

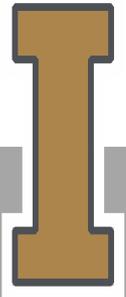
MASTER GARDENER TRAINING

Ken Hart, UI Extension Educator

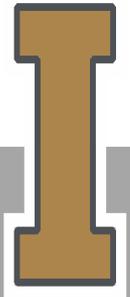
Lewis County Extension Office

khart@uidaho.edu

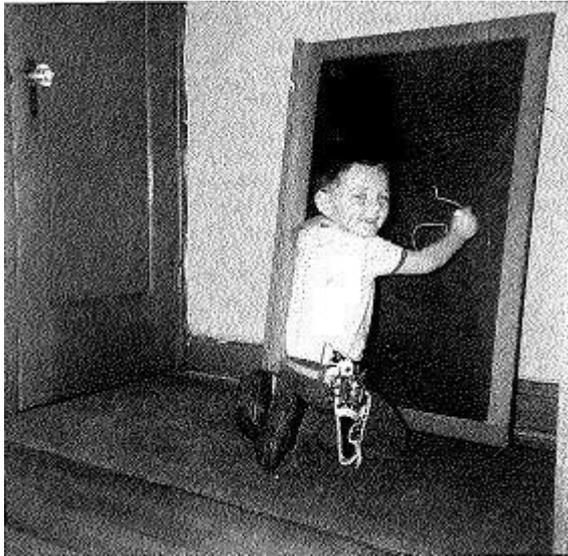
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GOPHER AND VOLE CONTROL



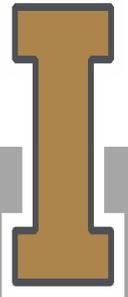
KEN HART, GOPHER FIGHTER



Early Gopher Control Planning Session



Gunning Up for Gopher Control



3 – 2 – 1

Three questions

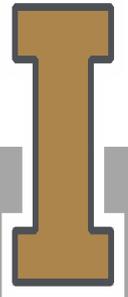
1. What are these critters?
2. Where and how do they live?
3. How can I live at peace with them (or kill them)?

Two Points

1. Gopher Control
2. Vole Control

One Action

1. New Cost/Benefit Understanding – or Win the Battle but Declare Truce on the War

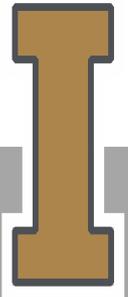


POCKET GOPHER?

#1

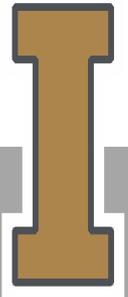


#2

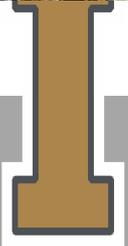




HOW ABOUT THIS ONE?



POCKET GOPHER

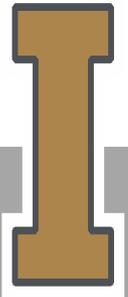


VOLE?

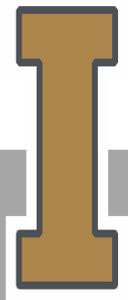
#1



#2



VOLES

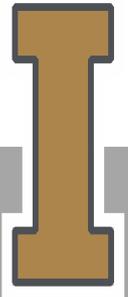


POCKET GOPHERS

Burrowing Rodents, 5-10 inches (or longer) in length.

Can live about anywhere there is food.

Cause extensive damage to crops, irrigation systems, pastures, orchards and forests.

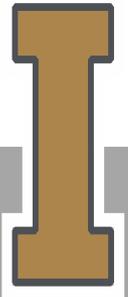


POCKET GOPHERS

Many different species and subspecies.

Feed on plant/tree roots underground, feed within a body length from the burrow opening, or pull vegetation into tunnels.

Generally one litter (sometimes two) per year, 3-4 per litter.

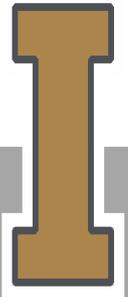
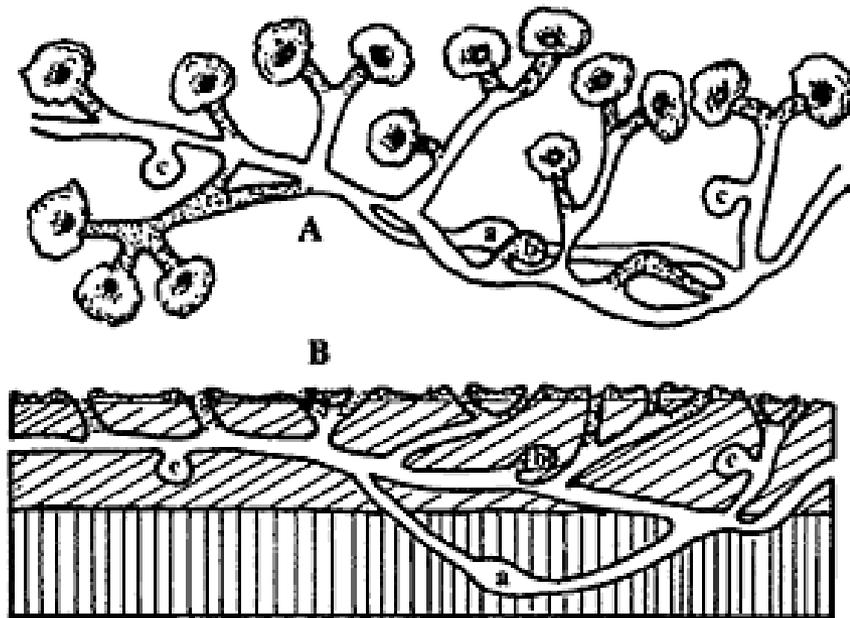


GOPHER BURROWS

Burrow system consists of:

- Main burrow, 4"-18" below the ground and parallel to the surface.
- Lateral burrows off the main burrow.
- Deep branches used as nests or food caches. Deep branches can be 6' or more deep.

