Wildlife Habitat Research And Fire in the Northern Rockies

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WILDLIFE in the northern Rocky Mountains, as elsewhere, is a resource produced by land and vegetation. In northern Idaho and western Montana our land and vegetation have been influenced for thousands of years by natural, recurring wildfires. Lewis and Clark (DeVoto, 1963), Granville Stuart (1925), J. B. Leiberg (1900) and others have reported the historically high incidence of fires in the northern forests. Barrows (1951) calculated that continued burning at the rate recorded before 1947 would have resulted in a 50-percent burn every 100 years with double or triple burns on 3.7 million acres. Modern day losses to fire are, of course, nowhere near this high. Continually improving fire suppression programs over the last 30 years have reduced the acreage burned annually in the Northern Region of the Forest Service to an average of less than 15,000 acres. Nevertheless, the influence of fire on northern forest ecosystems has shaped contemporary biotic development in several important ways.

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Wildlife populations, for example, have fluctuated over the past half century in direct response to the development of forest vegetation. These changes have been most noticeable for big game in a consistent downward trend of populations and harvest despite increasingly sophisticated management by the State game departments.

The basic problem is long-term deterioration of wildlife habitat. Unusually large fires in 1910 and 1919 created thousands of acres of seral, high-quality, brushfield habitat. Deer and elk populations increased in this favorable environment and reached unprecedented highs during the early 1940's. Since that time, normal successional development of forest vegetation has resulted in a variety of problems including deterioration of some ranges under the tree overstory, growth of shrubs beyond reach of big game animals, and damage by overuse of remaining ranges.

Maintenance of healthy big game herds, at stable levels consistent with multiple use objectives, requires replacement of these ranges. Such replacement cannot, for obvious reasons, be expected from new wildfires. However, a minimum of 100,000 acres is logged in the northern Rockies each year. Appropriate management of some portion of this logged acreage plus specific treatment of other acreages could produce both stability and abundance in game populations.

The objective of Forest Service wildlife habitat research in the northern Rocky Mountain region is to provide the background information that will enable land managers to manipulate forest vegetation for the benefit of wildlife either specifically or as a part of other resource management programs.

As a basis for our research we are using a hypothetical model of forest succession following fire (Fig. 1). In general, we already know that forbs and grasses appear first on burned sites—that shrubs will eventually resprout or seed in to replace herbaceous vegetation—and that trees will eventually overtop and dominate the forest plant community. Such a model provides a useful concept in research, but it is virtually worthless for management of any specific game range or forested tract. In order to be useful, the model must be defined in terms of plant community structure and value to wildlife. We need to know what plants are available and for how long. We need to recognize the variations in plant community structure caused by

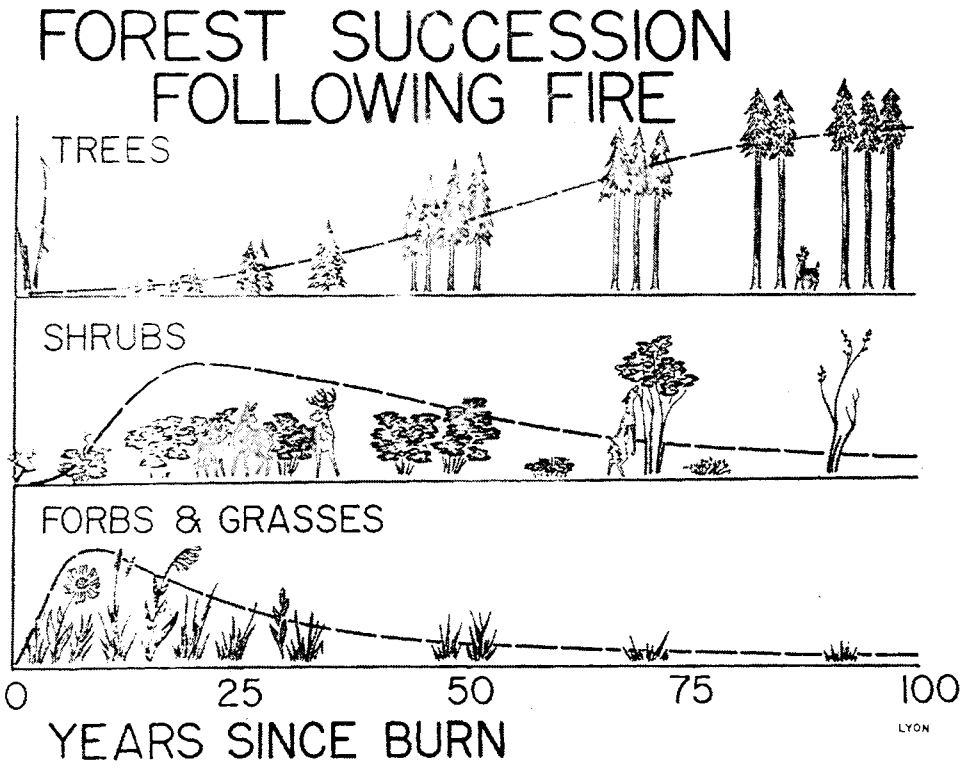

FIG. 1. Hypothetical model of forest succession following fire.

variation in original treatment, and we need to determine which sites can be expected to produce plant communities with wildlife production potential.

The research program we have developed encompasses three general phases of investigation including (1) synecological studies of natural seral communities; (2) comparative studies of seral plant communities which develop following man-caused disturbance; and (3) autecological studies of the important plants in seral communities. Not all of our studies are fire-oriented, but in keeping with the theme and interests of this conference, I will describe several studies that are both fire-related and representative of the research in progress.

