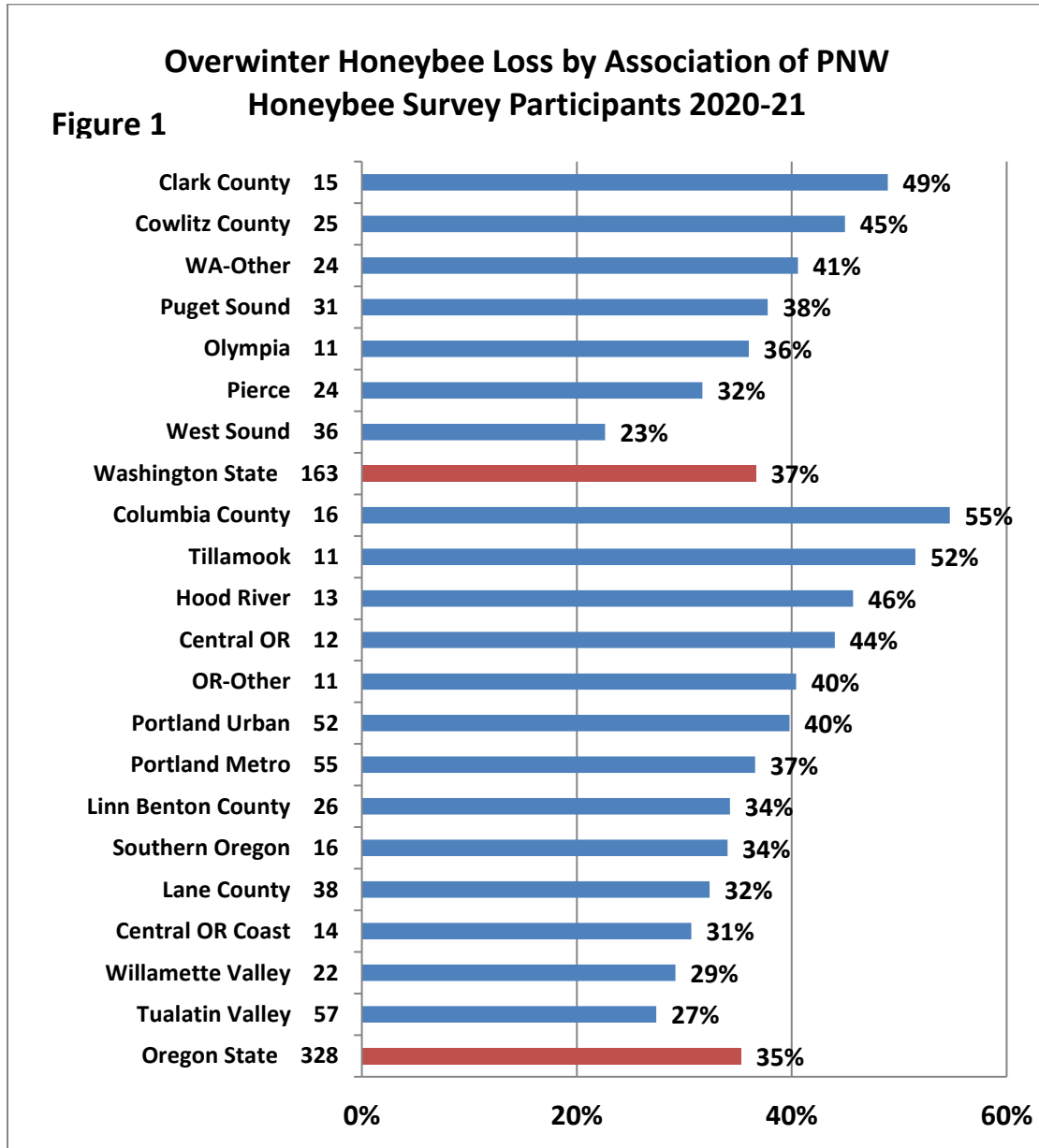


2021-22 PUB Winter Loss by Dewey M. Caron and Jenai Fitzpatrick

For the past 13 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 246 (82 fewer than in the previous year) were received from OR beekeepers with XXX additional returns from Washington beekeepers. During the 2020-2021 overwintering period, 52 PUB member surveys were returned, same number as last year reporting on 98 fall hives.

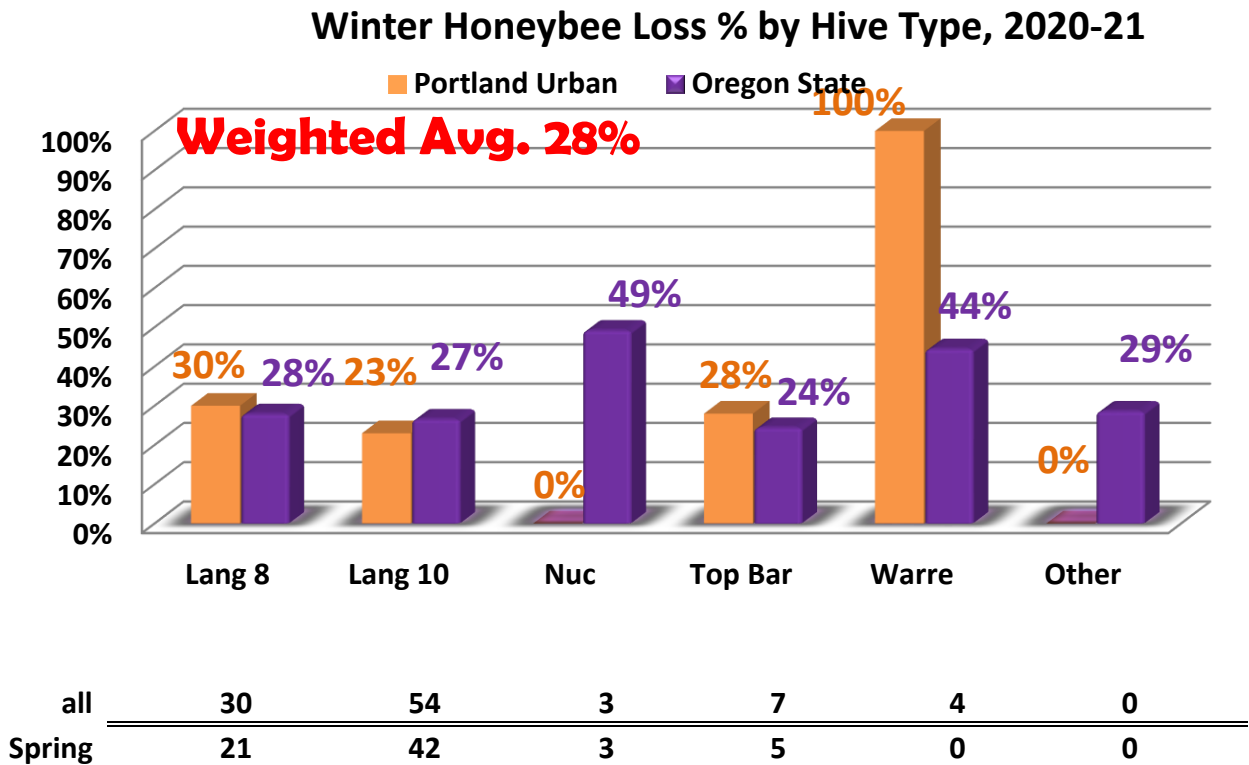


. Overwintering losses of small-scale Oregon backyard beekeepers was 28%, a decrease of 7 percentage points from last year **Average overwintering losses of PUB**

