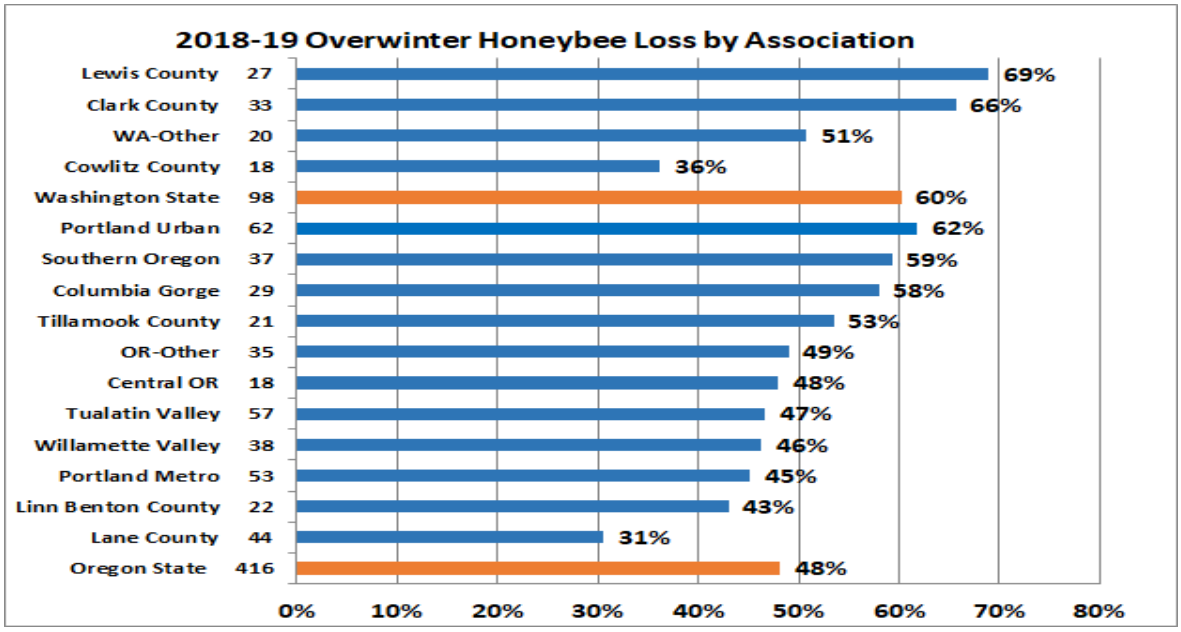
2018-19 PUB Winter Loss by Dewey M. Caron and Jenai Fitzpatrick

Overwintering losses of small scale Oregon backyard beekeepers was 48%, elevated 10 percentage point from 2017-2018. A total of 416 responses were received from OR beekeepers with 98 additional returns from Washington beekeepers. Information on winter losses and several managements related to bee health were obtained with an electronic honey bee survey instrument developed within the PUB bee group www.pnwhoneybeesurvey.com.



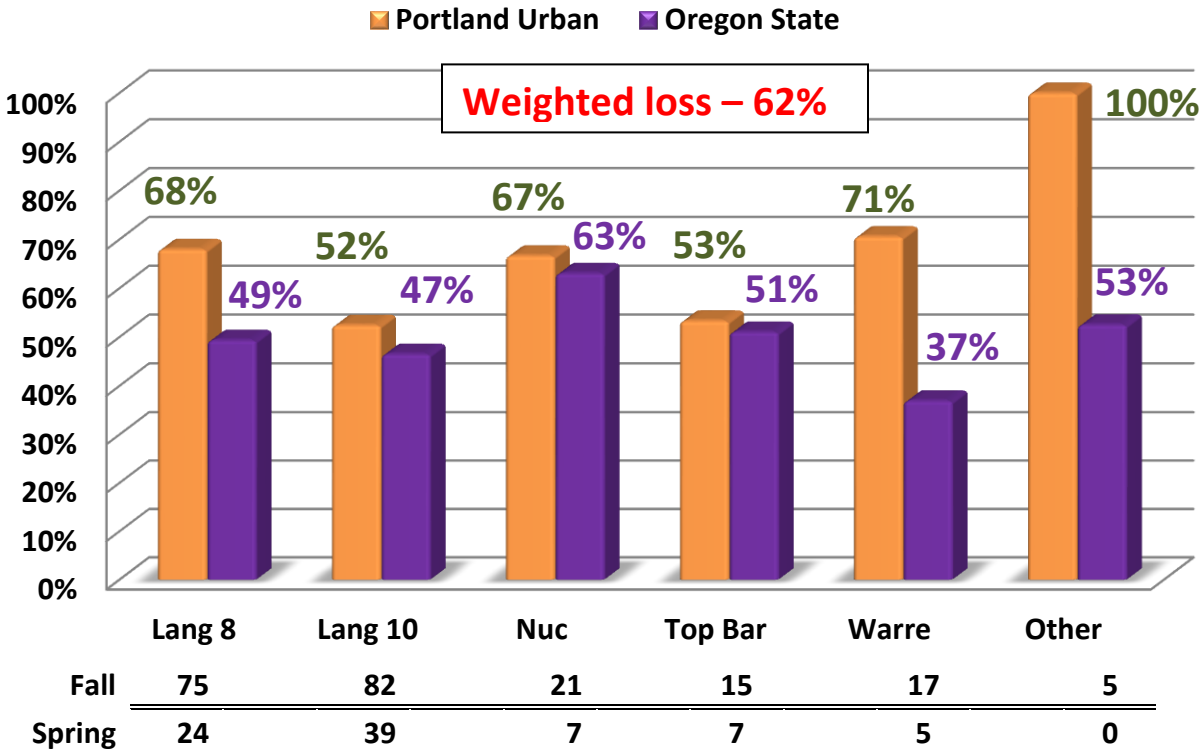
During the 2018-2019 overwintering period, 62 PUB member surveys, down by 5 individuals from the previous year, were utilized. Once again the heaviest loss of all the OR clubs was realized by PUB (see overall reports on www.pnwhoneyeesurvey.com website).

Total overwintering losses of PUB respondents was 62%,

Average loss was 7 percentage points higher than the previous season and 14 percentage points above the statewide loss of 48% (database of 416 OR backyarders). PUB loss rate of 62% was once again the highest of all other OR associations with 10 or more responses, as has been case in previous five of six survey years.

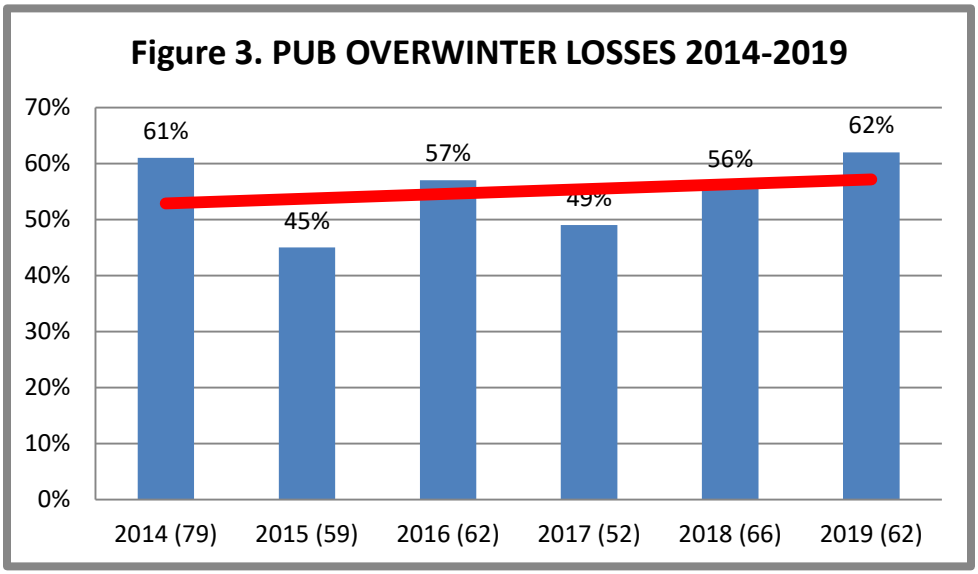
PUB losses of Langsroth 8 frame hives was 14 percentage points higher than Langstroth 10 frame hives and about the same as overwintered nucs. Only one of the 5 other hives was IDed (as a double nuc); therefore loss of 179 fall movable frame hives was 61%. Loss of top bar and Warré and the 4 unidentified other hives was 67%. For PUB, non-traditional hive percent loss (13%) was double the statewide level (6%). Losses by hive type of PUB compared to statewide loss is shown in Figure 2 below.

