RESEARCH PROJECT

Small Hive Beetles in BC

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Introduction

Imagine a world where you can't afford a cup of coffee every morning, where 52% of your fresh produce at the grocery store is unavailable, or beef, chicken and dairy is scarce. This is the possible reality the world faces with the decline of pollinators, especially the honey bee. With about "one third of all plants or plant products eaten by humans directly or indirectly dependent on bee pollination" (Spector, 2013), the great value of bees to help diversify our diet is astounding. For most people enjoying a cup of coffee is a daily ritual. However, "The coffee flower is only open for pollination for three or four days. If no insect happens by in that short window, the plant won't be pollinated." (Palmer, 2015).The California Almond Board, says, almonds "simply wouldn't exist." without pollination by bees (Palmer, 2015). Almond husks and other seeds are used as forage for cattle and chickens, without this food source their numbers would decrease causing a chain reaction of less beef, chickens, and dairy products. (ASAP Science, 2015).

In a dramatic demonstration on the effect of the loss of honeybees on fresh produce, the University Heights Whole Foods Market store "temporarily removed all produce that comes from plants dependent on pollinators. They pulled from shelves 237 of 453 products – 52 percent of the department's normal product mix" (PR Newswire, 2013).

Products removed included:

- Apples
- Onions
- Avocados
- Carrots
- Mangos

- Lemons
- Limes
- Honeydew
- Cantaloupe
- Zucchini
- Summer squash
- Eggplant
- Cucumbers
- Celery
- Green onions
- Cauliflower
- Leeks
- Bok choy
- Kale
- Broccoli
- Broccoli rabe
- Mustard greens

With the world facing the reality of declining bee populations, this issue affects every one of us. It will change the communities we live in and the economy as a whole. With food prices already on the rise due to climate change, the increased crop losses due to lack of pollination would be felt by society as a whole.

Bee populations are threatened by many factors here in British Columbia and around the world. When new threats emerge, bee keepers need to respond quickly to protect their bees and colonies. The possibility of a new major threat in BC is the Small Hive Beetle.

The Small Hive beetle *(Aethina tumida)*, a member of the sap beetle family *(Nitidulidae),* hails from Sub-Saharan Africa but has spread to several regions around the globe. It has become well established in many areas of the United States and Australia. First arriving in Canada in 2002, it is has been difficult for it to fully establish itself here due to climate, humidity, and environmental locations. It has been contained in Ontario since 2010 but appears to be slowly spreading in that region. The first recorded sighting of Small Hive Beetle (SHB) in BC was in August of 2015. The SHB adult beetle is dark reddish, brown-black, and completes metamorphosis from egg to adult in 21-94 days (Kozak, 2010). The most damage to honey bee colonies occurs during the larvae stage, where the beetle feeds on the developing stages of the bees, honey and pollen. Upon defecation by the SHB in the honey comb it destroys the honey causing it to ferment and spoil into a slimy, stinky, runny substance. Severe infestations can cause a weak colony to die or to abandon the hive causing significant economic repercussions to commercial bee keepers.

To be able to understand and manage this new pest in BC, this research project will attempt to address the following: What would be the most environmentally friendly, economical, and sustainable way for BC Bee keepers to control and manage the first recorded Small Hive Beetle (SHB) occurrence in BC?

Goals & Objectives

The goals and objectives of the research project will be to research current methods of management and control measure options for SHB; identify the economic cost of each method; any environmental impact each method might create; to collect data from Florida Bee keepers who currently deal with SHB and compare it to those measures used by BC Bee keepers to control the Varroa mite.

Rationale

The rationale behind this research is to compare methods currently in use against Small Hive Beetle with those used against the Varroa mite and to determine if similar methods would be beneficial to BC bee keepers should the Small hive beetle become established here.

The survey method of research will be the most effective for the project since the bee keepers used to collect data from are spread out over a very large area. By utilizing the internet and online surveys, it will capture a large sample size of the target market. By keeping the surveys to a maximum of 10 questions, it will encourage people to complete the survey, and not take up too much of their time.

By using two distinct areas for the survey, the researcher hopes to be able to compare the data by location and beekeeping practices.

These surveys will be directed through specific Bee Keeping Associations to ensure that only beekeepers in the chosen areas are contacted. The two groups to target are beekeepers in British Columbia and beekeepers in the southern United States, primarily Florida. Contact has been made with the president of the Florida Beekeeping Association, for help in distributing the online survey. For the BC beekeepers, contact has been made with the Ministry of Agriculture

apiary inspector for the Kootenay region (Axel Krause) and the provincial apiary inspector (Paul vanWesterndorp); and it is anticipated they will be able to help administer the survey through their contacts.

Background

To provide some insight a few definitions are provided for understanding of the honeybee, Varroa mite, and Small Hive Beetle.

Honeybee

The honey bee in Canada is the European/Western honeybee *(Apis mellifera).* Their pollination is responsible for "1 out of every 3 bites of food eaten and contribute approximately $2.2 billion to Canadian agriculture" (Croplife Canada, 2015). A social, and highly organized insect, the honey bee engages in a multitude of complex tasks such as communication, nest construction, environmental control, defense, and division of labour that are all based on chemical pheromones and dances that control these responsibilities (Penn State, 2007). A honey bee colony consists of a queen bee, worker bees, and drones, See Figure 1. (Photo from Honeybee Centre, 2013).

Figure 1

Varroa Mite

The biggest threat to the honeybee population at this time is the Varroa Mite, see Figure 2 (Photo from HBHC, 2015). An external parasite, the Varroa mite causes damage in 3 ways. First, they attach to the honeybee and transmit viruses (and other pathogens), second, they feed on the brood and adult bees, and lastly they cause physical damage to the hive and eventually if left unchecked will kill the entire colony. The Varroa mite is found on every continent except Australia and Antarctica.

Figure 2

Small Hive Beetle

The Small Hive beetle *(Aethina tumida)*, a member of the sap beetle family *(Nitidulidae),* hails from Sub-Saharan Africa but has spread to several regions around the globe. The SHB adult beetle is dark reddish, brown-black, and completes metamorphosis from egg to adult in 21-94 days, see Figure 3 (Kozak, 2010). The most damage to honey bee colonies occurs during the larvae stage, where the beetle feeds on the developing stages of the bees, honey and pollen. Upon defecation by the SHB in the honey comb it destroys the honey causing it to ferment and spoil into a slimy, stinky, runny substance. Severe infestations can cause a weak colony to die or to abandon the hive causing significant economic repercussions to commercial bee keepers.

Figure 3

Literature, Theories & Models

To address the question of "What would be the most environmentally friendly, economical, and sustainable way for BC Bee keepers to control and manage the first recorded Small Hive Beetle (SHB) occurrence in BC?" research into the current most destructive pest to honeybees, the Varroa Mite *(Varroa destructor)* was examined to determine what methods are being used to control this pest and whether they will be transferrable to the Small Hive Beetle (SHB).

Methods of Control

The current methods to attempt to control the Varroa mite are based around the bee population cycles as illustrated in Figure 4 (HBHS, 2015). They can be broken into the two main categories of Chemical Control Products and Non-Chemical Control products. Within Chemical Control, methods are divided again into Synthetic Chemicals, Essential Oils and Acids, see Figure 5 for full list.

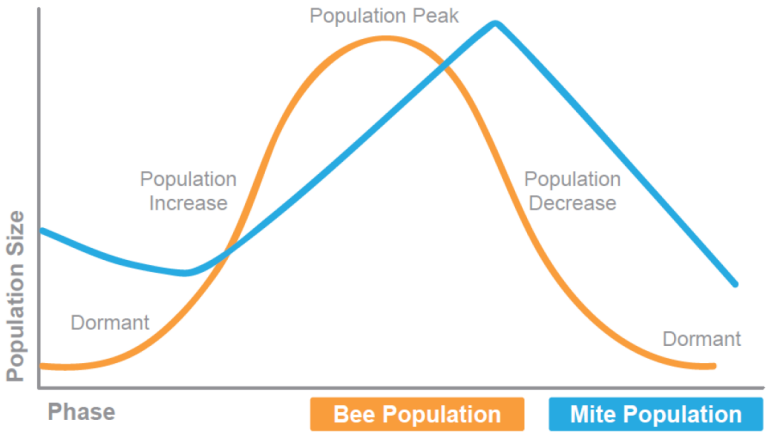

Figure 4

Research indicates that a proactive approach using different methods of control appears to be the most effective at minimizing population growth and damage of the mite. From compiling data from several sources, primarily Tools for Varroa Management: A Guide to effective Varroa sampling and control, HBHC, 2015; Recommendations for Honey Bee Diseases and Pests in Alberta 2014-2015, Nasr, Dr. M., 2015; and A new way of protecting bees against Varroa mites: The bee gate, Bayer Research,2012, the following methods of control are suggested for the four phases:

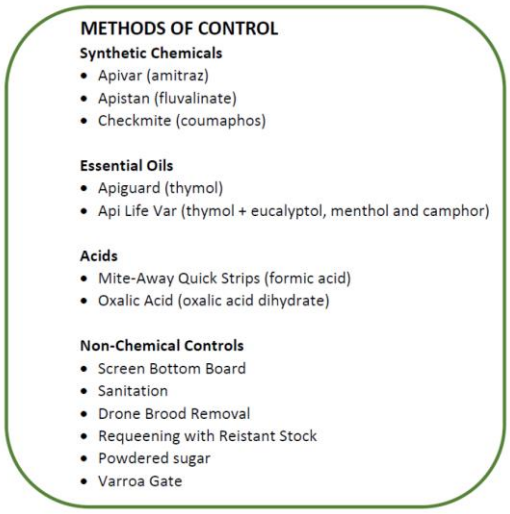

Figure 5

Dormant Phase

During the dormant phase the most effective option is to use oxalic acid in a fumigation method. Using Apiguard or Api Life Var or formic acid (Mite-away strips) can be moderately effective if temperatures remain at optimal ranges. The least effective method during this phase is the non-chemical approach of using a screen bottom board.

Population Increase

During the population increase phase Apivar, Apiguard or Api Life Var, Mite-Away strips or drone brood removal are highly effective options of control. Moderate options include Colony division, re-queening, and basic sanitation. Of least effectiveness is to use a screen bottom board, powdered sugar or mineral oils

Population Peak

Population peak is the phase where there is a period of nectar flow and commercial pollination services are offered. The most effective methods to control the mite include, Mite-Away strips, Apivar or Apiguard or Api Life Var (only if not producing honey). For moderate control beekeepers can try re-queening, division of the colony, or an oxalic acid drip. Using a screen board, or drone brood removal are of least effectiveness.

Population Decrease

This phase constitutes the post-honey harvest and the population begins to decrease to prepare for winter. Apivar, Mite-away strips, Apiguard or Api Life Var are likely to be most effective. While re-queening, dividing the colony or an oxalic acid drip can be moderately effective. CheckMite, Apistan, drone brood removal, screen bottom board and sanitation will be the least effective for beekeepers.

