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Vertebrate pest control is an important function which has been performed for many years by County Agricultural Commissioners. Since 1917, control materials have been prepared and distributed to assist farmers in the control of rodents and pest animals. Our authority for these programs comes from the California Food and Agricultural Code. It explains why this aspect of pest control is conducted by Agricultural Commissioners.

Section 5006 defines a pest as "any of the following things that is, or is liable to be, dangerous or detrimental to the agricultural industry of this state". For the purpose of this talk, it includes any form of animal life. This is the section involving vertebrate pests.

Section 5101 states: "Each Commissioner is an enforcing officer of all laws and regulations which relate to the prevention of, the introduction into, or the spread within the state of pests. He is, as to such activities, under the supervision of the Director" (Director means the Director of the California Department of Food and Agriculture). He has the authority to make inspections of any premise, plant, conveyance or thing in his jurisdiction, and if found infested with pests, may abate the nuisance pests under prescribed procedures.

County Boards of Supervisors have authorized their Agricultural Commissioners to prepare vertebrate pest control baits and sell them at cost and to assist growers in the control of vertebrate pest damage.

County programs in vertebrate pest control vary widely with each county, depending on the agricultural crops grown and the damage caused by vertebrate pests. Some counties only sell or provide baits to growers, while others may provide direct assistance (including materials, horses, vehicles, and personnel) and aid in the supervision and application of control materials.

In order to meet the requirements of the California Environmental Quality Act (CEQA), County Agricultural Commissioners must identify risks and benefits of any action which may affect the environment and to prevent misuse of the environment. Environmental impact statements have been prepared in counties having significant vertebrate pest control programs. To assure that environmental quality is maintained, precautionary measures are routinely programmed into vertebrate pest control activities. Pretreatment inspections are conducted to determine the extent of crop loss or damage, hazards present, and actual needs for treatment. If treatment is justified, test baiting and prebaiting is usually made to confirm acceptance of bait material. Close observation is made during the treatment period and, lastly, a post-treatment evaluation is made to determine if the treatment used was effective, safe, and conducted properly.

Rare or endangered species of animals are assured further protection within counties having vertebrate pest control programs. Agreements are annually reviewed with other governmental agencies. The California Department of Fish and Game receives detailed summaries of each county's program. To assure protection to the San Joaquin Kit Fox, the California Condor, and others, restrictions are placed on county programs, including materials used, methods of application, and proximity of baits placed in relation to the protected animal's habitat. Known locations of dens and sitings are mapped to assure further protection to the protected animals. Alternative control measures such as trapping, shooting, or fumigants are used in the close proximity of Kit Fox habitats.

Recent observations have shown a gradual increase in Kit Fox populations in many areas. The increased numbers are indicative that control measures on ground squirrels can be effectively conducted without reducing the population of Kit Foxes.

However, the current Federal law does not allow for a single animal to be killed, even accidentally, and imposes a \$10,000.00 fine on the person(s) responsible for even a single loss. This law creates an unjust threat on county control programs, which are obliged to promote and protect agriculture. Each year numerous San Joaquin Kit Foxes are reportedly shot by offending sportsmen or killed by automobiles, but the accidental death of a single animal from a county rodent control program could result in a heavy fine. We feel this law is neither fair nor realistic.

The major vertebrate pest animals that damage the wide variety of crops in California are the ground squirrel, pocket gopher, and meadow mouse (*Microtus* species). These pests are found throughout agricultural areas in the state and require periodic control to prevent crop losses from exceeding tolerable levels.

Ground squirrels are the most significant vertebrate pests controlled by Agricultural Commissioners in California. The ground squirrel and its several sub-species is found throughout the state and causes damage to a variety of agricultural crops. Control is also important from a health standpoint where rodent-borne diseases have been demonstrated to be present.

In certain areas of this state, Norway rats, muskrats, black rats, jackrabbits, wood rats, and certain tree squirrels often require assistance from the Agricultural Commissioner for their damage control. For these rodents, control measures are usually advised, or provided at actual cost to growers.

Certain depredating birds are also frequently controlled to some degree when found causing damage to crops. Starlings, black birds, linnets, horned larks, and sparrows cause a wide range of damage to agricultural operations and, occasionally, their damage is reduced at the local level through population management. Counties vary widely in the degree of control programs and protection offered to farmers.

Many of these birds are protected through international treaties with other countries. Crop losses must be verified by field inspections before control measures are undertaken, and reports of numbers taken and materials used are made regularly.

