

Pesticides: Perils and/or Benefits to Wildlife¹

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Highlight

Discusses the responsibilities of the range manager in planning chemical pest control programs. They are: (1) Understanding the nature of pest problems, (2) identification of priorities of multiple-use values involved, (3) knowledge regarding the technology of chemicals used.

“Among the assets of mankind, wildlife receives its true appraisal only in advanced stages of civilization . . .” (Kenney and McAtee, 1938).

Whether we are so advanced today is debatable; at least, our wildlife resource is receiving greatly increased consideration

in the formulation of management plans for both public and private lands. Both range and forest land have high recreational potential for their wildlife. Every fall thousands of big-game hunters besiege our tree farms. On the first day of elk season in 1964, for example, over 2,000 hunters lined up at the entrance to one tree farm. Such use of private forest lands is steadily increasing and is just one of the several major multiple-use values that forest and range land share.

The growing recognition by private owners that their management objectives must take all major uses into account is evidence of improving land stew-

ardship. On any piece of forest or range land generally there is one principal use, which automatically defines the primary objective. To gain this objective economically is the responsibility of management, and to implement it efficiently and without harm to other values, is the responsibility of professional land managers.

In certain instances the use of pesticide chemicals will be the best or only available means to control brush, insect outbreaks, and plant diseases or to repel animals. But chemicals may also affect organisms other than the prime target, sometimes far from the point of application and sometimes adversely. The affected resource may be a downstream fishery; it may be water used by range animals or migratory birds. Then we find ourselves involved in something more complex than the multiple use of our own lands. Since

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chemicals can have drastic effects, obviously we must use them with all possible skill, but there is no rational basis for categorically abandoning the use of all chemicals. Although the pesticide-wildlife relationship makes chemical use complex and difficult, the problems involved can be solved.

It would be a waste of time here to pass judgment on pesticides as either perils or benefits to wildlife. Many viewpoints, ideas, and beliefs have been expressed recently but most generalities fail.

Some excellent work has been done on the persistence of chlorinated-hydrocarbon residues in the environment, on the pathways of these residues into biological food chains and on their concentration and resulting toxic effects in the ecosystem far removed from their target. Nevertheless, chlorinated hydrocarbons are still necessary to maintain the present high state of agricultural productivity and to control insect vectors of human diseases. Herbicides, often classified as pesticides, have found a valued place in the production of certain game species; yet, even these chemicals affect the habitat of other wildlife species when used in the rehabilitation of depleted range land. All is definitely neither black nor white.

The responsibilities that accompany the use of pesticide chemicals can not be ignored. Though there are marked specific differences between forest pest problems and those on the range, there are also striking parallels. I would like to indicate how foresters' areas of responsibility might resemble those of range managers.

Responsibilities in the Use of Pesticides

Both trust and accountability are implied. Trust comes before the fact and accountability after. As professional land managers

we need the trust of others before taking actions that may affect their interests. We can not maintain that trust unless we are accountable for our actions. To achieve our management objectives and demonstrate good land stewardship, we must do three things: (1) Recognize the real nature of pest control in forestry and range management; our problems and goals differ from those of crop agriculture. (2) Recognize that we must deal with multiple-use values weighed on several widely different scales. (3) Recognize the obligation to use the best technology available and to continue the search for even better control methods. Default in any of these professional responsibilities could easily result in public resentment and restrictive legislation that could remove pesticides from our kit of tools and set management back several decades.

Nature of Pest Control On Range and Forest.—First, then, we have to recognize the real nature of pest control in forestry and range management; problems peculiar to those particular environments. We try to maintain near-natural conditions whereas the food crop agriculturists seek to maintain artificial conditions. To cite an example, heavy damage by native forest insects has often been closely associated with mature and over-mature timber. Again, on the range, periodic outbreaks of grasshopper plagues are often tied in with weather conditions beyond the control of the range manager. Each of these situations is quite unlike the insect problems that occur on the farm in a highly artificial monoculture of a field crop such as corn—an example of the simplest vegetation form man has devised. In contrast, a managed forest or range is a highly complex natural community or group of communities. Since conditions are completely different and varied in the case of the natural areas, pest control problems will also be very different.

