THE LOW (INNER) SHRUB ZONE

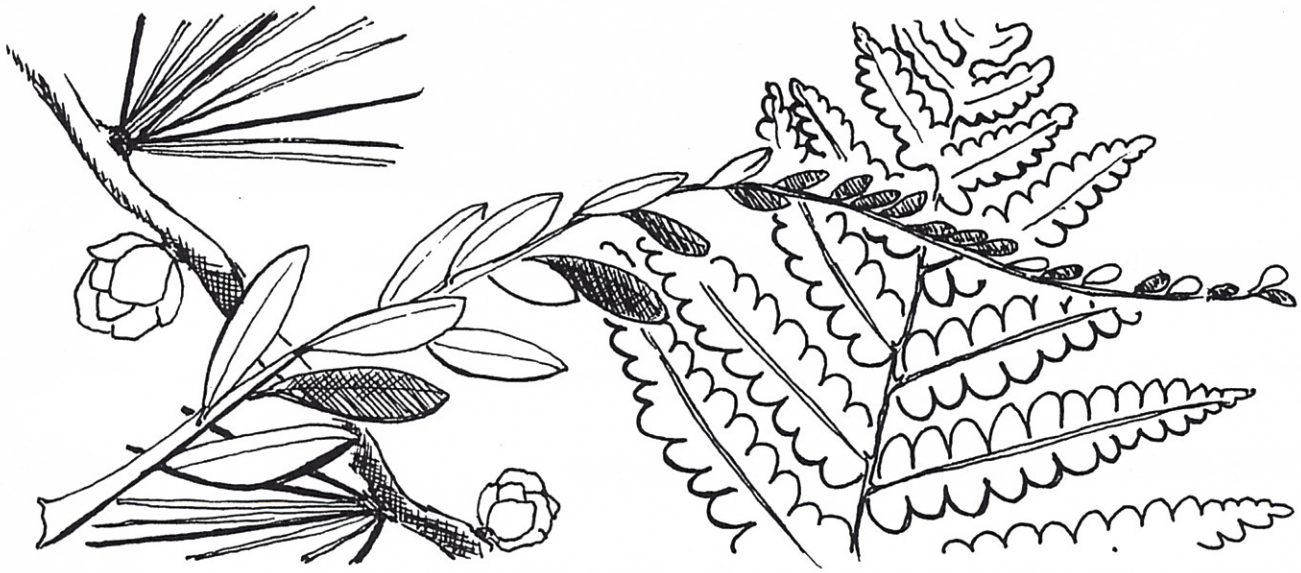
In School:

The zones of Volo Bog are not always real distinct; one doesn't end and another instantly begin. Most often, one grades into another. The low shrub zone, for example, has young tamarack trees growing in it and the outer shrub zone has a lot of dead tamaracks.

Each zone is constantly undergoing change. We say that they are dynamic communities. Dynamic means "changing." The process of change in biological communities is called Natural Succession.

When You Visit:

Are the tamarack trees found here older or younger than those you passed in the last zone?



Record the following:

Three Plants:

_____

_____

_____

Two Invertebrates:

_____

_____

Two Vertebrates or signs of their presence:

_____

_____

THE LOW (INNER) SHRUB ZONE (CONTINUED)

When You Visit:

Natural succession has been occurring in Volo Bog for over 10,000 years. For example, the area where the tall shrub zone is now had many living tamarack trees in it as recently as 1987. Many of them died off that year due to high water: they drowned. The tamaracks you see in the inner shrub zone are very young: some sprouted last year, the oldest ones may be only 15 years old. Today, the tamarack zone and the low shrub zone are hard to tell apart, there is so much overlap. What does that tell us about plant communities? Nature doesn't always fit into our neat little labelled packages or follow our rules! In the natural sciences, very few "rules" are set in stone. In physical sciences like math, chemistry and physics, things are a bit more cut and dry.

Things are really floating here! How can you demonstrate that the plants in this zone are floating?