Vertebrate pest control baits used by County Agricultural Commissioners are standardized and formulated according to recommendations of the California Department of Food and Agriculture. They are specific to the species of the vertebrate pest to be controlled. Specially rolled oat groats continue to be the most desirable grain for most species of ground squirrels, microtus, Norway rats, and jackrabbits. These squirrel oats are usually obtained from Oregon. They are preferred for their large, plump, lightly-crimped kernels absent of hulls. The most effective toxicant for the control of ground squirrels continues to be sodium fluoroacetate (1080). Its use is confined to range land and/or unpopulated agricultural areas. Usually treatment is necessary only once every two or three years to maintain a reduced population. This infrequent baiting prevents bait shyness from occurring. In more populated areas, diphacinone and chlorophacinone have shown to be effective and safe to use. These baits of .005% to .01%, applied three times per week or placed in bait stations, have become a very effective bait, especially in locations where acute toxicants such as 1080 and zinc phosphide present a hazard to nontarget animals. However, treating large acreages with the anticoagulants is presently unfeasible because of the expense of the large amounts of bait and labor required. Although zinc phosphide has shown to be effective in some areas, control is usually erratic and not reliable for ground squirrel control.

For pocket gophers, whole wheat is readily acceptable and preferred, especially when used with the mechanical gopher bait applicator. Strychnine is the most popular toxicant for pocket gophers. Whole wheat with 1.3% strychnine used in the mechanical gopher bait applicator has effectively reduced field infestations by 90% and better. For spot treatment and hand application, baits containing .2% to .3% strychnine, although less effective, offer a reliable control where the mechanical applicators are not feasible.

The ever-increasing cost of materials used in bait formulations, together with labor costs, has had an impact on county operations. Secondly, safety regulations on the requirements of mixing facilities have made it necessary for counties to either upgrade or build modern mixing facilities, or to contract with other counties to provide baits for them. This has led to some new innovations in mixing facilities in recent years.

In Kings County, we have constructed a mixing facility to meet our current maintenance needs and also the occasional emergency outbreaks of rodent populations. We also custom-mix certain baits for other counties.

Our mixing facility utilizes a stainless steel slurry seed treater, and is used in conjunction with a grain elevator, surge bin, a gross bagging scale, and conveyor. It has an output capacity of 3 to 6 tons per hour. We can provide bulk or sack baits usually at a lower cost than counties using conventional batch mixers, when including labor. In most of our mixing operations, only two persons are needed to operate the facility.

Currently, we formulate baits using sodium fluoroacetate, anticoagulants, and strychnine. For zinc phosphide, a special powder attachment is needed, which we have not added to date. The concentrate materials (toxicant safflower oil carrier or rhoplex-water solution and appropriate dye) is placed in a pre-mix tank. After this point, the system is closed and the concentrate material is automatically pumped and measured to grain during mixing. This provides added safety protection to the workers.

The safe handling of concentrate rodenticides in moderate to large amounts requires the use of other safety equipment. Fume hoods for weighing concentrate poisons, dust control ventilator systems for control of grain dusts, protective personal equipment such as gloves, respirators, face shields, aprons and coveralls, closed septic systems for collection of hazardous waste materials, emergency eyewash and shower facilities for accidental decontamination, and washers and dryers for the cleaning of protective clothing are a necessity. The California Agricultural Commissioners have recognized these needs and have adopted safety guidelines for facilities and equipment used in the formulation of vertebrate pest control baits. So you can see, some mixing operations have surpassed the old tub or cement mixer used previously for mixing vertebrate pest control baits.

As Agricultural Commissioners, we too are concerned with the future of regulations, especially those concerning vertebrate pest control materials. The Environmental Protection Agency (EPA) has issued RPAR (Rebuttal Presumption Against Registration) actions against two rodenticides: sodium fluoroacetate (1080), and the above-ground usage of strychnine (such as in jackrabbit and depredating bird control). In these cases, EPA has presumed that the risks are too great for re-registration and it is then dependent upon the registrants and other interested parties to rebut such presumption by showing that the risks are not great and/or the benefits of use of such pesticides exceed the risks. Once the RPAR tag has been attached to a pesticide, the stigma against it remains, even if the presumption should be cleared later. The California Department of Food and Agriculture and County Agricultural Commissioners have jointly issued a rebuttal to the RPAR regarding 1080 and strychnine. We firmly believe that these materials have been used safely and effectively and that their registration should be continued.

In conclusion, I want to emphasize that Agricultural Commissioners take their responsibilities very seriously, and particularly in vertebrate pest management. We recognize that increased populations of vertebrate pest animals decrease the production of food and fiber, cause damage to urban properties, and harbor rodent-borne diseases, and population management to some degree is usually necessary. We must continually support research to improve materials and methods of management to insure a better environment for all.