

# Winter Bee Losses of Pierce Co WA Backyard Beekeepers for 2019-2020

by Dewey M. Caron

Overwintering losses of small-scale Washington backyard beekeepers decreased this past winter, dipping one percentage point below the 5-year loss average. One hundred thirty-three Washington beekeepers (35 more 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](http://www.pnwhoneybeesurvey.com).

Response by local Oregon (OR) & Washington (WA) association varied as indicated by blue bars in Figure 1. Statewide loss level is highlighted with Orange bar. The number of respondent individuals is listed next to the association name. The bar length is the average club loss percentage for the year. Total fall colony response was 302 OR and 133 WA individuals; survey included 780 fall Washington beekeeper colonies. **Total WA backyard beekeeper overwinter loss = 50% loss.**

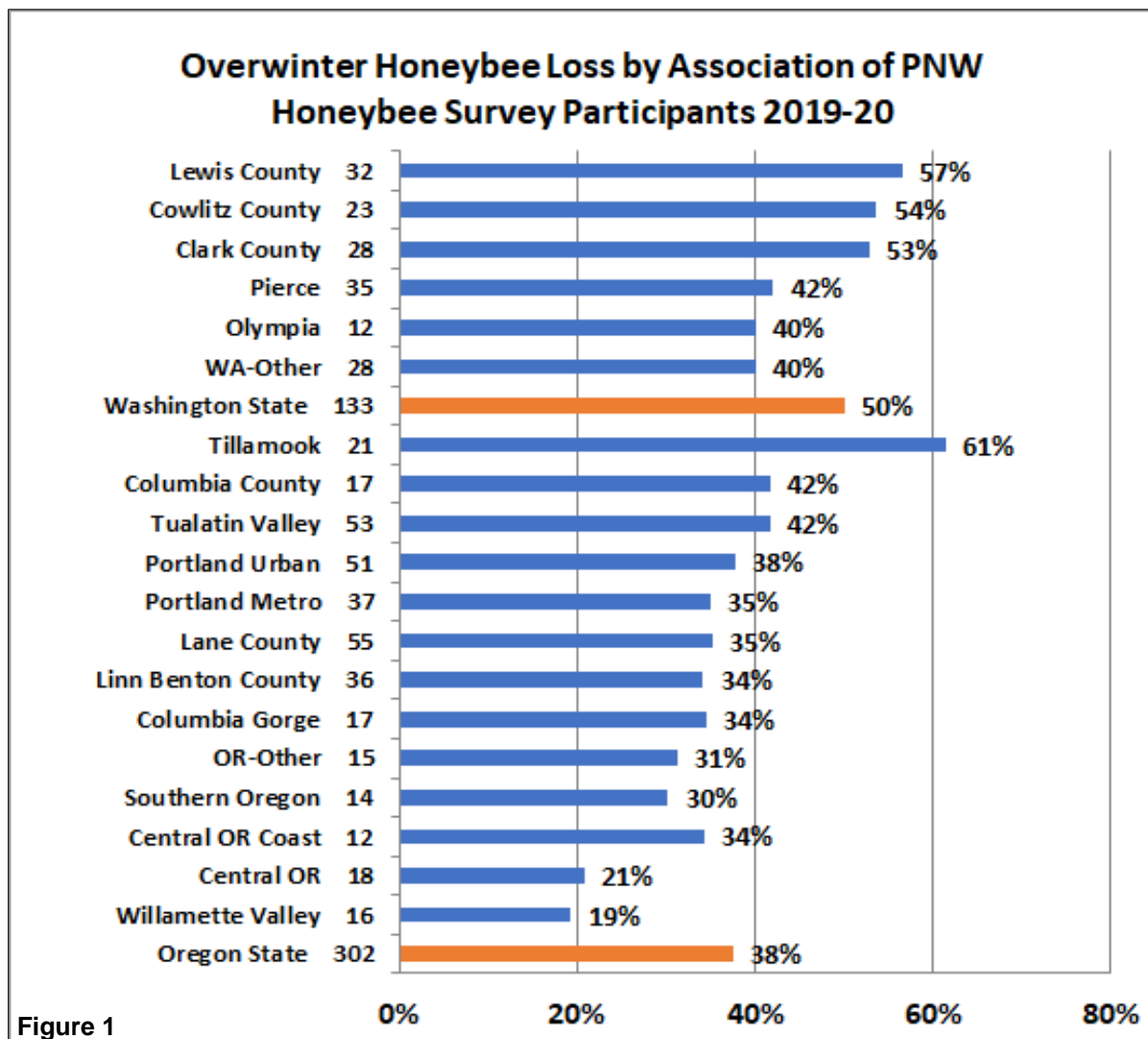
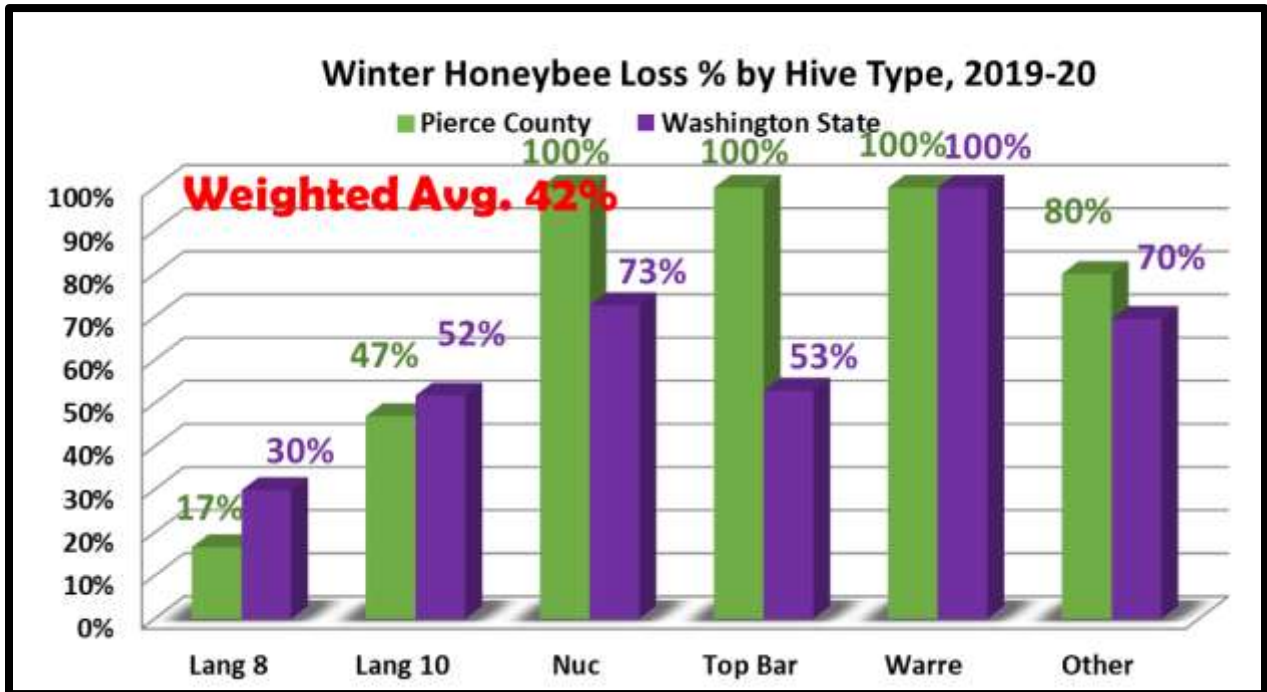


Figure 1

## 2019-2020 Overwinter Losses by Hive Type

The overwintering loss statistic was developed by subtracting number of spring surviving colonies from fall colony number supplied by respondents by hive type. Results, shown in Figure 2 bar graph, illustrate overwintering losses of 35 total Pierce CO beekeeper respondents in comparison with overall Washington beekeepers. **Total loss for Pierce Co was 42%**, 8 percentage points below statewide. The other were not identified.