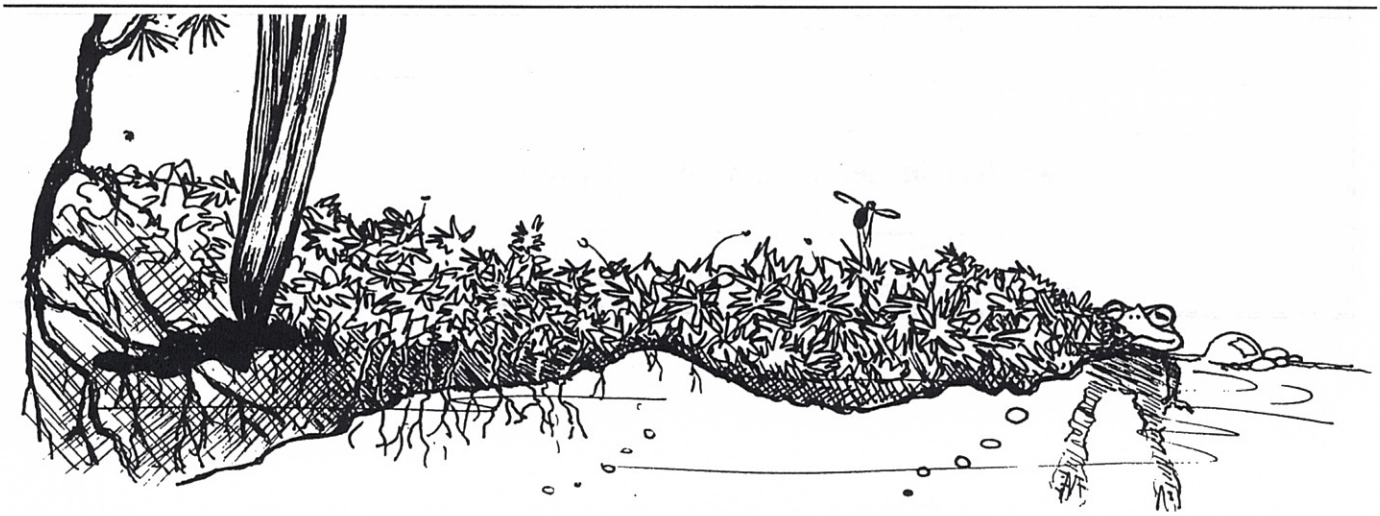
_____

_____

How are the plants adapted to surviving on the thin floating mat?

_____

_____



Water temperature_____ **Water Depth**_____

pH_____ **To what substance does this compare?**_____

Extension:

Learn how ferns differ from flowering plants. Make a poster demonstrating their life cycle and share this knowledge with your class.

THE FLOATING HERB MAT

In School:

The last zone before the center of the bog is the floating herb mat. Surrounding the open water pond, the plants growing here are on a thin mat too delicate to support the heavier shrubs or trees. Beneath the mat lies 50 feet of water and muck. The center pond of Volo Bog, now only 1/2 acre in size, represents all that remains of the kettle hole lake that was once about 50 acres. For the last 12,000 years or so, the lake has been filling in from the edges toward the center and from the top down. Over time, one plant community has replaced another. This process, called Natural Succession, will proceed onward until a force larger than itself takes the community in another direction. For example, fire, tornado, or even another glacier, can change the direction of succession. In time, what do you think will happen to this pond? What forces may change the direction of succession and what effect may they have?

_____

_____

_____

When You Visit:

Record the following:

Three Plants:

_____

_____

_____

Two Invertebrates:

_____

_____

Two Vertebrates or signs of their presence:

_____

_____

Water temperature_____ **Water Depth**_____

pH_____ **To what substance does this compare?**_____

Extension:

What would happen to a person or animal that fell through the floating mat? Read The Bog Man and the Archaeology of People by Don Brothwell.

SURROUNDS OPEN WATER

When you Visit:

The plants surrounding the open water pond are floating on a very thin, delicate mat of entwined roots and peat. GENTLY reach under the floating mat and VERY CAREFULLY lift the mat about 3 cm or so.

Reach into the water and grab a handful of suspended peat. Squeeze the water out of it. Examine it under your hand lens and describe it here:

_____

_____

RETURN THE PEAT TO THE SAME LOCATION.