respondents was 28%, 12 percentage points lower than last year and the second year of a loss level similar to the Oregon statewide loss average.

PUB losses of Langstroth 10 frame hives were 3 percentage points above statewide loss rate while losses of 8 frame Langstroth hives was 6 percentage points lower. For the past six years losses of 8 frame hives (36%) have averaged slightly the 10 frame hive losses (38%) statewide; for PUB members it is the opposite - 8 frame hive average PUB losses for past 5 years have been 43.3% and 10 frame Langstroth losses 38%. There were no nuc losses of PUB members last year. Nuc losses are typically higher (6-year statewide average= 50%); for PUB, the last 6-year average of nuc losses has been 41%.

Figure 2



PUB top bar and Warré hive losses are higher than statewide levels. PUB member holdings of top bar and Warré hives were one half of the total 70 TB and Warré colonies statewide last year but only 2% of total 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 above

The two figures below illustrate the loss levels of PUB respondents. The bar graph (Figure 3) shows the loss level for past 9 years. The blue line is the trend line. Obviously, losses, although still high, are trending in the right direction. Average backyard losses for last 9 years of

Oregon backyarders is 38.4%; for PUB members it is 48.5%. Figure 4 graphs PUB (9 years) with Oregon backyard and Oregon commercial losses.(past 13 years). Pub losses have consistently been higher than Oregon average losses until most recently. Commercial losses are typically about one-half of backyard beekeeper losses but were higher in 2022 for unknown reason.

Figure 3

Portland Urban Loss History

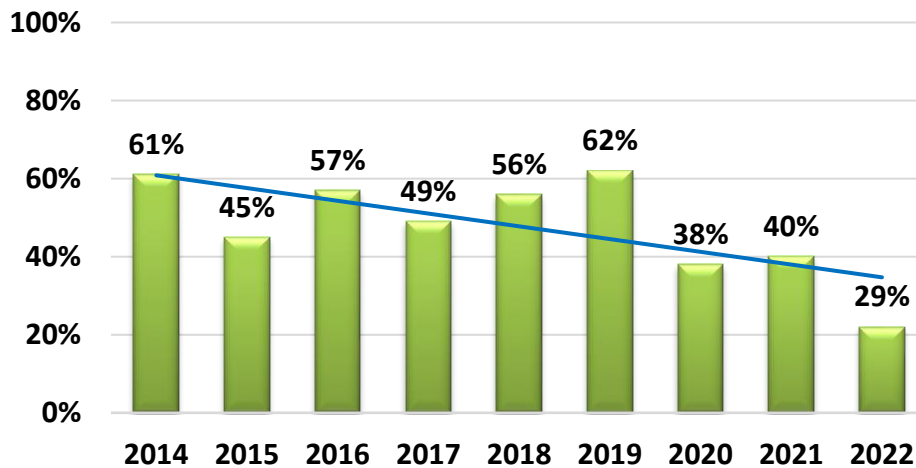
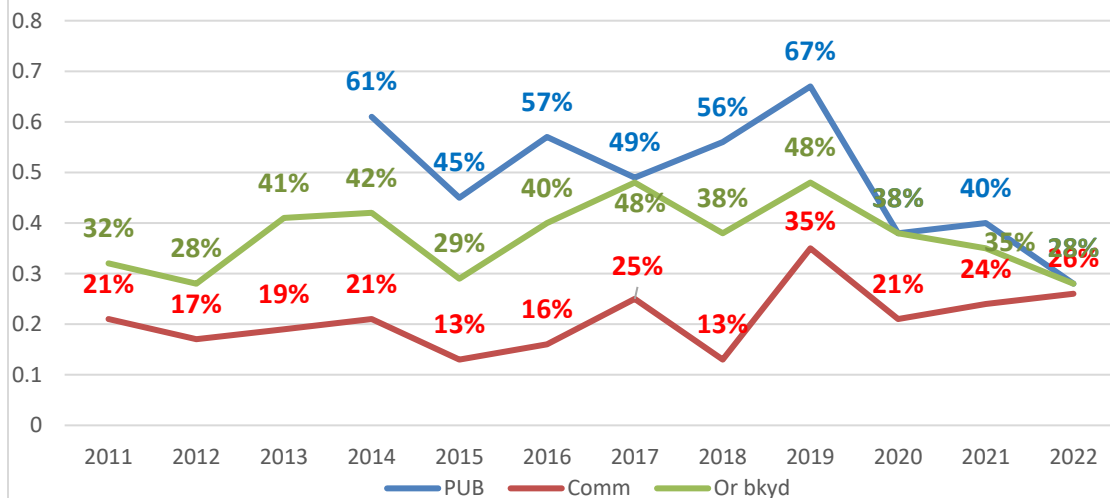
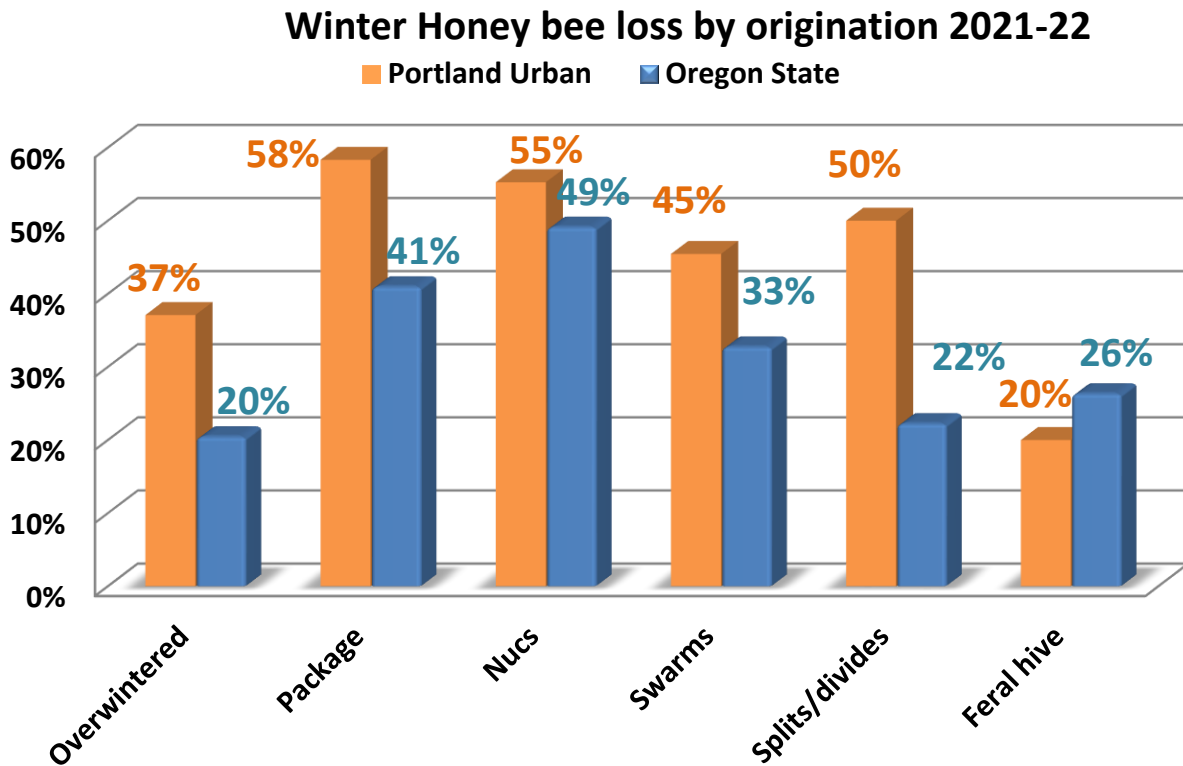


