The Annapolis Valley Sand Barrens

An Introductory Guide

VERSION 1

Katie McLean

Credits

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Clean Annapolis River Project

Foreword

Aerial view of Kingston, Nova Scotia.
Sean Basquill, Department of
Natural Resources and Renewables

By Sean Basquill

The Annapolis Valley Sand Barrens have long caught the attention of settlers and travellers from afar. In earlier times, they were a frustration and, for some, even a cause for disdain. Soils were poor, water was scarce, and vegetation was sparse. In 1849, Thomas Chandler Haliburton (1796-1865) wrote of the great sandplain, "It is just about as silent, and lonesome, and desolate a place as you would wish to see. All that country thereabouts, as I have heard tell when I was a boy, was once owned by the Lord, the king, and the devil. The glebe-lands belonged to the first, the ungranted wilderness-lands to the second, and the sand-plain fell to the share of the last."

Not everyone held the sand barrens with such low regard. In 1920, Harvard Botanist M. L. Fernald (1873-1950) began the first of two lengthy expeditions to Nova Scotia. As he peered out the train window from Berwick to Wilmot, he noted "vast uncultivated plains carpeted, where dry enough, with a close growth of the New Jersey pine barren *Corema conradii*; – these barrens were the finest we saw. Unspoiled, because, although these Corema heaths are forbidding enough in appearance and at the surface are highly acidic and barren, when deeply plowed and cultivated, they are transformed into the great orchards for which 'the Valley' is everywhere famed." Fernald and other early naturalists were fascinated with this outpost of southern temperate flora and by the barrens' stark beauty.

More than a hundred years earlier, Titus Smith (1768-1850) provided phenomenally prescient insights into barrens succession and soil development. Scientists have called Smith the first major contributor to plant ecology in North America. He was the first to recognize and name disjunct southern species in Nova Scotia, among them, *Corema conradii*, a species he called Acadian heath, and Pine Barrens Goldenheather (*Hudsonia ericoides*) a characteristic flower of the sand barrens.

Today many people drive by the Annapolis Valley Sand Barrens and scarcely notice their presence or realize their ecological significance. This is the largest and strongest expression of inland sand barrens in eastern Canada – a local biodiversity hot spot – hosting rare and uncommon ecosystems and species, unusual landforms, and a complex array of ecological processes. These features are wonderfully showcased in this beautiful new guide. Now local communities and visitors to this region can learn about the sand barrens and their fascinating ecological story. Fostering this kind of awareness and appreciation is critical to the conservation and restoration of this unique part of our natural heritage.

Introduction

Katie McLean

The Annapolis Valley Sand Barrens are an ecosystem found scattered throughout the Annapolis Valley, on sandy glacial deposits. This ecosystem is a local biodiversity hotspot, and home to species and plant communities rarely found elsewhere in Nova Scotia, or even Canada. Sand barrens ecosystems also provide a unique set of benefits or ecosystem services to humans.

Despite their importance, these natural sand barrens ecosystems are relatively understudied. With various threats affecting the Annapolis Valley Sand Barrens, it is estimated that only 3% of their original extent remains. This guide explains how this unique ecosystem formed in the Annapolis Valley, the species found there, the benefits it provides to surrounding communities, and how we can all help conserve it.

What are barrens?

Barrens are sparsely treed landscapes, dominated by low lying shrubs. When one thinks of what a 'barren' looks like, they might picture an uninhabitable landscape. But that's not the case! While barrens ecosystems are typically associated with harsh environments and poor quality soils, these conditions support species with special characteristics and interesting strategies for survival. As a result, barrens ecosystems often support unique and uncommon species.

As the name suggests, **sand barrens** are barrens that form over sand. They are found around the globe, including in the Annapolis Valley of Nova Scotia.

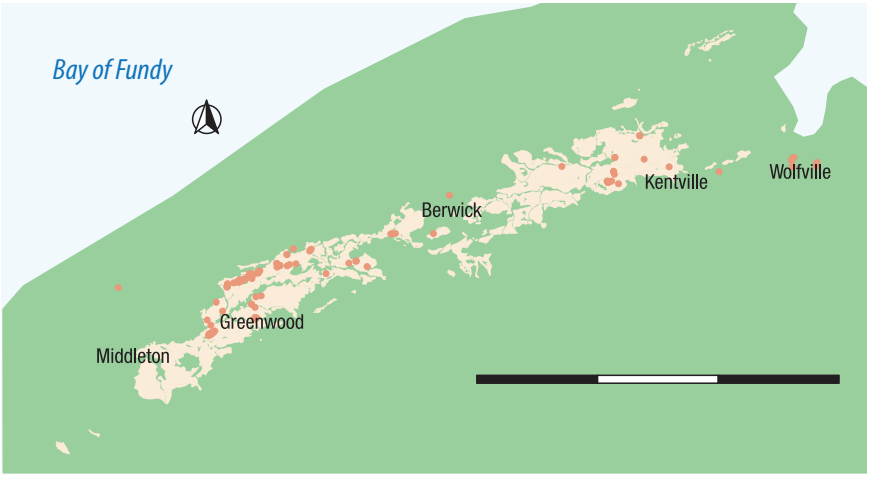
Kingston, Nova Scotia; Katie McLean

Where are the Annapolis Valley Sand Barrens?

Much of the remaining Annapolis Valley Sand Barrens can be found in the areas around Kingston-Greenwood and Kentville-Coldbrook. Its modern day extent, however, remains unknown as little research has been done on this ecosystem. This information gap provides an opportunity for us to learn more about these barrens!

On top of the following page is a 'predictive' map of the Annapolis Valley Sand Barrens. Sand deposits are mapped throughout the Annapolis Valley and observations (i.e., obtained through

It takes a community to find an ecosystem - help us find the Annapolis Valley Sand Barrens! Use the free iNaturalist app to log observations of indicator species in the area and they will automatically be used to update our predictive map. Follow our 'Annapolis Valley Sand Barrens' project on iNaturalist.



Predictive map of the Annapolis Valley Sand Barrens, with points representing observations of indicator species and lighter regions representing sand deposits.

iNaturalist) of indicator species are plotted on top to 'predict' where this ecosystem may occur. Indicator species are species that are considered highly representative of this ecosystem, and include Broom Crowberry, Common Bearberry, Pine Barrens Goldenheather, and Jack Pine. Where these species occur over sandy deposits provides a reasonable indication that sand barrens may be present.

