



Natural Heritage Hikes

Wolfe's Neck Woods State Park

Harraseeket Trail - 1.8 miles round trip, moderate

The land that has become Wolfe's Neck Woods State Park was donated to the state by Eleanor Houston and Lawrence M.C. Smith, notable conservationists and philanthropists. Eleanor Houston and Lawrence Smith also donated the land for the nearby Maine Audubon Society's Mast Landing Sanctuary, the Wolfe's Neck Center for Agriculture and the Environment, and the Percy & Small Shipyard grounds for the grounds of the Maine Maritime Museum in Bath. Part of their vision has been to connect people to the natural lands of Maine, and the habitats and species that occur here. In this Natural Heritage Hike, we explore the habitats of Wolfe's Neck State Park through the ferns, their relatives and several other spore-bearing species.

Getting There

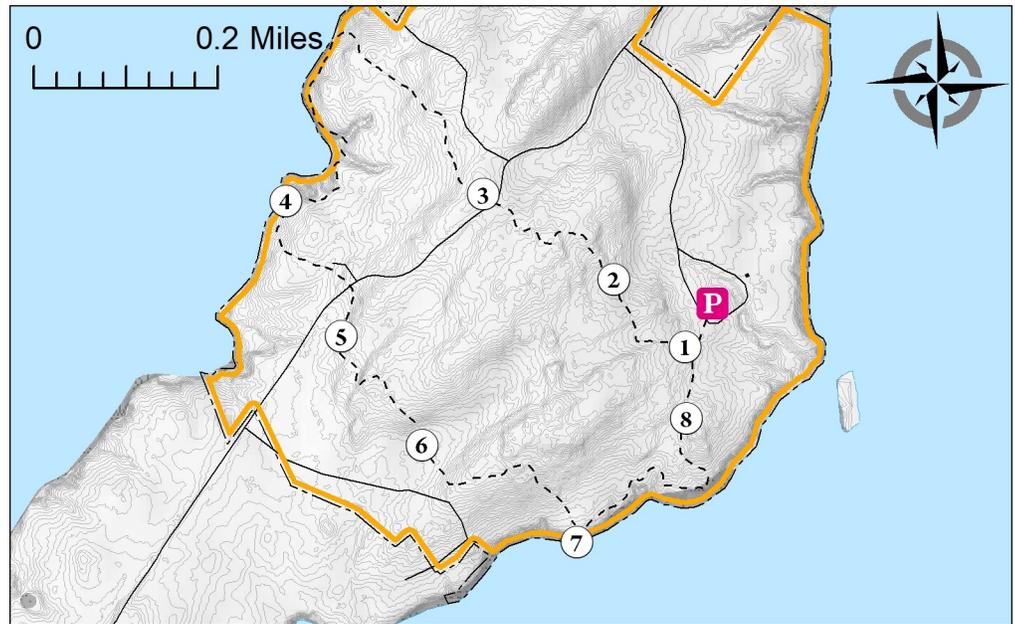
The entrance to Wolfe's Neck Woods State Park is along the Wolfe's Neck Rd. in Freeport.

Please visit mainetrailfinder.org for more information.

What are spores?



Many types of plants, fungi, algae and protozoa produce spores. Spores are (usually) single celled elements of sexual or asexual reproduction and dispersal. In ferns, spores develop into an intermediate life stage known as a *gametophyte*, which produces sperm and egg cells that fertilize itself or other gametophytes. Gametophytes are small and not easily recognizable. What we typically recognize as a fern is a *sporophyte*, which forms after fertilization.



① Wood ferns - 70.084241, 43.821137

Common inhabitants of upland forest, these species can be difficult to split apart.