Conceptual Model

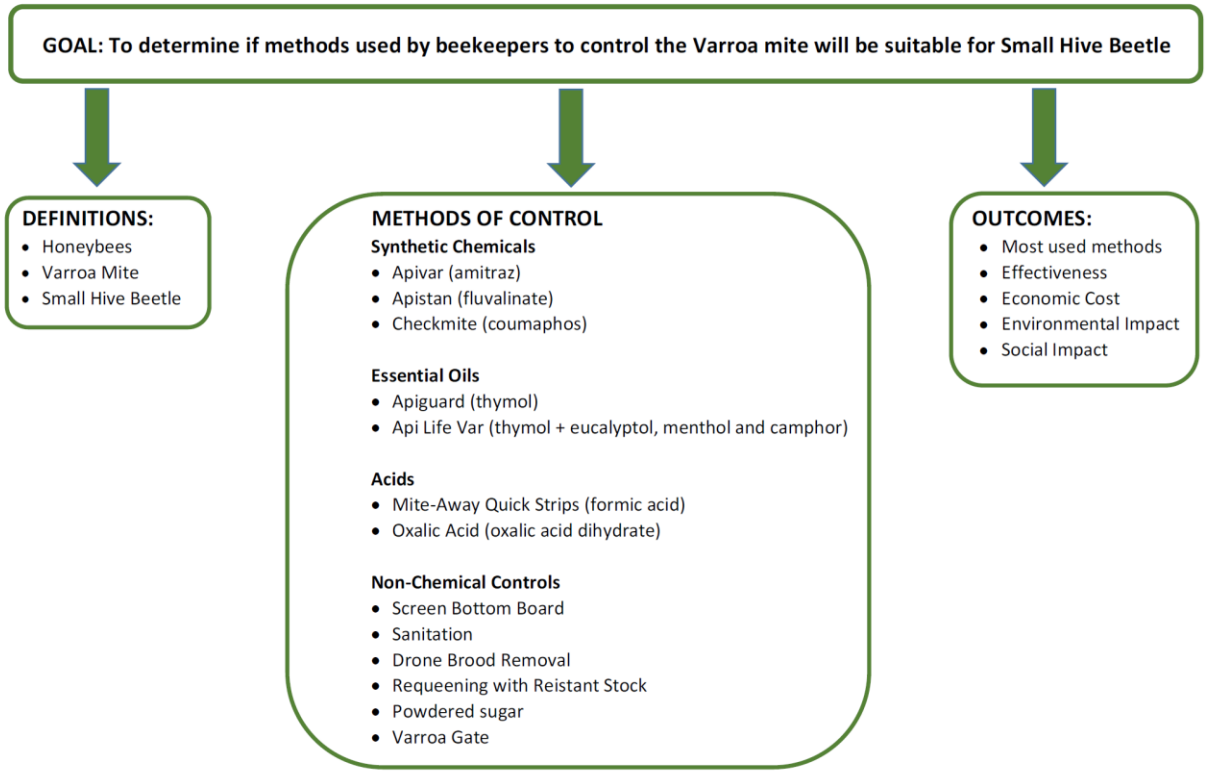

Figure 6

This conceptual model outlines what methods of control are currently being used to control the Varroa mite. Through further research and surveys with BC Beekeepers on their methods of controlling the Varroa mite, data will provide answers into what methods individuals use, the number of bee colonies they have, effectiveness of their control methods, the economic cost to use each method, environmental and social damage of using the methods (in particular synthetic chemicals and their build up in the environment). By analyzing this data and combining it with current methods of controlling Small Hive Beetle in other parts of the world, this research will provide a starting point for BC Beekeepers to examine what choices they can consider if the beetle becomes established.

Methods

The research method chosen will be an online survey via Survey Monkey (see Appendix A). One will be administered to beekeepers in areas affected by Small Hive Beetle (Southern United States) to determine the effect the beetle has had on their colonies, the effectiveness of treatment methods, and how they rate the beetle in terms of threat towards their hives compared to other pests.

The second survey will be directed at BC beekeepers, how they manage and control the Varroa Mite and how they believe the Small hive beetle will affect their beekeeping practices if it becomes established. Data from both surveys will be examined for any correlation between control, costs, and social or environmental impacts.

Informal interviews will also be conducted with bee keepers (either in person or via the telephone) to gain a rudimentary understanding of the bee keeping process and what issues and concerns are important to them and for networking to distribute the survey. Formal interviews if conducted will have interviewees sign a Consent form (see Appendix B) and the researcher has completed the Ethical Conduct for Research involving Humans course and Research Ethics Certificate (see Appendix C). Research into secondary data will be conducted using the internet to access information on beekeeping practices. A variety of articles and websites will be utilized to provide background information for the current research. A list of references will be included in the final report.

Findings

After distributing an online survey to bee keepers in Southern Florida and BC, the following data was compiled by using the responses from 36 BC participants and 20 Florida participants. Overall results (see Appendix D) will be utilized but often participants are separated into their specific geographic regions, or by individual response (see Appendix E). The overall experience levels of beekeepers was determined by their length of time in the field. The numbers appear comparable between the two areas (see Figure 7).

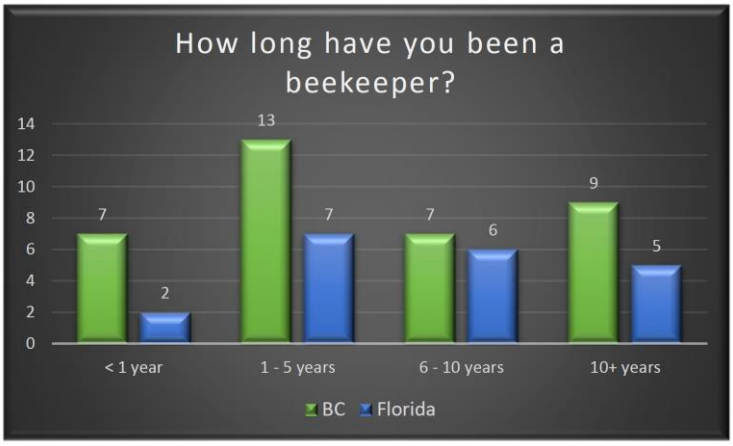

Figure 7

As shown in Figure 8, the number of bee colonies is similar and this paper will break these components apart into larger colonies (21 to >100) and smaller colonies (<20) to determine what control methods work best for each group.

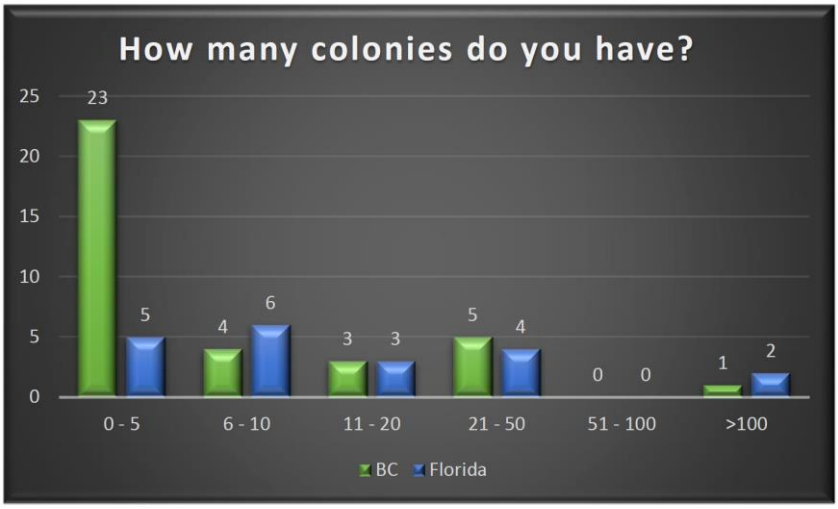

Figure 8

From the start, the difference between Florida and BC beekeepers is prevalent in the type of threats they feel are the most important to their bee health and colonies. As shown in Figure 9, the Varroa mite is the number one threat to both areas however, Florida ranks the Small Hive beetle as its second greatest threat, whereas BC ranks it in last place. This is indicative of the fact that Florida has been battling against the Small Hive Beetle for many years, and BC is yet to truly face it. If in fact it can become established in BC, this data indicates that it could rapidly become a great threat to the bee population in BC. A weighted average was used to calculate the numbers in Figure 9; using this ranking question, weights are applied in reverse, so the respondents' number one choice has the largest weight (in this chart a weight of 7) and the choice with the largest ranking average is the most preferred (Varroa Mite). For example, for BC beekeepers, 22 selected the Varroa mite as their number one threat, seven chose it as their second greatest threat, three in third, and one in sixth for a total of 33. The weighted average is calculated as follows: 7 x 22, 6 x 7, 5 x 3, 2 x 1 = 213/33 total = 6.45

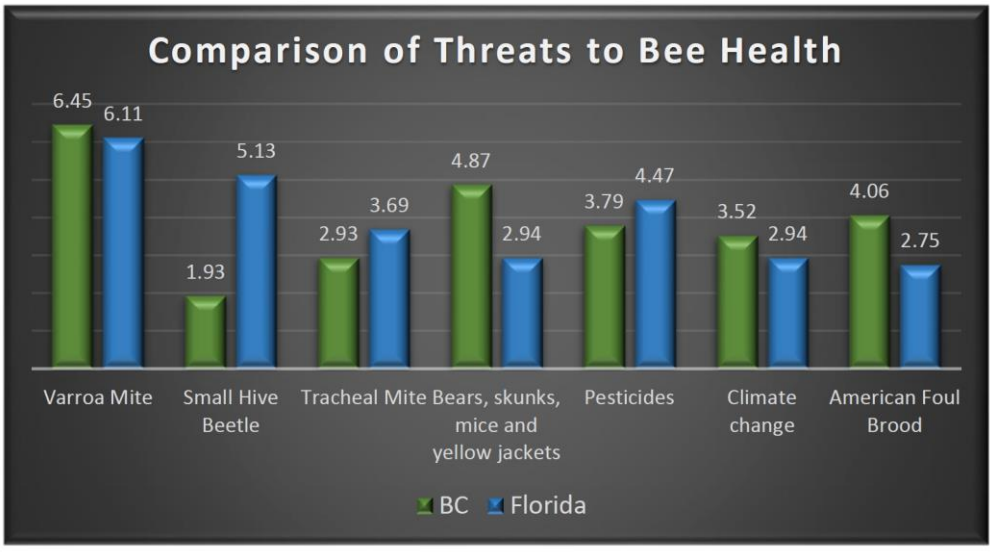

Figure 9

Current Methods of Control in BC and Florida

At the moment the most popular methods of control for BC and Florida bee keepers for each of the different phases (Winter, Spring, Summer, and Fall), is summarized in Figures 10 - 13. The two groups have almost identical practices. For all four phases the number one method chosen is a screen bottom board. In the Population Decrease Phase (Winter), both areas use Oxalic acid as their second choice but differ on the third; Florida uses Apivar and Sanitation whereas, BC uses powdered sugar.

