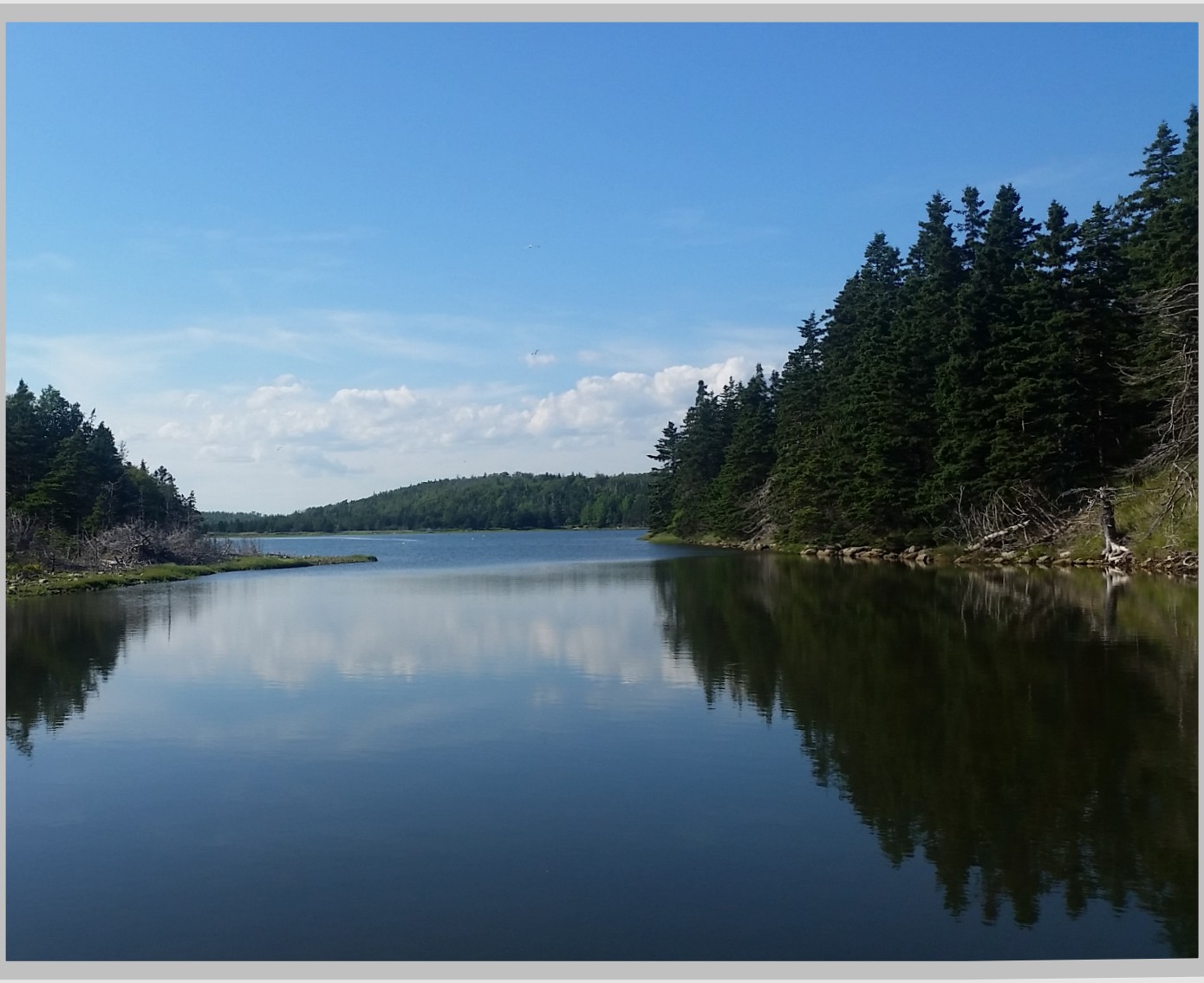
McNabs Island



School Kit: Interpretive Materials

The Friends of McNabs Island Society

McNabs Island School Kit - Summary:

This school kit is intended to help teachers use McNabs Island as an educational tool and outdoor classroom. The materials contained in this kit will help teachers educate their classes about a variety of subjects, including but not limited to:

- **History** (ranging from Aboriginal peoples to modern usage)
- **Biology** (especially terrestrial animals and habitats)
- **Social studies**
- **Environmental science** (including forest ecology)
- **Coastal oceanography** (including coastal zone management)

The school kit provides information about the island, ideas for activities and games, as well as suggested hikes and ways to incorporate McNabs Island into the curriculum for a variety of classes.

The kit is divided into different sections that cover topics including history, animals, habitats, ecosystem sustainability, and coastal areas.

The materials in this kit are suitable for nearly every grade level. Specific sections and activities have been included to suit classes such as Science 10 and Oceans 11, but this information can easily be adapted for other grade levels.

We hope that you will find this kit to be engaging, educational, and entertaining!

The FRIENDS of McNABS ISLAND Society

McNabs Island School Kit – Interpretive Materials

Table of Contents:

Acknowledgements:

The Friends of McNabs Island would like to thank the original authors of these materials, Nancy Simovic and Barbara Muller. Thank you to Benna Keoghoe for her work updating and retyping the school kit. A big thank you goes out to the volunteers and board members of the Friends of McNabs Island Society for all their help in maintaining McNabs Island as a beautiful natural space.

Introduction to McNabs Island

McNabs and Lawlor Islands were designated as a provincial park in 2002. In addition to the provincial park, McNabs Island is home to Fort McNab National Historic Site, which is operated by Parks Canada. Additionally, there are a few privately owned parcels of land on the island. McNabs Island presents a combination of cultural and natural history, with excellent recreational and educational opportunities.

Where is McNabs Island?

McNabs Island is located on the eastern side of the mouth of Halifax Harbour. It is approximately 5km long and 1.5km wide, covering 400ha (1000 acres).

Accessibility

McNabs Island is accessible from Halifax, Dartmouth, and Eastern Passage by charter or water taxi. To find out more information on how to get there, check out our website: http://mcnabsisland.ca/getting_here. The island is a provincial park; therefore it's open and accessible to anyone, at any time.

The two main docking areas are Garrison Pier on the west, Halifax Harbour side of the island and the Ives Cove Wharf, on the north end of the island. This wharf is for drop-off and pick-up only. If you are docking in Ives Cove, you are not able to tie up and leave your boat. Smaller boars can beach at Wreck Cove or Timmins Cove on the east side of the island.

The island is not wheelchair accessible. The trails on the island vary in terrain and width from the wide corridor trail (Garrison Road) to small single-file hiking trails. Hiking and biking are common activities for island visitors. Cyclists are restricted to the main corridor trails (Garrison Road and the Old Military Road) to avoid disturbing the more sensitive backcountry trails.

Figure 1 - Maugers Beach Lighthouse

Visitor Notes

Please consider the following when planning a trip to McNabs Island:

- The only amenities on the island are composting toilets and a few outhouses.
- Pack plenty of food and drinking water when visiting the island.
- **Weather** tends to vary from the mainland, usually cooler but sometimes hotter. Wear layered clothing.
- The island operates on a **pack-in, pack-out** basis. Bring all your garbage with you when you leave. Please do not litter!
- **Hunting** is forbidden on the island.
- The consumption of **alcohol is prohibited**.
- **Campfires** are banned, even on the beach.
- Beaches are not supervised.
- Visiting the island is done so **at your own risk**. For enforcement related issues call Nova Scotia Department of Natural Resources at 1-800-565-2224. In the case of emergency call 911.
- **Respect all wildlife, structures and historical landmarks.**
- Bring a **map** of the island; it is easier to get lost than one might think.
- Both **wood ticks and deer ticks** inhabit the island. Wear pants tucked into socks, use bug repellant, and do a ‘tick check’ once you get home.

McNabs Island - Historical Summary

Aboriginal Peoples

Archaeological sites surrounding McNabs Island provide evidence of human occupation of the area since the retreat of the glaciers 10,000 years ago. Artifacts found along the shores of Halifax Harbour confirm that the area had been occupied.

The **Mi'kmaq** people called this area K'jipuktuk (pronounced che-book-took), which means 'the great harbour'. The Mi'kmaq used what we now call McNabs Island as a seasonal base from which they hunted, fished, and traveled. **Shell middens (refuse heaps)** have been found on the island dating back 5,000 years, which provides evidence of Mi'kmaq hunting and fishing in the area for millennia.

With the arrival of European settlers to the area, the Mi'kmaq were forced from their traditional territories and hostilities between indigenous peoples and settlers increased. In the 1760s, the government forcibly resettled Mi'kmaq from Dartmouth onto McNabs Island (known then as Cornwallis Island). The Mi'kmaq camped on the northeastern point of the island, which is now called Indian Point.

Figure 2 - Mi'kmaq People

European Settlement

During the 1690s, **France** relied on **fishing stations** along the Atlantic coast of Nova Scotia, one being on the **Isle de Chibouquetou** (now known as McNabs Island). French fishermen had a station on the island until 1699.

The struggle for control of North America between France and England in the early 1700s placed increasing value on Isle de Chibouquetou. Realizing the strategic location and great natural harbour at Chibouquetou, France had planned the construction of fortifications on the island to guard against attack. In 1713, however, the **Treaty of Utrecht** was signed and France ceded control of mainland Nova Scotia to England. The French then had to depend on Ile Royale (Cape Breton Island) as a base from which to protect the entrance of the St. Lawrence River. It was there that they constructed their fortifications that were originally intended for Isle de Chibouquetou. That fortress was called **Louisbourg**.

Following the founding of Halifax in 1749 by **Colonel Edward Cornwallis**, Isle de Chibouquetou was renamed **Cornwallis Island**. With the settlement of Halifax, Cornwallis Island was heavily depended upon for its fishery and beaches used as drying stations. Wood was also harvested for timber from the island due to its easy access from the city.