Fall	66	134	6	1	4	10
Spring	55	71	0	0	0	2

Figure 2

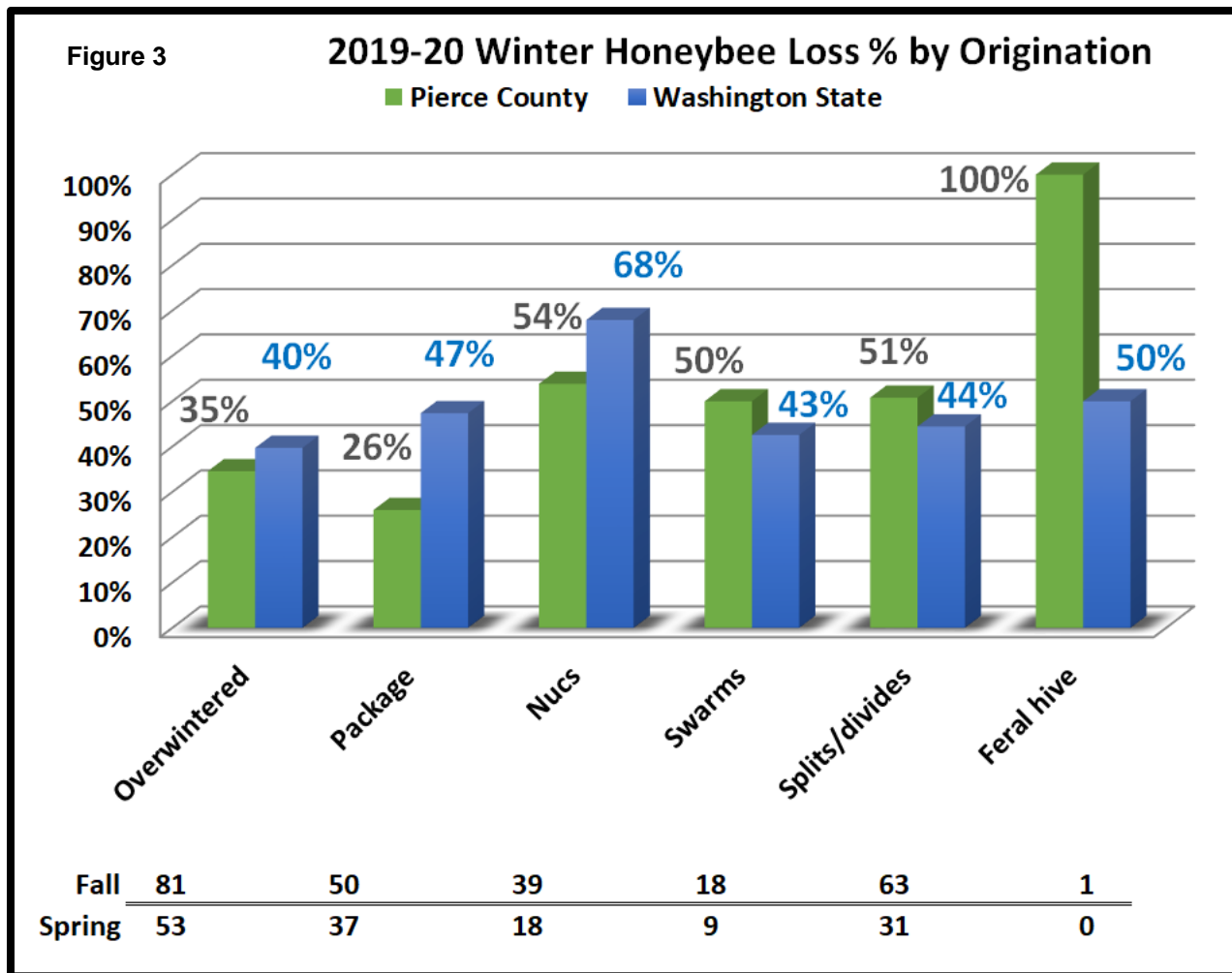
The Pierce Co. respondents to the electronic survey managed up to 36 fall colonies. Six individuals had 1 colony (33% loss), 7 respondents had 2 colonies (the greatest number) with 86% loss, and 4 members had 3 colonies (median - 75% loss. Individuals with 1, 2 and 3 colonies (49% of total respondents) and had a 72% loss. Ten individuals had 4 -6 colonies (57% loss), 4 individuals had 7 - 9 colonies (26% loss) and there were 3 individuals with 10+ colonies; they had 53% loss.

Seven individuals had 1 year of experience (9 ½% loss), 4 individuals had 2 years of experience (92% loss) and 6 individuals had 3 years of experience with 67% loss. For the 17 individuals (49% of respondents) with 1 to 3 years experience the loss level was 49%. Eleven individuals had 4 to 6 years experience – they had 62% loss, 2 had 7years’ experience 67% loss and 5 had 10+ years of beekeeping experience and had 26% loss. Highest level was 61 years.

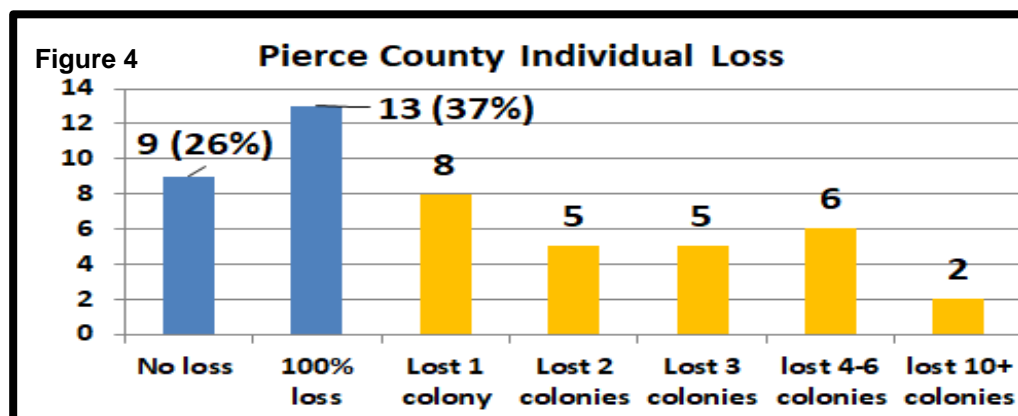
Seventy one (71%) of Pierce Co beekeepers had an experienced beekeeper mentor available as they were learning beekeeping.

## Survival Based on Hive Origination

We also asked about hive loss by origination. Data shown in Figure 3. All but packages had similar loss level; hives from packages exhibited slightly greater survival compared to others.



Among 133 WA beekeepers 19 individuals (14%) maintained more than one hive type. For the total WA beekeeper respondents, 25 (19%) had no loss and 54 individuals (41%) had total loss. For Pierce Co 9 individuals had no loss and 13 (37% of respondents) had total loss. Eight individuals lost 1 colony, 5 individuals lost 2 colonies and 3 colonies each, (69% of total losses) and 6 individuals lost 3-4 colonies. Two individuals lost 10 or more colonies; highest loss was 20 colonies. Data in Figure 4.

