Chiococca bermudiana*

Native species are those that arrived in Bermuda by natural means but remain essentially identical with their forebearers elsewhere. Thus they arrived by the same means as the endemics; by the ocean, wind, or transported on bodies of or in the intestines of migrating or windborne flying creatures. The difference with native species is that they did not evolve into a new species. Several native species important in the original forest never form large trees and are usually classified as shrubs. These are **Forestiera** (*Forestiera segregata*), **White Stopper** (*Eugenia axillaris*) and **Jamaica Dogwood** (*Dodonaea visosa*). These shrubs growing up to 7m or 20ft in height probably formed what is called the understorey, growing beneath the canopy of the larger trees.



**Forestiera** **NATIVE**  
*Forestiera segregata*



**White Stopper** **NATIVE**  
*Eugenia axillaris*



**Jamaica Dogwood** **NATIVE**  
*Dodonaea viscosa*

# Forest Plants & Animals Today

The plants and animals of the Bermuda forests, commonly termed the 'forest biota', are made up of a wide variety of ecological groups. Some are typical forest species that live nowhere else. Others are from a broader ecological group of organisms which are found in a variety of habitats but can tolerate forest conditions. This latter group can be expected to frequent forest edges rather than the deep recesses of woodland. Quite a few of the animals are not by any means permanent forest dwellers but move in and out seasonally, in migration or when certain food sources become available. Some birds use forest habitat as a protected nesting site, but feed elsewhere. The forest is a highly structured system that has habitats within it that are extremely stable.

As mentioned before, clearing, grazing and invasive species have radically changed the upland forest. A management programme exists to protect and restore these areas to their native state. The native fauna originally consisted of land snails, birds and skinks but has been altered by the presence of introduced species – frogs, lizards and toads. The forest habitat is still an important site for birds. The structure of these woodlands will depend on whether it is hillside or valley, distance to the sea, the history of land use and human disturbance.

Spittal Pond's upland forest as well as other forests in Bermuda is strongly dominated by introduced trees. This area is characterised by plants that prefer deep, nutrient rich soils and protection from high wind and salt spray. The main two species in this group are the **Fiddlewood** (*Citharexylum spinosum*) and the **Allspice** (*Pimenta dioica*) although the **Brazil** or **Mexican Pepper** (*Schinus terebinthifolius*) has also become very common in recent years. An introduced shrub, the **Surinam Cherry** (*Eugenia uniflora*) now dominates many areas that were originally treed forest. All of these species, although introduced, have become naturalised. This means that they reproduce naturally in the wild and are now widespread.



**Fiddlewood** *Citharexylum spinosum*  
INTRODUCED NATIVE



**Allspice** *Pimenta dioica*  
INTRODUCED NATIVE



**Brazil Pepper** *Schinus terebinthifolius*  
INTRODUCED INVASIVE



**Surinam Cherry** *Eugenia uniflora*  
INTRODUCED INVASIVE



**Warwick Lizard** *Anolis leachii*  
INTRODUCED



**Marine/Cane Toad** *Bufo marinus*  
INTRODUCED



**Marine/Cane Toadlets**

## Diseases & Pests

PHOTO: DAVID WINGATE



Spittal Pond after cedar blight, 1958

It is not only the introduced species outcompeting the native and endemic ones which are a problem but also diseases and pests arriving on introduced species and spreading to endemic ones. The best examples of this are the **Oystershell Scale** (*Insulaspis pallid*) and the **Cedar Scale** (*Carulapis minima*) both of which attacked the Bermuda Cedar. The scale insects are tiny creatures that are protected by a shell-like covering. They feed on plant sap and spread virus diseases. The Oystershell Scale was introduced in 1940 and the Cedar Scale probably in 1942, both on ornamental junipers closely related to the Bermuda Cedar. By 1949 over

15,000 dead cedar trees had been cut down; by 1953, 90% of the island-wide population was dead. A total of over 3 million trees had been lost because of the Cedar Scale. Fortunately, some of the surviving Bermuda Cedars had some resistance to the scale and others have been bred from these. Today the Bermuda Cedar is being reintroduced on a wide scale and in places is quite common. Another scale insect, the **Palmetto Scale** (*Comstockiella sabal*), introduced on ornamental palms, attacked the endemic Bermuda Palmetto but its effects have, fortunately, not been as severe as with the Cedar Scale.

## Upland Coastal Hillside

The flora of sheltered coastal areas more closely resembles that of Upland Forests with some salt intolerant species. Pre-settlement species included endemics such as Bermuda Cedar and Bermuda Palmettos, as well as natives such as **Bay Grape** (*Coccoloba uvifera*) and **Buttonwood** (*Conocarpus erectus*). Unfortunately invasive species such as the Brazil Pepper and Casuarina are now invading this habitat as well, significantly changing woodland composition.

The Coastal Forest habitat suffers similar stresses, but there is more soil, providing for a more diverse plant community. In general, the plant adaptations are the same as the rocky coast, as seen in the **Spanish Bayonet** (*Yucca aloifolia*) and **Prickly Pear** (*Opuntia stricta* var *dillen*), both native. However, less specifically adapted plants are also found, such as the **Seaside Goldenrod** (*Solidago sempervirens*) and **Lantana** – also known as **Common Sage** (*Lantana involucrata*).

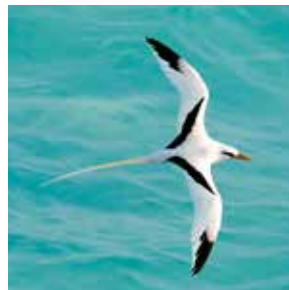
The sheer cliff affords many crevices suitable for the nests of the **White-tailed Tropicbird**, **Longtail** (*Phaethon lepturus catesbyi*), which breeds in Bermuda between May and September. During the winter months it stays at sea, resting on the water and sleeping on the wing.



Seaside Goldenrod **NATIVE**  
*Solidago sempervirens*



Bay Grape **NATIVE**  
*Coccoloba uvifera*



White-tailed Tropicbird **NATIVE**  
*Phaethon lepturus catesbyi*



Bermuda's forests play such a vital, if largely unappreciated role, in the maintenance of the high quality of life and standard of living enjoyed by Bermudians. Not only do woodlands support the lifecycles of Bermuda's native and endemic flora and fauna, they also:

- Protect structures and farmlands against salt laden ocean winds and storms
- Provide shade and reduce temperature
- Reduce rapid storm water runoff
- Minimize rainwater evaporation
- Increase soil fertility
- Absorb and store carbon dioxide
- Filter dust and pollution from the air
- Provide life-giving oxygen
- Provide aesthetically pleasing settings
- Provide camouflage and screen development and help to reduce traffic noise
- Provide recreational and educational opportunities and amenity value to locals and visitors

## The Rocky Coast

The rocky coastal zone is defined as the area between the high tide line and the beginning of significant soil cover. It grades into the coastal hillside zone where patches of soil and ground cover plants become continuous. While freshly eroded limestone is the same colour as beach sand, after several years of exposure the surface assumes a blackish gray colour. This is caused by colonisation of the rock surface by a blue-green algae. Key indicator plant species in this zone are **Sea Oxeye** (*Borrichia arborescens*), a fleshy leaved shrub which grows to 2' tall; **Coast Spurge** (*Euphorbia buxifolia*), a tiny leaved shrub which grows prostrate in rock depressions; and **Buttonwood** (*Conacarpus erecta*), a woody shrub which grows prostrate over the rocks but is capable of growing to bush or tree size where sheltered from wind and salt spray. The fauna of this zone includes 3 supra-littoral snails, most notably the **Beaded Periwinkle** (*Tectarius muricata*), and the **Sally Lightfoot** (*Grapsus grapsus*), which ranges up into this zone from the intertidal zone at night to shed its shell when growing larger. Deep sandy crevices in the cliffs are home to the now rare endemic **Bermuda Skink** or **Rock Lizard** (*Pleistodon longirostris*), which feeds on insects or carrion in the form of dead fish or broken seabird eggs. The **Longtail**, scientifically known as the **White-tailed Tropicbird** (*Phaethon lepturus*), returns from the surrounding ocean in March to nest in deep sandy floored cavities and erosional crevices in the cliffs where it lays its single reddish brown egg from April to June and rears the chick on fish and squid caught far at sea between June and August. Some late starting nesters may still be feeding a fledgling as late as mid November. Unfortunately, feral **Rock Doves** or **Pigeons** which feed at the nearby dairy farm are now competing with the longtails for those coastal cliff nestsites and storm waves in early season hurricanes occasionally wash out the nestling longtails as well.

Access to the rocky coastal zone is possible from the nature trail system at three points in the reserve. The first is the low lying area at east end of the pond where the sea floods in during storms. Here large blocks of fractured cliff rock lie scattered over the ground surface attesting to the power of hurricane waves that deposited them there. The second area is accessed by the steep trail up to the Portuguese Rock inscription site and then westward past Jeffrey's Cave to the saddle between hills where the trail turns inland again. The third area is the Checkerboard at the south west corner of the pond, another hurricane flood zone where large wave-washed boulders are scattered well inland.





