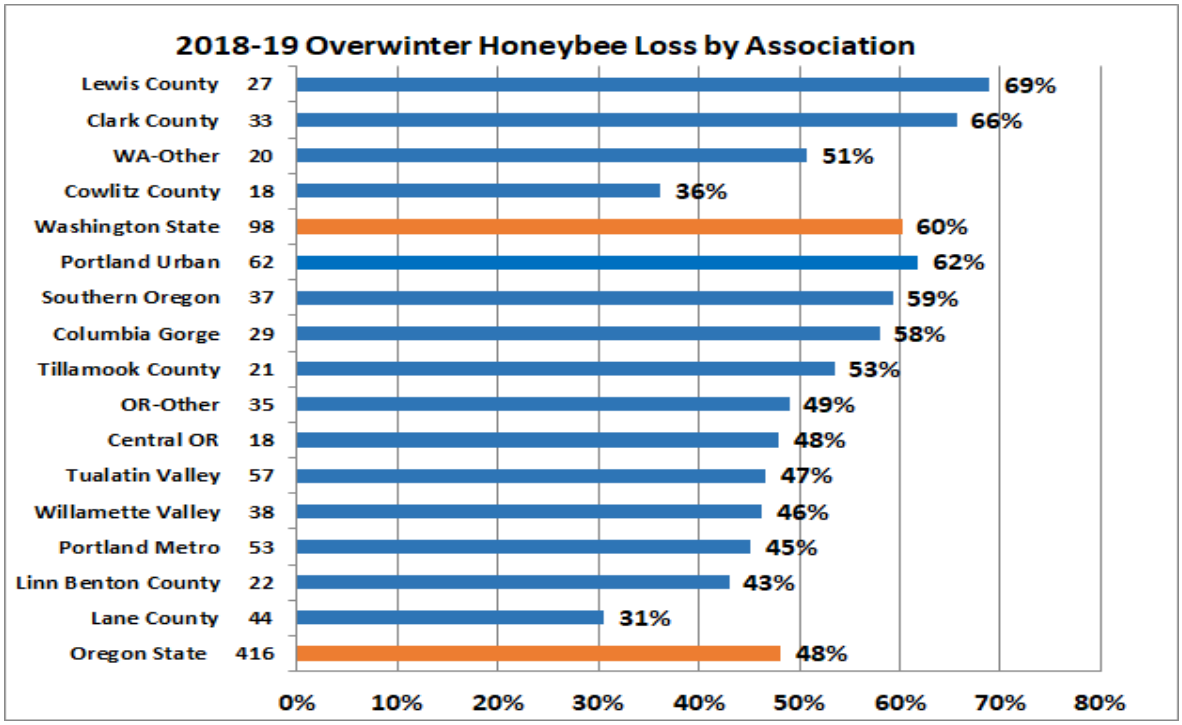
Washington backyard beekeeper Winter Losses 2018-19 Dewey Caron

Ninety eight Washington beekeepers (6 fewer than last year) supplied information on winter losses and several managements related to bee health with an electronic honey bee survey instrument www.pnwhoneybeesurvey.com. Overwintering losses of small scale Washington beekeepers were once again elevated this past winter.

Figure 1 shows total OR and WA response by local association. Statewide loss level is highlighted. Number individuals ( ) to left of association name is number of respondents, bar length is % overwinter losses by club. Total fall colony response was 416 OR and 98 WA individuals; survey included 551 WA fall colonies.



The WA respondents to the electronic survey managed up to 40 fall colonies. Fourteen individuals had 1 colony, 25 respondents had 2 colonies (the greatest number) and 16 individuals had 3 colonies (=55 individuals, 56% of total respondents, had 1, 2 or 3 colonies), 21 individuals had 4 to 6 colonies, 4 had 7-9 colonies and 18 individuals had 10+ colonies. When loss levels were computed the 1-3 colony owners had a 63% loss, the 4-6 colony owners had 49% loss level and the 10+ individuals had 60% loss of colonies in 2018-19 overwintering period.

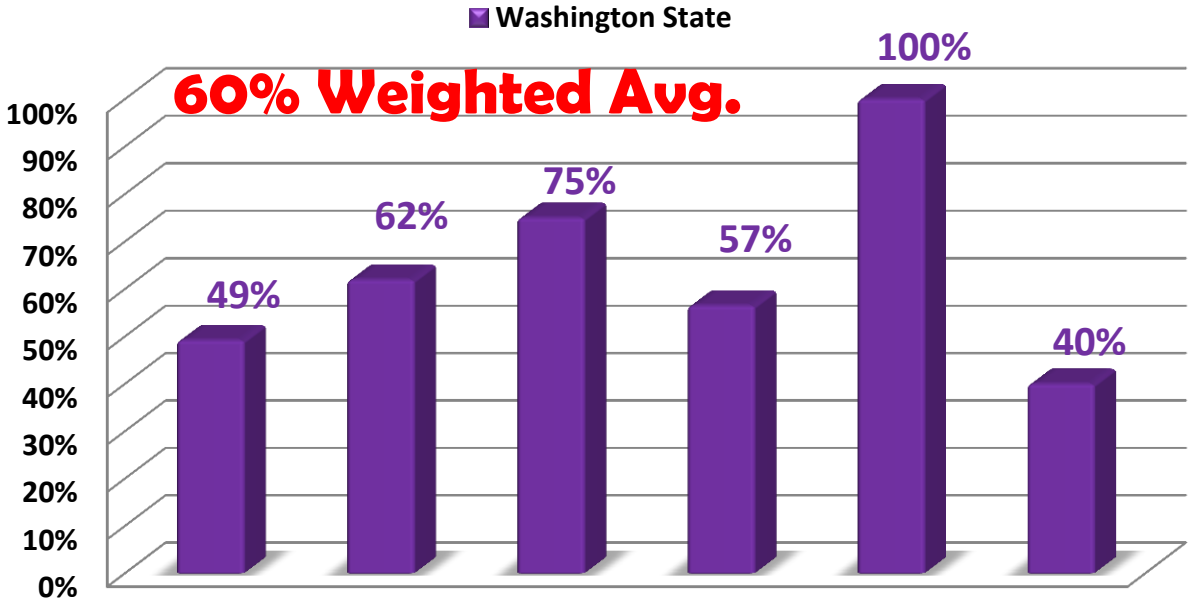
Thirty eight WA individuals (39% of respondents) had 1, 2 or 3 years of experience; 32 individuals (33% of total respondents) had 4 – 6 years' experience (medium number = 4), 12 individuals had 7-9 years experience and 16 had 10+ years with 39 the greatest. When loss level was correlated to experience, the 38 individuals with 1-3 years experience had 62% loss level, the 4-6 years experience group (44 individuals) had 54% loss and the 10+ years experience group (16 respondents) had a 71% loss.

Seventy one (73%) of WA beekeepers had an experienced beekeeper mentor available as they were learning beekeeping. This percentage was up from 62% the previous year.

Total WA backyard beekeeper overwinter loss = 60% loss.

The WA survey overwintering loss statistic was developed by subtracting number of fall colonies from surviving number in the spring by hive type. Results, shown in Figure 2 bar graph, illustrates overwintering losses of 98 total WA beekeeper respondents. Langstroth 8 and 10 frame beehives plus nucs (516 hives, 94% of total) had heavier average losses (61%) than the 35 alternative (Top bar, Warré and other) hive managers (54%). Overall weighted average loss=60%.

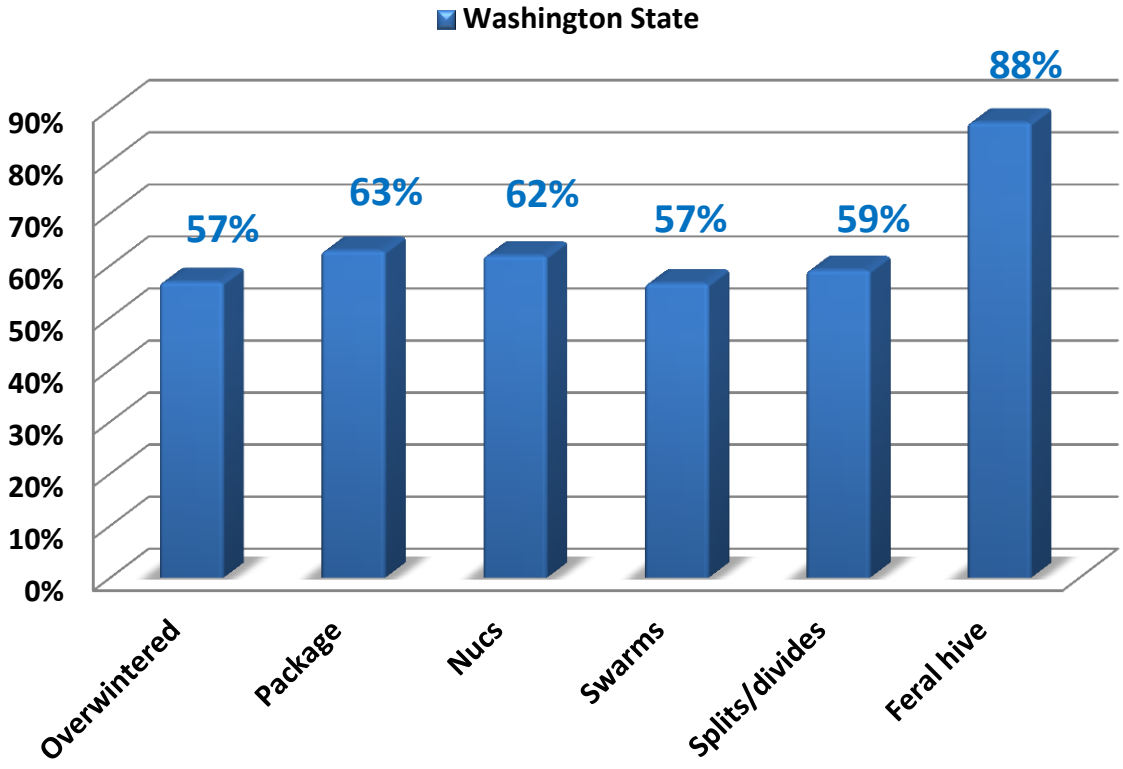
Figure 2 2018-19 Winter Honeybee Loss % by Hive Type



