2nd draft
revised 1st draft

0+2

To Conserve Our Natural Heritage
For the Good of Mankind

The immediate overwhelming impression I had on seeing the first clear picture of the earth taken by the Apollo 8 astronauts from thousands of miles out was the insignificance, the isolation, the loneliness of our planet in the immensity of space. I looked long at that picture of the streaked white and blue sphere, becoming increasingly awestruck by the thought of all that has been going on for so many hundreds of millions of years on this speck of matter. Every manifestation of the phenomenon called life, beginning with the dim record found in ancient rocks and evolving through uncountable variations up to the myriad living forms of today, originated on the surface of this small globe, powered by the thermonuclear fires of one star. And a more terrifying thought came to me that this amazing phenomenon, which began as a result of the most improbable coincidence, could be wiped out by inherent failures of the phenomenon itself. The destruction might

occur catastrophically, or it might occur insidiously over a longer period of time through mismanagement by the most sophisticated product of that evolution - man himself.

But I realized too with ironic satisfaction that however it might happen the planet would continue to ~~ride a~~ spin in a predetermined orbit around its star unchanged in outward appearance. Tragic only to the conscious product of the experiment, the event would go unnoticed in the totality of the universe. The experiment of life - the only one we know about - is answerable solely to and for itself. Self-contained, self-generating, and potentially self-destroying its future for all time is ~~encoded~~ contained in the basic genetic ~~structure~~ substance of all living ~~substance~~ matter. If the genetic material is destroyed life ceases.

Without doubt the most remarkable endowment of life is intelligence. It gives to man, in whom it has attained its highest development, unique powers of self-examination and self-control. He can if he wished within limitations direct his own future. The difficulty is not so much with ~~capability.~~ knowledge, which he ~~has in plentiful supply and he~~ is continuously storing up ~~information~~ at a prodigious rate, as with understanding and wisdom. ~~The difficulty lies with the self-assumed quality, wisdom.~~ Wisdom is what gives men the ability to judge the best course of action in terms of their own self-

interest. The farther into the future they are able to project the determination of self-interest the wiser they are.

The greatest benefit which could come from the space program is a deeper understanding of the responsibility man bears for the continuation of life on his home planet. The photographs of the earth from outer space give a new perspective on his world, from which comes the knowledge that the health and ultimate survival of the human race depend entirely on the restraint and wisdom he exercises in the exploitation of the finite resources of the earth, and that no resource from outside will be available to repair the damage done by his reckless acts.

Man has arrived at a crossroad in his destiny by the diligent application of knowledge to the manipulation of his environment. One direction leads surely to oblivion for himself and for many, if not all, of his fellow passengers on the planet. Others lead perhaps to better solutions but by no easy routes. All ways will be beset by difficulty, by hard choices, and by the severest tests of his intelligence and ~~wisdom~~ good sense. The direction which seems to promise the greatest rewards, the surest fulfillment of the hopes and aspirations of his 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.

Since Stimulated by military necessity during World War II, technology in the United States, not a battlefield of the war as were most of her allies, made enormous advances in innovative developments of which the harnessing of nuclear power is the most notable. Since the end of the war the effect on the environment of man's activities has become obvious to even the casual observer. During this period a technological revolution has been in progress invading all levels of scientific endeavour from engineering to theoretical physics and biology. The impact of the revolution on society has produced many cultural changes. All sorts of new products, now considered necessities, have appeared on the market. Even Agricultural practice has undergone drastic revision with the introduction of cheaper chemical fertilizers and a whole spectrum of organic insecticides. The enormous economic growth engendered by this revolution raised the affluence of society and increased the rate of consumption, a further stimulus to the economy. Built into Integral with the rising spiral of consumption is a skyrocketing demand for power and water.

And underlying and feeding this situation is the rapidly increasing population. These forces are not only changing the face of America, they are ~~altering the whole world~~ changing the quality of life.

