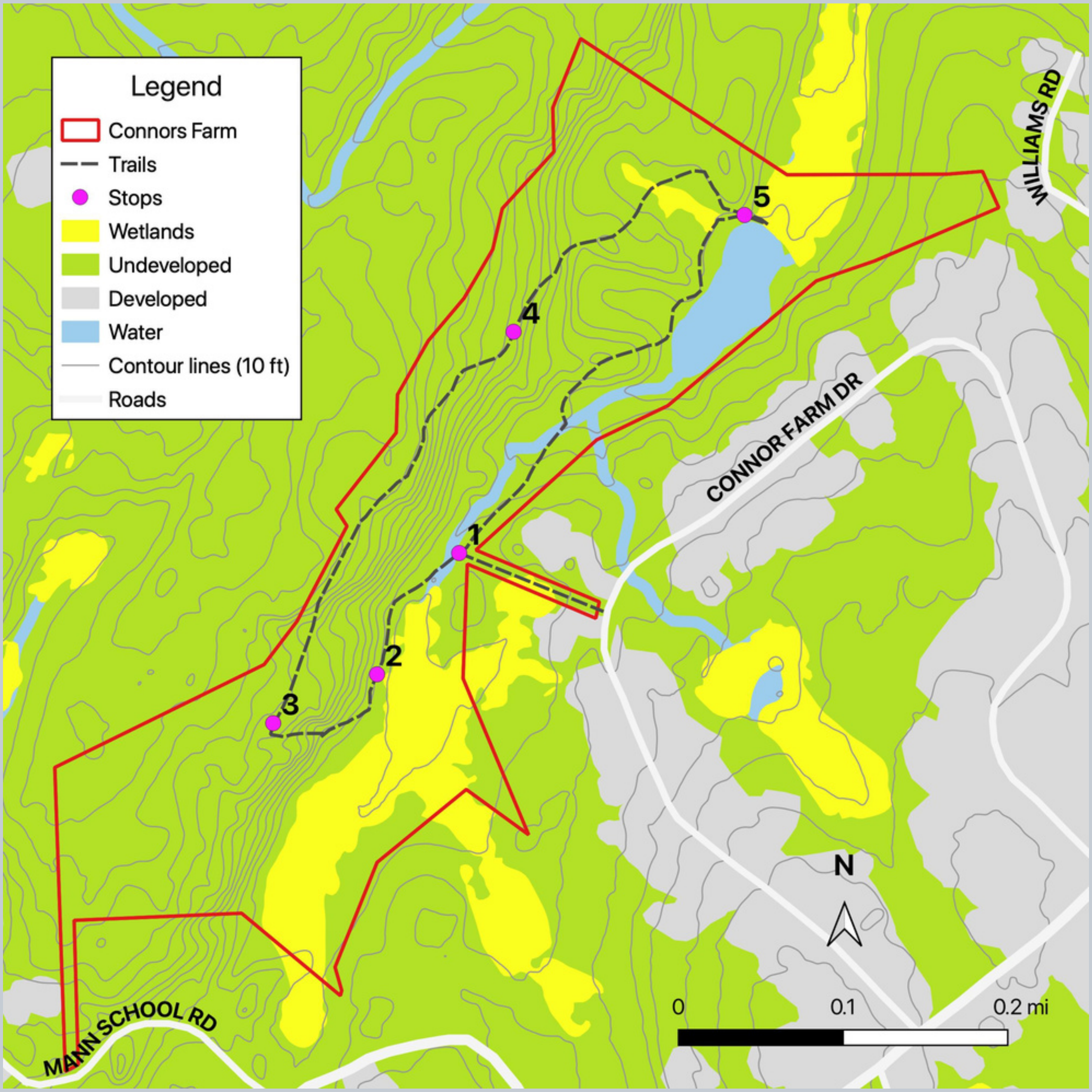
CONNORS FARM

Welcome!

This hike starts at a small parking area hidden behind a Smithfield sub-division. The development you've just driven through was built on the site of the Connor family dairy farm. The back edge of the farm, with its intact woodlands and steep, rocky slopes, was protected by the Smithfield Land Trust for public use. Follow along with the stops on the map for a gentle to moderate, roughly one mile loop and learn more about this special place!



