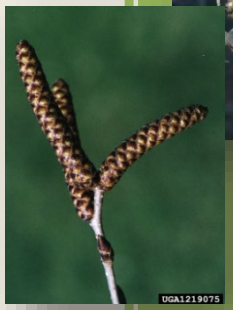


Yellow birch

(*Betula alleghaniensis*)

Yellow birch is a slow-growing, shade tolerant species, found mainly in northern Wisconsin. The volume of yellow birch has increased 23% since 1983 but remained largely unchanged in the last two decades. The number of sawtimber trees has increased since 2004 but the number of saplings and poles has decreased.

Growth and removals are relatively quite low and mortality is about average. Based on the assumption that these low growth rates will continue, growth models project that volume will decrease about 40% over the next 40 years.

Yellow birch is not an important timber species, accounting for less than 1% of roundwood production. As far as biomass production, the density of yellow birch wood is about average but there is limited volume.

Division of Forestry
WI Dept of Natural Resources 2019

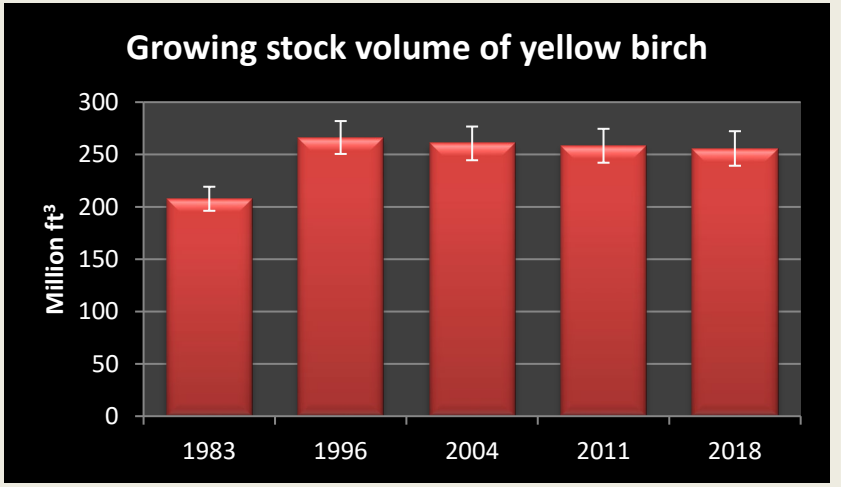
"How has the yellow birch resource changed?"

Growing stock volume and diameter class distribution by year

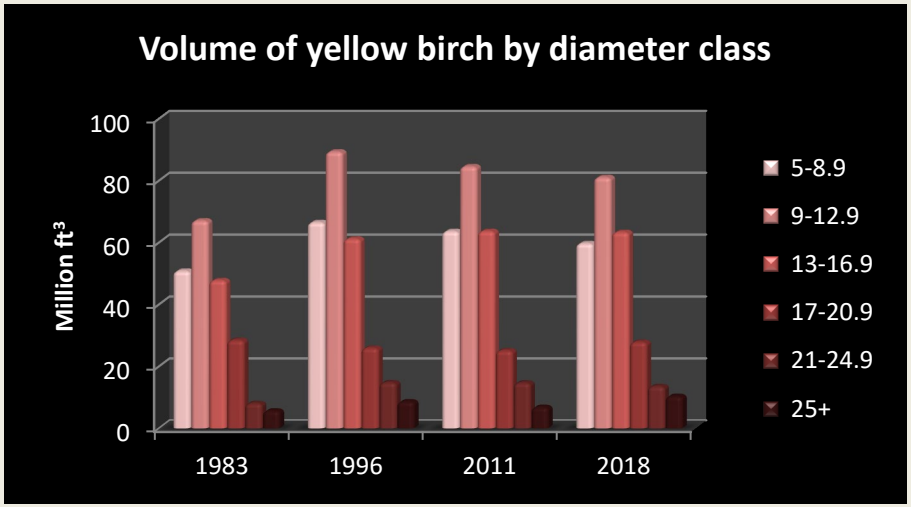
The growing stock volume of yellow birch in Wisconsin is approximately 256 million cubic feet or about 1.2% of total statewide volume (chart on right). This represents an increase of about 23% since 1983. Volume has remained statistically unchanged since 1996.