A single burrow system can contain up to 200 yards of tunnels and cover up to 700 square yards.

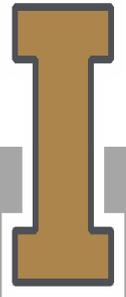


GOPHER BURROWS

Lateral burrows can be identified by the appearance of a fan-shaped mound with the entrances usually plugged to keep out intruders.

A single gopher may construct 300 soil mounds while moving over 4 tons of soil in one year.

Typically, one gopher per tunnel system unless during mating or females with litters.



OTHER GOPHER INFO



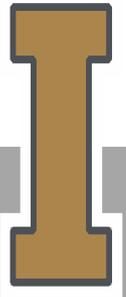
Females produce litters the spring after they are born.

Are active all year long.

Live their entire life in the soil.

Alfalfa is a preferred food source.

Generally don't live more than three years.

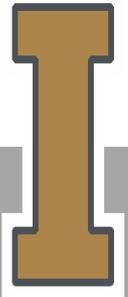


VOLES

Larger than common house mouse, often mistaken for mice when young. Can be 5 ½ inches long at maturity.

Very prolific, females can breed when 1 month old (Meadow). Produce an average litter of 5 every three weeks.

Can live up to two years. Most live less than 1 year.



VOLES

Live primarily above ground, but also tunnel on the surface and in the ground.

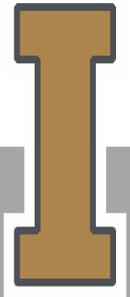
Wide range of food: plants, seeds, tubers, bulbs, tree and shrub bark. Also eat insects.

I Do not hibernate, are active day and night.



VOLE DAMAGE

Create “runways” on the surface of pastures and fields (feeding damage).
Girdle trees/shrubs.
High populations can cause substantial damage to field crops.



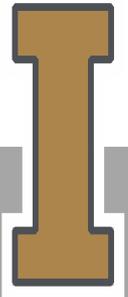
OTHER VOLE INFO

Are heavily predated by cats, dogs, foxes, coyotes, etc.

Best defense is to remain hidden either under vegetation or snow.

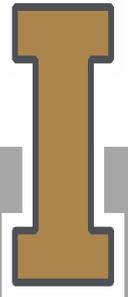
Normally not a pest of structures and homes.

Can transmit diseases (Tularemia, hantavirus).



VOLE BENEFITS

Cat Food?



GOPHER BENEFITS(?)



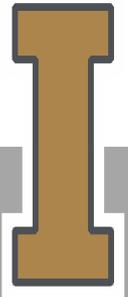
Increased soil fertility by adding organic matter.

Increased soil aeration and decreased soil compaction.

Increased soil formation 

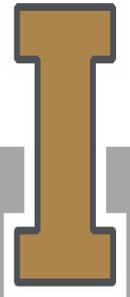
Increased water infiltration.

Big, Fat, Hairy Deal...



GOPHER CONTROL

(How to get rid of the buggers...)



GOPHER CONTROL

Cultural

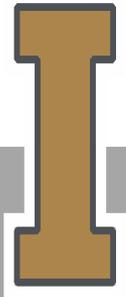
- Crop rotation
- Weed control
- Grain buffer strips
- Flood irrigation

Repellents

- Moth balls, sonic devices, etc.
- Not proven to work.

Snake Oil

- Gum, hair, ammonia, Pinesol, Lysol, vehicle exhaust, gasoline.



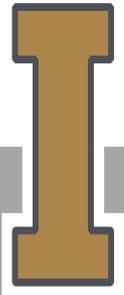
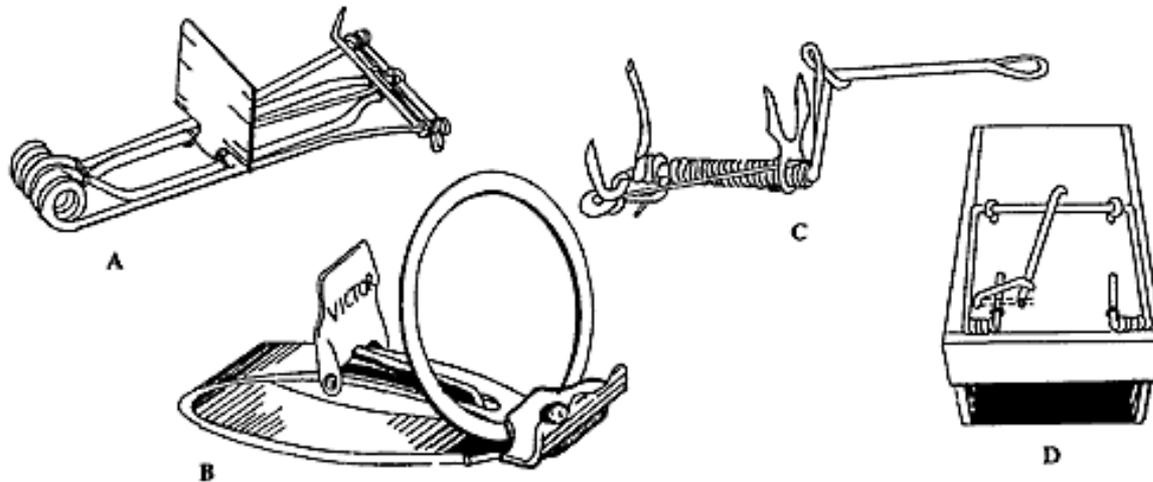
GOPHER CONTROL

