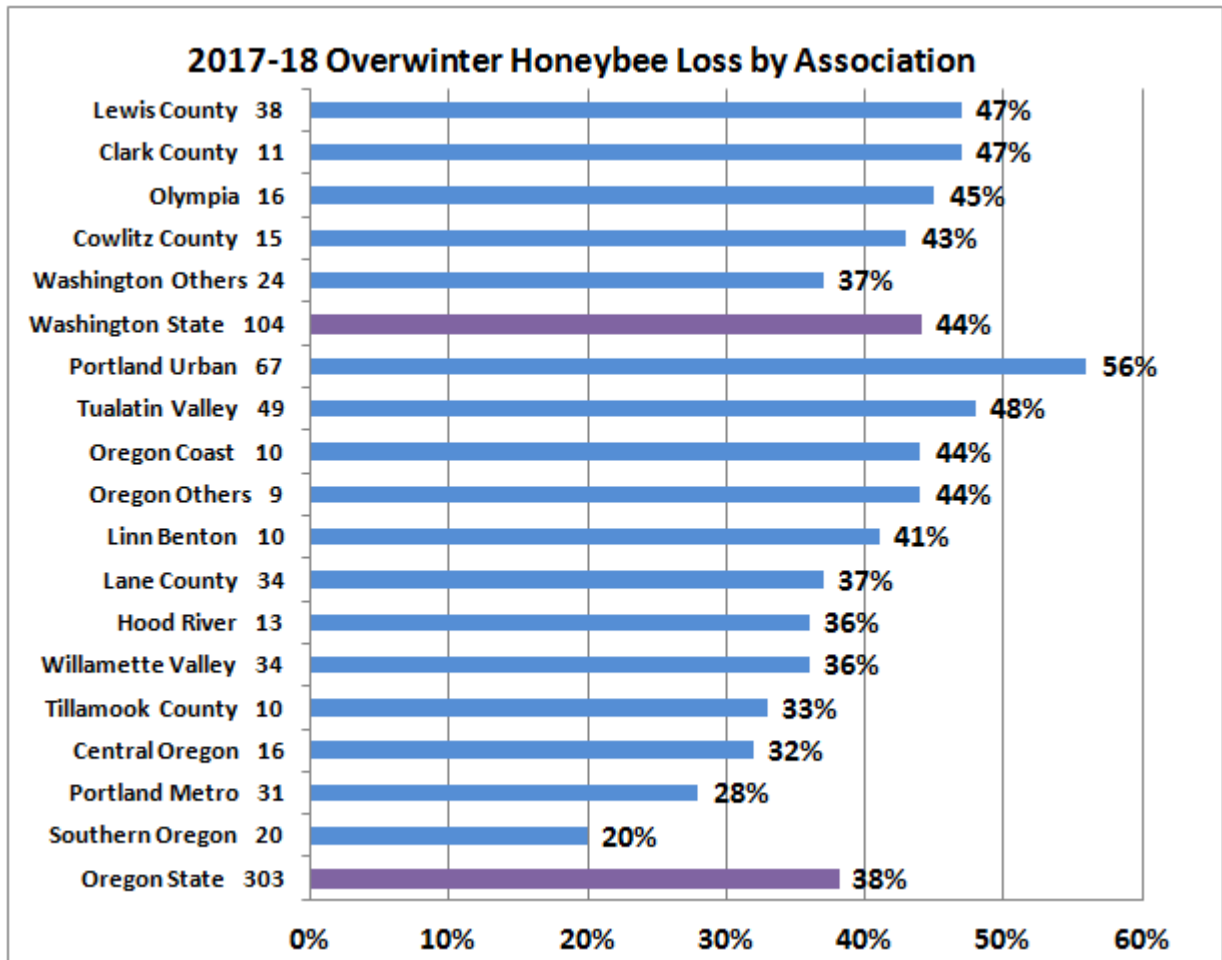


Washington backyard beekeeper Winter Losses 2017-18 Dewey Caron

One hundred four WA beekeepers 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 was reduced from the previous elevated loss levels in 2016-2017 of 63% to 44% 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 303 OR and 104 WA individuals; survey includes 1277 OR colonies (789 surviving = 38% loss) and 457 WA colonies (256 surviving = 44% loss).



The WA respondents to the electronic survey were a mixture of single digit colony numbers and others with more colonies and of new beekeepers mixed with more experienced individuals. Thirty seven percent (37%) of WA respondents had 1 or 2 years of experience; 28% had 3 to 4 years' experience (medium number = 3). 10 individuals (12%) had 5 to 7 years, 10% had 7 to 10 years and 12% had 14+ years of experience, [4 individuals above 30 years]; highest was 55. For fall colony numbers, 40.5% had 1 to 2 colonies, 26% had 3 or 4 colonies (medium was 3 colonies/individual), 19% had 5, 6 or 7 colonies, 8% had 8, 9 or 10 colonies and 7% had 12+ colonies; largest number was 35 colonies. Of the last 7% (>12 years' experience) there was 17.5% average years of experience and average of 6 colonies lost/individual.

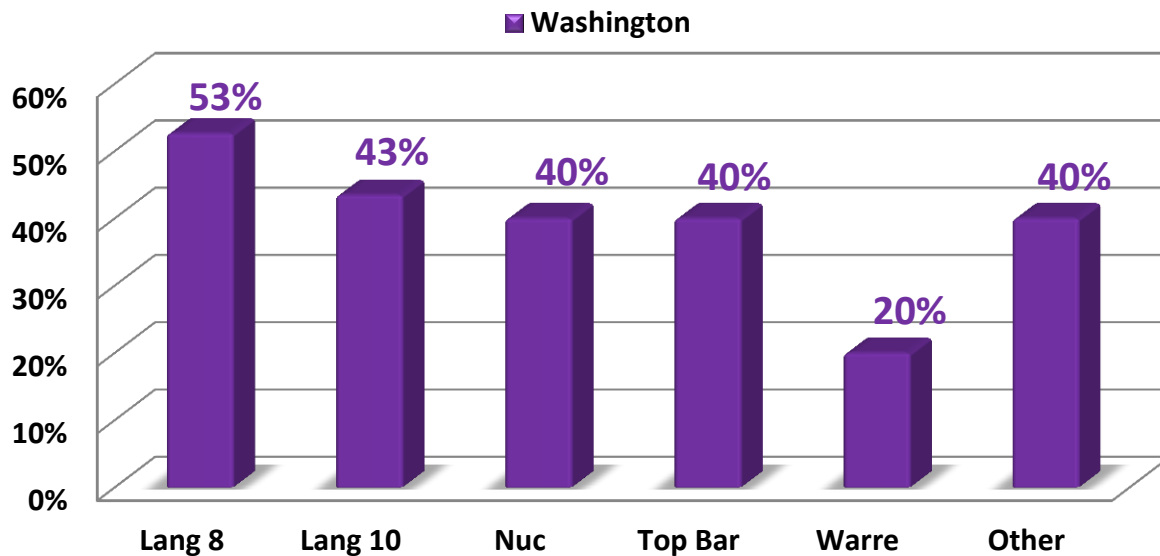
Seventy one (73%) of WA beekeepers had an experienced beekeeper mentor available as they were learning beekeeping. This percentage was up from 62% the previous year.

2017-2018 Overwinter Bee Losses

Total WA backyard beekeeper overwinter loss = 44% loss.

The WA survey overwintering loss statistic was developed by our asking number of fall colonies and surviving number in the spring by hive type. Results, shown in Figure 2 bar graph, illustrate overwintering losses for 104 total WA beekeeper respondents. Langstroth 8 and 10 frame beehives (88% of total) had heavier losses than 5 frame nucs (40% loss) and alternative hives. Total alternative – non-movable comb =10%). Other hive types Identified included long hives, tree hive and skeps plus others not specifically IDed. The previous year overall WA colony loss was 63%.

