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Managing Voles in Idaho Crops and Landscapes

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ABSTRACT: Vole populations in southern Idaho experienced a significant peak in 2009-10. Following 2010, a decline in the population was observed. However, in 2014-15, vole populations increased dramatically with more reported crop losses than in 2009-10. Reported crop losses for 2014-15 were 30% and higher. In extreme cases, producers experienced over 50% crop losses and removed fields from production. An Idaho producer tracked vole populations using a GIS/GPS mapping app and reported vole numbers of 200 and more per acre (per 0.4 ha). Increased vole populations significantly reduced yields in rangeland, alfalfa, pastures, and other agricultural crops. In addition, homeowners and gardeners experienced significant vole damage in lawns, gardens, and small acreage orchards. Hypotheses for increased vole populations include a series of mild, open winters allowing for higher winter survival rates and wet springs and falls that produced abundant vole forage and habitat. Voles have remarkable reproductive capacity, which further amplifies problems associated with these rodents. Extension educators and specialists have estimated average losses due to increased vole pressure in Idaho at 30% to 50% and higher in crops, pastures, alfalfa, and rangeland. If current climatic and management trends continue, populations may continue to increase. Knowledge and implementation of an integrated vole management program has become necessary to decrease damage to crops, pastures, lawns, and gardens. To address this significant problem, we informally tested several effective vole management methods. Information and data were collected on rodent biology and management techniques from existing literature and field observations. Voles are not a protected species in Idaho and can be legally managed on private and public lands. We have developed an integrated approach to managing these rodents through the use of monitoring for vole sign, habitat modification, protecting desirable plants, trapping and other mechanical control measures, and use of effective toxic baits. Lastly, we developed and implemented an integrated, multi-faceted vole education program for Idaho clientele that was critical to effectively manage increased vole populations.

KEY WORDS: baiting, IPM, *Microtus pennsylvanicus*, reduced crop yields, rodent control, rodenticides, vole control, vole damage

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INTRODUCTION

Voles (*Microtus pennsylvanicus*) cause significant damage to rangeland, alfalfa, pastures, cover crops, sugar beets, potatoes, wheat, and barley (Thaemert 2006). They also cause significant damage in orchards, nurseries, turf farms, ornamental flower plantings, landscapes, lawns, and vegetable gardens. Voles have remarkable reproductive capacity, which further amplifies problems associated with these rodents. Population surges can occur frequently when adequate forage and habitat are readily available. Forage losses in 2014-15 from voles were estimated at 30% to 50% and higher in Idaho crops, rangeland, pastures, and alfalfa (G. Shewmaker, Univ. of Idaho, pers. comm.). Voles can also damage and kill trees and ornamental shrubs. Damage to plants is caused by feeding on roots, bark on tree trunks, stems, tubers, and leaves.

Voles are non-game mammals in Idaho and can be legally managed on private property and public lands. Management options depend on the situation, crop or site of infestation, endangered species considerations, cost limitations, and equipment and labor availability. Since voles can cause extensive damage and substantial economic losses, it is important to understand their biology and habits before planning and implementing integrated management strategies.

Vole Biology

Several species of voles exist in Idaho, and it can be difficult to identify individual species. The meadow vole or meadow mouse (*M. pennsylvanicus*), is the most common species found in pastures, rangelands, crops, and lawns in Idaho. Meadow voles are heavy-bodied, small rodents with short legs and tails, small rounded ears, and coarse blackish to grayish-brown fur with black-tipped hairs and bi-colored tails. Voles generally average 4½ to 5½ inches (11.4-14 cm) long, including the tail, when full grown.

Voles can reproduce year-round with a peak breeding period in the spring followed by a second, smaller breeding period in the fall. Females can reach reproductive maturity in 35 to 40 days. They average one to five litters per year with three to six young per litter. Gestation length is approximately 21 days (Thaemert 2006). Females can breed immediately following parturition and have the potential to produce a litter every four weeks. In the laboratory, voles have produced 17 litters per year (O'Brien 1994).