At the trailhead, the forest has a rocky substrate and supports a mix of mature red spruce, red maple and white pine in the canopy. This association of trees is typical in areas of Wolfe's Neck State Park with thin soils. Spinulose wood fern (*Dryopteris carthusiana*) is a common species of mature upland forest at Wolfe's Neck State Park. As a group, wood ferns (*Dryopteris species*) can be difficult to identify, as they freely hybridize when growing in mixed populations. Spinulose wood fern can be distinguished from intermediate wood fern (*Dryopteris intermedia*) by examining the first lower leafules on the lowest leaflets. These leafules are typically as long or longer than the adjacent leafule. In intermediate wood fern, these leafules are shorter than the adjacent leafules. Spinulose wood fern is a species of hybrid origin, with intermediate wood fern and a now-extinct fern species as its parent species. Spinulose



First lowest leafule of spinulose wood fern.



Infertile (green) and fertile (cinnamon colored) fronds of cinnamon fern (*Osmundastrum cinnamomeum*).



Decaying log with hemlock reishi (*Ganoderma tsugae*).



The author's son with large white matsutake (*Trichaloma magnivarle*).

wood fern is widely scattered throughout the park. It can occur in a variety of moist forest habitats, but is less tolerant of open canopy conditions. If the forest canopy is disturbed, such as by wind, fire or insect pests, this habitat would be less suitable for spinulose wood fern. [Studies](#) have shown that wood ferns decline following major environmental changes, such as timber harvesting clear cuts.

② **Cinnamon fern** - 70.085807, 43.822182

A wetland indicator, cinnamon fern is regularly found in seepages and swamps

While Wolfe's Neck State park does not contain any extensive wetlands, numerous small forest seeps are widely scattered throughout the park. Common tree species in these wet areas include balsam fir and red maple. Several common fern species can be found in these seepage wetlands. Cinnamon fern (*Osmundastrum cinnamomeum*) is the park's largest wetland fern species, and is readily identified in the summer by its cinnamon colored fertile frond. In larger wetlands (outside the park), cinnamon fern can form large clonal colonies, and may in some cases become the dominant herbaceous species.

③ **Hemlock forest** - 70.088676, 43.823492

The impacts of hemlock woolly adelgid, and a tale of two fungi.

Wolfe's Neck Woods State Park is at the front lines of the ecological changes to Maine's forests caused by the Hemlock woolly adelgid. The Hemlock woolly adelgid is a non-native invasive insect that feeds on Eastern hemlock, typically killing trees in less than a decade. After feeding on trees at the park for years, mostly unseen, many trees are now greatly weakened and are dying. Though the Maine Forest Service has been releasing [predatory beetles to control woolly adelgid](#), most hemlocks at Wolfe's Neck State Park will likely be killed in the next decade. The loss of hemlock from the park will have long term consequences for the ecology of the forest.

Like ferns, fungi also use spores as part of their reproductive cycle. Many medicinal and edible fungi species can be found in hemlock forest that will be affected by hemlock woolly adelgid including two notable species, hemlock reishi (*Ganoderma tsugae*) and white matsutake (*Trichaloma magnivarle*). Hemlock reishi is a wood rotting shelf fungus that only occurs on hemlock. Reishi is known to have medicinal properties when prepared in teas. Reishi will initially benefit from the bounty of decaying hemlock wood that is in our future. If biocontrols are not effective in limiting woolly adelgid, this species will eventually decline after large hemlock logs have rotted away.

White matsutake is a mycorrhizal species that grows in symbiosis with eastern hemlock. The mycelium, or vegetative filaments, of matsutake intertwine with hemlock roots where they help the tree absorb nutrients and moisture in exchange for sugars derived through photosynthesis. White matsutake are



Dense patch of hayscented fern
(*Dennstaetia punctilobula*).



Ground pine (*Dendrolycopodium
obscurum*).



Lacy branches of wood horsetail
(*Equisetum sylvaticum*)

fairly specialized, and may occur in association with hemlock, red pine, jack pine, and pitch pine. While this species will not disappear from our woods, its extent will be dramatically reduced by the decline of eastern hemlock.

④ **Hay scented fern** - 70.092957, 43.823342

In disturbed soils, some native fern species form dense colonies.

