EFFECTS OF FIELD VERTEBRATE PEST CONTROL ON NONTARGET WILDLIFE (with emphasis on bird and rodent control)

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ABSTRACT: Vertebrate pest control measures may have an impact on nontarget wildlife. Bird and rodent control programs using avicides and rodenticides in California have been, and are currently being, examined by the California Department of Fish and Game on a routine basis. Each pesticide used has its deleterious side effects. This paper reviews these side effects and suggests possible future impacts which could be expected.

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The California Department of Fish and Game is responsible for protecting the fish and wildlife of our state. It is the objective of the Department of Fish and Game to prevent the loss of wildlife from the effects of pesticides and to see that the habitat upon which fish and wildlife depend is not adversely affected. The Department does not endorse the use of any pesticide. However, we know that pesticides in various forms are generally acceptable and are being used for many purposes. Recognizing that pesticides are going to be used, we recommend that materials least hazardous to fish and wildlife are employed.

The California Department of Fish and Game (CDFG) organized our present investigatory unit in 1956 by establishing an Economic Poisons Section in its Game Management Branch. The Pesticide Investigations Unit is now located organizationally in the Environmental Services Division of the Department. The major duties of the unit are to prevent pesticide-caused adverse fish and wildlife effects by assessment of new pesticides or formulations, review of current pesticide uses for adverse effects, and by investigation of pesticide-caused fish and wildlife losses. As part of this we review all uses of pesticides, including bird and rodent control activities, especially since these use vertebrate pest control materials potentially hazardous to nontarget wildlife.

The mid-Seventies saw an increased awareness of "the environment." Because of this, legislation was introduced in 1975 at the state level to prohibit the use of avicides and rodenticides that could kill or injure threatened or endangered animals. This bill was vetoed by the Governor. However, he did ask the Departments of Food and Agriculture and Fish and Game to develop a workable legislative proposal on this issue. The directors of the two departments appointed a committee to comply with the Governor's request to seek a practical solution. A joint policy statement between the two departments and the California Agricultural Commissioners' Association was the result. The CDFG entered into this agreement in 1977 with the California Department of Food and Agriculture and the California Agricultural Commissioners' Association to review the counties' vertebrate pest control programs for impacts to threatened or endangered vertebrates. This is the basis for our current relationship, including review of materials and methods for impacts to all species of fish and wildlife.

Prior to this, the concern for protection of nontarget wildlife goes back quite a ways. A paper published in our scientific quarterly, "California Fish and Game" (Pierce and Clegg 1916), describes tests to determine if strychnine sulfate was hazardous to California quail (Callipepla californica). It was determined that field applications would not be hazardous. This was in 1916. This type of issue is still being debated in the strychnine reregistration proceedings. In 1952, a short time after sodium monofluoroacetate (compound 1080) was developed for field use, tests were run by the CDFG to determine clinical signs in California quail exposed by gavage to solutions of 1080 (Sayama and Brunetti 1952). Clinical signs were not definitive, but, again, it was found not to be hazardous to this species when used on a grain bait.

A more recent history of CDFG tests done with rodenticides would include telemetry of San Joaquin kit fox (Vulpes macrotis mutica) in areas where 1080 was being used for California ground squirrels (Spermophilus beecheyi), monetary support of tests conducted by the University of California on the effects of 1080 on turkey vultures (Cathartes aura) as a surrogate for California condors (Gymnogyps californianus), incident monitoring to determine the cause of death of animals reported dead during pest control programs, and many field trips to review actual routine applications of rodenticides and avicides, especially in the 1970s when endangered species were first so classified.

RANKING OF THE HAZARD OF VARIOUS PESTICIDES USED AS CONTROL METHODS

Based on my experience in 10 years of review of vertebrate pest control methods using pesticides, I suggest the following ranking of the hazards of methods currently used, from least to most hazardous.

10, 9, 8. Starlicide, Avitrol, and poison perches. These have a small possibility of a secondary hazard to scavengers or predators such as peregrine falcons (Falco peregrinus) (Schafer 1984). We occasionally receive calls about this potential hazard in areas where the falcon has been reintroduced, such as in the bigger cities or high rises. We have no documentation of secondary poisoning with these materials. We usually recommend against the use of avicides in areas peregrine falcons are foraging so that a wide margin of safety is provided for this endangered species.

7, 6. Gas cartridges and aluminum phosphide. These are obviously hazardous to commensal animals such as Alameda whipsnakes (Masticophis lateralis euryxanthus), possibly giant garter snakes (Thamnophis couchi gigas), and burrowing owls (Athene cunicularia). Burrows should be checked for signs of owl or snake activity before using any kind of burrow fumigant. We have no documentation of adverse effects in our files.

5. Zinc phosphide. This can be hazardous for gallinaceous birds such as quail and pheasants (Phasianus colchicus). The U.S. Fish and Wildlife Service allows its use as an alternative to 1080 in areas inhabited by endangered mammals since it is not secondarily hazardous. We do have documentation in our files of adverse effects some years ago where quail were impacted. There have been no records in recent years of problems. We did become concerned a couple of years ago when a proposal was made to use zinc on a nonstandard seed bait for commensal rats in rice. The program did not develop to any degree and no adverse impacts were reported.