SYNECOLOGY OF WILDFIRE COMMUNITIES

Our most productive studies to date have been long-term examinations of permanent transects in areas recently burned by wildfire.

We have three major studies of this type in progress and probably will start others when appropriate opportunities are presented. These three current studies represent three totally dissimilar forest types and a wide range in community composition and development rates. At the same time, they include enough similarities to reveal an overall correspondence to our hypothetical model.

The first study in this series is an examination of the 28,000-acre Sleeping Child Burn on the Bitterroot National Forest. Until August 1961, the area could have been characterized as a lodgepole pine forest with subalpine fir, Vaccinium, and beargrass in the understory. Douglas-fir, Engelmann spruce, alder, willow, and other species were also present on some sites, and throughout the area a jackstraw fuel bed of dead lodgepole pine remained from a bark beetle epidemic in the 1930's.

We established 12 permanent transects within the burned area in 1962 and maintained continuous records of vegetal development through 1967. Figures 2–4 illustrate three representative transects. Complete data for all transects are being prepared for publication as an 8-year summary following the 1969 field season.

The most striking conclusion for the Sleeping Child Burn is extremely slow vegetal development coupled with practically no changes in the species composition of the plant community. Major components of the preburn community appear to be also the major components of the postburn community. And, despite a massive rehabilitation effort by the USDA Forest Service, ground cover after six growing seasons was still less than 50 percent on most sites.

Our second study involved only 120 acres, but it was unique in that we were able to examine an existing forest community before burning. Prior to August 1, 1963, the Neal Canyon study area near Sun Valley, Idaho, had a Douglas-fir overstory with a mixed understory of willow, mountain maple, serviceberry, mountain ash, two kinds of Ribes and a variety of herbaceous species (see Lyon, 1966, for more complete information). The area was burned with the trees still standing, and we have maintained annual records of vegetal development since the fire. Representative photographic records are presented in Figures 5 and 6.

Vegetal recovery at Neal Canyon, compared with that at Sleeping

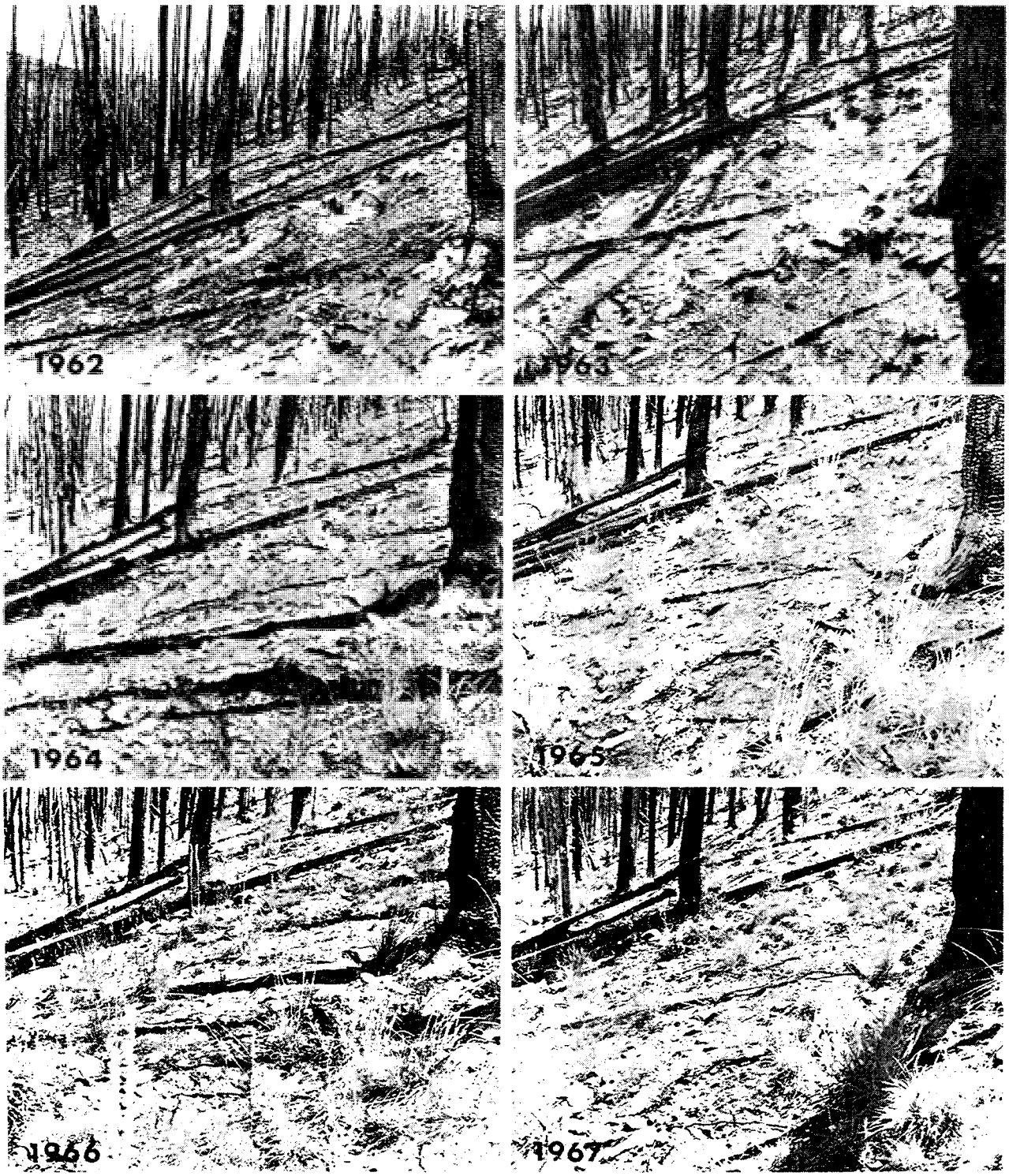

FIG. 2. Representative permanent transect within Sleeping Child wildfire, Bitterroot National Forest, 1962–1967.

