



Oregon State University
Extension Service



Dueling with diggers



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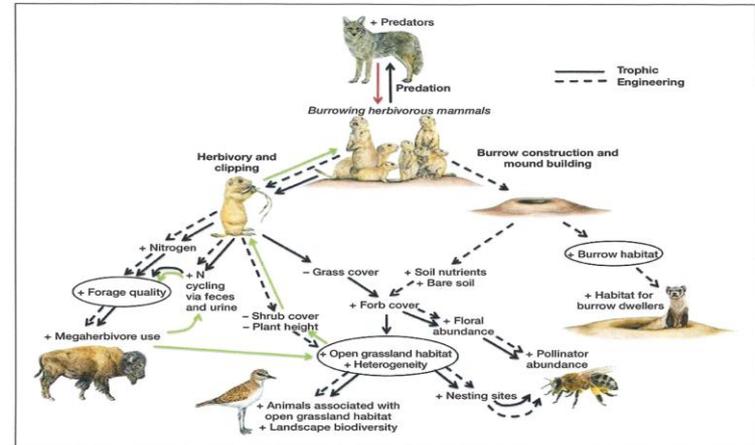
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<http://fw.oregonstate.edu/content/extension-wildlife>

<https://extension.oregonstate.edu/ask-expert>

Ecological roles of burrowing animals

- Aid soil formation, aeration, and nutrient mixing
- Move nutrients from leach zone to root zone
- Aid water infiltration – reduce erosion
- Add soil nutrients, organic & inorganic matter
- Food for predator species
- Provide habitat for other species
- Promote fine- and landscape-scale vegetation and ecosystem diversity through eating some plant species and helping others compete
- Promote and enable animal biodiversity
- *Often play keystone roles as ecosystem engineers*



From Davidson, A.D., J.K. Detling, and J.H. Brown. 2012. Ecological roles and conservation challenges of social, burrowing, herbivorous mammals in the world's grasslands. *Frontiers in Ecology and the Environment* 10(9):477-486

Concerns for sustaining burrowing species (and their ecological services) around the world

- Intentional poisoning
- Exotic diseases and pests/parasites
- Overhunting
- Habitat loss
- Climate change

>>Threatening ecological and economic collapse in some of the world's most unspoiled and productive natural and human landscapes



A Plateau pika in Tibet on the Qinghai-Tibetan Plateau Photo credit: Chinadialogue



A false zokor Photocredit: Igor Mavrín

Conflicts arise when:

- Animals get into & occupy structures
- Animals eat or damage what we don't want them to:
 - Ornamentals
 - Personal food/garden
 - Production crops (plant or animal)
- Animals cause structural damage or loss
 - Structures, crops, landscaping
- Animals pose a physical risk to humans
 - direct or indirect



Assessment first, then management

- Are there health or safety concerns?
- How serious is the problem?
 - insignificant, tolerable, beyond acceptable
- What is the context?
 - >> Spatial scale (a suburban yard, a neighborhood, a focal path or resource)
 - >>> What surrounds your work area? More/better habitat?
 - >> Social (human) scale
- Consider likelihood that the conflict or problem will reoccur

Basic tactics

- Anticipate and prevent a problem
- Modify habitat to reduce carrying capacity
 - Block entry
 - Deter use
- Remove the animal(s)

Why not just move them?

- Low survival
 - Intra-specific aggression
 - Vulnerable to predation
 - Homing behavior = risks along the way
 - Likely to starve, do poorly
 - Humans unlikely to select sites that = habitat
- Disrupt resident population
- Illegal in most cases
- Disease transmission
- Ethical issue of “moving the problem”

