

Forest characteristics of the Peshtigo River State Forest



WisCFI data 2007 - 2012

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Summary of the Peshtigo River State Forest

The Peshtigo River State Forest is a small forest and sampling errors for almost every measure in this report are high. For this reason, **caution must be used in evaluating and using this data.**

There are approximately 8,591 ($\pm 6.9\%$ sampling error or SE) acres of [timberland](#) on the Peshtigo River State Forest. The major [forest types](#) are oak and aspen. These two types account for over half of all timberland. Peshtigo River State Forest has a large percentage of acreage in pole and small sawtimber-sized stands and in stands that are between 41 and 80 years of age. The average site index on the forest is 61.3 which is well above the average of 56.8 for all state forests. Over 60% of timberland is classified as having a [habitat type](#) that is either very dry to dry or dry to dry-mesic.

There are 5.1 million trees ($\pm 12.1\%$ SE), 11.7 million cubic feet of growing stock ($\pm 10.5\%$ SE) volume and 35.2 million board feet of sawtimber ($\pm 15.1\%$ SE) on the Peshtigo River State Forest. The most numerous [growing stock](#) species are northern pin oak, quaking aspen and red pine. There are not many large trees; only 1% of trees have a dbh of 15 inches or greater. Red maple is by far the most common seedling species. Red pine and northern pin oak account for 41% of growing stock volume and 51% of sawtimber volume. Overall the Peshtigo River State Forest has an average volume of sawtimber per acre of 4.1 MBF/acre compared to 4.2 MBF/acre for all properties combined. However, this is mostly in smaller size classes, i.e. less than 20 inches dbh. The Peshtigo River State Forest has the lowest percent of volume in these very large trees.

Several measures are reported which assess forest health and species sustainability. All are approximations, either based on only one year of data, such as growth and mortality, or peripheral measures of health, such as crown characteristics and the number and volume of standing dead trees. Caution should be used in drawing firm conclusions from this data especially on forests with low acreage.

It is difficult to assess forest health on Peshtigo River State Forest because it's a relatively small property with few trees and with only a fifth of the plots re-measured for growth and mortality, sampling errors are very high. We can look at the forest health indicators for each of the major species and see if there are species that have elevated values for more than one which might indicate a problem for that species. The only species that has consistently higher values on more than one indicator is northern pin oak. It shows a lower ratio of growth to volume, a higher volume in standing dead trees and higher percentage of crown dieback than the average for this species on all state forests combined. For all species combined, growth rates are slightly lower on the Peshtigo River State Forest compared to all state forests (1.3% vs. 1.4%), the mortality to growth ratio is lower (12.5% vs. 25%), the volume of standing dead trees is higher (10.4% vs. 8.7%), and the average percentage of crown dieback is higher (2.4% vs. 1.8%).

As far as trends in growing stock volume from 2008 to 2012, volumes are too small and sampling errors too high to reveal anything significant.

Forward

There has always been a strong demand for timely, consistent, and reliable forest inventory and monitoring information for State Forests. Recently, the demand for timely and relevant information has been growing. Partners interested in State Forests want more recent information, covering a broader scope of forest attributes with more analysis and reporting capabilities. In response, the Wisconsin Department of Natural Resources implemented a State Forest Continuous Forest Inventory (WisCFI) program that will increase our capacity to collect, analyze and publish data on an annual basis for each State Forest individually and as a group (over 500,000 acres of forest and nonforest land).

The primary purpose of the Wisconsin CFI is to collect and report on the condition of the forest in a statistically sound manner on an annual basis for each State Forest. The information will be used to track the status and trends in forest extent, cover, growth, mortality, habitat, and overall health. The continuous forest inventory will provide unbiased, reliable information at the property level with the ability to incorporate regional trends. The inventory will assist in planning, management and monitoring.

Inventory goals:

- Provide information on the condition and health of the forest and track changes over time.
- Integrate effectively data, methods and tools in the planning and decision making processes.
- Develop and maintain data input models and methods for forestry analysis and planning.
- Develop up-to-date and easy-to-use information products and services for property managers and our public and partners.

Difference between WISFIRS (forest reconnaissance data) and WisCFI data

The WISFIRS (Wisconsin Forest Inventory and Reporting System or Recon) and the WisCFI (Wisconsin Continuous Forest Inventory) datasets are used to describe the same forests but their purpose, methodology and results are very different.

WISFIRS is a stand-based dataset and is used to **manage individual stands**. A stand is defined as having a fairly uniform composition of trees with a common management objective. The emphasis is on management. Since forests are never consistent throughout, data on cover type and tree composition must be generalized in order to describe the stand as a whole. Generalizing by stand is crucial for scheduling management activities but not for determining accurate forest-wide statistics such as volume by species, growth or mortality rates. In addition, since forest reconnaissance is performed at different intervals for different stands, tracking forest-wide trends such as changes in acreage by forest type, size class or other stand descriptors, is difficult.

WisCFI data is an analytical tool which can provide **statistically consistent and accurate** information as well as trends in this data. It is based on systematically randomized located plots (each plot represents c. 200 acres of forest) which are re-measured every five years. There are many stands defined by forest reconnaissance which will not have even one WisCFI plot and many stands which will have more than one. Many WisCFI plots will be assigned a cover type, size class or stand age which may be quite

different from the forest reconnaissance typing of the stand in which they are located. As previously stated, stands may be very inconsistent from one location to the next. The important thing is that the data is measured very consistently from plot to plot and from inventory to inventory and that each plot is located in a systematic and random manner. This allows a statistical determination of the amount of error attached to each measure. The more plots, the lower the sampling error. Knowing the amount of error means we can determine the accuracy of the measurement. For instance, for the NHAL an area of c. 2,500 acres yields a sampling error of about 25%. This means that there is a 2/3 probability that the actual value will be between 1,900 and 3,100.

WisCFI data cannot be used to describe small areas because of the large amount of error associated with small samples but it can be used to describe acreage by stand age, size class, forest type, soil type, habitat type, site index, and productivity for an entire state forest. It can be used to determine volume or number of trees by tree size class, crown class, stocking class, site index, etc. With the addition of P3 data, many other measures such as crown dieback or transparency, area of compacted or bare soil, quantity of coarse woody debris, or cover of invasive species can be estimated. These measures will initially have a large sampling error but as the plots are re-measured, the amount of error will diminish and trends will emerge from the data. Again, all of these measures have an associated sampling error and therefore their accuracy can be gauged. This allows us to say whether there is or is not, for instance, a significant change in the acreage of a forest type or the volume of a species.

As plots are re-measured for the first time in 2012, changes in these measures will emerge. For instance, as trees are re-inventoried, mortality or removals will be recorded. Growth rates will emerge as will changes in acreage by size class or forest type. As the definitions become clearer, the WisCFI data will become more and more useful as a tool to describe the effects of management forest-wide, including whether a State Forest is meeting the management goals set out in its Master Plan.

Sampling Error

The process of sampling (selecting a random subset of a population and calculating estimates from this subset) causes estimates to contain error they would not have if every member of the population (e.g., every tree in had been observed and included in the sample). The WisCFI inventory is based on a sample of 3,908 selected plots with an average sampling rate of about one plot for every 135 acres of state forest land.

Along with every estimate is an associated sampling error that is typically expressed as a percentage of the estimated value (the estimated value plus or minus the sampling error). This sampling error is the primary measure of the reliability of an estimate. We use a sampling error based on one standard error, that is, the chances are two in three that the results would have been within the limits indicated had a 100-percent inventory been conducted using these methods.

For instance, the Brule River State Forest has an estimated timberland acreage of 35,704 acres with a sampling error of 2.14%. This means that there is a 67% probability that the actual value is between 34,940 and 36,468 acres. The smaller the value being measured, the larger the sampling error. For instance the sampling error for seedling acreage is 22% and the error for seedling aspen acreage is 48%.

Sampling error must be considered when making assumptions about this data.

Stand Characteristics

Acres by forest type and stand size

Over half of timberland acreage on the Peshtigo River State Forest is in oak and aspen forest types. There is very little acreage in either seedling/sapling stands or large sawtimber. About 90% of timberland is in pole and small sawtimber-sized stands. Note that only four forest types have an estimated acreage that has a sampling error of less than 50%.