Recent findings have indicated that the Annapolis Valley Sand Barrens may stretch farther east than originally anticipated, but more research is needed to confirm their geographic extent!

Broom Crowberry; Sean Basquill, Department of Natural Resources and Renewables

Common Bearberry; Megan Timmons

Pine Barrens Goldenheather; Megan Timmons

Jack Pine; Sean Blaney

What's Special about the Annapolis Valley Sand Barrens?

Rare Ecosystem

Sand barrens are considered globally rare ecosystems. There are many different types of sand barrens ecosystems, with the Annapolis Valley Sand Barrens being formally classified as "Broom Crowberry Sand Barrens". Broom Crowberry Sand Barrens have specific plant communities, and many include a large amount of Broom Crowberry. Nova Scotia is the only province in Canada known to support this type of ecosystem. With the majority of Broom Crowberry Sand Barrens in the province being found within the Annapolis Valley, **this area may be the best representation of this ecosystem in all of Canada, if not the world!**

Katie McLean

Home to Species of Conservation Concern

On top of being a rare ecosystem, the Annapolis Valley Sand Barrens support provincially and federally listed Species at Risk. These species include the endangered Rockrose, a plant species whose range in Nova Scotia is closely linked to occurrences of this ecosystem. The threatened Wood Turtle has also been known to use these sands for nesting. Additionally, several at-risk insectivorous (i.e., insect eating) birds may use the open landscape of the Annapolis Valley Sand Barrens for foraging, including the Common Nighthawk and Eastern Wood-pewee.

While not considered at-risk in Nova Scotia, Broom Crowberry, one of the most iconic species of this ecosystem, is considered vulnerable (according to NatureServe; see Conservation Status Badges on page 14) across its range in North America, except in Nova Scotia. This makes Nova Scotia an important stronghold for this species.

Rockrose; Alain Belliveau, E.C. Smith Herbarium

The Importance of Conservation

This ecosystem has faced and continues to face threats, with estimates suggesting that up to 97% of the Annapolis Valley Sand Barrens have been lost to date. Currently, some protections are afforded to this ecosystem under the *Nova Scotia Endangered Species Act* and the federal *Species At Risk Act*. These acts prohibit disturbing Species at Risk and protects their core or critical habitat.

There are, however, no ecosystem-level protections or management targeting the Annapolis Valley Sand Barrens specifically. In addition, the Annapolis Valley Sand Barrens are not well recognized in other parts of North America. This lack of recognition and protection can make conservation challenging.

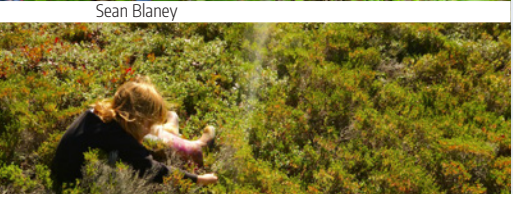
Community Benefits

The Annapolis Valley Sand Barrens support the wellbeing of the communities within and around them in a number of ways. The benefits we get from well functioning ecosystems are often referred to as ecosystem services. Here, we present four important ecosystem services the Annapolis Valley Sand Barrens provide to surrounding communities:

Ian Manning

Megan Timmons

Sean Blaney



Katie McLean

Water filtration

Rainfall is filtered by the plants as well as the deep layer of coarse sand underlying this ecosystem. This filtration provides clean water in the aquifers and rivers, and ultimately provides drinking water to local communities.

Supporting pollinators

The Annapolis Valley Sand Barrens provide habitat for burrowing Sweat Bees and a host of other pollinators. These bees are effective pollinators of both wild and garden variety flowers as well as agricultural crop species.

Berry production

This ecosystem supports species such as lowbush blueberry, serviceberry, and bearberry. Of course, humans can eat these berries, but they also support local wildlife.

Recreational opportunities

Living near or within the Annapolis Valley Sand Barrens gives community members the ability to interact with a rare ecosystem. Use the local trail systems for hiking while taking in bird watching or searching for rare wildflowers!

Habitats of the Annapolis Valley Sand Barrens

The Annapolis Valley Sand Barrens are associated to 3 main habitats, all of which are underlaid by deep sands:

1. Heathlands **2. Forests** **3. Dry bogs**

Heathlands

The heathlands are the dry, sandy areas covered by a mosaic of low-lying shrubs and lichens. The species found here are specialized to live in dry areas of high sun exposure and low nutrient availability.

Ian Manning

Natalya Naumovec via Canva.com

Katie McLean

The term heathland comes from 'heath,' referring to the heath family of plants. Thus, heathlands are areas dominated by plants of the heath family. This includes Broom Crowberry, a common species in this ecosystem, as well as blueberries.

Forests

Forests cover much of the sandy areas in the modern-day Annapolis Valley. Most trees in these forests are species of pine that do well in well-drained soils. It is thought that, historically, the sandy areas of the Annapolis Valley would have experienced periodic shifts between heathland and forest landscapes through the process of succession (i.e., more trees growing) and disturbance (e.g., fire burning down trees). See the next section on *Disturbance and Succession in the Annapolis Valley Sand Barrens* to learn more about this!

Katie McLean

Katie McLean

Katie McLean

Ian Manning

Dry bogs

Dry bogs are the most typical type of wetland in the sandy regions of the Annapolis Valley. They are relatively open, having sparse, stunted trees and are dominated by shrubs. They are referred to as 'dry' bogs because their water table drops more than 50 cm below the surface in the summer months compared to other bogs that maintain relatively stable water levels. It is thought this occurs because the sandy base of dry bogs allows excessive drainage compared to other soil types.

Dry bogs accumulate peat which is a deposit of decomposing plant material resembling soil. Peat is incredibly important for carbon storage. Worldwide, wetlands with peat soils store twice as much carbon as forests!

Sean Basquill, Department of Natural Resources and Renewables

Disturbance and Succession in the Annapolis Valley Sand Barrens

Historically, the Annapolis Valley Sand Barrens are believed to have experienced regular natural **disturbances**. Caribou herds, for instance, foraged the landscape and would trample young saplings in their paths. Additionally, fires are believed to have been more frequent on this landscape before large-scale European settlement. With the extirpation of caribou in Nova Scotia in the early 1900s and the active suppression of fires in the area to protect infrastructure, the Annapolis Valley Sand Barrens no longer experience these types of routine disturbances.

