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## TREE SUPPRESSION AND PREDICTION OF MORTALITY IN AN ASPEN STAND IN ITASCA STATE PARK

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Classifications of individual trees into crown classes on the basis of their relative dominance in the stand have been made for many years by European and American foresters. Four classes, dominant, codominant, intermediate, and suppressed are commonly recognized in American usage. Crown classification has been useful for predicting mortality, assessing tree vigor, and rating tree resistance to certain insects. However, for most American species permanent plot records have not been available for long enough periods to assess the reliability of mortality predictions on an experience basis.

### The Study

The availability of plots established by the junior author in 1937 in connection with insect studies provided an excellent opportunity to relate the mortality of aspen to suppression classification of the individual trees. Data on suppression, the incidence of Saperda borers and Hypoxyton canker, presence of Fomes and Nectria fruiting bodies, general tree condition and crown vigor, and tree mortality are available over the period from 1937 to 1968.

The stand containing the tenth-acre study is located at the junction of the north boundary of Itasca State Park and Highway 31. It consists of an almost pure stand of quaking aspen (Populus tremuloides Michx.) with a few paper birch (Betula papyrifera Marsh.), bur oak (Quercus macrocarpa Michx.), red oak (Quercus rubra L.), and red maple (Acer rubrum L.). Increment borings of 7 trees indicate the aspen and birch originated 48 to 51 years ago.

### The Data

Table 1 summarizes the mortality and changes in d.b.h. of the stand during the 31 year period of records. During this period, the number of trees on the tenth-acre sample plot decreased from 114 to 38.

A summary of the mortality history of the suppressed trees is given in Table 2. The trees are recorded as to the number of years they survived after first being classed as suppressed. The common silvicultural concept of a suppressed tree was used; namely, a tree over which the general stand canopy has closed.

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## Results

This study indicates that for aspen stands similar to that from which the data were collected the prediction of mortality of suppressed trees is extremely reliable; i.e., once an aspen has slipped below the crown canopy it dies in from 1-13 years. The median period of survival of such trees is 5 years. However, it is also apparent that over half of the trees which died during the 31 years of records were never identified as being suppressed. Some, but by no means all, of this extra mortality may be attributed to Saperda borers and Hypoxyylon canker. This suggests that the crown class "suppressed" gives a very conservative prediction of mortality for such purposes as marking for thinning, and that the "intermediate" crown class should also be included. These results support the generally accepted notion that trees of the genus Populus require a high degree of crown exposure to direct sunlight for survival to maturity.

TABLE 1. Number of trees per acre

Stand age	d.b.h. classes (inches)												Total	
	1	2	3	4	5	6	7	8	9	10	11	12		
19		270	330	320	180	30		10						1140
35		30	150	100	140	130	170	40						760
43			30		30	140	80	120	10	20	10			440
47			30		30	110	90	90	50	20	20			440
50			20			70	70	100	70	20	30			380

TABLE 2. Mortality of suppressed trees

Suppressed Trees Age <sup>1/</sup>	No.	Years of suppression <sup>2/</sup>												
		1	2	3	4	5	6	7	8	9	10	11	12	13
21	15	-	4	-	2	3	-	2	1	-	-	1	2	-
24	2	-	1	-	-	-	-	-	1	-	-	-	-	-
30	7	-	-	1	-	-	-	2	-	2	1	-	-	1
35	8	2	3	-	-	1	-	-	1	-	-	-	-	1
Total	32	2	8	1	2	4	-	4	3	2	1	1	2	2

<sup>1/</sup> Age at which the trees were first classed as suppressed.

<sup>2/</sup> Time lapsed before mortality occurred.

TABLE 3. Mortality history of plot trees

	No. trees	Percent
Total mortality from 1937-1968	76	100
Trees died before being classed suppressed	40	53
Trees died after being classed suppressed	36	47
Trees died with <u>Saperda</u> borer activity	10	13
Trees died with <u>Hypoxyylon</u> cankers	10	13