The use of artificial organic insecticides to control insect damage to monoculture crops, as for example is commonly practiced in cotton farming, has repeadedly failed in the long run to accomplish that purpose and has led ultimately to an exacerbation of the insect infestation it was designed to control with resulting catastrophic crop failures. These agricultural disasters are the consequences of a deplorable ignorance and disregard of the ecological relationships involved. What has happened over and over again is that an insecticide employed to control a particular insect pest, with notable initial success in terms of increased crop yield, has gradually become less effective as spraying is continued season after season. The reasons for this failure are two fold: the natural insect predators on the target species are killed off by the non-specific action of the insecticide; and the target species itself develops dominant resistant strains to the poison. Coincidentally the less susceptible insects that never before had caused significant damage become extremely destructive as their natural enemise are eliminated. To overcome the apparent lessening potency of the pesticide, the practice is to spray more frequently with higher concentrations, a self-defeating reaction that serves merely to augment the deteriorating situation. When this state of affairs is reached a switch is usually made to more toxic preparations of similar pesticides or to a different class of poisons altogether, resulting in only temporary control of the infestation since the elements within the biological system remain essentially unchanged. Such mistaken measures of insect poison application are what ecologists refer to as an insecticide treadmill -- accelerating amounts of insecicides applied in attempts to maintain crop productivity but with constantly diminishing returns until, predictably, the insect population gets completely out of hand as the ecological balance collapses and the crop is destroyed.

Ecological disruptions of this magnitude have occured in Peru, Guatemale, and the southern United States from which recover is only possible by discontinuing the use of all synthetic, non-biodegradable chemicals of the chlorinated hydrocarbon class of insecticides foreign to the environment, and returning to insect control methods used before their invention.

A by-product of these massive spraying programs has been a general contamination of the environment with DDT-like products. Since they cannot be destroyed by natural disintegrative processes they become concentrated in the bodies of all animls in the ecosystem. From unintentionally contaminated fodder and pastures, because they are fat soluble, they accumulate in the milk of cattle, and in human milk from other food sources. In the cotton raising regions of Guatemala, where intensive spraying with these insecticides has been practiced, human milk carries the highest concentrations of DDT measured anywhere in the world. What effect this heavy burden of poisons will have on infant health and mortality can only be surmised, but that it will ultimately produce adverse effects is certain.

All the biological balances -- the complex inter-dependencies between living things and between them and the physical environment, the relationships that are essential for a stable, for a healthy, and for a continuing total world order of life now recognized as a unified planetary system -- the world ecological system -- made up of these innumerable local inter-relationships -- are being persistently destroyed by the widespread dissemination of the products and wastes of the new post-war chemical technology. These products fall into two catagories: those new to the environment; and those, although not new, that are being distributed in such enormous quantities that their sheer mass is causing serious unanticipated dislocations of the environment. Among the

latter the fertilizers are causing eutrophication of lakes and rivers and are poisoning water supplies. Remedies for these conditions depend on whether we are willing to make the necessary adjustments in agricultural practice and policy. To the former catagory belong the soap-like non-biodegradable detergents, and more insidious in their action all the chemicals manufactured and applied intentionally for their biological effects -- the chbrinated biocides of plants and animals. However, there are other substances of this same general group which unwantedly contaminate the environment as spin-off degradants from industrial use -- the polychlorinated biphenyls, for example, contained in heat-exchange and high-voltage equipment. The common property of all these chlorinated compounds, because of which they were to a large degree manufactured in the first place, is indestructability by the natural enzymic reactions of living cells, by virtue of which they are able to perform their biocidal functions. Could they be broken down naturally the organism would marshal this ability to protect itself against their poisonous properties. The reason living things are unable to protect themselves, at least until they have had time to evolve a protective mechanism, is that these compounds are entirely strange to the biological environment where in the whole long history of evolution no organisms have ever before had to cope with them. No enzyme systems, no organic catalysts, exist to inactivate them. They remain, therefore, indefinitely in the environment, refractory to biological attack, subject only to slow disintegration by physical processes, accumulating constantly as they are disseminated by human agents, and presenting a perpetual and increasing danger to a widening circle of inter-acting units of the biosphere. Each succumbing organism is a break in the ecological fabric which as it becomes rent in many places loses resiliance and stability until at last the web of life itself is unable to accommodate to the damage, and the entire structure

disintegrates into discordant, non-viable fragments. The only possible way to turn aside from this predictably suicidal course and to assure life itself the fulfillment of a destiny implicit in the whole history of evolution that promises survival, is for men to cease altogether conducting themselves as though the biosphere were indestructable and inexhaustible , to refrain from cantaminating it with the disruptive and unassimilable products of their ingenuity.