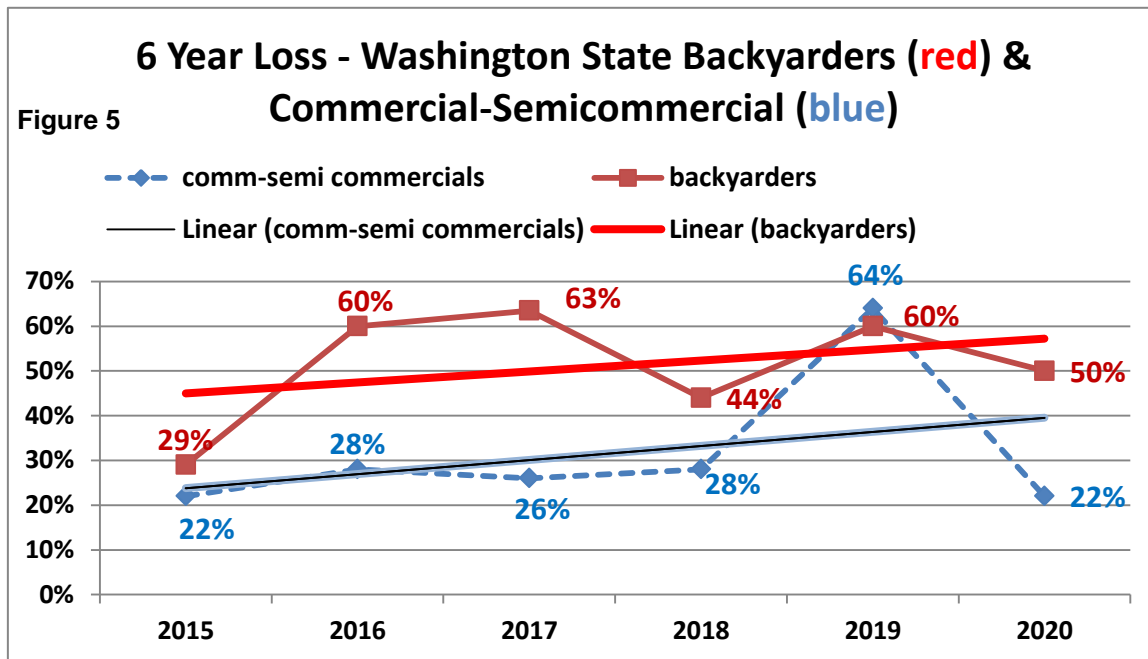


## LOSS History of Pierce County Beekeepers

The record from Pierce County includes 4 respondents last year – who had 54% loss level and this season – 35 individuals with 42% loss level. John Thomas surveyed Pierce members earlier this season. He received information from 32 respondents - members reported a total of 250 colonies with 135 overwintering = 54% colony losses, 12 percentage points higher than I received with the PNW survey. He indicated that 37.5% had 100% overwintering success, 28.1% had 100% overwintering mortality, 15.0% had 50% overwintering success and 1% had 75% overwintering success.

### Comparison to Larger-Scale Beekeeper Losses

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 the trend line of losses of both groups. Average loss level for Washington backyarders=50% and for Washington commercial/semi-commercial beekeepers = 22%.



# Comm hives	~40,000	33,200	16,604	29,015	~20,000	20,500
# backyarders	31	52	101	104	98	133

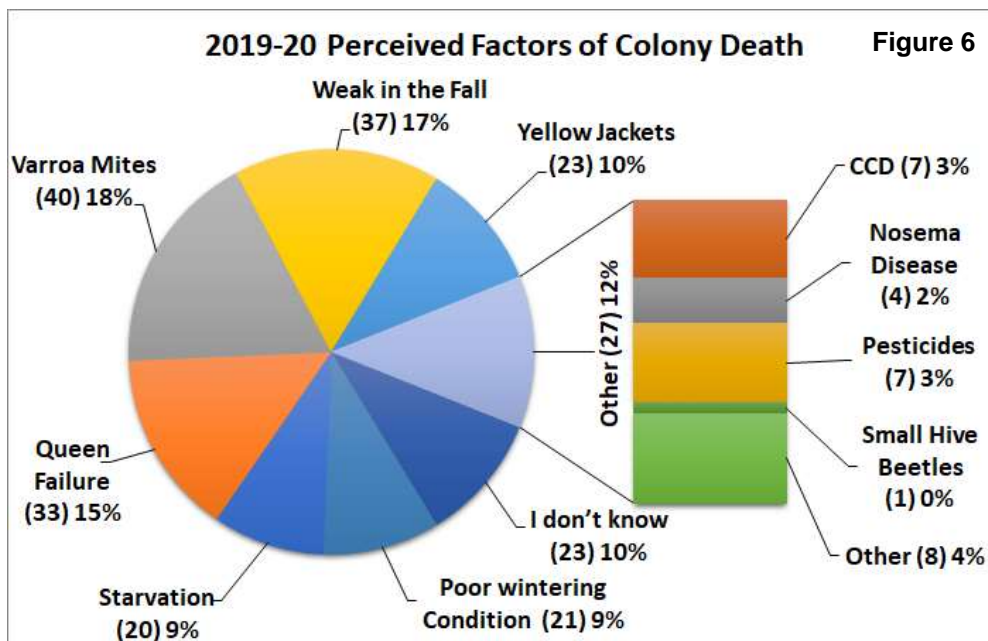
Backyard losses have consistently been higher, in some years double the losses of larger-scale beekeepers but in 2018-19 the commercial losses were higher than backyarder losses. Number of colonies of the commercial keepers returning surveys were essentially the same this past season (returns were an estimated 26% of the NASS estimate of 77,000 colonies in the state). The reasons backyarders have had higher losses 5 of the past 6 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 pollinate 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 PNW survey was conducted in part to “ground truth” the annual BeeInformed Survey (BIP) also conducted during April. 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 include colonies of migratory beekeepers who reported WA as one of their yearly locations. The BIP survey for the 2015-19 annual surveys (2020) 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). Average 5-year BIP WA loss is 23.7%. To access this data see <https://beeinformed.org/take-survey/>

### Colony Death Perceived Reason and Acceptable Level

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 (1.75/individual) provided. Weak in the fall (37 individual choices), Varroa mites (40) and queen failure (33 selections) were most common choices. For Pierce Co respondents there were 59 selections (1.7/individual), same as statewide. Varroa (12 individuals 40%), Queen failure (9 individuals) and poor wintering (8 individuals) were most common choices. Weak in fall and yellow jackets were indicated by 6 individuals each (20% of respondents), CCD by 4 individuals, 3 individuals said pesticide, 2 said starvation and 1 said Nosema. For vandalism, robbing and mice were listed. Five said didn’t know. Figure 6 shows the number and percent of factor selections for statewide respondents.



**Acceptable loss:** Survey respondents were asked reason for loss. Four individuals (12%) indicated zero (no loss). Eleven individuals indicated 15% or less. 20% was medium choice. Four individuals said 50% was an acceptable loss level. See table below.

Acceptable Overwinter Loss per 34 Beekeepers in Pierce County during 2019-20												
Loss level	5%	10%	15%	20%	25%	33%	50%	75%	100%	None	Other	
#	1	5	1	7	4	5	4	0	0	4	3	
%	3%	15%	3%	21%	12%	15%	12%	0%	0%	12%	9%	

**Why do colonies die?** There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. 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. More attention to colony strength and checking stores to help avoid winter starvation will help reduce some of the losses. **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. 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 multiple 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.

