Vertebrate Pests

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VERTEBRATE PESTS

OVERVIEW, GROWTH & DEVELOPMENT

Several wildlife pest species were identified by growers in a survey conducted during the preparation of this plan.[1] Most of these pests identified by growers (i.e., gophers, squirrels, marmots, various species of ducks and geese, ravens, crows, deer, skunks, weasels, and pelicans) were considered minor and consequently were not addressed as vertebrate pests of concern. In addition, these species were also not addressed because the Service does not consider them to be pests on a National Wildlife Refuge. One vertebrate pest of economic concern was identified and is addressed below.

MONTANE (OR MOUNTAIN) VOLE *S Microtus montanus*

This vole is the primary cause of economic damage by vertebrate pests on leased lands. Land users often confuse this species with mice and most often refer to it as being a mouse.

Figure 1.
Montane vole

Life Cycle

The following information was taken primarily from Prevention and Control of Wildlife Damage, University of Nebraska Cooperative Extension Service, 1994.

The Montane vole is 5.5 to 8.5 inches long. Its fur is brown, washed with gray or yellow, and mixed with some black-tipped hairs. Its feet are usually silver-gray and its body underparts are whitish. The tail is bicolored.

Voles occupy a wide variety of habitats and prefer areas with heavy ground cover of grasses, grasslike plants, or litter. Though voles evolved in "natural" habitats, they also use croplands and cultivated fields, especially when populations are high. They eat a wide variety of plants, most frequently grasses and forbs. In late summer and fall, they store seeds,

tubers, bulbs and rhizomes. They eat bark at times, primarily in fall and winter, and will eat crops, especially when populations are high. Occasional food items include snails, insects, and animal remains.

Voles are active day and night, year-round. They do not hibernate. Home range is usually 0.25 acres or less but varies with season, population density, habitat, food supply, and other factors. Voles construct many tunnels and surface runways with numerous burrow entrances. A single burrow system may contain several adults and young.

They may breed throughout the year but most commonly in spring and summer. They have one to five litters per year. Litter sizes range from one to eleven, but usually average three to six. The gestation period is about 21 days. Young are weaned by the time they are 21 days old, and females mature in 35 to 40 days. Lifespans are short, probably ranging from 2 to 16 months.

Large population fluctuations are characteristic of voles. Population levels generally peak every 2 to 5 years; however, these cycles are not predictable. Occasionally during population irruptions, extremely high vole densities are reached. One such irruption occurred in Klamath Basin in 1957 to 1958 where densities up to 4,000 per acre were recorded. Dispersal, food quality, climate, predation, physiological stress, and genetics have been shown to influence population levels. Other factors also may be involved.

The most easily identifiable sign of voles is an extensive surface runway system with numerous burrow openings. Runways are 1 to 2 inches wide. Vegetation near well-traveled runways may be clipped close to the ground. Feces and small pieces of vegetation are found in the runways.

Voles pose no major public health hazard because of their infrequent contact with humans; however, they are capable of carrying disease organisms such as plague *(Yersinia pestis)* and tularemia *(Francisilla tularensis)*.

Damage and Symptoms

It is fairly well known by local farmers that damage to high dollar crops such as potatoes occurs when voles are driven from fields such as small grains or alfalfa during harvesting. Consequently, potato fields next to alfalfa are susceptible to vole invasion immediately after each cutting. Potato fields next to grain fields may not receive damage until after harvest in late July or early August. Areas next to berms are always susceptible to damage if populations become extremely high, food sources become scarce, or cover on the berms is reduced.

Voles may cause extensive damage to orchards, ornamentals, tree plantings and field crops. Voles eat crops and also damage them by building extensive runway and tunnel systems. These systems interfere with crop irrigation by displacing water and causing levees and checks to wash out.

Short- and Long-term Management Recommendations

Cultural

- Cultural and habitat modification practices (including physical and mechanical methods) can reduce the likelihood and severity of vole damage. For example, eliminating weeds, ground cover, and litter in and around crops will reduce habitats that are attractive to voles. Voles can live in dense populations in ditch banks, rights-of-way, and water-ways that have dense vegetation. Adjacent crop fields can be cost-effectively protected by controlling vegetation adjacent to the field through tilling, mowing, spraying, or grazing.

- Soil tillage is effective in reducing vole damage as it removes cover, destroys existing runway-burrow systems, and kills some voles outright. Annually tilled crops tend to have lower vole population levels than perennial crops. Voles are nevertheless capable of invading and damaging annual crops, especially those that provide cover for extended periods of time.

- Flooding fields is a technique currently used on Lower Klamath to recharge soil moisture, provide waterfowl habitat, and reduce vole populations. This practice kills voles by drowning, and exposes others to predators such as raptors and coyotes. Fields are currently flooded from mid-November to mid-January. However, flooding for a period of 24 hours will kill or expose voles (Jim Hainline, USFWS, personal communication, January 8, 1997).

- Trapping is not effective in controlling large vole populations because time and labor costs are prohibitive. However, if trapping is used, voles are easiest to trap in fall and late winter. Shooting and frightening agents or techniques are not practical or effective in controlling voles.