4. M-44 sodium cyanide ejector device. This has killed a California condor in field use. The U.S. Fish and Wildlife Service has developed modifications of its use to prevent any future similar losses. The ejectors are now hidden under some kind of available cover to exclude them from the view of sight-feeding condors in anticipation of the return of condors to the wild.

3. Sodium monofluoroacetate (compound 1080). As you might imagine, the unit has quite a bit of file material on this rodenticide. We have conducted many field surveys over the years to investigate this subject. An especially large effort was forwarded in the Sixties and Seventies when an interest in what are now classified as endangered species developed. In over two dozen field trips and related investigations only four or five relatively minor incidents with nontarget wildlife such as corvids and blackbirds have been seen to date. Magpies (Pica sp.) seem especially sensitive. There are no records in our files of significant mammalian kills except for obvious misuses for illegal predator control. Some researchers have expressed an opinion that compound 1080 may have an impact in reduction of the food supply (ground squirrels) for predators. Ten-eighty seems to be relatively nonhazardous for scavenging raptorial birds based on our records and laboratory studies such as those conducted by UCD on vultures. We do not see losses of raptors with legal uses. Both bird and mammal losses will occur if it's used illegally for predator control. Illegal applications are likely to be at much higher dosages than those normally used for rodent control.

2. Diphacinone/chlorophacinone. Both mammals and birds have been affected by primary and secondary exposure in laboratory tests (Evans and Ward 1967; Mendenhall and Pank 1980). These and other laboratory experiments indicate a potential field hazard is present when using anticoagulants. We are starting to now receive animal submissions at our laboratory which show physical signs suggestive of anticoagulant poisoning. The circumstances of the losses as described by the field investigators are also suggestive. The signs we look for and have seen include the finding of different species of animals found dead together, such as carnivores and herbivores, their presence near water (a sign of dehydration typical of anticoagulant poisoning), and hemorrhage seen at necropsy. Residue analyses are difficult to perform using current technology. The finding of signs and residues together is rare but a cooperating laboratory did recover residues of diphacinone in one case we examined (Littrell 1988). The difficulty of performing residue analyses seems to be common throughout the U.S. as confirmed by personal communication with other researchers in the field. This seems to be at least partially attributable to the metabolism of the anticoagulants. They may be metabolized over time so that death occurs after the parent compound is gone. Instances of misuse by inappropriate placement or the use of a material not registered for field use are starting to come to our attention. I ask those of you using these materials to exercise great care in their placement to avoid exposure to nontarget wildlife.

1. Strychnine. This material is probably the worst because of its toxicity to a variety of species and because of its secondary persistence. We have no firm records of secondary or nontarget effects from small bird control, however. The problems have been due to exposure to strychnine used for rodent control, either ground squirrels or gophers (Thomomys sp.). Exposures have been both primary and secondary. There have been problems with secondary poisoning of predatory and scavenging birds. For instance, we have a documented case of Canada geese (Branta canadensis) being killed by spillage of a gopher (Thomomys sp.) bait formulation used at a park, and of at least one golden eagle (Aguila chrysaetos) killed by consumption of poisoned Belding's ground squirrels (Spermophilus beldingi). A bald eagle (Haliaeetus leucocephalus) was killed by ingestion of a Belding's ground squirrel in an area strychnine was being used for gopher control. We have also had cases of misuse when strychnine was being used illegally to kill or repel black bears (Ursus americanus) attacking bee hives.

As strychnine and 1080 are phased out and become unavailable, the anticoagulants will take their places as the most hazardous vertebrate pest control agents. We will see problems with their use and I am sure nontarget wildlife will be affected. Please follow labels very closely to avoid killing nontarget wildlife. We especially anticipate nontarget wildlife will be killed by improper placement of baits. This might happen by not using a bait box or by piling material in a mound. Illegal use for predator control will also be a problem. Even normal application methods are potentially hazardous because of residues found in carcasses. I expect to see more raptors come in with circumstantial signs of this type poisoning. We already have received a few.

As a sort of postscript of concluding remarks I would like to add the following. In researching our files for this presentation I came across an Administrative Report which was titled "A Review of the Use of Toxic Materials for Mammalian Animal Control in California" (Hagen 1972). This report was written in 1972, almost 20 years ago. I almost could have used it for my presentation today. I would like to leave you with two thoughts from the report. The first was the statement that federal registration for the use of compound 1080 for rodent control will be withdrawn within 5 years and that restrictions on the use of strychnine for rodent control may soon follow. This was in 1972, remember. The second was the thought that if compound 1080 becomes unavailable, rodent control may revert back to the ranchers and they will use strychnine and zinc phosphide. (I will add parenthetically here that now it probably will be anticoagulants that are used.) Paraphrasing again: lack of training in control methods or handling of hazardous materials by ranchers and farmers will result in far greater hazard to nontarget species.

Have times changed in 20 years?

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