

TEACHER'S GUIDE



West Rutland Marsh

BRIDGE *to* BRIDGE

Interpretive Trail

By Kathleen Doyle, Ph.D.

PRODUCED BY RUTLAND COUNTY AUDUBON SOCIETY

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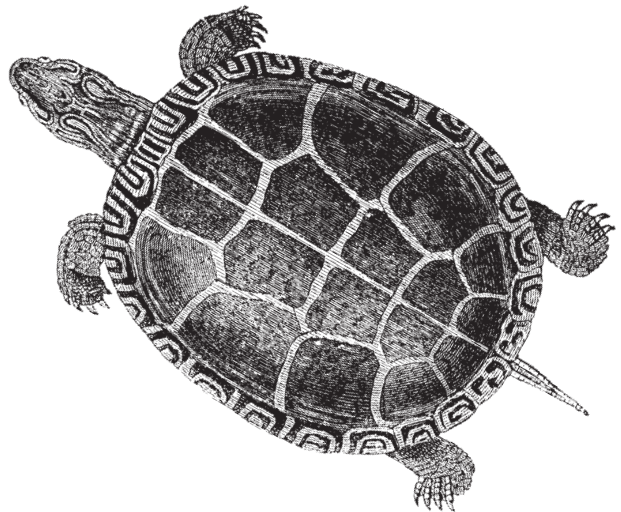
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Introduction: **It is our hope**

that this guide serves as a starting point for your exploration of West Rutland Marsh. You will find specific information about different natural communities in and around West Rutland Marsh, a discussion of ecological concepts pertinent to the area and information on selected plants and animals highlighted at the ten stations marked along the trail.

There are questions for students to ponder, cues about things to listen and look for, and suggested activities to pursue further with your students. In this exploration, your role as a teacher is to facilitate student participation, ask and encourage questions, pay attention to student interests, and help to foster a sense of wonder and connection to the natural world.

West Rutland Marsh changes dramatically throughout the year; some things that are prominent in one season are less prominent or absent in another. We hope that you make the opportunity to visit the marsh in more than one season to note the changes.

We welcome your feedback and comments on this guide. Please send your comments to Rutland County Audubon Society, P.O. Box 31, Pittsford, VT, 05765.



Station 1. Bridge

Stretching out beyond you is the channel of the Castleton River and a mosaic of wetland plant communities that will be highlighted along the trail. In the foreground is the plant community for which West Rutland Marsh is named and acclaimed, the Cattail Marsh community, dominated by the common cattail (*Typha latifolia*). The term marsh refers to wetlands dominated by herbaceous (non-woody) plants. Common cattail is easy to recognize with its characteristic brown flowering stalk reminiscent of a very short tail of a cat.



Look carefully when the plant is in flower and see if you notice that there are two portions of this flowering stalk. The thick cattail portion is comprised of female flowers and directly above this is a narrower tassel of male flowers, which produce pollen. As the flower matures, the flower head breaks apart and the numerous seeds are dispersed by wind.

There are few places in Vermont with Cattail Marsh as extensive as it is in West Rutland Marsh. Large marshes provide a number of important values and functions. For example, some bird species that are relatively rare in Vermont need extensive Cattail Marshes to sustain their populations. In 1998, West Rutland Marsh was awarded the designation “Important Bird Area”. Yet, wetlands are often unappreciated. Since the time of settlement, almost half of Vermont’s wetlands have been lost or degraded. Although the landscape around you has been altered considerably by humans since settlement, it provides numerous important ecological and human values.

See if you can think about several important values and functions of the Cattail Marsh and surrounding wetlands.



Seasonal birds to look and listen for:

American Bittern, Mallard, Tree Swallow, Marsh Wren,
Red-winged Blackbird.

Values and Functions of Cattail Marsh and other types of wetlands

1. Habitat for plants and animals including rare species.

Cattail Marshes are important habitat for a number of common and uncommon animals. Beavers and muskrats feed on the roots of cattail. Dense Cattail Marsh provides important cover and nesting habitat for many birds including the common marsh wren and red-winged blackbird as well as the more elusive American bittern (listen for the oonk-a-chunk), least bittern, sora and Virginia rail. Wetlands provide important spawning grounds and nursery areas for young fish. They are critical for a number of amphibian and reptile species. While wetlands occupy a relatively small portion of the Vermont landscape (5-10%), a disproportionate number of the state's threatened and endangered plant and animal species depend on wetlands for all or part of their life cycle.

2. Water purification

Wetlands act as giant water purifiers. As water flows through wetlands, sediments are trapped and nutrients and pollutants are filtered out. Consider how flowing water picks up nutrients and sediment as it crosses an eroding field in West Rutland. The water is purified as it travels through West Rutland Marsh, delivering clean water to the Castleton River and on to Lake Champlain and north and east to the Atlantic Ocean.