**Seaside Oxeye** *Borrchia arborescens* **NATIVE**



**Coast Spurge** *Euphorbia mesembrianthemifolia* **NATIVE**



**Buttonwood** *Conocarpus erectus* **NATIVE**



**Beaded Periwinkle** *Tectarius muricatus* **NATIVE**



**Sally Lightfoot** *Grapsus grapsus* **NATIVE**



**Bermuda Skink** *Pleistodon longirostris* **ENDEMIC**



**White-tailed Tropicbird** *Phaethon lepturus catesbyi* **NATIVE**



**White-tailed Tropicbird** **Brooding**



**White-tailed Tropicbird** **Chick in nest**

## Boiler Reefs

Off the rocky coast of Bermuda's south shore, boiler reefs are visible as the ocean swells break over them. They are not made of coral like most reefs but are produced by biological processes from calcareous worm shells and algae. They are very strong and shaped like a wine glass, the stem being under water. These reefs play the important role of lessening the force of the Atlantic on Bermuda's south shore, which is particularly vulnerable to erosion from wave action. The Boiler Reefs can be seen easily from Portuguese Rock.



## Tidal Pools



**West Indian Chiton** *Chiton tuberculatus* **NATIVE**

The path through the wildlife sanctuary at Spittal Pond Nature Reserve provides access to the south shore at several points. The best location is probably one near to the eastern gate, since it has fairly easy littoral gradients, but it is not as exposed as the Checkerboard near the western boundary of the reserve. However this second site is more difficult to study due to vertical drops of over 1m in several spots. It is however, more varied, has higher species richness and also has excellent tidal pools. The more westerly site has large populations of a **Rock-burrowing Urchin** (*Echinometra lucunter*). This site in

particular is dangerous when waves from the south are breaking. Even in a north wind, southerly swells may make the intertidal inaccessible. Look in tidal pools for fish, **West Indian Chiton** (*Chiton tuberculatus*), **West Indian Top Shell** (*Cittarium pica*) and **Vermetid worms** (*Vermetidae*), with irregularly coiled gastropod shells.

# Birds at Spittal Pond

Spittal Pond is Bermuda’s main refuge for migratory waterfowl and is therefore a very important bird sanctuary. The ponds provide a feeding ground for waterfowl in the winter and for shorebirds during the fall migration. Over 350 species of birds have been recorded in Bermuda, but there are only 20 resident species. This reserve is known as one of the most interesting, diverse and compact waterfowl sanctuaries in the world. It also has resident **Mallards** (*Anas platyrhynchos*), **Yellow-crowned Night-Herons** (*Nyctanassa violacea*) and **Common Moorhens** (*Gallinula chloropus*). The Mallards are dabbling ducks, which feed by tipping tail-up to reach aquatic plants, seeds and snails. There are a number of oddly coloured hybrid pairs. The Common Moorhens are distinguished from the **American Coots** (*Fulica americana*) by their red forehead shields and yellow-tipped red bills. The Coots’ bills are white with a dark band near the tips and they often appear in large numbers during the fall migration. Yellow-crowned Night-Herons feed nocturnally on the common **Red Land Crabs** (*Gecarcinus lateralis*). Please respect the privacy of the birds and be as quiet as possible while observing them in their daytime roosting site in the small woodland pond. It’s there that you may see the Moorhens, which tend to silently glide in and out of the trailing plants and fallen trees at the pond’s edge. They can also be found feeding around the edge of the main pond.



**Mallard** *Anas platyrhynchos* **RESIDENT**



**Yellow-crowned Night-Heron** *Nyctanassa violacea* **RESIDENT**



**Common Moorhen** *Gallinula chloropus* **RESIDENT**



**American Coot** *Fulica americana* **MIGRANT**



**Red Land Crab** *Gecarcinus lateralis* **NATIVE**

## Spring to Summer

The spring migration, unlike the fall, sees only stray birds here, as they tend to migrate north in high pressure cells, which generally steer them well away from Bermuda. However, you may spot **Eastern Kingbirds** (*Tyrannus tyrannus*), **Chimney Swifts** (*Chaetura pelagica*), **Belted Kingfishers** (*Megaceryle alcyon*), **Cedar Waxwings** (*Bombycilla cedrorum*) and at least twelve species of warbler. Of course, you will enjoy the spring serenade of local birds, especially the bright scarlet male Cardinals. You might see a summering **Snowy Egret** (*Egretta thula*) or a **Ring-necked Duck** (*Aythya collaris*).

Bermuda's harbinger of the spring season is the White-Tailed Tropicbird or Longtail. The early settlers called them 'Bosun Birds'. They come to Bermuda each year in spring to breed and leave again to go south for the winter. Peak viewing times are during the morning. You can watch these beautiful black and white seabirds perform their graceful aerial courtship just offshore. Bermuda is the northernmost breeding area for them. Spittal Pond's cliffs are one of the best places to see these native birds courting and feeding close to the surface of the water. Unfortunately, their nesting sites along our cliffs are being usurped by feral pigeons. Many have also been destroyed by storm damage. Sadly, the 2000 statistics show the numbers of their young down from previous years.



Eastern Kingbird  
*Tyrannus tyrannus* **MIGRANT**



Chimney Swift  
*Chaetura pelagica* **MIGRANT**



Belted Kingfisher  
*Megaceryle alcyon* **MIGRANT**



Cedar Waxwing  
*Bombycilla cedrorum* **MIGRANT**



Snowy Egret  
*Egretta thula* **MIGRANT**



Ring-necked Duck  
*Aythya collaris* **MIGRANT**

## Fall

During the fall, shorebirds arrive as early as July and will be seen throughout the season as long as the water level is not too high. Regular species include **Greater Yellowlegs** (*Tringa melanoleuca*) and **Lesser Yellowlegs** (*Tringa flavipes*), **Spotted Sandpipers** (*Actitis macularia*) and **Solitary Sandpipers** (*Tringa solitaria*), **Semipalmated Sandpipers** (*Calidris pusilla*) and **Least Sandpipers** (*Calidris minutilla*). Migrant warblers tend to arrive from mid-August with the largest influx in September and early October. Other arrivals include herons and egrets, swallows and martins (especially over the farm), migrant vireos, grosbeaks and buntings.

The margins of the pond are important for herons and egrets. You may recognise the **Great Blue** (*Ardea Herodias*), **Little Blue** (*Egretta caerulea*), **Green** (*Butorides virescens*) and **Tricoloured Herons** (*Egretta tricolor*), **Great** (*Ardea alba*), **Snowy** (*Egretta thula*) and **Cattle Egrets** (*Bubulcus ibis*) are often seen feeding during the day and some roost here at night. **American Bittern** (*Botaurus lentiginosus*) are often recorded in the fall standing well camouflaged between the grass at the edge of the pond. **Merlin** (*Falco columbarius*) is the most frequently observed bird of prey.



**Greater Yellowlegs** **MIGRANT**  
*Tringa melanoleuca*



**Lesser Yellowlegs** **MIGRANT**  
*Tringa flavipes*



**Spotted Sandpiper** **MIGRANT**  
*Actitis macularia*



**Solitary Sandpiper** **MIGRANT**  
*Tringa solitaria*



**Semipalmated Sandpiper** **MIGRANT**  
*Calidris pusilla*



**Least Sandpiper** **MIGRANT**  
*Calidris minutilla*



**Great Blue Heron** **MIGRANT**  
*Ardea herodias*



**Little Blue Heron** **MIGRANT**  
*Egretta caerulea*



**Green Heron** **RESIDENT**  
*Butorides virescens*





**Tricolored Heron**  
*Egretta tricolor* **MIGRANT**



**Great Egret**  
*Ardea albus* **MIGRANT**



**Snowy Egret**  
*Egretta thula* **MIGRANT**



**Cattle Egret**  
*Bubulcus ibis* **MIGRANT**



**American Bittern**  
*Botaurus lentiginosus* **MIGRANT**



**Merlin**  
*Falco columbarius* **MIGRANT**

## Winter

In the winter you may observe **Pied-billed Grebes** (*Podilymbus podiceps*). These small brown waterbirds are found in much of North America. They have a fascinating defence mechanism – submerging ‘submarine fashion’ when alarmed. Also during the winter you might see **Blue-winged Teal** (*Anas discors*), **Ringed-necked Duck** (*Aythya collaris*) or **Lesser Scaup** (*Aythya affinis*), **American Duck** (*Anas rubripes*) or **Hooded Merganser** (*Lophodytes cucullatus*).