Captain Joshua Mauger, "a colourful figure in the life of early Halifax", was involved in the fishery on the island as well as being a merchant, distiller, victualler, slave trader, smuggler and privateer. In 1752 he was granted the beach on the island for curing fish, and so it is named **Maugers Beach**.

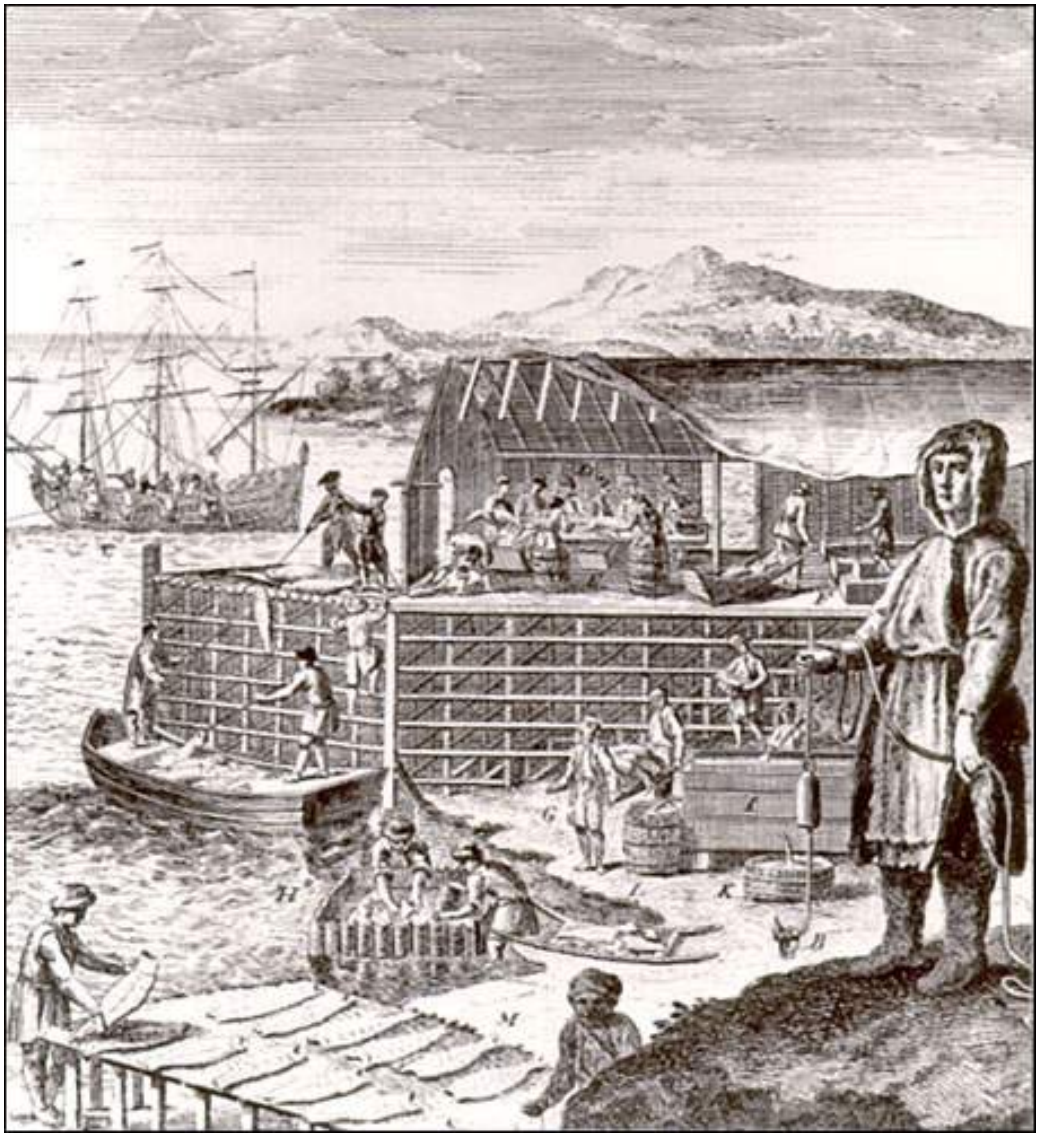


Figure 3 - An Example of a French Fishing Station

The McNab Family (1782-1934)

Refer to McNabs Family Tree for relations

Peter McNab I, a native of Scotland, originally leased land on the island from Cornwallis. Little is known of McNab's background or when he arrived in Halifax. He has been variously described as a shoemaker, Royal Navy Lieutenant on the staff of Governor Cornwallis and a veteran of the British Army, having served in America during the Revolutionary War. He is purported to have settled in Halifax in 1754, 1758 or after the peace of 1763. In 1763, he married Susannah Kuhn.

Peter McNab purchased the island in 1782 from Cornwallis for £1,000. He built a stone cottage at the head of McNabs Cove and used it as a country house, spending the winters in Halifax. Today, nothing remains of the McNab cottage. Peter died at age 69 on November 3, 1799, and was buried in St. Paul's Cemetery, Halifax. His wife Susannah died in 1822 and is also buried in St. Paul's Cemetery.

Peter McNab's son, **Peter McNab II**, was sent away to be schooled in England. He returned to Halifax and assumed a leading role in the business and social life of the city. Peter II made the island his home, living in his father's cottage. He had one-half of the island cleared for cultivation and pasture to raise sheep and cattle. In 1792, he married Joanna Culliton, the daughter of one of the island residents. Following her death in 1827, he married Mrs. Margaret Hopkins of Liverpool, Nova Scotia. Peter II later became a Colonel in the Militia and in 1838, was appointed to the Legislative Council (the so-called Council-of-Twelve), an upper house of the provincial legislature.

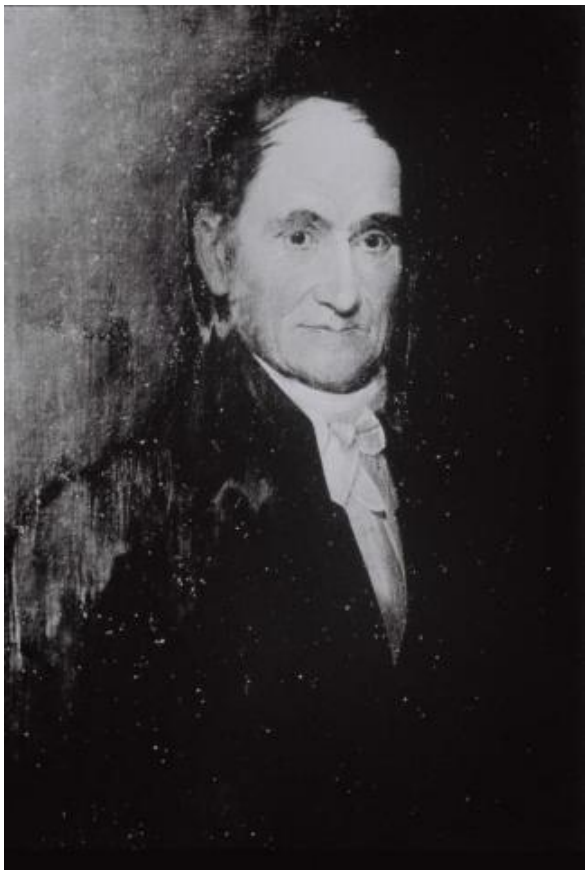


Figure 4 - Peter McNab II

Upon Peter II's death in 1847, a large part of the island was inherited by his sons, **James McNab** and **Peter McNab III**. James McNab was born on November 30, 1792; he married Harriet King on December 9, 1815. James was a prominent merchant in Halifax. He operated as James McNab and Company until December, 1815, when the firm was dissolved. Three months later he and John E. Fairbanks announced the formation of Fairbanks and McNabs at the head

of Fairbank's wharf, dealers in "Port and Madeira, Teas, Sugar, Coffee, Chocolate, Spices."

Like his father and grandfather before him, James was destined to play a prominent role in provincial politics. In 1840 he was elected to represent Halifax in the Legislative Assembly and in 1848 was appointed to the Legislative Council. A supporter of Confederation, in 1867 he became Provincial Treasurer in the Blanchard administration. He resigned later that year with his colleagues following widespread opposition to Confederation by a majority of Nova Scotians. James McNab's interest in the island was subsequently divided among three of his sons-in-law. James died on October 16, 1871, and is buried at Camp Hill Cemetery. His wife, Harriet, passed away on October 15, 1878.

Peter McNab III was a Presbyterian farmer on the island. He tried selling his land in the late 1840s, with no success. In 1850 he tried selling his land by dividing it up into 100 lots, but the majority was unsold by the time he died in 1856. His widowed wife continued to try selling the lots, and sold a 10 acre lot to the British War Department near Ives Cove. The construction of **Fort Ive**s began in 1865 on this property.

Lewis Kirby bought the remainder of the land in 1872 and tried selling it in smaller lots. Although a few did get sold, most did not. The Imperial Government bought the remainder of the western shore for military purposes and in 1899 started construction of **Fort Hugonin**. One of Kirby's land lots was sold to Charles Woolnough, and after changing owners a few times, was bought by **Matthew Lynch** in 1931.

Ellen McNab, the daughter of Peter McNab III, died in 1934, and was the last member of the McNab family to have lived on McNabs Island.

Military Forts on McNabs Island

Due to the strategic location of McNabs Island in the mouth of Halifax Harbour, it has been used extensively by the military and played a key role in the defence of Halifax.

Sherbrooke Tower was the first fortification built on McNabs Island with construction beginning in 1815 and completed in 1828. It was a Martello Tower located at the end of Maugers Beach where the lighthouse stands today. After construction was completed it was immediately adapted to serve as a lighthouse. It housed 24- pounder guns until 1864.