3. Regulation of Floods.

During periods of high precipitation, wetlands store water and prevent or reduce flooding.

4. Sources of human food, fiber and medicines

As for many species, the literature is rich with anecdotes of how common cattail has been used historically. The roots can be eaten as a raw or cooked vegetable and the pollen has been used as a substitute for flour. The down from the seeds was used to fill life preservers during WWII, as a filling for quilts and sleeping bags and as diapers for Native American infants. The long tough leaves are woven to make rush seats, baskets and matting.

A number of other important values and functions that you and your students may come up with include, but are not limited to, aesthetics, erosion control, shoreline stabilization, groundwater discharge and recharge, education and recreation.

For sharp eyes:



You may notice a second species of cattail. Look for individuals with narrower leaves and a separation (1–4 inches) between the male and female portions of the flowering spike. These are distinguishing characteristic of the narrow leaf cattail (*Typha angustifolia*) which is less common in freshwater marshes. You might also see hybrid individuals that are intermediate in characteristics between the two species.

Ideas for Student Activities

- 1) Ask the students to write an essay or story that reflects what the world would be like without wetlands.
- 2) Dissect a cattail flower: Depending on the time of year, dissect the head of a cattail, differentiating the male and female flowers or looking for mature seeds. Discover what insects might be found living there. Note: you may want to do this outside as it can be messy.
- 3) In season, make “Cattail Pollen Pancakes”:

Collect pollen in late May or early June by shaking pollen from the flower heads into a bowl or onto a clean cloth. Substitute pollen for up to half of the flour required in any pancake recipe.

Suggested Resources

Coon, Nelson. 1980. Using wild and wayside plants. Dover Publications, New York.

Environmental Concern Inc. URL: <http://www.wetland.org/>; (Lots of information on this site including how to order the 1995 publication: “Wow!: The wonders of wetlands, An educator’s guide)

Laughlin, Sarah, B. and Douglas P. Kibbe (editors). 1985. The atlas of breeding birds of Vermont. University Press of New England, Hanover.

Missouri Botanical Garden (information on biomes including freshwater wetlands). URL: <http://mbgnet.mobot.org/fresh/wetlands/index.htm>

Thompson, Elizabeth H. and Eric R. Sorenson. 2000. Wetland, woodland, wildland: a guide to the natural communities of Vermont. University Press of New England, Hanover.

U.S. Environmental Protection Agency, Wetlands, Oceans and Watersheds.

URL: <http://www.epa.gov/owow/wetlands/>







Station 2.

Phragmites

A major ecological threat to the Cattail Marsh natural community is the invasion of common reed (*Phragmites australis*). As you walk along the road, you may feel fenced in by this towering, 8-10 foot tall grass, so it is not surprising that the name *Phragmites* (pronounced Frag-my-tees) comes from the Greek word for fence “phragma”.

Notice how *Phragmites* is spreading through the marsh. It has the ability to outcompete native plants such as cattail. The *Phragmites*-dominated habitat is not as beneficial to wildlife for food and cover and the ecological functions of the marsh are changed. For example, the speed at which water filters through the wetland may change, altering flood control, water quality, and animal habitat. When *Phragmites* overtakes an area, the net result is a much less diverse landscape.

What differences do you notice comparing Cattail Marsh and the *Phragmites*-dominated area?

-  What characteristics do you think might allow an invasive species like *Phragmites* to be so successful?
-  What can be done to keep *Phragmites* from increasing or spreading to new areas?
-  What do students notice about the *Phragmites* dominated areas compared to the rest of the marsh?
-  Students may notice that the structure is different between the *Phragmites*-dominated and cattail-dominated marsh. *Phragmites* is much taller and where *Phragmites* grows one does not see patches of other species. *Phragmites* becomes established primarily near the road as it does particularly well in disturbed areas, but can spread over an entire marsh once established. It would be good to talk with students about how you might design an experiment to study the differences between *Phragmites*-dominated and cattail-dominated portions of the marsh.

Why are invasive species like Phragmites so successful?

1. Absence of herbivores or plant pathogens that control its growth
2. Growth in a wide range of conditions including disturbed or polluted environments
3. Adaptations for rapid dispersal by seed and underground stems (also called rhizomes)

Phragmites control

The most effective approach to controlling an invasive species is to limit its spread by not moving seeds or rhizomes around (for this reason, please do not pick the Phragmites as chances are you'll spread seed). It is important for roadcrews to be educated about the hazard of moving soil contaminated with Phragmites rhizomes or seeds to new areas.

