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Vertebrate Damage Management: The Future of an Evolving Profession

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VERTEBRATE DAMAGE MANAGEMENT: THE FUTURE OF AN EVOLVING PROFESSION

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Abstract: The author argues that an objective of a new group of people taking a systems approach to large wild animal problems should be to manage damage as a cost-reducing role within a total, profitable, long-term system, not necessarily to control the "pest." The needs are for well-grounded financial analyses both for customers, the public, the resources, and the well-being of the profession. A point of view is advanced for the need for evolving pest-related operations into a new, unique profession that is involved in a profound way as an element of a cost-effective total land and human resource production system.

Key Words: damage management, financial analyses, pest, resource production system, systems approach, vertebrate

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INTRODUCTION

Over my career I have backed into things. Not in my car, but in the woods! I backed into maple thickets in Oregon, blackberry bushes in the Virginia Piedmont, "laurel" (rhododendron) in North Carolina, and who knows what collection of awful things in Florida. I expect you understand very well the term "backing in." I want to back into some ideas in this paper. I have advocated to my classes in Systems Ecology that they back into their analyses. I also say "start at the end." By this I mean think about the desired end conditions, the history you wish you could read, or what you expect in some final evaluation report, and then work backwards, *up* the flow chart, to be sure that the desired final condition happens. We need now to look into an analysis of vertebrate damage management for the future.

PRACTICAL MEMORY

Ray Hilborn (1992), a fisheries scientist, complained that fisheries, as a field of work, has no *institutional memory*. As we think about the vertebrate damage management system for the future, we need to be sure we have a memory that prevents us from making that claim and the same mistakes. We cannot avoid making mistakes (for reasons too many to discuss here). We usually can avoid making the same mistake. Hilborn (1992) observed that there are few places where the need for institutional learning has occurred (March 1988), but there is evidence that it can occur and it is intuitive that it is needed.

There have been amazing changes in technology and in society, and some people will argue that history has little meaning today. I only argue that many good ideas have failed because of a poor presentation or because they were presented at the wrong time or place, or to the wrong person. The past system context for an idea may have been wrong; failure was not necessarily due to the quality of the idea. To document the reason for the failure may allow the efficiencies of the idea to be gained later. History does cost, but so does any mistake or past inefficiency. We need a cost-effective memory, one that is brief, practical, and oriented to a high probability of retrieval. We need one with a mechanism for being moved into current decision making.

In order to develop a practical memory, I suggest:

1. Periodic staff debriefing (twice a year reviews; the recent history).
2. A computer question-and-answer system designed to prompt people (once-a-year use) for answers and comments that may be useful later. This is a growing computer file of expert commentary.
3. Old-timer seminars (suggested by

Hilborn 1992).

4. Memoirs of retirees commissioned by the collective profession and written (as needed) with paid assistance.
5. New staff requirements (that they at least read important components and abstracts of the various historical media).

The history needs to be practical. I assume that much learning is built into policies. These tend to suggest limits and things to avoid and often emerge from past problems. Most people in the audience have heard: "Get rid of the massive policy manual!" However, at least the grounds for the policy manual need to be remembered. Policy doesn't emerge on its own.

I assume that techniques will be improved and thus embodied within each of them is a form of institutional learning. I am more concerned about remembering what did not work and why it was changed. I am even more concerned that the reason why the technique was first used may have changed. This is called "displacement of the objective" and it brings me to my next topic.

OBJECTIVES

By "starting at the end," I mean that we need a clear statement of a destination. That is the only way we can tell when we have arrived (the clarity of the logic exceeds the clarity of the map to the destination). What will be the "good" in this history that we create for ourselves? We have to be sure that our work on improved traps, trapping, devices, and repellents does not displace the objective. Why were we doing the work in the first place? Perhaps the objective was *improved profit.* If so, the evaluation of our work in the net income column should not be displaced by trap effectiveness, number of traps, area covered, or animals taken. There can be *big* differences between the two.

