Module #6
Soil Health and Protection

Darren L. Haver & Niamh Quinn

UCCE Orange

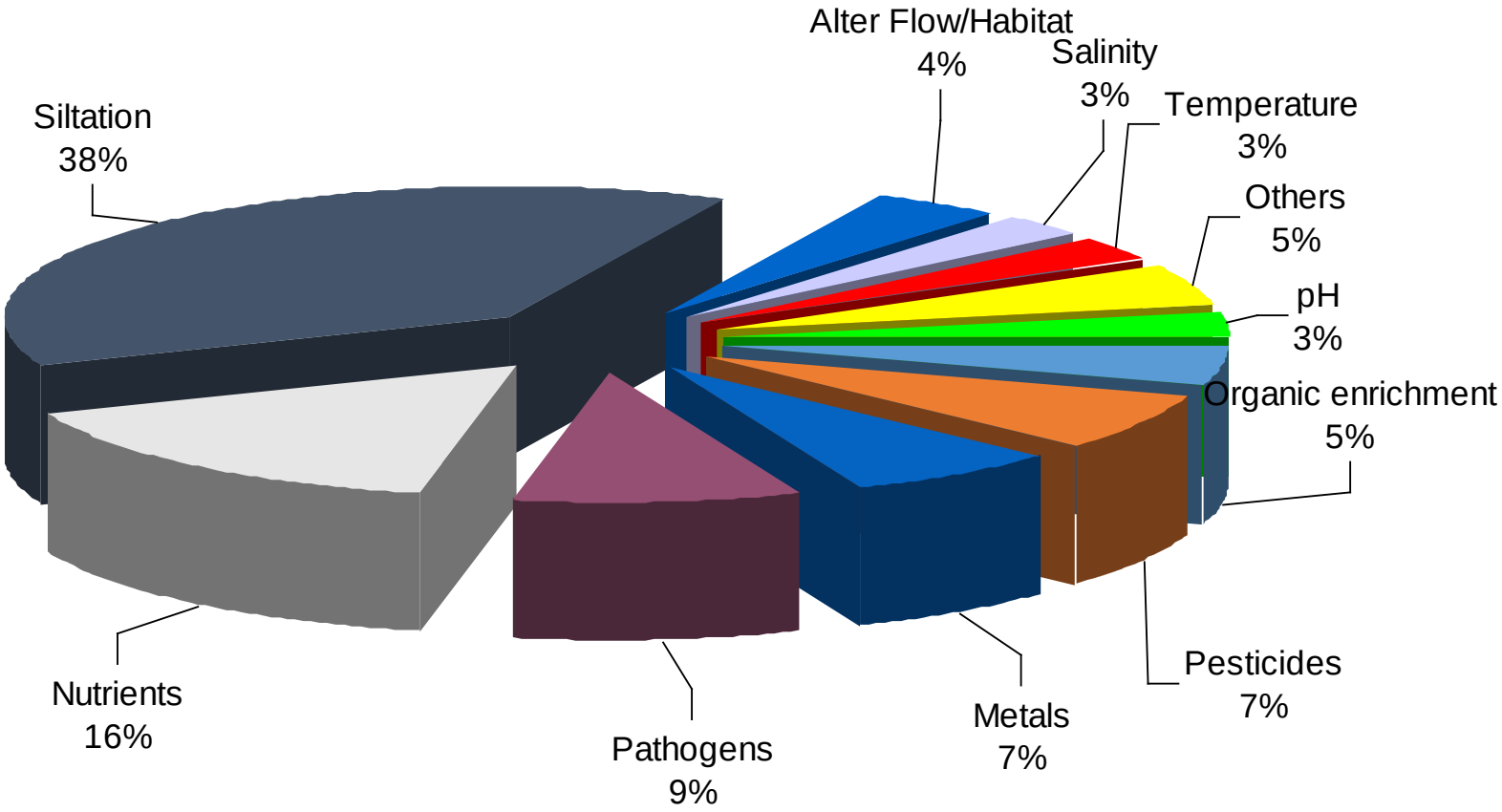
April 5th, 2016

Session Topics

- Erosion Impacts on Water Quality
- Burrowing Rodent Identification & Management
- Gopher Trapping Field Training

Erosion Impacts on Water Quality

Nonpoint Source Pollutants in U.S. Rivers



USEPA reported in 1992 that 206,179 miles of U.S. rivers and streams were impaired by nonpoint pollution.

SOURCE: Managing Nonpoint Pollution, USEPA, 1992

Landscape Erosion

- Exposed slopes where irrigation precipitation rates exceed infiltration rates
- Unprotected drainage ditches, streams, and other water coveyances.
- Broken irrigation delivery systems, such as sprinklers, pipe, and valves.

