

Sherwin

NATURE RESERVE

INCLUDING **Warwick Pond**



TEACHER RESOURCE GUIDE



ACKNOWLEDGEMENTS

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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 Sherwin 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

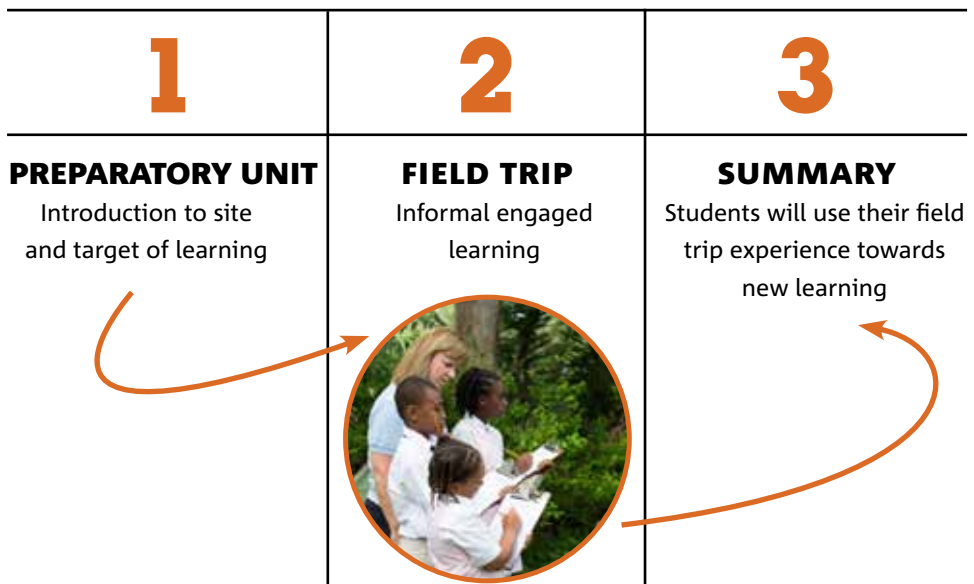
We can provide a “group teacher workshop” in our AXIS Education Classroom prior to a field trip with your students. A minimum of 10 teachers is required, maximum group size is 15. The time allotted for the work shop is 1.5 - 2 hours.

The overall focus of the workshop is to:

- Obtain a copy of the Sherwin Nature Reserve resource booklet
- Review the history of the reserve 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 your 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.



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 nature reserve 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 Sherwin Nature Reserve.

The Sherwin 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 Stage 6 and Secondary 1, Middle Stages 7 and 9. Curriculum links to activities are provided for integrating Science. While looking through the activities provided, teachers may also think of ways to integrate Music, Health and Physical Education activities. 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 Sherwin Nature Reserve

To schedule a trip to Sherwin Nature Reserve download and complete a school field trip booking form on our website, 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.

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 an enjoyable experience at the reserve it is essential that teachers:

- Assume responsibility for the safety, behaviour, support and welfare of students. The reserve contains bodies of water and Poison Ivy grows near some of the paths. Students will need to be supervised at all times
- Ensure that students are prepared with appropriate clothing and walking shoes
- Prepare and carry a register to include the names of all students with emergency and medical information
- Ensure that each student has a completed 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 following information:

- The history of Sherwin Nature Reserve and map showing the location of the reserve
- The definitions of key terms relating to plant and animal life
- The flora and fauna that inhabit the reserve

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 Sherwin 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 upper primary level, teachers of younger 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.

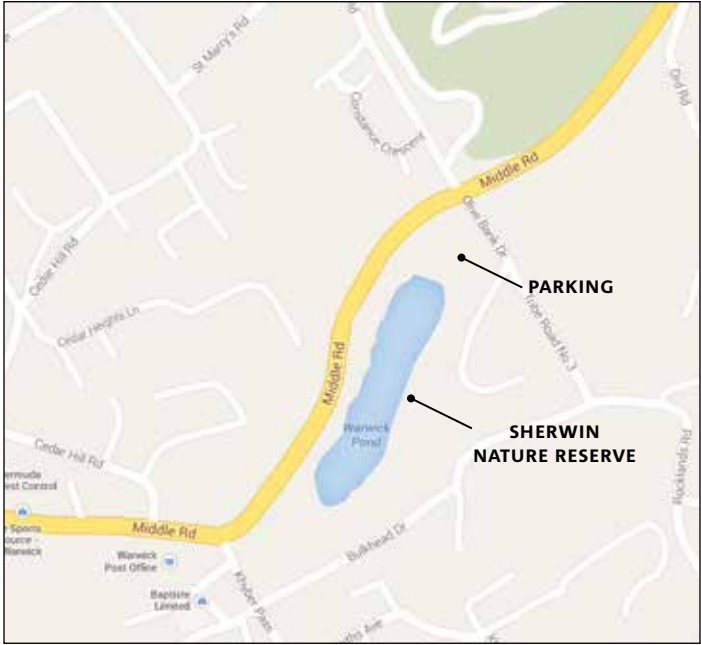
Provide students with the following information:

- The significance of Sherwin Nature Reserve
- There are different habitats in this nature reserve including the pond, the freshwater marsh, mud flats and forest. These represent a diversity of plant and animal life.
- Sherwin Nature Reserve is an important sanctuary for resident wetland birds and migratory shore birds.
- Sherwin 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

Sherwin Nature Reserve is located on Middle Road in Warwick Parish. If traveling by public transportation, take the number 8 bus leaving from the City of Hamilton, for a 20 minute trip, or from the Royal Naval Dockyard it is a 40 minute trip. Enter via Olive Bank drive.

Sherwin NATURE RESERVE

INCLUDING Warwick Pond



REPRESENTING FARMLAND, WOODLAND AND THE LARGEST FRESHWATER pond in Bermuda, this nature reserve is one of a chain of wetlands from Southampton to Smiths Parish.