Figure 1 2018-19 Winter Honeybee Loss % by Hive Type



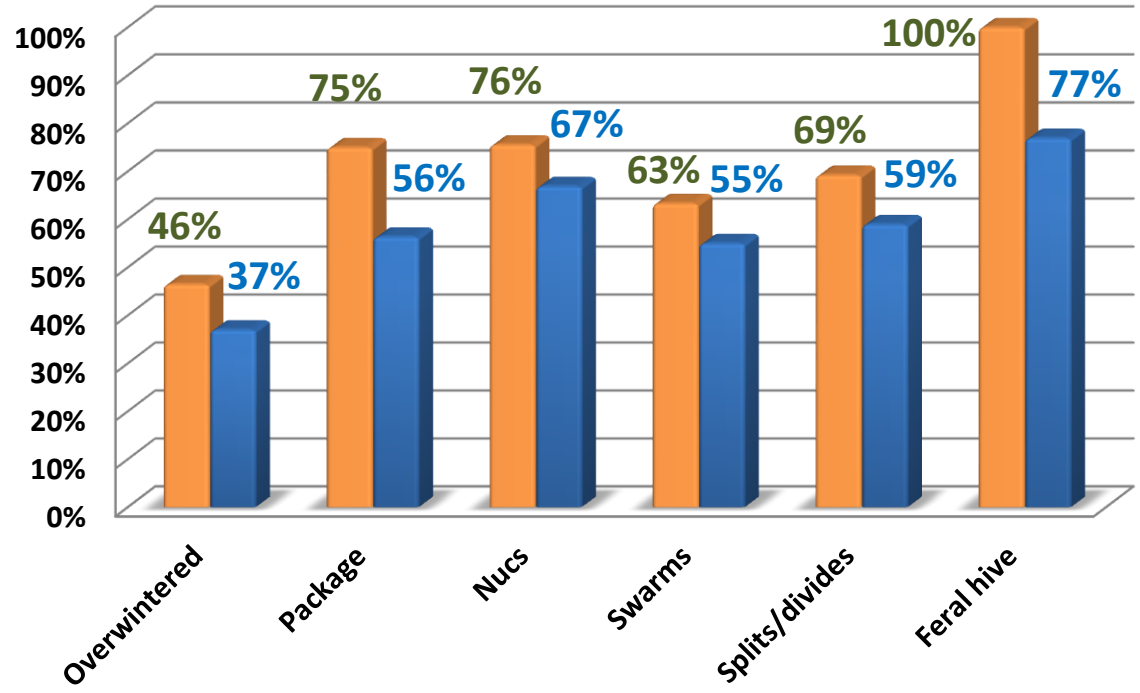
	Lang 8	Lang 10	Nuc	Top Bar	Warre	Other
Fall	75	82	21	15	17	5
Spring	24	39	7	7	5	0

PUB losses this past winter (62%) were 8.4 percentage points higher than the average loss level of 53.6% for the five previous seasons. Figure 3 illustrates average losses for PUB members the last 6 years. Numbers in ( ) are respondent size. Red = trend line.



The survey also asked for **loss by hive origination**. Thirty eight of the 71 overwintered PUB member colonies were alive in the spring (46% loss rate), 9 percentage points higher than statewide. PUB member respondents reported higher losses for packages (75%), nucs (76%), swarms (63%) and splits (69%) compared to the statewide averages. See Figure 4 for comparisons of PUB losses with statewide.

Figure 4 2018-19 Winter Honeybee Loss % by Origination



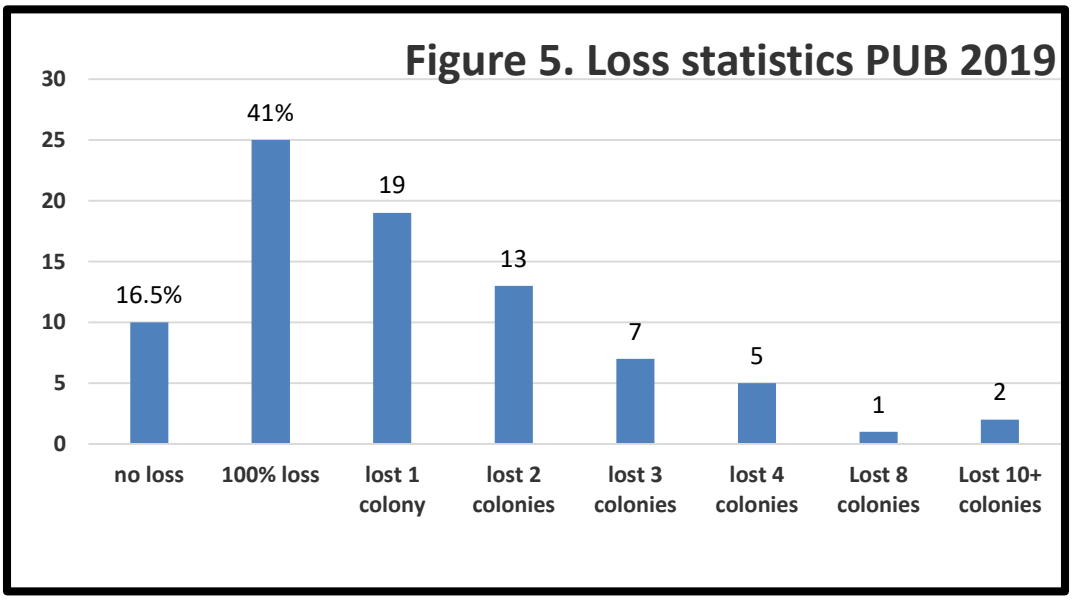
	Overwintered	Package	Nucs	Swarms	Splits/divides	Feral hive
Fall	71	12	45	90	39	2
Spring	38	3	11	33	12	0

PUB respondents kept 1 to a high of 15 fall colonies. Sixteen individuals had one and another sixteen had 2 colonies. 10 individuals had 3 colonies (52.5% of total PUB individuals). Eleven individuals had 4-6 colonies, 3 had 7 or 8 with 5 individuals keeping 10+ colonies (8%).

PUB survey respondents reported a **range of beekeeping experience**. Eight 8 individuals had one year experience, 7 had 2 years and 11 respondents had 3 years experience (1, 2 or 3 years = 42.5%), 23 individuals had 4-6 years experience (both 3 and 5 year were the most

common – 11 individuals each), six survey returners had 7 or 8 years experience and 7 individuals (11.5%) had 10+ years experience. Greatest number was 35 years keeping bees.