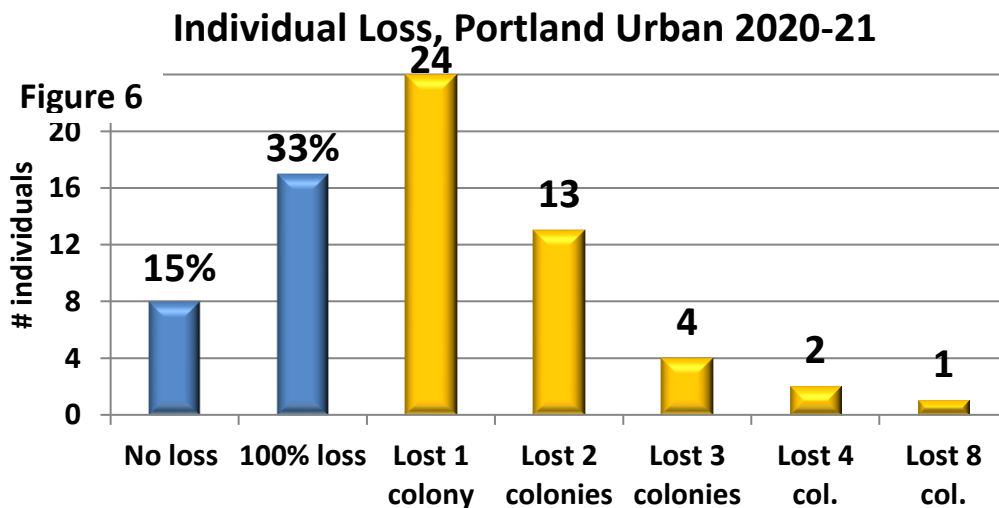
Figure 4 Average winter losses PUB, Oregon backyarders and Oregon commercials 2011-2022



The survey also asked for **loss by hive origination**. Overwintered colonies had the best survival in PUB (37%) and statewide (20%). Package (58%) and nuc losses (55%) were similar. Swarms (45%) and splits (50%) were slightly less. Eight of 10 feral transfers survived.



Not all individuals had loss. Eight individuals had total survival, i.e., no colonies lost. Unfortunately, double that number – 17 individuals - had 100% loss. Greatest loss was one



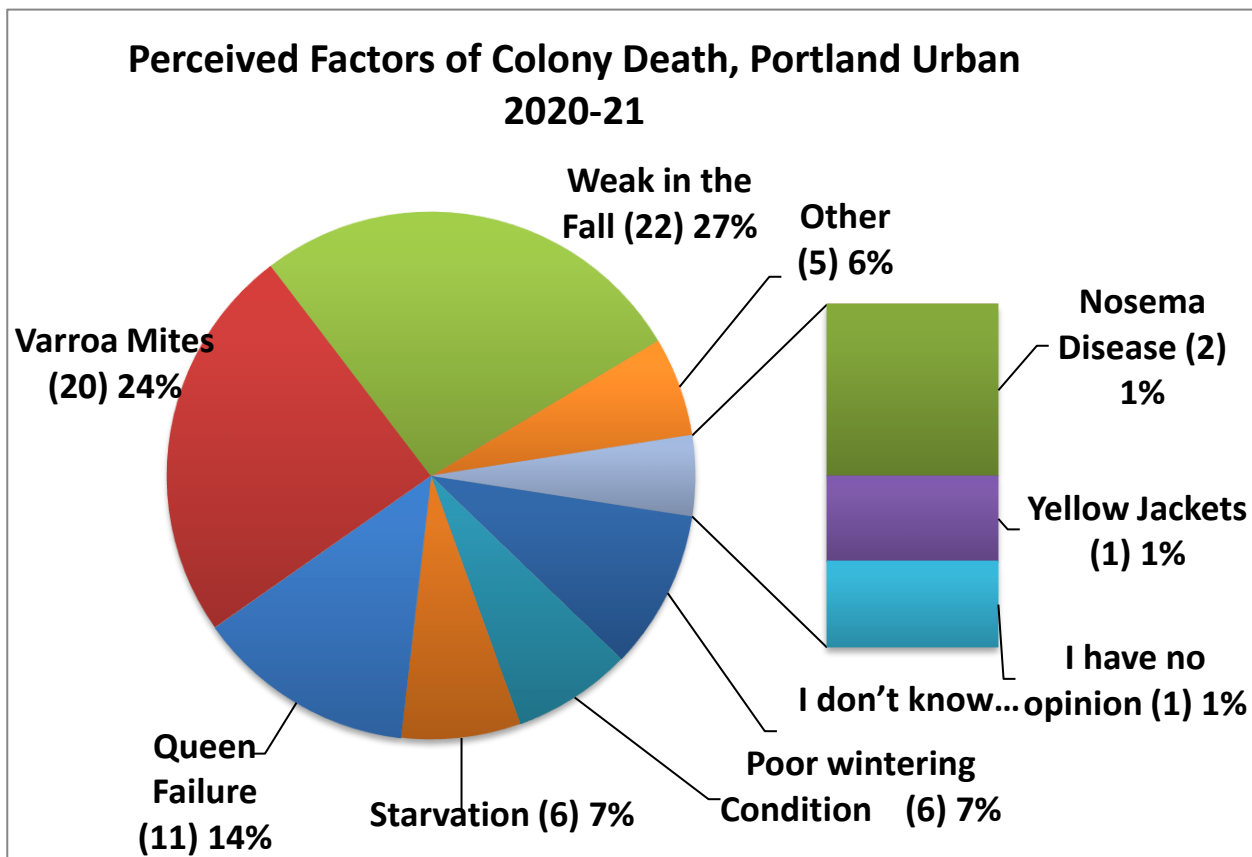
colony (24 individuals) and heaviest loss was 8 colonies. See Figure 6.

