



**Appreciating New Mexico
pocket gophers and prairie
dogs**

**Navajo Sustainable Agriculture Project
May 02, 2022**

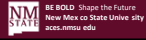


**Samuel T. Smallidge
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Cooperative Extension Service**

Information

Wildlife Damage & Vertebrate Pest Management
 New Mexico State University - http://aces.nmsu.edu/pubs/_L
 eXtension online - <https://wildlife-damage-management.extension.org/>
 Internet Center for Wildlife Damage Management - <https://icwdm.org/>

Rodenticide Information
 National Pesticide Information Center - <http://www.npic.orst.edu/>
 EPA Rodenticides - <https://www.epa.gov/rodenticides>
 Am. Assoc. of Poison Control Centers - <https://aapcc.org/>



Integrated Wildlife Damage Management

- Is wildlife management . . .
 WDM. . . balance the needs of humans with the needs of wildlife, to the enhancement of both
- Appropriate use
 - The label is the law!
 - Check local, state, and federal laws/regulations.
 - Humane dispatch

Multiple and Integrated Methods


2 FUNDAMENTAL STRATEGIES

HABITAT MANAGEMENT

Food
Water
Shelter

POPULATION MANAGEMENT

Direct
Indirect

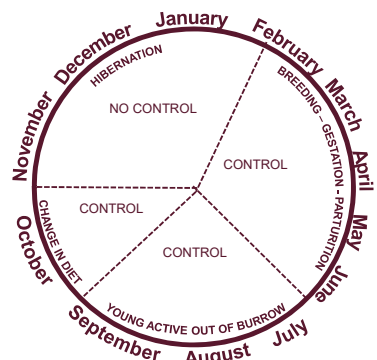

 BE BOLD. Share the Future.
 New Mexico State University
 www.nmsu.edu

IWDM approach

Steps to Consider:

- (1) Identify species and define and problem;
 - Identify species. What is the type damage? How much is damaged?
 - When does it occur?
 - Quantify amount (\$). Cost-benefit analysis
- (2) Understand problem species;
 - Nocturnal or diurnal? Carnivore or herbivore? Migratory?
- (3) Evaluation of control method(s);
 - pre-management monitoring; integrated mgmt. plan
- (4) Apply control method(s).
- (5) Monitor results & adapt
 - Monitoring plan;

