Developing an effective management program for Belding’s ground squirrels in alfalfa.

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Species Identification (Belding’s GS)

- Smaller, social ground squirrel species with short tail.
- Emerge from hibernation between late Jan and mid Feb.
- Hibernate between July and Sept.
- Belding’s ground squirrel have one litter per year (ave 7).
Species Identification (Belding’s GS)

- Belding’s ground squirrel causes substantial damage to alfalfa in Intermountain West.

- Loss of forage estimated between 17.1% and 65.9% from consumption and burrow destruction.

- Burrowing activity also causes damage.
Current Control Strategies

- Currently, we focus on an integrated approach that utilizes a number of strategies and tools to control vertebrate pests.
What Control Options are Available?

<table>
<thead>
<tr>
<th>Habitat modification</th>
<th>Baiting</th>
<th>Burrow fumigation</th>
<th>Trapping</th>
<th>Exclusion</th>
<th>Repellent</th>
<th>Frightening</th>
<th>Shooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belding’s GS GS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>?</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Control Options—Baiting

Belding’s ground squirrel

- zinc phosphide-coated cabbage now approved
Control Options—Baiting

Belding’s ground squirrel

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- mechanical mixer generally used (101% of desired concentration)
Control Options—Baiting

Belding’s ground squirrel

- zinc phosphide-coated cabbage now approved
- mechanical mixer generally used (101% of desired concentration)
- applied around burrow openings
Belding’s ground squirrel

- zinc phosphide-coated cabbage now approved
- mechanical mixer generally used (101% of desired concentration)
- applied around burrow openings
- prebaiting sometimes required
Control Options—Baiting

Belding’s ground squirrel

- efficacy tested across 20 sites
Control Options—Baiting

Belding’s ground squirrel
- efficacy tested across 20 sites
- efficacy varied regionally and with prebaiting

<table>
<thead>
<tr>
<th>Region</th>
<th>Pretreatment</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>Yes</td>
<td>78%</td>
</tr>
<tr>
<td>West</td>
<td>No</td>
<td>60%</td>
</tr>
<tr>
<td>East</td>
<td>Yes</td>
<td>42%</td>
</tr>
<tr>
<td>East</td>
<td>No</td>
<td>31%</td>
</tr>
</tbody>
</table>
Control Options—Baiting

Belding’s ground squirrel

- efficacy tested across 20 sites
- efficacy varied regionally and with prebaiting
  * west region = 23% > efficacy
  * prebait = 18% > efficacy
  * density = 0.65% > efficacy/GS
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Control Options—Baiting

Belding’s ground squirrel

- peak consumption in mid-morning and early afternoon
Control Options—Baiting

Belding’s ground squirrel

- peak consumption in mid-morning and early afternoon
- consumption still high following morning
Control Options—Baiting

Belding’s ground squirrel

- peak consumption in mid-morning and early afternoon
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- moisture loss and zinc phosphide degradation consistent and rapid
Control Options—Baiting

Belding’s ground squirrel

- peak consumption in mid-morning and early afternoon

- consumption still high following morning

- moisture loss and zinc phosphide degradation consistent and rapid

- very limited nontarget consumption
Control Options—Fumigation

• Involves use of poison gas in burrows to control vertebrate pests.

• Works best when soil moisture is high (after ground squirrels emerge in winter).

• Fumigants should not be used around buildings.
Control Options—Fumigation

Gas cartridges
- Effective for ground squirrels (100% control).
- Not restricted use but labor intensive and costly.

Aluminum phosphide
- Highly effective for ground squirrels (>94%).
- Is a restricted use pesticide.
Control Options—Fumigation
## Control Options—Fumigation

<table>
<thead>
<tr>
<th>Species</th>
<th>Device</th>
<th>Authors</th>
<th># of fields</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pocket gopher</td>
<td>PERC</td>
<td>Orloff</td>
<td>3</td>
<td>56%</td>
</tr>
<tr>
<td>Pocket gopher</td>
<td>PERC</td>
<td>Baldwin &amp; Orloff</td>
<td>3</td>
<td>62%</td>
</tr>
<tr>
<td>Pocket gopher</td>
<td>PERC</td>
<td>Baldwin &amp; Orloff</td>
<td>2</td>
<td>68%</td>
</tr>
<tr>
<td><strong>Belding’s GS</strong></td>
<td>PERC</td>
<td>Orloff</td>
<td>2</td>
<td>76%</td>
</tr>
<tr>
<td>California GS</td>
<td>PERC</td>
<td>Baldwin</td>
<td>2</td>
<td>66%</td>
</tr>
<tr>
<td>California GS</td>
<td>PERC</td>
<td>Baldwin</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>California GS</td>
<td>Cheetah</td>
<td>Baldwin</td>
<td>3</td>
<td>-7%</td>
</tr>
</tbody>
</table>
Control Options—Shooting

- Shooting is extensively used for ground squirrel control.
- Efficacy is unknown.
- Lead bullets have been banned in CA.
Management Program

- Cabbage bait a good option with mid- to high-density populations.
  - More effective in some areas
  - Prebaiting important

![Graph showing consumption index with number of applications]
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- Combine efforts across neighboring properties.
Questions?