Traps

- Various traps are available.
- Solid trigger pan traps are better for main runways.
- Open trigger pan traps are good for lateral runways.
- Requires some skill to be effective.

Must continue trapping until gopher activity stops.

Not suitable for larger populations or large infestations.



LOCATING THE BURROW

Dig Here!



Locate a mound that has fresh dirt or recent activity.

Dig with a shovel or spade at the base of the “fan” of the mound.

The burrow with a loose dirt plug should be easily identified.

If necessary, dig towards the main burrow to open the lateral burrow.



Project
University of California

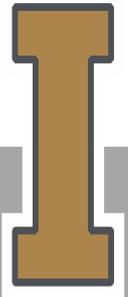
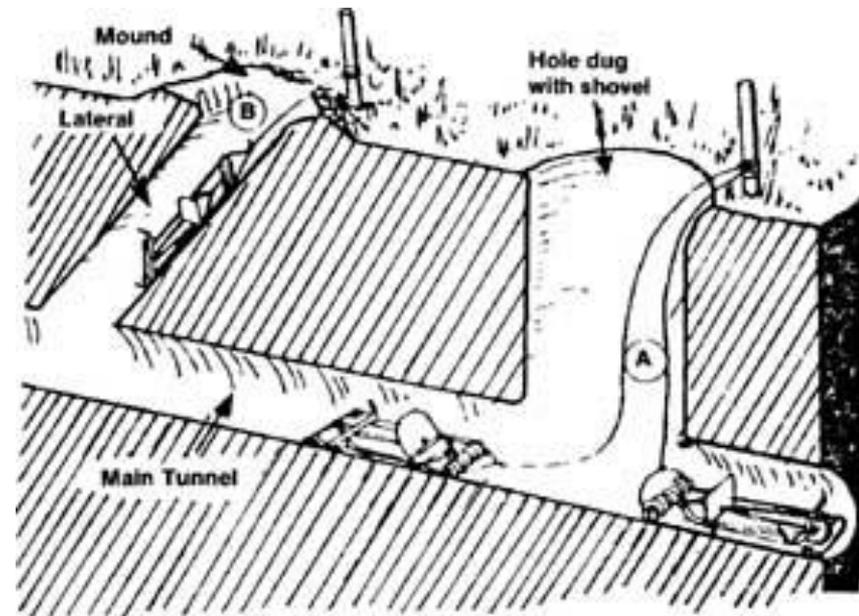
University of Idaho
Extension

TRAP PLACEMENT

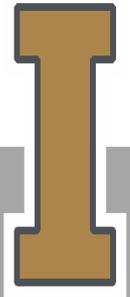
Figure A shows how to trap in a main burrow.

Figure B show how to trap in a lateral burrow.

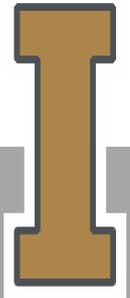
Secure traps by rope/wire/cable to prevent loss.



These Kids Are Good!



And
So Is
He!



GOPHER TOXICANTS

Strychnine Baits

- Most are Restricted Use! Widely used.
- Applied by hand or probe.
- Must be applied underground to prevent secondary poisoning.

Zinc phosphide

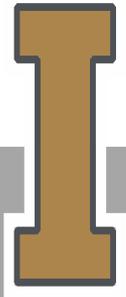
- Restricted Use!
- Similar to above baits for application.

Anticoagulants

- General Use Pesticide.
- Similar application techniques to strychnine baits.



UC Statewide IPM Project
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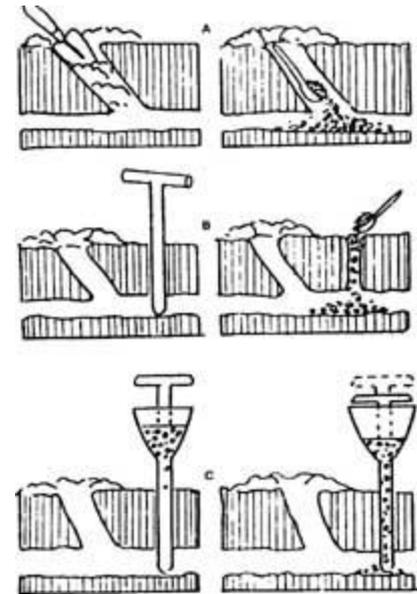
BAIT PLACEMENT

Hand Placement

- Locate main burrow by digging a lateral.
- Place bait into main burrow with long-handled spoon.