Acres of timberland by WisDNR forest type and size class

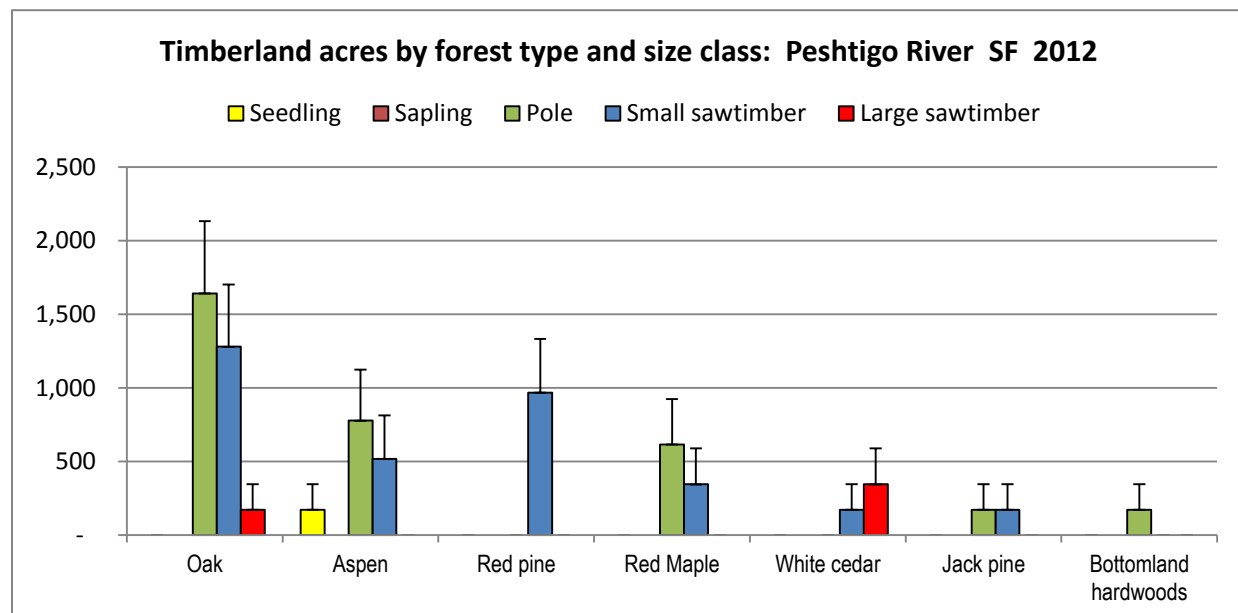
Forest type	Seedling	Sapling	Pole*	Small sawtimber*	Large sawtimber*	Total WisCFI**	Total WISFIRS
Oak	-	-	1,642	1,281	173	3,096	766
Aspen	173	-	778	519	-	1,469	2,222
Red pine	-	-	-	968	-	968	1,157
Red Maple	-	-	616	346	-	962	578
White cedar	-	-	-	173	346	519	373
Jack pine	-	-	173	173	-	346	145
Bottomland hardwoods	-	-	173	-	-	173	
Misc Deciduous***	-	-	173	-	-	173	
Scrub oak	-	-	173	-	-	173	2,691
Swamp hardwoods	-	-	173	-	-	173	163
Tamarack	-	-	173	-	-	173	42
White birch	-	-	86	-	-	86	44
White pine	-	-	86	-	-	86	111
All forest types	173	-	4,246	3,459	519	8,591	8,292

*Pole: 5-9" softwood, 5-11" hardwoods Small sawtimber: 9-15" softwoods, 11-15" hardwoods Large sawtimber: 15+ "

**Lowland brush and unsurveyed acreage have been omitted. Some WISFIRS types have been combined.

*** Misc Deciduous is mostly quaking aspen and black locust.

Figures in red have a sampling error of at least 50% and should be used with caution



Acres by forest type and stand age

Due to high sampling error, the following statements are only estimates.

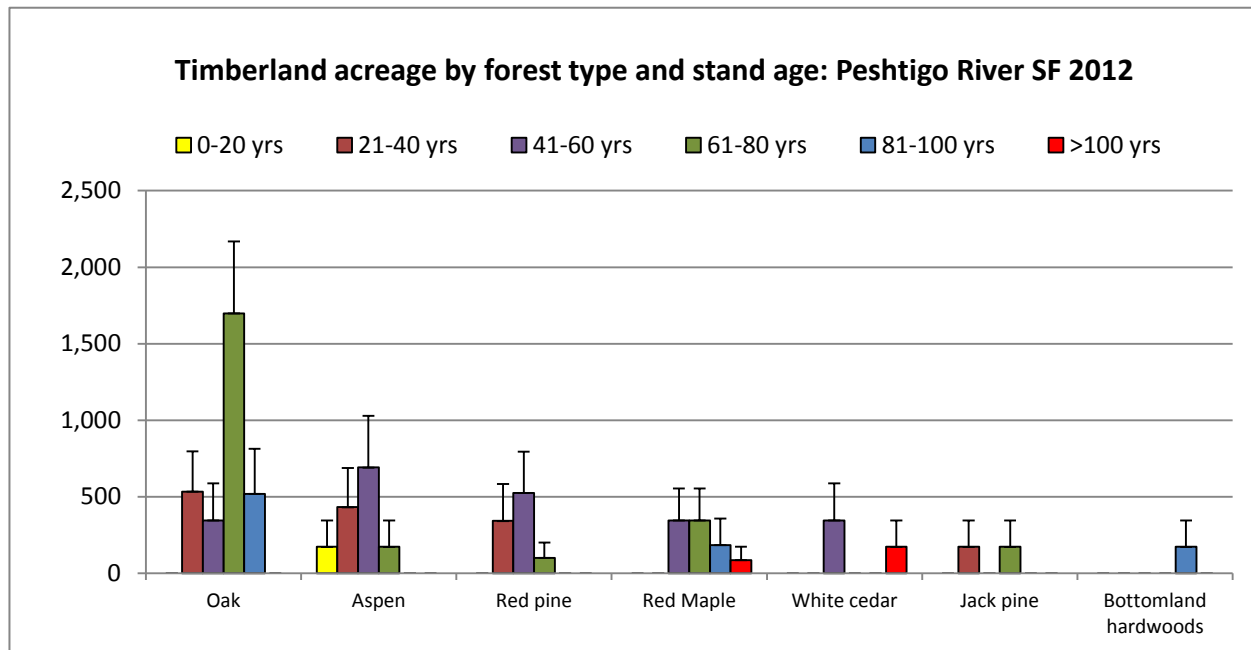
The Peshtigo River State Forest is very much middle-aged with only 2% of timberland less than 21 years of age and 3% of acreage in stands over 100 years of age. Almost $\frac{2}{3}$ is between 41 and 80 years old.

Acres of timberland by forest type and stand age

Forest type	0-20 yrs	21-40 yrs	41-60 yrs	61-80 yrs	81-100 yrs	>100 yrs	Total
Oak	-	533	346	1,698	519	-	3,096
Aspen	173	432	691	173	-	-	1,469
Red pine	-	343	525	101	-	-	968
Red Maple	-	-	346	346	184	86	962
White cedar	-	-	346	-	-	173	519
Jack pine	-	173	-	173	-	-	346
Bottomland hardwoods	-	-	-	-	173	-	173
Misc Deciduous	-	173	-	-	-	-	173
Scrub oak	-	-	-	173	-	-	173
Swamp hardwoods	-	-	-	173	-	-	173
Tamarack	-	-	-	173	-	-	173
White birch	-	-	-	-	86	-	86
Total WisCFI*	173	1,654	2,256	3,288	962	259	8,591
Total WISFIRS	1,171	818	1,735	1,681	2,612	275	8,292

*Lowland brush and unsurveyed acreage have been omitted.

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Acres by [site index](#) and forest type

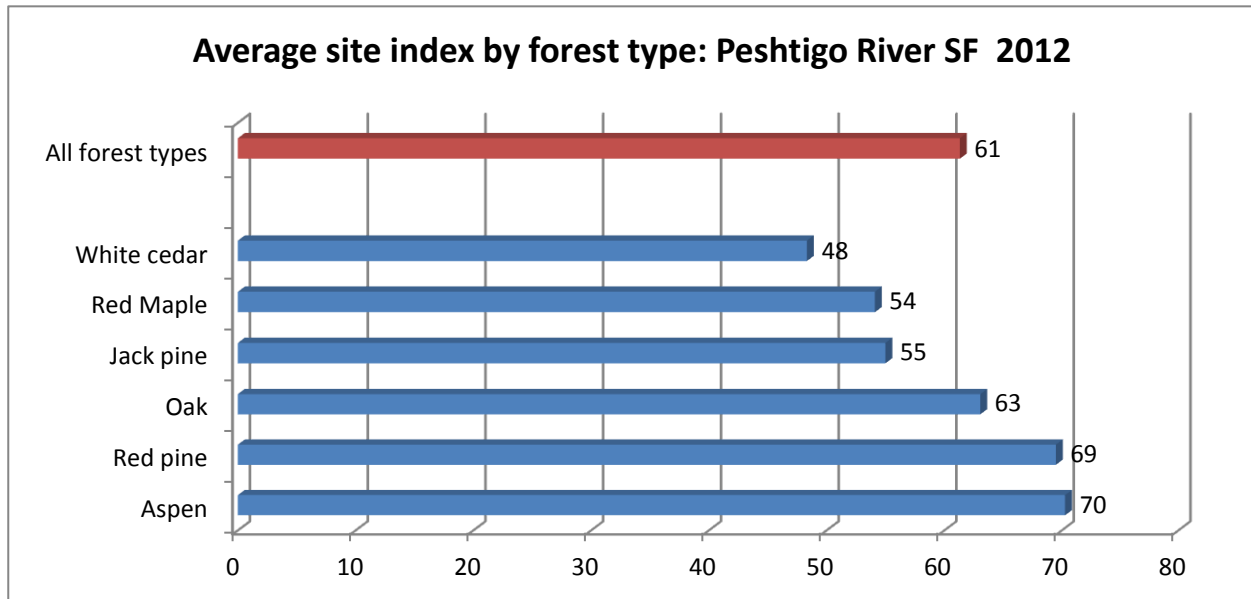
Due to high sampling error, the following statements are only estimates.