What it comes down to, especially in the industrial countries, is a choice between the advantage of immediate convenience and comfort, or a wider regard for aesthetic values on the one hand and ecological and moral responsibilities on the other. ~~I do not wish to be understood as recommending a complete abandonment of the use of organic insecticides. For crops and orchards and intensively farmed lands where a monoculture on large areas without competitive vegetation favors the development of insect pests and parasites, there may never be a substitute for organic poisons.~~ ~~But for~~ The indiscriminate spraying of forest land or suburban areas to control insect infestation for which there are alternate treatments, or when the efficacy and ricochets of the program are unknown, using these chemicals is not warranted since it may seriously upset the ecological balance, the consequences of which for all forms of life cannot be predicted. The Forest Service has sprayed DDT on forest areas in northern Minnesota and on mountains in New Mexico and Colorado to control spruce budworm. In Minnesota, after several years of aerial application, the program was abandoned as ineffective. In New Mexico, goaded by popular protest, the National Forest Service experts gave assurances that no harm would come to wildlife. This statement was made without knowing or attempting to ascertain what damage might be expected, or after the fact what ~~damage~~ injury if any was actually suffered. The only exception being a few minor and inconclusive control tests with caged fish in one or two of the streams in the sprayed area. In Colorado an unexpected result of the anti-budworm measures was

an outburst of spider mite infestation. Under natural circumstances spider mites are too scarce to cause significant damage to trees, but with the killing of their normal enemies non-selectively by DDT, to which the mites are highly immune, they multiplied explosively. Another spraying had then to be undertaken with an organic phosphate insecticide not toxic to spider mites.

An attitude current among Forest Service and Game Department personnel, and expressed frequently enough by executive officers that it demonstrates contempt for the less conspicuous passerine species, is to refer to them as dicky birds. A dicky bird is too low in the hierarchy for serious recognition. The epithet is commonly employed for the purpose of dismissing criticism of an ineptitude or obvious studipity and usually takes the pejorative form, "No harm was done except to a few dicky birds", which is an acceptable point of view for most sportsmen as well. Unfortunately, many people belonging to neither category find no objection to this term. To suburbanites who live in the denser housing development, birds, except for the hardier species, are largely unknown. Understandably they support spraying though unnecessary and ineffective to protect their few trees which are much more important to them than the occasional robin that finds it way to their lawns.

But to those people who are fortunate to live on the fringes of the cities, in the small towns, and in the country, birds have a great deal of meaning. The spraying of the suburbs of Detroit in recent years with pellets of aldrin in

order to destroy Japanese bettles was not accepted impassively. The effect on the bird life was immediately noted by the inhabitants, who complained to the responsible city departments. Not only were birds killed in large numbers, but some cats and dogs succumbed and a few children were made sick. In spite of objections from the people and of a known effective method of biological control -- a specific micro-organism that causes a fatal condition in the bettle called milky disease -- the spraying continued, thus illustrating the difficulty in side-tracking a bureaucratic decision, no matter how unjustified, once it has gained a certain momentum.

A similar situation has existed in the Gulf states where fire ants were accidentally introduced from the Argentine early in this century. The ants, named for their fiery sting, spread radially from the point of initial establishment by building large satellite ground nest colonies. They are generally self-limiting within the area through which they have advanced, being most troublesome and aggressive at the periphery of the infested region. Because their sting was considered dangerous to livestock, poultry, house pets, and unpleasant to people, the Department of Agriculture initiated a program of eradication by treatment of the area with heptachlor and dieldrin. Department toxologists categorically stated that the pesticides would not harm domestic animals or wildlife in the concentrations used for the application, which was to be carried out by aerial spraying. It wasn't long, however, before complaints of injury to both farm animals and wildlife

began to flow into county, state, and federal offices. Cows, pigs, and chickens were reported to have sickened and died from the effects of the chemical. And complaints of the disappearance of quail, songbirds, and small mammals were received in increasing number. After several years during which the eradication program was continued under the persistant assurances of government biologists that the insecticide was harmless to all living things except fire ants, and that reports of poisoning of livestock were ~~misleading~~ erroneous, even congressmen began to complain to the Department of Agriculture begging for a cessation of the operation. Nevertheless, despite rising local opposition the eradication program was stubbornly continued to the successful decimation, not of fire ants, which were able to adapt to this new environmental factor and even to increase, but of wild birds, fish, and mammals.