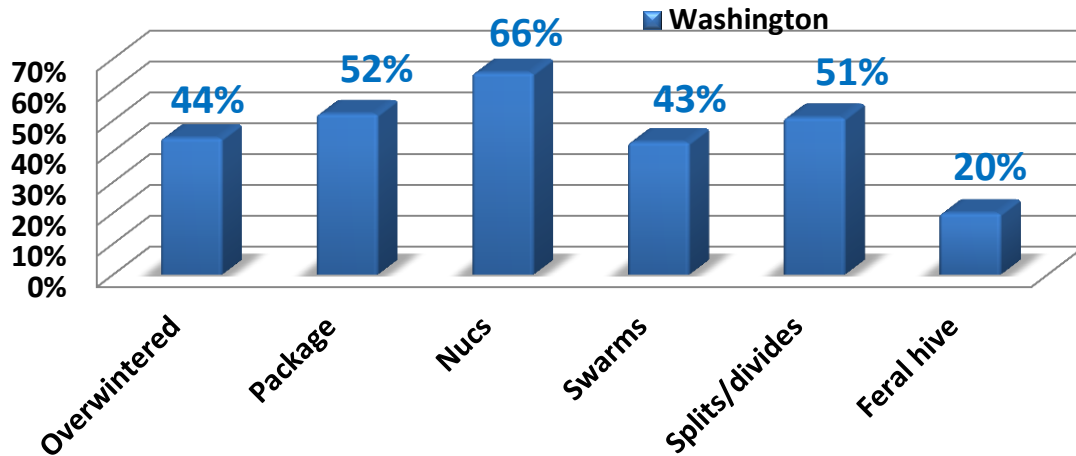
Figure 2. 2017-18 Winter Honeybee Loss % by Hive Type



Fall Col #	57	345	10	25	5	15
Spring Col	27	195	6	15	4	9

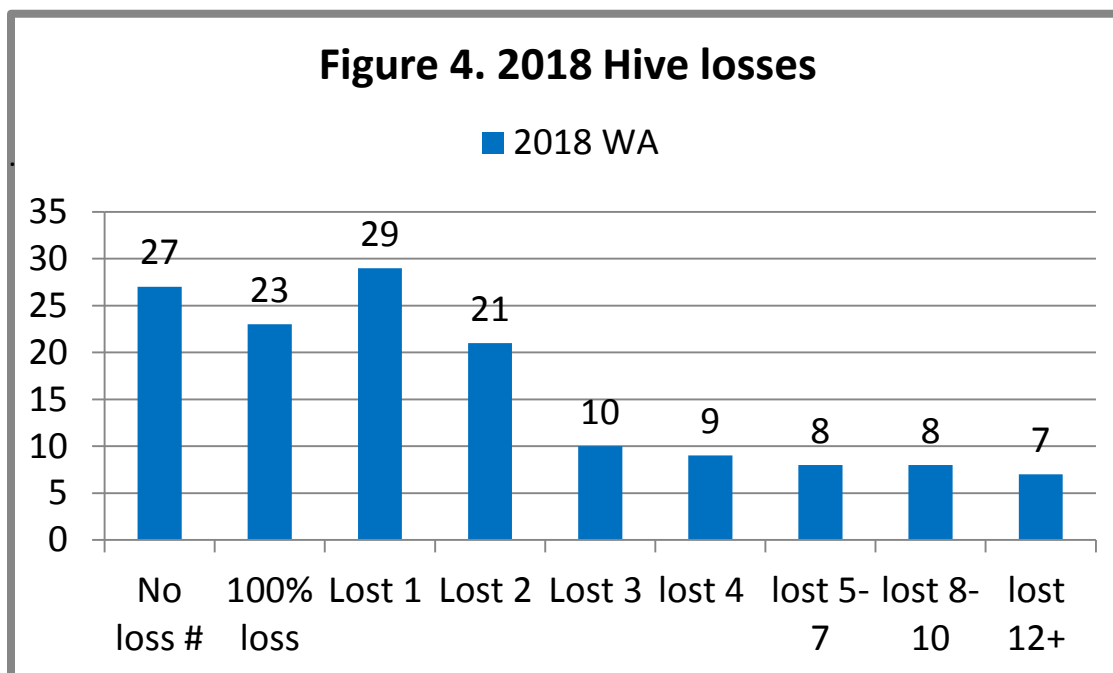
Origination: We also asked about hive loss by origination. Data shown in Figure 3. Overwintered colonies and swarms had better winter survival than did packages, nucs and splits. Feral colonies exhibited the best survival rate, although few in number.

Figure 3 2017-18 Winter Honeybee Loss % by Origination



Fall Col #	230	69	58	86	51	15
Spring Col	128	33	20	49	26	12

Among 101 total WA beekeepers (4 individuals were new beekeepers), 15 individuals (15%) maintained more than one hive type. For the total WA beekeepers, 27 (27%) had no loss and 23 individuals (23%) had total loss. Twenty-nine WA individuals lost 1 colony, 21 individuals lost 2 colonies and 10 individuals lost 3 colonies (60% of individuals with losses). Seven (7) individuals lost 12 or more colonies; highest loss was 20 colonies. Data in Figure 4.

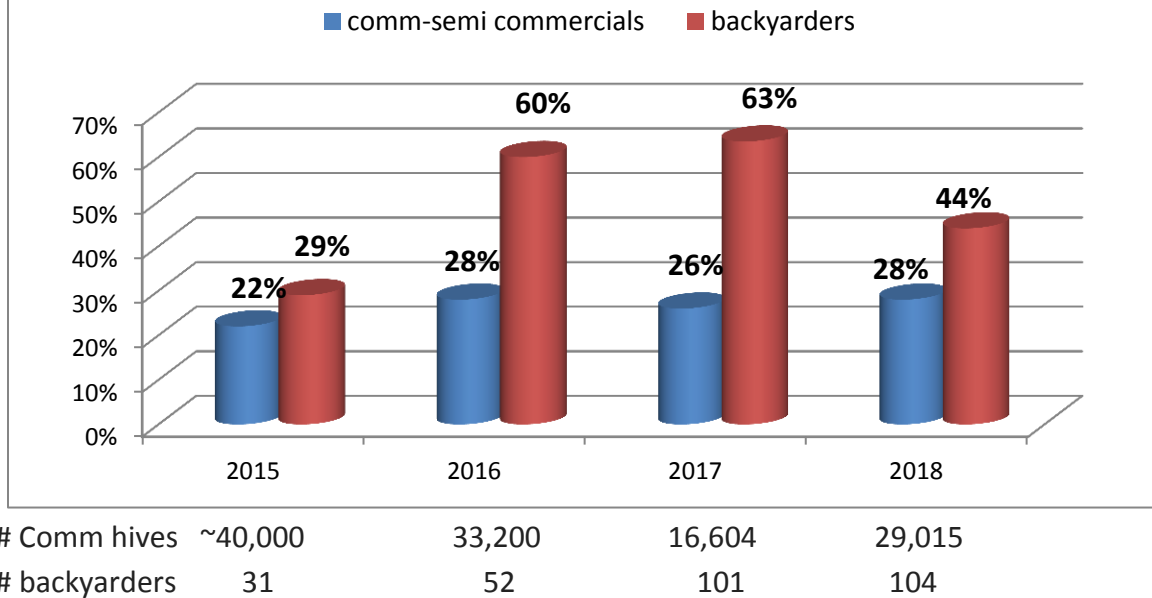


Comparison of backyarders and commercial/semi-commercial beekeepers

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.

Backyard losses have consistently been higher, most years double the losses of larger-scale beekeepers. The reasons for this dichotomy 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 proactive in varroa mite control management.