Disturbance

An event that causes a change in an environment that leads to ecological shifts to a landscape. This includes large-scale disturbances (e.g., fires) as well as small-scale disturbances (e.g. localized all-terrain vehicle (ATV) use). Disturbances can be caused by natural events or by human activities.

Succession

The natural progression of plant and wildlife communities in an ecosystem changing over time.

Periodic disturbances are important to maintain the heathlands of this ecosystem. Without disturbance to interrupt **succession**, trees become more prevalent, eventually shading out the sun-loving heathland species. Over time, the heathland transitions into forest and heathland species are lost.

Disturbance acts to interrupt this process. Fire, for instance, removes trees on a landscape. The first species to grow back following a fire must be able to tolerate open, full-sun landscapes. This includes lichens and heathland shrub species, of which many have evolved characteristics to excel in habitats affected by routine disturbances.

Ian Bryson

Megan Timmons

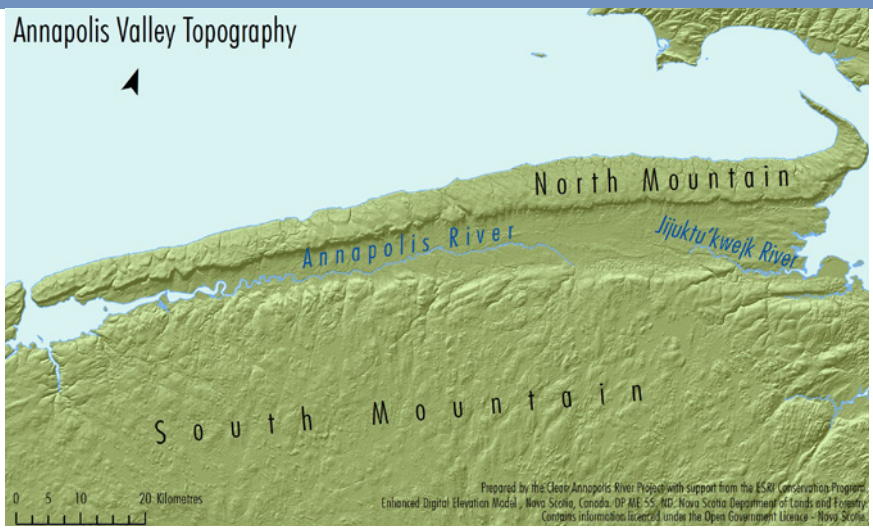
Where 'extinction' refers to the loss of a species entirely, 'extirpation' refers to the loss of a species in a given area.

The geological history that formed the Annapolis Valley Sand Barrens

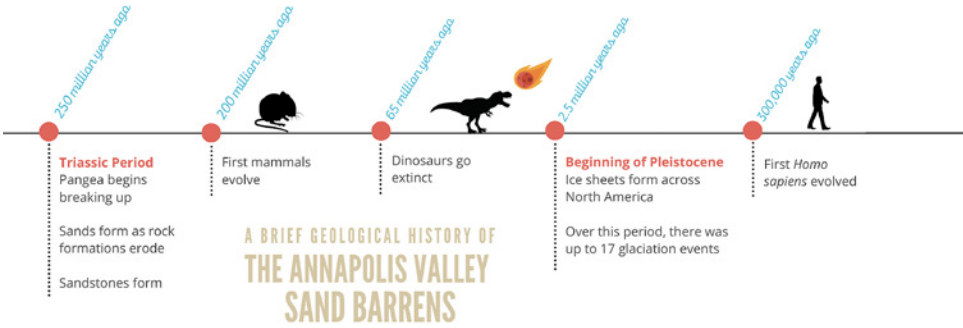
The Annapolis Valley Today

The Annapolis Valley at present-day runs northeast to southwest, nestled between the North and South Mountain.

Two major river systems run through the bottom of the valley. The Annapolis River drains to the southwest, and the Jijuktu'kwejk River drains to the northeast. But, the Annapolis Valley did not always look like this!



The modern-day topography of the Annapolis Valley, Nova Scotia.



Formation of the sand

About 200 million years ago, the supercontinent, Pangaea, began breaking up. During this time, basins, including the Bay of Fundy, began forming along fault lines. These basins filled with sands as granite and other rocks eroded from Pangaea.

Some of these sands began accumulating in lower lying areas. As sand continued to accumulate, pressure built on the deeper sand layers, helping cement them together to form sandstone. This is how the sandstone layer under the Annapolis Valley was formed.

Formation of Annapolis Valley

About 2 million years ago, the modern-day continents were largely in place.

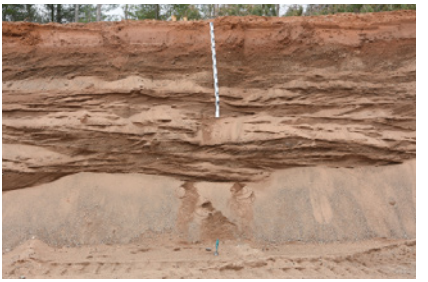
Around this time, the region we now know as the Annapolis Valley was much flatter. Rivers at the time flowed from southeast to northwest over the present-day North Mountain.

During this period, a series of glaciation events took place, each followed by a melting. Some of these glaciers were up to a kilometer tall! They carved through some of the harder rock, exposing the underlying sandstone of the Annapolis Valley.

Sandstone is a soft rock, so exposed areas erode much faster than the harder rock layers. As the erosion of the sandstone progressed, the rivers began flowing parallel with the North and South Mountains as they do in the present day.

Sand deposited in the Annapolis Valley

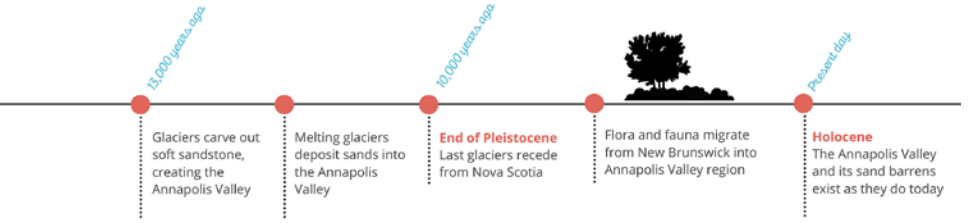
The sandstone in the Annapolis Valley eroded and broke back down to sand. The glaciers had rivers of meltwater flowing beneath them, which transported sands around, depositing them throughout the Annapolis Valley. There are regions in the Annapolis Valley where this sand is over 3.5 storeys deep!



