



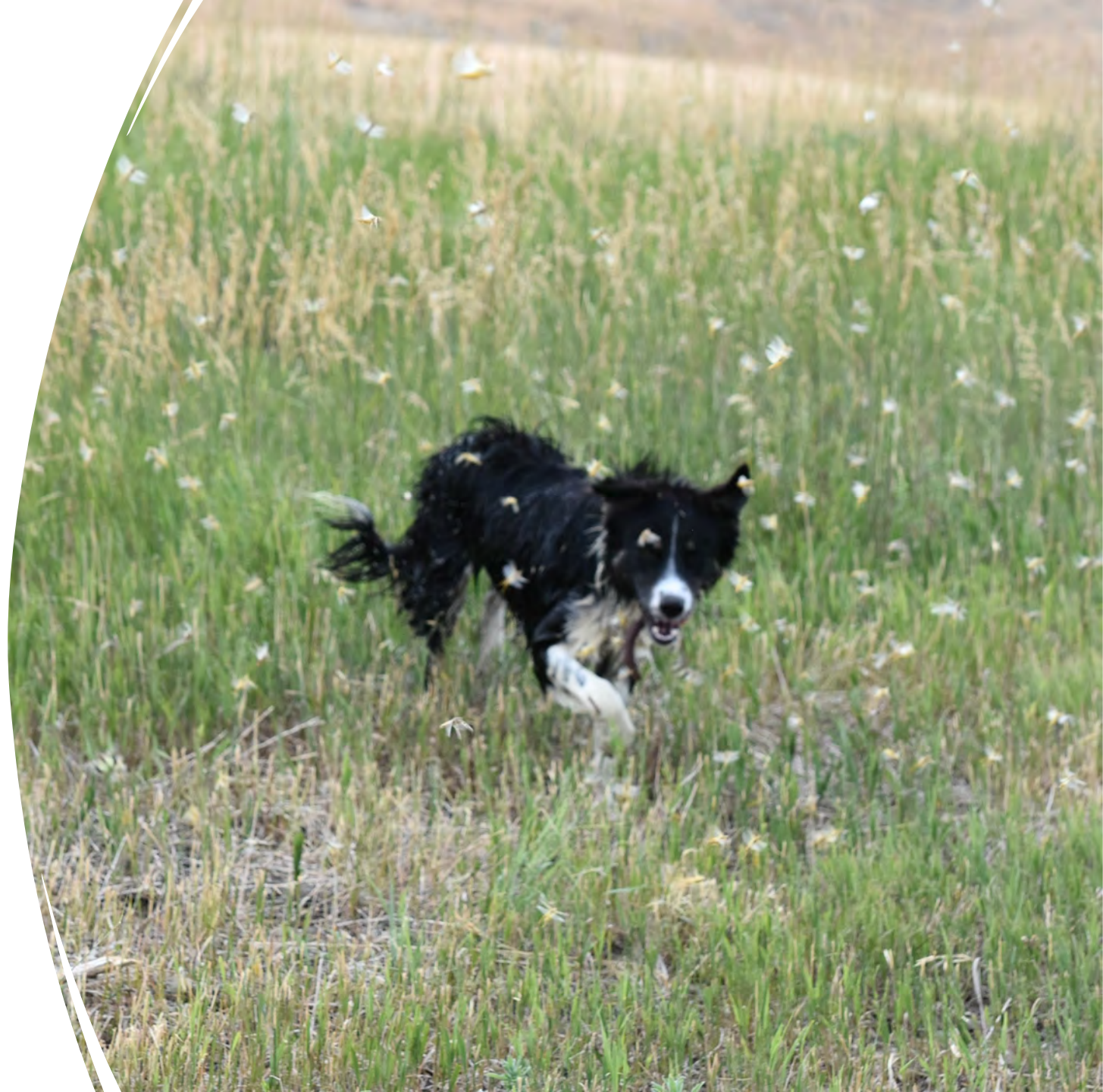
United States Department of Agriculture

How to Get Help with Grasshoppers (& Mormon Crickets) on Public Lands

Oregon - 2022

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Agenda:

1. What's the Problem?
2. Cooperative Solutions
3. Planning Timeline
4. Biology & IPM

Mature grasshoppers after treatment window on Scotch thistle for H₂O/food (Malheur Co., July 2021)

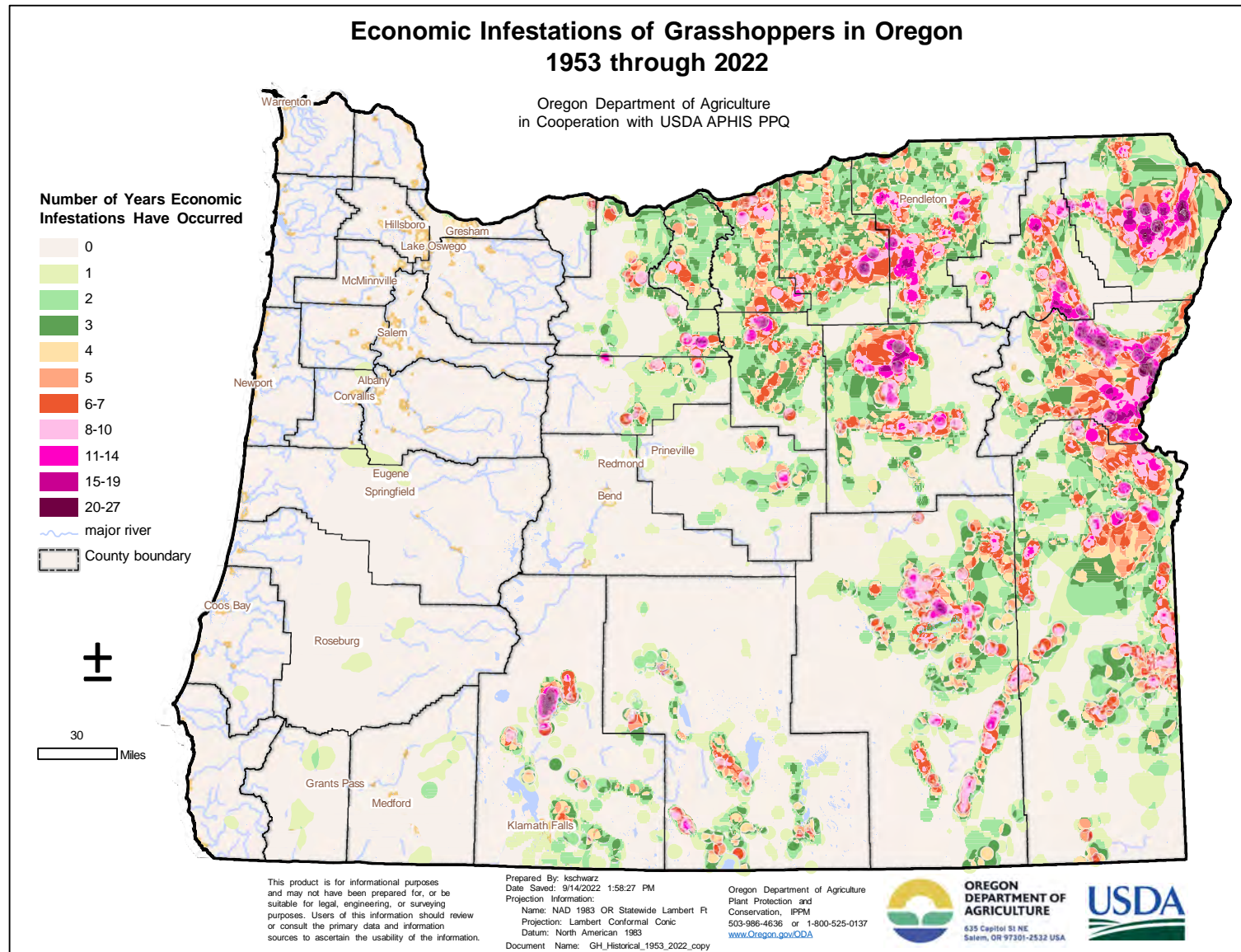
Grasshoppers: Who Cares?!