Typical of the statewide data, the PUB respondents are largely beekeepers with few colonies. 54% of PUB respondents had 1 or 2 fall colonies (2 was median number), another 21% had 3 to 6 colonies, while 7 respondents (13.5%) had 9+ colonies – maximum number for any respondent was 13 colonies. Individuals with 1 to 3 colonies (63.5% of respondents) lost 65% of their colonies, Individuals with 4-6 colonies lost 46%, the 4 individuals (8% of respondents) with 7 to 9 colonies lost 37% and the 4 individuals with 11 to 13 colonies lost 25%. The greater the number of colonies the low the percentage of loss.

PUB survey respondents reported a **range of beekeeping experience**. Twelve individuals had one year experience (they had 42% loss), 7 individuals had two and 6 members had 3 years experience; the 48% having 1 to 3 years experience had a 45.5% loss. Fifteen individuals had 4 to 6 years experience (4 was median number) with 40% loss, 8 individuals had 7-9 years experience with 45% loss and 4 individuals had 10+ years experience (55 was the highest number). They had only 13% loss. The loss number was similar to years of experience until the 4 individuals with 10+ years experience. Thirty-five of 52 PUB respondents (67%) said they had a mentor available as they were learning beekeeping.

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 8 individuals had no loss). A total



of 82 choices, 1.9/individual were listed. Twenty PUB individuals listed varroa (45% of respondents, 56 % of respondent choices). Weak in fall (22 respondents, half of respondents, 27 of choices) was the most common selection. Queen failure (25% of respondents, 14% of respondent choice) was next. Six individuals said starvation as did 6 in choice of poor wintering conditions. Among 5 listing other, mice, froze in ice storm, moving, kids toppling hive and queen excluder interference were listed. Two listed nosema and 1 yellow jacker. None listed pesticides or CCD or small hive beetle.

When asked about an acceptable loss, three said none, 6 said 10%, 5 said 15% , 9 said 20% and 4 indicated 25% (the median number). Nine individuals said 1/3 loss of colonies was acceptable and 12 said a 50% loss level was acceptable.

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

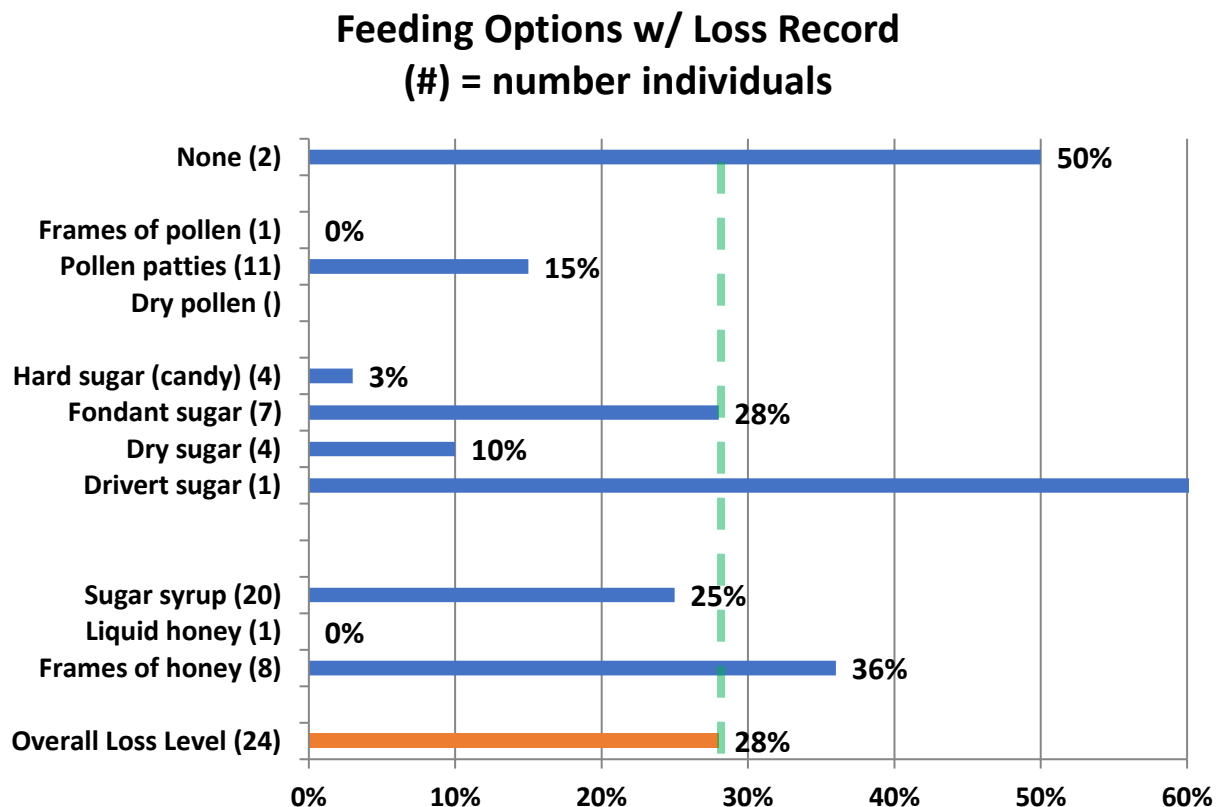
We asked in the survey for information about some managements practiced by respondents. The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, mite monitoring, both non-chemical and

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 57 feeding options = 2.6/individual. Two individuals made no choices – their loss rate was 50%. Four individuals (18%) selected a single choice (they had loss rate of 67%), six individuals had 2 choices (loss rate 40%), seven (the medium number) made 3 choices (also a 40% loss rate) and five individuals had 4 choices with a 10% loss rate. 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



Twenty PUB individuals (91% of respondents) said they used sugar syrup. They had a 25% loss rate, slightly less than the overall PUB average loss of 28%. As with statewide, the PUB individuals that fed protein had a survival improvement; the single individual using frame of pollen had no loss (2 colonies total). Similarly, use of dry sugar as hard candy or dry meant increased survival. The single PUB members using drivert had only a 100% loss (a single colony total)..