~~With the changes brought about by the technological revolution and the multiplication of people, the quality of life is changing.~~ People are becoming crowded into larger and larger communities, partly because they prefer to live in close proximity to their neighbors, but also because crowded living is cheaper. Urban sprawl is pre-empting farm lands and open space near all centers of population. ~~The spreading goes on~~ despite warnings of impending social and economic disaster ~~that if not contained disaster will ensue. The demand~~ The demand for raw materials by industries is accelerating at a frightening pace. Forests are cut down to supply the lumber demanded in an ever increasing quantity, with little thought for the loss or for the future. Even the Forest Service, the official custodian of trees, is forced to collaborate in this mining of resources ~~by proposing a higher rate of cutting in~~ National Forests. Watersheds too steep for lumbering by conservative means are denuded, exposing them to erosion with all the consequent permanent land destruction, devastating floods, and stream pollution. To supply the increasing demands for fuel and power, coal companies resort to more destructive methods of ~~strip~~ mining, and oil corporations ignoring public warnings, and even the adverse information they themselves have

~~disruption of patterns of life, the spreading goes on.~~ the concentration of population goes on fostered by the realestate promoters.

gathered - as the Santa Barbara oil disaster so dramatically illustrated - go ruthlessly ahead with their drilling. Coastal areas are being taken over for both nuclear and thermal power plants by utilities, because ocean water is cheapest for cooling, giving no thought to the beauty they destroy, the curtailment they impose on recreational resources, or the ecological disruption they cause.

To accommodate the increasing millions of automobiles, every year thousands of acres of land are covered with concrete and asphalt to provide parking lots and freeways. The highway departments of many states have been given the power of eminent domain which they exercise obdurately by constructing freeways through state parks and untrammelled wild areas for no better reason than to shorten the driving time by a few minutes from one place to another. Most people accept without protest these "improvements" which destroy much of the beauty of the places they were ostensibly intended to make more accessible for popular enjoyment. National

The National Park idea originally was to preserve, in their natural wild condition in perpetuity, places of outstanding beauty and scientific interest for the edification and enjoyment of all people

in their natural condition for the edification and enjoyment of all people. With the increasing wealth and

mobility of Americans, with a highway system that facilitates mobility, ~~with the promotion of parks by~~ the National Park Service has become a promotional agency which encourages visitation and offers ever more elaborate conveniences to the increasing millions of people who, desiring ~~ƒø⊀/ø/⊀⊥ø¢~~ to escape ~~⊀ø¢~~ for a time the pressures of industrial civilization, seek respite in the National Parks. Paradoxically, however, they prefer those parks in which the most comfortable, modern developments have been introduced, where they can enjoy conditions most like those they left behind. ~~ose they left behind.~~ They crowd into these parks by the thousands. They go not to see the natural wonders for which the park was established or to experience the joy of solitude ~~of~~ in primeval nature, but to carry on all the complex activities of social intercourse available only in dense communities. Steven Roberts, writing for the New York Times, describes Yosemite today: "The constant roar in the background was not a waterfall, but traffic. Transistor radios blared forth the latest rock tunes. Parking was at a premium. Dozens of children clambered over the rocks at the base of Yosemite Falls. Campsites, pounded into dust by incessant use, were more crowded than a ghetto. Even in remote areas, campers were seldom out of sight of each other. The whole experience was something like visiting Disneyland on a Sunday."