Map of Connors Farm

STOP 1 - SOME VERY GNEISS ROCKS

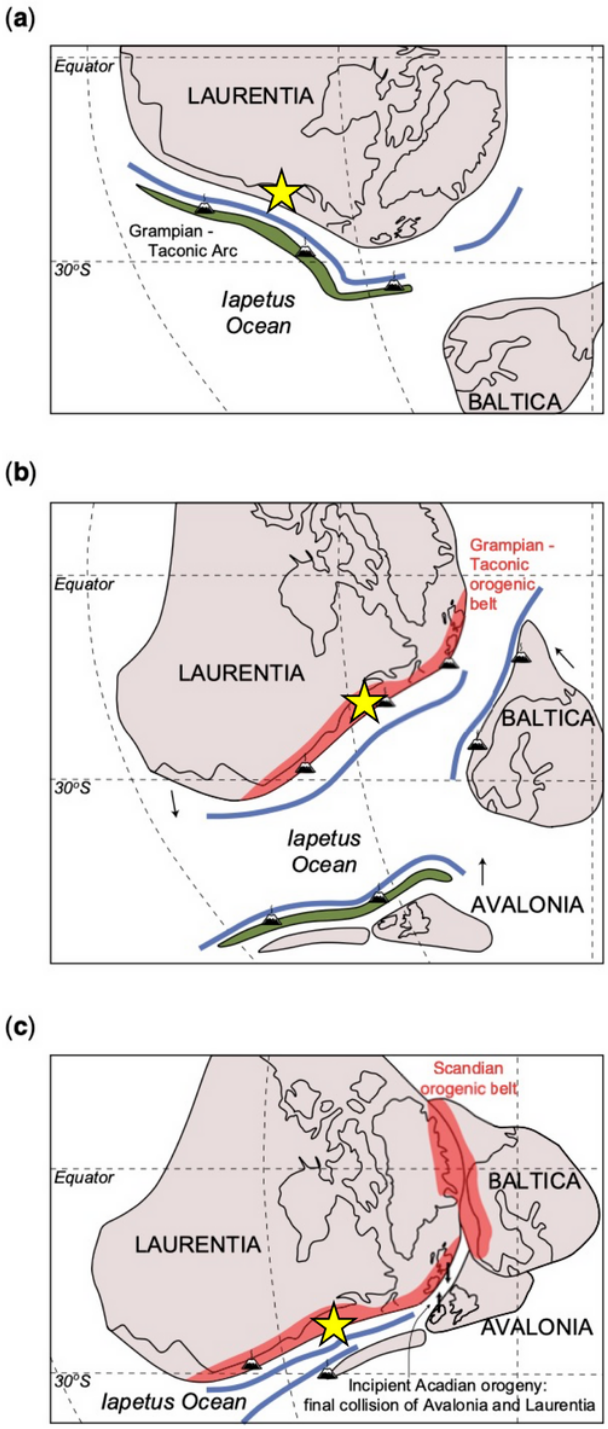
Shortly after you enter the woods, you should see an impressive rock staircase! But why is it here? Part of the answer is beneath your feet—you are standing on relatively soft metasedimentary rocks, formed by the slow accumulation of sediments in an ancient ocean basin. They are softer and more easily weathered away than the rocks in front of you, which are hard granitic gneisses belonging to a group of rocks called the Absalona Formation.

The term "granitic gneiss" is worth unpacking, because it contains an abbreviated biography of the rocks in front of you. The first word, granite, refers to a rock that forms from the cooling of magma inside the earth's crust; the second word, gneiss, is used to label the most heavily metamorphosed or deformed rocks, which have been transformed by heat and pressure almost beyond recognition. So how did these granites become gneisses?

Geologists estimate that the Absalona granites solidified about 500 million years ago, part of a small continent called Avalonia. Over 80 million years Avalonia advanced towards the precursor of today's North America, following in the footsteps of an island arc called the Taconic, which hit the main continent about 450 million years ago and raised the Appalachian Mountains. About 420 million years ago, Avalonia hit as well. Among other effects, this impact smeared the rocks that would become modern-day Rhode Island onto the east coast and raised the White Mountains of New Hampshire. As Avalonia collided with North America, the Absalona granites were contorted and smooshed, transforming into gneisses and mixing into marble cake-like swirls with other types of rock derived from the ancient ocean floor that had been caught in between.

These hard granitic gneisses have endured hundreds of millions of years—older than the Rockies or the Himalayas—and now they are standing in front of you with an incredible story to tell! Rhode Island may be small, but it is also mighty.