Landscape Mitigation Practices

Impacts of Vertebrate Burrowing on Landscapes and Water Conveyances

Burrowing Rodent Identification & Management

Biology and Identification

- Five species in CA
  - Botta's pocket gopher
- 6-8 inches long
- Active all year round
- Rarely seen above ground

Biology and Identification

- Fur-lined, external check pouches (or pockets)
- Well equipped for digging and tunneling
  - Large-clawed front paws
  - Fine short fur
  - Small eyes and ears
  - Highly sensitive facial whiskers
  - Special lips

Damage

Photos courtesy of Dr. Roger Baldwin

Current Control Strategies

Toxicants

- Anticoagulants
  - Chlorophacinone
  - Diphacinone
- Non- anticoagulant rodenticides
  - Zinc phosphide
  - Strychnine
  - Cholecalciferol

Lab rodenticide trials

Product	Active Ingredient	Carrier	S.Rosa	Pala	Total
Control	Maintenance diet	Rat chow	1/10	0/10	5%
CDFA	Chlorophacinone (0.01%)	Oat grain	3/5	2/5	50%
Rozol	Chlorophacinone (0.005%)	Wheat grain	3/5	2/5	50%
Wilco D	Diphacinone (0.005%)	Milo grain	------	0/5	0%
RCO Patrol	Diphacinone (0.005%)	Pellet	1/5	2/5	30%
Wilco ZP	Zinc Phosphide (2.0%)	Wheat grain	2/5	3/5	50%
Bell ZP	Zinc Phosphide (2.0%)	Pellet	4/5	0/5	40%
Omega	Strychnine (0.5%)	Oat grain	5/5	0/5	50%
Avalon	Strychnine (0.5%)	Mixed grain	5/5	1/5	60%
$Terad_3$	Cholecalciferol (0.075%)	Pellet	------	2/5	40%

Data courtesy of Dr. Roger Baldwin

Lab rodenticide trials

Product	Active Ingredient	Carrier	S.Rosa	Pala	Total
C+D	Chole (0.03%) + Diph (0.005%)	Pellet	5/5	3/5	80%
C+B 1	Chole (0.03%) + Brod (0.0025%)	Pellet	------	5/5	100%
C+B 2	Chole (0.015%) + Brod (0.0025%)	Pellet	5/5	5/5	100%
C+B 3	Chole (0.015%) + Brod (0.00125%)	Pellet	------	------	------

Data courtesy of Dr. Roger Baldwin

First field treatment

Active Ingredient	C + D (%)	C + B1 (%)	C + B2 (%)	Strychnine (%)	Control (%)
Field 1	75	33	50	71	0
Field 2	56	44	25	67	0
Field 3	14	100	63	100	-20
Mean	48	59	46	79	-7

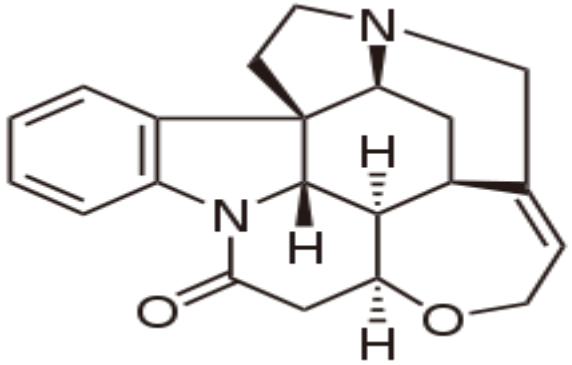
Data courtesy of Dr. Roger Baldwin

Second field treatment

Active Ingredient	C + D (%)	C + B1 (%)	C + B2 (%)	Strychnine (%)	Control (%)
Field 1	75	67	75	100	25
Field 2	89	89	75	100	0
Field 3	86	100	75	100	-40
Mean	83*	85	75*	100*	-5

Strychnine

- Very effective in certain cases
- Gophers can develop behavioral resistance



Zinc phosphide

- Less effective than strychnine
- Gophers can develop bait shyness

B CALIFORNIA RESTRICTED MATERIALS

This section is written in a quick reference format; refer to Title 3, California Code of Regulations (3 CCR) section 6400 for complete text.

Acrolein, labeled for use as an aquatic herbicide
Aldicarb – unregistered
All dust (except products containing only exempt pesticides)**
Aluminum phosphide
Any pesticide containing active ingredients listed under section 6800(a), labeled for agricultural, outdoor institutional, or outdoor industrial use[1]
Any pesticide pursuant to Section 18 of FIFRA (Emergency exemption)
4-Amino pyridine
Azinphos-methyl – unregistered
Brodifacoum
Bromadiolone
Calcium cyanide – unregistered
Carbaryl**,†
Carbofuran – unregistered
Chloropicrin
3-Chloro-p-toluidine hydrochloride
Dazomet, labeled for production of agricultural plant commodities
Dicamba*
2,4-dichlorophenoxyacetic acid (2,4-D)*
2,4-dichlorophenoxybutyric acid (2,4-DB)*
2,4-dichlorophenoxypropionic acid (2,4-DP)*
1,3-Dichloropropene (1,3-D)
Difenacoum
Difethialone
Disulfoton** – unregistered
Endosulfan**
Ethoprop, labeled for turf
Fenamiphos – unregistered
Lindane** – unregistered
Magnesium phosphide
Metam sodium, labeled for the production of agricultural plant commodities
Methamidophos – unregistered
Methidathion
Methomyl††
Methyl bromide
2-methyl-4-chlorophenoxyacetic acid (MCPA)*
Methyl iodide – unregistered
Methyl isothiocyanate (MITC), labeled for the production of agricultural plant commodities
Mevinphos – unregistered
Molinate - unregistered
Oxydemeton-methyl
Paraquat
Parathion-methyl – unregistered
Phorate
Phosphine gas
Potassium n-methyldithiocarbamate (metam-potassium), labeled for the production of agricultural plant commodities
Propanil (3,4-dichloropropionanilide)
Sodium cyanide
Sodium fluoroacetate (compound 1080) – unregistered
Sodium tetrathiocarbonate – unregistered
Strychnine**
Sulfotepp – unregistered
Sulfuryl fluoride
Thiobencarb
Tribufos
Tributyltin, organotin, or a tri-organotin compound formulated as an antifouling paint, coating, or compound and labeled for the control of fouling organisms in an aquatic environment
Zinc phosphide**

