Greenleaves

Newsletter of the Bruce Grey Woodlands Association

SUMMER 2022

www.bgwa.ca

INSIDE:

President's Message

Jim White

Dear BGWA members

Did you enjoy your summer? Lots of variety in terms of weather for sure. We spent many happy days in the forests over the summer, our own, provincial and national parks, all in southern Ontario. Last week we spent the week on the Bruce Peninsula, hiking, kayaking and biking. What a spectacular county with an amazing diversity of land use of which forests still have strong representation. It is all in our own backyard.

There are a couple of BGWA topics I would like to discuss with you.

First, we have the benefit of local professionals who are extremely knowledgeable and most capable communicators. I was able to participate in the Massie Forest Tree ID hike in August. We had a good turnout of members for the event and even received a couple emails thanking the hike leaders for their prep work and a fun experience. We learned about the differentiating characteristics of leaves and bark ranging between hardwood species and species of conifers. Our hike followed sections of the cross- country ski trail system resulting in us seeing maturing plantations, hardwood forest and even some wet areas.

The bugs were not too bad, mostly because we had one participant that

(Continued on page 2)

We acknowledge the Territory of the Anishinabek Nation: The People of the Three Fires known as Ojibway, Odawa, and Pottawatomie Nations. We further give thanks to the Chippewas of Saugeen, and the Chippewas of Nawash, known collectively as the Saugeen Ojibway Nation, as the traditional keepers of this land. We also acknowledge the Métis Nation of Ontario, whose history and people are well represented in what we now call Bruce and Grey Counties.

Would you like to host a member tour of your woodland property?

Contact Jim Coles:
jcoles@gbtel.ca
519-934-0020

the mosquitos seemed to prefer his donations. Your willingness to participate and ask questions made the event rewarding for members as well as the volunteers on the Events Committee.

Director Ron Stewart supported by BGWA volunteers participated with a tent display at the Heritage Farm Show last weekend. They estimate they talked with 450 people at the BGWA display. We need member volunteers to support the tent display at the Durham and Paisley Fairs respectively Sept 3 and Sept 11. Please contact me for more details if you can help. (info@BGWA.ca).

Watch the BGWA website and emails for our next event on Tree marking in October.

We have surpassed the number of physical and virtual events to date compared to 2021's full year. We have momentum and wonderful leadership from the board of directors. My thanks to each of you.

Lastly, I sincerely ask for members to volunteer to make contributions to *Greenleaves*. Each of us has experiences and knowledge that we can share with fellow members. We are a local association entirely resourced by volunteers. You can make a positive difference by volunteering. Without you volunteering *Greenleaves* newsletter gets thin in content. Send your content and/or ideas to: **newsletter@BGWA.ca**

I trust that you will enjoy reading the summer issue and look forward to seeing you at an event this fall!