Statewide for the last 6 years individuals doing no feeding had 6 percentage point higher losses (average 47%) i.e. poorer survival, compared to average loss rate of 39%. Average percent doing no feeding = 7% of individuals – (this year it was 4%). Individuals statewide that fed sugar syrup had a 5-percentage point lower loss level (average for the 5 years). Those feeding honey (as frames or liquid) had lower loss only during 2 of the past years (2018 and 2020). Individuals feeding non-liquid sugar (in any of the forms) had lower losses five of six past winter seasons; this year it was a 3 percentage point difference mainly due to the 13 drivert and 83 hard sugar candy feeding individuals. Dry sugar feeders had slightly better or equal survival all 6 past winters while hard candy feeders had a much-improved survival 5 of 6 past winters (including this past winter) (=31% average survival); fondant feeders had better survival 3 of the 6 past winters, but not this season.

For individuals feeding protein, only the protein patty users had better survival all 5 years; dry pollen feeders had much better survival in two of the past five years with losses the remaining three years, including the past one, close to the overall yearly average; for PUB members, none indicated use of dry pollen feeding.

WINTERING PRACTICES: One PUB individuals (4%) reported doing no winterizing; they had loss level of 30%; statewide eighteen individuals (7%) of the respondents indicated doing none of the several listed wintering practices; these individuals had a better than average 24% winter loss, 4 percentage points lower loss than overall loss of 28%. Multiple selections were possible and in fact the 24 PUB members who did some winter management averaged 2.8/individual. Three individuals chose a single management and had a 50% loss level while the 8 individuals checking 2 had 40% loss. The five individuals selecting 3 had 37% loss level and the four who selected 5 or 6 had 12% loss.

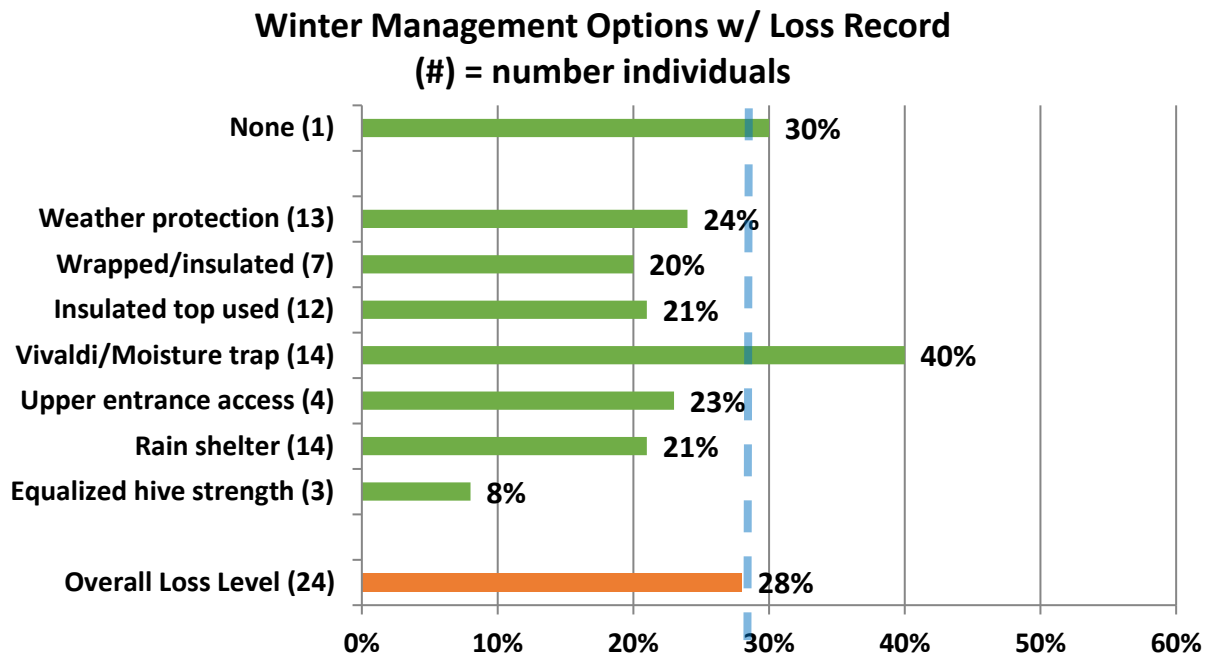


Figure 9

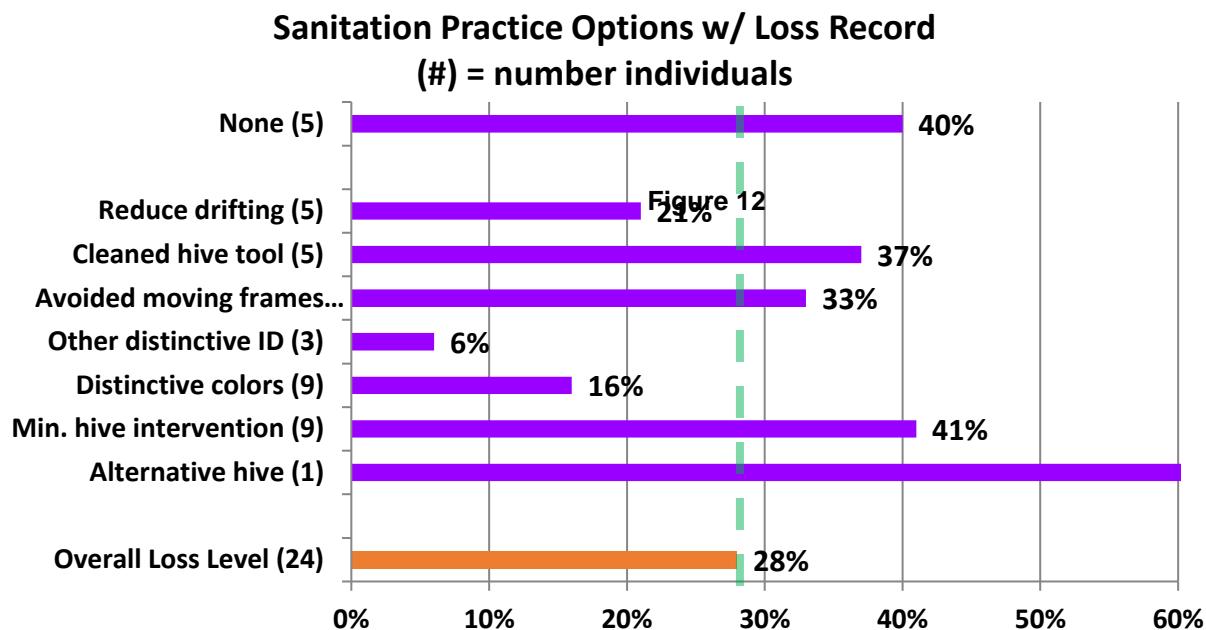
The three most common wintering managements selected were use of a quilt box (Vivaldi board) at colony top and use of rain shelter (14 PUB individuals each) with 13 selecting weather protection and 12 insulated top. Figure 9 shows number of individual choices for PUB members in () and percent loss of each selection. All managements showed better survival with equalizing hive strength exhibiting one-half average loss.