Fumigation

- Gas cartridges
  - Effective for ground squirrels (62–86% control)
  - Not effective for gophers

- Aluminum phosphide
  - Highly effective for gophers (90-100%)
  - Is a restricted use pesticide

Fumigation

- Aluminum phosphide is a restricted material
- Requires a restricted use permit to purchase and use
- You must also be a qualified applicator or be supervised by a qualified applicator to use this material

- Aluminum phosphide cannot be applied on school grounds except on athletic fields
- Can only be applied in burrow systems that are more than 100 feet from a building that is, or may be, inhabited by people or domestic animals
- May be applied in athletic fields or parks associated with schools

Fumigation Management Plan

February 5, 2010

UC CE University of California Agriculture and Natural Resources Cooperative Extension

UDAF
Utah Department of Agriculture and Food
PLANT INDUSTRY

TRAGIC FATAL INCIDENT

Carbon Monoxide

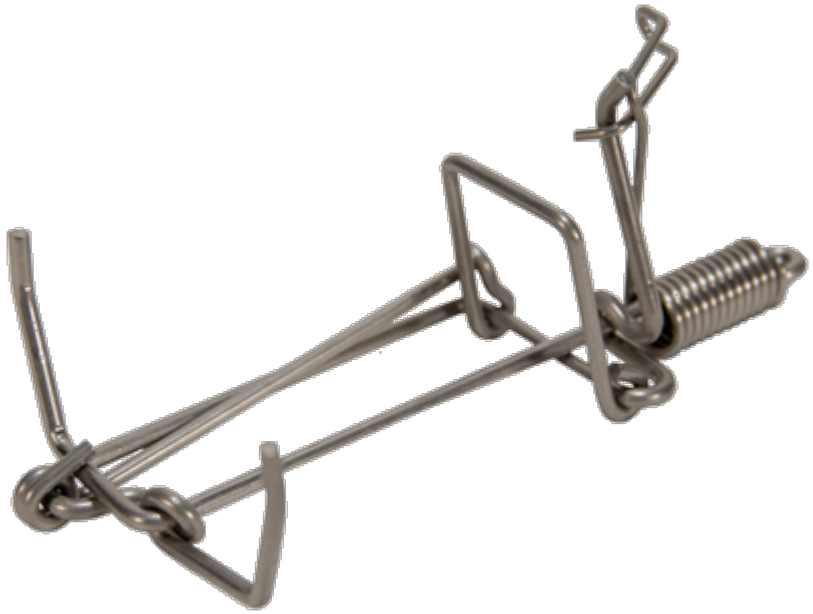
Species	Device	Authors	# of fields	Efficacy
Pocket gopher	PERC	Orloff	3	56%
Pocket gopher	PERC	Baldwin & Orloff	3	62%
Pocket gopher	PERC	Baldwin & Orloff	2	68%

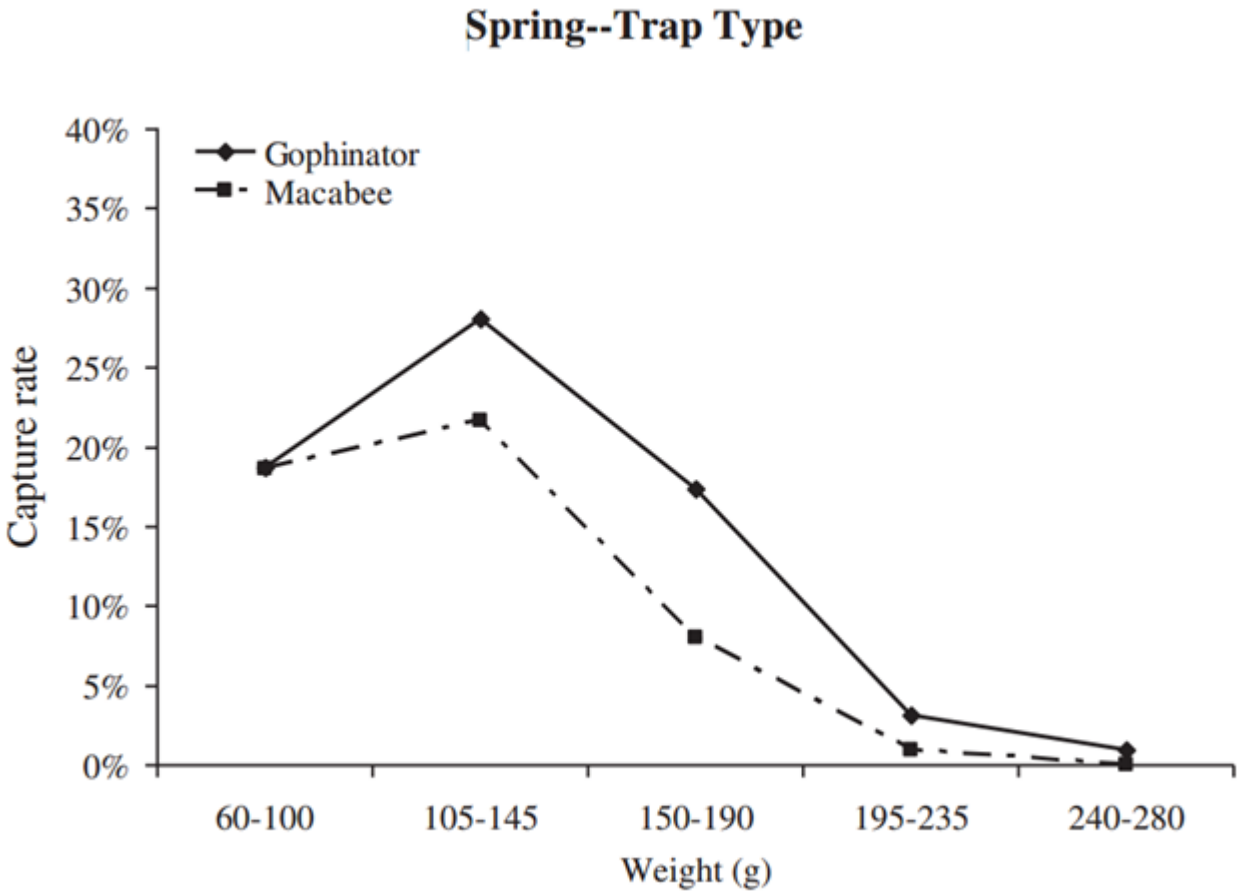
- Considerable research in the last 10 years on gopher research
- Much of it carried out in California
- By UCANR scientists