Figure 5. Comparison of WA Commercial losses with backyard beekeeper losses, 4 years 2015-18

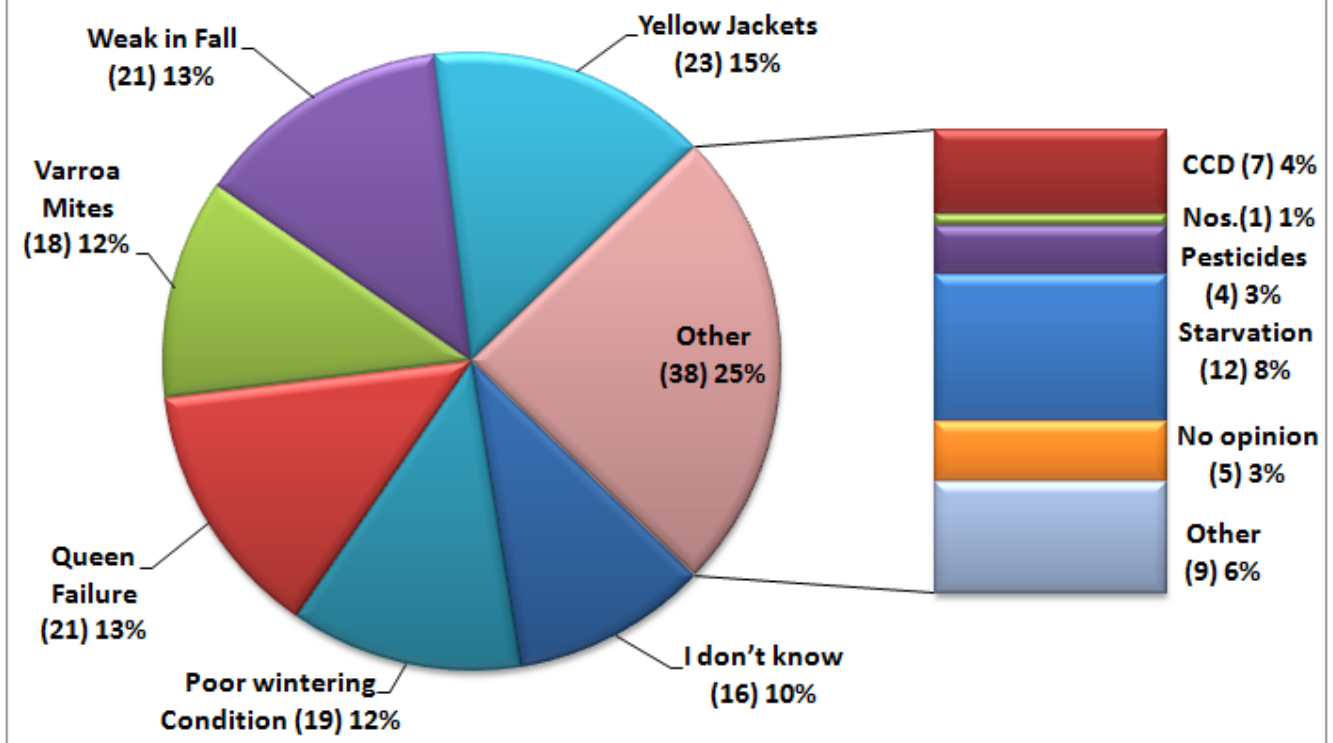


Self-reported “reasons” for colony losses: We asked survey takers who had winter losses for the “reason” for their losses. More than one selection could be chosen. In all there were 156 WA selections (1.5/individual) provided. Weak in the fall (21 individual choices), poor wintering conditions (19 choices), Varroa mites (18 individuals) and queen failure (21 individuals) were the major factors listed, closely followed by don’t know (16 individuals). The side bar shows other selections.

There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. **Doing the 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.**

Respondents were asked to select an acceptable loss level, being offered several categories to check. Four individuals said zero, while 8 said 10% (25% for both responses) 19 said 25%, medium number (40%), 5 said 33% and 9 said 50% loss (19%) was acceptable. One individual each said 75% and 100% (4%) each.

2017-18 Perceived Factors of Colony Death



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.

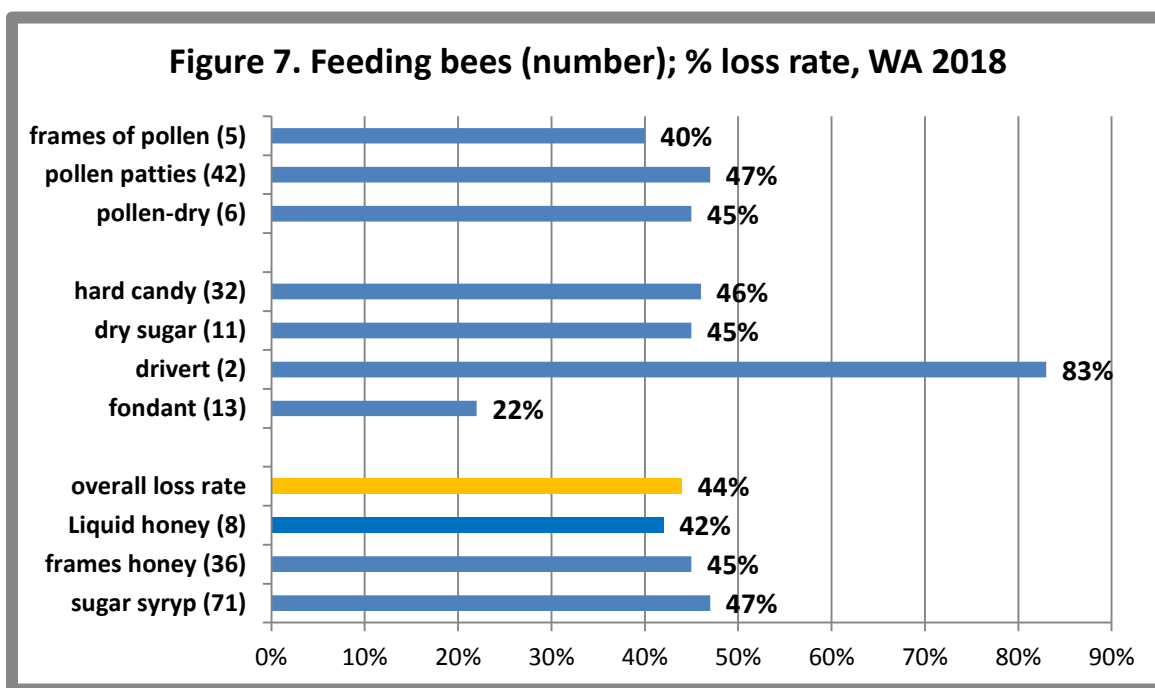
Pro-active Managements: Do you feed bee colonies in your care with sugar, honey or protein? Do you take extra measures for wintering preparation? Are we doing the sanitary practices we would in animal husbandry with our bees such as cleaning hive tools/frequently washing gloves (if used) between inspecting different hives or, when we find it necessary to take a frame from one colony to another do you check to confirm the donor colony is healthy?

Part 2 of the loss survey asks some basic questions to allow comparison of loss rates from beekeepers who may perform one management with those who don't do that management or with the average loss level. Analysis is of a single factor equated to losses but beekeepers do not normally do only a single management. The analysis is not cause and effect but rather a snapshot of losses related to what some beekeepers do for their colony management.

FEEDING PRACTICES: There were 231 selections of feeding managements by Washington beekeepers (2.7/individual). One individual made 6 selections (had zero loss) and 7 had 5 selections; their loss rate was 33%. Twelve had a single selection, 26 made 2 selections, 23 had 3 choices and 16 made 4 choices. Feeding bees carbohydrate in form of sugar syrup was indicated by 71 individuals (83% of individuals who had selections), frames of honey by 36 individual respondents (42%), feeding of hard sugar candy was done by 32 individuals (38%); Pollen patties were fed by 54 individuals (63%) with remaining managements by 13 or fewer individuals.

