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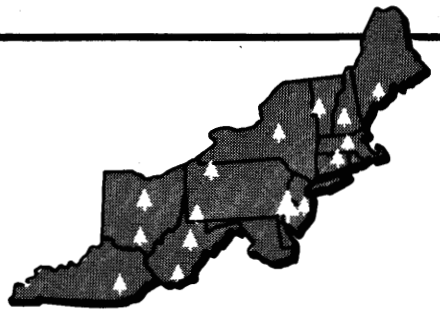

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ANIMAL DAMAGE TO YOUNG SPRUCE AND FIR IN MAINE

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Abstract.—The loss of terminal buds on small balsam fir (*Abies balsamea* (L.) Mill.) and spruce (*Picea* spp.) trees because of nipping by mammals or birds has increased on the Penobscot Experimental Forest in recent years. The cut stem is smooth and slightly angled; there is no sign of tearing. Unnipped trees grew about 13 percent more than the nipped trees; the nipped trees showed less vigor in the lateral bud that took over as leader.

KEY WORDS: Animal damage, balsam fir, spruce, bud injury.

Balsam fir (*Abies balsamea* (L.) Mill.) is damaged by many agents, from butt rots to budworms. One form of damage that seems to have increased in recent years is the nipping or cutting of terminal buds in late winter or early spring. This damage is most noticeable on young growth up to a height of about 15 feet. Although lateral buds are also cut, the cut terminals probably have the greatest adverse effect on growth. Large areas of young growth often look "mowed".

The agent responsible for this damage is not known, but red squirrels (*Tamiasciurus hudsonicus)* have often been observed nipping cones, lateral twigs, and flower buds (*Bakuzis and Hansen 1965*). Damage to Norway spruce (*Picea abies* (L.) Karst.) described by Viidik *(1973)* seems to be similar. However, damage of the type that I studied is so extensive and occurs during such a short time that I suspect flocks of migrating birds such as grosbeaks or crossbills (*Fringilladae* spp.). The lack of pronounced tooth marks on the damaged stems adds to this suspicion. All of the cut or nipped stems are similar in appearance: slightly angled and smooth, with no evidence of tearing (fig. 1).

Damage by nipping has become increasingly widespread in young, even-aged stands of softwood on the Penobscot Experimental Forest in central Maine. The buds apparently are nipped during a short period in late February or early March. Although balsam fir sustains most of the damage, the spruce (*Picea* spp.) also is nipped occasionally. Although the extent of such damage in other areas of the state is unknown, nipping is often cited as a source of damage to

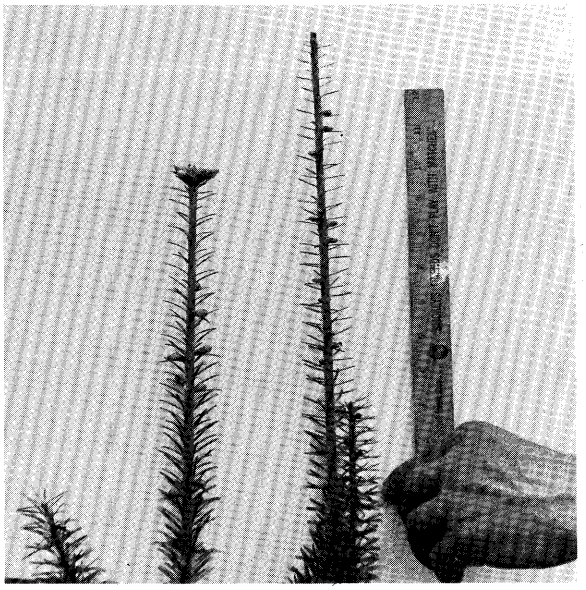


Figure 1.—Size comparison for nipped and unnipped terminal buds. Nipping also is evident on lateral buds.

balsam fir Christmas trees. (Personal communication from Lewis P. Bissell, Extension Forestry Specialist, now retired, U.S. Department of Agriculture, Cooperative Extension Service, Orono, Maine.)