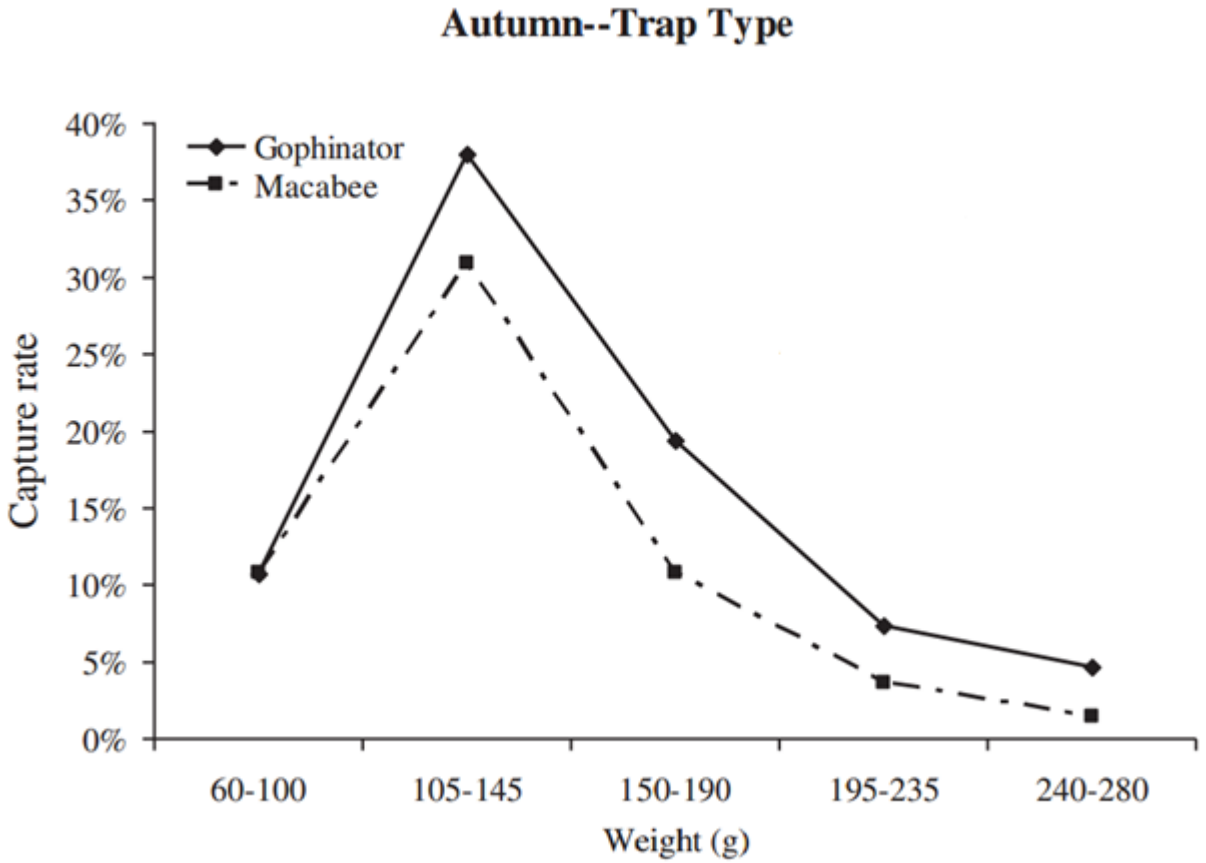
The science of management

- Maccabee vs Gophinator
- Covered vs uncovered
- Attractant vs no attractant
- Trained vs untrained
- Gloves vs no gloves
- “above” ground traps vs “in” tunnel traps