Sherwin Nature Reserve represents one of the few tracts of natural inland water that has survived and not been used for landfill. In this densely developed residential area of Bermuda, the land provides valuable open space and woodland area as amenity space. The pond is an important sanctuary for bird life, not only for the resident wetland and forest birds but especially for the migratory shorebirds which use the mud flats as they pass through Bermuda in the early fall and a much wider diversity of migratory waterfowl including herons, ducks, coot and grebes which visit Bermuda from North America for the winter.

Prior to 1968, the area was subdivided into about 30 shares, allowing persons to live and vote in one parish yet also own land and so have the right to vote in another parish as well. After 1968, all of the lots were gradually purchased by Mr. Leon Graham Bento Powell and later offered to the Trust for purchase. The first part comprising 9.318 acres, including much of the pond and surrounding woodland was purchased by the Bermuda National Trust in 1987, thanks to a donation by Dennis Sherwin.

In 2007 the southern tract of woodland was purchased, this time as part of a campaign to protect green spaces across the island and to preserve the undeveloped open space.

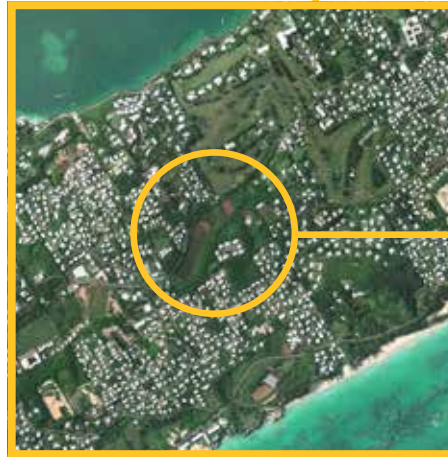
The conservation efforts of the Bermuda National Trust have transformed what was once thought to be a useless, mosquito-infested area into a now recognized Ramsar site because of its size, its importance to both resident and migratory waterfowl, and the fact that it is the only site in which the endemic **Bermuda Killifish** (*Fundulus bermudae*) has a freshwater-adapted population.



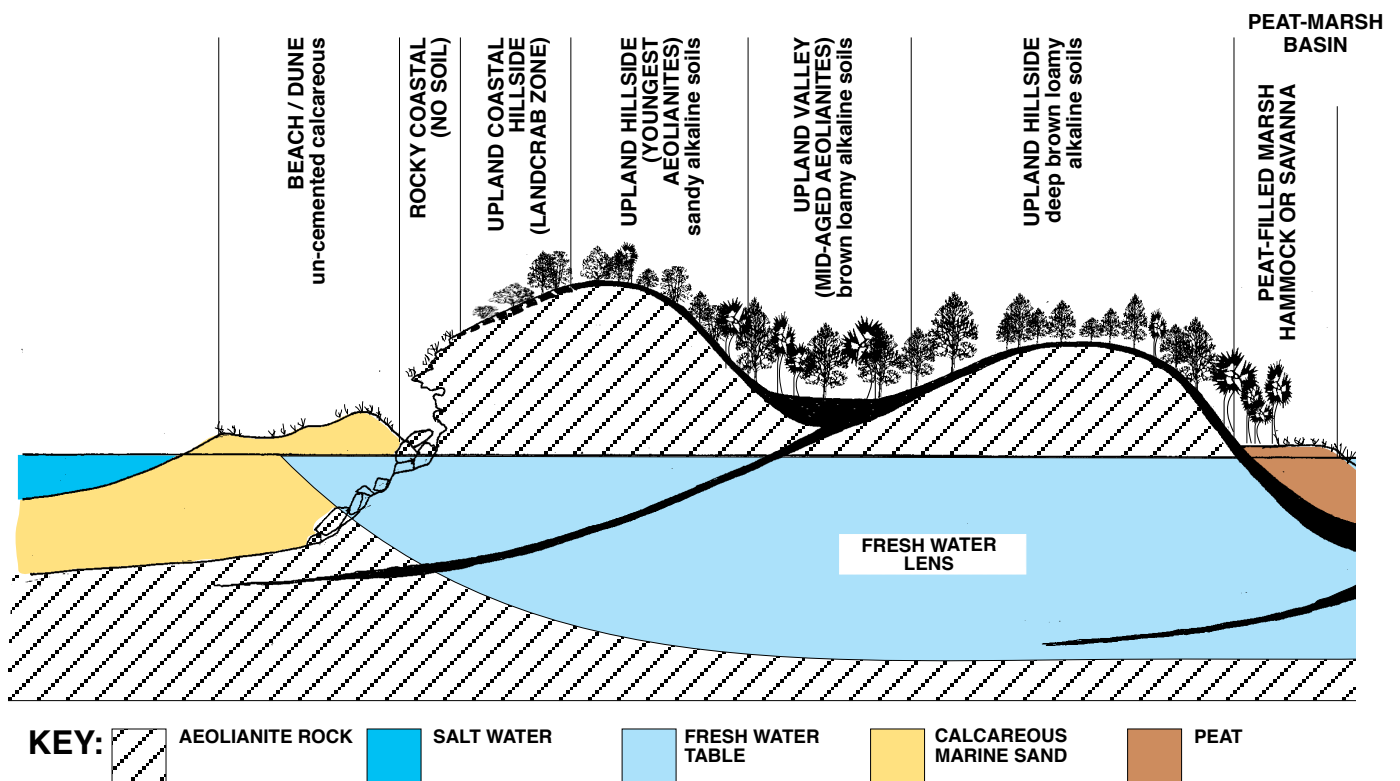
Sherwin Nature Reserve

Reserve Trail

The reserve can be explored by following the trail from either the entrance west of the car park, across from the agricultural land, or from the marked Railway trail. The trail provides a view of different habitats and various plant species. Allow between 1 and 2 hours to experience the area. Please remember that nature reserves are special areas – dogs should be kept on a leash and walkers are asked to keep to the trail to avoid disturbing wildlife.