Not all PUB members had loss. Ten individuals (16.5%) had total survival; unfortunately 25 individuals (41% of individuals) had 100% colony loss. Nineteen individuals lost one colony (37% of individuals with loss); 13 had a 2 colony loss. Heaviest losses were 11 and 14 colonies. See Figure 5.



Two individuals had two apiary locations five had 3 and one had four (13% of total PUB respondents). Losses at out-apiaries was 73% and these same individuals had 72% loss at their home apiary. Three individuals reported they moved bees during the year, all a short (2 to 10 miles) distance.

Forty-two of 62 respondents (68%) of PUB respondents said they had a mentor available as they were learning beekeeping, three percent points lower than the 71% statewide response and 1 percentage points below the percent indicated last year.

Reasons for Colony Loss/Acceptable loss

We asked individuals that had colony loss (52 individuals) to estimate what the reason might have been for their loss (multiple responses were permitted). There were 109 total listings for PUB, 2/individual. Twenty one PUB individuals listed varroa (38% of respondent choices), followed by queen failure (27%) and weak in fall (36%); 16 individuals chose Don't know (29%). Otherselections included 2 pesticide, 1 SHB and 4 felt loss was related to mite treatment. Choices were very similar to last year and to statewide choices. Table compares PUB with % statewide selections.

	Varroa mites	Poor wintering conditions	Weak in fall	Queen failure	Star-vation	CCD	Yellow jackets	Other
PUB (#) (%)	21 (38%)	10 (18%)	20 (26%)	15 (27%)	7 (13%)	1 (2%)	8 (14.5%)	11 (20%)
Statewide %	40%	23%	29%	27%	18%	4%	14.5%	15%

Acceptable loss: Survey respondents were asked reason for loss. Twenty seven individuals indicated 15% or less, 25% was medium. Twenty one respondents (34% of total) said 50% (most common choice),. Selections shown below in table.

	Zero	5%	10%	15%	20%	25%	33%	50%	75%	100%
	10	1	4	2	3	7	9	21	3	1

Why colonies die? There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. Examination of dead colonies is, at best confusing, and, although some options may be ruled out, we are often left with two or more possible reasons for losses. I am working on a book chapter on necropsy of dead bees and will post it as report on the www.pnwhoneybeesurvey.com website.

There is 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. PUB individual choices varied from zero to 100%, with medium of 25% with 34% indicating 50% loss was acceptable. This acceptable loss level has crept upwards over time.

Major factors in colony loss are thought to be mites and their enhancement of viruses, especially DWV (deformed wing virus) and declining nutritional adequacy/forage and diseases. Pesticides in the agricultural environment weakens colonies. Yellow jacket predation is a constant danger to weaker fall colonies, Management, especially learning proper bee care in the first years of beekeeping, remains a factor in losses. What effects our changing environment, such as global warming, contrails, electromagnetic forces, including human disruption of it, human alteration to the bee's natural environment and other factors, play in colony losses are not at all clear.

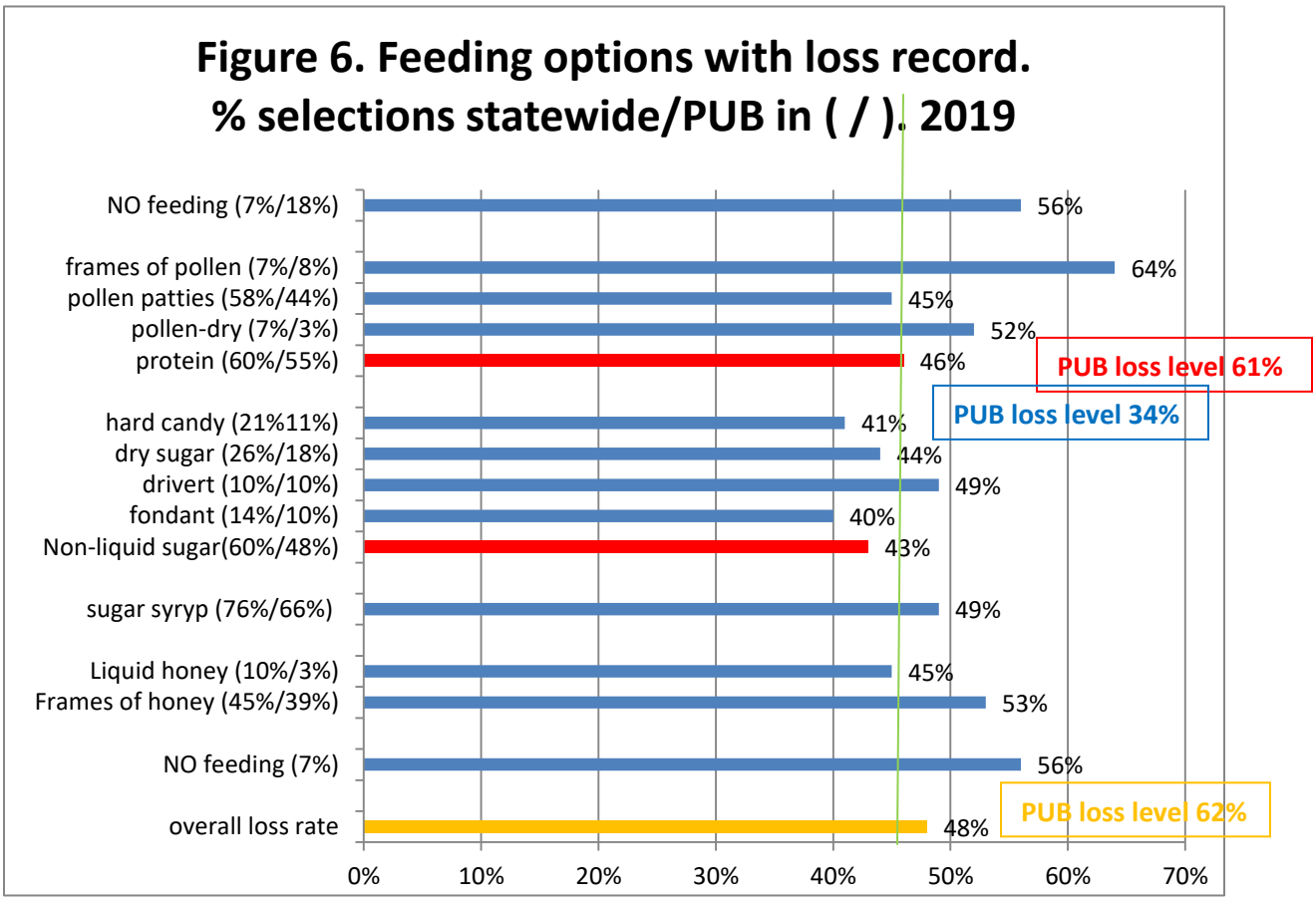
There is no simple answer to explain the levels of current losses nor is it possible to demonstrate that they are necessarily excessive for all the issues facing honey bees in the current environment. Varroa mites and the viruses they transmit are considered a major factor colonies are not as healthy as they should be

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 Oregon 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 do does not necessarily mean you too will improve success.

FEEDING: PUB survey respondents checked 142 feeding options = 2.3/individual, 0.5 percentage points less per individual compared to statewide. Twenty six individuals (42%) selected a single choice, 8 individuals had 2 choices, (the medium number), 15 had 3 choices,



10 individuals used 4 choices, 2 had 5 and one individual listed 6. The last 3 individuals (5 & 6 selected choices) had a 78% loss level. Eleven PUB individuals said they did NO FEEDING. They had a 56% loss level.