What aquatic rodent eats cattails, counteracting the successional processes acting to enclose the pond?

_____

Do you feel that Volo Bog should be managed to keep the center from filling in?_____ Why or why not?

_____

_____

The center of Volo Bog is a great place to share the many legends that surround bogs. Most of these legends come from northern European cultures, as this is where bogs are most abundant. Sit quietly while your leader shares some of these with you.

Extension:

Read Beowulf, *the classic tale of the search for Grendel, a mythical Norse monster!*

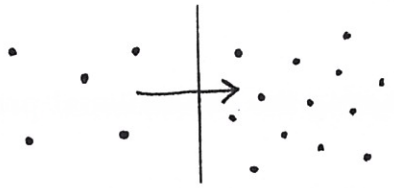
UNIQUE PLANT ADAPTATIONS

In School:

A bog is a harsh environment for plants and animals. Challenges that the bog plants and animals must overcome are:

a. Low oxygen levels in the water due to stagnancy
b. Low amounts of available soil nutrients due to slow decomposition
c. Unavailability of water due to its acidity*

* The unavailability of water seems strange. However, plants take in water by a process called osmosis. Osmosis is the movement of water, across a membrane, from an area of low concentration of materials in the water to an area of high concentration of materials in the water. Think of it as the water *wanting to dilute* the more highly concentrated solution until the solutions have equal concentrations. Thus because of all the acids dissolved in the water, the plant is in danger of losing water to the environment.



"Water, water everywhere & not a drop to drink" was cited by sailors to remind themselves that they should not drink sea water no matter how thirsty. The salt concentrations would draw fluids out of their bodies and into their digestive tract, further dehydrating and ultimately killing them!

Below is a list of plants at Volo Bog and their special adaptations. Using the letter above, link the challenge of survival to the adaptive modification.

_____ The Pitcher Plant traps insects in its pitcher-shaped leaves. The insect drowns and decomposes, then the plant absorbs its nutrients.

_____ The Leatherleaf has a thick, waxy coating on its leaves to prevent water loss.

_____ The Tamarack Tree, a member of the Pine family, drops all its needles every fall instead of remaining "evergreen". (HINT: See tamaracks on page 10.)

When You Visit:

Your leader will discuss some additional plant adaptations or modifications. List at least two here:

_____

_____

_____

Extension:

Try keeping a live carnivorous plant. Sundews and Venus fly traps are often available from mail-order nurseries or biological supply companies. Even though they are carnivorous, they are still capable of making their own food through photosynthesis if the proper nutrients are available.

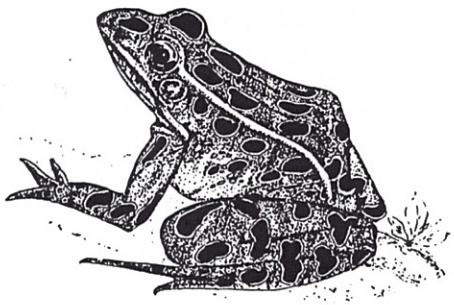
A good book on carnivorous plants is Carnivorous Plants of the United States and Canada by Donald E. Schnell. Pitcher Plants by Carol Lerner is also very good and is easier reading.

ANIMALS OF BOGS AND OTHER WETLANDS

In School:

Animals found in Volo Bog are typical of animals found in most wetlands of our area. What types of animals (including mammals, birds, reptiles, amphibians and insects and other invertebrates) would you expect to find?

Animals constantly interact with their environment. On the lines provided below, list some animals as well as plants and other elements of the wetland community then connect various members to show the relationships of a food web.



When You Visit:

Invertebrates and birds are the easiest animals to observe in the wild. Mammals, reptiles and amphibians take a bit more patience and quiet observation skills. Be aware with multiple senses: sight, sound and even smell can lead to an unexpected discovery!

Extension:

Choose one animal on which to do a 500 word report. Compile your report with those of other students in your class to make a book of Wetland Animals.