I have studied objectives and objective setting for years (Giles 1981) and with students (Buffington 1972, Cowles and Giles 1982, Lee 1972, Lobdell 1972, Ritter 1975, Waldon 1987). It is a topic as discussable as UFOs and, based on the evidence that I now have, just about as meaningful. Over many years I have argued for stating a large *set* of objectives (because we have many), estimating the *amounts* of each product or service that we need, assigning relative *importance* to each (because I know they are not of equal importance), assigning a *probability* of success or failure (because nature, weather, etc., will have its way no matter what our objectives may be), and then stating what we will *substitute* for some of those things we "demand." This all gets very complicated, but it is readily handled by computer. At least the equation and the relations described in it can help people understand and explain why some people are so sympathetic and other people have such disagreements. The chance of two people having equal objectives is almost zero.

Vertebrate damage management specialists (managers) are perceived (at least by me) as working at all parts of the system to achieve a high score using these concepts within a computer. The score improves as they reduce losses, achieve demand, modify values, make expectations realistic, encourage substitutions, and reduce costs and losses.

Now, however, I give up! I've fought the good fight and failed. I give up on trying to get people to work with such objectives. I suggest that the objective for our field be

> *to assist (public and private) land and property owners maximize profits partially by minimizing system costs (and equivalent actual or perceived losses) to vertebrate wild and semi-domestic animals, all subject to legal, ecological, economic, esthetic, and energetic constraints; all within* a *10% zone* of *performance; and all counted over a dynamic 100-year planning period.*

That is it. That is all. Just do it, any way possible. The scientists can work on the basic processes; the economists can work on the algorithms; the foresters and agronomists can worry about whether "yield" means wood, tomatoes, or profit; the nay-sayers can debate profit-motives, the free-market, and entrepreneurial systems. The ecologists can

struggle with what “relations” really mean and search for true "interactions;" and the vertebrate damage managers can work with them all.

VDM

I do not approve of the word “integrated” in IPM (integrated pest management) (ct. Giles 1980). If I am managing, I am integrating, I am working with everything all at once. The modern person working in our field is working with a whole complex system. Such people are attempting to manage (or assist in managing) a whole system. Not to *integrate* things as a manager is silly, without meaning. I am opposed to the idea of managing pests. I want to manage their effect or perceived effect (e.g., a bat flying through a bakery). I may have to kill or move an animal or increase its predators, but I can use barriers. I can use metal containers. When I exclude mice from grain, am I managing pests? Poisoning them, yes; excluding them, I think not. Of course I am managing their effects. When I prevent damage, I rarely do anything to the animals themselves. When I change knowledge of a cute animal into a disease vector, have I managed the pest? I think not; only the perception of the animal problem. I think we should manage perceived damage and reduce it at reasonable costs, not just manage pests.

I have no option but to hold on to the word vertebrate. As a person advocating a total system view, I see no way to separate high quality work on reducing costs and losses from wild animals -- whether they are vertebrates or invertebrates is a matter of their bones, not my practice. When I think of mosquitoes, I am thinking of tree holes and birds and flying squirrels. When I think of mice, I think of fleas, plague, and hanta virus. When I recommend “sanitation,” I am as involved in reducing invertebrates as with vertebrates. When I work with moles, I am actively involved (or believe I should be) with invertebrates, the creatures in the soil. I give up! Use “vertebrate;” draw another line, restrict our work and thoughts; but let us realize what we have done. Let us see these divisions that we have made as a regional line created for efficiency, employment, and for teaching and not as ground to be fought over as if by territorial squawking birds.

We are not wildlife managers because they cannot decide who they are. They cannot decide and neither can we. They call themselves “biologists,” but rarely do they talk about botany, require little botany in their education, spend 80% of their professional time working with groups of plants (which they call “habitat”), and cannot recognize a professional society take-over by an emerging bunch with the non-name of “conservation biology.” “Teaming with Wildlife,” a national tax proposal, if successful, will unleash massive new pest problems. Agencies have struggled with names and proper “homes” for vertebrate damage management work for years. The U.S. Fish and Wildlife Service, with its own identity crises over many years (in the very name itself), allowed damage work to move to the U.S. Department of Agriculture. Amazed observers note that moves within Departments are common; between Departments, rare.