The lighthouse was later the scene of an incredible display when, in 1852, the Nova Scotia Government placed the facility under the exclusive control of **Dr. Abraham Gesner** for one month. In December of that year Gesner used his newly discovered kerosene fuel to operate the light atop the lighthouse. It is said the experiment was so successful that mariners veered off course to witness the amazing spectacle.

The site for **Fort Ives** was cleared in 1762 but it was not built until 1865. This fort housed rifled muzzle-loading guns, the most modern weapons system of the time. Fort Ives was modified several times between 1860 and WWI in order to keep pace with changes in technology. 160 military personnel were stationed at Fort Ives in 1916, during World War I. It was only partially open during World War II, and continued to be used as a barracks until 1943. Fort Ives is the only fort on the island that has its original guns still mounted in their original emplacements.

Fort McNab was built between 1888 and 1892 to strengthen the outer defences of Halifax. It was equipped with new long range breech-loading weapons and continued to be modernized over the years. It was responsible for the examination anchorage used to check ships entering the harbour during WWI. It served to monitor and illuminate the harbour entrance and in 1945 was a radar post. Fort McNab represents the evolution of coastal defence technology from the 1880's to the 1940's and is therefore preserved as a National Historic Site.

Figure 5 - British Soldiers

Hugonin Battery was constructed in 1899 as a small battery of quick-fire guns to add additional support in covering the shore below York Redoubt. It was essentially a substation of Ives Point Battery

and protected the minefield in the main harbour channel. Between WWI and WWII, the battery served as a schoolhouse for children on the island. During WWII, it was used as a degaussing range and quarters for troops. It was the last military fortification used on the island as it acted as a listening post to monitor ships until the early 1990s.

Strawberry Battery is the only Canadian-built fortification on the island and was constructed in 1939 to guard a WWII anti-submarine net that stretched across to York Redoubt. It also housed electric searchlights and quick-firing guns for harbour monitoring and defence.

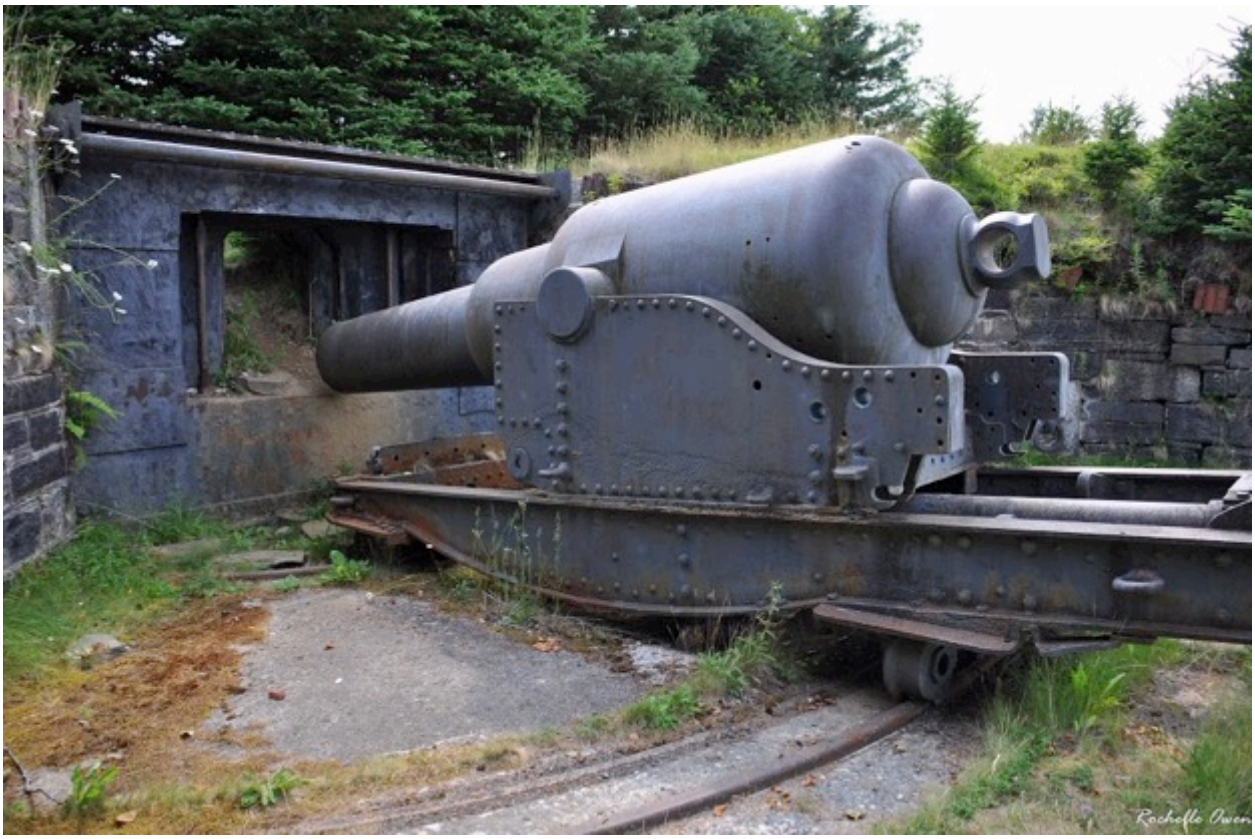


Figure 6 - Cannon at Fort Ives

Recreation on McNabs Island

There are records of the island being used for recreation from as early as 1762. However, it was not until 1844, when a steamer was dedicated to short trips in Halifax Harbour (including McNabs Island), that people started going there regularly for **picnics**. In 1845, a fundraising picnic organized by the Dartmouth Mechanics Institute attracted 4,000 people to the island. In 1846 the picnic was a greater success with 6,000 visitors to the island.

Charles Woolnough, who bought land after Peter McNab III died, catered to private picnics until he opened the grand **Woolnough's Pleasure Grounds** in 1873. Not long after, **James Findlay** acquired more land around the Hugonin Estate and created **Findlay's Picnic Grounds**, which built up to the point where in the early 1890s it rivaled Woolnough's Pleasure Grounds. This encouraged people to come to the island more frequently, making McNabs Island a popular weekend destination. **A.J. Davis** acquired some land in the early 1900s, and bottled soft drinks (both 'hard and soft'), that were sold under the brand name of "Pure McNab."

Bill Lynch, the son of lighthouse keeper Matthew Lynch, worked for Findlay's. He acquired the fairgrounds and in 1925 he took it off the island and started the Bill Lynch Shows. The shows became very popular and toured the Maritimes for decades. Bill Lynch kept his ponies on McNabs Island during the off season.

The Dartmouth Ferry Company cancelled regular runs to the island in 1928. After the late 1920s, the island was hardly used for recreation. It was not until after the 1950s, when the military use of the island was greatly decreased, that recreational activities on the island became popular again. In 1980, the McNabs Island Ferry Company began regular scheduled service to Garrison Pier from downtown Halifax. It was owned by John Jenkins, who also built **the McNabs Island Teahouse** to operate as a restaurant and venue for picnics for visitors to the island. Both the Ferry Company and the Teahouse closed in 1992. Today there are many charter boats that go to the island for school field trips, picnics, camping trips, and bike trips.

Sources and further reading:

Friends of McNabs Island Society. 2008. *Discover McNabs Island. Friends of McNabs Island Society*, Halifax.

Kinsman, B. 1994. *McNabs Island Halifax Harbour, Nova Scotia: An Historical Overview*. Nova Scotia Department of Natural Resources.

McNabs Island History - Activity Ideas

In-Class Activities

Creative Writing:
After having studied the fact sheets and learned about McNabs Island's military history, students can write sentences, paragraphs, or compositions (depending on the grade level) using the following leads:

- You are a French soldier in 1711 on Isle de Chibouquetou; describe how you would explain the island's strategic location and your ideas for building fortifications to the General.
- You are a Mi'kmaq person in the 1760s when more and more European settlers are arriving to the island; describe your relocation to Indian Point and your impressions of the island.
- You are working for Captain Mauger drying fish on Maugers Beach on McNabs Island; write about your typical day.
- You are a soldier at Fort Ives in 1868; write about your typical day.

Some Suggested Spelling and Vocabulary Words:
(Students can list in alphabetical order too)

- Fortification
- Military
- Technology
- Soldier
- Searchlight
- Lighthouse
- Strategic
- Harbour
- War
- Weapon
- Artillery
- Rifle
- Barracks
- Monitor
- Tower
- Submarine
- Defence
- Disarmed

Using the Military Facts Sheets:

- Students can write about a fact sheet that they have read
- Students may draw a picture pertaining to a fact sheet
- Students can locate the fort that they have read about on a map.

In-Field Activities

Visual Arts

Draw a fort, gun emplacement, or the view from the fort. Students may draw them as they stand today or as they may have looked while in use.

Make a rough floor plan of one of the buildings and draw what furniture and equipment may have been located there while the fort was active.

Drama

Students may be separated into smaller groups and asked to create a skit of a situation that may have occurred at the fort while it was active.

Language Arts

While exploring the forts, students may be asked to imagine what it would have been like to be a soldier there while the military was still active on the island. After exploration, students can write about it or talk about it in a talking circle.

Figure 7 – A Colonial British Military Fort

McNabs Island - Animals

A variety of animals live on McNabs Island. Some of these live there year round, some live there during certain seasons, others use it as a resting area or place to visit.

Many birds can be seen and heard while on the island, even when walking on the main trail; Garrison Road. Ospreys may be seen on their nests or in flight. Before Hurricane Juan, McNabs and Lawlor Islands had one of the largest communities of nesting ospreys in North America. The osprey is Nova Scotia's official provincial bird. Ospreys are very territorial and may harass anyone who comes too close to their nest. Please respect these birds and do not disturb them!