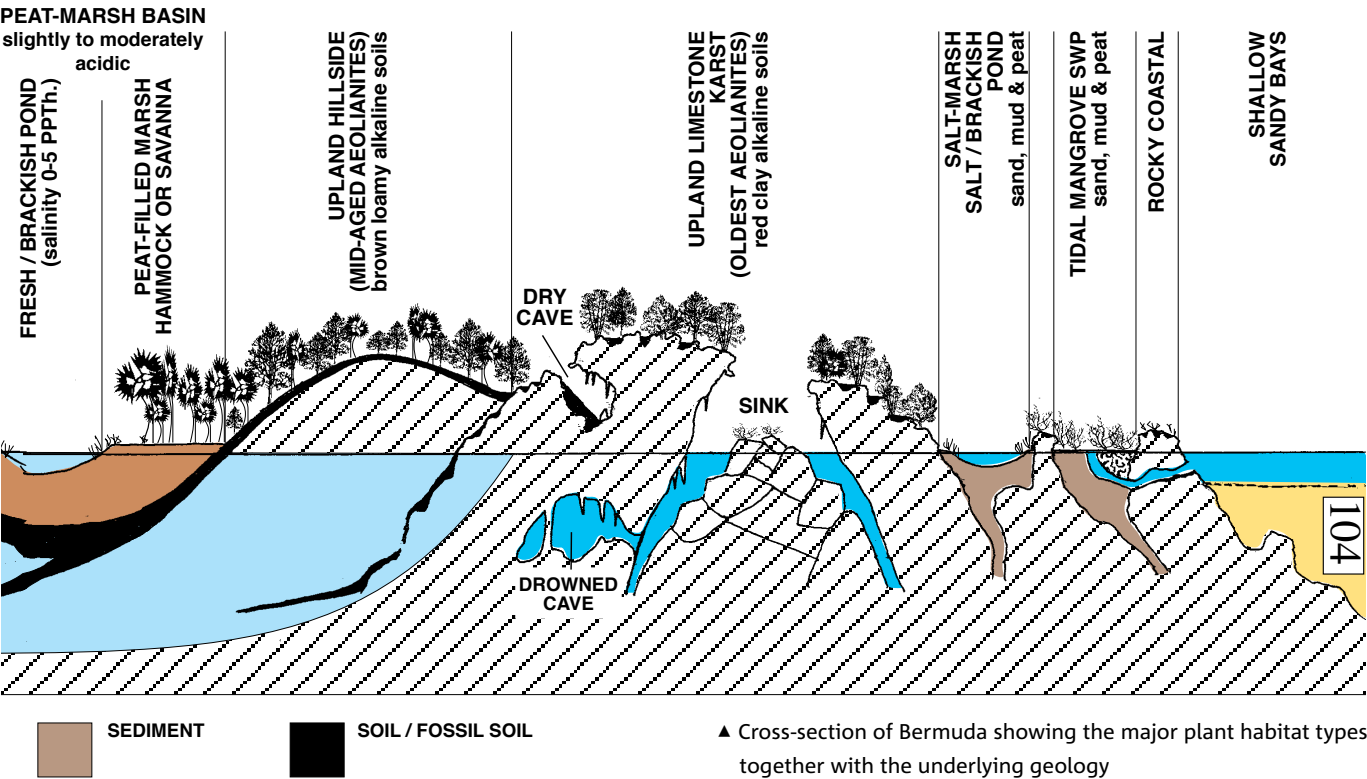


PHOTOS: © BERMUDA ZOOLOGICAL SOCIETY



Warwick Pond Formation

The pond lies in an inter-dune valley partly drowned by sea level rise, so that the fresh water table is now exposed above ground. Subsequent colonisation of the area with various marsh flora occurred, followed by the accumulation of dead plant remains over time. This resulted in a layer of peat which prevents mixing of fresh water with the salt water in the porous rock below. The presence of peat also increases the acidity of the water. Water level fluctuations occur predominantly as a result of rainfall and run-off from surrounding hillsides and from evaporation but also as a result of long term tidal fluctuations raising and lowering the water table. In the summer months, as evaporation increases, the water level decreases, exposing mud flats around the edges of the pond.



COURTESY OF BERMUDA ZOOLOGICAL SOCIETY
AND DR. MARTIN THOMAS

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.

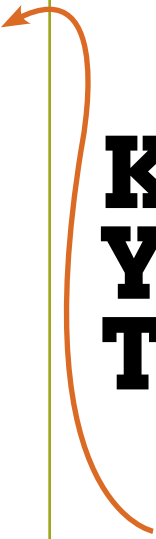
INTRODUCED: A species which is not found naturally in Bermuda, but has been brought here either accidentally or intentionally by humans.

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



Know Your Terms

Abiotic Factors: are the nonliving 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

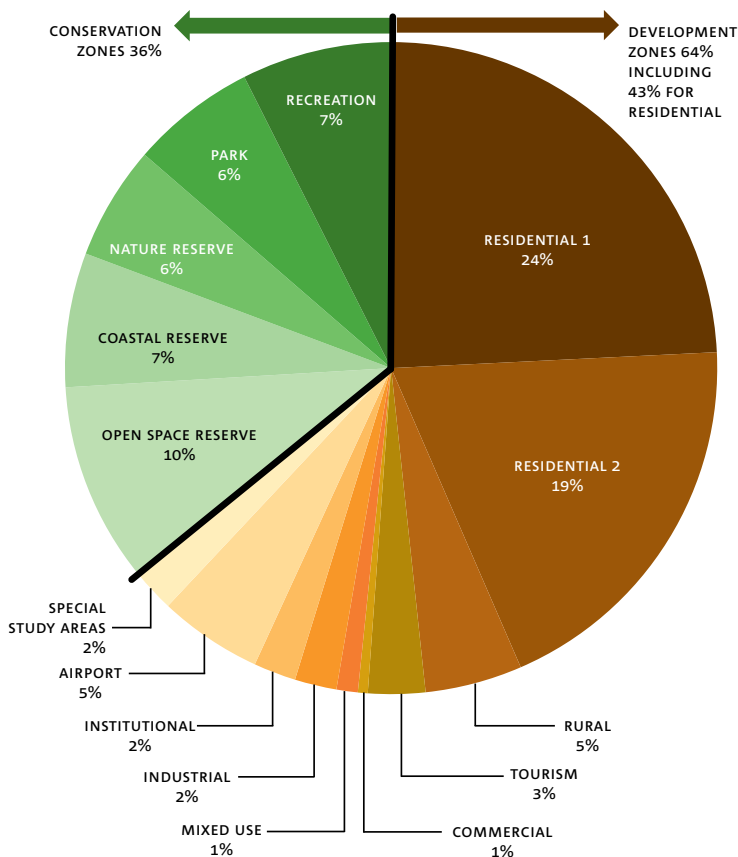
The chart below shows a breakdown of how Bermuda's land is used.