**Pied-billed Grebe** **RESIDENT**  
*Podilymbus podiceps*



**Blue-winged Teal**  
*Anas discors* **MIGRANT**



**Ring-necked Duck**  
*Aythya collaris* **MIGRANT**



**Lesser Scaup** **MIGRANT**  
*Aythya affinis*



**American Black Duck**  
*Anas rubripes* **MIGRANT**



**Hooded Merganser** **MIGRANT**  
*Lophodytes cucullatus*

## Woodland Birds

Resident birds in the woodland areas of this park include the **Mourning** (*Zenaida macroura*) and **Ground Doves** (*Columbina passerina*) and **Great Kiskadee** (*Pitangus sulphuratus*), **Grey Catbird** (*Dumetella carolinensis*), **White-eyed Vireo** or **Chick-of-the-village** (*Vireo griseus bermudianus*), **Northern Cardinal** (*Cardinalis cardinalis*) and **European Goldfinch** (*Carduelis carduelis*). During the winter months the trees and thickets provide shelter for a number of winter residents. You might be lucky enough to catch sight of a warbler such as the **Black-and-white** (*Mniotila varia*), **American Redstart** (*Setophaga ruticilla*), **Ovenbird** (*Seiurus aurocapillus*) and **Northern Waterthrush** (*Seiurus noveboracensis*). **Indigo Bunting** (*Passerina cyanea*) may also be glimpsed.



**Mourning Dove** **RESIDENT**  
*Zenaida macroura*



**Common Ground-Dove** **RESIDENT**  
*Columbina passerina*



**Grey Catbird** **RESIDENT**  
*Dumetella carolinensis*



**Bermuda White-eyed Vireo**  
*Vireo griseus bermudianus* **ENDEMIC**



**Northern Cardinal** **RESIDENT**  
*Cardinalis cardinalis*



**European Goldfinch** **RESIDENT**  
*Carduelis carduelis*



**American Redstart** **MIGRANT**  
*Setophaga ruticilla*



**Northern Waterthrush** **MIGRANT**  
*Seiurus noveboracensis*



**Indigo Bunting** **MIGRANT**  
*Passerina cyanea*

# Historic & Geological Sites

## Portuguese Rock

At the cliff face a bronze plaque records an early inscription believed to have been carved in the stone by survivors off a Portuguese ship wrecked on Bermuda's reefs in 1543. The original carving has deteriorated but the bronze plaque was cast from a lead mould taken of the inscription in 1893.

This site was formerly known as Spanish Rock because the initials were mistakenly thought to be those of a Spaniard. Later research, however, interpreted that a sailor, from a Portuguese ship out of Hispanolia wrecked off Bermuda's north shore, carved the initials as R.P. (an abbreviation for Rex Portugaliae, King of Portugal) and the cross as the Portuguese Order of Christ. The stranded Portuguese mariners did not stay long but built a new vessel and left the island. This inscription commemorates the longstanding presence and contribution of Bermuda's Portuguese community. It was renamed Portuguese Rock on September 24, 2009.

This site also provides a good vantage point to watch **Humpback Whale** (*Megaptera novaeangliae*) migration north in spring.



left:  
The bronze plaque was cast from a lead mould taken of the inscription in 1893

## Jeffrey's Cave

The small cavern, entered from an opening in the ground above is called 'Jeffrey's Cave', so called for a slave of that name who, according to legend, attempted to escape his servitude by hiding in the dank, subterranean lair. Jeffrey had escaped from his master, who searched for weeks to find him. The search was abandoned when it was believed he had escaped from Bermuda on a sailing vessel. However, the master began to notice the mysterious behaviour of one of his female slaves, who disappeared daily at sunset, always carrying a small package. He followed her as she walked through the woods, by the side of a pond and to the rocky shoreline. The next day a friend accompanied the master over the same route, which led them to a cave in which they found the well-concealed Jeffrey.

Many slaves tried to run away from their masters. Rewards offered ran from \$20 for a runaway slave mason to \$2 for a slave boy. In spite of rewards, slaves helped their fellow slaves to hide and run away.



## African Diaspora Heritage Trail • Bermuda

The Bermuda Department of Tourism and the international body **African Diaspora** created a trail linking sites, monuments and museums which have a common legacy of slavery. These sites were officially designated as part of the transnational heritage tourism initiative formed in 2001 and are part of the **UNESCO Slave Route Project** with the aim to protect and educate about the heritage and culture of those belonging to the African Diaspora.



## Checkerboard

This limestone oddity was created by nature, despite the fact that it looks so uniform that one might speculate that man had made it. The cracks are 'systematic joints' along which there has been little movement of the rock. "Systematic" in that there is a clear pattern, in this case, rectangular or even square. Sand and small stones are carried backward and forward by the waves, thus enlarging the cracks. Look for tiny creatures and little crab molts in these openings.

The fracturing is the result of pressure of the forces of plate tectonics. The lower part of the rock is Belmont 'marine' (deposited in the sea) and was later exposed to the air, due to a drop in sea level (the Checkerboard itself). Layered on top of the rock are a beach berm and a back beach dune. The Checkerboard reveals the submarine deposits left by the receding ocean. Keep a lookout for the tidal pools here which contain small hermit crabs. During Bermuda's whaling industry days in the 18th century, whales were hauled ashore here and stripped of their commercially valuable blubber.



*left:*  
The cracks are 'systematic joints' along which there has been little movement of the rock

# Plant & Animal Life at Spittal Pond



**Allspice**  
*Pimenta dioica* **INVASIVE**



**Ardisia**  
*Ardisia polycephala* **INVASIVE**



**Asparagus Fern**  
*Asparagus setaceus* **INTRODUCED INVASIVE**



**Bay Grape**  
*Coccoloba uvifera* **NATIVE**



**Bermuda Maiden-Hair Fern**  
*Adiantum bellum* **ENDEMIC**



**Olivewood**  
*Cassine laneana* **ENDEMIC**



**Bermuda Cedar**  
*Juniperus bermudiana* **ENDEMIC**



**Male Cedar showing pollen**



**Female Cedar showing berries**



**Palmetto**  
*Sabal bermudana* **ENDEMIC**



**Palmetto leaf & seeds**



**Bermuda Snowberry**  
*Chiococca bermudiana* **NATIVE**

Spittal Pond has a wide variety of animal and plant life within its habitats. The following list contains most that can be seen on a walk through the winding trails around the ponds, upland and coastal forest and rocky coast. When walking along the paths from either entrance notice how the plants change as you go down the hills towards the ocean; the grass changes from the common crab grass to those that are more salt tolerant.

PHOTOS: DEPARTMENT OF CONSERVATION SERVICES

Source: Martin L. H. Thomas, Bermuda Zoological Society, A Naturalist's Field Guide to Bermuda Bermuda Zoological Society, Project Nature Field Study Guides: Bermuda Wetlands, Bermuda Forests, The Rocky Coastz