Among the many animals on McNabs Island, deer live on both McNabs and neighbouring Lawlor Island. The deer swim between the two islands and the mainland. Hunting is illegal on McNabs Island, but before 1980, deer were hunted on the island. Deer are fairly shy and are usually only seen by people who are very quiet. It is more likely that their tracks, scat, bedding, and chew marks will be seen. There is evidence of coyotes on the island. Their tracks and scat may be found but they are very afraid of people so it is rare to see one. The only sign of a large cat was bobcat scat found in 1966. A black bear was sighted on the island a few times in 1991.

Amphibians and reptiles may be encountered on the island, particularly in damp areas. The Eastern Redback Salamander hides out under rocks and rotten logs, while American Toads can often be seen along trails.

Please respect the animals of McNabs Island and the natural environment. Please emphasize this with your students. The island is their home and any damage or garbage left there may be hazardous to them.

*Lists from *Discover McNabs Island* (refer to book for more information on each animal)

Mammals of McNabs Island

- Masked Shrew (*Sorex cinerius*)
- White Tailed Deer (*Odocoileus virginianus*)
- Little Brown Bat (*Myotis lucifugus*)*
- Northern Long-Eared Bat (*Myotis septentrionalis*)*
- Snowshoe Hare (*Lepus americanus*)
- American Red Squirrel (*Tamiasciurus hudsonicus*)
- Meadow Vole (*Microtus pennsylvanicus*)
- Muskrat (*Odonata zibethica*)
- Meadow Jumping Mouse (*Zapus hudsonius*)
- Coyote (*Canis latrans*)
- Red Fox (*Vulpes fulva*)
- Raccoon (*Procyon lotor*)
- Mink (*Mustella vison*)
- River Otter (*Lutra canadensis*)

*may be extirpated (locally extinct)

Figure 8 - Red Squirrel

Figure 9 - White Tailed Deer

Amphibians and Reptiles of McNabs Island

- Maritime Garter Snake (*Thamnophis sirtalis pallidula*)
- Eastern Smooth Green Snake (*Opheodrys v. vernalis*)
- Northern Redbelly Snake (*Storeria o. occipitomaculata)*
- Northern Ringneck Snake (*Diadophis p. edwardsii*)
- Eastern American Toad (*Bufo a. americanus*)
- Northern Spring Peeper (*Hyla c. crucifer*)
- Eastern Redback Salamander (*Plethodon cinereus*)

Figure 10 - Eastern American Toad

Birds of McNabs Island

This list includes birds living year round, seasonally, transients or just seen a few times.

- Common Loon
- Red-Throated Loon (transient)
- Red-Necked Grebe
- Horned Grebe
- Pied Billed Grebe
- Great Cormorant
- Double Crested Cormorant
- Great Blue Heron
- Snowy Egrets
- Mallard
- Black Duck
- Green-winged Teal
- Blue-winged Teal
- Gadwall
- Northern Pintail
- American Widgeon
- Northern Shoveler
- Bald Eagle
- Sharp-Shinned Hawk
- Cooper's Hawk
- Red Tailed Hawk
- Broad Winged Hawk
- Marsh Hawk
- Rough Legged Hawk (in winter)
- Peregrine Falcon
- American Kestrel
- Merlin
- Osprey

<u>Primarily in winter-offshore:</u>

- Scaup (greater and lesser)
- Goldeneye (Common and Barrows)
- Bufflehead
- Common Eider
- Scoter (White-winged, Surf and Black)
- Merganser (Hooded, Common and Red-Breasted)
- Gulls (Great Black Backed, Herring, Ring-Billed. Winter: Glaucus, Ice-land, Black Headed and Bonaparte)
- Terns (Common, Arctic, Roseate, Black)
- Auks (Razorbill, Dovekie, Black
- Spruce Grouse
- Ruffed Grouse
- Rails
- American Coot
- Killdeer Plover
- American Golden Plover
- Piping Plover
- Semipalmated Plover
- Black-Bellied Plover
- Spotted Sandpiper
- Solitary Sandpiper
- Pectoral Sandpiper
- White Rumped Sandpiper
- Least Sandpiper
- Stilt Sandpiper
- Semipalmated Sandpiper
- Willet
- Great Yellow-Legs
- Lesser Yellow-Legs
- Red Knot
- Dunlin
- Sanderling
- Dowithers (Long-Billed and Short-Billed)
- Whimbrel
- Ruddy Turnstone
- Phalarope (Red and Northern)

Guillemot)
- Murres (Common, Thick-Billed)
- Common Puffin
- Pigeons
- Doves (Rock and Mourning)
- Cuckoos (Yellow-Billed and Black Billed)
- Owls (Great horned, Snowy, Barred, Long-Eared, Short-Eared, Saw-Whet)
- Whip-Poor-Will
- Common Night Hawk
- Chimney Swift
- Belted Kingfisher
- Ruby-Throated Hummingbird
- Woodpecker (Pileated, Hairy, Downy, Black-Backed, Three Toed)
- Common Flicker
- Yellow Bellied Sapsucker

Potential Song or Perch Birds: Summer Residents

- Eastern Kingbird
- Eastern Phoebe
- Yellow-bellied Flycatcher
- Alder Flycatcher
- Least Flycatcher
- Eastern Wood Pewee
- Olive-sided Flycatcher
- Tree Swallow
- Bank Swallow
- Barn Swallow
- Cliff Swallow
- Gray Catbird
- Scarlet Tanager
- Rosebreasted Grosbeak
- American Robin
- Hermit Thrush
- Swainson's Thrush
- Veery
- Blue-gray Gnatcatcher
- Ruby Crowned Kinglet
- Solitary vireo
- Red-eyed Vireo
- Philadelphia Vireo
- Loggerhead Shrike
- Red-winged Blackbird
- Northern Oriole
- Rusty Blackbird
- Common Blackbird
- Brown-headed Cowbird
- Black-and-white Warbler
- Tennessee Warbler
- Nashville Warbler
- Northern Parula Warbler
- Yellow Warbler
- Magnolia Warbler
- Black-throated Blue Warbler
- Yellow-rumped Warbler
- Black-throated Green Warbler
- Chestnut-sided Warbler
- Bay-breasted Warbler
- Blackpoll Warbler
- Palm Warbler
- Ovenbird
- Common Yellow-throat
- Wilson's Warbler
- Canada Warbler
- American Redstart
- Savannah Sparrow
- Sharp-tailed Sparrow
- Chipping Sparrow
- Swamp Sparrow

Potential Song or Perch Birds: Winter Residents

- Horned Lark
- Mockingbird
- Northern Shrike
- Bohemian Waxwing
- Common Repoll
- Tree Sparrow
- Lapland Longspur
- Snow Bunting

Potential Song or Perch Birds: Transient

- Water Pipit
- Western Kingbird
- Yellow-breasted Chat
- Hooded Warbler
- Orange-crowned Warbler
- Rufous-sided Towhee
- White-crowned Sparrow
- Fox Sparrow

Potential Song or Perch Birds: Year Round Residents

- Black-capped Chickadee
- Boreal Chickadee
- Brown Creeper
- Gray Jay
- Blue Jay
- Common Raven
- Common Crow
- Purple Finch
- Pine Siskin
- American Goldfinch
- Red Crossbill
- House Sparrow
- Winter Wren
- White-winged Crossbill
- Evening Grosbeak
- Pine Grosbeak
- Golden-crowned Kinglet
- White-breasted Nuthatch
- Red-breated Nuthatch
- Dark Eyed Janco
- White-throated Sparrow
- Song Sparrow
- Common Starling
- Cedar Waxwing

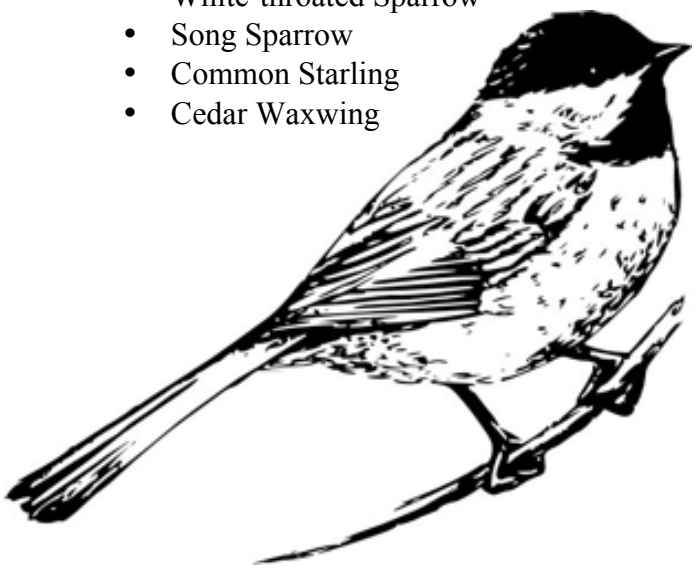


Figure 11 - Black-capped Chickadee

Little Brown Bat (*Myotis lucifugus*) and Northern Long Eared Bat (*Myotis septentrionalis*) and White Nose Fungus

White-nose Fungus (WNF) is caused by the fungus, *Pseudogymnoascus destructans* which infects skin of the muzzle, ears, and wings of hibernating bats. The fungus was first documented in New York in the winter or 2006-2007, and since it has spread at a fairly rapid rate throughout the eastern and mid western United States and eastern Canada.

It appears that once a bat is infected, the White Nose Fungus causes abnormal behaviour in the bats while in their hibernacula (hibernation sites). While they should be staying put and hibernating, bats have been found closer to the mouth of the caves and out flying in the daytime during the winter. The main issue is that the bats are consuming stored fat reserves too early on in the season and therefore not surviving through the winter.

The species that are most affected in Nova Scotia are the overwintering, Little Brown Bat (*Myotis lucifugus*), Northern Myotis Or Northern Long-eared Bat (*Myotis septentrionalis*) and Tri-colored Bat or Eastern Pipistrelle (*Perimyotis subflavus*). The disease has had a catastrophic effect on the bats of Nova Scotia with estimates of a 90% decline in population over the last few years.