Short Answer: The people who live on the land, they've told us repeatedly over a century & a half, and we listened!

Cyclical pests, up-cycle every 10-30 years, but worsened by drought...

Largest (widespread & densities) since 1980's,

...and much faster: from 3 year down trend, populations 'exploded' in basically a single year (2020)



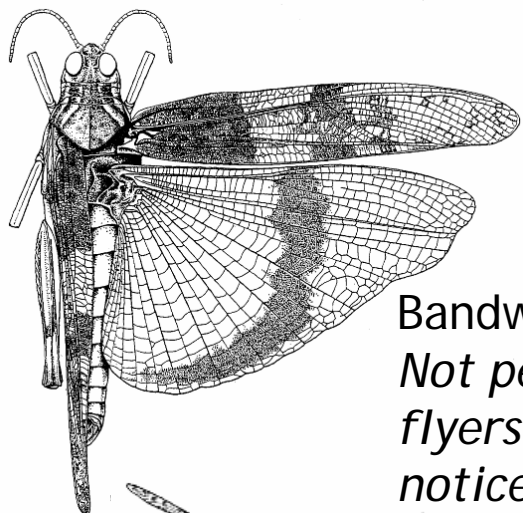


Role of Grasshoppers in a Prairie Ecosystem

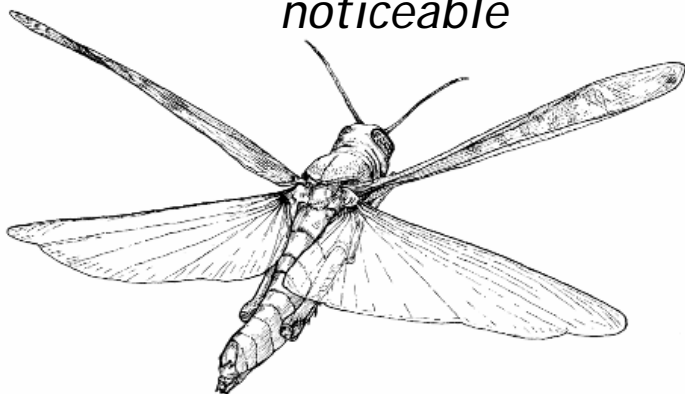
- Natural “mowers” stimulate plant growth
- Nutrient cycling
- Food for many prairie animals

Grasshopper Pest Species in the Western US

Class: INSECTA Order: ORTHOPTRA ('straight-wing') **Family: ACRIDIDAE** (mostly)



Bandwinged species
Not pests but loud flyers, very noticeable



Economic importance in 17 Western States:



Note: Dept of Ag. programs not uniform throughout due to differences in State gov's & land ownership/use, etc.

In Western US: 20 **pest species** (of over 500, <10%) = 'top herbivores'

Annually remove 20-25% of rangeland vegetation on average, Estimated loss \$400 million /year on average, *more in outbreak* (Forage losses in Texas estimated at 190 M\$ in single year 2000)

Up to 20 million acres/year treated during outbreaks of 1986-88

Thrive in arid climate: mild winter, wet spring, dry summer conditions

10 to 15-year outbreak cycle considered normal in Western US, with up-cycles lasting several years
But comparable to wildfire, outbreaks *may* be increasing with drought & regional climate shifts



Grasshopper Pest Species in Oregon

The most frequent economic pest grasshopper species in Oregon (all native, in rough order of concern) are:

<i>Melanoplus sanguinipes</i>	migratory GH
<i>Camnula pellucida</i>	clear-winged GH
<i>Aulocara ellioti</i>	big-headed GH
<i>Oedaleonotus enigma</i>	valley GH
<i>M. Bivittatus</i>	two-striped GH
<i>M. femurrubrum</i>	red-legged GH
<i>Ageneotettix deorum</i>	white-whiskered GH
<i>M. packardii</i>	Packard's GH
<i>M. foedus</i>	striped sand GH

Other grasshopper species considered potential pests in the Western US that are present in Oregon but not usually reaching economic levels are:

<i>Trachyrachys kiowa</i>	Kiowa GH
<i>Amphitornus coloradus</i>	striped GH
<i>Cordillacris occipitalis</i>	spotted-wing GH
<i>M. infantilis</i>	small spur-throat GH

“The most widespread...is without a doubt **Migratory grasshopper**, however, **Clear-winged grasshopper** and **Big-headed grasshopper** are often in very dense populations & may be more economically damaging during outbreaks.”

*-Thomas Valente,
ODA Taxonomist*

...currently in final stages of developing an Oregon field guide

Oregon Grasshoppers Major Pest Species



Big-headed Grasshopper
Aulocara ellioti



Valley Grasshopper
Oedaleonotus enigma



Two-striped Grasshopper
Melanoplus bivittatus



Clear-winged Grasshopper
Camnula pellucida



Migratory Grasshopper
Melanoplus sanguinipes



Clearwinged grasshopper



1



2



3



4

Nymphal development: 26-40 days (~1 wk/instar)