Sean Basquill, Department of Natural Resources and Renewables

Flora and Fauna

About 10 000 years ago, the glaciers were receding from Nova Scotia. As the glaciers receded from the present day Annapolis Valley region, deglaciated corridors in the Bay of Fundy allowed the migration of species from New Brunswick into the Annapolis Valley. This includes many of the sand barrens species we see today.



*Not to accurate scale

Threats to the Annapolis Valley Sand Barrens

This ecosystem is under threat, some caused by human activity and others by changes in our climate. In this section we discuss four major threats facing the Annapolis Valley Sand Barrens:

Incompatible human land-use

Agricultural, residential, commercial, and military developments and their associated activities have harmed the Annapolis Valley Sand Barrens over the past couple hundred years through direct habitat loss, degradation and fragmentation.

Loss of natural disturbance

As human presence grew in the region following European colonization, wildfires started being suppressed to protect infrastructure and human well-being.

Wildfire suppression and the extirpation of caribou in Nova Scotia have resulted in an absence of natural disturbance in these habitats. This has led to changes in the natural dynamics of these ecosystems. Succession continues to promote the transformation of heathlands to forests but there is no natural disturbance to restore forests back to heathlands.

What's the difference between a sand barren and a desert? While the sandy soils and shrubby plants of the sand barrens may resemble a desert at times, the key difference is the amount of rainfall. To be considered a desert, an area must receive less than 250 mm of precipitation annually. Compared to this, the Greenwood area receives nearly three times this amount on average a year.

Invasive species

Over the course of the last couple centuries, a number of invasive species have been introduced into this ecosystem. One of the most prevalent is the European Scots Pine (also commonly referred to as Scotch Pine). Some landowners value these trees for their fast growth relative to native species, so they are a common choice for ornamental trees and windbreaks. Unfortunately, Scots Pine are contributing to the loss of heathland landscapes in the Annapolis Valley. Once Scots Pines reach maturity, they are effective seed dispersers and often have many saplings growing near them. This leads to Scots Pines forming dense stands. Comparatively, the native Red, White, and Jack Pines distribute their seeds more sparsely across a landscape. Because Scots Pines can quickly dominate a landscape, this encourages the transition of heathland to forests.

Andreas Rockstein via Flickr.com

Climate Change

The effects of climate change on the habitats of the Annapolis Valley Sand Barrens are not fully understood and are likely complicated.

The average temperature in Nova Scotia has increased by 1°C over the last 60 years. This temperature increase is observed mostly in cooler months of the year, so this trend could lead to longer growing seasons, which may positively affect heathland species.

As the temperature rises, however, it decreases soil moisture content, depth of water table, and discharge from streams and rivers. This could lead to more incidences of drought in the region. In addition, the effects of a lowered water table on the heathlands could spur a shift in dominance from shrub species to grasses and invasive plants.

A reduced water table could also have significant effects on the dry bogs of the Annapolis Valley Sand Barrens by reducing the amount of peat accumulation.

How can you help?

Upload your observations to iNaturalist

The Clean Annapolis River Project and its partners have started an iNaturalist project called 'The Annapolis Valley Sand Barrens'. This project automatically keeps track of observations of key indicator species of this ecosystem. These observations allow us to gain a better understanding of just how far east and west the Annapolis Valley Sand Barrens reach!

Use compatible landscaping techniques in your yard

If you live in the Annapolis Valley Sand Barrens region, you can help by using landscaping techniques compatible with this ecosystem. This includes planting native species of the Annapolis Valley Sand Barrens. Because these species are adapted to the area's low nutrient and well-draining soils, this has the added benefit of requiring less fertilizer and water!

Now that you have an understanding of what the Annapolis Valley Sand Barrens are, let's explore the amazing species that you can find there!

Species of the Annapolis Valley Sand Barrens

The following two pages are a guide to the 'badges' that you will find throughout this section. These badges highlight key traits about each species and its life in the Annapolis Valley Sand Barrens. There are three categories of badges: (1) **Conservation Status**, (2) **Habitat**, and (3) **Adaptations**.

Conservation Status Badges

Species in this guide are given these badges based on their provincial conservation status ranking by NatureServe. Look for these ranks throughout this section to better understand the status of the iconic Annapolis Valley Sand Barrens species!

Critically Imperiled - At very high risk of extirpation

Imperiled - At high risk of extirpation

Vulnerable - At moderate risk of extirpation

Apparently Secure - At a relatively low risk of extirpation

Secure - At a very low risk of extirpation

Unranked - This species conservation status has not been assessed

Exotic - Non-native species

Habitat Badges

These badges are given to species in this guide based on which habitats in the Annapolis Valley Sand Barrens you would expect to find them.

Heathland

Forest

Dry Bog

Adaptation Badges

These badges are given to plant species in this guide to highlight some of the important adaptations that allow them to thrive in the Annapolis Valley Sand Barrens.

Fire-adapted - Species with this badge have fire-adapted traits that allow them to excel in habitats disturbed by routine fires.

Ant-dispersed seeds - Species with this badge use ants to help disperse their seeds.

Hairy leaves - Species with this badge have hairs on their leaves that act to reduce air flow around the leaf, helping prevent water loss through transpiration.

Reduced leaf surface area - Species with this badge have adaptations to the shape of their leaves that give them relatively small surface area compared to broad leaved plants. This means they have less surface area for potential water loss.

Waxy leaves - Species with this badge have waxy leaves, helping prevent water loss through evaporation.

Rhizome - Species with this badge have rhizomes. Rhizomes are specialized underground plant stems that both store food and help the plant reproduce. They grow horizontally from a parent plant and can produce shoots that grow into another plant nearby. They are particularly useful following a fire as new plants can grow from surviving rhizomes underground.

For more information, please visit NatureServe.org

Lichens

Lichens are a great example of symbiosis. They are complex life-forms composed of two or even three different taxons: fungi, algae, and/or cyanobacteria.

These different life forms live together and function as one organism. For instance, the fungi portions of a lichen may create the general skeleton, whereas the algae or cyanobacteria portions use photosynthesis to provide food. This symbiotic relationship between life forms allows some lichens to excel in sand barrens.