Percent colony losses statewide are presented for feeding options with numbers of statewide individuals and PUB member numbers in (/). Forty one PUB individuals (66% of respondents) said they used sugar syrup. They had a 59% loss rate, slightly lower than the overall PUB average of 62%. The statewide loss of 49% was not lower than statewide overall for the 76% of individuals indicating they fed sugar syrup.

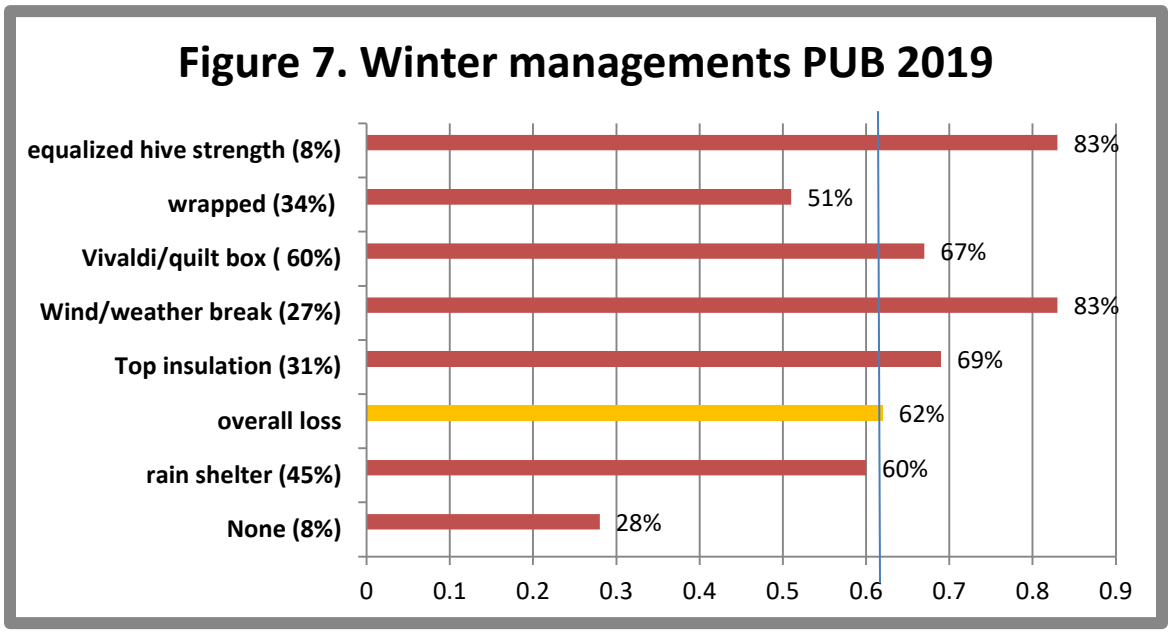
As with statewide, the 27 PUB individuals (55% of respondents) that fed protein had a slightly lower loss, 61.5%, compared to PUB overall loss of 62%. Those using non-liquid sugars (24 PUB individuals) had a lower loss level (51%) compared to overall PUB average. Those 7 PUB members using hard sugar candy had a 34% loss; 6 fondant feeders had 71% loss level, higher than overall losses.

Statewide, Individuals that fed non-liquid sugar collectively had a lower loss level of 43% compared to 48% overall and for PUB members 59% compared to PUB overall 62%. Most useful would appear to be hard candy. Among PUB members 11 individuals fed dry sugar with a 34% loss. Feeding of protein only improved survival marginally both statewide and among PUB members but there might be other good reasons for supplementing protein in bee colonies. Twenty seven individuals fed pollen patties and 2 of them also fed dry pollen and 5 indicated they also fed via frames of pollen

WINTERING PRACTICES: Five PUB individuals reported doing no winterizing; they had loss level of 28%; statewide these 5 were among 51 individuals (12% of overall statewide respondents) that indicated none of the several listed wintering practices; statewide losses were 63% for those doing no winterizing managements 15 percentage points higher loss than overall loss of 48%. Multiple selections were possible and in fact the 57 PUB members averaged 2.5/individual. Twenty one individuals (largest group) chose a single management and had a 57% loss level while the 6 individuals checking 5 or 6 of the options had a 48% level. Thirteen individuals chose 2 selections and 11 did both 3 and 4 options

The two most common wintering managements selected were use of a quilt box (Vivaldi board) at colony top (242 individuals statewide (58%) and 37 PUB) and use of a rain shelter (159 individuals statewide (38%), 28 PUB respondents). Figure 8 shows number of individual choices for PUB members in ( ) and percent loss of each selection. Only rain shelter and wrapping (in addition to none), exhibited increased survival (i.e. loss level below average of 62%).

Over the past three years no single winterizing management improved survival each survey year. However 6 managements improved survival in 2 of the 3 years. Those managements are Equalizing colonies in the fall, Use of the quilt box/Vivaldi board/moisture trap at top of colony, an upper entrance (most Vivaldi boards have an upper entrance built into the equipment), Wrapping colonies, Wind/weather protection and other (the other items are a large mixture from reduced bottom entrance, reducing number of boxes and some means of reducing moisture). In all 3 years those statewide doing no winterizing had heavier losses than overall, though this too showed greater survival for PUB members this past winter.