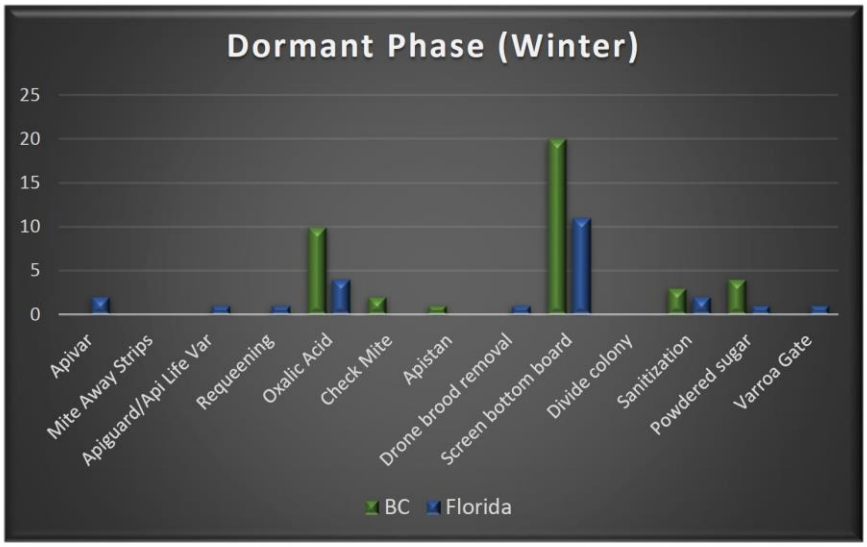

Figure 10

The Spring phase is identical for both areas with dividing the colony as their second choice and re-queening as the third.

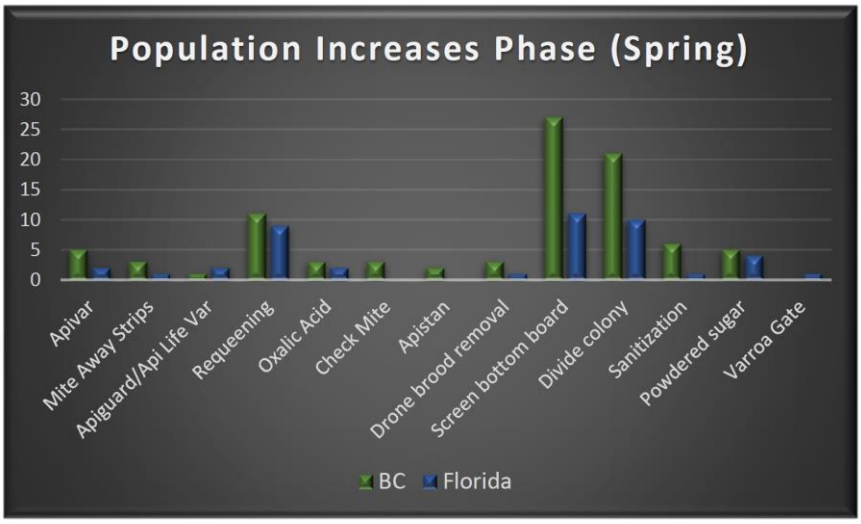

Figure 11

The Population Peak Phase shows the most differences in individual bee keepers and their location; Florida has a three-way tie for second choice with Apivar, Dividing the colony and powdered sugar, whereas BC chooses drone brood removal for its second choice and has a 3-way tie for its third choice of re-queening, dividing the colony and powdered sugar.

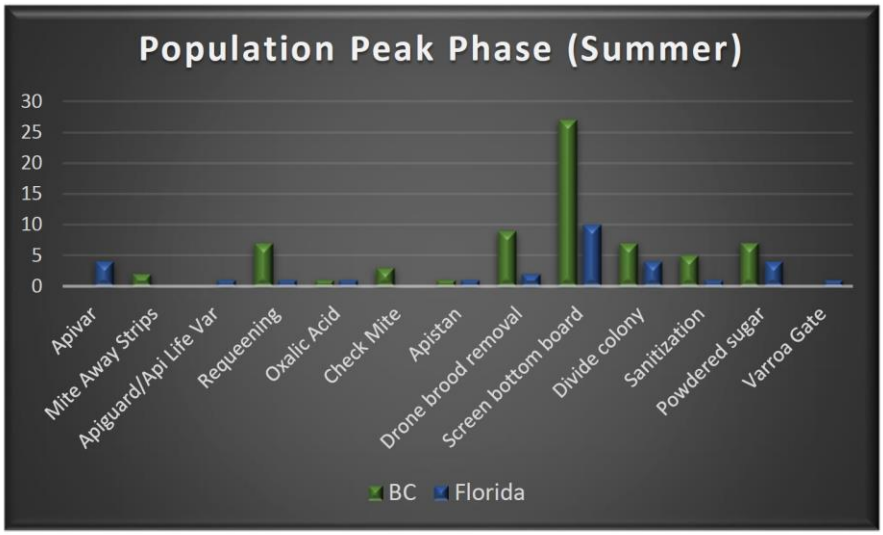

Figure 12

In the last phase of Fall, differences of re-queening in second place and Apivar in third for Florida, and in BC second choice is Oxalic acid and third is sanitization.

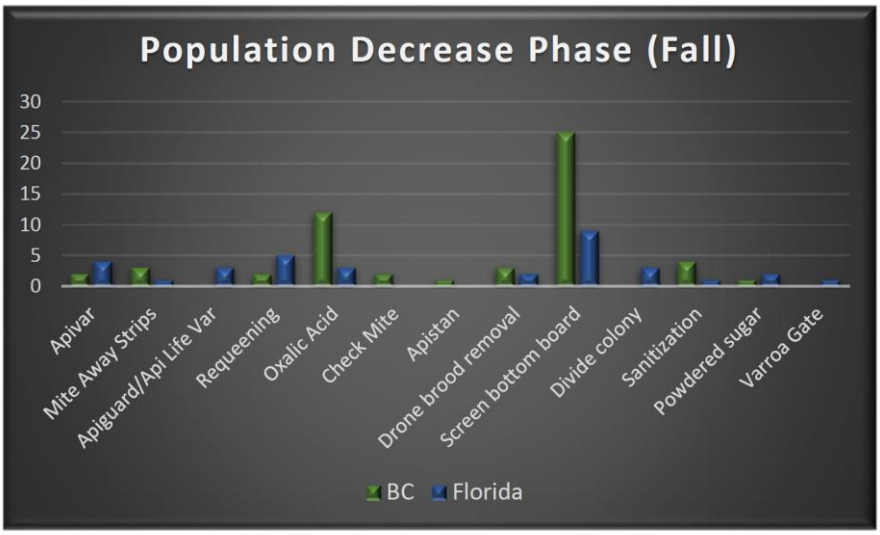

Figure 13

Economic Costs of Current Methods

To compare costs between the two geographic groups an analysis was done using a weighted average of all participant answers versus the total in each category with a division between Florida and BC. Figure 14 shows that as per the weighted average, the most expensive cost choice for BC is Apivar, whereas for Florida the biggest cost is re-queening. When comparing these results to the total in each category, it's clear that for BC the most chosen is screen bottom boards and for Florida Apivar takes the lead.

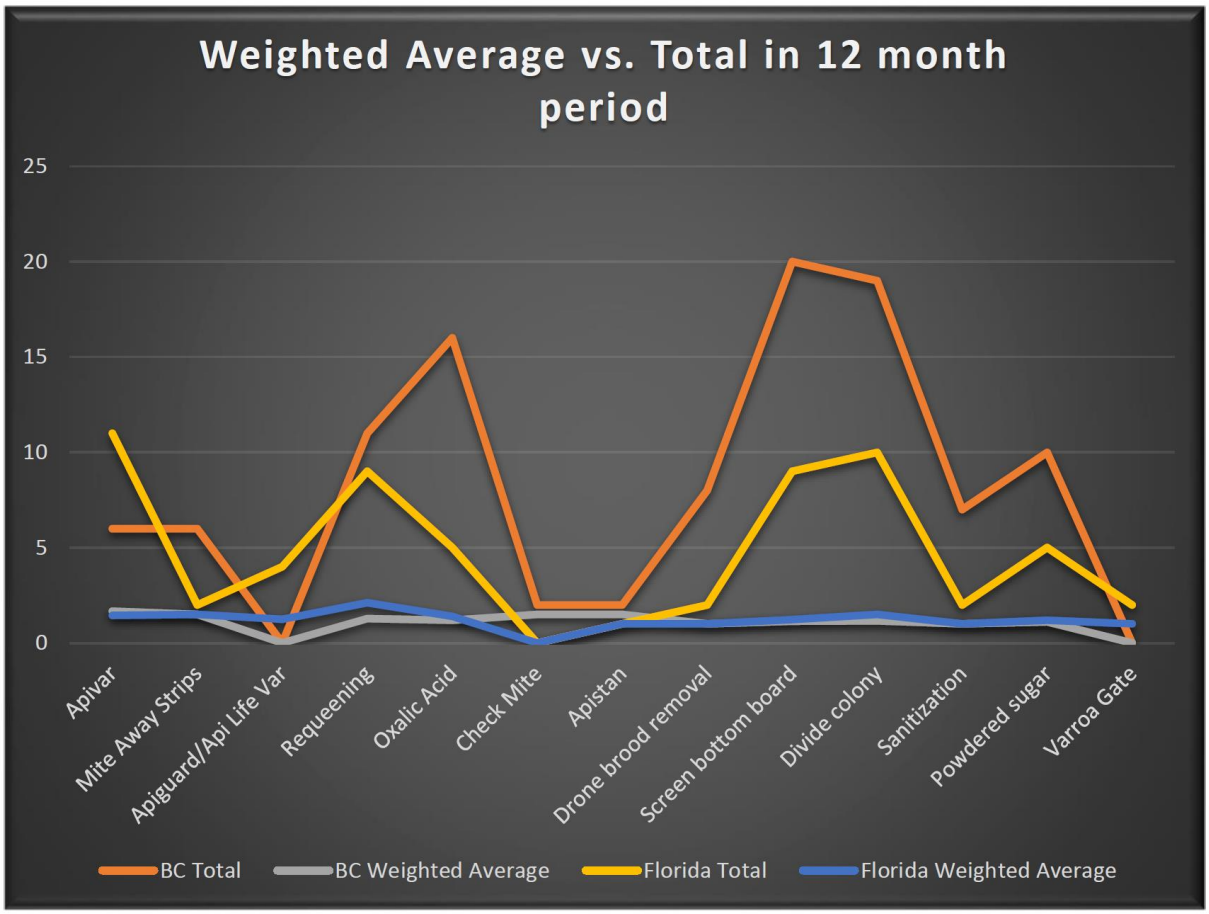

Figure 14

By further breaking down these results into subcategories of colony size, 1-5, 21-50 and >100, and approximate costs within a 12 month period, <$100, $100-$500, $501-$1000, and >$1000, Figures 15 - 17, illustrate that for Colony size 1-5 in BC and Florida the greatest cost is a tie between screen bottom boards and dividing the colony.