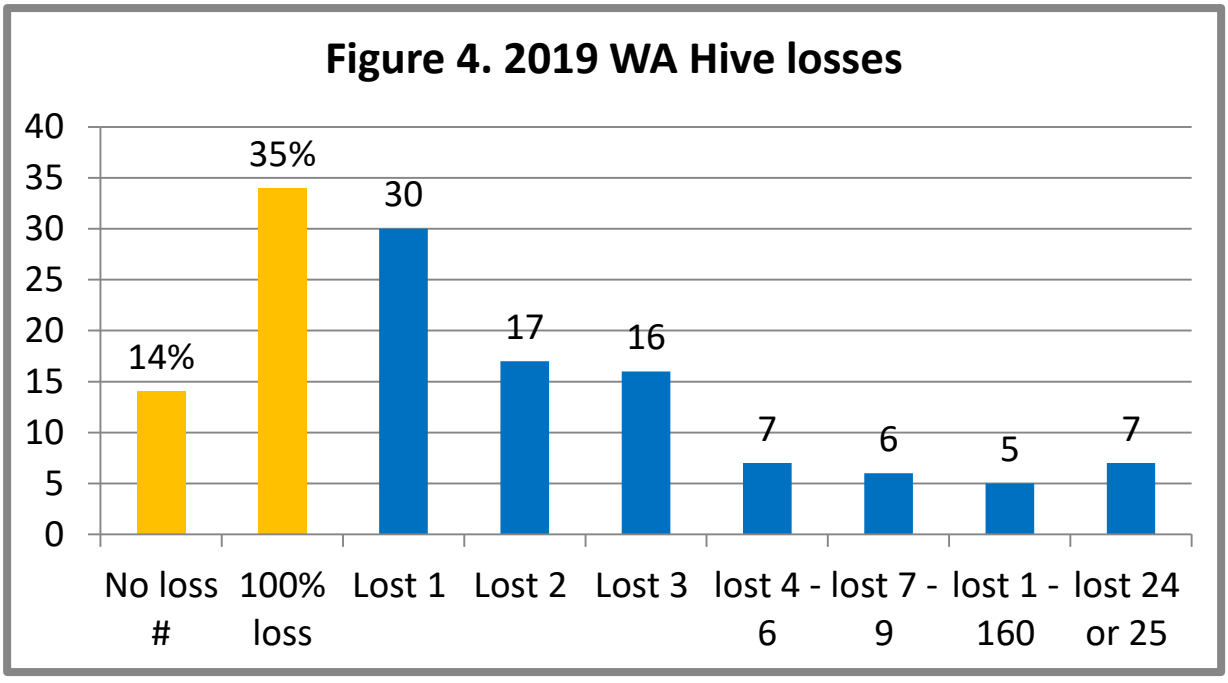
	Lang 8	Lang 10	Nuc	Top Bar	Warre	Other
Fall	65	439	12	23	2	10
Spring	33	167	3	10	0	6

Origination: We also asked about hive loss by origination. Data shown in Figure 3. All but feral hive transfers had similar loss level with overwintered hives slightly greater survival.

Figure 3 2018-19 Winter Honeybee Loss % by Origination



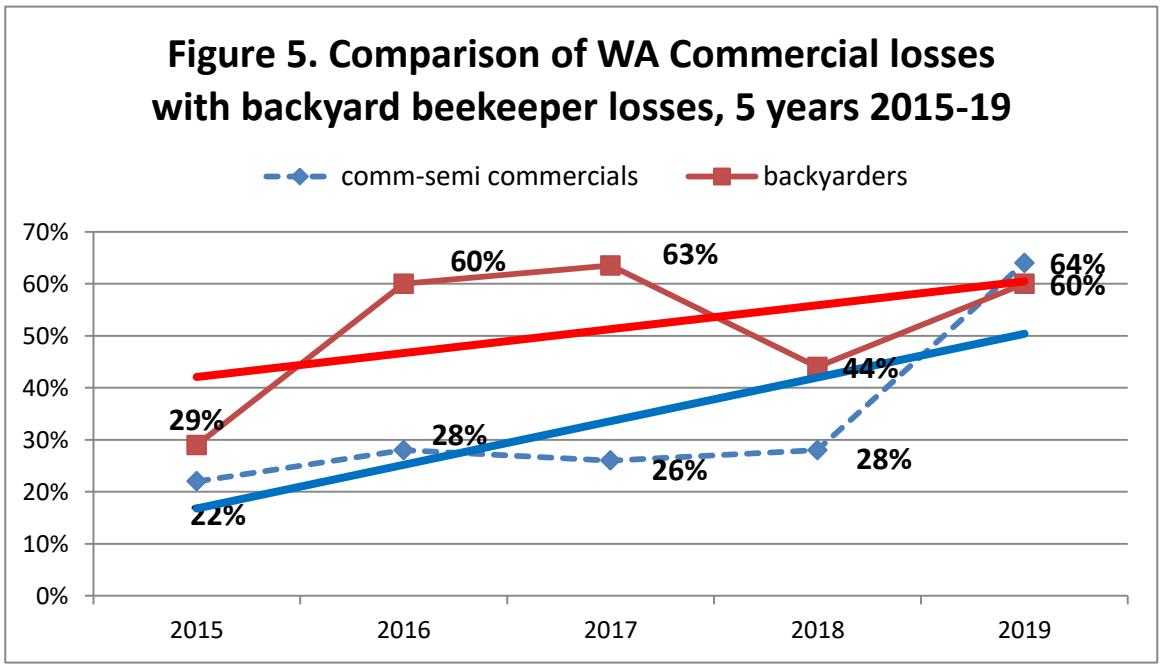
Fall	285	70	84	99	115	16
Spring	123	26	32	43	47	2



Among 98 WA beekeepers 15 individuals (15%) maintained more than one hive type. For the total WA beekeeper respondents, 14 (14%) had no loss and 34 individuals (35%) had total loss. Thirty WA individuals lost 1 colony, 17 individuals lost 2 colonies and 16 individuals lost 3 colonies (75% of individuals with losses). Eight (8) individuals lost 12 or more colonies; highest loss was 25 colonies. Data in Figure 4.

Comparison of backyarders and commercial/semi-commercial beekeepers

A different (paper) survey instrument was mailed to Pacific Northwest (PNW) semi-commercial (50-500 colonies) and commercial beekeepers (500+) asking about their overwintering losses. Comparison is shown in Figure 5 below with approximate number of colonies represented by the commercial/semi-commercial beekeepers and number of individual backyarder survey respondents. Also shown is he trend line of losses of both groups.

