FOREST PRODUCTIVITY IN THE SUPERIOR NATIONAL FOREST OUTSIDE OF THE BWCA

(Effects of SO_2 pollution are estimated based on the results of a Swedish study.)

The Forest Service has estimated its growing stock volumes and growth rates for the Superior National Forest exclusive of the Boundary Waters Canoe Area (BWCA)(Robert Rehfeld, personal communication). This area includes 1,195,308 acres of regulated commercial forest lands (RCFL). The growth rates are currently estimated to be 34 cu ft/acre. If influencing factors remain constant, it is projected that this rate will increase to 42 cu ft/acre by the year 2000 A.D. At the same time, it is estimated that the volume of growing stock will increase from the present 12,403,000 cunits (1 cunit = 100 cu ft) to 19,000,000 cunits. Tables 1 and 2 show the relative importance of each species in determining the total growth rate and volume of growing stock.

The predicted increase in growth rate and volume of growing stock could be decreased by atmospheric pollutants. Tamm and Aronson (1972) conclude that in Sweden growth reductions of a [3] percent have occurred in pine and spruce forests when the mean monthly concentrations of sulfur dioxide range between 39 and 52 $\mu g/m^3$. Growth reductions of nearly 20 percent occurred at concentrations of about 79 $\mu g/m^3$. The estimates of net annual growth of the growing stock (Table 3) of the forests of the Superior National Forest outside of the BWCA have been manipulated based on the results of this Swedish study. These estimates can be used as general indicators of the impact that may occur if ambient concentrations of sulfur dioxide reach the levels indicated in the Swedish study.

Table 1. Periodic net annual growth of growing stock on RCFL
by species and kind of material.

Superior National Forest, Outside Portal Zone

SPECIES	GROWING STOCK [b] M Cunits[a]	LARGE ROUNDWOOD[c] M Cunits[a]	PRODUCTS M Cunits[a]
Balsam Fir	47	14	33
White Pine	11	9	2
Red Pine	29	17	12
Jack Pine	24	24	--
White Spruce	17	14	3
White Cedar	22	11	11
Black Spruce	22	14	8
Tamarack	1	1	--
Aspen	118	65	53
Northern Hardwoods	24	7	17
Lowland Hardwoods	8	2	6
Paper Birch	66	22	44
Balsam Poplar	9	7	2
TOTAL	398	208	191

[a] Ccf x .60 = MBF Int. ¼; Ccf x 1.27 = Cords; DCF = 100 cu ft.

[b] Net volume of all live merchantable trees 5.0" DBH and larger
to a variable top DOB of not less than 4.0".

[c] Net volume of all softwood growing stock trees 9.0" + DBH and
all hardwood growing stock trees 11.0" + DBH to an 8" variable DIB.

Table 2. Total net volume of growing stock on RCFL by species
      and kind of material

Superior National Forest, Outside Portal Zone

SPECIES	GROWING STOCK [b] M Cunits[a]	LARGE ROUNDWOOD[c] M Cunits[a]	PRODUCTS M Cunits[a]
Balsam Fir	1398	234	1164
White Pine	443	336	107
Red Pine	654	320	334
Jack Pine	1072	441	631
White Spruce	475	275	200
White Cedar	392	221	171
Black Spruce	913	194	719
Tamarack	65	18	47
Aspen	3872	1296	2576
Northern Hardwoods	272	36	236
Lowland Hardwoods	447	132	315
Paper Birch	1819	317	1502
Balsam Poplar	581	214	367
TOTAL	12403	4034	8369

[a]Ccf x .60 = MBF Int. ¼; Ccf x 1.27 = Cords

[b]Net volume of all live merchantable trees 5.0" DBH and larger to
a variable top DOB of not less than 4.0".

[c]Net volume of all softwood growing stock trees 9.0" + DBH and all
hardwood growing stock trees 11.0" + DBH to an 8" variable DIB.

NOTE: Based on these data we can assess the impact on, a particular area,
of volume reduction due to land appropriation due to nonforestry activities.
We first must have an inventory of the area in question, however.

Table 3. Periodic net annual growth of growing stock.[a]
        (Superior National Forest-Exclusive of the BWCA)

SPECIES	PRESENT GROWING STOCK (M Cunits)	LESS 3%	LESS 20%
Balsam Fir	47	45	37
White Pine	11	10	8
Red Pine	29	28	23
Jack Pine	24	23	19
White Spruce	17	16	13
White Cedar	22	21	17
Black Spruce	22	21	17
Tamarack	1	--	--
Aspen	118	114	94
Northern Hardwoods	24	23	19
Lowland Hardwoods	8	7	6
Paper Birch	66	64	52
Balsam Poplar	9	8	7
TOTAL	398	386	318

SOURCE: Robert Rehfeld, Forest Supervisor, Duluth, Minn.

[a]Computations used 3% and 20% based on results of a Swedish study-
reported by C.O. Tamm and A. Aronsson In Plant growth as affected by
sulphur compounds in polluted atmosphere: A Literature Survey.
NR 12, 1972. Skogshogskolan, Stockholm.

Estimated growth rate will increase from the present rate of 34 cu ft/acre
to 42 cu ft/acre by the year 2000 A.D.

  42 cuft/acre →→→ less 3% = 40.7 cuft/acre; →→→ less 20% = 33.6 cuft/acre

REFERENCES CITED

Tamm, C.O. and A. Aronsson. 1972. Plant growth as affected by sulphur compounds in polluted atmosphere. A literature survey. Nr. 12 Skogshögskolan, Stockholm. 53p.