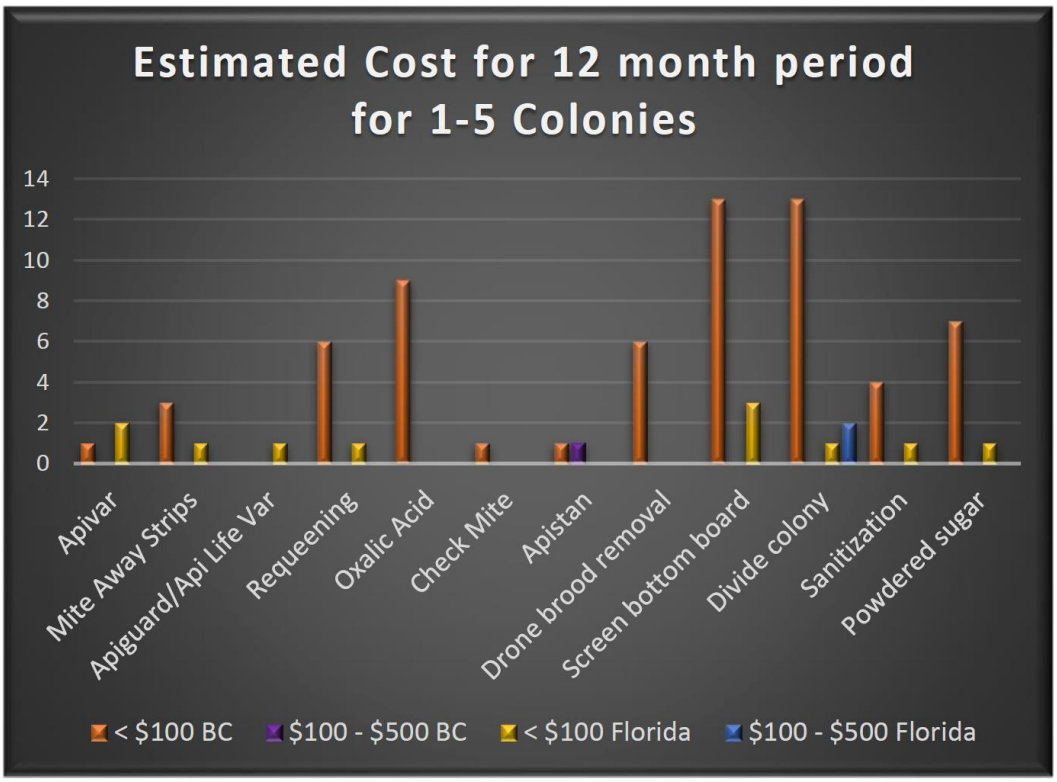

Figure 15

In Colony sizes from 21-50 in BC Apivar is the greatest cost and in Florida it's a tie between Apivar and re-queening.

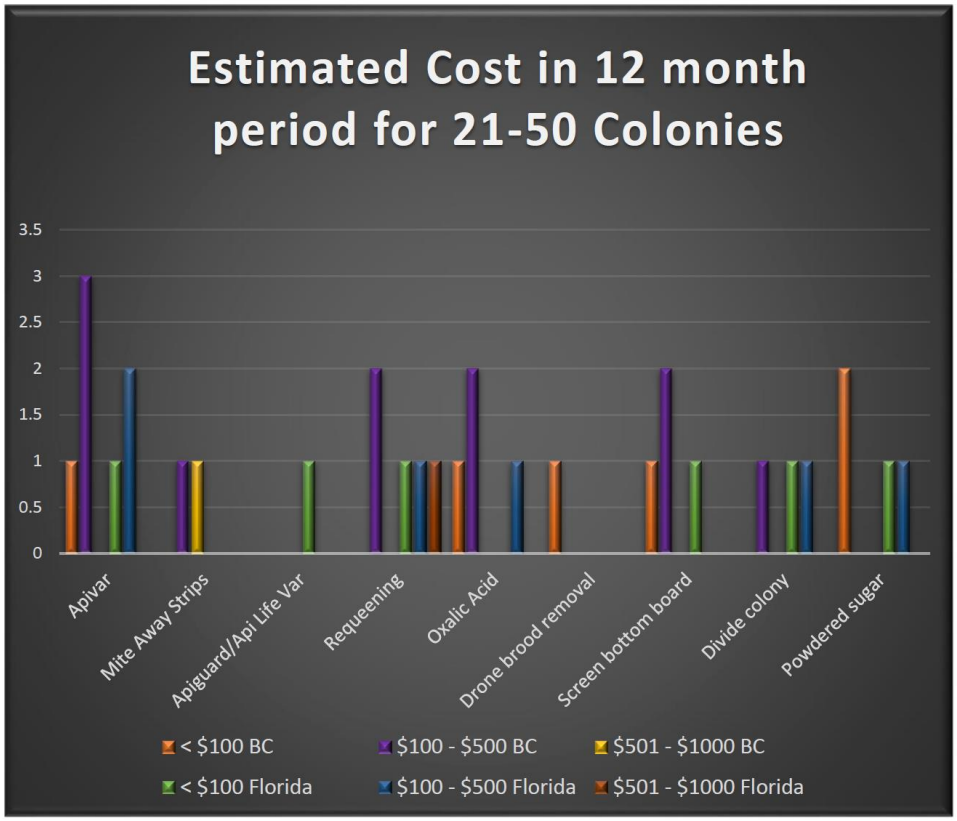

Figure 16

In Colony sizes of > 100 there are several differences. Florida uses Apivar, Mite away strips, Apiguard/Api Life Var, Drone brood removal, screen bottom boards, and the Varroa gate and BC uses none of these methods. In BC they use powdered sugar and Florida doesn't. All other methods are similar.

Figure 17

Importance of Methods Used

Out of the control methods used by beekeepers, five options were ranked according to how important it was to them. Some interesting differences were observed in this data between Florida and BC. The most obvious one was the Social Cost (ex. Concern for perceptions of using a specific method), in this category only one Florida participant felt this was an important issue and 9 believed it was not important. In BC, 14 participants believe it is important and only 8 felt it was not. In Florida 100% of participants believe that the "Effectiveness of Control Method" and "Sustainability of control method" is important but in BC only 89% and 94% respectively believe the same. Figure 18 shows the ranking of each of the five categories from most important (1) to least (5). The overall ranking results for Florida and BC were the same.

Importance of each option	
Effectiveness of control method	1
Sustainability of control method (will the continued use affect future generations of bees)	2
Potential environmental risks	3
Economic Cost	4
Social Cost (ex. Concern for perceptions of using a specific method)	5

Figure 18

Two open ended questions were asked of both bee keeping groups. The first was "For each of the 4 phases, please choose which methods of control you use." With the option of entering a response into an "Other" field if those choices listed didn't cover a method they use. Only 3 participants used this to enter other methods which were: beetle traps with veg. oil all year, hop-guard 2 (if needed during flow), and Hop-guard. This indicated to the researcher that the primary choices provided to the participants was accurate to describe the control methods used. The second question was "How many colonies have you lost this year? Please indicate the main reason for the loss". 15 respondents provided specific reasons with 6 indicating the Varroa mite, and other answers listing mismanagement (failing with splits and queen re-mating), weather, and pesticides.

Evaluation

As part of the research question, 3 parts were examined, the most environmentally friendly method of control, the most economical and the most sustainable way to manage the Small Hive Beetle.

Most Environmentally Friendly Method of Control:

A look into the current methods used by both Florida and BC bee keepers, shows that the most popular method used in each phase is a screen bottom board. This method is non-chemical so very environmentally safe. In the "Spring" phase the second and third methods of control are dividing the colony and re-queening, respectively. Again, both these methods are environmentally friendly as no chemicals are used. The "Summer" phase shows that both areas prefer non-chemical treatments, including dividing the colony, drone brood removal, re-queening, and powdered sugar. Florida does use Apivar as a second choice which is chemical and can produce some hazards. These include creating resistant mites and low-levels of the chemical noted in beeswax and honey (HBHC, 2015). In the "Fall", the methods of control follow the same as the Summer phase except that some BC bee keepers choose Oxalic acid as their second control method. The EPA registration in January 2015 of Oxalic acid dehydrate states that mites may become resistant as the "Oxalic acid's mechanism of action is unknown" (U.S Environmental Protection Agency, 2015). The "Winter" phase has both Florida and BC using Oxalic acid for their second choices and Florida choosing Apivar for its third. Overall it appears that the bee keepers surveyed are cognizant of the environmental impact their control methods have. This is shown in that "potential environmental risks" was rated third of importance to the survey participants.

Most economical control method:

The second part of the research question looks into the most economical methods of control. As evidenced by the results, the methods that both the Florida and BC beekeepers choose tend to be based on the number of colonies they own. Bee keepers with 1 -5 colonies choose to spend less than $100 a year on control methods. Those BC bee keepers with 21-50 colonies spend between $100 - $500 with the cost of Apivar as the highest. The Florida bee keepers also spend between $100 - $500 but with re-queening cost the most with one bee keeper spending $500 - $1000 on this. For the bee keepers with 100+ colonies the BC results show a variety of options but all within $100 - $500, whereas Florida shows greater than $1000 on re-queening with a variety of methods chosen and a variety of costs associated with those methods. The research indicates that the cost of control methods rates very low to the bee keepers surveyed; it came in at the fourth out of five most important factors. This indicates that money is not what motivates the bee keepers in maintaining bee health.

Most sustainable control method:

In looking at the research, it is clear that sustainability is important to those participants from the survey. The methods of control mostly tend to lean towards non-chemical options. This is an encouraging result that bee keepers care about the health of their bees and colonies but won't compromise environmental sustainability. This is clearly indicated by participants choosing sustainability of control method (will the continued use affect future generations of bees) as their number two choice of importance.

Discussion

In examining the different methods of control used during each phase, the survey results show specific differences from the literary research (see Figures 19 – 22). The research from the literary review prioritizes their results on the most effective forms of control without quantifying factors such as sustainability, economic cost or environmental risk. When comparing the literature to the participant responses, it is clear that bee keepers are motivated by more than just effectiveness of the control method even though they rate it as their number one of importance. Of clear difference between the survey results and literary review is that for the literary review the number one method of control for each phase is to use a chemical control method, whereas the survey results show for these bee keepers it is not their first choice. With respect to the Small Hive Beetle, it appears from the survey results that Florida bee keepers use mostly similar control methods as BC bee keepers, even though they have been battling this insect for many years. This indicates that the control methods currently used by BC bee keepers would be appropriate to use against the beetle should the need arise.