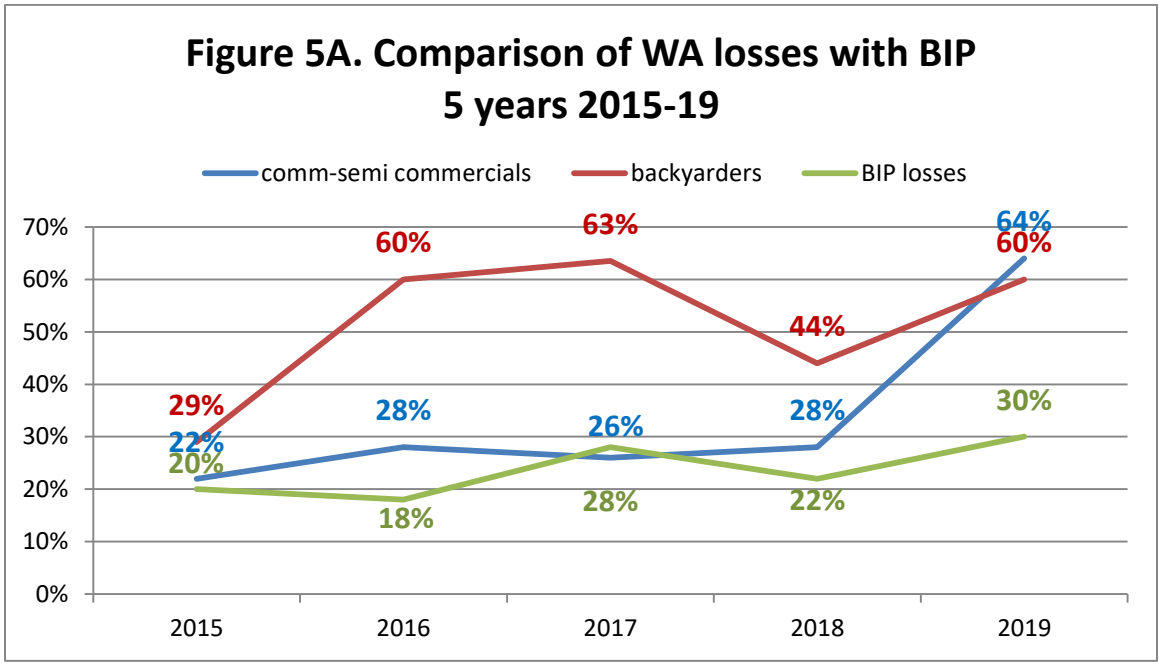


# Comm hives	~40,000	33,200	16,604	29,015	~20,000
# backyarders	31	52	101	104	98

Backyard losses have consistently been higher, in some years double the losses of larger-scale beekeepers but this past year the commercial losses were higher than backyarder losses. Number of colonies of the commercial keepers returning surveys were lower this past season (returns were an estimated 26% of the NASS estimate of 77,000 colonies in the state) which may explain the reversal. The reasons backyarders have had higher losses 4 of the past 5 years are complex. Commercial and semi-commercial beekeepers examine colonies more frequently and they examine them first thing in the spring as they take virtually all of their colonies to Almonds in February. They also are more likely to take losses in the fall and are more pro-active in varroa mite control management.

The PPNW survey was conducted in part to "ground truth" the annual BeeInformed Survey (BIP) also conducted during April. This survey recorded the highest loss level of past five years (30% loss for 2018-19 winter is a preliminary number that may change as the data is examined in further detail).

The BIP survey includes a mailed survey to larger-scale beekeepers and an electronic survey to which any Washington beekeeper can submit their data. Losses reported for a state include colonies of migratory beekeepers who reported WA as one of their yearly locations. The BIP survey for the 2015-18 annual surveys (2019 data not yet available) reports receiving responses from 90 to 95% of respondents exclusive to Washington but loss is computed on no more than 4% of the colonies exclusive to Washington state, indicating the BIP tally is primarily of commercial beekeepers (whom almost exclusively move to CA for pollination of almonds).



Graph 45A compares PNW with BIP survey clearly showing that the BIP survey loss numbers are those of the commercial beekeepers of Washington and not the backyarder losses. The same hold true for OR and ID comparisons. Numbers of respondents & colony numbers for the BIP Washington survey is as follows: 2015=158 indiv,~108,000 colonies; 2016 136 indiv, ~29,000 colonies; 2017=113 indiv,~73,500colonies and 2018=134 indiv, ~52,000 colonies (data for 2019 not yet available – will be published on site https://bip2.beeinformed.org/loss-map/)

Self-reported "reasons" for colony losses: We asked survey takers who had winter losses for the "reason" for their losses. More than one selection could be chosen. In all there were 188 WA selections (1.9/individual) provided. Weak in the fall (21 individual choices), Varroa mites (each 15%), poor wintering conditions (25 choices) and yellow jackets, both 13% were most common choices. The table shows number and % of selections.

There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. **Doing a dead colony examination (necropsy) is the first step in seeking to solve the continuing heavy loss problem. More attention to colony strength and checking stores to help avoid winter starvation will help reduce some of the losses. Control of varroa mites will also help reduce losses**.

I don't know	**13**	**7%**
CCD	13	7%
Nosema Disease	4	2%
Pesticides	3	2%
Poor wintering Condition	25	13%
Small Hive Beetles	1	1%
Starvation	19	10%
Queen Failure	20	11%
Varroa Mites	29	15%
Weak in the Fall	28	15%
Yellow Jackets	25	13%
I have no opinion	0	0%
Other	8	4%

Respondents were asked to select an acceptable loss level, being offered several categories to check. Twelve individuals said zero, while 7 said 5% and 10 indicated 10%, 20% was medium; 12 individuals (12.5% said 50% or more was an acceptable loss level.

IDK	None	5%	10%	15%	20%	25%	33%	50%	75%	100%
2	12	7	10	4	16	21	12	8	3	1

Why do colonies die? There appears to be no single reason for loss and a good deal of variance in opinion as to what might be an acceptable loss level. We are dealing with living animals which are constantly exposed to many different challenges, both in the natural environment and the beekeeper's apiary. Major factors are thought to be mites, pesticides, declining nutrition adequacy of the environment and diseases, especially viruses and Nosema. Management, failure to do something or doing things incorrectly, remains a factor in our losses.

What effects our alteration to the bee's natural environment and other external factors play in colony losses are not at all clear.

Langstroth wrote about the importance of taking winter losses in fall management saying if the beekeeper neglects such attention to his/her colonies 45% loss levels may occur, depending upon variable environmental conditions. It can be argued that losses of 30, 40, 50% or more might be the new "normal." Older, more experienced beekeepers recall when loss levels were 15% or less. Honey production fluctuates each year but, once again, seem to be declining on average. Numbers of U.S. bee colonies have declined since the 1940s, returning to numbers for 100 years ago, although numbers for the last 3 decades have not changed. Worldwide numbers of bee colonies are steadily increasing.

So there is no simple answer to explain the levels of current losses nor is it possible to demonstrate that they are excessive for all the issues facing honey bees in the current environment.

Colony Managements

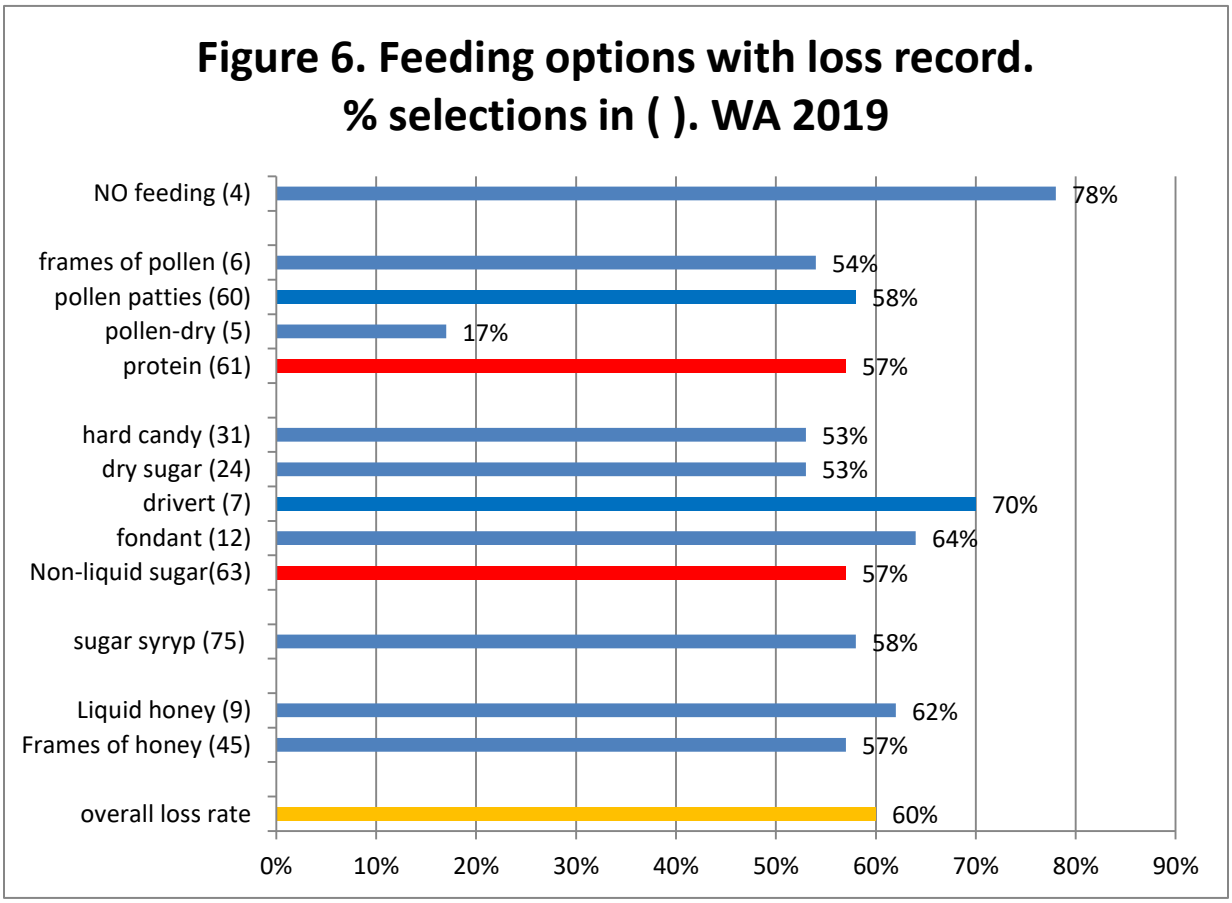
We asked in the survey for information about some managements practiced by respondents. Multiple responses were accepted. The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, mite monitoring, both non-chemical and chemical mite control techniques and queens. Respondents could select options and there was always a none and other selection possible. This analysis seeks to compare responses of this past season to previous survey years.

