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KEYNOTE ADDRESS - VERTEBRATES: A RESOURCE NEEDING MANAGEMENT

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A veritable storm of concern for wildlife - approaching biotechnology - is currently sweeping the nation. Some of this concern has a sound basis. But the very best of ideas and programs can be carried so far that they become irrational. We appear to be driving head-on into irrational actions with respect to environmental good housekeeping.

The vegetative cover in the United States has changed markedly as the result of Man's occupancy, reducing the habitat on which some wildlife species depend and greatly enhancing that of others. Competition, a no-holds-barred struggle, continues unabated between all living things for the finite amount of energy and space this globe provides. The problem areas for man are thus constantly shifting. Let us not delude ourselves that we have achieved anything more than a stand-off. The new "fronts" in the management of populations of vertebrates are no less vital to man's welfare than those times when our first concern was for animals too big for us to cope with bare-handed or so numerous they overwhelmed our efforts.

Typical of the irrational approach to solving environmental problems is the objection to management, per se - a "leave Nature to her own devices" philosophy. Anyone engaged professionally in bird, rodent or predator control is looked down upon by the academic biologist and bears numerous scars from encounters with textbook ecologists and environmental activists. Chemicals as tools for manipulating the plant composition or the populations of animals are in marked disfavor. There is but one interpretation - too many people *are* speaking outside their field of competence. Extremists attract the press, and politicians are susceptible to the publicity generated.

Of the 1 million animal species which inhabit this globe vertebrates constitute that segment most familiar to the public. Fish, amphibians, reptiles, birds and mammals are creatures readily observed, photographed, hunted, and to a degree, integrated into the human community. A number of these same species are essential and important sources of animal protein foods. Our affluent society has now magnified one of these values - that of experiencing free-living wildlife. The cloak of preservation has been thrown about them without any real knowledge of the demands these wildlife populations will impose on the resources or how they can be held in numerical balance, one with another. The oft expressed concept of "the right to survive" is a misinterpretation of natural laws that only extends "the right to compete for survival."

There are at least four basic needs for managing the vertebrate populations. I employ the term "NEED" quite deliberately as indicating something that is required, the only choice being in how we accomplish it. First, certain vertebrates are an imminent hazard. Either because they can employ a lethal defense mechanism, or because they happen to be vectors of disease. Certainly we would seldom find cause to reduce the number of bats (Myotis sp.) if the population is free of rabies. We would be more interested in building up the population of furbearers such as the red fox (Vulpes fulva) and the striped skunk (Mephitis mephitis) than being forced to reduce the population - again because of rabies. Grizzly bears Ursus horribilis) and tourists don't go together any better than a copperhead snake (Agkistrodon sp.) in the flowerbed where the family has small children.

Second, wildlife literally helps itself to the food supplies of the area. Many species depend importantly on growing crops or stored food supplies of man. The numbers that can be tolerated depend on limits dictated by the degree of injury to the resource. A porcupine (Erethizon dorsatum) in a 150 year old maple sugar "bush" does an inordinate amount of damage for the few meals acquired. A single pocket gopher (Geomys sp.) on a sandy terraced field can cause havoc. One mockingbird (Mimus polyglottos) purloining small fruits from a backyard garden can easily be tolerated but birds have the unfortunate habit of ganging-up and overdoing a good thing.

Third, vertebrates quite frequently require management of their populations for their own benefit. Under the stimulus of new habitat conditions and abundant food they not infrequently over-reach the carrying capacity of the area. If the cycle is permitted to continue to its ultimate end the habitat may be so damaged by the time the population

collapses, that few individuals can be sustained for extended periods of time thereafter. The history of big game animals in the United States furnishes numerous examples of this problem. Beaver (Castor canadensis) under low predator and utilization pressure of modern times can literally de-forest everything within reach of its engineered impoundments.

The problem of over-population does not necessarily result in a precipitous collapse of the population but the result may be almost as unsatisfactory. A lake in which bluegills (Lepomis macrochirus) have become overly abundant remains choked with small stunted fish.

