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Minnesota Forest Age Class Distribution, 2011

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The Minnesota Department of Natural Resources (MN DNR) recently issued a new policy regarding how it would be managing for older forests. In the discussions associated with issuing the new Extended Rotation Forest (ERF) policy, the MN DNR indicated that periodic compilations of forest age class distributions would aid assessing the need for further ERF policy revisions. As a consequence, this note presents a summary of the statewide forest age class distribution based on the US Forest Service Forest Inventory and Analysis (FIA)[2] data for Minnesota for 2011.

Figure 1 describes the changes in the forest age class distribution since 1977. In examining Figure 1, it is evident Minnesota s forests have moved from being largely young (ages 0 to 40 years) in 1977 to predominantly older forest (ages 41 years plus) in 2011. The annotations on the 2011 bars in Figure 1 further show an increase of 4.2 million acres in forest acreage in the 61 to 100+ age classes with that increase in large part developing from areas that were young forest in 1977. Clearly, Minnesota has accumulated considerable acreage of older forest over the past three decades.

Table 1 quantifies the change in the distribution of forest age classes from 1977 to 2011 in percentage terms. We note that in 1977, the age classes from 41 to 100+ represented 50% of the state s forest area. In 2011, this same set of age classes has grown to represent 66%, or two-thirds, of Minnesota's forests. Over this same period, the overall area of forest has remained rather stable (16.9 million acres in 1977; 17.2 million acres in 2011).

Table 2 shows these changes and the advancing age class distribution by covertype over this same time period (1977 to 2011). As these data indicate, the pattern of accumulation of substantial acres of old forest (60+ years old) has occurred in all of Minnesota's major forest covertypes since 1977.

Clearly, the data suggests that Minnesota's forests are aging. This is a result of two major factors. First, Minnesota's forests are still growing back from the extensive harvesting and land clearing that occurred during the late 1800s and early 1900s when Minnesota s farms were being established and towns settled. Second, the amount of timber that is annually harvested has been depressed since 2008 due to the general economic downturn. To put this recent decline in perspective, the harvest had been approximately 3 million cords annually since the 1930s until it rose to 4 million cords in the 1990s, subsequently falling to 3.7 million cords by 2008; then falling to 2.7 million cords in 2012. The decreased harvesting has accelerated the accumulation of old forest acreage as suggested by the acreage impacted and thus regenerated since 1990. The acres impacted by harvesting in 1991, 1996, and 2008 were 171, 193, and 134 thousand acres, respectively. These acreage values correspond to 1.11, 1.25, and 0.87% of the forest overall, indicating the amount of forest land annually subject to human disturbance has declined by 30% since 1996 (D'Amato et al. 2009).

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[2]The FIA program operates nationwide and provides data and reports from periodic and annual inventories of forest resources. For more information on this program and the data for Minnesota see http://www.fia.fs.fed.us/tools-data/.

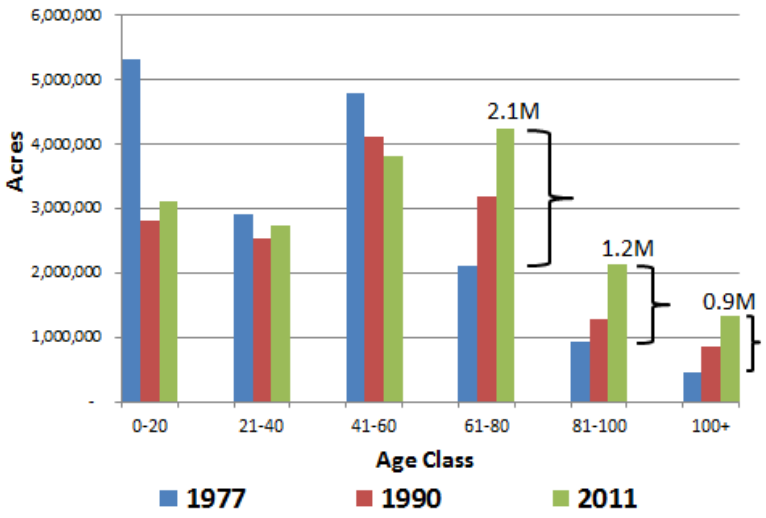

Figure 1. Minnesota s forest age class distribution, all covertypes and ownerships 1977, 1990, and 2011.

Table 1. Percentage of Minnesota s forest acreage, all covertypes and age classes 1977 versus 2011.