While most areas of Wolfe's Neck State Park have been used historically for agriculture, as evidenced by a myriad of crumbling stone walls, some areas of the park were likely used more intensively or for a longer duration. In the northwest portion of the park, the forest bears the evidence of more intensive agricultural impact. Here, many non-native species, such as bush honeysuckle (*Lonicera morrowii*) and Japanese barberry (*Berberis thunbergii*) have become established. Hay scented fern (*Dennstaetia punctilobula*) also grows abundantly here. Hay scented fern is a native species that thrives in disturbed soils, forming dense colonies. Hay scented fern is also not consumed by deer, and can thrive in areas with deer overabundance. Hay scented fern is known to hinder tree seedling establishment by forming a thick root mat and by blocking light from reaching the forest floor.

⑤ **Clubmosses**- 70.091714, 43.821234

These ancient fern relatives are widespread in upland forests.

Clubmosses are not related to mosses, but are a group of vascular plant species closely related to ferns. These species are, evolutionarily speaking, quite ancient. There are 14 species of clubmosses known to occur in Maine. These species have a variety of habitat preferences, with some preferring wetland sites, others preferring dry sites, and a few that only grow in alpine settings. Several common species can be found at Wolfe's Neck State Park including ground pine (*Dendrolycopodium obscurum*) and bristly clubmoss (*Spinulum annotinum*). A highly flammable powder made from dry clubmoss spores called "lycopodium powder" was historically used in flash photography and fireworks, and is still used for theatrical effects.

⑥ **Horsetails** - 70.089932, 43.819537

An ancient species, now diminutive.

Horsetails are another group of spore bearing vascular plants related to ferns. Over 200 million years ago, tree-sized horsetails were dominant in many areas of the planet. Horsetail biomass contributed significantly to the coal beds that originated during this time. Changes to the global climate and the evolution of conifer and cycad species led to the decline of giant horsetails. Today, several much smaller horsetail species occur in Maine's forests and wetlands. The wood horsetail (*Equisetum sylvaticum*) is unique among Maine horsetails in that its slender branches are compound (multiple branched). Wood horsetails occur in moist woods and forested wetlands.



Rockweed, including knotted wrack (*Ascophyllum nodosum*), carpeting rocks in sheltered tidal waters.



Rock polypody fern (*Polypodium virginianum*) colonizes crevices in boulders and ledges.

⑦ **Rockweed**- 70.086539, 43.818044

A marine algae with a symbiotic relationship.

Maine's rocky coastline is characterized by the vast beds of rockweed that line many of its sheltered tidal waters. One of the most common rockweed species on the Maine coast is knotted wrack (*Ascophyllum nodosum*). While spores are part of the life cycles of some algae species, knotted wrack is a multicellular algae that reproduces by production of sperm and egg cells which are released in spring without an intermediate spore and gametophyte stage. Fertilized 'zygotes' settle on rough surfaced areas and begin to grow a new algae. Around that time in its life cycle, knotted wrack becomes inoculated with spores of the fungus *Mycophycias ascophylli*. The relationship between knotted wrack and this fungus is symbiotic, and knotted wrack is known to grow faster and be more resistant to desiccation when inoculated with this fungus. In fact, knotted wrack is never found without this fungus in the wild. There is some debate about whether knotted wrack could, in fact, be [considered a lichen!](#)

⑧ **Rock polypody**- 70.084194, 43.820008

A fern with a boulder habit.

Because of Maine's glacial geology, our upland landscape contains many boulders, ledges, and rock outcrops. Rock polypody (*Polypodium virginianum*) is a fern species that is specialized to grow on crevices in rock, usually in moist woods. Rocky polypody is an evergreen fern that can withstand extreme fluctuations in moisture. Rock polypody helps weather rock surfaces, accelerating soil formation.

Property Manager: Maine Bureau of Parks and Lands, Wolfe's Neck Woods State Park
426 Wolfe's Neck Rd, Freeport, ME 04032
(207) 865-4465 / www.ParksAndLands.com

Natural Heritage Hikes is a project of the [Maine Natural Areas Program](#) in partnership with the [Maine Trail Finder](#) website.

For more Natural Heritage Hikes, please visit www.mainetrailfinder.com.

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