Over the past five years individuals that did no winterizing practice (average 12% of individuals) averaged 41.5% loss compared to 39.2% overall average loss of last 5 years, only a 2.3 percentage point poorer survival rate. Only 2 winterizing managements improved survival all 5 years – wrapping (28.2% lost rate, a 11-percentage point improvement) and upper insulation (30.8%, an 8.4-percentage point improvement). Vivaldi/quilt box, upper entrance (most Vivaldi boards have an upper entrance built into the equipment) and wind/weather protection had only slightly improved survival rates and were not noted in all past 5 years. Equalizing hive strength was the best PUB management activity (total of 3 individuals) to improve survival this 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. Five individuals said they did none of the sanitation – their loss rate was 40%. We received 47 PUB selections, 2.5/individual. Seven PUB members had 1 selection (loss rate 40%), five (median

choice) made 2 choices (15% loss), those four with 3 managements had a 50% survival and the three selecting 4 has a 17% loss rate. Figure 10.

Figure 10



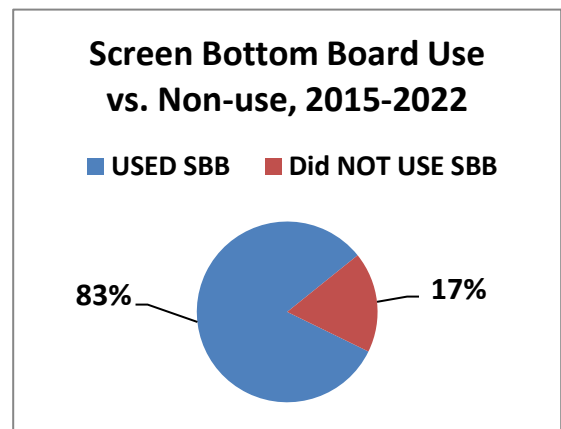
Minimal hive intervention (9 of them PUB beekeepers), painting hives distinctive colors (also 9 individuals) and avoiding moving frames (10 PUB members) were the most common options selected statewide. It could be argued that less intervention might mean reduced opportunity to compromise bee sanitation efforts of the bees themselves and that excessive inspections/manipulations can potentially interfere with what the bees are doing to stay healthy. These options however did not improve winter survival, either for statewide or PUB members.

Avoiding moving frames and reducing drifting were the two sanitation choices that demonstrated better average survival the past five years – 5-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. Other distinctive measures to reduce drifting had an 8 point improvement in survival this year; it has been a good sanitation in past years as well. Overall sanitation appears to be relatively minor toward improving survival.

SCREEN BOTTOM BOARDS (SBB)

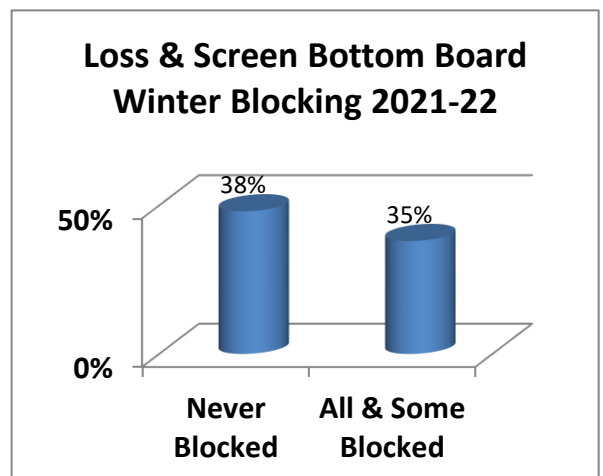
Although many beekeepers use SBB to control varroa, BIP and PNW surveys clearly point out they are not a very effective varroa mite control tool. In this recent survey statewide

38 individuals (15%) said they did not use screen bottom boards (last 2 years it was 10 and 11% respectively not using SBB). Average non-use for last eight years is 17%, vs 83% use, on some or all colonies. Figure 11 right.



This past overwintering season, the 38 statewide non-SBB users had 38% loss. The beekeepers using SBB on all or some of their colonies had 36% loss. Examining the seven-year average of SBB use, loss level of the 83% using SBB on all or some of their colonies had a 36% loss level whereas the 17% not using SBB had loss rate of 40%, a 4-percentage point positive survival gain for those using SBB versus those not using them. For PUB members the 4 not using them had 40% loss versus the 17 using on all their colonies had 31% loss. Screen bottom boards offer a very minor improvement for overwinter survival.

We asked if the SBB was left open (always response) or blocked during winter. This past season 16 PUB individuals, said they always blocked SBB during winter and they reported 26% loss level. The two individuals who did not block had 33% loss level. Statewide those who blocked always or sometimes had a 35% loss rate. Figure 12 shows that those who never blocked had a 38% winter loss, a 3-percentage point difference, a slight advantage **in favor of closing the SBB over the winter period to improve survival.**



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. If colonies are in an exposed site, providing some extra wind/weather protection and wrapping/insulating colonies might improve survival.

Feeding, a common management, appears to be of some help statewide in reducing losses. Feeding a hard sugar candy or dry sugar during the winter means consistently lower loss levels year after year. Providing frames of honey and feeding sugar syrup also means slightly 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 form of dry pollen and pollen patties does slightly improve survival. The supplemental feeding of protein, (pollen patties), might 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 a moisture trap (Vivaldi board or quilt box) and upper 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.