Bats are one of the best forms of natural insect control; the loss of such a high amount of bats is going to cause changes to the ecosystem. Research is ongoing to develop a way to control and treat White Nose Fungus in bats.

Figure 12 - A Northern Long-Eared Bat

Animals - Activity Ideas:

In-Class Activities

Word Search

There are two word searches in the kit. One is for younger grades, the other is more challenging, thus for older grades.

Animal Sounds

There is an 8 minute CD/file with common forest sounds from McNabs Island. The CD is bilingual; in French and English. The adjoining information is in this binder to explain these sounds.

Colouring

There are pictures of animals for students to colour. They are on white, laminated paper for better photocopy results.

Information Cards

There are two sets of information cards. These are on **Blue** and **Green** coloured paper, and may be used for a variety of activities, such as:

- The memory game: cards are laid out and turned upside down; students must find its pair.
- Students may get a card and read the information out loud.
- Students may get a card and write about that animal.
- All but the deer and squirrel can match up as predator and prey. Assign each student a card and get them to find their predator or prey.

Plastic Animal Toys:

These toys can be played with, handled and used for an in class version of game number 2 on the 'outdoor games' sheet.

Tracking

While on the island, the students may observe various animal tracks. As a basic guide, they can use the tracks book in the box.

Worksheet

There is a worksheet in the box that students in the older elementary of junior high school grades can use while in the field. There is one worksheet, laminated on white paper for best results when photocopied. There is an answer sheet in this binder.

Games

There is a sheet with awareness games and one with outdoor games in this section of the binder.

Forest Sounds on McNabs Island

Enclosed in the kit you will find a CD/file. On it is an 8 minute recording of various animals found on McNabs Island, sounds that visitors might hear. Prior to the sounds is the name of the animals, both in English and French. Following are briefs about the animal sounds.

1) Spring Peeper/Rainette crucifière (*Hyla crucifer*)
Habitat: May be found in a variety of marshes, swamps, lakes, ditches, etc.
Sound: The male produces a loud and piercing sound, heard through the spring, mainly at night.

2) American Toad/Crapaud d'Amérique (*Bufo americanus*)
Habitat: Reproduces in swamps and marshes; prefers shallow water.
Sound: The male's call is long and musical which can last up to 30 seconds.

3) White-tailed Deer/Cerf de Virginie (*Odocoileus virginianus*)
Habitat: Prefers fields between the woods and cleared land.
Sound: When frightened, the adults may produce a loud 'huff', as is they were snorting. The foals have a nasal shriek to attract their mother.

4) Common Loon/Huart a collier (*Gavia immer*)
Habitat: Deep lakes and ponds for breeding and ocean during winters.
Sound: The loons have 4 primary calls 1) Yodel: a territorial call during breeding season, only the male makes this call. 2) Tremolo: when frightened or there is danger, or during flight. 3) Wail: a communication call for long distance. 4) Hoot: more quiet and intimate communication between loons when they are closer together.

5) Osprey/Balbuzard (*Pandion haliaetus*)
Habitat: Found on McNabs and Lawlor Islands.
Sound: The osprey have a variety of cries. When disturbed, even by walking near the nest, they produce a 'cry' and fly around in circles above the perceived danger.

6) Ruffed Grouse/Gelinotte huppée (*Bonasa umbellus*)
Habitat: Mixed forests or deciduous forests during the reproductive season.
Sound: In the spring the males attract females and proclaim their territory by 'drumming'. The males perch on a mound or fallen tree and with open wings, quickly hit the air and their chest. They also have an alarm call.

7) Great Horned Owl/Grand-duc d'Amérique (*Bubo virginianus*)
Habitat: A variety of forested areas.
Sound: Regularly 5 "hoo-hoo". Partners reply to each other. Young beg for food by repeating a piercing sound.

8) Black-capped Chickadee/Mésange à tête noire (*Parus atricapillus*)
Habitat: Mixed and deciduous forests.
Sound: Sounds like the chickadee is calling its own name: *chika-dee-dee-dee-dee*. They also have other calls, including the males': *tee-tu*

9) Common Yellowthroat/Paruline masque (*Geothylpis thrichas*)
Habitat: Usually near water.
Sound: This is a yellow warbler. The song varies but has a recognizable sound that is easy to learn.

10) White-throated Sparrow/Bruant à gorge blanche (*Zonotrichia albicollis*)
Habitat: Understory of mixed or coniferous forests, especially areas with young conifers.
Sound: The sharp song is easy to recognize and imitate (by someone who whistles well). Some say it sounds like: *Oh sweet….Canada…Canada*

Figure 13 - An Osprey

Habitats on McNabs Island

McNabs Island consists of an elongated grouping of drumlin hills oriented approximately northwest to southeast. Erosional and depositional processes are highly active on the island due to its exposure to the elements and the island's soil composition. McNabs Pond and several marshes represent areas of exposed surface water. Several roads and trails exist as a result of past habitation and current recreational use.

- *Drumlin: glacial deposits of soil forming round, mound-shaped hills.*
- *Habitat: a home; a region where a plant or animal lives.*
- *Erosion: the wearing away of rock, soil, and vegetation by the actions of water and or wind; human activity can increase (speed up) erosion.*

Vegetation

There are over 330 recorded vascular plant species on McNabs Island. Considering the island's size and location, this diversity is very interesting. There are no recorded rare or endangered plant species on McNabs Island. As a result of past land use, a large number of introduced plant species are present, particularly in disturbed habitats.

- *Diversity: variety; often used as an ecological sense taking into account the number and variety of species in an area.*
- *Endangered species: a species (animal or plant) that has very few individuals left in its habitat, thus risks becoming extinct.*
- *Introduced species: a species that is not native to a habitat; brought by humans (purposely or not).*
- *Native species: a species that has naturally grown in an environment.*
- *Rare species: a species that is not often encountered in an area.*

Habitat Types on McNabs Island

1. Forest
2. Old Field
3. Pond
4. Salt marsh
5. Cobble Shore
6. Sand Shore and Dunes
7. Human-made

1. Forest

Approximately 80% of McNabs Island is forested, but due to Hurricane Juan's destruction in 2003 when 40% of the trees were toppled, the island is changing. There are now several areas of very young forest and pioneer species. The process of the forest regenerating will take 70 or more years to replace the mature stands destroyed by the hurricane.

The dominant forest type on the island was spruce-fir dominated forest, then angiosperm-dominated mixed wood and thirdly White Spruce-dominated forest. Mixed wood forests consist primarily of White Spruce, Balsam Fir, Red Spruce, Yellow Birch, Mountain White Birch, White Birch and Red Maple. Ground cover consists of hay-scented fern, hair-grass, downy alder and bunchberry.

Red Spruce, White Spruce and Balsam Fir are prominent in conifer-dominated forests. Ground vegetation in a coniferous forest consists primarily of hay-scented fern, mosses, grasses and wild lily-of-the-valley.

<u>The above mentioned species are:</u>

- White Spruce *Picea glauca*
- Red Spruce *Picea rubens*
- Balsam Fir *Abies balsamea*
- Mountain White Birch *Betula cordifolia*
- White Birch *Betula papyrifera*
- Yellow Birch *Betula allegheniensis*
- Red Maple *Acer rubrum*
- Hay Scented Fern *Dennstaedtia punctilobula*
- Hair-grass *Deschampsia flexuosa*
- Bunchberry *Cornus Canadensis*
- Wild-lily-of-the-valley *Maianthemum canadense*
- Downy Alder *Alnus crispa*
- Schreber's Moss *Pleurozium schreberi*

2. Old Field

Old Field habitats on McNabs Island are associated with abandoned lands once used for cultivation, pastures and lawns. Successional* stages are evident on these lands. Early vegetation to inhibit this land are the grasses sheep sorrel, yarrow, goldenrod, dandelion, strawberry and mosses. Shrubs such as alder, rose and bayberry

later invade these plants. A white spruce forest succeeds this stage.

**Succession: a progressive process of regeneration following a disturbance to the land.*

The above mentioned plant species are:

- Poverty Grass *Danthonia spicata*
- Couch-grass *Agropyron repens*
- Sheep-sorrel *Rumex acetosella*
- Yarrow *Achillea millefolium*
- Grass-leaved Goldenrod *Solidago graminifolia*
- Dandelion *Taraxicum officinale*
- Strawberry *Reagaria virginiana*
- Hair-cap Mosses *Polytrichum spp*.
- Speckled Alder *Alnus rugosa*
- Common Wild Rose *Rosa virginiana*
- Bayberry *Myrica pensylvanica*

3. Pond

Freshwater and brackish* water habitats occur behind Maugers Beach, at Green Hill Cove and at Findlay Cove Marsh. Varieties of vegetation inhabit these habitats including those surrounding it, submerged or partially submerged in it, and those found along its moist terrestrial edges. Dominant plant species include Blue-flag Iris, Cat-tail, Sago Pond-weed, and Blue-joint grass.

**Brackish water: a body of exposed surface water containing a mixture of fresh and salt water*

The above mentioned plant species are:

- Blue-flag Iris *Iris versicolor*
- Broad Leaved Cat-tail *Typha latifolia*
- Sago pond-weed *Potamogeton pectinatus*
- Blue-joint Grass *Calamagrostis canadensis*

4. Salt marsh

Prominent salt marshes on McNabs Island are located at Wreck Cove, Thrumcap Cove and McNabs Pond. Salt marshes are interesting habitats in that they house plant

species that live partially submerged in salt water. They must withstand periods exposed to the summer sun or winter winds, freshwater rain and sea water. Very few plants can withstand these elements and salty water, but even more interesting is that these plants can survive wide ranges. Not only survive, but thrive! Salt marshes are divided into littoral zones-high, middle and low (tides zones). The dominant plant species are the salt marsh grass, sedges, seaside goldenrod and red fescue.