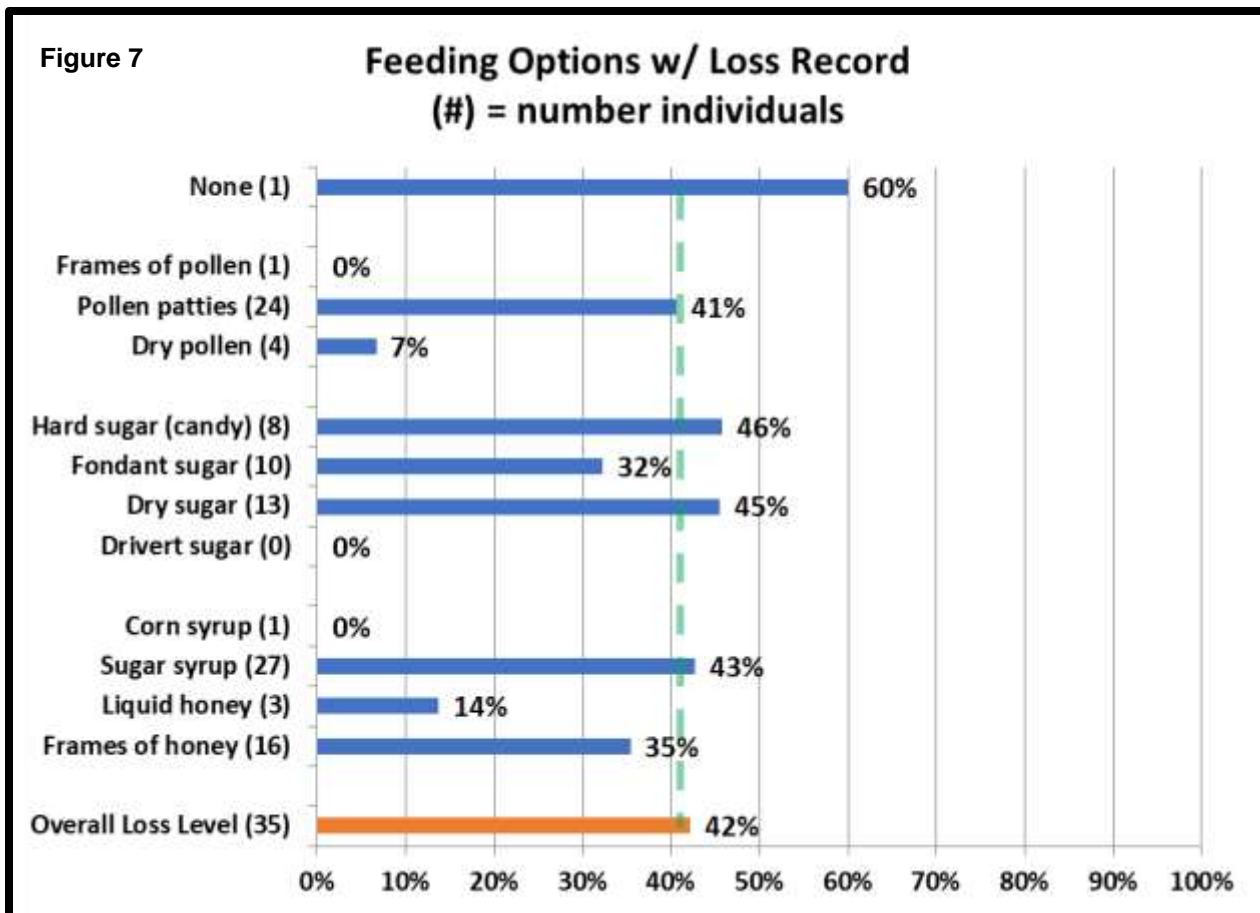
Most Washington beekeepers do not perform just one management to their colony (ies) toward improving colony health and overwintering success. This analysis however compares a single factor equated with loss level. Such analysis is correlative and doing a similar management as fellow beekeepers does not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

**FEEDING:** Washington survey respondents checked 348 feeding options = 3.1/individual. Pierce Co respondents had 107 choices, 3.1/individual same as statewide. The choices, with number of individuals making that selection is in ( ), bar length indicates loss level of individuals doing this

management. Those bar lengths to left of 57% (green dashed line) had better survival while those to right had greater loss level.

For individuals indicating one or more feeding managements, feeding sugar syrup was the most common feeding option of respondents (27 individuals, 77% of respondents). Their loss rate was 43%. Twenty four individuals fed pollen patties (70 ½%) and had same average loss level. The managements that showed best survival included feeding dry pollen (4 individuals), feeding fondant (10 individuals – 32% loss and feeding liquid honey (14% loss) or frames of honey.

For the last 3 years of losses individuals statewide doing no feeding had poorer survival all 3 years; this year they had average loss. The single Pierce Co Individual not feeding had 60% loss. Individuals that fed sugar syrup had marginal lower loss level in 3 of four 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 two years, including this most recent survey year; hard candy improved survival in three of the four years. For individuals feeding protein, protein patty users showed slightly better survival in 3 of 4 years; dry pollen feeders had significantly better survival in three of the four years, including this past year when 4 individuals had only a 7% loss.

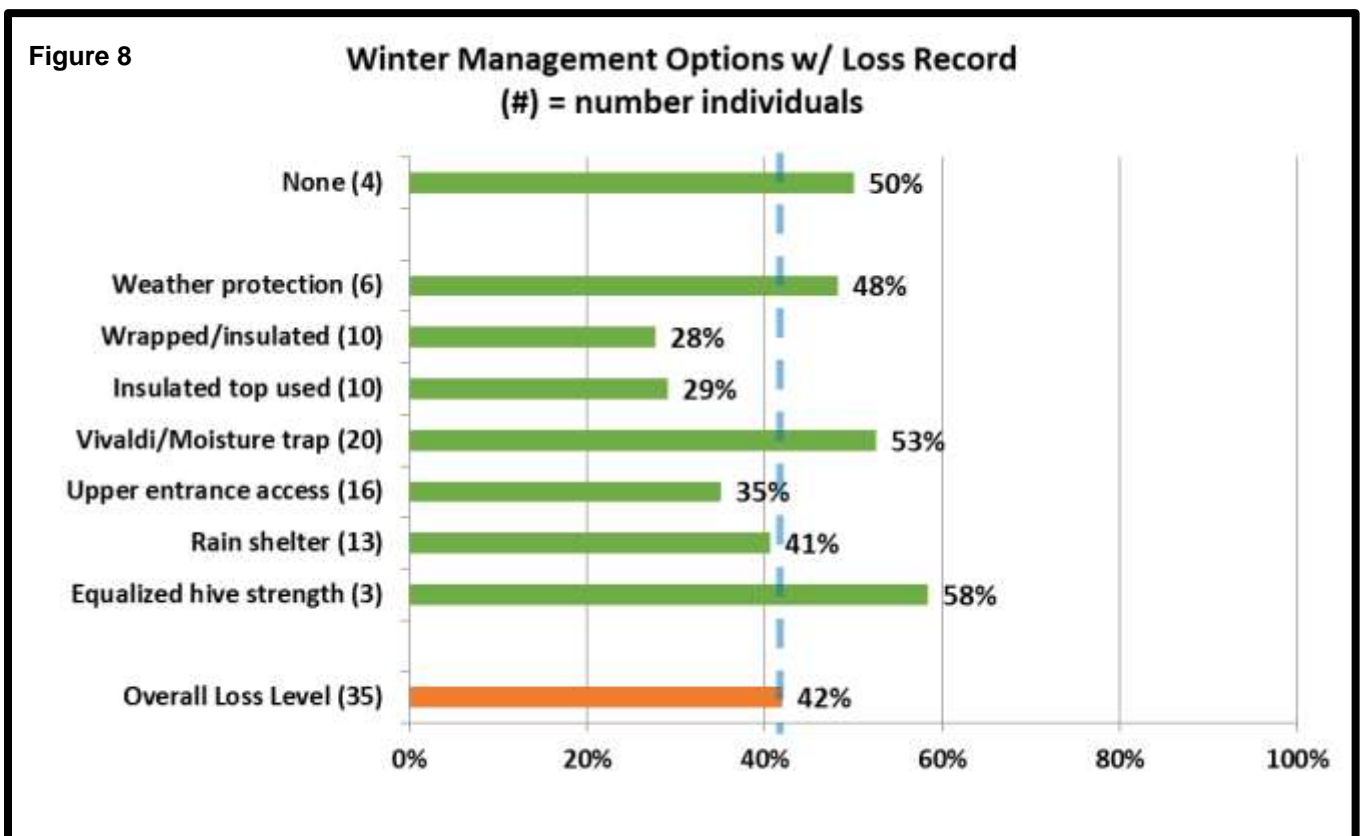




**WINTERING PRACTICES:** We received 312 responses (2.5/individual) about WA beekeeper wintering management practices (more than one option could be chosen). Pierce Co selected 82, 2.6/individual. The 4 individuals choosing none had 50% loss.