Probing

- Can probe and hand place or use a probe/bait dispenser.
- Locating the main burrow takes practice.



I Probing is generally more effective than hand placement.

Close burrow/cover probe hole after bait placement.

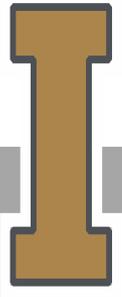
FUMIGANTS

Al Phosphide

- Sold in tablet or pellet form.
- Releases phosphine gas when exposed to moisture.
- Restricted Use Pesticide.
- **Read the label/manual prior to use!!!**

Gas Cartridges

- Not very effective.



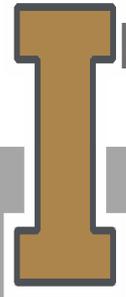
NON-TOXIC METHOD

Products that mix an explosive gas with oxygen and are injected into gopher runways.

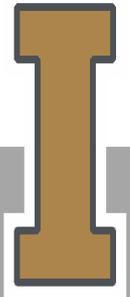
Will both kill gophers and collapse runways. Fairly effective when used properly

Need eye and ear protection.

Rodenator Pro, Rodex and other devices are currently being produced.



VOLE CONTROL



CONTROL OPTIONS

Habitat manipulation

- Plowing, disking, raking, burning, snow removal, etc.

Repellents

- Thiram, capsaicin. Short term only.

Trapping

- Not effective against large populations.

I Encourage predators

- Not very effective.

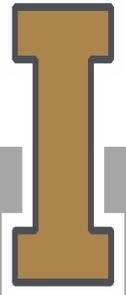


VOLE CONTROL

Generally, poison baits are the most effective control for large populations where habitat manipulation is not practical or not possible.

Baits can be broadcast to reduce large populations, but must be careful (non-target poisoning/secondary poisoning).

Bait stations are effective in areas where non-target poisoning may be an issue.

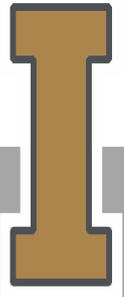


POISON BAIT'S

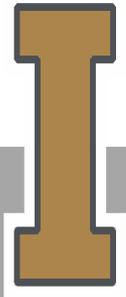
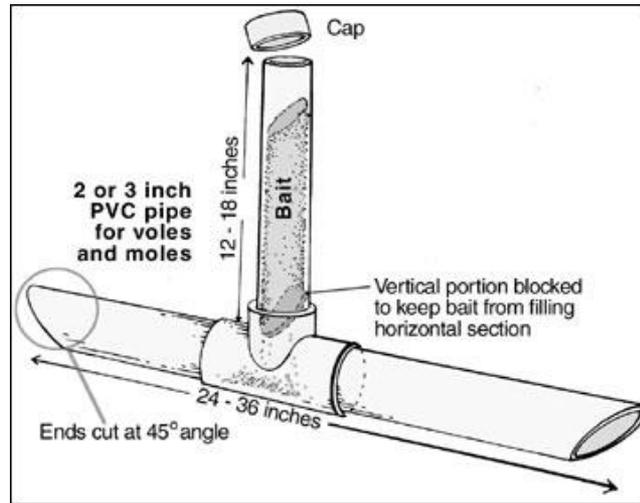
Many different baits exist, zinc phosphide and anti-coagulants are most common.

Bait stations provide a feeding area for voles and protection from non-target exposure.

Baiting is most effective in late summer and fall to reduce damage during winter.



BAIT STATIONS

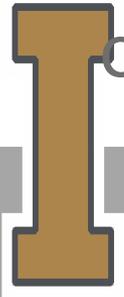
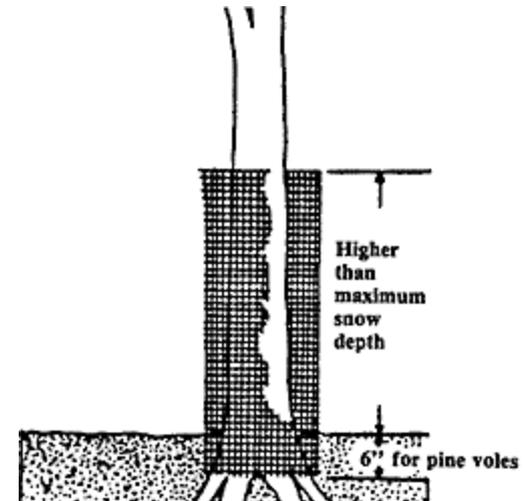