Dormant Phase			
	Research	**Florida**	**BC**
1	Oxalic acid	Screen bottom board	Screen bottom board
2	Apiguard, Mite away strips	Oxalic acid	Oxalic acid
3	Screen bottom board	Apivar, sanitization	Powdered sugar

Figure 19

Population Increase			
	Research	**Florida**	**BC**
1	Apivar, Apiguard, Mite away strips	Screen bottom board	Screen bottom board
2	Divide colony, re-queening, sanitization	Divide colony	Divide colony
3	Screen bottom board, powdered sugar	Re-queening	Requeening

Figure 20

Population Peak			
	Research	**Florida**	**BC**
1	Mite Away strips, Apivar, Apiguard	Screen bottom board	Screen bottom board
2	Re-queening, Divide colony, oxalic acid	Apivar, divide colony, powdered sugar	Drone brood removal
3	Screen bottom board, drone brood removal	Drone brood removal	Re-queen, divide colony, powdered sugar

Figure 21

Population Decrease			
	Research	**Florida**	**BC**
1	Apivar, Mite away strips, Apiguard	Screen bottom board	Screen bottom board
2	Re-queening, Divide colony, oxalic acid	Re-queening	Oxalic acid
3	Check mite, drone brood removal, screen bottom board	Apivar	Sanitization

Figure 22

Research Limitations

Utilizing an online survey was very effective and simple to distribute to bee keepers, however three issues were encountered. The first was the low number of participants from Florida. With a target market of approximately 200-300 people, only getting 20 responses was a bit disappointing. In consultation via email with the president of the Florida Bee Keepers Association, he expressed that perhaps the low turnout was due to bee keepers being "surveyed to death" recently. The second perceived hurdle came from how to distribute the survey to BC bee keepers. Originally the research considered that contacts could distribute it officially to association members, however when this failed a "word-of-mouth" email chain seemed to develop and responses were higher than estimated at 36 total. The last issue encountered was due to the choice to use Survey Monkey, which was unfamiliar to the researcher at the time. After completing the surveys it was realized that no export of data was allowed unless payment was made. Although more time consuming this hurdle was overcome by the researcher transferring data, then creating, analyzing and preparing charts through Excel. The participation in this gathering of online data has its difficulties in control. The experience taught the researcher that an original idea or plan comes up with roadblocks and you need to easily adapt and adjust accordingly to succeed.

Conclusions

The overall success of this research project is hard to quantify. Due to the fluid and multitude of variables that can affect bee health, it can be hard to determine for certain the most effective control methods without doing extensive controlled experiments. Unfortunately this would be beyond the scope of this researcher and of this project.

General conclusions can be drawn from the research gathered through the online survey of Florida and BC bee keepers. The most important was that control methods appear to be very similar regardless of the drastic changes in geography and climate. Both bee keeping groups rate the importance of different factors the same way including effectiveness of control, sustainability, and environmental risk. Both groups show little concern for the economic cost of a method chosen but base their choice on other factors. Social concern rates the lowest for both groups who obviously care more for their bees and bee health than how the public might perceive their actions. This is one of many positive insights learnt about both bee keeping groups.

Recommendations

Losing bees creates a ripple effect on the economic, social and environmental impacts to society. Less bees' means less pollination, which means less food for everyone. With humans dependent on bees for pollination on a commercial level, we need to do everything we can to protect them. For BC beekeepers, this means to be aware of new threats to their bees and colonies. The recommendations drawn from this project would be to remind beekeepers to be diligent with their colony health and that their current control methods might be effective against the Small Hive Beetle but they could consider changing a few practices to align with those utilized by Florida beekeepers. However, the decline of the worldwide bee population is a global issue. All members of society should be aware of the influence bees have on our everyday life and we as a whole should consider what choices we individually can make to help impact our immediate environment to help the bees.

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Appendix A

Beekeepers Survey

Hello,
My name is Corey and I'm a BBA student at College of the Rockies, in Cranbrook, BC, Canada. To complete my degree I am working on an applied research thesis. I am trying to determine the most effective ways beekeepers control and manage their pests and whether those techniques in the southern United States where Small Hive Beetle is prevalent may be applicable to British Columbia where this pest is not yet established but has recently been discovered.

Please take a moment to complete this brief 10 question survey.
All answers will be anonymous with the only identifying question being your location.
Thank you very much for helping with my research. If you have any further questions or concerns I can be reached via email at wildwhisper@live.ca or you can contact my faculty supervisor Greg, at GMcCallum@cotr.bc.ca

Cheers,
Corey

1. Where are you located? Please indicate province/state.

2. How long have you been a beekeeper?

3. How many colonies do you have?

4. Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite
Small Hive Beetle
Tracheal mite
Bears, skunks, mice and yellow jackets
Pesticides
Climate change
American Foul Brood

5. For each of the 4 phases, please choose which methods of control you use.

	Dormant Phase (Winter)	Population Increase Phase (Spring)	Population Peak Phase (Summer)	Population Decrease Phase (Fall)
Apivar				
Mite Away Strips				
Apiguard/Api Life Var				
Requeening				
Oxalic acid				
Check Mite				
Apistan				
Drone brood removal				
Screen bottom board				
Divide Colony				
Sanitization				
Powdered sugar				
Varroa gate				

Other (please specify)

6. For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

	< $100	$100 - $500	$501 - $1000	> $1000
Apivar				
Mite Away Strips				
Apiguard/Api Life Var				
Requeening				
Oxalic acid				
Check Mite				
Apistan				
Drone brood removal				

	< $100	$100 - $500	$501 - $1000	> $1000
Screen bottom board				
Divide Colony				
Sanitization				
Powdered sugar				
Varroa gate				

7. Please rank each option by importance to you in your choice of control methods used.

	Important	Neutral	Not Important
Economic cost			
Potential environmental risks			
Social cost (ex. concern for perceptions of using a specific method)			
Effectiveness of control method			
Sustainability of control method (will the continued use affect future generations of bees)			

8. Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost
Potential environmental risk
Social cost
Effectiveness of control method
Sustainability of control method

9. How many colonies have you lost in the last year?

- 0
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- 50 +

Please specify the number one reason for the loss.

10. Please choose your main purpose for beekeeping.

- Honey
- Wax
- Pollen
- Royal jelly
- Propolis
- Pollination
- Raising queens

Appendix B

Informed Consent Form

Hello, my name is Corey Lancaster and I'm an undergraduate student in the BBA program at College of the Rockies. I am currently working on an applied research project that is hoping to answer the question:

"What would be the most environmentally friendly, economical, and sustainable way for commercial BC Bee keepers to control and manage the first recorded Small Hive Beetle (SHB) occurrence in BC?"

In order to help with my research, talking to experts in the field of beekeeping is necessary. Participation in the interview is voluntary and you can choose to withdraw at any time. No personal information will be recorded unless specific quotes are required. In this case, you will be advised if any information provided will be included in the research paper, and can choose to allow it or not.

Please complete and sign the form below:

By signing this form, I agree that:

- The research project has been explained to me.
- All my questions were answered.
- Possible harm and discomforts and possible benefits (if any) of this interview have been explained to me.
- I understand that I have the right not to participate and the right to stop at any time.

- I understand that I may refuse to participate without consequence.
- I have a choice of not answering any specific questions.
- I am free now, and in the future, to ask any questions about the research.
- I have been told that my name may be used within the report.

- I understand that no information that would identify me will be released or printed without asking me first.

- I understand that I will receive a signed copy of this consent form.

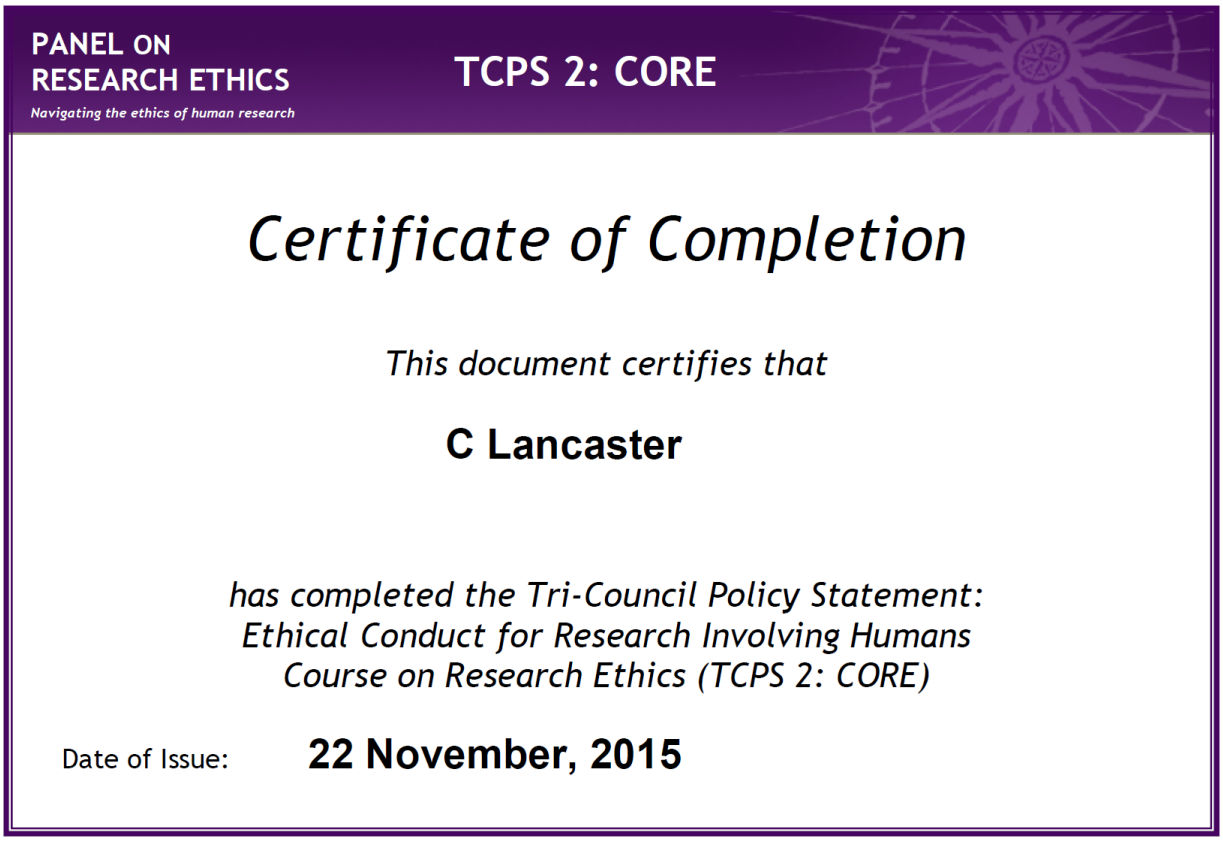
I hereby consent to participate in this interview:

Name of Participant: _____

_____

Signature Date

Appendix C



PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

C Lancaster

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **22 November, 2015**

Appendix D

Question 1 Where are you located? Please indicate you Province / State?

BC	Florida	Total
36	20	56

Question 2 How long have you been a beekeeper?

	BC	Florida	Total
< 1 year	7	2	9
1 - 5 years	13	7	20
6 - 10 years	7	6	13
10+ years	9	5	14
			56

Question 3 How many colonies do you have?