In the spring of 1974 the damage was so prevalent in a young even-age stand of spruce and fir that I decided to determine the amount of damage to the trees, by species and relative crown class. Forty-five permanent milacre regeneration plots were used, 3 each at 15 points on a systematic grid throughout a 33-acre compartment. In 1970, regeneration on the compartment was estimated at 18,160 stems at least 6.0 inches high; 48 percent of these stems were spruce and fir. At the time this study was initiated, the bulk of the regeneration was under 18 years of age *(Blum 1973)*.

From the plot tallies, I found that approximately 25 percent of all balsam fir, red spruce *(Picea rubens* Sarg.), and white spruce (*Picea glauca* (Moench) Voss), had lost their terminal buds. Nipped lateral buds, though observed, were not tallied.

Analysis of the damage indicated that balsam fir had the greatest percentage of terminal buds nipped, followed by red spruce and white spruce (table 1). It is not known whether this indicated a preference for balsam fir by the agent or was the result of the greater number of balsam fir in the stand.

Nearly 44 percent of the dominant and codominant trees were affected. The amount of damage seems quite severe because these trees were nearly half of the potential spruce-fir crop, and because nipping of both new and previously nipped trees has been observed for several consecutive years. Nipping of the terminal bud can cause a loss in height growth and malformation of the leader, and creates the potential for pathogens to enter the cut leaders. Also, damage seems to have increased during the 1975 and 1976 growing seasons; I estimated that 75 percent of the firs were nipped in the spring of 1976.

Since the potential for growth loss is of immediate concern, I compared the growth of leaders on nipped and unnipped trees for the 1974 season. I tagged 50 trees that had been nipped during the late winter of 1974, and 50 undamaged trees. Though these trees were not actually paired, I avoided gross bias by choosing nipped and undamaged trees that were fairly close to each other and alike in height and diameter at breast height (dbh).

When a tree is nipped, the uppermost lateral bud on the terminal usually assumes dominance

Table 1.—Percentage of trees nipped

Species	Crown class				All classes	Number of trees
	Dominant	Codominant	Intermediate	Suppressed		
Balsam fir	57	45	30	4	28	449
Red Spruce	7	12	50	0	10	41
White Spruce	0	20	0	0	3	39
All species	48	42	28	3	25	
Number of trees	88	147	76	218		529

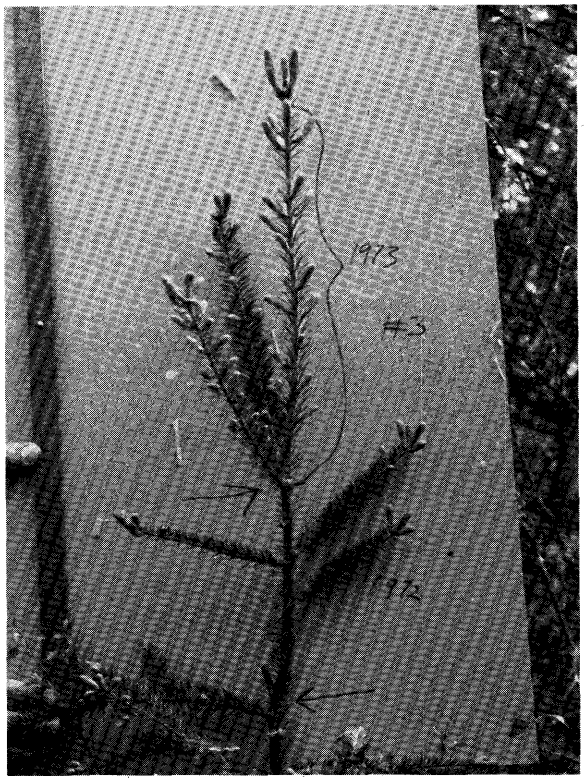


Figure 2.—Lateral buds assumed dominance on this tree after it was nipped in late winter of 1972 and 1973.