STOP 1 - SOME VERY GNEISS ROCKS



500 mya

Proto-North America (aka Laurentia) sits S of Equator

Taconic Island Arc forms and advances threateningly

450 mya

Appalachian Mountains built as Taconic Islands collide with Laurentia

Avalonia enters the scene

420 mya

Iapetus Ocean closes, White Mountains rise

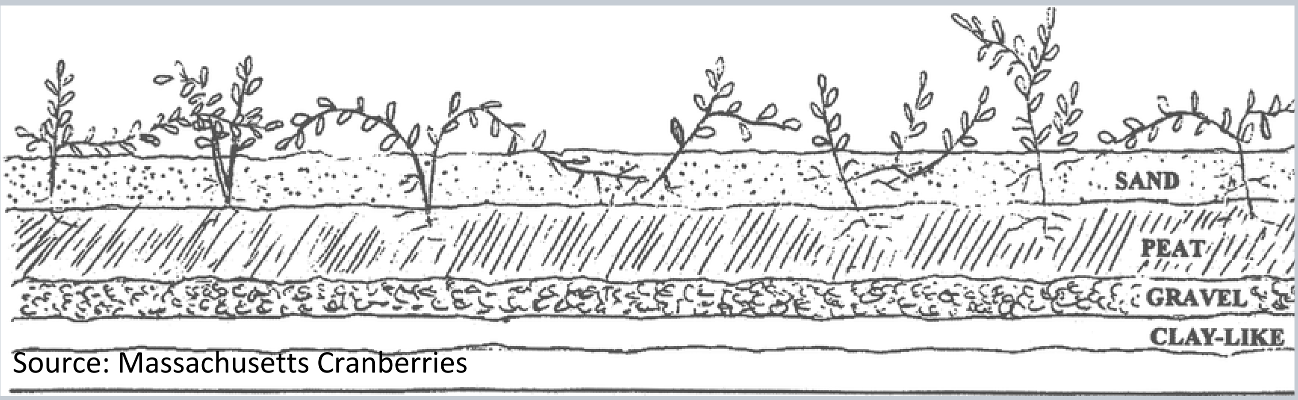
Far from the main action, Rhode Island accretes onto North America

Source: Chew and Strachan, 2014

The journey of Avalonia in three easy steps. Note: the approximate location of Rhode Island is shown on these maps with a star.

STOP 2: SWAMPY SPOTS WITH STORIES TO TELL

This property's rock outcroppings are eye-catching, but its low and boggy places are just as interesting and important. Indeed, for farmers in the early to mid-1800's, they were more important, because they created an opportunity for a profit. As you continue your walk, you are skirting the mosquitoey remnants of a man-made cranberry bog. The small stone bridge which you crossed shortly after our first stop was originally built to allow farmers to block the creek that flows through this swampy area, seasonally raising the level of the water and flooding the cranberries which they had planted there. It took a lot of work to turn a swamp into a cranberry bog—primarily digging networks of ditches to seasonally drain and then flood the swampy soils. In this relatively small area, though, perhaps the stone outflow structure was enough to control the water table without quite so much sweat.