THREATENED AND ENDANGERED SPECIES

In School:

Wetlands are the most productive ecosystems in Illinois if comparing biomass produced. They produce more plants and animals (weight per volume) than any other habitat. They provide habitat for more than 40 % of Illinois' Threatened and Endangered species. Wetlands provide resources needed by many species including vital water. Aside from needing to drink, many species including all amphibians and many insects depend on water in order to reproduce. Water provides a safe "hang out" for ducks and other water birds. All fish, obviously, need water but an aquatic system without plants is like a desert to a fish. Plants provide food, cover and places to lay eggs. Wetlands associated with lakes, rivers and streams therefore are essential to fish and other inhabitants of large bodies of water.

Wetlands provide food, shelter and natural open space necessary for wildlife in Illinois. Volo Bog's own Veery (a cousin to the robin) finds suitable nesting habitat in the shrub zones. This state threatened bird and its habitat are protected by the Illinois Endangered Species Protection Act.

Animals are not the only endangered species dependent upon wetlands. Pitcher plants, tamarack trees, several orchids and many other threatened and endangered plants find legal refuge in the wet environs of Volo Bog.

If wetlands provide so many needed resources, why are so many species that are dependent on these ecosystems endangered or threatened?

_____

_____

_____

_____

_____

When You Visit:

What are some things you personally can do to help protect threatened endangered species?

1. _____

2. _____

3. _____

Extension:

Find out how the Endangered Species Protection Act works in Illinois. How is a species determined to need protection? Who determines this need? How is the protection brought about? What are the consequences faced by someone who causes harm to a protected species?

ALDO LEOPOLD: A *MARSHLAND ELEGY*

In School and When You Visit:

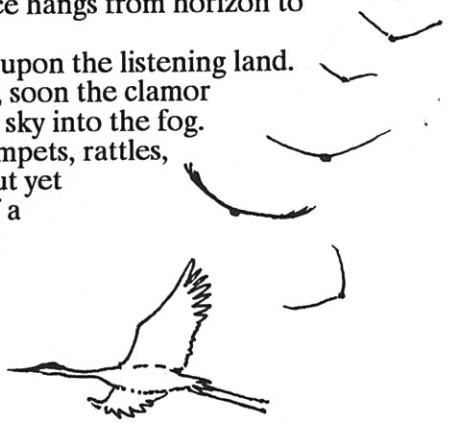
Aldo Leopold is considered the Father of Conservation. He was born in 1898 in Iowa and schooled and taught in Wisconsin. It was in Wisconsin that he bought an old, run-down farm. Over the years, his studies and observations led him to develop a special attitude toward the land that we now call a "land ethic." He shares his philosophy in his book A Sand County Almanac and Sketches Here and There. The following is a passage from Mr. Leopold's book.

Marshland Elegy

A dawn wind stirs on the great marsh. With almost imperceptible slowness it rolls a bank of fog across the wide morass. Like the white ghost of a glacier the mists advance, riding over phalanxes of tamarack, sliding across bog-meadows heavy with dew. A single silence hangs from horizon to horizon.

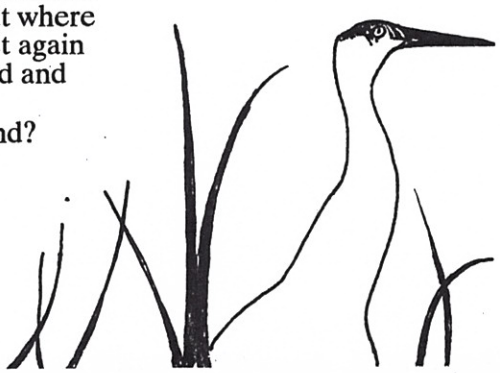
Out of some far recess of the sky a tinkling of little bells falls soft upon the listening land. Then again silence. Now comes a baying of some sweet throated hound, soon the clamor of a responding pack. Then a far clear blast of hunting horns, out of the sky into the fog.

