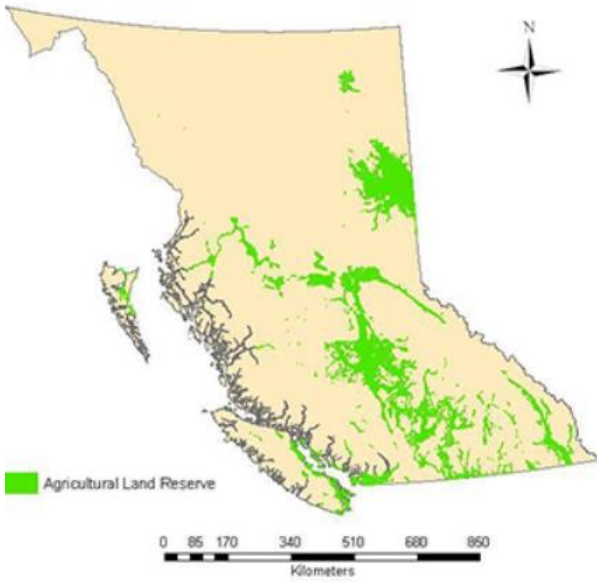
Grasshoppers of Concern to the Cariboo's Agricultural Sector



Dan Johnson

Invasive Species Council of BC

University of Lethbridge

Grasshoppers of Concern to the Cariboo's Agricultural Sector

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What grasshopper species are found in the Cariboo region, BC.

Recognition, identification, life cycle, timing, diet & impacts.

Pest and non-pest - detrimental, neutral, or even beneficial.

Which kinds are likely to increase or be invasive.

How and when to survey - what to look for.

Public observations (and citizen science) are useful.

Reducing losses to crops and environment.

Can land cover, crop choices, and natural enemies help us?

What would be the likely affects of climate change?

FAMILIES OF ORTHOPTERA OF BRITISH COLUMBIA

by
R. A. Cannings and G. G. E. Scudder

Key to Families of Orthoptera

1. Antennae with well over 30 segments (Suborder Ensifera)..... 2

- Antennae with less than 30 segments (Suborder Caelifera)..... 10

2. All tarsi 3-segmented, even if basal segment appears to be subdivided.....3

- At least middle tarsi, and usually all tarsi, 4-segmented..... 5

3. Hind femora very broad and oval; hind coxae nearly contiguous ventrally; eyes very small; body dorso-ventrally flattened; small, rounded, wingless insects living in ant nests ..... Myrmecophilidae

- Hind femora slender; hind coxae widely separated ventrally; eyes large; body flattened or cylindrical..... 4

4. Head with ocelli present; black or brown insects; body cylindrica.....Gryllidae

- Head without ocelli; pale, usually green insects; body flattened..... Oecanthidae

BRITISH COLUMBIA | Ministry of Agriculture

Grasshopper Monitoring and Control in British Columbia

December, 2015

Of the estimated 60 species of grasshoppers found in British Columbia, two species are of economic importance in most outbreak situations. These are the clear-winged grasshopper, *Camnula pellucida*, and the migratory grasshopper, *Melanoplus sanguinipes*. Other species, such as the two-striped grasshopper, *Melanoplus bivittatus*, and the redlegged grasshopper, *Melanoplus femurrubrum*, have also been recorded causing problems in B.C. Rangelands are under constant threat from grasshopper outbreaks during which grasshoppers compete with livestock for available forage. It is important that grasshopper outbreaks be detected early and any control actions be taken at the correct time and on an economic basis.

Biology of Grasshoppers

Economic species of grasshoppers overwinter in pods of 20 to 30 eggs laid in the soil the previous year. These pods are very resistant to cold and drying. Depending on site and weather, the eggs hatch during May and June and the young hoppers (nymphs) begin feeding and growing. Over the next 4 to 6 weeks they will pass through five stages (called instars) at which times they shed their skins in order to grow. Fully winged adult hoppers emerge from the final instar and begin mating about a week later. Only adult hoppers are able to fly and reproduce. During outbreaks when suitable forage is scarce, adults will swarm over large areas in search of food. Swarming will cease when females begin laying eggs. Each female can lay two to three egg pods per week until she dies due to freezing temperatures.

hillsides and in weedy areas, especially where the sod has been disturbed and vegetation is sparse, such as stubble fields, road allowances, over-grazed and weedy pastures.

Weather conditions play a very important role in the survival of hoppers and development and intensity of outbreaks. Outbreaks are usually preceded by 2 to 3 years of above average temperatures during the summers and falls. Warm, snow-free falls allow hoppers more time to feed and lay eggs and allow more complete egg development for faster and more even hatching the next spring. A late spring and cool summer delays nymphal development so that fewer adults are available to lay eggs. Cool, wet conditions during hatch will increase nymphal mortality; in August and September, such conditions will slow down egg laying. An early fall will cause many females to die before laying their full complement of eggs.

Damage and Action Thresholds

Grasshoppers feed on a wide variety of grassy and broadleaf plants, and if preferred hosts are lacking, will attack trees and shrubs. The amount of damage or crop loss is directly related to the number of grasshoppers present. Clear-winged grasshoppers prefer sedges and grasses, including cereals. Migratory grasshoppers and related species feed on both grassy and broadleaf plants, hence their preference for weedy areas.

Research has found that over the season, 12 to 24 grasshoppers per square metre in bluegrass

E-Fauna BC

Electronic Atlas of the Wildlife of British Columbia

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THE GRASSHOPPERS, KATYDIDS AND CRICKETS (ORTHOPTERA) OF BRITISH COLUMBIA

Short-winged toothpick grasshopper (*Pseudopomala brachyptera*),
(photo by Werner Eigelsreiter)

by

R. A. Cannings and G. G. E. Scudder

Updates

J. Entomol. Soc. Brit. Columbia 70 (1973), Aug. 1, 1973

ECOLOGICAL NOTES ON ORTHOPTERA *(S. STR.)* IN BRITISH COLUMBIA

V. R. Vickery and B. Nagy*

ABSTRACT

Collections and observations were made of the grasshoppers of the semi-arid Okanagan Valley of British Columbia, during August and September, 1969. The habitats, frequency and local distribution of 37 species are discussed, based on 40 collecting sites.

J. Entomol. Soc. Brit. Columbia 109, December 2012

Updated checklist of the Orthoptera of British Columbia.

JAMES W. MISKELLY[1]

ABSTRACT

Since the last publication of a checklist of the Orthoptera of British Columbia, much has been learned about the group. New information has come from a variety of web-based resources as well as new collections. An updated checklist is presented, listing 104 resident species in the province. Two of these species are represented by two subspecies in BC. Eight species have been added since the last list was published, including newly discovered native species and newly established non-native species. Records of six species have been found to be based on misidentified specimens and these species have been deleted from the checklist. An additional 15 species are considered hypothetical and may one day be confirmed to occur in BC.

Key Words: Orthoptera, British Columbia, Checklist

Buckell, E.R. 1921. Notes on the ecological distribution of some Orthoptera from the Chilcotin district of British Columbia. Proc. Ent. Soc. Brit. Columbia, Syst. Ser. 18:32-38.

Buckell, E.R. 1922. A list of the Orthoptera and Dermaptera recorded from British Columbia prior to the year 1922, with annotations. Proc. Ent. Soc. Brit. Columbia, Syst. Ser. 20:9-41.

Buckell, E.R. 1924. Additions and corrections to the list of British Columbian Orthoptera. Proc. Ent. Soc. Brit. Columbia, Syst. Ser. 21:7-12.

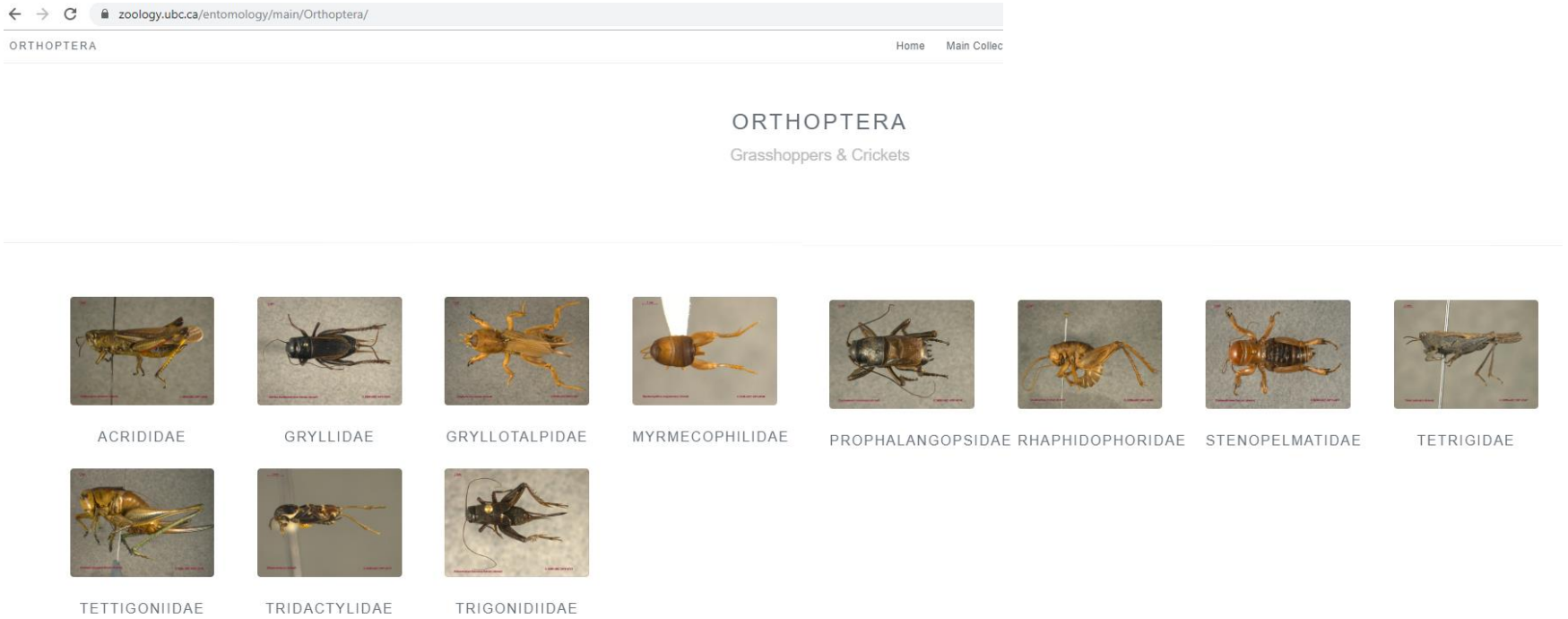
By province and region

Cite as: "List of Orthopteroid Insects of Canada, with Common Names"
Prepared by Dan Johnson, March 31, 2014, as requested by Environment Canada
Update, version 2: 2016-17
Data entry assistance for this project, and NatureServe rank entries: Craig Wiebe.
Additional assistance with literature and related work (labels, collection, etc.) was provided by:
Becky Coleman, Chelsea Oliphant-Rescanski, Kaylee Garnett, Kendra Blumhagen, Janine Andreas, Brad Big Swallow