# Plants



**Bermudiana** **ENDEMIC**  
*Sisyrinchium bermudiana*



**Black Mangrove** **NATIVE**  
*Avicennia germinans*



**Black Mangrove** **NATIVE**  
*Pneumatophores (roots)*



**Morning Glory** **INTRODUCED**  
*Ipomoea indica* **INVASIVE**



**Brazil Pepper** **INTRODUCED**  
*Schinus terebinthifolius* **INVASIVE**



**Burr Bush** **NATIVE**  
*Triumfetta semitriloba*



**Buttonwood** **NATIVE**  
*Conocarpus erectus*



**Casuarina** **INTRODUCED**  
*Casuarina equisetifolia* **INVASIVE**



**Chinese Fan Palm** **INVASIVE**  
*Livistonia chinensis*



**Cinnamon Fern** **NATIVE**  
*Osmunda cinnamomea*



**Coast Sophora** **NATIVE**  
*Sophora tomentosa*



**Coast Spurge** **NATIVE**  
*Euphorbia mesembrianthemifolia*

## Plants



**Darrell's Fleabane** **ENDEMIC**  
*Erigeron darrellianus*



**Fiddlewood** **INVASIVE**  
*Citharexylum spinosum*



**Flopper or Life Plant** **INTRODUCED**  
*Kalanchoe pinnata*



**Forestiera** **NATIVE**  
*Forestiera segregata*



**Giant Fern** **NATIVE**  
*Acrostichum danaeifolium*



**Holly Fern** **NATIVE**  
*Cyrtomium falcatum*



**Indian Laurel** **INVASIVE**  
*Ficus microcarpa*



**Joseph's Coat or Poinsettia** **NATIVE**  
*Euhorbia heterophylla*



**Match-Me-If-You-Can** **INTRODUCED**  
*Acalypha amentacea wilkesiana*



**Nasturtium** **NATIVE**  
*Tropaeolum majus*



**Natal Plum** **NATIVE**  
*Carrisa grandiflora*



**Prickly Pear** **NATIVE**  
*Opuntia stricta* var *dillenii*



## Plants



**Psilotum**  
*Psilotum nudum* **NATIVE**



**Red Mangrove**  
*Rhizophora mangle* **NATIVE**



**Rouge Plant or Blood Berry**  
*Rivina humilis* **INTRODUCED**



**Royal Fern**  
*Osmunda regalis* var *spectabilis* **NATIVE**



**Sawgrass**  
*Cladium jamaicense* **NATIVE**



**Screw Palm or Pine**  
*Pandanus utilis* **INTRODUCED**



**Sea Lavender**  
*Limonium carolinianum* **NATIVE**



**Sea Rush**  
*Juncus maritimus* **NATIVE**



**Seaside Daisy**  
*Wedelia trilobata* **INTRODUCED**



**Seaside Goldenrod**  
*Solidago sempervirens* **NATIVE**



**Seaside Oxeye**  
*Borrchia arborescens* **NATIVE**



**Seaside Purslane**  
*Sesuvium portulacastrum* **NATIVE**

# Plants



**Sheathed Paspalum Grass**  
*Paspalum vaginatum* **NATIVE**



**Shrubby Fleabane**  
*Pluchea odorata* **NATIVE**



**Spanish Bayonet**  
*Yucca aloifolia* **NATIVE**



**Surinam Cherry**  
*Eugenia uniflora* **INTRODUCED**



**Sword Fern**  
*Nephrolepis exaltata* **NATIVE**



**Tamarisk or Spruce**  
*Tamarix gallica* **INTRODUCED**



**Turnera**  
*Turnera ulmifolia* **NATIVE**



**Umbrella Sedge**  
*Cyperus alternifolius* **INTRODUCED**



**Virginia Creeper**  
*Parthenocissus quinquefolia* **NATIVE**



**Wax Myrtle**  
*Morella cerifera* **NATIVE**



**Widgeongrass**  
*Ruppia maritima* **NATIVE**



**White Beggar Ticks**  
*Bidens pilosa* **NATIVE**



## Animals



American Eel  
*Anguilla rostrata* **NATIVE**



Warwick Lizard  
*Anolis leachii* **INTRODUCED**



Beaded Periwinkle  
*Tectarius muricatus* **NATIVE**



Bermuda Skink  
*Eumeces longirostris* **ENDEMIC**



Blue Dasher Dragonfly  
*Pachydiplax longipennis* **NATIVE**



Buckeye Butterfly  
*Junonia coenia* **NATIVE**



Marine/Cane Toad  
*Bufo marinus* **INTRODUCED**



Monarch Butterfly  
*Danaus plexippus* **NATIVE**



Eastern Mosquito Fish  
*Gambusia holbrooki* **INTRODUCED**



Red Land Crab  
*Gecarcinus lateralis* **NATIVE**



Sally Lightfoot  
*Grapsus grapsus* **NATIVE**



Vermilion Glider  
*Tramea abdominalis*



White-tailed Tropicbird  
*Phaethon lepturus catesbyi* **NATIVE**



West Indian Chiton  
*Chiton tuberculatus* **NATIVE**

# Teacher Resources/Activities

## Before your visit

### Introducing Students to Spittal Pond Nature Reserve

The activities included aspire to engage young minds and foster observation skills and inquisitiveness about our environment. We encourage respect and appreciation for nature and open spaces, and promote knowledge and understanding of the unique features of the reserve.

*Curriculum links to all activities are provided in the appendix*

### \*ACTIVITY 1/PRIMARY 1-3

#### Science Vocabulary

Primary students should be introduced to or review the following vocabulary as it applies to the reserve before their visit:

**Flora:** flowers, plants, bushes, trees that live in and around our island

**Fauna:** birds/animals that live in and around our island

**Pond:** a small still body of water formed naturally or created artificially

**Marsh:** low-lying waterlogged land that is poorly drained and liable to flood when it rains

**Habitat:** the natural conditions and environment in which a plant or animal lives

**Nature reserve:** a managed and protected area of land usually containing rare or endangered plants or animals

**Mangroves:** an evergreen tree found growing along pond edges and shore lines with their roots exposed at low tide

**Forest:** a dense area of trees, also known as woodland, wood or woods. A typical forest is composed of the overstorey (canopy or upper tree layer) and the understorey

**Rocky coast:** a form of cliffed coast where the action of marine waves has formed steep cliffs that may or may not be steep

### \*ACTIVITY 2/PRIMARY 1-3

#### Geography/Where is Spittal Pond?

Having a visual sense of the reserve's location and where students will be travelling for the upcoming tour helps to build excitement before the visit. This activity provides a springboard for visiting other Trust reserves - Paget Marsh, Somerset Long Bay and Sherwin Nature Reserve/Warwick Pond.

**This activity also focuses on:**

- The location of parishes
- Bodies of water in and around our island
- Learning directional terms, north, south, east, west
- The location of other Trust properties, light houses, caves, tribe roads, forts, the airport, etc.
- A key, which displays symbols that correlate to areas on the map



## MATERIALS

- Access to a Smartboard, a computer and printer are needed
- Images of Bermuda maps and Trust properties are available on our website under our teacher resources heading
- Print both maps, one with Trust property locations and one without
- Print images of Trust nature reserves

To expand the activity, teachers can print images of other Trust properties available on our website and find other images of island landmarks online through Google/Images.

**Additional Materials:** poster board, self-adhesive Velcro, glue sticks and access to a poster size laminator. Local copy stores can enlarge/laminate the map and laminate landmark images.

## PREPARATION • BEFORE THE ACTIVITY

- Print the maps of Bermuda. Enlarge the map without nature reserve locations to suit a size large enough for a whole group introductory lesson and laminate for durability. Back the laminated map on a display board
- Print pictures of the nature reserves, back them with poster board and laminate; the recommended size of images – 2" x 2"
- Create and print names of parishes, tribe roads, etc. Google images of local landmarks and print as well
- Attach Velcro to the laminated images and the display map in the appropriate locations of Trust properties and refer to the map showing the nature reserve locations as a reference
- Have the display map and images ready for the Spittal Pond introductory lesson
- Log on to the Trust website/education section and display the digital images of Spittal Pond Nature Reserve and other Trust nature reserves on a Smartboard; or print 8½" x 11" size to share with students

## DURING THE ACTIVITY

- Ask students if they have visited a local reserve in the past; if so, which one(s). The images shown on the Smartboard or those printed will help them to recall prior visits and or may instill an interest in visiting nature reserves
- Ask students what they know about nature reserves, what is important about them, and additional information they would like to learn
- Refer to the created display map and landmark signs. Allow students to choose a landmark and place the labeled photo sign its proper location. The map with identified locations can be used as a reference

**Note:** Once the students have had this introduction to the location of Spittal Pond Nature Reserve and other landmarks they can work individually or with a peer to create their own map.

## INDIVIDUAL AND PAIRED STUDENT LEARNING

- Print a map for each student; recommended size - 8½" by 14"
- Print photos of nature reserve signs and additional landmarks
- Ensure that students have glue sticks, scissors and pencils
- Students cut out the reserve and landmark signs and glue them in their correct locations, working individually or in pairs

**Option:** students can draw landmark signs or create them on a computer and print

## \*ACTIVITY 3/PRIMARY 4-6

### Introduction to Spittal Pond

#### MATERIALS

- Access to a Smartboard, a computer and printer are needed

Teachers of Upper Primary and Middle levels should assess their students' prior knowledge of nature reserves and the science vocabulary (see Lower Primary Introduction) in preparation for their introduction to Spittal Pond Nature Reserve. Creating a classroom map will also benefit students who have not developed an understanding of the reserve's location as well as other important landmarks.

Log on to our website/education section and display the digital images of Spittal Pond Nature Reserve and other Trust nature reserves on a Smartboard, or print 8½" x 11" size to share with students.

Review the history and importance of Spittal Pond Nature Reserve with students and create:

- A table to show the time line of how the nature reserve evolved including a title, dates and description of each period.
- The overall importance of Spittal Pond (possible headings: environmental value, freshwater lens, nesting islands, landing site).

**Differentiation:** Teachers can create a time line with students through the use of a Smartboard, a blank table that enables them to complete the information on a computer or handwrite, or students can create the table on their own.

## THE DAY OF THE TOUR TO SPITTAL POND

### Tour materials needed - at a glance

Teachers need to:

- Ensure that all students have written parent/guardian consent to attend the tour
- Prepare a register to include the names of students in attendance and their emergency contacts
- We ask that the teacher notify the Trust education staff member of any students who do not have consent to be photographed during the tour

### What to wear

We advise everyone to wear appropriate clothing, comfortable walking shoes and hats and to apply sunscreen prior the visit.

### Bring the following items:

- First aid kit, a pre-charged cell phone
- Camera and binoculars 'optional' for adults and mature students (who will be responsible for such items)
- Light-weight blanket(s) for students to sit on during a 'snack break'

### Materials needed for each student:

- Clipboard, 2 pencils
- Snack and water bottle
- Backpack

### Capturing moments during the tour of Spittal Pond

Teachers are encouraged to bring a camera and photograph the experience, and to use the images in activities afterwards. Older mature students can bring a camera (and take responsibility) to photograph the experience as well. Spittal Pond Nature Reserve is a showcase of birds and pond life. Binoculars allow students to get a closer look. Suggested activities will include ideas for the use of photographs as a creative way to extend student learning of the reserve.

# During your visit/**Class Field Trip Activities**

The following activities are provided during the tour for primary and middle level students. A substitute activity may be provided upon request. In addition to the activity, students will be taken to historic and geological sites, Portuguese Rock, Jeffrey's Cave and the Checkerboard, where a description will be provided.

