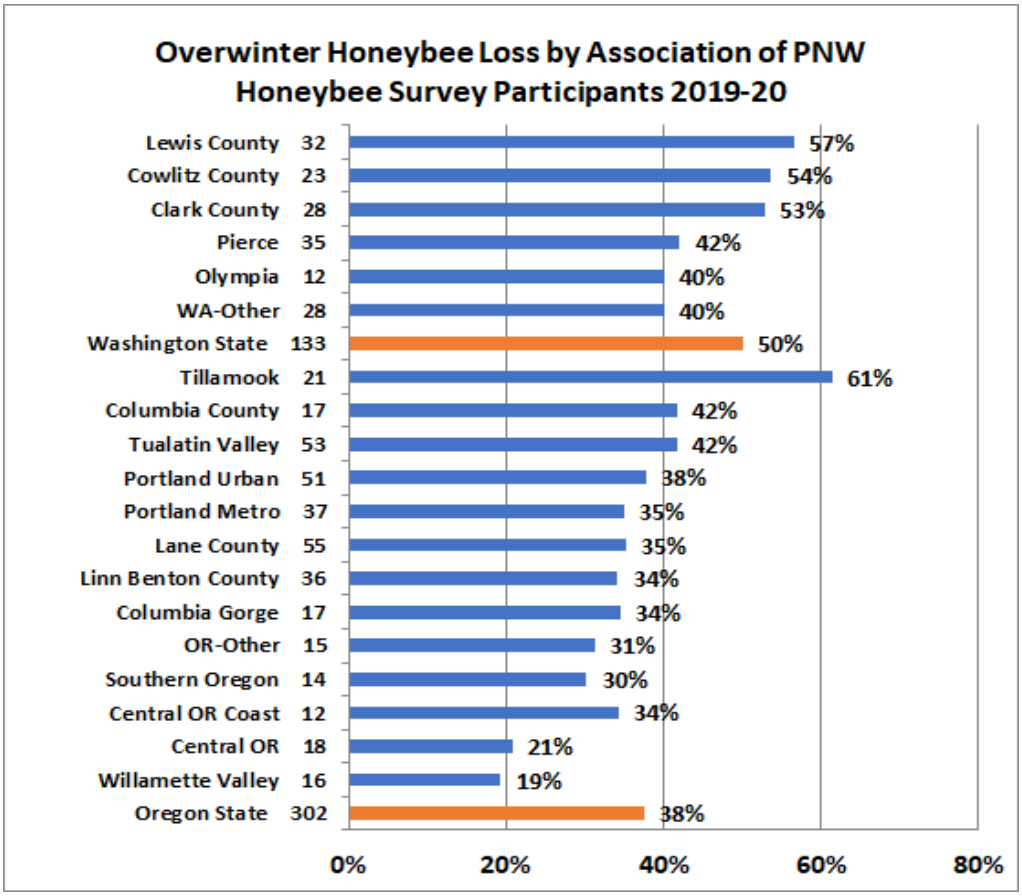
2019-20 PUB Winter Loss by Dewey M. Caron and Jenai Fitzpatrick

Information on winter losses and several managements related to bee health were obtained as in the past 10 years with an electronic honey bee survey instrument developed within the PUB bee group www.pnwhoneybeesurvey.com. **Overwintering losses of small scale Oregon backyard beekeepers was 38%,** a decrease of 10 percentage points from last year 2018-2019. A total of 302 responses were received from OR beekeepers with 133 additional returns from Washington beekeepers. Figure 1 below shows loss rates for clubs including PUB.



During the 2019-2020 overwintering period, 51 PUB member surveys were returned, down by 11 individuals from the previous. For a welcome change the heaviest loss of all the OR clubs was NOT realized by PUB (see overall reports on www.pnwhoneyeesurvey.com website).

Total overwintering losses of PUB respondents was 38%,

PUB losses of Langstroth 8 frame hives was slightly above statewide loss rate while losses of 10 frame Langstroth hives was slightly lower. Loss rates were not significantly different. Nuc losses of PUB members (57%) were higher than statewide. Over the past 6 survey years statewide, 8 frame Langstroth loss level average was $37^{2}/_{3}$% while loss level of 10 frame Langstroth was 40%. Nuc losses are typically higher (6 year statewide average= 53%).