5



Adult

ida

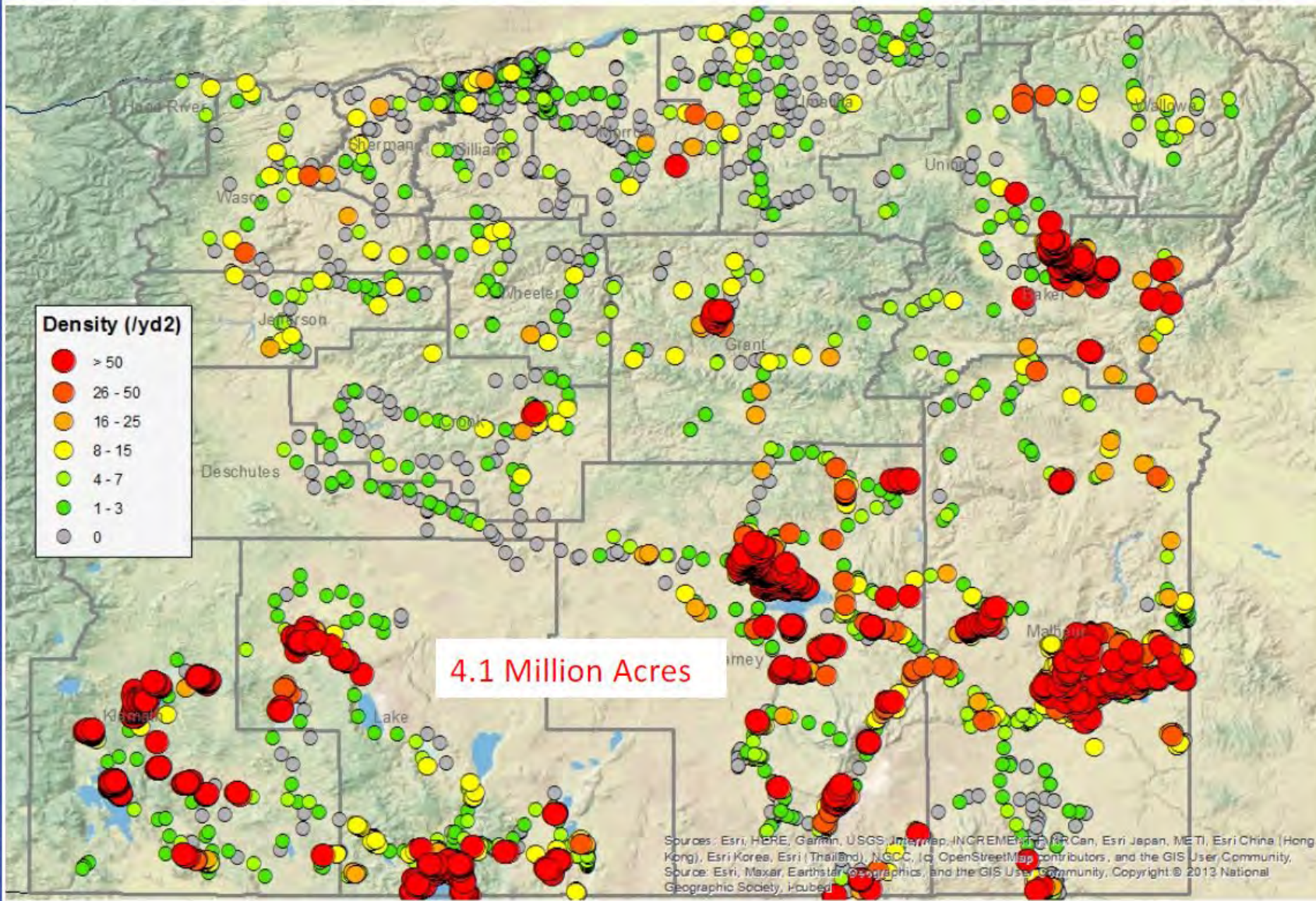
Feeding

How much do they eat?



A grasshopper can eat about its own weight or destroy up to 6 times its own weight of vegetation **daily**

2022 Grasshopper Stops



Prepared By: Todd Adams
 Date Printed: 9/12/2022
 GCS_WGS_1984, Scale: 1:2,399,757
 This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



60
Miles



**OREGON
DEPARTMENT OF
AGRICULTURE**



Some good news!

- USDA funding outlook better
- 12K survey stops indicate **60% fewer sites** than 2021 'economic' (8+ GH/yd²)

But... hotspots remain very hot:

- 73 GH/yd² mean density!
- Widespread in southern counties
- & Keating Valley, Baker County



Grasshoppers -vs- Crickets



Grasshoppers (Caelifera)

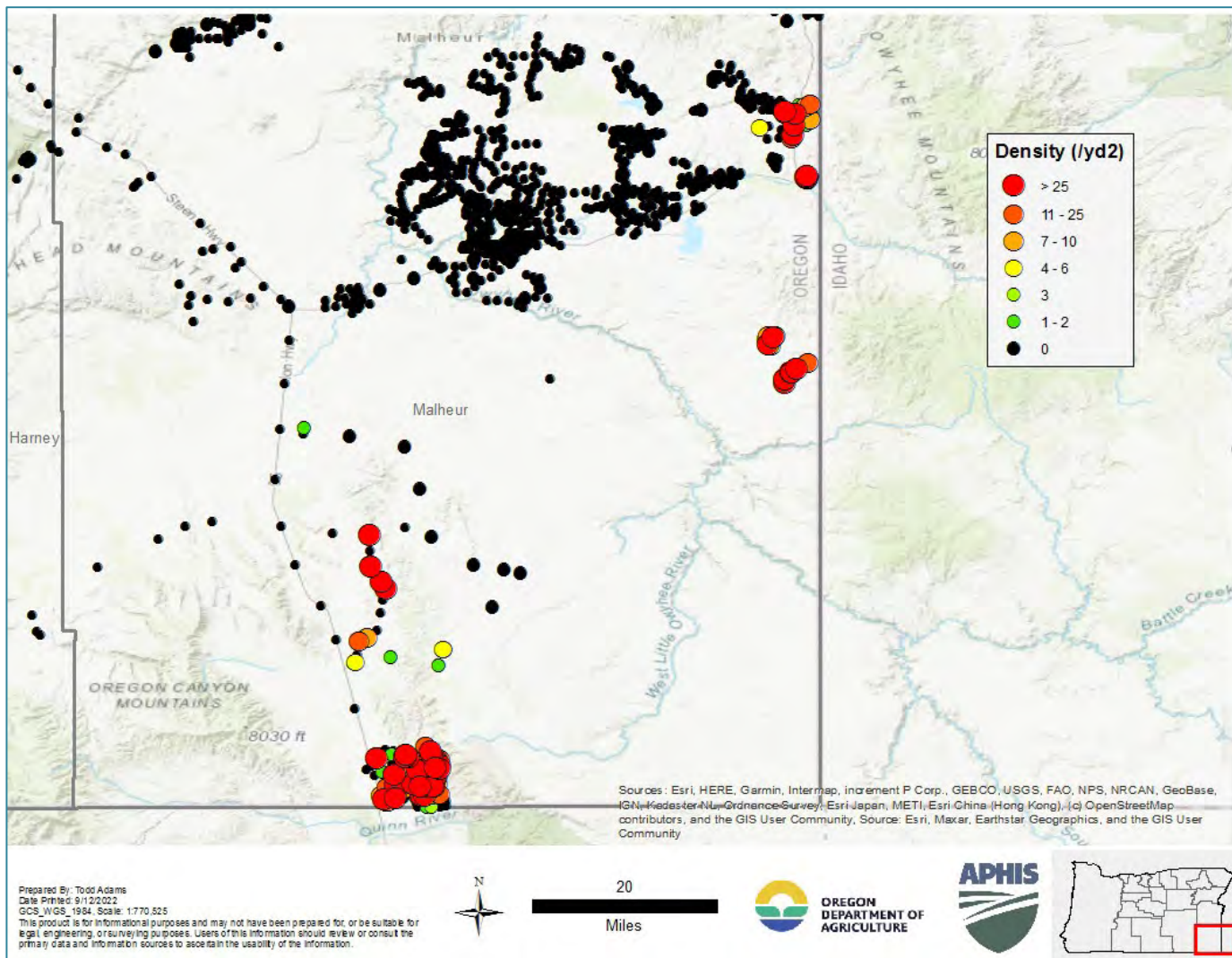
- Antennae short, relatively broad
- Ovipositor small, inconspicuous
- Tympanum (hearing organ) on abdomen
- Primarily herbivorous



Crickets and Allies (Ensifera)

- Antennae long, thread-like
- Ovipositor large and obvious
- Tympanum (hearing organ) on front legs
- Omnivorous

‘Mormon cricket’ *Anabrus simplex* — not a true cricket — in the Tettigoniinae subfamily (shieldbacked katydids), one of several in Oregon



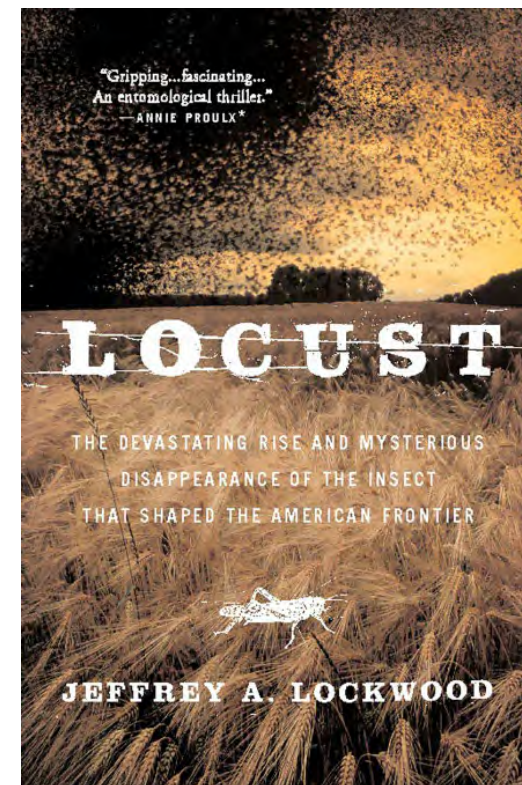
- Early hatching, thrifty & very mobile
- Migratory & cyclical (esp. Great Basin population)
- Feeding damage limited
- Crop contamination problem
- Public safety hazard (slick roads, airport bird strikes, foul smell, clogged gutters)
- Can be more difficult to manage than grasshoppers

