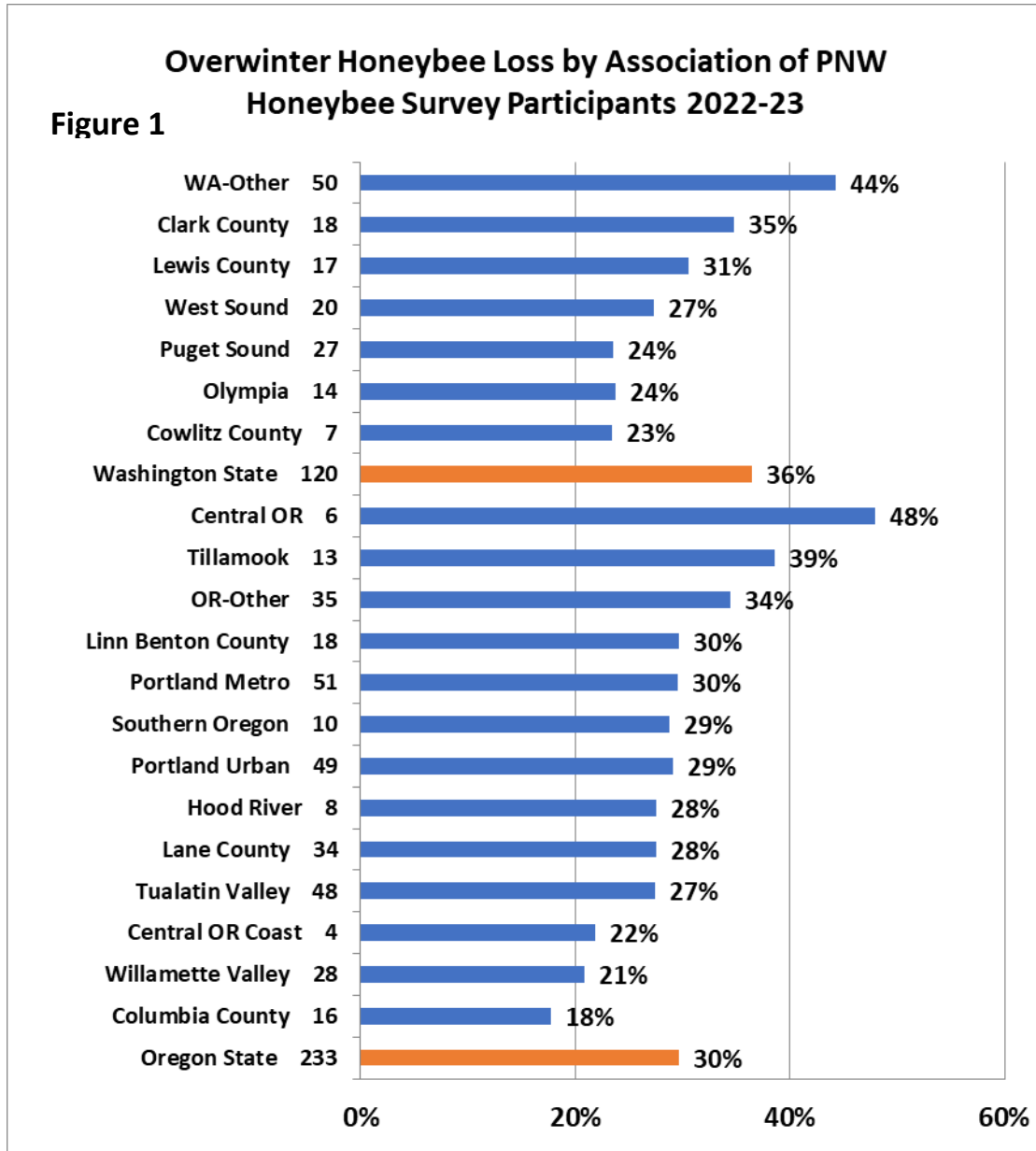


2022-23 PUB Winter Loss by Dewey M. Caron and Jenai Fitzpatrick

For the past 14 years, PNW winter colony losses and several managements related to bee health were solicited with an electronic honey bee survey instrument developed within the PUB bee group www.pnwhoneybeesurvey.com. A total of 233 (13 fewer than in the previous year and 95 fewer than 2020-21) were received from OR beekeepers with 120 additional returns from Washington beekeepers. During the 2022-2023 overwintering period, 49 PUB member surveys were returned, three fewer than each of last year two years.



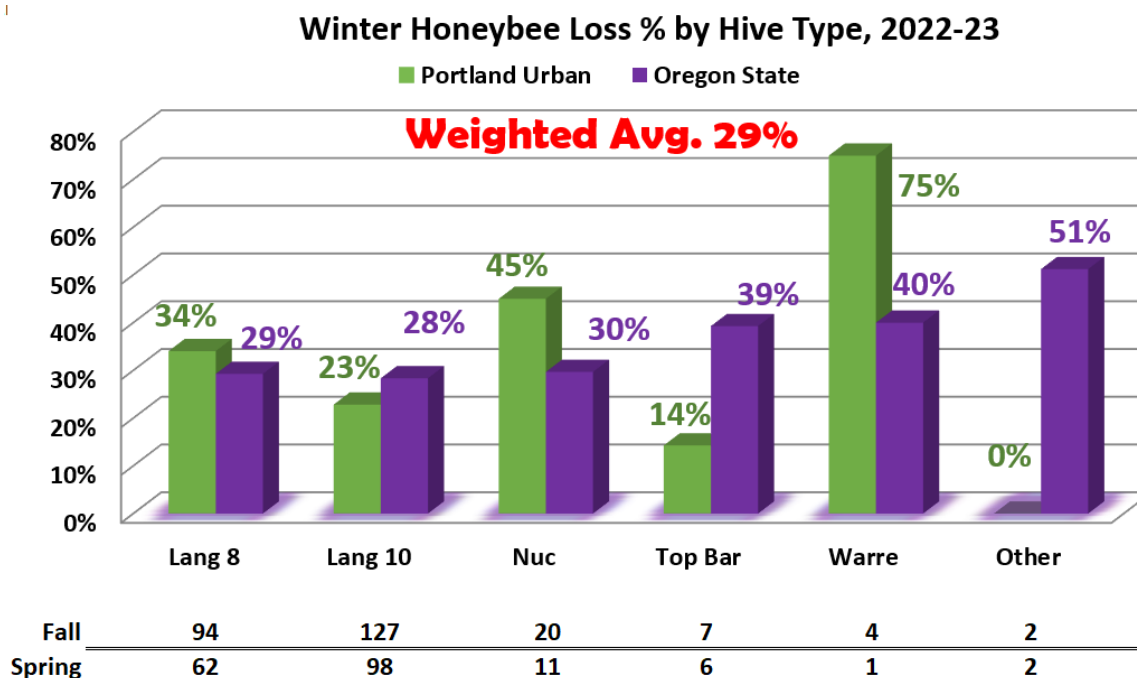
Overwintering losses of small-scale Oregon backyard beekeepers was 30%, an increase of two percentage points from last year and decrease of 5 percentage points from

2020-21. **Average overwintering losses of PUB respondents was 28%**, 1percentage point higher than last year, 11 percentage points lower than 2020-21. This is third year of a PUB loss level similar to the Oregon statewide loss average after earlier years of higher losses.