Top Bar hive and Warré hive losses are lower than statewide levels. Warré hive losses of PUB members were 13 percentage points below the statewide loss level. PUB member holdings of top bar and Warré hives were one half of the total 70 fall colonies statewide. Statewide 6 year loss averages, 54% for Top Bar and 40% for Warré hives, meaning PUB losses were below average losses for these two hive types this past winter. The 6 "other hives" included 2 AZ hives, a movable comb hive (frames slide out from back of hive) popularized in Slovenia that is commonly maintained within a bee house; the other 4 were not further identified. Losses by hive type of PUB compared to statewide loss is shown in Figure 2 below.

Figure 2

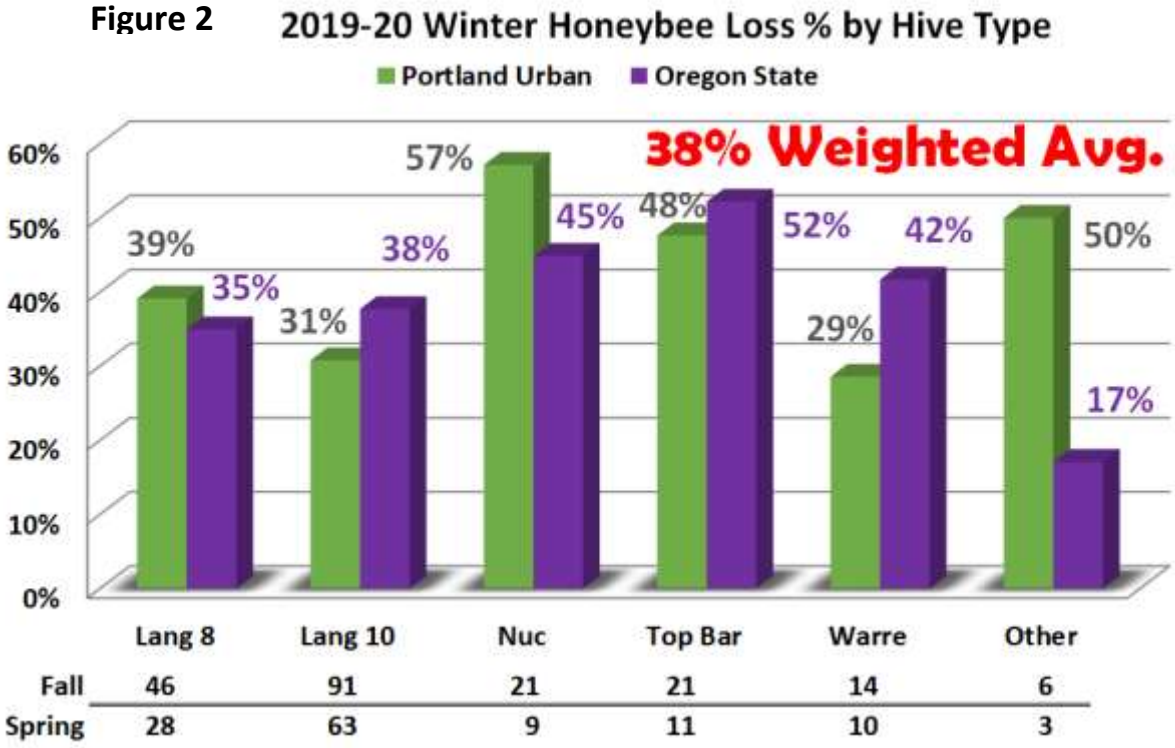


Figure 3. PUB Member overwinter losses 2014-2017; numbers on lower line = # respondents

