

III

Conservation -
Environment
DDT

No animals have received so much attention, been so extremely admired or so greatly persecuted, by man as have the birds. This dubious distinction has found its most impressive manifestation in North America during the past two centuries. Two species that populated the continent and its coastal waters in millions have been extirpated by the purposeful actions of men. The Passenger Pigeon whose migrating flocks like storm clouds darkened the mid-western skies was shot into oblivion for pig food, for fertilizer, and for the sport of killing. The Great Auk, the flightless, penguin-like bird of the northern hemisphere, whose teeming hoards, to the amazement of the first explorers of America's northeastern shores, occupied every niche and ledge on the rocky coasts of Labrador and Greenland, were bludgeoned into extinction by ship crews. With the less well known Labrador Duck their battered bodies were packed into hogsheads for the honor of later rendering into cooking oil.

American and Snowy Egrets were brought near to extinction in the United States early in this century by plume hunters. From this fate they were saved in the nick of time by Congressional action, responding to aroused public feeling, that declared illegal the importation and interstate traffic in plumes. At the time this legislation was passed Egrets were maintaining a precarious existence in southern Florida. Plumage hunters sought out the last remnants of these embattled species where they had retreated to the remotest mangrove islands and saw grass marshes of the Everglade wilderness. So

valuable were the feathers on the milliner's market that these men risked any danger, any hardship, in the trackless mosquito infested swamp in their rapacious, remorseless pursuit of the Egrets. The plumes, which develop only during the breeding season, were plucked from birds shot off their nests; their bodies left to rot where they fell. The young, unshaded and unfed, soon perished from neglect in the steamy mangrove jungle, and whole rookeries became a carnage. The horror of these deeds, though they never aroused the slightest doubts or compassion among their perpetrators, eventually became known to people with more refined sensibilities. The ensuing disgusted outcry at the cruelty, the waste, the pointless destruction committed for the gratification of greed and feminine vanity brought the slaughter to an end. Under the protection of laws which rendered the unconscionable exploitation unprofitable, and with broader protection against disturbance of these and many other birds afforded by sanctuaries and public parks, the Egrets have regained much of their former abundance. At last the aesthetic conscience of man prevailed over his acquisitive instincts permitting him to appreciate the greater beauty of the living bird than the plume in the lady's hat.

The fate of the Carolina Parakeet was the result of many causes not all understood, but which include shooting for its feathers in addition to destruction of the bird's habitat. As with the Ivory-billed Woodpecker, a bird also adapted to an environment of narrow ecological limits, the

Parakeet may neither have been able to survive in the dwindling habitat to which it had specialized, nor to adjust to a new environment.

Many of the species of birds that are barely surviving, or are slowly losing their fight for survival are in trouble because of curtailment of a favorable territory in which to carry on their breeding functions, in which to rest on migratory flights, or, in which, on winter grounds, to pursue a constant quest for food. The breeding and food gathering difficulties may be associated with the loss of critical spacial needs of individual pairs. The California Condor, the Whooping Crane, and several of the varieties of Prairie Chickens have been losing ground, not so much because of persecution by man as through the gradual attrition of their ancestral habitats. Though man is responsible for this whittling down, ^{cause of the} the decrease in wild life ^{has been} is indirect and unplanned, not a frontal, purposeful attack as it was on Passenger pigeons, Great Auks, and Buffalo.

Until recently most birds have not been directly threatened by the activities of man. This is because as a class they are remarkably adaptive. Even though enormous tracts of land have been cleared in the mid-western states the total number of birds has not apparently diminished. Certain forest species, of course, are less numerous, but many other kinds are more abundant than ever before. Some varieties of woodpeckers, nut-hatches, hawks, and owls are undoubtedly rarer. On the other hand, the birds which prefer semi-open country, bushy sprout land, and second growth forest have probably multiplied greatly.

Among these latter species are several kinds of warblers, many of the sparrows and their allies, cuckoos, some of the thrushes, and crows. It can hardly be doubted that Blue-winged and Golden-winged Warblers, Chestnut-sided Warblers, Song Sparrows, Robins, Bluebirds until very recently, and Crows are much more plentiful than they were in pioneer days. The three warblers favor sprout land and young second growth forest as nesting habitats; Song Sparrows are bush and ground nesting birds; Robins and Bluebirds, as everyone who has ever lived in a suburb or on a farm knows adapt readily to a human environment, nesting around buildings and in bird boxes put up to attract them. Robins are able to extract for themselves and their young an ample supply of worms from that favorite foraging place, the well kept watered lawn. How many of us are not familiar with the sight of a fat robin running in short spurts across a lawn, pausing, cocking its head to one side -- to listen we were told as children, but much more likely to look -- and of a sudden probing deep into the soft soil to pull out with braced legs and arching neck a long rubbery worm?