Orthoptera	Caelifera	Acrididae	Acridinae	*Metaleptea brevicornis*	(Johannson, 1763)	Clipped-Wing Grasshopper
Orthoptera	Caelifera	Acrididae	Cyrtacanthacridinae	*Schistocerca americana*	(Drury, 1770)	American Bird Grasshopper
Orthoptera	Caelifera	Acrididae	Cyrtacanthacridinae	*Schistocerca damnifica*	(Saussure, 1861)	Mischievous Bird Grasshopper
Orthoptera	Caelifera	Acrididae	Cyrtacanthacridinae	*Schistocerca lineata*	(Scudder, 1899)	Spotted Bird Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Acrolophitus hirtipes*	(Say, 1825)	Green Fool Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Aeropedellus arcticus*	Hebard, 1935	*Arctic Club-horned Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Aeropedellus clavatus*	(Thomas, 1873)	Club-horned Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Ageneotettix deorum*	(Scudder, 1876)	White-whiskered Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Amphitornus coloradus*	(Thomas, 1873)	Striped Slant-faced Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Aulocara elliotti*	(Thomas, 1870)	Big-headed Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Aulocara femoratum*	Scudder, 1899	White Cross Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Bruneria brunnea*	(Thomas, 1871)	Bruner Slant-faced Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Bruneria yukonensis*	(Vickery, 1969)	*Yukon Slant-faced Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Chloealtis abdominalis*	(Thomas, 1873)	Cow Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Chloealtis conspersa*	(Harris, 1841)	Sprinkled Broad-Winged Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Cordillacris crenulata*	(Bruner, 1889)	Crenulated Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Cordillacris occipitalis*	(Thomas, 1873)	Western Spotted-winged Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Dichromorpha viridis*	(Scudder, 1862)	Short-winged Green Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Eritettix simplex*	(Scudder, 1869)	Velvet-striped Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Mermiria maculipennis*	Bruner, 1889	Two-striped Slant-face Grasshopper
Orthoptera	Caelifera	Acrididae	Gomphocerinae	*Opeia obscura*	(Thomas, 1872)	Obscure Grasshopper

• • • More lists have been published by the National Grasshopper Management Board in the USA, USDA/APHIS, and the Biological Survey of Canada

Some museums have collections on-line now.



https://www.zoology.ubc.ca/entomology/main/Orthoptera/

Species lists and surveys exist for some regions of BC

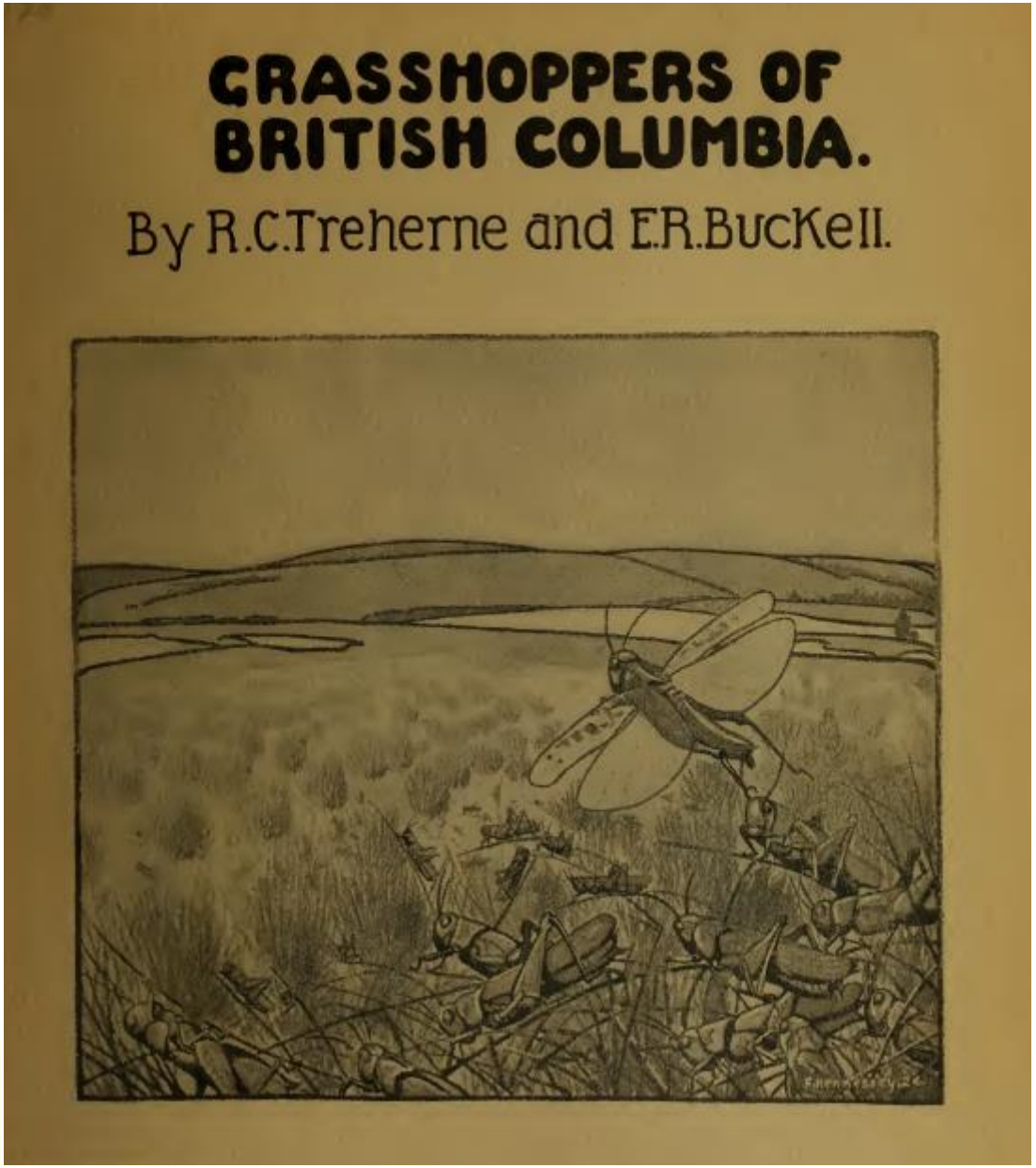
Journal of the Entomological Society of British Columbia

The Dermaptera and Orthoptera of Vancouver Island, British Columbia

E. R. BUCKELL, DOMINION ENTOMOLOGICAL LABORATORY
VERNON, B. C.

1924

What were the grasshoppers of concern in the past?



DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
BULLETIN No. 39—NEW SERIES

The Lesser Migratory Grasshopper, *Melanoplus mexicanus atlanis* (Riley) (Fig. 13)

This grasshopper, although not found doing any material damage on the open cattle ranges of the province during the past five years, is, nevertheless, next to the roadside grasshopper, *Camnula pellucida* (Scudder), the species most to be feared in British Columbia. Past records in the province, and state

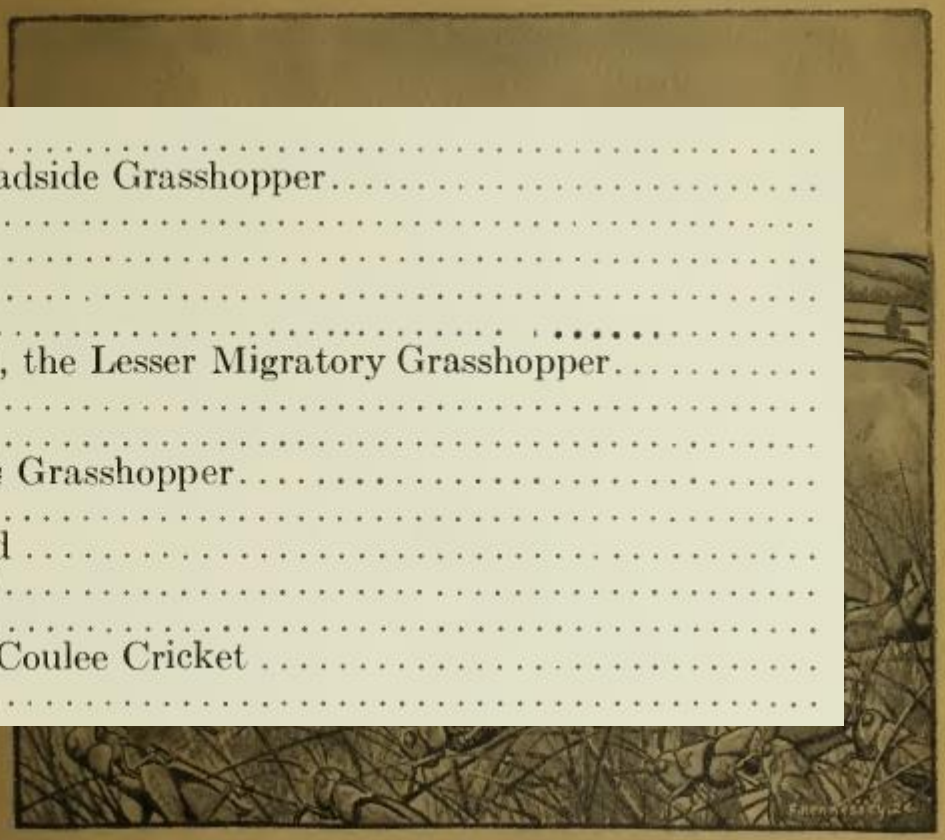
Fig. 13—Male of *Melanoplus mexicanus atlanis* (Riley) × 2. (Original)

ments from the central prairies of the United States and Canada, where outbreaks have occurred, clearly indicate the potentialities of this species as a pest

1924

GRASSHOPPERS OF BRITISH COLUMBIA.

By R.C.Treherne and E.R.Buckell.



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GRASSHOPPERS OF BRITISH COLUMBIA.

By R.C.Treherne and E.R.Buckell.

CAUSES OF RANGE DEPLETION

There must be a reason for the outbreaks of grasshoppers that have occurred in the interior sections of British Columbia, during the past forty years. It is possible that in the years previous to 1889, periods of extreme prevalence took place of which we have no record. Even granting that these periods did occur, no permanent or material damage to the range grasses took place until twenty to thirty years ago, as is evidenced by the excellent stands of bunch grass over the entire "dry belt," recollection of which is still present in the minds of those who have been resident in the districts for a long time (fig. 5). It is not necessary however, to rely on hearsay to realize that where the numbers of stock to the area available for ranging is in judicious proportion or where rotations of grazing grounds are practised, grasshoppers do not, or even cannot, permanently injure the range grasses.

Not much is known about grasshoppers in BC before 1889, but in Alberta, Saskatchewan, and the USA, it was a periodic emergency, caused by a species that is now extinct.

