



United States Department of Agriculture

USDA, APHIS, Plant Protection and Quarantine

3/29/22

2022 Rangeland Grasshopper and Mormon Cricket Program

Gary D. Adams
USDA, APHIS, PPQ
State Plant Health Director, Montana
(406)-657-6282

Gary.D.Adams@usda.gov



Today's Objectives

- Who is USDA, APHIS?
- Who is USDA, APHIS, PPQ?
- Brief overview of PPQ Programs
- Rangeland Grasshopper and Mormon Cricket Program
 - Biology
 - Management options
 - How you can request assistance.



USDA, APHIS

- **VS:** Veterinary Services
- **WS:** Wildlife Services
- **AC:** Animal Care
- **BRS:** Biotechnology Regulatory Services
- **PPQ:** Plant Protection and Quarantine



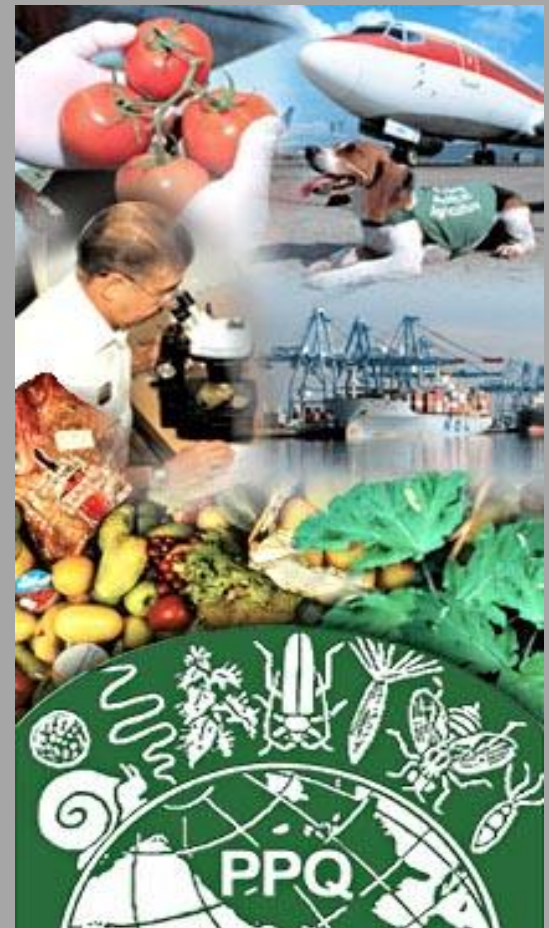
United States Department of Agriculture



United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine



Plant Protection and Quarantine





PPQ Mission

Safeguard Agriculture & Natural Resources

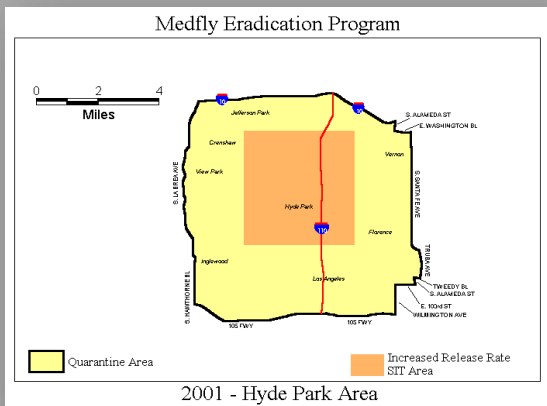
Ensure High Quality, Abundant & Varied Food Supply

Strengthen Marketability of U.S. Agriculture

Contribute to Preservation of Global Environment

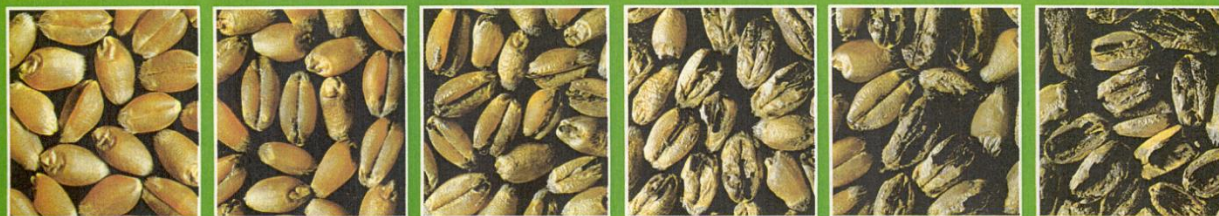
Domestic PPQ Programs

- ▶ Exotic Pest Surveys
- ▶ Quarantine and eradication
- ▶ Gypsy Moth/Japanese Beetle
- ▶ Biological Control
- ▶ Biotechnology
- ▶ Grasshopper & Mormon Cricket



Karnal Bunt

(*Neovossia indica*, syn. *Tilletia indica*)



Healthy seed showing no infection.

Point or trace infection at the embryo end.

10% infection; slight disease progress along crease.

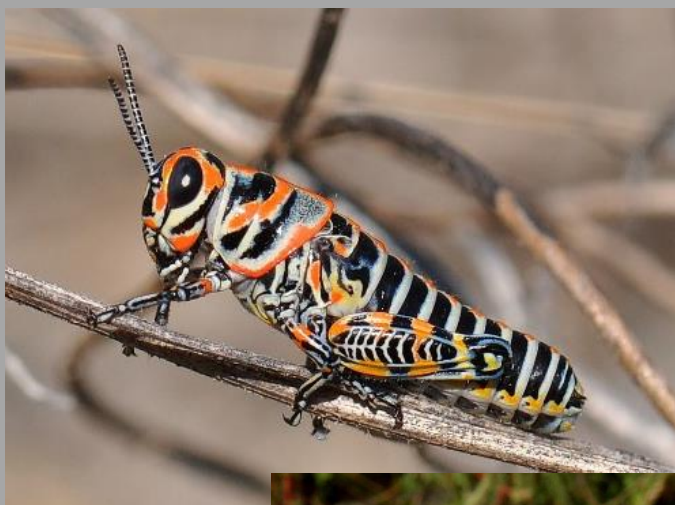
30% infection; disease has progressed about 1/3 along crease.

50% infection; disease has progressed about 1/2 along crease.

100% infection; endosperm totally replaced

Grasshopper and Mormon Cricket

- ▶ Survey
- ▶ Technical Assistance



- ▶ **Suppression Programs**
 - Border Protection treatments
 - Rangeland Protection treatments
 - Cost Share
 - RAATs