High horns, low horns, silence, and finally a pandemonium of trumpets, rattles, croaks, and cries that almost shakes the bog with its nearness, but without yet disclosing whence it comes. At last a glint of sun reveals the approach of a great echelon of birds. On motionless wing they emerge from the lifting mists, sweep a final arc of sky, and settle in clangorous descending spirals to their feeding grounds. A new day has begun on the crane marsh.



A sense of time lies thick and heavy on such a place. Yearly since the ice age it has awakened each spring to the clangor of cranes. The peat layers that comprise the bog are laid down in the basin of an ancient lake. The cranes stand, as it were, upon the sodden pages of their own history. These peats are the compressed remains of the mosses that clogged the pools, of the tamaracks that spread over the moss, of the cranes that bugled over the tamaracks since the retreat of the ice sheet. An endless caravan of generations has built of its own bones this bridge into the future, this habitat where the oncoming host again may live and breed and die.

To what end? Out of the bog a crane, gulping some luckless frog, springs his ungainly hulk into the air and flails the morning sun with mighty wings. The tamaracks re-echo with bugled certitude. He seems to know.



What does Elegy mean? Why did Leopold choose this word as title to this passage?_____

Extension

Marshland Elegy *is a very visual passage. Choose one image that it creates for you and sketch that image. This is a very personal exercise.*

The Leopold Education Project is a curriculum designed by Council 16 of the Association of the Illinois Soil and Water Conservation Districts. It is designed to help students develop an improved "land ethic." Contact your county SWCD for information on this fantastic teaching tool.

CREATIVE WRITING IN A BOG

When You Visit:

As a class, space yourselves with at least one meter between each other, going as far back as post seven (no further). Sit quietly on the board walk and make yourself comfortable. Do not talk to anyone; pay attention only to the natural world around you. Close your eyes and listen to the bog. Smell its presence. Then open your eyes.

Spend five quiet minutes recording your observations, either in words, sketches or both.

After five minutes of independent observations, your leader will call you back to the platform. *Remain Quiet.* Your walk along the next section of boardwalk should be done in silence. Concentrate on your powers of observation - sight, touch, hearing and smell. Be aware of the bog around you.

Extension:

Write a poem or song with a wetlands theme.

FUNCTIONS AND VALUES OF WETLANDS

In School:

Attitudes toward wetlands have come full circle over the decades. Historically, our primitive ancestors found many resources in wetlands. They also found them mysterious, a little dangerous and definitely places to be respected, for gods and goddesses were thought to dwell within. With the industrial age, attitudes changed. Wetlands were viewed as obstacles to development, sources of disease, evil and terrifying serpents. They were places to be dredged, drained or in any other way "improved upon" for human uses.

Today, our attitudes are somewhat enlightened. The function of wetlands becomes all to apparent when people living or working in an area "reclaimed" from wetland becomes flooded. The Mississippi, DesPlaines and Fox Rivers often remind us of the existence of floodplain wetlands along their banks. Dams, dikes and retaining walls have offered some protection to one community only to intensify flooding to others down river. Flooding is further aggravated by the development of non-river wetland areas: when absorptive land surface is covered with pavement and buildings, the water must go somewhere.

Aside from flood control, wetlands serve many other functions including water purification, sediment and erosion control, wildlife habitat, recreational opportunities, both consumptive and non-consumptive, food supplies, etc... When a function, or what something *does*, is deemed worthwhile by humans, the function takes on value. A value is the *worth* humans place on a function.

When You Visit:

Your leader will guide a discussion of wetland functions and values using metaphors. Below, list each item and the function or value that it represents.

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____
5. _____ _____
6. _____ _____
7. _____ _____
8. _____ _____

Extension:

Write a short essay about the difference between "function" and "value" and the value of wetlands to our society. What are some intangible values of wetlands or natural open spaces in general?

PROTECTING WETLANDS

In School:

Volo Bog is unique. There are very few bogs in Illinois, as they are a northern ecosystem found more frequently in Minnesota, Wisconsin, Michigan, Canada and other areas to the north. Volo Bog is Illinois' only bog to still have open water remaining in the center. It is the farthest south bog in North America to exhibit all the stages of bog succession including the remaining pond. Volo Bog's uniqueness was recognized by scientists and nature lovers as early as the 1920's. In 1958, the Illinois chapter of The Nature Conservancy purchased Volo Bog in order to protect it from development and other threats.