Star-tipped Reindeer Lichen *(Cladonia stellaris)*

Ian Manning

Ian Bryson

Ian Bryson

Symbiosis is a term used to describe mutually beneficial relationships between species in nature.

The Star-tipped Reindeer Lichen is Canada's unofficial national lichen

Sand-loving Iceland Lichen *(Cetraria arenaria)*

Ian Manning

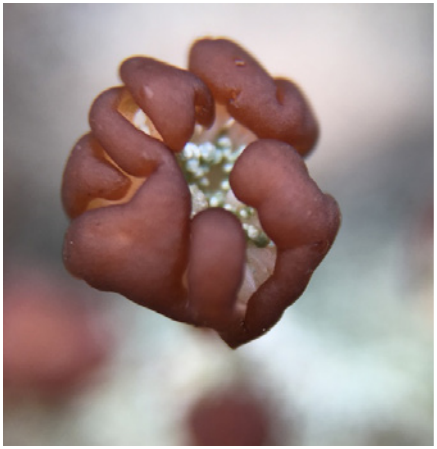
Thomas Palmer

Sean Basquill, Department of
Natural Resources and Renewables

Lichens

Granular Soil Foam Lichen *(Stereocaulon condensatum)*

Ian Bryson



Ian Bryson

Ian Bryson

The image directly above is a reproductive structure that produces spores for sexual reproduction. Spores are different from seeds as they are composed of a single cell. Some lichens can also reproduce asexually when pieces are broken off that contain both the fungi and algae/cyanobacteria portions.

Cyanobacteria is a term used for bacteria that can photosynthesize.

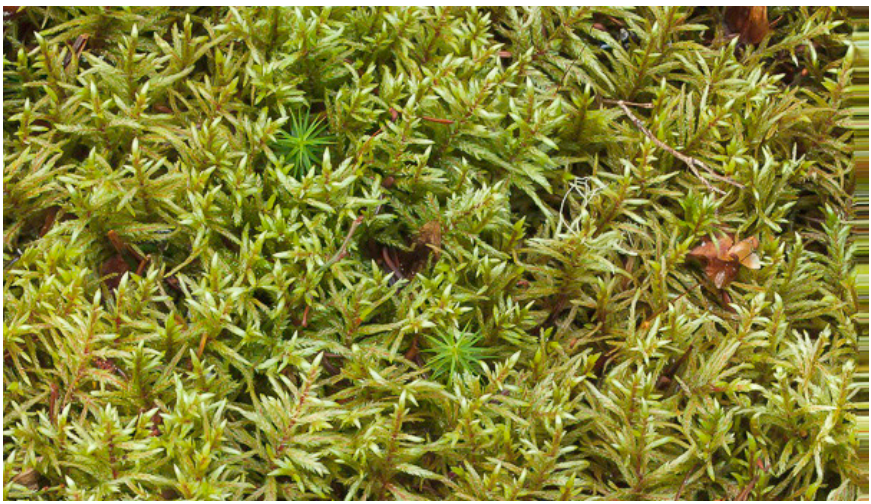
Mosses

Mosses are low-lying, simple forms of plants that have been around for hundreds of millions of years. They absorb their nutrients and water directly through their surfaces, without true roots. They tend to be found more abundantly in the wetter and more shaded portions of the Annapolis Valley Sand Barrens.

Red-stemmed Feathermoss *(Pleurozium schreberi)*

Northern Forest Atlas

Northern Forest Atlas



Northern Forest Atlas

In some parts of the world, Red-stemmed Feathermoss was used to insulate houses.

Mosses

Juniper Haircap Moss *(Polytrichum juniperinum)*

Northern Forest Atlas

Distant Hill Gardens via Flickr.com

VIDOK via Canva.com

Sporophytes (the long, grass-like structures pictured above) produce spores which allow mosses to reproduce.

Herbaceous Plants

Herbaceous plants are plants that have non-woody stems. The Annapolis Valley Sand Barrens tend to have landscapes speckled with various herbaceous plants such as goldenrods and grass-like species.

Field Goldenrod a.k.a **Gray Goldenrod** *(Solidago nemoralis)*

Joshua Mayer via Flickr.com

Frank Mayfield via Flickr.com

Sean Blaney

Herbaceous Plants

Large-pod Pinweed a.k.a. **Narrowleaf Pinweed**
(Lechea intermedia)

The Large-pod Pinweed is fire-adapted, making it well suited for the Annapolis Valley Sand Barrens. Exposure to extreme heat significantly improves the germination success of its seeds. This allows it to be among the first species to recolonize open, dry, hot areas like those produced by fires.

Sean Blaney

Megan Timmons

Lewnanny Richardson

Sean Basquill, Department of Natural Resources and Renewables

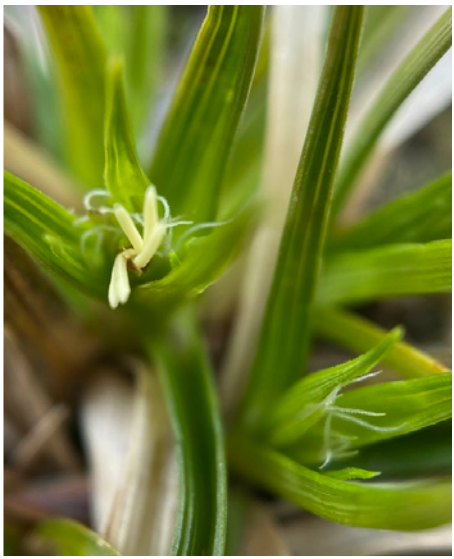
Herbaceous Plants

Shaved Sedge *(Carex tonsa)*

This species grows in dense clusters, which may be an adaptation to help conserve water.

Sean Blaney

Michael Hough



Ian Bryson

Herbaceous Plants

Arrow-leaved Violet *(Viola sagittata)*

This species does best in dry soils with routine disturbance preventing it from being outcompeted by woody plant growth. Similar to some other plants in the sand barrens, the Arrow-leaved Violet drops its seeds, making a 'seed bank' below the parent plant. Following a fire, these seeds will germinate, allowing it to recolonize the area.

Richard Abbott

Sean Basquill, Department of Natural Resources and Renewables

Diana Soteropoulos

Herbaceous Plants

Rockrose a.k.a **Long-branched Frostweed** or **Canada Frostweed**
(Crocanthemum canadense)

Rockrose is a Species at Risk, legally listed as Endangered in Nova Scotia. It prefers sandy soils and is sun-loving, making it a great specialist for the Annapolis Valley Sand Barrens.