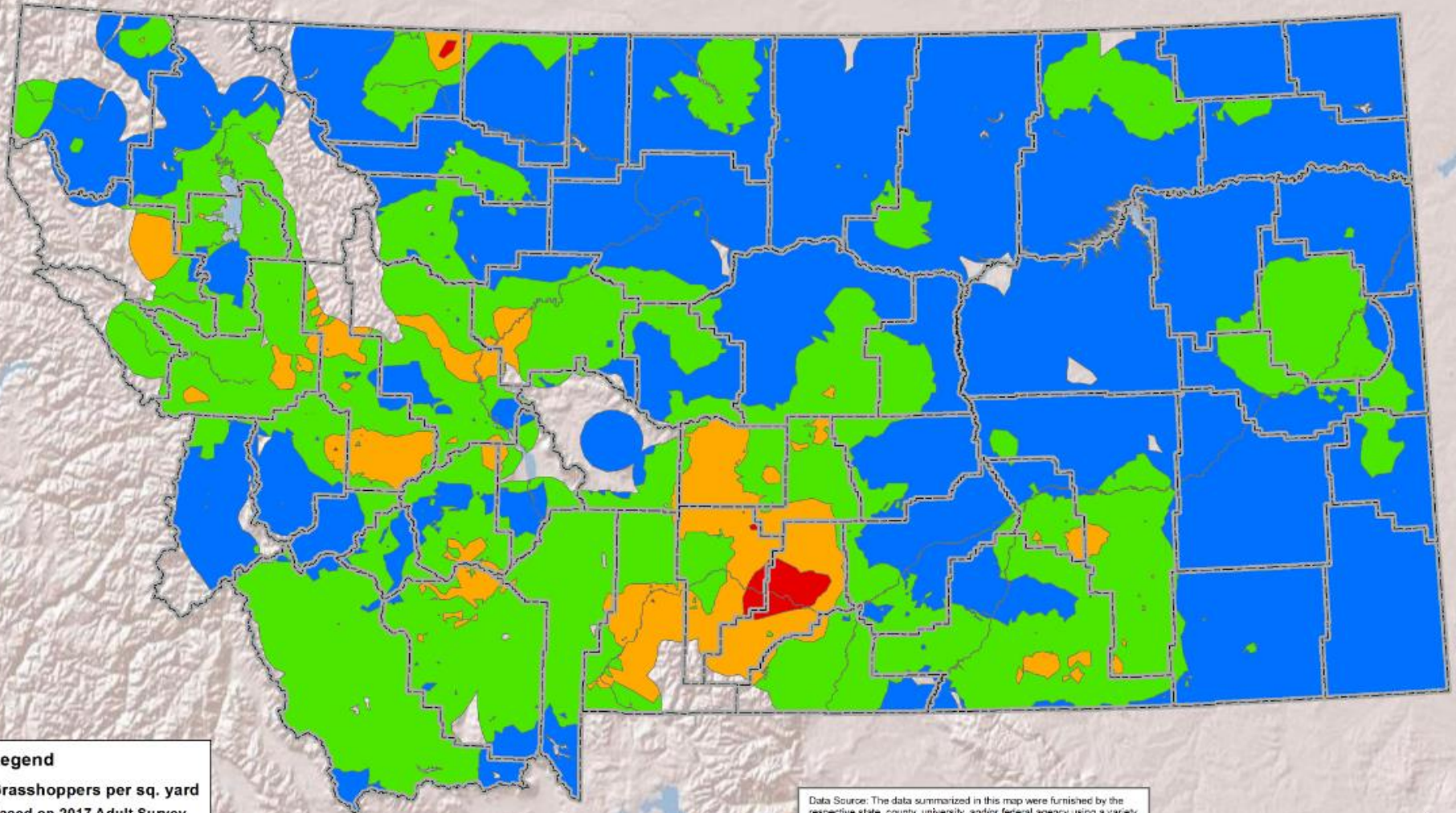
Surveys

- ▶ **Nymphal surveys**
- ▶ **Delimitation**
- ▶ **Pre Treatment**
- ▶ **Post Treatment**
- ▶ **Adult**

Conducting Surveys

- ▶ Visualize a square foot ahead of you on range
- ▶ Walk toward imaginary Ft²
- ▶ Count # of GHs that jump out
- ▶ Repeat 18 times
- ▶ Divide total by 2
- ▶ Give total GH/yd²

Montana 2018 Rangeland Grasshopper Hazard



Legend

Grasshoppers per sq. yard Based on 2017 Adult Survey

■	0 - <3	48.2 million acres
■	3 - <8	32.3 million acres
■	8 - <15	5.4 million acres
■	15+	378,811 acres

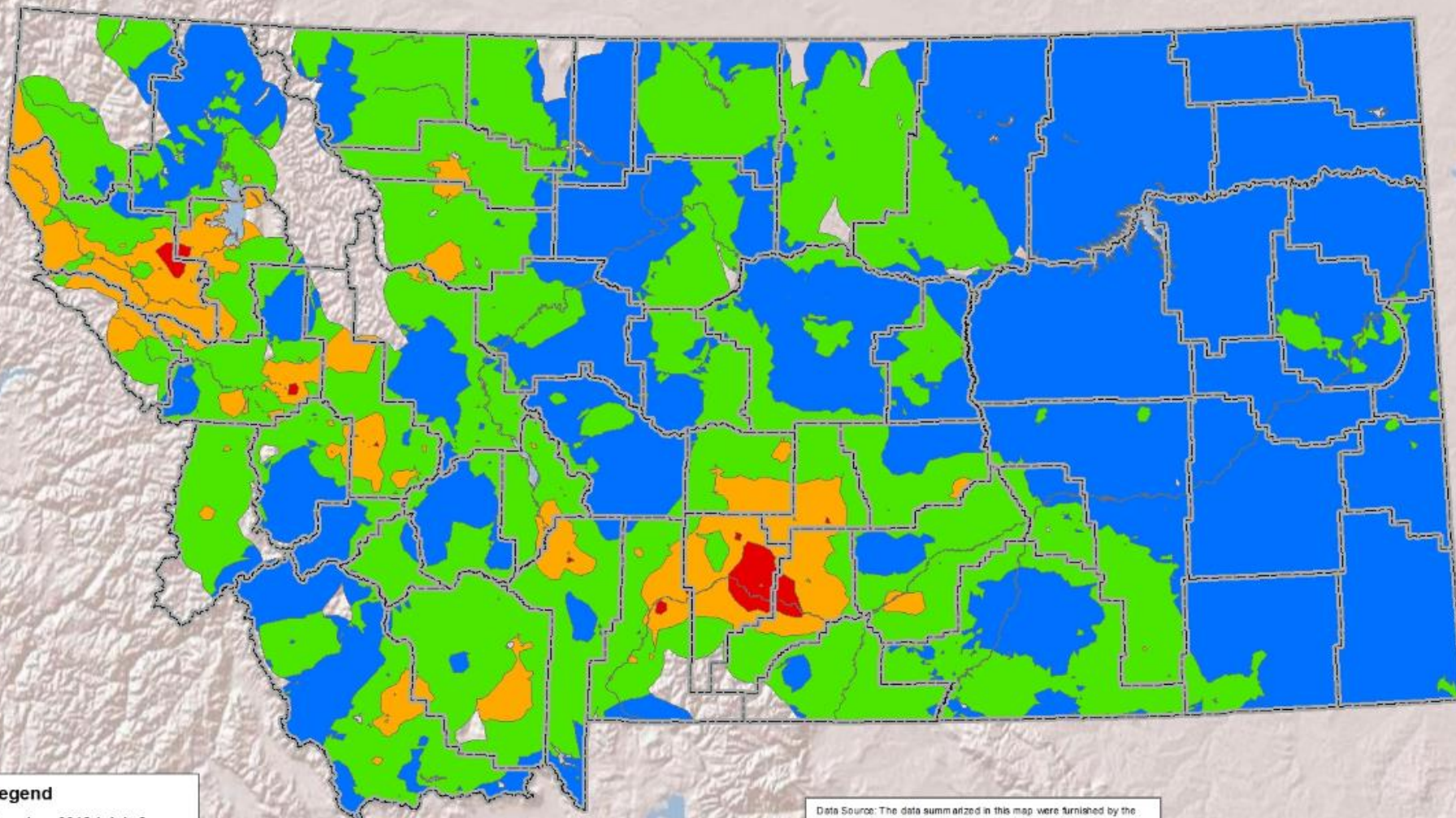
Data Source: The data summarized in this map were furnished by the respective state, county, university, and/or federal agency using a variety of survey methods and analytical techniques. Due to funding considerations, states may not have continuous survey coverage. This map was prepared by USDA/APHIS PPQ in cooperation with CPHST.

Preparation Notes: Adult and treatment survey densities of adult specimens were interpolated to a maximum buffer distance using an empirical Bayesian kriging model. Areas were then filtered by major water features to produce final acreage estimates. Acreages are approximated based on rounding to millions of acres.



