Quincy Bog Notes

Conserving Land, Connecting People with Nature

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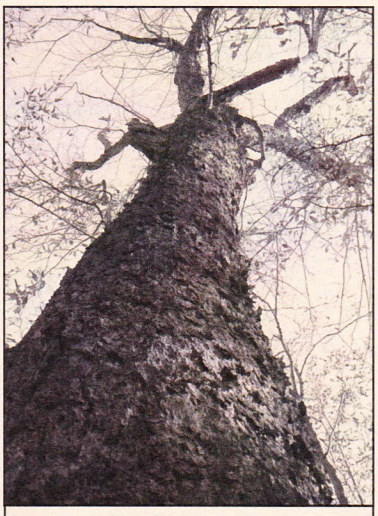
Old Growth Forests

Rick Van de Poll



Yellow Birch in the Bowl

What comes to mind when someone says "old growth forest?" Perhaps tall, stately trees of practically unimaginable size? Filtered sunlight hitting a mossy carpet on the forest floor? Lush ferns and undergrowth beneath countless tree limbs festooned with delicate lichens?

Certainly *some* of our old growth forests here in New Hampshire look like that. Some excellent well-known examples include the 3000-acre "Bowl" in the Sandwich Wilderness Area of the White Mountain National Forest, or Mountain Pond in Chatham, or the east bowl of Mount Sunapee. Yet, very few pristine forests remain after 200 years of settlement that cleared over 97% of forests in New Hampshire. Most of this old growth lies in the hard-to-reach places, the nooks and crannies of mountains, highest ridgetops, or steep talus boulder slides.

The definition of old growth itself is hard to pin down because it requires an understanding of the site, the kinds of natural disturbances, the longevity of the dominant species, and the acceptable level of human disturbance that would still qualify it for protection and use limits as old growth. For the Eastern Region of the USDA Forest Service, the average minimum age of "old growth" is just 120 years.

In 1997, leading forest ecologists in the eastern United States got together to decide what makes old growth, *Old Growth*. No consensus was reached but their efforts produced a list of attributes that are *likely* to occur in old growth forests:

1) Old trees (clearly for forested landscapes only)
2) A self-replicating stand of species that is typical for the site
3) Uneven age structure in a multi-layered canopy
4) The presence of canopy gaps (e.g. +/- 2% in our mixed mesic forest types)
5) Abundant coarse woody material in all stages of decomposition
6) Lack of significant artificial disturbance
7) Soil and substrate integrity & complexity

This last attribute was added later, after work by myself and others revealed strong connections between old growth forests and diversity in soil micro-organisms, but each factor must be taken in context to fully understand the diversity of old growth forest ecosystems and their importance on the landscape. For example, old trees in a landscape that is typically forested, such as a northern hardwoods (beech-birch-maple) forest, can reach 250-350 years in age. But in a forest type that regularly burns, such as a pine-oak woodland or pitch pine rocky ridge, "old" may be just 50 – 75 years.

While the greatest tree ages may be reached by certain individual trees in a stand, from 150 years for montane birches (e.g. *Betula cordifolia*) to over 1,000 years for northern white-cedar (*Thuja occidentalis*), because of natural disturbance, most old growth stands also include much younger trees.

Natural disturbances, such as fires, downbursts, and ice storms, tend to be localized. They typically result in a mix of young, intermediate, and old trees and create **canopy gaps**, that allow a combination of sun-tolerant and shade-tolerant species. In a study of canopy gaps by Tyrrell & Crow (1994) the gap size in hemlock-hardwood forests averaged 2-4 acres and occupied up to 17% of the landscape.

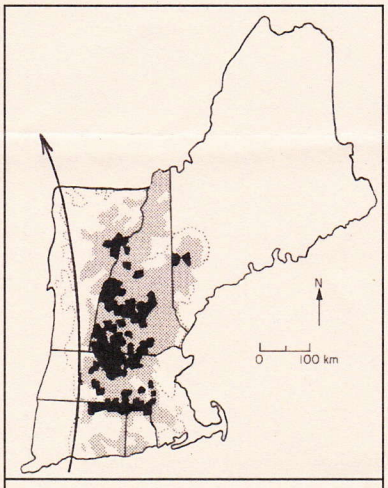


Image source: Foster 1988

Occasionally, however, natural disturbances are *stand originating* events, which can 'reset the clock' on a given forest by destroying all the trees. The 1938 hurricane is perhaps the most well-known stand originating event of the last 100 years. At left, the track of the 1938 Hurricane is shown by the arrow, along with areas it damaged slightly (unshaded areas within dashed lines), moderately (gray) and severely (black).

