



CLIMATE CHANGE ADAPTATION PROGRAM

Enhancing Information and Collaboration for Managing Emerging Pests

Final Report

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Enhancing Information and Collaboration for Managing Emerging Pests

Final Report

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Overview

In 2014-2015, the *Fraser Valley Adaptation Strategies* planning process brought together the Fraser Valley's agricultural producers and local and provincial government partners to evaluate climate change impacts on local agricultural production, and to develop strategies and actions to address the associated challenges.

During 2016, a project was implemented to accomplish the identified priority action to undertake "an assessment of immediate and near-term [pest] threats to the sector." Initiated in 2017, this project builds on the completed assessment by addressing additional actions including strengthening partnerships and collaboration to improve pest monitoring and management, and increasing the availability of "effective informational materials for producers for pest identification, management and control options." (Climate Action Initiative 2015, pp. 26) As the climate changes, regional weather patterns are shifting (Beddington *et al.* 2012; Vermeulen *et al.* 2012), altering the growing conditions and creating the potential for changing population patterns of agricultural pests across the Fraser Valley (Climate Action Initiative 2015). This is likely to make some pests more challenging to manage, and proactive planning and action are needed across the agricultural sector.

The 2016 assessment developed an inventory that documented pest-related activities in the Fraser Valley, as well as perceived pest threats across 30 agricultural commodities. This resulted in documentation of over 300 pest-related projects that have been conducted in the Fraser Valley over the past five years. Interviews with specialists, growers and producers helped to identify priority pests of concern, particularly those perceived as having a changing presence in the Fraser Valley. Following the completion of the inventory, results were shared through a cross-commodity workshop in December 2016 which also enabled pest specialists and leaders from across the agriculture sector to share priorities and acknowledge common goals.

The project summarized through this report moved forward with several next steps to encourage cross-sector connections and to apply the information gathered in the 2016 inventory. The project analyzed inventory results to prioritize near-term pest threats and their associated management challenges. This enabled the selection of particular pests and management topics as a focus for fact sheets and additional strategic planning. The catalogue of pest-related projects created in 2016 was updated, ensuring it provides an accurate list of projects completed and underway (to facilitate linkages and avoid unnecessary repetition of research).

Two focus groups held in 2017 brought together relevant individuals to define actions needed to address specific pests of concern (spotted wing drosophila and helminths). These sessions encouraged participants to define initiatives to enhance monitoring, management, research, or education related to the pest of concern. A cross-commodity workshop was held in December

2017 to share overall project results, to continue to strengthen the focus on common solutions, and provide an opportunity for networking.

The analysis of the Fraser Valley Pest Assessment Inventory has allowed for development of new knowledge transfer resources (seven fact sheets) as well as the initiation of more focused strategic collaboration. This project is not an end point, but a starting point for a shared approach to addressing the challenges of emerging pest threats in the Fraser Valley. Through analysis, outreach and collaboration the two completed projects provide a foundation for a cohesive and coordinated approach to shared pest threats.

Project objectives

1. Analyse 2016 inventory to identify pest (animal, plant and disease) priorities.
2. Develop fact sheets for several pests or pest groups that are identified as high priority from Objective 1.
3. Update project list from 2016 inventory.
4. Plan and implement two group sessions focused on developing short and long-term solutions for monitoring, management, education or research of specific pests identified in Objective 1.
5. Plan and implement a cross-commodity workshop to foster collaboration and communicate project findings.

1. Pest analysis

An analysis of the pest priorities for the Fraser Valley region was undertaken to evaluate and condense the wealth of information in the 2016 Fraser Valley Pest Assessment Inventory. The following categories were created to determine which pests (including plants, diseases, insects and other animal pests), to prioritize for near-term action:

- Pests with a potential for cross-commodity research
- Pests of highest concern to multiple commodities
- Pests affecting just one commodity
- Emerging pests
- Shortlist of pests for fact sheets

Currently, some individual commodity groups create an annual pest priority list to define their areas of focus for research each growing season. Through the broader 2016 inventory, the priorities of individual commodity groups were documented, allowing for similarities and differences to be assessed. For example, “generalist” pests such as thrips (insect) and powdery mildew (disease) are of high concern to multiple commodities while other pests, such as dearness scale (insect), only affect one commodity (cranberries) and therefore are not a candidate for collaborative action.

For pests with potential for cross-commodity action, the projects undertaken to date were compared with specific areas of concern mentioned during interviews. This enabled the

identification of gaps, providing direction for future research. It is hoped that this information will be used by both commodity associations and researchers to identify collaborative opportunities, as well as near-term industry needs for pest research.