TREE PROTECTION

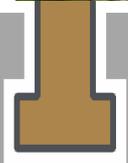
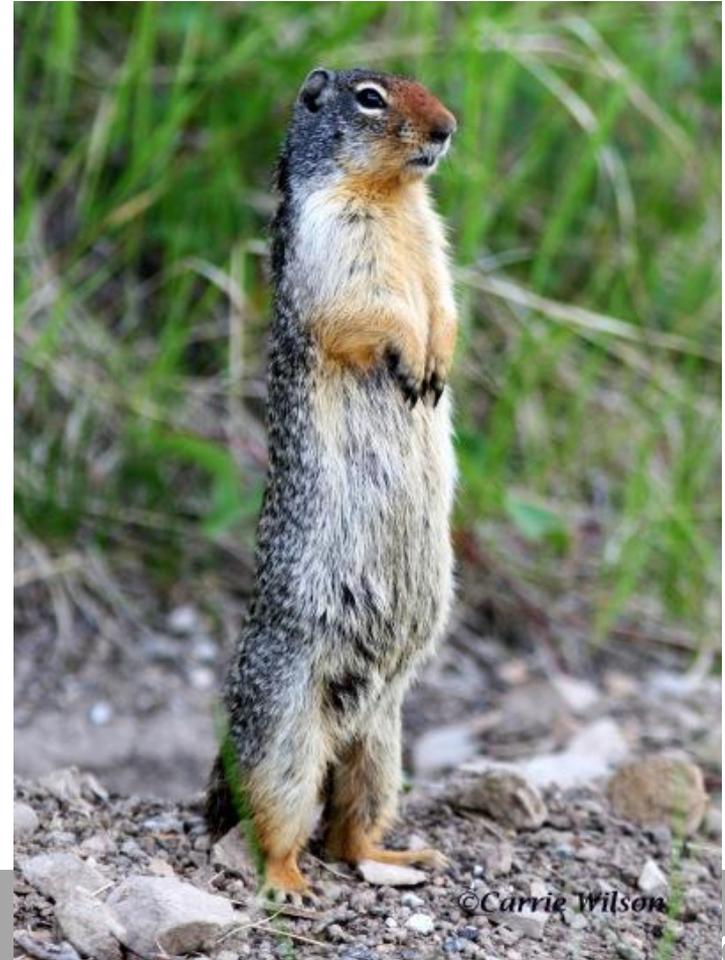
Screens and wraps are used extensively to protect young trees against vole damage.

Protection must be higher than the maximum snow depth.

Difficult for large number of trees.



GROUND SQUIRRELS



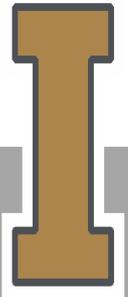
GROUND SQUIRREL

Live in extensive underground burrows

Feed above ground

Hibernation

Population dynamics



GROUND SQUIRREL CONTROL

Cultural methods

Exclusion

Repellents/fright

Flooding

Predators

Toxicants

Trapping

Shooting

Fumigants



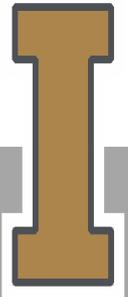
GENERAL RECOMMENDATIONS

Usually need a combination of control methods to reduce gopher and vole populations.

If an area is heavily infested, maximum effort is necessary to reduce the population.

Try to prevent gopher migration into an area by using buffers and/or effective monitoring and trapping/baiting when new activity is noticed.

When using baits, make sure that you limit the chance for non-target and secondary poisoning.



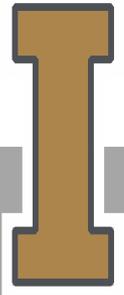
GENERAL RECOMMENDATIONS

For placing baits and Al Phosphide (Gophers):

- Reduce any chance of non-target poisoning.
- Probing for main runways requires practice.
- Remember to cover probe holes or burrow opening to get the maximum effect.

For all pesticide products:

- Safety, Safety, Safety!
- Read the Label!
- Store all pesticides in locked containers that are segregated and out of reach.



REMEMBER!

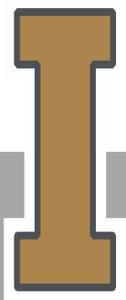
If you plan on using a RUP, you need to be licensed.

- Currently most strychnine baits, all zinc phosphide baits, and all aluminum phosphide fumigants are RUP's.

Watch endangered/threatened species restrictions.

If using explosive gas devices:

- Safety is key.
- Get recommendations and instruction from manufacturer.



Meadow Voles and Pocket Gophers: Management in Lawns, Gardens, and Cropland

D. Gunn, R. Hirnyck, G. Shewmaker, S. Takatori, L. Ellis

Meadow voles and pocket gophers cause significant damage to rangeland, alfalfa, pastures, and other agricultural crops. Combined or alone, forage losses from gophers and/or voles have been estimated at 10 to 50 percent in pastures and alfalfa. These rodents also cause significant damage in orchards, nurseries, turf farms, ornamental flower plantings, landscapes, lawns, and vegetable gardens.

Both voles and gophers damage plants by eating roots, trunks, stems, tubers, and leaves. Their tunneling habits also cause damage. Large mounds of soil left by rodents, particularly gophers, can dull knives and discs on harvesting equipment. Soil from mounds also contaminates hay bales. Underground rodent burrows and tunnels interfere with irrigation practices and equipment. The burrowing and mounding capabilities of gophers encourage weed invasion through ground disturbance and can cause injury to people, horses, and livestock that step into holes.

Although voles reproduce more rapidly than gophers, both have remarkable reproductive capacity. Population surges can occur frequently when adequate forage and habitat are available.

Voles and gophers are considered non-game mammals in most states and can be legally managed on private property and public lands. Check with your state wildlife

agency or department of agriculture regarding legal control methods in your area. Management options depend on the pest, the situation, cost limitations, and equipment and labor availability. It is important to understand the target pest's biology and habits before implementing management strategies.

Figure 1. Vole (meadow mouse). Photo by Danielle Gunn.



Figure 2. Vole (meadow mouse). Photo by Danielle Gunn.