Hurricanes like the one in 1938 add tremendous amounts of coarse woody material (CWM) to the forest floor. This is perhaps one of the most important, yet oft overlooked, aspects of old growth forest ecosystems. Except where fires convert much of this woody material to charcoal, the amount of organic debris on the forest floor can be used to determine if a stand is old growth.

Typical CWM measurements come in the form of cubic meters per hectare (m^3ha^{-1}). These values are from Tyrrell et al. 1998:

Forest Type Group	Lowest Median Value	Highest Median Value
Beech-Maple-Basswood	8.6	145.8
Northern Hardwood	121	213
Dry to Xeric Oak	24.3	34.6
Mesic to Wet-Mesic Oak	20.8	68.4
Hardwood Wetland	34.5	200.9
Conifer-Northern Hardwood	58.4	207.2
Montane Spruce-Fir	691	951

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President's Perspective

Gino Infascelli

"A thing is right when it tends to preserve the integrity, the stability, and beauty of the biotic community. It is wrong when it tends otherwise."
- Aldo Leopold

It is just past twilight. I am watching the stars appear as clouds move out, following a storm that left three inches of powdery snow. A flicker of shadow catches my eye. From 20 feet above the ground, an owl turns its head slowly two times, forth and back (as my father always insisted). A minute later this mostly nocturnal bird continues on its way, making no perceptible sound with its expansive wings.

Preserving and maintaining access to natural areas involves a challenging balance of minimizing disturbance to wildlife while allowing people to enjoy themselves on protected conservation properties. As visitor numbers increase at places like Quincy Bog, it is good to remind ourselves to disturb as little as possible by staying on the designated trails and taking only photos, along with our memories, leaving nature in its place for the next person to enjoy.

This past summer, our evening programs and weekend nature walks resumed with caution, allowing visitors with masks into the Quincy Bog Nature Center. The popular 'Fabulous Fungi' workshop in September found 27 species within 100 yards of the Nature Center, highlighting the diversity of organisms in this area.

A special thank you to our Quincy Bog Hosts for all of their time and efforts to provide guidance and a friendly welcome to all, and thanks as well to our many visitors and supporters.

Congratulations to the Pemi-Baker Land Transactions Committee for their commitment and hard work in concert with the Campton Conservation Commission to finalize a conservation easement on an ecologically significant 145-acre property in Campton along West Branch Brook.

We wish all of you a peaceful, healthy, and happy new year.

Gino Infascelli has been busier than ever in retirement between various Quincy Bog commitments and his "never ending" house projects.

Images from Unsplash: Barred Owl by Philip Brown, Mushroom by Oliver Fetter.

(Continued from page 1, Van de Poll)

Sites with more recent natural disturbances in warmer climates trend towards the low end of CWM values, while sites either with few disturbances or in cooler climates trend towards the high end of CWM values. For example, CWM values in dry, xeric oak old growth areas of the Castle-in-the-Clouds, Moultonborough, were 16-26 m^3ha^{-1} compared to those from spruce fir forests in the Bowl Natural Area, Sandwich and Waterville Valley, with 691 to 951 m^3ha^{-1} CWM. The Bowl study was completed in 1986 by Lee Carbonneau as a part of her Master's thesis at UNH, while I completed the Castle study in 2004 for the Lakes Region Conservation Trust. While CWM measurements will naturally vary by site and forest type, an average between 25 and 45 m^3ha^{-1} appears to be a minimum amount for our most common forest types in the state.

The final and most pressing attribute of old growth forests has to do with **soil integrity**. This attribute has become one of the most important aspects for carbon dioxide release into the atmosphere and global climate change. Old growth forest soil integrity has much to do with the complexity and biomass of living organisms in the soil, with the movement of organic carbon by fungi, bacteria, and other micro-organisms accounting for as much as 54% of our stored carbon on planet Earth.

Old growth forests, long recognized for their ability to store carbon and regulate its release into the atmosphere, still stimulate debates over whether forest management can 'improve' upon or accelerate the rate of carbon sequestration. Although forest carbon credit markets have increased more than 400% over the last decade, they are still being offered for managed forests where the goal has more to do with above-ground biomass accumulation than below-ground accumulation. Rough estimates indicate there is four to five times more carbon stored underground than what is stored above-ground, so perhaps we should re-examine the ways in which we can accelerate *below-ground storage*. One clear and prescient way to do this is to recognize, quantify and *protect* old growth forest ecosystems wherever they have survived here in the Northeast.

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400-year old White Oak in Sandwich, NH