The most common wintering management selected was use of ventilation/quilt box at colony top (20 individuals (53% loss), followed by upper entrance (16 individuals 35% loss). Wrapping/insulating the colony and Insulated top use (10 individuals each) had better survival. Figure 8 shows number of individual choices and percent of each selection. Bar length below 50% (blue dashed line) had better than average winter survival.

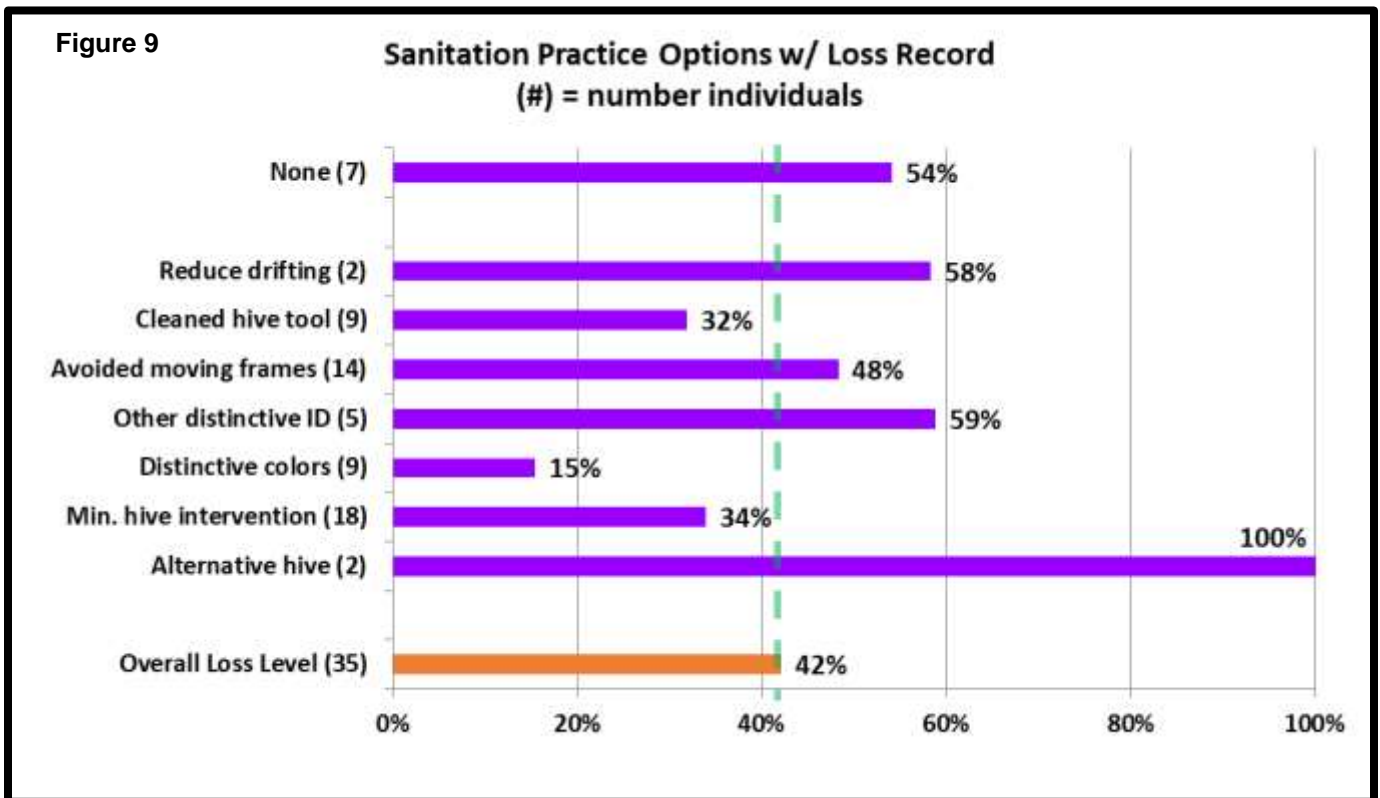
Over the past three years a couple of winterizing management improved survival for statewide respondents. Those doing no winterizing had higher losses all 4 years. Equalizing hive strength in the fall demonstrated lower loss levels in all four recent winter periods (only 25% loss this past winter). Top insulation has demonstrated lower loss in three of the four years, in the most recent winter 35 individuals realized a 14 percentage point improvement. Ventilation above the colony (Vivaldi Board/quilt box) demonstrated improved survival two of the four winters but not this past one (1 percentage point higher loss); it did not prove useful for Pierce County members this past winter.



**SANITATION PRACTICES:** It is critical that we practice some basic bee sanitation (some prefer use of term bee biosecurity) in our bee care to help insure healthy bees. Statewide there were



158 responses for this survey question 2.2/individual. For Pierce respondents there were 59 choices 2.1/individual. Distinctive hive colors (9 individuals – 15% loss), minimal hive intervention (18 respondents – 34% loss) and cleaning hive tool (9 individuals - 32% loss) had better survival.



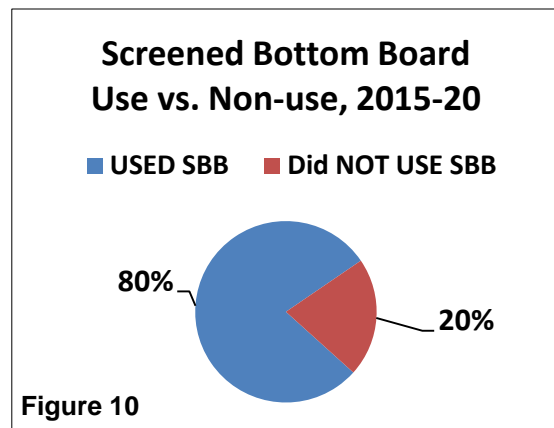
In three of four years doing none of these managements resulted in improved survival; this was the case this past winter when the 17 individuals statewide, seven in Pierce Co, doing nothing had losses of 44% statewide and 54% in Pierce. Using an alternative hive resulted in lower losses in two of four winters but not this past year statewide. Providing hives with color, distinctive hive ID measures 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).

### **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 20 Washington individuals (16%) said they did not use screen bottom boards; they lost 78% of their colonies. Those 80 beekeepers using SBB on all of their colonies had 60% loss. The 24 individuals using SBB on some of their colonies had 34% loss. For Pierce Co 20 individuals (65% of respondents) used SBB, 6 said they didn't use and 9 used on some of their colonies. Loss levels for Pierce Co were 56% for those using SBB on all colonies while losses were 30% for those not using screen bottom boards just the opposite of statewide.

In 5 survey years statewide 20% said they did not use SBB and 80% did use SBB on some or all of their colonies. See Figure 10.

**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. This past season 66 individuals statewide (53%) said they always blocked SBB during winter. They had a 44% loss rate, average loss rate for statewide. Thirty six individuals (29%) said they never blocked SBB and had loss rate of 60%, 16 percentage points higher. Thirteen individuals (10%) blocked them on some of their colonies. Their loss rate was 79%. Among Pierce Co respondents 21 individuals (61%) always blocked and 10 persons (28 ½ %) never did. Loss was 47% for Pierce Co always blocking and 44% for the never blocking respondents, only a 3 percentage point difference.

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 16 percentage point difference in favor of closing the SBB over the winter period.. 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 losses 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.