The demand for establishing permanent recreational facilities in wild areas is becoming almost irresistible. Government agencies, legislatures, and Congress are being importuned to authorize profit-motivated projects for vacationers on wild public lands except, for the present at least, on those areas specifically set aside as wilderness. These include the construction of marinas, lodges, and ski resorts, ~~and long-term leases for summer homes,~~ with, of course, all necessary access roads. The usual defense of these projects is ~~the claim~~ that they are democratic and conform to national tradition, whereas to deny such developments would show favoritism for the ~~pro-~~affluent ~~sperous~~ who alone can afford the luxury of going into wilderness areas under their own resources. Nothing could, in fact, be farther from the truth. Any one who has an interest in wildness can visit an established wilderness on foot or on horseback. The most he needs is a knapsack and bedroll, but the prices which prevail at lodges and resorts, though regulated by the government, are prohibitive to all but the well-to-do. The marinas on the shores of Lake Mead and Lake Powell are facilities for the ~~affluent~~ well-to-do boat owner. Before the damming of Glen Canyon, people with small rafts or canoes could make the trip through the canyon with perfect safety and at little expense. Today they can get nowhere without a motor boat.

The demands for the development of wilderness by interests like the Disney Enterprises and the manufacturers of expensive equipment (campers, boats, outboard motors, snow mobiles) are not going to diminish while the economy remains strong and the population continues to grow. And there will be attempts also ~~at~~ To subvert~~ing~~ the intent of the Wilderness Act ~~to~~ by allowing establishments to be constructed in wilderness lands.

So far I have ~~discussed~~ mentioned only the changes in the environment arising from direct exploitation of material resources. These are the most obvious. However, there are less easily discernable, though no less objectionable, changes being wrought by more subtile and generally inadvertent causes, and because they have widespread effects and are constantly at work on the environment, and go largely unrecognized, the injury they produce is the severest and most alarming. Adverse effects on the environment in this catagory are almost entirely the by-products of human activities. A good proportion of the harm done is an immediate consequence of industrial technology which disposes of waste products by dumping them into the atmosphere and water systems. A large number of poisonous substances are disposed of this way without regard for the effect on the environment or the health of the human inhabitants. The air around industrial regions is being heavily

polluted with all sorts of organic chemicals, combustion products of fuels, and solid materials which create an opaque blanket of smog that may reduce visibility to nighttime conditions in cities and render the atmosphere unbreathable. Any one who drives on the New Jersey Turnpike near New York will have experienced this condition. Industry is well aware of the dangerous situation it creates, but disparages its significance because of the correction costs. ~~Improvement will be forced only by overwhelming public protest.~~

Among the most poisonous substances being dumped into the atmosphere are the oxides of sulfur and nitrogen. They kill plants and animals and people too. Near the town of Sudbury, Ontario, where one of the largest nickle smelters in the world is located, thousands of acres of surrounding land have been completely denuded of vegetation, all life destroyed, and the rocks blackened to a semblance of lava by the waste gases. Recently a powerful coal company has brought suit against the State of Missouri to enjoin enforcement of regulations governing the maximum sulfur content of coal burned in the state. While this action was in process, a situation developed in St. Louis, where the high sulfur coal supplied by the company is the common fuel, which presented a serious health hazard. Atmospheric inversion - a not uncommon occurrence over

the city - caused a sudden rise of sulfur dioxide in the air to the highest concentrations on record. Prompt action by the city advising people to stay indoors may have prevented a repetition of a disaster like that of London more than a decade ago. In the northwest corner of New Mexico a thermal power plant using locally mined low-grade coal is pouring hundreds of tons of fly ash into the atmosphere each day, more than the solid matter released over greater New York. The particles of ash are too fine to settle; they are spread by air currents for hundreds of miles into northern New Mexico and Arizona. The Rio Grande Valley is repeatedly subject to days of low visibility and the ~~smog~~ haze is reaching over into the Colorado River basin. This is happening in a region which once enjoyed the clearest air in the United States, where visibility of well over one hundred miles was usual. The utility officials, the legislature, and the Governor of New Mexico have displayed ~~callous~~ astonishing indifference to a situation which is rapidly worsening. Here again resistance to corrective measures is economic, but the loss in terms of a degraded environment and diminished quality of life is not taken seriously. ~~Only massive public protest will bring a change in official attitude.~~ by those who cause the degradation.