Most Washington beekeepers do not perform just one management to their colony (ies) toward improving colony health and overwintering success. This analysis however is mainly of a single factor equated with loss level. Such analysis is correlative and doing a similar management as fellow beekeepers does not necessarily mean you too will improve success.

FEEDING: Washington survey respondents checked 278 feeding options = 3.0/individual. Four individuals (4%) indicated no feeding, 15 selected a single choice and had 72% loss level, 21 (21% of respondents) indicated 2 choices and had a 74% loss, 31 (he greatest choice and also the median) made 3 choices and reported a 62% loss level. Seventeen respondents had 4 choices with a 57% loss 6 individuals had 5 choices with the lowest loss level 21%; 2 individuals each made 6 and 7 choices with 67% loss. More choices seem to improve survival.

The choices, with percent of individuals making that selection is in ( ); bar length indicates loss level of individuals doing this management. Figure 6. Those bar lengths to left of 60% had better survival while those to right had greater loss level.

Four individuals said they did **NO FEEDING. They had 11 fall colonies and realized a 78% loss,** 18 percentage points higher than overall loss level. For individuals indicating one or more feeding managements, feeding sugar syrup was the most common feeding option of respondents (75 individuals, 75% of respondents). Their loss rate was 58%, statistically same as overall average. Percent of individuals feeding protein (61%) and non-liquid sugar was 63%); both collectively had slightly better survival rate. Some selections, most notably dry pollen and dry sugar and hard candy had lower losses than the average overall loss rate.

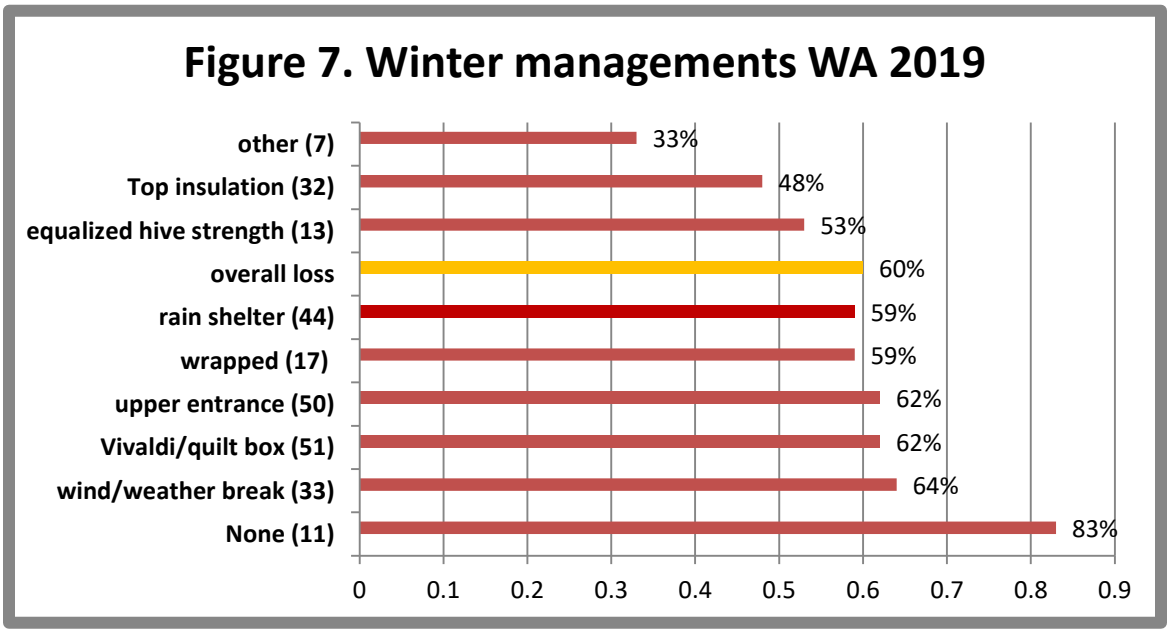


For the last 3 years of losses individuals doing no feeding had poorer survival all 3 years, including this year with 78% loss reported by the 4 individuals who indicated they did not feeding. Individuals that fed sugar syrup had marginal lower loss level in 2 of three years as did those using frames of honey to feed bees Individuals feeding non–liquid sugar in the form of fondant and hard candy likewise had lower losses in at least one year (fondant - 13 individuals had 22 percentage point lower losses in 2017) and hard candy in two of the three years (31 individuals had 7 percentage point better survival this season and 22 percentage point improvement by 13 individuals in 2018.) For individuals feeding protein, protein patty users showed slightly better survival in 2 of 3 years; dry pollen feeders had significantly better survival in two one of the three years, including this past year when 5 individuals had only a 17% loss, 43 percentage point improvement compared to overall loss. In 2016 the gain was 40 percentage points but only 2 individuals reported use of dry pollen.

WINTERING PRACTICES: We received 256 responses (2.9/individual) about WA beekeeper wintering management practices (more than one option could be chosen). Eleven individuals (11%) percent of the respondents indicated none of the several listed wintering practices was done; these individuals had an 83% winter loss, 23 percentage points higher loss than overall loss of 60%. For those indicating some managements, 18 (18%) did one single thing

had 83% loss level, 2 respondents had 46% loss, 20 had 3 choices with a 58% loss (the medium choice), 18 did (57% loss), 6 did 5 (53% loss); 3 had 6 choices 78% loss and 1 had 7 responses 80%.

The most common wintering management selected was ventilation/use of a quilt box at colony top (51 individuals (51%), followed by upper entrance (50 individuals, 38%). Figure 7 shows number of individual choices and percent of each selection. Equalizing hive strength, top entrance and other were the 3 selections that had best survivorship. Other choices of the 7 were entrance reduction (6 individuals), more ventilation (2 individuals).



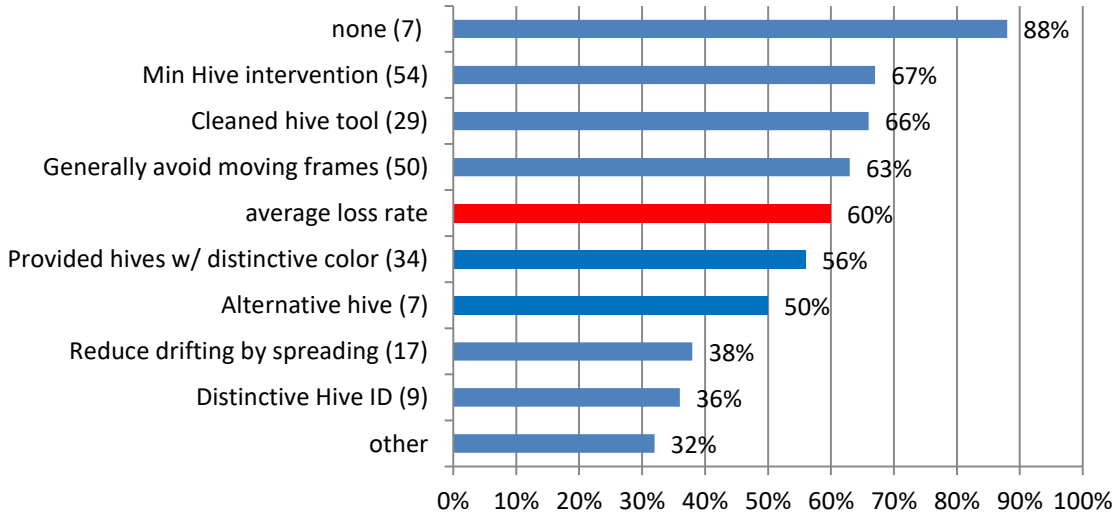
Over the past three years a couple of winterizing management improved survival. Those doing no winterizing had slightly higher losses (this year a 23 percentage point difference). Equalizing hive strength in the fall demonstrated lower loss levels in all three recent winter periods (7 percentage points this past winter, 9 percentage points last winter and 6 percentage points in 2016-17 winter).Top insulation has demonstrated lower loss in two of the three years, in the most recent winter 32 individuals realized a 12 percentage point improvement. Ventilation above the colony (Vivaldi Board/quilt box) demonstrated improved survival two of the three winters but not this past one (2 percentage point higher loss).