Rockrose requires disturbance to maintain open, sunny areas to prevent it from being outcompeted by other plants. Additionally, while Rockrose produces normal seeds through pollination, it also produces a special type of seed that often requires disturbance to germinate. This gives it a competitive edge when there are routine fires because even if a fire destroys the parent plant, the seeds can still germinate. These seeds have significantly lower germination rates in the absence of fire disturbance, however.

Alain Belliveau, E.C. Smith Herbarium

Brittni Scott

Katie McLean

Anton Reznicek

The flower of Rockrose only opens one day a year for about 3 hours for pollination. After this short time, the petals fall off.

The name 'Frostweed' comes from a special phenomenon only seen in a few species. When environmental conditions are just right, with air temperatures reaching freezing but the ground is not yet frozen, water in the plant's stem can be drawn upward causing the stem to split. As the water exits the split, it freezes instantly as it contacts the air. Water continues to exit and freeze, forming a delicate ribbon of ice. As this ribbon grows and bends, it creates a unique 'frost flower'.

Shrubs

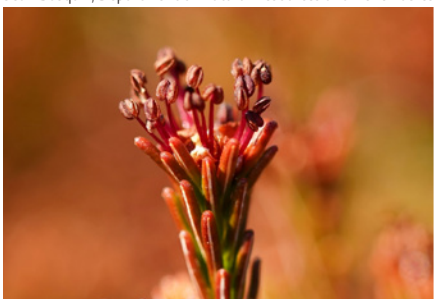
Shrubs are short, woody plants. They are the dominant species of the heathlands and dry bogs.

Broom Crowberry *(Cormea conradii)*

Broom Crowberry is the most prevalent species of the heathlands of the Annapolis Valley Sand Barrens. Broom Crowberry is considered vulnerable across its range, except in Nova Scotia. This means Nova Scotia can act as a stronghold for this species, making it a critical plant to conserve provincially.

Broom Crowberry is well adapted to life in the sand barrens. It has needle-like leaves, reducing the surface area for water loss. It has also developed a symbiotic relationship with ants that helps it live in this ecosystem! See the section on ants (pg 49) for more information.

Sean Basquill, Department of Natural Resources and Renewables



Megan Timmons

Broom Crowberry seeds; Sean McCann

Broom Crowberry is named after its broom-like flowers.

Shrubs

Common Bearberry *(Arctosaphylos uva-ursi)*

Bearberry, along with Broom Crowberry, helps make up the predominant plant cover on the heathlands. It has thick, waxy leaves that help it both store water and prevent water loss. In addition, disturbance, including fires, help bearberry seeds to germinate.

Megan Timmons

Megan Timmons

USO via Canva.com

Brittni Scott

Shrubs

Sweet Fern *(Comptonia peregrina)*

Sweet Ferns are, in fact, not true ferns, although their leaves resemble them. These leaves have a strong, sweet smell, hence their name. Sweet-fern roots are able to fix nitrogen, allowing them to do well in low nutrient soils like those of the Annapolis Valley Sand Barrens.

Sean Blaney

Northern Forest Atlas

Megan Timmons

Ian Manning

Shrubs

Lowbush Blueberry *(Vaccinium angustifolium)*

Lowbush Blueberries are a fairly common species of the Annapolis Valley Sand Barren heathlands. They do best in sandy, acidic soils like those found in the sand barrens. The bell-shaped flowers of this species are important for supporting native pollinators, and the berries are important for supporting the diet of local wildlife species.

Megan Timmons

Sean Blaney

Ian Manning

Bex Goreham

Shrubs

Pine Barrens Goldenheather *(Hudsonia ericoides)*

Pine Barrens Goldenheathers drop their seeds which collect in the soil under the plant, creating a 'seed bank'. Disturbance, including fires, helps these seeds to germinate.

Megan Timmons

Sean Basquill, Department of Natural Resources and Renewables

Megan Timmons

Megan Timmons

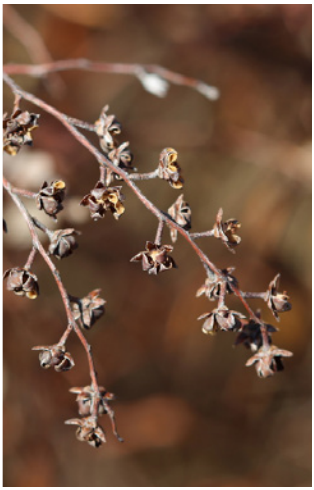
Shrubs

Leatherleaf *(Chamaedaphne calyculata)*

Megan Timmons

Brittni Scott

Ian Bryson



Megan Timmons

Despite not having needle-like leaves, leatherleaf is considered an evergreen bush. This means they do not lose their leaves every year.

Shrubs

Sheep Laurel a.k.a. **Lambkill**
(Kalmia angustifolia)

Ian Manning

Northern Forest Atlas

Megan Timmons

Sometimes referred to as 'Lambkill,' this plant has evolved toxins that help prevent herbivory. Oddly, these toxins seem to have little effect on deer!

Shrubs

Rhodora *(Rhododendron canadense)*

Megan Timmons

Ian Manning

Megan Timmons

While Rhodora are known for their showy pink flowers, there is a rare variety that produces white flowers.

Trees

Earlier successional trees

Early successional trees have characteristics, such as a tolerance for full sunlight, that allow them to be among the first to dominate the landscape following a disturbance.

Jack Pine *(Pinus banksiana)*

Jack Pine is an evergreen species well adapted to sandy soils and is fire-adapted. They have thickened bark, helping to make them somewhat fire-resistant, but most importantly, Jack Pines produce serotinous cones. Serotinous cones have a special design that promotes seed dispersal during and immediately following fires. Resin seals serotinous cones shut and prevents the release of seeds in normal conditions. Extreme heat will melt the resin, releasing the seeds. This ensures that even if a fire destroys the tree, its seedlings can recolonize the landscape. Extreme heat without fire can also open the cones, but this is less beneficial to Jack Pine. Climate change and its associated warming temperatures may threaten the presence of Jack Pine in the Annapolis Valley given that southern Nova Scotia represents the southern tip of this species' distribution range.