GRASSHOPPERS OF BRITISH COLUMBIA.

By R.C.Treherne and E.R.Buckell.

that in 1919 the red-legged grasshopper, *Melanoplus femur-rubrum* (De Geer), occurred in great numbers on the Matsqui prairie. Garden produce was attacked on this occasion and oats were cut for hay owing to the damage being caused.

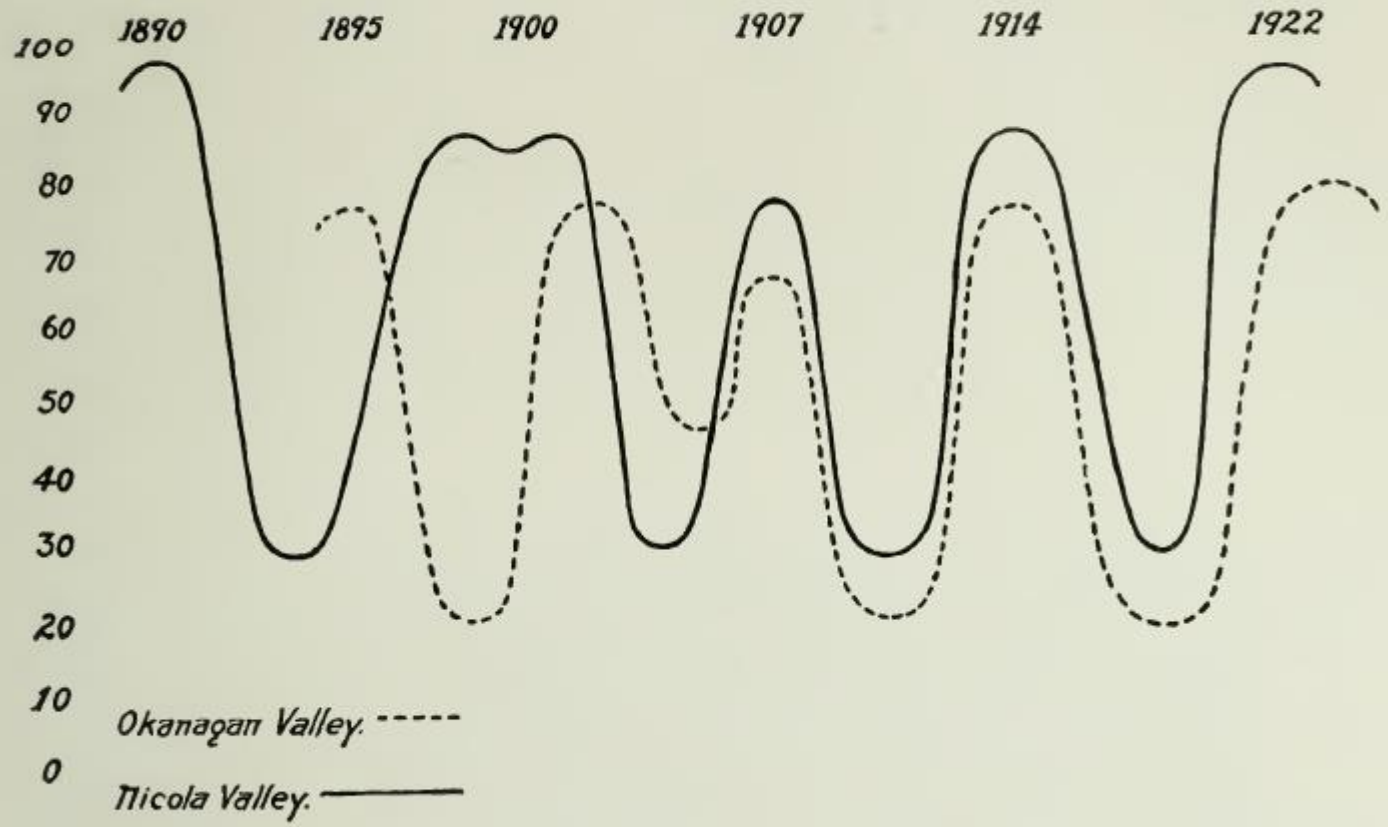
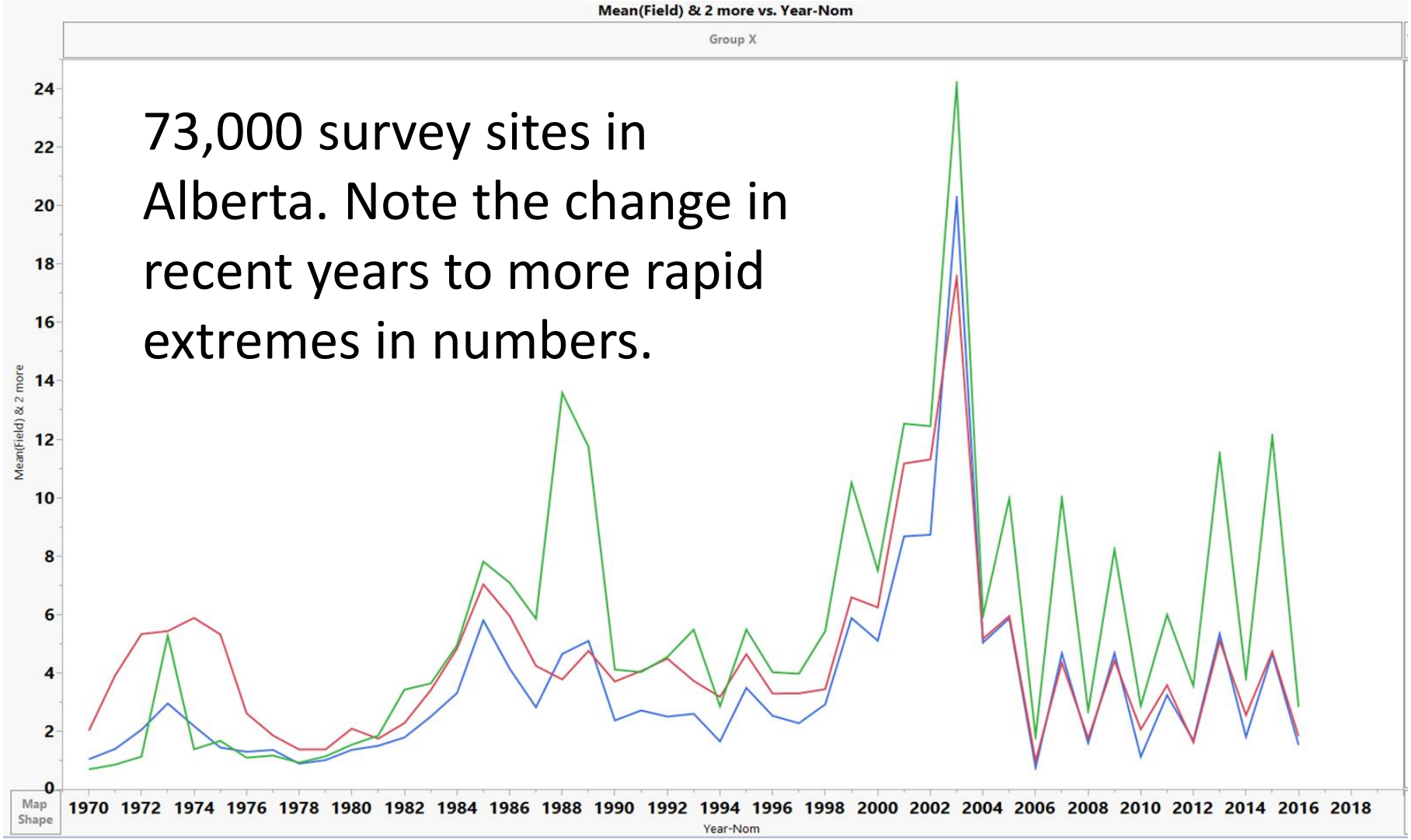


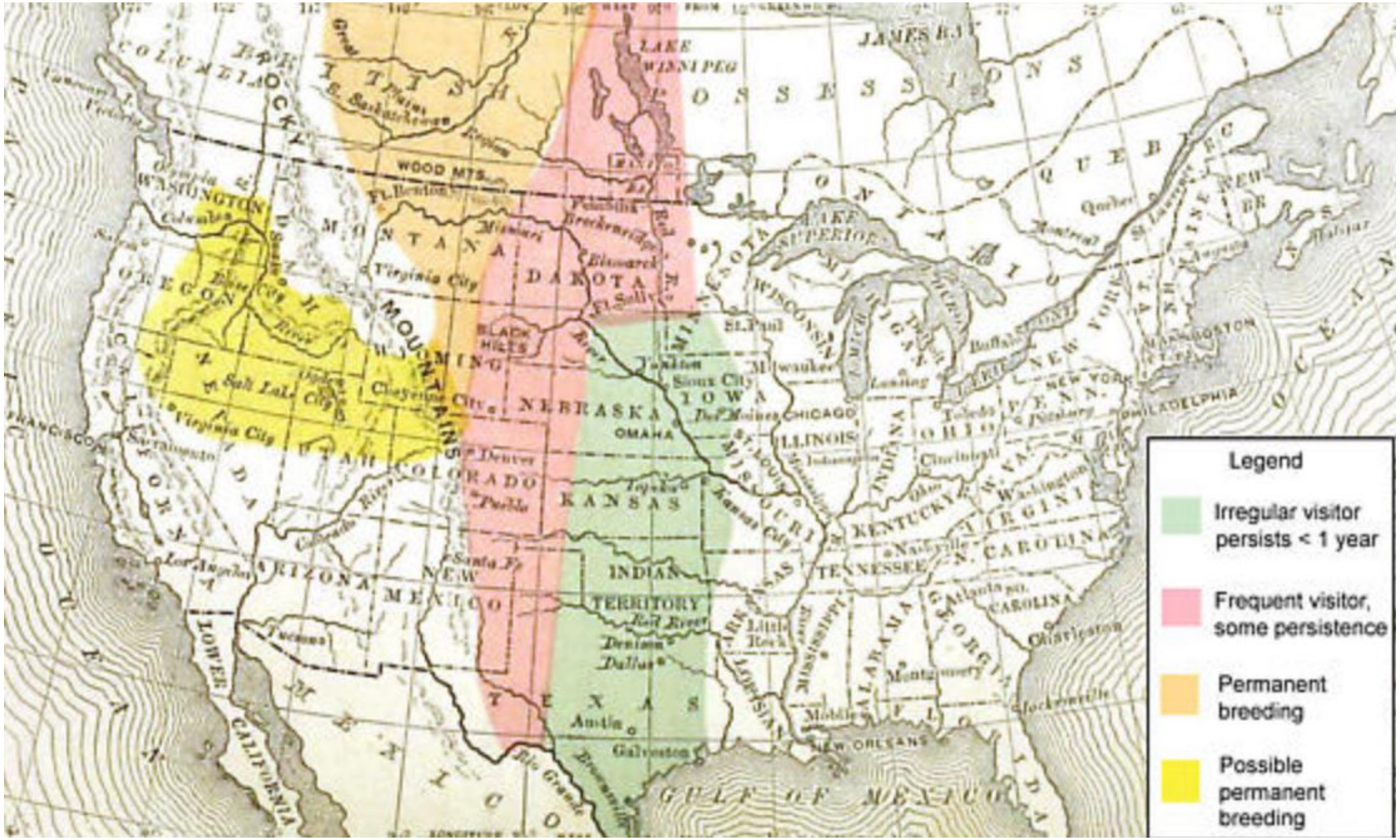
Fig. 4—Graph showing hypothetically the heights of the grasshopper outbreaks in the Okanagan and Nicola valleys respectively during the years indicated.