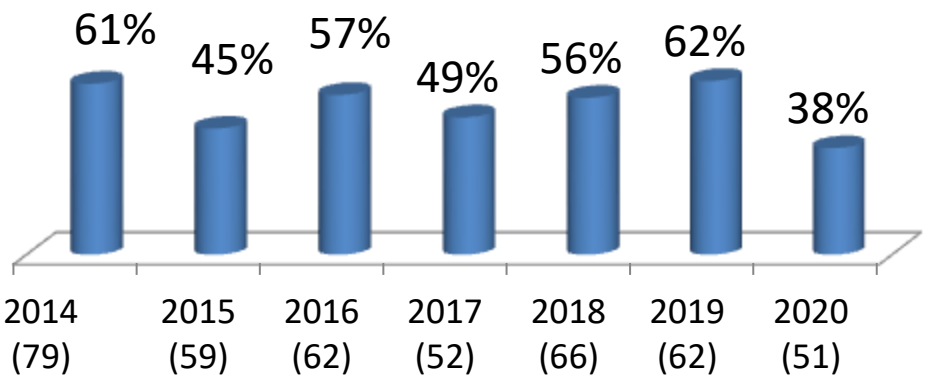
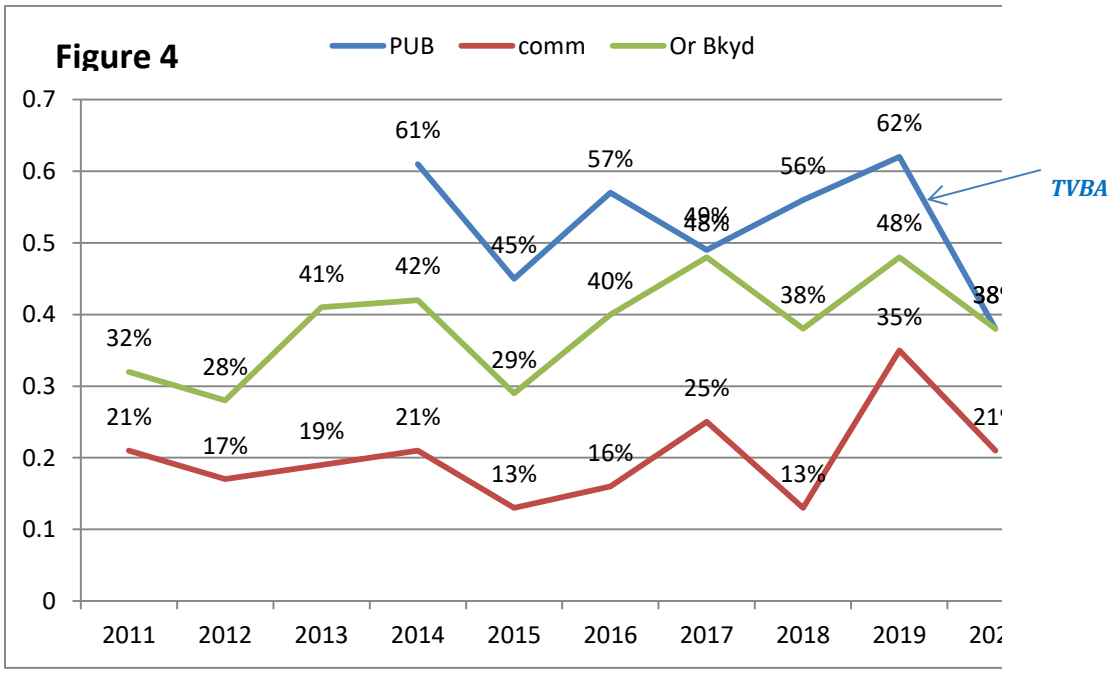
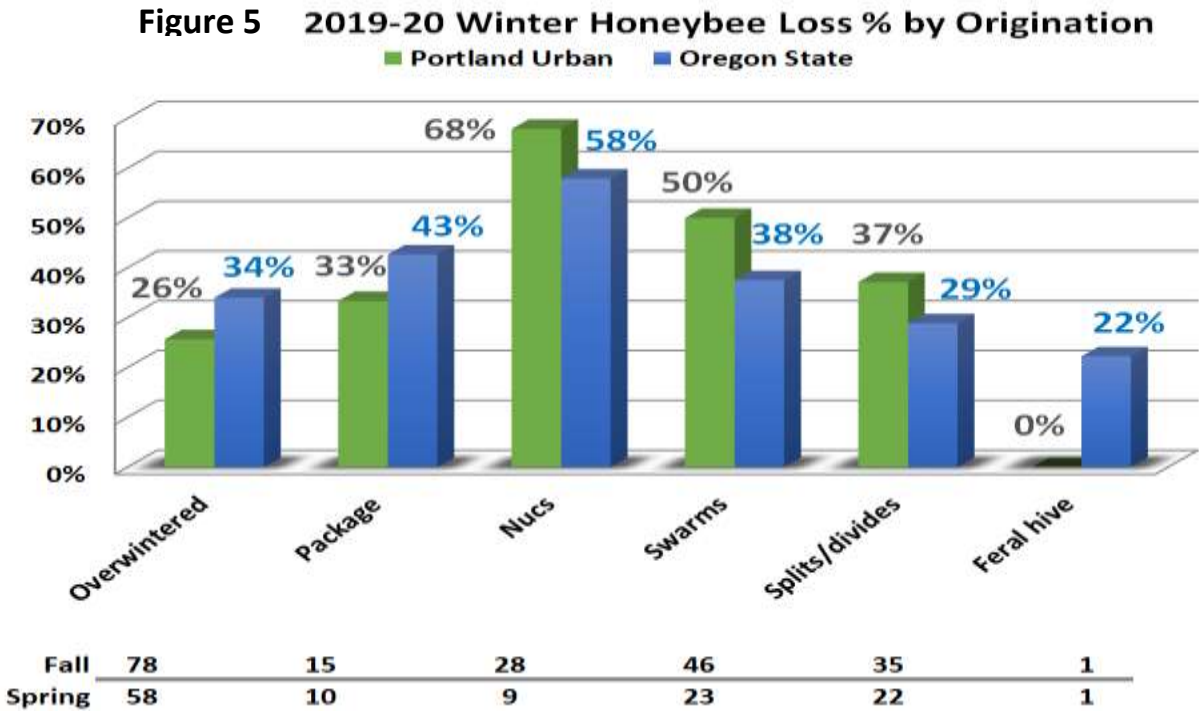


