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SMALL MAMMAL EXCLOSURES FOR FOREST SEEDING STUDIES

by

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ABSTRACT

Descriptions are given of seven exclosures (8 feet by 8 feet) tested to exclude mice and chipmunks from experimental seed plots in white spruce, Picea glauca. The upper sidewall of all exclosures was constructed of sheet metal and the lower of hardware cloth. The top was left open. The lower side of hardware cloth, which was bent at a right angle four inches from the edge, was buried four inches in the soil facing the outside of the exclosure. An exclosure of 18-inch hardware cloth and a 12-inch vertical sheet metal barrier excluded mice. A barrier 24 inches or more in width was needed to exclude chipmunks.

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J.W. Bruce Wagg[1]

Small mammals, particularly mice and chipmunks, have been destructive to many experiments involving the direct sowing of tree seed in the field. Experimenters (cf. e.g. Keyes and Smith 1943, Smith 1951, Place 1955, Cooper et al 1959) have protected seeding plots with screening devices — small cones or caps over seedspots and various sized rectangular cages for seedbeds. While affording protection in most instances, the devices modify the micro-environment to various degrees; and results of seed germination and seedling survival under screens may not correspond to those observed on unscreened plots. A need has existed for a device that protects seeding plots from small mammal depredation without disturbing the microclimatic environment during germination and early stages of seedling development.

In conjunction with regeneration studies, work was begun in 1960 to devise a suitable small mammal exclosure at Minton, Alberta. The exclosure was to prevent deer mice, Peromyscus maniculatus (Wagner), red-backed mice, Clethrionomys gapperi (Vigors), meadow voles Microtus pennsylvanicus (Ord.) and M. longicaudus (Merriam) and least chipmunks, Eutamias minimus (Backman), from entering seeded plots. While the idea of using exclosures for forestry experiments is not new, having been used by Moore and Reid (1951) and Keith (1961) for forest range studies and by Taylor and Gorsuch (1932) and Kangur (1954) for evaluations of the influence of animals and birds on regeneration, the application to direct

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seeding experiments has not been reported. Mammalogists have reversed the principle and used enclosures for studying the habits of small mammals (cf. e.g. Orr 1959).

CONSTRUCTION OF EXCLOSURE/ENCLOSURE

Reversing the principle of exclosure to enclosure, several types of (8 feet by 8 feet) enclosures were tested to determine their effectiveness for containing small mammals. Sections of the enclosures are illustrated in Figure 1. All enclosures embodied the same elements of construction, making the lower sidewall of 5/16-inch-mesh hardware cloth and the upper part of galvanized sheet metal. The sheet metal barriers at the top — set at various angles to the sides — ranged in width from 6 to 24 inches. The lower part of the hardware cloth was bent at a right angle, 4 inches from the edge, and buried 4 inches in the soil with the flange toward the interior of the enclosure. Wooden posts were set on the outside of the corners and wood strips were used to fasten the sheet metal to the hardware cloth on the sides. The sides, which were built in 8-foot sections in the shop, were assembled into the enclosure in the field.

To determine effectiveness of the different types of enclosures, small mammals were placed inside and observed as they attempted to escape. One species of small mammal was observed at a time. Mammals were placed directly in the enclosures from live traps in the field, as these animals were more highly motivated to escape than animals that had been in captivity for several days. Various results were observed among the animals and types of enclosures.