The average site index on the Peshtigo River State Forest is 61.3, much higher than the average site index for all state forests, 56.8. The forest types with the highest average site index are aspen and red pine. The types with the lowest average site index are scrub oak, jack pine and wetland types such as white cedar, swamp hardwoods, bottomland hardwoods and tamarack.

Acres of timberland by forest type and site index

Forest type*	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	>90	Average SI
Oak			1,439	816	841			63
Aspen		173	432	173		519	173	70
Red pine				533	435			69
Red Maple		346	357	259				54
White cedar		346	173					48
Jack pine			346					55
Bottomland hardwoods	173							35
Misc Deciduous							173	95
Scrub oak		173						45
Swamp hardwoods	173							35
Tamarack			173					55
Total	346	1,146	3,176	1,784	1,276	519	346	61.3

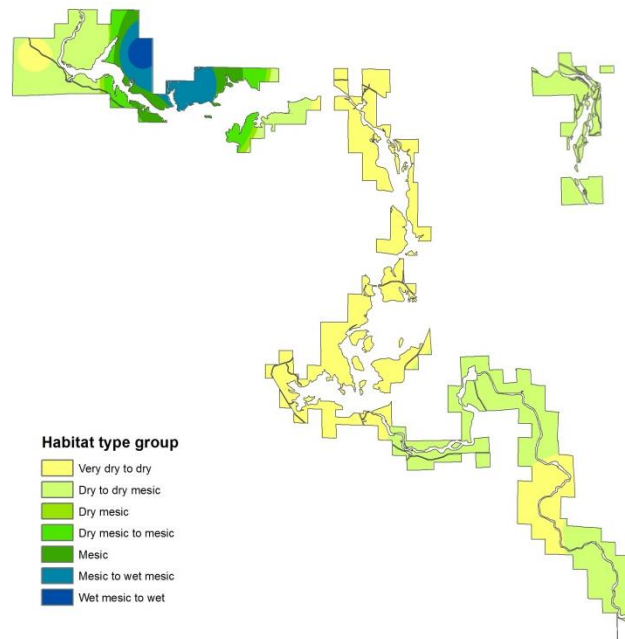
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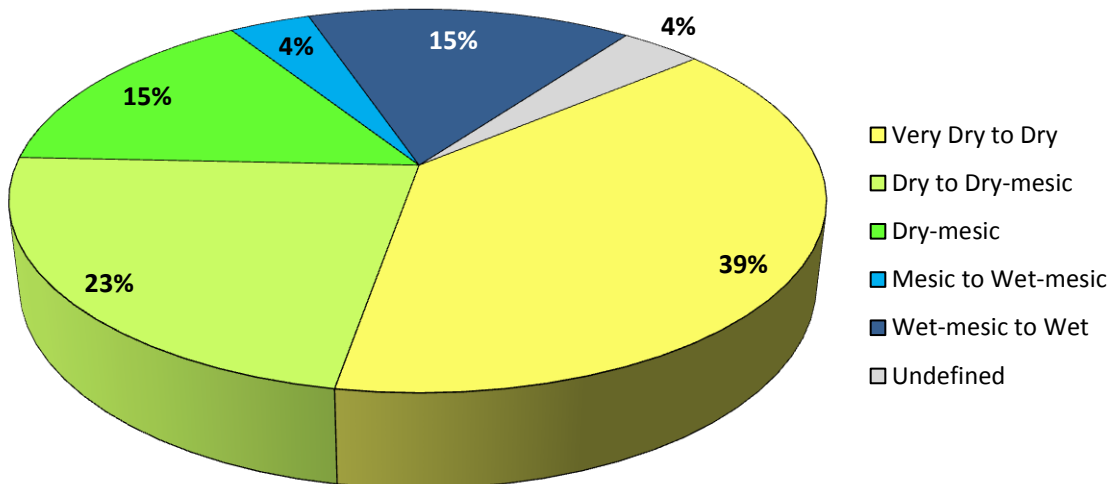
Habitat types

The habitat type system is a method of site classification that uses the floristic composition of a forest community (understory herbs and shrubs as well as trees) as an indicator of site capability along a moisture/nutrient gradient ranging from very dry to wet and nutrient poor to nutrient rich. Only 28 plots on the Peshtigo River State Forest were sampled for habitat type and sampling errors are very high. For this reason percentages rather than acres are reported.

About 62% of all timberland on the Peshtigo River State Forest is classified as either very dry to dry or dry to dry mesic. Another 15% is dry mesic and 19% is wetter, mesic to wet-mesic or wet-mesic to wet.



Peshtigo River State Forest



Tree Numbers and Volume

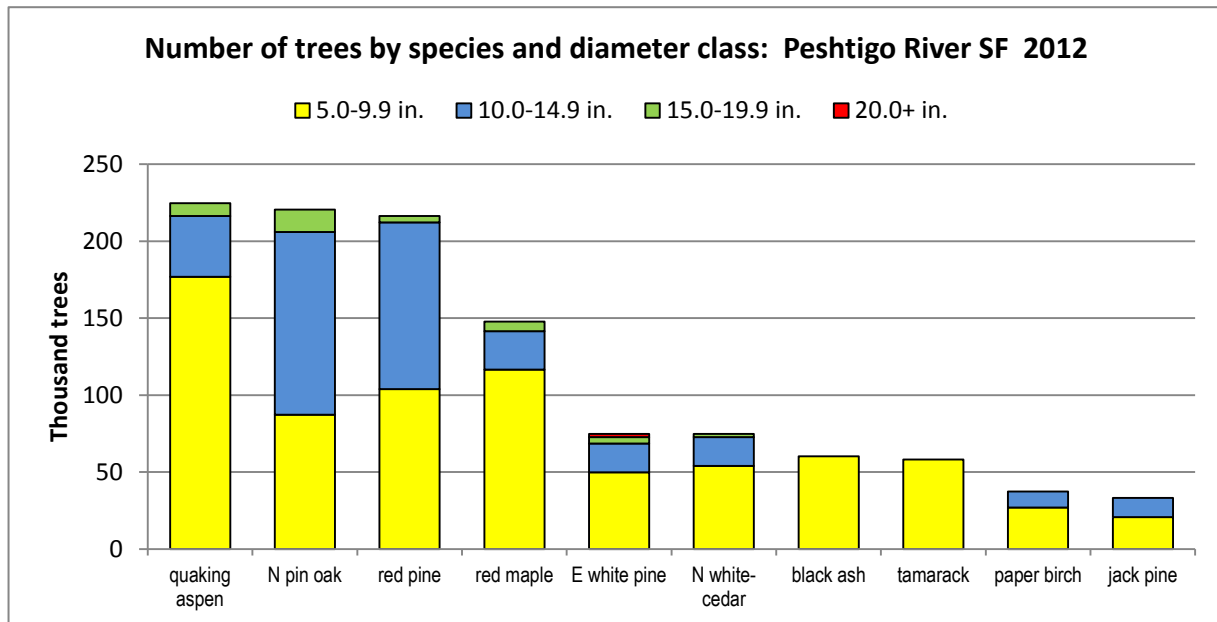
Number of trees by species and diameter

Due to high sampling error, the following statements are only estimates. Red maple and eastern white pine make up 40% of all trees on the Peshtigo River State Forest but only 17% of trees over 5 inches dbh. The most numerous growing stock trees are northern pin oak, quaking aspen and red pine. Together these three species account for half of all trees over 5 inches. Only 1% of trees are least 15 inches dbh or greater and 71% are less than 5 inches.

Number (thousands) of trees by species and diameter class.