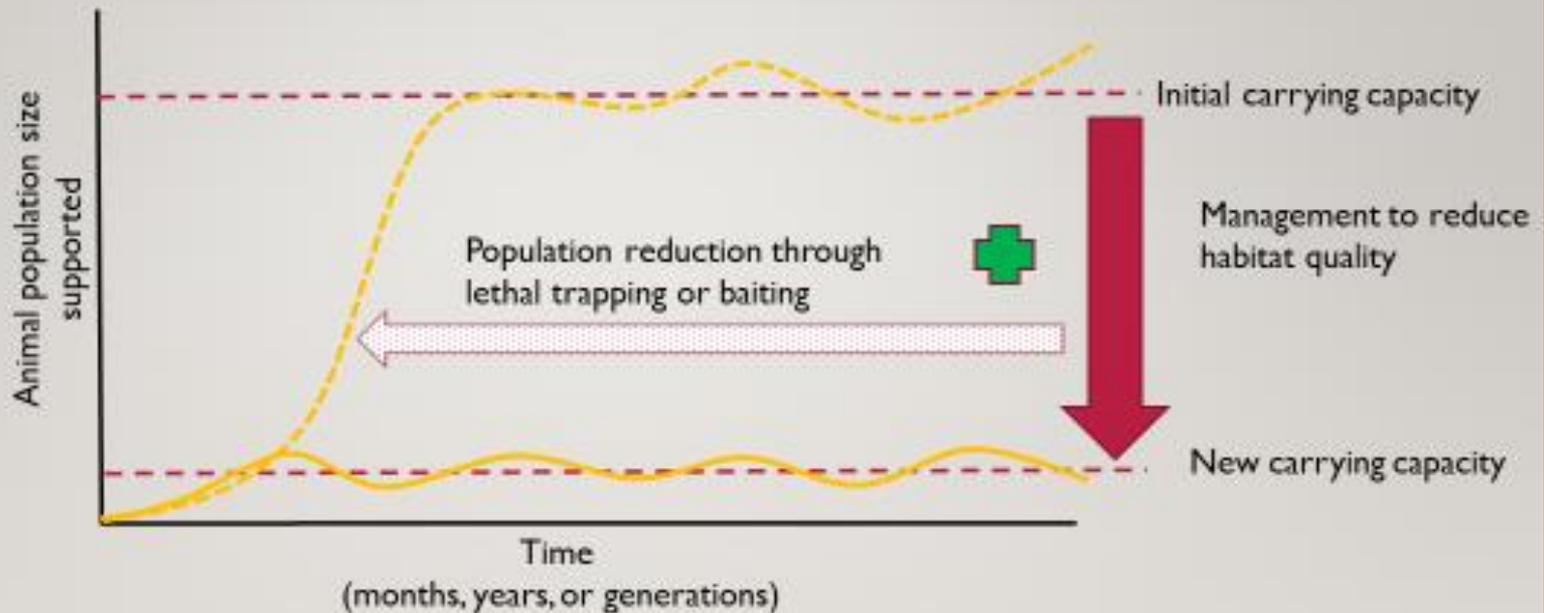


Habitat, a biological definition:

Habitat is the combination of factors (biotic and abiotic) necessary to allow members of a particular species to occupy a location, to survive, and to successfully reproduce.

Habitat quality speaks to resource abundance, quality, accessibility, or even safety (predation risk)

Reducing carrying capacity is a vital part of breaking the conflict cycle



Go native: Enjoy plants while preventing your yard from getting hammered

Native vegetation tree, shrub, ground cover, and grass & forb species:

- Tolerate the vagaries of weather in their habitat
- Have evolved in “arms race” with the things that eat them
- Often host other organisms that are food for other animals

Lower habitat quality **by reducing food availability**

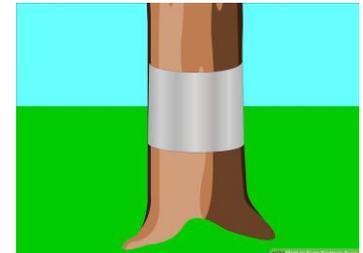
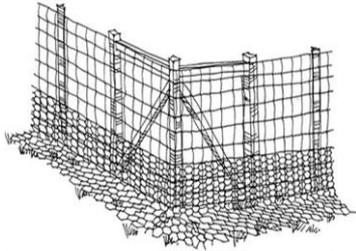
- Ground cover choices
 - Many factors depending on use, setting, and logistics BUT
 - Factor in the ground cover's role in (potentially) driving the wildlife conflict
- What potential food sources are in close proximity or interspersed in the area?
 - How can we target exclusion and/or point-source management treatments to reduce habitat quality and visitation over the whole area?
- Native landscaping vegetation trees, shrubs, and grass & forb species:
 - Tolerate the vagaries of weather in their habitat
 - Have evolved in “arms race” with the organisms that eat them
 - Often host other organisms that are food for beneficials