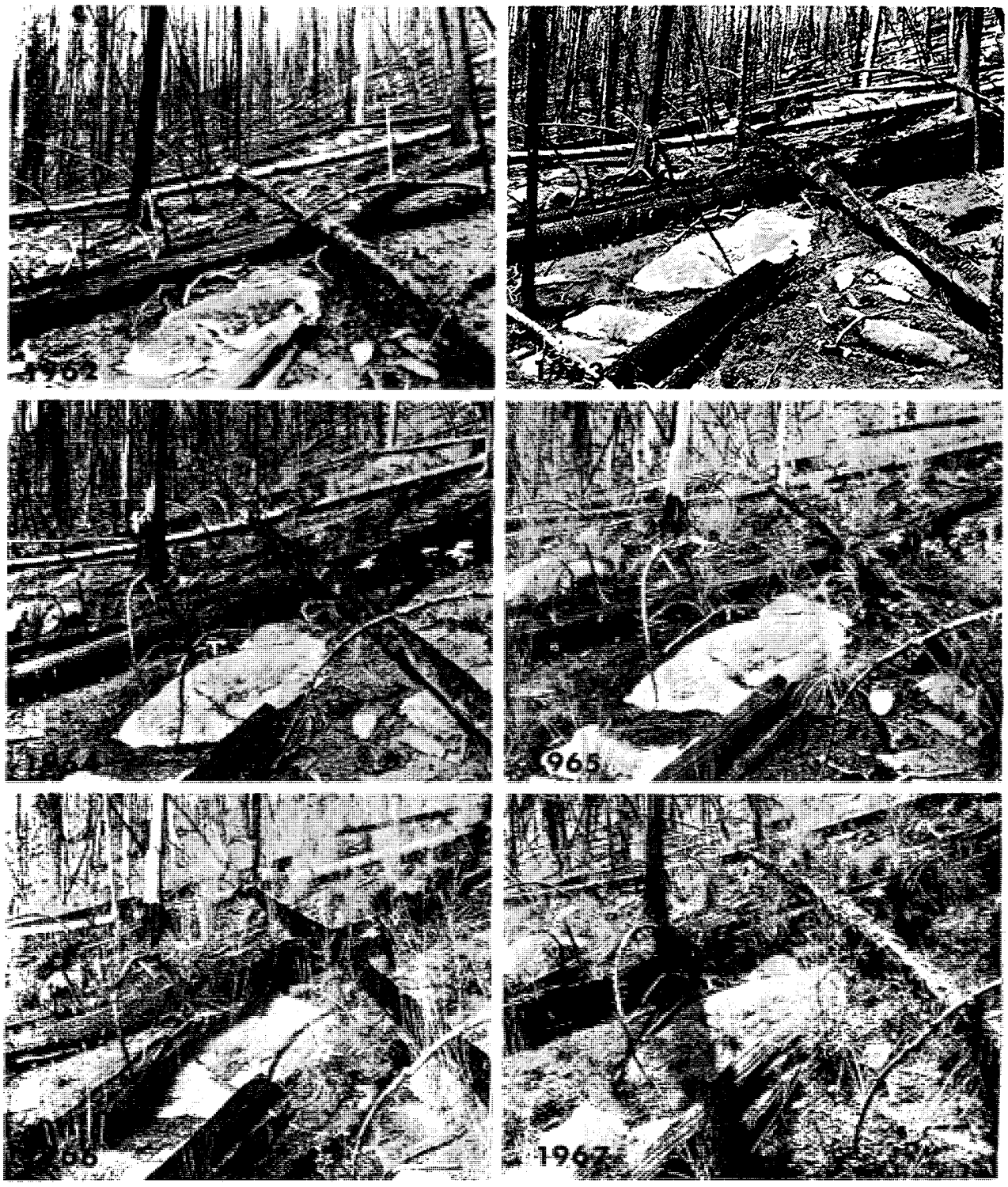

FIG. 3. Representative permanent transect within Sleeping Child wildfire, Bitterroot National Forest, 1962–1967.