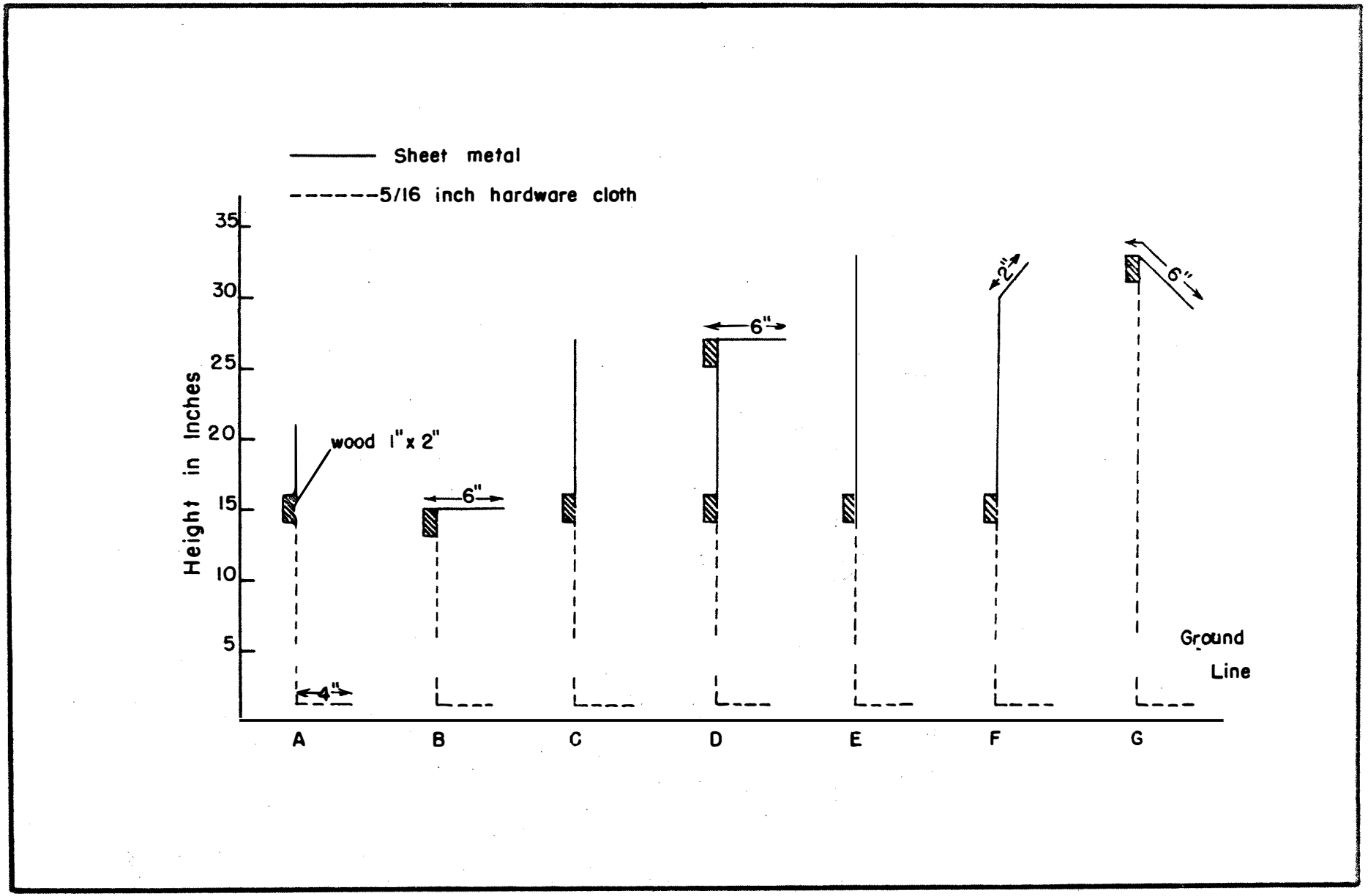

Figure 1. Vertical sections of exclosures/enclosures showing use of sheet metal and hardware cloth.

THE EFFECTIVENESS OF EXCLOSURES/ENCLOSURES

Six of the seven types of enclosures effectively retained deer mice, red-backed mice and meadow voles. Type A was ineffective as the mice were able to escape over the 6-inch sheet metal barrier. The barriers of types B, D and G were more difficult to close tightly at the corners than types C and E. When the corners were improperly closed, the mice were able to squeeze between the overlaps in the sheet metal and escape.

None of the enclosures proved satisfactory for retaining least chipmunks, although not all animals were able to escape from type E. The method of escape was interesting. First the animals would run vigorously up the side, claw their way partially up the sheet metal and fall back to the ground; then repeat the attack until some were able to escape over a side near a corner. Some animals were able to escape either by climbing the flat-headed nails in the sheet metal barrier at the corners, or by a jumping back flip and roll from the hardware cloth on one side of a corner to the top of the sheet-metal on the opposite side. The animals escaped more readily from type F than type E as the bend in the top of the sheet metal, instead of forcing the animals down the side, lowered the height of the barrier and provided a ledge to crawl upon. A sheet metal barrier 18 inches wide can be scaled easily.

Neither depth in the ground of the hardware cloth nor the width of the flange was varied as the 4-inch by 4-inch construction retained all test animals. It is imperative that no holes, large enough to pass the animals, exist either in the flange of the hardware cloth or at the joins in the corners.

Since the smaller C-type enclosure effectively contained deer mice, red-backed mice and meadow voles, it is recommended as an exclosure for these animals. It requires less material than the larger types E and F. Probably type E or F would be an effective exclosure for least chipmunks, because neither would the animals be as highly motivated to enter as to escape nor would the outside corners assist an escape like the inside corners.