The yellow birch resource is aging as volume in large trees (13+ inches diameter) has increased slightly while volume in small trees (5-12.9 inches) has decreased since 1996 (chart below left).

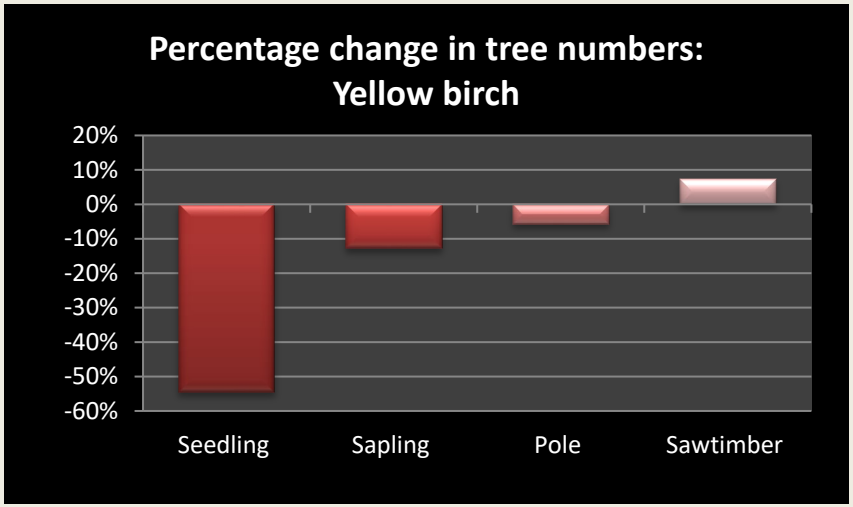
Only the number of sawtimber trees increased between 1996 and 2015 (chart below right). The number of saplings and poles has decreased slightly indicating a questionable future for yellow birch.



Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data



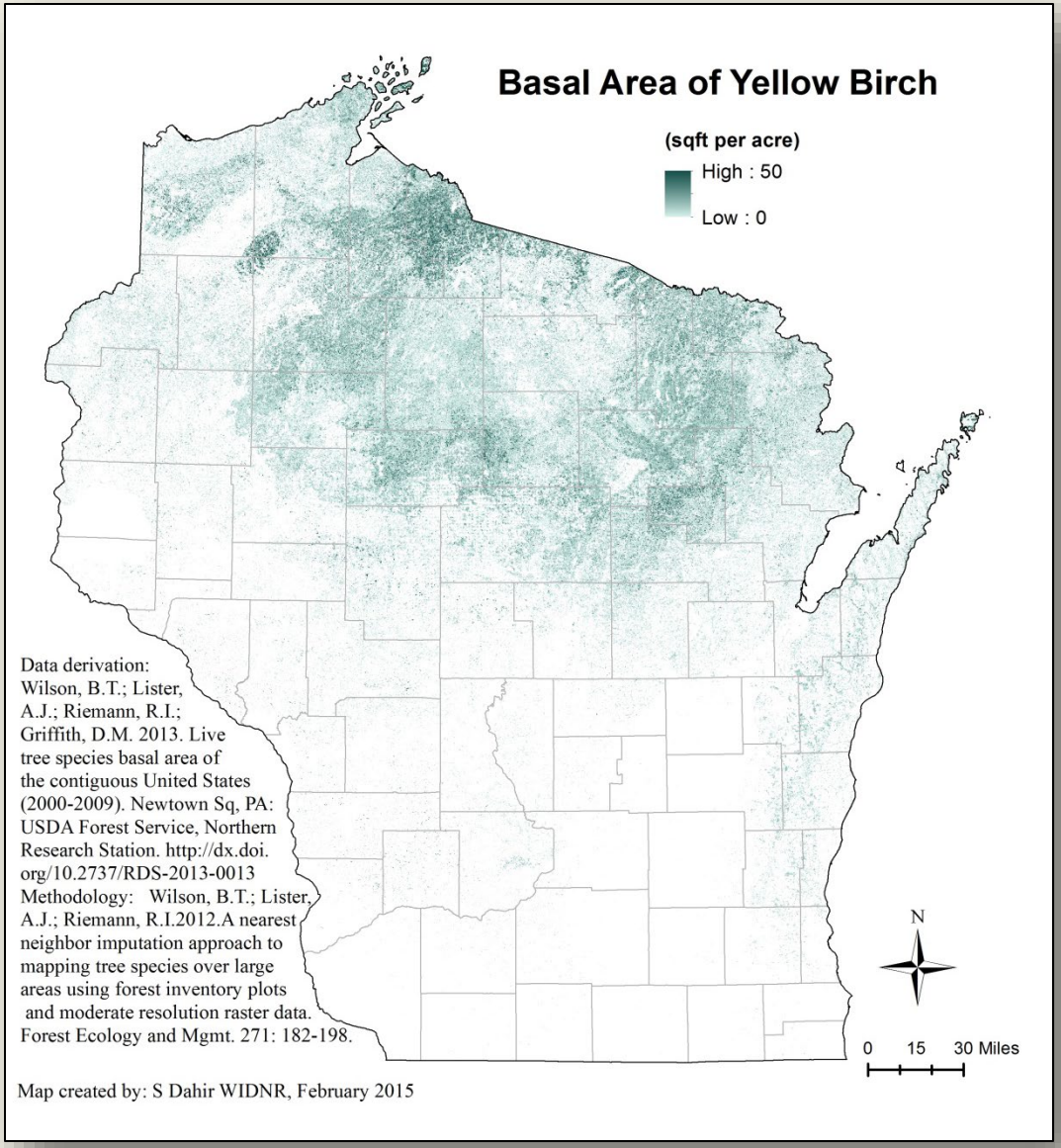
Growing stock volume (million cubic feet) by diameter class (inches).
Source: USDA Forest Inventory and Analysis data



Percentage change in the number of live trees by size class between 2004 and 2018.
Source: USDA Forest Inventory and Analysis data 2004 and 2018.

"Where does yellow birch grow in Wisconsin?"

Growing stock volume by region with map



Yellow birch is mostly a northern species with 85% of growing stock volume in the northeast and northwest regions of the state (Table 1).

In the north, the majority of yellow birch volume occurs on the maple basswood forest type. In the south, it also is found on elm / ash / cottonwood types.

Table 1. Growing stock volume (million ft^3) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total
Yellow birch	24	101	118	11	2	**256**
Percent of total	**9%**	**39%**	**46%**	**4%**	**1%**	**100%**

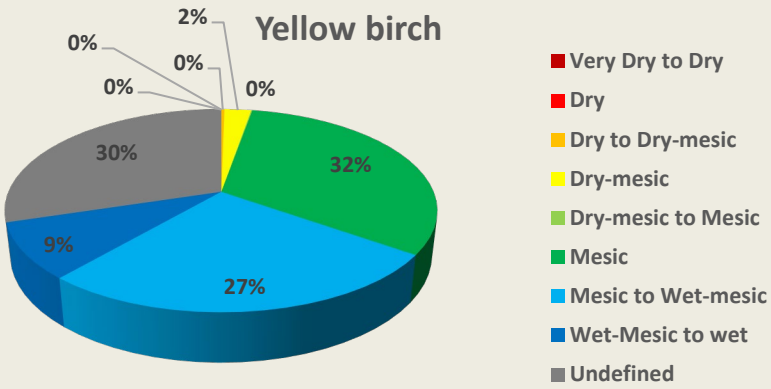
Source: USDA Forest Service, Forest Inventory and Analysis

For a table of **Volume by County** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf

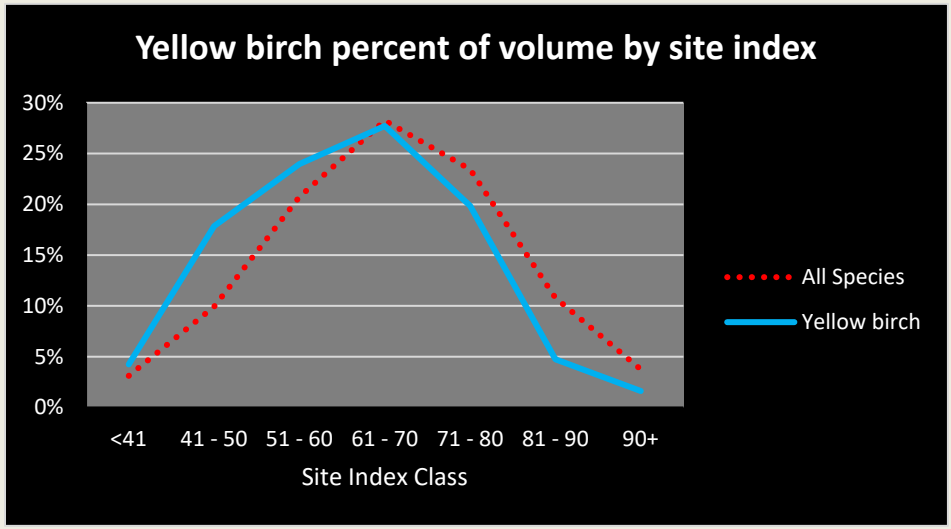
"What kind of sites does yellow birch grow on?"

Habitat type[1] and site index distribution

Yellow birch grows primarily on mesic and wetter habitat types. The vast majority of growing stock volume occurs on these mesic, mesic to wet-mesic and lowland sites (chart below).



Percent distribution of growing stock volume by habitat type group[1] (USDA Forest Inventory & Analysis data).



Percent distribution of growing stock volume by site index class (USDA Forest Inventory & Analysis data).

Almost half of yellow birch growing stock volume is found on wetter sites in the north which have some of the lowest site index values of all forestland. Nearly half of yellow birch volume grows on sites with site index less than 60 (chart on left).

The average site index by volume for yellow birch is 61, lower than the average for all species, 66.

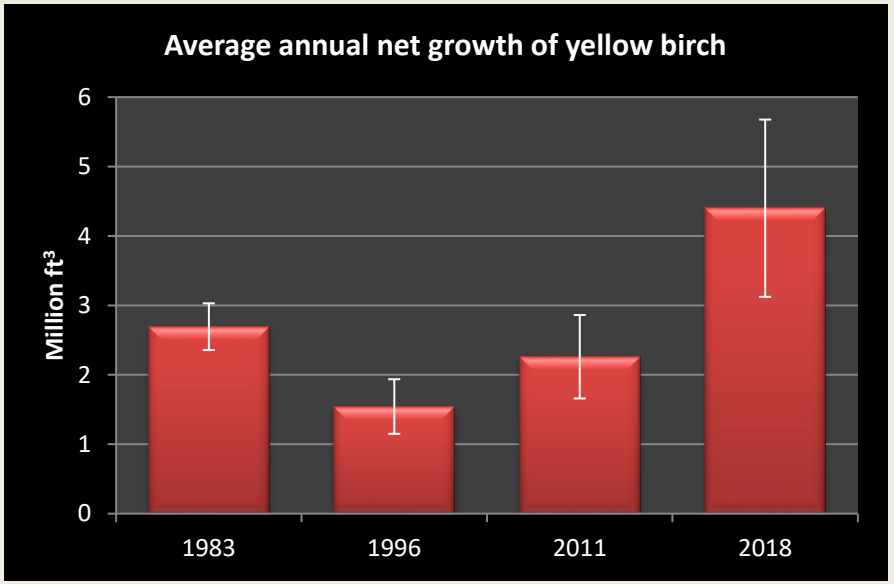
[1] For more information on habitat types see Schmidt, Thomas L. 1997. Wisconsin forest statistics, 1996. Resource Bulletin NC-183. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central

"How fast is yellow birch growing?"