Warm regards

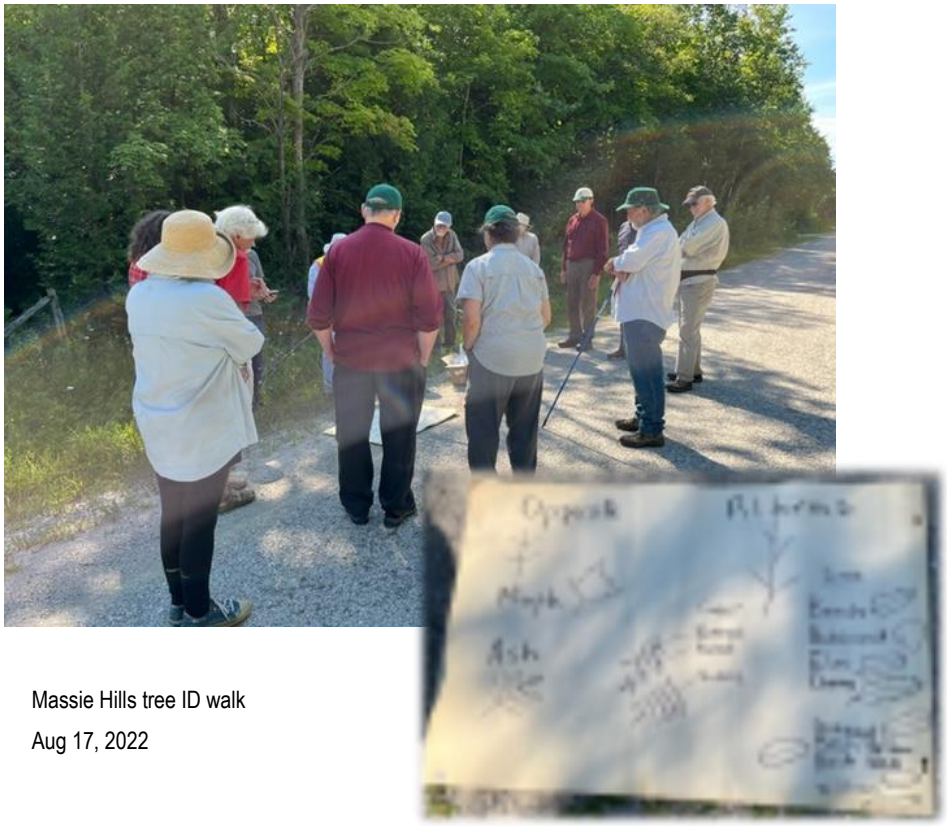
Jim

Upcoming Board Meetings:

Oct 11 2022
Dec 13 2022
Jan 10 2023

7:00-8:30PM Members Welcome!

Contact secretary@bgwa.ca to confirm format (virtual/in-person/hybrid) and location or zoom link.



Massie Hills tree ID walk
Aug 17, 2022

GREENLEAVES

is published by Bruce Grey Woodlands Association (BGWA) and distributed to members to provide information, guidance, instruction, ideas and opinions related to trees, woodland ecosystems, forest management, and recreation in forest settings in or relevant to Bruce and Grey counties.

Content of articles is the sole responsibility of the authors and does not necessarily represent the views of BGWA. Images accompanying articles are provided by the author unless indicated otherwise.

BGWA's vision:

Promoting healthy forests and ecosystems in Bruce and Grey Counties through education, recreation and sustainable management practices.

bgwa.ca **info@bgwa.ca**

Mailing address:

BGWA, Box 45, Neustadt, ON, N0G 2M0

What's going on with the Scots Pine this year?

By Susan McGowan, BGWA Director

Many people have noticed the decline of Scots Pine in our area. These trees in Bruce and Grey counties have exhibited symptoms of brown spot needle blight for several years, and this has been recorded and mapped by the provincial forest health monitoring unit of the Ontario Ministry of Natural Resources and Forestry in 2018, and 2019. Mapping for 2022 is being concluded and areas of damage will be available soon. (see copies of maps on following page).

After being present on trees since at least 2018, and each year's worth of infected needles having dropped, very little foliage is left to sustain the tree by this year. By August the new growth of 2022 appears green, but farther back on the branches is bare, where infected needles have fallen.

Brown-spot needle blight, (BSNB) is a disease, native to North America, which kills foliage and slows growth in pine. Brown or reddish brown needles that drop prematurely are characteristic of this disease. All pine species are susceptible, but our Scots pine and Austrian pine are most commonly infected.

The disease overwinters on dead infected needles remaining on the tree and on the ground and therefore is most damaging on low branches and small trees. Warm wet weather is required for spores to germinate and penetrate healthy needles. The disease seldom kills trees but can cause significant defoliation on 2- and 3-year-old needles with current year needles also being infected in severe disease years.

Most infections occur in late spring and can take several months for symptoms to appear. Yellow and tan spots appear early in the summer, later coalescing into brown bands with yellow halos encircling the needle by late summer and fall. Black fruiting bodies form on infected needles in the tree and on the ground.

On a small scale, some control can be achieved by removal and disposal of all infected material, including needles on the ground if practical.

This information was edited from the Brown Spot Needle Blight Fact Sheet, from the Ministry of Natural Resources and Forestry, at the following website:

https://www.ontario.ca/page/brown-spot-needle-blight

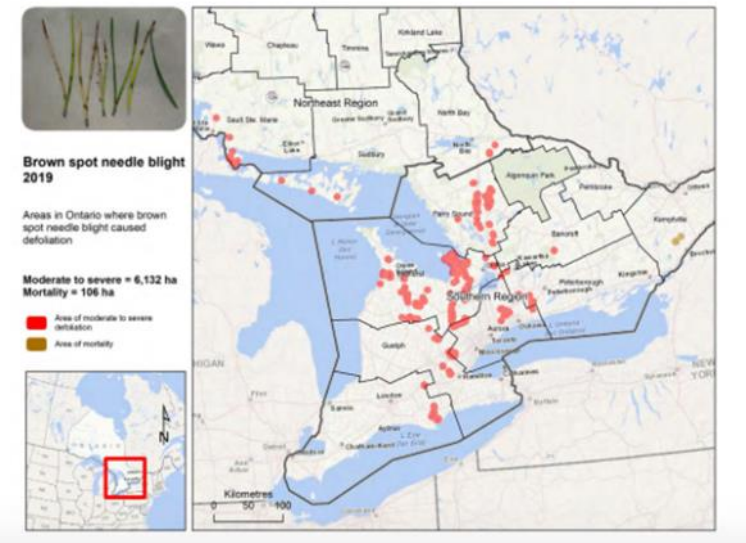
Yearly reports on Forest Health in Ontario can be viewed and downloaded from:

https://www.ontario.ca/page/forest-health-conditions

Information on the management of Scots pine is available from the Ontario Invasive Plant Council:

https://www.ontarioinvasiveplants.ca/wp-content/uploads/2020/10/ScotsPine_BMP.pdf

Map of brown spot needle blight in 2018, created by the Ministry of Natural Resources and Forestry. 1,760 ha of damage mapped.



Map of brown spot needle blight in 2019, created by the Ministry of Natural Resources and Forestry. 6,132 ha of damage mapped.

Welcome! Meet some new BGWA Members ☺

We are new members Beth Hamilton and Mark Mariash. We live in a geodesic dome, two domes actually, in West Grey, east of Durham, situated on the Traditional Territory of the Anishinabek Nation. We have lived on our forested property for over a decade now, however it was just last year that we registered a Stewardship Plan for our tiny forest of approx.12 acres. Donna Lacey of SVCA came out for a 'walk and talk' and much to our surprise, Donna encouraged us to draft the plan ourselves. It was a very rewarding process as we took stock of what we had already accomplished, distilled our core values, and generated tangible goals for the next decade.

Climate action, reconciliation, and living sustainably are at the heart of our work as we work to decolonize and heal the land. As amateurs we have been learning from books, workshops, friends, and of course from the land. We make a good team as Beth enjoys wildflowers and understory plants and Mark's greatest interest is trees.

At this stage in our plan we are working to remove invasive species and also to increase biodiversity by adding native trees and plants. We enjoy the bounty from the forest including heating our home with firewood, tapping trees for maple syrup, and wild leek pesto in the spring. Every year the land continues to surprise us with "new finds" such as leatherwood along the old rail line and the distinctive calls of a whippoorwill for one summer season.

We look forward to getting to know you all and participating in the BGWA community.

Beth Hamilton & Mark Mariash

Climate Change and it's Effect on our Forest Ecosystem

By Jim Coles BGWA Director

Our local climate determines our basic living conditions. It controls the growth of agriculture and forest crops, determines our heating and cooling needs, the size of our storm drains, and influences the potency of pollutants in our water and air. There is a great deal of natural variation in our climate over time but human activities such as fossil fuel use, steel, fertilizer and cement production and land use change are driving up the concentration of carbon dioxide and other greenhouse gases (GHG) well above the natural variation. These GHGs trap heat and alter our climate.

Canada has an array of more than 2500 weather monitoring stations across the country focused mainly in the heavily populated southern region. The original, in Toronto, dates to 1840. The stations have almost all been converted from manned to automated (east entrance to the Kinghurst property) and, from 1948 onward, provide reasonably homogeneous data for the country.

How Our Climate is Changing

Temperature

Canada is not faring well when it comes to temperature increases. The average annual temperature in Canada increased 1.7 0C between 1948 and 2016.. This is roughly twice the increase observed for Earth as a whole. Ontario is doing slightly better with an average increase of only 1.3 0C. Northern Canada has higher temperature increases than southern Canada. The temperature increases are also not uniform throughout the year but vary by season and regions:

Canada : winter - 3.30C; spring - 1.70C; summer - 1.50C; autumn - 1.70C .

Ontario: winter - 2.0 0C; spring - 1.5 0C; summer - 1.1 0C; autumn - 1.0 0C.

Temperatures in Canada and Ontario are forecast to continue to increase regardless of the various prediction scenarios employed.