There is no easy solution for controlling the species once it is established. However, several methods have been successful. The plant can be cut and the roots covered with black plastic or herbicide can be applied to the cut stem.

Is Phragmites a non-native species?

Frequently, species that are not native to a region have the ability to succeed because there are no predators (disease, insects or other herbivores) to control the abundance of the species. Yet, Phragmites Australia is a wide-ranging species occurring on every continent except Antarctica and there has been some question about whether or not Phragmites is indigenous to New England. Recent research has helped to answer this question. Studies of pollen deposits, show that Phragmites has been a minor component of coastal, tidal wetlands in New England for over 3000 years. Yet, over the last 100 years or so, the distribution of Phragmites has expanded, showing up in freshwater and brackish water wetlands and forming dense monocultures. Recent research indicates that there is great deal of genetic variation in the species and the more invasive genotype (and the one seen in freshwater wetlands in New England) was introduced to North America from Europe.



Seasonal birds to look and listen for:

Unattractive to birds, occasionally swallows may perch on the plumes.

Idea for student activity

Students could learn first hand about invasive species by helping to pull or remove invasive species in a natural area. Contact the Nature Conservancy, Department of Forest and Parks, USDA Natural Resource Conservation Service or a local conservation commission to help with a community service project.

Suggested Resources

Ecology and Management of Invasive Plants Program, Cornell University:

URL: <http://www.invasiveplants.net>

IPANE: Invasive Plant Atlas of New England. Mehrhoff, L. J., J. A. Silander, Jr., S. A. Leicht, E. S. Mosher and N. M. Tabak. 2003. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA.

URL: <http://www.ipane.org>

Station 3. Boardwalk



As you examine the landscape from the forested ridges on down to the open water of the Castleton River winding through the Cattail Marsh, it is clear that marshes and other wetland types are transitional between upland and aquatic communities. Generally, wetlands are described as vegetated ecosystems where the soil is saturated for at least a portion of the growing season. Thus, designated wetlands must meet three criteria:

1. Presence of wetland soils indicating saturated conditions
2. Dominance by plants that can survive in saturated soil
3. Presence of water at or near the surface during some part of the growing season

Notice the different types of wetland communities around you. Here at the end of the boardwalk you see a shrub-dominated wetland community called a Shrub Swamp. Swamps are wetlands dominated by shrubs or trees. Notice that Cattail Marsh tends to grow in the deeper-water portions of the wetland and trees and shrubs are generally found in shallower areas or areas that are not as frequently flooded.

 **Look and see how many different types of shrub species you can pick out from the boardwalk.**

 **Can you find shrubs with an opposite branching pattern and those with an alternate branching pattern?**

Guide to shrubs visible from boardwalk

Shrubs with opposite leaves

(leaves and buds situated directly across from each other on the twig)

Red osier dogwood (Cornus sericea) — Bright red twigs with brown lenticels (raised areas on the stem), white pith*, flat topped flower cluster, berries turning whitish.

Silky dogwood (Cornus amomum) — Purplish to tan stems, lacking brown lenticels; brown pith*; young twigs pubescent (look near the tip early in the season), fruit turning blue, flowers have a knob-shaped tip of the style).

** to examine the pith (the central tissue in a stem), use a knife to slice vertically along the stem*

Shrubs with alternate leaves

(leaves emerge singly at different points along a twig)

Meadow-sweet (Spiraea alba var. latifolia) — Elliptical leaves with toothed margins, flower cluster is longer than wide (often can see old flower clusters remaining on stems in winter).

Shrub Willows (Salix species) — Several different species of willow are present. They flower in early spring, often before leaves emerge. Male and female flowers are borne on different individuals.

Speckled Alder (Alnus incana) — Dark stems speckled with raised, white horizontal lenticels, buds have short stalk, leaves toothed and elliptic, look for male and female catkin flowers appearing in April before the leaves and cone-like fruits remaining from previous year.

What is a “natural community”?

Ecologists find it useful to describe the variation and the repeating patterns on the landscape using the natural community concept. A natural community is defined as “an interacting assemblage of organisms, their physical environment and the natural processes that affect them”.

With your students, see if you can list some of the organisms, physical factors and processes that make up the Cattail Marsh natural community type.

Organisms, Physical Factors and Processes that make up the Cattail Marsh

Organisms: Common cattail, red-wing blackbird, marsh wrens, American bittern, muskrat, bullfrog, green frog, painted turtle.

Physical factors: soil (muck), water (depth varies through the year), climate etc.

Processes: pollination, seed dispersal, flooding, predation, herbivory



Seasonal birds to look and listen for

Great Blue Heron, Least Bittern, Wood Duck, Virginia Rail, Belted Kingfisher.