SANITATION PRACTICES: It is critical that we practice some basic sanitation (some prefer use of term bee biosecurity) in our bee care. We can do more basic sanitary practices to help insure healthy bees. We received 211 responses for this survey question. Seven individuals (7%), said they did not practice any of the 6 offered alternatives; they had a loss rate of 88% compared to overall rate of 60%. Twenty seven individuals (27 %) had 1 selection and had 46% loss, 29 (29%) had 2 choices (the greatest number) with 57%, 24 selected 3 managements with

61%; 8 had 4 (66% loss) and 3 made 5 choices (68% loss). There were 2.3 selections per individual.

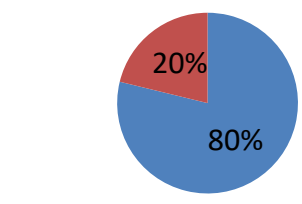
In two of three years doing none of these managements resulted in improved survival; this was not the case last winter when the 7 individuals doing nothing had very high losses of 88%. Using an alternative hive resulted in lower losses in two of three winters but this was not borne out by examining statistics of Figure 2 (loss by hive type). Providing hives with color, distinctive hive ID and measures to reduce drifting were helpful managements this past winter but not in the previous two seasons though their loss level was same as or similar to overall loss level (these three choices were not always available in previous survey years).

Figure 8. Sanitation measures ()= # individuals, bar length = 2019 WA loss %



SCREEN BOTTOM BOARDS (SBB): Although many beekeepers use SBB to control varroa mites, BIP and PNW surveys clearly point out they are not or at best not a very effective varroa mite control tool. In this recent survey 16 Washington individuals (16%) said they did not use screen bottom boards. This past overwintering season, the 16 non-SBB users had 87 fall colonies of which they lost 47 for 54% loss. Those 65 beekeepers using SBB on all of their colonies had 64% loss. The 17 individuals using SBB on some of their colonies had 57% loss.

Figure 9. % SBB use vs non-use, 2015-19 PNW

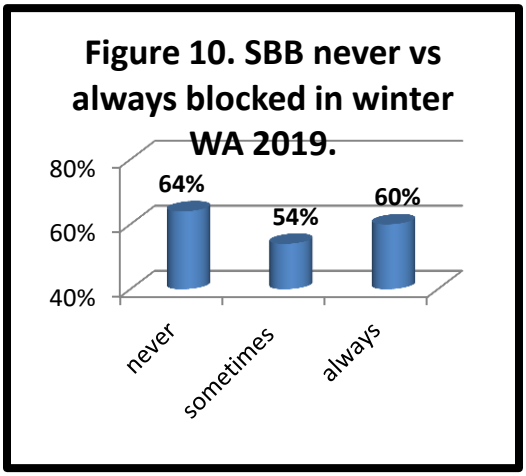


In 5 survey years 20**% said they did not use SBB and 80% did use SBB on some or all of their colonies.** See Figure 9.

Examining the five year average of SBB use, loss level of those using SBB on all or some of

their colonies had a 42.8% loss level whereas for those not using SBB had loss rate of 44.2% (a 3% positive survival gain for those using SBB versus those not using them). They are very minor in improving overwinter survival.

We asked if the SBB was left open (always response) or blocked during winter (bottom Figure 10). This past season 46 individuals (51%) said they always blocked SBB during winter. They had a 60% loss rate, average loss rate for statewide. Thirty seven individuals said they never blocked SBB and had loss rate of 64%. Seven individual (8%) blocked them on some of their colonies. Their loss rate was 54%.



There is no good science on whether open or closed bottoms make a difference overwinter but some beekeepers "feel" bees do better with it closed overwinter. **Comparing the always and sometimes left open with the closed in winter response reveals a slight percentage point difference in favor of closing the SBB over the winter period.** See Figure 10. **This relationship has been consistent over the past five years averaging nearly a 10 percentage point advantage when the SBB is closed during the winter.** An open bottom, at least during the active brood rearing season, can assist the bees in keeping their hive cleaner and promote good hive ventilation.

Things that seem to improve winter success: It should be emphasized that these comparisons are correlations not causation. They are single comparisons of one item with loss numbers. Individual beekeepers do not do only one management option nor do they necessarily do the same thing to all the colonies in their care. We do know moisture kills bees, not cold, so we recommend hives be located in the sun out of the wind. If exposed, providing some extra wind/weather protection might improve survival.

Feeding, a common management, appears to be of some help in reducing losses. Feeding fondant sugar or a hard sugar candy during the winter meant lower loss levels. Providing frames of honey or sugar syrup, the most common selection, also meant slightly lower loses for some individuals but these basic managements are useful in other ways such as for spring development and/or development of new/weaker colonies besides insuring better winter survival.

Feeding protein in form of pollen patties did slightly improve survival. The supplemental feeding of protein (pollen patties), might be of assistance earlier in the season to build strong colonies.

Winterizing measures that apparently helped lower losses for some beekeepers was equalizing strength, providing an upper entrance, a moisture trap (Vivaldi board or quilt box) and some attention to adding protection against the elements. Spreading colonies out in the apiary and painting distinctive colors or doing other measures to reduce drifting also appeared to be of some value in reducing winter losses. Avoiding movement of frames from one colony to another might also improve survival but the gain over what this interchange might accomplish might be greater than a minor advantage in survival.

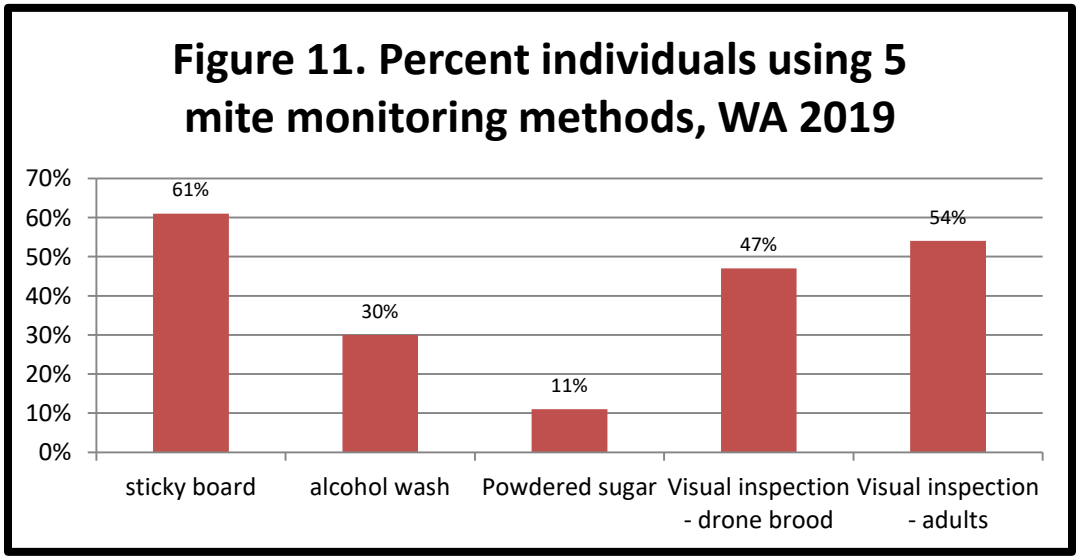
It is clear that doing nothing for feeding or winterizing or this past season in sanitation resulted in the heaviest overwinter losses.

Replacing standard bottom boards for screened bottoms only marginally improved winter survival. It is apparently advantageous to close the bottom screens during winter.

Mite monitoring/sampling and control management

We asked percentage of Washington hives monitored for mites during the 2018 year and/or overwinter 2018-19, whether sampling was pre- or post-treatment or both and, of the 5 possible mite sampling methods, what method was used and when it was employed. Sixty eight individual respondents (68%) said they monitored their hives. Losses of those individuals monitoring was 58%. Twenty four (24%), reported no monitoring; they had a higher loss rate of 74% loss. Six individuals monitored some with loss rate 57%. Montoring helps.