The list of emerging pests (i.e. “pests known to currently be present in the Fraser Valley but that are not yet widespread, and pests that are not believed to currently be present [but that may move into the region]”), will provide a valuable resource for producers and specialists, particularly as the climate shifts and the risk of these pests appearing or establishing in the Fraser Valley increases. This is an area of the analysis that will require regular updating.

Produced document: Scholefield J, Ma K, & Dessureault M. 2017. Fraser Valley Pest Assessment Inventory – Pest Analysis.

2. Pest fact sheets

As part of the pest analysis, a shortlist of pests for which producers required more or new information was created (Table 1). Pests were included in the shortlist if they appeared within multiple categories of the pest analysis. Some additional pests were prioritized based on input from the project oversight committee and select experts. A total of six fact sheets were developed, one for each of the top priority pests (Table 1). Since it was not possible (within the project scope) to develop a fact sheet for every pest on the shortlist, the list also points to gaps where additional informational resources are still required.

Table 1. Shortlist of potential pests for fact sheets, with selected pests shown in bold, along with the associated fact sheet title.

Pest	Fact sheet areas of focus
Brown marmorated stink bug	
Darkling beetle	General information and management, including an IPM approach
Dearness scale	
Helminths in livestock	<i>No fact sheet, but addressed in focus group</i>
Himalayan blackberry	Identification and management (included in Important agricultural weeds fact sheet)
Hops downy mildew	Monitoring and management
Important agricultural weeds	Best management practices for herbicide use, specific information for lambs’ quarter, redroot pigweed, tansy ragwort, Himalayan blackberry, and yellow nutsedge
Nematodes and associated viruses in vegetable crops	
Spotted wing drosophila	Management timeline, details and resources <i>Also addressed in a focus group session</i>
Thrips	
Weevils	Fact sheet 1: Prevention, monitoring and management in berry crops Fact sheet 2: Prevention, monitoring and management in nursery & floriculture
Western corn rootworm	Damage, risk factors and management
Wireworms	

A fact sheet distribution plan was created, focusing on existing communication channels used by producers and commodity to share or access information. For example, most commodities have email listservs, some have regular in-person meetings, and many producers get information from local experts. Using existing mechanisms will allow fact sheet distribution to be targeted via the preferred channels and therefore to reach as many producers as possible.

Produced documents: Pest fact sheets – developed by E.S. Cropconsult Ltd. with reviews from identified experts and the project oversight committee.

3. Project list update

To update the project list (for 2017) emails were sent to all researchers who were interviewed and/or contributed to the project list in the 2016 inventory. A total of 42 projects were added to the list, and a further 16 previously-listed projects were updated to reflect extensions in project duration. Known pest-related research activities based in the Fraser Valley in 2017 encompassed 19 commodities and 26 pests. The extent of this update indicates the value of an annual update process to ensure that the resource remains up-to-date and relevant.

Produced document: Fraser Valley Pest Assessment project list 2017.

4. Focus group sessions

The pest inventory analysis also helped to identify two pests, or pest groups, for a more focused strategic planning process. The two pests selected were spotted wing drosophila (SWD) in berry crops, and helminths in livestock. The criteria for selection included the potential for collaboration (across multiple sector groups and agencies) and the apparent extent of need for strategic action. To initiate a strategic planning approach, two focus groups were planned and delivered – with invitations issued to key individuals involved with the relevant commodities and key government and private sector specialists.

For the selected pests, the objectives of the focus group sessions were:

1. Share the latest local knowledge and research about management of the selected pest in a changing climate.
2. Identify local challenges to more effective and efficient pest management and control.
3. Identify and prioritize potential opportunities to address local pest management challenges.
4. Outline a collaborative action plan to improve pest management in the Fraser Valley.

Working with the contracted project team, a professional facilitator, Tim Wilson, developed the agenda and outline for each session, and facilitated discussion during the focus group sessions. A decision matrix approach, designed by Tim Wilson, was used to select top solutions for the identified pest management challenges. Immediate next steps and responsibilities were then outlined for these selected initiatives. Following each session, a brief report was distributed to attendees. Key outcomes from the two focus group sessions are reported below.

Focus group session #1: Spotted wing drosophila in berry crops

Thirteen people attended from various groups and agencies including government specialists, private consultants and researchers, university and government researchers, growers, and grower association representatives.

