2014 BC Peace Collaborative Pest Monitoring Season Summary

Overview

During the 2014 monitoring season, a valuable and expansive data set was generated from key pests in the BC Peace River region. Over 400 insect samples alone were collected and catalogued during weekly monitoring efforts, along with over 650 pathology samples collected during year end surveys and throughout the season as discovered. In total, 11 weekly monitoring sites were established with cooperators- 5 Canola, 5 Wheat, and 1 extra weather station site with remote data-download capabilities (near Clayhurst, BC) allowing regular transfers to AAFC modellers. Three additional manually shuttled weather stations were placed in Rolla, Montney, and Farmington to fill in data gaps for longer term purposes. Collectively, these data will prove extremely valuable for forecasting, modelling, and looking at changes to pest populations over time in this unique region.

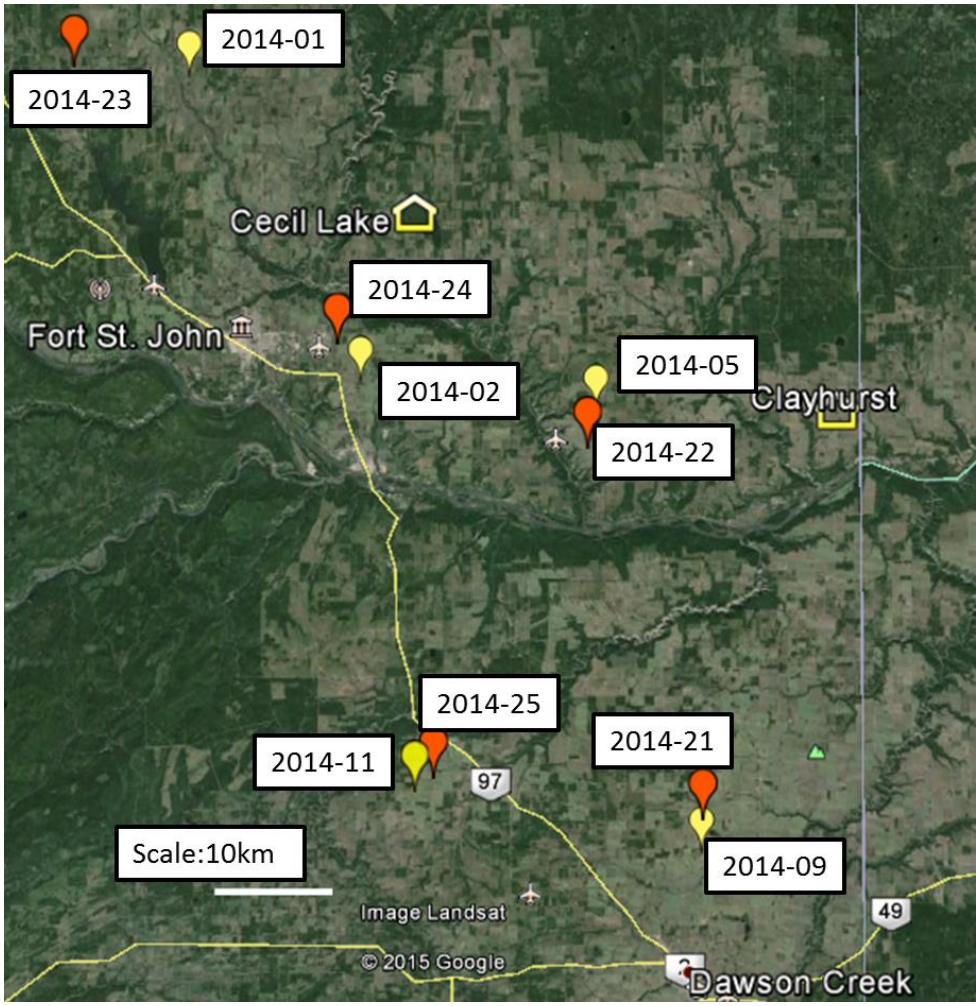

Figure 1: Overview of 2014 weekly monitoring cooperator sites. Orange sites are wheat sites, yellow are Canola. The extra weather station site is ~2km east of 2014-22 near Clayhurst. Red clover casebearer was also monitored from the Canola sites.