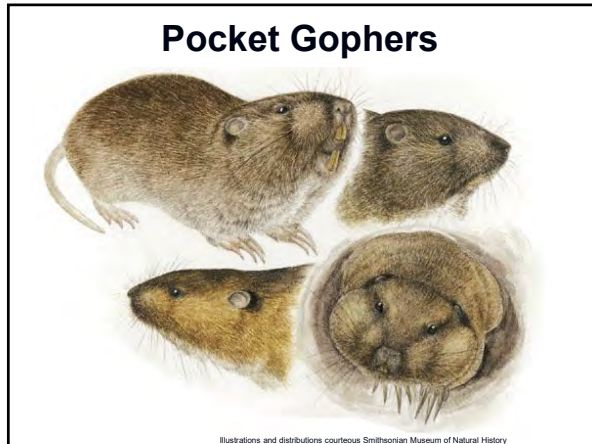
BIOLOGICAL YEAR

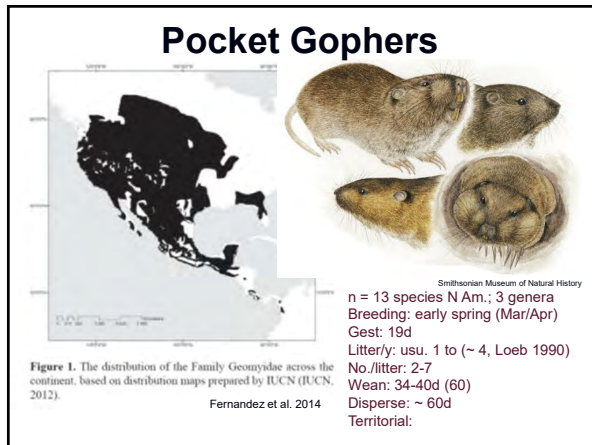


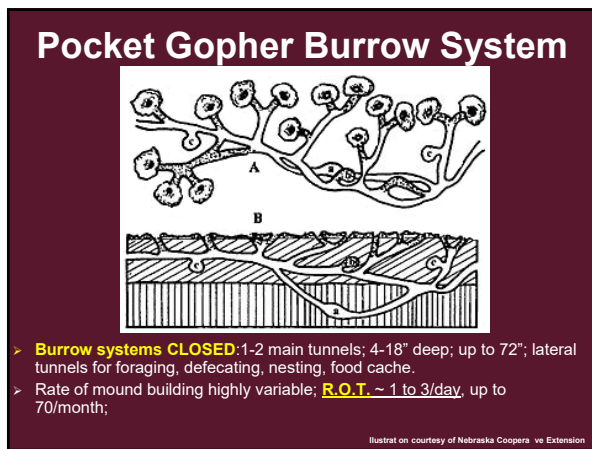
Integration

- Habitat Mod.
- Exclusion
- Fumigation
- Baiting
- Harassment
- Repellants
- Trapping
- Shooting

Biological & Legal







Potential Gopher Benefits

- Increase soil fertility by adding organic matter
- Soil cycling – 1 t/y
- Increase soil aeration and decrease soil compaction
- Increase water infiltration



Pocket Gopher Damage



- Consume roots of saplings (pos. girdle)
- Consume forage
- Tunnels divert irrigation water
- Undermine irrigation infrastructure
- Gnaw water lines
- Damage equipment
- Invasive seed bed



Damage

NE ~\$10M (Jasch et al. 1992)

Loss in Productivity

State	Alfalfa	Nat. Hay	Author
NE	45%	-	Luce et al. 1981
NE	21-49%	-	Luce et al. 1979
Western Pl.	17-49%	--	Case et al. 1989
NE	17%	31%	Hegarty 1984
CO	20%	50%	Andelt & Case 2006

*Weed yield 7X in fields w PG vs. fields w/o PG Luce et al. 1979


Habitat Modification

- remove weeds to create an unsuitable buffer strip
- mechanical or chemical modification
- adjacent to areas experiencing consistent damage
- deep plowing or ripping (18")

Planting 50-foot buffer strips of annuals (grain) around fields to discourage gopher immigration

Flooding -

Exclusion

- Expensive and has limited practicality 
- Fence valued ornamental shrubs or trees
 - 1/4 or 1/2 inch hardware cloth buried at least 18-24 inches

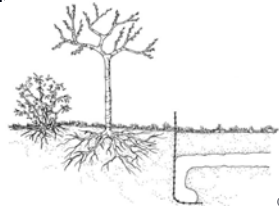


Photo courtesy tas y chisdoge.com

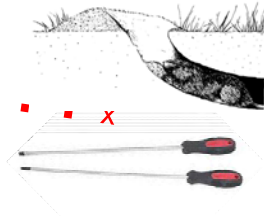
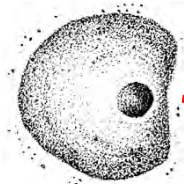
(Drawings by Jennifer Rees)

Finding Tunnels



Locate main runway

Find **fresh**est mound
 4-12 in. behind plug
 15 to 18 inches from mound
 Patience, skill, experience key



Fumigants



- aluminum phosphide (RUP): effective
 - gas cartridges (GUP): not effective
- efficacy related to soil moisture.

Fumigants

Prohibited: residential properties, nursing homes, schools (except athletic fields), day care facilities, and hospitals. within 100 feet of a building that is or may be occupied by people or domestic animals.

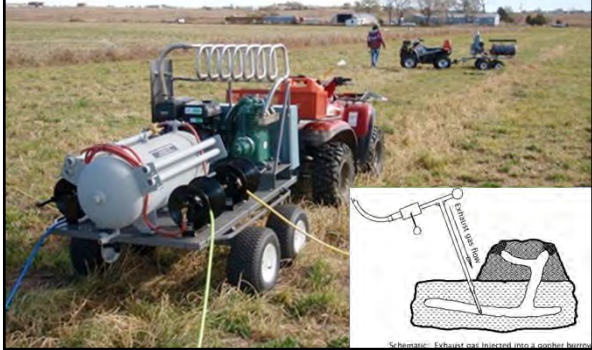
DANGER/PELIGRO
Image of skull and crossbones,
DO NOT ENTER/NO ENTRE,
FIELD NOT FOR USE

name and EPA registration number of the fumigant,
& a 24-hour emergency response number.