Only a single management, feeding of fondant by 13 individuals, showed improved survival. In contrast last year, feeding of hard sugar candy and the 4 individuals that fed pollen (2 as dry pollen (14% loss) and 2 as pollen frames, 33% loss) had better overwintering success compared to the average WA loss last year of 55%.

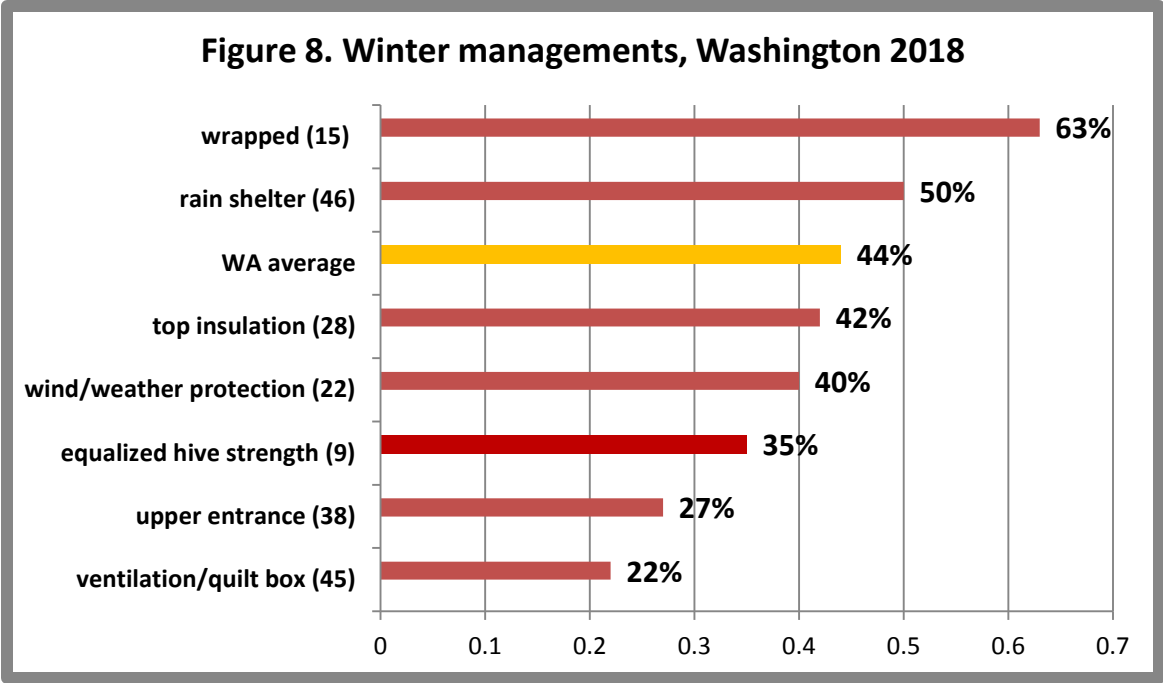
Oregon beekeepers that fed honey (133 total) had 30% loss in 2017-18 survey (overall loss was 38%) and Individuals that fed non-liquid sugar collectively had a lower loss level of 32%. Best survival was with feeding of hard candy (60 individuals, 23% winter losses) and, as with Washington beekeepers, feeding of fondant sugar feeders had lower losses (54 OR individuals fed fondant with a 30% loss level). Protein feeding did not improve winter survival of Oregon beekeepers, nor those in Washington, though it might be useful for colony development or preparing for winter with fall feeding.



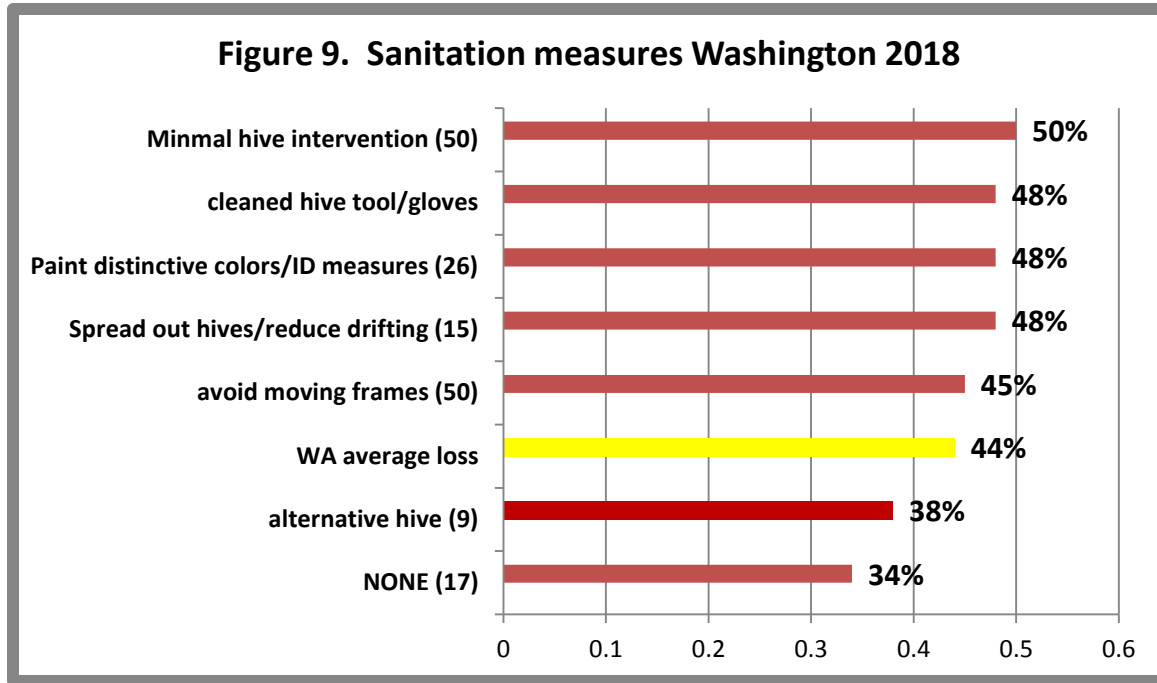
WINTERING PRACTICES: We received 211 responses about WA beekeeper wintering management practices (more than one option could be chosen). Twelve individuals (14%) percent of the respondents indicated none of the several listed wintering practices was done; these individuals had a 49% winter loss compared to overall of 44%. Twenty individuals (23.5%) had 1 selection, 40 had 2 selections (47%), 16 individuals had 3 choices and there were 8 with 4 selections and 3 with 5; of those with 4 or 5 selections their loss rate was 33%.

The most common wintering management selected (46 individuals) was a rain shelter followed by ventilated (quilt) box/Vivaldi board at colony top 43 individuals and upper entrance 38 individuals. Figure 8 shows number of individual choices and percent of each selection.

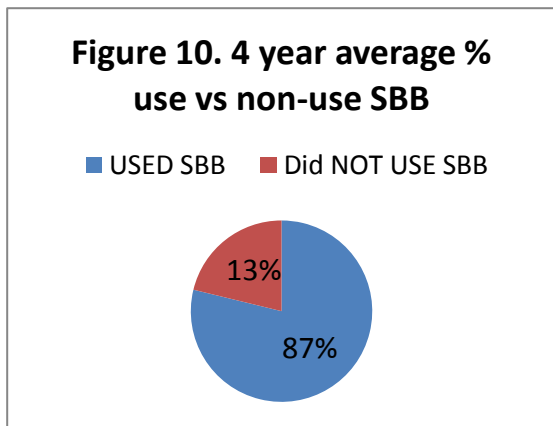
Two selections, rain shelter and wrapping did not seem to improve overwintering success but the remaining 5 winterizing managements all did. Respondents using a ventilation (quilt) box, also called a Valvaldi board, had ½ the losses of overall. For the 303 Oregon survey respondents, use of an upper entrance, equalizing hive strength (both 31%) and wrapping (33% loss) were managements that showed higher survivorship (overall loss rate was 38%). Use of a ventilation (quilt) box, among the most useful managements the previous year, was not among the managements with the lowest loss level this past season.