The above mentioned plants are:

- Cord Grass *Spartina alterniflora*
- Salt Meadow Cord Grass *Spartina patens*
- Sedge *Carex paleacea*
- Seaside Goldenrod *Solidago sempervirens*
- Red Fescue *Festuca rubra*

5. Cobble Shore

This is a narrow, coastal area exposed above the high-tide mark and below the coastal forest. It consists of boulders and round, stony cobbles. The stones are round due to their continuous tumbling in the surf. This habitat almost entirely surrounds McNabs Island's parameter and supports a variety of plants. These include beach pea, field horsetail, red fescue, alder, and beach and dune grasses. Common Wild Rose and Rough Rose with pink or white flowers are common in the cobble shores as well.

The above mentioned species are:

- Beach Pea *Lathyrus japonicas*
- Field Horsetail *Equisetum arvense*
- Red Fascue *Restuca rubra*
- Downy Alder *Alnus crispa*
- Speckled Alder *Alnus rugosa*
- American Beach Grass *Ammophila breviligulata*
- American Dune Grass *Ellymus mollis*
- Common Wild Rose *Rosa virginiana*
- Rough Rose *Rosa rugosa*

6. Sand Shore

The sand shore habitat is most extensive from Maugers Beach to the lighthouse but can be found in small patches elsewhere, such as Wreck Cove. Sand dunes are extremely

sensitive, unstable habitats composed simply of sand bound together by dune grass roots. Dunes are ever changing and moving due to wind and wave activity. Sand dunes develop plant communities dominated by beach grass, dune grass, red fescue, beach pea and sea rocket. Dunes are popular breeding grounds for particular bird species.

It is strongly advised to use existing trails and **do not walk on the dunes**. Even one crossing by one person causes damage to this delicate habitat.

The above mentioned plant species are:

- American Beach Grass *Ammophila breviligulata*
- American Dune Grass *Elymus mollis*
- Red Fescue *Restuca rubra*
- Beach Pea *Lathyrus japonicus*
- Sea Rocket *Cakile edentula*

7. Human-Made

Due to McNabs Island's long history of habitation by settlers and by the military, 'human –influenced' habitats commonly occur in the vicinity of abandoned buildings and along road sides. These habitats support a variety of ruderal plants including ferns, spruce trees, birches, alder, Japanese Knotweed, and raspberry.

- *Ruderal: a plant that occurs in a recently disturbed site; a 'weed'*
- *Weed: any plant regarded by people as a pest*

The above mentioned plant species are:

- Hay-scented Fern *Dennstaedtia punctilobula*
- New York Fern *Dryopteris noveboracensis*
- White Spruce *Picea glauca*
- Kentucky Blue-grass *Poa pratensis*
- White Birch *Betula papyrifera*
- Speckled Alder *Alnus rugosa*
- Common Wild Rose *Rosa virginiana*
- New York Aster *Aster novi-belgii*
- Common St. Johns Wort *Hypericum perforatum*
- Japanese Knotweed *Polygonum cuspidatum*
- Red Raspberry *Rubus strigosus*

Habitat - Activity Ideas

In-Class Activities

Puzzles

There are two puzzles in the kit that cover Sand Beach, Cobble Shore, Human Made and Field Habitats. One is a 30 piece puzzle and the other is a 110 piece puzzle. The 110 piece puzzle is much more challenging.

Habitat Boxes

There are transparent boxes with items in them representing things that have been found on McNabs Island.

There are also two boxes that contain items from two habitats on McNabs Island: one from a forested area and the other from a seaside area. These boxes may be opened and the items may be touched, smelled and observed.

Plants Presses

There are pressed plant specimens in the kit, including some information on each, which may be observed. The teacher may create activities related to them.

Word/Definition Match

The students receive a word or a definition and must find their match. The words are names of one of seven defined habitats found on McNabs Island. Since there are multiples of the definitions and words, it is okay if there is an uneven number of students (knowing that one group might be of three)

Stories

Students may write a story about animals that live in chosen or given habitat on McNabs Island (i.e. a day on the life of an animal).

There are also **seven stories** written with a photograph. These stories may be read to the younger primary grades, and may be handed out or photocopied for the older primary grade (Grades 3 &4) *Grade level to be judged by the teacher.*

Collage

Students may prepare a collage of images of a habitat on McNabs Island.

Journal

Students may write a journal about their experiences on the island or their thoughts about particular habitat they may have visited or would like to visit.

In-Field Activities

A Closer Look

Students, in pairs or individually, could take a closer look at a habitat. What lives in the micro-habitat of an area? What is the habitat of an ant? A toad? A spider? Magnifying glasses are included in the kit for this activity. (If it is sunny please be cautious of students starting fires with magnifying glasses).

Rubbings

Leaf/flower/bark rubbings. Teacher could do this in the field, since the materials to be used should be left on the island. Students put their item under a sheet of paper and rub with charcoal. (Not included in school kit)

Figure 14 - An Example of Animals in a Forest Habitat

Suggested Trips on McNabs Island Covering a Variety of Habitats Each

1. Pond, forest, human-made, sand beach habitats:
   From Garrison Pier, walk south towards the lighthouse on the large gravel road (Garrison Road). You will find a marsh and McNabs Pond to the right of the trail and a forest to the left. Continuing on the large trail for a while will come to a fork on the path. To the right (west) is Fort McNab. To the left (east) is Wreck Cove. At the fort you will find a human-made habitat and at Wreck Cove you will find a sand beach habitat.

2. Sand dune, cobble shore, pond and human-made:
   From Garrison Pier, you may walk towards the lighthouse on the beach. Here is a sandy beach habitat, including sand dunes and beach grasses. Afterward, you can walk left (east) and join up on the large Garrison Road. Continue on the road and you will find McNabs Pond to the right. Continuing on the large road for a while you will come to a fork on the path. To the right (west) is Fort McNab and to the left (east) is Wreck Cove.

3. Cobble shore, marsh, old-field habitats and human-made:
   From Garrison Pier walk left (north), away from the lighthouse and towards Halifax, on the large gravel road (garrison Road). You will encounter a marsh habitat on your left. At the end of road, you will find Fort Hugonin, old cottages and fields that are human made habitats. Continue on the road and you will get to Fort Ives on your left (north). If you continue on the large road you will get to the Davis-Conrad and Mathew Lynch homes.

4. Forest, old field, human-made, sand and cobble shore habitats:
   From Garrison Pier, walk left (north), away from the lighthouse and towards Halifax, on the large gravel road (Garrison Road). Shortly after getting on the road you will find a path veering to the right up the hill. Follow this path and you will get to the old Teahouse and site of the Hugonin-Perrin Estate and Victorian Gardens. There are two habitats there: field and human-made. While on the path you will be going through a forested habitat. Afterward you may return on the path and come back to Garrison Road. You may then head toward the beach after the pier where you will be on a sandy beach habitat, with dunes and dune/beach grasses and will end up on a cobble beach.

Outdoor Appreciation Games

Purpose: To gain more appreciation of the intricate balance and wonders of nature

Materials:

- Game 1: none
- Game 2: items found in field or kit
- Game 3 and 4: Item list sheets contained in the kit.

Game 1: The Living Camera

Divide students into pairs. One student has their eyes closed and hand out with thumb up. The other student guides the "blind" student to a spot where a "picture" should be seen, and can arrange the "lens" (the head of the partner) to view the picture properly. When all is set, the "photographer" presses down the thumb of the "blind" student (the camera), and the "blind" student opens their eyes for 2 seconds and then closes them again. The photographer may take many pictures and then they can change roles. (Note: if the thumb idea does not seem to work, pulling the ear of the "camera" can be replaced)

Game 2: See & Search/Memory

While in the field, the leader may pick up 15 objects, such as stones, bark, featherm or cones, and cover the objects. The students then pair up and have 30 minutes to find as many of those objects as possible.

This activity can be changed for in-class activity as a memory game. There are many objects in the kit which the teacher may choose and cover up. The students will get 30 seconds (or less) to look at the objects and then either, must list as many objects as they can remember or the teacher removes one object and they must figure out which object is missing.

Game 3 & 4: Backyard Bingo and Scavenger Hunt

Both of these games are similar in nature and are to be done in the field. They both require the students to look for the listed item. The students can be paired up and allowed to search a determined area for the items on the list, once found they should tick the item off on the list. The items they find should be left in place and only observed since this is a Provincial Park and we must leave nature for all to enjoy.

Awareness Games

There are a few awareness games that can be played while out on McNabs Island.

Purpose: The purpose of the games is to increase the awareness of the students to their surroundings by using all of their senses.

Materials: Blind Folds (*provided*), String (game 1-*provided*), Noisemaker (two sticks/drum, game 2-*not provided*)

Game 1:

A string of 20 to 40 meters long is strung around objects in the woods, making an "obstacle course" from the fallen trees, rocks, branches, etc., that the students must follow and climb over or crouch under. The students are blind folded and one at a time they are led to the course (not having seen it) and must follow the string. They must walk slowly and silently to sense their environment, so as not to trip or hurt themselves. Allow plenty of time between each student so that they don't run into each other. The participants who are finished need to remain silent. Have a leader at the beginning, middle and end of the string to help guide the students if needed. When done the game, please carefully roll the string back up and return to kit.

Game 2:

The students are blindfolded and lined up. They hold onto the shoulders of the person in front of them. The teacher/leader is not blindfolded and has a noisemaker, which they use to make noise. The first student must follow the sound but must walk in a cooperative manner, being conscious that there are many others holding on behind. For example, if the first student encounters a log or rock to walk over, he/she should not speed up afterwards, realizing that everyone behind must do so too. Every so often the walk is stopped and the first student is led to the back of the "snake" and the next student becomes the leader as the line moves on again. Students should be silent during this activity.

Game 3:

The students put their blindfolds on and are separated from each other and must sit (or stand) for a few minutes silently, listening to the sounds, smelling the scents, touching their immediate surrounding and feeling the area out. There are many sounds, smells, textures and feelings that one experiences outside of the city. Everyone should be silent during this activity. Once finished get the students to take turns to tell about something they heard, smelled, or felt that was different from when they are in the city.