USDA, Animal & Plant Health Inspection Service (APHIS), Plant Protection & Quarantine (PPQ):

1. Lead US agency for regulating *exotic* plant pests while facilitating trade
2. Also leads survey & suppression efforts for grasshoppers (even though *native* plant pests), by law from 1934, updated in the Plant Protection Act of 2000
3. Grasshopper concerns helped create the USDA & the field of Economic Entomology 150 years ago, as well as applied Integrated Pest Management (IPM)

See subject matter expert Jeffery Lockwood's Locust (2005) on early history & the Rocky Mountain locust:

(free video summary also at: www.jeffreylockwoodauthor.com)



USDA APHIS PPQ's Grasshopper Program Summary (continued)

4. Provide free survey & advice of both adult and immature grasshopper populations to all land managers, plus long-term analysis drawing on 70+ years

A cooperative program in OR with Oregon Dept. of Ag. (ODA)

Sign up for survey reports: oda.direct/gmc

5. No executive authority (or land management role), means Formal request + adv. planning required for any treatment, regardless of outbreak

6. Effectiveness mandate: *short treatment window* but long planning window, outbreaks tend to last many years

7. Cost share program on State (50%) or Private land (1/3), minus overhead (~16.5%) for treatments

8. 100% on federal or tribal land

9. Full NEPA compliance, above & beyond FIFRA (normal pesticide label) + Land Manager's specs.



www.aphis.usda.gov/vanityurl/plant-health/grasshopper

USDA FAQ's and resources about coronavirus (COVID-19). [LEARN MORE](#)

[Plant Health](#) / [Pests and Diseases](#) / [Programs](#) / [Insects](#) / [Grasshopper - Mormon Cricket](#)

Plant Health
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Grasshopper Mormon Cricket

Last Modified: Nov 10, 2022

Print

Rangeland in the western United States is a valuable agricultural resource for livestock production and provides an important habitat for wildlife. Grasshoppers and Mormon crickets (hereafter, referred to collectively as grasshoppers) are natural components of this ecosystem. However, their populations can reach outbreak levels and cause serious economic losses to rangeland forage, especially when accompanied by a drought.

Not all grasshopper species significantly damage rangeland forage, so action to protect rangeland resources is not always required when grasshopper populations increase. However, a rapid and effective response is required when a grasshopper outbreak develops and threatens rangeland forage. During such an event, Federal land management agencies, State agriculture departments, county and local governments, private groups, and/or individuals can request assistance from the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) to suppress rangeland grasshopper populations. Under the Plant Protection Act, APHIS has the authority, subject to funding availability, to treat Federal, State, or private lands that have economically significant infestations of grasshoppers.

News and Information

- [Overview Video of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program](#)
- [ID tool for grasshoppers of the Western U.S.](#)
- [Mobile App Series: Grasshoppers of the Western U.S.](#)
- [Frequently Asked Questions About Grasshoppers and Mormon Crickets in Western States](#)
- [Fact Sheet - Grasshoppers and Mormon Crickets](#)
- [Image Collection – Grasshoppers and Mormon Crickets](#)

Maps

- [Grasshopper Hazard Map](#) (PDF; 670 Kb)

Management

- [Environmental Documents](#)
- [ARS Grasshopper Management](#)
- [Grasshopper Integrated Pest Management User Handbook](#)

• [Overview Video of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program](#)

• [ID tool for grasshoppers of the Western U.S.](#)

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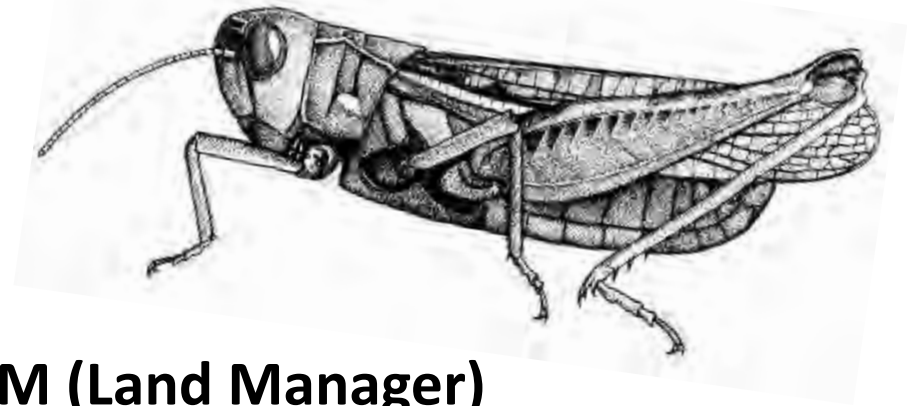
• [Grasshopper Hazard Map](#)

• [Environmental Documents](#)

• [ARS Grasshopper Management](#)

• [Grasshopper Integrated Pest Management User Handbook](#)

Cooperative Roles



Depts. of Ag.

- Conduct surveys & share results
- NEPA: EIS, state-specific draft EA &
- ESA Section 7 consultation with US Fish & Wildlife Service (FWS)
- Result in: final Environmental Assessment (EA) &
- Finding of No Significant Impact (FONSI)
- Solicit Contractors
- Supervise Treatments

BLM (Land Manager)

- Report Hatch, help direct survey
- Letter of Request (for treatment)
- Review EA
- Consultation (FWS, ODFW)
- Pesticide Use Proposal (PUP)
- Propose Treatment Areas (shapefiles)
- Specify requirements beyond EA





Action Timeline:

Current Year: Gather data to support a treatment request, such as... infestation rates, species composition, describe resource needing protecting, do neighbors want to treat too?

Decide if have you have time & interest for pursuing a treatment request. (If not, document why not.)

By January 15th: Letter of Request, MOU, basic plan including an acreage estimate and method due.

By March 1st: Communication on NEPA considerations that may limit treatment, or any internal matters that will delay treatment a single day during the treatment window, should be complete.

During 1st or 2nd instars (vary by location & species, ~April – June): Report hatch and dispatch survey crews to your proposed treatment blocks. Their findings will ultimately support your plan moving forward to contracting.

Within a week of survey: Finalize your specific treatment request and any internal documents (e.g. PUP) and submit to APHIS.

Survey is Key

Provides data to support management

Spring / Nymphal survey supports current season treatments logistics

Summer / Adult survey helps with following year predictions

Sentinel site survey provide baseline population data with fixed survey sites

You can: 1) Sign up for reports!