(…outbreaks in BC were severe in the 1930s, esp. 1944)



1970 **1980** **1990** **2000** **2010**

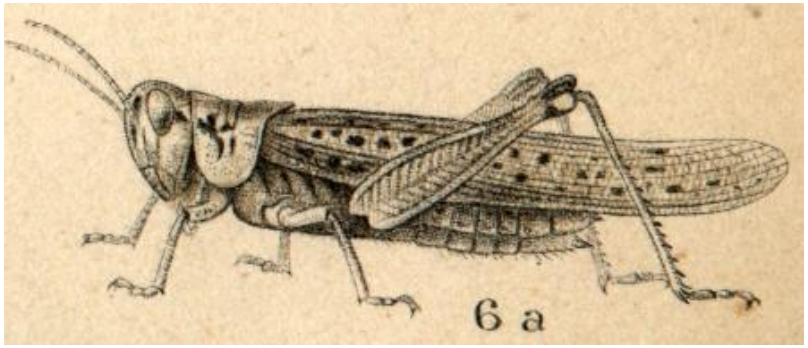
Johnson, D., and Meers, S., 2017



Riley, Charles V. The locust plague in the United States: being more particularly a treatise on the Rocky Mountain locust or so-called grasshopper, as it occurs east of the Rocky Mountains, with practical recommendations for its destruction. Chicago: Rand, McNally & Co., 1877.

16th-19th century

Rocky Mountain Locust



A catastrophe that resulted in midwestern states forming constitutions and organizing polices and agriculture departments. Some states called them “grasshopper constitutions”.

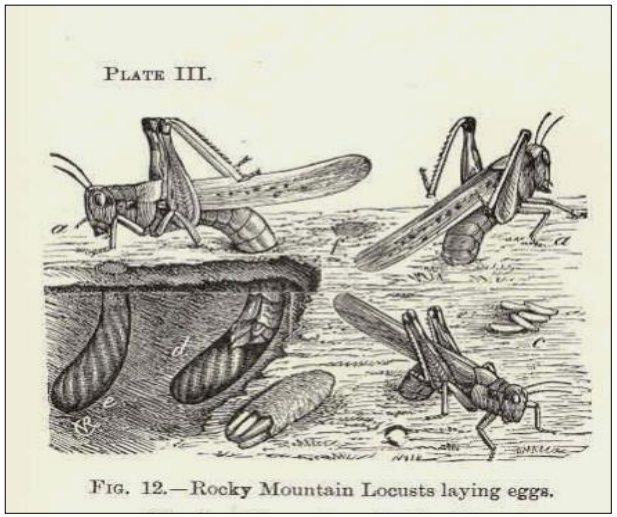
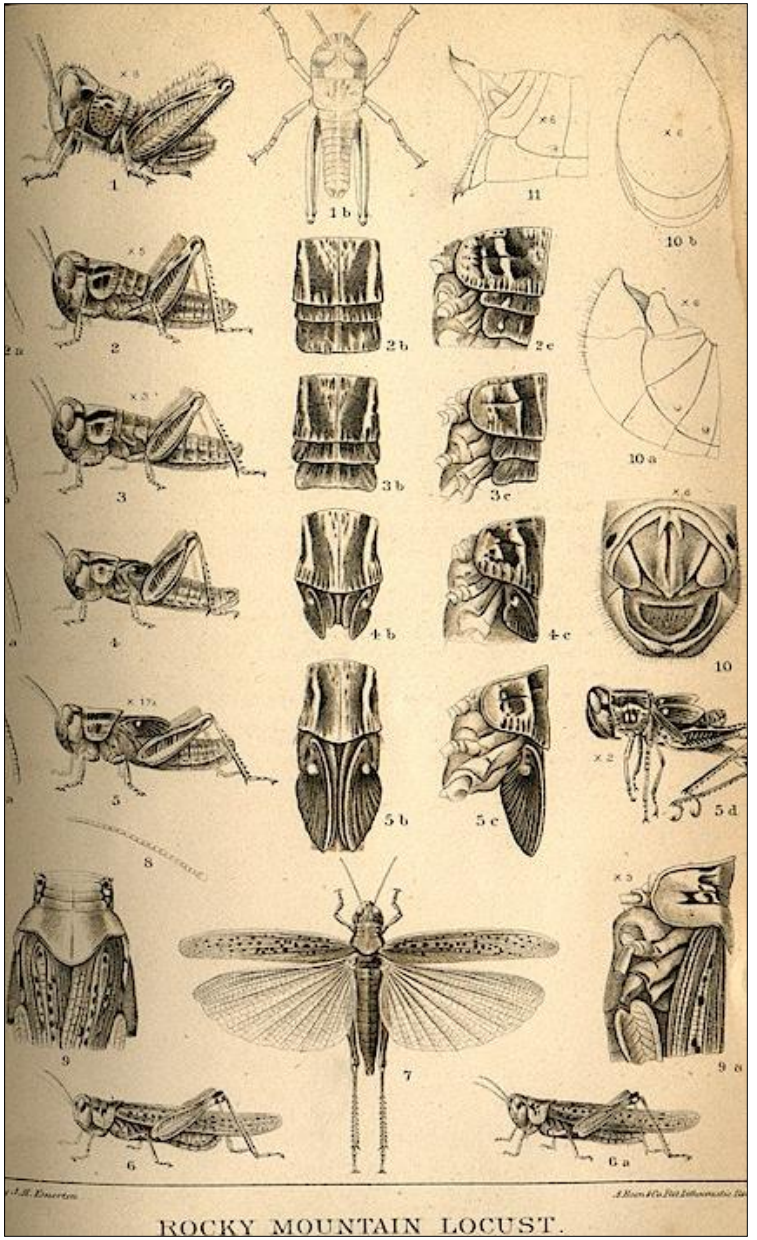
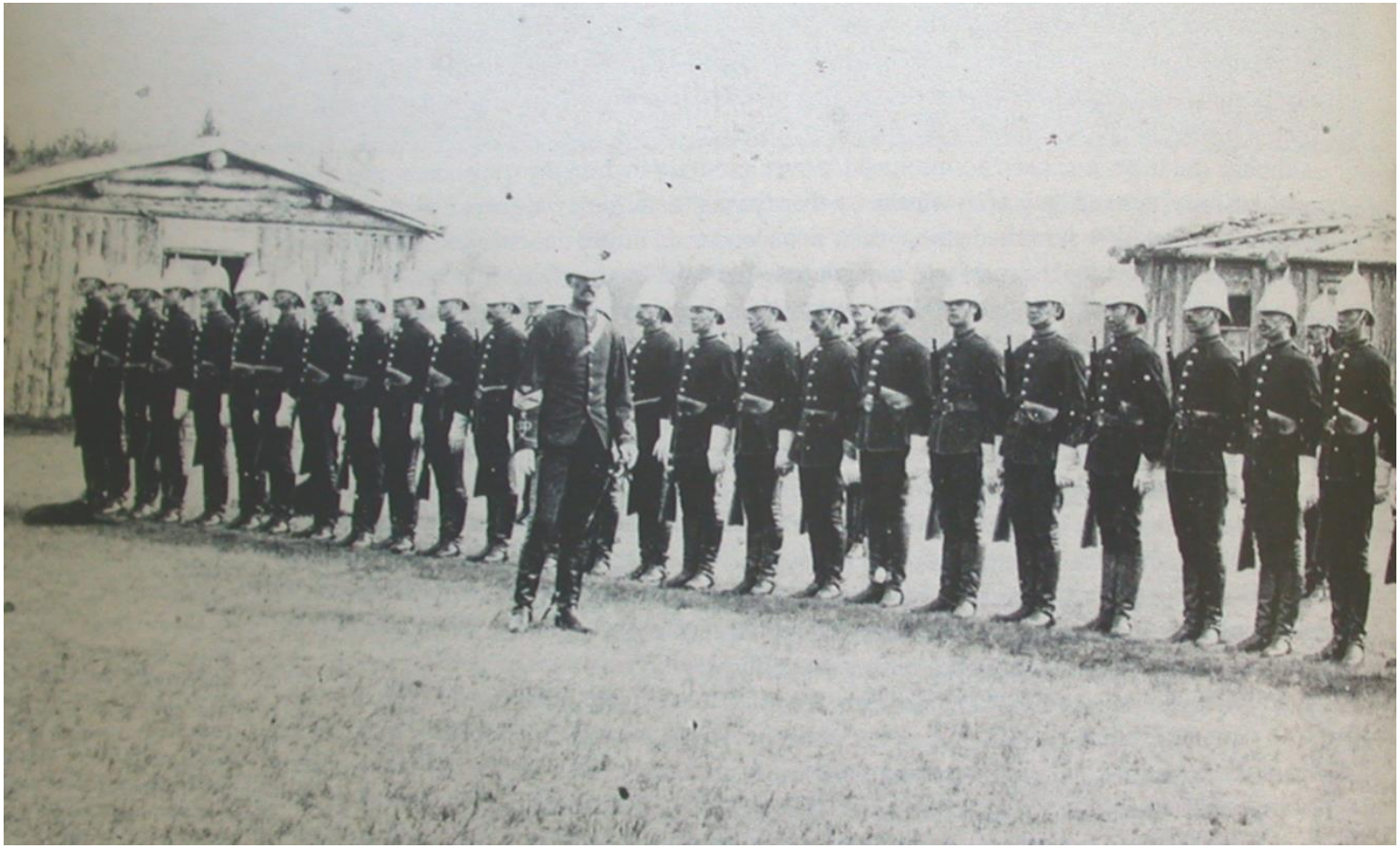


FIG. 12.—Rocky Mountain Locusts laying eggs.





“F-troop on parade at Fort Calgary in 1876. The grasshoppers were so numerous they at the canvas tents.”

Source: Alberta in the 20th Century, a Journalistic History of the Province in 11 Volumes. United Western Communications, Edmonton. 1991

Mechanical methods

B. Water-tight trays to fit into bottom of frame to hold the water and coal oil. (Original.)

in use the trays, fig. 4B, are filled with about an inch of water and one-half inch of coal oil, into which the locusts fall after striking the back or sides of the hopperdozer. The appliance is drawn by two horses, one on each end, see fig. 5. It is especially useful in pastures where there is some risk in using poisoned-baits.