Three solutions were identified by participants and next steps have been taken to move these forward. Further details are in Appendix C: Outcomes from SWD focus group.

1. *Implement next phase of regional-scale SWD trapping program*
2. *Produce outreach program and materials to promote SWD best management practices:* Since the focus group session, a meeting has been held to discuss next steps and a proposal is being circulated among interested participants. Improved management of the pest across the berry sector will positively impact all growers and could improve fruit quality for local and export markets.
3. *Develop region-wide strategy to manage non-crop host plants and habitats for SWD:* This solution was not discussed in detail at the focus group but was seen as important. It was discussed more fully at the cross-commodity workshop held in December, as it is also a concern for commodities not directly affected by SWD. Himalayan blackberry, an important SWD host, is an invasive weed of concern on both private and public land and therefore action will require multiple stakeholders in different industries. It will be important to identify shared values and benefits to controlling this weed, such as restoring and replacing blackberry hedgerows with beneficial species. The identified next steps were to put together a description of issues and possible solutions, and identify a small area with potential to conduct a pilot removal/rehabilitation project.

Of the returned feedback forms, all attendees indicated that the session had met or exceeded expectations, with 50% indicating that expectations were exceeded. Many participants felt that hearing the different perspectives on various issues was the most helpful outcome from the session.

Focus group session #2: Helminths in livestock

Eleven people attended this session representing four different commodities – sheep, goats, poultry, and beef cattle. Attendees included private and government veterinarians, producers, producer association representatives and industry specialists.

Some differences between commodities were identified, highlighting the challenges of working across a broad pest group (helminths) and across commodities with very different production methods, such as poultry and sheep. One broad solution was identified for this pest group and was of greatest importance to the representatives of the sheep and goat industries (Appendix D).

1. *Research into helminth distribution, prevalence, and/or management:* This was discussed further at the cross-commodity workshop and further details are reported in Appendix A and D.

All attendees who returned feedback forms indicated that the session either met or exceeded expectations, with 75% indicating that it exceeded expectations. A key challenge for these commodities is finding local people with the capacity and expertise to take initiatives forward.

Produced documents:

- i. Scholefield J, Yates D, & Wilson T. 2017. Outcomes from spotted wing drosophila focus group – October 27, 2017, plus appendix. *Also available in Appendix C of this report.*
- ii. Scholefield J, Yates D, & Wilson T. 2017. Outcomes from helminths focus group – November 17, 2017, plus appendix. *Also available in Appendix D of this report.*

5. Cross-commodity workshop

The workshop agenda was based on feedback received from a survey conducted with participants of a similar session held as part of the 2016 project. Sixteen responses were received to the survey which was distributed in September 2017. Most respondents indicated interest in the objective of developing knowledge and strategic approaches to pests of concern, as well as having an opportunity to network. As with the focus groups, the workshop agenda and structure of facilitated discussion were developed by Tim Wilson in collaboration with the contracted project team and oversight committee.

The objectives of the cross-commodity workshop were to:

1. Share and discuss the latest pest management knowledge gained from industry experience, applied research and project findings.
2. Develop collaborative action plans to advance key initiatives for improving pest monitoring, management and informational resources.

There were 33 attendees at the workshop representing over 20 different crop and livestock commodities in the Fraser Valley. The morning began with a presentation on the outcomes of project activities to date and an inspiring talk by an invited speaker (Melissa Tesche, Okanagan-Kootenay Sterile Insect Release Program). Breakout groups then discussed common issues and leading solutions in pest management across multiple sectors.

The final activity was selecting pests from a shortlist of pests anticipated to become more problematic with climate change, and developing strategic actions to address associated management challenges. The selected pests and outcomes of the discussion can be found in the workshop outcomes document (Appendix A).

Feedback from workshop participants was positive, with 96% of returned feedback forms stating that the workshop met or exceeded expectations - Met expectations (22%); Exceeded expectations (74%); Did not meet expectations (4%). The final activity of the workshop was to evaluate interest in participating in similar meetings on an ongoing basis. 96% of feedback form

respondents stated that they would attend similar meetings in the future. Other comments received through feedback included the appreciation for a unique opportunity to network with people from different commodities and to find common ground.

Produced document: Scholefield J, Yates D, & Wilson T. 2017. Outcomes from cross-commodity workshop – December 5, 2017, plus appendix. *Also available in Appendices A and B of this report.*

Conclusions and future directions

The multi-faceted approach used in this project enabled the information collected in the 2016 Fraser Valley Pest Assessment Inventory to be applied directly and to be further disseminated. The work completed in 2017 has identified several areas for potential future projects, including:

- Research areas of focus for specific pests of concern;
- Pests for which collaboration would be beneficial; and
- Pests that are “emerging” or expected in the Fraser Valley.