2) Help report hatch in spring! (They will be tiny, ask cooperators to help)

3) Direct survey crews to specific locations, request technical advice

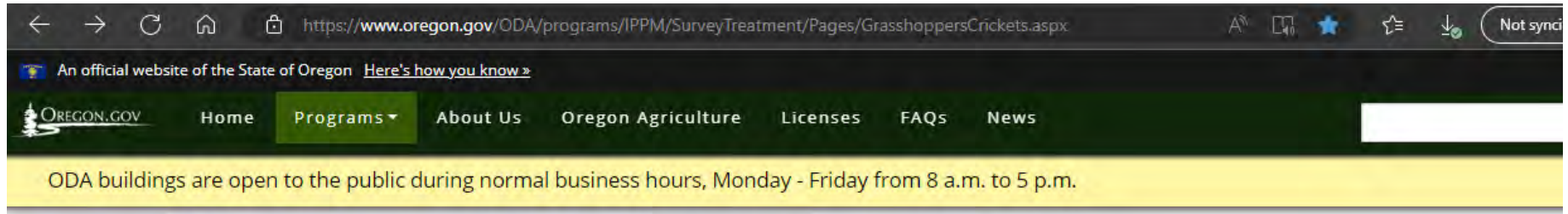


4) Species data can be requested

5) Shapefiles can be requested

ODA website:

ODA.DIRECT/GMC



Oregon Department of Agriculture / Programs / Insect Pest Prevention and Management / Survey and Treatment Projects

Grasshoppers and Mormon Crickets

Oregon Grasshopper/Mormon Cricket Outbreak Reporting Form

For 2022 Season Reporting

Please complete this form to report Oregon grasshopper or Mormon cricket sightings/infestations, sign up to receive reports, and request information.

First name*

Last name*

Phone number*

Email*

Would you like to register for weekly grasshopper survey reports (email)?

Yes No

In the summer of 2021, Oregon suffered its worst outbreaks of grasshoppers and Mormon crickets in fifty years. A record 10 million acres of rangeland in 18 counties suffered damaging levels of infestation. At infested sites, grasshoppers reached an average density of 65 animals per square yard (8 or more grasshoppers per yard can cause significant damage to rangeland).

We already had a historic outbreak in 2020, when 60% percent of all ODA survey sites recorded significant grasshopper numbers.

Grasshopper outbreaks often follow or coincide with drought years. Low rainfall and warm spring weather support egg hatches and survival of small grasshopper nymphs. As a result, grasshoppers develop rapidly. These conditions also reduce the impact of predators and diseases that limit grasshopper numbers.

Grasshopper outbreaks mean less forage and vegetation cover essential for livestock and wildlife. Less vegetation leads to environmental damage and erosion. Starving grasshoppers may also invade agricultural areas where they eat crops.

- [Grasshopper & Mormon cricket outbreaks in Oregon — FAQs](#)
- [Brotos de saltamontes y grillos mormones en Oregon — Preguntas frecuentes](#)

Grasshopper and Mormon Cricket Population Suppression Cost-Sharing Program

Senate Bill 5561 passed in response to the forage loss on Oregon rangelands from outbreak grasshopper populations in 2020 and 2021. The bill provides one-time funding of \$5,000,000 to help combat the severe grasshopper season expected in 2022.

- [Grasshopper & Mormon Cricket Cost Share Program fact sheet](#)

Contact

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 Service - Plant Protection & Quarantine
 colin.g.park@usda.gov
 Phone: 503-730-7622

Sign up for email updates!

- [Grasshopper & Mormon Cricket Information](#)
- [Grasshopper & Mormon Cricket Weekly Reports](#)

*Grasshopper
suppression
treatments occur*

Grasshopper scouts
Hired
By mid-March

Grasshopper scout
Training March 15-22

Nymph surveys

Adult surveys

egg hatch

depending on weather, elevation and species



January February March April May June July August September October November December

Timeline of Grasshopper Activity

Buffers & Protective Measures

Required on all USDA run Treatments:

- Water: 500 ft (air), 200 ft (grd.) liquid; 200 ft (air), 50 ft (grd.) solid bait
- Environmental Monitoring (dye cards, various samples to check for overspray); Temp & wind speed (<10mph) for air
- General survey for and buffer of any sensitive sites, GIS technology req.



Additional (Site Specific):

- ESA Section 7 consultation with FWS provides programmatic buffers (found in EA)
- Species specific larger buffers
- May require specific survey of species or just buffering of entire habitats
- *Additional requirements provided by land manager*--BLM consults with ODFW
- Sage grouse restrictions, especially:
No activity two hours <2 hours after sunrise within **4 miles of leks**

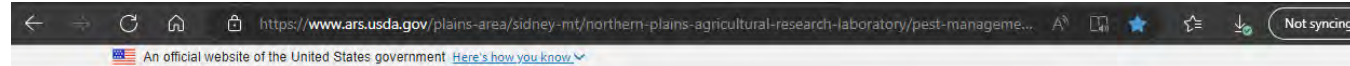
Limited Treatment window due to pest phenology: from egg hatch (May) until mid-instars (June – July), *or earlier for Mormon Crickets*

Peak complaints are late for treatment & early for next year planning!





IPM Handbook Overview : USDA ARS



Pest Management Research: Sidney, MT

Research ▾ People ▾ NPARL ▾

[ARS Home](#) » [Plains Area](#) » [Sidney, Montana](#) » [Northern Plains Agricultural Research Laboratory](#) » [Pest Management Research](#) » [PMRU Docs](#) » [Grasshoppers: Their Biology, Identification and Management](#): » [IPM Handbook](#) » IPM Handbook Overview



Sidney, MT ARS

[NPARL Home](#)

[PMRU Home](#)

[ASRU Home](#)

Grasshopper Website

[Site Highlights](#)

[Outbreak and Survey Info](#)

[ID Tools | Apps](#)

[Grasshopper Management](#)

[IPM Handbook](#)

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[III. Environmental
Monitoring & Evaluation](#)

IPM Handbook Overview

Grasshopper Integrated Pest Management User Handbook

Gary L. Cuninghame and Mike W. Sampson
Technical Coordinators

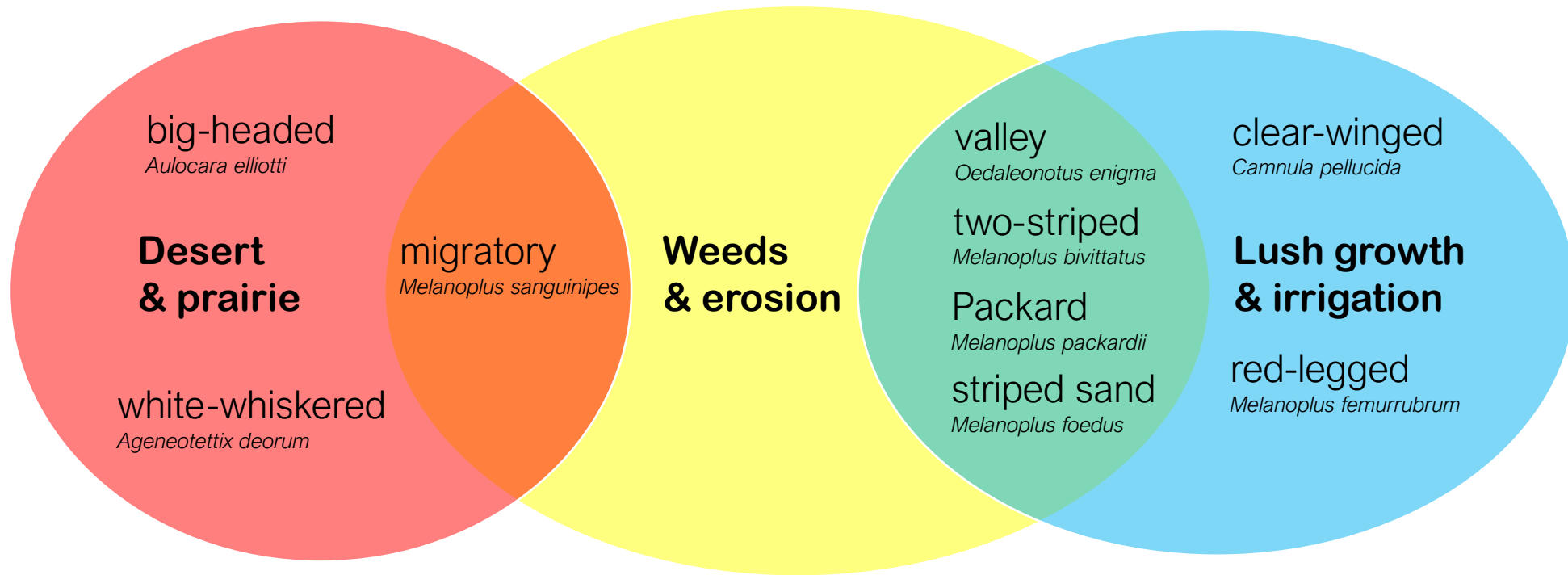
United States Department of Agriculture
Animal and Plant Health Inspection Services
Technical Bulletin No. 1809
Issued Spring 1996 - Summer 2000
Washington, DC