Figure 3 above and Figure 4 below illustrates average losses for PUB members the last 7 years. PUB losses this past winter (38%) were 17 percentage points lower than the average loss level of 55% for the six previous seasons. Numbers in Figure 3 ( ) are respondent size (unfortunately this last season was the lowest respondent number). Figure 4 illustrates the heavier than statewide loss level of PUB respondents for all but 2017 and this past season.



The survey also asked for **loss by hive origination**. Fifty eight of the 78 overwintered



PUB member colonies were alive in the spring (26% loss rate), 6 percentage points better survival than statewide. PUB member respondents reported higher losses for nucs (68%), swarms (50%) and splits (37%) compared to the statewide averages but a better survival rate for packages – 10 of 15 survived. For past 5 years statewide overwintered hives show lowest loss level (36%) while both packages and nucs averaged 52% loss for past 5 years. Swarms (45%) and splits (41%) are intermediate. See Figure 5 for comparison of PUB losses with statewide for most recent winter.

Who are survey respondents?

PUB respondents kept 1 to 21 fall colonies. Sixteen individuals had one colony (the greatest number of colony holdings), 13 had 2 colonies and 7 individuals had 3 colonies (=36 individuals which was 70½% of total PUB respondents). Six individuals had 4-6 colonies, 5 had 7-9 with 4 individuals keeping 10+ colonies (8% of total respondents but these 4 individuals represented 32½% of total PUB colony number).

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 years 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. Fourteen individuals (27% of respondents) had total survival; unfortunately 16 individuals (31% of individuals) had 100% colony loss. Twenty individuals lost one colony (54% of individuals with loss). Heaviest loss was 15 colonies. Statewide 43% of individuals, those with 1, 2 or 3 colonies lost 56½% of total colony loss. See