The F-type exclosure, which has been used around seedbeds for three years at Hinton, has effectively excluded all mice and chipmunks in the area. The periphery of all enxlosures must be kept free of brush and sturdy plants that the animals can climb. None of the exclosures would provide protection against the larger burrowing or jumping mammals such as: ground squirrels, Citellus spp., pocket gophers, Thomomys spp. and rabbits, Lepus spp.

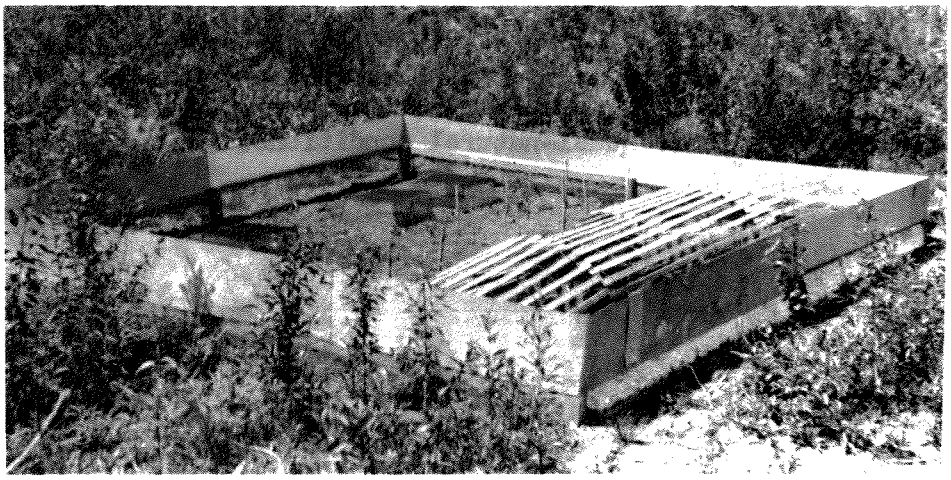

Figure 2. Small mammal exclosure used in a direct seeding experiment at Hinton, Alberta.

USES FOR EXCLOSURES

The small mammal exclosure has several important uses in the study of the establishment of forest reproduction. The use of exclosures around direct seeded plots provides an opportunity to study the physical factors that influence seed germination and seedling development with a minimum of microclimatic disturbance. Figure 2 illustrates a 16-foot by 16-foot exclosure used to study the influence of shade, including influence of small screen cages on seed performance and seedling development. The C-type exclosure in Figure 2 can be used only in areas where larger animals and birds are not destructive to seedbeds.

The exclosure provides an opportunity to study the relative damage to seeds and seedlings by small mammals and birds. Birds can gain easy access to the seedbeds whereas the small mammals cannot. Differential exclosures or enclosures that allow the entry of a small sized mammal while excluding a larger sized mammal can be used to study the relative damage to seedlings caused by the different animals. Further, the exclosure reversed to form an enclosure may be useful to study the habits and food preferences of small mammals under quasi-natural conditions.

LITERATURE CITED

COOPER, R.W., C.S. SCHOPMEYER and W.H.D. McGREGOR. 1959. Sand pine regeneration on the Ocala National Forest. U.S. Department Agriculture, Forest Service, Production Research Report 30:37 pp.

KANGUR, R. 1954. Shrews as tree seed eaters in the Douglas fir region. Oregon State Board of Forestry, Research Note 17: 23 pp.

KEITH, J.O. 1961. An efficient and economical pocket gopher exclosure. Journal Range Management 14(6): 332-334.

KEYES, J. and C.F. SMITH. 1943. Pine seed-spot protection with screens in California. Journal Forestry 41(4): 259-264.

MOORE, A.W. and E.H. REID. 1951. The Dalles pocket gopher and its influence on forage production of Oregon mountain meadows. U.S. Department Agriculture, Circular 884: 36 pp.

ORR, H.D. 1959. Activity of white-footed mice in relation to environment. Journal Mammalogy 40(2): 213-221.

PLACE, I.C.M. 1955. The influence of seed-bed conditions on the regeneration of spruce and balsam fir. Canada, Department Northern Affairs and National Resources, Forestry Branch Bull. 117: 87 pp.

SMITH, D.M. 1951. The influence of seedbed conditions on the regeneration of eastern white pine. Connecticut Agricultural Experiment Station Bull. 545: 61 pp.

TAYLOR, W.P. and D.M. GORSUCH. 1932. A test of some rodent and bird influences on western yellow pine reproduction at Fort Valley, Flagstaff, Arizona. Journal Mammalogy 13(3): 218-223.