

# The Great Northern Paper Company P.O. Series—Stand Dynamics in Northern Maine, 1924-1994

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The Permanent Observation (PO) series of plots were established in the fall of 1924 with the object of capturing a continuous record of regeneration. These plots, located in the Penobscot River watershed on the Great Northern Paper Company ownership, have been periodically remeasured up through 1994, and have more than met the original objective. All plots had experienced a recent cutting (1913 to 1923) of spruce and fir to a 6" diameter limit, i.e. commercial clearcut. Seedling age data collected in 1924 indicated a fir regeneration initiation in the period of 1911 to 1916 and a spruce regeneration initiation in the period of 1914 to 1916. I assigned 1915 as the average year representing stand initiation for these plots. Because of their location adjacent to various water bodies, the majority of plots did not receive pesticide spraying to reduce spruce budworm related defoliation and mortality impacts.

The 70 years of remeasurement data, photographic documentation, and graphical analysis encompass two major dynamic developments:

- Up through the 1960s, the stand maturation response following the 1910 – 1920 spruce budworm epidemic and the circa 1920 harvest, and
- The stand degradation process from the mortality impacts of the 1970s – 1980s era spruce budworm epidemic.

Five plots (PO – 2, 3, 5, 6, and 10) can be characterized as representing a spruce flat development type, with equal representation of spruce and fir, moderate to poor drainage, and associated species of red maple, yellow birch, and white birch. In 1924, at a derived spruce-fir stand age of 10; these plots averaged 13,000 seedlings, 97 saplings (1 – 6" dbh class), and 50 merchantable size trees per acre. The merchantable basal area was 53 sq.ft./acre and the merchantable volume was estimated at 12 cords per acre, 95 percent of which was post-harvest residual yellow and white birch.

For the twenty-five year period (stand age 24 – 49), spruce-fir ingrowth averaged 0.51 cords per acre per year, with fir ingrowth concentrated early in this period and spruce tagging along later. At the 1963 data collection cycle and at a stand age of 49 years, spruce-fir periodic accretion peaked at 1.29 cords/acre/year. In 1973, ten years later, the mean annual increment of spruce-fir peaked at 0.52 cords/acre/year. At this

derived stand age of 59 years, the average merchantable stock and stand values per acre were 630 trees, 167 sq. ft. of basal area, and 32 cords.

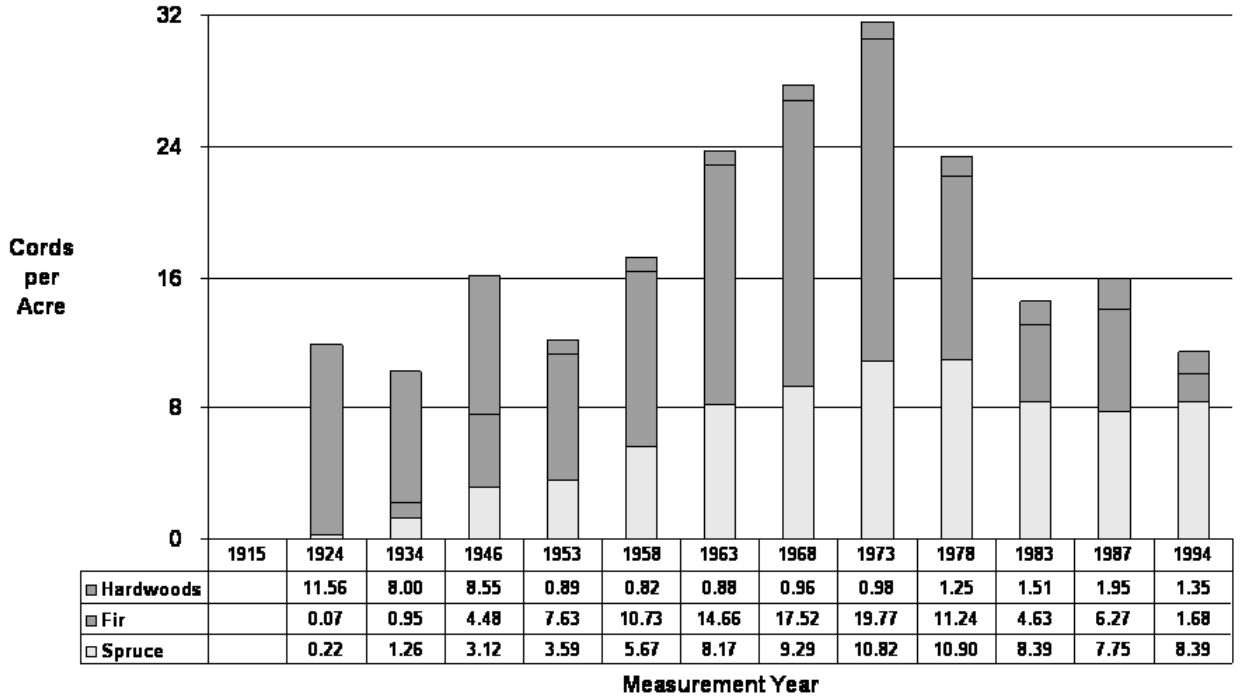
The next 10-year period encompasses the recent spruce budworm epidemic and how it impacts these plots:

- 1974 - 1978, the plots average an estimated (2.04) cords/acre/year in mortality, resulting in an estimated net growth of (2.01) cords/acre/year. There was no measurable accretion.
- 1979 - 1983, the plots average an estimated (1.72) cords/acre/year in mortality, resulting in an estimated net growth of (1.72) cords/acre/year. Again, there was no measurable accretion.

In 1983, the average merchantable stock and stand values per acre are now 217 trees, 70 sq. ft. of basal area, and 14 cords. The four remaining unharvested plots continued to decrement in volume and net growth through the last measurement period of 1984 - 1994, even as the next stand of seedlings/saplings started to express their development.

In 2005, the Maine Forest Service will revisit and remeasure the surviving plots within the PO and several other long-term series initiated by Great Northern back in the 1920s. This will provide one more critical data point on both the continuing stand degradation and the dynamic pace of development of the new stand arising out of the circa 1970 budworm period.

**Merchantable volume for 3 major species groups, by measurement date**



**Tracking of All Species, PAI versus MAI**