- Physical barriers can be an effective control for voles. This year, two leased-land farmers (Tule Lake NWR) used aluminum roof flashing and a bare buffer strip to prevent vole damage. The first of these (Terry Guthrie, personal communication, September 26, 1996) encircled a 100-acre potato field with 12-inch aluminum flashing. The flashing was purchased locally in 50-foot rolls at $16 per roll (totaling $3,700 to surround the field).

  The flashing was hand-installed in early August in a 2-inch trench followed by placing 4 inches of dirt on both sides to stand it in place. The roll ends were connected by overlapping a couple of inches and duct-taping the overlap. In addition, lathing was driven into the ground every 15 feet or so to support the fence. The job took four people 4 days for an estimated cost of $1,000 to $1,200. Total cost for the project included $1000 to $1200 for labor and $3,700 for materials for 100 acres or $49 per acre. In addition, the fence can be rolled at the end of the season and is totally reusable. Since the flashing is made of aluminum, it has a current salvage value of 40 to 50 percent.

  Prior to placement of the flashing, an area approximately 25 feet wide was tilled encircling the field. Flashing was placed on the inner edge of

this blackened area. This tilled area not only supported the flashing but was a bare area that the voles had to cross to reach the field, exposing them to predation.

The result was an overwhelming success. The field was harvested with "literally no damage." Mr. Guthrie stated that he didn't find "one cull" in the whole field and this field had "10 to 12 percent" damage the previous year. He plans to encircle every potato field next year.

Brian O'Conner (personal communication, September 27, 1996) had similar success. However, he had placed the flashing on only three sides as his field bordered an alfalfa field. He stated he hadn't observed any damage on the sides with the flashing but did find some damage on the side without flashing. He estimated his total costs to be approximately $65 per acre and he also plans to encircle all potato fields next year.

This method of control is extremely economical. For example, in 1995, number 1 potatoes sold for $9 per 100 pounds while culls sold for $2 per 100 pounds. Assuming 10 percent damage (Mr. O'Conner sustained 30 percent in 1995), and a yield of 400 sacks per acre, this computes to a loss of $280 per acre. Consequently, the flashing more than pays for itself. The major investment (the fence) is reusable, leaving future installation costs of approximately $10.00 per acre.

Biological

- A wide variety of predators feed on voles. Voles are relatively easy for most predators to catch and are active and available day and night year-round. However, despite their vulnerability and availability, voles are usually not "controlled" by predators. This is because voles have a high reproductive potential that allows them to increase at a faster rate than predators.

Chemical

- There are currently no PUP-approved rodenticides for use on the refuges. Three rodenticide baits labeled for vole control are zinc phosphide, chloraphacinone, and diphacinone. Zinc phosphide is highly toxic to birds and, in the Klamath Basin, was linked to the deaths of up to 2,500 waterfowl (primarily snow geese in 1958) and 40 birds (including 30 white-fronted geese, several snow geese, and two Ross's geese in 1984). The latter poisonings by zinc phosphide were confirmed by laboratory testing by the National Wildlife Health Research Center, Madison, Wisconsin (Diagnostic Case 5029 in a letter from Dr. Lynn Creekmore, DVM, to Steve Schwartzbach, U.S. Fish and Wildlife Service). Biologists investigating the 1958 deaths concluded that use of baits, even color-dyed baits, with any rodenticide toxic to birds will result in waterfowl deaths, when these birds are foraging in the area (Memorandum from Thomas Horn, Tule Lake NWR, to Regional Director, Portland, March 7, 1958).

Both chloraphacinone and diphacinone baits act as anticoagulants and are less toxic to birds, but may require more than one application and may be toxic to nontarget mammals. Based on these considerations, and on the availability of several promising cultural control techniques, cultural management rather than rodenticide bait control is recommended. Furthermore, it is unlikely any rodenticides will receive PUP approval.

FURTHER RECOMMENDATIONS

Farmers have expressed unanimous concern with vole damage in potatoes. In addition, considerable concern exists with damage to sugarbeets, alfalfa, and small grains. With this in mind, it is recommended that physical barriers (as identified above) be used to prevent damage to potato crops, and to sugarbeets, alfalfa and small grains where farmers feel the investment is warranted.An integral part of this physical barrier is the tilled ground surrounding the field. Keeping this area black ensures barrier effectiveness.

Timing for placement of barriers is critical and is based upon vole movements from other harvested fields to the protected field. Barriers must be in place prior to first cutting of alfalfa or harvest of adjacent grain fields (assuming these fields are unprotected from barriers). It is also recommended that the depth at which the flashing is buried be monitored closely as voles burrow up to 6 inches deep.

Flashing may be acceptable for control of voles in alfalfa and/or small grains, but would have to be in place prior to spring growth. Some question arises as to whether this would be effective in alfalfa fields if the voles were already present in early spring. If farmers consider voles in alfalfa to be a significant problem this could be tried on an experimental basis.

Flooding to control vole populations in conjunction with other purposes is viable on Lower Klamath NWR. However, flooding for the sole purpose of vole control is probably not a wise use of water.

LITERATURE CITED

1. New Horizon Technologies, Inc. 1996. Agriculture pest survey results: Lands leased for agriculture production on Tule Lake and Lower Klamath wildlife refuges. September 19, 1996. Project file.

2. U.S. Department of the Interior. 1993. *Vole management in fruit orchards.* Fish and Wildlife Service. Biological Report 5. March 1993.