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LONGLEAF SEED LOSSES TO ANIMALS ON BURNED SEEDBEDS

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SOUTHERN FOREST EXPERIMENT STATION

*Losses of longleaf pine seeds to animals (mostly mice, *Peromyscus* spp.) in well-stocked, second-growth stands were about the same on fresh fall burns as on old roughs, worse on winter burns than on old roughs. Tree percents (the number of seedlings per 100 seeds) were low, but uniformly higher in the roughs.*

The seed crops of longleaf pine (*Pinus palustris* Mill.) are seldom large enough to feed native populations of seed-eating animals and still produce acceptable stands of seedlings. Since burning is often necessary in preparing an old rough for seedling establishment, two studies were conducted on the Escambia Experimental Forest in southwest Alabama to learn what effect fire might have on losses of seed to animals.

PROCEDURE

Small burns.—One study was in well-stocked, 40- to 60-year-old longleaf stands that had not been burned for 5 or 6 years. Two 40-acre blocks were quartered into square 10-acre plots. In each plot 24 seed-spot locations were systematically established, with three spots per location. The three spots were 18

to 24 inches apart. On each spot 10 untreated longleaf pine seeds were placed on mineral soil. All animals except insects or equally small creatures were excluded from one spot by a $\frac{1}{4}$ -inch mesh wire cone about 5 inches in diameter at the base. The second spot admitted small mammals but was protected from birds and large mammals by a cage made from $\frac{3}{4}$ -inch mesh hardware cloth. In this cage openings of about $1\frac{1}{2}$ by $2\frac{1}{4}$ inches were cut on opposite sides to allow entrance of mammals as large as cotton rats or wood rats. The third spot was unprotected.

The spots were observed from August 24 to September 4, 1959. Two randomly selected plots in each block were burned on October 19. All spots were reestablished 2 weeks after burning, during the peak of a light seedfall.

The exclusions made it possible to estimate the seed losses to three classes of animals—insects, small mammals, and birds plus large mammals. Spots were checked 10 times between establishment and January 25, 1960.

Small-mammal populations were sampled by snap traps. One trap was placed at each of the 192 seed-spot locations and run 4 successive nights in August 1959 (before burning), February 1960, October 1960, and February 1961.

Large winter burn.—The second study was in a longleaf pine stand that had been unburned for 7 years. A 160-acre block was burned on January 16, 1962. Since no streams run through the area, the burn was complete.

Five transects were located at right angles to the control line that divided the burned from the unburned part of the stand. Each transect was 24 chains long, with half its length in the fresh burn and half in the old rough.

Six days after the fire, groups of three seed spots were placed along each transect at 1, 3, 7, and 11 chains from the fireline, in both the burn and the rough. The layout of each group, with the exclusion devices, was the same as in the first study. The spots were checked seven times through March 16, 1962.

Thirteen trap locations were established along each transect, at intervals of 2 chains. One small-mammal live trap was set at each location and run 6 nights for a total of 390 trap nights during each of three trapping periods, which began 2 months before burning and 6 days and 4 weeks after burning. Two snap traps were set at each location for a final 4-night trapping period that began 8 weeks after the fire.

RESULTS

Small burns.—On the spots sown before burning, predators destroyed or removed about 73 percent of the unprotected seeds. Differences in losses between plots scheduled for burning and those to remain unburned were not significant.

The unprotected seeds sown after burning were quickly attacked, and very few survived to become seedlings. The cumulative loss to animals (fig. 1) was similar on burned and unburned plots. However, in January the tree percent of 2.6 in the rough was significantly greater than the 0.2 percent on burned plots. Small mammals destroyed most of the seeds. Birds and large mammals, primarily birds, were more active on burned than unburned plots. Losses to insects were minor (table 1).

During the four trapping periods 46 small mammals were caught. Catches were highest in February 1960, 4 months after burning (table 2), when 27 small mammals were caught on the burns and only 10 in the roughs. The difference was significant at the 0.05 level. Small mammals were much more active on

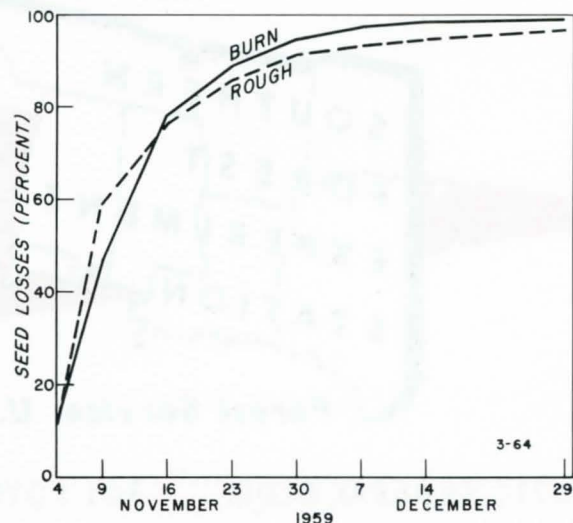


FIGURE 1.—Cumulative loss to animals of sound, unprotected longleaf pine seeds on fresh 10-acre burns and on old roughs.