Lower habitat quality and deter use of area by raising risk of predation

- Few if any scent products have replicated tests of effectiveness
- Many prey species make up for high predation rates with high birth rates and fast maturation
- Knowing your species:
 - Manipulate habitat to raise the perception & danger of detection
 - Know what eats it and encourage/tolerate those animals to help out



Reducing habitat quality and accessibility via exclusion:



Deter by taste or smell: A very limited option vs. the diggers

- Commercial products are available for *above-ground plant material*
- Require reapplication after rain and exposure to sun over time
- Vary in effectiveness
- Most lack replicated tests of effectiveness
- Need to rotate products to avoid habituation



Reducing populations:

Lethal removal via trapping

Species diagnosis is vital for:

- Trap selection
- Trap placement
- To bait or not to bait
- When to trap
 - Minding annual, seasonal, environmental conditions and how that factors for target species and your effectiveness

Toxicants as tools to reduce population of a species

READ THE LABEL. FOLLOW THE LABEL. LABEL IS THE LAW.

- Responsibility to prevent non-target kills – including humans
- Retail (on the shelf) products vs. Registered, restricted use products (require ODA pesticide applicator license to buy/use)
- Please keep in mind secondary impacts of pesticides, because chemicals have no knowledge of what has swallowed them.
 - Improper application of zinc phosphide bait for voles kills 1000s to >10,000 geese per event – Usually 1-2 events per year in OR
 - If rodents are likely to have sub lethal doses of toxicants onboard, what other (living) tools might be affected? (Your dog? Owls? Hawks? Foxes?)

Moles

- Solitary predators – Eat invertebrates
 - *Townsend's mole does eat bulbs, etc.
- Molehills are the nuisance in many cases
 - “Disappear” when burrowing deep to follow prey species according to their soil habitat conditions
- Molehills – Plug in *middle* of dirt cone
 - When close to surface may push up ridges
- Treat lawn for grubs and worms to reduce food source
- Little known about reproductive ecology –
 - Likely 1 litter/year, between Feb-Apr, 1-4 young
- Burrows make work hard for predators: Some raptors, owls, snakes, and other mammals
- Body-gripping traps or poison moleworms if must removed