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

Habitats of The Sherwin Nature Reserve

The Pond

The pond originated from rainwater accumulation in a valley, where the fresh water table was exposed above ground. Subsequent colonisation of the area with various marsh flora occurred followed by the build up of dead plant remains over time. This resulted in a layer of peat which increased the acidity of the water. Water level fluctuations occur predominantly as a result of rainfall and run-off from surrounding hillsides and from evaporation but also as a result of long term tidal fluctuations raising and lowering the water table. In the summer months, as evaporation increases, the water level decreases exposing more of the mud flats around the edges of the pond.

The pond itself is still thought to be home to the only endemic fish of Bermuda's ponds, the **Bermuda Killifish** (*Fundulus bermudae*). It is only found in a limited number of ponds across the island. Killifish are able to live in either fresh or salt water, known as 'euryhaline.' They feed on small invertebrates, plant material, and sediment from the pond. The male and female are quite different visually, with the larger female being a darker olive colour, and the smaller male a bright colour. Due to the threats of loss of habitat, predation, competition pressures and pollution, their population decline is of concern.

Introduced in 1928 for mosquito larval control, and now abundantly naturalised, the **Eastern Mosquito Fish** (*Gambusia holbrooki*) are a key link in the food chain and are eaten by herons, kingfishers, and other waterfowl. Damselflies and dragonflies are usually present and conspicuous on pond edges. The **Red-eared Slider** (*Trachemys scripta elegans*) has either escaped or been introduced and is quite common in the pond as well.



Killifish
Fundulus bermudae

ENDEMIC



Eastern Mosquito Fish
Gambusia holbrooki

INTRODUCED



Red-eared Slider
Trachemys scripta elegans

INTRODUCED
INVASIVE

The Marsh Wetland

The area surrounding the pond is a marshy wetland, and so is dominated by grasses and sedges. Distinct zones of flora can be observed in the north east corner surrounding the pond. The **Giant Fern** (*Acrostichum danaeifolium*), is found on the southern edge between the Cattails and the forest. This large fern is easy to spot since the huge fronds tower to at least 2.5 m (8 ft) high. The **Cattail** (*Typha angustifolia*) is easily distinguished by its height and flower stalk. **Sheathed Paspalum Grass** (*Paspalum vaginatum*) forms an extensive community next to the water; this area is subject to periodic flooding. **Para Grass** (*Panicum barbinodes*) the taller grass behind the **Paspalum** is found on drier ground and the agricultural field is subject to human influence of periodic flooding. The fauna associated with this grassy area may include a number of invertebrates: roaches, ants, butterflies, and dragonflies. The most common vertebrate may be the **Giant Cane** or **Marine Toad** (*Bufo marinus*), but rodents and lizards may also be seen. Birds include mourning doves, ground doves, starlings and sparrows all year round.



Giant Fern *Acrostichum danaeifolium* **NATIVE**



Cattail or Lesser Bulrush *Typha angustifolia* **NATIVE**



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



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

Mud Flats

The mud flat at the north end of Warwick Pond forms only in summer and early fall when high evaporation rates lower the water level of the pond. It is rich in nutrients, tiny crustaceans, insect larvae and worms that allow migratory shore birds to refuel rapidly and safely. The only resident species of water bird on Warwick Pond are the **Mallard** (*Anas platyrhynchos*) and the **Common Gallinule** (*Gallinula galeata*), a chicken-like rail with red on its beak. Migratory birds using the pond and its shores for refueling include:

Shorebirds sandpipers & plovers



Black-necked stilt **MIGRANT**
Himantopus mexicanus



Solitary Sandpiper **MIGRANT**
Tringa solitaria



Stilt Sandpiper **MIGRANT**
Calidris himantopus



Semipalmated Sandpiper **MIGRANT**
Calidris pusilla



Least Sandpiper **MIGRANT**
Calidris minutilla



Spotted Sandpiper **MIGRANT**
Actitis macularia



Lesser Yellowlegs **MIGRANT**
Tringa flavipes



Short-billed Dowitcher **MIGRANT**
Limnodromus griseus



Semipalmated Plover **MIGRANT**
Charadrius semipalmatus



Greater Yellowlegs **MIGRANT**
Tringa melanoleuca



Pectoral Sandpiper **MIGRANT**
Calidris melanotos

Waterfowl ducks, grebes, rails & herons



Pied-billed Grebe **RESIDENT**
Podilymbus podiceps



American Coot **MIGRANT**
Fulica americana



Blue-winged Teal **MIGRANT**
Anas discors



Snowy Egret **MIGRANT**
Egretta thula



American Bittern **MIGRANT**
Botaurus lentiginosus



Mallard **RESIDENT**
Anas platyrhynchos



Lesser Scaup **MIGRANT**
Aythya affinis



Ring-necked Duck **MIGRANT**
Aythya collaris



Belted Kingfisher **MIGRANT**
Megaceryle alcyon



Great Egret **MIGRANT**
Ardea albus



Sora **MIGRANT**
Porzana carolina



Green-winged Teal **MIGRANT**
Anas carolinensis



Green Heron **RESIDENT**
Butorides virescens



Little Blue Heron **MIGRANT**
Egretta caerulea



Common Gallinule **MIGRANT**
Gallinule galeata

The Forest

Prior to human settlement, Bermuda was forested exclusively with native and endemic flora. Following colonisation, the native flora has been gradually overwhelmed by introduced and invasive species, which now comprise 95% of the vegetative cover of Bermuda. The original forest no longer exists. Nonetheless, pockets of the original forest flora and fauna can be seen in a few restricted areas.