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. Seventeen individuals (18%) did not select any of the options listed under sanitation practices; they had a 34% loss rate. A total of 183 selections were marked (2.35/individual), 27 individuals had a single selections, 25 individuals had 2 selections, 17 individuals had 3 selections, 6 had 4, 2 had 5 and 4 had six selections. Those 4 individuals with 6 selections had a 40% loss level. Minimal hive intervention (53 individuals - 68%) was the most common option selected and avoid moving frames (50 individuals – 64%) was also commonly indicated. Only none and alternative hive selections had loss levels below the overall level. For Oregon beekeepers those doing none also had lower losses as did reduce drifting by spreading colonies out and providing hives with distinctive colors –ID & other hive ID measures. Last year, providing hives with distinctive colors showed slightly lower loss rate.

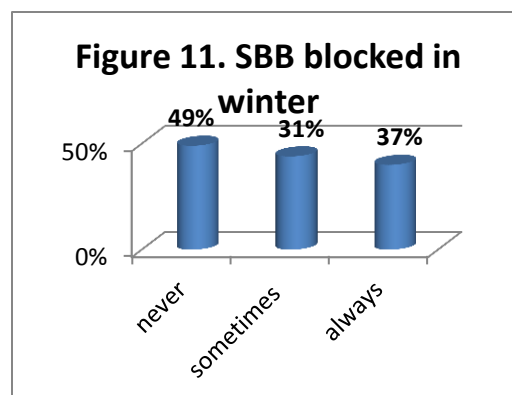


SCREEN BOTTOM BOARDS: Although many beekeepers use SBB to control varroa, BIP and PNW surveys clearly point out they are not a very effective varroa mite control tool. In this recent survey 13



individuals (12.5%) said they did not use screen bottom boards. In 4 PNW (OR and WA beekeepers) survey years 21% said they did not use SBB and 79% did use SBB on some or all of their colonies. See Figure to right of Washington SBB use this past season. The 13 individuals who did not use SBB actually had a slightly lower loss (41%) compared to those who used on some or all of their colonies (44%). **The four year average of SBB use by PNW beekeepers 41.3% loss level of those using SBB on all or some of their colonies and 43.4% for those not using SBB (a 5% positive gain) illustrates how SBB are very minor in improving overwinter survival.**

We asked if the SBB was left open (always response) or blocked during winter. This past season 40% of individuals said they always blocked SBB during winter. They had 225 colonies in the fall and lost 135 for a 40% loss rate. Thirty six individuals (35%) blocked them during winter (never response). They had 140 colonies in the fall and lost 72=49% loss rate. Ten individuals (10%) blocked them on some of their colonies. Their loss rate was 44%. **Comparing the always closed and never left open responses reveals a 9 percentage point difference in favor of closing the SBB over the winter period.** See Figure 11.



There is no good science on whether open or closed bottoms make a difference in overwinter but some beekeepers “feel” bees do better with it closed overwinter. Four years of comparison of PNW beekeepers shows those closing the screen during winter did have a 10 percentage point improvement in colony survival. An open bottom, at least during the active brood rearing season, can assist the bees in keeping their hive cleaner.

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, has shown to be of some help in reducing losses. However only feeding fondant sugar (13 individuals) had a lower loss level this past year for Washington beekeepers. In contrast last year, feeding of hard sugar candy and the 4 individuals that fed pollen (2 as dry pollen (14% loss) and 2 as pollen frames, 33% loss) had better overwintering success compared to the average WA loss last year of 55%. Oregon beekeepers that fed honey and Individuals that fed non-liquid sugar collectively had a lower loss level. Protein feeding did not improve winter survival of Oregon or Washington beekeepers, though it might be useful for colony development or preparing for winter with fall feeding.

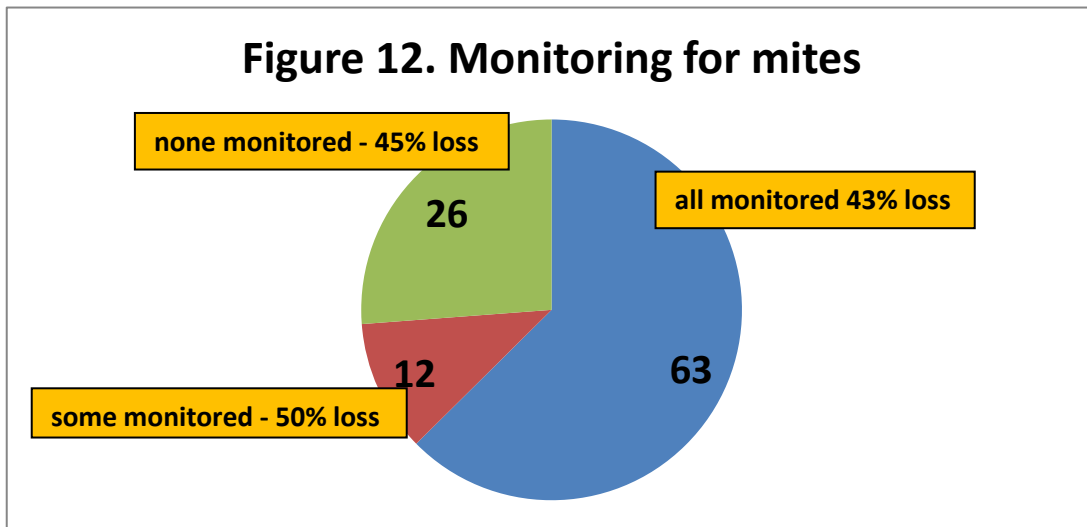
Doing some winter managements did seem to help improve survival. Respondents using a ventilation (quilt) box, also called a Valvaldi board, had ½ the losses of overall. For the 303 Oregon survey respondents, use of an upper entrance, equalizing hive strength (both 31%) and wrapping (33% loss) were managements that showed higher survivorship (overall loss rate was 38%). Use of a ventilation (quilt) box, among the most useful managements the previous year, was not among the managements with the lowest loss level this past season in Oregon for unknown reasons.

The sanitation choices did not measuredly improve survival. In fact for both Oregon and Washington respondents those individuals that di nothing had the lowest losses. For Oregon beekeepers those beekeepers who sought to reduce drifting by spreading colonies out and those providing hives with distinctive colors –ID & other hive ID measures had lower losses. Last year, providing hives with distinctive colors showed slightly lower loss rate.

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

Mite monitoring/sampling and control management

We asked percentage of colonies monitored for mites during the 2016 year and/or overwinter, 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 three individual respondents (61%), 2 percentage points fewer than the previous year, said they monitored all their hives and when those individuals monitoring was



compared to loss, this group had a 43% loss. Twenty six (25%), reported no monitoring and they had a slightly higher loss rate, 45% loss. 12 individuals reported monitoring some of their colonies; they had a 50% loss. See Figure 12. Oregon beekeepers also reported an advantage in monitoring. 184 individuals who monitored had a 38% loss while 77 individuals who did not monitor had a 49% loss. See the pnwhoneybeesurvey site for a report on monitoring for Oregon beekeepers.