Ideas for Student Activities

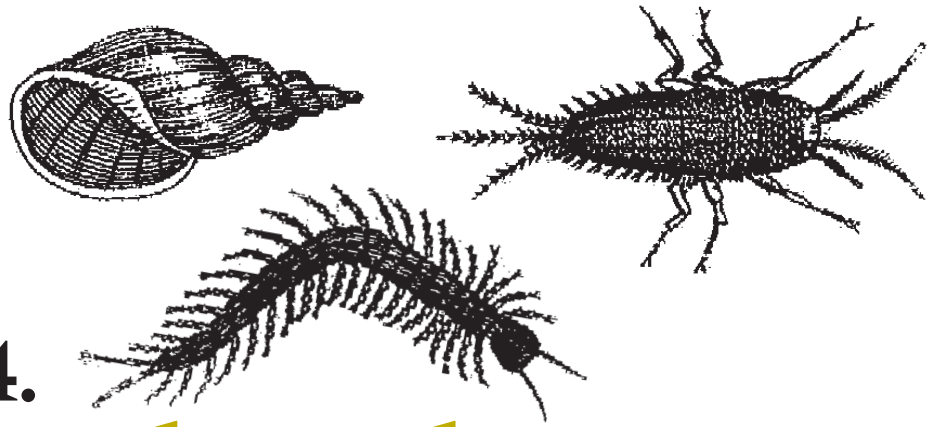
1. Have students write an identification key to six different shrub species. A dichotomous key is one where there are only two choices at any given point. Look at different types of published keys to get a sense of how keys are organized. One might want to start with making a key to kitchen utensils or carpentry tools or some other category of familiar objects before trying to write a plant identification key.
2. Become familiar with the book *Wetland, woodland, wildland: a guide to the natural communities of Vermont*. Visit other sites and learn to recognize other natural community types.

Suggested Resources

Cambell, Christopher, and S. Fay Hyland with Mary Cambell, Illustrator. 1975. *Winter keys to woody plants of Maine*. University of Maine Press.

Newcomb, Lawrence with Gordon Morrison, Illustrator. 1977. *Newcomb's Wildflower Guide*. Little Brown and Company, Boston.

Thompson, Elizabeth H. and Eric R. Sorenson. 2000. *Wetland, woodland, wildland: a guide to the natural communities of Vermont*. University Press of New England, Hanover.



Station 4.

Wetland Soils

By probing into the soil, one can become a detective unraveling secrets of the past. Characteristics of the soil, like the color, feel, and smell, tell a story about the events that have occurred during the formation of the soil. Wetland soils develop when the soil is waterlogged repeatedly over time. Depending on how frequent flooding is and how long the soil is flooded or saturated, wetland soils develop different characteristics.

? What makes waterlogged soils different from upland soil?

An essential factor is that when soils become waterlogged, they become low in oxygen and when oxygen is low, a number of things can happen.

1. Decomposers, like bacteria, that use oxygen are scarce so decomposition is slow resulting in an accumulation of dark-colored organic matter. Soils composed mainly of organic material are called mucks or peats.
2. Some chemical compounds like hydrogen sulfide and methane (that do not contain oxygen) may be formed by anaerobic bacteria giving off the smell of rotten eggs (from hydrogen sulfide) or swamp gas (from methane)
3. When compounds like iron and manganese are in a soil environment without oxygen they change their chemical state and are characterized by a grayish color.
4. Yet, not all wetland soils are saturated all the time and therefore soils may show more or less of the characteristics listed above. For example, they may have more or less accumulated organic matter. A fascinating soil pattern can develop in soils that fluctuate between being waterlogged and drained. These soils can develop a grayish background color speckled with bright red nodules. The speckles of bright red develop as the soil water drains and some of the iron particles are exposed to an oxygen-rich environment.

Look at the Layers



To get some clues about past flooding recorded in the soil profile, select an undisturbed area in the cattails and dig a hole with a shovel (prepare to get wet feet). Then dig another hole at a drier site (perhaps across the road) and look at differences in soil characteristics. With your students, describe the soil. In some soil, you will see distinct layers, called horizons: A – top layer, B – subsoil and C – influenced by bedrock. You can see variation in the soil horizons depending on the pattern of flooding and saturation. Some soils, such as deep organic wetland soils lack these distinct horizons.



Here are some questions to help reveal how frequently and for how long the soil is flooded

1. How deep do you have to dig until you hit water?
2. Do you notice any smell, like rotten eggs or swamp gas?
3. Is the soil deep or shallow?
4. Is the soil rich in dark organic matter or rich in minerals (grittiness is a sign of sand)?
5. What is the color?
6. Is the color the same throughout or does the color vary with depth?
7. Do you see reddish nodules in the soil? They indicate fluctuation between flooding and draining.