Protecting wetlands is a complex issue. Many levels of government have laws that affect wetland uses. Volo Bog is protected by the Illinois Department of Conservation and is designated a Nature Preserve by the Illinois Nature Preserves Commission. Laws prohibit people from removing or disturbing anything from Volo Bog. Scientists need special permits to collect for their studies.

Not every wetland is protected. Some have *more value* than others. Some serve only certain functions. Many are degraded by invasion of purple loosestrife, a non-native plant that out competes native plants and serves little function for wildlife. Others are contaminated with pollutants and litter. Regardless, all wetlands serve at least some of the functions we've discussed.

How does the word preserve, used above, compare with its use on pages 4 & 5?

_____

_____

When You Visit:

What are some reasons people may have for wanting to protect Volo Bog and other natural areas?

_____

_____

_____

_____

Extension:

What laws exist that protect wetlands? Are there any proposed laws designed to protect wetlands. Write to your local representative to express your opinion about these laws.

RECOMMENDED READINGS

BOOKS

Bogs of the Northeast, Charles W. Johnson, University Press of New England, Hanover, NH, 1985.

Bog Man and the Archaeology of People, Don Brothwell, Harvard University Press, Cambridge, MA, 1987.

The Bog People: Iron-Age Man Preserved, P.V. Glob, Ballatine Books, 201 E. 50th St., New York, NY, 1969.

A Field Guide to the Wetlands of Illinois, State of Illinois, Illinois Department of Conservation, Springfield, IL, 1988.

People of the Wetlands: Bogs, Bodies and Lake-Dwellers, Bryony and John Coles, Thames and Hudson Inc., 500 Fifth Ave., New York, NY 10110, 1989.

Pond Life, Golden Guide series, George Reid, Western Publishing Co., Inc., Racine, WI, 1987.

Reading the Landscape of America, May Theilgaard Watts, Macmillian Publishing Co., Inc., New York, NY, 10022, 1975.

Walking the Wetlands: A Hiker's Guide to Common Plants and Animals of Marshes, Bogs, and Swamps, Janet Lyons and Sandra Jordan; John Wiley and Sons, Inc., New York, NY, 1989.

Wetlands, William J. Mitsch and James G. Gosselink, Van Nostrand Reinhold, 115 Fifth Ave., New York, NY, 10003, 1986.

Wetlands, The Audubon Society Nature Guides, William A. Niering, Alfred A. Knopf, Inc., New York, NY, 1987.

Wetlands of North America, Photography by Bates Littlehales, Text by William A. Niering, Thomasson-Grant, Inc., One Morton Drive, Suite 500, Charlottesville, Virginia, 22901, 1991.

ARTICLES

Food, Warmth, Home, the Womb of Life, readers photo collection, Michigan Natural Resources Magazine, Michigan Department of Natural Resources, Jan-Feb. 1991.

Land of the Quaking Soils, by Dave Ambrose, Outdoor Highlights, Illinois Department of Conservation, June 18, 1990.

Life-like Man Preserved 2,000 Years in Peat, by P.V. Glob, National Geographic, March, 1954.

Mysteries of the Bog, by Louise E. Levathes, National Geographic, March, 1987.

Our Disappearing Wetlands, by John G. Mitchell, National Geographic, October, 1992.

Reservoirs of Life, by Gary Thomas, Outdoor Highlights, Illinois Department of Conservation, December 4, 1989.

A NATURE PRESERVE ETHIC

Walk quietly so as not to disturb others- animals or human.

Pick no flowers - so that they may form seeds and so that others may enjoy their beauty. Also pick no other plant parts.

Tread lightly - stay on trails or in designated study areas. Avoid stepping on plants.

Respect all living things. Do not disturb wildlife or their homes.

Take only memories. Leave only footprints. Do not collect anything except litter.

REVIEW

In School:

Be sure you understand the following words.