PUB losses, reporting on 254 fall hives, showed higher losses of 8 frame compared to 10 frame Langstroth hives. For the past seven years losses of 8 frame hives are exactly the same at 38%. Eleven of 20 nucs survived (45% losses). Nuc losses are typically higher (7-year statewide average= 49%); for PUB, the 7-year average of nuc losses has been 41.6%.

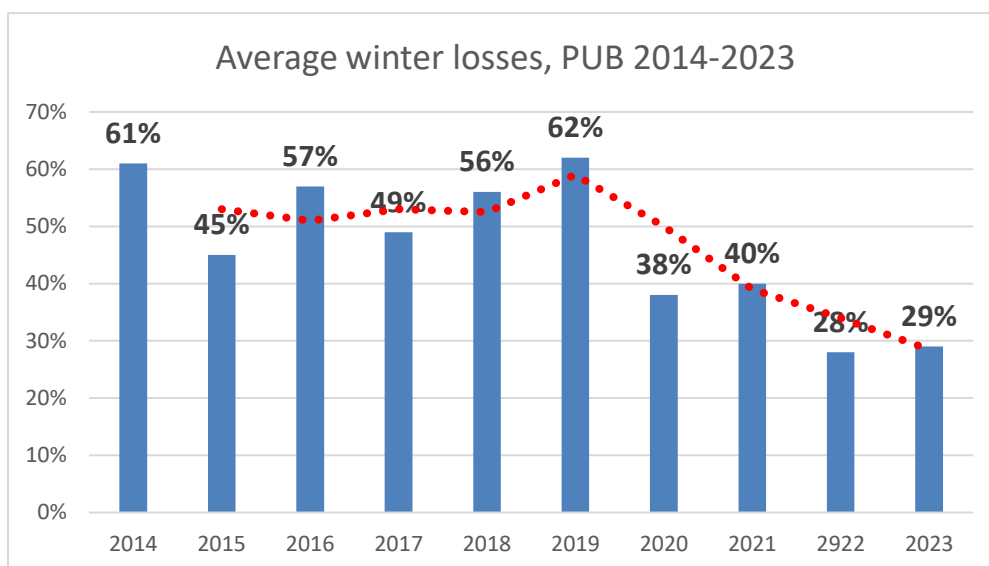
PUB top bar and Warré hive losses are typically higher than statewide levels. This year only a single top bar hive did not survive, while three of four Warré died. PUB member holdings of top bar and Warré hives two years ago (2020-21) were one half of the total 70 TB and Warré colonies statewide but only 2% of total last year and 38% of 38 total from survey respondents this year. Statewide the past 8-year loss averages have been 50% for Top Bar and 41% for Warré hives. Losses by hive type of PUB compared to statewide loss is shown in Figure 2.

Figure 2



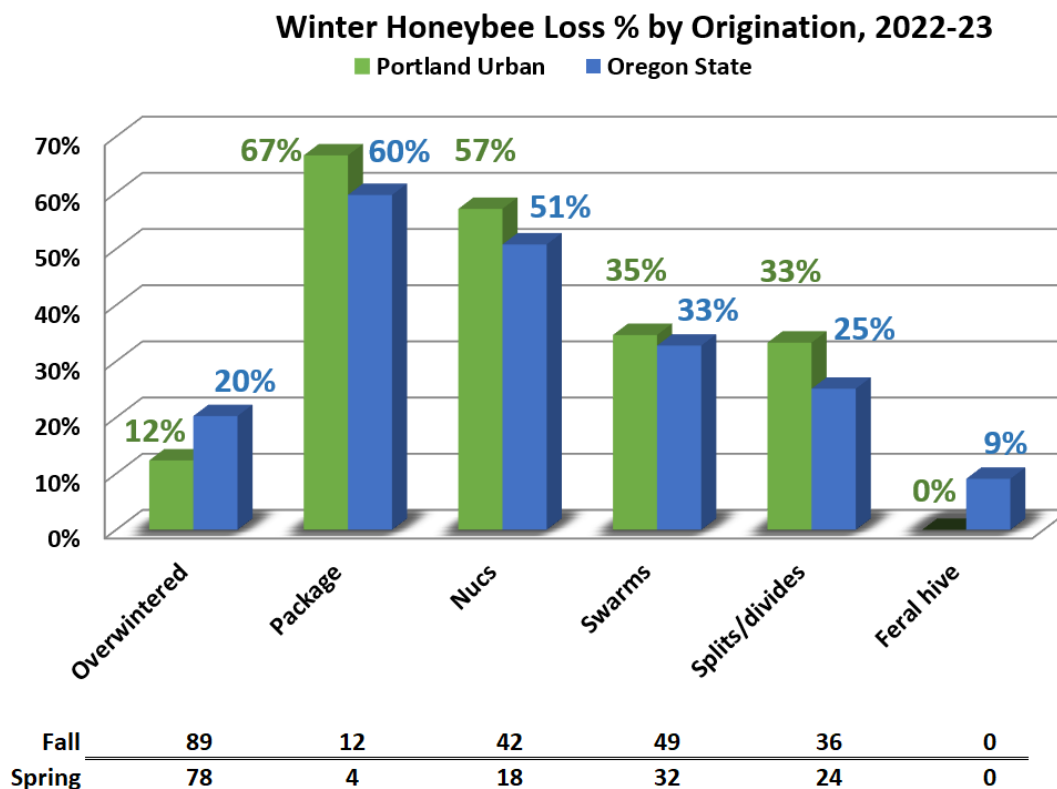
The two figures below illustrate the loss levels of PUB respondents. The bar graph (Figure 3) shows the loss level for past 10 years. The blue line is the trend line. Obviously, losses are trending in the right direction. Average backyard losses for last 9 years of Oregon backyarders is 37.5%; for PUB members it is 46.5%, 9 percentage points higher. For comparison the average 14-year loss average for Or Commercial beekeepers (50+ colonies) is 21%.

Figure 3



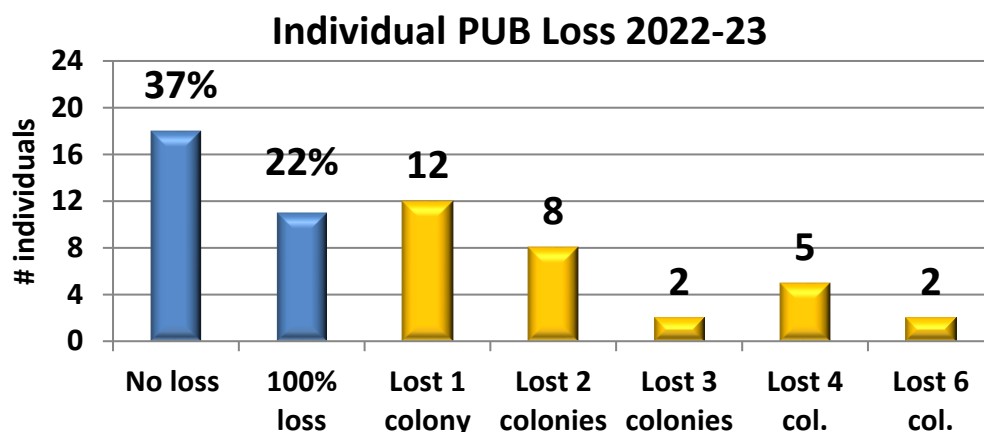
The survey also asked for **loss by hive origination**. Overwintered colonies had the best survival in PUB (12%) and statewide (20%). Package (67%) and nuc losses (57%) were similar, 5 times higher, similar to last year. Swarms (35%) and splits (33%) were slightly less, 2 times higher. No PUB feral transfers survived were reported by the 49 PUB respondents.