## **\*ACTIVITY 1/PRIMARY 1-2**

### **Natural & Man-made Environments**

To explore students' awareness of natural and manmade environments, they will identify and categorise items in their immediate surroundings (including things they brought with them). In pairs, they will then investigate their classmates' selections, indicating with ribbons. A group discussion will conclude the activity to confirm or challenge the classifications.

## **\*ACTIVITY 2/PRIMARY 1-2**

### **Exploring Plant & Animal Habitats through the Senses**

Spittal Pond's habitats are a focus for students as they explore individual areas that support life for plants and animals. Students will tour different habitats in the reserve and draw animals and plants that they see and describe the different smells of the Upland Hillside, Ponds and Rocky Coast areas.

## **\*ACTIVITY 3/PRIMARY 3-4**

### **The Influence of Physical Environments**

Students will create and interpret simple maps of Spittal Pond and describe how physical environments influence human activity. By describing their interpretation of their nature walk experience with pictures and symbols on the map, the group explores how the outdoors can be a source of entertainment and compares with other activities they do, recognising the benefits of each.

## **\*ACTIVITY 4/PRIMARY 3-4**

### **Observing Plants & Animals at Spittal Pond**

Plants and animals have different needs in order to grow and thrive. Students will explore the Upland and Coastal Hillside and the Rocky Coast to see the plants and animals in this environment.

## **\*ACTIVITY 5/PRIMARY 5**

### **Cool Things About the Trails at Spittal Pond**

We can learn a lot from experiencing a walk along the trails at Spittal Pond. Students will look for seeds dropped from trees in the forest and learn how the wind, birds and water help plant colonisation.



## **\*ACTIVITY 6/PRIMARY 6**

### **Food Webs**

To visualize a food web, students stand in a circle and name some plants in the area. As plants are named, they pass a ball of string around. They are then asked for examples of herbivores that might eat these plants and the string is passed to those students. Then they list some carnivores that eat the herbivores. The string continues around, ensuring that all connections have been made, forming a network across the circle, resembling a food web. The facilitator then introduces a disturbance to the web. (e.g. a cedar tree is cut down or casuarinas blows over in a hurricane) and that student tugs lightly on the string. When each student feels a tug, they give a tug. The group sees how many others in the circle are affected. The group quickly sees every individual in the web is affected by the destruction of one tree.

## **\*ACTIVITY 7/MIDDLE 1-3**

### **Threats to Our Resources**

To investigate environmental threats to Bermuda and develop an understanding of sustainable development, students mark out an area roughly the shape of Bermuda and are invited to 'develop' this land to meet the needs of the people by using resources available. The facilitator presents various issues to the group to address (ie. housing, transportation, recreation, population increase) and students determine how to meet the needs with the limited resources.

## **\*ACTIVITY 8/MIDDLE 1-3**

### **Classifying Plants**

Some plants can be found in different habitats; others have flowers and seeds and different types of stems. Students will learn the different ways that we can classify plants.

# After your visit/Additional Information & Activities

The following activities can be offered to students before or after a field trip to Spittal Pond.

Each has a recommended grade level and can be modified to meet other levels and student abilities.

## Habitat & Plants

### \*ACTIVITY 1/PRIMARY 1-2

#### Outdoor Classroom: Habitat and Plant Study

The school playground can be the perfect location to attract and support wildlife by creating an ideal habitat for particular species. Ask each student to bring to school a rock or piece of tile. Create a rock garden in the back of the playground. The moisture and somewhat controlled temperature in the rocks will attract frogs, toads and lizards. Plant flowers that attract, feed and create a habitat for caterpillars and butterflies, such as milkweed, dill, hollyhocks and peonies. Collect a large pile of sticks to be home to creatures such as beetles and woodlice and larger mammals such as squirrels and chipmunks. Invite the class to visit the playground often and take a few moments to observe, discuss and learn outside the classroom.

### \*ACTIVITY 2/PRIMARY 1-2

#### Animal Babies

Students explore animal babies with this identification lesson. Students will listen to stories *Is Your Mama a Lama?*, by Deborah Guarino and *Are You My Mother?*, by Phillip D. Eastman and discuss what each mother and its baby are called. Students match animal pictures including mothers and babies and then place pairs in their correct habitat. This activity can also result in a display created by students on a bulletin board.

### \*ACTIVITY 3/PRIMARY 1-2

#### Habitat Poster

Learning about different habitats and the animals that live in them is fun when students can design their own poster showing at least 6 different animals and the habitat they live in. Students can collect pictures of animals from magazines or draw them. Their finished work can include materials that enhance their poster, such as feathers from a bird, shells, sand, dirt, etc.

### \*ACTIVITY 4/PRIMARY 3

#### Stem Exploration

Just as people have different jobs to do in the community, each part of a plant has a different job to do to help the plant grow and stay healthy. Stems have several jobs, including transporting water from the soil to the rest of the plant. In this activity, students will put plant stems in water with food colouring and will observe what happens as the plant absorbs the coloured water. Plants such as celery leaf stalks and carnation flowers work well. Students can predict how the coloured water will affect the objects overnight. Optional: Have students make drawings of the set-up, including the objects in the jars. Let the objects sit in the water overnight and the next day note the changes that occur.

### **\*ACTIVITY 5/PRIMARY 3**

#### **Student Plant Hunters**

Take a guided walk around the outside of your school with 'Student Plant Hunters'. Their mission is to record what they notice about plants in an observation notebook. They may write or draw. Allow your 'Plant Hunters' to use a magnifying glass to help them search for plant parts and then draw different parts of the plants they find. As a homework assignment ask parents to supervise their children using a digital camera to take pictures of different parts of plants they find around their home. Parents can email you a few pictures to display on the classroom Smartboard.

### **\*ACTIVITY 6/PRIMARY 4**

#### **Mini Habitats Near You**

Habitats are all around us. They can be found in small rock gardens, in a tree stump and even a potted plant. Students are given the task of hunting for habitats around their homes and making a list of those they have found. They choose one to draw a diagram of the community that exist within this unique habitat, which includes the animals that reside inside and the overall structure of their home.

### **\*ACTIVITY 7/PRIMARY 4**

#### **Comparing Habitats**

Students choose two habitats i.e. Rocky Coast and Upland Hillside, to research and compare. Their assignment is to learn about both communities, the animals and plants that grow in each, noting their differences and similarities, the overall environment – is it wet or dry, sunny or shady, windy or still? What occurs naturally in each community that allows plants and animals to grow and survive? Students decide which habitat they would enjoy living in and why.

### **\*ACTIVITY 8/PRIMARY 5**

#### **Lights Out!**

Without enough sunlight, plants cannot use the process of photosynthesis to produce food. Pick a shrub, tree or houseplant that you can use for an experiment. Using cardboard or aluminum foil cut out geometrical shapes like a circle, square or triangle. Make sure your shapes are big enough to make a patch that will cover nearly half of the plant leaf. Paperclip each shape on a different leaf. If you use a house plant, place it near a south, west or east window where it will get plenty of sunlight. Make notes about the weather each day and add them to your observations. After four days, remove the shapes from the leaves and observe each of the leaves that had a shape covering it. Compare the areas on the leaf that were covered with the shape to other parts of the leaf. What has happened to the leaves? Describe the effects that the lack of sunshine has on leaves.

## **\*ACTIVITY 9/PRIMARY 5**

### **Hitching a Ride**

Plants are not able to move, so they need another way to spread their seeds, otherwise they would all grow on top of each other. The way they avoid this is by seed dispersal. Seeds are dispersed naturally by wind, water or hitching a lift on animals or people by sticking onto fur, feathers or clothing. Sticky seeds stick to bird bills or feet and scatter when they fall off. Seeds inside fleshy fruit are eaten by animals, pass through their digestive track and get dispersed with their droppings. Students learn about different dispersal strategies by taking a walk around their school or neighborhood looking for plants that have burrs with barbs and hooks, fleshy fruits or seeds with sticky skin. Have students keep a look out for seeds that are lying in wooded areas along paths. Ask students how they think seeds found on the ground arrived there.

## **\*ACTIVITY 10/PRIMARY 6**

### **Diorama and Report Writing**

Spittal Pond has a variety of habitats awaiting discovery – Brackish Pond, Upland Hillside, Upland Coastal and Rocky Coastal. Students choose a habitat to research and learn about the animals and food chain found in this community of living things. Creativity abounds as students re-create their habitat using a shoebox and materials of their choice. Depending on ability level, students complete a report on the habitat, which includes images they have downloaded or drawn. Students can also give a speech about the food chain in their habitat.

## **\*ACTIVITY 11/PRIMARY 6**

### **Personal Habitat**

Offer students the opportunity to reflect on their own use of space and how they meet their survival needs. On a blank sheet of paper, each student should draw a picture detailing where they sleep, eat and find food, as well as how they stay warm and dry. Give students an additional piece of paper and instruct them to draw a worm's habitat. Discuss the range of space needed for each human as compared to each worm. Talk about the importance of caring for our space and how this may be accomplished.