Macabee vs Gophinator

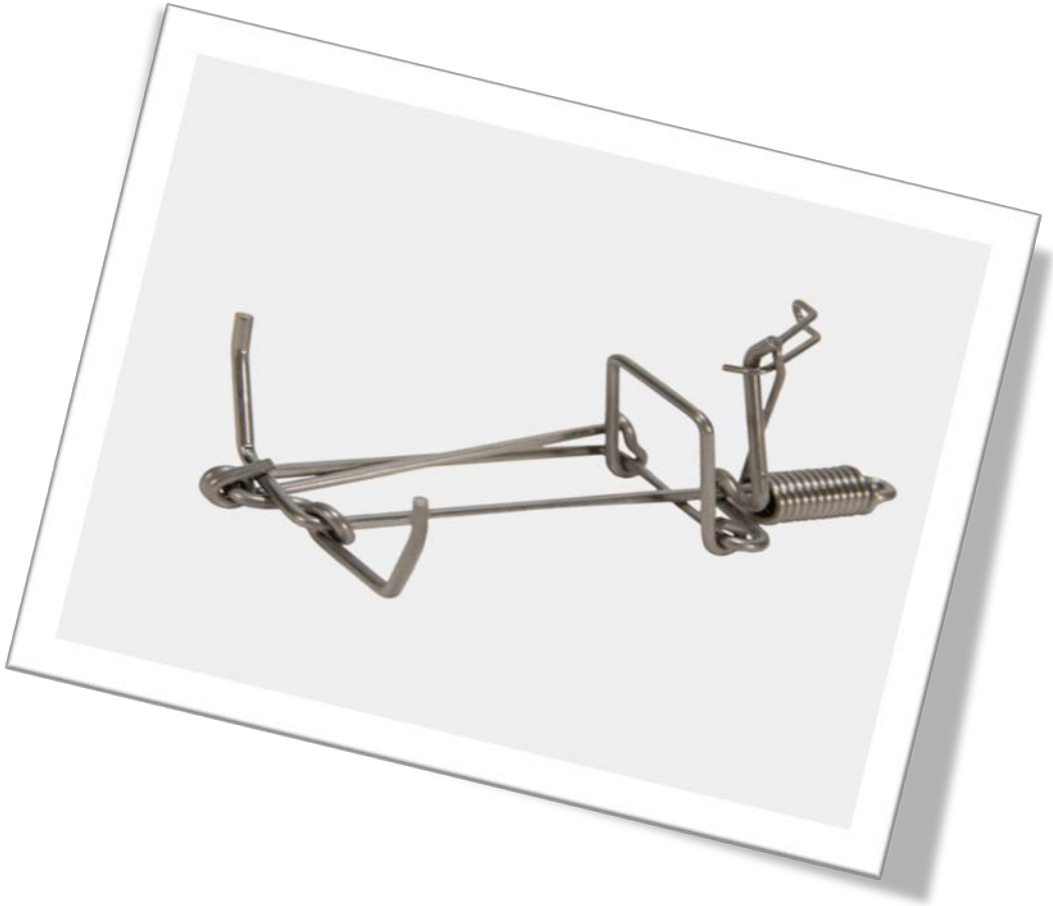


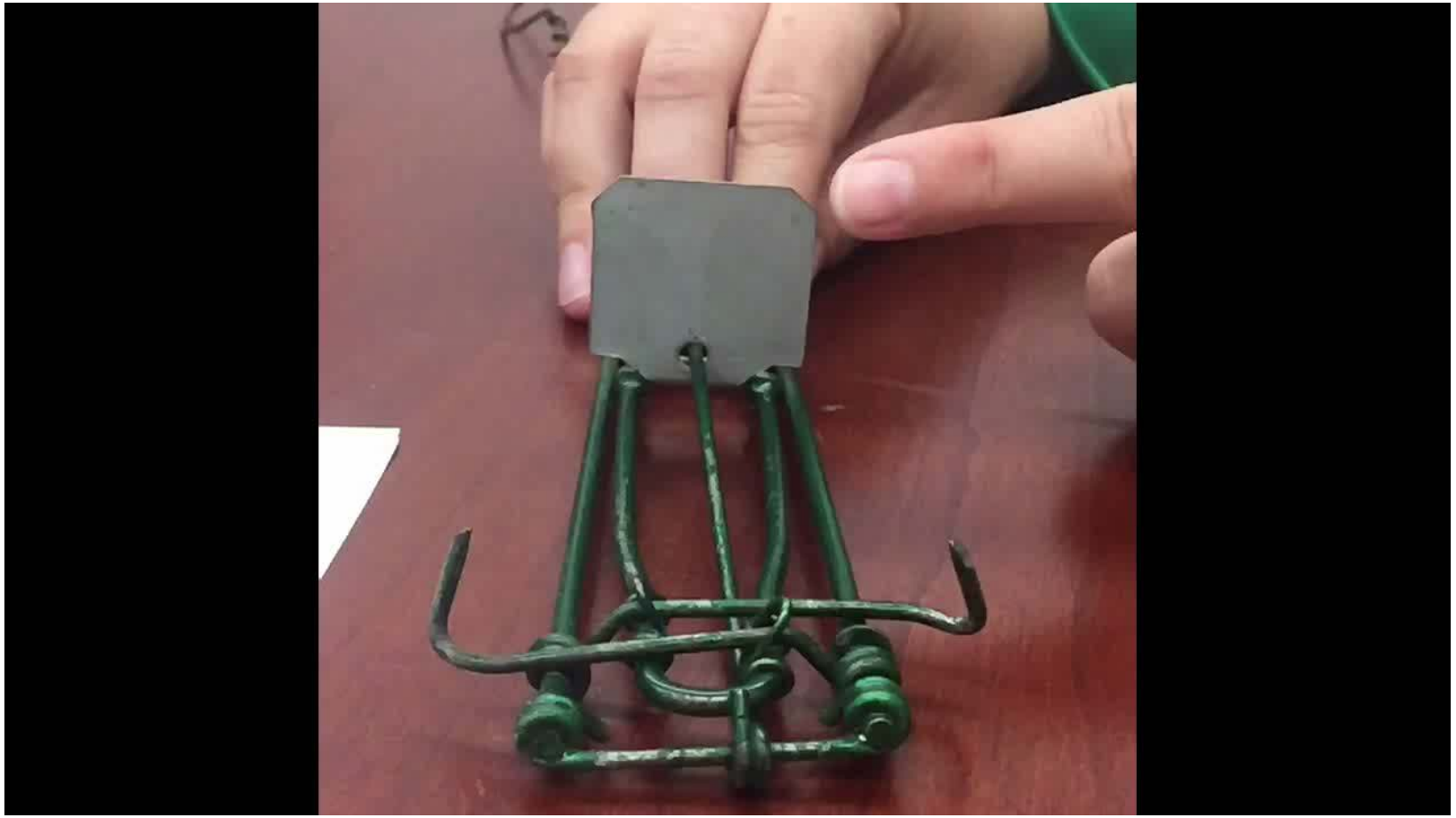

Spring--Trap Type
Gophinator
Macabee
Capture rate
40%
35%
30%
25%
20%
15%
10%
5%
0%
60-100
105-145
150-190
195-235
240-280
Weight (g)


Autumn--Trap Type
Gophinator
Macabee
Capture rate
40%
35%
30%
25%