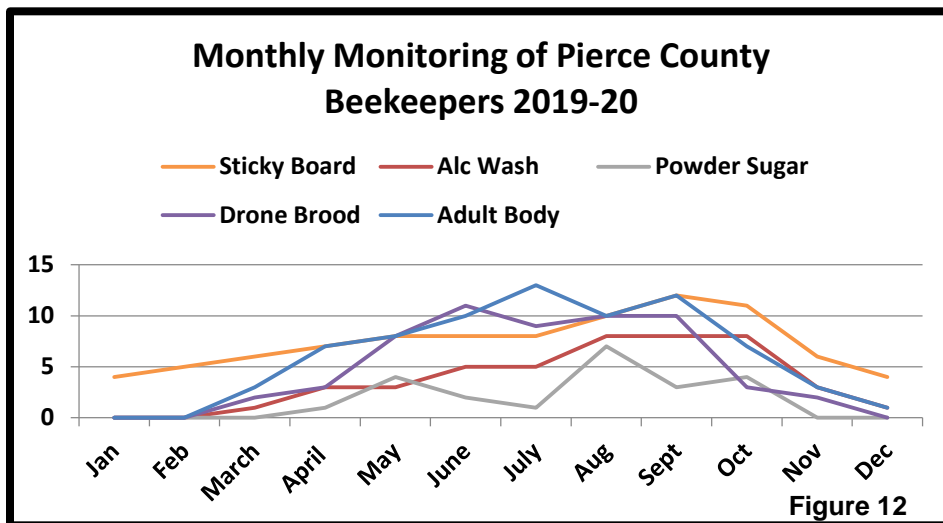
Winterizing measures that apparently helped lower losses for some beekeepers was equalizing strength, providing an upper entrance, a moisture trap (Vivaldi board or quilt box) and some attention to adding protection against the elements. Spreading colonies out in the apiary and painting distinctive colors 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**

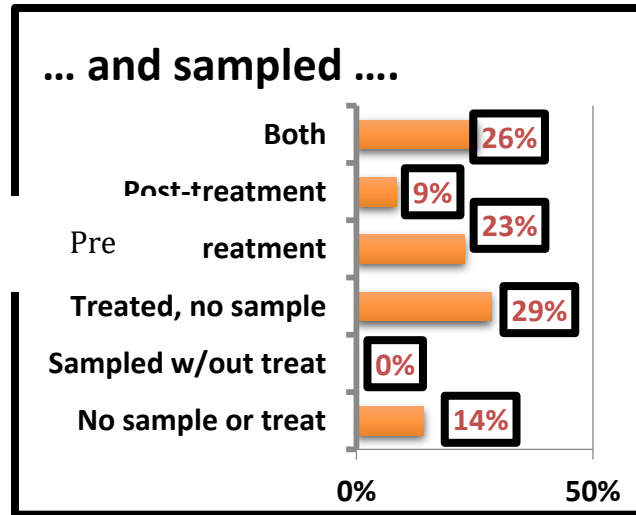
We asked percentage of Washington hives monitored for mites during the 2019 year and/or overwinter 2019-20, whether sampling was pre- or post-treatment or both and, of the 5 possible mite sampling methods, what method was used and when it was employed. Eighty six individual respondents (65%) said they monitored their hives. Losses of those individuals monitoring was 44%. Thirty three (25%), reported no monitoring; they had a higher single percentage point higher loss rate of 45%. Thirteen individuals monitored some with loss rate 70%. In Pierce Co 30 individuals monitored all (55%), 2 did no monitoring (32%) and 3 did some (Figure 12.) Loss levels for Pierce County were 30 were 71% for those doing no monitoring, 100% for those doing some and 38% for those monitoring all. Monitoring provides a number and then permits a more educated decision on what might be done.

In order of popularity of use, Sticky boards were used by 49 individuals statewide, 49% total of 99 individuals who did some or all monitoring of colonies, followed by 42 individuals (42% of individuals doing monitoring) that used both visual inspection of adults and visual inspection of drones brood. The two most accurate means of determining mite load, alcohol wash was used by 11 individuals (11%) and powdered sugar was employed by 22 respondents (22%). Individuals were able to select more than one option and averaged 1/7/individual. In Pierce Co 15 individuals (45%) selected sticky board, 14 alcohol wash, 8 powdered sugar, 14 visual inspections of drone brood and 15 looked for mites on adults.



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 13 below for number of months each of the 5 sampling methods were used.

The most common sampling of statewide respondents in 2018-19 was treated but did not sample (33% individuals) followed by both pre and post treatment and not sampling nor treating (20%). Thirteen indicated sampling pre and 9% post. Selections shown in Figure 13 below.

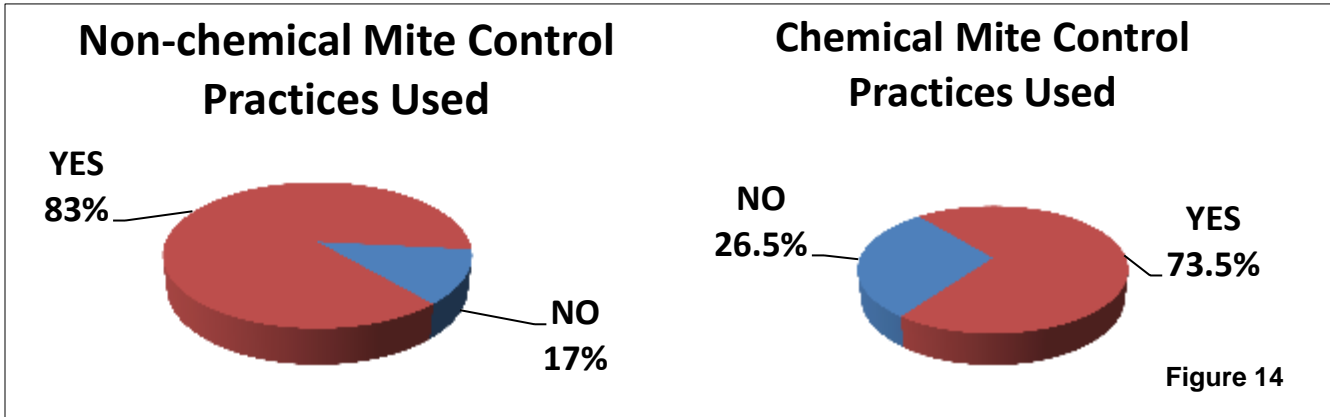


**It is important to KNOW mite numbers.** Less effective mite monitoring methods include sticky (detritus) boards below the colony (often so much detritus drops onto a sticky board that picking out the mites can be hard, especially for new beekeepers) but sticky boards used for a day can help confirm the usefulness 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.