Insect Monitoring

Agriculture and Agrifood Canada (AAFC) provided insect monitoring protocols that have been well established for use across the prairies in the Prairie Pest Monitoring Network (PPMN), and these were employed with minor modifications to details such as deployment dates where necessary, as per recommendations from AAFC in Beaverlodge. Monitoring sites were set up in Montney, Clayhurst, Baldonnel, Farmington, and Rolla. In Canola, flea beetle sticky cards and Diamondback moth (DBM) pheromone baited traps were deployed early in the season in the first week of May, followed by Swede Midge and Red Clover Casebearer (RCCB) pheromone traps at the end of May. Sweep sampling for Lygus and leafhoppers was also done periodically at these sites throughout the season.

An interesting observation was made with flea beetle populations in 2014- pest species recovered from crops were relatively low in some parts of the Peace compared to non-pest flea beetles. Across the prairies, the most important and abundant pest species are Crucifer (*Phyllotreta cruciferae),* Striped *(Phyllotreta striolata),* and Hops *(Psylliodes punctulata).* However, Figures 2 and 3 below confirm that the striped flea beetle is likely the most important damage causing species in the BC Peace, but in some areas at certain times of the year, the majority of flea belts present are actually the non-pest species, *Crepidodera nana*. Not a single *P. cruciferae* specimen was recovered in 2014 from the BC Peace. This demonstrates the value of population data of this nature- proper differentiation of *C. nana* from the morphologically similar *P. cruciferae*, is key to understanding the unique pest dynamics of Canola in the BC Peace.