Acid
Adaptation
Aerobic
Alien
Anaerobic
Aquatic
Biomass
Bog
B.P.
Community
Compound Leaves
Conservation
Deciduous
Decompose
Diversity
Dominant
Dynamic
Ecosystem
Elegy
Endangered
Environment
Ethic
Food Web
Function
Glacier
Habitat
Herbaceous
Hummocks
Intangible
Invertebrate
Isolated
Kettle Hole
Metaphor
Native & Non-native
Natural Succession
Organic
Osmosis
Peat
pH
Preserve
Primary Consumer
Producer
Secondary Consumer
Species
Sphagnum Moss
Stagnant
Tamarack
Threatened
Till
Value
Vertebrate
Wetlands

When You Visit:

Be sure to ask your leader any questions you may have if you have not already! You can use the space provided here to keep track of the answers.

_____

_____

_____

_____

_____

_____

Extension:

Write an article about your experience at Volo Bog. Try to get your article published in your local newspaper!

FROM THE AUTHOR

This activity guide has been two years in the making. Many people helped to make it a reality.

Special thanks go to artist Ed Kirwan for his specialty drawings here and there. Jim Kostohrys contributed the leopard frog.

Cindy McGuckin, high school science teacher gave endless suggestions and test-ran the program on several classes in 1993 and 1994. Her inspiration and enthusiasm kept my momentum up throughout the project.

Pamela Duncan, high school biology teacher, helped nourish the seeds of my ideas and developed the concepts for the "Communities" and "Unique Plant Adaptations".

Joe Lindquist, also a biology teacher, offered more valuable suggestions.

Janet Ginsburg gave good critique from a news writers' perspective.

My mother, Merry Miller, helped with the proofreading.

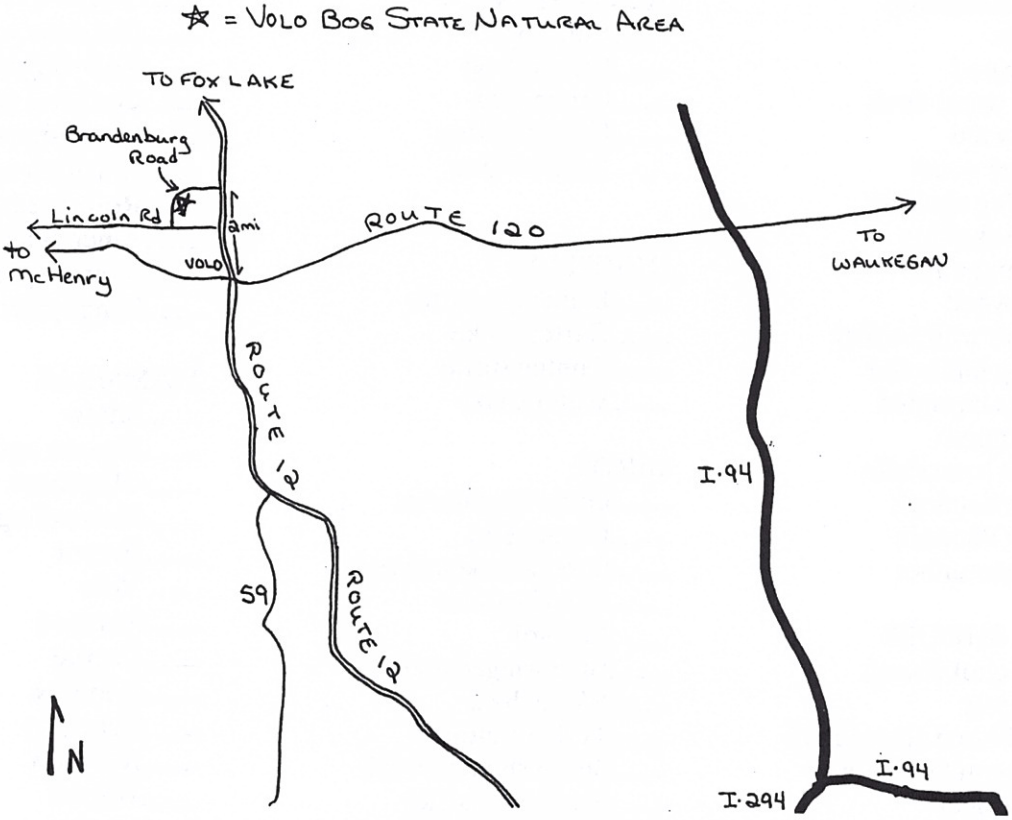
My boss, Greg Behm, patiently kept me moving forward and on track with this project.