Montana 2019

Rangeland Grasshopper Hazard



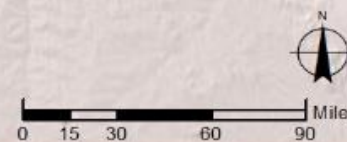
Legend

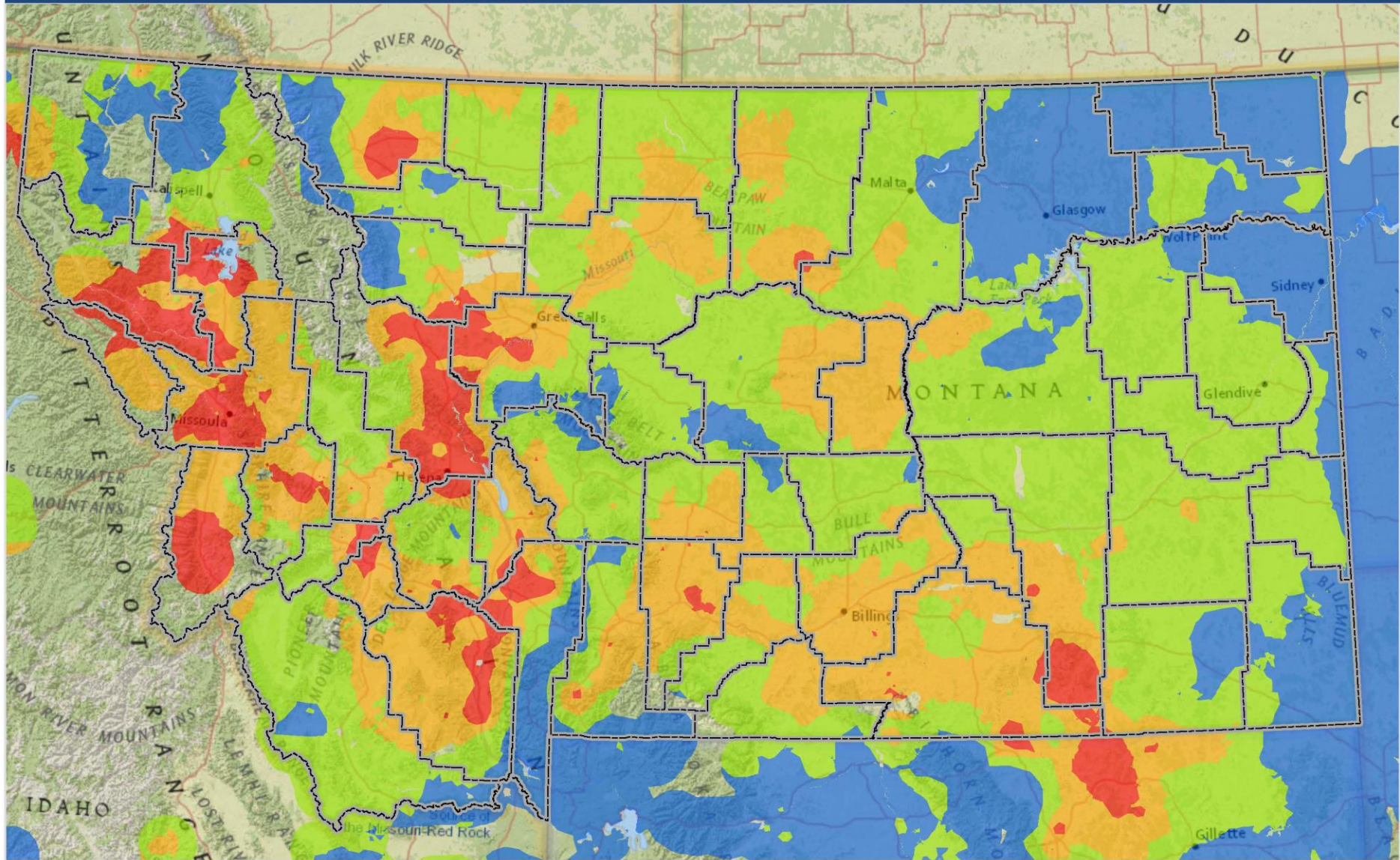
Based on 2018 Adult Survey

■	0 - <3	45.5 million acres
■	3 - <8	36.1 million acres
■	8 - <15	6.0 million acres
■	15+	461,777 acres

Data Source: The data summarized in this map were furnished by the respective state, county, university, and/or federal agency using a variety of survey methods and analytical techniques. Due to funding considerations, states may not have continuous survey coverage. This map was prepared by USDA/APHIS PPO in cooperation with CPHST.

Preparation Notes: Adult and treatment survey densities of adult specimens were interpolated to a maximum buffer distance using an empirical Bayesian kriging model. Areas were then filtered by major water features to produce final acreage estimates. Acreages are approximated based on rounding to millions of acres.





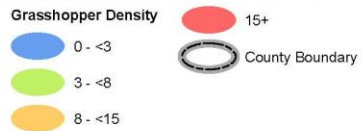
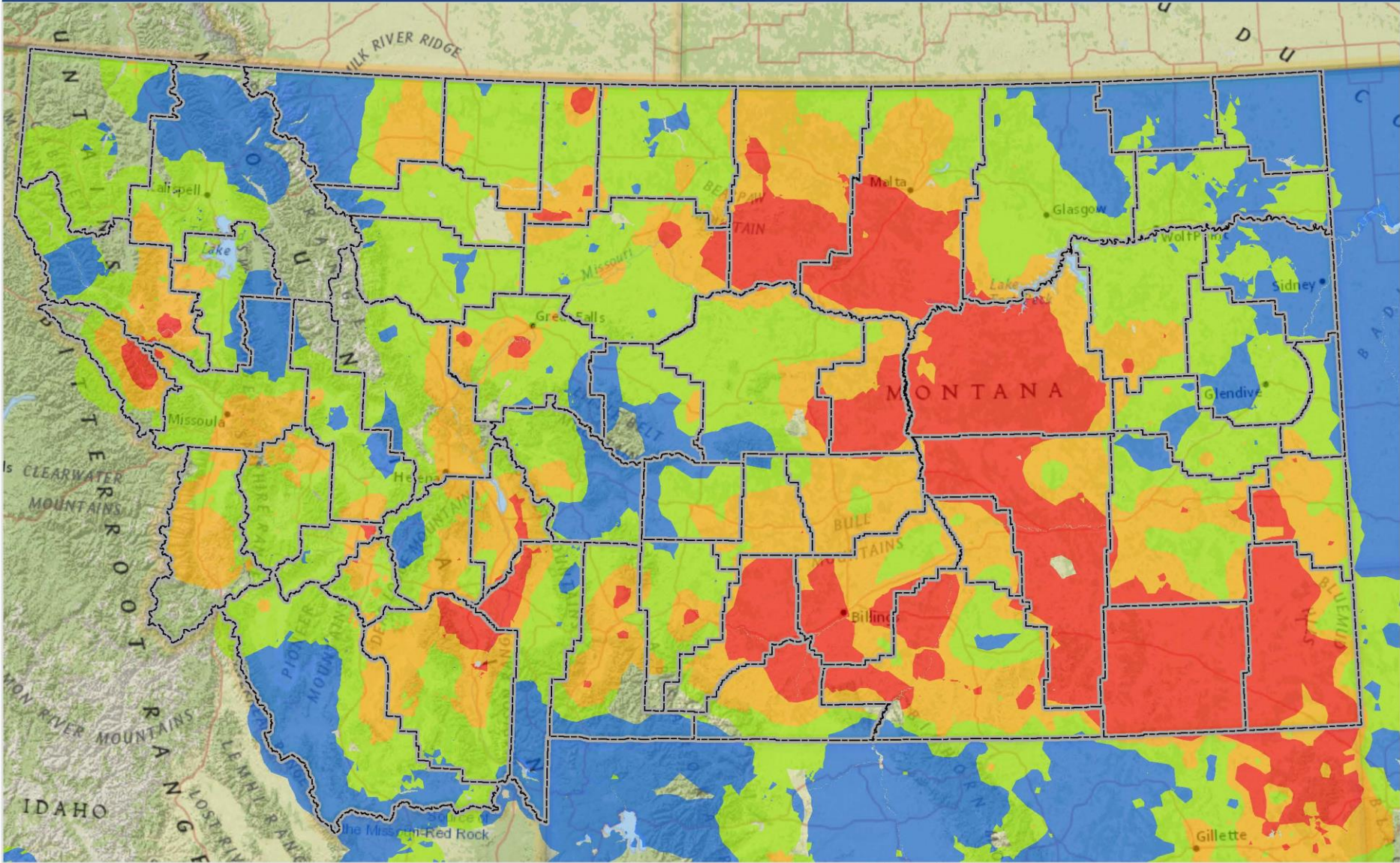
Data Source: The data summarized in this map were furnished by the respective state, county, university, and/or federal agency using a variety of survey methods and analytical techniques. Due to funding considerations, states may not have continuous survey coverage. This map was prepared by USDA APHIS PPQ in cooperation with CPHST.
 Preparation Notes: Adult and treatment survey densities of adult specimens were interpolated to a maximum buffer distance using an empirical Bayesian kriging model. Areas were then filtered by major water features to produce final acreage estimates. Acreages are approximated based on rounding to millions of acres.