Vole populations are cyclic and can fluctuate dramatically from year to year. During most years, voles are not a significant problem and are partially controlled by predators such as snakes, coyotes, foxes, hawks, owls, dogs, and domestic cats (Whitaker 2000). However, if

habitat is abundant and provides adequate protection from predators, high-protein food sources exist, and weather conditions are ideal, vole populations can quickly reach damaging levels. Minor peak populations occur approximately every four to six years, and epidemic populations occur about every 10 to 12 years. These cycles are not necessarily regular. It appears the length of time between population peaks and the duration of peaks have increased in conjunction with the dynamic weather patterns the Northwest U.S. has recently experienced and with current changes in farming practices. Population explosions may last a year or more before the population crashes. These events can result in infestations of 200 voles or more to the acre (0.4 ha), resulting in significant potential for economic and aesthetic losses.

Vole Behavior

Most damage caused by voles is the result of their feeding activity. Voles can weigh 3-4½ oz (85-128 g) and can eat nearly their own body weight daily. One vole can consume 41 lbs (18.6 kg) of plant material a year (Thaemert 2006). Voles damage crops by feeding on roots, stems, grass, seeds, and underground reproductive structures such as bulbs and tubers. They damage and kill trees and shrubs by girdling and removing the bark from the trunk or stems near the base. Damage to trees and shrubs normally occurs in the winter when voles are foraging under snow cover. Voles have a home range of approximately ¼ acre (0.1 ha). Home range varies according to food and habitat availability, population density, and season. Voles are active all year (Orloff et al. 1997), especially in the spring and fall. They are most active in the evening but are also active during the day.

Voles are normally found in areas of dense ground cover. Vegetation greater than six inches (15.2 cm) in height, accumulation of plant debris, weed skeletons, snow cover, brush piles, leaves, and low-hanging tree limbs all provide excellent habitat protection from predators. Rangeland, dry farms, alfalfa, grass hayfields, pasture, orchards, home lawns, and gardens provide ideal habitat and food sources for these pests.

Voles do not like crossing bare ground and prefer cover when feeding. Feeding activity can easily be recognized by the presence of shallow tunnels and runways in vegetation and by circular nests or piles of grass, stems, and leaves. Runways are approximately 1-2 inches (2.5-5.1 cm) wide with an entrance hole leading underground. Frequently-used runways may have grass and other nearby vegetation clipped very close to the ground. Feces and small pieces of clipped vegetation are usually found in runways. Voles seldom stray from their normal travel routes.

Economic losses can be severe but are often not quantified. Very few references exist as to the extent of the cost of vole damage in field crops, lawns, and nursery stock due to the cyclic nature of their populations and the potential for explosive population epidemics. Historical data and field calculations based on studies in California indicate that 100 meadow voles per acre (0.4 ha) can destroy approximately 4% of an alfalfa crop (Jameson 1958). The average income from one acre of alfalfa in Idaho yielding four tons of hay per acre is a \$449 net

value after harvesting costs (Patterson and Painter 2015). Since voles can cause 30-50% crop losses in recent years, this can equate to a loss of up to \$225 per acre. This calculation does not include income loss due to shortened stand longevity and long-term loss of vigor in perennial crops and grasses. In 2015, Idaho producers experienced crop losses of 30% and higher in sugar beets, alfalfa, irrigated pasture, wheat, and barley. In severe cases, crops losses caused by voles were high ($\geq 50\%$) and producers were forced to take fields out of production. Economic losses for Idaho producers are substantial. Data from 2015 Idaho Ag Statistics (USDA 2015) lists the cumulative value of these crops, excluding irrigated pasture, at \$2,909,797,000. Thus, a 30% yield loss results in an estimated economic loss of \$872,939,100.

METHODS

Information on vole biology and management techniques (including habitat modification, trapping, baiting, and predation) was collected from existing literature and field observations. In addition, data were collected from producers and homeowners regarding vole infestations and their experiences in the field. Control methods were informally tested in dryland pasture, cropland, and vegetable gardens. Methods tested included trapping, habitat modification, and baiting with rodenticides. Field observations conducted by Extension educators and specialists were also conducted to determine the severity of vole feeding damage. “Hands-on” vole control demonstrations during Extension gardening classes taught clientele how to monitor for vole signs and use control measures, including rodenticides, safely and effectively.

Vole Management

Areas subject to vole invasion should be routinely monitored for signs of feeding activity from early spring until late fall. If possible, monitor for signs in the winter. Vole sign can be identified year-round. Runways, circular nests or piles of grasses and leaves, feces, clipped forage, gnawed stems, bark, and roots, and tunnels are all signs of possible vole activity. Vole sign during winter months includes the presence of entry holes and tunnels in snow, disturbed snow at ground level, and torn grass deposited on top of the snow cover.