During the last major outbreak of grasshoppers in the mid-1980's on Western United States' rangelands, Federal and State governments saw the need to develop new and better ways of grasshopper management. From that need, Congress created the Grasshopper Integrated Pest Management Project. (APHIS file photo.)

Important Notes: See the Grasshopper Management Section for up-to-date information on using livestock grazing to prevent grasshopper outbreaks, new RAATs chemical control methods, environmental side-effects of grasshopper control, USDA-APHIS grasshopper control programs,

Ecological Factors Favoring Economically Damaging Grasshopper Species in Oregon



Information source: **Grasshopper Species Fact Sheets** - Wyoming Agricultural Experiment Station Bulletin 912
by Robert E. Pfadt

Grasshopper IPM: Overview

Integrated Pest Management is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices:

Essential Components:

- Monitoring
- Decision-making
- Methods & Materials



3-Phased Approach, *All rely on Survey & Sampling* (species type/stage)

Prevention

cultural control (e.g. ‘twice over’ livestock grazing)

Intervention

decision support (forecasting) + hot-spot chemical control

Suppression

last resort, 10k minimum, decision support (economic model), while supporting general diversity (conservation biocontrol)



USDA program Chemical options (typically also the best options available)

- Diflubenzuron (Dimilin 2L or equivalent, Durant 2L etc.):
 - ULV logistics make cost effective (though must be combined with water & oil), several week residual... will be discussed in detail
- Carbaryl Bait: good alternative for smaller treatments but can be done by air, mode of uptake limits non-target exposure and run-off making a good environmental alternative even through a neurotoxin (AcChE inhibitor) Carbamate

Phased out in Oregon for many years:

Malathion, provided 'true' ULV logistics (i.e., no mix), used extensively in the 80s, broad-spectrum and poisonous, short residual effect, volatile.

Liquid Carbaryl, requires similar timing as Dimilin to be efficient and much less safe, also very difficult to keep in good solution... may still be a good option for a boader treatment of a crop but no longer an option for USDA treatments.

Grasshopper IPM: Skip-swath/RAATs

Reduced Area Agent Treatments
(RAATs):

*Leaves untreated swaths as refuge
for non-target insects within the
block*

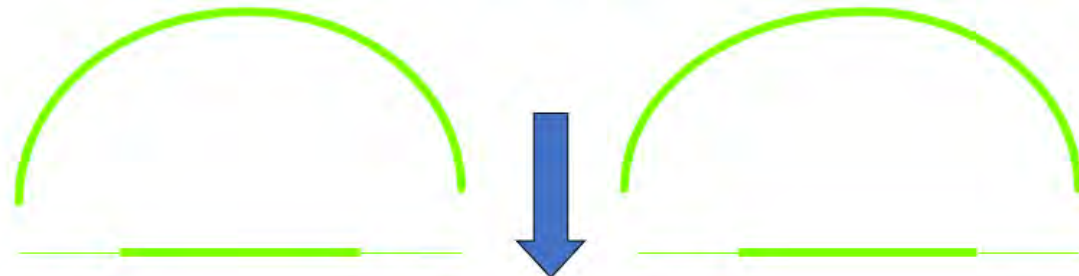
Works very well with Dimilin, since:
Immature insects not usually very
mobile, while grasshoppers are
extremely mobile

Also works with bait applications

Conventional/Blanket/100%



RAATs



Grasshopper IPM: Diflubenzuron (Dimilin)

Diflubenzuron (Dimilin 2L & others) Insect Growth Regulator

No lethal dose for vertebrates;
more selective: targets immature invertebrates

Long Residual (allows use of RAATs)

Reliable Results

Good Temperature Range

Timing is important

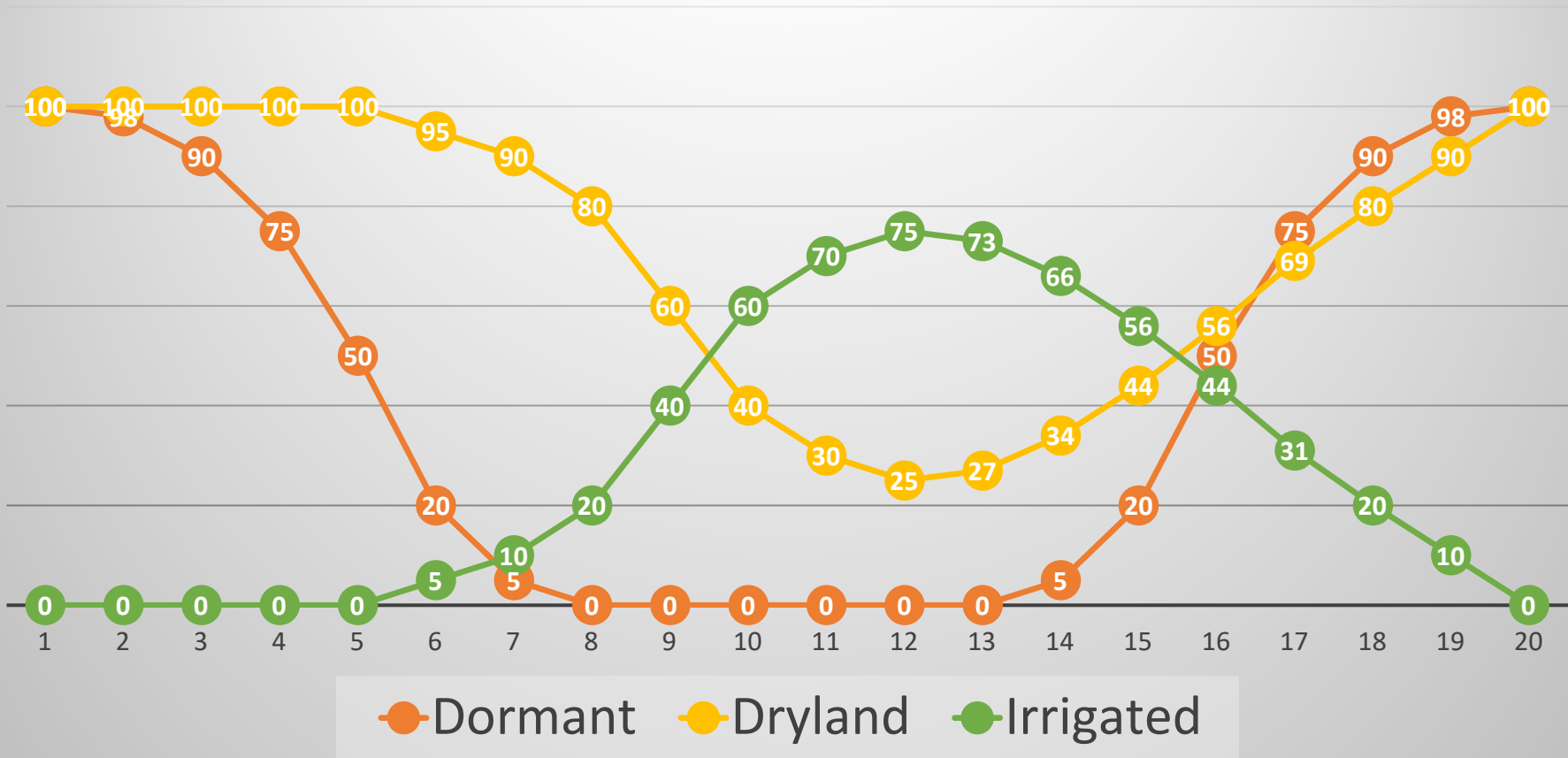
Restricted Use Pesticide as lethal to aquatic
invertebrates