Figure 5



Not all individuals had loss. Eighteen individuals (37%) had total survival, i.e., no colonies lost, total colony number 86 hives. Eight individuals lost 50%, 24 fall colonies. Unfortunately, 11 individuals (22%) had a 100% loss (26 fall colonies). Greatest number loss was one colony (12 individuals), heaviest loss was 8 colonies (not included in Figure 6.)

Figure 6



Typical of the statewide data, the PUB respondents are largely beekeepers with few colonies. 53% of PUB respondents had 1, 3 or 3 fall colonies (3 was median number), another 26,5% had 4 to 6 colonies, loss 27% one had 7 colonies, no loss and 8 had 10+ colonies (highest number 33 colonies); they had a 21% loss. This relationship of increasing colony numbers having, on average, lower losses has been constant every survey year

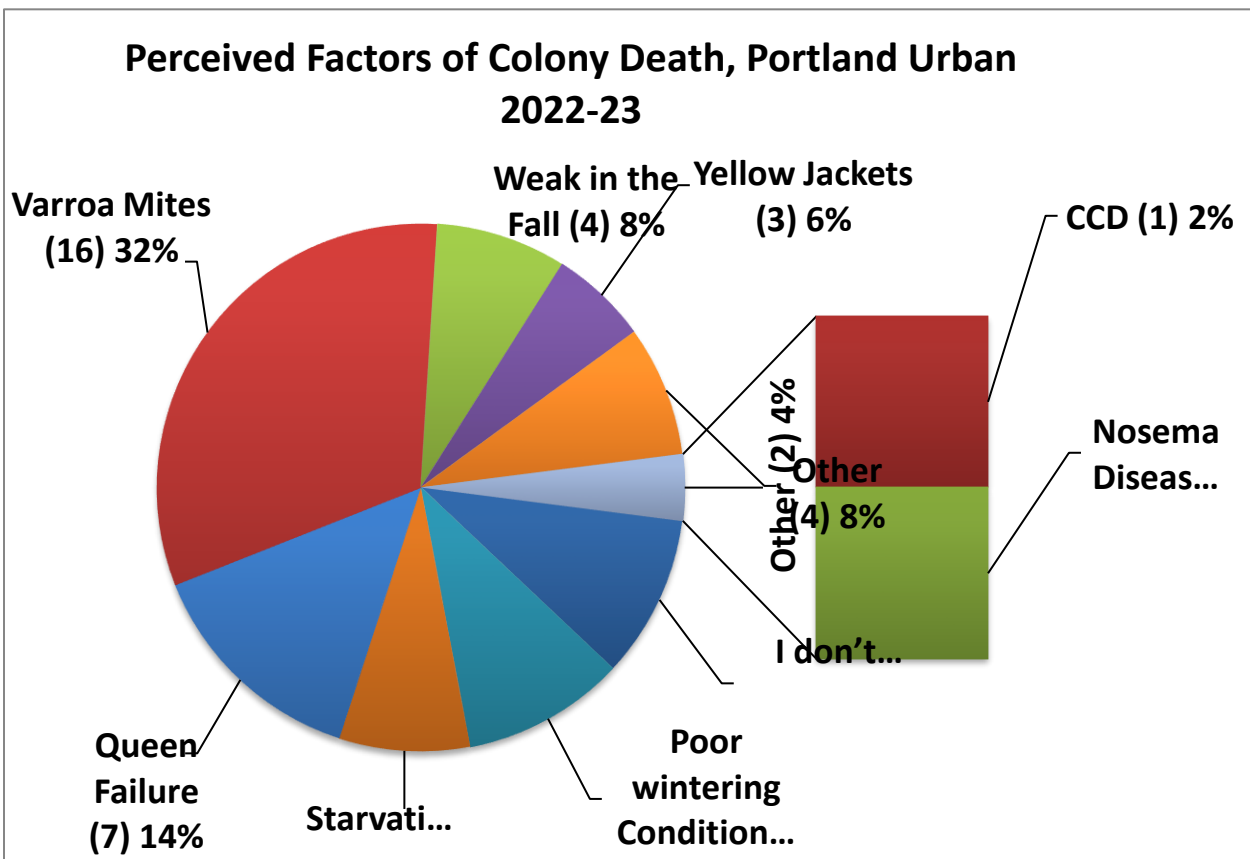
PUB survey respondents reported a **range of beekeeping experience**. Three individuals had one year experience (they had 33% loss), 7 individuals had two and 11 members (the greatest number of years experience) had 3 years experience; the 43% having 1 to 3 years experience had a 30% loss. Twelve individuals had 4 to 6 years experience (4 was median number) with 28.5% loss, 10 individuals had 7 or 8 years experience with 43% loss and 4 individuals had 10+ years experience (27 was the highest number). They had only the lowest loss level of 20%. As years of experience increased generally loss level fell statewide, a bit less so for PUB respondents. Thirty-nine of 49 PUB respondents (69.5%) said they had a mentor available as they were learning beekeeping; last year 67% said they had mentor.

Three individuals had 2 apiary sites. One lost more colonies at 2nd site. Three individual moved hives from 8 to 12 miles generally for nuc development.

Reasons for Colony Loss/Acceptable loss

We asked individuals that had colony loss to estimate what the reason might have been for their loss (multiple responses were permitted – recall that 18 individuals had no loss). A

total of 50 choices, 1.6/individual were listed. Highest selection 16 of 31 individuals (51.5%) indicated varroa, 7 said queen issues, 5 poor wintering (as well as didn't know), 4 starvation and weak colonies. Three said yellow jackets, 1 CCD, 1 Nosema, 1 leaving covers off by accident, 1 said colony was honey bound and 1 said the extreme cold.



When asked about an acceptable loss, six said none, 5 said 5%, 10 said 10% (highest selection), 2 said 15%, 9 said 20% (the median) and another 9 said 25%, Six individuals said 33% and 3 indicated 50% an acceptable loss level.

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. Examination of dead colonies is often confusing, some options may be ruled out, we are often left with two or more possible reasons for losses. 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. Our 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, plus declining nutritional adequacy/forage and diseases. Pesticides in the agricultural environment weakens colonies. Yellow jacket predation is a constant challenge 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 currently facing honey bees. Varroa mites and the viruses they transmit are considered a major factor why colonies are not as healthy as they should be.