## **\*ACTIVITY 12/MIDDLE 1**

### **Simulated Habitat Destruction**

People are notorious for destroying habitats. Lead students through an activity to demonstrate how this affects the survival of animals. Clear away the desks and appoint 4-6 students to represent birds. Give them six minutes to set up a habitat using a desk for a nesting area, green construction paper for food and a piece of blue construction paper for water. Next, 6-9 students can represent trees to provide protection near the nest. Then, allow 9-10 students to represent developers. Using bed sheets have students build housing developments or a business district in the classroom. They must clear their area of food, water and shelter before constructing their buildings. After the construction is complete, allow the affected birds to react to the changes. Discuss, as a class, what happened to the animal species when developers build on open space and possible solutions.



### **\*ACTIVITY 13/MIDDLE 1**

#### **Habitat Interview**

In order to develop empathy for the plight of animals in their habitats, assign students to take on the role of a particular animal and talk about their habitats. Write the name of familiar animals on note-cards, one animal per card. Divide the class into pairs. One student will begin as the interviewer and ask questions about the animal's habitat. The other student will draw the name of an animal from the stack of cards and answer the questions on behalf of that animal. The students must discuss the consequences when the habitat is disturbed or destroyed. After a 10-minute discussion, the interviewer should take on the persona of an animal from the stack of cards and answer questions in turn. If the partnership encounters questions to which they do not know the answer, they may do some on-the-spot research in an encyclopedia or on the class computer.

### **\*ACTIVITY 14/MIDDLE 3**

#### **Plant Survival**

Bermuda provides habitats for a variety of plants in close proximity. Using scientific investigation and technological skills students will investigate the climate and growing conditions of plants. Have them do a comparative analysis of plants from different areas; one dry (terrestrial) and another wet (aquatic). Have them compare and contrast the conditions that are necessary for the survival of both, identify the common and scientific names of the plants and determine the correlation between location and plant characteristics. Allow students to use a digital camera, a computer, and the Internet to create a Web site to share their findings with other students across the internet.

### **\*ACTIVITY 15/MIDDLE 3**

#### **The Role of Producer, Consumer and Decomposer**

Students work in cooperative groups and discuss the roles of the producers, consumers, and decomposers in the ecosystem. Provide each group an unlabelled picture of an ecosystem and tell them to identify individually the producers with a green-coloured marker, the consumers with a blue-coloured marker, and the decomposers with a red-coloured marker. Students then draw a picture of one of the following: a forest scene, a desert scene, an ocean scene, or a scene from their own community. Tell them to include the producers, consumers, and decomposers that would be found in that ecosystem. Display the drawings in the classroom. Each student should answer the questions:

**Q:** What are three organisms considered to be producers?

**A:** Pine tree, fruit trees, grasses, vegetable plants, rose bushes, etc.

**Q:** Why are producers important in an ecosystem?

**A:** Producers use energy from the sun to produce food and oxygen for all other organisms.

**Q:** What are three different organisms considered to be consumers?

**A:** Horses, dogs, cats, cows, humans, birds, fish, snakes, insects, etc.

**Q:** What purpose(s) do consumers serve in an ecosystem?

**A:** Consumers control populations of other organisms; they also return carbon dioxide and nutrients to the environment that the producers need to produce food.

**Q:** What are three different organisms considered to be decomposers?

**A:** Bacteria, fungi, some insect larva, and insects.

**Q:** What two things would happen to an ecosystem if no decomposers were present?

**A:** Very few nutrients would be returned to the environment. Dead organisms would not be broken down and would continue to pile up in the ecosystem.

**Q:** What does the word autotroph mean in Latin?

**A:** Self-feeder.

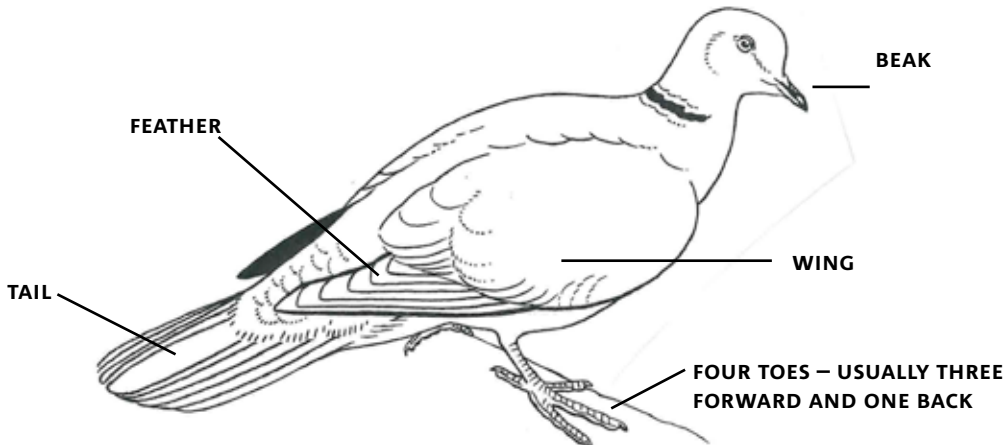
**Q:** What does the word heterotroph mean in Latin?

**A:** Other feeder.

# Discovering Birds

## What is a Bird?

Birds are found in almost every climate and location on earth. They come in many shapes, colours and sizes, each adapted to their environment. Even so, all birds have many physical features in common: a beak, two wings, two legs, feathers, a tail, etc. Birds also lay eggs and have hollow bones to make them light for flight.



There are many different kinds of birds. We can tell them apart by:

- The shapes of their bodies, beaks and feet
- The colour of their feathers
- The places where they live

If we look at a bird's beak, wings and feet, we can often tell what they eat and where they live. You can see that by taking the time to carefully observe birds you can tell a lot about them without even knowing what kind they are.

Feet		Beaks	
SWIMMING			FILTERING
SWIMMING/ WALKING			PROBING
WALKING			CATCHING INSECTS
PERCHING			CRACKING SEEDS
SEIZING PREY			TEARING MEAT
CLIMBING			DRILLING HOLES

# Feet Adaptations

Name: \_\_\_\_\_

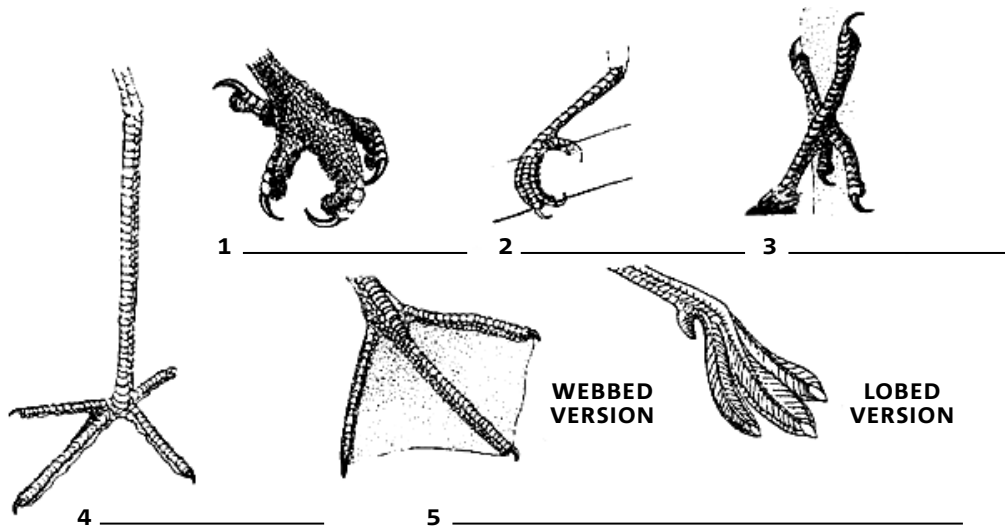
Date: \_\_\_\_\_

Look carefully at the six different types of bird feet illustrated below. These are the foot adaptations certain birds have developed to manoeuvre in their habitats while gathering food.

Choose the word from below that best describes the type of function that would be most useful for each foot, and then label the drawing, with the word, on the blank line beneath it.

wading    preying (seizing & capturing prey)

swimming    perching    climbing



Using the images of birds on pages 26 to 30, name examples of:

**Birds with feet like #4**

1. \_\_\_\_\_

2. \_\_\_\_\_

**Birds with feet like #5**

1. \_\_\_\_\_

2. \_\_\_\_\_



# Beak Adaptations

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Each beak adaptation, shown below, is especially useful for gathering certain types of food.