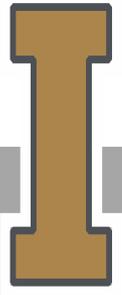
Voles

Vole biology

Several species of voles exist in the Pacific Northwest, and it can be difficult to distinguish among them. The meadow vole, or meadow mouse (*Microtus pennsylvanicus*), is the most common species in pastures, rangelands, crops, and lawns. 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 bicolored tails. When fully grown, voles generally average 4½ to 5½ inches long, including the tail (Figures 1 and 2). Under good weather and feeding conditions, voles can reach 7½ inches in length.

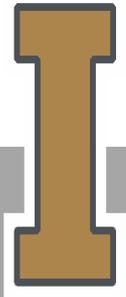
A Pacific Northwest Extension Publication: University of Idaho • Oregon State University • Washington State University

<https://www.extension.uidaho.edu/publishing/pdf/PNW/PNW0627.pdf>



INFORMATION

- Be careful...
- <https://www.extension.uidaho.edu/publishing/pdf/PNW/PNW0627.pdf>
- Contact:
 - U of I Extension
 - County rodent control authority
 - Irrigation districts
 - ISDA



WILDLIFE DAMAGE MANAGEMENT

- ▶ Wildlife Damage in the US
 - Cost is ~ \$22 billion annually

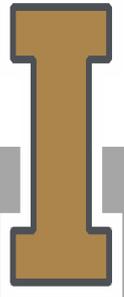


Photo: USDAAPHIS



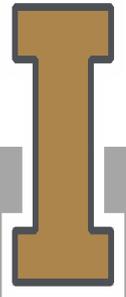
Photo: A. Wywiśłowski

- ▶ Control is important due to
 - Expanding human populations
 - Intensified land-use practices



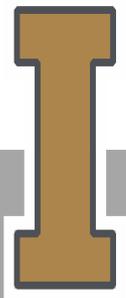
WILDLIFE DAMAGE MANAGEMENT MUST BE . . .

- ▶ Based on sound economic, ecological, and sociological principles
- ▶ Carried out as positive, necessary components of wildlife management programs
 - **Actions must be justified, environmentally safe, humane, and in the public interest**



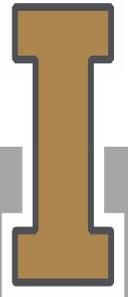
FOUR PRINCIPLE COMPONENTS

- (1) Problem definition
 - Species causing problem
 - Number of animals
 - Amount of loss
 - Nature of conflict
- (2) Ecology of the problem species
- (3) Management methods application
 - Develop an appropriate management strategy using (1) and (2)
- (4) Evaluation of management effort
 - Assess the results relative to cost and impact on target and non-target populations



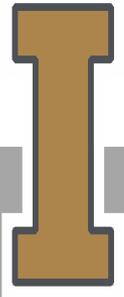
LEGAL REQUIREMENTS FOR MANAGEMENT

- ▶ It is important to understand the laws regarding target and non-target species
 - Capture, possession, or killing of most mammals, reptiles, and amphibians is regulated by state or provincial laws
 - Federal regulations require that a depredation permit be obtained before most migratory birds can be captured, killed, possessed, or transported to control depredation



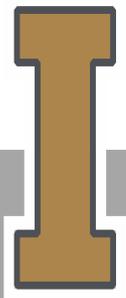
EXAMPLES OF DAMAGE BY BIRDS

Species	Damage
Gulls	Aviation safety, Building damage, Nuisance
Blackbirds, Starlings	Aviation safety, Crops (corn, sunflower, rice), Nuisance
Pigeons, House Sparrows	Grain contamination, Building Damage
Crows, Ravens, Magpies	Predation (birds, livestock), Crops (corn, fruit), Nuisance
Hérons, Egrets, Cormorants	Commercial and natural fisheries
Raptors	Aviation safety, Predation (poultry, livestock)
Woodpeckers	Damage to wooden structures, Nuisance
Ducks, Geese, Sandhill Cranes	Aviation safety, Crops, Nuisance



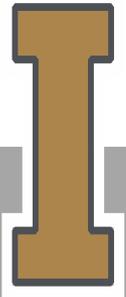
EXAMPLES OF CONTROL TECHNIQUES FOR BIRDS

- ▶ Habitat Modification and Cultural Practices
- ▶ Netting and Screening
- ▶ Frightening Devices
- ▶ Repellents
- ▶ Toxicants and Capture Agents



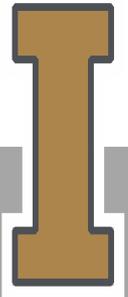
HABITAT MODIFICATION AND CULTURAL PRACTICES

- ▶ Can be implemented to make roosting, loafing, or feeding sites less attractive
- ▶ Lure crops may be used to control waterfowl or blackbirds.
- ▶ Bird-resistant crops may also be used to limit losses



PROOFING AND SCREENING

- ▶ Plastic netting to protect crops
- ▶ Netting or wire screening may be used to exclude birds from building structures
- ▶ Building ledges can be angled 45° to deter perching
- ▶ Spikes and electric wires can be used to deter perching
- ▶ Overhead monofilament lines can be used to deter many bird species