	BC	Florida	Total
0 - 5	23	5	28
6 - 10	4	6	10
11 - 20	3	3	6
21 - 50	5	4	9
51 - 100	0	0	0
>100	1	2	3
			56

Question 4 Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

	BC								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**	**Weighted Ave**
Varroa Mite	22	7	3	0	0	1	0	33	6.45
Small Hive Beetle	0	2	0	2	0	9	14	27	1.93
Tracheal Mite	0	1	2	8	5	9	4	29	2.93
Bears, skunks, mice and yellow jackets	5	9	6	5	2	2	2	31	4.87
Pesticides	2	6	6	3	6	5	5	33	3.79
Climate change	2	3	5	6	8	2	7	33	3.52
American Foul Brood	1	4	9	6	9	3	1	33	4.06
Total	32	32	31	30	30	31	33		

	Florida								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**	**Weighted Ave.**
Varroa Mite	12	4	0	0	0	0	2	18	6.11
Small Hive Beetle	2	7	3	1	2	0	1	16	5.13
Tracheal Mite	0	2	1	5	2	2	1	13	3.69
Bears, skunks, mice and yellow jackets	0	2	2	2	2	5	4	17	2.94
Pesticides	1	2	7	5	3	1	0	19	4.47
Climate change	1	0	3	1	4	4	4	17	2.94
American Foul Brood	3	0	0	1	4	6	6	20	2.75
Total	20	19	19	19	22	24	25		

Question 5 For each of the 4 phases, please choose which methods of control you use

	BC					Florida				
	Dormant Phase (Winter)	Population Increases Phase (Spring)	Population Peak Phase (Summer)	Population Decrease Phase (Fall)	Total	Dormant Phase (Winter)	Population Increases Phase (Spring)	Population Peak Phase (Summer)	Population Decrease Phase (Fall)	Total
	BC	BC	BC	BC	BC	Florida	Florida	Florida	Florida	Florida
Apivar	0	5	0	2	7	2	2	4	4	12
Mite Away Strips	0	3	2	3	8	0	1	0	1	2
Apiguard/Api Life Var	0	1	0	0	1	1	2	1	3	7
Requeening	0	11	7	2	20	1	9	1	5	16
Oxalic Acid	10	3	1	12	26	4	2	1	3	10
Check Mite	2	3	3	2	10	0	0	0	0	0
Apistan	1	2	1	1	5	0	0	1	0	1
Drone brood removal	0	3	9	3	15	1	1	2	2	6
Screen bottom board	20	27	27	25	99	11	11	10	9	41
Divide colony	0	21	7	0	28	0	10	4	3	17
Sanitization	3	6	5	4	18	2	1	1	1	5
Powdered sugar	4	5	7	1	17	1	4	4	2	11
Varroa Gate	0	0	0	0	0	1	1	1	1	4

Note: 35 answered question, 1 skipped

Question 6 For each of the control methods used, please estimate your approximate cost for it in a 12 month period

	BC						**Florida**					
	< $100	$100 - $500	$501 - $1000	> $1000	Total	Weighted Average	< $100	$100 - $500	$501 - $1000	> $1000	Total	Weighted Average
Apivar	2	4	0	0	6	1.67	6	5	0	0	11	1.45
Mite Away Strips	4	1	1	0	6	1.5	1	1	0	0	2	1.5
Apiguard/Api Life Var	0	0	0	0	0	0	3	1	0	0	4	1.25
Requeening	8	3	0	0	11	1.27	3	3	2	1	9	2.11
Oxalic Acid	13	3	0	0	16	1.19	3	2	0	0	5	1.4
Check Mite	1	1	0	0	2	1.5	0	0	0	0	0	0
Apistan	1	1	0	0	2	1.5	1	0	0	0	1	1
Drone brood removal	8	0	0	0	8	1	2	0	0	0	2	1
Screen bottom board	17	3	0	0	20	1.15	8	0	1	0	9	1.22
Divide colony	16	3	0	0	19	1.16	6	3	1	0	10	1.5
Sanitization	7	0	0	0	7	1	2	0	0	0	2	1
Powdered sugar	9	1	0	0	10	1.1	4	1	0	0	5	1.2
Varroa Gate	0	0	0	0	0	0	2	0	0	0	2	1

Note: Only 33 answered question, 3 skipped

Note: Only 19 answered question, 1 skipped

Question 7 Please rank each option by importance to you in your choice of control methods used

	BC					Florida			
	Important	Neutral	Not Important	Total		Important	Neutral	Not Important	Total
Economic Cost	15	12	8	35		7	11	0	18
Potential environmental risks	33	3	0	36		13	6	0	19
Social Cost (ex. Concern for perceptions of using a specific method)	14	14	8	36		1	8	9	18
Effectiveness of control method	32	4	0	36		18	0	0	18
Sustainability of control method (will the continued use affect future generations of bees)	34	2	0	36		13	0	0	13

Note: Only 19 answered, 1 skipped

Question 8 Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

	BC						**Florida**					
	1	**2**	**3**	**4**	**5**	**Weighted Average**	**1**	**2**	**3**	**4**	**5**	**Weighted Average**
Economic Cost	0	4	5	11	11	1.6	1	1	3	8	0	1.61
Potential environmental risks	8	7	12	3	1	1.06	4	1	6	4	1	1.32
Social Cost (ex. Concern for perceptions of using a specific method)	0	1	6	9	18	1.83	1	2	2	0	14	2.44
Effectiveness of control method	17	6	7	1	0	1.11	8	3	2	2	0	1
Sustainability of control method (will the continued use affect future generations of bees)	10	13	5	5	2	1.06	3	10	4	0	3	1
Total	35	31	35	29	32		17	17	17	14	18	

Question 9 How many colonies have you lost in the last year?

	BC	Florida	Total
0	5	1	6
1 - 5	26	12	38
6 - 10	2	2	4
11 - 20	3	1	4
21 - 50	0	3	3
50+	0	1	1

Question 10 Please choose your main purpose for beekeeping

	BC	Florida	Total
Honey	22	15	37
Wax	1	0	1
Pollen	0	0	0
Royal Jelly	0	0	0
Propolis	1	0	1
Pollination	10	4	14
Raising Queens	1	1	2

Appendix E

Individual survey responses divided by geographic region, 20 for Florida and 36 for BC.

Florida responses:

#1

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 5
Pesticides 4
Climate change 7
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) Hopguard

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Oxalic acid < $100
Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5

Q10: Please choose your main purpose for beekeeping. Honey

#2

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 7
Small Hive Beetle 5
Tracheal mite 2
Bears, skunks, mice and yellow jackets 3
Pesticides 6
Climate change 4
American Foul Brood 1

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Dormant Phase (Winter), Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Requeening $100 - $500
Screen bottom board < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important

Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Social cost 3
Effectiveness of control method 4
Sustainability of control method 5

Q9: How many colonies have you lost in the last year?

11 - 20

Q10: Please choose your main purpose for beekeeping. Honey

#3

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Tracheal mite 7
Bears, skunks, mice and yellow jackets 6
Pesticides 2
Climate change 3
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Dormant Phase (Winter)
Requeening Population Increase Phase (Spring), Population Peak Phase (Summer)
Drone brood removal Population Increase Phase (Spring), Population Peak Phase (Summer)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)
Sanitization Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Powdered sugar Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Varroa gate Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) hop-guard 2 , if needed during flow

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Screen bottom board < $100
Divide Colony < $100
Sanitization < $100
Powered sugar < $100
Varroa gate < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Potential environmental risk 1
Social cost 5
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. varroa

Q10: Please choose your main purpose for beekeeping.

Honey

#4

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? > 100

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Tracheal mite 4
Bears, skunks, mice and yellow jackets 2
Pesticides 3
Climate change 6
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Peak Phase (Summer)
Mite Away Strips Population Increase Phase (Spring)
Apiguard/Api Life Var Population Increase Phase (Spring)
Requeening Population Increase Phase (Spring), Population Decrease Phase (Fall)
Oxalic acid Dormant Phase (Winter)
Apistan Population Peak Phase (Summer)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Mite Away Strips $100 - $500
Requeening $501 - $1000
Oxalic acid < $100
Apistan < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 3
Potential environmental risk 4
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?
21 - 50
Please specify the number one reason for the loss. nosema

Q10: Please choose your main purpose for beekeeping.
Honey

#5

Q1: Where are you located? Please indicate your province/state.

Florida

Q2: How long have you been a beekeeper?

1 - 5 years

Q3: How many colonies do you have?

6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Bears, skunks, mice and yellow jackets 7

Pesticides 5
Climate change 6
American Foul Brood 1

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Dormant Phase (Winter)
Drone brood removal Dormant Phase (Winter)
Screen bottom board Dormant Phase (Winter)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Potential environmental risks Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Social cost 1
Effectiveness of control method 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Swarming

Q10: Please choose your main purpose for beekeeping.

Honey

#6

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1

Small Hive Beetle 3
Tracheal mite 2
Bears, skunks, mice and yellow jackets 5
Pesticides 4
Climate change 7
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Decrease Phase (Fall)
Apiguard/Api Life Var Population Decrease Phase (Fall)
Requeening Population Decrease Phase (Fall)
Oxalic acid Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Apiguard/Api Life Var < $100
Requeening $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 3
Potential environmental risk 4
Social cost 5
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Not sure, probably varroa.

Q10: Please choose your main purpose for beekeeping.

Honey

#7

Q1: Where are you located? Please indicate your province/state.

Florida

Q2: How long have you been a beekeeper?

1 - 5 years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Bears, skunks, mice and yellow jackets 7
Pesticides 5
Climate change 6
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Divide Colony $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Social cost 2
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

21 - 50
Please specify the number one reason for the loss. Queen mating failure

Q10: Please choose your main purpose for beekeeping.

Raising queens

#8

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 4
Bears, skunks, mice and yellow jackets 6
Pesticides 3
Climate change 5
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Increase Phase (Spring), Population Decrease Phase (Fall)
Requeening Population Increase Phase (Spring)
Oxalic acid Dormant Phase (Winter)
Powdered sugar Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Requeening $501 - $1000
Oxalic acid $100 - $500
Powered sugar $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 2
Potential environmental risk 4
Social cost 5

Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year?

21 - 50
Please specify the number one reason for the loss. death of forage

Q10: Please choose your main purpose for beekeeping. Pollination

#9

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 4
Bears, skunks, mice and yellow jackets 7
Pesticides 3
Climate change 5
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Decrease Phase (Fall)
Other (please specify) beetle traps with veg. oil all year

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Screen bottom board < $100
Divide Colony $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 1
Social cost 5
Effectiveness of control method 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. unknown - maybe pesticides

Q10: Please choose your main purpose for beekeeping.

Honey

#10

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? > 100

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 4
Bears, skunks, mice and yellow jackets 6
Pesticides 3
Climate change 5
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Decrease Phase (Fall)
Requeening Population Increase Phase (Spring)
Oxalic acid Population Decrease Phase (Fall)
Drone brood removal Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Requeening > $1000
Oxalic acid $100 - $500
Drone brood removal < $100
Screen bottom board $501 - $1000
Divide Colony $501 - $1000
Varroa gate < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 3
Potential environmental risk 4
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 50 +

Q10: Please choose your main purpose for beekeeping. Pollination

#11

Q1: Where are you located? Please indicate your province/state.

Florida

Q2: How long have you been a beekeeper?

1 - 5 years

Q3: How many colonies do you have?

6 – 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 1
Pesticides 3
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Divide Colony Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Respondent skipped this question
Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

0

Q10: Please choose your main purpose for beekeeping.

Honey

#12

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 1
Tracheal mite 3
Bears, skunks, mice and yellow jackets 6
Pesticides 4

Climate change 5
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Peak Phase (Summer)
Apiguard/Api Life Var Population Decrease Phase (Fall)
Sanitization Dormant Phase (Winter)
Powdered sugar Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Apiguard/Api Life Var < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 1
Potential environmental risk 2
Social cost 5
Effectiveness of control method 4
Sustainability of control method 3

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. mismanagement

Q10: Please choose your main purpose for beekeeping.