When asked how the hives were monitored, the 75 WA individuals who indicated they did monitor had five choices. Twenty-four individuals selected only a single method (12 sticky board, 2 alcohol wash, 2 powdered sugar, 3 drone brood and 5 adults) while the remainder selected two or

more methods. Most popular was visual on adults =48 and sticky board 47. Drone brood was selected by 30 individuals, powdered sugar 17 and alcohol wash 14. For the 14 individuals used alcohol wash and 17 using powdered sugar losses of both were respectively

For WA beekeepers the most common response was did not sample or treat (29 individuals, had 48% loss) followed by treated but did not sample (26 individuals, also had 48% loss). Beekeepers sampling both pre- and post-treatment (23 individuals) had 41% loss. Individuals who sample pre-treatment (13 individuals) had 26% loss and those who did only post-treatment (6 individuals) had 27% loss. Six individuals who sampled but did not treat had a 45% loss.

Figure 13 compares sampling/treatment relationships of past two years. The number of individuals varies widely as does the loss averages. Individuals (17 in 2016-17 and 23 in 2017-18) that sample both before and following treatment had losses below the overall averages (53% in 2016-17 and 44% this past winter but not greatly so. The small number of individuals (3 in 2016-17 and 4 this past survey year) who sampled only post treatment likewise had slightly lower losses both years. Individuals who neither treated nor sampled and those who sampled but did not treat had losses similar to overall losses for their respective years.

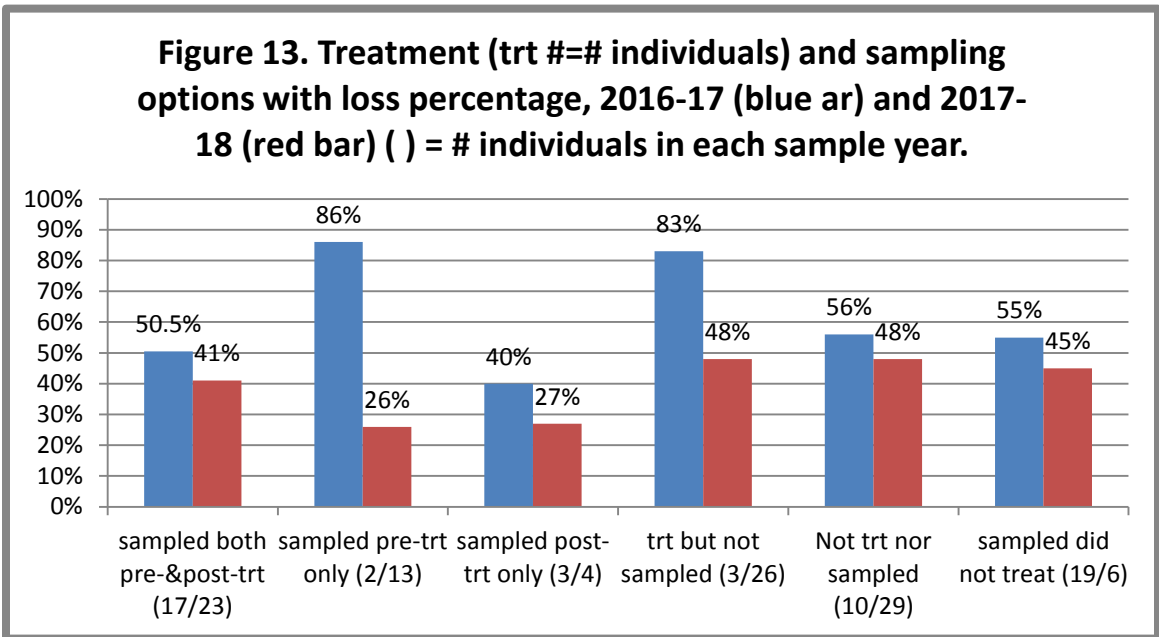
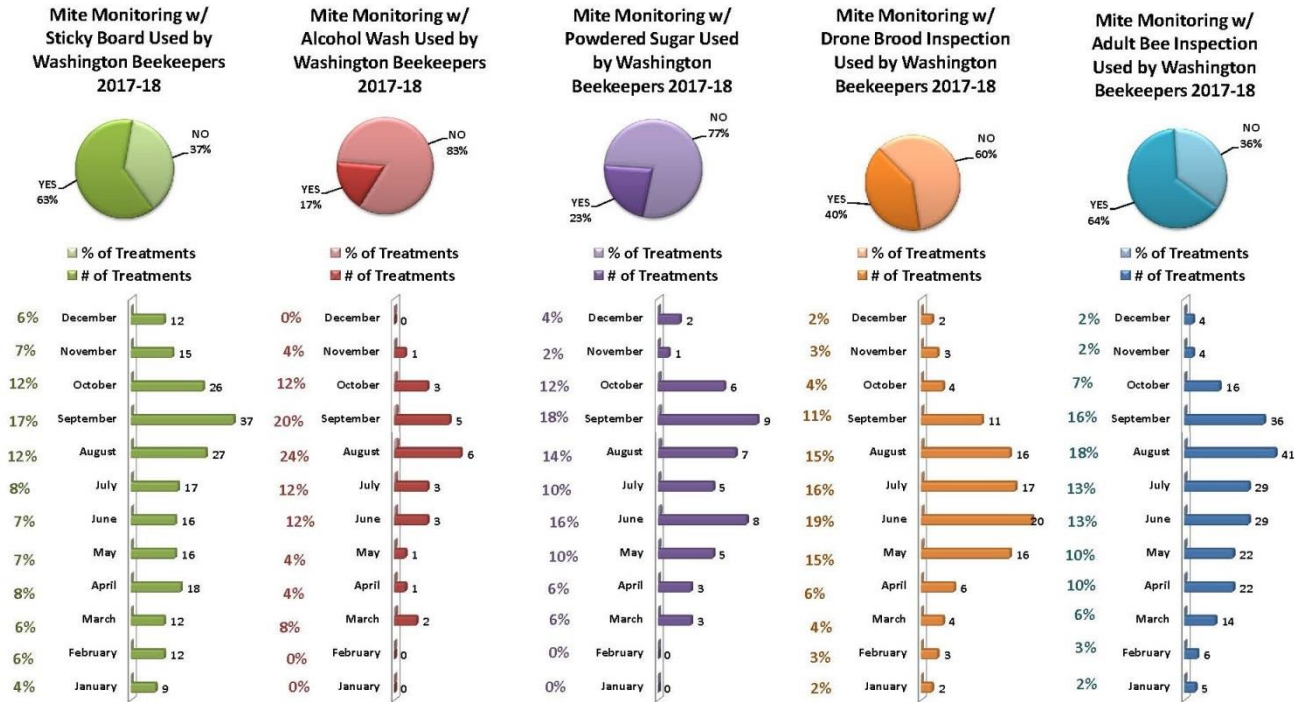


Figure 14 illustrates the sampling methods and when they were performed. Most months are included for all 5 sample methods, except alcohol wash and powder sugar in the winter months. Most sampling is done April to October as expected.