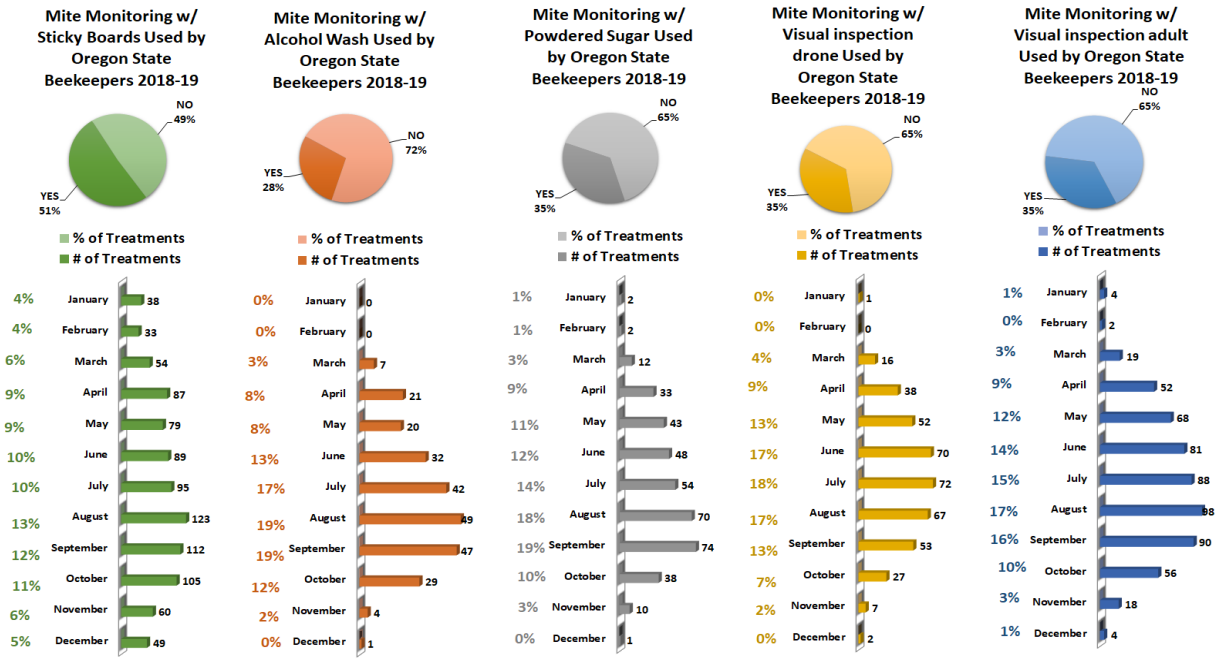
In order of popularity of use, Sticky boards were used by 45 individuals, 61% total of 74 individuals who did some or all monitoring of colonies and 46% of total selections, followed by 40 individuals (54% of individuals doing monitoring) that used visual inspection of adults and 35 individuals (47%) that used visual inspection of drones brood. The two most accurate means of determining mite load, alcohol wash was used by 22 individuals (30%) and powdered sugar was employed by 8 respondents (11%). Figure 11.



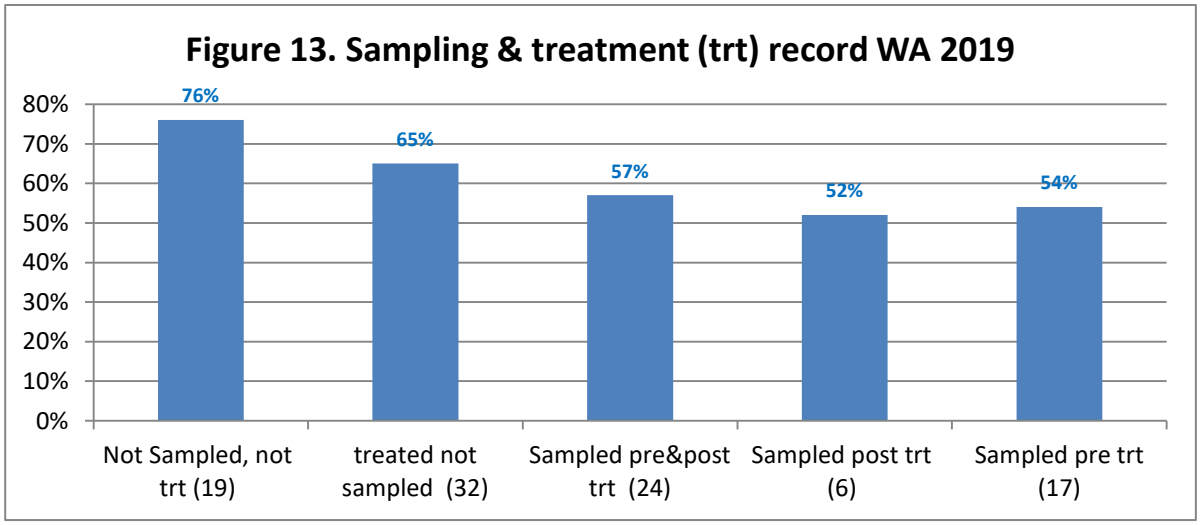
Individuals however are likely to use more than one monitoring technique (1.8/individual). In total choices, Twenty six used a single monitoring method, 19 used two, 22 used three and 5 used 4 sampling methods.

Most sampling to monitor mites was done in July – September, as might be expected since mite numbers change most quickly during these months and results of sampling can most readily be used for control decisions. See Figure 12 below for number of months each of the 5 sampling methods were used.

Figure 12



The most common sampling of respondents in 2018-19 was treated but did not sample (32% individuals) followed by both pre and post-treatment (24%). Nine individuals said they did not sample or treat. Data for loss level % shown in Figure 13; # respondents in ( ).



It is important to KNOW mite numbers. Less effective mite monitoring methods include sticky (detritus) boards below the colony (often so much detritus drops onto a sticky board that picking out the mites can be hard, especially for new beekeepers) but sticky boards used for a day can help confirm the useful of a treatment when inserted post treatment. Visual sampling is not accurate: most mites are not on the adult bees, but in the brood. Unfortunately looking for mites on drone brood is also not effective as a predictive number but can be used as an early warning that mites are present; if done, look at what percentage of drone cells had mites.

See ***Tools for Varroa Monitoring Guide*** www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes suggested mite level to use to base control decisions based on the adult bee sampling. A colony is holding its own against mites if the mite sample is below 2%. It is critical to not allow mite levels to exceed 2% during the fall months when bees are rearing the fat fall bees that will overwinter. It is also the most difficult time to select a control method (if one is deemed needed) as potential treatment harm may negatively impact the colony. We are seeing more colonies suddenly disappear (abscond?) during the fall, which may be related to the treatment itself.

Mite control treatments

The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Eighteen individuals (18%), 3 individuals more than last year, said they did not employ a non-chemical mite control and 20 individuals (20%), fourteen fewer than last year, did not use a chemical control. See Figure 14. Those 18 individuals who did not use a non-chemical treatment reported a 51% winter loss, while those who did not use a chemical control lost 77% of their colonies. The individual options chosen for non-chemical and chemical control are discussed below.

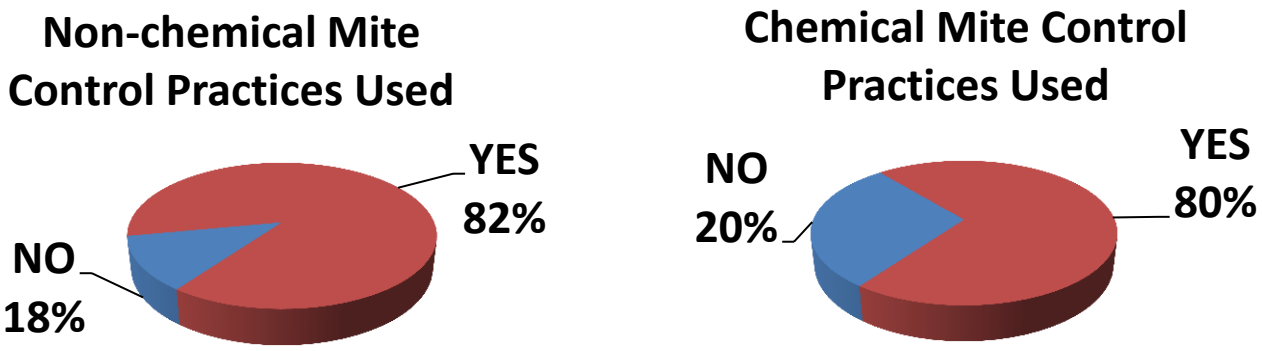
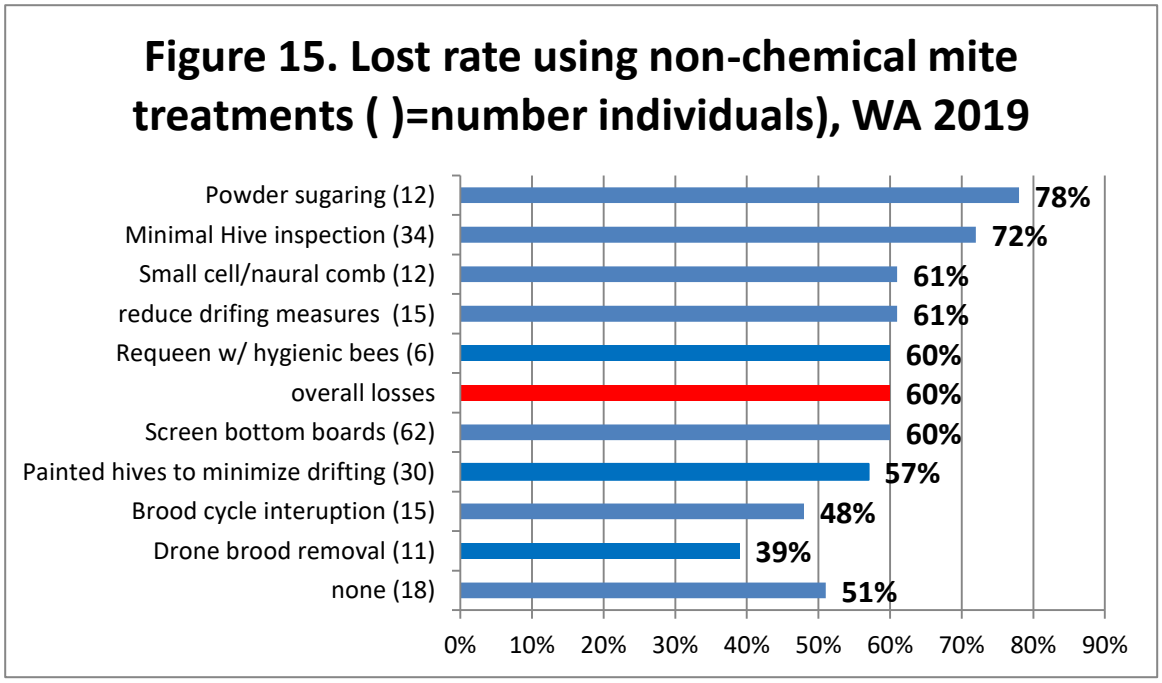