We are regulators; we are “Extension;” we are emergency services; we are public health workers; members of the agroforestry and agro-silvo-pastoral efforts. We are very diverse and scattered unequally throughout health fields, agriculture, military, product suppliers, inventors, and livestock people. As customs workers, we stand guard to prevent invasions; as students, we follow those creatures already having invaded. My view is that the demands for effective vertebrate damage management are profound. They encompass all of the concepts, techniques, and work of the field once called game management, now called imprecisely and inaccurately wildlife management. They demand breadth of knowledge of ecology (more than classical wildlife management), and simultaneously they require use of the extra knowledge domains of economics, esthetics, and energetics ... all within the envelope of enforcement systems. This will not be embraced by any agency, any university. We need total systems people. What person recommends costly population controls to a person otherwise going into bankruptcy? What person accepts costs of operations far greater than the benefits likely to be received? What more than the most

simple economics requires that we discount treatment costs over the life of a program if we are going to do reasonable financial analyses? More than "biologists" are needed!

I am now convinced that more good for humanity can be done over the next 20 years for the expanding world of 5.7 billion people by those people in the vertebrate damage management area than by all advances in agricultural research (Huffaker et al. 1976). We can reduce *losses* of the total production by 10% or more; agriculturists are not likely to increase net *production* by that much. Vertebrate damage management is an essential in modern society. It is an essential for survival. The population is expanding. We shall not bring it under control. It will double in 50 years at our present rate. It has already doubled since I've been on Earth. I feel crowded, stressed; things are half as sweet, we are more than twice as "bad off."

We have to see ourselves, clearly, to be very, very important for ourselves, our natural resources, and for our children. Who are we for the future? Vertebrate damage managers? I once defined wildlife management using the phrase "the science and art" (Giles 1971). I now reject that. Wildlife management just means deciding and manipulating populations, habitats, and people.[1] There is science and some art, but much more. It is just doing it. "Science" crept into my thought and that of U.S. society with Sputnik. If anything was scientific, it was good. That premise secretly slipped into "it is only good if it is scientific." Now we can step back and realize that there are many ways to know things. Science (typically induction/deduction) is only one. We need a new way to proceed. Science can help, but it is only one of many ways to know—to know how to manage vertebrate damage.

THE KNOWLEDGE BASE

We have to use the power of the geographic information system (Jones 1976, deSteiger and Giles 1981, Giles and Nielsen 1991) to understand what animals are involved where; what people are involved; what the estimated real losses are and how those will match with the estimated costs of control, enforcement, applications, and inspections. We now have wildlife information systems in >20 states; we have demonstrated we can "do ecology" at the level of areas about 1/3 the size of a football field. We've moved past speculation and dreams of Giles (1973) and into the world of monthly advances in relevant applications heralded in trade magazines (e.g., GIS World).

I have spent 30 years modeling natural resource systems and advocating use of systems analyses and computer decision aids (Giles 1979). I now finally realize that every model I attempted to create requires more data, more inputs, than I could *ever* get (e.g., Gruen 1993, Wajda 1993). I attributed my lack of success to *someone else's* failure to get and hold data for me. A simple vertebrate population model with any practical meaning requires a minimum of 34 pieces of information. I now realize that these data rarely are available for *any* population, even those most intensively studied! It is interesting to think about them, program them, simulate what would happen *if* certain numbers existed, but we now know that the numbers do not exist and the funds for getting them do not exist, and the time required to get and process them is too great for them to be of timely use. I once thought funny the statement "We can use a computer to predict exactly the next day's weather . . . but it takes a week to run it!" Just last year a forest model was reported to take 3 weeks to run on today's fast PCs! The situation is no longer funny. Timely approximations from feasible-to-run programs remain needed. We need powerful alternatives, one of which is a growing knowledge base with emphasis on ranges and medians, not means and deviation. We need all of the aspects of the rationally robust paradigm (Giles 1979, Giles et al. 1993).

[1]My current recommendation is: Wildlife management is making decisions and taking action to manipulate the structure, dynamics, and relations of wild animal (and plant) populations, faunal space, and people to achieve specific, stated human objectives by means of the wild fauna resource.