Learning about the Sustainability of Ecosystems on McNabs Island

*Intended for Science 10 Classes

By using McNabs Island as an outdoor classroom, students will have a learning experience like no other. They will not only learn about their curriculum through the information presented in the classroom, but they will be able to fully experience what they are studying. No matter the abilities of the students, a visit to McNabs will pique their interest as they are immersed in their lessons and engaged at a hands-on level.

A visit to McNabs Island reinforces to students that what they are learning is important as there are scientific lessons all around them. McNabs Island is minutes from downtown Halifax and provides a setting where students can engage with the curriculum and be stimulated by the subject matter in a new and fascinating way.

Coastal Changes

Changes of the McNabs Island shoreline are documented in charts since 1758 and aerial photography beginning in 1934. Areas of particular interest include the Thrumcaps (Thrumcap Shoal, Big Thrumcap, Little Thrumcap and Thrumcap Hook), Drakes Gut and Maugers Beach. Together, these demonstrate the conceptual model of shoreline evolution and the often profound impacts of human interference in coastal processes.

Charts by Cook in 1758 and by Morris and Jeffries in 1759 show that Thrumcap Shoal was not completely submerged at the time. The exposed sediments may have been part of a larger barrier beach, anchored on numerous shoals in the area, which partially protected McNabs and Lawlor Islands. Approximately 100 years later, in 1853, a chart by Bayfield shows that Thrumcap shoal was completely

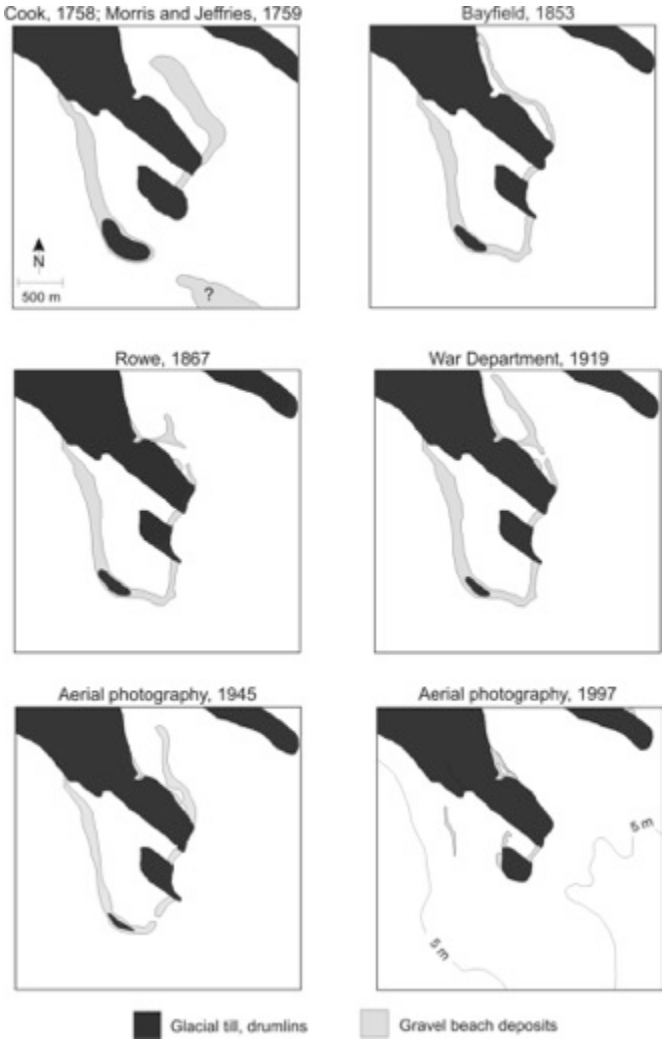


Figure 15 - Coastal Changes: Thrumcaps

submerged and the sediment on it had, in part, formed Thrumcap Hook connecting Big and Little Thrumcaps. In the interim, both had been considerably eroded. Also during this period, a large beach in Drakes Gut narrowed and moved closer to shore. These changes may represent the first of many exploitations of beach sediment on McNabs, which were first mentioned in a for sale advertisement referring to "large quantities of ballast stone sold annually" from the island. At Maugers Beach, overwash breaches in Hangmans Beach were present, allowing sediment transported from the eroding Thrumcaps to supply sediment to the future Maugers Beach.

Changes in the McNabs shoreline continued into the mid 20th century and were also strongly influenced by human activity. At Hangmans Beach, coarse sediment accumulated on the south side of a breakwater protecting a causeway constructed to provide access to the lighthouse. The causeway closed off McNabs Pond and allowed finer sediment to accumulate on its north side at Maugers Beach and form dunes.

In the latter half of the 20th century significant changes also occurred at Big Thrumcap. A Geological Survey of Canada photograph from 1914 shows a prominent beach (part of Thrumcap hook) protecting the drumlin, after 1945, with destruction of Thrumcap Hook, erosion of Big Thrumcap progressed rapidly. Erosion continues today, under the influence of waves, storm surges and sea-level rise, at rates of up to 6 meters per year, with an average of approximately 2.5 meters per year.

The Impact of Hurricane Juan on McNabs Island

The high waves superimposed on the high water level caused extensive erosion on McNabs Island. Most notable to visitors is the breaching of the causeway leading to the Maugers Beach lighthouse. During the hurricane, a south to north hydraulic gradient caused by overwash of a small barrier beach at the south end of McNabs Pond produced flow well over the capacity of a sand-clogged culvert and caused the breaching of Maugers Beach. Less apparent to visitors who had not been to Big Thrumcap before Hurricane Juan may be several meters of cliff erosion that occurred there.

The Future Shoreline?

At Big Thrumcap, with an average cliff erosion rate of 2.5 meters per year and about 300 meters left to erode, the drumlin may be completely consumed in approximately 120 years. The resulting shoal will continue to supply sediment to the beach below Fort McNab, Hangman's Beach and Maugers Beach for sometime after.

The future of McNabs Pond is uncertain in the short term as the breach at the north end through Maugers Beach may or may not heal depending upon the continuation of any hydraulic gradient driven by wave setup on a barrier beach at the Pond's south end. In the long term, as sea level rises, the pond will become increasingly saline, and may become a channel separating the Strawberry Battery drumlin from the main island.

Should the breakwater protecting the former causeway to Maugers Beach lighthouse be

left unmaintained and finally destroyed by storm waves and surges, breaches in Hangman's Beach will reform, allowing further delivery of sediment to Maugers Beach. With this increased sand sedimentation, the small dunes may grow larger; however in the longer term, wave energy in this area will increase causing erosion rather than deposition. Erosion of Doyle Point will continue to provide sediment, though much of this may infill the dredge scours before increasing the size of the beaches and dunes in Wreck Cove.

In thousands of years, like the islands that came before it and now form shoals at the entrance to Halifax Harbour, the sediments forming McNabs Island will eventually be completely eroded and will be recycled to form new beaches further up Halifax Harbour for the enjoyment of future beachgoers.

Figure 16 - Coastal Erosion

See photos included in the school kit for more details.

Sustainability of Ecosystems: Activities

Social debate:

Before McNabs Island received Provincial Park status, there was discussion of building the sewage treatment plant for Halifax on the island. Divide the class into two groups and have a debate about why the island should be classified as a protected area versus the development potential for the island.

This should encourage the class to look at the human impact on nature and why protected areas are so important. They can include the importance of the various ecosystems that make up McNabs Island, as well as creating two opposing views on environmental issues.

Identifying Ecosystems:

Learning and identifying the difference between ecosystems, communities, populations and individuals. Have the students identify an example of each on the island. Students can present their findings using various forms of communication: either written or illustrative through drawings or charts.

Discuss the changes to McNabs Pond from Hurricane Juan and what that would mean for its ecosystem and the species that live there with the change from a fresh marsh to a brackish marsh: examine the different types of plant species that exist in each type of marsh.

Pick a specific ecosystem or habitat area of McNabs Island. Have the students identify all of the different biotic and abiotic factors of that area. Have the students expand their discoveries and create connections by analyzing how these factors rely on each other for survival. If looking to incorporate creativity, have students represent their findings with a chart, drawing or diagram.

Habitat Suitability: Case Study of White-tailed deer

Upon Completion of this lesson students will be able to:
Name three different types of habitats.
Define habitat suitability.
Name three factors that affect habitat suitability for all wildlife.
Describe the habitat requirements of white-tailed deer.
Evaluate a habitat type based on its suitability for white-tailed deer.

Part 1: Habitat Requirements

This activity will help students recognize that the characteristics of a habitat influences the species found there. Through this activity, students will learn about white-tailed deer and their habitat requirements. An animal's habitat is the area that provides all of the life requirements for that animal (food, water, shelter, cover, and space).

Provide students with an overview of the different habitat types found in Nova Scotia. These include: young and mature forests, farm fields, meadows, wetlands, lakes and ponds, streams and rivers, cities, towns, urban parks, and suburban neighbourhoods. Point out that having a rich diversity of habitat types can result in a greater diversity of wildlife.

Discuss with your students why animals live where they do. The habitats in which you find them provide everything in which the animal needs to survive. Working in small groups, have students research the habitat requirements of white-tailed deer. They may wish to use field guides, library books, and the Internet.

Habitat requirements of white-tailed deer:

- Food: Variety of leaves, forbs, herbs, and grasses in season; also eats waste grain, corn. Acorns and nuts are favourite foods. In winter, deer feed on buds, and twigs of trees and woody shrubs, preferring viburnum, maple, oak, and hemlock.
- Water: No specific requirements for open water.
- Cover/Shelter: Uses woodlands, tall shrubs, forbs, and grasses for hiding and travel corridors. Prefers brushy edges between fields and forests. Uses conifer thickets and swamps during severe winters

Part 2: Field Trip: Habitat Suitability Survey

Introduce the concept of habitat suitability to students. It is defined as the amount and type of food, water, cover, and space in an area. This determines the areas suitability for a species. Habitat suitability is affected by a number of items including; stage of succession, vertical structure, edge, interspersion, corridors, and fragmentation. Review these terms with your students. Point out that a habitat suitable for one species may not be suitable for another. When a habitat is changed, the species of wildlife found in that area may change.