The smog that is increasing everywhere is not due solely to industrial pollutants. A large share is attributable to automobile exhaust. The automobile

industry, typical of industry in general, resists invisible improvements in engine efficiency, but will spend millions on styling. No one can see the reduced fumes, but everyone notices a new strip of chromium. We are all familiar with the plight of Los Angeles where the smog which lasts for days is now known to be caused by the automobile ~~exhaust~~. ~~In~~ De spite ~~of the~~ sore throats and irritated eyes, not to mention more serious ~~injury~~, Lung disease, caused by the products of incomplete combustion, suffered by millions of people, automobile manufacturers felt no responsibility to improve combustior efficiency until compelled by California law, and then only in automobiles for sale in California.

The dangerous products of incomplete burning of gasoline are hydrocarbon fractions, the oxides of nitrogen, sulfur, and lead, and carbon monoxide. The first of these have the most insidious effect on health. ~~Although~~ Lead is an accumulative poison, which is being distributed all over the world, ~~by automobile exhaust~~ from, and is even found on polar snows. The smog producing, ~~incompletely burned hydrocarbons~~ gasoline fractions and the gaseous oxides cause mucus membrane irritation and lung disease.

On the eastern seaboard smog from all causes is gradually invading the upper atmosphere where its presence is most dramatically evident from the air. A few years ago a layer only three thousand feet thick was

observed from airplanes; now the layer is five thousand feet thick and extends all the way from New York to Washington. At the present rate of increase it will reach in a few years an altitude of over ten thousand feet and cover all the eastern states, ~~from Maryland to Massachusetts and beyond~~.

A far more immediately serious debasement of the biotic environment is being produced by the incredible and continuing pollution of the lakes and river systems of the United States. Rivers become nothing less than open sewers as municipalities pour raw sewage, and industries dump chemical-laden and oily wastes into them. They are used too as dumps for garbage and solid trash and even ~~worn out~~ old automobile bodies. Attempts at correction ~~to correct these practices~~ are ~~is~~ resisted by those responsible who cite political and economic justification for these practices which have, as well, the sanction of tradition. For in America, a continent only recently occupied by Europeans, the pioneer concept of nature as a force to be subdued and a resource to be exploited still receives general acceptance. Rivers are regarded as rightful places for the disposal of the waste products and trash of civilization.

Correct ~~Correction of~~ ~~Expostulation against~~ these practices ~~are more often than~~ is difficult resisted ~~not met with indifference or angry defense,~~ by the pollutees because the ~~for~~ rivers ~~in~~ of America have traditionally been regarded as a rightful

~~place for disposing of the waste products and trash of civilization.~~ Their beauty has gone unappreciated, their banks have been ravaged by inappropriate exploitation, their riparian life destroyed, and when they can no longer be used as super disposals they are dammed up. The Merimac on which Thoreau and his ~~br~~other made their famous excursion more than a century ago is so badly polluted that it is unsafe to ride on it in a motor boat. So far has the raping of the rivers of the United States gone that one is hard pressed to find anywhere within its boundaries a pure ~~unpolluted~~ primeval stream, ~~in its primeval state.~~

Our lakes have fared no better. Lake Erie, long used as a cesspool, is now largely destroyed as a living lake: its oxygen has been absorbed by decay, its fish are dead, its beaches are corrupted, and swimming is unsafe. As Lake Erie spirals towards the ultimate of offensive degradation, recovery becomes less possible. Lake Michigan is headed for the same fate unless the people of four states take ~~heroic~~ strong action to prevent it. Lake Tahoe in the Sierra Nevada, which once held the clearest water in the world, is becoming green with algae from the chemically laden runoff of its mistreated shores.