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.

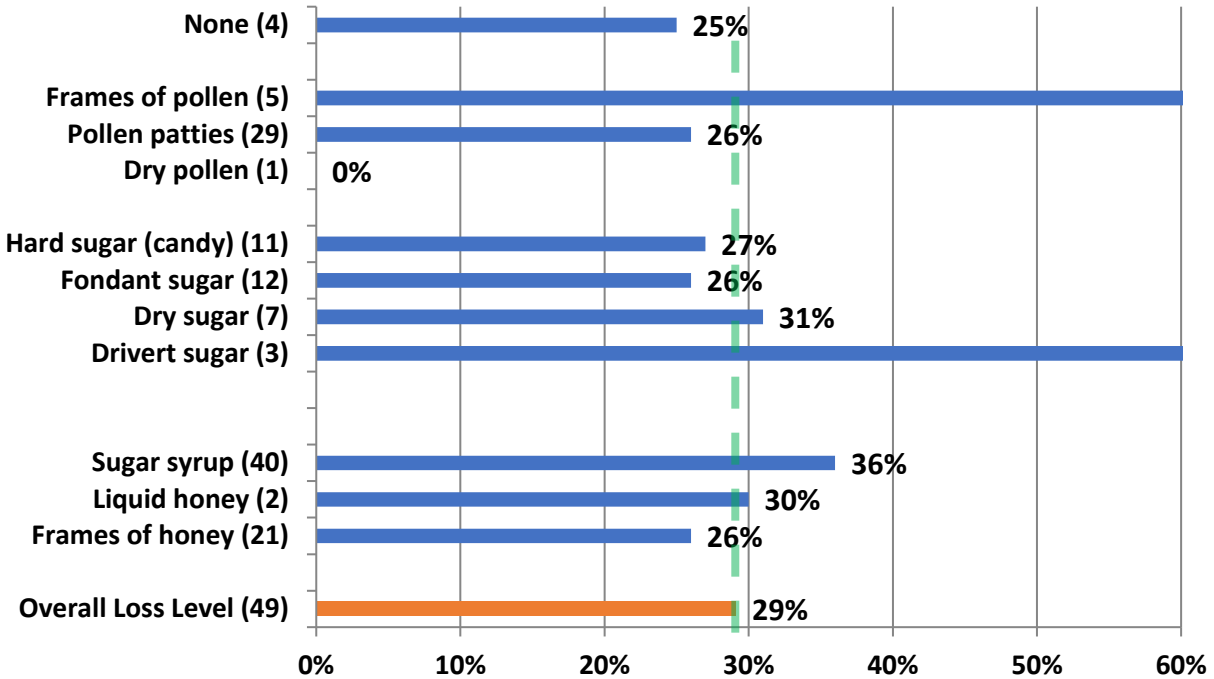
Most PUB beekeepers do not perform just one management to their colony (ies) to improving colony health and overwintering success. Some do no management of their colonies. This analysis compares a single factor equated with loss level. Such analysis is correlative and doing a similar management as fellow beekeepers do does not necessarily mean you too will improve success. But it is evident that some things can be done to reduce losses.

FEEDING: PUB survey respondents checked 124 feeding options = 2.85/individual. Four individuals (12 fall colonies) made no choices – their loss rate was 33%. Four individuals (9% selected a single choice) (each had a single colony), they had loss rate of 50%, thirteen individuals (36 colonies) had 2 choices (loss rate 33%), sixteen respondents (the medium number holding 114 fall colonies) made 3 choices (a 29% loss rate). Six individuals had 4 choices (47 fall colonies), lost 26 %, four individuals had 5 choices (36 fall colonies) had 33% loss and the one individual with 3 colonies who chose 6 options had no loss.

Percent colony losses statewide are presented for feeding options with numbers of PUB member numbers in (). For loss levels to left of green dotted line survival was improved with use of that management.

Figure 8

Feeding Options w/ Loss Record
(#) = number individuals



Forty of 45 PUB individuals (89% of respondents) said they used sugar syrup. They had a 36% loss rate, 7 percentage points greater than the overall PUB average loss of 29%. As with statewide, the PUB individuals that fed pollen patties had a survival improvement; the five individuals using frame of pollen had a 67% loss (6 of 18 colonies survived). Fondant and sugar candy user had a small survival advantage. The PUB members feeding results were not in close agreement with statewide feeding results.

Summary: Statewide for the last 7 years individuals doing no feeding had 6 percentage point higher losses (average 45%) i.e. poorer survival, compared to an average loss rate of 38%. The average percent doing no feeding = 7% of individuals – this year it was 5.7%. Individuals statewide that fed sugar syrup had a 4.3 percentage point lower loss level average for the 7 years; this year it was one percentage point greater survival. Those feeding honey (as frames or liquid) had lower loss only during 3 of the past 7 years, this year it was a one point improvement. Individuals feeding non-liquid sugar (in any of the forms) had lower losses six of past 7 past winter seasons; this year it was a 3 percentage point difference, same as last year. Dry sugar feeders had slightly better or equal survival all 7 past winters while hard candy feeders had a much-improved survival 6 of 7 past winters, including this past winter. Fondant feeders had better survival 3 of the 7 past winters, but not this season.

For individuals feeding protein, the protein patty users showed better survival 6 of 7 years (this year losses were 2 percentage points better; dry pollen feeders had better survival in three of the past seven years. Pollen patty feeders had the best survival this year.

WINTERING PRACTICES: One PUB individuals (4%) reported doing no winterizing; they loss 1 of 4 colonies overwinter = 25% loss; statewide eighteen individuals (8%) of the respondents indicated doing none of the several listed wintering practices; these individuals had a 40% winter loss, 10 percentage points higher loss than overall loss of 30%. Multiple selections were possible and in fact the 48 PUB members who did some winter management averaged 2.2/individual. Seven individuals (79 colonies) chose a single management and had a 14% loss level. The 17 individuals (65 fall colonies) checking 2 had 46% loss, the 12 individuals (53 colonies) with 3 selections had 34% loss, the 6 individuals (27 colonies) indicating 4 choices had 22% loss and the 5 individuals (24 colonies) who made 5 choices had a 25% loss level.