20%
15%
10%
5%
0%
60-100
105-145
150-190
195-235
240-280
Weight (g)

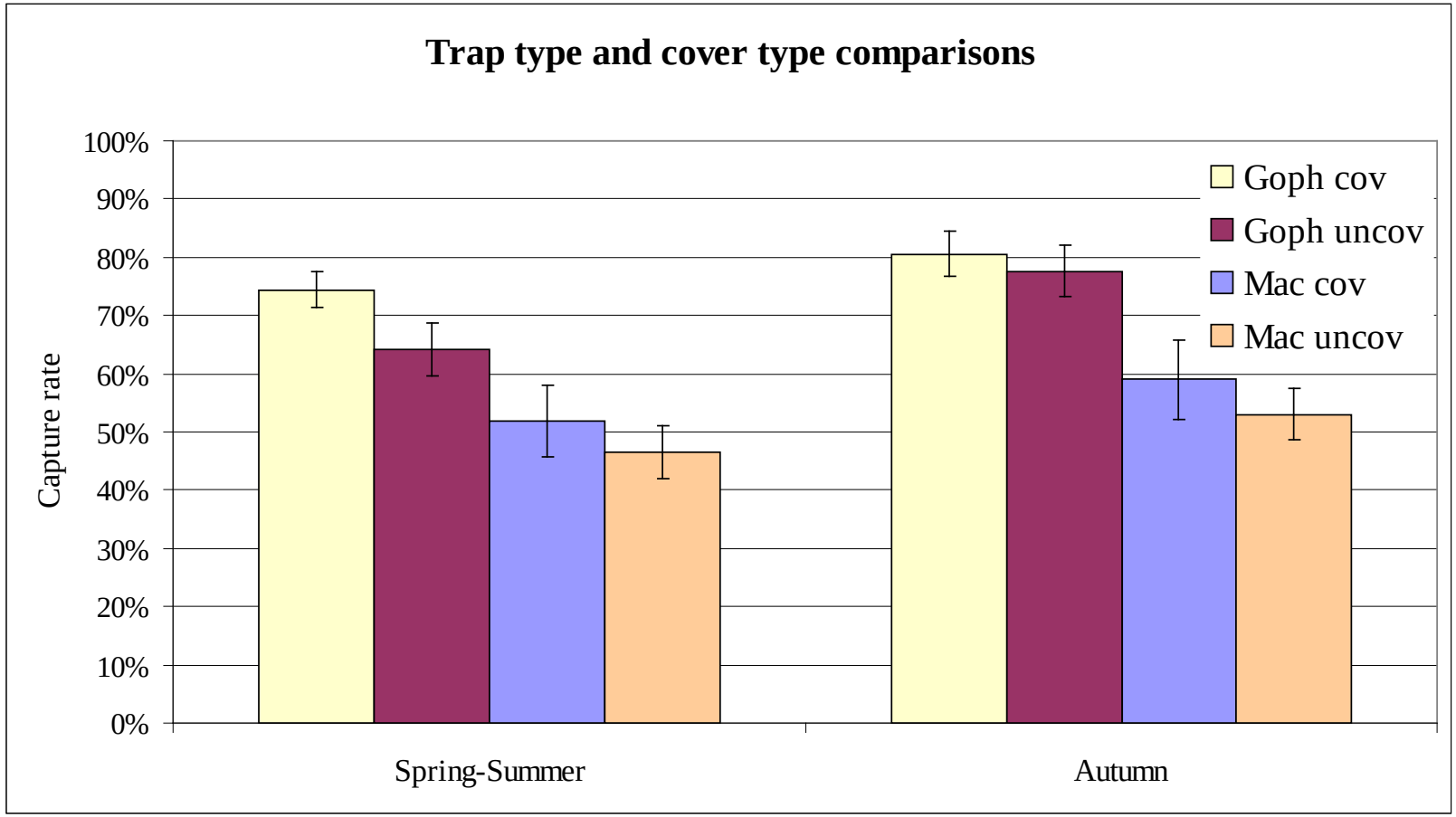
Gophinator

- Powerful trap
- Grips the animal high on the body
- Trigger arm offset to prevent upward pressure on gopher
- Rotating pincer arm that clamps to stationary arm
  - More secure capture