Sean Blaney

Megan Timmons

Northern Forest Atlas

Northern Forest Atlas

Fun Fact: Try it yourself! Collect some Jack Pine serotinous cones and try putting them in the oven or BBQ on a pan, or even put them in a campfire. As the resin warms up, you'll see the cones open up and release their seeds!

Trees
Earlier successional trees

Gray Birch *(Betula populifolia)*

Following a disturbance such as fire or logging, Grey Birch are able to quickly regrow from remaining stumps.

Brittni Scott

Megan Timmons

Ian Manning

Lewnanny Richardson

Trees

Later successional trees

Later successional trees tend to do better in relatively shadier environments, although all these tree species still need a fair amount of sunlight to thrive. These trees grow in the understory of early successional trees, and can eventually dominate the landscape as early successional species die out.

Red Oak *(Quercus rubra)*

The root systems of Northern Red Oak often survive fire and will grow shoots better than most other tree species.

Lewnanny Richardson

Ian Manning

Sludge G via Flickr.com

Andreas Rockstein via Flickr.com

Northern Red Oaks can live to be 500 years old.

Trees
Later successional trees

Eastern White Pine *(Pinus strobus)*

Similar to Jack Pine, this species has relatively thick bark increasing its chance of survival in a fire.

Brittni Scott

Ian Manning

Ian Manning

Megan Timmons

The Eastern White Pine is the tallest growing tree in Eastern Canada and can grow over 30 meters tall!

Trees
Later successional trees

Red Pine *(Pinus resinosa)*

Ian Bryson

Lewnanny Richardson

Ian Manning

Sean Basquill, Department of Natural Resources and Renewables

Megan Timmons

The Red Pine is sometimes referred to as a Norway Pine, although it is in fact not native to Norway! It is thought that this name may have been the result of the early English settlers confusing the Red Pine with Norway Spruce.

Black Spruce *(Picea mariana)*

Black Spruce are typical of the Dry Bogs of the Annapolis Valley Sand Barrens, preferring the wet, peat soils. They also have semi-serotinous cones helping them reproduce following a fire.

Sean Blaney

Nicholas A. Tonelli via Flickr.com

Nicholas A. Tonelli via Flickr.com

Ian Bryson

Black Spruce cones can stay on a tree for up to 30 years!

White-throated Sparrow *(Zonotrichia albicollis)*

This ground-nesting bird often forages seeds in open areas, such as the Annapolis Valley Sand Barrens, as well as the disturbed landscapes following a fire.

PaulReevesPhotography via Canva.com

PaulReevesPhotography via Canva.com

Both male and female White-throated Sparrows can have one of two colour forms – they can either have white stripes along their head (bottom) or tan stripes (top). Interestingly, white-striped individuals tend to be more aggressive than tan-striped individuals.

Common Yellowthroat *(Geothlypis trichas)*

You can find Common Yellowthroats in the dry bogs of the Annapolis Valley Sand Barrens. Males of this charismatic wetland warbler species are easily distinguished from females by the black mask on their face.

Sean Blaney

PaulReevesPhotography via Canva.com

Carol Hamilton via Canva.com

Carol Hamilton via Canva.com

Female Common Yellowthroats tend to prefer males with larger face masks.

Birds

Pine Warbler *(Setophaga pinus)*

This is a rare species in the Maritimes, with Nova Scotia being along the northern tip of its range. It is closely associated with pine forests, with its diet consisting largely of pine seeds.

Raymond Henessey via Canva.com

Bethany Kay via Canva.com

wingsinnature via Canva.com

Nashville Warbler *(Leiothlypis ruficapilla)*

This insectivorous bird prefers a habitat that is sparsely treed, making early successional forests or heathlands ideal. This bird nests on the ground, often in pine needles.

PaulReevesPhotography via Canva.com

Mick Thompson via Flickr.com

Rumen Rayek via Canva.com

One of the easiest ways to pick out an adult male Nashville Warbler from a female is the subtle chestnut-coloured patch on top of the male's head. Can you spot the difference?

Birds

Eastern Wood-pewee *(Contopus virens)*

The Eastern Wood-pewee is a Species at Risk, provincially listed as Vulnerable and federally listed as Special Concern. You can find these insectivorous birds in the forested habitats of the Annapolis Valley Sand Barrens, especially in areas with hardwood trees but also in pine stands. Eastern Wood-pewee nest in live trees and often decorate their nests on the outside with lichens.

Andrew Weizen via Flickr.com

BrianEKushner via Canva.com

Jeff Bryant via Flickr.com

The Eastern Wood-pewee is named after its distinctive 'pee-a-wee' call.

Common Nighthawk *(Chordeiles minor)*

The Common Nighthawk is a Species at Risk, listed as Threatened both provincially and federally. This species is, in fact, not a hawk. It requires open areas to hunt insects, making the Annapolis Valley Sand Barrens an ideal foraging habitat.

Joaquin Paredes via Canva.com

Jukka Jantunen via Canva.com

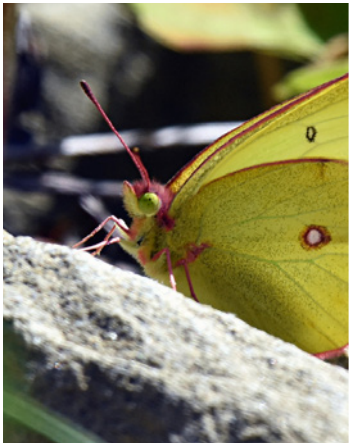
BOOM

Common Nighthawks make a loud 'boom' noise that sounds almost like an engine braking. They do this by rushing air in a particular way over their feathers while diving. Males will make this noise to attract females or to try to warn off predators. Check it out on YouTube!

Pink-edged Sulphur *(Colias interior)*

This butterfly species lays its eggs on blueberry leaves or the leaves of other heath species, making the Annapolis Valley Sand Barrens an ideal breeding habitat for this species.

Jason Forbes via Flickr.com



Jimmy Dee

Jimmy Dee

Immaculate Antlion *(Myrmeleon immaculatus)*

Antlions are named for their squat, large-jawed larvae. These larvae occur only in sand, where they hide, partially buried, at the bottom of small excavated pits. They use their large jaws to capture and consume any insects that fall into their pit. Watch for the adults, which have large wings and clubbed antennae, at porch lights!