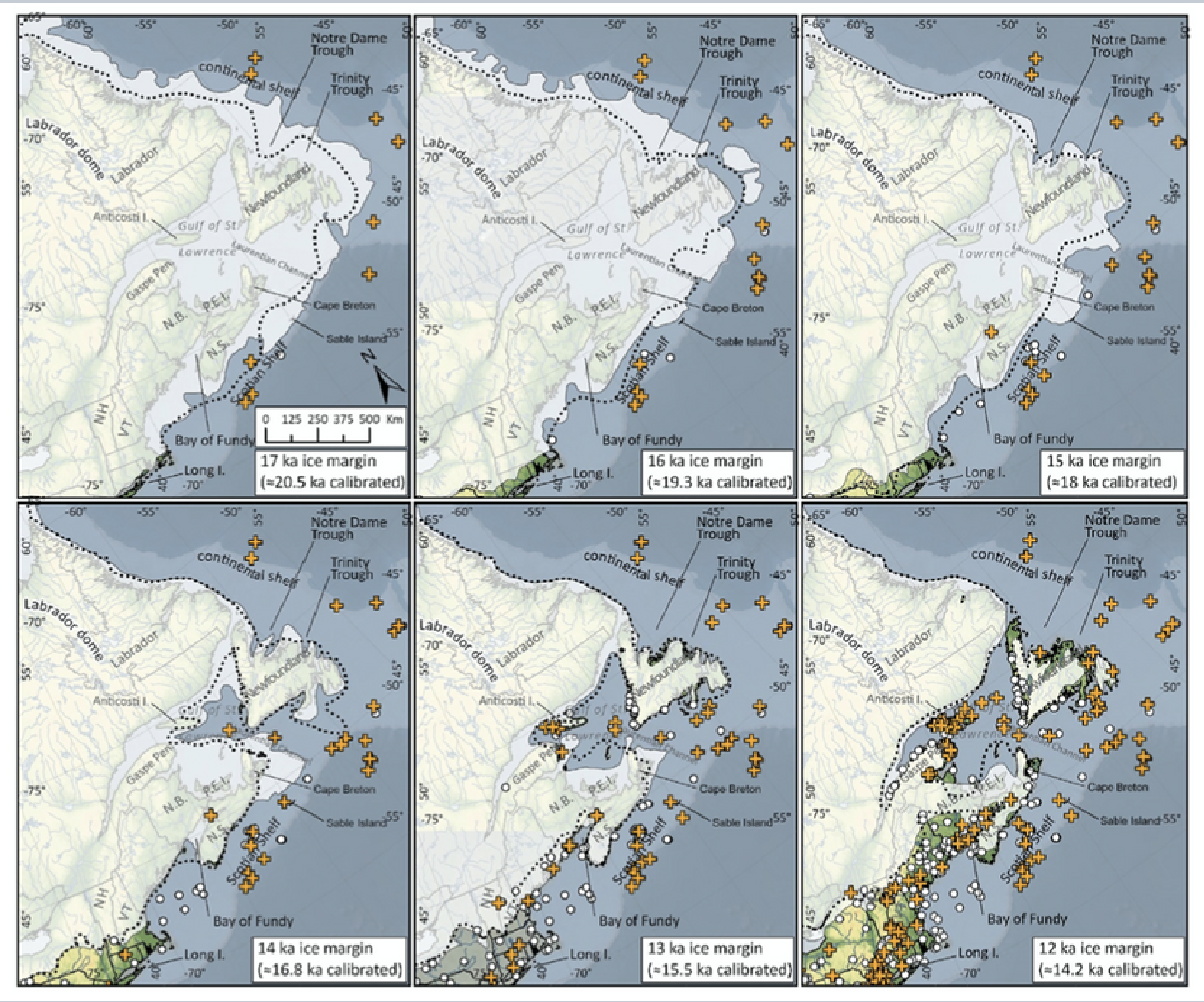


Source: Massachusetts Cranberries

However they did it, the cranberry farmers here weren't starting from nothing; they were just improving on what was already underneath them. In perfect conditions, like on Cape Cod, cranberries grow on top of a very special sequence of "post-glacial" soils, which are only present where ice sheets once stood. At the bottom of this sequence is a layer of fine-grained clays, which are formed when rocks are ground up under the immense pressure of glacial ice and then deposited by moving water. The clays are important because they create an impermeable layer past which water cannot drain, causing the upper soils to become soaked and swampy. At Connors Farm, where bedrock is so close to the surface, it's possible that a bedrock depression serves as the impermeable bottom of the swamp. Next in the sequence come coarse gravels. These could be deposited by a strong river or stream flowing from the face of the retreating glacier, or they may have melted directly out of the retreating glacial ice. Finally come mucky peats, which would have accumulated over time as plants grew and died in the still water of a small pond or lake.

STOP 2: SWAMPY SPOTS WITH STORIES TO TELL

When we imagine all these layers under the surface of today's swamp, we can start to see that this spot is not just a link to a hidden human story; it's also a connection to an older post-glacial past. Compared to the rocks of the Avalonia Formation, though, that past is actually incredibly recent. If you were standing on this spot just 20,000 years ago (at the peak of the last Ice Age), you would be squished beneath an ice sheet almost two miles thick. Ouch!



This figure shows the retreat of the Laurentide Ice Sheet in northeastern North America from 20,000 years ago (top left) to 14,000 years ago (bottom right). Rhode Island is near the very bottom of each frame.