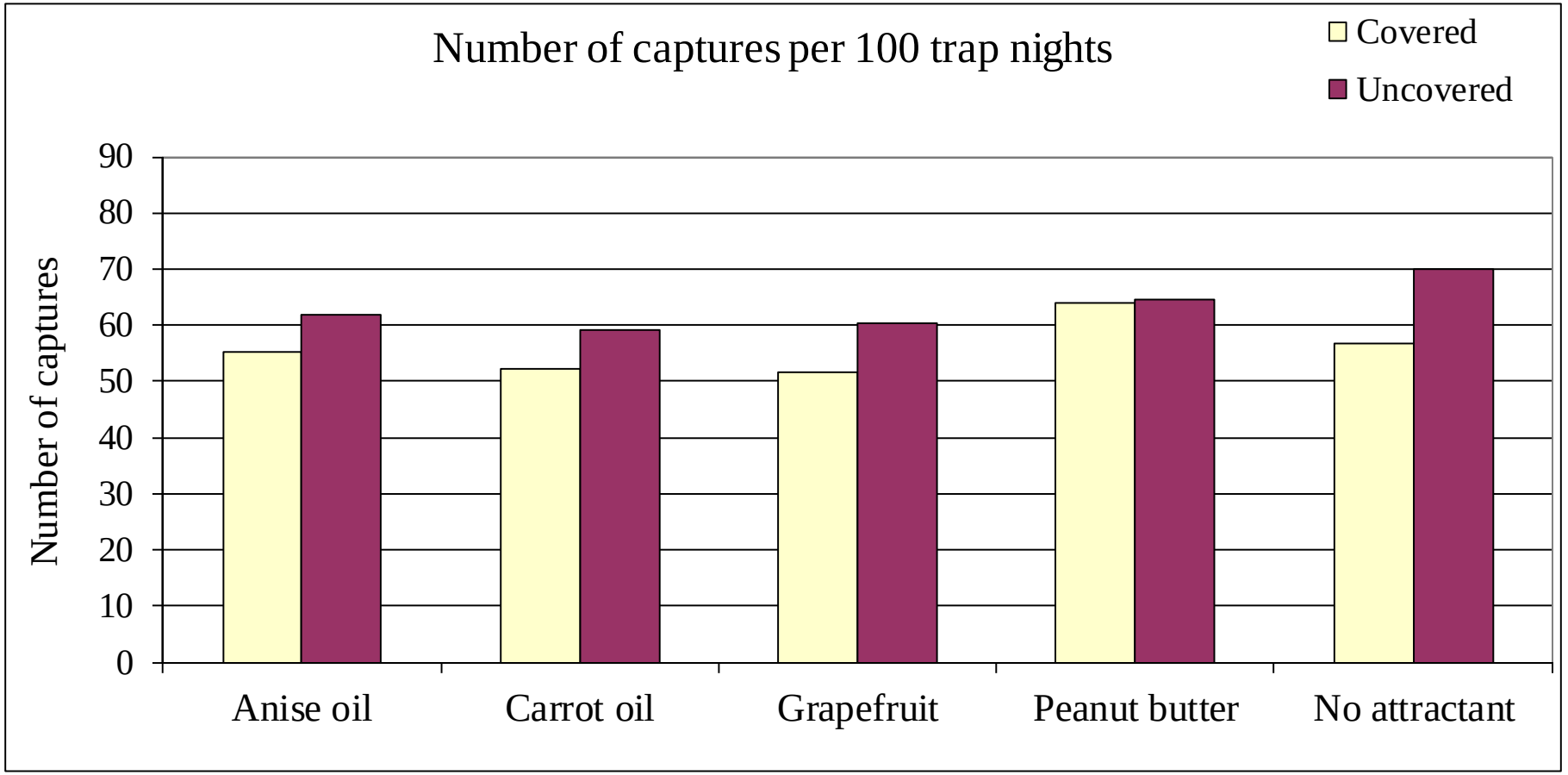




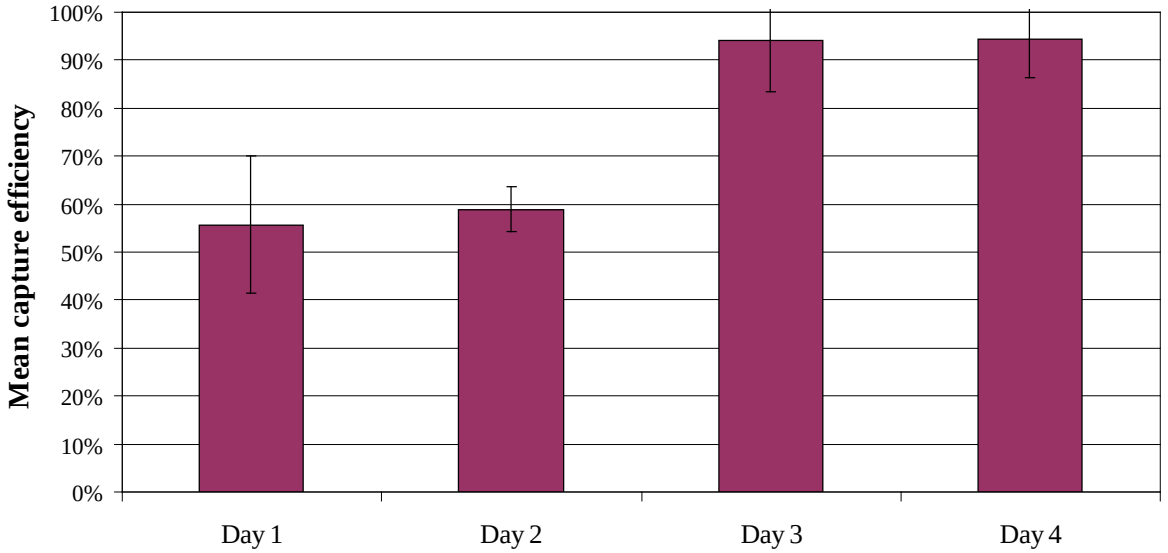
Covered vs uncovered

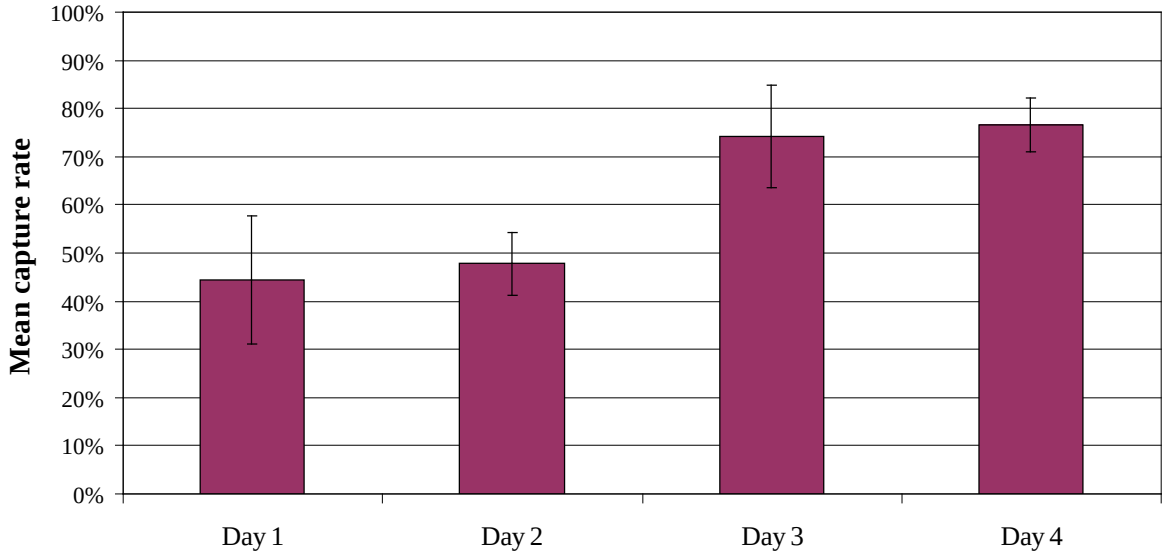


Attractant vs no attractant



Trained vs untrained





UC CE University of California Agriculture and Natural Resources Cooperative Extension

Refinement of a trapping method increases its utility for pocket gopher management

Roger A. Baldwin [a, *], Angela Chapman [b], Christopher P. Kofron [c], Ryan Meinerz [a], Steve B. Orloff [d], Niamh Quinn [e]

[a] Department of Wildlife, Fish, and Conservation Biology, One Shields Avenue, University of California, Davis, CA 95616, United States
[b] Biology Program, California State University Channel Islands, Camarillo, CA 93012, United States
[c] U.S. Fish and Wildlife Service, 2493 Portola Road, Suite B, Ventura, CA 93003, United States
[d] University of California Cooperative Extension, 1655 South Main Street, Yreka, CA 96097, United States
[e] University of California Cooperative Extension, South Coast Research and Extension Center, 7601 Irvine Blvd, Irvine, CA 92618 United States

ARTICLE INFO

Article history:
Received 15 June 2015
Received in revised form
5 August 2015
Accepted 7 August 2015
Available online xxx

Keywords:
California
Gophinator
Modified Macabee
Pocket gopher
Scent
Trap

ABSTRACT

Trapping is a useful and effective tool for managing detrimental pocket gopher populations, and methods to increase its effectiveness are in high demand. The Gophinator trap previously proved more efficient than the Macabee trap, primarily because of its ability to capture larger pocket gophers. However, the Macabee is still widely used given large stockpiles of these traps by land managers and pest