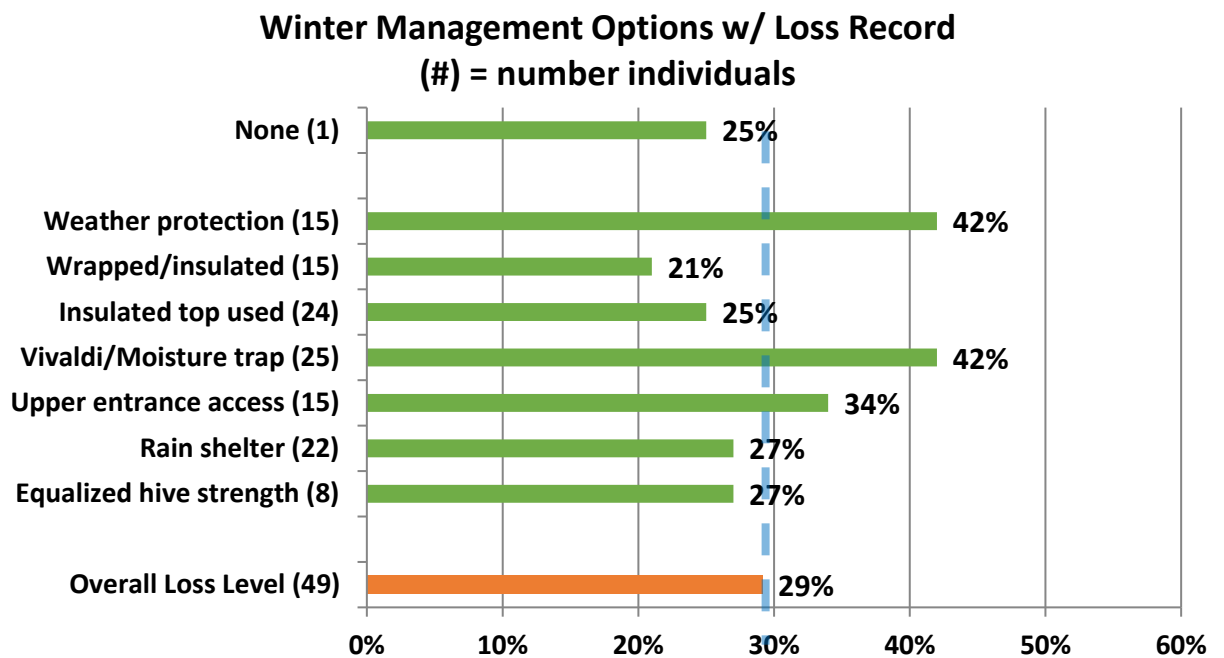


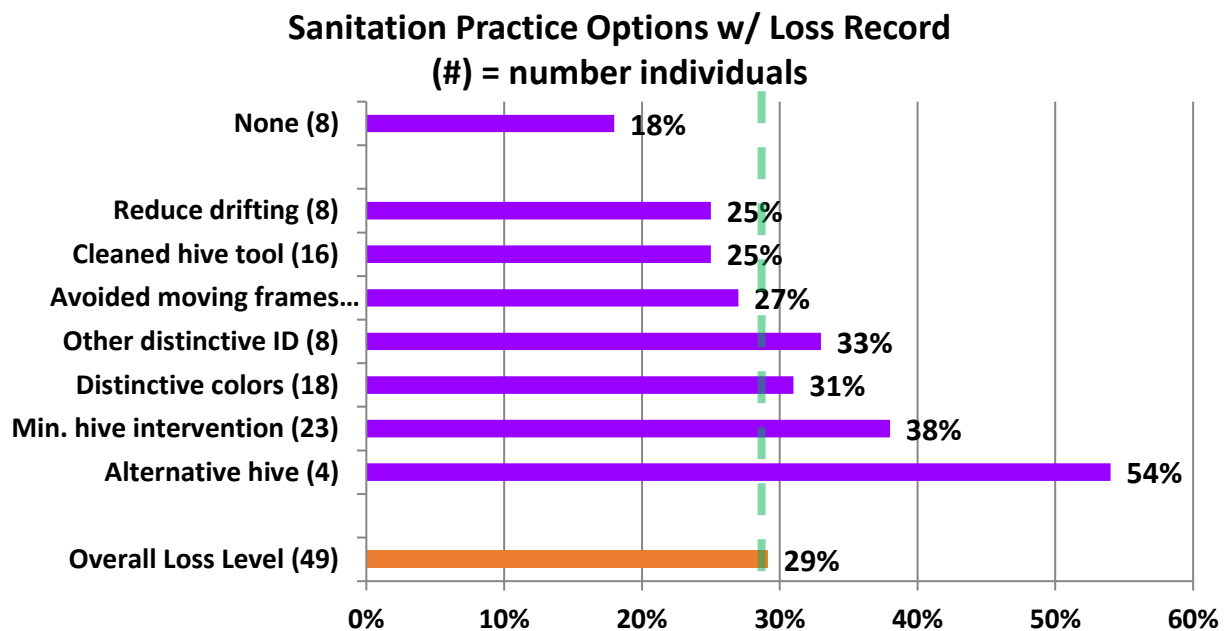
Figure 9

The three most common wintering managements selected were use of a quilt box (Vivaldi board) at colony top (25 of 48 individuals), who had 12 percentage point higher losses, but those using an insulated top 24 individuals and rain shelter (22 persons) had lower than average losses (25% and 27% respectively). Those 15 who wrapped had the best survival 21% loss level). Figure 9 shows number of individual choices for PUB members in () and percent loss of each selection.

Over the past six years statewide, individuals that did no winterizing practice (average 11.3% of individuals) averaged 41.3% loss compared to 37.7% overall average loss of last 6 years, a 4.6 percentage point poorer survival rate. Only a single winterizing management improved survival all 6 years – insulated top (6 year average loss of 30%, a 7.7-percentage point improvement). Vivaldi/quilt box, upper entrance (most Vivaldi boards have an upper entrance built into the equipment), wrapping and wind/weather protection had only slightly improved survival rates and were not noted in all past 6 year; wrapping was the best winterizing for PUB this past winter. Equalizing hive strength was the best management to improve survival both this and the past year.

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. Twelve individuals said they did none of the sanitation – their loss rate was only 18% (this speaks to how sanitation measures may not have much to do with reducing winter losses. We received 90 PUB selections, 2.5/individual, same as last year. Twelve PUB members (85 fall colonies) had 1 selection (loss rate 32%), 13 respondents (median choice with 38 colonies) made 2 choices (42% loss), there were 7 (28 fall colonies) with 3 managements (they had an 18% lost (and best survival for this management), six (27 fall colonies) had 4 choices 48% loss survival and the three selecting 5 has (13colonies) a 23% loss rate. Figure 10.

Figure 10

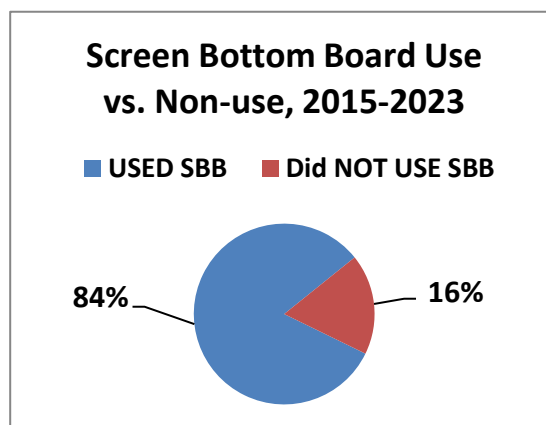


Minimal hive intervention (22 of them PUB beekeepers), painting hives distinctive colors (17 PUB individuals) and avoiding moving frames (19 PUB members) were the most common options selected statewide. It could be argued that less intervention might mean reduced opportunity to compromise bee sanitation 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, either for statewide or PUB members. Avoiding moving frames, cleaning hive tool and reducing drifting were the most favorable managements of PUB members at reducing winter losses.

