BNFFG Pest Monitoring Series

Agricultural Pest Monitoring in Bulkley-Nechako and Fraser-Fort George
Project Overview

Factsheet #1
March 2023

Why did we start this project?

With a shifting climate, many insect pest species are expanding outside their original ranges and negatively impacting forage and other crops in British Columbia (BC). Although there has been considerable work in southern BC, much less is known about pest issues on forage crops in central BC [1]. After consultation with the Ministry of Agriculture and Food and producers in this region, this project was undertaken as a joint venture between the University of Northern British Columbia and the BC Forage Council and with funding from the Climate Change Adaptation Program and Mitacs.

This two-year project will lay the foundation for a pest monitoring network within the Bulkley-Nechako and Fraser-Fort George regions. Pest and beneficial insect and spider species present in and near forage crops within the region will be identified and with this information, region specific recommendations will be developed on how to mitigate crop damage using existing or new land management methods.

The Bulkley-Nechako and Fraser-Fort George regions present a unique agricultural landscape, but some of the pests and their natural enemies may be similar to those elsewhere. Knowing what is present in forage crops here will allow testing of specific integrated pest management methods from elsewhere. In addition, monitoring in this region now will provide a baseline accounting of current insect communities for better monitoring as communities change due the rapidly changing climate.

The project is currently identifying the species of pests and natural enemies that exist in forage crop fields and in field-adjacent forest stands along the Highway 16 corridor from Dunster to Telkwa. Among other things, this will allow us to determine if different amounts of forest edge next to fields impact the beneficial and non-beneficial insect and spider assemblages that are present, and if management of adjacent land use types can be used as a tactic to control/manage for pest species in a broader integrated pest management strategy.

Beneficial vs. pest species

What interactions are we exploring?

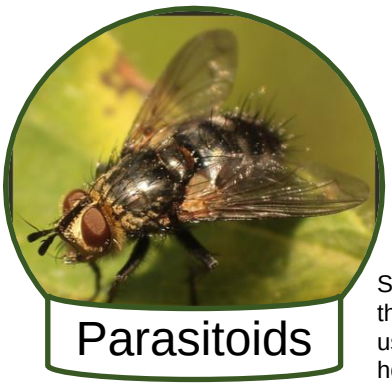
Forage crops in this region of British Columbia (BC), include *Medicago sativa* (alfalfa), *Trilfolium* spp. (clover), Poaceace (grasses, such as Timothy grass) and various other species which can be damaged by pests such as the *Hypera postica* (alfalfa weevil), which delays growth and reduces biomass

Beneficial arthropods are species which have life histories and behaviours which align with the goals and outcomes desired by forage producers. Beneficial arthropods include pollinators that aid in the propagation of some crops [2], or **predators** and **parasitoids** that prey on herbivore **pests** and thus help control pest populations [3]. Predators such as spiders, ground beetles, rove beetles, and large wasps – or parasitoids (usually small wasps or certain flies) –are natural enemies to agricultural herbivore pests and help control population levels of pest species by consuming them as prey or using them as hosts for their offspring.

Adult Alfalfa weevil which is a known pest species on alfalfa in BC. Robert Webster 2014 (CC-BY-SA-4.0)

Alfalfa weevil damage in immature life stage. Whitney Cranshaw 2013 (CC BY 3.0)

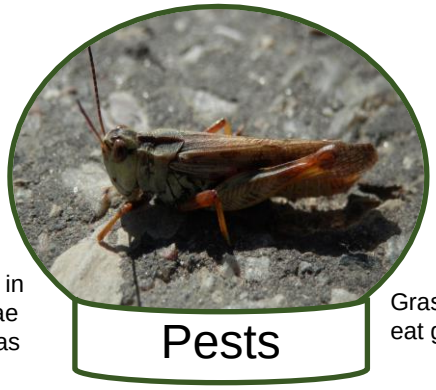
Interaction of pests, beneficials and crops



Parasitoids

Pete Beard 2013 (CC BY 2.0)

Some parasitic flies in the family Tachinidae use grasshoppers as hosts for young



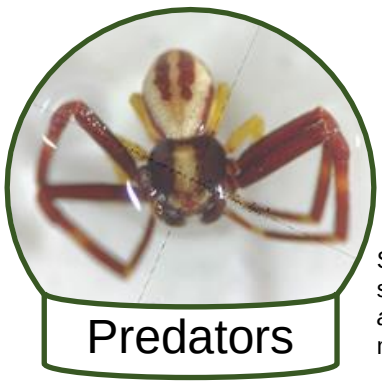
Pests

Ryan Hodnett 2014(CC BY-SA 4.0). Cropped.

Grasshoppers eat grasses

Crops

James K Lindsey 2006 (CC BY-SA 2.5). Cropped.