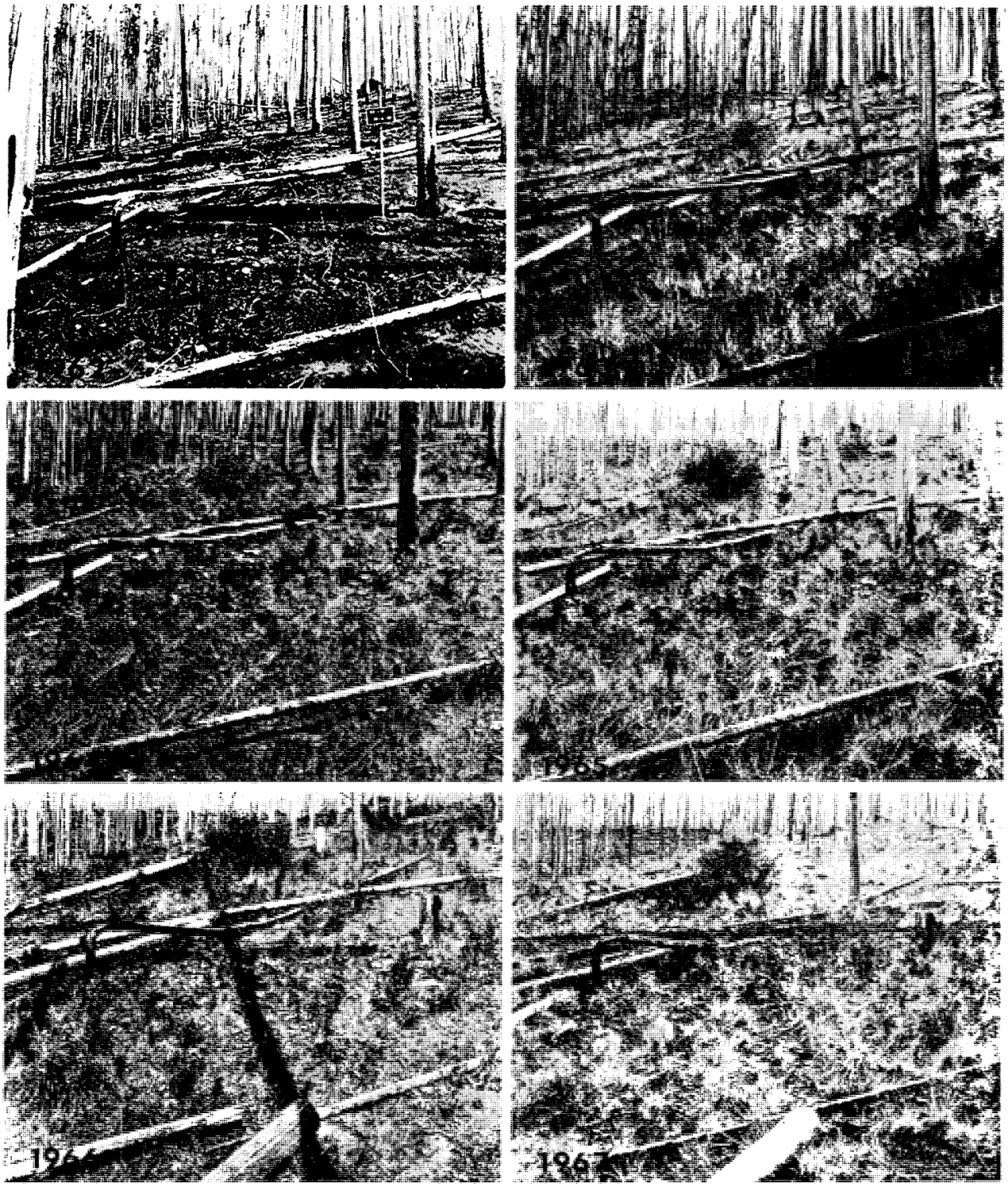

FIG. 4. Representative permanent transect within Sleeping Child wildfire, Bitterroot National Forest, 1962–1967.