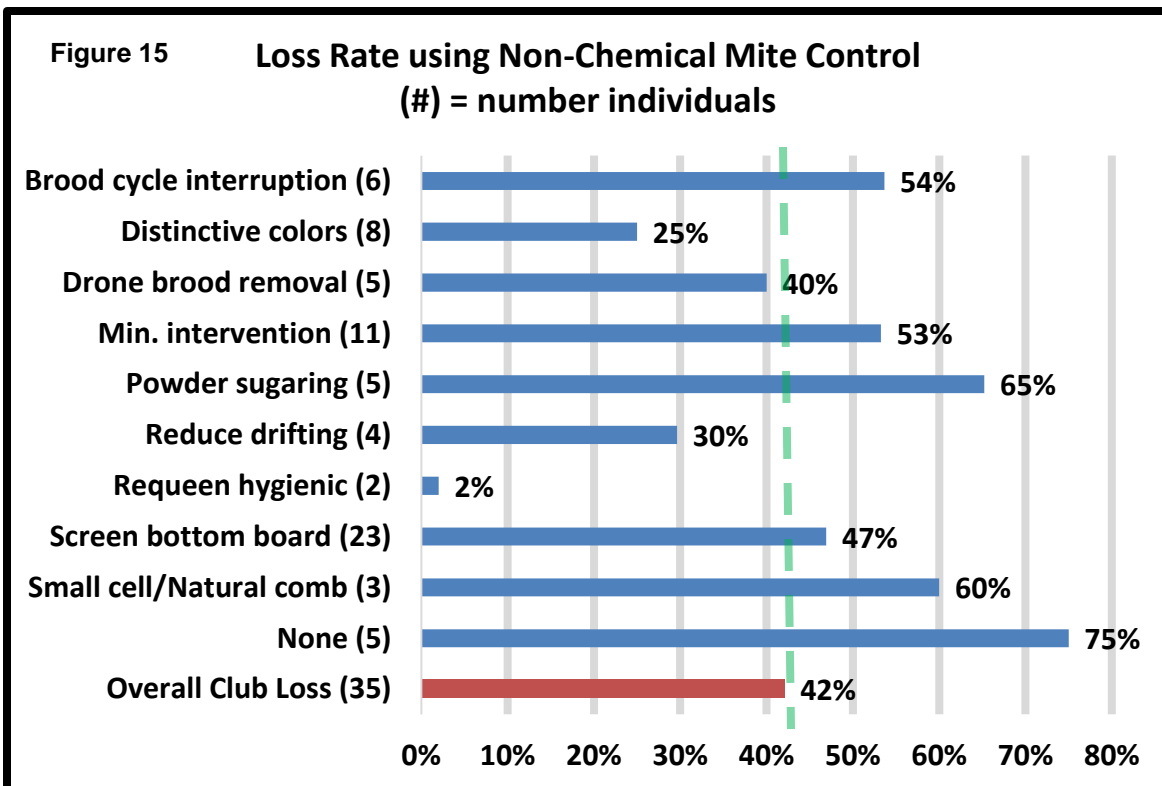
See *Tools for Varroa Monitoring Guide* [www.honeybeehealthcoalition.org/varroa](http://www.honeybeehealthcoalition.org/varroa) on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes 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 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. Five Pierce individuals (14%) said they did not employ a non-chemical mite control; they had a 75% loss (61% loss statewide). Five individuals also did not use a chemical control; losses of these 9 individuals in Pierce Co was 83%; statewide it was 61% winter loss. Figure 14 shows statewide data.



**Non-Chemical Mite Control:** Of nine non-chemical alternatives offered on the survey (+ other category,) 39 individuals used one method and had a 39% loss, 28 used two (52% loss level), 37 used three (60% loss) and 12 used 4 or 5 (42% loss). Total selections were 240, 2./individual. Among the Pierce respondents there were 67 selections 2.2./individual. Eleven individuals selected one (mostly screen bottom boards or minimal hive inspection) and had 50% loss, 7 had 2 choices and also had 50% loss. The 5 individuals with 3 choices had 76% loss.

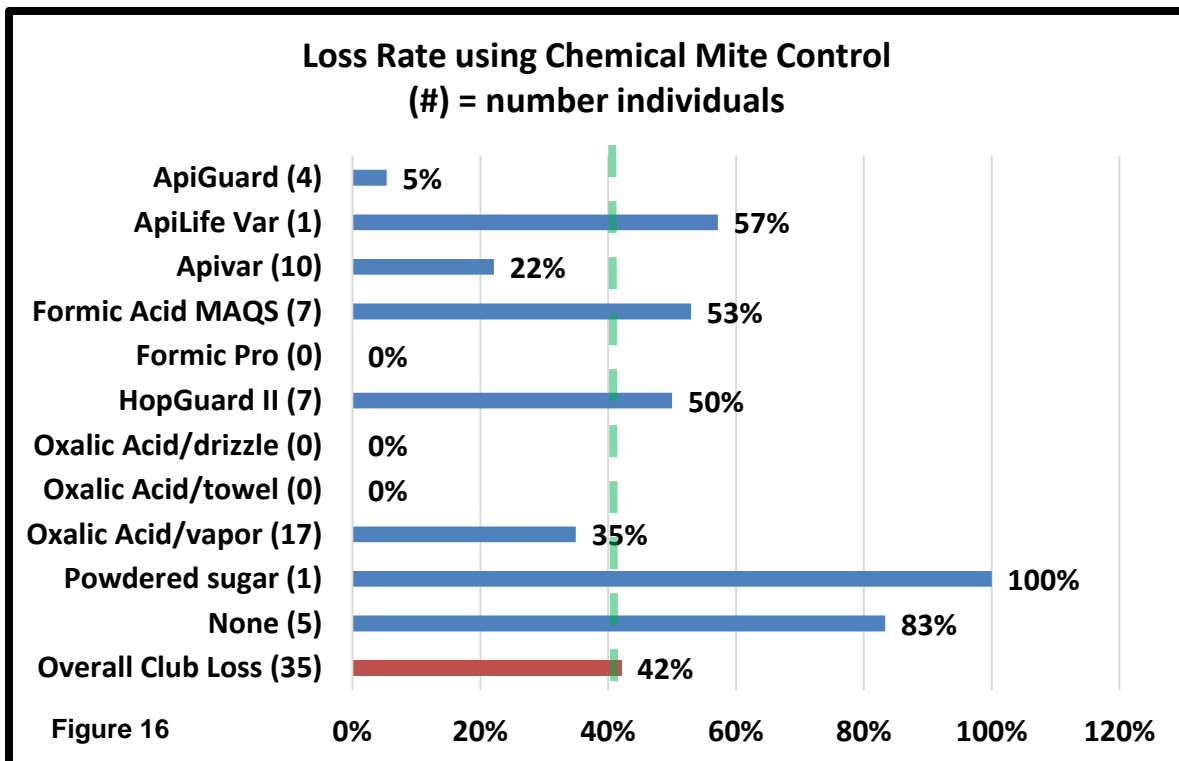


Use of screened bottom board was listed by 23 individuals. They had losses 5 percentage points higher than club average. The next most common selection was minimal hive inspection (11 individuals) and they had 11 percentage point higher losses. The use of the remaining 7 selections are shown in Figure 15; number of individuals in ( ), bar length represents average loss level of those individuals using each method. Those to left of **green dashed line** had better than average survival. Measures that improved survival included distinctive colors and spreading colonies to reduce drifting. The 2 individuals that requeened with hygienic queens had great survival.

Five of the non-chemical alternatives demonstrated reduced losses this past year – requeening with hygienic queens has not been showing better survival in previous years (but did for 2 Pierce Co members) while drone brood removal (5 individuals) and painting hives distinctive colors (8 Pierce respondents) has resulted in better survival in each of past two survey years.

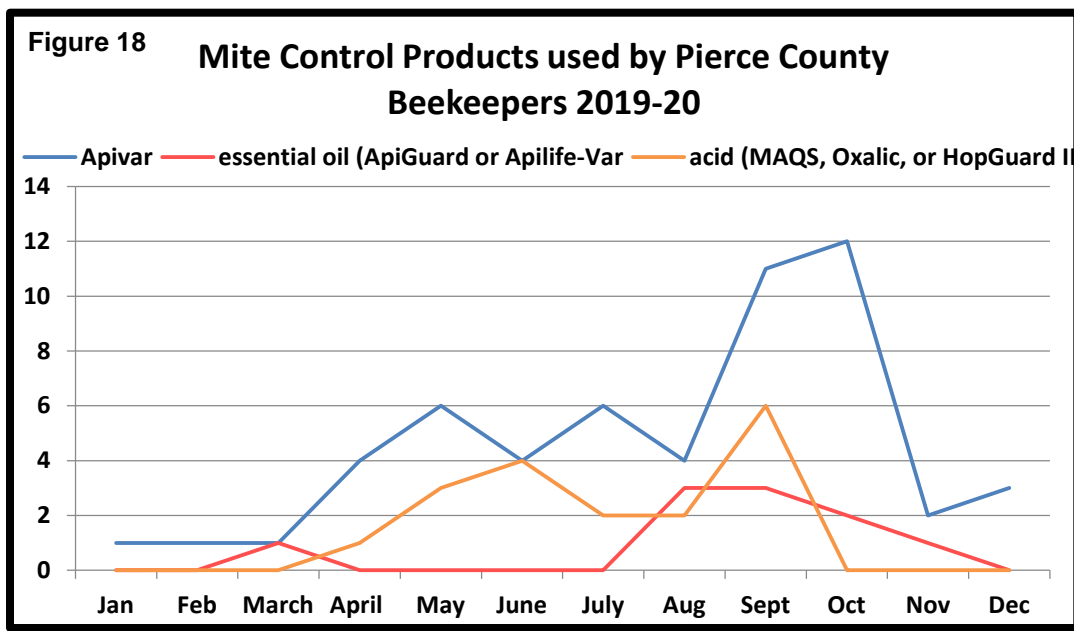
**Chemical Control:** For mite chemical control, 35 individuals (26 ½% of total respondents – 5 were Pierce Co respondents, which represented 14% of County members) used NO chemical treatment; these individuals had a 63% loss level statewide and 83% in Pierce. Those using chemicals used at rate of 1.5/individual statewide and 1.6/individual in Pierce. Fifty two individuals (56%) used one chemical and had 50% loss, 31 used two and also had 50% loss, 10 used 3 (only 15% loss). For Pierce 16 individuals used one chemical and had 58% loss, 1 used 2 with 54% loss and the 4 who used 3 had only 22% loss.