Data Source:
 ESRI, PPQ

Date Created:
 10/21/2020

USDA, APHIS, PPQ
 5353 Yellowstone Rd, Ste 208
 Cheyenne, WY 82009

These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its cooperators on APHIS' behalf, for restricted government purposes only and is the sole property of APHIS. See full disclaimer: www.aphis.usda.gov/help/map-disclaimer



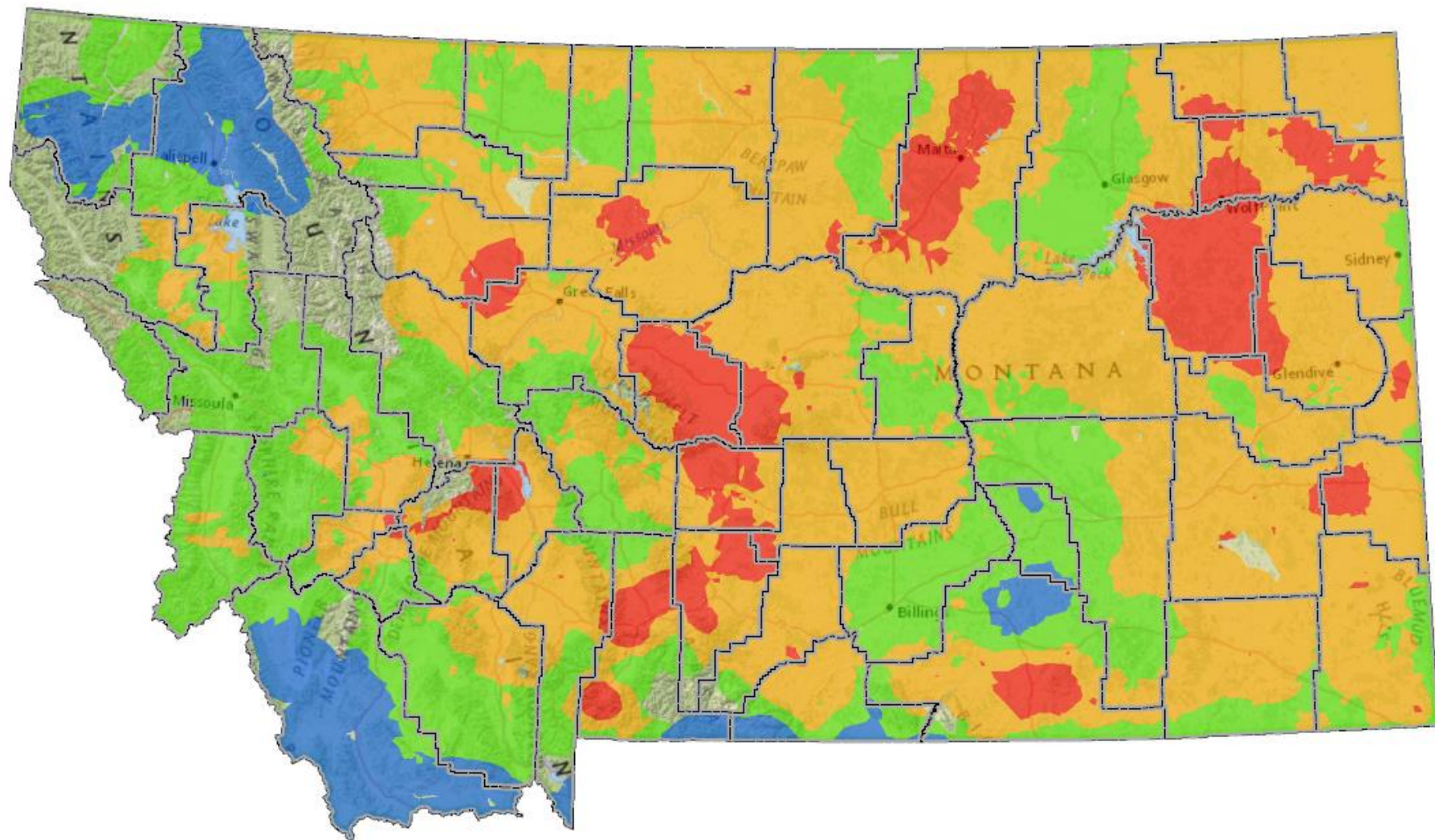
Data Source: The data summarized in this map were furnished by the respective state, county, university, and/or federal agency using a variety of survey methods and analytical techniques. Due to funding considerations, states may not have continuous survey coverage. This map was prepared by USDA APHIS PPQ in cooperation with CP45T.
 Preparation Notes: Adult and treatment survey densities of adult specimens were interpolated to a maximum buffer distance using an empirical Bayesian kriging model. Areas were then filtered by major water features to produce final acreage estimates. Acreages are approximated based on rounding to millions of acres.

Data Source: ESRI, PPQ

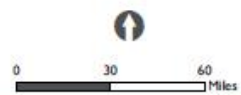
Date Created: 10/8/2020

USDA, APHIS, PPQ
 5353 Yellowstone Rd. Ste 208
 Cheyenne, WY 82009

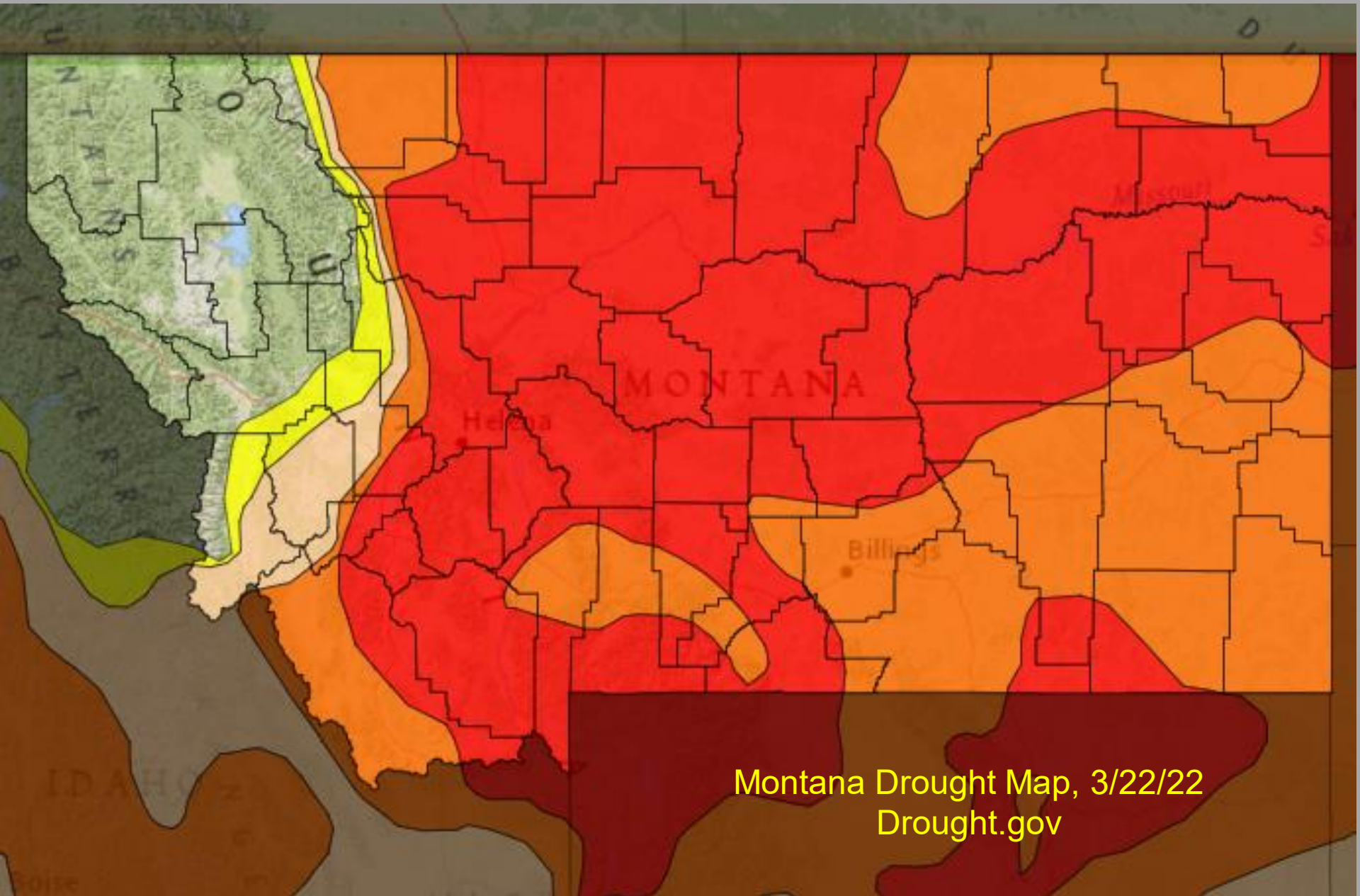
These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its contractors, on APHIS' behalf for restricted government purposes only and is the sole property of APHIS. See full disclaimer: www.aphis.usda.gov/help/map-disclaimer