~~communities.~~

Debasement of the biotic environment by pollution of ~~the~~ air, ~~water systems of the United States is~~ water

The Pollutants of our waterways ~~are destroying~~ destroy aquatic life and disrupt~~ing~~ the ecology. Effects are appearing at great distances from the source of contamination. ~~The~~ Killing aquatic insects with chemicals and suffocating ~~of~~ water plants with oily wastes can destroy ~~the~~ river fish for hundreds of miles. Birds are driven away for lack of food, but since other areas are already like their kind they have no place to go ~~occupied~~ fully occupied by ~~the same species their total numbers are diminished by the shrinking of their habitats, lack of food and breeding failure.~~ and eventually perish from starvation and breeding failure. The total destruction of life brought about by industrial pollution in unknown because man is ecologically immature. Instead of ~~trying to anticipate~~ anticipating damage and trying to ~~circumvent~~ forestall it, he waits until ~~it~~ the damage is done and then, when too late, attempts to correct ~~the~~ it. ~~situation.~~ And so a constant slow attrition of wild life goes on ~~unnoticed~~ unappreciated by most people until suddenly to their surprise they notice the loss and regret it. Man is not a self-sufficient animal; he needs the diversity of life which surrounds him, ~~and~~ and from which he has arisen, to maintain his physical and mental health. If in his enthusiasm for technical inovation and over-confidence in his manipulative ingenuity he extinguishes a considerable portion of this life, he will destroy himself.

Equal to the inadvertant ~~effects~~ harm produced on the environment ~~caused~~ by pollution are the insidious effects caused by the application of chemicals for biotic control.

than ~~through~~ by pollution, ~~although pollution is involved here too.~~ Not Two general catagories of substances in common and increasing use are those designed to destroy life and those to stimulate it. To the first belong the insecticides, fungicides, and herbicides; to the second the fertilizers and growth stimulants. A class of chemicals developed since the war, which is being manufactured in enormous quantity and distributed throughout the world for the control of insects is the group of chlorinated hydrocarbons. They are artificial compounds unknown in nature. They are non-selective, highly toxic nerve poisons active in extreme dilution. They are used to eliminate insect infestations of crops and forests ~~and~~ to eradicate noxious and disease-carrying insects. ~~Being water insoluble they are applied in emulsion as sprays or as dusts.~~ Their use has proved on the whole highly effective. Since they are ~~chemically stable, non-biodegradable, and~~ new to the environment, most organisms have evolved no protection against them. The commonest chemical in this class is DDT.

The ~~trouble with~~ danger from chlorinated hydrocarbon insecticides is their non-specificity; they kill much more than the target species. ~~They kill~~ the desirable as well as the undesirable ~~insects~~, but they kill also many higher animals. Rachel Carson in 1962 predicted the disasters which unrestrained application to the land of DDT and

related chemicals would ~~cause~~ bring to animal life. She was ridiculed and condemned by the manufacturers and users alike of these chemicals, but her pessimism has been ~~overwhelmingly~~ vindicated by subsequent events. The advocates of chlorinated hydrocarbons always put forward the alleged benefits but belittle or deny the undesirable effects. What are these disadvantages? They were not at first apparent, but it is now recognized that chlorinated hydrocarbons can have a devastating effect on life far distant from the place of application. The properties shared by these substances which are most responsible for injury to life are stability, insolubility in water and fat solubility. Inertness renders them non-metabolically degradable while their solubility~~ies~~ ies ~~properties~~ render them difficult to eliminate and lead to concentration in the lipids and fats of the animal bodies they enter. Among aquatic animals DDT and like substances enter the food chain at the lowest level by adsorption onto particles which settle to the bottom of lakes and ponds where they are eaten by invertebrates living in the mud. Bottom feeding fish ingest the DDT with their food, and being unable to do anything else deposit it in their fatty tissues. Carnivorous fish eat the bottom feeders and again deposit the DDT in body fats. At each stage the concentration in the fats goes up until it becomes many thousand times higher than