Table 1 provides a summary of various control measures to help manage damaging vole populations.

Habitat Modification

Habitat modification and/or population reduction strategies will prevent large population increases. Methods include the following:

- Mowing, cultivating (O’Brien 1994); burning ditch banks, barrow pits, and fence lines.
- Clearing weeds and debris from windbreaks and other affected areas.
- If practical, developing weed-free cultivated buffer strips (Salmon and Gorenzel 2010) a minimum of 15-30 feet wide (4.6-9.1 m) around cropland and/or large acreages: this strategy can substantially discourage vole activity in crop and rangeland.

- Alfalfa and pasture can be grazed or mowed short (Orloff et al. 1997), approximately 3-6 inches (7.6-15.2 cm), in late fall when active plant growth is not taking place, to reduce habitat and food sources.
- Aluminum flashing or other materials can be constructed around areas of concern to serve as vole entry barriers.

Plant Protection

Install 3/8-inch or 1/4-inch net wire approximately six inches below soil level to approximately six inches (15.2 cm) above ground around trees, shrubs, and flower beds to protect plants from vole predation.

Trapping

Trapping with wooden mousetraps is best utilized in

small areas, such as lawns and gardens, and is not effective or practical for large vole infestations. Trap placement is crucial for optimum success. Place traps at right angles to and flush with the ground in surface runways. Always attach a small chain to the trap to prevent raptors and other predators from dragging the vole and trap away. Bait is generally not needed because voles will trip traps during normal activity. If desired, traps can be baited with peanut butter, oatmeal, or apple slices. Voles occasionally learn to take bait without tripping the trap. To avoid bait loss, mix peanut butter with cotton wool or cotton balls and clamp into the tripping mechanism of the trap. Examine traps daily and remove and bury dead voles. Like all rodents, voles can carry diseases, bacteria, and other organisms that can be harmful to human health, so do not handle voles without gloves.

Table 1. Vole management options currently available for Idaho.

Control Method	Rodenticide	Legal Constraints	Timing	Comments
Vegetation Modification	n/a	n/a	Early spring through late fall	Mow, graze, or burn vegetation. Remove weeds and other debris.
3/8" or 1/4" netted wire/exclusions 6" below and above desired vegetation.	n/a	n/a	Year-round	Excellent for protecting trees, shrubs, and flowers.
Trapping	n/a	n/a	Anytime	Begin in early spring. Place traps at right angles in surface runways.
Hand and Mechanical Baiting	Zinc phosphide	Check individual product labels, some allow use on cropland. Some formulations are restricted use products.	Early spring and late fall	Apply by hand or mechanically. Bait stations are useful for larger populations. Do not apply when moisture is anticipated.
Hand and Mechanical Baiting	Anticoagulants: Diphacinone; Warfarin	For non-crop use only. Generally for use around homes and buildings.	Anytime	General use pesticides available without a license. Requires multiple applications.
Hand and Mechanical Baiting	Restricted use anticoagulants: Diphacinone and Chlorophacinone	Restricted use pesticide. For use in orchards, nurseries, turf, lawn, golf courses, tree and forestry plantations and other non-crop areas. May be applied to dormant alfalfa.	Early spring through late fall.	Requires multiple applications. Requires a pesticide applicator license to purchase and apply.
Hand and Mechanical Baiting	Restricted use anticoagulants: Diphacinone Chlorophacinone Brodifacoum Bromadiolone Difenacoum Difethialone	Restricted use pesticides. For use in orchards, nurseries, turf, lawn, golf courses, tree and forestry plantations, and other non-crop areas.	Early spring, late fall, winter	May require multiple applications. Requires a pesticide applicator license to purchase and apply.