Figure 14

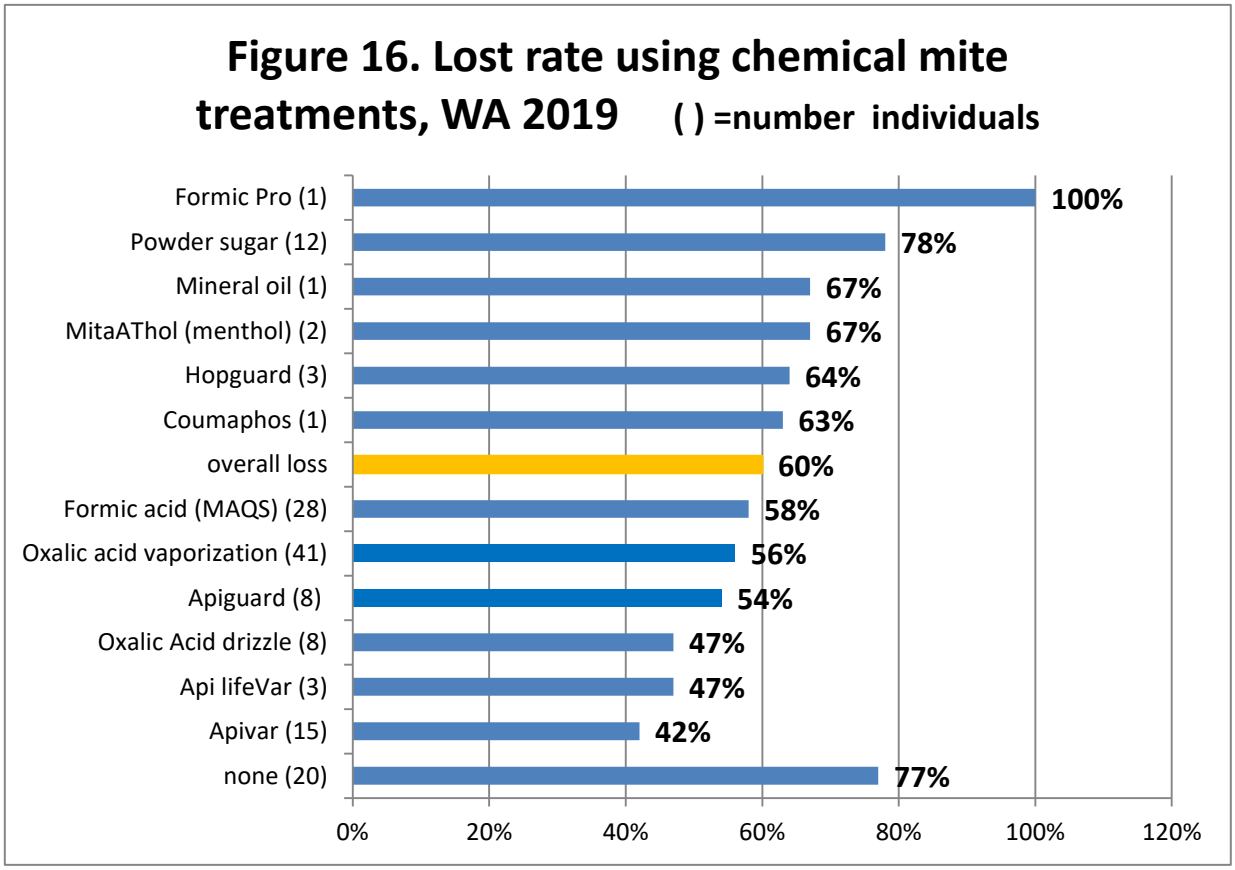
Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category,) 27 individuals used one method and had an 85% loss, 20 used two (53% loss level), 14 used

three (60% loss), 8 used 4 (67% loss), and 8 also used 5 with a 53% loss. The 3 using 6 selections had 55% loss. Use of screened bottom board was listed by 62 individuals (20 individuals short of number that listed use of SBB on all or some of their colonies in a different section of survey (see page 10). The next most common selection was minimal hive inspection (34 individuals). The use of the remaining 7 selections are shown in Figure 15; number of individuals in ( ), bar length represents average loss level of those individuals using each method. Under other additions was attempted heat treatment by 1 individual who lost both of their fall colonies.

Two of the non-chemical alternatives demonstrated reduced losses this past year – brood cycle interruption and Drone brood removal. Painting hives to reduce drifting also showed a 3 percentage point reduced loss. Painting hives reduced loss by 4 percentage points last year and brood cycle interruption was the best performing alternative last year. Requeening with hygienic queens used by 3 individuals in 2016-17 and one individual in 2017-18 as a non-chemical treatment had the same loss level as overall in 2018-19 wintering period.



Chemical Control: For mite chemical control, 20 individuals (20% of total respondents) used NO chemical treatment; these individuals had a 77% loss level. Those using chemicals used at rate of 1.6/individual. Fifty one individuals (51%) used one chemical and had 64% loss, 19 used two and showed better survival of 40% loss, 6 used 3 (517% loss), 1 used 4 (33% loss)and the single individual that used 6 had a 57% survival. Forty one individuals (53% of total chemical uses) indicated they most commonly utilized Oxalic acid vaporization and 28 respondents used MAQS, formic acid, (one indicated use of Formic Pro), followed distantly by Oxalic acid drizzle (8 individuals, 10% of total chemicals used). The 12 individuals that used powdered sugar had losses same as those who indicated use of no chemicals. Figure 16 illustrates number of uses ( ) and bar length indicates the loss rate for those using that chemical.



Consistently the last 3-4 years five different chemicals have helped beekeepers realize better survival. The essential oils APiguard and ApiLifeVar have consistently demonstrated the lowest loss level. Apiguard has a 31% better survival and ApiLifeVar has a 30% better survival record over past 4 years. Apivar use, the synthetic (amitraz), has demonstrated a 29% better survival over past 4 years (2016-19). Oxalic acid vaporization over past 3 years has a 13% better survival (the survey did not differentiate Oxalic vaporization from drizzle in 2016). Formic acid demonstrated a 14% better survival but this product has changed and how we use it is changing so this information is more difficult to tease out of the data. This past season for example Formic Pro seemed to perform better than the traditional formic MAQs pads, although the one identified user of Formic Pro did not have any survival . At least indicated using formic acid in a “shop towel” delivery.

The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in Figure 17 for 2016-17 season. Further review is needed to determine if the timing of treatments was more effective than at other times for the various chemicals.