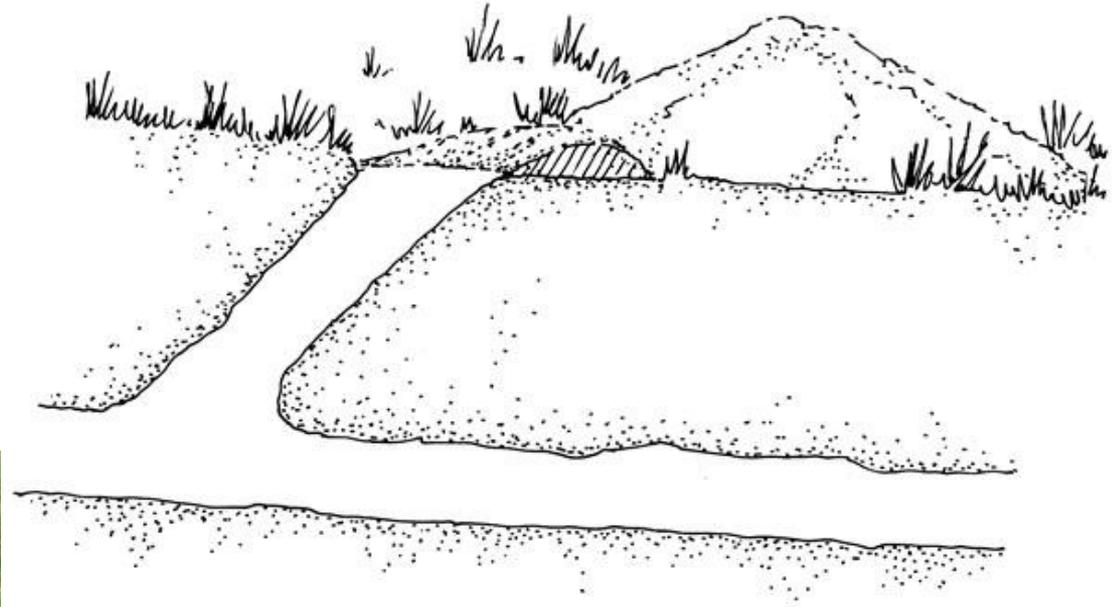


Pocket gophers

- Herbivores that prefer roots, bulbs, tubers, corms
- Do not hibernate
- Solitary & strongly territorial: We don't share burrows!
- Young born Feb. to June; 1-2 litters/yr.; short lifespan
- Traps effective in small areas, otherwise tractor-drawn “burrow-builders” that distribute toxic bait in artificial burrows
- Owls and mammals as predators – little known



Pocket gophers



- Extensive burrowing
- Notice the lumps in soil and location of plug in burrow entrance
- Eskers can form under snow

Voles



- Damage by eating tubers, seeds, and bulbs. WValley floor species prefer grasses but will also girdle shrubs and trees.
- Some species create extensive tunnel systems or “runs” above and/or below ground
- Short lifespan: 2 to 16 months, but high reproductive potential (Mar-Oct/Nov)
- Many litters/year; 3 weeks to mature!
- (In)famous for achieving near-exponential population growth in some years
- Snap traps (limited scale) or in-burrow rodenticide
- Predators: Owls, hawks, foxes, coyotes, skunks, herons, snakes, and many others

Oregon's (un-striped) ground squirrels

Washington

Columbian

California

Belding's

Merriam's

Piute

Wyoming

Tales of two ground squirrels



California

- Green vegetation, fruits, seeds, crop grains
 - Noted for a significant **seasonal diet shift**
- **Habitat generalist compared to others**
- Colonial burrow systems: Openings 4”, multi-chamber, can be >1m deep
 - Propensity for climbing
- Breeding season: Feb through March*
- Lifespan up to 3-6 yrs.
- Litter size estimate for Oregon is 3-7 (5)
- Hibernate, but some **young** active year-round
- Estivation by adults for up to 1 week/bout



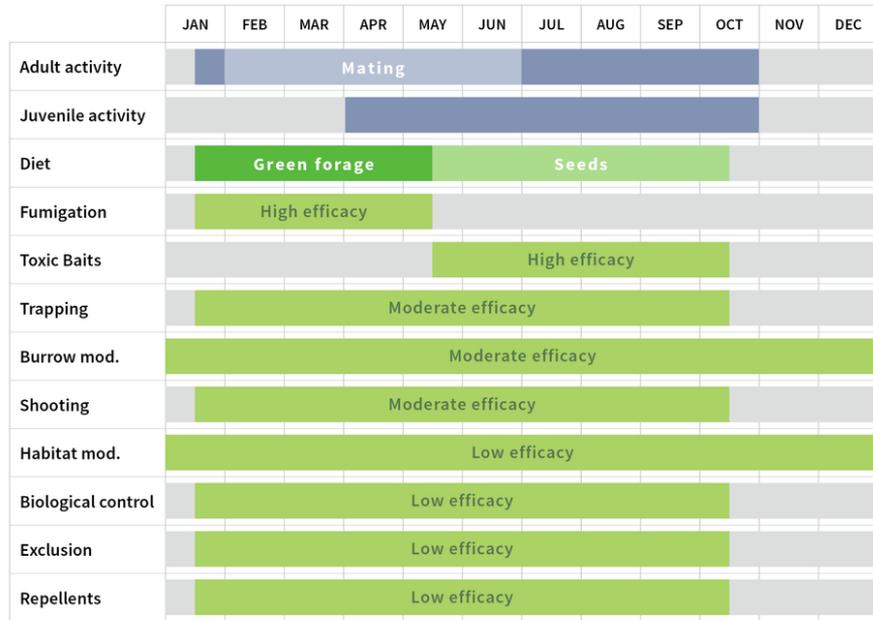
Belding's

- Opportunistic herbivore, but also takes insects and animal material
 - Tends to shift from grasses to forbs
- Steppe and higher-drier elevation ecosystems
- Breeding season differs by altitude/seasonality:
- Lifespan 1-1.5 yrs.
- Litter size varies by elevation and dam age
- Spend **6-8** months in torpor
- Juveniles go into torpor, too, only 2/3 emerge