FIG. 5. Hopperdozer in use. (Original.)

pulleys about 12 inches to 16 inches in diameter can be used with truck wheels and fastened on the outside of the wheel. A tightener pulley with spring tension to keep the chain or drive belt taut is essential. This tightener pulley can serve as a clutch to start or stop the bait spreader.

The drive for the types which are constructed from the wheels and rear axle assembly of discarded automobiles is already provided for. When the propeller shaft is placed in a vertical position it supplies an excellent drive shaft for the spreader table.

Because of the difference in gear ratio in different automobiles, it is sometimes necessary to use additional gears or other means to increase the speed of the spreader table and thus throw the bait the desired distance. This applies especially when the auto trailer type is drawn by horses and also when the required spread of bait cannot be obtained unless the machine is hauled faster than the rate of about 15 miles per hour, which is the maximum suitable for travel on baiting areas.

FIVE TYPES OF SPREADERS

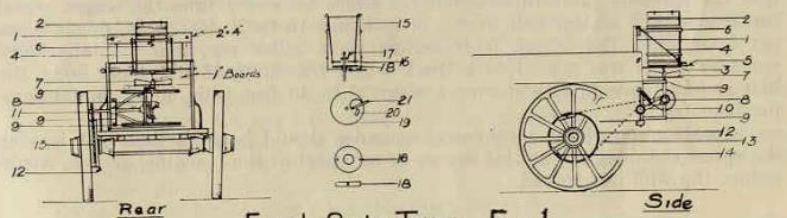
The following five types are described:—

(*a*) End gate type.
(*b*) Auto trailer type.
(*c*) Combine straw spreader type.
(*d*) Cone-hopper wagon or truck type.
(*e*) Truck trailer type.

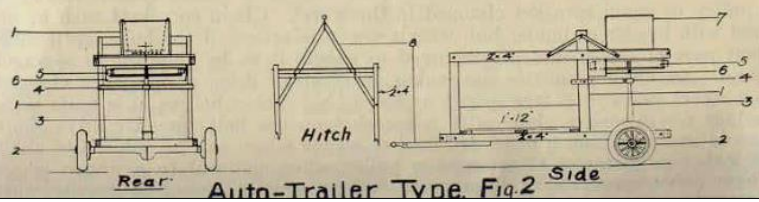
End Gate Type

Essential parts consist of: A specially constructed end gate on which is mounted a 14- by 22-inch oil drum, or any 25-gallon drum; a binder reel gear assembly with an automobile radiator fan for spreading the bait. The machine

Various Grasshopper Bait Spreaders.



End-Gate Type. Fig. 1



Auto-Trailer Type. Fig. 2

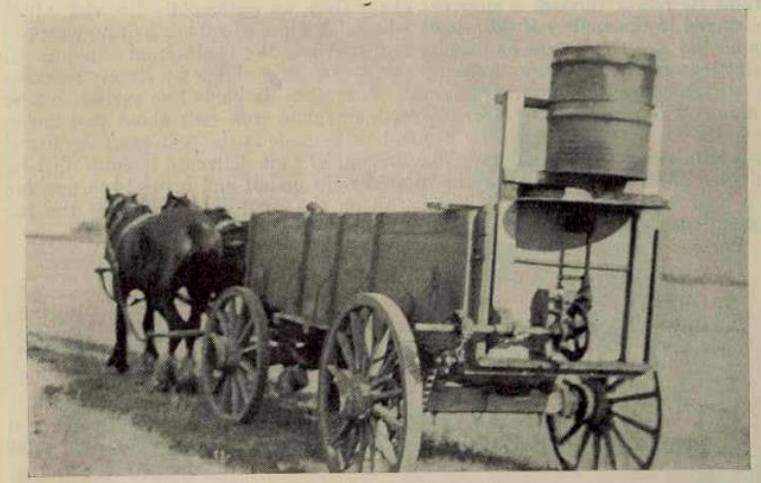
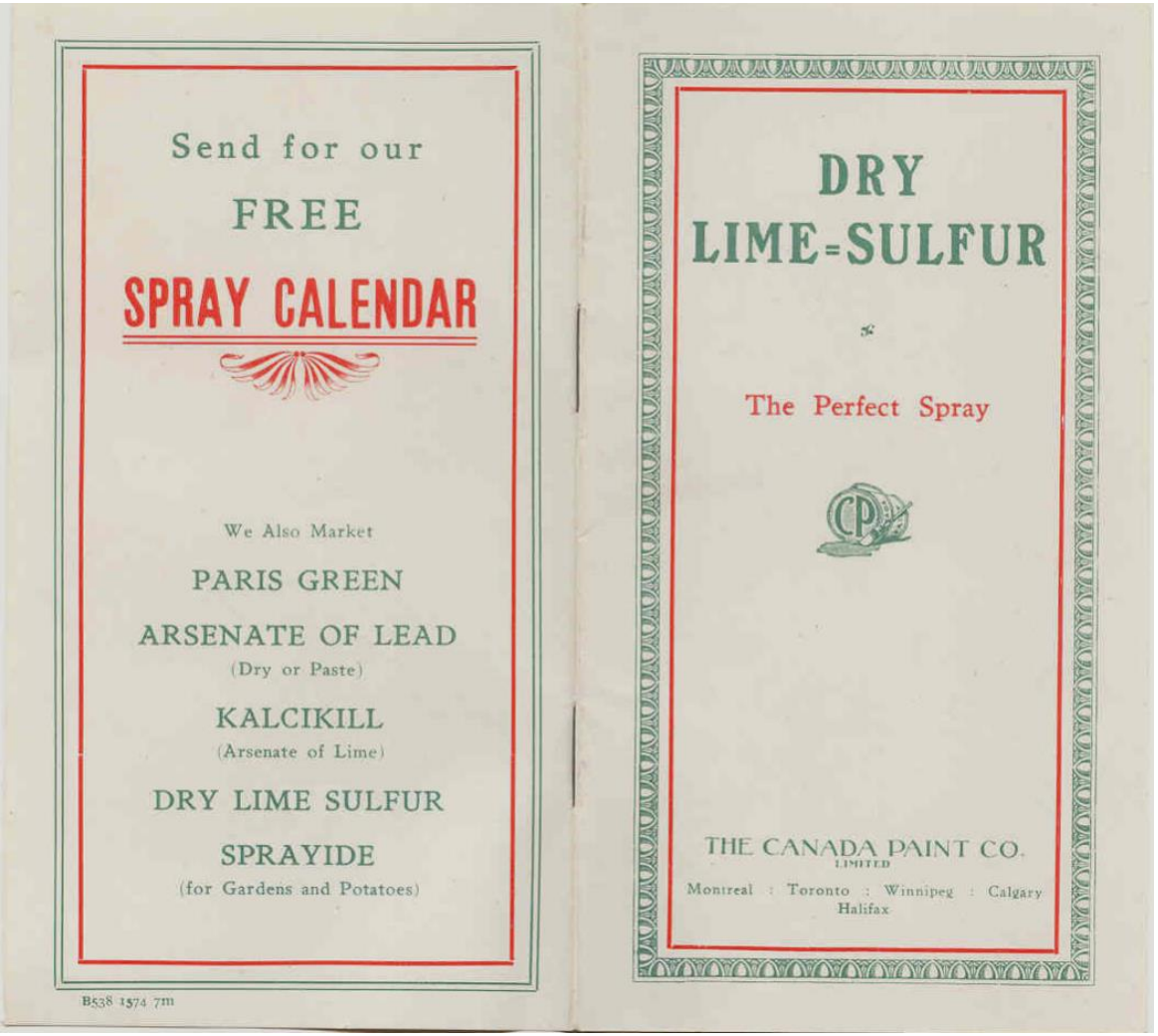


Fig. 3.—Endgate bait spreader.

Fig. 4.—Endgate bait spreader.



… 1920-1940, arsenic and other toxins were used in bait

1924

Dry powdered cattle manure.....	15 gals.
or	
Bran and sawdust, half and half by weight.....	25 lbs.
and	
Paris green or white arsenic.....	1 lb.
Salt water to thoroughly moisten.	

BRITISH COLUMBIA | Ministry of Agriculture

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I would add these, at least. - Dan

***Melanoplus bruneri*, especially on alfalfa and broadleaf crops.**

Other species of rangeland grasshoppers (several types could increase, although most are harmless and even ecologically valuable)

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Other species of rangeland grasshoppers (several types could increase, although most are harmless and even ecologically valuable)

Melanoplus bruneri, Bruner's spur-throat grasshopper

Melanoplus bruneri, Bruner's spur-throat grasshopper

Melanoplinae, the spur-throated grasshoppers (includes Two-striped, Migratory, Packard's, Bruner's, and relatives)

dan.johnson@uleth.ca

Lesser migratory grasshopper
Melanoplus sanguinipes

Two-striped grasshopper
Melanoplus bivittatus

Striped sedge grasshopper
Stethophyma lineatum

Northern grasshopper
Melanoplus borealis

Bruner's spur-throat grasshopper
Melanoplus bruneri

Marsh meadow grasshopper
Pseudochorthippus curtipennis

Clear-winged grasshopper
Camnula pellucida

Huckleberry grasshopper
Melanoplus fasciatus

Broad-winged bush katydid
Scudderia pistillata

PHOTOS AND IDENTIFICATIONS: DAN JOHNSON, 2019

Most of what people consider to be grasshoppers of British Columbia and Alberta agricultural land…

Acrididae, short-horned grasshoppers.

130 species in Canada; three main subfamilies:

spur-throated - protruding spine on throat area

slant-faced - front profile oblique; sing

band-winged - hind wings often colored

Separate taxonomic families: crickets, katydids and bush crickets

Some BASIC RULES of thumb:

- Any grasshopper flying before June 1 is not a pest.
- Crop pest grasshoppers hatch in late May and early June, are brown or black, and always have tiny triangular wing buds, not large wings that can be folded back when examined closely.
- Any grasshopper with coloured hindwings (under the forewings that serve as covers) visible in flight is not a pest.
- Any grasshopper that sings, calls, clacks, clatters or makes any other song is not a pest.
- Any grasshopper that inhabits a crop on a warm day without feeding on the vegetation may be a temporary resident that is moving to more preferred vegetation.
- Grasshoppers that remain in rangeland, headlands, or other grassland without moving into crops are likely to be species that do not damage crops (monitoring during warm weather will allow this to be determined).