Forests are examples of stratified ecosystems comprised of:

- A canopy – uppermost layer of leaves and branches where the bulk of photosynthesis takes place
- The understorey – shrubs, the density of which is dependent on the light through the canopy
- The herb layer – fungi, mosses, ferns and seedlings as well as a variety of invertebrates
- The soil layer – rich in roots and fungal threads, burrowing insects and worms

History of Upland Forest

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. Looking back to records of the first explorers and settlers shows very little detail. 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 early 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, ship building and business.

Ornamental gardens were planted and a further destructive series of changes happened; purposely introduced species competed with native ones, plants accidentally brought in introduced insect pests and diseases to which native trees were susceptible.

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 and the Bermuda Palmetto. 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 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 alba*).

Native species are those that arrived in Bermuda by natural means but remain essentially identical to their forbearers 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 from 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 viscosa*). These shrubs grow up to 7m or 20ft in height and probably formed what is called the understorey, growing beneath the canopy of the larger trees. There is also poison ivy in the reserve – this too is a native species (sadly!)



Bermuda Sedge *Carex bermudiana* **NATIVE**



Maidenhair Fern *Adiantum bellum* **ENDEMIC**



Bermuda Snowberry *Chiococca alba* **ENDEMIC**



Forestiera *Forestiera segregata* **NATIVE**



White Stopper *Eugenia axillaris* **NATIVE**



Jamaica Dogwood *Dodonaea viscosa* **NATIVE**

Animal & Plant Life of the Forests

The animals and plants 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 protected nesting sites, but feed elsewhere. The forest is a highly structured system that has habitats within it that are extremely stable.

Predominant Flora

Introduced, Invasive & Endemic Trees

The predominant trees in the forest at the Sherwin Nature Reserve are the **Allspice** (*Pimenta dioica*) and **Chinese Fan Palm** (*Livistona chinensis*), although many **Brazil Pepper** trees (*Schinus terebinthifolius*) line the eastern edge of the pond. All of these are invasive, dominating the landscapes on which they grow. While forest birds eat the berries of the Brazil Pepper and hence propagate them across the island, the fruit of the Allspice can be collected in the fall and ground to form a flavouring used in cooking. At one time the straight woody stems of the sapling Allspice were used to make fishpots in Bermuda, because the wood did not float when saturated with salt water. The two endemic trees of Bermuda, the **Bermuda Cedar** (*Juniperus bermudiana*) and the **Bermuda Olivewood** (*Cassine laneana*), and the endemic palm, the **Bermuda Palmetto** (*Sabal bermudana*), are also seen in the forest at Sherwin Nature Reserve.



Allspice
Pimenta dioica **INTRODUCED**



Chinese Fan Palm
Livistona chinensis **INVASIVE**



Brazil Pepper
Schinus terebinthifolius **INVASIVE**



Olivewood
Cassine laneana **ENDEMIC**



Bermuda Cedar
Juniperus bermudiana **ENDEMIC**



Palmetto
Sabal bermudana **ENDEMIC**

Other Flora



Japanese Pittosporum
Pittosporum undulatum **INVASIVE**



Indian Laurel
Ficus microcarpa **INVASIVE**



Fiddlewood
Citharexylum spinosum **INTRODUCED**

Fruit Trees



Loquat
Eriobotrya japonica

INTRODUCED



Surinam Cherry
Eugenia uniflora

INTRODUCED
INVASIVE



Paw-paw
Carica papaya

INTRODUCED

Sedges/Grasses on the Pond Edge



Great American Bullrush
Schoenoplectus validus

NATIVE



Cattail
Acrostichum danaeifolium

NATIVE



Sheathed Paspalum Grass
Paspalum vaginatum

NATIVE

Low Growers in the Forest



Bermuda Sedge
Carex bermudiana

NATIVE



Morning Glory
Ipomoea indica

INTRODUCED
INVASIVE



Rouge Plant or Blood Berry
Rivina humilis

INTRODUCED



Poison Ivy
Rhus radicans

NATIVE



Shrubby Fleabane
Pluchea odorata

NATIVE



Doc Bush
Baccharis glomeruliflora

NATIVE

Fern & Fern-like



Holly Fern
Cyrtomium falcatum **INTRODUCED**



Long-leaved Brake
Pteris longifolia **INTRODUCED**



Asparagus Fern
Asparagus setaceus **INTRODUCED**

Forest Fauna

In the canopy and sub-canopy, climbing insects and spiders are found. The giant native **Golden Orbweaver** (*Nephila clavipes*), also named **Golden Silk Spider** or **Hurricane Spider** becomes common in summer weaving its strong yellow webs high between tree branches. This is the largest spider found in Bermuda and can reach 6 inches across, including the legs. The **Crab Spider** or **Spiny-Backed Orbweaver** (*Gasteracantha cancriformis*) makes webs low across pathways which can tangle in the hair of unwary path users. A number of smaller birds feed in the forest canopy or forest floor. The forest floor itself is home to a variety of invertebrates including: Centipedes, Millipedes, Pill-bugs (Rolly Polly), snails, termites, roaches, flies, ants, and beetles.