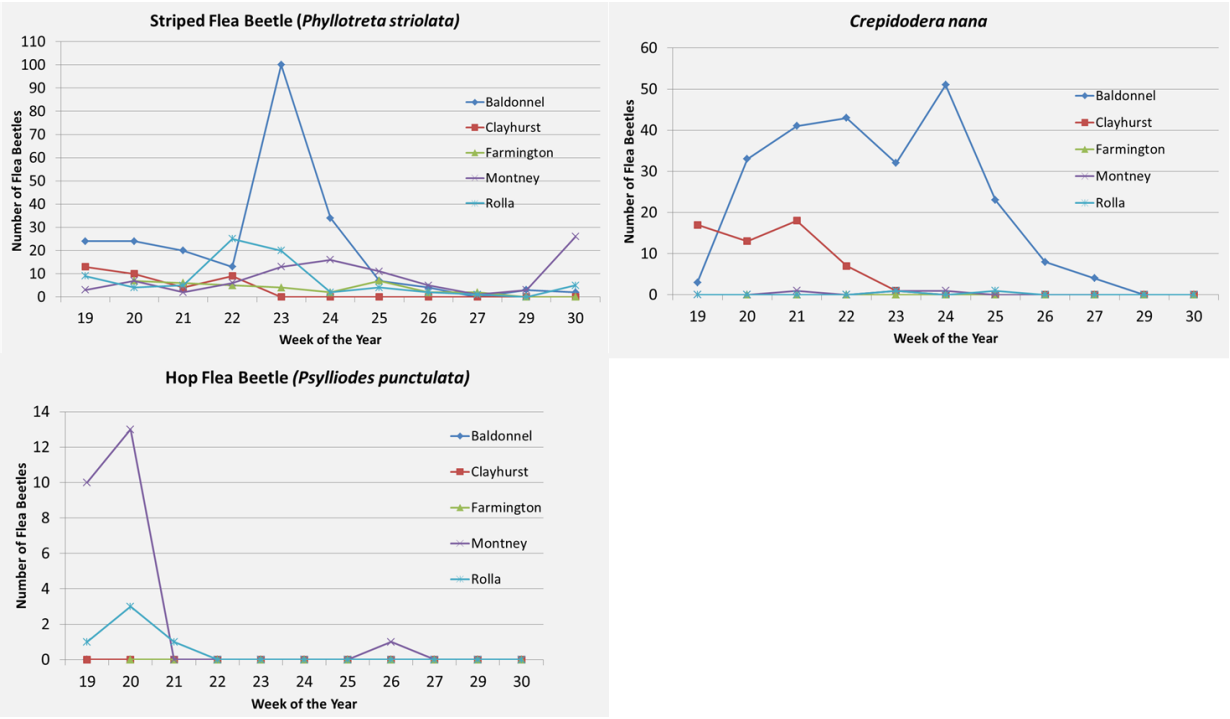

Figure 2: Flea Beetle populations over time and across 5 canola sites in the BC Peace. Notice the difference in scale on the y-axis for different species. Baldonnel had higher overall peak populations than other sites, though the significance of this is hard to comment on after a single year of data. Striped flea beetles were by far the most prominent species at all sites.

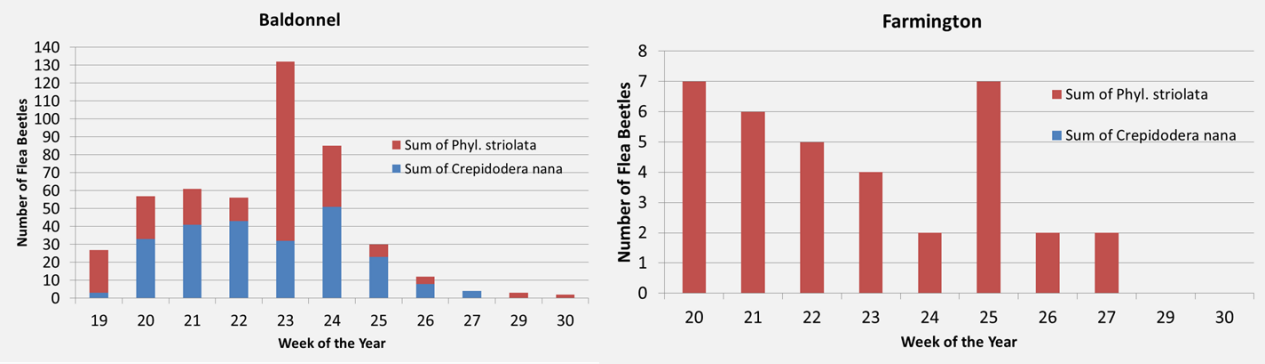

Figure 3: An example of the variance between flea beetle population compositions at different sites during the 2014 season. At some sites, such as Baldonnel, at certain points earlier and later in the season, a species not known to cause damage in canola, *C. nana*, makes up the majority of the population. In Farmington however, *C. nana* is absent all season, though overall numbers of flea beetles were lower. This could be due to a lack of trees bordering the field in Farmington, or a difference in control measures taken by cooperators early in the season.

On a small note concerning the Diamondback moth (DBM), which is not known to overwinter in the Prairies to any meaningful degree; annual infestations in the Peace are due entirely to populations from southern wind trajectories, and the degree and localization of infestations are dependent on when and where the wind currents come early in the season. If the climate shifts to allow colonization and overwintering of this pest, we could see drastic shifts in the frequency of problem years as it's capable of multiple generations in short periods of time. Pheromone monitoring in the Peace allows us to track arrival times, and adult population levels throughout the season. The earlier the moth arrives, and if in sufficient numbers, the more time the population will have to establish and cause a problem that year. In the 2014 season, arrival times varied within the Peace by up to a month (see Fig. 4), and adult populations never reached levels where infestations were likely.