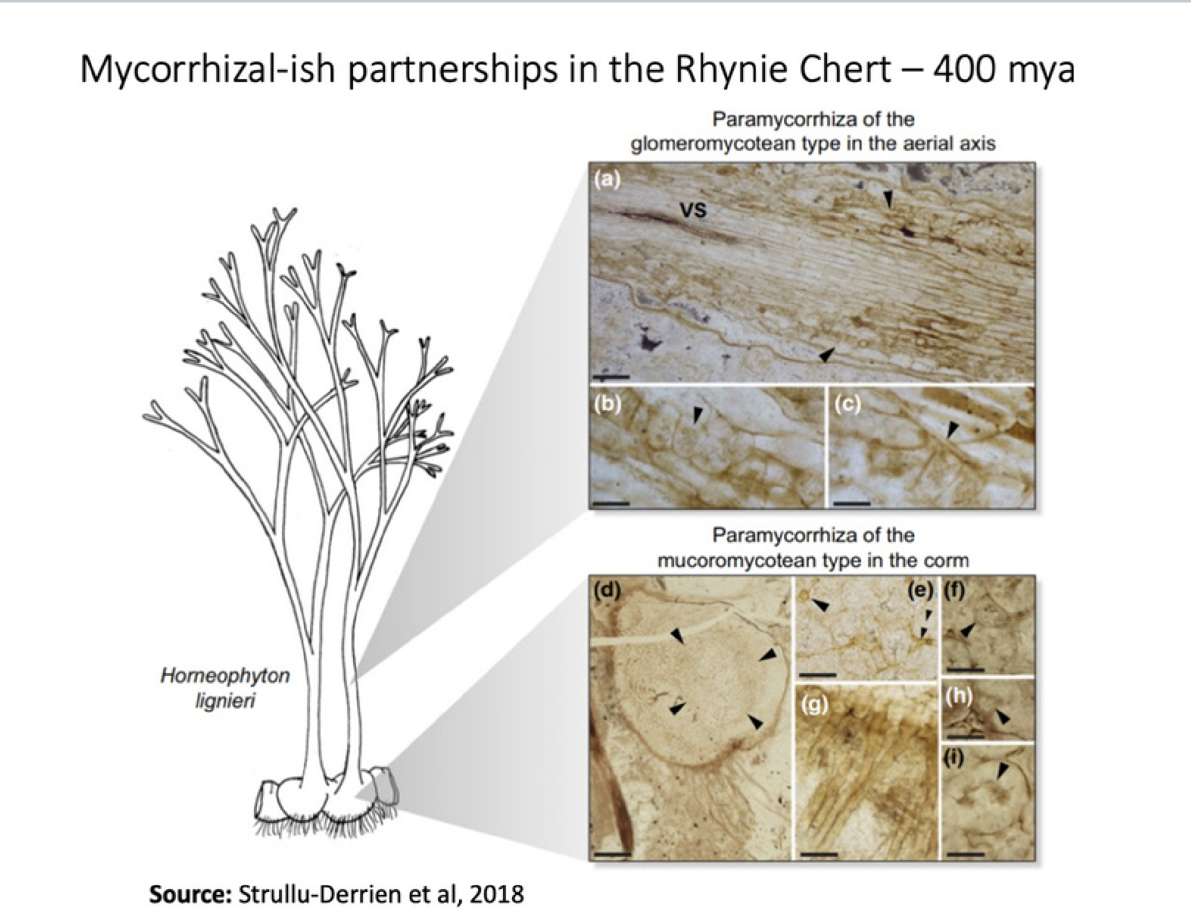
STOP 3: ANCIENT BLUEBERRIES

As you ascend the trail from the bog to the top of the ledges, keep your eye out for small green shrubby plants with pointed, oval leaves that emerge alternately along either side of a green twig. See the picture for a better sense—sometimes the leaves are fuzzy or edged with red. These are wild, lowbush blueberries! In addition to being a tasty snack (to the confident and well-informed botanist—please don't eat any wild berries on the basis of this information alone), they are an exceptional plant because they thrive on hot, dry, acidic soils. This is a very mellow place to find a blueberry, all things considered.

What are blueberries doing differently to live so happily in harsher environments? It turns out they are partnering with fungi that make structures called mycorrhizal networks—fungal filaments that weave in and out of plant roots and feed plants water and hard-to-access soil nutrients in exchange for sugars from photosynthesis. While mycorrhizal partnerships are common, occuring in over ninety percent of studied plant species, the blueberries and their plant family, the Ericaceae or heaths, are connected to a special group of "ericoid-mycorrhizal" partners which join extra-closely with their host plants. These fungal partnerships are a big part of how that small, sweet blueberry comes to grow on a dry, sunny ledge.