These last two management statewide, avoiding moving frames and reducing drifting, were the two sanitation choices that demonstrated better average survival the past six years statewide – 6-year loss rate was 34.8% for not moving frames which is 2.5 percentage points better survival and 32.2% for reducing drifting a 5 percentage point improvement in survival. Overall sanitation appears to be relatively minor toward improving survival.

SCREEN BOTTOM BOARDS (SBB)

Although many beekeepers use SBB to control varroa, BIP and PNW surveys clearly point out they are not a highly effective varroa mite control tool. In this recent survey, statewide 19 individuals (8%) said they did not use screen bottom boards. This is the lowest percentage of the last 3 years for non-use of a screened bottom – 25% said they used sometime. Average non-use for the last eight years is 16%, vs 84% use, on some or all colonies. Figure 13 right. Last year all but one PUB beekeeper indicated using SBB – the one person not using didn't lose any colonies (7 total).



This past overwintering season, the 38 non-SBB users had winter losses of 27 colonies a 28.5% loss. **Examining the eight-year average of SBB use, loss level of the 84% using SBB on all or some of their colonies had a 33.9% loss level whereas the 16% not using SBB had loss rate of 36.8%, a 3.1-percentage point positive survival gain for those using SBB versus those not using them. Screen bottom boards offer a minor improvement for overwinter survival.**

We asked if the SBB was left open (always response) or blocked during winter. This past season, 67%, 150 individuals, said they always blocked SBB during winter; 22 individuals statewide said they blocked some of the SBBs. Statewide those who blocked always or sometimes had 999 colonies in the fall and lost 717, a 28.2% loss rate. Those 51 who never blocked had a 28.5% winter loss, a mere 0.3-percentage point difference. As in past years, there

was a slight advantage in favor of closing the SBB over the winter period to improve survival. This was not the case for PUB. The 9 not closing the bottom had only a 9% winter loss. Why the difference (high usage and not blocking showing a heavier loss of PUB compared to statewide is not known.

Screen bottom board use has a slight survival advantage. For those using SBB, the advantage appears to be to close, partially or completely, the screen over the winter period.

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, nor do they necessarily do the same thing to all the colonies in their care. We do know the inability of bees to manage moisture overwinter kills bees, so we recommend hives be located in the sun out of the wind. If colonies are in an exposed site, providing some extra wind/weather protection and wrapping/insulating colonies might improve survival.

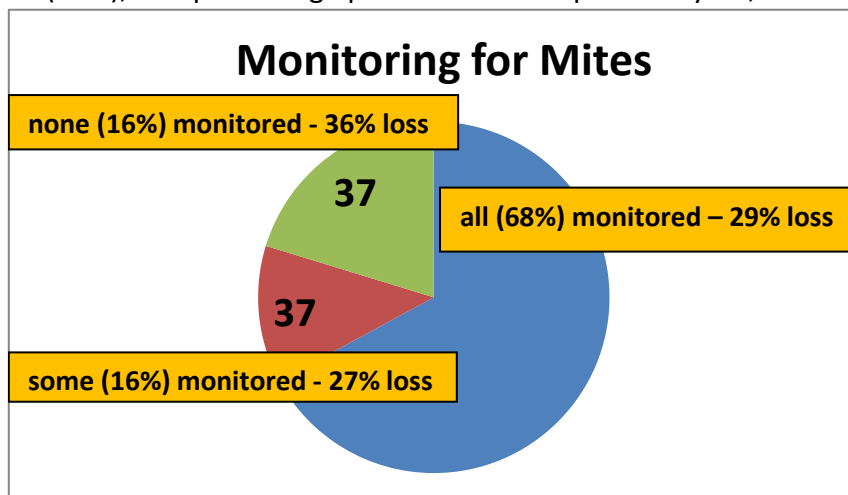
Feeding, a basic management for all livestock, appears to be of some help statewide in reducing losses. Feeding a hard sugar candy or dry sugar during the winter means lower loss levels. Providing frames of honey and feeding sugar syrup also yields lower losses for some individuals. Such feeding management is of great value for spring development and/or development of new/weaker colonies as well as for colony rearing of bees to overwinter. Feeding protein in any form did slightly improve survival. The supplemental feeding of protein (pollen patties) might additionally be of assistance earlier in the season to build strong colonies and in the fall to build the fat bee population needed for successful overwintering. To determine if feeding might help monitor what sources your bees are visiting and manage accordingly.

Winterizing measures that apparently helped lower losses for some statewide beekeepers were top insulation and wrapping the colonies (or otherwise adding some insulation to provide added protection against the elements). Spreading colonies out in the apiary and 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 to bolster weak colonies and start new divides might be greater than a minor advantage in survival.

Replacing standard bottom boards for screened bottoms marginally improved winter survival. It is apparently advantageous to close the bottom screens during winter. It is clear that doing no feeding, winterizing or sanitation resulted in the heaviest overwinter losses.

Mite monitoring/Sampling and Control Management

We asked the percentage of Oregon hives monitored for mites during the 2022 year. Statewide 159 individual respondents (68%), two percentage points above the previous year, said they monitored all their hives. The losses of those individuals monitoring was 29%. Thirty seven individuals (16%) reported no monitoring; they had a higher loss rate of 43% loss. 37 individuals reported monitoring some of their colonies; they had a 23.6% loss. Among PUB respondents 31 individuals (64.5%) monitored all



hives and had 35% loss level, the 6 individuals monitoring some hives had the lowest loss level (lost 4 of 39 colonies- 10% loss). The 11 individuals doing no monitoring (45 total colonies) had 20% loss. Why PUB results were different from statewide is unknown.

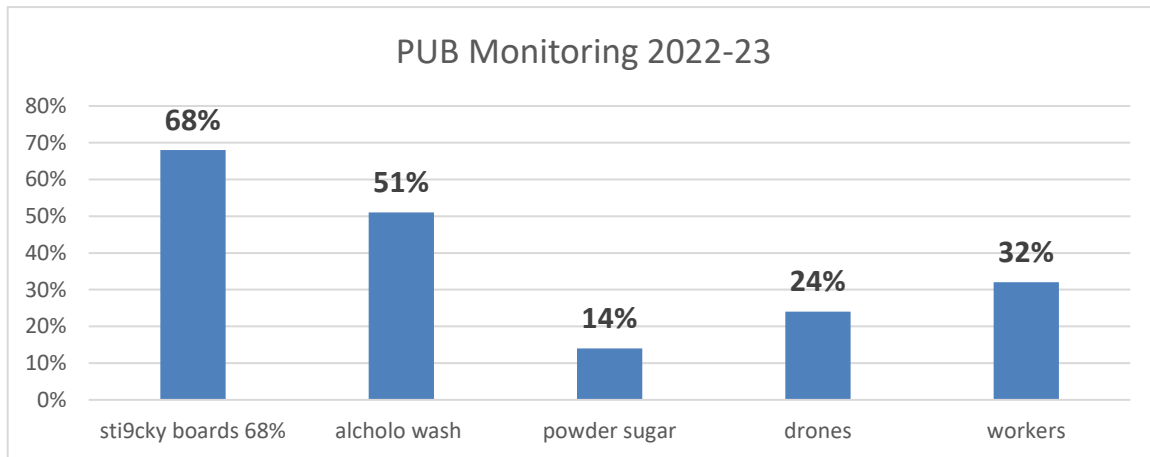
Monitoring alone is a means towards improved winter survival. The table below compares % individuals and % winter loss for individuals statewide who monitored all colonies compared with those who monitored none. Seven-year difference is 8 percentage point better survival monitoring all colonies. The loss rate of 13-15% who monitored some colonies was variable, averaging 4 percentage points lower than those monitoring all colonies.