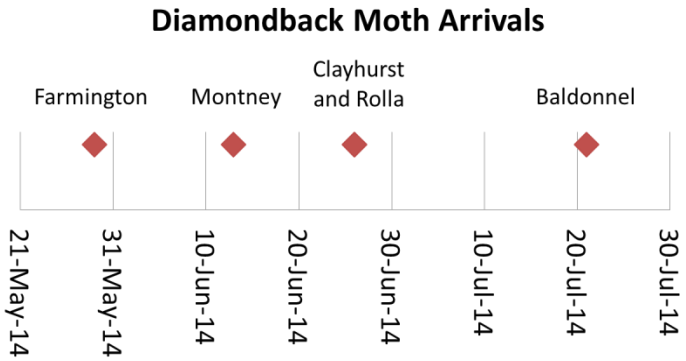

Figure 4: Diamondback moth arrival dates during the 2014 growing season. When the moth arrives in a region is entirely dependent on southern-originating wind currents. Adult moth populations were extremely low and larvae were only rarely observed in canola crops this season.

Swede Midge pheromone monitoring confirmed that this pest is likely still not present in the BC Peace. It's a highly destructive pest in some areas of Ontario where Brassica crops, including canola, simply aren't viable anymore. This is because the midge is extremely difficult to control, and once in a region, long crop rotations are the only available means of managing it. It's established populations in areas of the prairies and modelling efforts indicate that if it were introduced in the BC Peace, it would likely survive and reproduce, so proactive monitoring for this pest is crucial.

Wheat Midge pheromone traps were set out at wheat sites mid-June, and adult midge were detected at all sites within the first week (the 26th week of the year in Fig.4). They were most abundant in the south-eastern portion of the BC Peace, in Rolla, though in terms of risk levels populations were still low across the region.

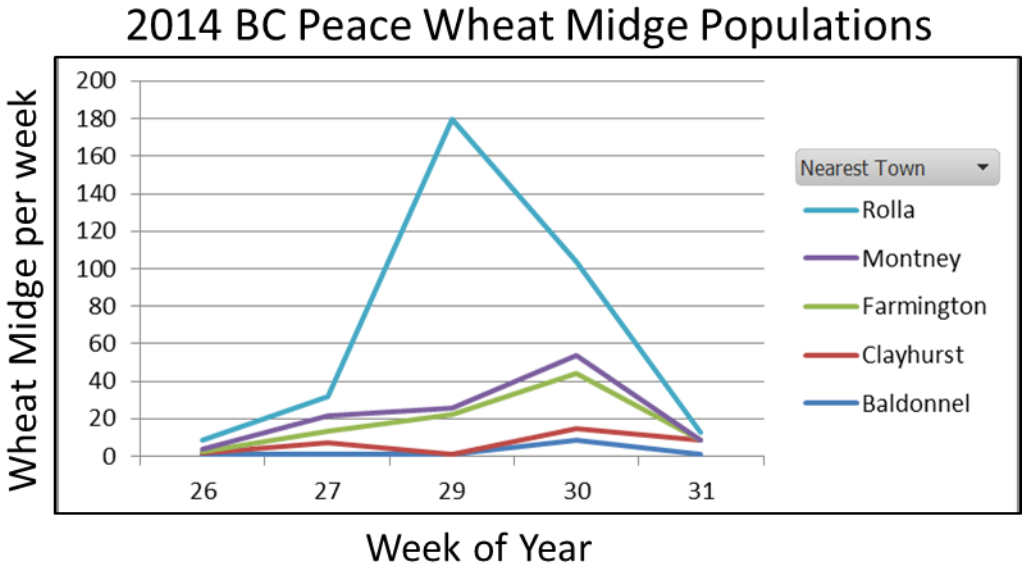

Figure 5: Wheat midge pheromone trapping results. Week of year values are based on collection dates and run from the first week of July (26th WoY) to the first week of August (31st WoY). Wheat midge counts were weekly and represent the sum of 4 traps per site, 50m apart.