Predators

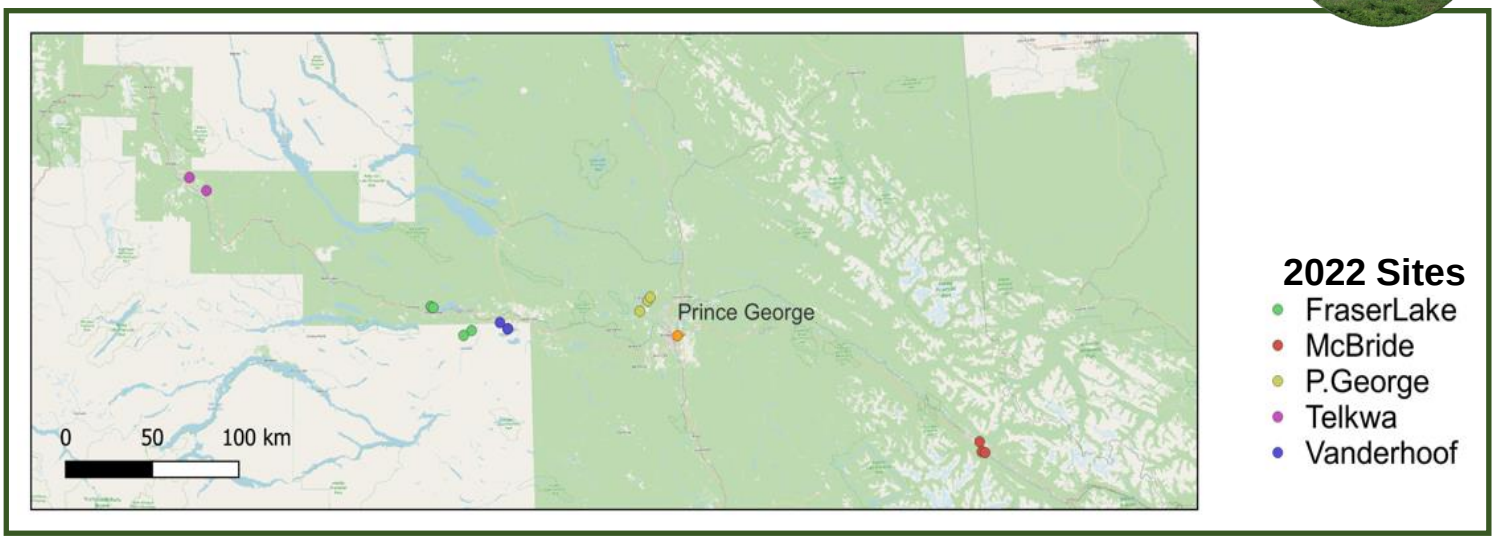
Some spiders eat pest species *Meromyza americana* (wheat stem maggot) [4]

Pests

gailhamshire 2020 (CC BY 2.0)

Wheat stem maggots eat plant stems when immature (larva) [4]

Scope of project



This project is building a baseline inventory of which insect and spider species are currently living in communities in forage crop fields along Highway 16 from Dunster to Telkwa. The overall focus is on pests and their likely natural enemies. We have designed our sampling efforts so that we can learn what insect assemblages are present in adjacent forested areas and how those communities may spill over into fields.

We hope to determine whether maintaining forested edges can help enhance the presence of the natural enemies of the pest species in nearby fields, and which attributes of the surrounding forest may best contribute to an overall IPM strategy. We are conducting this work in a rapidly changing global and regional climate, and plan to contextualize our results in terms of which pest and natural enemy species we currently find in our region and how we may expect that to shift in coming years.