The fact sheets will provide straightforward, applied information to producers about problem pests. The momentum started in the focus groups and continued at the cross-commodity workshop is promising and encourages the use of this structure (of support for collaborative meetings and action) for addressing pest issues in the future.

The updating of the pest-related project list added 42 new research projects for 2017 and is a good indication that regular updates of this list will be useful in continuing to inform local researchers of recent, and on-going, pest-related research activities.

Finally, there was strong support for the continuation of an annual cross-commodity workshop. Sourcing funding and planning support for this will be an important next step. The opportunity provided to participants to come together and problem-solve common issues is unique, and with the continued threat of climate change and its unpredictable impacts it will be important to maintain, and strengthen, these links.

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Appendix A: Outcomes from Fraser Valley Pest Workshop – December 5th, 2017

Meeting objectives

1. Learn, share and discuss the latest pest management knowledge gained from industry experience, applied research and project findings.
2. Develop collaborative action plans to advance key initiatives for improving pest management.

Knowledge sharing

Presentations were provided by:

- Jen Scholefield (E.S. Cropconsult Ltd.) – project overview and outcomes
- Melissa Tesche (Okanagan-Kootenay Sterile Insect Release Program) - “Area-wide IPM in the Okanagan: The Sterile Insect Release Program”

Common issues and leading solutions

A list of common issues and related solutions for pest management across multiple sectors was generated as a tool to help guide solutions-oriented discussions at the workshop, and is a tool that can be used by groups/associations in future. A preliminary list was provided and discussed in break-out groups with additions being made where gaps were identified. A missing area under “Knowledge Transfer” involving public perception and education was added following discussion. In addition, a separate category, “Advocacy”, was added to the list as it was identified that improving recognition from politicians of the challenges facing agriculture is another way to generate activity and attention. Other small additions were made to existing issues and solutions (Appendix B).

Strategic planning for pests affected by climate change

The following pests were available to be voted on by participants. These were selected as they were of concern for multiple commodities and have been predicted to become increasingly impactful as the climate changes. In addition, pests that were previously addressed in focus groups were available for voting in case further planning was needed for those pests. Top ranked pests are indicated with ‘*’.

- **Helminths (livestock) ***
- **Himalayan blackberry ***
- **Horsetail ***
- **Powdery mildew ***
- **Spider mites ***
- **Spotted wing drosophila***
- Aphids
- Flies (livestock)
- Thrips

Helminths

Issues: This was an update following on from a focus group held for this pest on November 17th. Although discussions were focused on the Fraser Valley, it was decided that Helminths is a province-wide issue and making progress will be more successful at the provincial level.

Ongoing steps:

- Danielle Arnott (Langley Animal Clinic) is currently reaching out to associations and key industry people to identify needs and expertise.
- Heidi van Dokkumburg (goat producer/E.S. Cropconsult Ltd.) suggested that the University of the Fraser Valley may be interested in being involved; she will reach out to them.
- Susan Russel (sheep producer) will attempt to contact local vets to see what data they have.
- Plan to create an online document to track funding, updates, and ongoing efforts so that whole group has access.

Himalayan blackberry

Issues: This invasive weed is a concern on private and public land and therefore action will require multiple stakeholders in different industries. It is a host plant for pests, most noticeably spotted wing drosophila, which lays its eggs in ripe blackberries causing population increases. It will be important to identify shared values and benefits to removing it, such as restoring and replacing blackberry hedgerows with beneficial species.

Identified next steps:

- Put together description of issues and possible solutions, and identify a small area to conduct a pilot removal/rehabilitation project – Karina Sakalauskas (BCAGRI) and Emily MacNair (BCCAI), and maybe Dave Woodske (BCAGRI) to work on this. They plan to distribute a draft to the whole group by mid-February.
- Hold a targeted, small meeting in late February with key affected commodities to discuss project concept, interest and commitment for next steps.
- If successful, a follow-up meeting can be held to determine funding partners and feasibility/scope.

Spider mites

Issues: This is an established pest, but it continues to be challenging to manage and may become worse with increasing hot and dry summers. Growers do not trust current management tools or timing of recommendations. Additional tools for management are needed and existing tools require evaluation. Many commodities are impacted including hops, raspberries, strawberries, floriculture, and field vegetables, so it is a good pest for collaboration.