Honey

#13

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 7
Tracheal mite 5
Bears, skunks, mice and yellow jackets 4
Pesticides 3
Climate change 1
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. poor management practices -- did not know how to make splits properly

Q10: Please choose your main purpose for beekeeping.

Honey

#14

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Pesticides 5
Climate change 3
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Peak Phase (Summer)
Apiguard/Api Life Var Dormant Phase (Winter), Population Increase Phase (Spring), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Apiguard/Api Life Var $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Sustainability of control method 5

Q9: How many colonies have you lost in the last year?

6 - 10
Please specify the number one reason for the loss. Dry summer

Q10: Please choose your main purpose for beekeeping.

Honey

#15

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Small Hive Beetle 3
Bears, skunks, mice and yellow jackets 6
Pesticides 1
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 5
Social cost 3
Effectiveness of control method 2

Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

6 - 10
Please specify the number one reason for the loss. mites

Q10: Please choose your main purpose for beekeeping.

Honey

#16

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 7
Small Hive Beetle 4
Bears, skunks, mice and yellow jackets 2
American Foul Brood 1

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Peak Phase (Summer)
Apiguard/Api Life Var Population Peak Phase (Summer)
Drone brood removal Population Peak Phase (Summer)
Divide Colony Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Apiguard/Api Life Var < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Not Important

Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Potential environmental risk 3
Social cost 2
Sustainability of control method 5

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Varroa

Q10: Please choose your main purpose for beekeeping.

Pollination

#17

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 6
Bears, skunks, mice and yellow jackets 3
Pesticides 4
Climate change 7
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Respondent skipped this question

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. splits failed to requeen

Q10: Please choose your main purpose for beekeeping.

Honey

#18

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 6
Bears, skunks, mice and yellow jackets 5
Pesticides 4
Climate change 3
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Mite Away Strips Population Decrease Phase (Fall)

Requeening Population Increase Phase (Spring), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Mite Away Strips < $100
Screen bottom board < $100
Divide Colony $100 - $500
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 1
Social cost 5
Effectiveness of control method 2
Sustainability of control method 3

Q9: How many colonies have you lost in the last year? 1 - 5

Q10: Please choose your main purpose for beekeeping.

Honey

#19

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 3

Tracheal mite 5
Bears, skunks, mice and yellow jackets 4
Pesticides 2
Climate change 7
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. unknown

Q10: Please choose your main purpose for beekeeping.

Honey

#20

Q1: Where are you located? Please indicate your province/state. Florida

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 4
Bears, skunks, mice and yellow jackets 7
Pesticides 3
Climate change 6
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Decrease Phase (Fall), Population Increase Phase (Spring)
Drone brood removal Population Decrease Phase (Fall)
Screen bottom board Population Decrease Phase (Fall), Population Peak Phase (Summer), Population Increase Phase (Spring), Dormant Phase (Winter)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 1
Social cost 5
Effectiveness of control method 2
Sustainability of control method 3

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. mites, beetles, ants

Q10: Please choose your main purpose for beekeeping. Pollination

BC responses:

#1

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 2
Bears, skunks, mice and yellow jackets 5
Pesticides 4
Climate change 7
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Drone brood removal Population Peak Phase (Summer)
Screen bottom board Population Decrease Phase (Fall), Population Peak Phase (Summer), Population Increase Phase (Spring), Dormant Phase (Winter)
Divide Colony Population Increase Phase (Spring)
Other (please specify) Wintergreen

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Respondent skipped this question
Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 2
Social cost 4
Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year?
1 - 5

Please specify the number one reason for the loss. Mite

Q10: Please choose your main purpose for beekeeping.

Honey

#2

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.
Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 5
Bears, skunks, mice and yellow jackets 3
Pesticides 6
Climate change 4
American Foul Brood 2

Q5: For each of the 4 phases, please choose which methods of control you use.
Apivar Population Decrease Phase (Fall)
Mite Away Strips Population Increase Phase (Spring), Population Decrease Phase (Fall)
Requeening Population Increase Phase (Spring), Population Decrease Phase (Fall)
Oxalic acid Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Apivar $100 - $500
Mite Away Strips $100 - $500
Requeening $100 - $500
Oxalic acid $100 - $500
Screen bottom board $100 - $500
Divide Colony $100 - $500
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Important
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 2
Potential environmental risk 5
Social cost 3
Effectiveness of control method 1
Sustainability of control method 4

Q9: How many colonies have you lost in the last year? 11 - 20
Please specify the number one reason for the loss. Mites over winter

Q10: Please choose your main purpose for beekeeping. Honey

#3

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 2
Tracheal mite 4
Bears, skunks, mice and yellow jackets 3
Pesticides 5
Climate change 7
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Drone brood removal Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100
Drone brood removal < $100
Screen bottom board $100 - $500
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 2
Social cost 5
Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Climate

Q10: Please choose your main purpose for beekeeping. Honey

#4

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 3
Bears, skunks, mice and yellow jackets 7
Pesticides 2
Climate change 5
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Powdered sugar Population Peak Phase (Summer)
Other (please specify) wintergreen oil

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Neutral
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 2
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

0

Q10: Please choose your main purpose for beekeeping.

Pollination

#5

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 3
Bears, skunks, mice and yellow jackets 4
Pesticides 6
Climate change 2
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Sanitization Population Peak Phase (Summer)

Other (please specify) I use Formic Acid in the fall as needed. PS I consider Nosema to be my 2nd most serious threat.

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100
Screen bottom board < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 2
Social cost 4
Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Dry spring and forest fire smoke -> poor colony growth

Q10: Please choose your main purpose for beekeeping. Honey

#6

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 7
Tracheal mite 4
Bears, skunks, mice and yellow jackets 3
Pesticides 5
Climate change 1
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Drone brood removal Population Peak Phase (Summer)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) Mitegone pads

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Drone brood removal < $100
Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 3
Potential environmental risk 1
Social cost 5
Effectiveness of control method 2
Sustainability of control method 4

Q9: How many colonies have you lost in the last year? 6 - 10
Please specify the number one reason for the loss. Quick big changes in winter weather

Q10: Please choose your main purpose for beekeeping.

Honey

#7

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2

Small Hive Beetle 6
Tracheal mite 5
Bears, skunks, mice and yellow jackets 4
Pesticides 3
Climate change 1
American Foul Brood 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Increase Phase (Spring)
Oxalic acid Population Decrease Phase (Fall)
Drone brood removal Population Peak Phase (Summer)
Divide Colony Population Peak Phase (Summer)
Powdered sugar Dormant Phase (Winter)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Oxalic acid < $100
Drone brood removal < $100
Divide Colony < $100
Sanitization < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 5
Potential environmental risk 3
Social cost 4
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Cannot specify

Q10: Please choose your main purpose for beekeeping. Honey

#8

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Bears, skunks, mice and yellow jackets 3
Pesticides 7
Climate change 6
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Increase Phase (Spring), Population Peak Phase (Summer)
Other (please specify) Formic Acid - MiteGone (Spring & Fall); Thymovar (Spring & Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100
Screen bottom board < $100
Divide Colony < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 2
Sustainability of control method 1

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. one - varroa mites

Q10: Please choose your main purpose for beekeeping.

Pollination

#9

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 5
Bears, skunks, mice and yellow jackets 2
Pesticides 3
Climate change 7
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Drone brood removal Population Peak Phase (Summer)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Other (please specify) Wintergreen oil in spring and fall

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 1
Social cost 5
Effectiveness of control method 3

Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. I lost 2 hives. I'm not sure why but I wonder if it was the smoke from the forest fires

Q10: Please choose your main purpose for beekeeping. Propolis

#10

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Bears, skunks, mice and yellow jackets 2

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Decrease Phase (Fall)
Oxalic acid Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Drone brood removal Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)
Sanitization Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) oil of wintergreen fumigation

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Oxalic acid < $100
Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Neutral

Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 3
Potential environmental risk 1
Social cost 5
Effectiveness of control method 2
Sustainability of control method 4

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. colony collapse disorder?

Q10: Please choose your main purpose for beekeeping. Pollination

#11

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1

Q5: For each of the 4 phases, please choose which methods of control you use.

Other (please specify) wintergreen essential oil

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Respondent skipped this question
Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Social cost 3
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

0

Q10: Please choose your main purpose for beekeeping.

Pollination

#12

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 4
Bears, skunks, mice and yellow jackets 2
Pesticides 5
Climate change 7
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Mite Away Strips Population Decrease Phase (Fall)
Requeening Population Increase Phase (Spring)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) Formic Acid, Mite Wipes

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Mite Away Strips < $100
Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Neutral
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 2
Potential environmental risk 4
Social cost 5
Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Varroa

Q10: Please choose your main purpose for beekeeping.

Honey

#13

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 7
Tracheal mite 6
Pesticides 1
Climate change 3
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)
Sanitization Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Other (please specify) Essential oils and breeding local

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Divide Colony < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Social cost 3
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Over wintering

Q10: Please choose your main purpose for beekeeping.

Honey

#14

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 1
Pesticides 3
Climate change 5
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Other (please specify) Wintergreen - Spring and Summer

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100
Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 3
Social cost 4
Effectiveness of control method 2
Sustainability of control method 1

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Varroa mite

Q10: Please choose your main purpose for beekeeping.

Honey

#15

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Small Hive Beetle 4
Pesticides 7
Climate change 5
American Foul Brood 6

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Increase Phase (Spring)
Requeening Population Increase Phase (Spring), Population Peak Phase (Summer)
Drone brood removal Population Peak Phase (Summer)
Divide Colony Population Peak Phase (Summer)
Other (please specify) Fall Thymovar

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Effectiveness of control method 1
Sustainability of control method 3

Q9: How many colonies have you lost in the last year?

11 - 20
Please specify the number one reason for the loss. shortage of replacement queens

Q10: Please choose your main purpose for beekeeping.

Wax

#16

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 2
Pesticides 5
Climate change 4
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring), Population Peak Phase (Summer)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) Thymovar in late summer

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 2
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Weak colonies, wasps

Q10: Please choose your main purpose for beekeeping.

Honey

#17

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.
Varroa Mite 1
Small Hive Beetle 4
Tracheal mite 7
Bears, skunks, mice and yellow jackets 6
Pesticides 5
Climate change 3
American Foul Brood 2

Q5: For each of the 4 phases, please choose which methods of control you use.
Apivar Population Increase Phase (Spring), Population Decrease Phase (Fall)
Apiguard/Api Life Var Population Increase Phase (Spring)
Requeening Population Peak Phase (Summer)
Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Sanitization Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Requeening < $100
Oxalic acid < $100
Screen bottom board < $100
Divide Colony < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 4
Potential environmental risk 3
Social cost 5

Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. chalk brood

Q10: Please choose your main purpose for beekeeping. Pollination

#18

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 3
Tracheal mite 7
Pesticides 6
Climate change 2
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Check Mite Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Drone brood removal Population Peak Phase (Summer)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Other (please specify) wintergreen oil for mite control

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Check Mite < $100
Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Potential environmental risk 1
Social cost 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. unknown

Q10: Please choose your main purpose for beekeeping.