Species	1.0-4.9 in.	5.0-9.9 in.	10.0-14.9 in.	15.0-19.9 in.	20.0+ in.	Total	% of trees > 5 in dbh	% of all trees
Red maple	1,244	116	25	6	-	1,392	12%	28%
E white pine	518	50	19	4	2	593	5%	12%
Black cherry	441	4	2	-	-	447	1%	9%
Quaking aspen	181	177	40	8	-	406	19%	9%
N pin oak	181	87	119	15	-	402	16%	8%
Black ash	259	60	-	-	-	319	4%	7%
Red pine	26	104	108	4	-	242	15%	5%
Paper birch	130	27	10	-	-	167	3%	4%
Balsam fir	104	40	-	-	-	143	3%	3%
N white-cedar	52	54	19	2	-	127	6%	3%
Tamarack	52	58	-	-	-	110	4%	2%
Black spruce	78	17	4	-	-	99	1%	2%
N red oak	26	10	8	4	-	49	2%	1%
White spruce	26	12	6	-	-	45	1%	1%
Bigtooth aspen	26	10	6	-	-	43	1%	1%
Jack pine	-	21	12	-	-	33	3%	1%
Minor species	311	40	6	0	2	359	3%	7%
Species	3,421	899	399	44	2	4,765		

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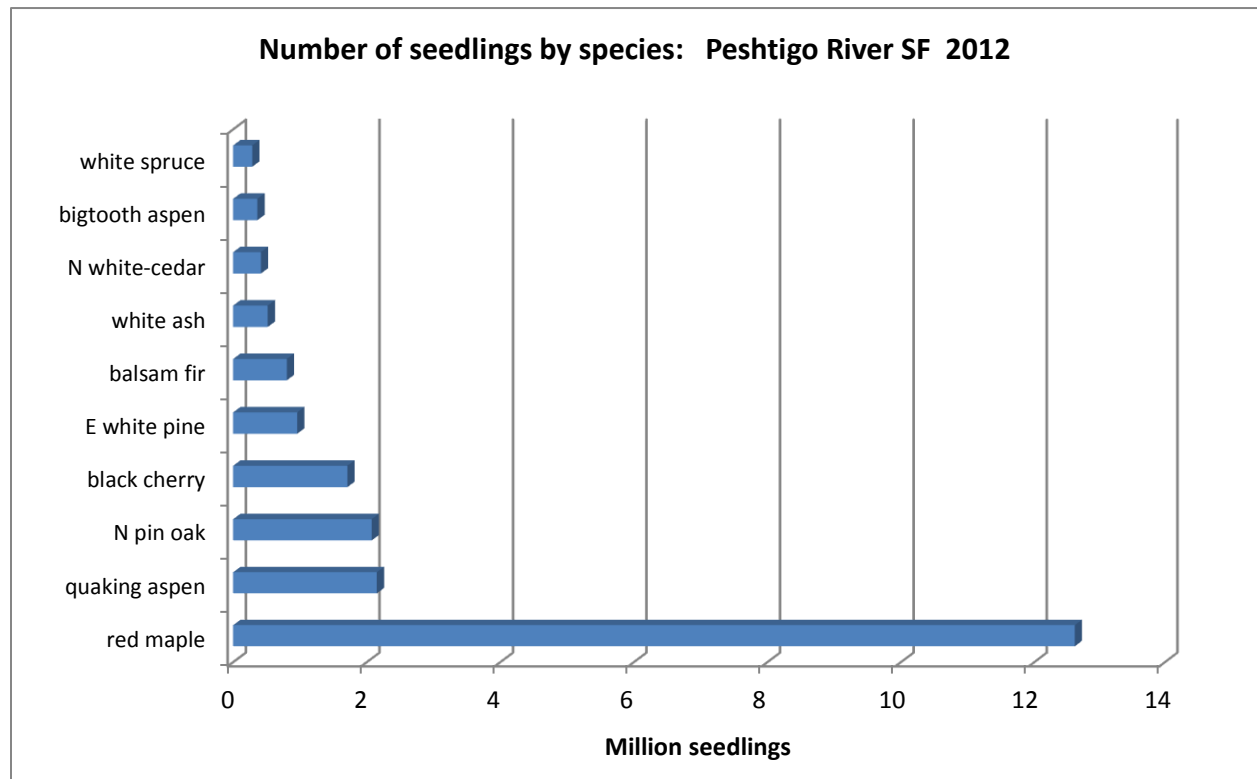
Number of seedlings by species and forest type group

Due to high sampling error, the following statements are only estimates.

Red maple accounts for over half of all seedlings on the Peshtigo River State Forest. Over 60% of seedlings are found on two forest type groups: oak / hickory and aspen / birch.

Number (thousands) of live seedlings on timberland by forest type group and species

Species	Aspen / birch	Elm / ash / cottonwood	Spruce / fir	Maple / beech / birch	White / red / jack pine	Oak / hickory	Total	Percent of total
red maple	4,276	363	207	1,088	2,902	3,654	12,620	56%
quaking aspen	1,166	0	0	0	155	803	2,151	10%
N pin oak	78	26	26	78	648	1,140	2,073	9%
black cherry	181	0	26	181	311	933	1,710	8%
E white pine	52	0	78	441	26	363	959	4%
balsam fir	78	285	52	0	0	363	803	4%
white ash	0	0	0	492	0	26	518	2%
N white-cedar	0	233	181	0	0	0	415	2%
bigtooth aspen	155	0	0	26	78	104	363	2%
Total	6,038	1,270	752	2,358	4,120	7,593	22,468	
Percent of total	27%	6%	3%	10%	18%	34%		



Volume of growing stock (>4.9in dbh) by species and diameter

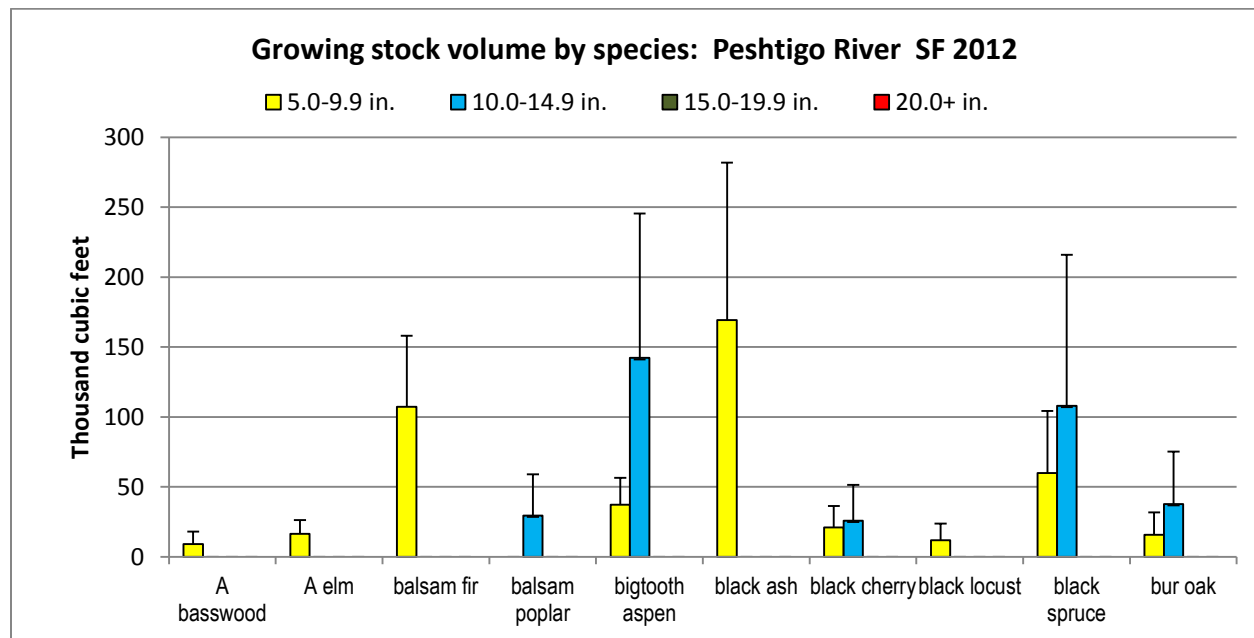
Due to high sampling error, the following statements are only estimates.

Three species account for over half of all growing stock volume on the Peshtigo River State Forest: northern pin oak, red pine and quaking aspen. This state forest has the lowest percent of volume in trees over 20 inches, 1.9%, compared to an average of 14% for all forests. Note that only five species have estimated volumes with a sampling error less than 50%.

Volume of growing stock (thousand cubic feet) by species and diameter class.

Species	5.0-9.9 in.	10.0-14.9 in.	15.0-19.9 in.	20.0+ in.	Total Volume	% volume
N pin oak	451	1,623	421		2,496	21%
red pine	543	1,632	167		2,341	20%
quaking aspen	779	678	274		1,731	15%
red maple	543	392	163		1,098	9%
E white pine	214	233	187	226	861	7%
N white-cedar	226	262	58		546	5%
N red oak	51	132	196		379	3%
paper birch	150	196			346	3%
tamarack	286				286	2%
jack pine	98	152			250	2%
white spruce	68	158			226	2%
bigtooth aspen	37	142			179	2%
black ash	169				169	1%
black spruce	60	108			168	1%
E hemlock	54	65			119	1%
white oak	8	103			110	1%
balsam fir	107				107	1%
Total	3,958	6,005	1,466	226	11,655	100%
% of total	34%	52%	13%	2%	100%	

Figures in red have a sampling error of at least 50% and should be used with caution.