THE RATIONALLY ROBUST PARADIGM

There are 10 components of the paradigm that I propose (Giles et al. 1993) as a replacement paradigm for the pseudo-scientific, crisis-response, agency-bound, predominantly socialistic policies under which much vertebrate damage management work is now done. All of these, I assert, for the future are too concentrate on profit (within constraints) as defined above. They are:

1. Use site-specific knowledge, typically in a GIS, acknowledging that every site is unique.
2. Acknowledge the limits and consistency of financial support, minimizing costs and accepting the unlikelihood of long-term studies.
3. Accept lower confidence levels for (statistical) sampling and reaching conclusions.
4. Use estimates of median values (to replace the mean).
5. Use knowledge of range limits of ecological factors.
6. Study the general system's phenomenon of equifinality and its consequences.
7. De-emphasize time in system analyses, replacing it with other phenomena such as cumulative energy received.
8. Use regression techniques, simultaneously using factors that operate in many models (e.g., precipitation).
9. Use regression and modeling techniques to accommodate the non-linear nature of most economic, aesthetic, and ecological systems.
10. Operate as if in a clinical milieu, with conservative changes made rapidly with feedback.

CONSTRAINED PROFIT

Years ago, state operated soil-testing labs were privatized. Free (tax-paid) soil tests were inappropriate in an entrepreneurial system. Only when an open market existed did private soil labs become possible. By analogy, and for other more compelling reasons, I hold that vertebrate damage management can and should exist in an open market environment. The public is served inadequately by the budget-strapped, often inefficient agency. Needs are increasing; the tax base is not increasing; the customer is changing rapidly to the urbanite or to the agribusiness person. The power of the current knowledge of the field is not being used and developments for the future remain in the hands of a tax-limited few people in public agencies seeking to placate strongly-different, politically-weighted demands.

I believe studies should be done and techniques developed by companies to achieve a competitive edge. Superior students who will work will be recruited by well-paying companies. Effective practices will be used to achieve highest success for lowest cost as in any open-market system. Prevention contracts will be seen to be as valuable as fire insurance. Rapid-response units will form as collectives from within often-competing companies. Of course, there will remain regulation, the enforcement of which is the rightful role of agencies, but beyond this, there is the need for vital companies working to help landowners make profit, reducing inappropriate regulation and control costs, and either adding gains or reducing losses from vertebrates. A deer (for example) in a regulated environment is at once an urban pet, a crop destroyer, an aesthetic entity, and a potential trophy game animal. It destroys endangered plants, changes forest structure, contributes to improving forest site index, is a highway hazard, and is one vector of ticks transmitting Lyme disease. There is no "solution" for the deer problem. It is called by one analyst a "wicked problem" for which there is no solution, only the needs for management to blunt the extreme conditions for separate groups. The professional vertebrate damage manager is needed. Such people can deal with such large, complex, multi-faceted problems. How will they (or society or customers) know when they succeed when there is not a solution? By the measure of constrained profit. The constraints are ecological (do not extirpate; do not diminish an endangered species; work for desired natural productivity of forests, waters, and rangelands). The constraints also are economic or monetary (limited staff, equipment, budgets, cash flow, time, required profit, and discount rate). The constraints also are energetic (energy

conservation and preparedness for looming fossil-energy shortages). They are aesthetic (subject to group and individual sensibilities relative to humane tactics, animal care, and animal removals). Except for major public constraints (laws, regulations, and policies), moving professional work to the private sector allows an objective to be decided and progress to be made. Without such clarification, damage/or pest-related agencies are adrift. Their performance is recited in calls that are made by the public, counts of animals moved, and other numbers unrelated to their real objective—presumably the health, safety, welfare, economic well-being, and quality of life of citizens (Giles 1982). No one yet has a measure for the collective "social good" (except the scoring procedure suggested above) and I do not recommend waiting for one to be used. In our modern society, I recommend working toward constrained profit in a free enterprise system.

PROFIT VS YIELD

In creating a model of tomato disease, I discovered that the effect of disease on profit was not known. Must 100% crop loss always be assumed? Perhaps birds cause loss of grade in a fruit, but what is the total loss in profit for the year, given the current complex of supports, tariffs, and transportation cost? What was the tolerable loss for a landowner before the minimum profit threshold was passed?

I once suggested to an agency that my models of a boll weevil control program could suggest very effective control, so effective that it would increase cotton supplies and cause the price of cotton to drop, perhaps below a profit margin. I was encouraged not to pursue *that* line of analysis.

"Sustained yield" is required of the U.S. Forest Service. Often debated, it is very important that yield be interpreted as profit, not cubic yards of wood. Neither in forestry nor elsewhere is biological yield the end result needed. Sustained productivity of products in a deflated economy can lead to bankruptcy.