Lastly, vertebrate populations require control when they get out-of-balance and exert adverse effects on associated species which man is endeavoring to perpetuate. Off the New England coast attempts have been made to check the explosive increase of the herring gull (Larus argentatus). No marine environment would be complete without a few of these distinctive birds. On the other hand, released from the centuries-old pressure of egging, and protection by International Treaty, this bird has progressively extended its breeding range south to New Jersey and Delaware. It is a serious predator on the eggs and young of other species of shorebirds. A marked decline in the numbers of terns (Sterninae), the common eider (Somateria roollissima), black ducks (Anas rubripes) and many other island nesting species takes place when the herring gull arrives in large numbers.

In Northern Michigan a valiant attempt is being made to protect the nesting habitat of an endangered species, the Kirtland's Warbler (Dendroica kirtlandii). The effort appears to be losing ground. The ornithologists involved believe that this is due in a large part to the egg substitution in the warbler's nests by the cowbird (Molothrus ater).

For a number of years in the Eastern United States we have been witnessing the successful adaptation of the raccoon (Procyon lotor) to land use patterns as they presently exist. Despite extensive game and fur harvests the raccoon remains overly abundant in many areas. Supplemental control is required to protect waterfowl and other ground nesting birds. For example, in establishing artificial nesting platforms for the osprey (Pandion haliaetus), attention must always be given to mechanical predator guards on platform supports.

In these few illustrations I have deliberately avoided reference to obvious pest species, for the problems they constitute are rather well known.

In considering the topic of pollution and environmental degradation, the popular concept that man alone is responsible is quite fallacious. Please recall that environmental concern has embraced temporary situations and laid stress on the aesthetics. There is hardly a more dramatic example of what uncontrolled wildlife populations can do than is found in historical accounts of deer (Odocoileus sp.) and other big game in the United States. The destruction of the vegetation on the Kaibab in Arizona and its extremely slow recovery is classical. The rise and collapse of the moose (Alces americana) population on Isle Royale National Park in Lake Superior caused serious degradation of the habitat. As recently as 1957 in a seven state area in the Northwestern U. S. meadow mice (Microtus sp.) reached levels of 3,000 per acre and not only laid waste surface vegetation but mined the soil for roots. (1) One year later (1958) the cotton rat (Sigmodon hispidus) reached plague numbers in two broad areas of Texas. Significant environmental damage resulted from the girdling of the more slowly replaced trees and shrubs.

In the early 1930's, by way of some man-made links between the Great Lakes and the St. Lawrence River, a highly destructive vertebrate, the sea lamprey (Petromyzon marinus) became established in the Nation's most important fresh water fishery. By the early 1960's this parasitic eel had contributed to the collapse of the commercial fishery in Lake Huron and Lake Michigan for such valuable species as the lake trout (Salvelinus namaycush), lake whitefish (Coregonus clupeaformis), yellow perch (Perca flavescens)and other large predatory fish. This was not only environmental damage through lessening the diversity of aquatic species in the Great Lakes; but by diminishing predatory fish it furnished a competitive advantage to another newcomer to the Great Lakes, the alewife (Alosa pseudoharengus). In Lake Michigan, alewives were taken for the first time in 1949, yet by 1966 represented 80 percent of all fish in the lake. By sheer numbers in competition for food the alewives severely depressed the abundance of other forage fish in the lake such as the chubs (Leucichthys sp.), the American smelt (Osmerus mordax), the emerald shiner (Notropis atherinoides) and others - an adverse environmental effect. Then, as a crowning insult, in the summer of 1967 the alewives died by the hundreds of thousands, littering the beaches of Lake Michigan and caving-in the screens of the Chicago water intake - truly a pollution problem.

While uncontrolled vertebrate populations can and do cause adverse environmental effects, they are guilty locally of contributing to pollution of the environment - not too much different from man. Certainly house rats (Rattus sp.) and mice (Mus musculus) can be considered as pollutants, per se. The starlings (Sturnus vulgaris) that roost by the thousands on the window ledges and trim of downtown buildings are not far behind. As for the eutrophication of small lakes through over-enrichment, may I call your attention to the nesting rookeries of herons and the beautiful snowy egret (Leucophoyx thula). Hardly less of a problem with respect to over-enrichment and algal blooms are the concentrations of tens of thousands of geese, ducks, and other waterfowl that winter with us. And in the "good ol' days" of the past, I can imagine in what shape a particular segment of the western prairie looked like after a herd of 10,000 buffalo (Bison bison) had tramped, fed, and wallowed over it.