Figure 14



The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in Figure 15 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

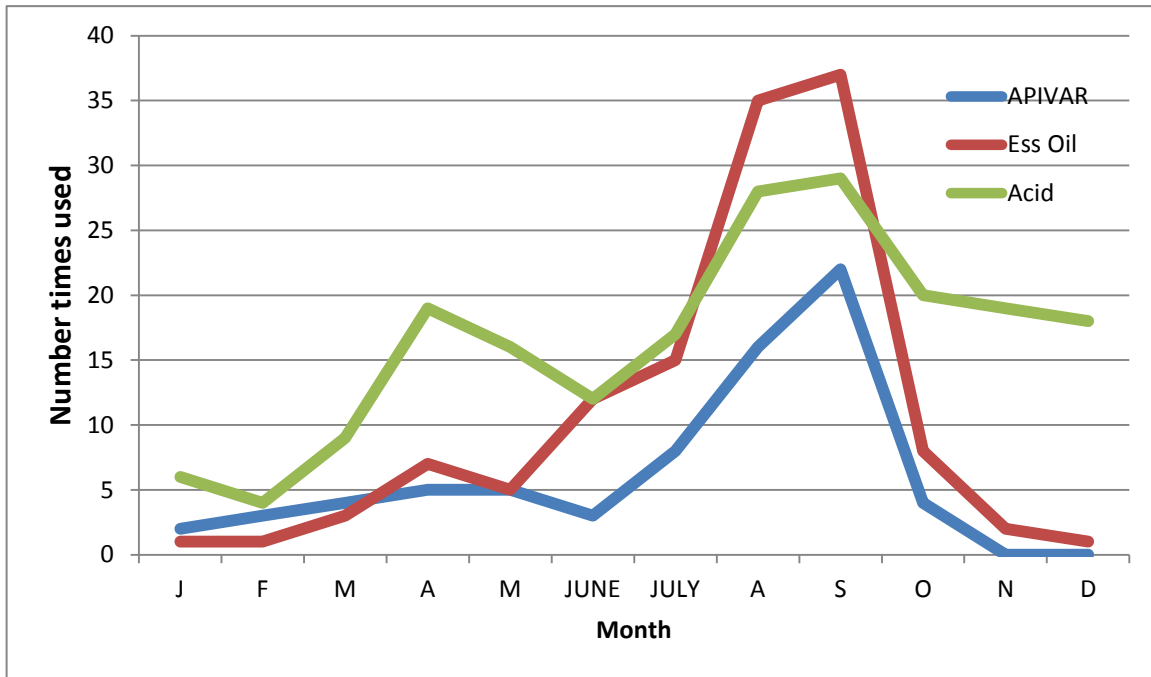
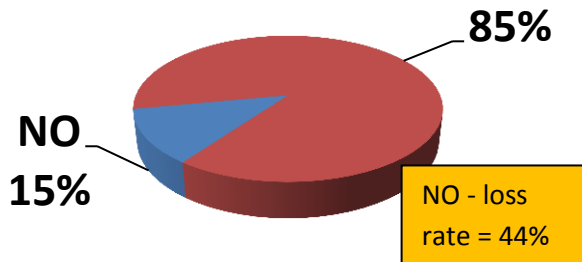


Figure 15

Mite control treatments

The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Fifteen individuals (15%) said they did not employ a non-chemical mite control and 34 individuals (34%) did not use a chemical control. See Figure 16. Those who did not use a non-chemical treatment reported a 44% winter loss while those not using a chemical control had a 42% loss, both lower than overall Washington beekeeper loss. Last year with those indicating doing nothing had a 10 percentage point lower loss level than the total respondent base. The individual options are discussed below.

Non-chemical Mite Control Practices Used YES



Chemical Mite Control Practices Used

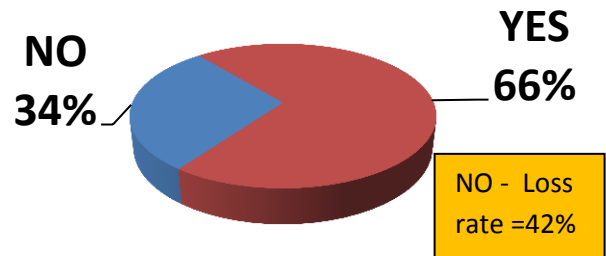
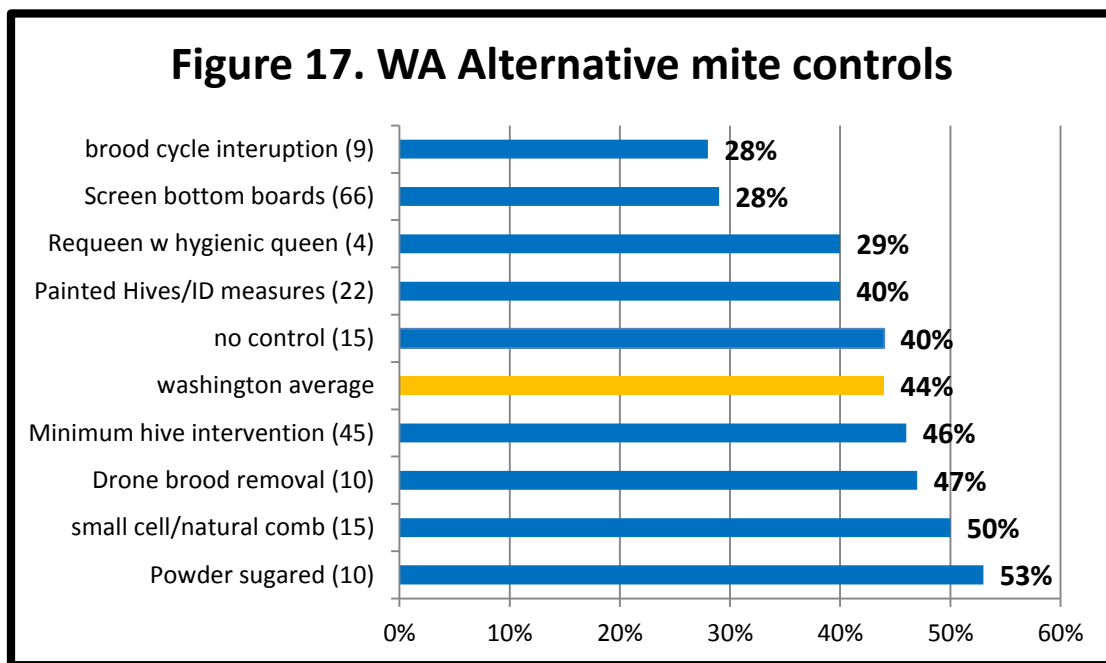


Figure 16

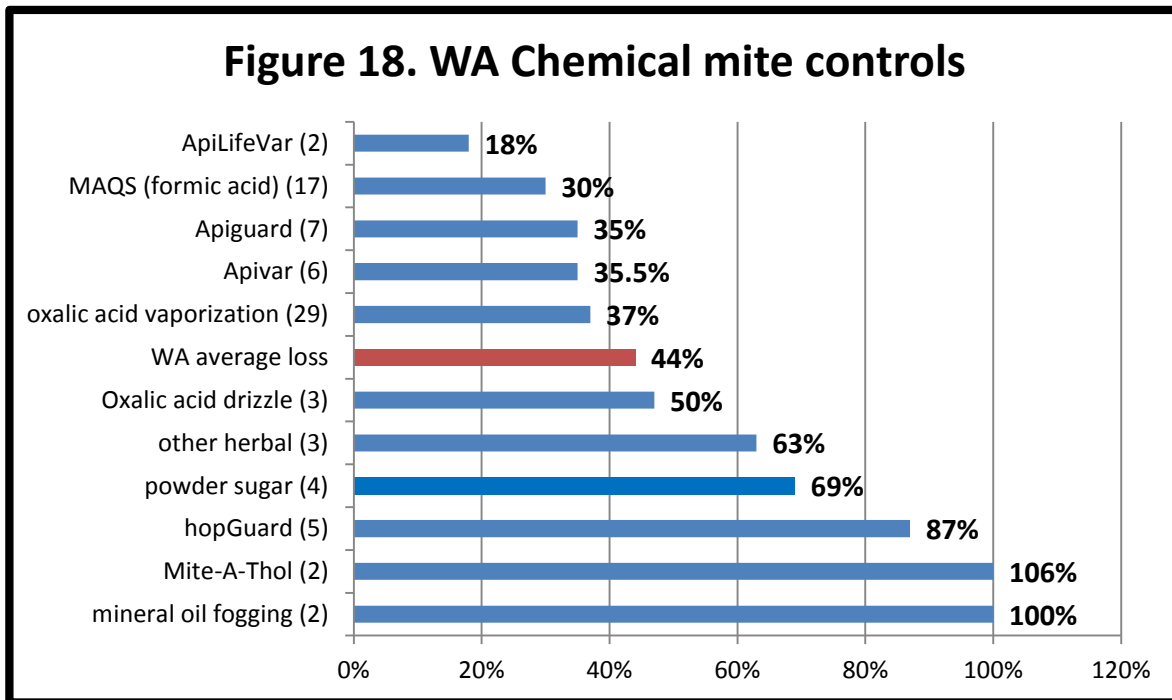
Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category) use of screened bottom board was listed by 66 individuals (0%, up by 11 percentage points from last category)



year). The next most common selection was minimal hive inspection (45 individuals, 55% also higher than last year). The use of the remaining 7 selections are shown in Figure 17; number individuals in ().