(Always remember after you have dug to replace the soil back as carefully as you can).



Seasonal birds to look and listen for:

Willow Flycatcher, Yellow Warbler, Common Yellowthroat, Swamp Sparrow, American Goldfinch.

Idea for Student Activity

Obtain paint color chips from a hardware store and make soil color chart. Look at soils in different environments and describe the characteristics of different horizons: color, texture, smell, water saturation and other distinguishing characteristics.

Suggested Resources

Lyon, John, G. 1993. Practical handbook for wetland identification and delineation. Lewis Publishers, CRC Press.



Station 5.

Aspen—Change over time

Quaking aspen (*Populus tremuloides*) is a fascinating tree to watch through the seasons. Depending on the weather conditions, the smooth bark ranges in color from gray, to white to olive green. The green color, apparent especially after spring rains, is due to the chlorophyll in the bark. The tree can photosynthesize even before the tree has leafed out.

In early spring, the clusters of flowers, called catkins, emerge before the leaves, resembling little caterpillars hanging down from the stems. Some trees have clusters of male flowers that produce wind-dispersed pollen, while other individuals have clusters of female flowers that will eventually shed the cottony masses of seeds.

 **Why might it be an advantage for the tree for the flowers to appear before the tree has leafed out?**

The movement of pollen from male flowers to female flowers is not impeded by the presence of leaves.

Quaking aspen reveals its name if you watch the leaves. Because of the long flat leaf stalks, the leaves tremble or quake, in even the slightest breeze. As the leaves emerge in early spring, they have a soft wooly felt-like texture before becoming bright green. In the fall, aspen leaves are a lovely yellow. You may notice that all of the trees in a cluster leaf out and then lose their leaves all at the same time. This is because aspen spread by root sprouts, producing a cluster of stems that are genetically identical. Some aspen clones in the western United States are so large they have been estimated to be three times greater in mass than the largest giant sequoia.

Aspen trees are an important pioneer species over much of North America, quickly colonizing sites where the vegetation has been disturbed, such as burned areas, roadsides or old fields. Aspen is a prolific seed producer and the seeds can be dispersed long distances by wind. Once established aspen grows quickly and spreads by root sprouts. It does not persist in older forests, as it is short lived and is not tolerant of shade.

Four species of poplar can be found at West Rutland Marsh: quaking aspen, balsam poplar (*P. balsamifera*), eastern cottonwood (*P. deltoides*), and bigtooth aspen (*P. grandidentata*). Look near the roadside for balsam poplar, also known as “tacamahac” or “Balm-of-Gilead”, a species with a much more northern distribution than quaking aspen. It has much larger buds that are gummy and have an aromatic-smelling, sticky resin. You may be fortunate enough to observe bees collecting resin that they combine with their saliva to make propolis, which is used to seal cracks in their hives. Native Americans also used the sticky substance to seal their canoes.

The poplars are preferred by beavers and a favorite browse species of deer and moose. The aspen habitat adjacent to West Rutland Marsh is a wonderful place to hear warbling vireos in late spring to early summer.



Seasonal birds to look and listen for

Downy Woodpecker, Blue Jay, White-breasted Nuthatch, House Wren, Warbling Vireo.

Idea for student activity

Aspen is an interesting species to track over the course of the spring. If a clone of aspen exists near the school, students could keep notes on the emergence of flowers, leaves, color of the bark, shedding of seeds etc. A great resource is Plant Watch a program of the Devonian Botanic Garden, University of Alberta, Edmonton T6G2E1.

Suggested Resource

Plant Watch, Devonian Botanic Garden, University of Alberta.

URL: <http://www.devonian.ualberta.ca/pwatch/>

Station 6. Berries and Fruit



Each species of animal requires food, cover and water in a close enough proximity to meet its particular needs. At this site, you can see a variety of shrubs and trees that provide food for birds and other wildlife.

? How many different kinds of berries, fruits or seeds do you see at this site?

Some fruits are so delectable and sought after by birds that they do not last long. In the background (to the left), is a small smooth-barked tree that flowers in late April and May, known by several common names including serviceberry, juneberry and shadbush (*Amelanchier* sp). The blue berries are produced in June, but are rapidly consumed by birds, in particular, American robins and cedar waxwings.

Another showy shrub with opposite, three-lobed leaves and a cluster of white flowers that emerge in May or June is the cranberry viburnum (*Viburnum opulus* var. *americanum*). It produces berries that turn red by fall and have a tart cranberry-like taste. A second *Viburnum* that can be found in the vicinity is called wild raisin (*Viburnum nudum* var. *cassinoides*) or withered rod for its flexible stems. The buds and underside of the leaves have rusty, bran-like scales covering them. After blooming in summer, the shrub produces berries that eventually turn blue in September – October. The berries are eaten by grouse and other birds. You will notice the familiar wild grapes (*Vitis* sp), and the domesticated apple (*Pyrus malus*), a tree commonly planted by the early settlers. Both are important sources of food for birds and other wildlife.