Data Source: ESRI, PPQ
 Date Created: 11/17/2021
 USDA, APHIS, PPQ
 5353 Yellowstone Rd., Ste 208
 Cheyenne, WY 82009



These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its cooperation as APHIS' label, for restricted government purposes only and is the sole property of APHIS. See full disclaimer: www.aphis.usda.gov/hdp/nap-disclosure

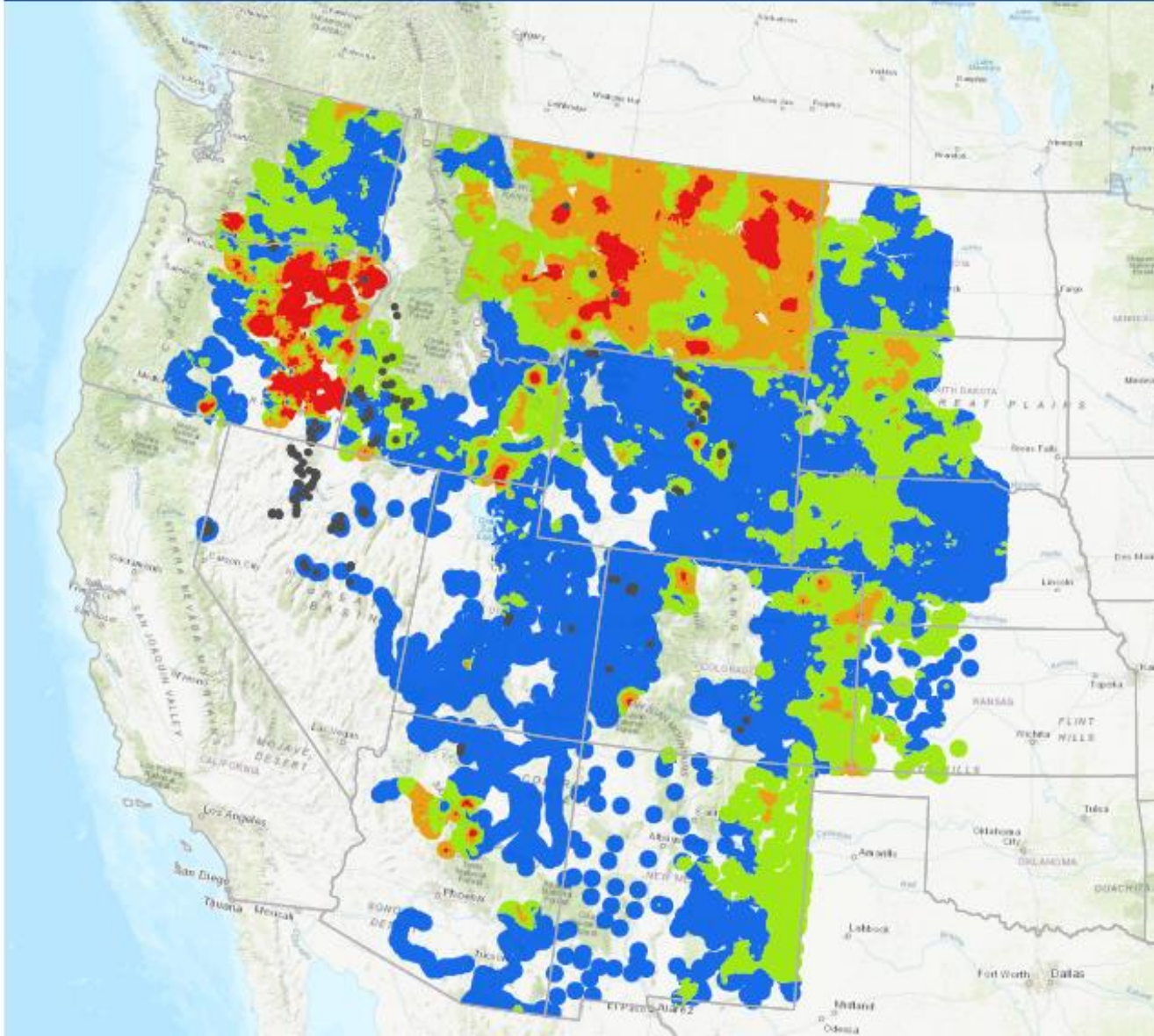


Montana Drought Map, 3/22/22
Drought.gov



Animal and Plant Health Inspection Service
UNITED STATES DEPARTMENT OF AGRICULTURE

2022 RANGELAND GRASSHOPPER HAZARD WITH MORMON CRICKET PRESENCE



Species

There are more than **400 known species** of grasshoppers in the Western United States, only about **two dozen** are considered pest species capable of producing economic damage.

A few species are actually beneficial because they eat undesirable plants.



Common Montana Species

<i>Aeoloplides turnbulli</i> (Thomas)	Russianthistle grasshopper	<i>Melanoplus borealis</i> (Fieber)	Northern grasshopper
<i>Aeropedellus clavatus</i> (Thomas)	Clubhorned grasshopper	<i>Melanoplus bowditchi</i> Scudder	Sagebrush grasshopper
<i>Ageneotettix deorum</i> (Scudder)	Whitewiskered grasshopper	<i>Melanoplus bruneri</i> Scudder	Bruner spurthroated grasshopper
<i>Amphitornus coloradus</i> (Thomas)	Striped grasshopper	<i>Melanoplus confusus</i> Scudder	Pasture grasshopper
<i>Anabrus simplex</i> Haldeman	Mormon cricket	<i>Melanoplus dawsoni</i> (Scudder)	Dawson grasshopper
<i>Arphia conspersa</i> Scudder	Specklewinged grasshopper	<i>Melanoplus devastator</i> Scudder	Devastating grasshopper
<i>Arphia pseudonietana</i> (Thomas)	Redwinged grasshopper	<i>Melanoplus differentialis</i> (Thomas)	Differential grasshopper
<i>Aulocara ellioti</i> (Thomas)	Bigheaded grasshopper	<i>Melanoplus femurrubrum</i> (DeGeer)	Redlegged grasshopper
<i>Aulocara femoratum</i> Scudder	Whitecrossed grasshopper	<i>Melanoplus gladstoni</i> Scudder	Gladston grasshopper
<i>Boopedon nubilum</i> (Say)	Ebony grasshopper	<i>Melanoplus infantilis</i> Scudder	Little spurthroated grasshopper
<i>Brachystola magna</i> (Girard)	Plains lubber grasshopper	<i>Melanoplus keeleri</i> (Thomas)	Keeler grasshopper
<i>Bruneria brunnea</i> (Thomas)	Bruner slantfaced grasshopper	<i>Melanoplus lakinus</i> (Scudder)	Lakin grasshopper
<i>Camnula pellucida</i> (Scudder)	Clearwinged grasshopper	<i>Melanoplus occidentalis</i> (Thomas)	Flabellate grasshopper
<i>Chorthippus curtipennis</i> (Harris)	Meadow grasshopper	<i>Melanoplus packardii</i> Scudder	Packard grasshopper
<i>Chortophaga viridifasciata</i> (DeGeer)	Greenstriped grasshopper	<i>Melanoplus rugglesi</i> Gurney	Nevada sage grasshopper
<i>Cordillacris crenulata</i> (Bruner)	Crenulatewinged grasshopper	<i>Melanoplus sanguinipes</i> (Fabricius)	Migratory grasshopper
<i>Cordillacris occipitalis</i> (Thomas)	Spottedwinged grasshopper	<i>Mermiria bivittata</i> (Serville)	Twostriped slantfaced grasshopper
<i>Derotmema haydeni</i> (Thomas)	Hayden grasshopper	<i>Metator pardalinus</i> (Saussure)	Bluelegged grasshopper
<i>Dissosteira carolina</i> (Linnaeus)	Carolina grasshopper	<i>Oedaleonotus enigma</i> (Scudder)	Valley grasshopper
<i>Dissosteira longipennis</i> (Thomas)	High Plains grasshopper	<i>Opeia obscura</i> (Thomas)	Obscure grasshopper
<i>Encoptolophus costalis</i> (Scudder)	Dusky grasshopper	<i>Orphulella speciosa</i> (Scudder)	Slantfaced pasture grasshopper
<i>Eritettix simplex</i> (Scudder)	Velvetstriped grasshopper	<i>Phlibostroma quadrimaculatum</i> (Thomas)	Fourspotted grasshopper
<i>Hadrotettix trifasciatus</i> (Say)	Threebanded grasshopper	<i>Phoetaliotes nebrascensis</i> (Thomas)	Largeheaded grasshopper
<i>Hesperotettix viridis</i> (Thomas)	Snakeweed grasshopper	<i>Psoloessa delicatula</i> (Scudder)	Brownspotted grasshopper
<i>Hypochlora alba</i> (Dodge)	Cudweed grasshopper	<i>Spharagemon collare</i> (Scudder)	Mottled sand grasshopper
<i>Melanoplus alpinus</i> Scudder	Alpine grasshopper	<i>Spharagemon equale</i> (Say)	Orangelegged grasshopper
<i>Melanoplus angustipennis</i> (Dodge)	Narrowwinged sand grasshopper	<i>Trachyrhachys kiowa</i> (Thomas)	Kiowa grasshopper
<i>Melanoplus bivittatus</i> (Say)	Twostriped grasshopper	<i>Xanthippus corallipes</i> (Haldeman)	Redshanked grasshopper