The point of these examples is that there is a need, a glowing opportunity for a modern profession of vertebrate damage management to step into the forestry-agricultural and the expanded residential-urban realm to help customers see clearly their monetary or financial situation and to engage in cost-effective analyses of their enterprise and the role that rational vertebrate damage management can play.

Critics for years have claimed that no one can quantify the worth of a duck or the beauty of a sunset. I advocate not trying, agreeing. My hypothesis is that "money talks;" that when financial concerns clearly are incorporated into a 100-year profit-making enterprise with all the needed societal constraints, then all of those extra, said to be non-quantifiable, needs will be amply accommodated—ducks and sunsets.

THE VDM SYSTEM

The professional manager is not yet being produced in the University. It is unlikely this will occur soon for reasons I am embarrassed to discuss, so I recommend and believe a high-intensity educational program can emerge. Created by one company or a collective, *education for profit* can emerge.

Research needs to be company specific, but a company also is likely to find that a research and development group may be useful. "Basic research" rarely will be tolerated; use of existing knowledge, synthesis, and modeling to help find the sensitive areas that can be manipulated will be the task of this group, which itself, can be financially self-sufficient.

The "pest control operator" has already had many tools removed from the arsenal of managerial tactics. The new profession needs to regain these, to overcome the reasons for past removals, and to exercise skillful, site-specific, timely, cost-effective field work *after* the computer-aided analysis has been made of expected financial returns in the context of the customer's needs (and society's constraints). [I find this free-market concept analogous to the freedom to go anywhere in the U.S., as long as you follow the rules of the road.]

We in vertebrate damage management have to achieve (at least in some place) a level of

expertise, competence, and image that will allow us to do the work needed. I have in mind an image of a Mayo Clinic, a Rand Corporation. I have in mind military special forces—Rangers or Seals. There are pieces of an image, one or more centers of exceptional capability in analyzing, designing, and implementing a vertebrate damage management system.

I am convinced that with increasing college costs, shrinking class hours, grade inflation, professors without experience, a persuasive reductionist research paradigm (which will not change soon), and narrow college departmentalism, there will be no graduates to hire for these imagined centers of excellence. Therefore, I see the need to privatize an educational center for the vertebrate damage management system. I do not believe we can count on any university. One or two modified curricula locked within the present-day university cannot handle the task or overcome the contextual inertia for the tasks ahead. Vertebrate damage managers need their own "special force" educational center, one that recruits special people, educates them (and continues to do so) to deal with the total production system for society, and then does it.

Along with the people of such a center there will be needed complex staff work to implement the selective, unique tasks usually needed. Usually average solutions are suboptimal. Suboptimum is the enemy. There is need for the injunction, the subvention, the emergency procedure—in carefully analyzed situations. The law is right for the average, everyday case; the law can be a messenger of policy and limits. The growing daily needs, however, are for the equivalent of laser surgery, and the military strike. We have a long way to go and we'll not achieve the perceived possible and needed changes in 50 state offices, several national offices, or several agency offices. We'll not achieve society's respect by defining ourselves as PCOs or as wildlifers with an emphasis, or as entomologists that apply their knowledge to large animals, or as health officers more interested in the virus than the vectors, and with a slogan of the question "but what can you do?"

Let me assure you that I am very serious. Do not dismiss the message today as that of an afterthought. We have within our grasp a profound need—safety, health, food, forests, rangeland, and quality urban spaces. We can have that only when a vital system of vertebrate damage management is operated. The need is too great and the solution too large and complex to be designed and managed by the average "grade-C" university graduate of a non-descript, small curriculum full of electives. It will not be handled well by a biologist never having a course in economics. The molecular biologist will not master "all ecology" in one watered-down, over-extended, and case history-infused course on that topic. With only 3% of the U.S. population now living on farms, the vocabulary of the field is no longer known by the person on the street. Without the words, there can be no understanding!

I do not like very much where my thoughts have taken me. Perhaps I should back track. Maybe "backing in" has been very bad. "Backing in" can be dangerous if you don't know where you are going. I know where vertebrate damage management must end up—a vital field of work serving all society, working to achieve the most profound of social, ecological, and esthetic objectives—working at purposefully achieving profitable partnerships in human health, safety, foods, welfare, recreation, and defense.

We are too important; we know too much; people suffer too much damage. We must develop a bold new strategy and then take action to create the vertebrate damage management so badly needed for the future.

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