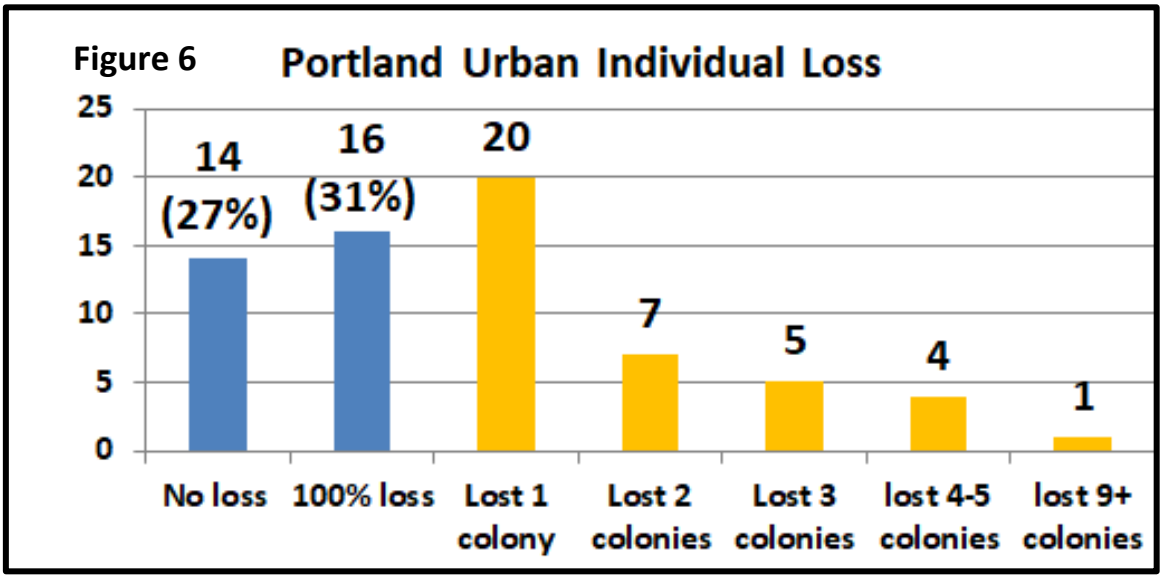


Figure 6 for PUB individual losses in 2019-2020.

Seven individuals had two or more apiary locations (14% of total PUB respondents). Losses at out-apiaries was 40½% and these same individuals had 42% loss at their home apiary. Four individuals reported moving bees during the year, all a short (3 to 6 miles) distance; two were due to move of beekeeper or friend, one for a more favorable location and one for temporary protection against a pesticide application.

Thirty-five of 51 PUB respondents (68½%) said they had a mentor available as they were learning beekeeping, seven and a half percent points lower than the 76% statewide response and 1/2 percentage point below the percent indicated last year.

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). There were 76 total listings for PUB, 2/individual. Twenty two PUB individuals listed varroa (56 % of respondent choices), followed by weak in fall (31%) and queen failure (26 %). Five individuals said don't know and 2 had no opinion. Among other Nosema, moisture, beekeeper mistake, queenless swarm and pests were indicated by one each; 6 said pesticides (15%). Choices were very similar to last year. Table below compares PUB with % statewide selections.

	Varroa mites	Poor wintering conditions	Weak in fall	Queen failure	Star-vation	CCD	Yellow jackets	Other
PUB (#) (%)	22 (56%)	2 (5%)	12 (31%)	10 (26%)	7 (18%)	2 (5%)	2 (5%)	11 (28%)
Statewide %	24%	3%	15%	16%	11%	4%	6%	15%

Acceptable loss: Survey respondents were asked reason for loss. Eighteen individuals indicated 15% or less (37% of total), 25% was medium (and largest choice). Ten respondents (20½% of total) said 50%. PUB selections shown below in table.

	Zero	5%	10%	15%	20%	25%	33%	50%	75%	100%
	6	2	6	4	5	11	5	10	0	0

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. 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 50%, with medium of 25%. 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