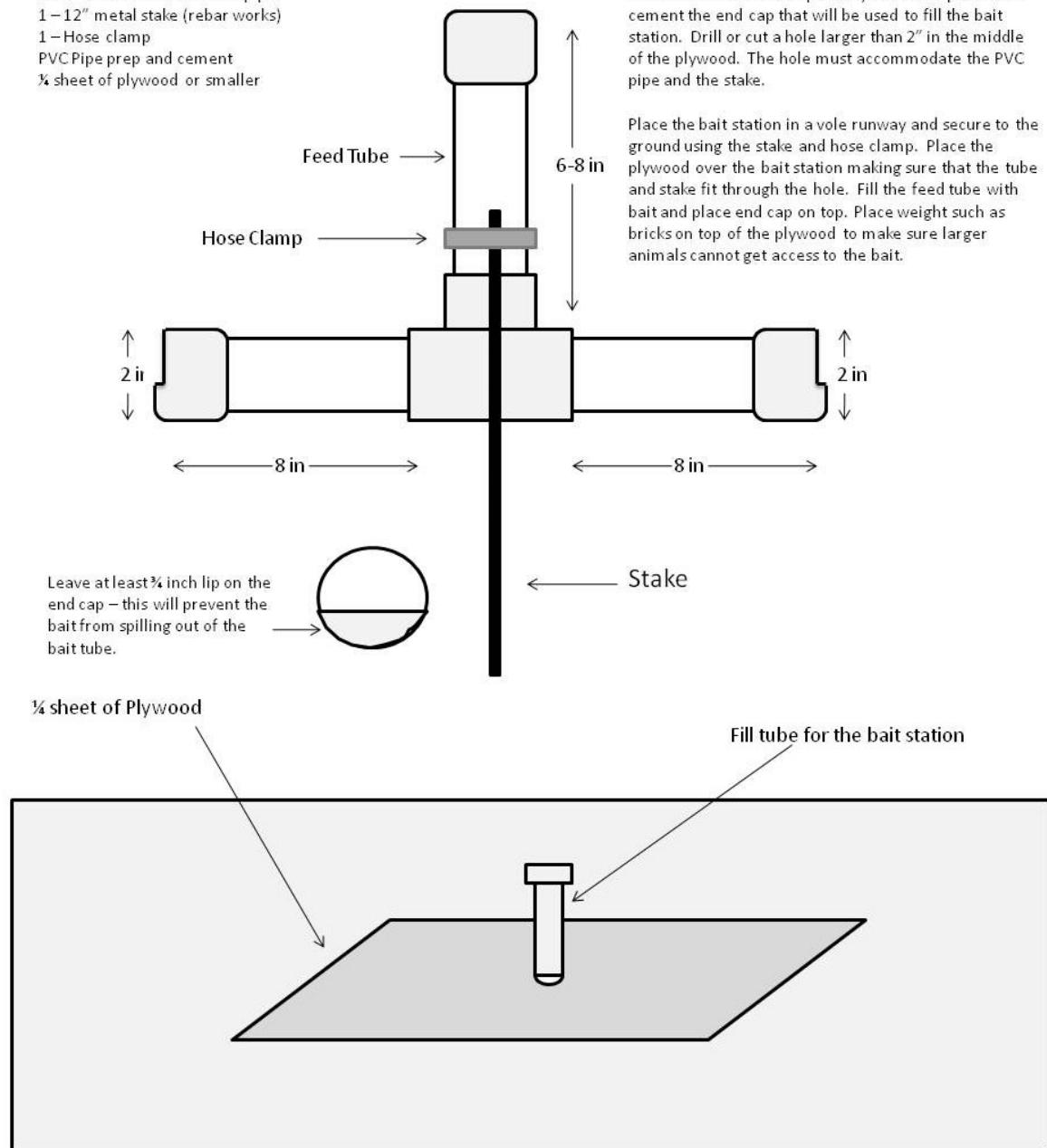
Materials Needed:

- 3 - 2" PVC pipe cut to 8" lengths
- 3 - 2" PVC pipe end caps (two partially cut, see diagram)
- 1 - 2" T-connection for PVC pipe
- 1 - 1/2" metal stake (rebar works)
- 1 - Hose clamp
- PVC Pipe prep and cement
- 1/4 sheet of plywood or smaller

Instructions:

Assemble all of the pieces as seen in the diagram below, making sure that you cement all of the pipes to the T-connection and the two partially cut end caps. Do not cement the end cap that will be used to fill the bait station. Drill or cut a hole larger than 2" in the middle of the plywood. The hole must accommodate the PVC pipe and the stake.