Crab Spider
Gasteracantha cancriformis **INTRODUCED**



Crab Spiderweb



Golden Silk Spider
Nephila clavipes **NATIVE**

Resident Woodland Birds



Grey Catbird **RESIDENT**
Dumetella carolinensis



Northern Cardinal **RESIDENT**
Cardinalis cardinalis



Bermuda White-Eyed Vireo
Vireo griseus bermudianus
ENDEMIC

Migratory Birds Frequenting the Woodland



Black and White Warbler
Mniotilta varia **MIGRANT**



North American Wood Warbler
Phylloscopus sibilatrix **MIGRANT**



Ovenbird **MIGRANT**
Seiurus aurocapilla



Northern Parula **MIGRANT**
Setophaga americana



American Redstart **MIGRANT**
Setophaga ruticilla



Barn Swallow **MIGRANT**
Hirundo rustica

Management Goals for Sherwin Nature Reserve

Pond Management

Ecosystems change over time and ponds are no exception. As eutrophication continues, peat accumulates filling in the pond. The grasses bordering the edge encroach further and further over time and if left to the natural process of succession, would eventually cover the pond. Thus pond management is critical to maintaining the current diversity of habitats. One long-term possibility is to pump sediment from the south end of the pond, putting it on the agricultural field on the north side. This would raise the land in the field, retain the mud flat for the migratory shorebirds at the northern end, and deepen the southern end of the pond. Preserving this last feature is important because Warwick Pond is subject to drying up over the course of a hot dry summer resulting in the death of the endemic fish within.

The Warwick Pond Killifish are genetically distinct enough that they should be kept isolated until genetic studies are completed. As part of the management plan Warwick Pond Killifish were translocated to a pond at WindReach and overseas to the Vienna Zoo, where they are being bred successfully. Four hundred were introduced into Seymour Pond in 2011 and that population mushroomed to 10,000 in 2012. It is possible that Killifish no longer exist in Warwick Pond.

Pond Pollution

Warwick Pond is very contaminated with metals and petroleum hydrocarbons in its sediments which have detrimental effects on the environment and our biodiversity. Recent studies have shown that the PAHs (polyaromatic hydrocarbons) cause endocrine disruptions while metals suppress immune function in animals and humans.

An expert in the US has said that used motor oil is a prevalent source of PAHs in our ponds, which is not surprising considering the cultural habit of pouring used motor oil on the ground. We have only been recycling motor oil since 1991. We also know that atmospheric deposition and road run-off contribute to all of the metals and hydrocarbons that have been identified in the ponds.

Woodland Management and Native Flora Restoration

The long-term goal of the Bermuda National Trust for this reserve is to employ woodland management in order to restore the woodland to a more diverse and native-dominated forest by selective culling and replanting. Clearings within the dominant allspice woodland are intended to favour adult cedars by creating sunny openings. Subsequently, the planting of other endemics and natives such as the Bermuda Palmetto, Bermuda Olivewood, Southern Hackberry and Wax Myrtle and Bermuda Snowberry will also be encouraged. The end result: a more diverse and healthier forest, favouring diversity of fauna as well.

Source: Dr. Jamie Bacon, 2012

Teacher Resources/Activities

Before your visit/

Introducing Students to Sherwin 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

Upper primary and middle level students should be introduced to, and/or review, the vocabulary as it applies to the reserve before their visit. Refer to the glossary for the terms that are used within this resource.

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

*ACTIVITY 2/PRIMARY 1-3

Geography/Where is Sherwin Nature Reserve?

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.

Ask students:

- If they have visited a local reserve in the past, create a list of those they have visited
- What they know about nature reserves, what is important about them, and additional information they would like to learn
- Log on to our website/education section and display the digital images of Sherwin Nature Reserve and other Trust nature reserves on a Smartboard

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

- A table to show the time line of how the nature reserve evolved to include a title, dates and description of each period
- The overall importance of Sherwin Nature Reserve (possible headings: environmental value, nesting islands, landing site)

THE DAY OF THE TOUR TO SHERWIN NATURE RESERVE

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 to 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)

Materials needed for each student:

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

Capturing moments during the tour of Sherwin Nature Reserve

Teachers are encouraged to bring a camera and photograph the experience, and use the images in activities afterwards. Older mature students can bring a camera (and take responsibility) to photograph the experience as well. Sherwin Nature Reserve is a showcase of birds and plant life. Binoculars allow students to get a closer look.

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

The following activities are provided during the tour for primary and middle level students:

***ACTIVITY 1/PRIMARY 6** **Food Chains**

To visualise a food chain, students are given the names of plants and as they are named, a ball of string is passed around the circle. They are asked for examples of 'herbivores' that might eat these plants and the string is passed to those students. Then they name 'carnivores' that might 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 introduces a disturbance to the web. (e.g. a cedar tree is cut down) and this student will tug lightly on the string. When each student feels a tug, they give a tug. The group sees that others are affected, understanding how the web is affected by the destruction of one tree.

***ACTIVITY 2/PRIMARY 6** **Observing Plants: Where and How They Grow**

Students will explore the various habitats of the reserve to understand that plants have different needs in order to grow and thrive. They will see how plants have adapted to their environment over time.

***ACTIVITY 3/MIDDLE 1 & 3** **Threats to Our Environment**

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 (i.e. housing, transportation, recreation, population increase) and students determine how to meet the needs with the limited resources.

***ACTIVITY 4/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. This activity is the first in a series of three that will introduce students to classification.

After your visit/Additional Information & Activities

The following sections provide suggested activities to use with students after the tour.

>PRIMARY 6 & MIDDLE LEVELS 1 & 3

*ACTIVITY 1

Protecting the Communities within Sherwin Nature Reserve

Map out the different communities within the reserve: pond, marsh, mud flats and forest. Discuss what changes have occurred to this area over time and those which may occur in the future. How have humans influenced the reserve? How can we protect this natural resource? Write a description that would provide information for someone that would prepare them for a visit to this reserve.

*ACTIVITY 2

Major Plants, Invertebrates, Vertebrates at Sherwin Nature Reserve

Observe the plants and other animals at the reserve. Discuss their features and what makes them suitable to live in the area. Write a description of the plants and animals.