Temperature Extremes and Indices

Probably more important than temperature itself are temperature extremes and the various associated indices, many of which are derived from daily temperature data and have important implications - for instance:

- heating degree days (sum below 180C) & cooling degree days (sum above 180C) - energy utility planning
- growing degree days (sum above 50C) - agriculture output and forestry
- number days maximum above 300C, daily minimum above 220C - health implications.

Observed changes in temperature and extremes indicate that warm events are becoming more intense and frequent while cold events are becoming less intense and less frequency. The annual lowest daily minimum temperature averaged across the country increased by 3.30C between 1948 and 2016 with the strongest warming in the west. Extreme cold temperatures increased much more rapidly than extreme warm temperatures , consistent with greater warming in winter than in summer and greater warming in night temperatures than in day temperatures.

Warming in winter and spring has resulted in a significant decrease in the number of frost days (minimum temp of 0^{o}C or lower) and ice days (maximum temp of 0^{o}C or lower) as well as shortened winter seasons. Averaged for the country as a whole, frost days have decreased by more than 15 and ice days by more than 10 days from 1948 to 2016. These changes are consistent across the country. As a result, the frost-free season has been extended by 20 days, starting about 10 days earlier and ending about 10 days later. The length of growing seasons and the number of growing degree days have also increased. The growing season, which starts when there are six consecutive days with daily mean temperature above 5^{o}C in spring and ends when this condition fails to be met late in the year, started earlier and ended later, resulting in an increase in growing season length of about 15 days between 1948 and 2016. With the longer growing season, the number of growing degree days has also increased.

Precipitation

Precipitation, both rain and snow, is the ultimate source of water for our land, lakes and rivers and plays an important role in shaping and sustaining our ecosystems. Humans and natural systems have evolved and adapted to variable precipitation in the past but shifts in precipitation beyond the historical range could have profound impacts.

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(Climate Change, from page 5)

Precipitation measurements at our weather stations are less accurate than temperature as they are affected by weather conditions. Thermometers are enclosed in protecting shields while precipitation gauges are in the open air. Precipitation gauges catch only a portion of rain if it is windy and snowfall amounts are even more difficult to measure. In addition, as precipitation is sporadic in time and space, a point observation represents only a very small area of the observation site.

Across the country, precipitation has increased by about 20% since 1948. The percentage increase was larger in northern Canada but southern Ontario has seen a increase in precipitation although there is low confidence in the estimate of the magnitude. Warming has resulted in the proportion of precipitation falling as snow steadily and significantly decreasing in southern Ontario. A change in the form of precipitation from snow to rain can have major effects on such aspects as river flow with the spring freshet coming much earlier. Change in precipitation in percent:

> Canada : annual - 18.3; winter - 20.1; spring - 25.3; summer - 12.7; autumn - 19.0 .
>
> Ontario: annual - 9.7 ; winter - 5.2; spring - 12.5; summer - 8.6; autumn - 17.8.

Southern Ontario is in a unique position. It is on the border between the wetter northern area and the dryer south central US. Predicting future precipitation trends in southern Ontario is iffy.

Extreme Events

There has been an increase in costly extreme weather and climate events in Canada (wildfires in Fort McMurray & Lytton, 2013 floods in southern Alberta and recently in southern BC) . Luckily, Ontario has been spared except for the ice storms of 1998 and 2013. Much of this increase in extreme events is due to increased population and value of our supporting infrastructure.

Changes to the intensity and frequency of damaging extreme weather events due to climate change, may also be playing a role but is difficult to assess. Recent research has focused on whether human induced climate change has influenced the probability and severity of these extreme events.

Canadian Forest Fire Weather Index (FWI)

Changes in temperature and precipitation each have impacts but, when combined, can have additional impacts such as fire weather. The FWI is a collection of indices that use weather variables like temperature and precipitation to characterize fire risk. All of the FWI indices represent factors affecting fire potential but the occurrence of a large wildfire also depends on ignition sources, fuel characteristics and fire management actions. Higher temperatures now and in the future will contribute to increased values of the FWI indices leading to increases in the frequency, intensity, timing and extent of forest fires. Despite the increase in precipitation across the country, it is insufficient to offset the increase in temperatures.