Economic Montana Rangeland Species

Aeoloplides turnbulli (Thomas)	Russianthistle grasshopper	Melanoplus borealis (Fieber)	Northern grasshopper
Aeropedellus clavatus (Thomas)	Clubhorned grasshopper	Melanoplus bowditchi Scudder	Sagebrush grasshopper
Ageneotettix deorum (Scudder)	Whitewiskered grasshopper	Melanoplus bruneri Scudder	Bruner spurthroated grasshopper
Amphitornus coloradus (Thomas)	Striped grasshopper	Melanoplus confusus Scudder	Pasture grasshopper
Anabrus simplex Haldeman	Mormon cricket	Melanoplus dawsoni (Scudder)	Dawson grasshopper
Arphia conspersa Scudder	Specklewinged grasshopper	Melanoplus devastator Scudder	Devastating grasshopper
Arphia pseudonietana (Thomas)	Redwinged grasshopper	Melanoplus differentialis (Thomas)	Differential grasshopper
Aulocara ellioti (Thomas)	Bigheaded grasshopper	Melanoplus femurrubrum (DeGeer)	Redlegged grasshopper
Aulocara femoratum Scudder	Whitecrossed grasshopper	Melanoplus gladstoni Scudder	Gladston grasshopper
Boopedon nubilum (Say)	Ebony grasshopper	Melanoplus infantilis Scudder	Little spurthroated grasshopper
Brachystola magna (Girard)	Plains lubber grasshopper	Melanoplus keeleri (Thomas)	Keeler grasshopper
Bruneria brunnea (Thomas)	Bruner slantfaced grasshopper	Melanoplus lakinus (Scudder)	Lakin grasshopper
Camnula pellucida (Scudder)	Clearwinged grasshopper	Melanoplus occidentalis (Thomas)	Flabellate grasshopper
Chorthippus curtipennis (Harris)	Meadow grasshopper	Melanoplus packardii Scudder	Packard grasshopper
Chortophaga viridifasciata (DeGeer)	Greenstriped grasshopper	Melanoplus rugglesi Gurney	Nevada sage grasshopper
Cordillacris crenulata (Bruner)	Crenulatewinged grasshopper	Melanoplus sanguinipes (Fabricius)	Migratory grasshopper
Cordillacris occipitalis (Thomas)	Spottedwinged grasshopper	Mermiria bivittata (Serville)	Twostriped slantfaced grasshopper
Derotmema haydeni (Thomas)	Hayden grasshopper	Metator pardalinus (Saussure)	Bluelegged grasshopper
Dissosteira carolina (Linnaeus)	Carolina grasshopper	Oedaleonotus enigma (Scudder)	Valley grasshopper
Dissosteira longipennis (Thomas)	High Plains grasshopper	Opeia obscura (Thomas)	Obscure grasshopper
Encoptolophus costalis (Scudder)	Dusky grasshopper	Orphulella speciosa (Scudder)	Slantfaced pasture grasshopper
Eritettix simplex (Scudder)	Velvetstriped grasshopper	Phlibostroma quadrimaculatum (Thomas)	Fourspotted grasshopper
Hadrotettix trifasciatus (Say)	Threebanded grasshopper	Phoetaliotes nebrascensis (Thomas)	Largeheaded grasshopper
Hesperotettix viridis (Thomas)	Snakeweed grasshopper	Psoloessa delicatula (Scudder)	Brownspotted grasshopper
Hypochlora alba (Dodge)	Cudweed grasshopper	Spharagemon collare (Scudder)	Mottled sand grasshopper
Melanoplus alpinus Scudder	Alpine grasshopper	Spharagemon equale (Say)	Orangelegged grasshopper
Melanoplus angustipennis (Dodge)	Narrowwinged sand grasshopper	Trachyrhachys kiowa (Thomas)	Kiowa grasshopper
Melanoplus bivittatus (Say)	Twostriped grasshopper	Xanthippus corallipes (Haldeman)	Redshanked grasshopper



Economic Montana Rangeland Species

Ageneotettix deorum (Scudder)

Aulocara ellioti (Thomas)

Camnula pellucida (Scudder)

Melanoplus bivittatus (Say)

Melanoplus dawsoni (Scudder)

Melanoplus femurrubrum (DeGeer)

Melanoplus infantilis (Scudder)

Melanoplus sanguinipes (Fabricius)

Opeia obscura (Thomas)

Phlibostroma quadrimaculatum (Thomas)

Phoetaliotes nebrascensis (Thomas)

Trachyrhachys kiowa (Thomas)

Anabrus simplex (Haldeman)