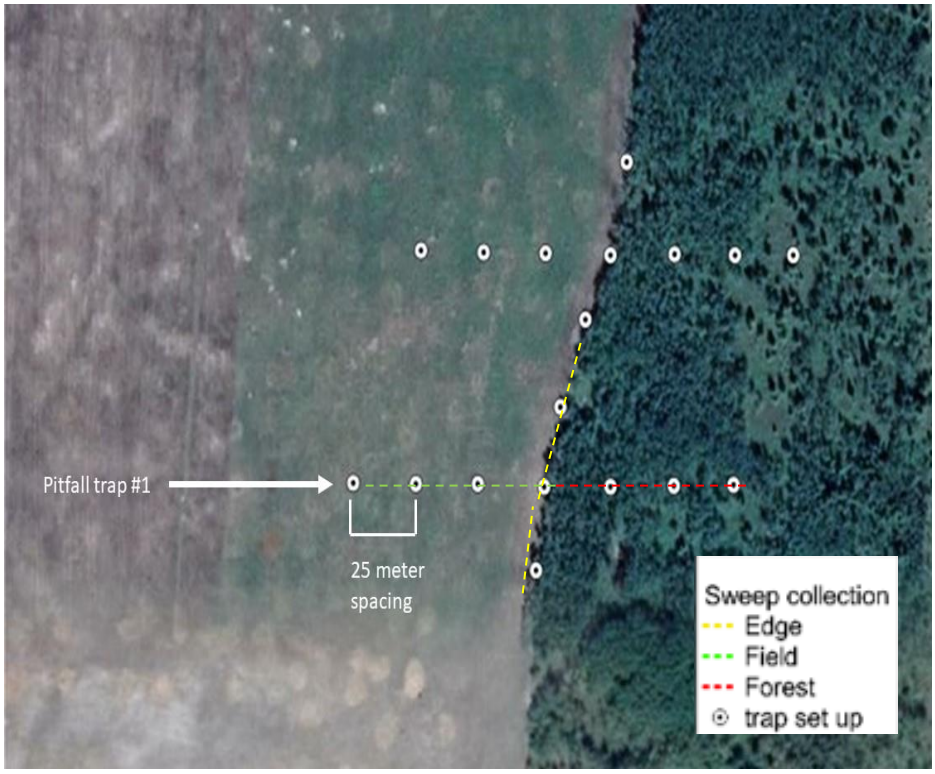
Land management to preserve and enhance natural enemy communities has always been important, and will become more important in the context of shifting temperature and precipitation patterns and related changes in cropping choices, planting, and harvesting times

Edge between forage field and forested area in McBride site. Summer 2022.

Alfalfa field at Fraser Lake site. Summer 2022.

Forested area adjacent to forage field site in Telkwa. Summer 2022.

2022 Sampling



Example of 1 site set up in Vanderhoof, BC 2022. 18 pitfall traps were set up per site and 3 sweeps of 75 m were completed on the edges, field and forest each sampling period.

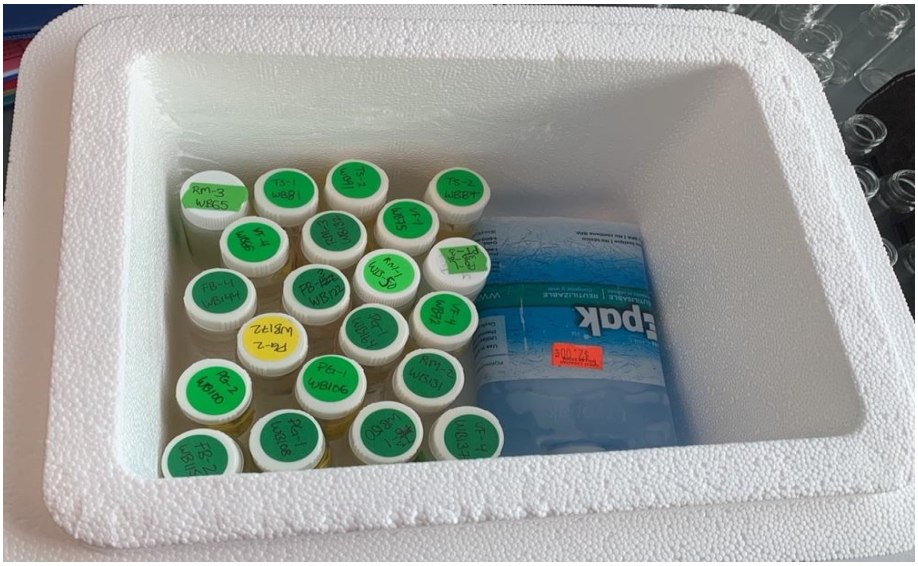
Insect collection from pitfall trap in summer 2022, Prince George

Sweep net collection in summer 2022 in Prince George

How were samples collected?

Fourteen forage fields with perennial forage crops – including alfalfa, grasses, and clover – were selected from those provided by gracious volunteers in the producer community between Dunster and Telkwa. We sampled the fields and adjacent forest land from late-May to August 2022. A wide variety of insect and spider species were collected using pitfall traps and sweep nets in field interiors, along the edges of adjacent forest areas, and within adjacent forest area during three sampling periods.

Over 600 hundred samples were collected in 2022 using **pitfall traps** and **sweep net** collections. We are currently identifying species and tabulating abundance of each species within the lab using previously established guides. We will also use DNA-based methods to verify our identifications.



Several samples that were collected during the summer 2022 season.

2022 Key Findings

What have we found?

Few grasshoppers were collected or observed. Grasshoppers have generally been considered one of the primary pest species in forage fields and a second collection in summer 2023 will be required to determine whether or not 2022 represents normal current populations or if there were external factors that decreased grasshopper populations in 2022.