STOP 3: ANCIENT BLUEBERRIES

Mycorrhizal partnerships aren't just important in the present; they are ancient, predating the evolution of the blueberry, its ancestors, and its ancestors' ancestors. The earliest well-preserved land plants are found in a Scottish rock formation called the Rhynie Chert, named after a village near Aberdeen. This formation preserves plants that are more than four hundred million years old, and it preserves them so well that, when these plants are sliced and put under a microscope, scientists can see the microscopic structures inside their cells! But in the last twenty or so years, scientists have found something unexpected: there are clearly-recognizable fungal structures inside those cells. These plants were closely linked to mycorrhizal fungi (or something very much like them) even though many of them had yet to evolve roots. So the blueberries we see today are a link to a much older past than we might first have realized.



Source: Strullu-Derrien et al, 2018

This figure shows microscopic views of the stem and primitive roots of a plant found in the Rhynie Chert, with mycorrhizal structures visible (to the trained eye). Look for small, curling structures inside the round cells of (B) or for a long fungal filament stretching between cells in (C).

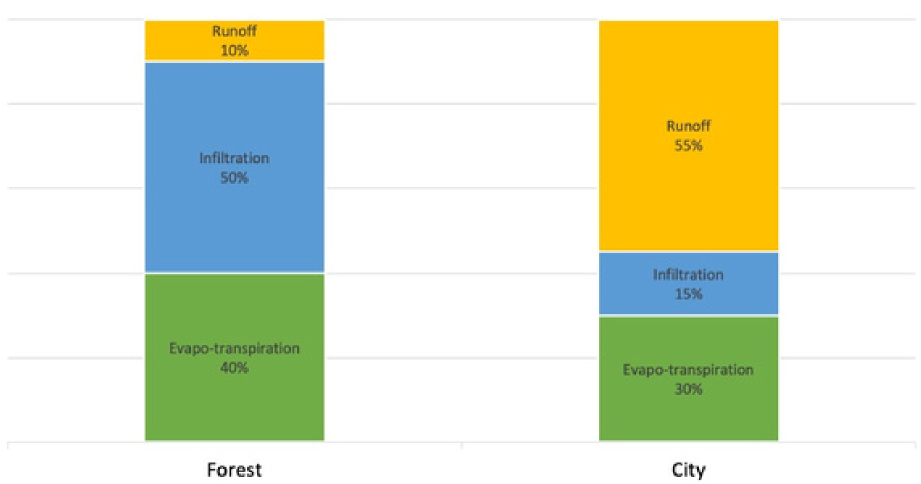
STOP 4: WHAT'S IN A SEEP?

Rhode Island isn't just the ocean state; it's also a state of swamps, streams, and seeps. You're now standing next to (or, depending on how muddy you are, on top of) a seep, an area where groundwater reaches the surface, soaks the soils, and seasonally flows away as a stream. If the mosquitoes haven't gotten you yet, consider just how much water this tiny wetland and many others like it are feeding surface streams and rivers throughout our watershed!

A forested landscape like the one around you absorbs into the ground, on average, more than fifty percent of the rain that falls on it. This water slowly infiltrates through deep soils and percolates through cracks in bedrock, forming a "stream" that moves much more slowly than surface waters. Eventually, in special places like this one, the water seeps up and soaks the soils, which release it gradually, like a very wet sponge. This small sponge and the many others like it are a big part of the system that modulates the yearly highs and lows of our rivers and streams.

Standing in the more urbanized parts of our watershed, where wetlands have been drained, filled in, and paved over, we are missing this important part of our natural water-regulation infrastructure! On average, urban areas retain just fifteen percent of their rainfall in soils, which leads to increased flooding and greater instability in the annual water budget of urban areas like Providence. Next time you come across a muddy spot in the trail, pause and consider just how thankful we can rightly be for all the muddy spots in our watershed!

Where does the water go? Hydrologic budget by land use type



Source: adapted from Arnold & Gibbons, 1996

STOP 5: GET TO KNOW THE CONNOR FAMILY

You are now standing at the edge of a man-made stock pond, a watering place for dairy cows on the old Connors Farm. The story of the Connor family and their cows is a story of Rhode Island in the first half of the 20th century—both unique and common in its move away from agriculture and into post-war life.