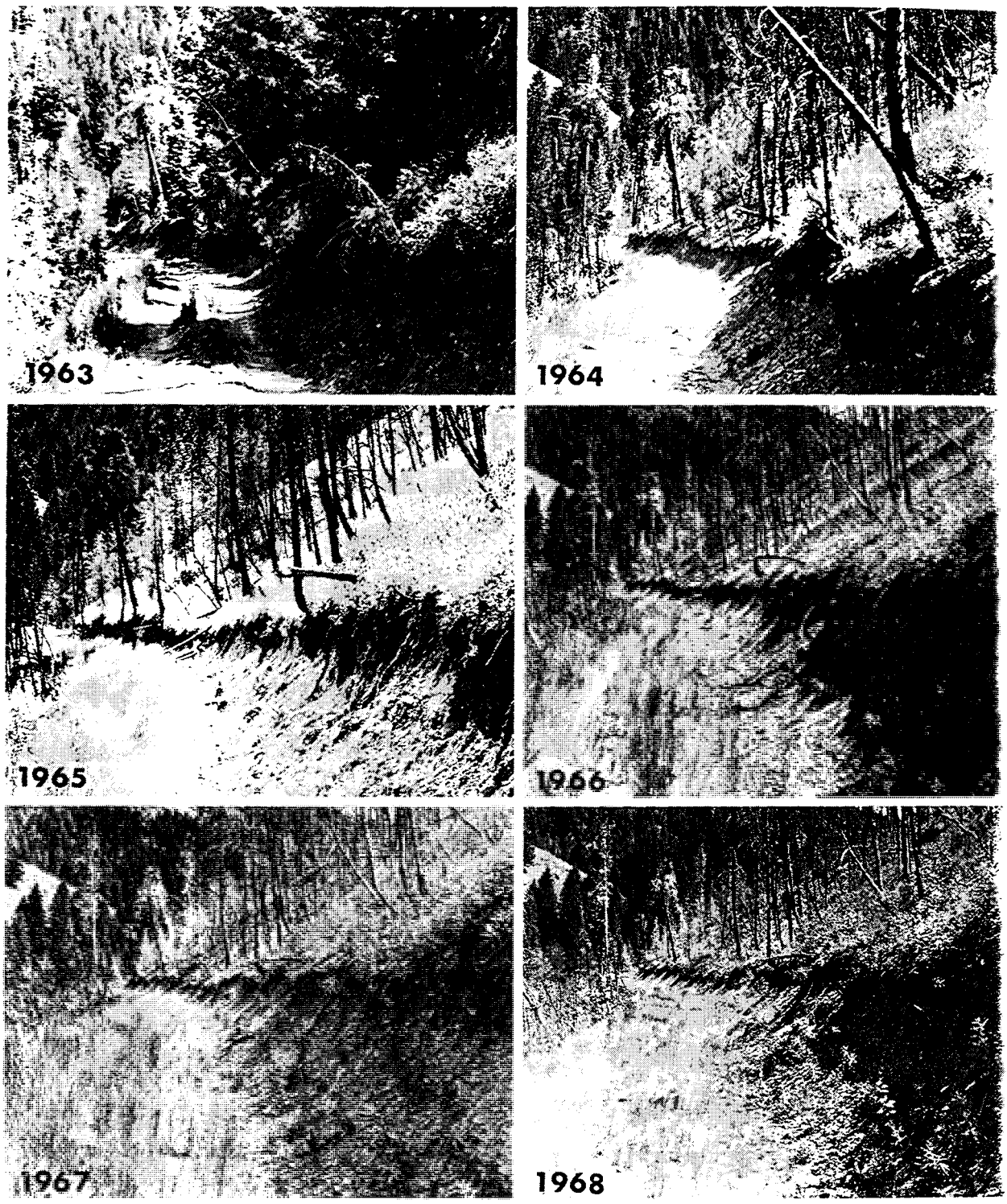

FIG. 5. Photographic transect within Neal Canyon prescribed fire, Sawtooth National Forest, 1963–1968.

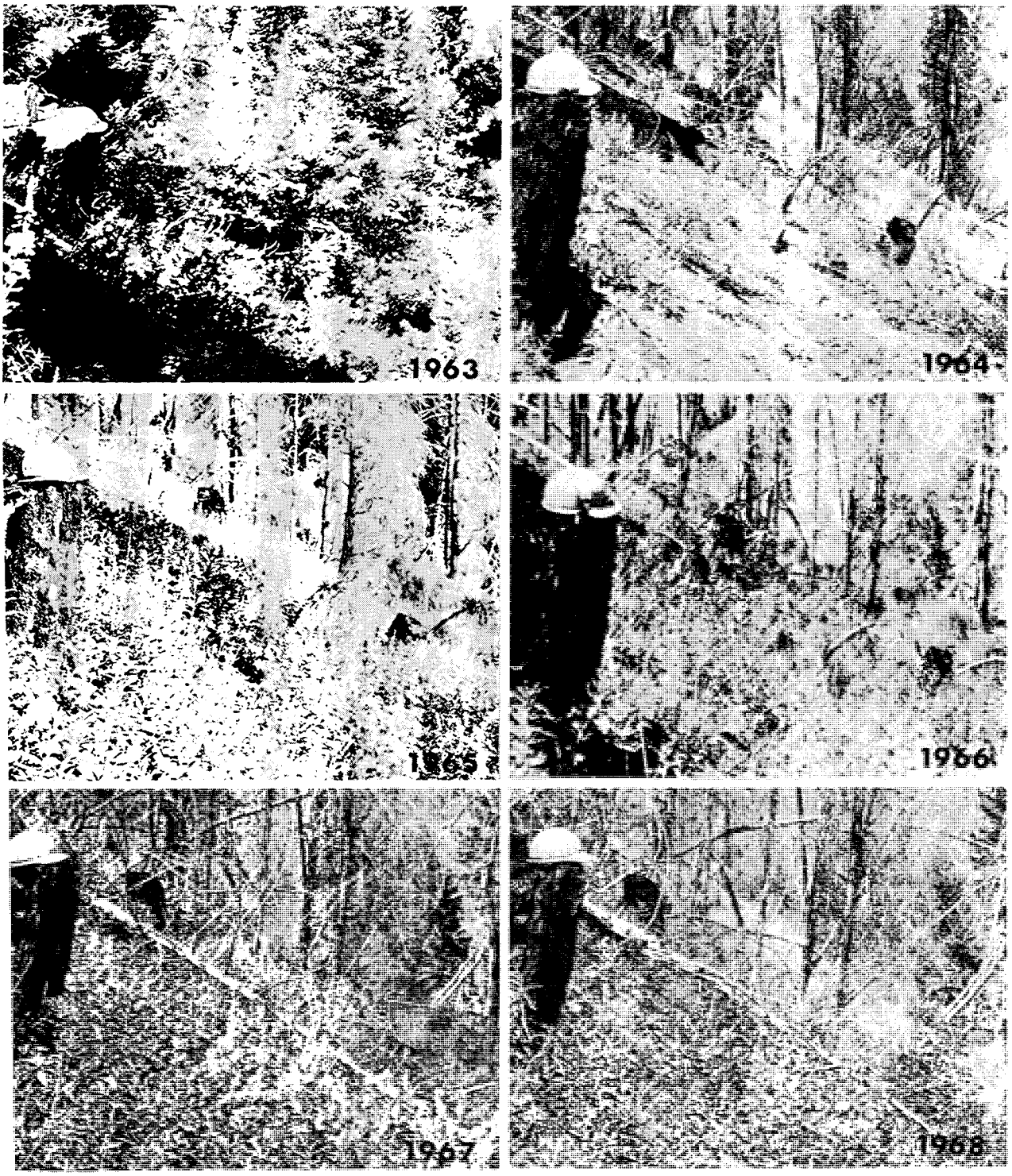

FIG. 6. Photographic transect within Neal Canyon precribed fire, Sawtooth National Forest, 1963–1968.