A non-native species, European or common buckthorn (*Rhamnus cathartica*) has a sharp stout thorn at the tip of branches, which appear to be almost opposite. It is often inconspicuous, lack-

ing showy flowers, but buckthorn often forms thickets along roadsides, dominates wetlands and takes over the ground layer of forests, outcompeting native species. The small blue fruits ripen in August or September and are consumed and widely dispersed by birds. Once the shrub becomes established, it out-competes many native shrubs, reducing the diversity and quality of food available to wildlife in the summer and winter.

Of course, each species of animal has different needs that vary over the course of a lifetime and from season to season. Some species need large tracts of homogeneous vegetation, while other species do well in habitat where many different vegetation types are in close proximity, such as this edge habitat near the road. In addition to finding quality food, wildlife must have adequate cover and water. Ask the students to look for other features that are important to wildlife. Look for standing dead trees that provide nesting sites and food for birds such as woodpeckers that feed on wood-eating insects. Ask the students to keep their eyes open for signs of wildlife including insect herbivory, bird nests, beaver-chewed stumps, and browsed twigs.



Seasonal birds to look and listen for:

Least Flycatcher, Gray Catbird, American Robin, Cedar Waxwing, Northern Cardinal, Baltimore Oriole.

Idea for Student Activities

1. Plant native species in schoolyard that celebrate native species and benefit wildlife. The National Wildlife Foundation provides information and certification program for schools who would like to designate their schoolyard as wildlife habitat.
2. Learn more about the common names of plants and their meaning.

Suggested resources

Parren, Steve. 1993. Backyard Wildlife Habitat in Vermont. Agency of Natural Resources. Vermont Fish and Wildlife Department, Nongame and Natural Heritage Program, Waterbury, VT.

National Wildlife Foundation Backyard Wildlife Habitat.
URL: www.nwf.org/schoolyardhabitats/



Station 7.

Variation across the landscape

As you look up from the bottom to the top of the slope, notice the change in vegetation from willow- dominated wetlands, to drier fields with goldenrod and scattered red cedar, to the ridge dominated by pines. (The view of the slope is best to the north of the sign post). At each location, a combination of factors such as climate, topography, soil conditions, and the presence of a variety of plants and animals determine the natural community that will develop over time. At each site, there is an intricate web of relationships between living things.

It is fascinating to think about how much the landscape surrounding a site has a vital influence on the character of the natural community that develops at the site. The movement of animals and plants across the landscape, the movement of nutrients down a slope, and patterns of weather including the speed of wind, all are affected by the character of the surrounding vegetation. The surrounding landscape can have a detrimental influence by supplying pollutants or invasive species or being a barrier to movement, as are roads or paved areas.

? Can you think of other ways that the landscape surrounding a site influences what happens ecologically at a site?

Encourage students to come up with a number of ideas. You might ask more questions, such as how it would be different if an abandoned field were surrounded by a forest versus a cornfield.

Take a close look at the shrub-dominated wetland at the bottom of the slope. Here you can see several species of willow (*Salix* spp). Visitors to West Rutland Marsh in early spring are treated to a succession of flowering catkins as the flowers of the different species of willow emerge, some species flowering before and some after the leaves have come forth. Like the related quaking aspen, male and female catkins are borne on separate individuals. Identifying willows is

tricky with close to 20 native species of willow and a number of introduced species that have become naturalized in Vermont, not to mention a handful of hybrids. Moreover, some identification keys require one to have leaves, flowers and fruits in hand to make a positive identification. Most of the species are shrub or small tree size, with notable exceptions including the native tree-size black willow, and a tiny, prostrate willow restricted to alpine areas. Enjoy the diversity of willow species in the marsh, take note that some species tend to prefer the wetter spots, while other are on slightly higher and drier ground.

Keep your eyes open for the pine cone gall that is said to prefer the tips of the twigs of the Heart-leaved willow (*Salix cordata*). The larva of the gall gnat, (in the family *Cecidomyiidae*) a tiny, delicate fly secretes a chemical that induces a willow bud to become deformed into the enlarged gall. Here the larva remains protected though the summer and winter emerging as a pupa in early spring. The adult emerges soon after and lays eggs in the new buds of the willow.

In addition to the willows, look in the vicinity for species mentioned before, including the common cattail, silky dogwood, aspen, meadow-sweet and speckled alder. Near the drier roadside is goldenrod. Notice the galls on the stems made by the larval stage of the goldenrod gall ball fly.