The introduction by the technological revolution which has taken place since the end of World War II, of chlorinated hydrocarbon insecticides for insect pest control has caused a decline in the United States in the populations of several species of birds. Some of the chemicals in this class are toxic also to plants and are used as weed killers and defoliants. The most familiar of these insecticides is DDT. It was first used to control mosquitoes, but was soon dis-

covered to be active against many orders of insects, and belatedly to kill crustaceans, fish, and birds. DDT and its many close chemical relatives, because they kill by interrupting the transmission of nerve impulses, are non-specific nerve poisons and therefore active on a broad spectrum of organisms. They are substances foreign to the environment without counterparts in nature, refractory to decomposition by the natural chemistry of living organisms. And because they cannot be gotten rid of either through excretion by the normal eliminating organs, the animal as a last resort stores them where they will be out of direct contact with vital processes. Since they are all fat soluble and since fats themselves serve as a reservoir of surplus energy, which is not continuously utilized, these hydrocarbons can safely be deposited in the adipose tissues -- the attics and cellars -- of the animal body where they may remain for years until fats are mobilized to meet emergency demands. When this occurs they appear in the circulation, and then the animal is in for trouble. Unfortunately, the organism has little choice into which fatty tissues it deposits these foreign substances, whether in liver, kidney, bone marrow, or most disastrous of all in the lipid elements of nerve tissue where they are in close relationship with the mechanisms of nerve impulse conduction, and can produce paralysis. Moreover, some kinds of these poisons, not completely resistant to catabolic attack, are partly reduced to even more toxic and resistant products which cause injury in concentrations a thousand times lower than the ^{precursor} parent substances.

But this is not the worst of it. These hydrocarbons are passed up the food chain from lower to higher animals. The toxicity to them is not uniform throughout the biota; some animals being more susceptible than others, which store the insecticides in high concentrations, a situation that has had a devastatingly deleterious effect on predator species. The extreme water insolubility of chlorinated hydrocarbons is a property responsible for misjudgment of the effect they produce on the biological environment. Measurements of contaminating concentrations of these chemicals in water yield such small figures that manufacturers belittle their significance in disregard of the mechanism by which they enter the food chain, and because financial interest predisposes them to do so. The very fact of the extreme difference in their solubility in water and fats leads to the absorption from water of even minute amounts by the lipids of aquatic organisms until a state of equilibrium is attained between the greatly divergent solubilities in the two media. As a result all lower forms of life from bacteria to protozoans through the aquatic worms and insect larvae continue to extract from their environment all such non-metabolizable substances as fast as they appear as contaminants. Subsequently, scavengers, bottom feeders, and fish that eat insects and other invertebrates concentrate the hydrocarbons further in their fatty tissues. The carnivorous fish carry this storage to still higher concentrations of thousands of parts per million, an increase of a million-fold over the starting concentration in water of

less than one part per billion. Fish eating birds -- grebes, loons, and ospreys to name a few -- consequently may over a period of time ingest massive doses of chlorinated hydrocarbons. The reproductive physiology of birds is particularly susceptible to disruption by DDT and its allied chemicals which interfere with the enzyme system involved in calcium metabolism manifested first as lowered fertility and later by defective egg shell formation. Robins that have suffered extremely high death rates in communities where DDT was used for controlling Dutch Elm Disease obtain the poison from earthworms taken from the soil under sprayed trees. Earthworms like fish concentrate DDT, but unlike fish are highly resistant to its effects and so remain for life a reservoir of death to robins.

Because most insects are very small they can be killed by small amounts of poisons, whereas larger animals are only effected by proportionately larger doses. If the proportionality goes by weight, the amount of poison intake necessary to kill a man would be about one hundred million times that needed to kill a mosquito weighing a milligram. So when an area is sprayed for mosquitoes or some other insect pest it is unlikely that enough poison will come in contact with a person, a dog, or even a bird to injure it immediately. Such may have been the reasoning first put forward to reassure people as to the harmlessness of these chemicals. That many of them are deadly to man has been proved by the accidental spilling of concentrates on handlers who have died in spite of every effort to wash off the poison immediately. And the breathing of sprays during crop

application has also lead to fatalities.