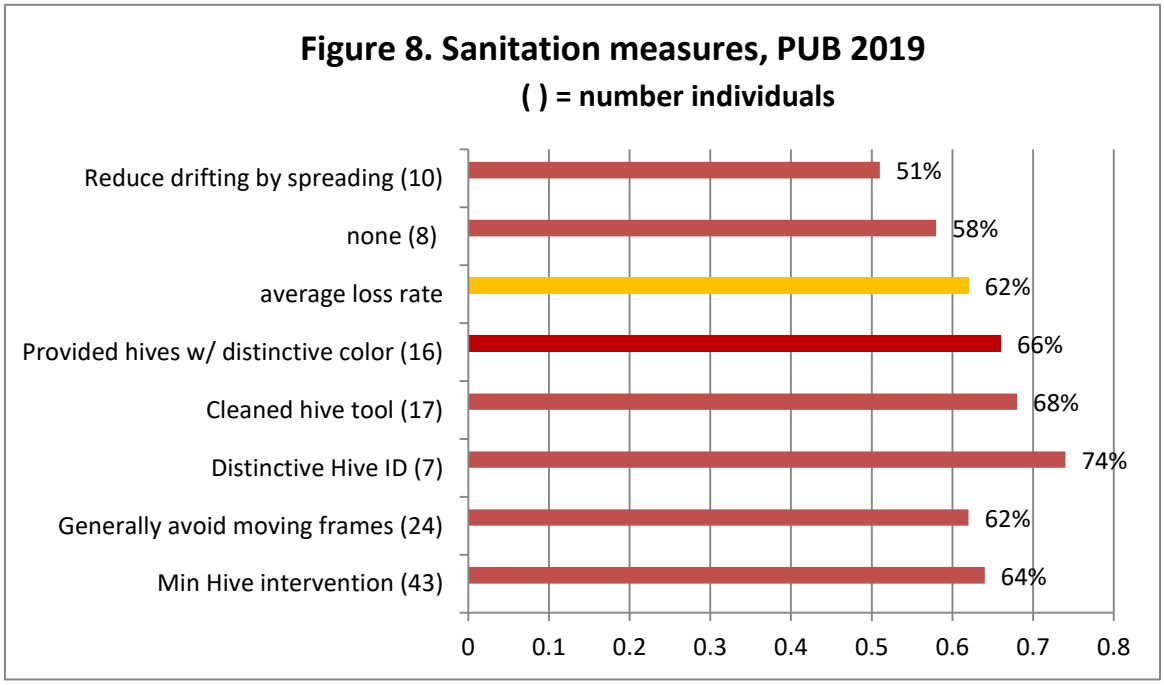


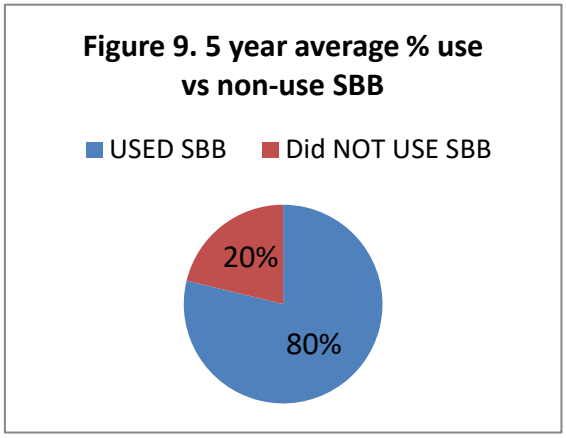
SANITATION PRACTICES: It is critical that we practice some basic sanitation (some prefer use of term bee biosecurity) in our bee care. We can do more basic sanitary practices to help insure healthy bees. We received 826 responses for this survey question statewide, 131 were PUB member responses. Sixty eight individuals statewide (16%) and 8 among PUB (13%) said they did not practice any of the 6 offered alternatives. Loss rate statewide (52%) was 4 percentage points higher than the overall loss rate of 48%; for PUB respondents, loss rate was 58%, likewise 4 percentage points but in this case lower than overall PUB loss average 62%. Sixteen PUB members had 1 selection (loss rate 52%), 17 made 2 choices, 11 selected 3 managements, 4 made 4 choices and 3 made 5 choices (loss rate 56%). Statewide and PUB members had 2.4 selections/individual.

Minimal hive intervention (209 individuals, 43 of them PUB beekeepers) was the most common option selected. It could be argued that less intervention might mean reduced opportunity to compromise bee sanitation efforts of the bees themselves and that excessive inspections/ manipulations can potentially interfere with what the bees are doing to stay

healthy. This option however did not improve winter survival; the loss rate for this group statewide was 54%, 64% for PUB.

The two sanitation choices that did seem to improve survival was reduce drifting by spreading colonies out and providing hives with distinctive ID /doing other hive ID measures. For PUB respondents, 12 did managements to reduce drifting and 1 did something to provide distinctive ID. See Figure 7. Number in (/) is number statewide/number PUB individuals.

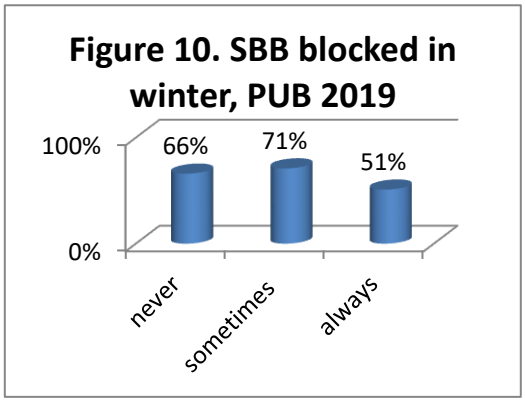




SCREEN BOTTOM BOARDS: Although many beekeepers use SBB to control varroa, BIP and PNW surveys clearly point out they are not a very effective varroa mite control tool. In the recent survey 63 individuals (20%) statewide and 15 PUB members (24%) said they did not use screen bottom boards. Loss level was 48% for non-users; PUB, non-users had 63% loss. The loss rate for the 76% of PUB members who used SBB on some or all of their colonies, was 62% (49% statewide) One percentage point difference is not significant. In 5

PNW survey years, 20**% said they did not use SBB and 80% did use SBB on some or all of their colonies.**

This one percentage point difference means that in the PNW surveys there have been differences of 1, 1, 2 and 13.4 percentage points better survival over 4 years) i.e. better survival), and for the fifth year 8 percentage points lower survival. **The five year average of SBB use, 42.8% loss level of those using SBB on all or some of their colonies and 44.2% for those not using SBB (a 3% positive gain), illustrates how SBB are very minor in improving overwinter survival.**



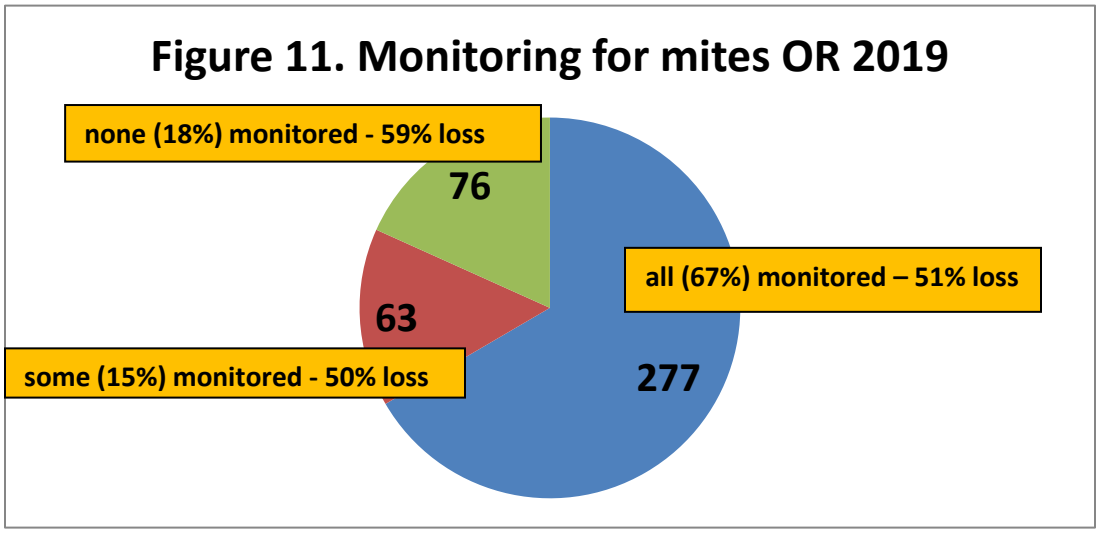
The survey asked if the SBB was left open (always response) or blocked during winter. This past season 23% of individuals statewide (PUB 40%) said they always blocked SBB during winter; statewide loss rate was 37%; PUB losses were 51%. One hundred fourteen individuals statewide (44%) did not block them during winter (never response), of which 23 individuals were PUB members. Statewide never responders had a 42% loss rate, 5 percentage points higher than those who block. For PUB the difference was 14% percentage points. **Comparing the always and sometimes left open with the closed in winter response reveals an average 10 percentage point difference (over 5 years) in favor of closing the SBB over the winter period for OR beekeepers.** See Figure 10.

There is no good science on whether open or closed bottoms make a difference in overwintering but some beekeepers "feel" bees do better with it closed overwinter. Five years of comparison 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.

Mite monitoring/sampling and control management

We asked percentage of 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. 277 individual respondents (67%) statewide said they monitored all their hives. Losses of those individuals monitoring was 51%. Seventy six (18%) reported no monitoring; they had a higher loss rate of 59% loss. 63 individuals reported monitoring some of their colonies; they had a 50% loss. See Figure 11.