California ground squirrel at Otter Reservoir, CA
By Catherine Ramsay, 2014, CCL

How to Time Management Efforts | California Ground Squirrels

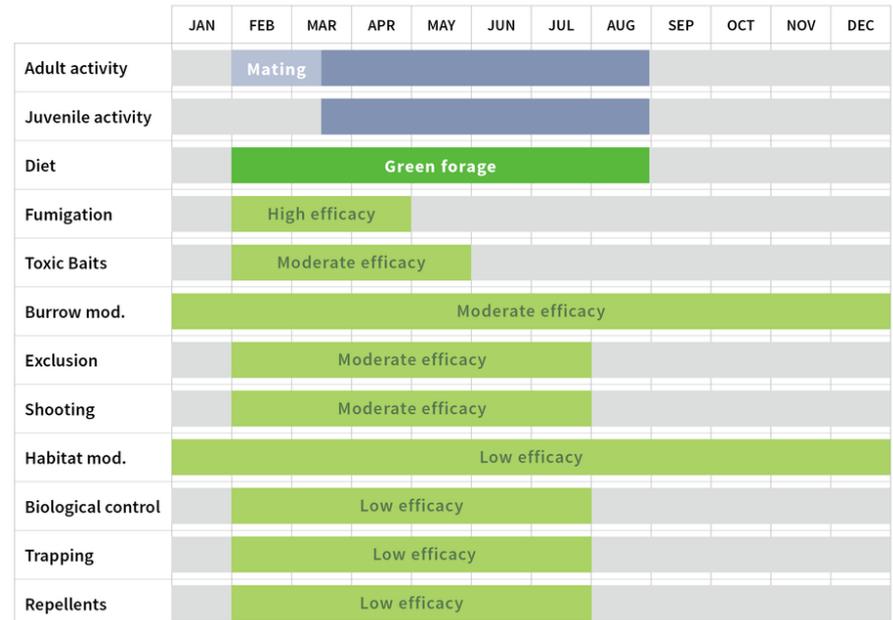


■ Active
 ■ Feeding
 ■ Management window
 ■ Hibernation/Method ineffective
 Note: Ground squirrel activity may vary by region. This variance may affect management windows.



Ron Wolf

How to Time Management Efforts | Belding's Ground Squirrels



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University of California at <http://www.groundsquirrelbmp.com/>

Species ID translating to management choices

Management Method Efficacy | California Ground Squirrels

	Time of Year	Efficacy	Cost	Labor	Restrictions
Fumigation	Mid-Jan to Mid-May ¹	HIGH	●	●	● ²
Toxic Baits	Mid-May to Mid-Oct	HIGH	●	●	● ²
Trapping	Mid-Jan to Mid-Oct	MODERATE	●	●	●
Burrow modification	Year-round	MODERATE	●	●	●
Shooting	Mid-Jan to Mid-Oct	MODERATE	●	●	●
Repellents	Mid-Jan to Mid-Oct	LOW	●	●	●
Habitat modification	Year-round	LOW	●	●	●
Biological control	Mid-Jan to Mid-Oct	LOW	●	●	●
Exclusion	Mid-Jan to Mid-Oct	LOW	●	●	●

¹ Management window may be longer if high soil moisture persists, particularly following substantial irrigation.

² Dependent on which fumigant or bait is used.

● = Low
 ● = Moderate
 ● = High

Management Method Efficacy | Belding's Ground Squirrels

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Burrow modification	Year-round	MODERATE	●	●	●
Shooting	February to July	MODERATE	●	●	●
Exclusion	February to July	MODERATE	●	●	●
Repellents	February to July	LOW	●	●	●
Habitat modification	Year-round	LOW	●	●	●
Biological control	February to July	LOW	●	●	●
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Image by Pat Henson, CCL

THANK YOU
FOR YOUR
TIME TODAY!



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- **Ask an Expert portal:**

- <https://extension.oregonstate.edu/ask-expert>

- New publication to share:

- Manage wildlife conflicts in your home and garden

- <https://catalog.extension.oregonstate.edu/pnw719>

- ODFW site with photos and briefs on all of Oregon's sciurids: <https://myodfw.com/wildlife-viewing/species/squirrels-chipmunks-and-marmots>