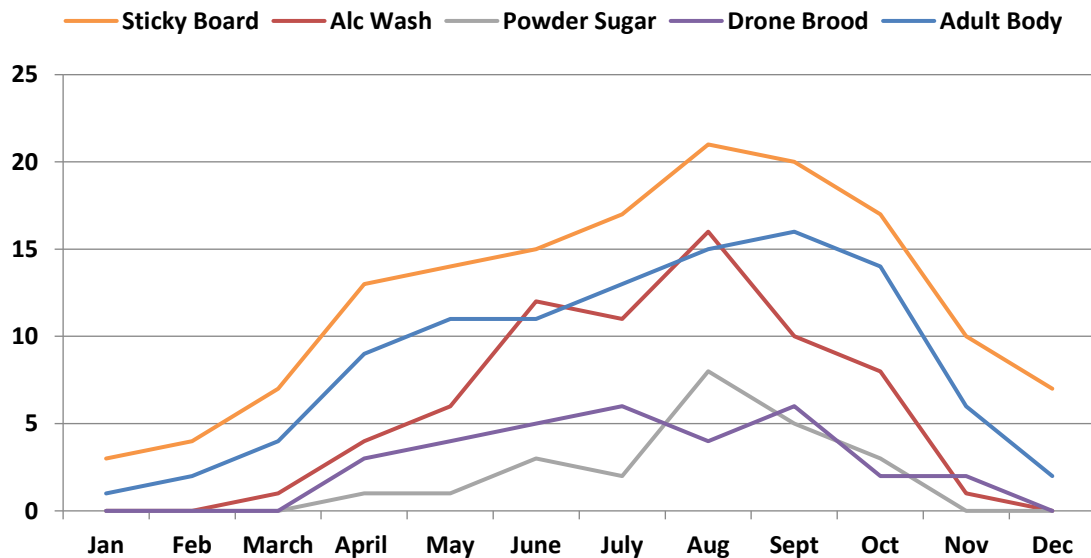
Mite monitoring/Sampling and Control Management

We asked percentage of Oregon hives monitored for mites during the 2021 year and/or overwinter 2021-22, 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. Sixteen PUB individual respondents, (67%), said they monitored all or some of their hives. Losses of those individuals monitoring was 16 %. The eight who indicated they did not monitor (although some did check options) had two percentage point higher loss rate of 18% loss. Monitoring alone did not improve survival for PUB members and the same held true for statewide Oregon beekeeper respondents this past year. Over several years however monitoring did result in improved winter survival. The table below compares % individuals and % winter loss for individuals who monitored all colonies compared with those who monitored none. Five-year difference is 8 percentage point better survival monitoring all colonies. The 11-15% who monitored some colonies was variable.

Individuals indicated use of 1.6 monitoring techniques on average. In total choices, in order of popularity of use, sticky boards were used by 9 individuals, 6 PUB individuals used alcohol wash to monitor and 6 also said they monitored adults for mites. Three individuals monitored drone brood and a single individual used powdered sugar monitoring.

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 key control decisions. Figures 13 below illustrates monthly sampling five methods statewide last year- data was similar this most current year.

Monthly Monitoring of Portland Urban Beekeepers 2020-21



Nine PUB members said they sampled both pre and post (16% loss), 3 pre only (33% loss) and one post only (20% loss). The six who treated but did not sample had a 27% loss while those five not sampling or treating had a 73% loss level.

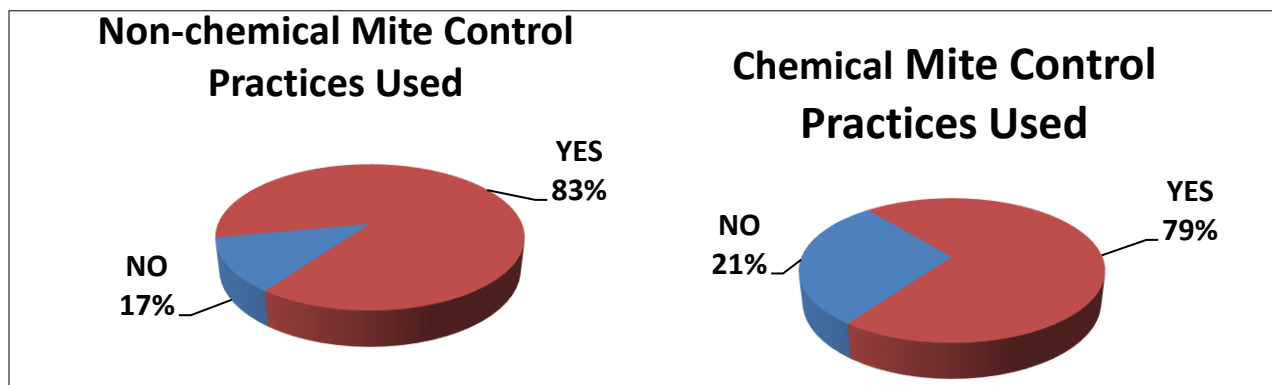
It is important to KNOW mite numbers. Less effective mite monitoring methods include sticky (detritus) boards below the colony (often so much detritus drops onto a sticky board that picking out the mites can be hard, especially for new beekeepers) but sticky boards used for a single day pre- and post-treatment can help confirm the effectiveness of a treatment if lower 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 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