FRIGHTENING DEVICES

- ▶ No device is 100% effective
 - Birds quickly habituate

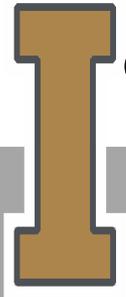


- ▶ Propane cannons
- ▶ Pyrotechnics
- ▶ Recorded alarm / distress calls



Photo: USDAAPHIS WS

- ▶ Flags, kites, and helium balloons
- ▶ Strobe lights
- ▶ Ultrasonic devices



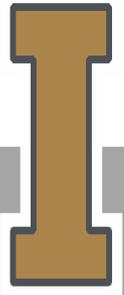
REPELLENTS, TOXICANTS, AND CAPTURE AGENTS

▶ Repellents based on smell and taste are generally ineffective

▶ Condition-aversive repellents are more effective

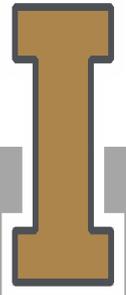
- Produce illness or adverse physiological responses upon ingestion

- ▶ Toxicants and capture agents require knowledge of the habits and food preferences of the target species
 - DRC-1339: used to control starlings, gulls
 - Avitrol: frightening agent used to control pigeons, gulls, house sparrows, starlings, blackbirds
 - Alpha-chloralose: used to capture waterfowl and pigeons



EXAMPLES OF UNGULATE DAMAGE

Species	Damage
Cervids (deer, elk)	Aviation and vehicle safety, crops (soybean, corn, alfalfa, stored), trees, urban landscapes, and disease
Feral swine	Crops, pasture, yards, and native habitat



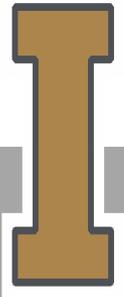
CONTROL TECHNIQUES FOR UNGULATES

▶ Lethal control

- Regulated hunting

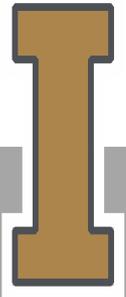
- Sharp shooting

- ▶ Habitat and Food Modification
- ▶ Fencing and Barriers
- ▶ Frightening and Hazing
- ▶ Dogs as Deterrents
- ▶ Repellents
- ▶ Fertility Control



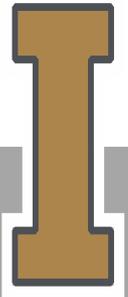
LETHAL CONTROL

- ▶ Regulated managed hunting is the most practical and effective method of management
- ▶ Is the most ecologically, socially, and fiscally responsible method



HABITAT AND FOOD MODIFICATION

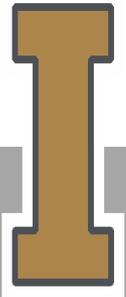
- ▶ Select unpalatable/ resistant plants
- ▶ Reduce permanent cover
- ▶ Harvest crops as soon as ripe
- ▶ Lure crops / Baiting



EXCLUSION: FENCING AND BARRIERS

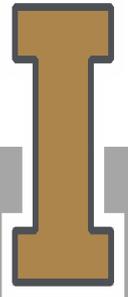
► Fencing can be a long-term, nonlethal control method. Fencing provides protection by acting as a physical barrier and/or psychological barrier

► Variables to consider: level of protection desired, seasonality of the resource being protected, physical ability of the target species, motivation to breach, behavioral characteristics, cost, longevity of materials, potential negative effects



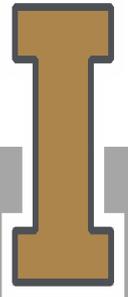
FRIGHTENING AND HAZING

- ▶ Ungulates habituate quickly
- ▶ Many marketed devices do not work
- ▶ Devices that target multiple senses are the most efficacious
- ▶ Persistent hazing can be effective
- ▶ Dogs may be used as deterrents



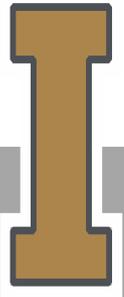
REPELLENTS

- ▶ Limited effectiveness
- ▶ Odor repellents: designed to repel animals, and either mimic predator odors or are repugnant
- ▶ Contact repellents are applied directly to the target resources and change the hedonic quality of the item, and/or cause illness (aversive conditioning)
- ▶ Systemic repellents: are incorporated into plants naturally, by supplementation, or genetic manipulation



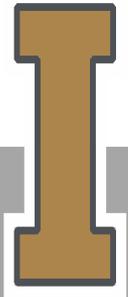
FERTILITY CONTROL

- ▶ Wildlife contraceptives have the potential to be complimentary management tools, however; it is unlikely that fertility control will become a stand-alone management strategy
- ▶ Methods include chemosterilants, intrauterine devices, immunocontraceptives, and surgery
- ▶ Recent developments include single-shot fertility control methods, orally delivered contraceptives, viral- or bacterial-vectored delivery methods



DAMAGE BY RODENTS/SM. MAMMALS

Species	Damage
Beaver, Muskrat, Nutria	Waterways, Wetlands, Trees, Crops (rice, sugarcane)
Deer & White-footed mice	Seed predation, Crops, Home invasion
Ground Squirrel	Pasture, Rangeland, Gardens, Crops (forage, grain, fruit, nut)
Marmots	Burrowing, Gardens, Crops (alfalfa, soybean, vegetables, fruit)
Voles	Trees, Shrubs, Crops (field & garden)
Moles	Burrowing (turf, pasture, crop fields)
Pocket gopher	Burrowing, Crops (field, root), Trees, Pasture
Prairie Dog	Burrowing, Crops, Grasslands, Crops
Rabbits & Hares	Landscape plantings, Gardens, Crops, Rangeland, Trees, Shrubs
Tree Squirrels	Trees, Shrubs, Plantings, Nuisance, Power lines
Woodrats	Fruit, Seed Crops, Herbaceous & Woody Plants, Nuisance
Commensal rodents	Grain Crops, Birds, Livestock, Property damage, Burrowing