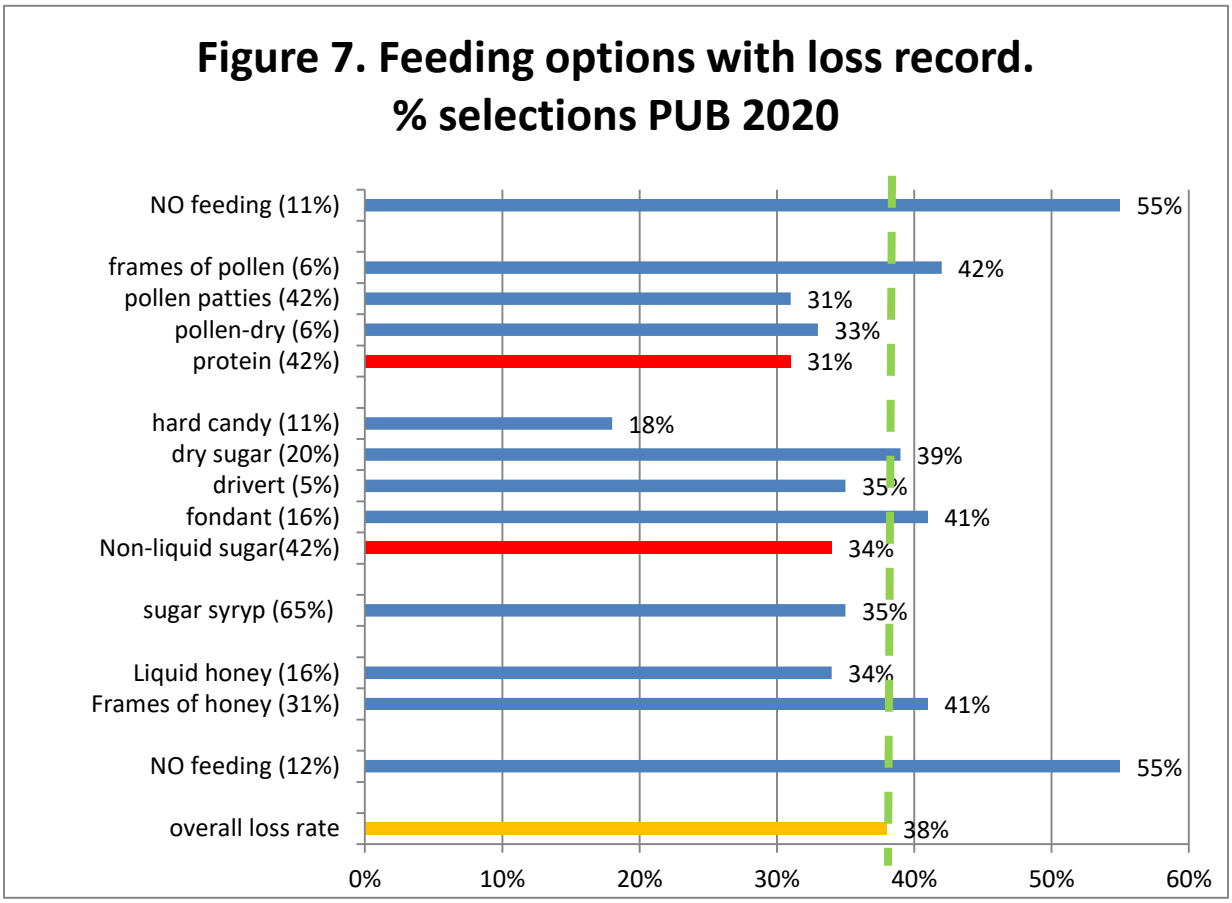
We asked in the survey for information about some managements practiced by respondents. The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, mite monitoring, both non-chemical and chemical mite control techniques and queens. Respondents 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) toward improving colony health and overwintering success and 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 116 feeding options = 2.6/individual. Six individuals made no choices – their loss rate was 55%. Sixteen individuals (36%) selected a single choice (they had loss rate of 54%), 9 individuals had 2 choices, (the medium number), 8 had 3 choices, 7 individuals selected 4 options and 5 individuals had 5, 6 or 7 choices; their loss rate was 32%.

Percent colony losses statewide are presented for feeding options with numbers of PUB member numbers in ( ). Thirty three PUB individuals (65% of respondents) said they used

sugar syrup. They had a 35% loss rate, slightly less than the overall PUB average losses of 38%. As with statewide, the 23 PUB individuals (42% of respondents) that fed protein had a slightly lower loss, 31%, compared to PUB overall loss. Those using non-liquid sugars (23 PUB



individuals) also had a slightly lower loss level (34%) compared to overall PUB average. Those 6 PUB members using hard sugar candy had an 18% loss.

Summary: For the last 4 years statewide (average loss rate =43%), **individuals doing no feeding had 12.6 percentage points higher losses (poorer survival) all 4 years (AVERAGE PER CENT DOING NO FEEDING = 8% of individuals, AVERAGE STATEWIDE LOSS 4 YEARS = 55.6%).**

Individuals statewide that fed sugar syrup had a 7¾% lower loss level (average for the 4 years). Those feeding honey (as frames or liquid) had lower loss only during the 2018 and this past winter overwinter period. Individuals feeding non–liquid sugar (in any of the forms) had lower losses all four past winter seasons, with 5 or 6 percentage point improvement from overall losses. Dry sugar feeders had slightly better survival all 4 winters (average= 39¼%) while hard candy feeders had a much improved survival all 4 winters (=31% average survival); fondant feeders had better survival 3 of the 4 winters ($37^{3}/_{4}$ %).