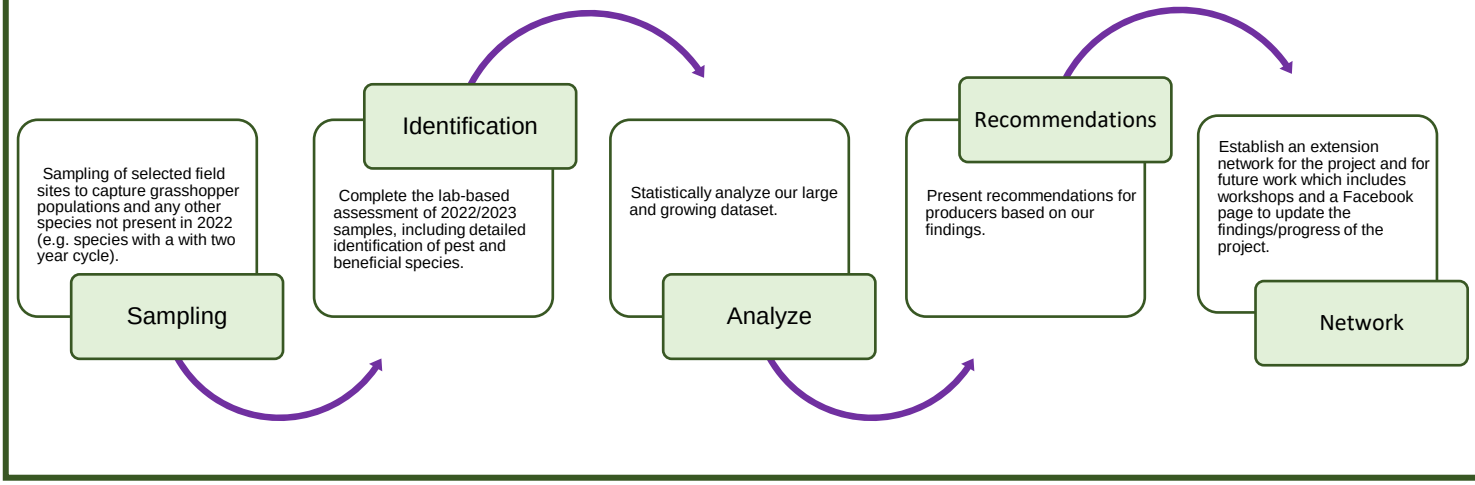
Pests collected in 2022 included, but were not limited to: leafhoppers, click beetles (wireworms), leaf miner flies, and aphids. We are working on confirmation of detailed species identification through DNA analysis. Lists of identified pest insects and their natural enemies will aid producers in planning regional IPM tactics and strategies.

We observed and collected from a large abundance and diversity of spiders and parasitic wasps. These are beneficial arthropods that help to reduce certain herbivorous insects. Natural enemy diversity was higher near the edges and in the adjacent forested areas.

Overall, there were more insect and spider species (in other words, higher diversity) on edges and in forests. Fields had a lower number of species (lower diversity) but with higher abundances .

While our analysis of 2022 samples is still in its early phase, there are signs of a positive relationship between vegetation diversity and insect/spider diversity. This may be an early indication that having diversified crops and nearby forests or other vegetation could enhance the presence of natural enemies of herbivores.

2023 Research Plans



Resources

Want to keep up to date with this project, follow our Facebook page:
https://www.facebook.com/profile.php?id=100090075117545

To contact the project lead please email pests@bcforagecouncil.com

References

1. Powell, GW. Priority Pests of the Cariboo-Chilcotin, Final Report. Climate & Agriculture Initiative of BC. 2018
2. Dunn L, Lequerica M, Reid CR, Latty T. Dual ecosystem services of syrphid flies (Diptera: Syrphidae): pollinators and biological control agents. Pest Management Science. 2020;76(6):1973–9.
3. Rand TA. Assessing the role of generalist predators in the biological control of alfalfa weevil (Coleoptera: Curculionidae). The Canadian Entomologist. 2017 Aug;149(4):525-33.
4. Philip H, Floate K, Mori B. Field Crop and Forage Pests and Their Natural Enemies in Western Canada: Identification and Management. Agriculture and Agri-Food Canada; 2018.

Research partners

This factsheet was produced by Meganne Harrison (a graduate student at the University of Northern British Columbia) as part of a two-year project (2022/2023) that is collaborating with farmers and ranchers to monitor and identify pests of concern for the agriculture sector across the Bulkley-Nechako and Fraser-Fort George regions.

Meganne's research is being overseen by Dr. Dezene Huber (University of Northern British Columbia) and Dr. Jasmine Janes (Victoria Island University) with support from Serena Black (BC Forage Council) and a dedicated Project Oversight Committee.

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