- There is some existing monitoring data from E.S. Cropconsult that can be used to look at spider mite populations in different crops. This could be used along with new data from other crops, depending on funding.

- Wim Van Herk (AAFC), Jen Scholefield and Allyson Mittelstaedt (E.S. Cropconsult Ltd.) to work on a proposal to try to get funding, possibility for a graduate student to do analysis.
- Will maintain connections with others in group to keep updated on progress.

Powdery mildew

Issues: Multiple commodities are affected, but each commodity is affected by a different species or strain. This makes it difficult to track the movement and spread of powdery mildew.

- Solution: weather-based model to focus on forecasting in specific crops.
- It is a well studied pest so can draw on that and identify gaps in local information. This makes securing funding more difficult, though – not cutting edge or exciting enough.
- Required skills: high level of knowledge on the pest, weather station access, ability to ground-truth in selected crops, modeling expertise to predict pest pressure, ability to host the tool in an effective place.
- Rishi Burlakoti (AAFC) to draft a proposal to be sent out to all people involved, with a long-term vision of a one stop access portal for weather and pest information.

Horsetail

Issue: This weed has been around for a long time and is a continuing challenge. Until recently, there was no local weed specialist who could help producers with improved weed management.

- Prevention is best. Avoiding the spread to “horsetail-free” fields is key.
- Jichul Bae is the new weed specialist at AAFC. This expertise has been lacking and this new addition will be useful to growers.
- On-farm demonstrations were suggested as a key way for growers to learn appropriate and effective techniques for weed management, including for horsetail.

Future pest management strategic planning

Following brief table discussions about how the workshop went, general support emerged for continued collaborative-style workshops to be held on an annual basis. In-person interactions and the ability to focus discussion on specific topics were valued. Ideas for future meetings included: increasing the amount of time for general networking, increasing the representation for certain sectors, and making space to focus on emerging pests.

We have received workshop evaluations from 28 participants, which will be reviewed in further detail to help guide potential future iterations of the pest management workshop. If you wish to provide any further feedback or suggestions to the project management team, please don't hesitate to contact us.

Appendix B: Common issues and leading solutions identified at Fraser Valley Pest Workshop – December 5th, 2017.

Table B1: Common issues and leading solutions in pest management across multiple commodities in the Fraser Valley. A previous version of this list was provided to workshop participants in advance of the event. Updates have been made following discussions and suggestions made during the Workshop.

Category	Issue	Solution
Knowledge Transfer	Core principles of integrated pest management missing from on-farm decision-making processes	Create outreach materials to improve grower/producer awareness and understanding of the principles of Integrated Pest Management (IPM)
	Existing education and outreach efforts with growers/producers have limited efficacy	Evaluate effectiveness of current methods and explore new methods of communication; explore ways to incentivise growers/producers to seek out good information
	Lack of connection between industry and research, including on-farm implementation of research findings and suitability of some research solutions for on-farm implementation	Improve current pathways and develop new ways to communicate researchers' and growers' needs to respective groups
	Much of the information available to growers/producers is not locally derived and/or does not come from unbiased, third-party sources	Increase awareness of conflicts of interest in grower/producer community and increase accessibility of unbiased, locally-relevant information for growers/producers
	Public perception of pest management is frequently incorrect e.g. public thresholds for pest damage too high	Continue to educate general public to improve understanding about agriculture and pest management e.g. superficial pest damage not hazardous, what it takes to keep plants pest free
Research	Small commodities lack resources/capacity for their own research initiatives	Identify synergies between larger and smaller commodities to enable collaboration for pest research; identify needs and priorities; support secure funding
	Most research occurs within commodities whereas pests move between them	Develop collaborative research proposals for pests that affect multiple commodities; can take place between regions or across borders

Category	Issue	Solution
Monitoring and surveillance	Need for more comprehensive pest data	With producer consent, create a shared data resource using data collected by private companies; could become a decision-aid tool for pest management
	Existing thresholds for management and impact of climate change on some pests not known due to a lack of existing data	Initiate monitoring/surveillance of key pests in region to inform management actions and provide a baseline for climate impacts
	Expect new pests to emerge as climate changes	Conduct surveillance for expected new/emerging pests
Operations	Registration of new products, or label expansion for existing products, is time-consuming and particularly challenging for small commodities	Share and create resources to improve knowledge and understanding of existing registration process for new products or label expansions
	Concern that pesticides are not applied in optimal way and in compliance with label	Evaluate spray methods and techniques to improve efficacy of existing products
Regional planning	Managing pests at the on-farm level not always enough to achieve adequate pest management	Implement pest management plans at the regional scale, rather than on-farm only
Advocacy	Lack of awareness in politics of the challenges facing agriculture due to climate change	Advocate to politicians for improved awareness of challenges facing agriculture due to climate change

Appendix C: Outcomes from SWD focus group – October 27, 2017

Proposed solutions

Following a general discussion of SWD challenges facing the berry sector in the Fraser Valley, participants confirmed and completed a list of potential solutions to address them (Table 1).