Seasonal birds to look and listen for:

Red-tailed Hawk, American Kestrel, Mourning Dove, Ruby-throated Hummingbird, Eastern Kingbird.

Idea for Student Activity

The willow gall can be collected in early March. Slice the gall lengthwise (but off-center to avoid damaging the chamber) and place in a jar with wet cotton. Watch the larva transform into a pupa and then develop into the gall gnat.

Suggested Resource

Entomology Notes: The Michigan Entomological Society. Insect galls.

URL: <http://insects.ummz.lsa.umich.edu/MES/notes/noteslist.html>

Station 8.

Sedge meadow



The meadow here in the foreground is dominated by sedges. Sedge Meadows are a common natural community in Vermont. They typically are permanently saturated and flood seasonally, occurring in somewhat drier settings than the Cattail Marsh. Notice the clumped growth form of the sedges creating drier, elevated hummocks in the wet meadow. Wetland species that are less tolerant of flooding are often rooted in these raised mounds.

Some people learn the rhyme “sedges have edges, rushes are round and grasses are hollow like holes in the ground” to help distinguish sedges from their grassy counterparts. Another way is to use a magnifying glass to learn to distinguish the inconspicuous, but surprisingly beautiful flowers.

A number of wildlife species frequent sedge meadows including the swamp sparrow, which nests in the sedges. Sedge meadows are also important breeding grounds for amphibians such as leopard frogs.

The highly aggressive, exotic plant, purple loosestrife, (*Lythrum salicaria*) is a frequent invader of sedge meadows, Cattail Marshes and other types of wetlands. Where it becomes widespread, habitat for wildlife is critically altered. Purple loosestrife is most conspicuous starting in July when the purple flowers are in bloom. During other times of year, the plant often goes unnoticed, but the old stems with small brown seed pods can be found many months of the year. Abundant seed production, a tenacious root system and lack of herbivores that eat purple loosestrife has led to its rapid spread in North America and traditional control methods have not been effective. For the last decade, a large scale experiment in biocontrol of purple loosestrife is being conducted across North America. After rigorous testing to insure that the insects do not feed on native species, two species of beetle (in the genus *Galerucella*) have been introduced to North America. The beetles, which feed on the bud, leaf and stem of purple loosestrife, were released to kill the loosestrife in West Rutland Marsh in 1998. While purple loosestrife is still present, observers are optimistic that the beetles seem to be doing their job controlling the spread of purple loosestrife.



Seasonal birds to look and listen for:

Northern Harrier, Wilson's Snipe, Common Raven, Song Sparrow.

Idea for student activity

Find out more about the successes and failures of species introduction for biological control. Research alternative methods of control of exotic invasive species including pulling, herbicides, burning, cutting. Research why different methods are more or less effective for different species.

Suggested Resource

The New England Wildflower Society. 180 Hemenway Road, Framingham, MA 01701
URL: <http://www.newfs.org/>



Station 9.

Red Maple—Black Ash Hardwood Swamp Forest

Forested swamps dominated by red maple (*Acer rubrum*) and black ash (*Fraxinus nigra*) with a rich diversity of other trees, shrubs, ferns, herbs, grasses and mosses are one of the most common types of wetland in Vermont. They are found in places that become flooded in the spring, and typically dry out by late summer.



See if you can see for yourself how the red maple got its name. At almost anytime of year, you can find red: red buds, red flowers, red fruits, red leaf stalks and red leaves in fall. Black ash, on the other hand, was probably named for its dark colored buds.

Perhaps, because of its darkness, dense growth and diversity of plants, along with the call of a pileated woodpeckers or the song of a veery, the forest has a mysterious and intriguing quality of the unexpected, as you wait with anticipation for what will appear next. Older forest are particularly dense, as several distinct layers of vegetation can develop: the uppermost tree canopy, a layer of younger trees, a shorter shrub layer, an herbaceous layer and a ground layer of moss.

A characteristic feature of Red Maple – Black Ash Swamp forests is the uneven ground surface.



Can you think about what might cause these slightly elevated hummocks to form on the ground?

1. It is relatively easy for the shallow-rooted trees to be blown over by wind, as the fallen logs decay they create the moss-covered hummocks on the ground surface.



Do you see any differences between what grows on the hummocks and what grows between the hummocks?

1. Frequently shrubs grow from the drier more elevated tops of the hummocks.

Other characteristic species of Red Maple – Black Ash Swamps:

In addition to Red Maple and Black ash, a diversity of tree species are found including:

American elm (Ulmus americana), white pine (Pinus strobus), balsam poplar, quaking aspen, northern white cedar (Thuja occidentalis), musclewood (Carpinus caroliniana), white ash (Fraxinus americana), and red oak (Quercus rubra).