Both forest and range environments are the result of long ages of adaptive evolution during which equilibrium, if not harmony, has usually come about among the bio-

logical components. This condition can be upset drastically, however, by any slight imbalance that triggers an insect epidemic. Although the latter may be of short duration, it may be near-disastrous in waste and cost. In agriculture, on the other hand, the crop being favored is usually so "unnatural" that a whole host of ecological forces are working continually to reject it.

It is characteristic of the forest and range environment that the forester or range manager rarely needs to control insect pests because he is dealing with a relatively balanced ecosystem. Silvicultural treatments and range management practices are aimed at developing and maintaining healthy forest and range conditions: endemic populations of insects can be tolerated because there is little substantial effect on either the quantity or quality of the forest or grass crop. Pest-control operations, when necessary, are confined to a specific situation and typically, decades pass before an area has to be resprayed.

In contrast, the agriculturist tries to eliminate insect pests to maintain quality and usually sprays or dusts routinely, often several times a year. Under such circumstances, the quantity of pesticides used is apt to be great. Information compiled by Hall (1962) on acreage receiving insecticides, classified by major land uses, is shown in Table 1.

Table 1. Application of insecticides to major land use categories in conterminous United States (adopted from Hall, 1962).

Category	Acreage Receiving Insecticide Treatment		%
	Million acres	Million acres	
Forest lands	640	1.8	0.28
Grassland	630	1.6	0.25
Cropland and pasture	457	68.6	15.0
Wildland;			
desert, swamp	77	2.5	3.24
Water areas	32.6	0	—
Urban areas	53	15	28.3
Non-forested parks, wildlife refuges, sites	45	—	—
Total	1,934.6	89.5	4.62

One aspect of pest-control activities on forest and range land deserving greater emphasis is the need to communicate to the public the need for control under emergency conditions. In an emergency an information and education effort at all levels is essential: we must identify those opposed and do our best through meetings and field trips to gain their understanding. News media, conservation groups, and legislators should be kept fully and accurately informed. Even though improvements in communication are constantly being made, public-relations problems often develop with little warning. Ours is a continuing responsibility to do a better job of informing everyone likely to be concerned about forest and range pests and our efforts to control them when the need arises.

Evaluations And Priorities In Pest Control.—The second point is that protection of forest and range presents features and difficulties that have few parallels on farm-lands. Forest and range lands are more than a source of wood or meat—they can include watersheds, wildlife habitats and recreation areas. Several uses mean several bases of value and an increase in the complexity of the issues involved when pest control is undertaken. As far as possible, every value must be respected when the decision is made. Then we face the problem of evaluation and setting priorities for uses that are weighed on different scales by different people. And we find that the economic scale is not the only one in use: economics obviously carry far less weight with people who have no investments in trees or meat, than among those who do. We also face the fact that few large pest-control projects are likely to be accomplished without some unfavorable but usually temporary side effects.

Let's assume that a hypothetical insect-control project has employed the best known technology in planning and applying the pesticide (an organic phosphate, highly toxic but a nonpersistent chemical) so that danger to all forms of life, other than the target organism, was minimized. Suppose that, in spite of precautions, adverse side effects occurred. Streams within the project area showed that fish were unaffected but that some aquatic insect

populations were reduced. And suppose that mortality and a temporary drop in the reproductive potential of the living occurred among birds that gorged on dying insects. Should this unfavorable aspect of the otherwise successful control project condemn the whole effort?

Many of the critics of pesticides do not realize that most forms of wildlife have great ability to reproduce themselves or that one of the key factors exerting a check on natural populations is the availability of suitable habitat. Birds, animals, fish . . . all increase to the limit of habitat able to support them. If a population is depleted by chemical spraying, in a short space of time original numbers again prevail. A "vacant" habitat rarely remains vacant for long. Repopulation will occur from outside the area as well as from inside. In effect, we may control nature in small part and for a short time, without serious qualms knowing that her forces will quickly correct any change from the normal (mortality of certain birds and aquatic insects) that we have caused. In actual fact, the potential for continuing maintenance of the wildlife population in the affected area is greater than if the insect attack were allowed to run its course and *destroy* or drastically change the habitat.