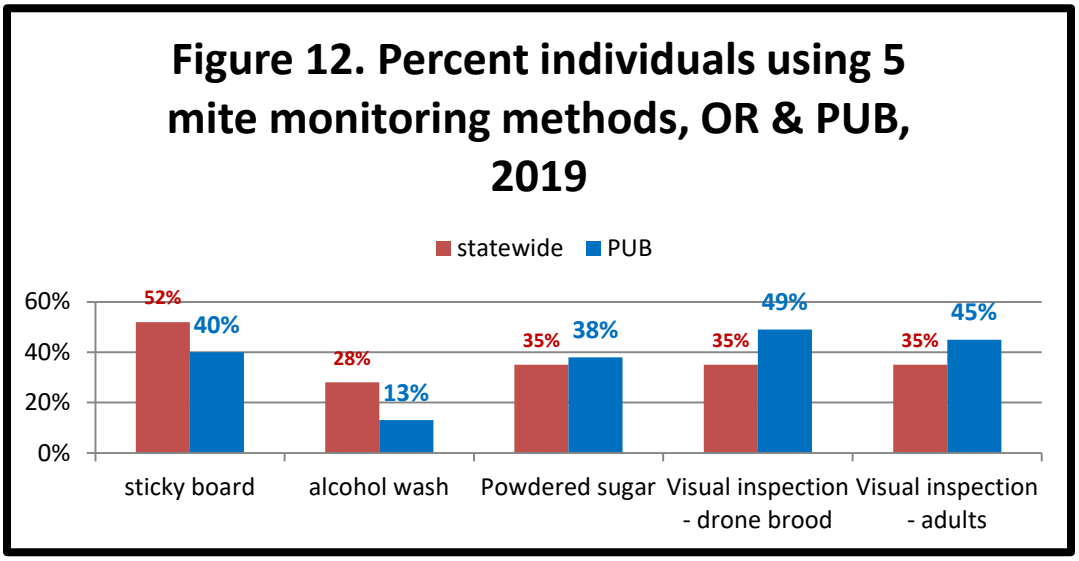
PUB results were the opposite for unknown reasons over past 3 seasons. This past year, thirty five (56%) PUB individuals monitored all their colonies; they had a lost rate of 66%. Fifteen individual (24%) did no monitoring but had the lowest loss level 52%. The some colonies monitored individuals (12 individuals - 19%) had a 59% loss.



Statewide it is obvious that monitoring alone is a means towards improved winter survival. The table below compares % individuals and % winter loss for individuals who monitored all colonies compared with those who monitored none. The 14-15% who monitored some colonies was variable but 3 year average mirrors those who monitored all colonies.

	ALL Colonies Monitored % individuals	% loss	SOME Colonies Monitored % individuals	% loss	No colonies Monitored % individuals	% loss
2019	67%	51%	15%	50%	18%	59%
2018	63%	38%	14%	26%	26%	49%
2017	63%	43%	15%	60%	22%	48%
3 year loss avg		44%		45%		53%

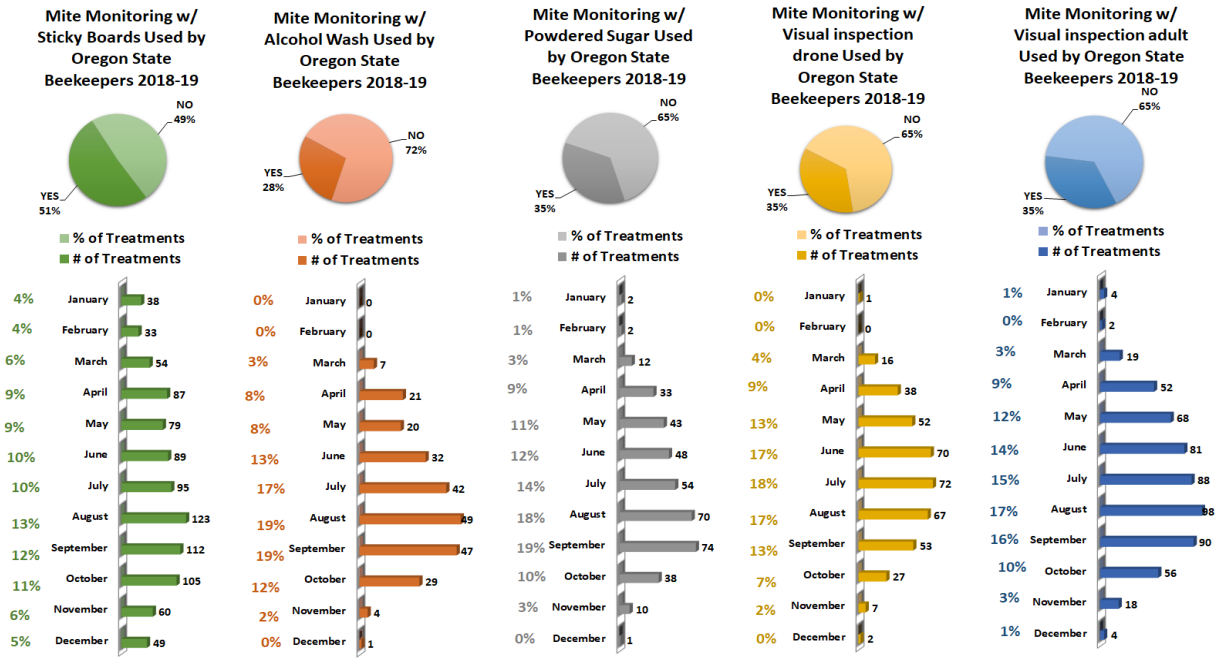
In order of popularity of use, visual sampling methods were used by 23 (drone brood) and 21 individuals (adults). Sticky boards were utilized by 19 individuals (40%). The comparison of statewide (red bars) and PUB (blue bars) is shown below. In past 5 years, the use of sticky boards has decreased in use and both alcohol wash and powdered sugar shake have increased in use statewide; visual methods have remained about the same. Figure 12.



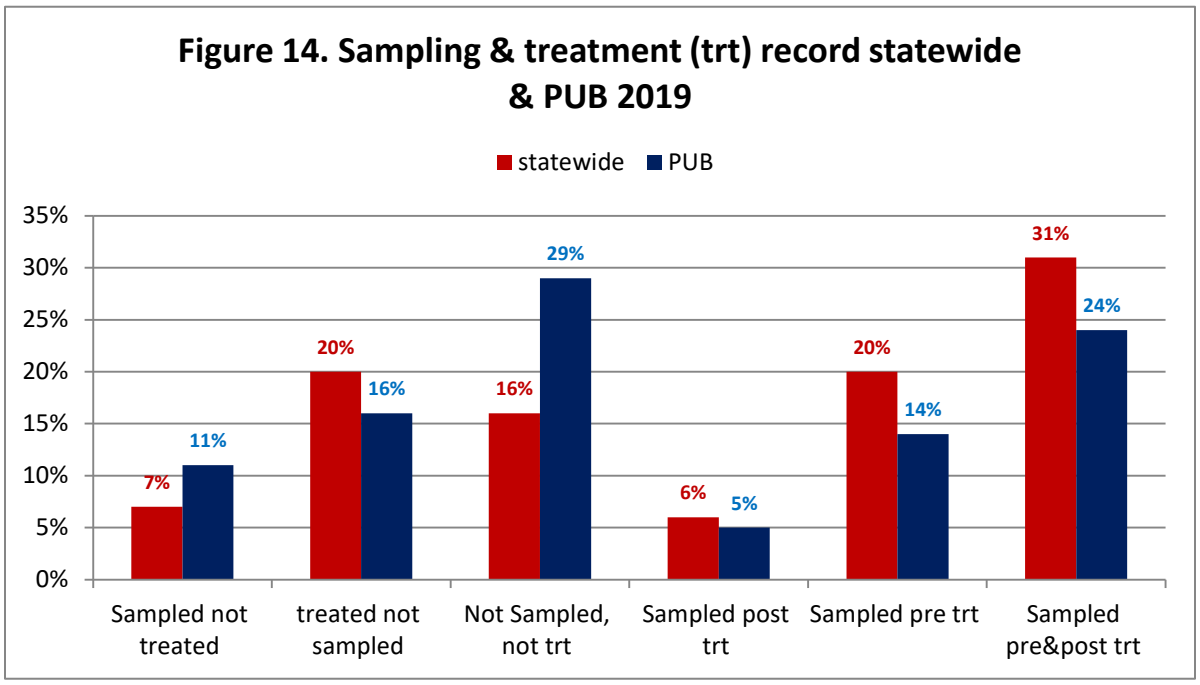
Individuals however are likely to use more than one monitoring technique (1.8/individual). In total choices, the two visual methods were the greatest in terms of use, 49% & 45%, followed by 40% of sticky board and 38% of powdered sugar; alcohol wash was used the least (13%) by both PUB and Statewide.