Signs may be removed 2 days after the final treatment.
Fumigant Management Plans required



Pressurized Exhaust Rodent Control PERC



Propane Exploder



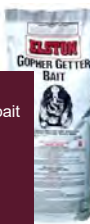


Mixture of propane and oxygen

- Built-in, self contained ignition system ignites mixture creating underground shockwave or concussion
- May collapse burrow system




Toxic Baits

<p>Anticoagulants</p> <p>Diphacinone (RUP)</p> <p>Chlorophacinone (GUP/RUP)</p> <p>Multiple feedings</p>		<p>Acute</p> <p>Zinc phosphide (RUP)</p> <p>Strychnine (GUP/RUP)</p> <p>Single feedings</p>	 
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Follow label
Apply rec. amount of bait


April-May
Late September
Early October




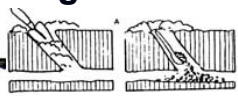


Bait Applied Underground

Follow label
Apply rec. amount of bait

April-May
Late September
Early October





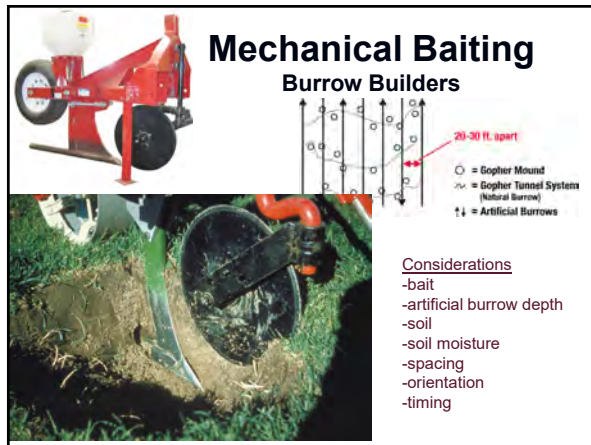
Hand Baiting

Thorough training ~ doubled efficiency rates for bait applications.

15 min. = 27% efficiency
90 min. = 58% efficiency

1. Ensure bait is in active tunnel (active v. backfilled).
2. Regular check application equipment for clogging.

Baldwin 2014



Mechanical Baiting
Burrow Builders

20-30 ft. apart

- = Gopher Mound
- ~ = Gopher Tunnel System (Natural Burrow)
- ↑↓ = Artificial Burrows

Considerations

- bait
- artificial burrow depth
- soil
- soil moisture
- spacing
- orientation
- timing

Reducing Risks

1. Follow the label.
2. Keep away from children & pets (storage and in use).
3. Use appropriate appl. method/bait for situation.
4. Employ complimentary control measures.

INVESTIGATION VS. APPLICATION

Improve efficiency, reduce need & amounts of rodenticides

Trapping Gophers

Effective on small **or large** infestations or as supplement control

A) Macabee
B) Victor
C) D-K 1
D) Guardian

Trapping Gophers

Mound Set & Main Tunnel Set

Trapping Gophers

Mound Set Main Tunnel Set

Tunnel no wider than trap-jaw width
Trap all the way in the tunnel
Bed the trap

Trapping and Comparisons

Covered sets ↑ late spring/early summer (no diff. autumn)
 Covered sets = > T req. (Diff. in captures not enough)
 Ag. setting don't cover sets Baldwin et al. 2013b

No Sig. Diff. for Peanut Butter, anise, grapefruit essence, carrot w/o attractant - uncovered > covered
 PB/covered sets yielded heavier PGs (mop-up/breeders) Baldwin et al. 2014

Method	Up to
Trapping	92%
Alum. Phosphide	84%
PERC	62% Baldwin et al. 2013a; 68% Baldwin et al. 2017
Toxicants: w/ training	58% Baldwin 2014
burrow builder	94% Evans et al. 1990, Ward & Hansen 1960
	5-15% Tickes et al. 1982

NOTE: toxic bait efficacy highly variable.

Economic of Gopher Control

Method	Time of Application	No. Burrows Treated (8 hrs)	Efficacy (% n=2)	Fixed + Labor Costs (\$) n=1d
Aluminum Phosphide	23	81	81	131
PERC	204	156	56	8,535
Trapping	181	71	86 (n=3; 95)	674

Baldwin et al. 2016

College of Agricultural, Consumer and Environmental Sciences



Prairie Dogs

All About Discovery™
 New Mexico State University
 aces.nmsu.edu

The College of Agricultural, Consumer and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic research and extension programs.