Volume of sawtimber by species and diameter class

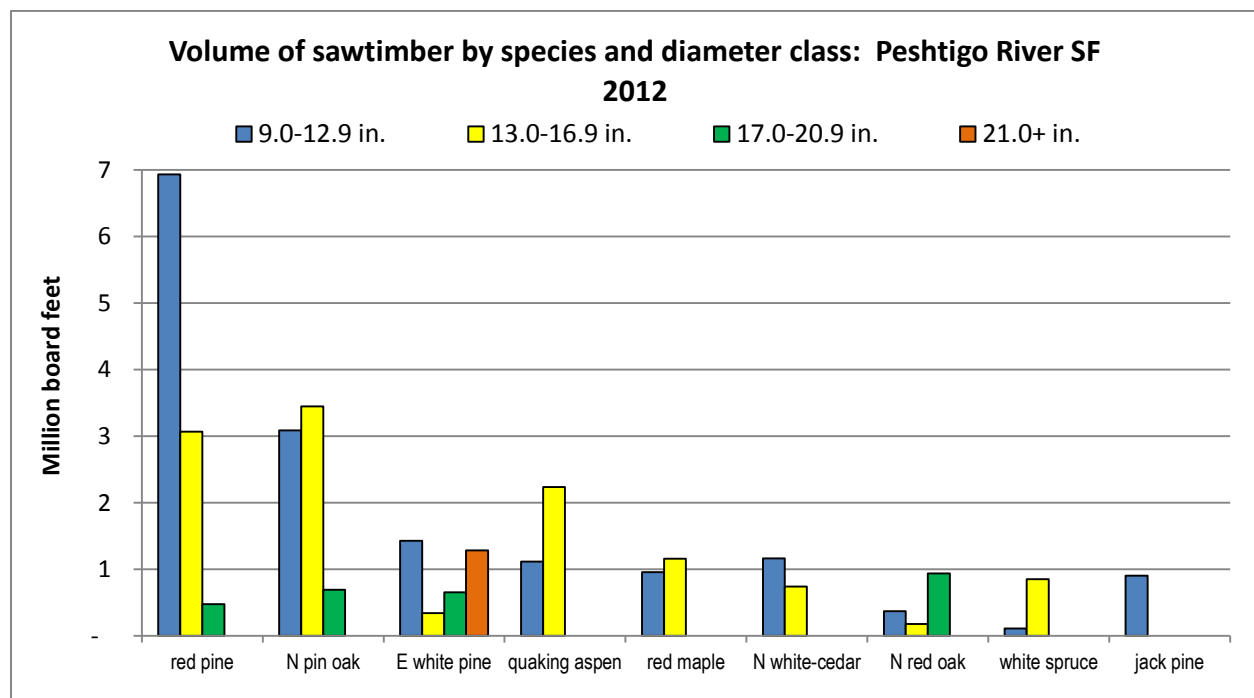
Due to high sampling error, the following statements are only estimates.

Four species account for 72% of sawtimber volume on the Peshtigo River State Forest: red pine, northern pin oak, eastern white pine and quaking aspen. Peshtigo River State Forest has the lowest volume of sawtimber in trees over 17 inches dbh, 12% compared to 40% for all state forests combined.

Volume of sawtimber (thousand board feet) by species and diameter class

Species	9.0-12.9 in.	13.0-16.9 in.	17.0-20.9 in.	21.0+ in.	Total	Percent total
red pine	6,932	3,067	476		10,475	30%
N pin oak	3,086	3,447	695		7,228	21%
E white pine	1,429	343	656	1,286	3,714	11%
quaking aspen	1,113	2,238			3,351	10%
red maple	959	1,158			2,117	6%
N white-cedar	1,162	742			1,904	5%
N red oak	372	179	936		1,486	4%
white spruce	111	849			960	3%
jack pine	904				904	3%
bigtooth aspen	175	477			652	2%
paper birch	159	447			606	2%
black spruce		601			601	2%
E hemlock	314				314	1%
Total	17,576	13,547	2,762	1,286	35,171	100%
Percent total	50%	39%	8%	4%	100%	

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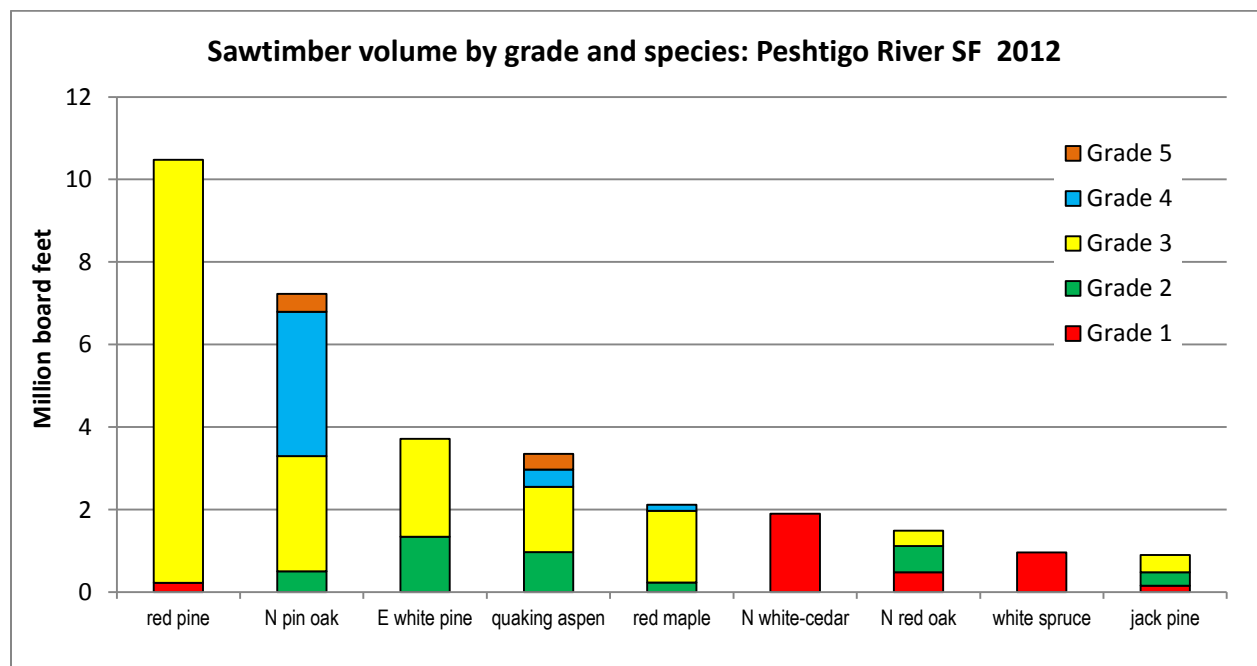
Volume of sawtimber by [tree grade](#) and species

Due to high sampling error, the following statements are only estimates. Peshtigo River State Forest has the least amount of grade 1 and 2 sawtimber, 26%, compared to an average of 44% for all state forests. Most of the grade 1 sawtimber is in softwoods like northern white-cedar, white spruce, black spruce, eastern hemlock and red pine.

Volume of sawtimber (thousand boardfeet) on timberland by species and tree grade

Species	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Total	% Grade 1
red pine	223		10,251			10,475	2%
N pin oak		506	2,794	3,495	433	7,228	
E white pine		1,340	2,374			3,714	
quaking aspen		972	1,576	423	380	3,351	
red maple		231	1,742	144		2,117	
N white-cedar	1,904					1,904	100%
N red oak	485	630	372			1,486	33%
white spruce	960					960	100%
jack pine	155	324	425			904	17%
bigtooth aspen		237	414			652	
paper birch			606			606	
black spruce	601					601	100%
E hemlock	314					314	100%
white oak			226			226	
white ash			162			162	
Total	4,825	4,240	21,074	4,220	813	35,171	14%
Percent total	14%	12%	60%	12%	2%		

Figures in red have a sampling error of at least 50% and should be used with caution.



Forest Health and Sustainability

There are several measures that serve as indicators of forest health and sustainability. These include the ratio of average annual net growth to volume, the ratio of mortality to gross growth, the number and volume of standing dead trees and the percentage of crown dieback and transparency. These measures assess very different aspects of forest health and have varying degrees of precision and statistical reliability. Since growth and mortality are based on only one year of data, sampling errors are high. For this reason and in order to normalize between site variability, ratios are presented as well as absolute values.

The ratio of growth to volume and the ratio of mortality to gross growth are measures of sustainability of species. So long as the growth rate is positive and maintained over time and so long as mortality does not surpass growth for long periods, a species should continue to play a sustainable role in the forest.

Mortality may be caused by insects, disease, adverse weather, succession, competition, fire, old age or human and animal activity and is often the result of a combination of these factors. The ratio of mortality to gross growth (growth plus mortality) indicates whether a species is declining or maintaining its current position in a particular forest. By normalizing mortality by growth rate, the ratio allows comparisons across diverse landscapes.

The number and volume of standing dead trees is much less precise as there is little indication of when trees died and some species will remain vertical for a longer period. But numbers are larger and the sampling error will be lower. Standing dead trees serve as an indicator of forest health and diversity in several ways, functioning as indicators of past mortality events, as habitat for many species and as carbon storage.

The condition of tree crowns within a stand reflects the overall health of a forest. Crown indicators can also vary by species and are often temporary. Dieback is the percentage of dead branch tips in the crown. Crown transparency is a measure of the proportion of the crown through which the sky is visible. A forest suffering from a disease epidemic or insect infestation will have obvious dieback and high transparency.