Management can do much to alleviate the more serious problems of vertebrate wildlife impact on the environment. However, in so doing we have to determine whether the benefits achieved out-weigh the effort, cost, and risk to achieve them. We need an appraisal of each program that will permit a benefit/risk evaluation.

We have quite a variety of "tools" at our disposal for management of vertebrate populations: hunting, both sport and professional; denning and nest destruction; trapping, both deadfall and for transfer; chemical controls, toxic agents, repellents, attractants, and fumigants; biological controls, micro and macro predation, habitat manipulation; and lastly mechanical, electrical, thermal and physical barriers and deterrents. Most encouraging is the fact that significant funding is going into research to augment the types, efficiency and safety of control methods. However, we are not well enough equipped for the task of managing so complex an assortment of animal life (41,100 species of vertebrates in the world) that we should lightly accept legislative or administrative bans on any tool, be it a State anti-steel trap law or a flat prohibition of toxic agents against a class of pests requiring control. On the other hand, it is logical to impose strict regulations on the use of any high-risk control method, defining who may employ it and under what circumstance the use is justified.

As we are beginning to comprehend, there is almost no vertebrate alive that doesn't have a champion somewhere. Preservation of a segment of every known species is a program that receives popular support. Very few persons recognize, however, what an irrational and unachievable task we may have set for ourselves. Establishing a complex of sanctuaries, where environmental deficiencies can be artificially provided, is the only means at our disposal. With the larger and more colorful species it is worth a try. In this connection I am not speaking about species endangered through over harvesting by man and where the habitat is still reasonably suitable. In this field the wildlife manager has many accomplishments in the last 40 years about which he can be justifiably proud. It is this involvement in habitat management that has focused attention on control programs, demanding that they be specific and without detectable side effects. Biological control is understood by the general public to fulfill this requirement.

Unfortunately no approach to wildlife management is without possible side effects. Enhancing habitat conditions for one vertebrate species almost invariably lessens its usefulness for another. None of the management "tools" are completely selective and safe, whether we are speaking about traps, coyote getters, toxic baits, or biological controls. Since chemical controls have recently acquired such a bad reputation, the statement that they can be far more selective than biological controls is met with incredulity and disbelief. The Massachusetts Audubon Society has a problem. On the off-shore nesting islands the herring gull populations have to be reduced if the rich variety of other nesting species is to continue. Having rather outspoken reservations about the use of chemical controls the society joined the Bureau of Sport Fisheries and Wildlife in a limited 4-year experiment using a biological control on six small islands. (4) Each season, shortly after nesting began, two red foxes (Vulpes fulva) or two raccoons were released on each island. An attempt was made to trap and remove the predators later in the season as there was not sufficient food to carry them the year around. The program succeeded well in eliminating reproduction of gulls and in reducing colony size in succeeding years. It is obvious, however, that this biological control has very definite limitations. Neither the fox nor the raccoon is very choosy about the species of egg or chick it feeds upon. On the other hand, chemical methods are known that can selectively remove adult gulls, or merely suppress reproduction, IN THE PRESENCE OF OTHER NESTING SPECIES.

When conventional control methods failed to bring the European hare (Oryctolagus cuniculus) under control in Australia, they turned to a biological tool, myxoma virus, the causative agent of a fatal disease in rabbits, myxomatosis. (5) Having the proper conditions for the spread of the virus by a vector mosquito, the program was outstandingly successful. This same rabbit was a pest - a serious pest - in England and France. However, it was known to be lethal to domestic rabbits and strenuous efforts were made to keep it from being introduced there. Unfortunately the landowners with a rabbit problem had other ideas, and the subsequent smuggling and transfer of infected rabbits inflicted losses on the domestic rabbit trade. We had a jackrabbit (Lepus sp.) problem of no small proportion in the United States at the same time, but in addition to domestic rabbits raised for meat, we also had a valuable wild population of cottontails, (Sylvilagus sp.) , snowshoe, (Lepus americanus), swamp rabbits, (Silvilagus aquaticus) and others we simply could not endanger. The introduction of myxoma virus was strictly forbidden.

In the early days of rodent control, still another biological pathogen was marketed in Europe for control of house rats. Early in the 1930's this material was given limited trial by the Denver Wildlife Research Laboratory. Although the acceptance and kill was not outstanding basically the fact that the pathogen, (Salmonella sp.), was also the causative organism of food poisoning in man eliminated it from consideration.