Whitewiskered grasshopper

Bigheaded grasshopper

Clearwinged grasshopper

Twostriped grasshopper

Dawson grasshopper

Redlegged grasshopper

Little spurthroated grasshopper

Migratory grasshopper

Obscure grasshopper

Fourspotted grasshopper

Largeheaded grasshopper

Kiowa grasshopper

Mormon cricket

Variety of Species

Two-striped
female
1.1 g



Whitewiskered
female
0.3 g



Adults
Melanoplus sanguinipes
Migratory Grasshopper

Male
20-26 mm

Female
20-29 mm



Melanoplus dawsoni
Dawson Grasshopper

Male
14-19mm



Female
17-22 mm



Dissosteira carolina (Linnaeus) Carolina Grasshopper

Male

29-32 mm

Female

36-39 mm



Boopedon nubilum (Say)
Ebony Grasshopper

Male
22-22.5 mm



Female
36-38 mm





Some Common Grasshoppers of Montana Croplands or Rangelands				
	Common name	Food Types		
		Grasses	Grasses / Forbs	
Spur-throated grasshoppers:				
<i>Melanoplus bivittatus</i>	Two-striped grasshopper		x	Small grains, alfalfa, corn
<i>Melanoplus differentialis</i>	Differential grasshopper		x	Small grains, corn, alfalfa, vegetables, fruit trees
<i>Melanoplus femurrubrum</i>	Red-legged grasshopper		x	Small grains, alfalfa, clover, corn, vegetables
<i>Melanoplus gladstoni</i>	Gladston grasshopper		x	Winter wheat in Fall
<i>Melanoplus infantilis</i>	Little spur-throated grasshopper		x	Rangeland grasses and forbs
<i>Melanoplus occidentalis</i>	Flabellate grasshopper		x	Rangeland grasses and forbs
<i>Melanoplus packardii</i>	Packard grasshopper		x	Small grains, alfalfa
<i>Melanoplus sanguinipes</i>	Migratory grasshopper		x	Small grains, alfalfa, corn, clover, vegetables, ornamentals
<i>Phoetaliotes nebrascensis</i>	Large-headed grasshopper	x		Rangeland grasses, winter wheat in Fall
<i>Xanthippus corallipes</i>	Red-shanked grasshopper		x	Rangeland grasses, alfalfa
Slant-faced grasshoppers:				
<i>Ageneotettix deorum</i>	White-whiskered grasshopper	x		Rangeland grasses
<i>Amphitornus coloradus</i>	Striped grasshopper	x		Rangeland grasses
<i>Aulocara ellioti</i>	Big-headed grasshopper	x		Rangeland grasses
<i>Aulocara femoratum</i>	White-crossed grasshopper	x		Rangeland grasses
<i>Chorthippus curtipennis</i>	Meadow grasshopper	x		Rangeland grasses
<i>Cordillacris occipitalis</i>	Spot-winged grasshopper	x		Rangeland grasses
<i>Mermiria bivittata</i>	Two-striped slant-faced grasshopper	x		Rangeland grasses
<i>Metator pardalinus</i>	Blue-legged grasshopper	x		Rangeland grasses
<i>Phlibostroma quadrimaculatum</i>	Four-spotted grasshopper	x		Rangeland grasses
Band-winged grasshoppers:				
<i>Camnula pellucida</i>	Clear-winged grasshopper	x		Rangeland grasses, small grains
<i>Dissosteira carolina</i>	Carolina grasshopper		x	Rangeland grasses, wheat, alfalfa, corn
<i>Dissosteira longipennis</i>	High plains grasshopper	x		Rangeland grasses
<i>Trachyrachis kiowa</i>	Kiowa grasshopper	x		Rangeland grasses



Species	May			June			July			Aug.			Sept.			Oct.		
	Early	Mid	late	Early	Mid	late	Early	Mid	late	Early	Mid	late	Early	Mid	late	Early	Mid	late
Ageneotettix deorum		Yellow	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Aulocara ellioti		Yellow	Yellow	Yellow	Yellow	Purple	Purple	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Camnula pellucida		Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Melanoplus infantilis			Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Trachyrhachys kiowa				Yellow	Yellow	Yellow	Purple	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Melanoplus dawsoni					Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Phoetaliotes nebrasciensis						Yellow	Yellow	Yellow	Purple	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Arphia conspersa		Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		Yellow	Yellow	Yellow	Yellow				

Migratory grasshopper developmental stages



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

Do I treat?

▶ Decision Support Software

- CARMA

<https://johnhastings.herokuapp.com/carma/>

▶ ≥ 8 GH per yd²

▶ ≥ 15 GH per yd²

▶ Can I wait for mother nature?

▶ Is there grass to save? (drought)

▶ Should I just buy hay?

Control Alternatives

▶ Biological Control

▶ No classical biological control.

- ▶ Grasshoppers are native

▶ *Nosema locustae*,

- ▶ Naturally occurring.
- ▶ sick, eat less, and begin to die.
- ▶ The disease spore spreads to healthy grasshoppers through cannibalism.
- ▶ “In 2-4 weeks, 50% of the grasshopper population will die, and most survivors will be infected to continue spreading the disease. Infected survivors eat 75% less than healthy grasshoppers and lay fewer eggs. Will NOT harm people, pets or the environment.”

▶ Not considered for PPQ Suppression Programs



Control Alternatives for PPQ

- ▶ **No Action**
- ▶ **Insecticide Applications at Conventional Rates and Complete Area Alternatives**
- ▶ **Reduced Agent Area Treatments (RAATS) Alternatives**
 - **Modified RAATS**



No Action

- ▶ **Non economic levels of grasshoppers**
- ▶ **Environmental Factors**
- ▶ **Threatened and Endangered Species Factors**

Insecticides

▶ **Malathion**

▶ **Carbaryl**

- Liquid
- Bait

▶ **Diflubenzuron**

▶ **Chlorantraniliprole: Prevathon**

▶ **Ask your local contractor for other option.**

DiFlubenzuron (Dimilin)

- ▶ **Long Residual**
- ▶ **Mode of Action**
 - Chitin inhibitor
 - Ingestion
- ▶ **Arthropod specific**
- ▶ **Must be used before adult stage**

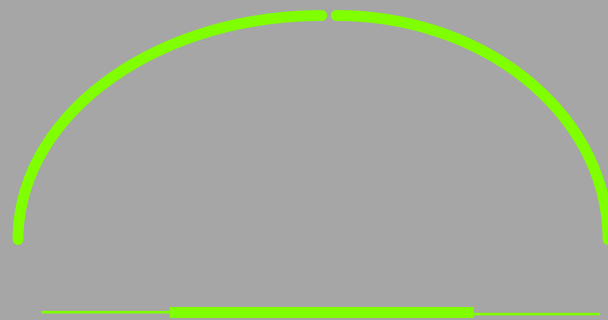
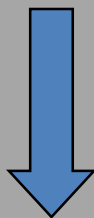
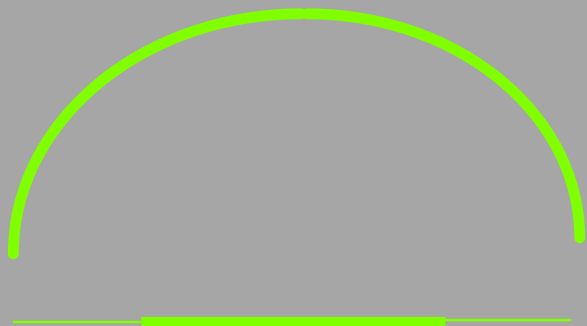
Reduced Agent and Area Treatments (RAATs)

- ▶ **Basically skip swathing**
- ▶ **GH mortality in treated swaths**
- ▶ **GHs move from non-treated to treated swaths**
- ▶ **More predacious insects and parasitoids survive**
- ▶ **Birds and predators continue naturally feedin on GH**
- ▶ **Arthropod specific**
- ▶ **Must be used before adult stage**