Because these measures are all approximations with a certain degree of error, taken together they can give a general accounting of forest health and sustainability.

Ratio of annual net growth to volume

Due to high sampling error, the following statements are only estimates.

Red pine and quaking aspen make up 43% of all growth on the Peshtigo River State Forest. The only species with a higher than average growth to volume ratio are tamarack and northern red oak.

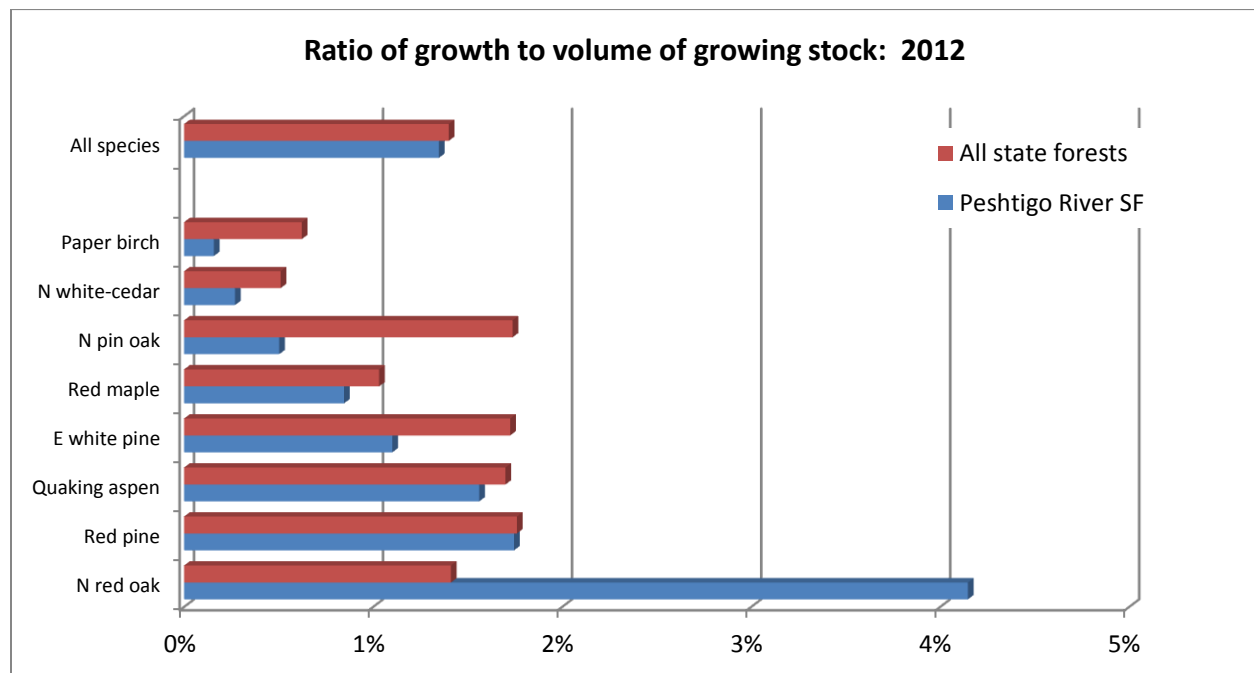
Most of the other species listed have a growth to volume ratio that is lower than the average for all state forests.

Annual net growth (cft/yr) and growth/ volume ratio for the Peshtigo River State Forest and all state forests combined.

Species*	Average annual net growth	Growth / volume ratio	
		Peshtigo River State Forest	All state forests
Tamarack	15,307	5.4%	1.2%
N red oak	15,732	4.1%	1.4%
Red pine	40,875	1.7%	1.8%
Quaking aspen	27,040	1.6%	1.7%
E white pine	9,485	1.1%	1.7%
Red maple	9,296	0.8%	1.0%
N pin oak	12,565	0.5%	1.7%
N white-cedar	1,472	0.3%	0.5%
Paper birch	546	0.2%	0.6%
All species	157,185	1.3%	1.4%

Figures in red have a sampling error of at least 50% and should be used with caution.

The average growth rate on the Peshtigo River State Forest, 1.3% is slightly less than the average for all state forest properties, 1.4%.



Ratio of mortality to gross growth

Due to high sampling error, the following statements are only estimates.

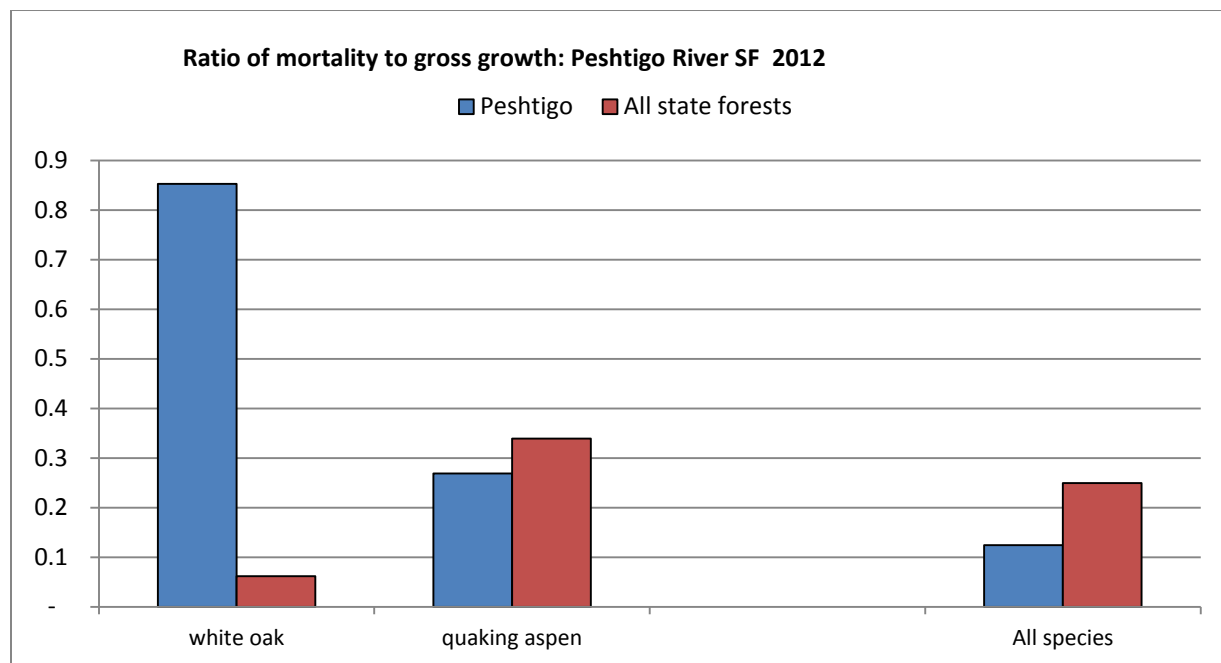
The only two species which showed any mortality on the Peshtigo River State Forest were quaking aspen and white oak. The mortality to gross growth ratio for quaking aspen was lower than the average for all state forests and the ratio for white oak was much higher but the sampling error is large. Overall the mortality ratio on the Peshtigo River State Forest is half that of the average for all state forests.

The annual percentage of trees dying on the Peshtigo River State Forest is less than half that of all properties combined.

Mortality to gross growth ratio of growing stock on the Northern Highland American Legion and for all state forests combined.

Species	Peshtigo River State Forest				All state forests			
	Mortality of growing stock (cft)	Gross growth (cft)	Mortality / gross growth	Percent trees dying per year*	Mortality of growing stock (cft)	Gross growth (cft)	Mortality / gross growth	Percent trees dying per year*
quaking aspen	15,098	42,138	0.36	0.43%	761,316	1,647,117	0.46	0.43%
White oak	7,255	1,683	4.31	9.87%	7,255	112,831	0.06	0.76%
All species	22,353	179,538	0.12	0.08%	2,767,937	11,082,704	0.25	0.20%

* Number of trees (at least 1 inch dbh) that died in one year divided by number of all trees, live and dead.
 Figures in red have a sampling error of at least 50% and should be used with caution.