Brood cycle interruption (9 individuals) had the best survival and so did Screen bottom boards. Painting hives a color/distinctive ID measures (22 individuals) and requeening with hygienic queens (only 4 individuals) also seemed to be effective (last year 6 individuals checked this choice and they too had lower losses. powder sugaring (10 individuals) were also popular; the remaining selections were chosen by 6 or fewer individuals. **Timing and proper application of alternatives is critical to successful completion. Bees need time to properly prepare for winter following successful mite reduction.**

Chemical Control: Thirty-four WA beekeepers did NOT use a chemical control –they had a 47% loss. In all, 49 selections were made (1.1/individual, 7 individuals used 2 chemicals, 4 used 3 materials and one each used 4 and 5 chemical treatments). The choices and the loss rate are shown in Figure 18. Several materials ApiLifeVar, MAQS (formic acid), Apiguard, Apivar and oxalic acid vaporization showed lower losses.



Last year only the 2 WA individuals who used oxalic acid dribble (had no loss of colonies) and those who used MAQS (formic acid) had losses below the average loss. In comparison, for OR beekeepers, Apiguard had the lowest loss rate of 24% of all the chemical choices this past year and it was 10 percentage points lower than the previous year. Oxalic acid vaporization use increased this year (64 OR individuals compared to 38 last year) and loss rate was 9 percentage points below overall, the second year it has had losses below the overall level. Oxalic acid drizzle use was higher this year (42 OR individuals compared with 27 last year) and loss rate indicates, like vaporization, that users had reduced loss rate (4 percentage points below overall this season: last year 7 percentage points lower). Finally ApiLife Var, used by 29 individuals (increase from 16 last year) had a loss rate of 34% (10 percentage points greater than last year but still lower than overall.) The reason for the difference between WA and OR beekeepers is unknown.

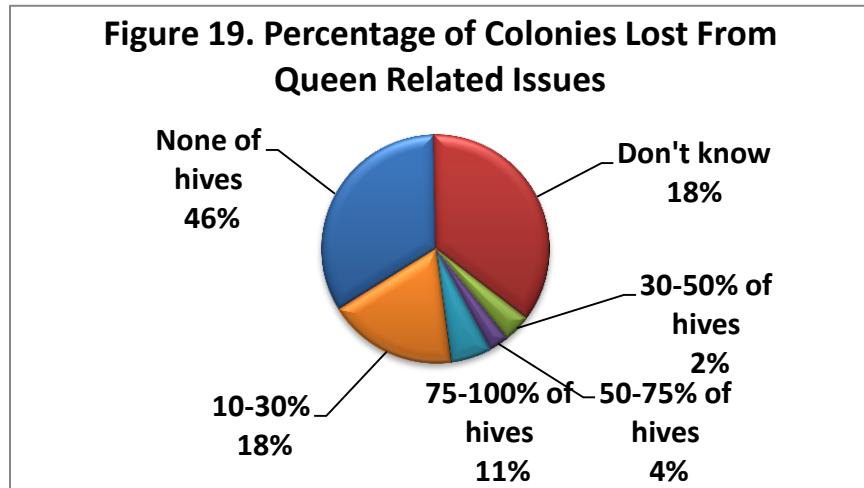
Antibiotic use

Twelve individuals (12%) used Fumigillan (for Nosema control); their loss rate was 29%. One individual used Nosevet (17% loss rates). Two individuals (one less than last year) indicated use of terramycin. They had 56% loss level.

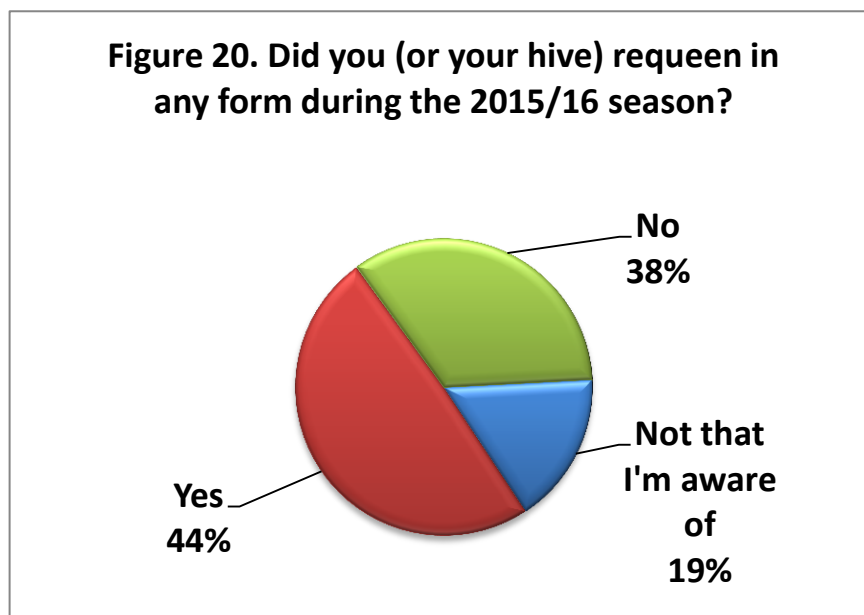
Queens

We hear lots from beekeepers who report “issues” related to queens “problems”. Recall under the questions asking the reasons why colonies didn’t survive, that 21 individuals, 13%, self-reported queen failure as one of their selections. In the survey we also asked what percentage of loss could be attributed to queen problems. 46% (45 individuals) said one and an additional 18 individuals said didn’t know = 64%. Thus 36%, a little more than double from those self-reporting queen failure, said that they lost some colonies from queen failure. The majority, 18 individuals, listed queen issues in 10-30% of their colonies. Eleven individuals listed this as a 75-100% effect. Number of individuals, in (), and percentage of estimate of loss rate is shown in pie chart Figure 19.

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. Eighty one (up 7 from previous survey year) (29%) said yes. The related question then was did you or your bees replace their colony queen? Forty-three percent (121 individuals) said yes, 36% said no and the remainder was ‘not that that I am aware of.’ Figure 20.



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 five individuals (26%) said yes. The related question then was did you or your bees replace their colony queen? Forty-four percent (42 individuals) said yes, 38% said no and the remainder was 'not that that I am aware of.' Figure 20.



One technique to reduce mite buildup in a colony is to requeen/break the brood cycle. The question “How did bees/you requeen” received 69 responses (more than one option could be checked). Sixteen percent (16%) of respondents indicated their bees were requeened with a mated queen. Bees did their own requeening more commonly via swarming 26% than supersedure 23% according to respondents. Five individuals said they requeened with virgin queens and 3 with queen cells. Eleven (11) individuals said they did requeening via splitting. Two “other” respondents said they introduced brood from selected colonies and eliminated all other queen cells so the bees would rear queens of their selection.

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. Reports for individual bee groups 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 and Jenai Fitzpatrick, June 2018

THANK YOU. Bee counted-Bee informed! I hope you find this useful. Please consider participating in the PNW and/or the National BIP survey next April! Help make the Washington state report more robust with an even larger participant base next year