it was at the lowest level. When birds at the top of the food chain such as grebes and ospreys eat the larger fish they concentrate the hydrocarbon still further. But fatty tissues are not like ~~the~~ our attics and cellars ~~of houses~~ where discarded possessions are stored away and forgotten. Fats take part in the economy of the animal and when concentrations in them of poisonous substances reach a certain level they begin to spill over producing insidious and sometimes lethal ~~consequences~~ results. The primary lethal action of DDT as a nerve poison is explained by its inhibition of the enzyme assodated with the transmission of nerve impulses. ~~A more insidious~~ another action recently discovered in birds is a blocking of the enzyme-hormone complex involved with steroid metabolism in the liver. Interruption of the production of steroids implicated in the oestrus cycle of the female results in sterility; but still more far reaching, calcium metabolism related to egg shell formation governed by the sex hormones is interfered with. Female birds which have ingested more than an unknown limiting quantity of DDT become sterile and lay infertile eggs; they may also lay eggs with fragile shells that do not survive incubation, or eggs with no shells at all. The bald eagle, the peregrin falcon, the osprey, and the brown pelican are threatened with extinction in the United States through this process of interference by DDT with reproduction.

Song birds are also killed by DDT sprayed from the air in insect control programs. Following these applications many birds die quickly from nerve poisoning, ~~and~~ In experimental areas they have been found dead on their nests. Robins are destroyed by the thousands by Dutch elm disease control programs. In this case they die from eating earth worms in whose bodies DDT, washed into the soil from the treated elms, has become ~~highly~~ concentrated. Rachel Carson's gloomy prediction of a silent spring might well become a reality if the widespread spraying with DDT is not stopped. A very great obstacle to ending its use is bureaucratic inertia. For a long time after it became obvious that the fire ant eradication program in the Gulf states was not eradicating the fire ant, but was destroying wild life, it nevertheless was continued, despite the vigorous objection of congressmen from the states involved. The same thing happened on a lower governmental level in Detroit in an attempt to eliminate the Japanese beetle. Eradication is a favorite term among entomologists in the Department of Agriculture although no extermination of insects by chemical poisons has ever been successful.

The difficulty centers in the rate of reproduction of insects which produce many generations in one season providing the opportunity to develop mutant strains resistant to the poisons. The phenomenon of developed

resistance has occurred time and again with mosquitoes and various other insects. The immediate reaction to the appearance of resistant strains is to use more and greater concentrations of insecticide, which does no good, but does kill many higher forms of life. Those who defend the continued manufacture and use of DDT on the grounds that it has saved innumerable lives in malaria countries never mention the resistance factor. It would be interesting to know in how many anti-malarial programs a shift ~~in~~ to other chemicals has been necessary. ~~A search for biodegradable anti-anopheles agents should certainly be undertaken~~.

More alarming consequences ~~from~~ of the dissemination of chlorinated hydrocarbons throughout the environment are becoming apparent. Owing to the low solubility in water of DDT and its allies, their advent in the environment has gone largely unnoticed before the harm they produce has become evident. Thus, such minute amounts as one part in a trillion kill brine shrimps. Therefore to monitor the dispersion of these toxins by sampling the environment could be misleading. A sounder method, which will give a more realistic picture of the situation, is to analyze animals at various levels of the food chain in which the hydrocarbons are concentrated. The sensitivity of fresh water fish to DDT has long been known, but not

until recent years has an influence on marine fisheries been observed. DDT enters the oceans from the land, is picked up by phytoplankton and passed on up the food chain to the fishes among which it may eventually cause extensive die-offs. But it also acts to decrease photosynthesis ~~by~~ in the phytoplankton. Since more than half the world's photosynthesis is carried on by these single-celled algae, any significant reduction in their activity could have profound and possibly irreversible effects on the equilibrium of the biosphere. Reduction of photosynthesis will lead to gradual loss of atmospheric oxygen with serious consequences to all animal life including man.