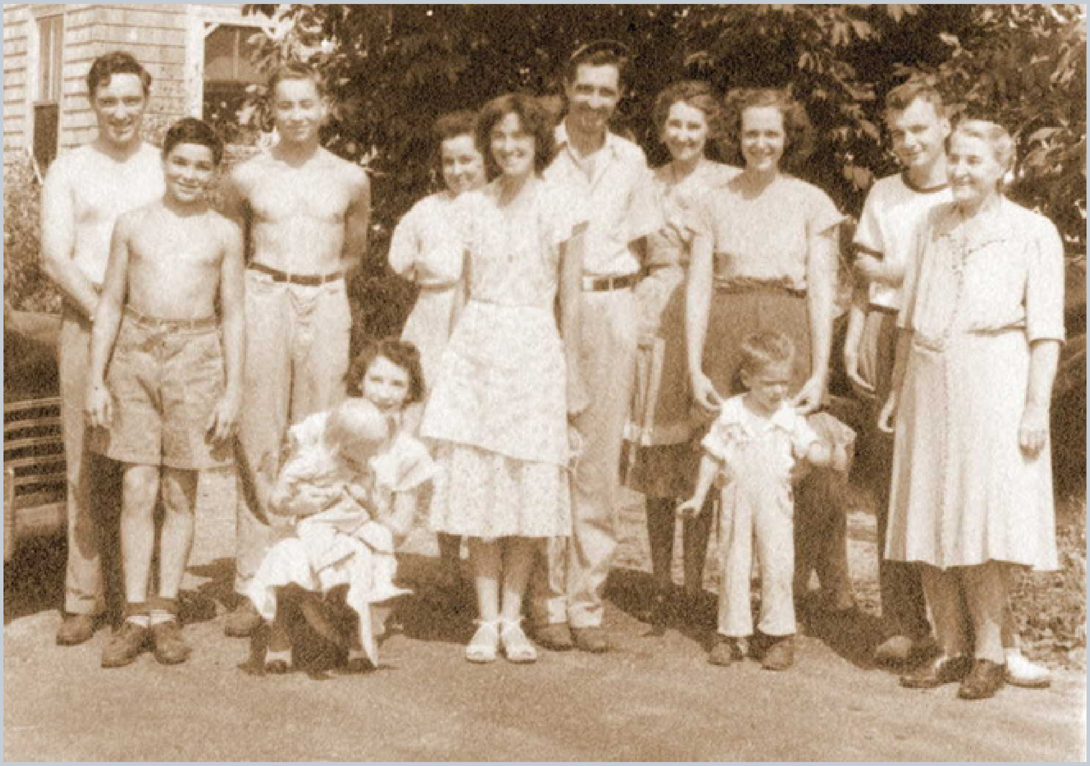
John and Katherine Connor moved here in 1913 – John had a cement business, but the family also operated a small dairy, with fields, barns, and a pond. John and Katherine had three children, John Jr., Kathleen, and Leo, and also raised a cousin, Mary, as their daughter. As they grew up, the Connor kids helped out around the farm, and by the 1930's John Jr. and Leo operated the dairy as Connor Brothers Dairy Farm. John Jr. also worked for Providence Pipe and Sprinkler Co., where he must have learned about maintaining and installing refrigeration systems; as a result, the Connor Brothers Dairy didn't just produce milk, they also drove it in refrigerated trucks to market in Providence!

John Sr.

After World War II, John Jr. moved to New Hampshire and Leo moved to Vermont. Mary and Kathleen both lived the rest of their lives in Rhode Island. Kathleen was a teacher and librarian in Smithfield, and Mary, who had served in the Red Cross Motor Corps during the war, was the first woman in Rhode Island to receive a motorcycle license. It feels appropriate to be reminded of this family as your visit to Connors Farm nears its end. Maybe this pond can be a peaceful place to think about how their lives came together and grew apart, and how much this spot might have mattered to them all.

STOP 5: GET TO KNOW THE CONNOR FAMILY

The whole Connor fam (with cousins and grandchildren)



John Jr. and Leo by the chicken coop

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Stop 1 - Bedrock geology

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Stop 2 - Cranberry bog

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Stop 3 - Bluberries and mycorrhizae

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Stop 4 - Seeps

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Stop 5 - Connor family

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