Table 1: Proposed solutions, associated category, and solution descriptions used in decision making for the spotted wing drosophila focus group.

Category	Solution	Solution Description
Coordinated management and planning	Develop region-wide strategy to manage non-crop host plants and habitats for SWD	Implement region-wide management strategy involving municipalities to help manage non-crop host plants and habitats for SWD (e.g. Himalayan blackberry management), including unmanaged berry fields.
	Coordinate management activities between growers at local level	Improve communication between neighbours to coordinate efforts in pest management (high SWD pressure in one field will impact neighbouring fields); unmanaged fields a rising concern.
Monitoring	Implement next phase of regional-scale SWD trapping program	Continue some form of regional-scale SWD trapping program to maintain local data on SWD pressure (pre-existing Area Wide SWD trapping program has just reached completion in 2017).
Research	Strengthen linkages with researchers to access funding	Collaborate with local researchers (gov't, post-secondary, private) to access funding sources and other research resources that haven't been explored as much in recent years.
	Explore and evaluate efficacy of non-chemical management tools	Explore efficacy of non-chemical management tools with emphasis on organic production: mass trapping and attracting methods, insect-plant deterrents (ex. mint row cover), reducing canopy moisture via pruning and row spacing, etc. Long-term research into biological controls is in progress.
	Survey and monitor SWD for resistance to pesticides	Spray options are limited (especially for certain export markets); there is a real risk of resistance developing to one or multiple products.
Operations	Expand labels for existing Canadian-registered products	Pool efforts to pursue label expansions for existing Canadian-registered products.
	Register organic and conventional products from USA	Work together to encourage registration of organic and conventional products from the US, in Canada.

Ranking of proposed solutions

Each solution was scored based on three criteria to decide which were most suitable to move forward with. In addition, attendees selected their preferred options for short and long-term solutions, as well as what they would prefer to focus on for the remainder of the meeting. These categories are described below, along with the three top-ranked solutions for each and their associated score, with complete information available in the Appendix.

Usefulness: Would success in this area be of little help (1), or extremely helpful (5)?

1. Register organic and conventional products from USA (55)
2. Expand labels for existing Canadian-registered products (54)
3. Develop region-wide strategy to manage non-crop host plants and habitats for SWD (53)

Commonality: In your opinion, would this help only a few Growers (1), or almost all Growers (5)? Also consider diversity of production types (organic, conventional).

1. Register organic and conventional products from USA (55)
2. Expand labels for existing Canadian-registered products (54)
3. Develop region-wide strategy to manage non-crop host plants and habitats for SWD (50)
3. Create links to with researchers to access funding (50)
3. Explore and evaluate efficacy of non-chemical management tools (50)

Feasibility: In your opinion, would this be very difficult to implement (1), or fairly straightforward to implement (5)?

1. Regional-scale SWD trapping program (51)
2. Produce outreach program and materials to promote SWD management practices (46)
2. Develop simple and consolidated web platform to access SWD knowledge (46)

In addition to ranking criteria, participants identified preferred solutions with short-term or long-term time-frames, as well as those that they wished to focus more on during the session.

Short-term: Identify and rank the Top 3 solutions that you think are worth pursuing in the next year.

1. Expand labels for existing Canadian-registered products (22)
2. Regional-scale SWD trapping program (13)
3. Produce outreach program and materials to promote SWD management practices (7)

Long-term: Identify and rank the Top 3 solutions that you think are worth developing over the long term.

1. Register organic and conventional products from USA (14)
1. Explore and evaluate efficacy of non-chemical management tools (14)
2. Develop region-wide strategy to manage non-crop host plants and habitats for SWD (8)
2. SWD management certification program (8)

Session focus: Identify and rank the Top 3 solutions that you would like to focus on today (top four solutions shown).