	Age Class					
Year	0-20	21-40	41-60	61-80	81-100	100+
1977	32	18	28	13	6	3
2011	18	16	22	24	12	8
2011 vs 1977	-14	-2	-6	+11	+6	+5

50%

66%

Table 2. Percentage of Minnesota s forest acreage by MN DNR covertype and age class 1977 versus 2011.

	Age Class					
	0-20	21-40	41-60	61-80	81-100	100+
Total	-14	-2	-7	12	7	5
Jack pine	0	-3	-27	12	16	2
Red pine	-60	29	15	6	7	4
Balsam fir	-29	3	-2	13	10	4
White spruce	-48	11	31	5	3	-1
Black spruce	-54	-8	13	22	12	15
Tamarack	-34	-4	9	12	11	6
Northern white-cedar	-21	-3	-5	-1	7	22
Oak	-9	-4	-11	12	8	4
Northern hardwoods	2	-5	-12	5	10	0
Lowland hardwoods	-22	-1	-3	12	6	8
Aspen	2	1	-14	9	1	0
Birch	1	-9	-24	21	9	2
Balsam poplar	-8	-1	-7	14	0	0

Importantly, these dynamics in the age class structure are not a surprise. They were largely predicted by the Generic Environmental Impact Statement on Timber Harvesting and Forest Management (GEES) in 1994 (Jaakko Pöyry Consulting, Inc. 1994). See Table 3, which is reproduced from the GEIS final report.

As shown in Table 3, the area of old forest was projected to increase over the amount that existed in 1990 despite potentially higher (than present) harvest levels (base, medium, and high harvest scenarios corresponding to annual harvests of 4, 5, and 7 million cords). In fact, even at a very high harvest level of 7 million cords annually, the GEIS projected the area of old forest would approximately double by 2040.

What might be concluded from these data? Minnesota's forests have been aging and will continue to do so for decades. In fact, we have seen a doubling of the acreage of forest 60+ years of age (22% to 44%) since 1977. What does this mean for consideration of a forest age class policy? It makes sense to monitor the changes in forest age class distributions. Fortunately, the FIA plot data is a very effective tool for doing so, except perhaps for small geographic areas where there are only a few inventory plots.

But no one age class should be paramount. Policies that disproportionately favor certain age classes (young or old forests) rarely maximize the full range of benefits that can be derived from forests. Classic forest management and sustainability strategies stress long-term goals of having an approximately equal acreage in each age class, except for perhaps the oldest classes where natural mortality eventually precludes carrying large areas of a species to a very advanced age. Forest landowners have the option of choosing rotation ages by which to manage their forests for a combination of ecological to economic and social objectives. Finally, each option will embody tradeoffs in terms of forest health and productivity. In Minnesota, these tradeoffs are often expressed in economic returns, habitat and recreation values, and aesthetics.

Literature Cited:

D'Amato, A.W., N.W. Bolton, C.R. Blinn, and A.R. Ek. 2009. Current status and long-term trends of silvicultural practices in Minnesota: a 2008 assessment. Staff Paper Series No. 205, St. Paul, MN: Department of Forest Resources, College of Food, Agricultural, and Natural Resource Sciences, University of Minnesota.

Jaakko Pöyry Consulting, Inc. 1994. Final generic environmental impact statement on timber harvesting and forest management in Minnesota. Prepared for the Minnesota Environmental Quality Board. Tarrytown, NY: Jaakko Pöyry Consulting, Inc.

Table 3. GEIS Table 7.10. Area of old forest for 1990 and projected 2040 for the base, medium, and high harvest scenarios, all forest lands (acres).*

Forest type (threshold age)	Current 1990	Base Scenario 2040	Medium Scenario 2040	High Scenario 2040
Red pine (120)	21,200	107,496	110,344	96,944
White pine (120)	12,300	91,674	87,743	73,643
Black spruce (120)	157,800	614,219	471,636	436,736
White cedar (120)	60,000	225,600	211,569	183,990
Tamarack (120)	73,000	299,604	268,390	156,307
White spruce (90)	27,400	211,815	185,720	149,583
Oak-Hickory (120)	51,400	342,702	293,044	241,232
Elm-Ash-Soft maple (120)	69,400	483,185	416,120	295,024
Maple-Basswood (120)	37,000	404,502	344,407	181,618
Jack pine (70)	115,100	244,518	207,612	99,269
Balsam fir (70)	304,000	452,468	335,385	256,276
Aspen (70)	467,500	982,911	961,039	837,726
Balsam poplar (70)	24,900	76,629	74,129	73,029
Paper birch (70)	324,400	643,809	559,835	352,494

*Acreages are those determined from the GEIS covertype algorithm
Source: Jaakko Pöyry Consulting, Inc. 1994.