Fertilizers washed from the land into rivers and lakes are disrupting hydrological ecology. Nitrates in excessive amounts cause blooms of algea that interfere with the normal biota of lakes, leading to the disappearance of many aquatic types. They have probably contributed to the degradation of Lake Erie. These untoward results could largely be obviated if the practice of over-fertilization (like the practice of over-spraying with pesticides) were discouraged, ~~but it would require an educational program in conflict with sales campaigns of the fertilizer manufacturers.~~ In some mid-western communities nitrates in the runoff from farmland have

contaminated water supplies rendering them undrinkable.

With spreading smog from industry and automobiles, with rising carbon dioxide concentrations in the atmosphere from fossil fuel combustion, with

If ~~all~~ the ~~various kinds of~~ damage being wrought on the the various kinds of and environment by/pollution, ~~of all kinds by~~ insecticides, ~~by~~ fertilizers is not soon arested, the efforts of conservationists to preserve wild ~~areas~~ and wilderness areas and wild life refuges will all be in vain. The preserved fragments of a once beautiful earth, alomg with all the rest, will sink into total degeneration. A wiser custodianship than this of man's heritage is needed for survival.

~~[illegible], along with all the rest, will descend~~ into the sink of total ~~degradation~~ degeneration if men do not practice a wiser custodianship of their heritage.

Why is it to our interest to preserve the environment in part in its primeval condition? Why should we not exploit it all, eliminating that which has no apparent value? In the first place, purely pragmatically, we are not omniscient; we know not, nor are we able to imagine, what material use we may yet discover for some element of the environment which we now regard as useless. We know not, nor may we ever know, enough about the complexities of world ecology to foresee the long range consequences of manipulation, which might well ~~be~~ turn out to our disadvantage. But a still

more compelling biological reason exists to eschew the temptation to simplify our environment. No people are wise enough to forecast with certainty the evolutionary potential of the mass of life. Indeed we have succeeded in tracing the histories of some individual species in their wanderings through the ages from their bones and footprints, and we can with some degree of certainty predict the future of a few others who seem to waiver on the brink of extinction, but we possess little insight into the destiny of the vast majority of living things. What intelligent being would have predicted, with no clues to go by other than those available to it at the time, the splendid future that lay ahead for a shy, hairy, shrew-like animal, the ancestor of mammals, who shared the Mesozoic swamps with the dinosaurs?

Evolution draws upon diversity. The abundance of life on this planet - its incredible variety - should make this statement self-evident. Out of the richness of life new organisms are steadily appearing to take the place of those that failed. The readiness with which replacements occur depend on the ~~availability~~ supply of forms of life which potentially can adapt to new conditions, to the conditions under which the extinguished organisms failed to survive. The more life available there is, the more quickly the vacancy will be filled, and conversely the simpler the biota the longer

the time required to fill the empty ecological nitches. Many oceanic islands illustrate this phenomenon of a simplified biota perpetuating itself. What happens on a limited scale in isolated areas, however, has little influence on the totality of world life, but when man, with his power for destruction, attacks the whole biota in the name of greater efficiency, in exploitation of his ~~self~~-assumed interests, he runs the risk of carrying the simplification of the ecosystem beyond the point of recovery. Enough variety to fill the gaps he has created may not survive. Through ignorance he could so reduce the genetic reservoir that an unexpected disaster to any of the remaining species might threaten his own survival.

A more compelling argument for all who accept a longer view of man's dominance on this ~~lonely satellite~~ isolated planet is that the quality of his tenure, so breath-takingly short, is inextricably interwoven with the lives of all his companions. He cannot do without them. A few pathogenes could no doubt be dispensed with, but the vast majority, not confined alone to those he eats or weaves into shelter for his body, are essential to his welfare - to his psychic health. They enter into his life on many levels, enriching it, adding variety without which living would become ~~a~~ wearisome ~~monoton~~y. It has been said that wildness is a luxury, a commodity with which

man will be forced to dispense as his occupancy of the earth approaches saturation. If this comes about then he is finished. Wilderness must be preserved because wilderness is a spiritual necessity. Even though few may visit wilderness areas they remain an open back door, a safety valve, for those who never enter them but know they are there and a way out in case the going gets too rough.