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 record of months each of the 5 sampling methods were used (statewide data).

Figure 13



The most common sampling of respondents in 2018-19 was both pre and post-treatment (31%) statewide but for PUB it was choice Not sampling nor treatment (29%). Sampling just pre-treatment was 3 times sampling post treatment. Treatment without sampling has increased in each of last 3 years. Data comparison for 2019 between PUB and statewide. Figure 14.



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 useful 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 key 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

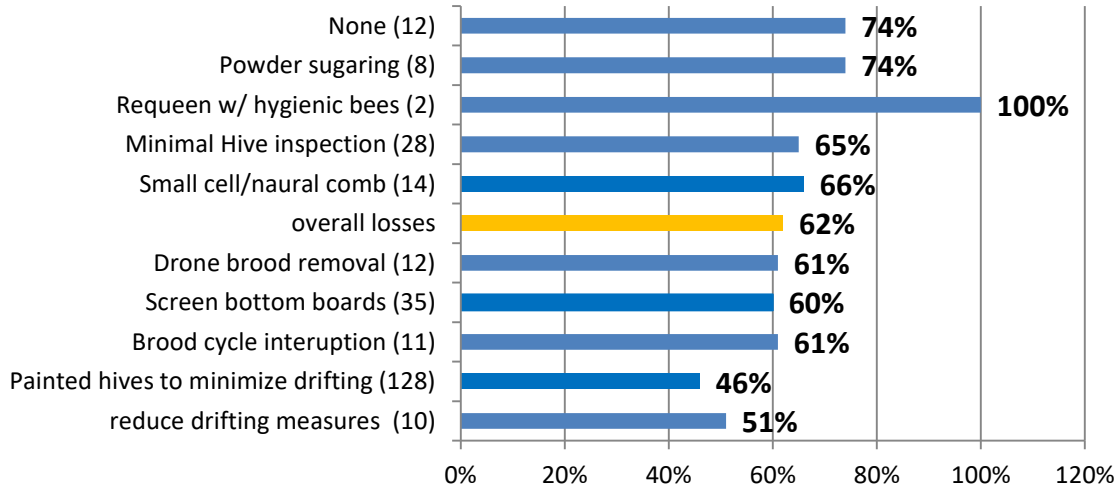
is also the most difficult time to select a control method (if one is deemed needed) as potential treatment harm may negatively impact the colony. We are seeing more colonies suddenly disappear (abscond?) during the fall, which may be related to the treatment itself.

Mite control treatments

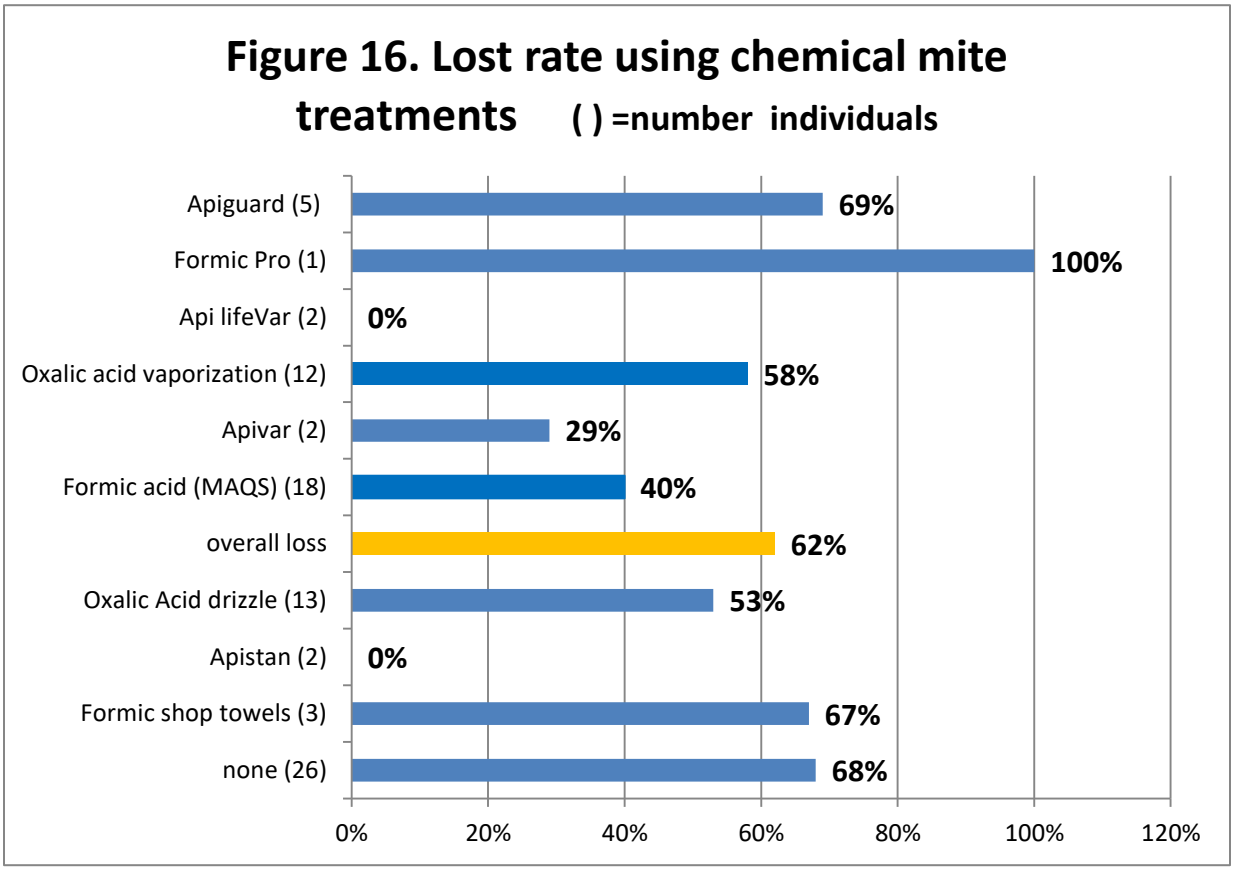
Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category), 27 PUB individuals used one method, 11 used two, 8 used three, 9 used 4, 5 used 5 and 2 had 6 choices. Rate loss of those using one or two selections (59% loss) was essentially the same as those 7 individuals using 5 or 6 methods (61%). **Use of screened bottom board was listed by 35 individuals with minimal hive inspection (28 individuals) next most popular.** Both were just below or slightly above the average PUB 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 PUB individuals using each method.