Place the bait station in a vole runway and secure to the ground using the stake and hose clamp. Place the plywood over the bait station making sure that the tube and stake fit through the hole. Fill the feed tube with bait and place end cap on top. Place weight such as bricks on top of the plywood to make sure larger animals cannot get access to the bait.



Note: Place heavy object (bricks, weights) on top of the plywood to prevent larger animals (dogs, foxes, etc.) from disturbing the bait station.

Figure 1. Bait station construction – diagrams by Sherm Takatori (Gunn et al. 2011)

Baiting

Toxic bait can successfully control voles in gardens, turf, rangeland, and cropland perimeters. Many types of bait available for vole control must be placed in bait stations. Figure 1 illustrates a simple PVC pipe bait station (Gunn et al. 2011). The illustrated plywood cover provides an area voles will go to that is protected from

predators or raptors. It also keeps bait dry so it does not lose effectiveness, and it prevents access by children, birds, pets, and other animals. Although Figure 1 suggests a quarter sheet of plywood, any sturdy covering, such as tarps, canvases, disc harrow blades, or metal roofing material will suffice. When using this type of bait station in turf areas, it is important to regularly move the

bait station so turf under the cover is not significantly damaged. Place bait station(s) on the edges of turf where the most significant activity is apparent.

For range and pastures, lengthen the feeding tube to at least 12 inches (30.5 cm) and stake the bait station to the ground (Gunn et al. 2011). The longer tube holds more bait, since these stations cannot be monitored as often as those in lawns and gardens. The longer feeding tube also reduces bait spillage. In these areas, bait stations do not need to be covered, since pets and children are not likely to be present, and good vegetative cover will encourage voles to visit the bait station. However, if safety is a concern, use a durable type of covering over the bait station. The cover will prevent non-target poisoning and deter other animals from damaging the bait station.

Normally, voles are not bait shy and will readily consume bait. However, once vegetation is green and actively growing, vole consumption of bait products will decline. Furthermore, changes in farming practices, an abundance of cover crops, winter wheat, dormant alfalfa, and mild, warmer climate patterns provide voles with an abundant source of food and habitat. These conditions are optimum for voles, so they will not consume bait products as readily. To achieve optimum control with baits, bait in the early spring, late fall, and winter. To improve vole bait consumption, always use fresh bait products. Opened, unused bait products six months old and older may have an off odor or could be moldy or damaged. In addition, older bait can lose efficacy. If voles are not consuming bait products, pre-baiting with non-toxic bait that is the same size, shape, and formulation as the toxic bait may be used to increase bait consumption. Once voles are used to consuming the non-toxic bait on a regular basis, begin using the toxic bait.

When using toxic baits, caution must be used around children, pets, and non-target animals. Pick up any spilled bait and dispose of according to the bait label. Carefully read and follow all label instructions before applying bait and always store rodenticides in their original containers. Dispose of dead voles and bait that may escape the trap so there is no chance of poisoning pets, livestock, or wildlife.

Rodenticide baits may pose a hazard to federally-designated endangered and/or threatened species and may not be used in any manner that results in their harm or death. It is the responsibility of the pesticide applicator to perform any application correctly so that it will not harm and/or kill any threatened and/or endangered species. Extensive endangered species information may not always be listed on the label. Check the Environmental Protection Agency's Endangered Species Bulletins online for restrictions regarding the use of rodenticides in areas these species may or are known to inhabit. If you have questions or concerns regarding species that may be affected by your application, please contact your local Extension Office, the local or state fish and wildlife agency, or your state department of agriculture.

Available Rodenticides

Bait: Zinc Phosphide

Zinc phosphide is sold under trade names such as Prozap® and ZP AG®. Zinc phosphide products are

formulated on grain or in pellet form. Some zinc phosphide products are restricted-use pesticides and require a pesticide applicator license to purchase and use. These products include those labeled for agricultural crops such as wheat, barley, alfalfa, potatoes, sugar beets, grape vineyards, orchards, and nursery stock. Idaho has several Special Local Need (SLN) registrations for broadcast applications to agricultural crops. Before purchasing these products, be sure the product is labeled for the target site or crop and the target pest.