*ACTIVITY 3

Dominant Tree Species at Sherwin Nature Reserve

Review the terms native, endemic, introduced and invasive. Explore the consequences of monocultures versus biological diversity. What does endangered mean? Research Bermuda endemic plants and animals that are endangered (on our protected species list) and what efforts are being made to protect them.

*ACTIVITY 4

Food Chains at Sherwin Nature Reserve

Identify food chains within the communities at the reserve. Who are producers, consumers, decomposers? Draw an ecological pyramid or diagram to show how they relate to each other.

*ACTIVITY 5

Migratory Birds at Sherwin Nature Reserve

Find out about migratory patterns of a specific bird or butterfly that resides in the reserve. Draw a map of the migration routes and destinations. How long does the trip take? Where does the bird or butterfly find food along the way?

*ACTIVITY 6

Doing Our Part

Schedule a class trip to help with block clearing and reforestation of endemic species in an area at Sherwin Nature Reserve. Document your work in the form of a data spreadsheet or graph to illustrate the species that were cleared, and the trash that was collected. Discuss how litter affects the area and the domination of a particular species.

*ACTIVITY 7

Nature Walk • Hunting for Specific Trees

Go on a hunt for the following trees and discuss their characteristics and talk about the importance of protecting trees in nature. Have students draw the different trees, label them with their correct names, point out the characteristics of each which make them similar or different.

Male & Female Cedar Trees

Bermuda Cedar trees flower in March and April. Male trees produce pollen-filled yellow cone-like flowers. The females have small flowers that become the characteristic berries. The blue-grey berries ripen and turn dark purple between September and December, and provide an excellent source of food for birds. Cedar trees also provide valuable nesting sites for birds such as the native Bluebird.

PHOTOS: BERMUDA CONSERVATION SERVICES



Male Cedar – showing pollen



Female Cedar showing berries

Bermuda Palmetto & Chinese Fan Palm

Chinese Fan Palms can be distinguished from Bermuda Palmettos by the thorns found on the leaf stem of most Fan Palms. Palmettos never have thorns. Also the Fan Palm has a uniformly green leaf, hard oval grey-blue berries and the leaf meets the stem in a 'C' shape when viewed from above. Remember C is for Chinese Fan Palm. Distinguishing a young Fan Palm from a Palmetto is difficult, unless the parent tree is nearby.

Bermuda Palmettos grow to 35 feet (10.5 m) high. The leaf stalk projects about halfway into the leaf in a V-shape which distinguishes it from the invasive Chinese Fan Palm. Also the leaf stalk of the Bermuda Palmetto never has spines or thorns. Bermuda Palmettos have an attractive bright yellow strip up the middle of the leaf. The dark green leaves are quite firm and hold up well in Bermuda's windy weather.

PHOTOS: BERMUDA CONSERVATION SERVICES



Chinese Fan Palm



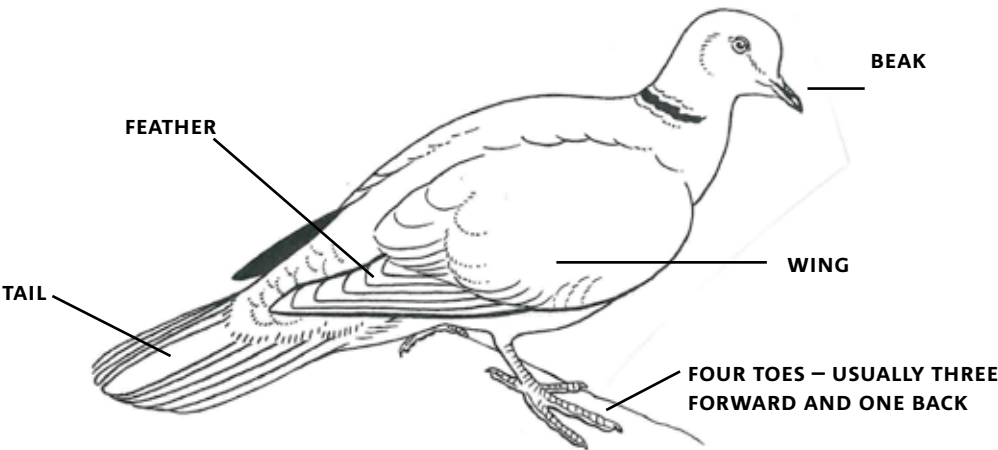
Palmetto

Appendix

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: _____

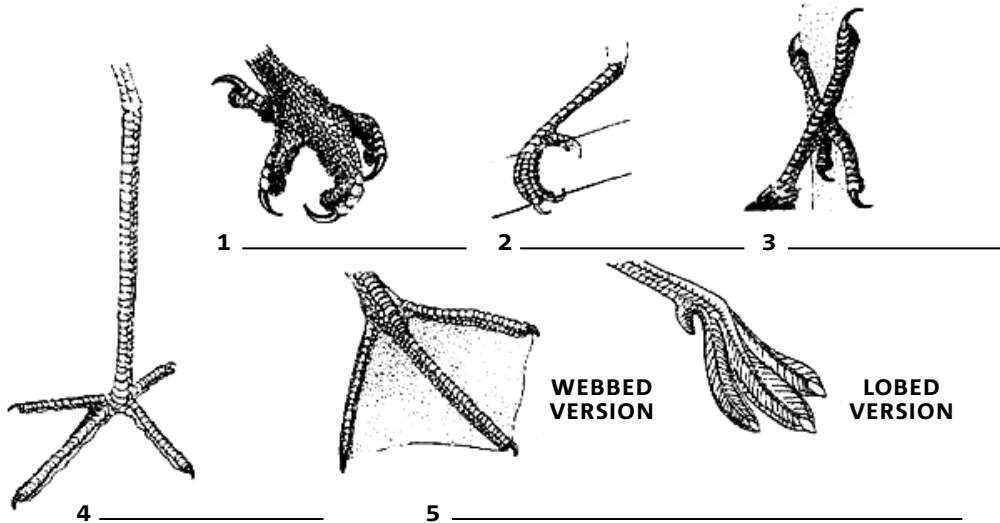
Date: _____

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 signs at Sherwin Nature Reserve, 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: _____



Using the signs at the reserve, 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

Bird name: _____

What it likes to eat: _____

Land Birds/drawing of head & beak

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 the vegetation in your picture.