Too many students to name here have given their input from the recipients viewpoint - they are the ones who have to do the work for class credit and grade. It is important to me above all else that they have fun while learning about Volo Bog and perhaps a bit about themselves in the process.

I must also thank Volo Bog and her inhabitants for the many discoveries they have offered to me along the way and the many more to come.

Stacy Miller-Dwanicki

WHERE ON EARTH *IS* VOLO BOG???



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THE BACK PAGE
A Brief Check List of Plants & Animals

FERNS, HORSETAILS & MOSSES
____Cinnamon fern
____Marsh fern
____Marsh horsetail
____Royal fern
____Sensitive fern
____Sphagnum moss

SEDGES, RUSHES & GRASSES
____ Bottlebrush sedge
____ Cattail (broadleaved)
____ Common bur-reed
____ Reed canary grass
____ Rusty cotton grass
____ Wool grass sedge

FLOWERING HERBS
____Arrowhead (Duck potato)
____Blue vervain
____Bog buckbean
____Boneset
____Bulb-bearing hemlock
____Deadly nightshade
____Ditch stonecrop
____Dodder
____Duckweed
____Great water dock
____Jewelweed
____Joe Pye weed
____Mad dog skullcap
____Marsh skullcap
____Rose pogonia
____Smartweed
____Smooth white violet
____Swamp milkweed
____Swamp marigold
____Tear thumb
____Tufted loosestrife
____Water hemlock
____Water Plantain
____Wild cucumber

TREES & SHRUBS
____Black chokeberry
____Blueberry
____Dwarf birch (Bog birch)
____European buckthorn
____Leatherleaf
____Meadowsweet
____Poison sumac
____Pussy willow
____Red dogwood
____Tamarack
____Winterberry holly

INVERTEBRATES
____Backswimmer
____Copepod
____Crayfish
____Damselfly
____Deerfly
____Diving beetle
____Dragonfly
____Fisher spider
____Giant water bug
____Mosquito
____Scud
____Snail
____Stilt spider
____Water boatman
____Water mite
____Water scorpion
____Water strider
____Whirligig beetle

AMPHIBIANS
____Bull frog
____Chorus frog
____Green frog
____Grey tree frog
____Leopard frog

REPTILES
____Blanding's turtle
____Garter snake
____Painted turtle
____Water snake

BIRDS
____Great blue heron
____Great egret
____Green-backed heron
____Canada goose
____Mallard
____Blue-winged teal
____Wood duck
____Turkey vulture
____Sharp-shinned hawk
____Northern harrier
____Red-tailed hawk
____Osprey
____Ring-necked pheasant
____Sandhill crane
____Virginia rail
____Sora
____Mourning dove
____Screech owl
____Great horned owl
____Common flicker
____Red-bellied woodpecker
____Downy woodpecker
____Willow flycatcher
____Least flycatcher
____Tree swallow
____Barn swallow
____Blue jay
____Crow
____Black-capped chickadee
____White-breasted nuthatch
____Marsh wren
____Grey catbird
____American robin
____Veery
____Cedar waxwing
____Yellow warbler
____Yellow-rumped warbler
____Common yellowthroat
____Red-winged blackbird
____Common grackle
____Brown-headed cowbird
____Northern cardinal
____Rose-breasted grosbeak
____American goldfinch
____Swamp sparrow
____Song sparrow

MAMMALS
____Shrew
____Eastern cottontail
____Chipmunk
____Groundhog (Woodchuck)
____Beaver
____Vole
____Muskrat
____Coyote
____Red Fox
____Grey Fox
____Raccoon
____Weasel
____Mink
____White-tailed deer