Visit various areas of McNabs Island and have students work in small groups to complete the "Habitat Evaluation Worksheet" on the different areas. A copy of the worksheet is included in the school kit and can be photocopied. This worksheet and activity can be applied to other animals that are found on McNabs.

Discuss the student's findings. Would the habitat studied make good deer habitat? Why or why not? Could you find suitable food sources? Shelter/cover? Describe the food sources and shelter/cover a deer could use in each area? Is anything lacking? Food? Shelter/cover? Space? List ways the habitat could be improved for deer (provide food, shelter/cover, water, sites to raise young, etc.)? What factors may be limiting deer populations? What habitat component seems to be in the shortest supply?

EarthCaching

What is an EarthCache?

An EarthCache site is a specific geological location that people can visit to learn about a unique geoscience feature or aspect of Earth. Visitors to EarthCache sites can see how our planet has been shaped by geological processes, how we manage resources, and how scientists gather evidence. As a part of geocaching — an adventure game based around the use of a Global Positioning System (GPS) receiver to find caches of small hidden treasures — an EarthCache adventure is treasure hunting for geological and geographical caches that Earth itself has stored. The treasure is the lessons people learn about our planet.

EarthCaching is an exciting educational activity through which you can learn about Earth and the natural processes that shape our planet over time. By combining GPS technology with outdoor field experiences, EarthCaching allows students and others to experience the wonders of Earth in an entirely new and entertaining way.

Information about EarthCaching for educators can be found at http://www.geosociety.org/Earthcache_Lessons. There is a free Educator's Guide that includes lessons and correlations to the National Science Education Standards and National Geography Education Standards.

Materials

- GPS units or GPS-enabled mobile phones
- EarthCaching: An Educator's Guide. Free download at geosociety.org/Earthcache/teacherGuide
- Computer with Internet access
- Pens or pencils and notebooks of lined paper
- Cameras (optional)

Procedure

Go to www.geocaching.com or www.earthcache.org and find EarthCaches on McNabs Island. Select an EarthCache and print its information, including images and logging tasks. Discuss what you expect to find at the EarthCache and explore connections to lessons learned previously in class.

Visit the EarthCache and solve the required logging tasks. Have students record their answers in their notebooks. Photographs are not required, but they are encouraged. Students may enjoy documenting their findings with a cellular phone camera, for example. Back at school, review their answers to the logging tasks together as a class. Go to www.geocaching.com to submit your answers, upload photographs (optional), and "log" your EarthCache find.

Learning about Oceans on McNabs Island
* Intended for Oceans 11 Classes

McNabs Island is an excellent place for students to explore a variety of coastlines, learn about coastal zone ecology, and understand the impact of the ocean on life in Nova Scotia. Before exploring coastal zones, please take note of weather conditions and tide schedules. Visit http://www.waterlevels.gc.ca/eng/station?sid=490 for predicted tide heights and times.

Areas of Interest:

Findlays Cove / Hugonin Point

Easily accessible from Garrison Road, Findlays Cove represents a section of primarily cobble beach with a variety of different vegetation, seaweed, and driftwood to examine. A short walk down Findlays Cove will bring your group to Hugonin Point, an outcropping of land. The Point is visibly eroding quickly, and can demonstrate the effects of coastal erosion to the class.

Maugers Beach

One excellent area for students to learn about coastlines is along Maugers Beach. This primarily sandy shore features outcropping of bedrock near Garrison Pier, as well as cobble towards the lighthouse. A walk down Maugers Beach exposes students to a variety of habitats and vegetation, including sand dunes and different species of seaweed and algae which wash ashore.

McNabs Pond

The pond can be viewed and accessed from Garrison Road as well as Lighthouse Road and the Colin Stewart Trail. This tidal cove became a freshwater pond in the mid-1800s when the military built a road to the lighthouse, sealing off the pond from the harbour. Hurricane Juan breached the road in 2003, and the pond has returned to a tidal cove. This area contains an excellent example of a salt marsh and represents the dynamism of coastal zones.

Wreck Cove

Long a popular destination for recreational boaters, and home to several shipwrecks, Wreck Cove boasts a sandy beach, sand dunes, a nesting Osprey, and interesting intertidal rock pools. Walking down Wreck Cove at low tide can reveal a variety of species including rock crab, hermit crabs, green crab, periwinkle snails, barnacles, and various examples of shellfish.

Coastal Areas - Activities

In-Field Activities:

Crab Nab:

Purpose: Examine the impact of invasive species on coastal areas and learn about sampling and data collection.

Background: The European green crab (*Carcinus maenas*) is an invasive species and not native to the coasts of Nova Scotia. Green Crabs out-compete native species and cause damage to the ecosystem. Learn more about them here: http://www.nfl.dfo-mpo.gc.ca/e0009747

Materials: Buckets, gloves (optional), measuring tape and place-markers to demarcate boundaries, pencil and paper.

Instructions: Have students section off an area of the beach (specifically in the intertidal zone) at low tide. Have students search the demarcated zone for crabs. Collect the crabs and make a count of how many Green Crabs are found as well as Rock Crabs and any other species which may be found.

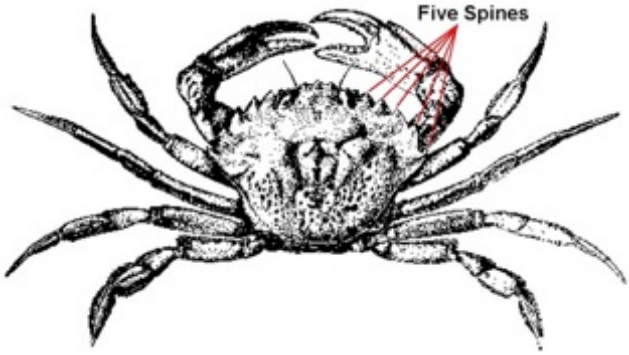


Figure 17 - Green Crab (*Carcinus meanas*)

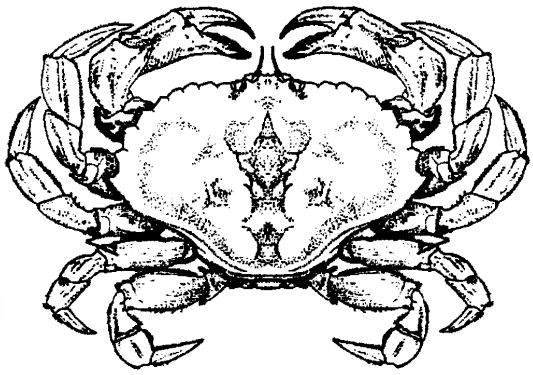


Figure 18 - Rock Crab (*Cancer irroratus*)

Exploring the Intertidal Zone

Purpose: Understand the physical habitat of the intertidal zone.

Materials: Measuring tape and place-markers, pencils and paper.

Instructions: At low tide, have students determine the normal high-tide mark and low-tide mark (water's edge). Measure this length and make note of the total tidal range of this area. Have students examine the intertidal zone, making note of the different species of animals and vegetation in this area. Make notes about which animals are found in tide-pools, in grasses, etc. Have students describe the ways different parts of the intertidal zone are used by different species.

In-Class Activities:

Sea-level Rise and Coastal Erosion

Purpose: Examine the issues associated with sea-level rise and coastal erosion and its possible impacts on McNabs Island.

Materials: Maps of McNabs Island, paper and pencils.

Instructions: Have students examine maps of McNabs Island and identify key points including infrastructure or ecologically significant zones which are at risk from coastal erosion and sea level rise. Have students discuss ways in which these areas can be protected, and why such protection should happen.

Thought Exercise: Coastal Zone Management

Purpose: Examine the complexities of coastal zone planning and management in the context of Halifax Harbour and McNabs Island.

Materials: Pencil and paper.

Instructions: Give students the following scenario: The Halifax Regional Municipality is looking to build a wastewater treatment facility in Halifax Harbour. One city planner has put forward the idea of building it on McNabs Island. Have students examine and discuss the environmental and social issues associated with such a proposed development. What impacts might such a project have on the coastal ecosystem and on tourism on the island? Is there another area in the Halifax region which may be better suited to this kind of development?

Additional Resources for Information on McNabs Island

Department of Education, Nova Scotia Museum. (1966) *A Preliminary Survey of the Natural History of McNabs Island, Halifax Harbour, Nova Scotia*. Nova Scotia Museum, Halifax, N.S.

Friends of McNabs Island Society. (2008) *Discover McNabs Island (2nd Edition)*. Dartmouth, N.S.

Nova Scotia Department of Natural Resources (2005) *Management Plan: McNabs and Lawlor Island.* Information Series Pks 2005-1. Halifax, N.S.

Simovic N. (1998) *The Use of Indicator Plants as Educational Tools on McNabs Island: A Survey.* Dalhousie University. Halifax, N.S.

Willison M., Freedman B., Horn A. & Miller C. (1996) *Inventory of Ecological Values on McNabs Island, Halifax County*. Parks Canada, Halifax, N.S.

Contacts:

Friends of McNabs Island Society, Dartmouth, N.S.

Email: info@mcnabsisland.ca

Department of Natural Resources Field Office, Waverley, N.S.

Email: waverleyoffice@gov.ns.ca

Phone: 902-861-2560

Parks Canada Offices at the Citadel, Halifax, N.S.

Email: halifax.citadel@pc.gc.ca

Phone: 902-426-5080

McNabs Island School Kit updated August 2016 by Amber McMunn and Alex Miller.