Four of the non-chemical alternatives have demonstrated reduced losses over past 4 year. Reducing drifting such as spreading colonies and different colony colors in apiary has demonstrated a 13% better survival. Both were the controls that showed the best survival this past winter for PUB members. Brood cycle interruption has demonstrated an 11% better survival and drone brood removal a minor 2% advantage over past three years statewide. These two, along with SBB, demonstrated a minor advantage this past season for PUB members.

Figure 15. Lost rate using non-chemical mite treatments PUB ( )=number individuals)



Chemical Control: For mite chemical control, 26 PUB individuals used No Chemical treatment (42% of total PUB respondents; statewide 24% used NO chemical). These 26 individuals had 68% loss Those 36 using chemicals used at rate of 1.5/individual; 21 used a single chemical, 12 used 2; 3 used 3 and one indicated use of 4 chemicals.



The chemicals listed above the overall loss rate orange bar had losses below the statewide level of 48%. For PUB members Apiquard (5 individuals) and the 1 individual using formic pro had higher losses than the PUB overall average (62%) . Those below the orange bar had higher losses than statewide average. For PUB members, the 13 oxalic acid drizzle users and the 2 Apistan users had losses lower than the PUB overall average.

Consistently the last 3-4 years, five different chemicals have helped beekeepers improve better survival The essential oils Apiguard and ApiLifeVar have consistently demonstrated the lowest loss level; this year Apiguard did not perform as well for PUB members, Apiguard statewide demonstrates a 31% better survival and ApilLife a 30% better survival record over past 4 years. Apivar, the synthetic (amitraz), has demonstrated a 29% better survival over past 4 years (2016-19). Oxalic acid vaporization over past 3 years has demonstrated a 13% better

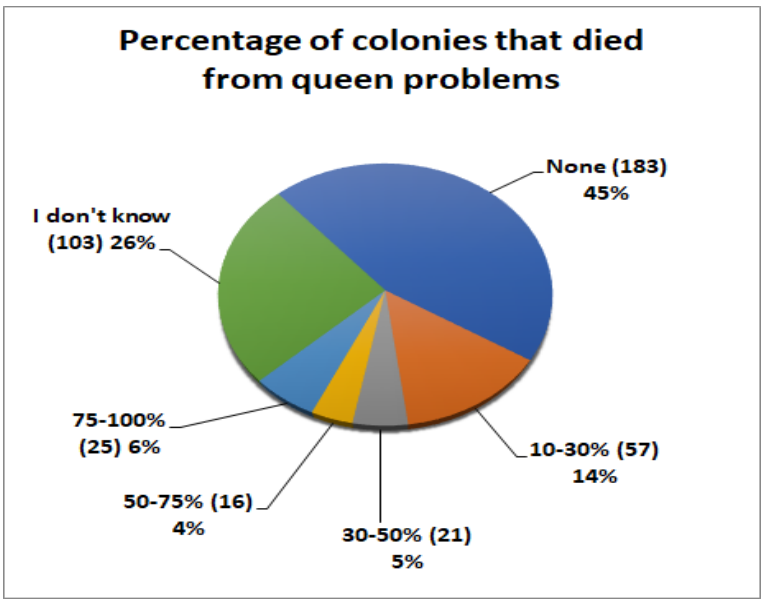
survival (the survey did not differentiate Oxalic vaporization from drizzle in 2016). Oxalic acid drizzle did better for13 PUB members this year than overall average loss.

Formic acid has been the most popular chemical for OR beekeepers (both PUB and statewide). Statewide is has 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 (except for the single Formic Pro user of PUB). Three PUB members indicated using formic acid in a "shop towel" delivery.

Queens

We hear lots of issues related to queen "problems. In Section 8 of the survey we asked what percentage of loss could be attributed to queen problems. One hundred twenty nine individuals statewide subdivided queen related issues from 10 to 100% of their hives. One hundred eighty three (44) said none (45%); an additional 103 individuals (24.5%) said they didn't know. The number and percent expressed by statewide respondents is shown in pie chart Figure 17. PUB responses were very similar Twenty four PUB members said none (39%) and fifteen (24%) said they didn't know.

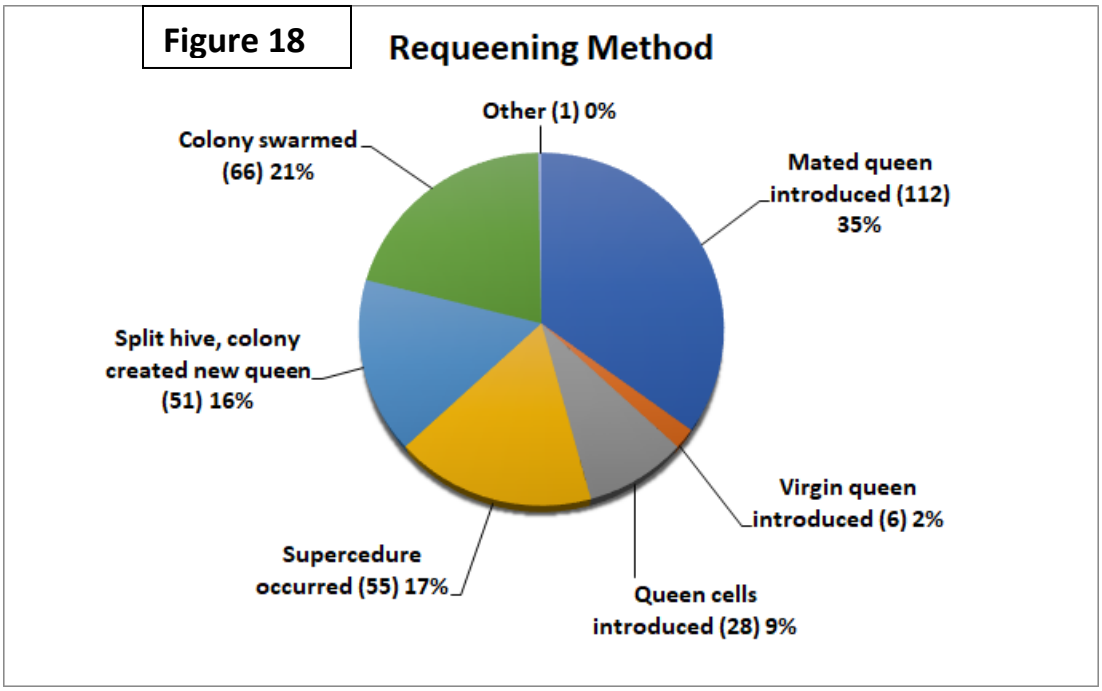
Figure 17



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 percent had marked queens statewide while only half that (14%) had marked queens among PUB members. The related question then was did you or your bees replace their colony queen? Forty-nine percent said yes statewide and 31% said no while in PUB 29% said yes and 39% indicated no.

One technique to reduce mite buildup in a colony is to requeen/break the brood cycle. The question "How did bees/you requeen" received 318 responses statewide, 61 from PUB members (more than one option could be checked). Statewide responses are shown in Figure 18. Statewide, 35% indicated their bees were requeened with a mated queen while more than one half (54%) indicated it was the bees that requeened, via swarming, supersedure or emergency rearing. PUB responses were 59% requeened via mated queen while bees were listed by 71%. Such results indicates too few individuals were seeking to use this valuable tool for mite control

Figure 18



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. The BeeInformed survey is mainly the response of larger scale OR beekeepers not the backyarders 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.