Ludo Leclerc

Ian Manning

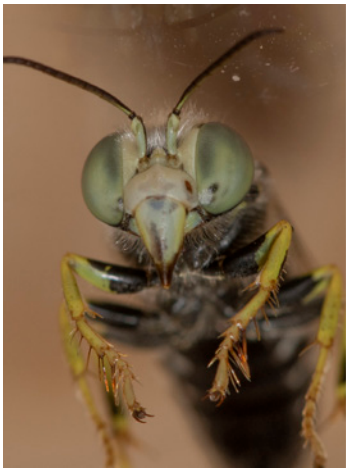
yogesh_more via Canva.com

Insects

American Sand Wasp *(Bembix americana)*

Typically found on coastal beaches in the Maritimes, the American Sand Wasp is also common in the open sandy habitat of the Annapolis Valley. Females dig nest burrows, which provide growing young a steady diet of flies.

Sean McCann



Owen Ridgen

Owen Ridgen

Insects

Ants *(Family Formicidae)*

Ants in the Annapolis Valley Sand Barrens are understudied. We do, however, know that they play a crucial role in shaping the landscape of this ecosystem.

Ants have developed an extraordinary relationship with some heathland plant species by helping disperse their seeds. This includes the iconic Broom Crowberry. Broom Crowberry produces a nutrient-rich substance attached to their seeds that attracts ants. Ants bring these seeds to their nests to eat the nutrients and then take the seeds out of their nest, often creating crescent-shaped seed deposits as pictured below. This is an incredibly important process for Broom Crowberry to disperse its seeds.

Sean McCann

Sean McCann

Sean McCann

Insects

Sweat Bee *(Lasioglossum* species)

Although they are understudied, evidence of Sweat Bee burrows has been detected deep in this ecosystem's sand layers, indicating an age-old relationship.

These bees need loose, sandy soils to build their burrows, making the Annapolis Valley Sand Barrens an important habitat for them. Although these bees do not produce honey, they are important pollinators for wildflowers and agriculture in the area.

Elena Ponomarenko

Agnes Barr-Klouman

Ashlea Hegedus-Viola

The speckled pattern (the image above to the left) in the soil layers of the Annapolis Valley Sand Barrens shows historic sweat bee burrows. These bees live independently or in small groups and build their burrows underground.

Wood Turtle *(Glyptemys insculpta)*

The Wood Turtle is a Species at Risk, listed as Threatened both provincially and federally. They require a mix of habitat types to survive, including rivers for aquatic habitat and fields or forests for foraging in the summer. Wood turtles need sandy ground for nesting and usually use the same nesting site year after year.

creighton359 via Canva.com

Jerry Edmundson

Wood Turtles stomp on the ground, creating vibrations that encourage earthworms to the surface for them to eat. It could be that these vibrations trick the worms into thinking it is raining, to which the worms react by coming to the surface to avoid drowning.

Other Wildlife

Hygroscopic Earthstar *(Astraeus hygrometricus)*

This peculiar-looking fungus does well in sandy soils as well as on disturbed ground. They can be found individually or in groups.

Nick Hill

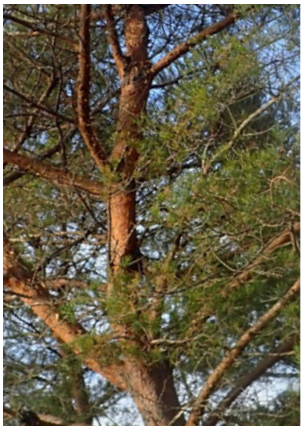
Colin Chapman-Lam

David Mazerolle

When wet, the outer layer of this fungus closes into a ball to protect itself from predators such as snails.

Scots Pine a.k.a **Scotch Pine** *(Pinus sylvestris)*

Originally from Europe, Scots Pine is invasive across much of North America. This species has quickly become problematic in the Annapolis Valley Sand Barrens. It outcompetes native pines and transforms the landscape into an unsuitable environment for heathland species.



Ian Manning

Megan Timmons

Ian Manning

Katie McLean

Katie McLean

Now you know more about the Annapolis Valley Sand Barrens and its interesting species. The conservation of this incredibly unique and rare ecosystem depends on the stewardship of its local community members!

Contact us to hear more about our work and how you can get involved!

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Glossary of Terms

Barren
A landscape that is sparsely treed and dominated by low-lying shrubs.

Disturbance
An event that causes a change in an environment that leads to ecological shifts to a landscape.

Ecosystem services
The benefits and services that functioning ecosystems provide to humans.

Extinction
The loss of a species globally.

Extirpation
The loss of a species regionally.

Fire-adapted
Species that are 'fire-adapted' have traits that allow them to excel in ecosystems prone to fire.

Heathland
A landscape dominated by shrubs of the heath or heather family.

Rhizome
Specialized underground plant stems that both store food and help the plant reproduce.

Serotinous cones
These types of cones are sealed with resin and open in extreme heat to release seeds.

Succession
The natural progression of plant and wildlife communities in an ecosystem changing over time.

Know Your Pines

Use this section to identify pine species on your property! Here are two helpful tips for starting:

Tip 1 Start by looking at the number and size of needles grouped together.

Tip 2 Examine the size and shape of the cone.

Jack Pine

S. Rae via Flickr.com
Brittni Scott

Joshua Mayer

Sean Blaney

Needles: • Grouped in twos • 3-5 cm long • Twisted • Rigid and sharp

Cones: •Serotinous cones grow near tips of branches • Often closed and curved • ~5 cm long

Bark: • Consistently brown on the tree

Red Pine

bjphotographs via Canva.com
Brittni Scott

Jani_Autio via Canva.com

S. Rae via Flickr.com

Needles: • Grouped in twos • 9-15 cm long • Flexible and soft

Cones: • ~5 cm long

Bark: • Red and brown

White Pine

Ian Manning
Brittni Scott

seven75 via Canva.com

Ian Manning

Needles: • Grouped in fives • 5-10 cm long • Straight • Flexible and soft

Cones: • ~ 20cm long

Bark: • Grey and reddish-brown. • Very thick and ridged when old

Scots Pine

Andreas Rockstein via Flickr.com
Brittni Scott

Megan Timmons.com

andreaskrappweis via Canva.com

Needles: • Grouped in twos • 4 - 9 cm long • Twisted • Rigid and sharp

Cones: • ~ 5cm long

Bark: • Greyish-brown bark on most of the tree • Young branches and and treetops are orange