A more insidious danger arises from residual poisons on vegetables and fruits that have been sprayed to kill pests. Although federal regulations govern allowable residues on market products, and prescribe the minimum time between the last spraying and harvesting, inadequate inspection and state laws less strict than federal often fail to prevent the marketing of dangerously contaminated farm produce. Since residues are not readily washed off, even with soap, those who eat these products accumulate poisons in their bodies faster than is considered safe by the usually permissive standards of government agencies, regardless with equal solicitude for the economic advantages to the chemical manufacturers as for the health of the consumer. And even when residues are kept to accepted safe limits they will in time accumulate to levels which though not immediately harmful to health can under morbid stress and chronic illness exacerbate a disease process and contribute to the cause of death.

Even if we are willing to accept these hazards to health and the cost in life, still the use of organic insecticides permanently to control various kinds of insects is a futile undertaking in the end, and so the losses are sustained without the advantages of the expected benefits. Adaptation to changes in the environment comes about through mutations; and the rate at which mutations occur in turn depends on the rate of reproduction of the species under consideration. In man the periodicity of reproduction is about twenty years which means

that many centuries or even millennia must pass before adaptation through natural selection -- leaving out of consideration the possibility of future genetic engineering -- becomes appreciable. For passerine birds, the common song birds for example, reproductive periodicity is about one year so that even with them evolution is too slow a process to adapt a species to a potentially lethal environmental change, in time to save it from extinction. With insects, however, the situation is quite different. The reproductive cycle of the house fly is so short that if all the descendants of one pair lived and reproduced normally during one summer season from April to August the total number would be 10^{20} . One hundred billion billion. A comparable figure for the cabbage aphid assuming an average of 41 young per female in 16 generations between March and October is 10^{24} , ~~or 10,000 times more than the house fly.~~ Thus it is obvious that among insects the opportunity for mutations to take place bestowing resistance to organic poisons is enormously increased. Strains of insects resistant to many of the common insecticides have been observed. House flies insusceptible to DDT are becoming common. In many mosquito control programs it has been noted after several applications of chlorinated hydrocarbons that the insect is as abundant as it was at the starting of spraying. In Tampa Bay, Florida where mosquito control was conducted for several years by aerial spraying, increasingly high concentrations of DDT were found necessary to produce the same results as were obtained the previous year until ultimately the program

The use of artificial organic insecticides to control insect damage to monoculture crops, as for example is commonly practiced in cotton farming, has repeatedly failed in the long run to accomplish that purpose and has led ultimately to an exacerbation of the insect infestations it was designed to control with resulting catastrophic crop failures. These agricultural disasters are the consequences of 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 ~~can~~ become extremely destructive with the ^{at the} elimination of their natural enemies ^{are}. To overcome the apparent lessening potency of the pesticide, the practice is to spray more frequently with higher concentrations, ^a which is self-defeating ~~(section suggests that)~~ and 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 insecticides ~~are~~ 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.

Recovery from ^{ecological} disruptions of this ^{magnitude} order ~~which~~ have occurred

southern ^{from which recovery} ~~is~~ only possible by ^{discontinuing} ~~abandoning~~ 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 ~~in~~ ^{use} before their invention.

A byproduct 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 animals 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 ^{world} continuing total/order of life ~~XXXXXX~~ now recognized as a unified planetary system, the world ecological system, made up of/innumerable local ~~XXXXXX~~ ^{these} ~~XX~~ 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 categories: those new to the environment; and those, ^{that} although not new, ^{are} being ^{disintegrated} ~~produced~~ in such enormous quantities that their sheer mass is causing/unanticipated dislocations of the environment. Among the latter ~~are~~ ^{the} fertilizers ~~that~~ ^{are} causing eutrophication of lakes and rivers and ~~are~~ ^{are} poisoning water supplies. Remedies for these ^{conditions} ~~effects~~ depend on whether we are willing to make the necessary

Assignment

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changes in agricultural practice and policy. To the former category belong the soap-like non-biodegradable detergents, and more insidious in their action belong all the chemicals manufactured ~~XXXXXXXXXXXXXXXXXXXX~~ and chlorinated ~~applied~~ distributed intentionally for their biological effects - the biocides of plants and animals. ^{However,} But there are other substances of this same general group which unwantedly contaminate the environment as spin-off degradants from industrial use - the polychlorinated biphenyls ^{contained} used 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} produced 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. If they could be broken down naturally the organism would marshal this ability to protect itself against their poisonous properties. The reason ~~they~~ 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/organisms have ^{no} never before had to cope with them. ^{> (No enzyme system, no organic catalysts exist to inactivate them)} They remain therefore indefinitely in the environment, refractory to biological attack, subject only to ^{slow deterioration} deterioration by physical ^{processes} means, 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 resilience and stability until ^{at last} finally 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 ~~XXXXXXXXXXXX~~ predictable suicidal course ^{and to assure} ~~XXXXXXXXXXXX~~ life itself ~~XXXXXXXXXXXX~~ 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 indestructible and inexhaustible, to refrain from contaminating it with ^{the} disruptive and unassimilable products of their ingenuity.