Average annual net growth: trends and the ratio of growth to volume

Average annual net growth of yellow birch was about 4.4 million cubic feet per year from 2012 to 2018 (chart on right), which represents 0.8% of statewide volume growth.

Yellow birch accounts for 1.2% of all volume in the state but only 0.8% of growth.



Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data

Table 2. Average annual net growth (million ft³/year) and ratio of growth to volume by region of the state.

Region	Net growth	% of Total	Ratio of growth to volume
Northeast	1.7	38%	**1.7%**
Northwest	2.1	49%	**1.8%**
Central	0.5	11%	**2.0%**
Southwest	0.1	2%	**2.8%**
Southeast	0.0	1%	**0.4%**
Statewide	**4.4**	**100%**	**1.7%**

Source: USDA Forest Inventory and Analysis

The highest volume growth for yellow birch is in the northern part of the state but the highest rates of net growth to volume are in southwest Wisconsin (Table 2).

The average ratio of net growth to volume is 1.7%, much lower than the statewide average of 2.6% for all species.

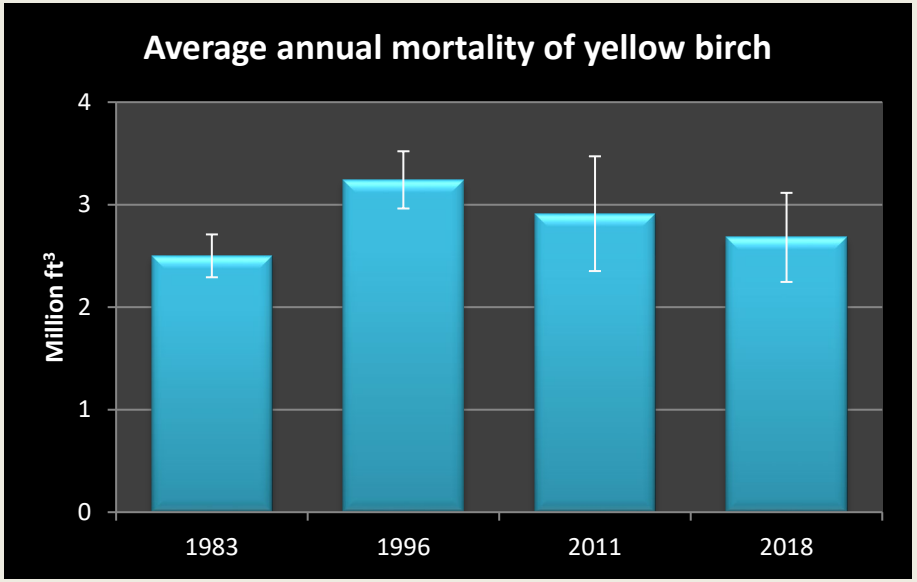
For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How healthy is yellow birch in Wisconsin?"

Average annual mortality: trends and ratio of mortality to volume

Average annual mortality of yellow birch, about 2.7 million cubic feet per year between 2012 and 2018, has remained relatively steady since 1983 and over the last decade (chart on right). This represents about 1.0 % of total statewide mortality.

The ratio of mortality to volume is 1.0% for yellow birch, which is slightly below the statewide average of 1.1% for all species (Table 3). This is despite a growth rate which is much lower than other species.



Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data

Table 3. Mortality, volume and the ratio of mortality to volume.