Child, seemed spectacularly fast. The amount of shrub crown was as high in the first year as the best samples on Sleeping Child had been in 2 years, and ground cover in the second year surpassed preburn values by 90 percent. This herbaceous cover value proved to be somewhat misleading because the biennial species dominant in the second year following fire disappeared in the third year. Nevertheless, this site has never had more than 40 percent of mineral surface exposed since the first growing season after the fire.

Our third wildfire study was started in September 1967, while fire crews were still mopping up control lines on the 56,000-acre Sundance Fire in northern Idaho. This fire ran 22 miles in one night and burned through a variety of vegetation types including cedar, hemlock, Douglas-fir, western white pine, western larch, and untimbered brushfields.

These all provide more mesic environments than the two burned areas already described. Nevertheless, the 1-year recovery rates were spectacular even by Neal Canyon standards. Figure 7 illustrates recovery on three representative transects in a single year.

At this early date our hypothetical model has not been adequately described, but we do have a good start toward identifying areas and plant communities that have potential for successful manipulation.

SYNECOLOGY OF LOGGED FORESTS

The study of wildfire communities provides a background essential for understanding environmental structure and development of seral northern forests. However, economics and reason dictate that uncontrolled fire cannot be viewed as a management tool. Thus, the second phase of our research is concentrated on plant communities created by logging and postlogging silvicultural or slash treatment.

Variations in forest communities that follow man-caused disturbance could be considerably greater than variations following wildfire. In addition to natural variance among sites and burn communities, postlogging treatment can impose additional variance ranging from the searing fire of a heavy slash disposal through lighter burns to no burn at all. Moreover, such variations in treatment may be applied in months that would not be considered normal for wildfire.

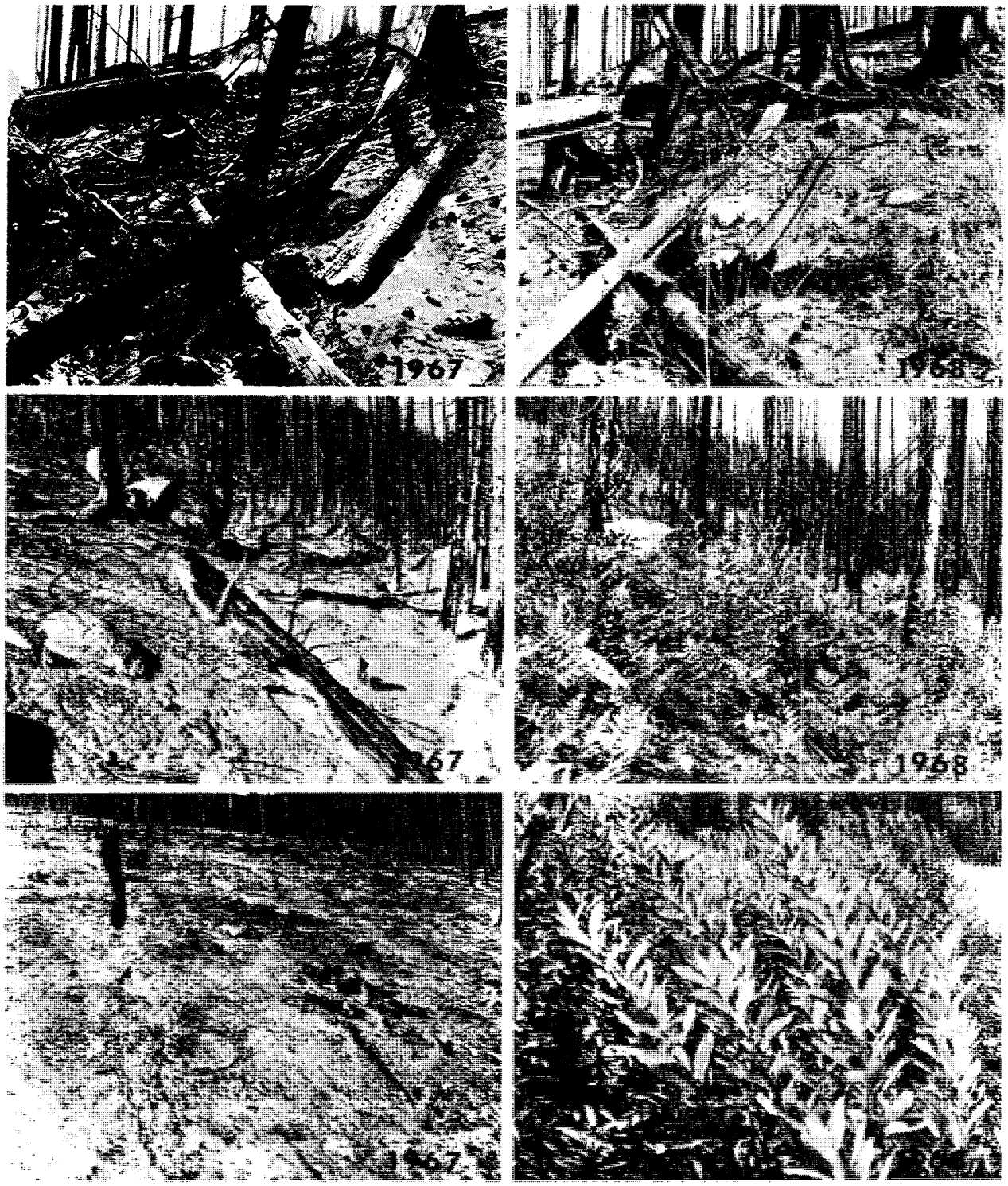

FIG. 7. Representative permanent transects within Sundance wildfire, Kaniksu National Forest, 1967–1968.