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was discontinued. In the mean time the destruction of fish and crustacean life in the shallow waters of the bay had become so extensive that the population of herons and egrets, tourist attractions of the region, which depend on these animals as a major food resource were driven from the area.

The defenders of DDT, who oppose any limitation on its manufacture and use, cite the undeniable benefit it has brought to people around the world, notably in the undeveloped, tropical countries, by controlling malaria and other insect vector diseases. Ceylon is named as the ^{prime} arch-example of a country whose moribund society, saddled with endemic malaria, was rescued from a condition of chronic ill-health and lassitude and raised to a state of vigor and social progress by the wide-spread application of DDT to control the anopheles mosquito. Yet, recently the effectiveness of the insecticide has diminished, the anopheles have not been eradicated as forecast and are reappearing in strains resistant to DDT, and malaria more virulent than before has returned to deplete the Ceylanese. To forestall regression to the former state of social deterioration the use of DDT has had to be supplanted by other insecticides of the chlorinated hydrocarbon group, with only partial success, and at the same time old conventional public health measures have been reinstituted. The question must be asked whether chemical insecticides offer any hope for the elimination or lasting control of insect born diseases, or should a totally different approach be sought for the permanent eradication of these plagues on mankind of which biological controls promise the greatest success.

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 ^{categorical} 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 ^{injury} ~~damage~~ 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 stupidity 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 its 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 beetles 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 beetle 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 persistent assurances of government biologists that the insecticide was harmless to all living things except fire ants, and that reports of poisoning of livestock were ^{erroneous} misleading, 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 persistence 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} ~~has been proved to have~~ carcinogenic properties in experimental animals.

Why programs, with such dubious justification ^{and marginal advantage} 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 ^{technology and} population control. Two kinds of points of view prevail among the proponents 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 ^{background} 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". ^{and} 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

they say that it is not to our greatest interest to pre-empt the whole world for our exclusive use.

This is the peril we are bringing upon ourselves with our rampant technology. According to those admirers of man's ingenuity, who support conservation for use, progress must be given free reign, and if, as technology advances, large pieces of the environment are destroyed, whole areas of wilderness wiped out, and life endangered, this is merely the cost we should accept for the improvements and comforts that innovations bring us. These progress-at-any-cost people give little thought to the possible adverse effects of technological achievements or that comforts may finally turn out to be unimaginable discomforts. Their acceptance without question of man's ability to order nature for his own use and advantage -- endlessly -- is not a thesis supported by past experience with exploitation. Men have produced deserts and dust bowls before; we could well be on the road to creating a wasteland on a worldwide scale today.

The greatest good which could come from the U. S. space program is not man's setting foot on the moon or Mars; it is rather the perspective he may gain in his small, vulnerable, lonely home planet. The appearance of our mottled blue-and-white sphere from thousands of miles out should make us conscious of the exceptional conditions under which the phenomenon we call life -- the only life of which we have any knowledge -- originated. We should be impressed by the beauty and fragility of the dynamic balance that has been preserved

for so many hundreds of millions of years during which life has persisted on earth. And we should especially appreciate the shortness of our tenure on earth and use the powers we have so recently assumed to perpetuate not destroy the balance.

The direction which seems to promise the greatest rewards, the surest fulfillment of the hopes and aspirations of man's troubled and inquiring spirit, and of a distant and ultimate happiness, is a course of least arrogance towards his living companions -- a course even less negative than the absence of superiority -- a course of humble respect for life, a sympathy which sustains a recognition of the essential interdependence of all living things.

Admiration for nature is a trait of rather recent origin. The pioneer thought of nature as an enemy to be fought and conquered and tamed and if not tamable to be excluded. With the development of technology and the freeing of people from the constant drudgery of making a living and the compulsion, originating in necessity, to use or destroy all things, they can afford the time and leisure to look at the earth around them with less predatory and less acquisitive eyes. Not many generations ago men began to look at nature with a new awareness and a new kind of awe. Its mysteries were not always taken for granted as men's minds began to recognize the greatest mystery of all, the existence of multitudinous, infinitely diverse forms in which living nature exhibits its face. And with the recognition of this mystery, with the overwhelming awe of sudden understanding, and paradoxically

simultaneous incomprehension, of the unending complexity and unity of nature, grew a sense of the incredible beauty of it all. Thoreau devoted most of his short life, one hundred years ago, to admiring nature. And since his time it has become at least fashionable to profess appreciation of the natural world, and at most a matter of inner satisfaction and spiritual fulfillment to commune with nature.