Grasshoppers

short-horned grasshoppers

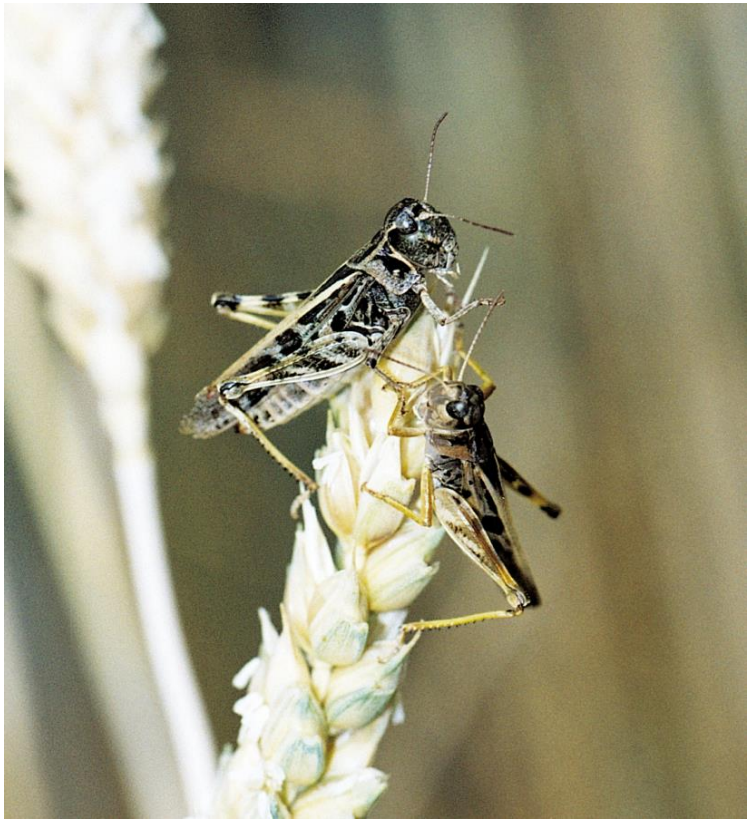
spur-throated – protruding spine on throat (some pests)

slant-faced - front profile oblique; sing (no pests)

band-winged - hind wings often colored (no pests)

katydids and bush crickets (no pests)

Pest of pasture grass and cereal crops



Clear-winged Grasshopper is a species in the band-winged family of grasshoppers, but their hind wings (visible in flight) are clear. Pest of cereals and grass, not broadleaf crops.

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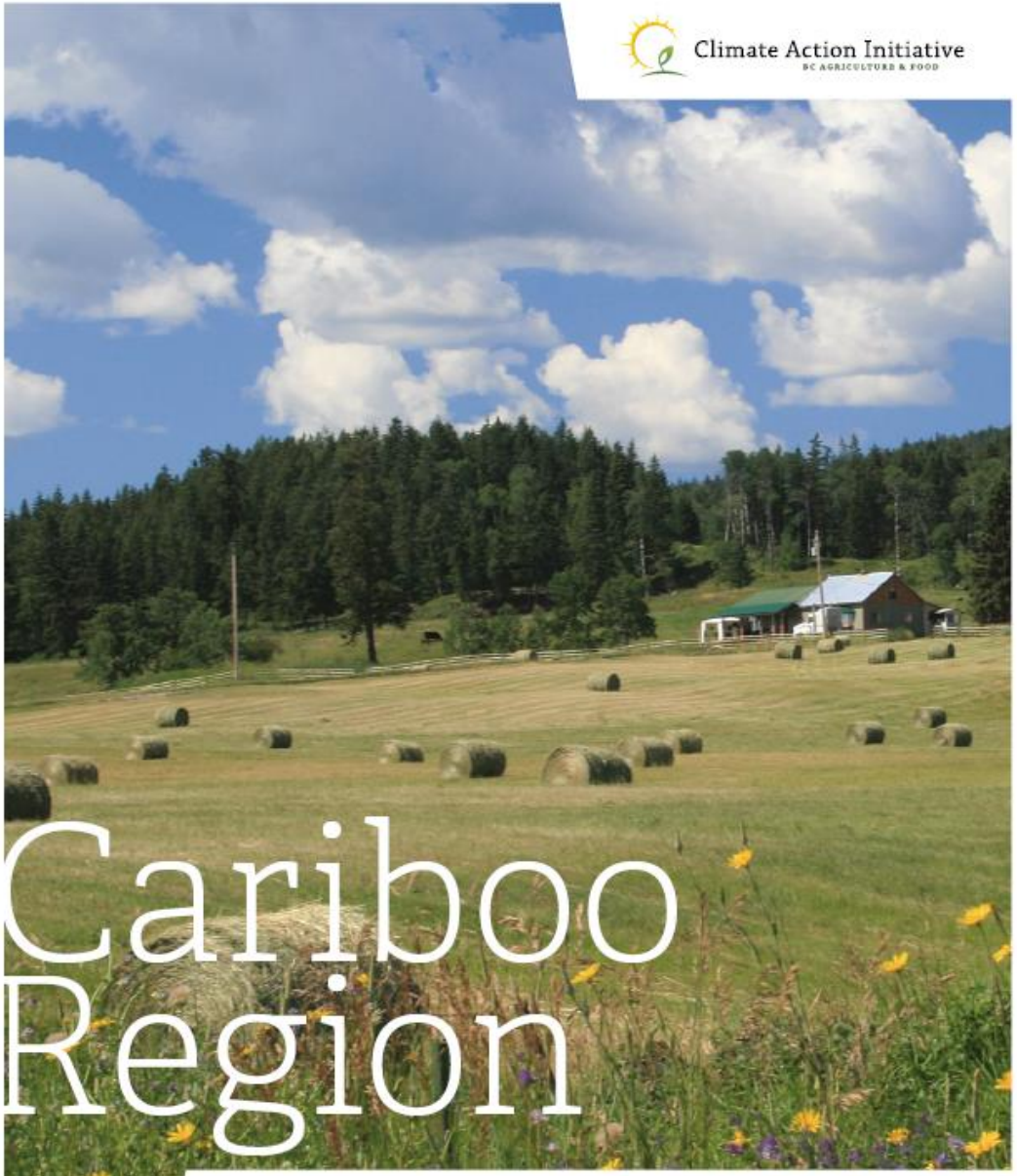
The Clear-winged Grasshopper will likely increase in B.C. grasslands under warm, dry conditions. It flies to new sites to breed.

Barley crop removed by clear-winged grasshoppers.

Coronation, AB. Aug 29, 2002.

Climate Action Initiative
BC AGRICULTURE & FOOD



Cariboo Region

BC Agriculture & Climate Change
Regional Adaptation Strategies series

Changing pests, diseases & invasive species

As temperatures warm, particularly winter temperatures, the range and prevalence of pests, diseases and invasive species is anticipated to shift. These changes may involve conditions that enable existing problem species to increase and new species to move into the region.

The Cariboo region has been significantly impacted by Mountain Pine Beetle outbreaks, in part because of a lack of extremely cold winter temperatures to control beetle populations. Some existing pests that producers are concerned may become more problematic include: wasps (for apiculture), fire ants, mildews, root maggots, cutworms, blights, wilts, and the grey tortrix moth in alfalfa. More challenging from the perspective of producers is the potential for the introduction of species into areas where they have not previously existed.

Critical to managing changes in populations and ranges of economically significant species (those that cause extensive damage to crops or harm to livestock) is monitoring what is occurring on the ground. Existing resources around monitoring and management in the Cariboo region include the Cariboo Chilcotin Coast Invasive Plant Committee (CCCIPC), and the Cariboo Regional District's Invasive Plants Program.[31] The CCCIPC has conducted a number of monitoring and management pilots that provide a strong base for future programs.

The strategies in this section work toward the *goal* of:

- ***Minimizing and managing agricultural impacts of changing pest, diseases, and invasive species distribution and prevalence***

Relevant Climate Change Impacts

- Increasing temperatures, growing degree-days/heat units, growing season length
- Warmer winter temperatures
- Increasing spring precipitation and extreme rain events
- Drier summer conditions

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- → Increasing temperatures, growing degree-days/heat units, growing season length
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- → Increasing spring precipitation and extreme rain events
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PACIFIC CLIMATE IMPACTS CONSORTIUM

Preliminary Analysis of Climate Change in the Cariboo-Chilcotin Area of British Columbia

08 September 2008

R.J. Dawson
Ministry of Agriculture and Lands

A.T. Werner, PCIC
T.Q. Murdock, PCIC

Integrated Land Management Bureau

University of Victoria

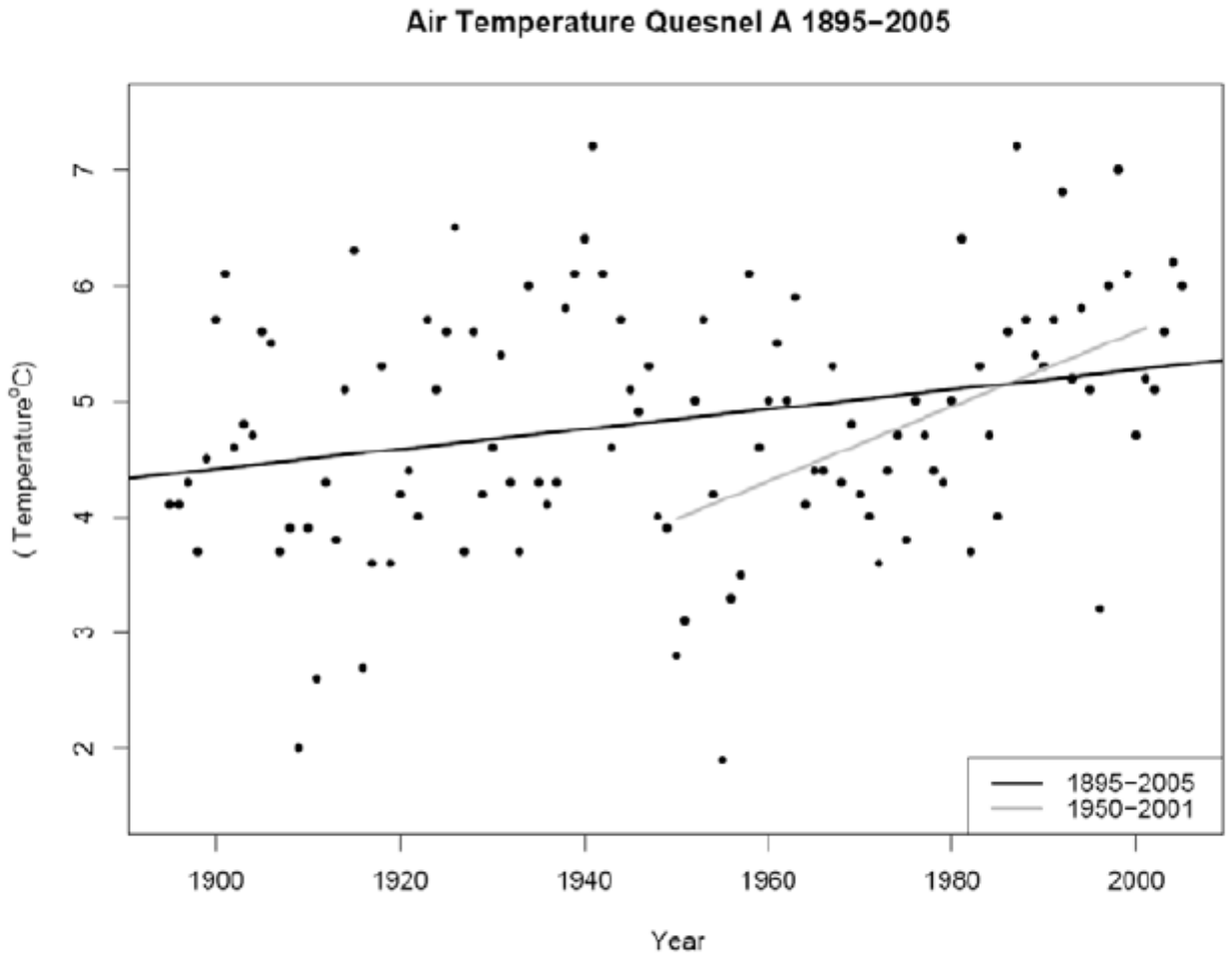


Figure 3-5 – Quesnel mean annual temperature trend 1895-2004 and 1950-2001. Both trends are significant at the 95% confidence level ($p<0.05$).