Other zinc phosphide products are general-use pesticides and do not require a pesticide applicator license. These products can be purchased by consumers in packages of one pound or less. The general-use zinc phosphide products are labeled for gopher and mole control and allow only below-ground application. The Federal Insecticide Fungicide Rodenticide Act (FIFRA) Section 2ee allows a pesticide use for a pest that is not on the label. However, if the crop or site is not already labeled, FIFRA 2ee does not apply. Idaho utilizes the FIFRA 2ee allowance to apply zinc phosphide for vole control as below-ground applications. This is done by placing the bait directly in the vole entry holes. These general-use products cannot be broadcast applied.

Do not apply zinc phosphide when irrigating or when precipitation is expected. Moisture, including small precipitation events of rain, snow, and heavy dew activates the chemical to produce phosphine gas, rendering it ineffective very quickly.

Zinc phosphide is an acute toxin and acts rapidly. A single feeding is generally lethal to voles within 12 hours. In rare cases, voles may survive and become bait shy. For this reason, zinc phosphide should not be used in the same field more than once in a six-month period, even though the label may allow a second application 25 days after the first application.

Zinc phosphide converts to phosphine gas when it is ingested by a vole, causing death. It does not accumulate in the vole's body tissues. Therefore, predators or scavengers such as dogs or cats are not likely to be affected by eating poisoned rodents. However, children, pets, birds, and other animals can be affected by direct contact with the bait. Store bait out of reach and use it carefully to minimize unintended access.

Bait: Anticoagulants

Anticoagulants are classified as first- and second-generation products. First-generation anticoagulants require multiple feedings by the rodent before a lethal dose is ingested. Examples of these products include warfarin (Rodex®), diphacinone (Ramik Brown®), and chlorophacinone (Rozol®). Warfarin and some of the diphacinone products are first-generation anticoagulants registered as general use pesticides specifically labeled for vole control. These products can be used for home and residential use but must be used in a tamper-resistant bait station. Some of the diphacinone products prohibit outdoor uses and would not be allowed for vole control. Each label will contain specific use directions. Chlorophacinone general-use rodenticides specifically prohibit this use for meadow vole control.

Diphacinone first-generation anticoagulant bait prod-

ucts (Ramik Brown[®] and Kaput-D[®]) that are sold in large quantities are restricted-use pesticides available only to those who have a current pesticide applicator license. These products can be used in fruit and nut orchards, tree nurseries and farms, but cannot be applied directly to food or feed crops. Rozol[®] Vole Bait (chlorophacinone) is a restricted use pesticide that can be used in non-crop areas, lawns, turf, ornamental flower and shrub plantings, orchards, nurseries, and tree and forestry plantations. Currently, the state of Idaho has a Special Local Need (SLN) registration for aerial application of Rozol in non-cropland areas.

Second-generation anticoagulants are highly toxic, sing-feed products and are not allowed to be sold in grocery, drug, hardware or home improvement stores for home and residential use. These products are registered for use in Idaho. However, uses will vary from state to state. For example, the use of these products in an agricultural field situation is not allowed in California. Second-generation products will have one of the following active ingredients: brodifacoum, bromadiolone, difenacoum, or difethialone. Products containing these active ingredients are sold under a variety of brand names and are restricted to professional, farm, ranch, and facility use, and only labeled for use on non-food or non-feed sites. Bait stations are required for all outdoor, above-ground placements. Difethialone is the only second-generation anticoagulant specifically labeled for vole control. Idaho utilizes the FIFRA 2ee allowance for the other second-generation anticoagulants if the site is labeled.

Anticoagulant baits are formulated using grain or other food sources that will attract rodents. These baits are usually in the form of whole grain baits, pellets, and blocks. Some baits incorporate paraffin to provide moisture resistance. Paraffin-grain baits are useful around ditches and other areas where moisture may cause other types of baits to spoil and lose potency.

Anticoagulant baits cannot be applied directly to food or feed crops. To avoid contact with a growing crop, these baits are used in areas adjacent to crop fields, around field perimeters, and in orchards after fruits or nuts are harvested. Before purchasing any rodenticide, check the label to be sure it can be used on the target site and does not prohibit the use for vole control (U.S. EPA 2016).

All anticoagulant baits are toxic to other animals; take precautions to prevent non-target animals from consuming the bait. It has been noted that in some cases, anticoagulants (particularly second-generation active ingredients) have caused secondary poisoning. When using these products, dispose of dead voles and do not allow non-target species, children, or pets to have direct contact with poisoned voles. Carefully read and follow the precautionary statements on the pesticide label. Bait must be used at the specific target site as indicated on the label.