and takes over as leader (fig. 2). Of the 50 nipped trees in my sample, however, 15 either developed multiple leaders or, in most cases, the uppermost bud failed to develop and a lower bud assumed dominance. The average distance from the "nip" to the first lateral bud in the sample was 5.1 cm (range: 1.9 to 9.2 cm). This can be considered an immediate loss in height since the stem above the bud that assumes dominance dies back to this point (fig. 3). However this loss was not subtracted from the subsequent growth reported here.

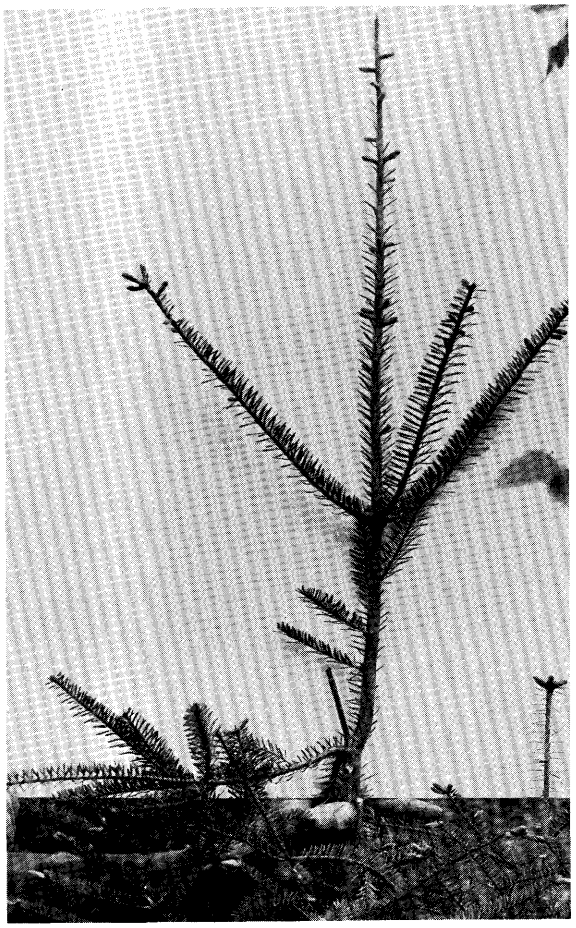
Leader growth on the undamaged trees for the 1974 growing season was measured from the center of the old terminal whorl to the top of the newly set terminal bud. For the undamaged trees, the average growth in 1974 was 35.6 cm (14.0 inches); growth ranged from 16.0 to 68.0 cm. On the nipped trees, the growth of the new leader was measured from the center of where it joins the stem to the top of the newly set terminal bud. The average growth in 1974 for the nipped trees was 22.9 cm (9.0 inches); growth ranged from 8.0 to 40.6 cm. This difference in average growth between damaged and undamaged trees was highly significant.

Besides the immediate loss in height when the nipped stem dies back to the first viable bud, an additional loss of growth is inherent in the creation of a new leader.

I tried to remeasure the sample trees in 1975, but of the 40 previously undamaged trees that were found again, 43 percent had been nipped during the winter of 1974-75. Forty-six percent of the nipped trees remaining from the 1974 season had been nipped again. I observed some trees that seemed to have been nipped for 3 or 4 consecutive years.

Damage to the terminal bud by any agent results in an immediate loss in height, a subse-

Figure 3.—Dead stub of a previously nipped leader, and point where lateral bud assumed dominance.



quent loss in height growth, some stem malformation and, occasionally, the creation of multiple leaders. I found that balsam fir receives most, but not all, of the damage. Height growth may be seriously impaired if the damage is repeated for several years, and losses in height growth may be substantial over large acreages. The possibility that nipping provides entrance courts for pathogens could be of major concern.

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