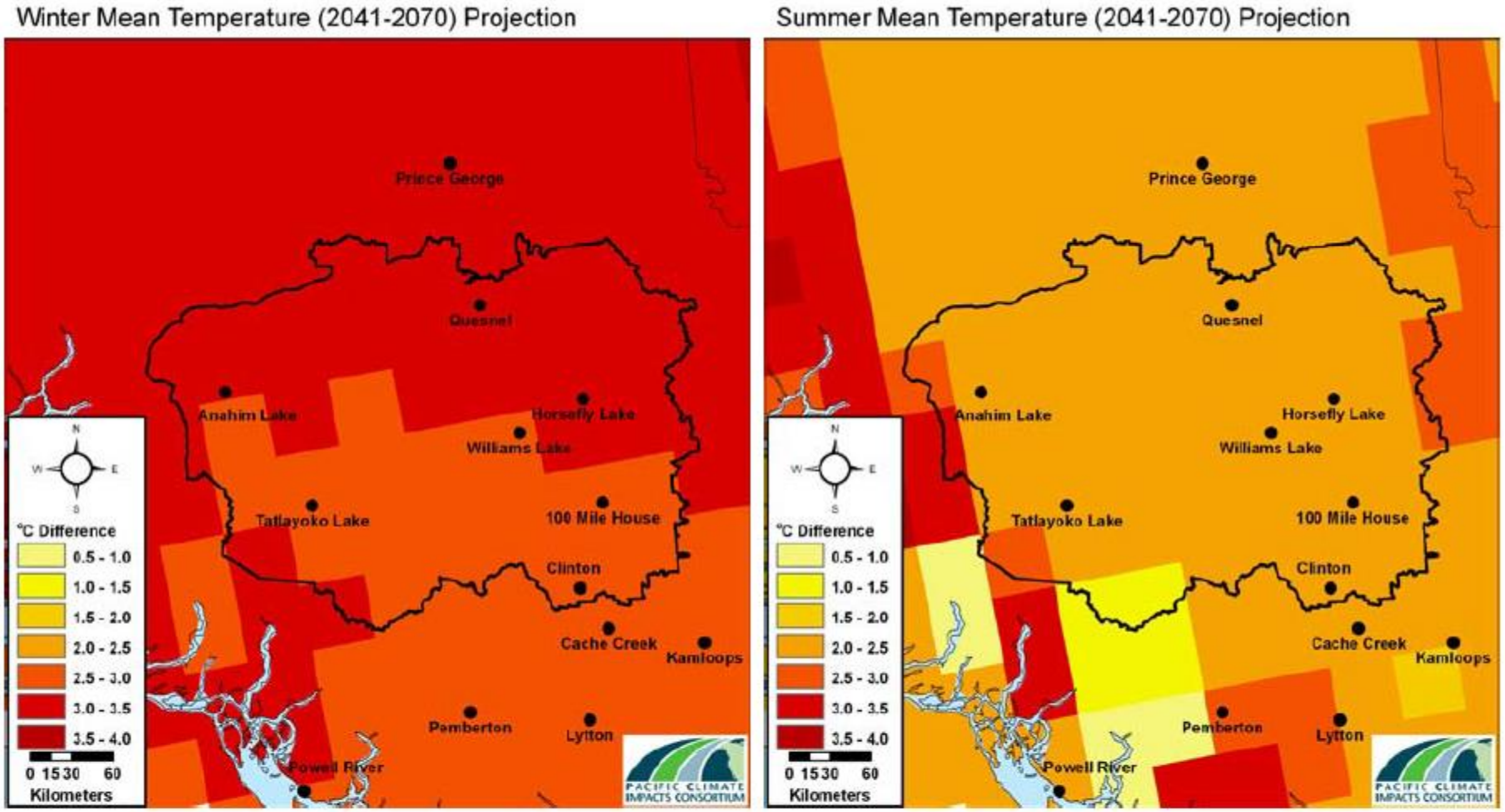
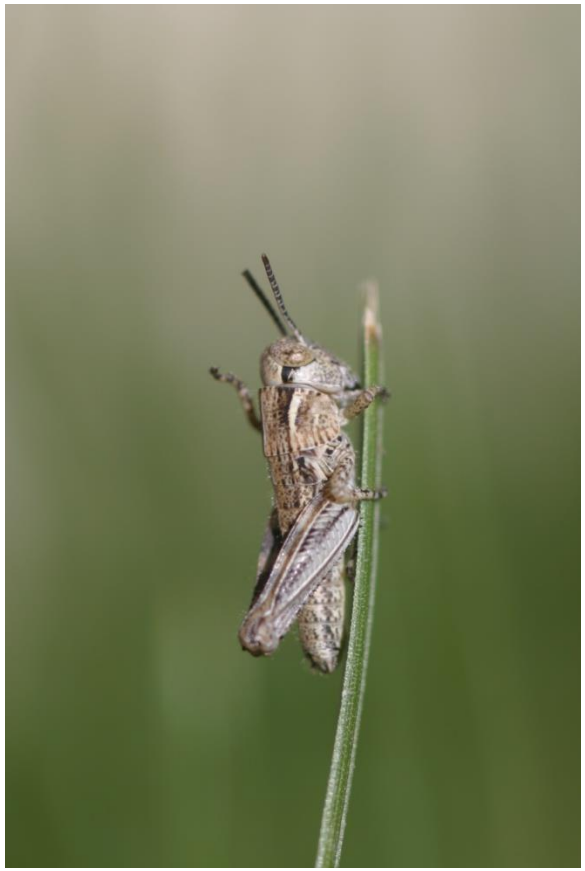


Figure 3-12 – RCM projected change in B.C. 2050s (2041-2070) mean seasonal temperature as compared to the 1961-1990 baseline in winter (left) and summer (right).



Lesser Migratory Grasshopper, a pest of pulse, oilseeds and cereals.

This species is usually tan, but can appear very dark when nearly mature. In all stages, it has a stripe on the side of the head, and usually broken bands on the legs. Common in British Columbia. May increase.

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Red-legged Grasshopper

Moister vegetation. Rarely a serious pest in western Canada.

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Bruner's Spur-throated Grasshopper.

Like Lesser Migratory Grasshopper, but heavier and darker. Northern; foothills and forest. Feeds on all crops but prefers broad-leaf plants like alfalfa. Likely to increase.

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Melanoplus borealis, northern spur-throat grasshopper, may increase but rarely becomes a pest

Two-striped Grasshopper feeds on cereals, pasture, and broadleaf crops.

Breeding and egg-laying begin in July and continues into the fall.

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Packard's Grasshopper is often lime-green before maturity, with pepper spots on the back. It feeds on grasses and broadleaf crops and alfalfa. Some related species look similar.