	ALL Colonies Monitored % individuals	% Loss	SOME Colonies Monitored % individuals	% loss	No colonies Monitored % individuals	% loss
2023	68%	29%	16%	27%	16%	36%
2022	66%	37%	15%	27%	18%	42%
2021	73%	34 %	11%	36%	17%	36%
2020	67%	33%	13%	16%	20%	49%
2019	67%	51%	15%	50%	18%	59%
2018	63%	38%	14%	26%	26%	49%
2017	63%	43%	15%	60%	22%	48%
7 year loss avg		38%		35%		46%

Individuals statewide indicated use of 1.85 monitoring techniques on average. In total choices, in order of popularity of use, 104 individuals used alcohol wash and 98 individuals used sticky boards (53 and 50% respectively of those responding to using a monitoring technique). 48 individuals used powdered sugar monitoring; visual inspection of drones (53 individuals) and visual inspection of adults (60 individuals) were also indicated. In the past 5 years, the use of

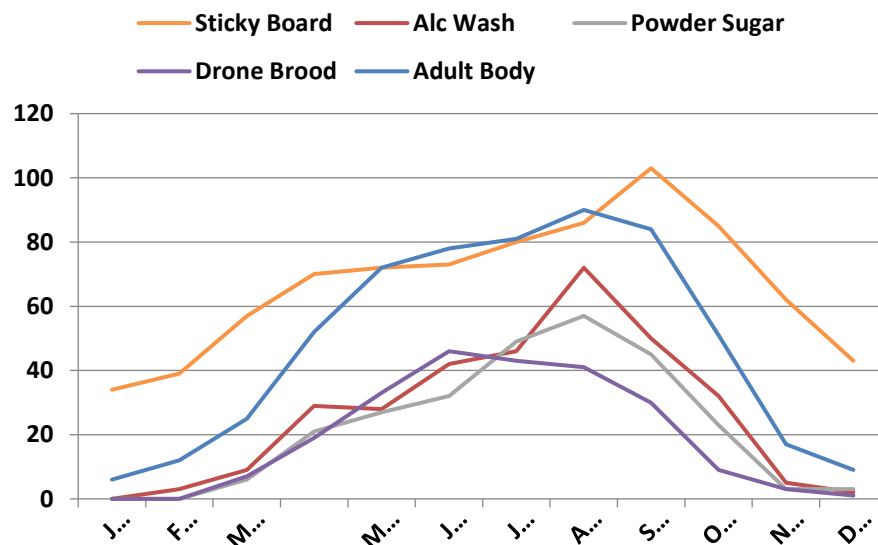
sticky boards has decreased in use and alcohol wash has increased in use. This was the first year alcohol use monitoring was the major monitoring technique statewide. For PUB, sticky board were used by 25 individuals (67.5%), and alcohol by 19 (51%). Twelve indicated looking on adults, 9 on drones and 5 used Powdered sugar monitoring. See Figure 13.

Figure 13



Whatever technique used, most sampling to monitor mites was done in July – September, as might be expected since mite numbers change most quickly during these months and sampling results can be used to key control decisions. Figure 14 illustrates monthly sampling with five methods.

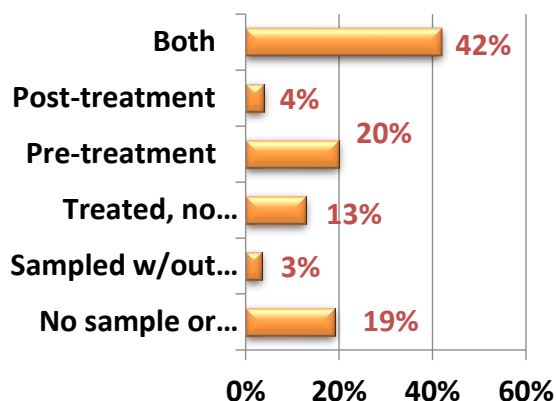
Figure 14



The most common sampling of respondents is both pre- and post-treatment (42% average). The sampling pre-treatment percentage has been decreasing while post treatment sampling has slowly been increasing. It is important to know if the treatment works so post

treatment shouldn't be avoided. Treatment without sampling was 13%, (last year it was 28% an anomaly, double the more typical percentage of this year). Figure 15.

Figure 15



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 counting the mites can be hard, especially for new beekeepers). Sticky boards used for a single day pre- and post-treatment can help confirm the effectiveness of a treatment, if numbers drop post treatment. Visual sampling is not accurate: most mites are not on the adult bees, but in the brood, especially when there is a lot of brood and the adult mites are NOT on the adult body where they can be observed (over 90% are on the lower abdomen, tucked within the overlapping bee sternites). Sampling for mites on drone brood is also not effective as a predictive number but can be used as an early warning that mites are present; if done, look at what percentage of drone cells had mites.

See ***Tools for Varroa Monitoring Guide*** www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes suggested mite level to use to base control decisions based on the adult bee sampling. A colony is holding its own against mites if the mite sample is below 2%. It is critical to not allow mite levels to exceed 2-3% during the fall months when bees are rearing the fat fall bees that will overwinter. It is also the most challenging 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.

[Here](#)

Mite Control Treatments

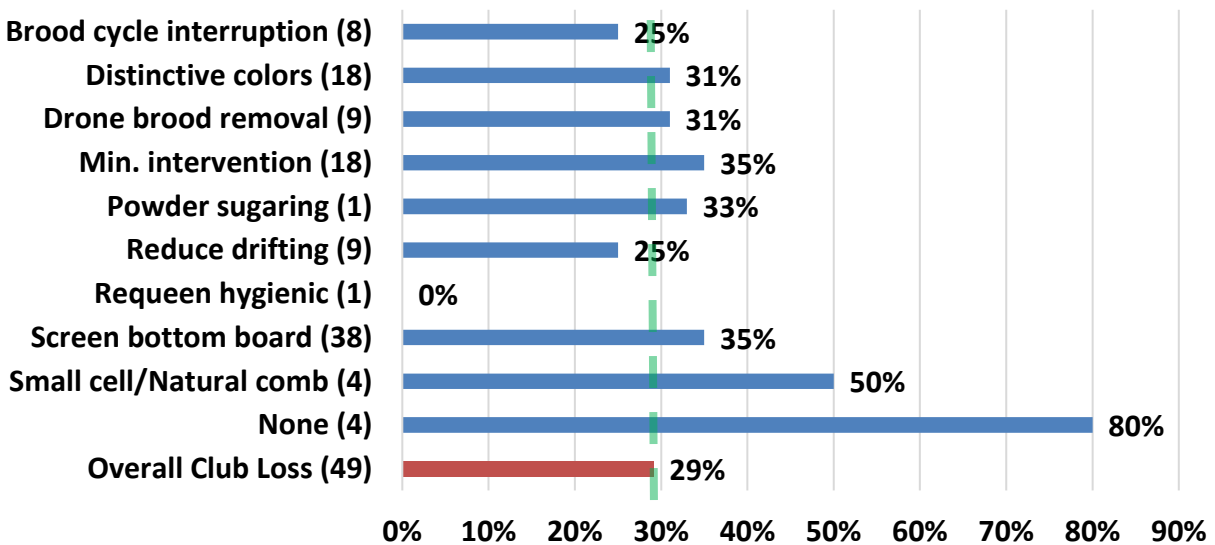
The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Four PUB individuals (17%), said they did not employ a non-chemical mite