Prevents successful Molting:



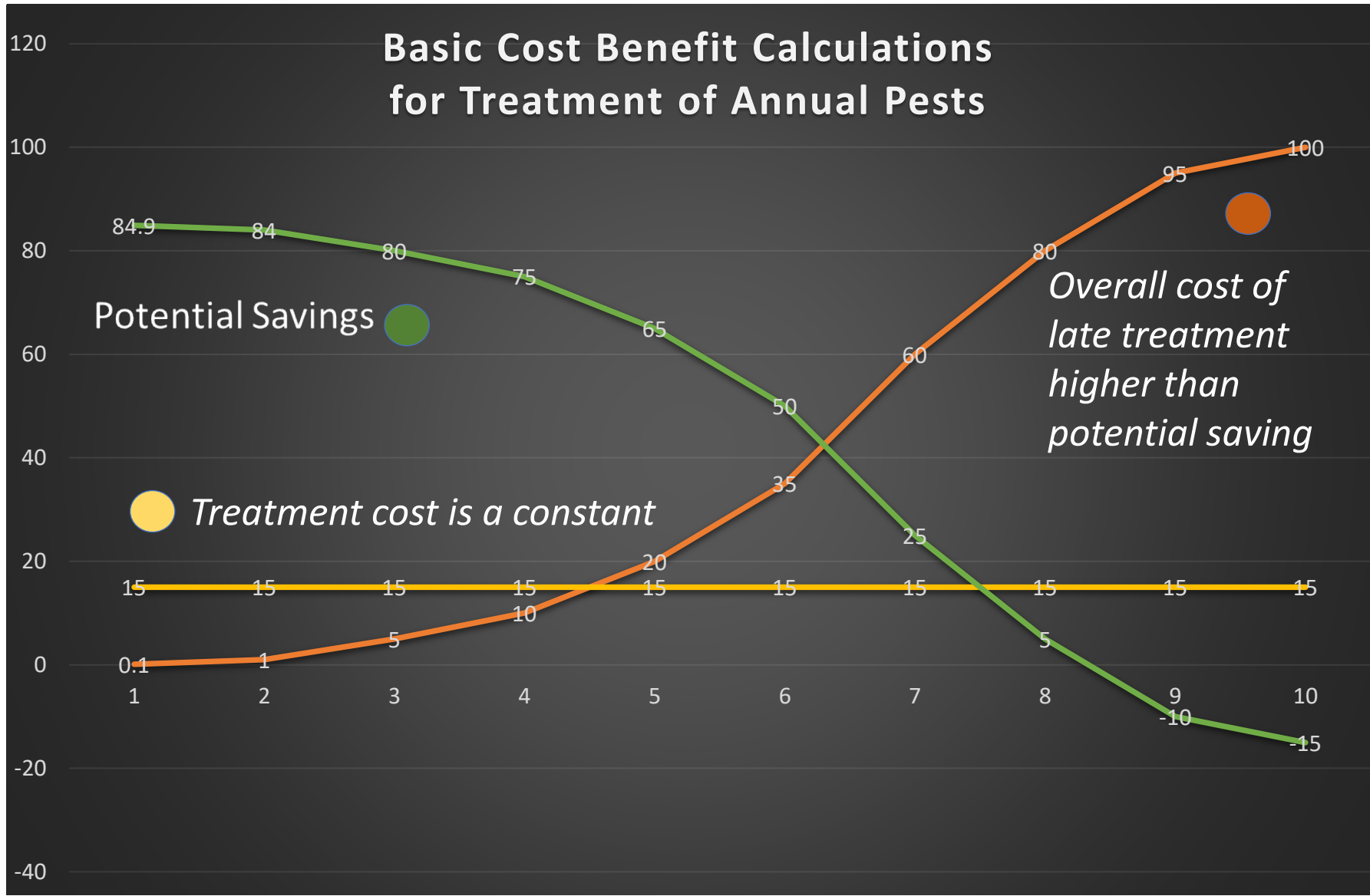
Grasshopper IPM: Effective Timing

Grasshopper Presence on Dryland vs. Irrigated Areas (or Dormant) through Growing Season



Later instars and adults may migrate off of range land, on to irrigated pasture/crops in summer. One of many reasons to attempt to treat rangeland as early as possible

Grasshopper IPM: Effective Timing



Basic economic management of any annual pest: delaying treatment = less yield & same treatment cost. Large grasshoppers also harder to kill, potentially adding 'insult to injury' of full damage plus cost of treatment

Grasshopper IPM: Overview

Survey is key!

1. **ODA** provides weekly & annual reports, custom sampling & recommendations
2. **Adult survey** results are best indicator of treatment planning for following season
3. Watch for hatch in spring, activate ODA for **nymphal survey**, finalize plan (slightly) and treat as early as possible if warranted
4. Target treatments to outbreak of **pest species threatening valuable resources** only

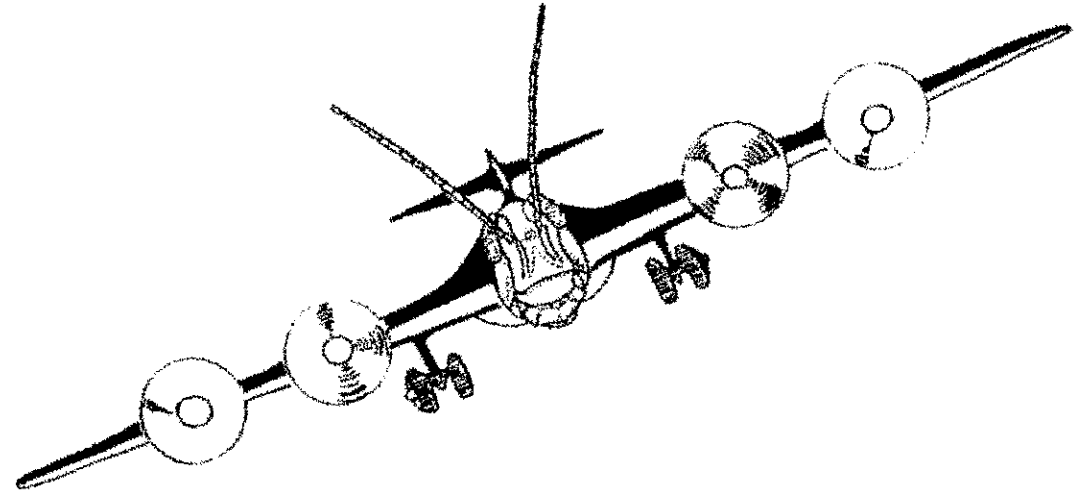


Grasshopper IPM: Overview

If Suppression Treatment is Required:

Talk to neighbors and treat ~10k acre or more to prevent reinfestation

Use skip swathing aka Reduced Area Agent Treatments (RAATs) to increase efficiency & limit non-target impact