Bird & Location 1:

Bird & Location 2:

Glossary

Abiotic Factors: the nonliving factors in an ecosystem that affect the population growth of a species. Such factors include: pH, moisture, depth of soil, water level, humus content, light intensity, and wind exposure

Accumulation: to gather or pile up, especially little by little.

Biodiversity: the number of different species present at a location

Biotic Factors: the living factors in an ecosystem that affect the population growth of a species. Such factors include: competition with other species, predation, grazing by herbivores, food supply, population density, and disease

Carnivore: an animal that eats other animals

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

Colonise: the spreading of a species into new areas

Development: the act or process of growing or progressing

Dominate: to rule or take over, to control

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

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

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 vapor.

Evolve: to develop gradually

Herbivore: an animal that feeds only or mainly on grass and other plants

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

Invertebrates: an animal that does not have a backbone, e.g. an insect or worm

Migration: going from one country, region, or place to another

Monocultures: in forestry, monoculture refers to the existence of one species of tree

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

Peat: a compacted deposit of partially decomposed organic debris, usually saturated with water

Preserve: to keep alive or in existence; make lasting

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

Succession: the series of changes that create a full-fledged plant and animal community, e.g. from the colonisation of bare rock to the establishment of a forest

Threat: an indication of warning or probable trouble

Translocated: to move somebody or something from one place or position to another

Vertebrates: an animal with a segmented spinal column and a well-developed brain, e.g. a mammal, bird, reptile, amphibian, or fish

Wetland: land that has a wet and spongy soil

Sherwin Nature Reserve • INCLUDING Warwick Pond

Teacher Resources

Activities & Curriculum Links

Before your visit/Introducing Students to Sherwin Nature Reserve

Activity	Grade Level	Subject	Curriculum Link
Activity 1 Science Vocabulary	Primary 6	Social Studies	P6 – Use physical and thematic maps to make comparisons about natural resources and natural vegetation.
Activity 2 Geography Where is Sherwin Nature Reserve?		Information Technology	P6 – 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
Activity 1 Food Chains	Primary 6	Science	P6 – Children have explored and can construct food chains in a particular habitat.
Activity 2 Observing Plants: Where and How They Grow	Primary 6		P6 – Explore how humans have positive and negative effects on the environment
Activity 3 Threats to Our Resources	Middle 1 & 3	Science	M1 – Discuss positive and negative influence of humans on the environment.
	Middle 1 & 3	Social Studies	M3 – Describe and investigate some effects of human influences on the environment.
Activity 4 Classifying Plants	Middle 1 & 3	Science	M3 – Investigate at least two major environmental threats to Bermuda. Develop an understanding of sustainable development. M1 – Classify animals and plants into major groups, using some locally occurring examples. M3 – Use and construct keys to identify plants and animals.

After your visit/Additional Information & Activities

Activity	Grade Level	Subject	Curriculum Link
Activity 1 Protecting the Communities within Sherwin Nature Reserve	Primary 6	English	P6 – Reading and writing non-fiction.
	Primary 6	Social Studies	P6 – Use physical and thematic maps to make comparisons about natural resources and natural vegetation. Explain how the human and natural alterations have produced positive and negative consequences.
	Middle 1	Science	M1 – Discuss positive and negative influence of humans on the environment.
	Middle 3	Science	M3 – Explain the ways in which living things are adapted to their habitats. Describe factors affecting the size of populations.
Activity 2 Major Plants, Invertebrates, Vertebrates at Sherwin Nature Reserve	Middle 3	Science	M3 – Explain the ways in which living things are adapted to their habitats.
Activity 3 Dominant Tree Species at Sherwin Nature Reserve	Primary 6	Science	P6 – Explain how the human and natural alterations have produced positive and negative consequences.
	Middle 1	Science	M1 – Understand what is meant by a species. Investigate variation within a species. Classify animals and plants into major groups, using some locally occurring examples.
	Middle 3	Science	M3 – Explain the ways in which living things are adapted to their habitats. Describe factors affecting the size of populations. Use and construct keys to identify plants and animals.
Activity 4 Food Chains at Sherwin Nature Reserve	Primary 6	Science	P6 – Children have explored and can construct food chains in a particular habitat.
	Middle 1	Science	M1 – Draw and model simple food chains.
	Middle 3	Science	M3 – Explain and model food chains, food webs and energy flow. Explain the role of decomposers.

Activity	Grade Level	Subject	Curriculum Link
Activity 5 Migratory Birds at Sherwin Nature Reserve	Primary 6	Social Studies	P6 – Use physical and thematic maps to make comparisons about natural resources and natural vegetation.
	Middle 1	Science	M1 – Investigate variation within a species.
	Middle 3	Science	M3 – Explain the ways in which living things are adapted to their habitats.
Activity 6 Doing Our Part	Primary 6	English	P6 – Reading and writing non-fiction.
	Primary 6	Science	P6 – Explore a number of ways of caring for the environment.
	Middle 1	Science	M1 – Understand what is meant by a species. Investigate variation within a species. Classify animals and plants into major groups, using some locally occurring examples.
	Middle 3	Science	M3 – Describe and investigate effects of human influences on the environment.
Activity 7 Nature Walk – Hunting for Specific Trees	Primary 6	English	P6 – Reading and writing non-fiction.
	Middle 1	Science	M1 – Understand what is meant by a species. Investigate variation within a species. Classify animals and plants into major groups, using some locally occurring examples.
	Middle 3	Science	M3 – Describe and investigate effects of human influences on the environment.

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