control and four, did not use a chemical control. One group had very high losses -80% (4 of 5 colonies didn't survive - colonies of non-chemical control individuals) but the second group only 1% loss (1 colony of 9 total) and 73% respectively. The individual options chosen for non-chemical and chemical control are discussed below.

Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category,) ten individuals (68 colonies) used one method (26.5% loss), 14 (88 colonies) used two (20.5% loss), 10 (54 colonies) used 3 (31.5%), 6 (21 colonies) used 4 (33%) and the 2 using 5 options (16 colonies) had 62.5 % loss.

Figure 17

**Loss Rate using Non-Chemical Mite Control
(#) = number individuals**

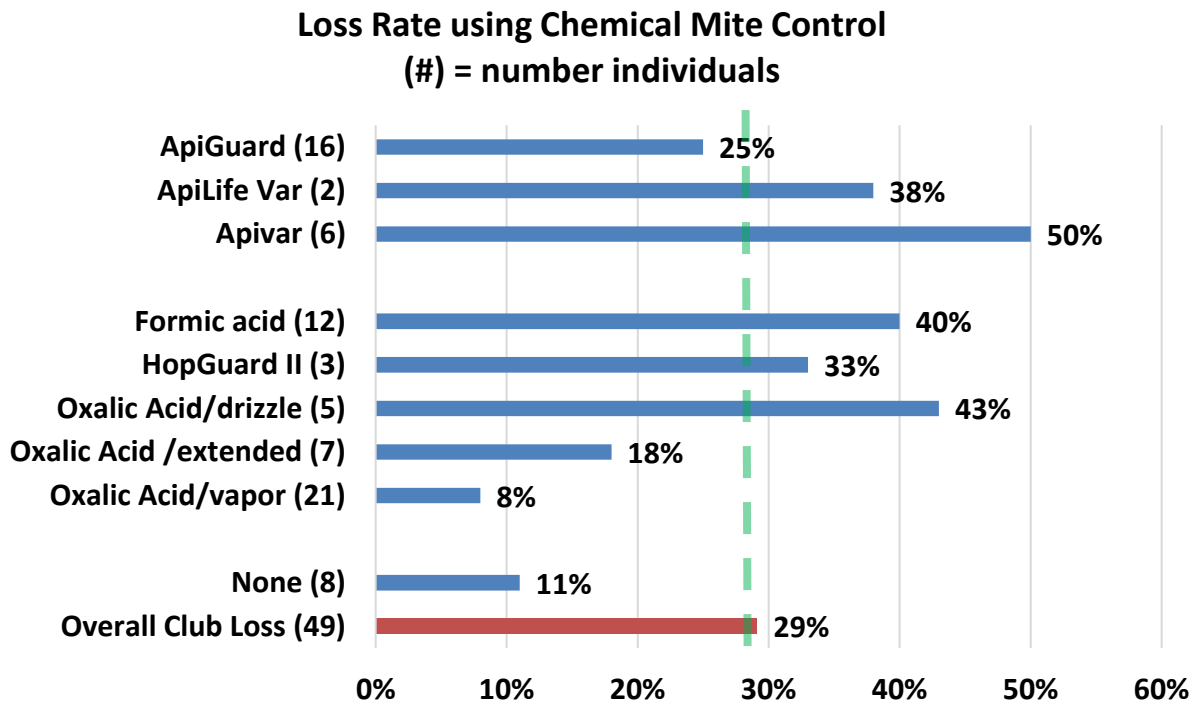


The 9 individuals who reduced drifting (36 colonies total), the 8 doing brood cycle interruption (67 colonies) and the one who requeened with hygienic stock (3 colonies) showed improved survival. The use of the remaining selections are shown in Figure 15; number of individuals in (), bar length represents average loss level of those individuals using each method. Those left of **green dashed** line had improved survival.

Two of the non-chemical alternatives have demonstrated reduced losses over past 5 years statewide. Reducing drifting such as spreading colonies (33% loss average for 4 years – question not asked in 2016-17 survey) and brood cycle break (36%, 5-year average) have consistently year after year demonstrated somewhat better survival than average loss (41%).

Chemical Control: For mite chemical control, 8 individuals (16% of total respondents) used NO chemical treatment. They had a loss level of only 11% (lost 3 of 28 colonies). Those using chemicals used at rate of 2/individual. Fifteen individuals used one chemical (had 44% loss level), fifteen also used two (17% loss), 9 used three 31.5% loss and 5 used four with 33% loss. Figure 16 below shows number of individuals using a chemical and their loss rate.

Figure 18



Consistently the last 6 years five different chemicals have helped beekeepers improve survival. Of the three starting api---, only the essential oil Apiguard (average 6-year loss level 30.5%), was also beneficial to PUB members. Apivar (31.2% average 6-year loss level), but the 6 PUB individuals lost 8 of 16 colonies and ApiLifeVar (34.4% average loss level over last six years) but the 2 individuals lost 6 of 16 colonies. Oxalic acid vaporization (31.3% average loss level over last 6 years) had the best result for PUB members, 8% loss. In contrast the oxalic acid drizzle average of last 5 years is 37.8% loss level is only 0.4 percentage points above the 5-year average of 37.4% and for the 5 PUB members (40 colonies) it did not have good results. Formic acid has changed from MAQS to Formic Pro but for 12 PUB members it did not prove as useful.

Queens

We hear lots of issues related to queen “problems”. 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. Twelve PUB individuals (33%) said yes. The related question then was

‘were your hives requeened in any form?’ to which 27 said yes, 8 said no and the remainder that responded (13 individuals) said ‘not 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 15 responses from 11 individuals. Seven respondents stated their bees were requeened with a mated queen and an additional 7 with queen cells plus 2 with virgin queen. Seven split (divided) hives, 14 individuals indicated it was the bees that requeened via swarming and 9 said their bees superseded.

Closing comments

This survey is designed to ‘ground truth’ the larger, national Bee Informed loss survey. Some similar information is additionally available on the BeeInformed website www.beeinformed.org and individuals are encouraged to examine that data base as well. Recall that the BeeInformed survey is measuring the larger scale OR beekeepers not the backyarders (See *American Bee Journal* April 2020 article by Dewey). 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 with Jenai Fitzpatrick, July 2022

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.