Impacts Of The Changing Climate On Our Forest Ecosystems

The Great Lakes- St Lawrence Forest

Grey Bruce is in the more southerly portion of Great Lakes-St Lawrence forest region and may face a transition as it gives way to a new mix of species from the Carolinian forest to the south. Our sugar and red maples, ash, yellow birch, beech, basswood, red oak, white and red pine, cedar and hemlock forest of today may include tulip, magnolia, black gum, white oaks, hickories, sassafras, and red bud in the future.

But there are so many other complicating ecological functions that will change that it is almost impossible to predict the response of long-lived organisms like trees to changing climate.

1.Trees obviously migrate very slowly so that it is likely that the movement of various species will lag well behind the movement of climate zones.

2. Warmer winters promote earlier spring vegetative and flower bud burst, making them more susceptible to late spring frosts.

3. Climate change may disrupt the critical synchronies between the timing of flowering, pollen availability, seed development and the life cycles of the animals that pollinate them and transport seed.

4. Climate exerts a strong influence over the water cycle. As more winter precipitation falls as rain, the duration and extent of snow cover is expected to diminish, leading to earlier runoff and lower spring flows.

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(Climate Change, from page 6)

5. Warmer winters and longer growing season will increase evaporation and water use (transpiration) by forests, agriculture crops and other plants. Greater water use will likely reduce summertime soil moisture and increase the occurrence of droughts.

6. How the productivity of our forests will change is unclear. Longer growing seasons and higher CO2 concentrations may increase productivity while increased summer drought, changes in suitable habitat, and air pollution may decrease productivity.

7. The productivity of our forests is linked to the supply of nutrients. Climate change can alter nutrient dynamics by changing the rate of litter decomposition, the leaching of key nutrients from the soil, and the uptake of nutrients and water by fine roots and symbiotic fungi.

8.. Competition between tree species is likely to increase as suitable habitat shifts to favour more southern species.

9. Invasive plant species are often better able to tolerate changing climate than native species. Invasive plant species like buckthorn and Norway maple, vines like dog-strangling and kudzu, and annual vegetation like garlic mustard and wild chervil may also increase competition.

10. Warmer winter temperatures reduce the number of extreme cold days which increases the survival rate of forest pests like the emerald ash borer, forest tent caterpillar, spruce budworm, gypsy moth.

Forest Management Options To Accommodate The Change

Our knowledge of the rate, magnitude and location of changes in forest composition and distribution remains highly uncertain. As such, we have very few options for forest management decisions made today as they will have effects far into the future. We might consider:

Assisted Migration: using seeds, seedlings or other genetic material from a wider geographic range - perhaps more southernly - in the hope of finding better adapted sources for future conditions.

Harvesting: harvesting species that are most vulnerable to disturbance (eg: insect infestations)

before their rotation age so that better adapted species or populations can move in.

Pests & Diseases: Improving insect and disease monitoring and management or perhaps improving the capability (increasing vigor) of our forests to withstand damaging insects and diseases.

Reducing Competition: Actively managing the understory competition by removing undesirable, poorly adapted and invasive species so that better adapted species can survive.

Or, we can just sit back and let nature do as it wishes.

Sources—Much of the information for this article was taken from:

1. Canada's Changing Climate Report, 2019.

2. Changing Climate, Changing Forests: The Impacts of Climate Change on the Forests of the NE US and Eastern Canada. US Forest Service. 2014.

Distinguishing Among the Four Wetland Types

By Kevin Predon, RPF, BGWA Director

Wetlands are areas of land commonly referred to as swamps, fens, mires, marshes, bogs, sloughs, and peatlands. They appear sporadically throughout the landscape adjacent to lakes, rivers, and streams, as well in other places with a shallow water table. They can vary in size from a few meters squared to many kilometers squared. As an area where land and water come together, wetlands provide niche habitat for many species that are unable to live anywhere else. Wetlands are critical components of ecological processes and functions across the landscape, and therefore their preservation is essential for protecting the quality of the biosphere that humans share with all other living organisms.

According to my source material, the technical definition of a wetland is as follows:

> *Lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface; in either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants.*

Some words to focus on in that definition are *seasonal*, as it is common for many wetlands to not always be

(Continued on page 8)

(Wetlands, from page 7)

wet – particularly at this time of year, and *hydric soils* as the presence of organic soils are critical for defining the boundary of a wetland. That is also why it is necessary to look at the soil, vegetation, and wildlife when studying wetlands, as they are all indicators as to what type of wetland is present.