With wilderness all gone, paved over, plowed under, deforested, leveled by bulldozers, built on, and sterilized; with recreation mechanized, controlled, regimented, and socialized; with all ~~these in the face of~~ this imposed on an increasing need to escape the dull, ~~deadening humdrum~~ monotony of their self-imposed prisons, men will cease to lead biologically integrated lives, ~~because~~ they will have destroyed the ~~essential basis for participation in the total living community~~ total living community in which participation is so essential for their well being. Under these conditions meaning will go out of life, inspiration and joy will fade away, people will become apathetic, listless, and, if observations on other animals have any significance for humans, sexual drives will wither. Then the birth rate will fall; ~~no effort to reverse the trend could be sustained - the end result: extinction.~~ Perhaps we see here nature's way, short of war or famine, of solving the population crisis, but, in the light of man's manifest intelligence, even without much wisdom to go with it, I find it difficult to accept such a solution. Before it

is too late men should, men must, awake to the hard facts of their inescapable self-interest.

At the foundation of these awesome problems facing mankind is the elementary one of numbers - of how many people is consistent with the health and survival of his species. Animals are not very good at this kind of self-appraisal. No species has ever voluntarily brought its multiplication to a halt, but then there never has existed before a creature endowed with a brain capable of self-examination. So perhaps at last the miracle of self-limitation will take place. Unless mankind does stop the runaway population growth and stabilizes his numbers at a level compatible with the existance of a maximum diversity of his earthly companions, all efforts to prevent degradation of the environment by pollution, by dissemination of chemicals, by misuse of land, by improvident mining of resources are doomed to failure. And when these efforts fail the reservation of National Parks, wildernesses, and wild life preserves become meaningless because they will protect and preserve nothing.

The worldwide spurt in the human population which has been viewed with growing misgivings by conservationist, ecologist, demographers, and politicans alike is a direct consequence of the phenomenal advances in public health and medical science in this

century. The series of technological break-throughs in medicine which have occurred since 1900 have so drastically reduced the death rate in all the densely populated countries of the world that their populations have doubled and re-doubled in this time. During the same period the productivity of the world has not kept pace with the growing numbers of people. Today a food deficite exists creating starvation conditions for millions in the underdeveloped countries in which violence, riots, and mindless slaughter are becoming ever more frequent phenomena. Within the next decade some ecologists predict - and the time is probably too late to prevent them - widespread famines will overwhelm densely populated regions of the world like India and South America. Death by starvation is nature's way of re-establishing a balance between populations and food supplies, but it is not an orderly way; disruption of whole ~~civilizations~~ Cultures and chaos are the by-products. A heroic attempt is ~~called for~~ in order to ameliorate the situation by lowering the birth rate to ~~bring it into~~ correspondence with or below the death rate. Responsibility for devising a program to realize a stable population rests with science, particularly with medical science, with support from governments. William Vogt in Road to Survival in 1948 persuasively describes how modern medicine, blind to long term effects, has successfully reduced the death

rate from disease in the most over-crowded countries without devoting comparable effort to birth control. The result has been a net increase in misery and hopelessness.

If doctors feel a moral obligation under the Aesculapian code to alleviate human suffering, ~~and~~ but in the process of saving lives foster more suffering by raising the population density beyond the carrying capacity of available resources - and I mean intangible as well as tangible resources - then they ~~have tacitly~~ must accept~~ed~~ an equal moral responsibility for preventing children being born into misery. To prevent death from smallpox, malaria, cholera, and innumerable other diseases with no greater promise than a life of despair, and ~~with~~ ultimate death from famine, is no fulfillment of the pledge. Better to die, or not to have been born, than kept alive for such a fate, since the prospect for hundreds of millions of children yet to be born in this century is no less desperate, unless the trend is reversed, the obligation of the medical profession to work for a reduction of the birth rate is clear.