It is an indisputable fact that there is no completely safe toxic agent for the removal of vertebrate pests. It is equally true that in professional hands the hazard to other than the target species can be reduced to acceptable levels - acceptable in terms of an adequate benefit/risk appraisal. For example, Dr. Vernon C. Applegate and associates in the U. S. Bureau of Commercial Fisheries began in 1953 the long arduous task of discovering a selective chemical that would destroy the larval, stream bottom-burrowing stage of the lamprey eel. Previously control attempted with mechanical and electrical barriers at the mouth of spawning streams had not sufficiently reduced the eel. After screening some 6,000 chemicals at the Hammond Bay Laboratory a satisfactory chemical known as TFM (3-Trifluormethyl-4-nitrophenol) was discovered. (6) Many other safety evaluations followed before it was put into use to treat all tributaries of Lake Superior in which lamprey were found to spawn. Progressively, as time and money permitted, the program was expanded to Lake Michigan and finally Lake Huron. Eradication of the lamprey from the Great Lakes by use of TFM (or any other control device) should not be expected - only the effective suppression of the population. Control of the sea lamprey, plus a fish restocking program by Michigan Department of Natural Resources earned for Lake Michigan in 1970 the appellation, "World's Greatest Fishin' Hole." (7) While still annoyed by illegal pesticide residues that prevents return to commercial ventures, the growth of fish in Lake Michigan is almost unbelievable. Coho salmon (Oncorphynchus kisutch) released into Lake Michigan grow from one ounce to an average of 10-12 pounds in18 months. In fact, the world's record weight coho salmon (33 lbs. 3 ozs.) showed up at the weir on one of Lake Michigan's tributary streams, the Little Manistee River. Lake trout are returning to the Great Lakes in record numbers after an absence of nearly 30 years. Steelhead and/or Rainbow trout (Salmo gairdneri) and brown trout (Salmo trutta) are growing even more rapidly in Lake Michigan than in inland water - and spawning naturally. Now the Chinook salmon (Oncorhynchus tshawytscha) has joined the ranks of introduced fish and individuals weighing 40-50 lbs. are expected to be boated this year (34 pounders have already been taken). This has all been possible because of a pesticide, - a pesticide that is not completely safe for all species of fish at stream treatment levels. However, the benefit/risk evaluation is easy to make.

Times have changed. It has been decided that pesticide chemicals carrying a label direction for direct application to water must now provide information that will enable The Environmental Protection Agency, Food and Drug Division, to establish a finite tolerance in fish if Federal registration is to be continued. So it is back to the drawing board for TFM and an estimated expenditure of several hundred thousand dollars.

One by one the traditional toxic agents for predator animal and rodent control are being regulated out of existance. A part of this action is due to the narrowing margin between benefit and risk. We have succeeded so well in getting on top of the major problems of 30-40 years past that the present need (benefit) for control is not clearly evident to the decision makers. In part also, these actions of removing chemical tools rather than setting limits on the programs they serve stems from any real knowledge of the rebounding nature of these vertebrate problems. In a publication in 1948 entitled, "Applied Ecology of Predation on Livestock Ranges," Clifford Presnall points out that until the annual take of coyotes by hunters supervised by the Fish and Wildlife Service reach 100,000

their population on western ranges if anything increased. It was recognized at that time that "coyote predation upon grazing animals is directed chiefly against sheep, with goats, antelope and deer next in importance." (8) You can rest assured that the coyote has lost nothing of his adaptability to live in close association with man's activity. Nor has its reproduction potential declined. We were unable to bring the population down originally by trapping and hunting and that method is unlikely to hold even the relatively small numbers in check now. The decision of the Federal Government to withdraw their professionally trained staff from supervision of the use of chemical tools against an unwanted predator has to be based on the fact that the program is politically unpopular, - not that they could not employ toxic chemicals correctly and with reasonable safety.

The problems of managing vertebrate populations still exist. Perhaps they are not as acute, but they have not gone away. Much of the credibility of professionals seems to have been lost to environmental emotions. We need to make the necessary adjustments to new situations but should not relinquish leadership in the field to sidewalk architects, lest we end up once again with only a mousetrap.

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