Seventeen individuals (57% of total chemical users) indicated they most commonly utilized Oxalic acid vaporization and had improved survival (35%). Seven used formic acid (MAQS) and Hopguard II but both of these users had heavier than average loss. Apiguard (4 users) and Apivar (10 individuals) had the best survival. 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 statewide. 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 improvement this year.

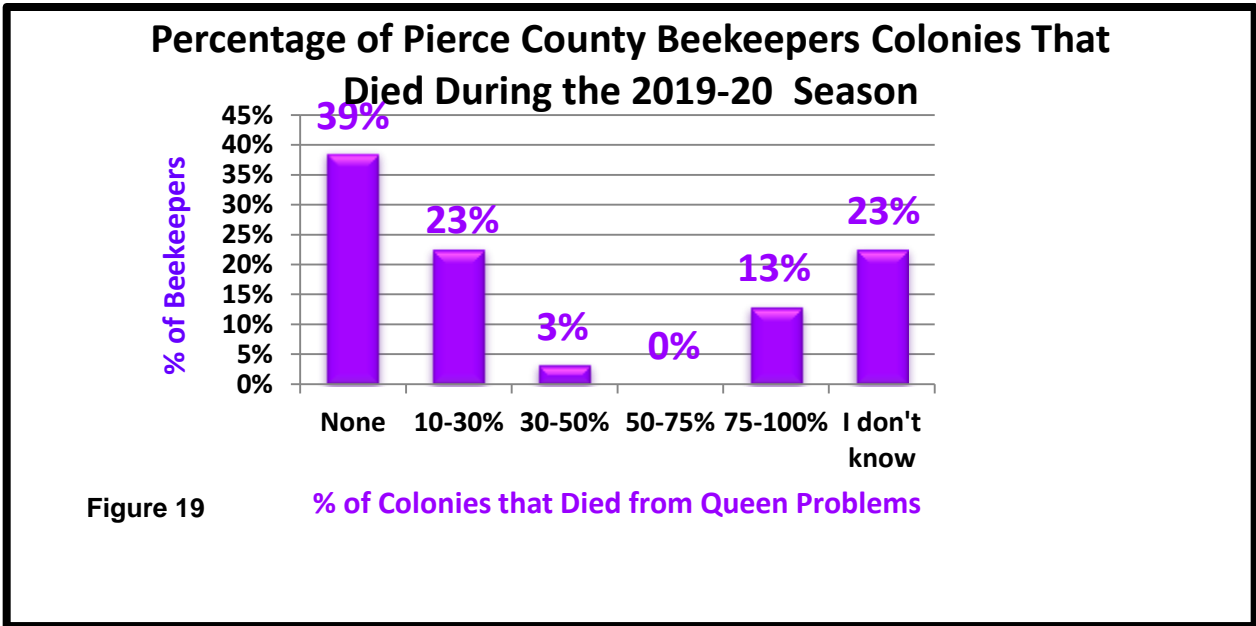
The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in Figure 18. Further review is needed to determine if the timing of treatments was more effective than at other times for the various chemicals.



## Queens

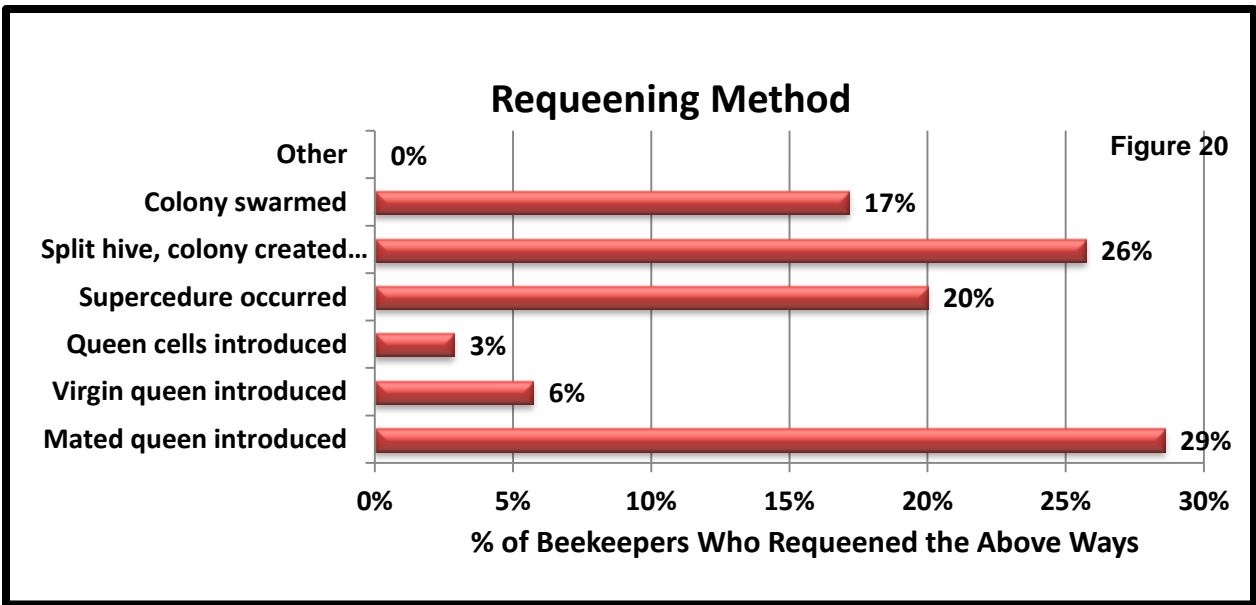
We hear lots of issues related to queen “problems”. Twelve (39%) subdivided queen related issues from 10 to 30% of their hives (7 individuals), 30-50% (1 individual) and 75-100% (4 individuals). Thirty nine percent (12 individuals) said they had no queen problems and an additional 7 individuals (23%) said they didn’t know. The number of respondents and percent losses of each is shown in 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. Only 31% said yes. The related question then was 'were your hives requeened in any form?' to which 62% (21 individuals) said yes, 6 (18%) 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 32 responses (more than one option could be checked). Nine individuals indicated they requeened with a mated queen and they had a 34% loss level, two used a virgin queen (49% loss) and 1 used a queen cell (56% loss). A higher percentage (22 instances vs 13) said the bees requeened via Supersedure (7 instances, 39% loss), splitting (9 individuals, 40% loss) or swarming (7 individuals, 59% loss). Requeening with mated queens improved survival for Pierce Cc respondents.



## **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](http://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 5). 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](mailto:info@pnwhoneybeesurvey.com) with "REMINDER" in the subject line. We have a blog on the [pnwhoneybeesurvey.com](http://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 June 2020