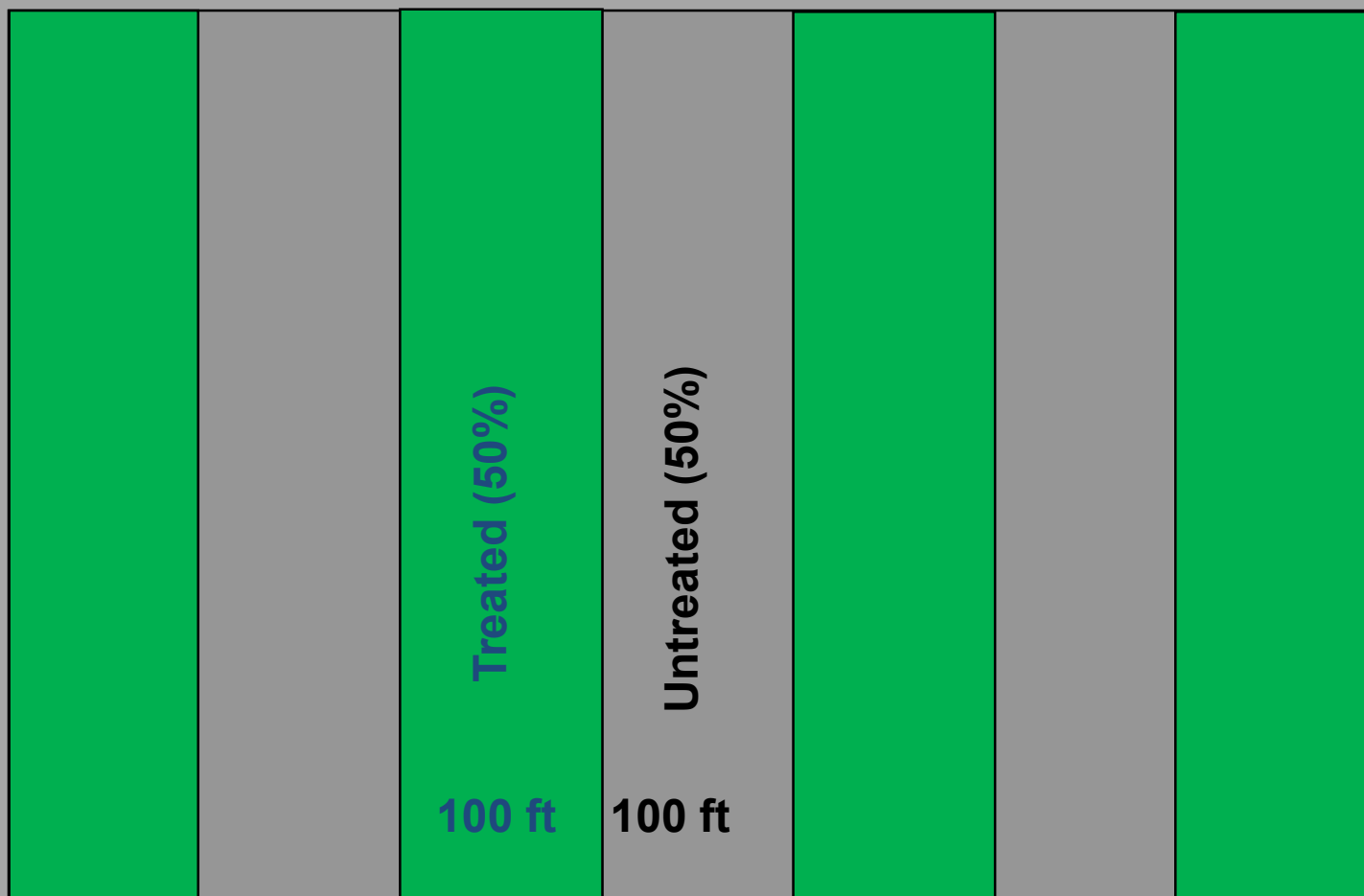
Conventional/Blanket/100%



RAATs



RAATs Example



Reduced Agent and Area Treatments (RAATs)

- Skip distance greatly depends on the chemical used
- Low residual = less skip
- Longer residual = wider skip (within limitations)

Reduced Agent Area Treatments (RAATS) Alternative

▶ Not Standardized

- Determined on a case by case basis

▶ Aerial

- Malathion: 80% coverage
- Carbaryl: 50% coverage
- Dimilin: 50% coverage

Methods Development

General Needs for Field Study Area

- 1) 3,000-4,000 acres currently estimated
- 2) Private land if possible (willing to entertain using public land, but hurdles to do so are often insurmountable in the time frames we need) – introduce us and we're happy to take it from there!
- 3) Untreated previously for at least beyond 1 year, preferably 2-3 years
- 4) Native rangeland habitats.
- 5) Relatively flat terrain (hills are fine, just not mountains/plateaus, etc.)
- 6) Sufficient populations of grasshoppers – at least 8/yd²
- 7) Easily accessible – we come equipped with a UTV and several ATVs, which we plan to use as needed, but we prefer to be able to access the main site from a decent road/trail that can accommodate our main vehicles: panel truck (mobile HQ), SUV, pick-up, and our various trailers.
- 8) Shielded from the public/fenced – main reason is to not have studies disturbed
- 9) Access to a building/field station with water/power – we come prepared with a mobile HQ, but having stationary buildings with the ability to move study components inside, have access to a fridge/freezer, etc. is always very helpful



United States Department of Agriculture

ATV-RAATs:

Boom Buster nozzles



Boomless nozzle spray pattern





United States Department of Agriculture

BAIT / BRAN



United States Department of Agriculture

Bran Spreaders: ATV





United States Department of Agriculture

Bran Spreaders: Pickup



Match Bran to Spreader



Bran formulations



Mormon crickets



Bran Acceptance

Species Sensitive
(>55% control)

- ▶ Control is expected to average about 70%
- ▶ Worst-case and best-case scenario will be about 55% and 85%, respectively

- | | |
|------------------------------------|-----------------------------------|
| ▪ <i>Melanoplus foedus</i> | ▪ <i>Ageneotettix deorum</i> |
| ▪ <i>Melanoplus infantilis</i> * | ▪ <i>Anabrus simplex</i> |
| ▪ <i>Melanoplus occidentalis</i> * | ▪ <i>Aulocara elliotti</i> |
| ▪ <i>Melanoplus packardii</i> * | ▪ <i>Camnula pellucida</i> |
| ▪ <i>Melanoplus sanguinipes</i> | ▪ <i>Hadrotettix trifasciatus</i> |
| ▪ <i>Spharagemon equale</i> | ▪ <i>Melanoplus bivittatus</i> * |
| ▪ <i>Stenobothrus brunneus</i> | ▪ <i>Melanoplus confuses</i> |
| ▪ <i>Mermiria bivittata</i> * | ▪ <i>Melanoplus dawsoni</i> |

*These species are not likely to suffer best-case scenario levels of control

Vulnerable (30% to 55% control)

- ▶ **Control is expected to average about 42%**
- ▶ **Worst-case and best-case scenario will be about 12% and 72%, respectively**
 - *Aulocara femoratum**
 - *Eritettix simplex*
 - *Melanoplus femurrubrum*
 - *Oedaloenotus enigma*
 - *Opeia obscura*
 - *Phoetaliotes nebrascensis*
 - *Psoloessa delicatula*

*These species are not likely to suffer best-case scenario levels of control

Nonsusceptible (<30-% control)

- ▶ **Control is expected to average about 15%**
- ▶ **Worst-case and best-case scenario will be about 0% and 30%, respectively**
 - *Aeropedellus clavatus*
 - *Amphitornus coloradus*
 - *Cordillacris crenulata*
 - *Cordillacris occipitalis*
 - *Hesperotettix viridis*
 - *Metator pardalinus*
 - *Phlibostroma quadrimaculatum**
 - *Trachyrhachys kiowa*

*These species are not likely to suffer best-case scenario levels of control

Treatment Programs

▶ **Plant Protection Act of 2000**

- **Border Treatments**
- **Rangeland Treatments**
- **Contingent on Availability of Funds**



Border Treatments

- ▶ **Federally-Administered Land Adjacent to Private Agricultural Land**
- ▶ **GH/MCs moving Fed → Private**
- ▶ **Written request from Federal Land Manager**
- ▶ **PPQ Treat $\frac{1}{4}$ to $\frac{1}{2}$ mile buffer**
 - **Aerial Contractor**
 - **PPQ Ground**



Rangeland Treatments

- ▶ **10,000 Acres Minimum**
- ▶ **Rangeland only**
 - 20% cropland (paid by landowner)
- ▶ **PPQ Cost Share**
 - 100% Federal/Trust land.
 - 50% State land.
 - 33% Private land.
 - 16.15% indirect charges.



Rangeland Treatments

- ▶ **Letter(s) of Request** and Questionnaire from all parties
 - Tribe
 - BIA
 - Sensitive sites/environmental considerations
- ▶ **Cooperative (reimbursable) Agreements(s)** signed
- ▶ **Maps** of all ownership/exclusions/boundaries
- ▶ PPQ will **contract** with aerial applicator
 - (1-3 weeks)



2020 Costs

- ▶ **Private land (your 2/3 cost):**
 - ▶ **2020: \$1.78 - \$2.60 / protected acre**
 - ▶ **2021: \$1.69 - \$2.01 / protected acre**
- ▶ **Federally-Managed land (trust): PPQ funded**



Endangered Species Act ESA

- ▶ **USFWS: Section 7 Consultations**

- ▶ **Mitigation Measures**
 - **Buffers**
 - **Treatment Alternatives**



National Environmental Policy Act (NEPA)

- ▶ **Final Environmental Impact Statement (FEIS)
– 2019**

- ▶ **Site Specific Environmental Assessments
(EAs)**
 - **Sent to all Tribes**

- ▶ **Finding of No Significant Impact (FONSI)
4/22/21**



Environmental Monitoring

- ▶ **Water bodies**
- ▶ **Pesticide and formulation Quality Control**
- ▶ **Other, as needed**



Summary

- ▶ **Plan now**
- ▶ **Survey Early**
- ▶ **Weigh your alternatives**
- ▶ **Don't wait until.....**

Going



Going

Gone



United States Department of Agriculture

Gary D. Adams
State Plant Health Director-Montana
(406) 657-6282
(406) 431 6531 (cell)
Gary.D.Adams@usda.gov

<https://www.aphis.usda.gov/aphis/ourfocus/planthealth>