Wheat Midge will be a growing problem in the coming years, as reports show populations seem to be rising in nearby Alberta regions as well as the BC Peace, but we still don't understand well how this pest's biology will affect it in the Peace. The window of crop susceptibility to this pest is very short- only after heads emerge, but before flowering, so climate data will be increasingly valuable to tracking this pest's crucial synchrony with its host, and tracking its populations will allow the region to make necessary shifts towards tolerant varieties as needed. Sweep samples from 2014 did recover the Wheat Midge parasitoid, (*Macroglenes penetrans*), so this will be an important consideration in future management regimes. So far, midge population levels are far below threshold values (which currently only consist of counting in-flight adults in the crop), but this could change in the future.

Grasshoppers caused major damage, mainly in Northern areas of the Peace, during the 2014 growing season, and warm weather conditions in the Fall and 2015 Spring mean they are likely to reach high population densities in the 2015 growing season as well. Identifying which species are present in or near a crop early on in the season is important for making later control decisions; as such, I compiled identification materials into a nymph key complete with glossary and photos in the hopes farmers would be able to distinguish some important species. The main differentiation that needs to be made, is between Clearwing (*Camnula pellucida*), and other pest species, because Clearwings are unlikely to feed on any non-grass crops, whereas most other species are more generalist. The predominant species present in the problem areas were Two-striped (*Melanoplus bivittatus*) and Migratory (*Melanoplus sanguinipes*). Grasshopper monitoring efforts will be improved during the 2015 season to provide more accurate/useful long-term population data and will include periodic sweep samples across multiple sites, as well as late season egg counts.

In early-mid July, a Canola sweep survey was performed in conjunction with AAFC who sent staff to assist with sample collection. The results from the 206 sites sampled across the BC and Alberta Peace were compiled into a report by Jennifer Otani. The primary goal of the survey was to verify the absence of Cabbage Seedpod Weevil, but in addition, data for 15 other species of arthropods was gathered from the samples, including parasitoids and other important natural enemies. This data is available from http://www.peaceforageseed.ca/ and other sources.

Insects were by far responsible for most pest problems during the 2014 season, but pathology and weed sampling was also carried out to try and get an idea of their distribution in the BC Peace.

Pathology and Weed Monitoring

Pathology and weed monitoring was carried out in the form of late season surveys, and notes taken throughout field monitoring at and around cooperator insect monitoring sites. Efforts suffered from a lack of organized, established protocols which are so well characterized for insects. However, using advice from AAFC scientists, important crops and pathogens were identified as focus systems for our area, and survey protocols were designed based off these. Weed surveys were adapted from a 2009-2010 protocol followed in Alberta by the provincial and federal governments.

The pathology surveys were carried out in barley and canola, but disease was almost completely absent from every field. There were trace levels of smut in barley, and trace levels of root rot in both canola and barley. Soil samples sent to the BC plant health lab were tested with PCR methods and found no clubroot across the region, so it seems this important disease is still restricted to parts of the prairies, the nearest being around Edmonton, Alberta. The predominantly hot, dry conditions usually make for low disease years, and high insect years, as was the case this season.

The barley survey was carried out in early August and consisted of 9 fields across the region. At each site, 10 plants were pulled from each of 5 sub-sites for a total of 50 plants per field. These plants were processed in the lab for diseases flagged as important by AAFC and included: Net Blotch, Stripe Rust, Scald, Smut, Take-all, and Common Root Rot. Stripe rust was found in Beaverlodge, Alberta in a few fields, but was not recovered in the BC Peace.

Canola disease surveys were carried out later, in mid-August, and plants were collected from the 5 insect monitoring sites. Five plants were collected from each of 5 sub-sites at a field, for a total of 25 plants per field. These were returned to the lab and assessed for similarly determined “important” canola diseases including: Blackleg, Sclerotinia, Alternaria, Fusarium Wilt, Aster Yellows, Foot Rot and Brown Girdling Root Rot. A challenge with assessing disease when it isn’t present in a field, is that many pathogens, like *Sclerotinia* and *Alternaria*, are ubiquitous in the environment, so culturing plant samples in the lab usually recovers them, but it’s hard to assess risk levels based off this. As such, the more relevant information regarding pathogens is whether or not they caused disease at a site, so next season this will be the focus of all pathology surveys.