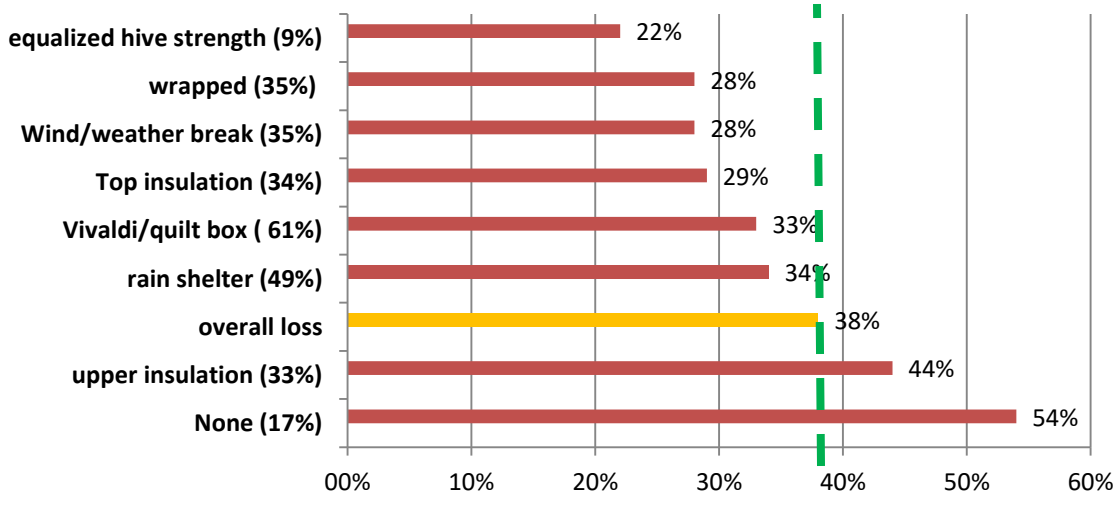
For individuals feeding protein, only the protein patty users showed better survival all 4 years; dry pollen feeders had much better survival in two of the four years with losses the remaining two were close to the overall yearly average.

WINTERING PRACTICES: Seven PUB individuals (14%) reported doing no winterizing; they had loss level of 55%; statewide these 7 individuals were among 37 individuals (12½% of overall statewide respondents) that indicated none of the several listed wintering practices; **statewide losses were 50% for those doing no winterizing managements 12 percentage points higher loss than overall loss of 38%.** Multiple selections were possible and in fact the 44 PUB members who did some winter management averaged 2.9/individual. Eleven individuals (largest group) chose a single management and had a 46% loss level while the 11 individuals checking 5, 6 or 7 of the options had a 29% level. Eleven individuals chose 2 selections, 4 chose 3 and 7 chose 4.

The two most common wintering managements selected were use of a quilt box (Vivaldi board) at colony top (31 PUB individuals) and use of a rain shelter (25 individuals). Figure 8 shows number of individual choices for PUB members in ( ) and percent loss of each selection. Only upper insulation or doing nothing exhibited poorer survival.

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 were 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.