Preventive Method: e.g. Targeted egg bed treatments (works especially well for Clear-wing grasshopper), or border treatments of a protected resources

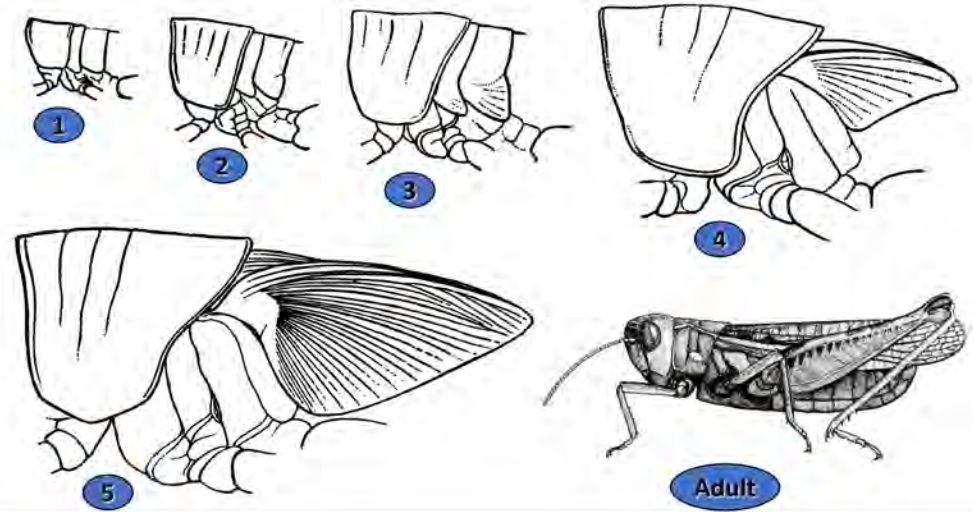
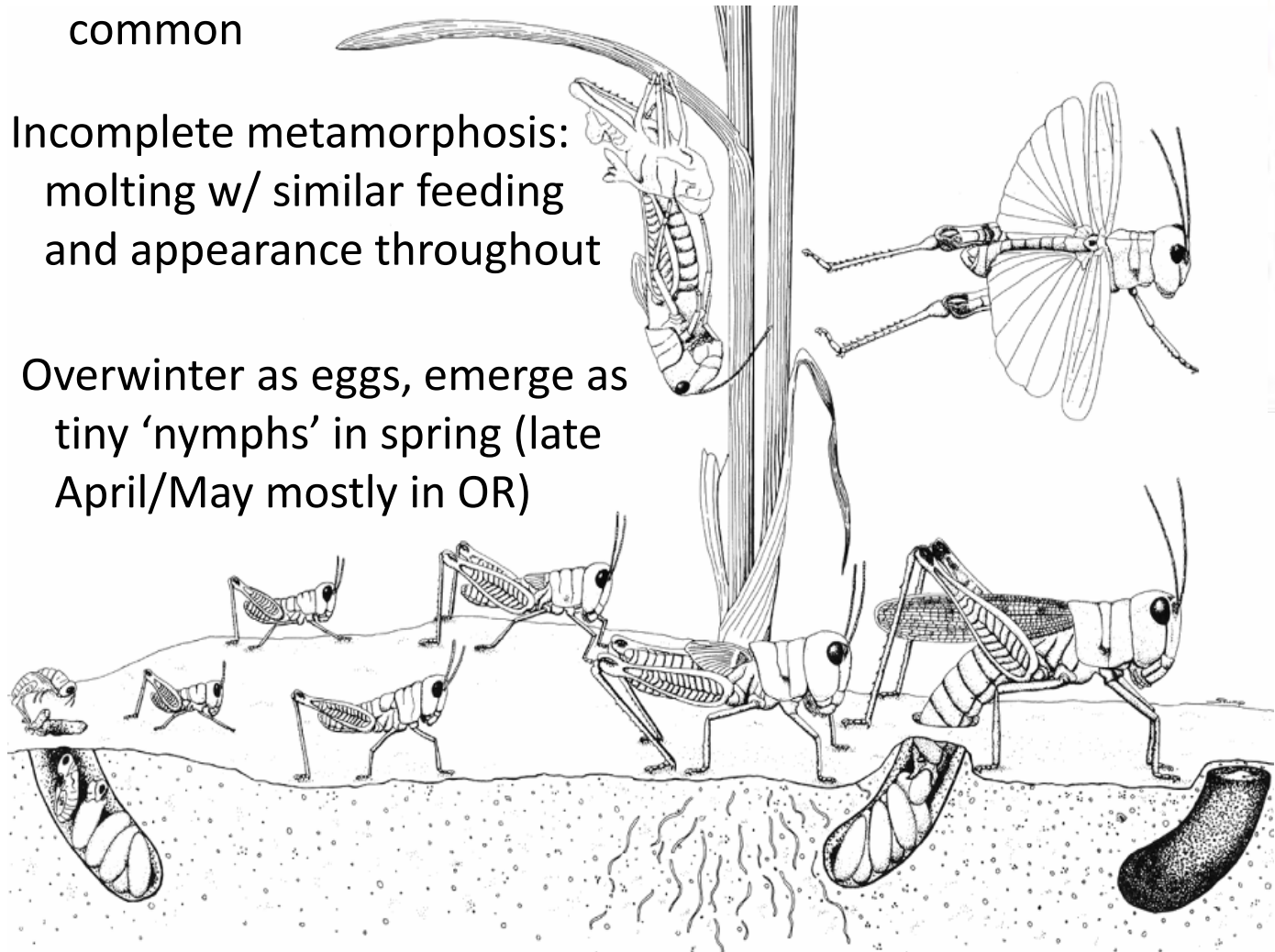
More IPM methods are available to land managers, see ARS Handbook, such as “Twice Grazing”, also not killing beneficial insects, though natural controls will become ‘saturated’ during outbreaks.

Grasshopper Biology: Life-Cycle

One generation per year in Oregon (more possible in SW US),
 Most stages quite mobile with migration during season
 common

Incomplete metamorphosis:
 molting w/ similar feeding
 and appearance throughout

Overwinter as eggs, emerge as
 tiny 'nymphs' in spring (late
 April/May mostly in OR)



Several nymphal stages or 'instars' with
 molting between each: developing 'wing-
 pads', increased size and mobility

Nymphal stages typically 30-40 days total,
 followed by 40-60 days more as Adults

Sexual reproduction and 'ovipositing' 1-4
 egg-pods of <80 eggs per female



United States Department of Agriculture

further

Resources:

Special Thanks to:

University of WY, Entomology

<https://www.uwyo.edu/entomology/grasshoppers/>

Provided many of the Grasshopper Biology, Ecology, & IPM information in this presentation

ODA Grasshopper & Mormon Cricket Program

<http://ODA.DIRECT/GMC>

USDA APHIS Grasshopper & Mormon Cricket Program:

www.aphis.usda.gov/vanityurl/plant-health/grasshopper

Grasshopper ID Tools:

idtools.org/id/grasshoppers/

USDA ARS Grasshopper,

Biology, Identification & Management:

www.sidney.ars.usda.gov/grasshopper/

USDA ARS Field guide:

www.ars.usda.gov/ARSUserFiles/30320505/grasshopper/Extras/PDFs/FieldGde.pdf

-Grasshopper ID Tools-



Admirable grasshopper

While the admirable grasshopper can occur at moderate to high densities, its habit of feeding on a variety of grasses and its preference for somewhat disturbed areas suggests it is unlikely to cause damage in rangeland.

The adult male and female differ strongly in size and appearance, and both sexes are very slender and...