1. Expand labels for existing Canadian-registered products (13)
2. Regional-scale SWD trapping program (12)
3. Produce outreach program and materials to promote SWD management practices (10)
4. Develop region-wide strategy to manage non-crop host plants and habitats for SWD (8)

Following group discussion, it was decided that ‘Expand labels for existing Canadian-registered products’ was already receiving a lot of attention and resources and that little more could be done in this area. Therefore, it was agreed that time would be better spent working on other solutions which have had less effort and resourcing invested to date.

There was also interest expressed in ‘Develop a region-wide strategy to manage non-crop host plants and habitats for SWD’. While this solution was not pursued in subsequent discussion, people were interested in working with local partners on this as a potential future project.

Action planning – next steps

1) **Regional-scale SWD trapping program**

Champion: Tracy

Discussion points:

- Trapping between January and July most useful to track increase in SWD populations early in the season. However, if trapping is stopped at a given threshold (e.g. ten flies per trap), growers would lose information that would be useful for them to compare catches during harvest with prior to harvest.
- At this point, would not add any extra questions such as looking management of SWD during winter or spring months (e.g. mass trapping in hedgerows when population is low).
- Should ensure that temperature and relative humidity are also measured at the trapping site.

Immediate next steps: Tracy to draft proposal document and send to working group by November 17th. Working group to respond with feedback by December 1st.

2) **Knowledge transfer about SWD to growers**

Champion: Karina, with assistance from Grant and growers

Discussion points:

- How to generate incentive for growers to learn and/or adopt best management practices for SWD? Involving packing houses seems like a good option but how to get all packing houses to adopt the same standards and who would oversee this?
- Could this be done through the Environmental Farm Plan?
- There is a need to evaluate current methods of knowledge transfer and see if and how they can be improved. This could be a research project with a graduate student from UBC (Juli Carillo’s lab).

Immediate next steps: Juli to contact Karina with suitable graduate student(s) who may be able to do evaluation about current methods. Karina and/or Grant could come up with a proposal and distribute.

Appendix D: Outcomes from Helminths focus group – November 17, 2017

Background

Presentations were provided by Dr. Glenna McGregor (ruminants) and Dr. Victoria Bowes (poultry) to give background on relevant Helminths species and highlight some areas for attention. Some differences between the poultry and other livestock industries were acknowledged, both in terms of the biology and management of the pests and the ways that the industries are regulated. Similar challenges being faced by all industries included:

- Limited treatment options
- Organic farming/reluctance to use pharmaceuticals
- High stocking densities
- Poor access to good information/easy access to incorrect information online
- Extension resources lacking/less local government presence
- Not clear who could host and conduct livestock research, even if funding were mobilized

Proposed solutions

Following a general discussion of challenges related to helminths facing selected livestock sectors (sheep, goats, beef cattle, poultry) in the Fraser Valley, participants confirmed and completed a list of potential solutions to address them (Table 1).

Table 1: Identified issues, proposed solutions, and solution descriptions used in decision making for the helminths focus group.

Category	Issue	Solution	Solution Description
Monitoring	Concern that climate change is impacting helminth life cycle	Implement regional-scale helminths monitoring program	Select some farm sites (possibility for different livestock industries) and monitor at set time points through the year for a number of years. Important to ensure that management activities on each farm are recorded.
Research	Current species' distribution and abundance not well understood	Assess distribution and abundance of helminth species	Wide-spread surveillance of helminths at multiple sites in the Fraser Valley at a single time point. The goal here will be to gain a single snap shot of a wide range of industries and areas within the region.
	Current monitoring tools not well utilised by producers	Evaluate and improve current helminth monitoring tools	Work closely with local vets and labs to evaluate current monitoring practices and ways in which they can be made easier for producers and/or cheaper for labs.
	Lack of funding and personnel for research	Collaborate with researchers to access funding sources and personnel	Researchers can be based outside of the immediate region, if none are locally available. Likely need to contact universities that do livestock research and see if they have a graduate student that may be interested in a project on helminths.