If we plan to utilize the obvious potential of this variation, we will have to compare and evaluate many combinations. Logging and slash preparation on two large timber sales on the Flathead and Lolo National Forests in Montana are being conducted in accordance with research needs. Replicated small blocks of timber on four different aspects have been prepared for burning at biweekly intervals between spring breakup and first snowfall. Slash loads, fuel moisture, and heat output are being measured and watershed behavior, timber regeneration, and wildlife habitat are also being studied. Air pollution is being evaluated under an outside grant.

As of last summer, we had established 96 permanent transects in 45 timber stands. Planned treatments will range from unburned through light and heavy burns in every month when burning is possible. Not all of these areas have been logged, and those already logged and burned have had only a single growing season to respond. Nevertheless, there are very real differences among the areas treated (Fig. 8). We believe our research will eventually delineate the situations in which slash disposal can be effectively utilized for the benefit of wildlife.

AUTECOLOGY OF BURNED PLANTS

The third phase of our research program includes a variety of studies in taxonomy, phenology, and life histories of individual plant species. Community structure and the welfare of individuals are inseparably allied. If we understood the reproductive requirements and ecological tolerances of each species in a forest community, treatment could be manipulated to favor those species considered desirable for various management purposes.

The only study in this phase that involves fire directly was initiated last summer. We are attempting to determine species response to fire by burning one shrub at a time under controlled conditions at monthly intervals. Fuel loads are supplied at three levels designed to duplicate a light flashy fire, a moderate fire, and a relatively heavy burn (Fig. 9). Each plant is instrumented with thermocouples and a flowing water calorimeter to measure absolute temperatures above and below ground and heat flux in the plant crown.

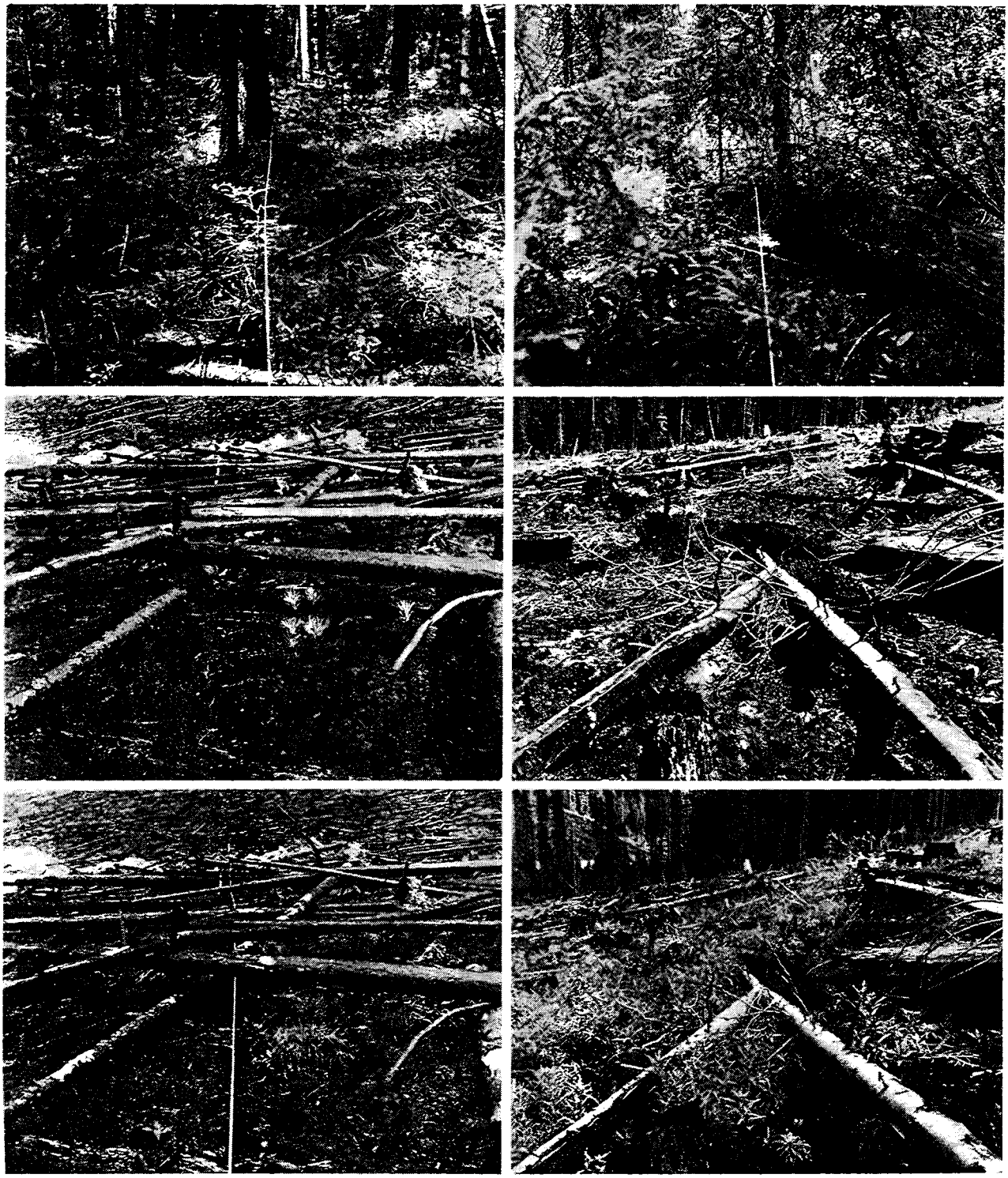

FIG. 8. Permanent transects within areas logged and burned, Flathead National Forest, prelogging, immediate postfire, and first growing season.