Species	Average annual mortality (ft^3)	Volume of growing stock (ft^3)	Mortality / volume
Yellow birch	**2,680,856**	**255,776,143**	**1.0%**

Source: USDA Forest Inventory & Analysis data

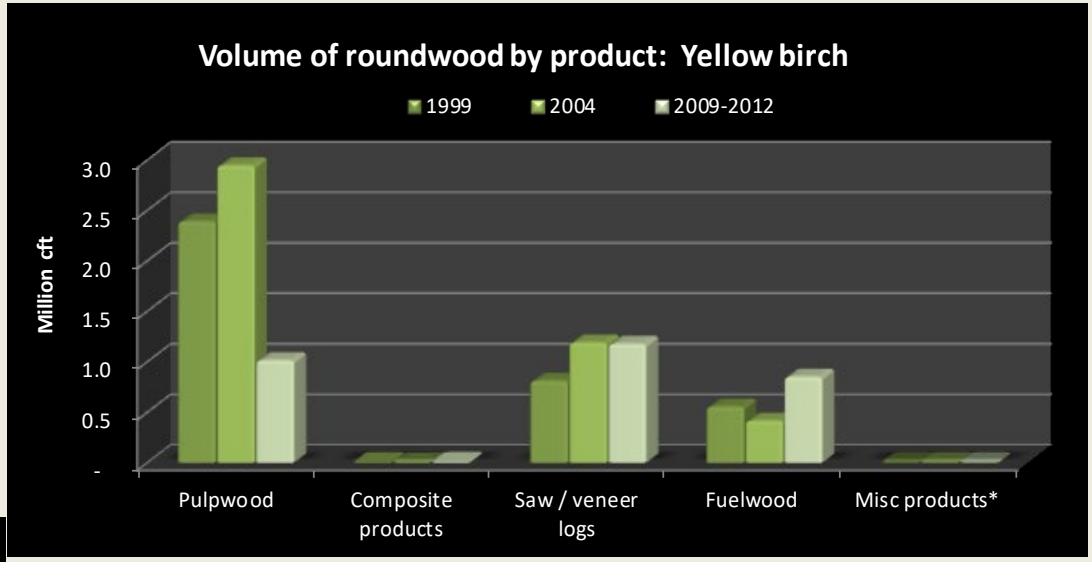
For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much yellow birch do we harvest?"

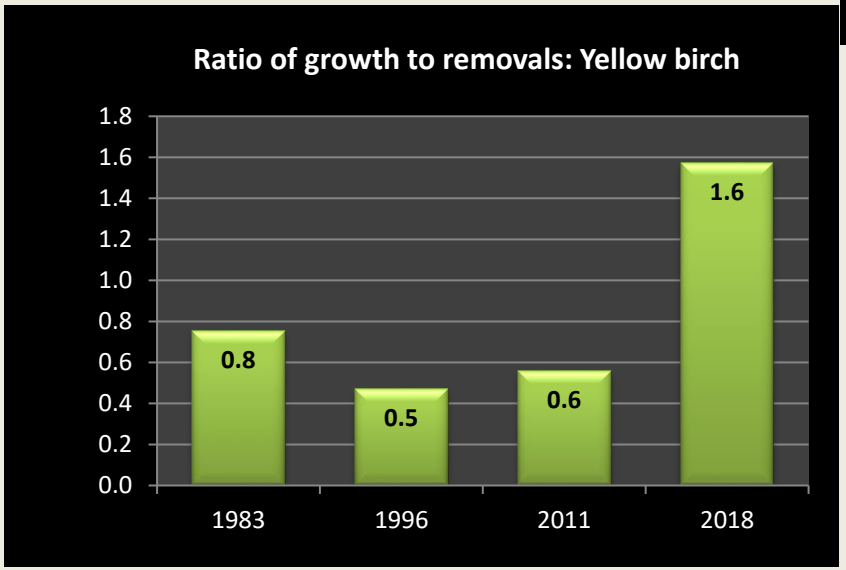
Roundwood production by product and ratio of removals to growth

In 2009-2012, yellow birch roundwood, accounted for 3.1 million cubic feet or less than 1% of statewide production. About 33% was used for pulpwood and 40% was in sawlogs (chart on right).

From 2004 to 2009, yellow birch pulpwood production decreased by 68% while fuelwood production doubled.