The Canadian Wetland Classification System (Environment Canada 1987) recognizes five wetland types (marsh, fen, bog, swamp, and shallow open water); however, the OWES (Ontario Wetland Evaluation System) combines marshes and shallow water, as it may be impossible to distinguish between the two. The following descriptions of wetlands are as they appear in the OWES manual.

Bogs

Bogs are peat-covered areas or peat-filled depressions with a high-water table and a surface carpet of mosses, primarily Sphagnum moss. The water table is at or near the surface in the spring, and slightly below during the remainder of the year. The mosses often form raised hummocks, separated by low, wet, crevices. The bog surface is often raised, or if flat or level with the surrounding wetlands, it is virtually isolated from mineral soil waters. Hence, the surface bog water and peat are strongly acid and upper peat layers are extremely deficient in mineral nutrients. Peat is usually formed in situ under closed drainage and oxygen saturation is very low.

Although bogs are usually covered with Sphagnum moss, sedges may also be present, and frequently characterized by a layer of ericaceous shrubs (i.e. blue berries and cranberries). Another important indicator of a bog (as it was emphasized during my OWES training course), is that bogs may be treed or treeless, but tree cover will not exceed 25%, and that tamarack may be present, but only in small numbers and mostly confined to the periphery. The reason that there will be limited amounts of tamarack growing in a bog is due to that species being a deciduous conifer. After they've dropped their needles in the fall, tamaracks will have a difficult time growing them back the following spring because bogs are very poor in nutrients.

I have seen a lot of bogs during my time as a forester – but I haven't seen many around Grey and Bruce Counties. However, even though I haven't personally been there, my research tells me that The Osprey Wetlands near Dundalk, which is a property managed by the Nottawasaga Valley Conservation Authority, are "essentially a raised bog that rest in a depression of bedrock" (www.ontarionaturetrails.com/trail/osprey-wetlands). The website recommends that it is best to visit this site in the winter time (probably to minimize disturbance) so perhaps we could plan to have a snowshoe in a few months (I know, this is the summer issue of *Greenleaves*, but as they say in Game of Thrones: winter is coming).

Fens

Fens are peatlands characterized by surface layers of poorly to moderately decomposed peat, often with will-decomposed peat near the base. They are covered by a dominant component of sedges, although grasses and reeds may be associated in local pools. Several moss species with narrow pH tolerances are common in fens and, if you can identify them (I am very bad at differentiating between moss species), they can be used as an indicator of a fen.

Sphagnum moss may be present or absent, often there may be a lot of low to medium height shrub cover, and a sparse layer of trees. The water and peat in a fen are less acidic than that in a bog and are often nutrient rich and minerotrophic since they receive water through groundwater discharge from adjacent uplands.

Around Grey and Bruce Counties, some fen wetlands develop directly on limestone rock where the minerotrophic waters are emerging through constant groundwater discharge. A good example of a local fen to go and check out would be the Oliphant Fen in South Bruce Peninsula. There is a wooden boardwalk that allows you to safely traverse through the wetland (without damaging the sensitive vegetation or getting wet feet) and be sure to look for the carnivorous Pitcher-Plant.

Swamps

A swamp is a wooded wetland with at least 25% or more cover of trees or tall shrubs. This is an important threshold marker between the previous two types of wetlands, as there is never enough tree cover in a bog or a fen for them to be considered a forest;

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(Wetlands, from page 8)

however, in this case the tall tree/shrub component must be dominant for the wetland community to be considered a swamp.

In swamps, standing to gently flowing waters occur seasonally or persist for long periods on the surface. Frequently there is an abundance of pools and channels indicating subsurface water flow. The substrate (i.e. soil) is usually continuously waterlogged. Waters are neutral to moderately acidic, and have little deficiencies in oxygen or nutrients. Many swamps are characteristically flooded in spring, with dry relict pools apparent later in the season.

In Grey and Bruce County, both thicket swamps (dominated with shrubs like alder) and forest swamps (dominated by mature coniferous or deciduous trees) are quite common. In fact, a big reason why many areas remained forested is that they were too wet farm or build on and were therefore left as swamps. Among the best indicators of swamp tree species are soft maples, elm, ash, yellow birch, white cedar, tamarack, and black spruce (black spruce isn't all that common around here – but there are few in Lindsay Township, check out the Owen Sound Field Naturalists schedule in October if you would like to go and see some with me).