Predators

Owls, hawks, snakes, cats and dogs, among others, utilize voles as a food source. In southwestern Idaho, owl boxes have been installed by landowners the past three years to help control voles. Preliminary data indicates that each breeding owl pair consumes an average of six

voles per day (Canyon County Weed and Pest Control 2016). This management tactic may be beneficial for an integrated pest management (IPM) approach; however, more data are needed. Current information indicates that reliance on predator control will not keep vole populations at an acceptable level to minimize or eliminate damage to cropland, rangeland, trees, and lawns but can be encouraged to help control vole infestations.

RESULTS

Based on field observations, producer and homeowner interviews, current milder weather patterns, and changes in farming, cropping, and grazing patterns, vole populations may continue to increase. Currently, all known factors involved in the epidemic vole populations and dramatic fluctuations during the past five years are not fully understood. Due to the extremely high vole numbers experienced in 2014-15, Idaho Extension educators and specialists have been inundated with questions regarding vole management. Many county Extension educators do not have expertise in this area and are not familiar with the most current rodenticides that are available for consumers and licensed pesticide applicators. In addition, rodenticide labels can change frequently as determined by federal, state, and local laws. Many educators are not able to stay current with these changes.

In an effort to provide educators, specialists, producers, and homeowners with solutions to cyclic and more frequent vole population increases, University of Idaho (UI) Extension, in cooperation with the Idaho State Department of Agriculture, formed a pest management team. The team developed a variety of educational products to deliver information to producers and homeowners regarding vole biology and management. PowerPoint presentations have been developed that can be utilized by county educators and specialists at producer meetings, commodity schools, consumer-focused public meetings, and Master Gardener programs. The PowerPoint presentations describe vole biology and habits, management practices to reduce vole numbers, and have the most current, legal, and effective rodenticide recommendations. We have published a poster, a detailed regional Extension publication for distribution to clientele (<http://www.cals.uidaho.edu/edcomm/pdf/PNW/PNW0627.pdf>) that is currently used as a study guide for Idaho pesticide applicator exams, and a 2-page fact sheet (<http://extension.uidaho.edu/clearwater/files/2014/10/Managing-Voles-in-Idaho-Lawns-and-Landscapes.pdf>).

Our publications have been well-received. From January 2015 through February 2016, our two publications combined have been downloaded over 4,300 times. In addition, we have taught vole biology and management at Idaho commodity conferences for the 2015-16 growing seasons. Commodity conferences include the University of Idaho Potato Conference; five UI Cereal Conferences throughout southern, eastern, and western Idaho; the UI Sugar Beet Conference; and the Idaho Hay and Forage Conference. To date, we have reached over 800 producers through these educational efforts.

CONCLUSIONS

Due to the remarkable reproductive capacity of voles,

changes in farming practices, plentiful forage and habitat, and climatic conditions, more than one control method may need to be utilized to achieve acceptable population levels. Investigative results show baiting in early spring, late fall, and winter to be one of the most successful control options, particularly when combined with habitat modification practices. It is absolutely crucial that producers and homeowners monitor for vole activity. Remember that voles are active during the winter and can cause substantial damage to crops, trees, and lawns that are under snow cover. When vole sign is discovered, control measures should be implemented to reduce property damage. The old adage “an ounce of prevention” certainly applies to vertebrate rodent control.

Clientele responses to our educational methods and efforts to manage this difficult problem indicate our efforts have been very successful. Our vole publications are some of the most widely distributed publications via local Extension offices. Our vole seminars are very well attended and received. Our hands-on demonstrations of monitoring for voles and properly placing bait have also been very effective and are helping clientele protect their properties. Several clients have reported they were able to successfully control the vole populations around their homes and gardens after implementing our control methods. Producers have begun implementing these control measures to protect crops and are achieving success with baiting and habitat modification practices.

Disclaimer

ALWAYS read and follow the instructions printed on the pesticide label. The pesticide recommendations in this UI publication do not substitute for instructions on the label. Pesticide laws and labels change frequently and may have changed since this publication was written. Some pesticides may have been withdrawn or had certain uses prohibited. Use pesticides with care. Do not use a pesticide unless the specific plant, animal or other application site is specifically listed on the label. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock. Trade Names: To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

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