PRAIRIE DOGS

images: Hyngstrom and Virchow (1994)

Gunnison's prairie dog
Cynomys gunnisoni

Black-tailed prairie dog
Cynomys ludovicianus

White-tailed prairie dog (light)
Cynomys leucurus

Utah prairie dog (medium)
Cynomys parvidens

Mexican prairie dog (dark)
Cynomys mexicanus



Black-tailed prairie dog
14-17 in
24 – 59 oz
3 to 4 in. tail
black tipped
3,000 – 6,000 ft (<8,000)
most common
30-50 burrow entrances/Ac
Active all year
Sexual mat. after 2nd winter
Breed: January – March
Gest: ~ 34 d
Litter: 3-4; 1-8 pups (Altricial)
Pups: emerge May – June
1 year wild; 5y M; 8y F



Gunnison's prairie dog
12-15 in
23-40 oz
1.25 – 2.25 in. tail
Tan to whitish tipped
5,000 – 12,000 ft
smallest of species
< 20 burrow entrances/Ac
Hibernate: October – February
Sexual mat. after 1st year
Breed: March
Gest: ~ 30 d
Litter: 4; 1-6 pups (Altricial)
Pups: emerge May – June
1 year wild; up to 8 y

images: ftp://www.nmda.nmsu.edu/wp-content/uploads/2013/02/Prairie-Dog-Mgt.pdf

Plague Facts

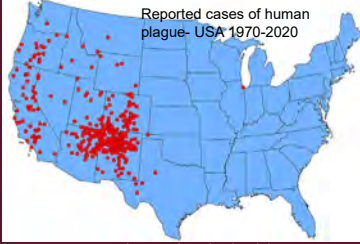
(*Yersinia pestis*) 13/3

1949-2020 – NM 286

Reservoir Species
mice, pack rats, etc.


Amplifying Species
pack rats, chipmunks, ground squirrels, prairie dogs & marmots

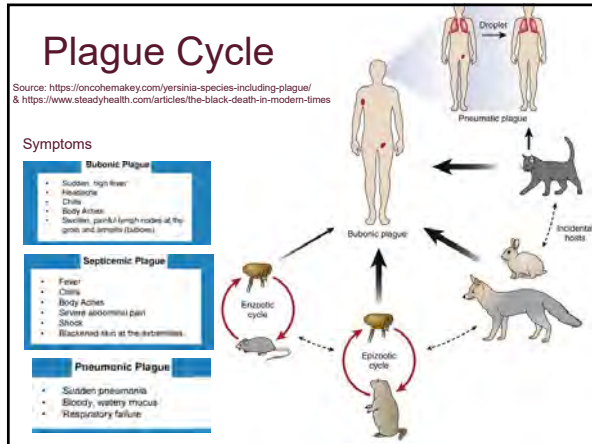
Bubonic, Septicemic, Pneumonic Plague
early detection & antibiotics
M ≤ 90% historically; modern M = 16%



Reported cases of human plague- USA 1970-2020

http://www.cdc.gov/plague/maps/index.htm





Transmission of Plague:

- flea bite
- direct contact with infected animal tissue & fluids
- respiratory droplets (human or animal)

Environmental Conditions; Host; Vector
Enzootic to Epizootic Cycle

To Reduce Risk:

Prevent pets from

- eating wild animals
- roaming through rodent infested areas
- carrying fleas (treat for fleas; flea collar)
- sleeping in your bed
- coughing in your face
- cats: highly susceptible 40%
- dogs: resistant

For humans

- don't handling wild animals w/o PPE
- roaming through rodent infested areas - PPE

Prairie Dog Control – Non-Lethal



Photos: NPS.gov trapping; USGS.gov releasing

Translocation

Trapping

- 6x6x24 live traps
- Rolled oats/peanut butter or sweet feed
- \$30-300/animal

<http://environmentalchemistry.com/yogi/environmental/200704prairiedogcontrolnonlethal.htm>

early spring before green-up
oats/pb, sweet feed, corn oil, anise oil

Prairie Dog Mitigation – Non-Lethal

Translocation

Sudsing (Elias et al. 1974)

- Mixture of soap & water – suds introduced into burrow system and flush out prairie dogs

http://www.ecosolutionsnm.com/Home_Page.html



Foam with entrained air

MUST HAVE A PLACE TO TAKE THEM

Prairie Dog Control – Lethal

Restricted Use Products (RUP)
State required Pesticide Applicators License

- Toxicants
- Fumigants
- Trapping
- Shooting




Al Phosphide Fumigant Pellet



Photo: ICWDM.org

Endangered Species Protection Bulletin



Obtain: Pesticide Use Bulletin For Protection of Endangered Species

May need to conduct wildlife survey in NM prior to product application

<https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins>


Toxicants

Anticoagulants

Diphacinone (RUP)