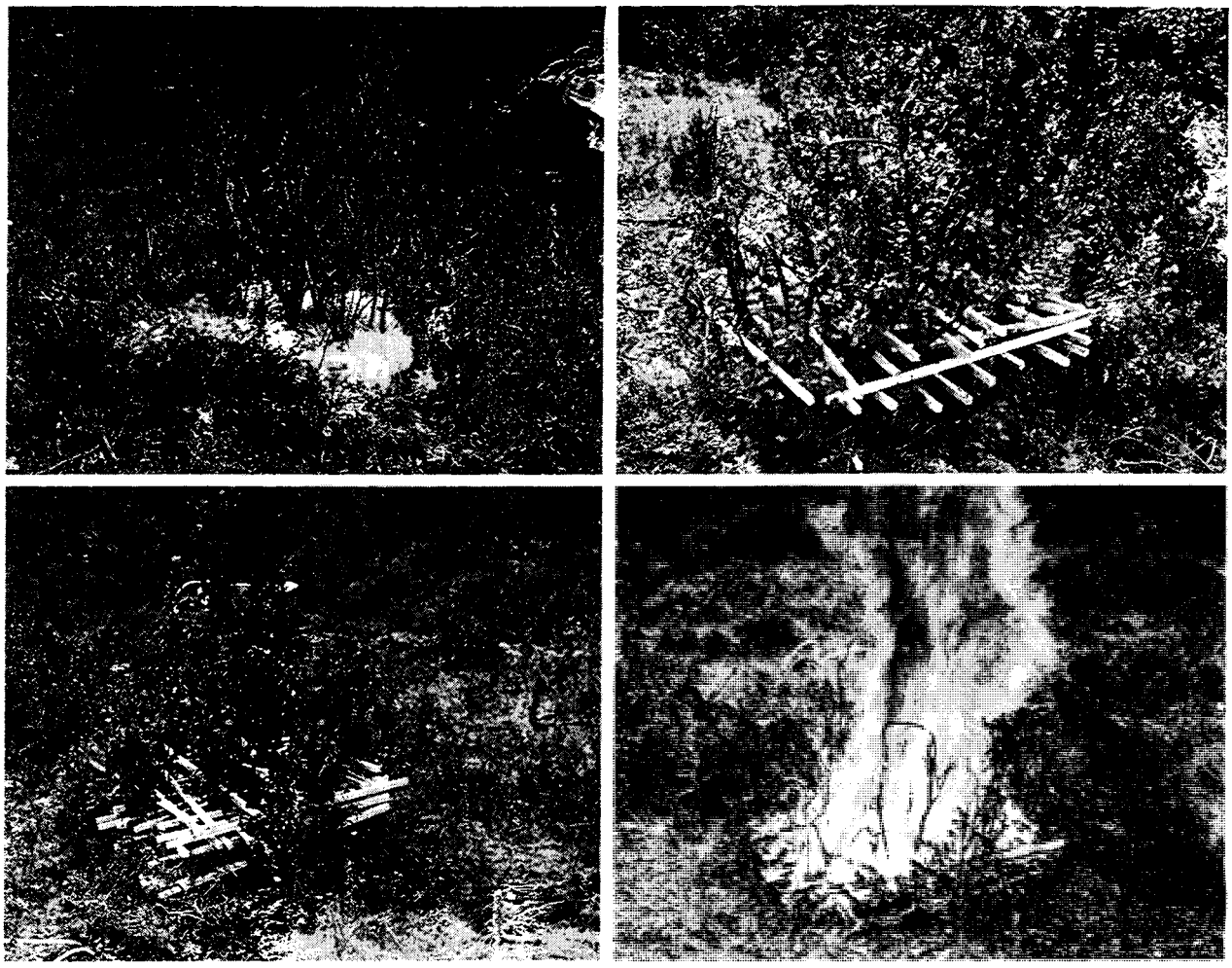

FIG. 9. Light, medium and heavy fuel loads in a study designed to determine shrub response to fire intensity.

Having completed 1 year of burning decadent serviceberry, we can predict a great potential in this study. Fuel loads and heat flux can be converted to slash loadings for management; and if the recovery pattern indicated by our early burns is consistent we can suggest some very significant limitations on the way slash fires should be managed to obtain wildlife habitat benefits.

SUMMARY

Wildlife habitat research being conducted at the Forestry Sciences Laboratory, Missoula, Montana, is not specifically fire oriented.

However, the history of the northern forests is a history of repeated natural fires and it is not possible to understand and describe seral forest communities without treating fire as a significant factor of environment.

Our research program includes three general phases: (1) synecological studies of natural seral communities, (2) comparative studies of seral plant communities developing after man-caused disturbance, and (3) autecological studies of important shrubs in seral communities.

This paper describes representative studies in each phase of the program with emphasis on fire as an underlying ecological influence and a tool for habitat management.

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