Percent standing dead trees and volume by species

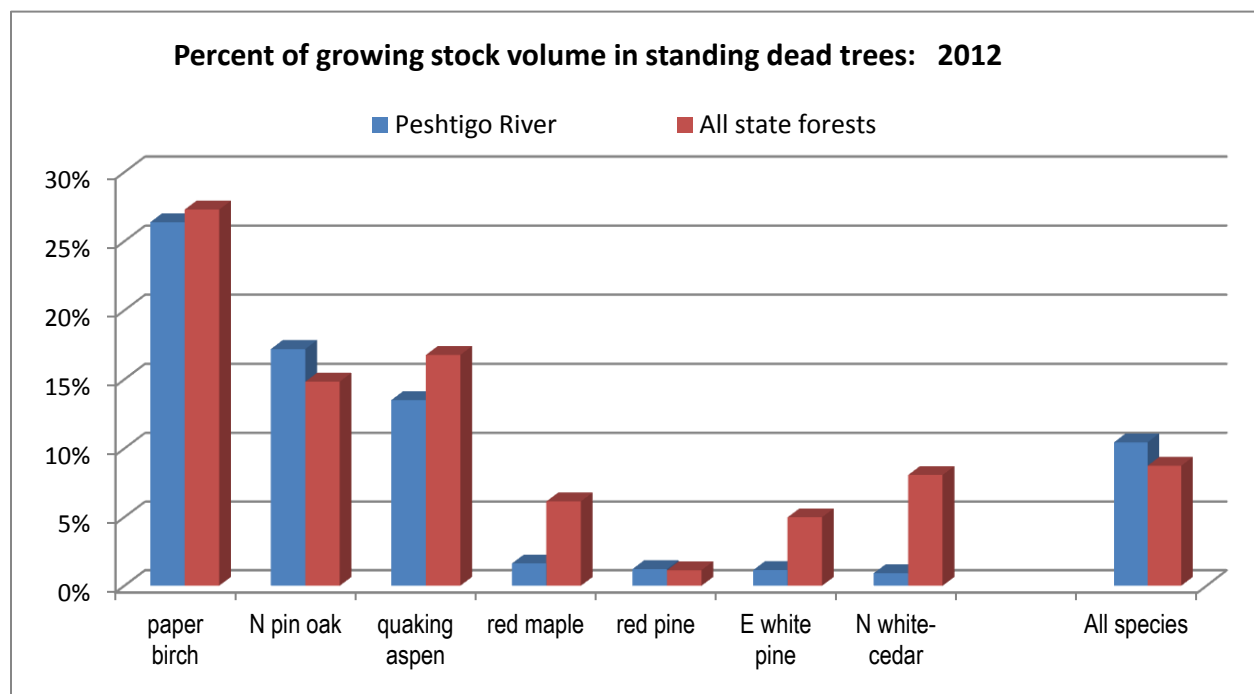
Due to high sampling error, the following statements are only estimates.

The percentage of standing dead trees and volume in dead trees over 5 inches dbh is higher on the Peshtigo River State Forest than on all state forests combined. Several major species including northern pin oak, red pine, quaking aspen and paper birch have higher numbers of standing dead trees on the Peshtigo River State Forest than on all state forests combined. Only northern pin oak has a higher volume as well.

Percent of all trees and all volume in trees >5 inches dbh that are standing dead.

Species	Percent of trees that are standing dead		Percent of volume in standing dead trees	
	Peshtigo River State Forest	All state forests	Peshtigo River State Forest	All state forests
paper birch	19.3%	9.9%	26.4%	27.3%
N pin oak	16.6%	3.3%	17.2%	14.8%
quaking aspen	9.5%	4.8%	13.5%	16.8%
red maple	0.4%	1.2%	1.6%	6.1%
red pine	2.5%	1.4%	1.2%	1.1%
E white pine	1.1%	1.8%	1.1%	5.0%
N white-cedar	1.7%	5.6%	0.9%	8.1%
jack pine	31.8%	5.9%	17.5%	22.9%
All species	4.6%	2.8%	10.4%	8.7%

* Red indicates species which make up less than 3% of total volume and have high sampling error.



Crown dieback and transparency

Due to high sampling error, the following statements are only estimates.

The only major species with higher than average values for crown dieback on the Peshtigo River State Forest is northern pin oak.

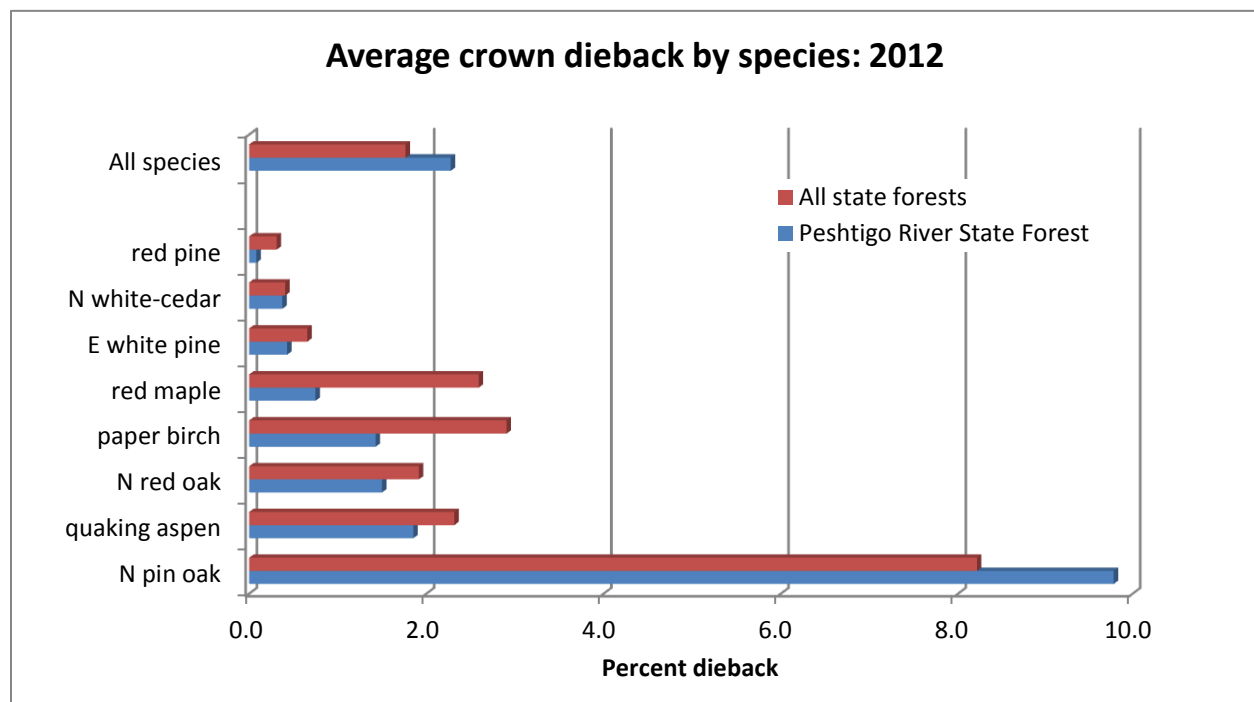
The only major species with higher than average values for crown transparency are eastern white pine, northern white-cedar and red pine.

In general, dieback and transparency are higher on the Peshtigo River State Forest than on all state forests combined.

Average crown dieback and transparency for the Peshtigo River State Forest compared to all state forests combined.

Species*	Average crown dieback		Average crown transparency	
	Peshtigo River State Forest	All state forests	Peshtigo River State Forest	All state forests
N pin oak	9.8	8.2	20.8	21.4
quaking aspen	1.9	2.3	17.6	20.1
N red oak	1.5	1.9	15.5	16.2
paper birch	1.4	2.9	18.7	18.8
red maple	0.8	2.6	15.5	17.8
E white pine	0.4	0.7	18.7	17.0
N white-cedar	0.4	0.4	26.1	18.1
red pine	0.1	0.3	14.4	13.6
balsam poplar	3.0	1.5	18.0	22.9
yellow birch	1.5	2.5	13.0	17.7
white spruce	1.0	0.4	14.7	11.6
balsam fir	1.0	0.9	19.7	13.6
black ash	0.2	4.8	19.1	22.0
All Species	2.3	1.8	18.2	17.1

* Red indicates species which make up less than 3% of total volume and have high sampling error.



Trends

Growing stock volume

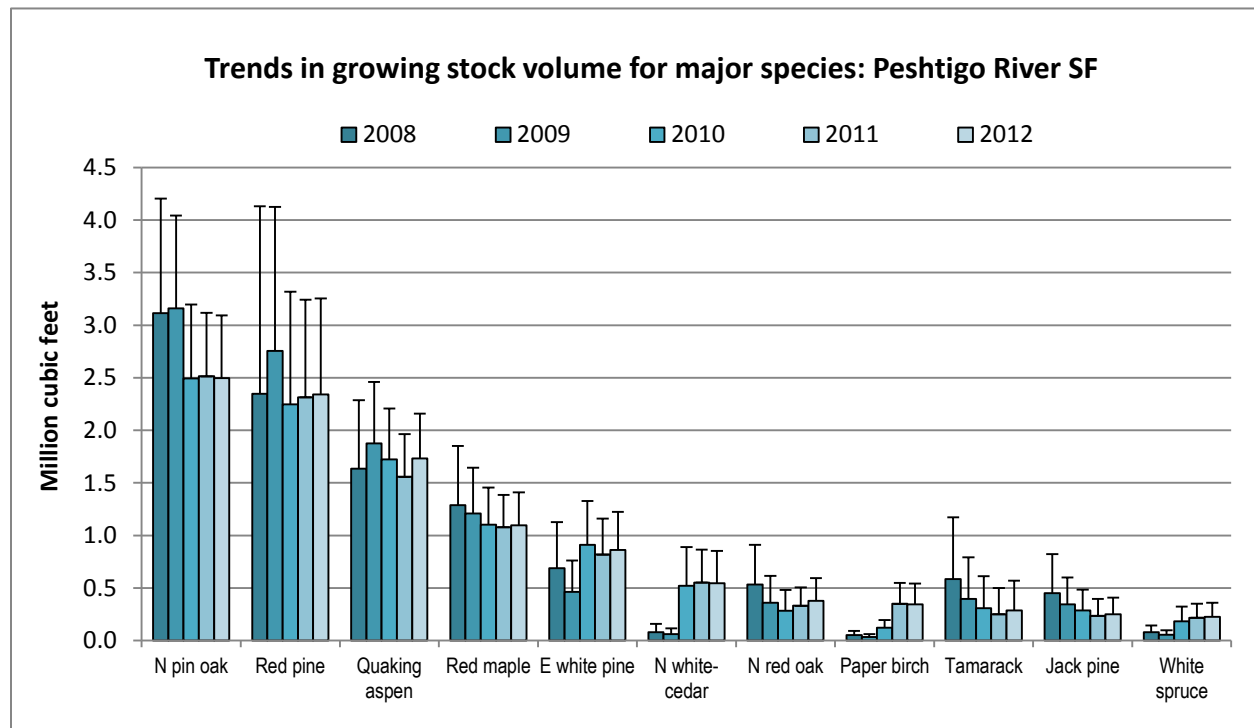
There appear to be trends in species volume which cannot be verified statistically since the data is highly auto-correlated. Future re-measurements may help to reduce this correlation and high sampling error.