Weed surveys were carried out as requested by the Peace Region Forage Seed Association (PRFSA), though difficulties contacting cooperators with the desired fescue crops resulted in only 3 out of 5 fields visited being assessed. The protocol consisted of all weeds being identified and quantified in five ¼m sub-sites per field. Weeds not noted in the quadrats but along the survey path were recorded as trace. Foxtail barley, an weed especially important in forage seed production, was often present throughout the fields sampled, whereas Canada thistle was usually present in ditches or along field edges when observed.

Outreach and Communications (adapted from interim report)

I have produced summaries throughout the season when an issue was identified that growers might need information about. These information bulletins would tell growers what pests/disease to watch out for at a given crop stage/time of year, and how they can identify and deal with it. They also included links to AAFC pest monitoring updates from the prairies, and links to agricultural websites with further information. These were shared by email with AAFC researchers, BCGPA/PRFSA members, growers, and agronomists from various industry groups. PRFSA also posted them on their website.

I also gave a radio interview with CBC, and an interview with the Alaska Highway newspaper to relay information about the grasshopper outbreak observed this year.

A twitter account was created for the project which now has 39 followers from the region and across the prairies and follows 44 other users. The aim with this was to give quick updates on current undertakings, or brief updates regarding information in the summaries I produced and emailed. It allows me to track issues other pest monitoring professionals are noticing in nearby areas, and allows me to give more exposure to the project.

I participated in both the PRFSA and BCGPA field days where I provided informational presentations on the more relevant pests for each group. I created handouts that summarized what I talked about and filled participants in on what I was monitoring. I also gave presentations at their AGMs this winter to summarize my findings from the season. The annual Western Forum on Pest Management meeting in Saskatoon was also attended, and allowed me an opportunity to inform professionals from AAFC and growers associations across the prairies about the BC Peace pest monitoring project. They provided feedback and support during the meeting and will continue to do so throughout next season. This meeting also allowed for discussion of revisions to various protocols we employed for insect monitoring.

Final Notes (from interim report)

This project has gathered a large amount of data on pests and beneficials in the region which should provide insight into which specific areas can expect which pests in future years. This, along with the highly accurate weather data collected, will allow the agriculture sector to better prepare for any potential outbreaks in coming years. It can also prove to be useful in assessing how pests biologies might change in our region compared to the better characterized prairie regions. Crucially, this project has shown certain devastating pests, namely Swede Midge, Cabbage Seedpod Weevil, and Clubroot, still seem to be absent from the region, and this is useful twofold: it gives peace of mind to the producers in the region and assures them they are still safe to practice agriculture as previously without worrying about shifting rotations or added cultural/chemical control costs, and it could also help with marketing the region as a strong agricultural area.

Section 1: Report on Progress (Continued)

	Activities		Status	
Due Date	**Proposed**	**Delivered** (***Please add comments if necessary***)	**In Progress**	**Complete**
June 2014	Establish producer cooperator sites			**X**
June 2014	Establish field monitoring equipment as per provided protocols			**X**
July 2014	Seek and schedule training from AAFC Collaborators, BC Ministry of Agriculture and/or BC Grain Producer Association staff	AAFC training in weeds/pathology techniques		**X**
Oct 31,2014	Collect weekly, bi-monthly, monthly and/or annual data for insects, weeds, diseases as per protocols			**X**
Oct 31,2014	Process and enter data as it is generated			**X**
Oct 31,2014	Respond to *emerging* insect, weed and pathological field crop pest issues	Ongoing in year 2- grasshopper issue responded to, wheat midge, swede midge, and clubroot are ongoing emerging issues being proactively monitored.	**X**	
Oct 31,2014	Record seasonal temperature/ RH/ precipitation data	Ongoing throughout the winter at 4 sites.		**X**
Oct 31,2014	Summarize data and generate weekly textual summary for AAFC experts (to support monitoring protocols)			**X**
Oct 31,2014	Transfer monitoring and surveillance data/samples to/from AAFC			**X**
On-going	Undertake communication to share findings with producers including: o Textual summaries for distribution o Oral/poster presentations at winter grower meetings o Generate annual report	Have provided summaries/presentations for producer field days, radio, and news. Annual report generated, and summaries provided at grower meetings (BCGPA and PRFSA)- Spring updates for producers in year 2 ongoing.	X	
On-going	Represent the BC Peace at regional/national meetings/conferences (as possible)	Attended Prairie-wide agricultural pest conference in Saskatoon this winter and was able to present the project to scientists and professionals from across Canada.	X	