Volume of roundwood. Most recent figures for pulpwood and composite products are from 2012 while other product volumes are from 2009. * Miscellaneous products include poles, posts and pilings.
Source: Ronald Piva, USDA Forest Service, Northern Research Station, St. Paul MN



Ratio of volume harvested annually to net growth.
Source: USDA Forest Inventory & Analysis data

Removals of yellow birch were 2.8 million cubic feet per year from 2012 to 2018 or 1.0% of total removals.

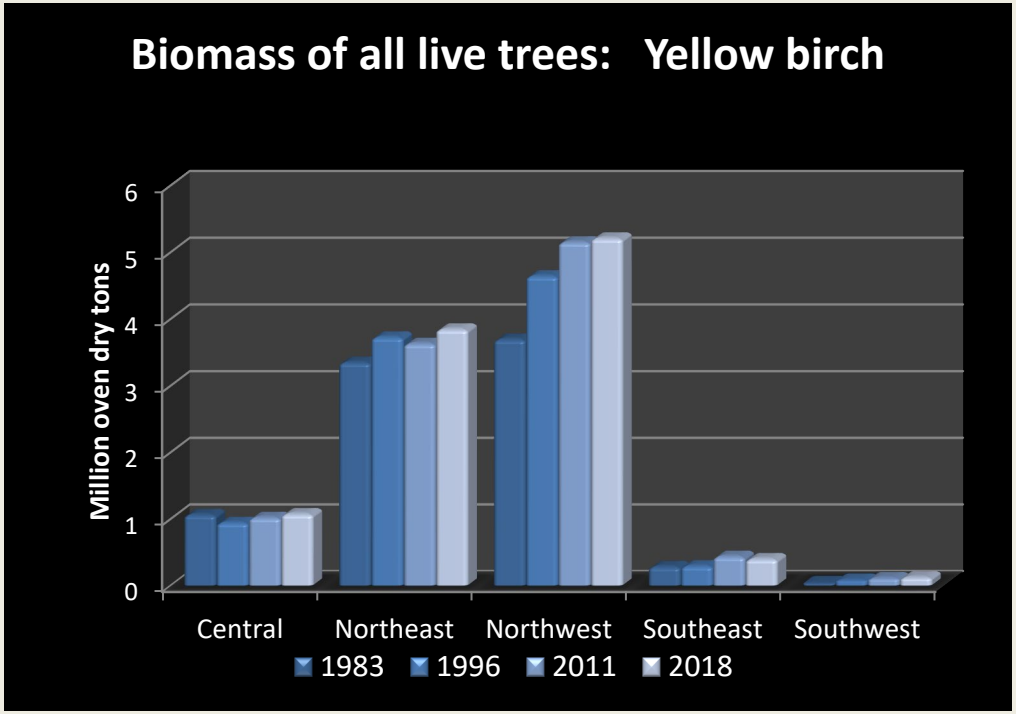
The ratio of average annual net growth to removals is 1.6. This is similar to the ratio of 1.7 for all species in the state. This ratio has increased since 1996 as removals have fallen 15% and growth has increased 185%.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much yellow birch biomass do we have?"

Aboveground biomass by region of the state

There are 10.7 million tons of aboveground biomass in live yellow birch trees, an increase of 26% from 1983. This is equivalent to approximately 5.3 million tons of carbon and represents 1.6% of all aboveground biomass statewide. As with volume, most yellow birch biomass is located in northern Wisconsin (chart below).



Biomass (above ground dry weight of live trees >1 in dbh, short tons) by year and region of the state.
Source: USDA Forest Inventory & Analysis data

The density of yellow birch wood is higher than average with a ratio of biomass to volume of 38 oven-dry lbs. per cubic foot (ODP/ft^3). The average for all hardwoods is about 36 ODP/cubic feet and for all species is 33 ODP/cubic feet.