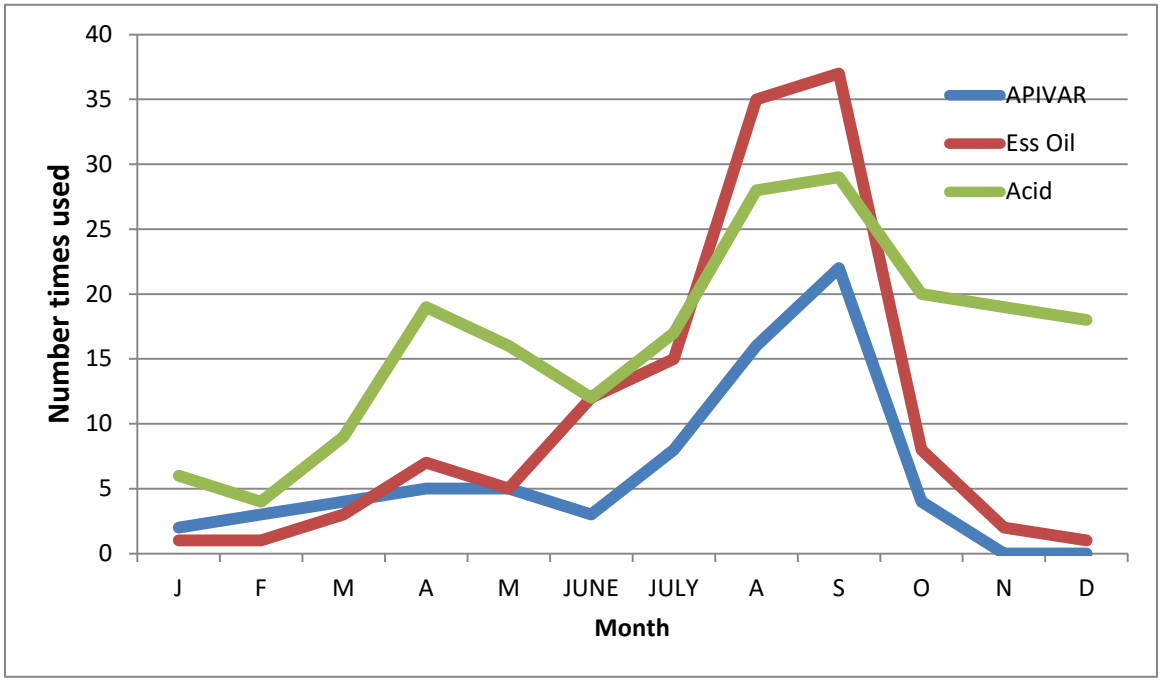


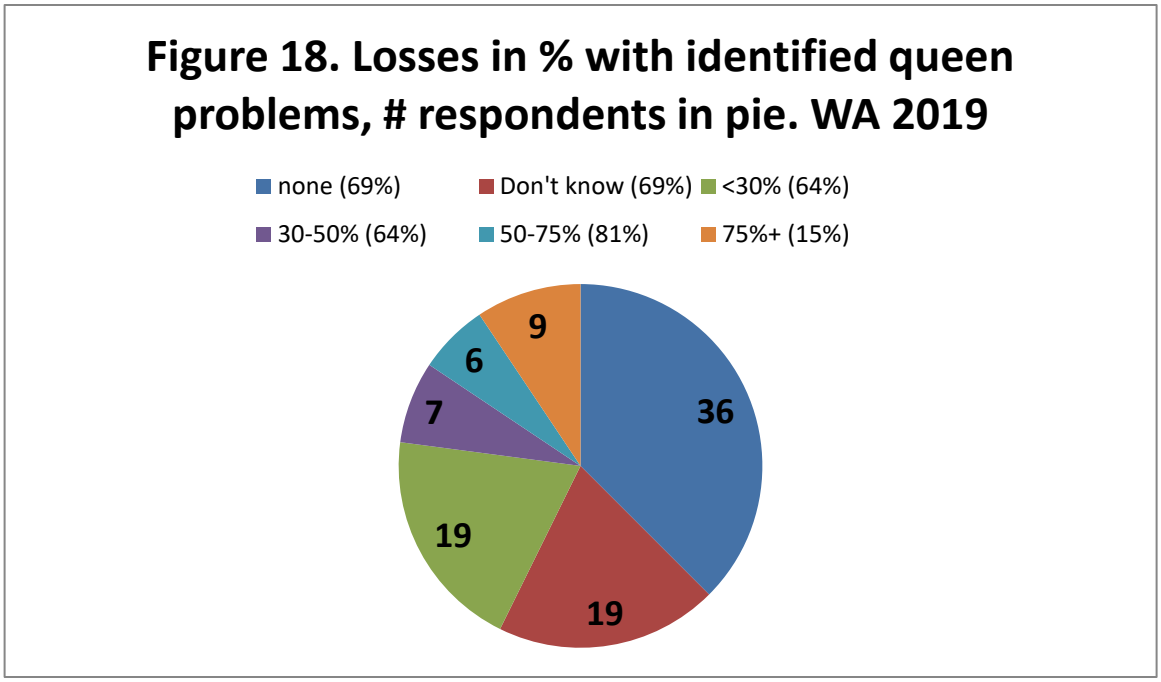
Figure 17

Antibiotic use

Nine individuals (9%) used Fumigilian (for Nosema control); their loss rate was 68%, slightly higher than overall loss level. One used nosevet in addition. Two indicated use of essential oil (One IDed as lemongrass) and had a 61% loss. One individual indicated use of terramycin (63% loss)and 2 said they used Tylan (38% loss) for bacterial brood disease control.

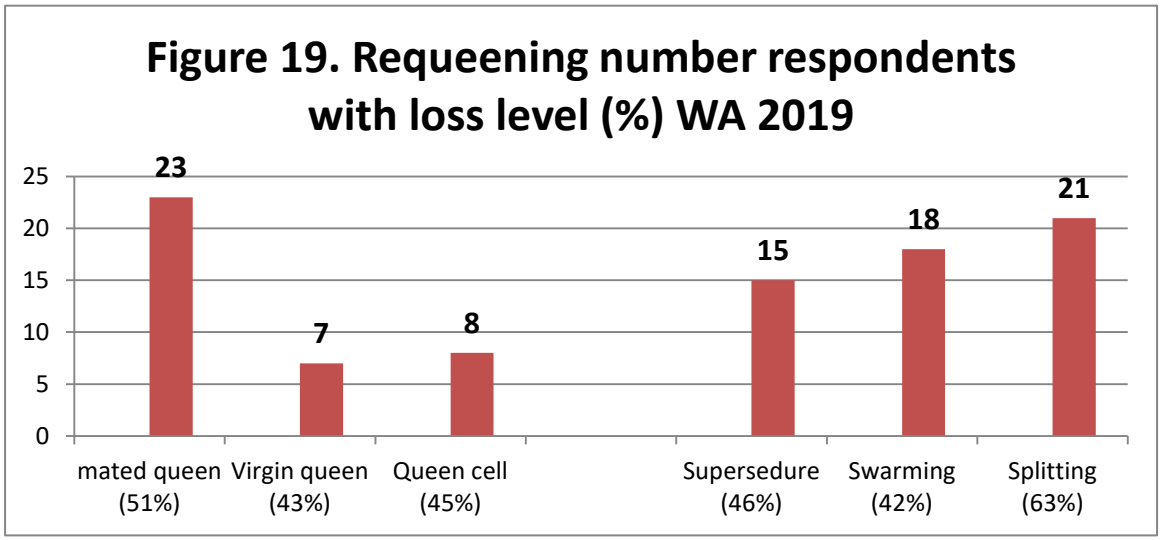
Queens

We hear lots of issues related to queen "problems". Recall under the questions asking the reasons why colonies didn't survive that 20 individuals, 20% believed queen failure as one of their selections. In Section 8 of the survey we asked what percentage of loss could be attributed to queen problems. Forty one individuals subdivided queen related issues from 10 to 100% of their hives; the majority (19 individuals) indicating up to 30% Thirty six (36%) said none; an additional 19 individuals (19%) said they didn't know. The number of respondents and percent losses of each is shown in pie chart Figure 18.



Queen events can be a significant factor contributing to a colony not performing as expected. We asked if you had marked queens in your hives. Twenty eight (28%) said yes. The related question then was did you or your bees replace their colony queen? Fifty three said yes, 28 said no. and the remainder 'not that that I am aware of.'

One technique to reduce mite buildup in a colony is to requeen/break the brood cycle. The question "How did bees/you requeen" received 92 responses (more than one option could be checked). as illustrated in Figure 26. Twenty three individuals indicated they requeened with a mated queen and they had a 51% loss level, seven used a virgin queen (43% loss) and 8 used a queen cell (45% loss). A higher percentage (54 instances vs 38) said the bees requeened via Supersedure (15 instances, 46% loss), splitting (21 individuals, 63% loss) or swarming (18 individuals, 42% loss). With the exception of use of mated queen and splitting, loss levels were very similar.



Closing comments

This survey is designed to 'ground truth' the larger, national Bee Informed loss survey. Some similar information is additionally available on the BeeInformed website www.beeinformed.org and individuals are encouraged to examine that data base as well. Recall that the BeeInformed survey is reporting losses of the larger scale WA beekeepers not the backyarders (figure 5A.) Reports for individual bee groups with 18 or more respondents are customized and posted to the PNW website.

We intend to continue to refine this instrument each season and hope you will join in response next April. If you would like a reminder when survey is open please email us at info@pnwhoneybeesurvey.com with "REMINDER" in the subject line. We have a blog on the pnwhoneybeesurvey.com and will respond to any questions or concerns you might have.

Thank You to all who participated. If you find any of this information of value please consider adding your voice to the survey in a subsequent season. Dewey Caron July 2019