TABLE 1.—Proportion of unprotected seed losses caused by animals of various classes

Animal class	Small fall burns		Large winter burn	
	Fresh burn	Old rough	Fresh burn	Old rough
----- Percent -----				
Insects	5.5	5.3	0.5	2.0
Small mammals	68.6	78.2	87.0	81.4
Birds, large mammals	25.9	16.5	12.5	16.6

TABLE 2.—Small mammals caught per 100 trap nights during each trapping period¹ on small burns

Trapping period	Burned plots	Rough plots
August 1959 (preburn)	0.26	0.26
February 1960	7.03	2.60
October 1960	.26	.26
February 1961	.78	.52

¹ From total of 768 trap nights in a trapping period (384 burn, 384 rough).

the fresh burns than in the old roughs during the winter. But November seed losses did not show any great difference in activity between burned and unburned plots.

The catch comprised 25 oldfield mice (*Peromyscus polionotus* Wagner), 14 cotton mice (*P. gossypinus* Le Conte), 4 least shrews (*Cryptotis parva* Say), 2 harvest mice (*Reithrodon-*

tomys humulis Audubon and Bachman), and 1 golden mouse (*P. nuttalli* Harlan).

Arata¹ also trapped nearly three times as many *Peromyscus* (primarily *P. polionotus*) on a 150-acre winter burn as in nearby unburned areas, and trapped cotton rats in unburned areas only.

Large winter burn.—Animals, especially small mammals (table 1), destroyed unprotected seeds more rapidly and completely on the fresh burn than in the old rough (fig. 2).

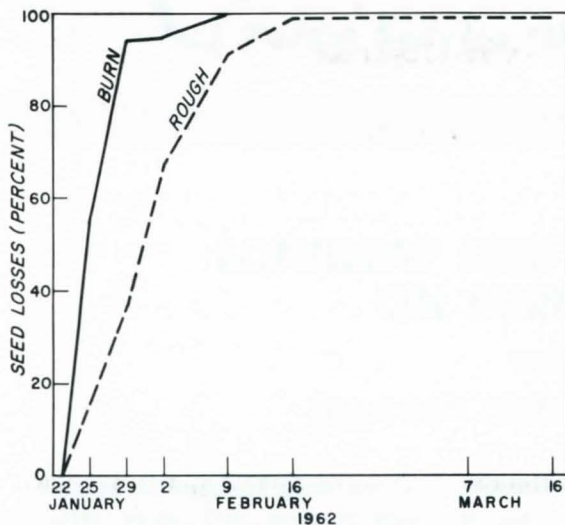


FIGURE 2.—Cumulative loss to animals of sound, unprotected longleaf pine seeds on a fresh 160-acre burn and on old roughs.

¹Arata, A. A. Effects of burning on vegetation and rodent populations in a longleaf pine-turkey oak association in north-central Florida. Quart. Jour. Fla. Acad. Sci. 22: 94-104. 1959.

Within a week of seeding, they had eaten or removed 94 percent of the sound, unprotected seeds in the burn, as compared with 36 percent in the rough. Seeds were destroyed sooner 11 chains inside than 1 chain inside the burn. At the final examination, 53 days after seeding, all unprotected seeds in the burn had been destroyed. In the rough 0.5 percent survived to become established seedlings.

Despite the rapid seed loss, only five small mammals were caught in 1,690 trap nights: three cotton mice and two least shrews, not enough to show the effect of fire.

DISCUSSION

Under the conditions of the studies reported here, burning shortly before seeding may increase losses of longleaf pine seeds to animals.

Loss of seeds on the large burn, rapid compared with that in the rough, apparently was caused not by more but by hungrier animals, since normal food supply had been almost completely destroyed in the fire. Pine seed losses were affected more by availability of food than by number of animals per acre.

Seeds were sown on the large burn too soon after the fire for either a natural increase in the population of resident small mammals or an invasion from the outside to have occurred, although neither could be ruled out on the small burns.