Growing stock volume (thousand cubic feet) by major species and year

Species	2008*	2009	2010	2011	2012	Change 2008 to 2012
N pin oak	3,114	3,162	2,495	2,514	2,496	-20%
Red pine	2,347	2,756	2,247	2,314	2,341	0%
Quaking aspen	1,637	1,875	1,725	1,558	1,731	6%
Red maple	1,288	1,209	1,104	1,080	1,098	-15%
E white pine	688	464	912	818	861	25%
N white-cedar	79	61	521	553	546	588%
N red oak	535	361	284	332	379	-29%
Paper birch	51	34	123	349	346	578%
All species	17,981	17,333	16,736	17,290	17,196	-4%

* Each year contains previous years' data, i.e. 2010 includes 2008, 2009 and 2010 data.

Figures in red have a sampling error of at least 50% and should be used with caution.



Definition of Terms

Average net annual growth of growing stock --The annual change in cubic foot volume of sound wood in live sawtimber and poletimber trees, and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes. Average net annual growing stock is the average for the years between inventories.

Forest type-WisCFI. - A tract of forest land characterized by the predominance of one or more key species which make up 50 percent or more of the basal area of saw-timber and pole-timber stands, or of the number of trees in seedling and sapling stands. Forest land less than 10 percent stocked with commercial tree species is classified as upland brush, grass or lowland brush.

Aspen--Aspen comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

Bottomland hardwoods --Any combination of silver maple, green ash, swamp white oak, American elm, river birch, and cottonwood comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. Hardwood dominated forests occurring on floodplains and some terraces.

White birch --White Birch comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

White cedar --White cedar comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed swamp conifer stands, white cedar is predominant.

Central hardwoods --Any combination of oaks, hickories, elms, black cherry, hackberry, red maple, white ash, green ash, basswood, and sugar maple, which does not satisfy the defining criteria for NH, MR, or O cover types. The CH type occurs only on uplands within and south of the Tension Zone (southern Wisconsin).

Balsam Fir --Balsam fir comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed swamp conifer stands, balsam fir is predominant.

Hemlock --Hemlock comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

Miscellaneous Conifers --Conifer forests dominated by uncommon or exotic species; e.g. Eastern red cedar, Scotch pine, Norway spruce, European Larch.

Miscellaneous Deciduous --Hardwood forests dominated by uncommon or exotic species; e.g. box elder, honey locust, black locust, Norway maple.

Red Maple --Red Maple comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. If soil is poorly drained, then swamp hardwood.

Northern hardwoods --Any combination of sugar maple, beech, basswood, white ash, and yellow birch comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

Oak --Oak comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in saplings and seedling stands.

Scrub oak --More than 50% of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands is comprised of oak with site indices ≤ 50 . Typical forest products include only fuelwood and fiber.

Red pine --Red pine comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed pine stands, red pine is predominant.

White pine --White pine comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed pine stands, eastern white pine is predominant.

Jack pine --Jack pine comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed pine stands, jack pine is predominant.

Black spruce --Black spruce comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed swamp conifer stands, black spruce is predominant.

Swamp hardwoods --Any combination of black ash, green ash, red maple, silver maple, swamp white oak, and American elm that comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. This type occurs on wetlands characterized by periodic inundation (fluctuating water table near or above the soil surface) and nearly permanent subsurface water flow.

White Spruce --White spruce comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

Tamarack --Tamarack comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands. In mixed swamp conifer stands, tamarack is predominant.

Black Walnut --Black walnut comprises 50% or more of the basal area in saw-timber and pole-timber stands, or 50% or more of the stems in sapling and seedling stands.

Growing-stock tree.--A live timberland tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.--Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0- inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Habitat types and habitat type groups – An aggregation of units of land capable of producing similar plant communities at climax and having similar potential productivity. Habitat type groups are groupings of habitat types with similar soil moisture and nutrient regimes and potential productivity.

Sawtimber tree.--A live tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d. b. h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.--Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified otherwise), from stump to a minimum 7.0 inches top d. o. b, for softwoods and a minimum 9.0 inches top d. o. b, for hardwoods.

Site index.--An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Stand-size class.--A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

Nonstocked - Meeting the definition of accessible forest land, and one of the following applies: (a) less than 10 percent stocked by trees of any size, and not classified as cover trees (see code 6), or (b) for several woodland species where stocking standards are not available, less than 5 percent **crown cover** of trees of any size.

Large saw-timber stands (15+") - Saw-timber stands typed as large saw-timber within the primary cover type based on the basal area size class distribution of saw timber trees 15.0 inches d.b.h. and larger.

Small saw-timber stands (Softwoods 9-14.9", Hardwoods 11-14.9") - Saw-timber stands typed as small saw-timber within the primary cover type based on the basal area size class distribution of saw-timber trees less than 15.0 inches d.b.h.

Pole-timber stands (Softwoods 5-8.9", Hardwoods 5-10.9") - Stands typed as pole-timber within the primary cover type having a minimum net basal area of 10 sq. ft./acre.

Sapling stands (1-4.9") - Forest stands typed as saplings within the primary cover type having a minimum of 200 seedlings per acre.

Seedling stands (<1") - Forest stands typed as seedlings within the primary cover type having a minimum of 200 seedlings per acre.

Stand-age class.--A classification based on age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Timberland.--Forest land that is producing, or is capable of producing, more than 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber utilization, and that is not associated with urban or rural development. Currently inaccessible and inoperable areas are included. (Timberland was formerly called commercial forest land.)

Tree grade.--A classification of the lower 16 feet of the bole of standing trees based on external characteristics as indicators of the quality and quantity of lumber that could be produced from the tree. Tree grade was assigned to a sample of hardwood sawtimber trees during the 1996 inventory. See Wisconsin Dept of Natural Resources Division of Forestry. October 2011. Wisconsin State Forest Continuous Forest Inventory Volume I: Field Data Collection Procedures for Phase 2 Plots- Version 3.0, <http://dnr.wi.gov/topic/ForestPlanning/documents/WisCFIvolumelversion3.pdf>, pp 219-229.

References

Kotar, J., and T.L. Burger. 1996. *A guide to forest communities and habitat types of central and southern Wisconsin*. University of Wisconsin-Madison, Department of Forestry and Wildlife Ecology, Madison. 377 pp.

Kotar, J., and T. Burger. 2002. *A guide to forest communities and habitat types of northern Wisconsin*. Second edition. University of Wisconsin-Madison, Department of Forest Ecology and Management, Madison. 478 pp.

Wisconsin Dept of Natural Resources Division of Forestry. October 2011. Wisconsin State Forest Continuous Forest Inventory Volume I: Field Data Collection Procedures for Phase 2 Plots- Version 3.0, <http://dnr.wi.gov/topic/ForestPlanning/documents/WisCFIvolumeIversion3.pdf>

Wisconsin Dept of Natural Resources Division of Forestry. October 2007. Wisconsin State Forest Continuous Forest Inventory Volume II: Field Data Collection Procedures for Phase 3 Indicators - Version 2.0, <http://dnr.wi.gov/topic/ForestPlanning/documents/WisCFIvolumeIIversion2.pdf>

Wisconsin Dept of Natural Resources Division of Forestry. 2013. The State Forests of Wisconsin - Continuous Forest Inventory Baseline Report 2007 - 2011, <http://dnr.wi.gov/topic/ForestPlanning/documents/CFIBaselineReport-07-11.pdf>

For more information on the WisCFI database including background, reports, tables and access to the data, please go to the WIDNR Wisconsin's Continuous Forest Inventory website at: <http://dnr.wi.gov/topic/ForestPlanning/forestInventory.html>