Category	Issue	Solution	Solution Description
	Some helminth species may be resistant to available products	Investigate chemical resistance and its prevalence	Test for resistance to products in multiple helminths species, taking into account the formal definition of resistance in helminths. This goes along with monitoring.
Operations	Limited number of products available	Develop a strategy for new registrations for anthelmintics/ vaccines	Work together to find out what is needed to raise awareness and generate attention towards new registrations and products. Needs monitoring data and/or data on resistance to show that there is a need.
	Processing of samples in labs is too costly	Improve affordability of on-farm helminths monitoring	Is it feasible to reduce lab costs for livestock producers? What would this entail? What incentives and/or subsidies might be needed?
	Lack of local expertise in pasture management	Improve availability of pasture management planners in the Fraser Valley	Conduct a training session for individuals working in the livestock sector focused on pasture management to allow for improved availability of this service for producers. Bring in planners from other regions. This was something offered by BC Cattlemen's Association many years ago.
Knowledge Transfer	Lack of local information and extension about helminths management	Produce outreach materials to educate producers about helminths best management practices (BMP)	Educate producers using locally-produced materials (eg. as paper copies, or website) on helminth life cycle, on-farm monitoring options, management and treatment options, how to manage for resistance. Creating a contact list would help to implement this effectively.
		Hold a workshop series to educate producers and vets about helminths best management practices (BMP)	Workshops can be targeted specifically towards producers and vets of different commodities to allow for species-specific learning

Ranking of proposed solutions

Each solution was scored based on three criteria to decide which were most suitable to move forward with. In addition, attendees selected their preferred options for short and long-term solutions, as well as what they would prefer to focus on for the remainder of the meeting. These categories are described below, along with the three top-ranked solutions for each and their associated score, with complete information available in the Appendix.

Usefulness: Would success in this area be of little help (1), or extremely helpful (5)?

1. Produce outreach materials to educate producers about helminths BMP (51)
2. Hold a workshop series to educate producers and vets about helminths BMP (51)

3. Investigate chemical resistance and its prevalence (51)

Commonality: In your opinion, would this help only a few Producers (1), or almost all Producers (5)? Also consider diversity of production types.

1. Produce outreach materials to educate producers about helminths BMP (49)
2. Hold a workshop series to educate producers and vets about helminths BMP (48)
3. Investigate chemical resistance and its prevalence (48)

Feasibility: In your opinion, would this be very difficult to implement (1), or fairly straightforward to implement (5)?

1. Hold a workshop series to educate producers and vets about helminths BMP (47)
2. Produce outreach materials to educate producers about helminths BMP (45)
3. Improve availability of pasture management planners in the Fraser Valley (34)

In addition to ranking criteria, participants identified preferred solutions with short-term or long-term time-frames, as well as those that they wished to focus more on during the session.

Short-term: Identify and rank the Top 3 solutions that you think are worth pursuing in the next year.

1. Produce outreach materials to educate producers about helminths BMP (11)
2. Hold a workshop series to educate producers and vets about helminths BMP (10)
3. Investigate chemical resistance and its prevalence (9)

Long-term: Identify and rank the Top 3 solutions that you think are worth developing over the long term.

1. Implement a regional-scale helminths monitoring program (11)
2. Develop a strategy for new registrations for anthelmintics/vaccines (9)
3. Tie: Evaluate and improve current helminth monitoring tools (8); and Improve availability of pasture management planners in the Fraser Valley (8)

Session focus: Identify and rank the Top 3 solutions that you would like to focus on today (top four solutions shown).

1. Hold a workshop series to educate producers and vets about helminths BMP (13)
2. Produce outreach materials to educate producers about helminths BMP (11)
3. Evaluate and improve current helminth monitoring tools (8)

Following group discussion, it was decided that the knowledge transfer category had been addressed to some degree in the sheep industry with province-wide workshops held across two summers. There was a strong sentiment in the group to discuss research further, to address the lack of baseline information about the pest pressure and resistance within the Fraser Valley and

to take steps towards identifying individuals who could conduct the needed research. The poultry sector individuals elected to assist the rest of the participants with working towards a common solution, rather than work on a solution specific to the poultry sector.

Action planning – next steps

Objective: Create a document outlining research needs regarding collection of baseline data on helminths across interested industries

Next steps:

1. ES Cropconsult to communicate with Danielle (potential champion) to confirm willingness
2. Individuals to consult with associations/partners about research interests
3. Use the framework below to send a brief outline of research priorities to potential champion (to be confirmed) by December 2nd
4. Sub-group to meet at December 5th workshop to combine and pass information on to Samantha (BC Climate Action Initiative)
5. Samantha to present information to participants at regional climate adaptation meeting to source potential researchers and collaborators

Framework provided by email to participants following focus group:

1. List three things that you would like to know about helminths in your industry (e.g. current species' distribution and abundance). If you wish, use documents from Focus Group session to guide conversation.
2. Create three research questions to support the three 'issues' you have identified above.
3. What aspect of management does each question address?
4. If known, provide details of interested researchers and/or potential funding sources to initiate research.

Appendix

Please refer to separate appendix document for complete decision matrix outcomes.