Shrubs may be common including: winterberry holly (Ilex verticillata), wild raisin, speckled alder, silky dogwood and meadow-sweet.

A diversity of ferns and understory herbs include:

royal fern (Osmunda regalis), sensitive fern (Onoclea sensibilis), cinnamon fern (Osmunda cinnamomea), intermediate wood fern (Dryopteris intermedia), white hellebore (Veratrum viride), sedges (Carex spp), horsetail (Equisetum spp) and trout lily (Erythronium americanum).



Seasonal birds to look and listen for:

Yellow-bellied Sapsucker, Northern Flicker, Pileated Woodpecker, Red-eyed Vireo, Veery.

Idea for student activity

This site would be a great location to use field guides to identify different tree, shrub and fern species with the students.

Suggested Resources

Newcomb, Lawrence with Gordon Morrison, Illustrator. 1977. Newcomb's Wildflower Guide. Little Brown and Company, Boston.

(includes a number of woody shrubs and vines as well as herbaceous plants)

Petrides, George. 1998. Peterson Field Guide, A field guide to the eastern trees: Eastern United States and Canada, including the midwest. Houghton Mifflin Co., New York.

Thompson, Elizabeth H. and Eric R. Sorenson. 2000. Wetland, woodland, wildland: a guide to the natural communities of Vermont. University Press of New England, Hanover.

Westin, Doug and Sue Westin, and edited by Ginger Anderson. 1995. Common Ferns of Vermont. Vermont Agency of Natural Resources, Department of Forest, Parks and Recreation.

Station 10.

Northern White Cedar



It is fitting to end our guided tour of West Rutland Marsh at a cluster of northern white cedar (*Thuja occidentalis*), a much-celebrated tree and one that has a strong connection with the marble region. The tree is also known as “arborvitae” which translates to “tree of life”. The name commemorates the life-saving properties of the tree. In 1535, the crew of Jacques Cartier’s Canadian expedition made a tea of the bark and foliage (now known to be high in vitamin C) apparently curing them of scurvy. The native Americans called the tree “oo-soo-ha-tah” which means “feather leaf”, an apt description of the delicate foliage. These names are a reminder of the vital connection people have with the natural world and how individual species can come to symbolize the connections humans have with nature.

It is vital that we recognize our connections with the natural world and identify ways to learn about and sustain the natural world as it sustains us. Wetlands in general and West Rutland Marsh as an example, have not always been appreciated and celebrated. Unfortunately, some people continue to use the marsh as a dumping ground. Exotic invasive species, like *Phragmites* and European buckthorn are threats to the integrity of the natural communities in and around West Rutland Marsh. Without intervention, these species will continue to replace native plant species, changing the function of the ecosystem and making the landscape less suitable for a diversity of species. Yet, today there are advocates for West Rutland Marsh, including the town of West Rutland, state and federal agencies, and the Rutland County Audubon Society. These citizens, government entities and organizations are committed to collecting information, educating the public and protecting the biological treasures of West Rutland Marsh.

 What might you do to be an advocate for West Rutland Marsh?

Other connections:

Northern white cedar, at the southern edge of its range in Vermont is strongly associated with bedrock high in calcium. Similarly, the town of West Rutland and the history of West Rutland Marsh are vitally connected to calcium-rich bedrock or marble, which is metamorphosed limestone. West Rutland was a major marble producer in Vermont from the late 1800s to early 1930s. The wetlands that are now West Rutland Marsh were formed inadvertently about 70 years ago, as an outcome of the marble industry. Tons of sand slurry, a byproduct of the marble industry, were dumped into the Castleton River flooding adjacent agricultural fields creating the conditions for the Cattail Marsh and other communities that exist today.

We have limited information of what the area that is now West Rutland Marsh looked liked at the time of European settlement, however, northern white cedar may have been much more prevalent in the area than it is today. It is interesting to note that extensive Northern White Cedar – Red Maple Swamps are common in the large floodplains to the north in the Champlain valley that are also underlain by marble. Although, we don't have all the information, it is important to be aware of how dramatically past events shape the landscape we see today. This sentiment is expressed well in an Indian saying "the forest holds many voices, whatever has occurred and whatever has been said still lingers here".



Seasonal birds to look and listen for:

Turkey Vulture (soaring over the ridge), Hairy Woodpecker, American Crow, Black-capped Chickadee, Purple Finch.

Idea for Student Activity:

Lead a discussion with the students about their relationship to the natural world. Encourage them to think about how their perspectives might be similar to or different from people who lived in what is now West Rutland 50, 100, 200 or more years ago.