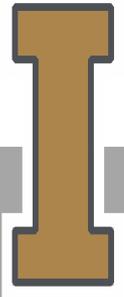


RODENTS AND OTHER SMALL MAMMALS

► Damage is frequently difficult to measure; most species are nocturnal and not easily observed. Characteristics of damage may provide clues. Quantification of damage is often made by comparing the damaged site with an undamaged area, then converting the losses to dollars.

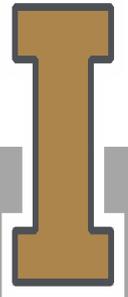
► Damage to plants may be generally grouped as:

- Root damage
- Trunk debarking
- Stem & branch cutting
- Needle clipping
- Debudding



EXAMPLES OF CONTROL TECHNIQUES

- ▶ Habitat Modification
- ▶ Cultural Practices
- ▶ Exclusion
- ▶ Frightening Devices
- ▶ Removal
- ▶ Biological Management
- ▶ Fertility Control
- ▶ Repellents
- ▶ Fumigants
- ▶ Toxicants



HABITAT MODIFICATION AND CULTURAL PRACTICES

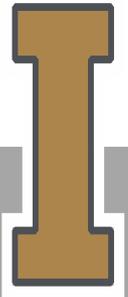
▶ Elimination of food and shelter

▶ Remove brush, debris, woodpiles, garbage, refuse, tall vegetation

▶ Mechanical devices

▶ Provision of alternative foods

▶ Remove insect and invertebrate food supplies

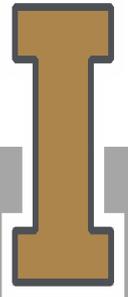


EXCLUSION

- ▶ Installation of barriers that prevent access to structures or areas, or eliminate contact with specific objects
- ▶ “Rodent proofing”



Photo: USDA APHIS WS



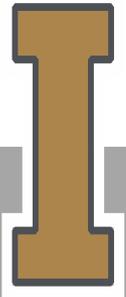
BIOLOGICAL MANAGEMENT AND FERTILITY CONTROL

► Biological Management:

- Introduction of agents of disease and predatory species. Be careful, historically has led to dire unintended consequences (e.g., mongoose).

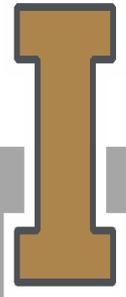
► Fertility Control:

- In time may be an effective supplemental tool. Oral and immunological agents are being developed as are viral-vectored immunocontraceptives.



REPELLENTS

- ▶ Repellents are most effective when applied to foods
- ▶ Several compounds are registered for use, however; efficacy data is often lacking
- ▶ Chemical repellents include:
 - Sensory repellents
 - Semiochemical odors
 - Taste avoidance behavior compounds

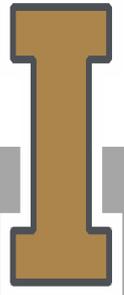


FUMIGANTS AND TOXICANTS

► Fumigants are used for lethal control of burrowing mammals. Examples include smoke-producing gas cartridges, aluminum phosphide, choloropicrin, and methyl bromide

► Toxicants are labor and cost efficient, and are the most commonly used method of control. Potential hazards to non-target wildlife must be considered prior to use. Two types of toxicants are commonly used

- Anit-coagulants
- Non-anti-coagulants



REMOVAL

- ▶ Foothold traps are commonly used to trap beaver, muskrat, and nutria; smaller sizes are used to capture small mammals. Body gripping traps are used for beaver, muskrat, nutria, moles and pocket gophers. Snap traps are typically used to control rats and mice. Snares may be used to capture or kill beaver, rabbits, and other animals.



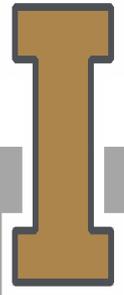
Shooting may be used to selectively eliminate some pest mammals

Live traps are often used to capture mammals of all sizes



DAMAGE BY CARNIVORES AND OTHER MAMMALIAN PREDATORS

Species	Damage
Badger	Small Mammals, Birds, Lambs, Poultry, Burrowing
Black & Grizzly Bear	Livestock, Field crops, Beehives, Nuisance, Trees
Coyote, Wolves, Dogs	Predation (livestock, big game, poultry), Fruit crops
Mountain Lion, Bobcat, Lynx	Predation (livestock, horses, big game, poultry, pets)
Foxes	Predation (small mammals, livestock, poultry), Fruit crops
Opossums	Predation (poultry), Nuisance
Raccoons	Predation (poultry, livestock, small vertebrates, birds), Crops (corn), Nuisance
Skunks	Predation (waterfowl, poultry), Nuisance
Weasels & Mink	Predation (poultry, small vertebrates, birds, fish)
Feral Cats	Predation (songbirds, small vertebrates)



QUESTIONS OR COMMENTS?

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