	Project Deliverables		Status	
Due Date	**Proposed**	**Delivered** (***Please add comments if necessary***)	**In Progress**	**Complete**
June 2014	Producer-co-operator sites			**X**
June 2014	Field monitoring equipment (as per provided protocols)	Procured as per recommendations from experts.		**X**
Oct 31,2014	Monitoring samples and data for prioritized pest, weeds, diseases	Samples have all now been collected and processed, data has been updated and is current for samples collected.		**X**
March 31,2015	Weather monitoring data	Weather monitoring is ongoing throughout the fall/winter. 2014 data all accounted for.	X	
March 31,2015	Summaries of monitoring findings - communications to government and industry regarding monitoring	Summaries have been shared with growers, and the industry through online updates. The data has also been given/used by AAFC to generate further communications through risk maps for some insects (wheat midge, grasshopper). This is ongoing across seasons and throughout the winter.	X	
December 2014	Data entry into AAFC databases	All data has been transferred. Weather data has been transferred and will be transferred for winter data this summer.	X	
On-going	Posters and/or presentations	4 presentations have been given, final summary posters still in the works (for presentation in 2015). Final reports have been completed.	X	

	Qualitative Performance Indicators	
Timeframe	**Proposed**	**Result (please include brief comments)**
Near-term	On the ground monitoring of economically significant pests, pathogens and weeds (in the BC Peace)	**Insect pest monitoring efforts were highly successful, pathogen monitoring was also successful but will be revised for next year- discussion ongoing. Weed monitoring needs to be revised and particularly interested parties are being consulted to provide a more desired dataset next year. Weeds of particular importance for the region were identified and documented however. PRFSA is involved in new spring training initiatives.**
Near-term	Availability to producers of the monitoring information of monitoring data	**Producers were provided with email updates and will have access to the final report data through cooperator websites.**
Near-term	Improved local capacity and expertise to monitor pests, pathogens and weeds	**Knowledge-base improved by creating producer-usable identification keys for significant pests in the region (grasshoppers), and the contractor gained valuable experience that will add to future efforts.**
Near-term	Improved linkages with AAFC experts and data processing opportunities	**AAFC has been involved deeply with training, as well as data management and processing. They've provided personnel and processing space throughout the season/winter.**
Medium to long-term	On-going monitoring of BC Peace (economically significant) pests, pathogens and weeds	**Region specific datasheets, protocols, and collection templates have been established which will ensure this can continue.**
Medium to long-term	Long-term capacity to monitor changes in distribution and prevalence of pests, pathogens, weeds	**Good baseline data collected on insects. With a lack of formal protocols for weeds and disease, collecting data was difficult. Surveys were adapted from some provincial protocols and future efforts have a good base to build on now.**

Quantitative Performance Indicators	
Indicator	**Result to date** (***please include a number and short description***)
Number of partners involved in project implementation	
Number of producer co-operators (sites at producer's operations)	6 co-operators, 11 full time sites, ~40 survey sites (1 time visit for various projects)
Number of presentations and number of participants at each presentation	4 public presentations- BCGPA field day:____ participants, BCGPA AGM ~50 participants, PRFSA meeting ~60 participants, PRFSA AGM ~35 participants.
Number of e-mail summaries and number of recipients on mailing list	8 summaries/43 recipients including co-operator organizations, producers and industry professionals.
Number of participants in project or at presentations who reported gaining new knowledge	**N/A** Next season will have developed a short survey to allow feedback to be given to me easily by participants.