Honey

#19

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? > 100

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Small Hive Beetle 2
Bears, skunks, mice and yellow jackets 5
Pesticides 6
Climate change 7
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Mite Away Strips Population Peak Phase (Summer)
Requeening Population Increase Phase (Spring)
Oxalic acid Population Increase Phase (Spring)
Check Mite Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer)
Divide Colony Population Increase Phase (Spring)
Sanitization Population Increase Phase (Spring)
Powdered sugar Dormant Phase (Winter), Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening $100 - $500
Oxalic acid $100 - $500
Check Mite $100 - $500
Divide Colony $100 - $500
Powered sugar $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Neutral
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 1
Social cost 4
Effectiveness of control method 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. Varroa mites

Q10: Please choose your main purpose for beekeeping. Honey

#20

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Bears, skunks, mice and yellow jackets 2
Pesticides 4
Climate change 7

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Population Decrease Phase (Fall)
Drone brood removal Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100
Screen bottom board < $100
Divide Colony < $100

Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Neutral

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 2
Effectiveness of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Bear

Q10: Please choose your main purpose for beekeeping.

Honey

#21

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 3
Pesticides 2
Climate change 4
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring)
Oxalic acid Dormant Phase (Winter)

Screen bottom board Population Peak Phase (Summer), Population Increase Phase (Spring), Dormant Phase (Winter)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Oxalic acid < $100
Screen bottom board < $100
Divide Colony < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 3
Potential environmental risk 1
Social cost 2
Effectiveness of control method 4
Sustainability of control method 5

Q9: How many colonies have you lost in the last year? 0

Q10: Please choose your main purpose for beekeeping. Honey

#22

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Small Hive Beetle 7
Tracheal mite 6
Pesticides 1
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Check Mite Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Powdered sugar Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Neutral
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 1
Social cost 4
Effectiveness of control method 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

0
Please specify the number one reason for the loss. 1st colony is still overwintering so I don't know how they're doing

Q10: Please choose your main purpose for beekeeping.

Pollination

#23

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 4
Bears, skunks, mice and yellow jackets 2
Pesticides 7
Climate change 5
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Mite Away Strips Population Increase Phase (Spring)
Requeening Population Increase Phase (Spring)
Drone brood removal Population Peak Phase (Summer)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Other (please specify) wintergreen, spring and fall

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Mite Away Strips < $100
Requeening < $100
Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 5
Potential environmental risk 3
Social cost 4
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. probably viruses vectored by Varroa

Q10: Please choose your main purpose for beekeeping. Raising queens

#24

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 4
Bears, skunks, mice and yellow jackets 6
Pesticides 3
Climate change 5
American Foul Brood 2

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Peak Phase (Summer)
Apistan Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100
Apistan $100 - $500
Divide Colony $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Neutral

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 2
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 4

Q9: How many colonies have you lost in the last year? 1 - 5
Please specify the number one reason for the loss. mites over winter

Q10: Please choose your main purpose for beekeeping. Honey

#25

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 6
Tracheal mite 4
Bears, skunks, mice and yellow jackets 7
Pesticides 2
Climate change 5
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Other (please specify) spearmint & wintergreen essential oils

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Screen bottom board < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Social cost 3
Sustainability of control method 5

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. divided colony didn't survive winter

Q10: Please choose your main purpose for beekeeping.

Pollination

#26

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Tracheal mite 7
Bears, skunks, mice and yellow jackets 3
Climate change 4
American Foul Brood 2

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Increase Phase (Spring)
Requeening Population Increase Phase (Spring)
Oxalic acid Dormant Phase (Winter)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Powdered sugar Dormant Phase (Winter), Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar < $100
Requeening $100 - $500
Oxalic acid < $100
Screen bottom board $100 - $500
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important

Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Potential environmental risk 3
Social cost 5
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

11 - 20
Please specify the number one reason for the loss. varroa mites

Q10: Please choose your main purpose for beekeeping. Honey

#27

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 6 - 10

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 3
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 4
Pesticides 2
Climate change 5
American Foul Brood 1

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Dormant Phase (Winter)
Screen bottom board Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Oxalic acid < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important

Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. weak colonies

Q10: Please choose your main purpose for beekeeping.

Honey

#28

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.
Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 4
Pesticides 2
Climate change 3
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.
Mite Away Strips Population Peak Phase (Summer), Population Decrease Phase (Fall)
Requeening Population Increase Phase (Spring), Population Peak Phase (Summer)
Oxalic acid Dormant Phase (Winter), Population Decrease Phase (Fall)
Apistan Population Increase Phase (Spring)
Drone brood removal Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Divide Colony Population Peak Phase (Summer)
Powdered sugar Population Increase Phase (Spring), Population Peak Phase (Summer)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Mite Away Strips < $100
Requeening < $100
Oxalic acid < $100
Apistan < $100
Drone brood removal < $100
Screen bottom board < $100
Divide Colony < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 0
Q10: Please choose your main purpose for beekeeping. Honey

#29

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 4
Pesticides 2
Climate change 3
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Population Decrease Phase (Fall), Population Peak Phase (Summer), Population Increase Phase (Spring), Dormant Phase (Winter)
Divide Colony Population Increase Phase (Spring)
Other (please specify) mitegone pads in the fall, wintergreen pads in spring/summer - under $100 cost

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.
Respondent skipped this question
Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 2
Social cost 5
Effectiveness of control method 3
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. we lost one hive in the fall - we are not sure - mites? colony collapse? Question 10 below - bee stewards

Q10: Please choose your main purpose for beekeeping.

Pollination

#30

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2

Small Hive Beetle 6
Tracheal mite 4
Bears, skunks, mice and yellow jackets 1
Pesticides 7
Climate change 5
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Oxalic acid Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Screen bottom board < $100
Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 3
Potential environmental risk 2
Social cost 5
Effectiveness of control method 1
Sustainability of control method 4

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Unknown

Q10: Please choose your main purpose for beekeeping.

Honey

#31

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Tracheal mite 5
Bears, skunks, mice and yellow jackets 1
Pesticides 7
Climate change 6
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Increase Phase (Spring)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)
Divide Colony Population Increase Phase (Spring)
Other (please specify) Wintergreen

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Requeening < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Not Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 1
Social cost 5
Effectiveness of control method 3
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Unknown, but possibly weather for 1, and a complete unknown for a 2nd one that died this fall.

Q10: Please choose your main purpose for beekeeping.

Pollination

#32

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 10 + years

Q3: How many colonies do you have? 21 - 50

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.
Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 7
Bears, skunks, mice and yellow jackets 2
Pesticides 5
Climate change 4
American Foul Brood 3

Q5: For each of the 4 phases, please choose which methods of control you use.

Apivar Population Increase Phase (Spring)
Requeening Population Peak Phase (Summer)
Oxalic acid Population Decrease Phase (Fall)
Other (please specify) I use another formaic acid treatment in the fall, and use the oxalic vapourizer in late November. all my hives have screened bottom boards. I divide colonies as an increase and swarm-prevention method anyway. I prefer not to destroy drone brood; it may be a symptom of a failing queen, but generating an excess of drones using drone frames I see as a bit of a waste of energy for the bees and queen and I haven't found it to be as good a method as natural drop tests with a sticky-board. It's always good to have some live drones around - you never know when you'll need them. I never scrape them off. You left out nosema, which is a significant killer in the spring. Below, I listed formic under Mite-away, though that product hasn't been so reliable, though formic is hard to "dial-in" at the best of times.l in"

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Apivar $100 - $500
Mite Away Strips $501 - $1000
Oxalic acid $100 - $500

Q7: Please rank each option by importance to you in your choice of control methods used.
Economic cost Important
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.
Economic cost 3
Potential environmental risk 4

Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year? 6 - 10
Please specify the number one reason for the loss. Dead heat between varroa and wasps, but as far as expense is concerned, the cost of electric fences beats them all.

Q10: Please choose your main purpose for beekeeping. Honey

#33

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 6 - 10 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 2
Bears, skunks, mice and yellow jackets 1
Pesticides 3
Climate change 4
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Mite Away Strips Population Increase Phase (Spring)
Oxalic acid Population Increase Phase (Spring), Population Decrease Phase (Fall)
Screen bottom board Dormant Phase (Winter), Population Increase Phase (Spring), Population Peak Phase (Summer), Population Decrease Phase (Fall)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Mite Away Strips < $100
Oxalic acid < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Not Important
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 4
Potential environmental risk 3
Social cost 5
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Drought

Q10: Please choose your main purpose for beekeeping.

Honey

#34

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 11 - 20

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 6
Tracheal mite 5
Bears, skunks, mice and yellow jackets 2
Pesticides 3
Climate change 7
American Foul Brood 4

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Population Peak Phase (Summer)
Divide Colony Population Increase Phase (Spring)
Sanitization Population Increase Phase (Spring)
Other (please specify) natural brood break by swarming or divides; otherwise, treatment-free

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Divide Colony < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral

Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 2
Social cost 4
Effectiveness of control method 3
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. weak colony or queen. With untreated colonies, only the strong survive, aided greatly by a brood break from natural swarming

Q10: Please choose your main purpose for beekeeping.

Honey

#35

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? 1 - 5 years

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 3
Small Hive Beetle 7
Tracheal mite 6
Bears, skunks, mice and yellow jackets 1
Pesticides 4
Climate change 2
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Requeening Population Peak Phase (Summer), Population Increase Phase (Spring)
Divide Colony Population Increase Phase (Spring)
Sanitization Population Decrease Phase (Fall), Population Peak Phase (Summer), Population Increase Phase (Spring), Dormant Phase (Winter)

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Divide Colony < $100
Sanitization < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Economic cost Neutral
Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 2
Social cost 4
Effectiveness of control method 3
Sustainability of control method 1

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. Climate change

Q10: Please choose your main purpose for beekeeping.
Respondent skipped this question

#36

Q1: Where are you located? Please indicate your province/state. British Columbia

Q2: How long have you been a beekeeper? < 1 year

Q3: How many colonies do you have? 1 - 5

Q4: Please rank the following threats to bee health and your colonies. 1 is the greatest threat, 7 is the least.

Varroa Mite 1
Small Hive Beetle 7
Tracheal mite 4
Bears, skunks, mice and yellow jackets 2
Pesticides 6
Climate change 3
American Foul Brood 5

Q5: For each of the 4 phases, please choose which methods of control you use.

Screen bottom board Population Increase Phase (Spring)
Powdered sugar Population Peak Phase (Summer)
Other (please specify) essential oil of wintergreen

Q6: For each of the control methods used, please estimate your approximate cost for it in a 12 month period.

Screen bottom board < $100
Powered sugar < $100

Q7: Please rank each option by importance to you in your choice of control methods used.

Potential environmental risks Important
Social cost (ex. concern for perceptions of using a specific method) Neutral
Effectiveness of control method Important
Sustainability of control method (will the continued use affect future generations of bees) Important

Q8: Please rank the following from the most important (1) to the least (5) in terms of the control methods you utilize.

Economic cost 5
Potential environmental risk 4
Social cost 3
Effectiveness of control method 1
Sustainability of control method 2

Q9: How many colonies have you lost in the last year?

1 - 5
Please specify the number one reason for the loss. smoke from forest fires

Q10: Please choose your main purpose for beekeeping.

Pollination