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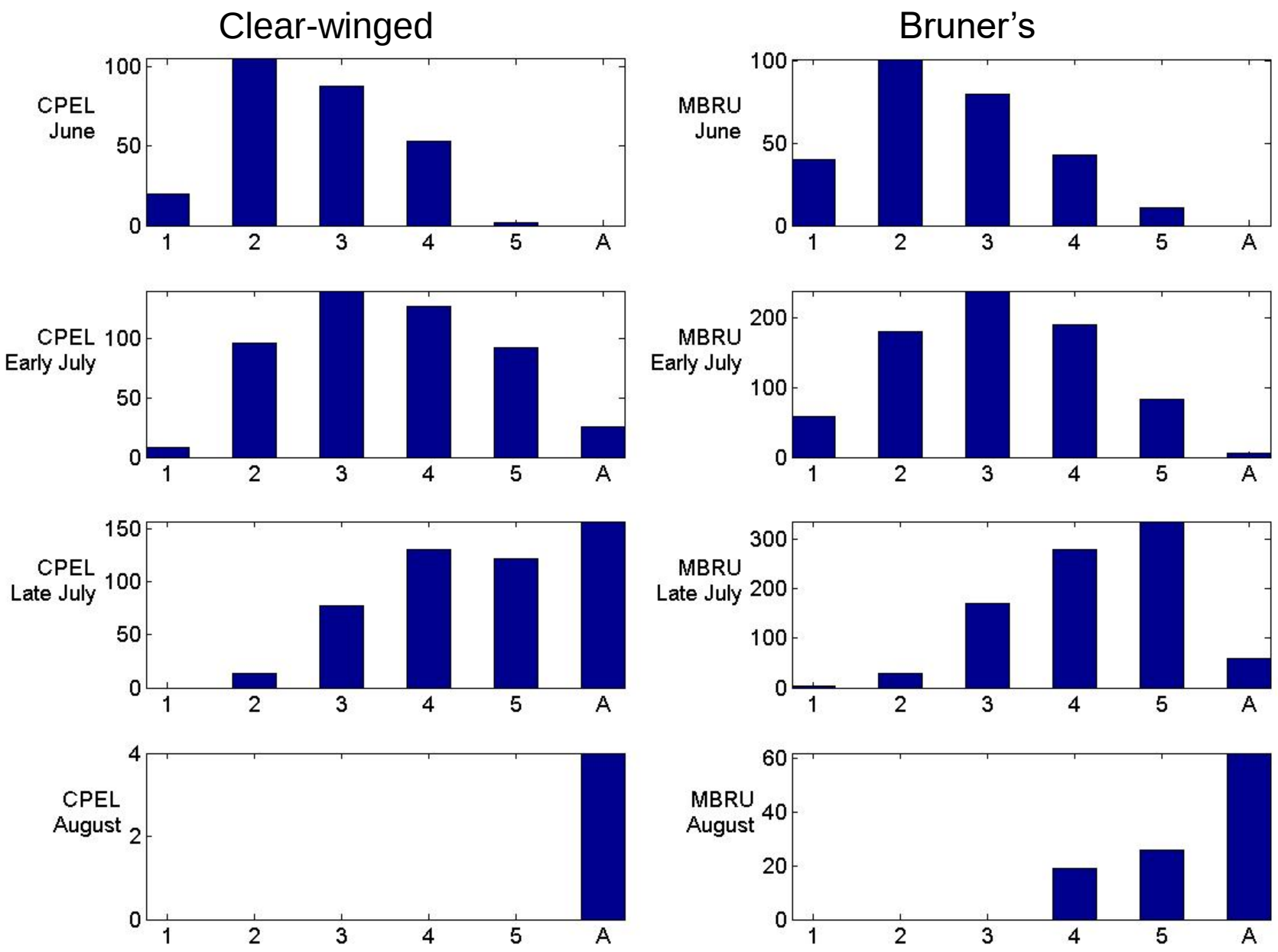
Clear-winged
Bruner's
CPEL June
MBRU June
CPEL Early July
MBRU Early July
CPEL Late July
MBRU Late July
CPEL August
MBRU August
1
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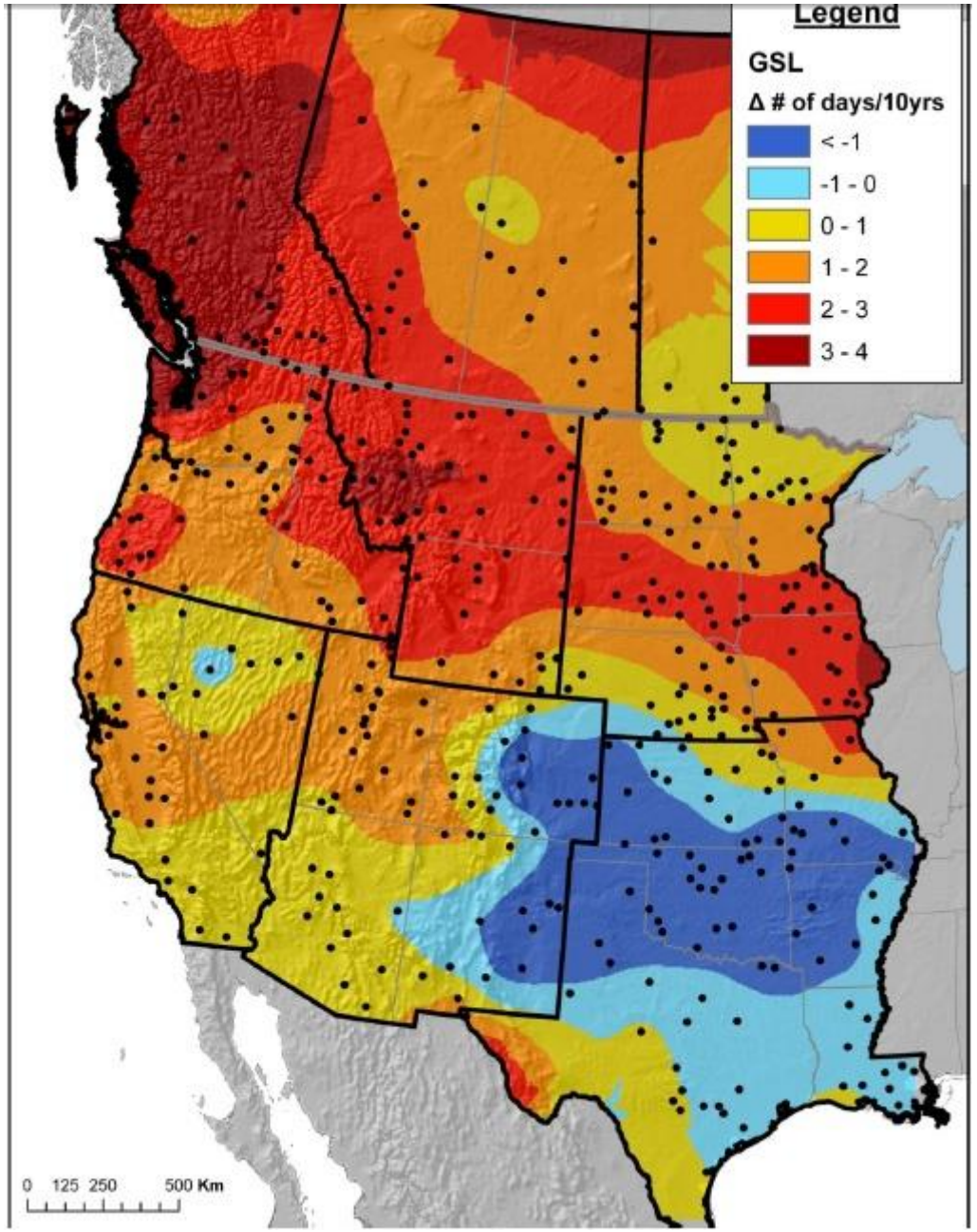
Trends in growing season length



Graduate student Evan Booth.

(Booth, E., J. Byrne, and D. Johnson. Climatic Changes in Western North America, 1950 – 2005)

Gov.bc.ca

The official website of the Government of British Columbia.

Grasshopper Monitoring and Control in British Columbia

December, 2015

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Weather conditions play a very important role in the survival of hoppers and development and intensity of outbreaks. Outbreaks are usually preceded by 2 to 3 years of above average temperatures during the summers and falls. Warm, snow-free falls allow hoppers more time to feed and lay eggs and allow more complete egg development for faster and more even hatching the next spring. A late spring and cool summer delays nymphal development so that fewer adults are available to lay eggs. Cool, wet conditions during hatch will increase nymphal mortality; in August and September, such conditions will slow down egg laying. An early fall will cause many females to die before laying their full complement of eggs.

Damage and Action Thresholds

Grasshoppers feed on a wide variety of grassy and broadleaf plants, and if preferred hosts are lacking,

"Research has found that over the season, 12 to 24 grasshoppers per square metre in bluegrass pasture eat as much forage as one cow per acre. A population of one grasshopper per square metre destroys about 11 kg of forage per hectare per month (10 lbs/acre/month)."

… it will be apparent.

Grasshopper Monitoring and Control in British Columbia

December, 2015

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Damage and Action Thresholds

Grasshoppers feed on a wide variety of grassy and broadleaf plants, and if preferred hosts are lacking,

Table 1. Nymphs and Adults per Square Metre

Rating	Field	Roadside	Control Action
Normal	0 - 3	0 - 6	not required
Light	4 - 6	7 - 12	usually not required
Moderate	7 - 12	13 - 24	may be required
Severe	13+	25+	required

For rangeland, use the values under Roadside to establish infestation rating. The quality and quantity of the forage (AUM value), cost of alternative or supplemental forage sources and cost of control (product and application) should be considered when deciding whether control is justified.

Again, damage will be apparent.

Life cycle and survey.

Eggs are laid about an inch into the soil, in late summer.

They are typically the size of large grains of rice.

A coarse screen can be used to check for eggpods. Pods are about the size and shape of macaroni, and have a foam plug at the end of the eggs. Eggs are the size of rice.

Pest grasshoppers hatch between May 25 (warm spring) and June 15 (cool spring).

Underdeveloped

Partly developed

Ready to hatch

Eggs can be soaked in dilute bleach and examined. Eyes indicate that development is under way. A darker hopper embryo indicates that the eggs are close to hatching.

Newly hatched grasshoppers (end of May, and early June) are very small, but have a hopper appearance.

Not grasshoppers

Counts in the fall are for the survey. Spring notes and collections help to improve it.

Count the approximate number per square meter (about 10 sq. ft.)

Observations by the public are very useful: location and year of large numbers

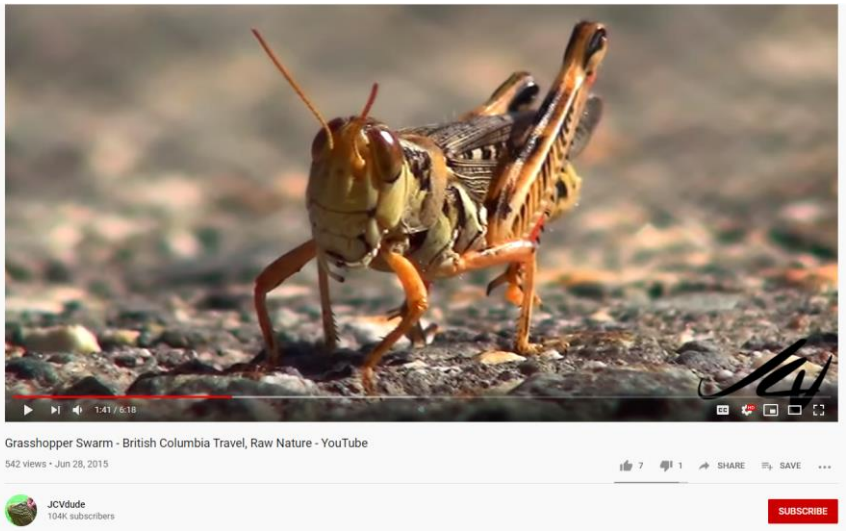
Grasshopper Swarm - British Columbia Travel, Raw Nature - YouTube

542 views • Jun 28, 2015

7 1 SHARE SAVE

JCVdude
104K subscribers

Appears to be Lesser Migratory Grasshopper, *Melanoplus sanguinipes,* and Clear-winged Grasshopper, *Camnula pellucida* (-Dan)



Appears to be a female lesser migratory grasshopper, *Melanoplus sanguinipes.*

Red-legged grasshopper, *Melanoplus femurrubrum,* would be more yellow underneath and have less of a barred pattern on the hind femur.

(-Dan)

Katydids and Bush Crickets are not pests in Canada. Any singing grasshopper is not a pest.

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On grass, this small species may be confused with the less migratory grasshopper

Little spur-throated grasshopper

Clear-winged Grasshopper sometimes congregate

Turin – Enchant, AB, June 7, 2001

dan.johnson@uleth.ca

Review of tips…

NOT A PEST:
A grasshopper that does any of these.

- flies before June.

- has wings highly visible in flight (red, yellow, orange or black).

- sings, calls, clacks, clatters or makes other similar sounds, either in flight or on the ground.

- inhabits a crop on a warm day without feeding.

Natural enemies

Flies, crickets,

diseases of insects.

dan.johnson@uleth.ca

***Metarhizium anisopliae* (Deuteromycotina: Hyphomycetes)**

Cultural Control Methods

- **crop and cultivar selection** (resistance to feeding)
- **early seeding**
- **timing control measures** (early warning)
- **weed control (**can reduce egg-laying and survival)
- **trap strips**. Grasshoppers drawn to the trap strips can be economically killed with insecticide.
- Natural enemies of grasshoppers may reduce numbers. These can include beeflies, fungal diseases, predators, and parasites.