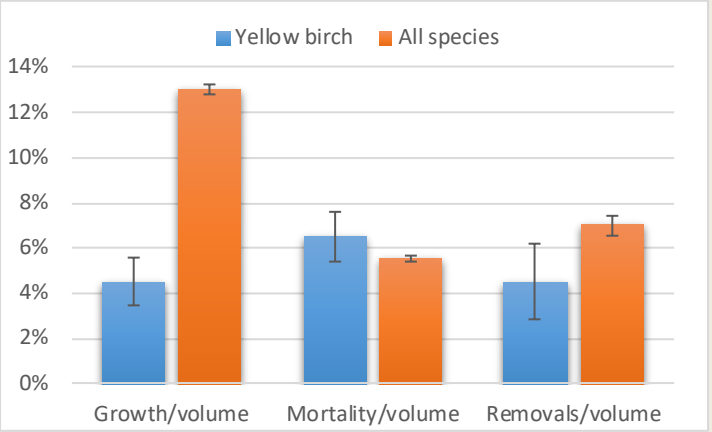
Approximately, 67% of all yellow birch above ground biomass is located in the main stem, 10% as saplings, 4% in the stump and 19% in the top branches.

For a table of **Biomass by County** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf

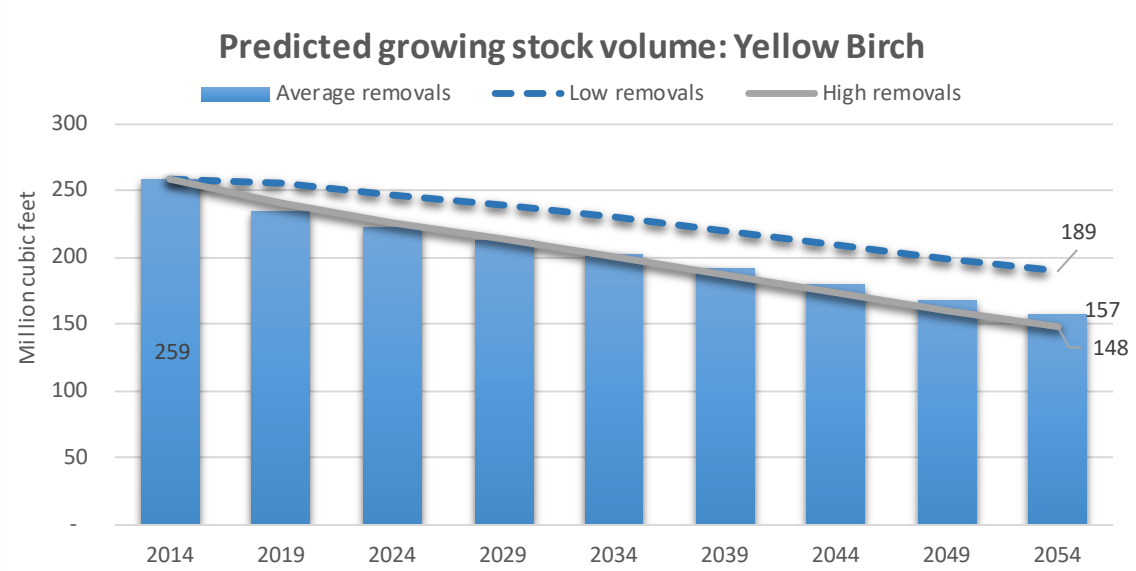
"Can we predict the future of yellow birch?"

Predicted volumes based on current rates of mortality and harvest

The 5-year ratio of growth to volume is almost 1/3 of the average for all species in the state (chart on right). Removals are slightly lower and mortality slightly higher. Such low relative growth rates may very well portend volume decreases in the future.



The Forest Vegetation Simulator (FVS[1]) was used to predict future volumes of yellow birch through 2054. Three scenarios are forecast. One with current rates of mortality and removals (i.e. average annual mortality and removals for 2009 to 2014). Another with current mortality rates and the lower 67% confidence interval for current removals and another with the upper 67% confidence interval for removals.



As predicted, volume decreases in all three scenarios, 39% by 2054 for current average removal levels, 27% for the lower confidence interval for removals and 43% for the higher confidence interval for removals.

The Forest Vegetation Simulator is a forest growth and yield simulation model created by the USDA Forest Service, see http://www.fs.fed.us/fmsc/fvs/.