**Read each description, find the beak drawing that matches the description, and then label the drawing with the name of the beak type on the blank line beneath it.**

**Fish-eating beak:** long, slim, strong, and pointed to reach into the water and to grasp slippery creatures

**Insect-catching beak:** small beak that can open wide to grab insects in flight

**Seed-eating beak:** arched into the shape of a cone; stout and sharp to crack seeds

**Insect & Fruit-eating beak:** narrow and pointed to grab insects or reach for fruits, and slightly arched to crack seeds; larger than an insect-catching beak but shorter than a fish-eating beak; sleeker and longer than a seed-eating beak

**Water & Mud-shifting beak:** wide and shallow; comb-like strainers on edges filter out bits of food in the water

**Chisel beak:** sturdy and sharply pointed to chisel into wood; accompanied by an extremely long, barb-tipped tongue to pull insects and insect eggs out of tunnels in bark or wood

**Preying beak:** stout, sharp, and sharply hooked to tear into the flesh of animals

**Probing beak:** thin and long to reach insects and other small animals buried in mud or sand



1 \_\_\_\_\_



2 \_\_\_\_\_



3 \_\_\_\_\_



4 \_\_\_\_\_



5 \_\_\_\_\_



6 \_\_\_\_\_



7 \_\_\_\_\_



8 \_\_\_\_\_

# Beak Adaptations & Food Choices

Name: \_\_\_\_\_

Date: \_\_\_\_\_



Investigate the beaks and food choices of birds from the different habitats.

**Shorebirds & Waders/** drawing of head & beak →

**Bird name:** \_\_\_\_\_

**What it likes to eat:** \_\_\_\_\_  
\_\_\_\_\_

**Water Birds/** drawing of head & beak

**Land Birds/** drawing of head & beak

**Bird name:** \_\_\_\_\_

**What it likes to eat:** \_\_\_\_\_  
\_\_\_\_\_

**Bird name:** \_\_\_\_\_

**What it likes to eat:** \_\_\_\_\_  
\_\_\_\_\_

# Bird Watching at Reserves

Name: \_\_\_\_\_

Date: \_\_\_\_\_



Look for birds that you can see around the reserve. Observe their shape, size, colour, behaviour and location. Draw two of the birds that you see. Try to include where you see them in your picture. Are they on the water, in the trees or on the plants?

## Bird & Location 1:

## Bird & Location 2:

# Colouring the Birds of Bermuda

Name: \_\_\_\_\_

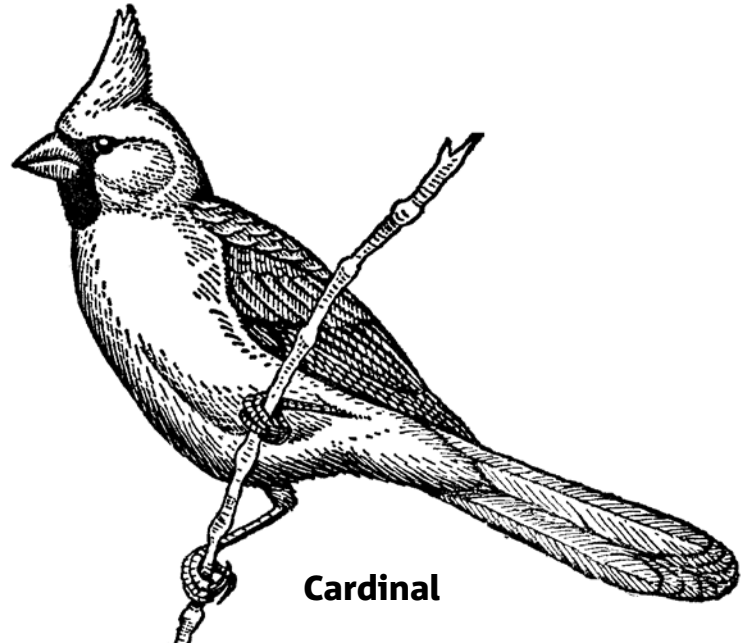
Date: \_\_\_\_\_



Colour In the pictures of the birds



**Bluebird**



**Cardinal**



**Yellow-crowned  
Night Heron**



**Chick-of-the-village**





# Bird Word Search

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Can you find the names of these birds that visit nature reserves?

The names run forward, backward, horizontal, vertical and diagonal.

X S T Q A P R F G Z J Z X Q L  
Z L P F V G S T A R L I N G D  
F T C A R D I N A L R W R F Z  
A L Q E R R S F Q X Z O W D S  
D S B U K R G U C F U P O Y Q  
X E F L I Z O Y N N H T L I B  
T L I T S Q G W D E Z F L S K  
D D U C K F T D R I B T A C M  
P M N B A B O O B F Q Z W O K  
Q W S R D V N Z T G S G S O B  
B J G R E V O L P G O U L T Z  
J T Z Q E Z F H X M K B R E L  
S A N D P I P E R E L B R A W  
Z A D P F T H Q M K S S W L P  
Q E G A L L I V E D K C I H C

## MARSH EDGES

Ground dove  
Starling  
Sparrow  
Swallow

## MUDFLATS

Stilt  
Sandpiper  
Plover

## WOODLANDS

Catbird  
Cardinal  
Chick-of-the-village  
Kiskadee  
Warbler

## ON THE POND

Grebe  
Coot  
Teal  
Duck  
Heron

# Bird Word Search/ANSWERS

---

S  
P G S T A R L I N G  
C A R D I N A L R  
E R O W  
B K R U O  
E I O N H L  
T L I T S W D E L  
D U C K D R I B T A C  
A O O W O  
D V N S O  
R E V O L P T  
E E  
S A N D P I P E R E L B R A W  
L  
E G A L L I V E D K C I H C

---

# Chick-Of-The-Village

Name: \_\_\_\_\_  
Date: \_\_\_\_\_



How many words can you make from the bird name, CHICK-OF-THE-VILLAGE?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11. \_\_\_\_\_

12. \_\_\_\_\_

13. \_\_\_\_\_

14. \_\_\_\_\_

15. \_\_\_\_\_

16. \_\_\_\_\_

17. \_\_\_\_\_

18. \_\_\_\_\_

19. \_\_\_\_\_

20. \_\_\_\_\_

# Quiet Observation Worksheet

---



**Name:** \_\_\_\_\_

**Location:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Time:** \_\_\_\_\_

---

## Observations:

Sit quietly by yourself for a few minutes and observe the area around you. Record the various sights and sounds in the environment. Use your senses. What animals and plants do you see? What are the animals doing?

---

## Thoughts:

As you watch your surroundings, write down some of your thoughts.



# Living or Non-living

---

Name: \_\_\_\_\_

Date: \_\_\_\_\_



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Draw and label things that you see in nature reserves that are living or non-living. Make sure you put them in the correct column!

Living	Non-living

# Glossary

**Absconder:** someone who runs away secretly to avoid punishment

**Abundant:** present in great quantity; more than adequate; over sufficient

**Adapt:** to make suitable for the requirements or conditions; to modify fittingly

**Agriculture:** the science, art or occupation concerned with cultivating land, raising crops, and feeding, breeding, and raising livestock

**Apprehend:** to take into custody, arrest by legal warrant or authority

**Bio-deposition:** the process that forms coral reefs on and around the platform and marine organisms, such as seaweed and algae

**Biodiversity:** the number of different species present at a location

**Brackish:** a mix of fresh and salt water

**Calcareous:** containing or composed of calcium

**Camouflage:** the act, means, or results of obscuring things to deceive an enemy; concealment by some means that alters the appearance

**Climate change:** the long-term change in the earth's climate, especially a change due to an increase in the average atmospheric temperature; usually referred to as a consequence of human impacts

**Commemorate:** to serve as a memorial or reminder of something, honouring a memory

**Conservation management:** a procedure for maintaining a species or habitat in a particular state. It is a means whereby humankind secures wildlife in a favourable condition for contemplation, education or research

**Defence mechanism:** the reaction of an organism to protect it from unacceptable or painful impacts

**Development:** the act or process of growing or progressing

**Distinguish:** to mark off or recognise as different

**Diverse:** of various kinds, forms or character

**Dominate:** the act of ruling or taking over, controlling

**Ecology:** the external surroundings in which a plant or animal lives which tend to influence its development and behaviour

**Ecosystem:** a system involving the interactions between a community and its non-living environment

**Endangered:** threatened with extinction

**Erosion:** the process by which the surface is worn away by the action of water, wind, waves etc.

**Eutrophication:** an abundant accumulation of nutrients that support dense growth of algae and other organisms, the decay of which depletes the shallow waters of oxygen in summer

**Evaporation:** the act of changing from a liquid state into vapour

**Evolve:** to develop gradually

**Exoskeleton:** an external covering or integument, especially when hard

**Extinct:** no longer in existence

**Fluctuate:** to change continually; to shift back and forth; to vary irregularly

**Fossil:** any remains, impression, or trace of a living thing of a former geological age

**Geological:** of or pertaining to the science that deals with the dynamics and physical history of the earth, the rocks of which it is composed, and the physical, chemical, and biological changes that the earth has undergone or is undergoing

**Habitat:** a small area of environment where animals live

**Herbaceous:** of, pertaining to, or characteristic of a herb, a flowering plant valued for its medicinal properties, flavour or scent