Chlorophacinone (nRUP/RUP)


Multiple



Acute


Zinc phosphide (RUP)

Single feedings



Nontarget & Secondary Poisoning

- Follow the label
- Use common sense & restraint



(EXCERPT: <http://npic.orst.edu/>) Table 3. Secondary poisoning risks to birds and mammals


Rodenticide	Secondary risk to birds	Secondary risk to mammals
Chlorophacinone	slight risk	high risk
Diphacinone	moderate risk	high risk
Zinc phosphide	low risk	slight risk

Efficacy:

- Zinc phosphide (RUP) ~83% (Eisemann et al. 2003)

BTPD ONLY

- chlorophacinone (RUP): ~ 90% (Lee et al. 2005)
- diphacinone (RUP) - ~90% (Lee & Leflore 2007)



<https://www.allaboutbirds.org/>

Fumigants

- Gas Cartridge (GUP) (USDA: sodium nitrate, charcoal, fuller's earth, borax)
- Aluminum Phosphide (RUP)

Al Phosphide Fumigant Pellet

Photo: ICWDM.org

Fumigants

Not recommended as primary in large areas
(\$, time, hazards)

Fumigation Management Plan

May need to survey site prior to application
(Black-footed Ferrets; burrowing owls; swift fox; etc.)


Soil moisture considerations

MDA

Gas Cartridge


Active Burrow Inactive Burrow

Fumigants **WEEVIL-CIDE®**
Aluminum Phosphide Fumigant



aluminum phosphide (RUP)

- moisture in burrow
- phosphine gas (PH₃)
- gloves
- newspaper
- soil



**** efficacy related to soil moisture**


Aluminum Phosphide: Restrictions Include

Prohibited:

- residential properties, nursing homes, schools (**except athletic fields**), day care facilities, and hospitals.
- within **100 feet** of a building that **is or may be** occupied by people or domestic animals.


Post Signs W/

DANGER/PELIGRO
Image of skull and crossbones,
DO NOT ENTER/NO ENTRE,
FIELD NOT FOR USE
name and EPA registration number of the fumigant,
& a 24-hour emergency response number.



Certified applicator must be physically present: visual/voice contact
Signs may be removed 2 days after the final treatment.
EPA Endangered Species Pesticide Use Bulletin
Fumigant Management Plans required

Cheetah Rodent Control Machine



General
2-cycle engine; air/CO mixer = 25,000 PPM
16 lbs.; \$1300

P-Dog
Insert tube ≥ 6' & cover w/ soil
Run 2 min.
Backfill all burrow entrances w/in 12 ft
Continue to run for 6-7 min.
Remove tube & backfill
Claim 75-80% efficacy

Nontarget & Secondary Poisoning

- Follow the label
- Use common sense & restraint



Efficacy:

- Aluminum Phosphide (RUP) ~95% (Hyngstrom & VerCauteren 2000)
- USDA Gas Cartridge (GUP) ~95% (Hyngstrom & VerCauteren 2000)
- PERC (GUP) ~ 66-100% (not P-Dog; Meinerz etal 2018)
- Cheetah (GUP) ~ <15% (not P-Dog; Meinerz etal 2018)
- Burrow Blocker Not a fumigant NO DATA

SOIL CHARACTERISTICS, SOIL MOISTURE AND PROPER APPLICATION KEY TO FUMIGATION

Prairie Dog Control – Lethal

Trapping & Shooting



Trapping P- dogs - Lethal



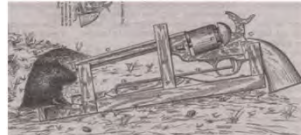
- Trapping can be effective** in reducing low to moderate populations
- Try baiting with banana and/or peanut butter; walnuts, almonds, slice of orange or melon.



Shooting

Selective; non-hazardous to non-target wildlife
 Spring most effective – (Mar.-May) disrupts breeding
 Continuous/persistent shooting remove ~65%
 Not practical/cost effective
 Gun-shy & wary (Blinds help address)
 (Knowles 1987)

Propane cannon to desensitize prior to shooting campaign



Legal considerations



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Extension Wildlife Publications online:

http://aces.nmsu.edu/pubs/_L

Information

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