Eventually the program was discontinued, when the appropriations for this purpose were exhausted. However, in 1969 a pellet form of an allied chlorinated hydrocarbon pesticide sold under the proprietary name of Mirex was recommended for the control of fire ants by the Department of Agriculture, and with undeterable persistance and no greater promise of success than before the spraying program was reactivated. The only possible explanation for the continued support the fire ant program receives from the Department of Agriculture is political. The unattainable goal of eradication -- unattainable certainly by broad spectrum chemical insecticides -- rather than practical limited control, continues to be advanced as the

government's aim. And in spite of conclusive evidence to the contrary Mirex is described by its promoters as a harmless chemical to all but ant life. Tests have shown that not only does it kill crustaceans and fish, but that it enters the food chain to appear in high concentrations in birds to cause infertility and egg shell thinning. And even more disturbing, Mirex has ~~been~~ proved ~~to have~~ carcenogenic properties in experimental animals.

Why programs, with such dubious justification involving so much ignorance concerning inadvertent consequences, should be pushed with such inflexibility, becomes explicable only under a presumed operative principle of the Agricultural Research Service of the Department of Agriculture, that lack of information supports license to proceed immediately with a project and sanctions postponement or cancellation of investigation. In this particular case the contention has been that any delay in the program would let the fire ants get out of control, an unconvincing claim since the fire ants have been out of control from the time they first appeared in the United States.

Discouraging as these examples of headstrong administrative decisions are, nevertheless a growing number of people are becoming increasingly vocal in the defense of wildlife and the natural scene against stupid destruction and exploitation. Whether their numbers are multiplying faster than the rate of population growth is uncertain. If they are not, then their cause may be lost by submersion in the population explosion.

So the battle for conservation becomes at the same time a battle for population control. Two kinds of points of view prevail among the proponants of conservation which are about as far apart as the points of view of either group is from that of the raider of forest resources during the nineteenth century. The dominant group of conservationists believe that the only valid justification for preserving or protecting any feature of nature rests in the economic advantage to be derived therefrom. This attitude is deeply imbedded in our Judeo-Christian inheritance and stems directly from the Bible in the Noacian imperative. God said unto Noah: "And the fear of you and the dread of you shall be upon every beast of the earth, and upon every fowl of the air, upon all that moveth upon the earth, and upon all the fishes of the sea; unto your hands are they delivered. Every moving thing that liveth shall be meat for; even as the green herb have I given you all things". This was all very well at a time before man had over-run the whole earth; at a time when there was still room to move about; at a time when if men were dissatisfied with one place they could pack up and move to another less populated place. The question is, can the most successful animal that has ever come down the evolutionary path afford to take the chance of creating a world in which he reigns supreme over all the forms of life which he in his arrogance has decided may continue to exist; a world in which he, in his assumed superiority but limited wisdom, grants life only to those living things that he regards as useful. Will he in the end create a world in

which he himself will be unable to live because he has failed to learn that variety is an essential ingredient of a healthy biological system. Too late he may discover that his machines, his artificial pleasures, his synthetic foods, have ceased to nourish his spirit though they may still nourish his body. And so the vital essence for survival withers and he loses his fierce will to live.

The second group of conservationists hold to the belief that conservation for non-use is the only reasonable, the only viable kind of conservation. They believe that the fact of the existence of an organism bestows on it a valid claim to life, provided it can survive the normal competition unmanipulated by man. They believe in the greatest possible non-interference with the processes of nature. This is, of course, an ideal to which there are many exceptions: they acknowledge the necessity, in the interest of human welfare, of stamping out disease and of controlling to a limited degree the numbers of certain animal and plant species. But they assert that the dominant position of people on earth demands of them a greater responsibility towards their fellow creatures than their fellow creatures exhibit towards one another. And they especially believe that men through knowledge and understanding have acquired a practical as well as moral responsibility to control and limit their own numbers to the extent that all other animals will be able to continue to share the planet with them. And finally in diametric opposition to Biblical philosophy