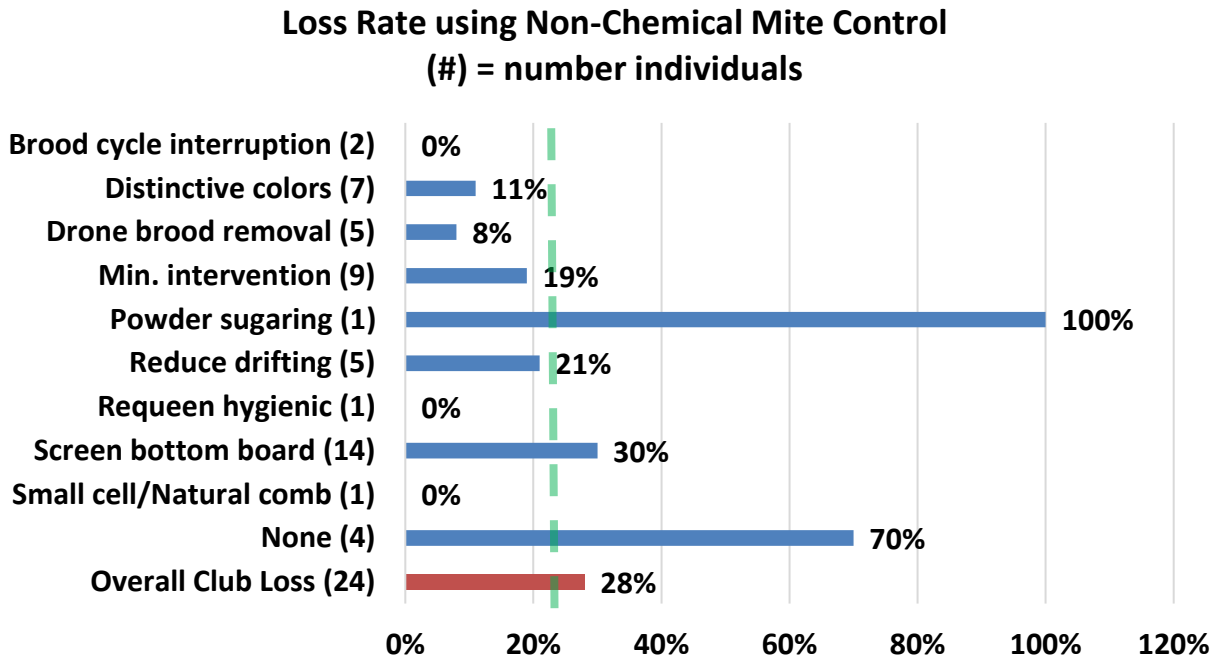
The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Four PUB individuals (17%), said they did not employ a non-chemical mite control and five individuals (21%), did not use a chemical control. Both groups had very high losses -70% and 73% respectively. 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,) six individuals used one method (28% loss), 7 used two (25% loss), 4 used 3 (36%), 6 used 4 (17%) and the 3 using 4 or 5 options had zero loss.

Use of screened bottom board was listed by 14 of 20 individuals (70% of total respondents). Of the next most common selections, distinctive colors (7 individuals) showed better survival than minimal hive inspection. One individual using small cell had no loss of 2 colonies, the one individual using powdered sugar lost their single colony while the individual who requeened with hygienic queen had their single colony survive. 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

Figure 15



Three of the non-chemical alternatives have demonstrated reduced losses over past 5 years. Reducing drifting such as spreading colonies (33% loss average for 3 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%). For PUB, reducing drifting (5 individuals) had good survival (21% loss) while the 5 individuals doing drone brood removal had great success (8% loss level).

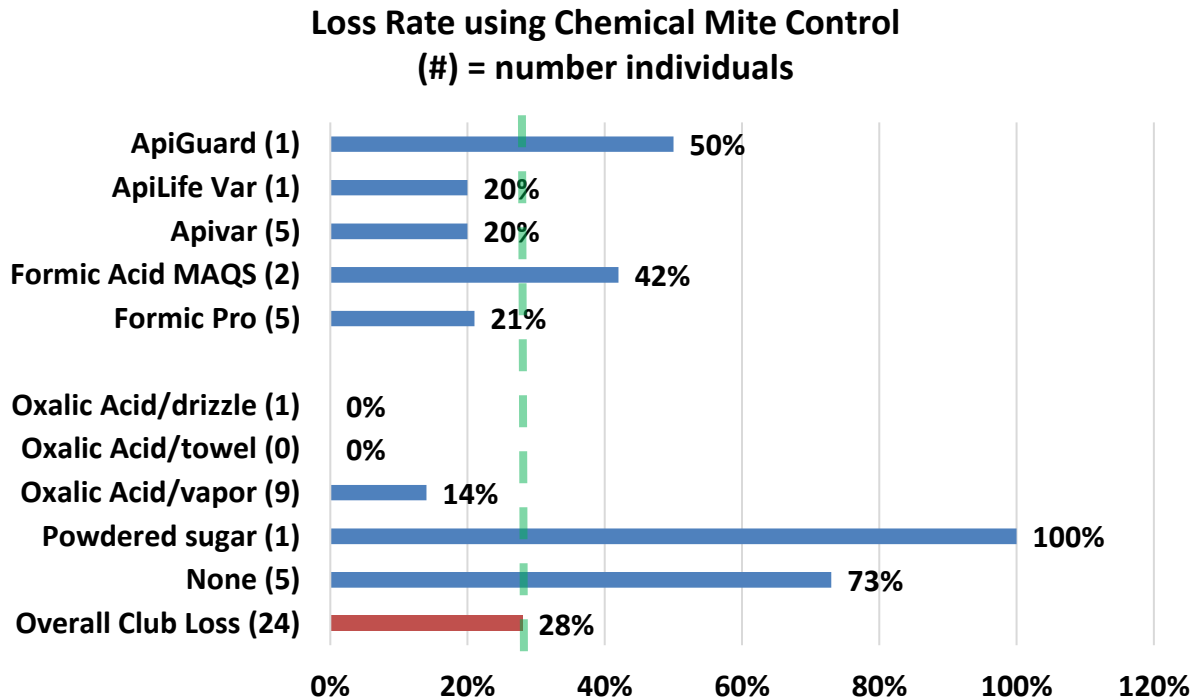
Chemical Control: For mite chemical control, 5 individuals (21% of total respondents) used NO chemical treatment. They had a loss level of 73%. Those using chemicals used at rate of 1.4/individual. Thirteen individuals used one chemical (had 14% loss level), five used two (20% loss), and one used four without loss.

Nine respondents using a chemical) indicated they used oxalic acid vapor; this provided improved survival (14% loss level). All except MAQS and Apiguard (the one individual indicating use lost one of two colonies) provided better than average survival. Figure 16 below.

Consistently the last 6 years five different chemicals have helped beekeepers improve survival. The essential oils Apiguard (average 6-year loss level 30.5%), Apivar (31.2% average 6-year loss level), Oxalic acid vaporization (31.3% average loss level over last 6 years – 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%), ApiLifeVar (34.4% average loss level over last six years) and formic acid MAGS formulation 39.4% loss level the last 6 years. Average loss level has been 39.2% the last 6 years. Formic Pro has steadily increased in use – it looks very promising at 25.3% loss level the past three years (when average loss was 36.5%). Numbers are very low to develop any conclusions among PUB users.

Figure 16



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. Six individuals (33%) said yes 18 said no. The related question then was ‘were your hives requeened in any form?’ to which 11 said yes, 9 said no and the remainder that responded (4 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. Five respondents stated their bees were requeened with a mated queen, 2 split (divided) hives, 5 individuals indicated it was the bees that requeened via swarming and 2 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.