Up to here I have stressed the similarities in problems of controlling insects on forest and range lands. In contrast, the use of herbicides to control unwanted vegetation on range has resulted in a special problem. Both the forest and livestock industries have engaged in poor management practices and produced many acres of unwanted brush. The development of herbicides has provided land managers with an effective and economic tool for rehabilitating such lands. But, whereas foresters have used herbicides with little or no comment from the general public, range managers have been criticized for similar efforts to rehabilitate range land. To be sure, the elimination of brush species has a profound impact on certain kinds of wildlife on either forest or range land, but this criticism is hardly justified in the case of efforts to re-establish good vegetative cover earlier destroyed through poor land management practices. Some researchers have found that herbicidal

control of big sagebrush benefits elk at the expense of sage grouse. Even among wildlife biologists there may be disagreement as to which wildlife forms and, hence, which habitat types should be encouraged. It is necessary to be able to assign the priority values involved in forest and range management on the basis of a comprehensive understanding of these environments as biological units. The decision to spray for the control of insects or brush, if based solely on deference to timber or meat values involved, is not a responsible one. Neither is the stand which denies the use of chemicals solely on the grounds that some birds or fish may die or have their habitat altered. Only when the interaction and interdependency of all factors involved are understood will the rating of priorities be truly responsible and thus provide the greatest over-all good.

Using The Best Technology.—The third point deals with our responsibility to use the best technology available in planning and executing each control project. This means using the most effective material, with all possible skill. It implies appreciation of the total effect of a chemical control measure, not just the effect on the target organism. As requirements for government registration of pesticides continue to grow more stringent, fewer new materials will pass the early screening and few indeed are likely to reach the operational stage. Realism, cooperation, and understanding of the chemical industry's problems on the part of the government agencies and the officials involved will be essential if better and safer pest-control chemicals are to be found. Otherwise, investment money logically will be channelled away from forest and range to more profitable opportunities.

It was encouraging to hear that a marked increase in budget funds has been requested by the President for research and education in pest control. The budgeting of the additional funds suggests that the allotment among areas of research is reasonable. Research on biological control, however, appears to be over-emphasized in comparison with that on non-persistent chemical control. It must be kept in mind that biological control is basically preventive whereas chemical control is correc-

tive—the only available means of stopping an epidemic in full course.

The technique of biological control is intriguing. By its very nature it tends to be highly specific and usually the outcome of long-term (or extended) and costly research. Furthermore, we have far too many economic pests for a biological control agent to be developed for each, even assuming this were possible. In the control of Klamath weed by *Chrysolina* beetles range management has scored a striking success but there is no parallel to this type of biological control in forest management.

Even in chemical control the need for clarification is considerable. "Persistence", for example, is a relative term that can mean hours, days, months, or years. The worst insect epidemics typically involve large forest areas with varied topography and environments: at any given time the insects are apt to be in many different stages of development. This seldom is true in small areas of field crops and the whole insect population there is usually vulnerable to treatment as a unit for at least a brief period. In the case of a forest, only a part of the pest-insect population will be at the right stage of development to be controlled by a short-lived chemical. Perhaps the need for some persistence in range chemicals is not as pressing but the point is that overemphasis of non-persistence, in order to meet the special needs of agriculture and public sentiment, could

mean that our specific needs are ignored. If we are to control pests with responsibility, then we must be professional and use the best technology. The quality of the job done will depend partly on the tools available and, over time, appropriate positive research will improve the tools and their application. Effective protection is one part of responsible land management. Give up protection and a cornerstone of scientific land management has crumbled away. For the present and the foreseeable future, pesticide chemicals will continue to be our only means of preventing massive ecological change brought about by insect epidemic and the like. Without their use, land management can be neither responsible nor professional.

Summary

It is essential to understand what pest control on forest and range really is—a highly technical and unique manipulation of natural biological environments—manipulation that will affect the various values to different degrees, favorably and perhaps unfavorably, saving one from destruction and modifying others. We have to appreciate the complexity of the inter-relationships so that all values can be appraised and taken into account in making the final decision. And we must use the finest skills that biological science and tech-

nology can bring to bear. A positive and realistic approach by all appropriate authorities to control methods now existing, under development, and possible development is essential.

The management of the Nation's forest and range lands, public or private, is a matter of trust just as is the guarding of human health. Shortcomings, real or imagined, whether created by ignorance or by circumstances, are not cured by hasty legislation. Laws seldom make the best any better but merely prevent the worst from being quite so bad; they may, however, stifle good efforts. Restrictive legislation and regulation are already making themselves felt. The best and perhaps only offensive is the practice of complete professional responsibility by forest and range managers plus the best communications effort we can devise and afford. Anything less will lose both the battle and the war.

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