control operators. The addition of a cable restraint to the front of the Macabee may be sufficient to keep larger individuals from escaping capture, thereby allowing trappers to more effectively use this common trap. Human scent may also impact trap success by deterring pocket gophers from entering trap sets. Therefore, we tested the capture efficiency and visitation rate of trap sets when using both Gophinator and modified Macabee traps to determine the potential utility of these trap designs. We compared these results to a previous investigation to better define the potential usefulness of the cable restraint on the Macabee. We also tested the impact of human scent on capture efficiency and visitation rate to determine the potential relevance of eliminating human scent from trap sets. Gender and weight of captured individuals were used to determine their potential impacts on capture efficiency and visitation rate. We found that the Gophinator was a more effective trap than the modified Macabee because of its ability to capture larger pocket gophers more efficiently. However, the modification did appear to increase capture efficiency of larger individuals when compared to the standard Macabee, suggesting that this modifi-

Gopher Trapping Field Training

How do I trap?

- Materials
  - Traps
  - Probe
  - Gloves
  - Wire
  - Flags
  - Kneepads

Technique

- Active mounds
- Probe for tunnel
  - Watch out for back-filled tunnels
- Leave probe in mound
- With hori-hori, dig hole
- Examine burrows for
  - Size
  - Turns
  - Divides

Demonstration

- Learn how to set traps indoors first
  - Macabee and Gophinator
- Outside
  - Probe for tunnels
  - Expose tunnel
  - Learn how to make a good trap set