**Impenetrable:** cannot be penetrated; unable to pass through

**Indigent:** lacking food, clothing, and other necessities of life because of poverty

**Inscription:** a historical record cut or impressed on a hard surface; usually a dedication

**Littoral:** of or pertaining to the biogeographic region between the sublittoral zone and the high-water line

**Monospecific:** composed almost entirely of a single species

**Nocturnal:** active at night

**Percolation:** the slow movement of water through the pores in soil or permeable rock

**Pneumatophores:** air breathing roots

**Porous:** able to be penetrated by water or air

**Predator:** any organism that exists by preying upon other organisms

**Preserve:** to keep alive or in existence; make lasting

**Propagate:** to cause an organism to multiply by any process of natural reproduction

**Ramsar:** an international treaty for the conservation and sustainable utilisation of wetlands; i.e. to stem the progressive encroachment on and loss of wetlands now and in the future, recognising the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value

**Refuge:** shelter or protection from danger or trouble; a place where one has recourse for aid or relief

**Regeneration:** the restoration or new growth by an organism that has been lost, removed or injured

**Remnant:** a remaining, usually small, part

**Restoration:** the act of returning something to a former, original, or unimpaired condition

**Salinity:** the total dissolved salt content of water

**Sanctuary:** a sheltered place, or sometimes facility, where animals can live protected, able to maintain comfortable conditions; a safe haven

**Sediment:** mineral or organic matter deposited by water, air or ice; the matter that settles at the bottom of liquid

**Servitude:** compulsory service or labour as punishment; slavery or bondage of any kind

**Settlement:** a stable or permanent basis; an arrangement of business affairs

**Sluice gate:** an artificial channel for conducting water at the upper end for regulating the flow

**Strata:** layers of material, naturally or artificially formed; a single bed of sedimentary rock, generally consisting of one kind of matter representing continuous deposition

**Submerged:** hidden or covered under the surface of water

**Subterranean lair:** a secluded or hidden place under the surface of the earth

**Succulent:** having fleshy and juicy tissues

**Surge:** a strong, wavelike forward movement; the swelling and rolling sea

**Systematic:** having or involving a system, method or plan; can be concerned with classification

**Tectonic plates:** The two sub-layers of the earth-crust (lithosphere); their motion of colliding with, sliding under, or moving past adjacent plates causes geological reactions and formations

**Threat:** an indication of warning or probable trouble

**Tolerant:** to allow the existence, presence, or act of something without prohibition or hinderance

**Vertebrate:** an animal having a backbone or spinal column

**Vulnerable:** capable of or susceptible to being wounded or hurt; open to attack

**Wetland:** land that has a wet and spongy soil

# Spittal Pond Nature Reserve

## Teacher Resources

### Activities & Curriculum Links

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## Before your visit/ Introducing Students to Spittal Pond Nature Reserve

Activity	Grade Level	Subject	Curriculum Link
<b>Activity 1</b> Science Vocabulary	Primary 1, 2, 3	Social Studies	<b>P1</b> – Understand the concept of a map, Identify a map of the island of Bermuda.
<b>Activity 2</b> Geography Where is Spittal Pond?			<b>P2</b> – Be able to connect places with their correct parish.
<b>Activity 3</b> Introduction to Spittal Pond	Primary 4, 5, 6	Social Studies	<b>P3</b> – Create and interpret simple maps. Identify, draw or model and describe Bermuda's landforms, bodies of water, identify bridges, parishes and places as noted in the P1 and P2 curriculum.
		Information Technology	<b>P4</b> – Create and interpret maps of Bermuda, using cardinal signs, symbols and simple legends, identify and describe major land forms and water bodies in Bermuda.  <b>P5</b> – Use cardinal and intermediate directions latitude and longitude to locate specific points in the community.  <b>P6</b> – Use physical and thematic maps to make comparisons between natural resources and natural vegetation.  <b>P4, 5, 6</b> – Manage computer generated documents. Format text using a word processor. Use graphic software tools.



# During your visit/Class Field Trip Activities

Activity	Grade Level	Subject	Curriculum Link
<b>Activity 1</b> Natural & Man-made Environments	Primary 1-2	Social Studies	<b>P1, 2</b> – Understand the difference and give examples of natural and man-made environments.
<b>Activity 2</b> Exploring Plant & Animal Habitats through the Senses	Primary 1-2	Science	<b>P1</b> – Know that animals or plants are living things. Explore ways that different animals and plants inhabit local environments.  <b>P2</b> – Explore how human senses enable humans and other animals to be aware of the world around them.
<b>Activity 3</b> The Influence of Physical Environments	Primary 3-4	Social Studies	<b>P3</b> – Create and interpret simple maps. Describe how the physical environment influences human activity.
<b>Activity 4</b> Observing Plants & Animals at Spittal Pond	Primary 3-4	Science	<b>P4</b> – Identify and describe major land forms and water bodies in Bermuda.  <b>P3</b> – Can sort things into groups using simple features and describe rational for groupings.  <b>P4</b> – Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
<b>Activity 5</b> Cool Things About the Trails at Spittal Pond	Primary 5	Science	<b>P5</b> – Observe how seeds can be dispersed in a variety of ways.
<b>Activity 6</b> Food Webs	Primary 6	Science	<b>P6</b> – Children have explored and can construct food chains in a particular habitat.
<b>Activity 7</b> Threats to Our Resources	Middle 1 & 3	Science	<b>M1</b> – Discuss positive and negative influence of humans on the environment.  <b>M3</b> – Describe and investigate some effects of human influences on the environment.
		Social Studies	<b>M3</b> – Investigate at least two major environmental threats to Bermuda. Develop an understanding of sustainable development.  <b>M1</b> – Classify animals and plants into major groups, using some locally occurring examples.
<b>Activity 8</b> Classifying Plants	Middle 1 & 3	Science	<b>M3</b> – Use and construct keys to identify plants and animals.

# After your visit/Additional Information & Activities

Activity	Grade Level	Subject	Curriculum Link
<b>Activity 1</b> Outdoor Classroom: Habitat & Plant Study	Primary 1-2	Science	<b>P1</b> – Explore ways that different animals and plant inhabit local environments. Can name the major parts of a plant looking at real plants.
		Social Studies	<b>P2</b> – Can identify similarities and differences between local environments and know about some of the ways in which these affect the animals and plants found there.
			<b>P1-2</b> – Understand the difference and give examples of natural and man-made environments.
<b>Activity 2</b> Animal Babies	Primary 1-2	English	<b>P1</b> – Anticipate what happens next in a story. Talk about events in a story and make simple inferences about characters and events to show understanding.
		Science	<b>P2</b> – Identify and describe story settings and characters, recognizing that they may be from different times and places.
			<b>P1</b> – Know that there are living things and things that have never been alive. Know that humans and animals produce offspring which grown into adults.  <b>P2</b> – Can identify similarities and differences between local environments and know about some of the ways in which these affect the animals found there.
<b>Activity 3</b> Habitat Poster	Primary 1-2	Science	<b>P1</b> – Know animals are living things.  <b>P2</b> – Can identify similarities and differences between local environments and know about some of the ways in which these affect the animals found there.
<b>Activity 4</b> Stem Exploration	Primary 3	Science	<b>P3</b> – Know that water is taken in through the roots and transported through the stem. Know that plants have roots, leaves, stems and flowers.
<b>Activity 5</b> Student Plant Hunters	Primary 3	English	<b>P3</b> – Reading and writing non-fiction.
		Science	<b>P3</b> – Can sort things into groups using simple features and describe rational for groupings. Know that plants have roots, leaves, stems and flowers.
		Visual Arts	<b>P3</b> – Demonstrate proper technique for holding a camera.

Activity	Grade Level	Subject	Curriculum Link
<b>Activity 6</b> Mini Habitats Near You	Primary - 4	English  Science	<b>P3-4</b> – Writing non-fiction.  <b>P4</b> - Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
<b>Activity 7</b> Comparing Habitats	Primary - 4	English  Science	<b>P4</b> – Reading and writing non-fiction.  <b>P4</b> – Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
<b>Activity 8</b> Lights Out!	Primary - 5	Science	<b>P5</b> – Know that plants need energy from light to grow.
<b>Activity 9</b> Hitching a Ride	Primary - 5	Science	<b>P5</b> – Observe how seeds can be dispersed in a variety of ways.
<b>Activity 10</b> Diorama & Report Writing	Primary - 6	English  Science	<b>P6</b> – Reading and writing non-fiction.  P6 – Explored and construct food chains in a particular habitat.
<b>Activity 11</b> Personal Habitat	Primary - 6	Science	<b>P6</b> – Explore a number of ways of caring for the environment.
<b>Activity 12</b> Simulated Habitat Destruction	Middle - 1	Science	<b>M1</b> – Discuss positive and negative influence of humans on the environment.
<b>Activity 13</b> Habitat Interview	Middle - 1	Science	<b>M1</b> – Describe how organisms are adapted to their habitat, drawing on locally occurring examples. Discuss positive and negative influence of humans on the environment.
<b>Activity 14</b> Plant Survival	Middle - 3	Science	<b>M3</b> – Explain the ways in which living things are adapted to their habitats.
<b>Activity 15</b> The Role of Producer, Consumer and Decomposer	Middle - 3	Science	<b>M3</b> – Describe the role of decomposers.

## References

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