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Short-Term Effects of Silicone Antitranspirant on Bird and Mammal Populations

Abstract

Aerial application of a 5 percent emulsion of polydimethysiloxane and a water carrier at a rate of 40 gal/acre had no short-term effect on rodent numbers or their reproduction in a cedar-hemlock watershed of northern Idaho. Song bird nesting was apparently unaffected also.

Chemicals are continually being synthesized and tested for possible employment in modifying environments for man's benefit. Testing procedures have been intensified in recent years to prevent use of chemicals with undesirable side effects such as those associated with the field use of chlorinated hydrocarbons. Silicones have a possible field application as antitranspirants to increase the volume of watershed runoff. Their low toxicity has been known for several decades (Rowe *et al.,* 1948), but the effects of field application on bird and mammal populations has remained unassessed. This study was undertaken to determine the possible effects of an aerial application of polydimethylsiloxane on bird and mammal populations of a coniferous forest in northern Idaho.

Study Area

The study area supports a mature stand of western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) on two small watersheds within the Priest River Experimental Forest, Bonner County, Idaho. Elevations range from 3,300 to 4,600 ft (1100-1530 m). Seral species present include western white pine (*Pinus monticola*), lodgepole pine (*P. contorta*) and western larch (*Larix occidentalis*). Douglas-fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*), climax species in other habitat types, are also represented. A shrubby understory is usually lacking. The upper parts of both watersheds support small numbers of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), dominants of habitat types at higher elevations. Shrubs such as mountain maple (*Acer glabrum*) and huckleberry (*Vaccinium* spp.), occur in this ecotonal area. About 10 acres within the treated watershed were logged in 1940 and the second growth thinned in 1967. This area now supports a flourishing growth of conifers and a shrubby understory.

Methods

A 5 per cent emulsion of polydimethylsiloxane (Dow Corning) was applied to a 65-acre watershed on June 8, 1974, by helicopter at a rate of 40 gal/acre using a water carrier. An adjoining watershed of 51 acres served as a control.

Museum Special traps were set out in transect lines of 100 traps each on both the treated and control areas and maintained for two days weekly from one week prior

to treatment through seven weeks following treatment. Peanut butter was used as bait. Shrew populations were sampled by burying unbaited No. 10 cans to ground level. Nesting birds were censused weekly from June 19 through July 25 by mapping locations of singing males, a technique used in earlier studies (Kendeigh, 1944; Hensley and Cope, 1951). Red squirrels (*Tamiasciurus hudsonicus*) were censused in the same manner since none were captured in snap traps. Snakes and frogs were captured by hand. Specimens were necropsied to determine reproductive status. Litter size was determined by counts of visible embryos and placental scars. The decayed state of carcasses from can traps prevented an assessment of treatment effects on litter size of shrews.

Results and Discussion

Few rodents were trapped on either the treated or control areas, a result anticipated since cedar-hemlock habitat types support few rodents (Rickard, 1960; Hoffman, 1960). Treatment had no apparent effect on these populations. No significant ($P>.05$) difference in catch of deer mice (*Peromyscus maniculatus*), red-backed mice (*Clethrionomys gapperi*) or red-tailed chipmunks (*Eutamias ruficaudus*) occurred between sites (Table 1). Treatment had no effect on the litter size of deer mice, the only species caught in sufficient numbers to permit comparison. Breeding commenced several weeks before treatment and continued for at least a month afterward. Embryo counts and placental scars averaged 5 ($n=7$) in mice from the control area and 5.4 ($n=5$) in those from the treated area. Deer mice and red-backed mice produced two litters on both sites.

Table 1. Catch of rodents from snap traps and shrews from can traps.

	Control		Treated	
	N	Catch per 100 trap days	N	Catch per 100 trap days
Deer mouse	15	1.25	12	1.00
Red-backed mouse	4	0.33	3	0.25
Red-tailed chipmunk	6	0.50	8	0.67
Common shrew	18	1.10	10	0.57
Dusky shrew	16	0.98	13	0.75
Unidentified shrews	2	0.12	4	0.23

Red squirrels were sighted in about equal numbers on both treated and control areas. Few pocket gophers (*Thomomys talpoides*) were present and no attempt was made to estimate their numbers. There was some use of the study area by white-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) during the spring and early summer. Their movement to higher elevations during the summer was expected and not related to treatment.

Both the common shrew (*Sorex cinereus*) and the dusky shrew (*S. obscurus*) were taken in can traps on both sites (Table 1). A few additional shrews, including the water shrew (*S. palustris*), were taken in snap traps. There was no significant difference in the shrew catch from can traps between treated and control areas ($X^2 = 1.48$; 1 df; $P > .05$). The frequency distribution of shrew captures deviated significantly from the Poisson series ($X^2 = 15.9$; 2 df; $P < .05$) primarily because of greater than

expected numbers of can traps with no captures and multiple captures. Shrews probably are not randomly distributed throughout the trapping area, a plausible explanation for the large numbers of traps lacking a catch. The increased number of multiple captures may result from vocalizations of captured animals which attract other shrews to the trap.

Treatment had no measurable effect on breeding bird populations. Counts of singing males of five species differed little between sites (Table 2). Some males were probably counted more than once during multiple visits. The golden-crowned kinglet (*Regulus satrapa*) was the most numerous breeding bird on the study area. Territories of winter wrens (*Troglodytes troglodytes*) were easily identified because of their persistent singing from vantage points along roadsides. Swainson's thrushes (*Hylocichla ustulata* and evening grosbeaks *(Hesperiphona vespertina)* were best counted during the evening hours when singing was most frequent.

Table 2. Counts of singing males during five visits.

	Total Counts		Counts/Acre	
Species	Control	Treated	Control	Treated
Golden-crowned kinglet	20	19	0.39	0.29
Winter wren	9	13	0.17	0.20
Evening grosbeak	11	5	0.21	0.08
Swainson's thrush	4	10	0.08	0.15
White-breasted nuthatch	5	5	0.10	0.08

Other species occurring on the study area and likely nesting there include: Varied thrushes *(Ixoreus naevius),* western tanagers *(Piranga ludoviciana),* pine siskins *(Spinus pinus)*, mountain chickadees (*Parus gambeli*), chipping sparrows (*Spizella passerina*), Wilson's warbler (*Wilsonia pusilla*) and Audubon's warbler (*Dendroica auduboni*). Chipping sparrow and warbler nesting was restricted to shrubby sites on the upper slope and on the logged area.

There was some use of both sites by hummingbirds (species unknown), pileated woodpeckers (*Dryocopus pielatus*), Williamson's sapsuckers (Sphyrapicus thyroideus), northern three-toed woodpeckers (*Picoides tridactylus*), blue grouse (*Dendagapus obscurus*), goshawks (*Accipiter gentilis*), common night hawks (*Chordeiles minor*), ravens (*Corvus corax*) and Oregon juncos (*Junco oreganus*); but nesting by these species on the study area was not confirmed. Western garter snakes (*Thamnophis elegans*) and rubber boas (*Charina bottae*) occurred in small numbers on the logged section of the treated area. Pacific tree frogs (*Hyla regilla*) were found on both the treated and control sites.

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