Obviously you don't have to go very far around here to see a swamp, however the Greenock Swamp, which is the dominant land feature of Greenock Township in the Municipality of Brockton would be a "text book" example if you needed one. The Saugeen Valley Conservation Authority manages an abundance of property in the Greenock, and last year Donna Lacey treated the BGWA to a fantastic tour (so I've been told – I missed the tour due to an embarrassingly HUGE error in judgement on my part that required Scott McGregor rescue mission). Now would be the time to go and check out a swamp, with the bug season being mostly over and the lower water levels.

Marshes

Marshes are wet areas periodically inundated with standing or slowly moving water, and/or permanently inundated areas characterized by robust emergents, and to a lesser extent, anchored floating plants and submergents. Surface water levels may fluctuate seasonally, with declining levels exposing drawdown zones of matted vegetation or mud flats. Water remains with the rooting zone of plants during at least part of the growing season. The substratum usually consist of mineral or organic soils with a high mineral content, but in some marshes there may be as much as 2 meters of peat accumulation. Waters are usually neutral to slightly alkaline and there is usually high oxygen saturation.

Marshes characteristically show zones or mosaics of vegetation, frequently interspersed with channels or pools of deep or shallow open water. They include open expanses of standing or flowing water which are variously called ponds, shallow lakes, oxbows, reaches or impoundments. Marshes may be bordered by peripheral bands of trees and shrubs but the predominant vegetation consists of a variety of emergent non-woody plants such as rushes, reeds, reed grasses, and sedges. Low shrubs such as sweet gale, red osier, and winterberry may also occur. Where open water areas occur, a variety of submerged or floating plants flourish.

Again, in Grey and Bruce County's, one doesn't need to travel very far to find themselves in a marsh, but a favourite of mine is the Bognor Marsh. This is a property managed by the Grey Sauble Conservation Authority and is also a location where the BGWA was treated to a recent tour, this time by Mike Fry. The Bognor Marsh has an abundance of trails and boardwalks that bring you up-close to many of these signature wetland features that help to define this unique aquatic ecosystem.

I'm certainly not an expert on wetlands by any means, but when I was working as a Forester Intern with the Ministry of Natural Resources back in 2008, I was fortunate enough to take the Ontario Wetland Evaluation System training course that was offered in North Bay. I won't say that the course changed my life, but it did change the way that I look at my surroundings while I'm walking through the forest when my feet are wet. A little bit of knowledge and training can go a long way in improving any experience – especially those taking place in the woodlands.

SOURCES: This information was extracted from the Ontario Ministry of Natural Resources and Forestry's Ontario Wetland Evaluation System Northern Manual 1st Edition, Revised December 2002. (There are more current editions available – including a southern Ontario edition, but this is what I had on my bookshelf).

Woodland Word Search: Forestry Tools & Equipment

m	s	k	a	o	q	h	r	a	e	p
b	a	g	l	o	v	e	s	d	l	o
r	f	r	d	p	s	l	e	m	u	l
e	e	e	k	r	r	m	p	a	r	e
p	t	n	p	i	e	e	s	p	g	s
p	y	u	i	s	n	t	a	l	o	a
i	g	r	n	m	g	g	n	e	l	w
h	e	p	e	w	l	n	t	x	r	a
c	a	l	i	p	e	r	s	a	s	v
a	r	c	o	m	p	a	s	s	p	r
n	e	x	a	h	s	u	r	b	e	e
t	f	c	h	a	i	n	s	a	w	t
h	s	c	o	m	p	u	t	e	r	e
o	k	t	o	f	h	c	n	i	w	m
o	i	b	r	e	t	t	i	p	s	o
k	d	x	a	l	e	v	o	h	s	n
i	d	m	u	l	c	h	e	r	u	i
p	e	a	v	e	y	e	w	t	c	l
h	r	i	f	r	s	n	i	a	h	c
c	o	r	e	s	a	m	p	l	e	r

FIND THEM ALL:
prism
calipers
logrule
skidder
pruner
clinometer
feller
chainsaw
helmet
safetygear
gloves
chains
axe
marking tape
peavey
splitter
canthook
brushaxe
polesaw
gps
compass
winch
chipper
mulcher
computer
core sampler
shovel

BONUS WORDS:
nut
oak
maple
yew
fir
pine
pear

Many thanks to BGWA Chair Jim White for building this word search challenge!