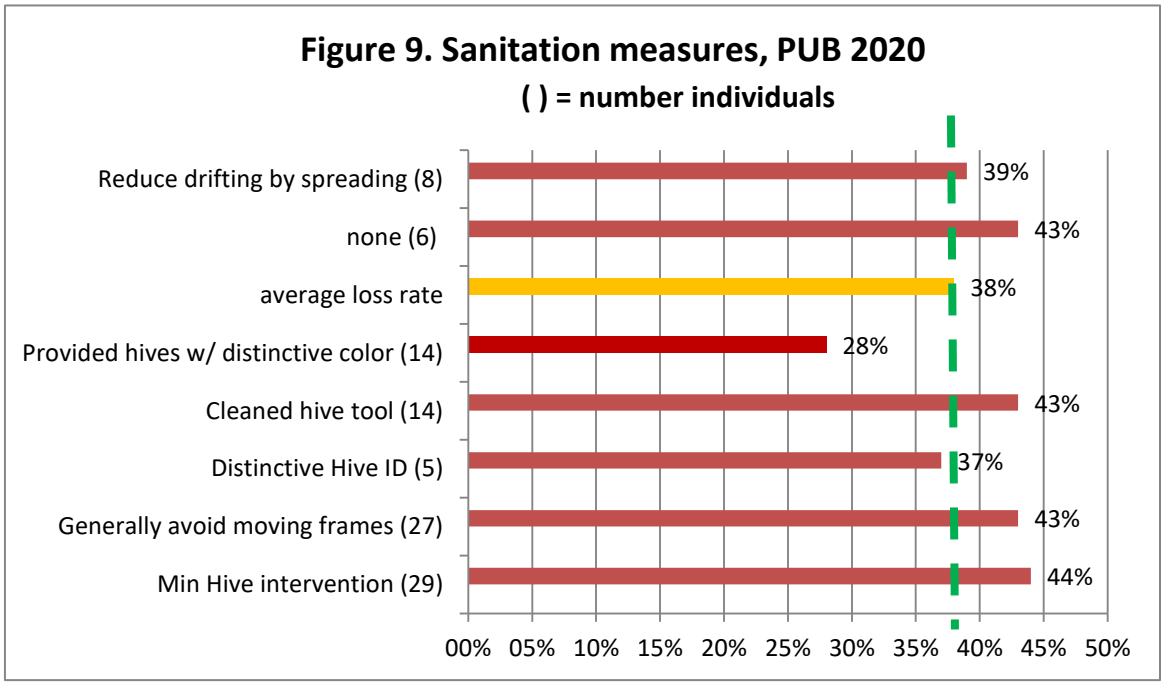
Figure 8. Winter managements, PUB 2020



Over the past three years statewide individuals that did no winterizing practice (average 13 1/3% of individuals) averaged 48% loss compared to 41% overall average loss of last 3 years, a 7 percentage point poorer survival rate. Only two winterizing managements improved survival all 3 years – these were wrapping (30 % lost rate, an 11 percentage point improvement) and upper insulation (32 %, a 9 percentage point improvement). Vivaldi board use (38 %), upper entrance also 38% (most Vivaldi boards have an upper entrance built into the equipment) and wind/weather protection (also 38%) had only slightly improved survival rates, each 3 percentage points.

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. Six individuals said they did none of the sanitation – their loss rate was 24%, one-half the statewide loss (50%) for the beekeepers selecting to do none of these sanitation managements. . We received 89 PUB selections, 2/individual. Eleven PUB members had 1 selection (loss rate 24%), 16 made 2 choices, 14 selected 3 managements, and 4 each made 4 and 5 choices (loss rate 35%).

Minimal hive intervention (27 of them PUB beekeepers) and avoiding moving frames 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; the loss rate for this group statewide or PUB members.

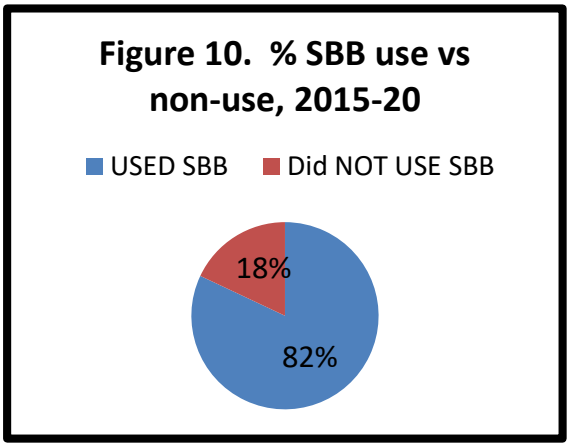


The single sanitation choice that did seem to improve survival was providing hives with distinctive color. For PUB respondents, 14 did this management. Avoiding moving frames and reduce drifting were the two sanitation choices that demonstrated better average survival the past three years, though both were relatively minor – 4 year loss rate was 35% for frame moving and 37½% for reducing drifting compared to overall rate of 41%,minor 6 and 3 ½ percentage point difference. Avoid moving frames (37% loss rate this year, 40% last 3 years) plus distinctive hive address via painting (40% this year which was also 3 year average) had a single percentage point advantage over average loss rate (41%) of last 3 years.

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 the recent survey, 30 individuals statewide (10%) and 7 in PUB (14%) said they did not use screen bottom boards. This was the lowest percent of respondent non-use of SBB statewide in last 6 years. Average non-use is 18% vs 82% use on some or all colonies over the 6 year period. Figure 10 right.

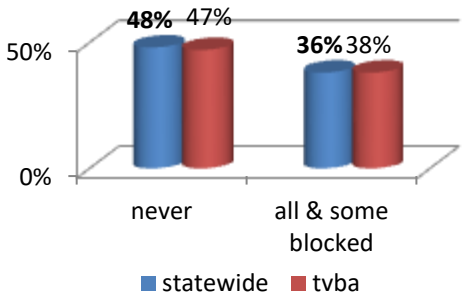
Figure 10. % SBB use vs non-use, 2015-20



This past overwintering season, the 30 non-SBB statewide users had 222 fall colonies of which they lost 120 for 54% loss. The 220 beekeepers using SBB on all of their colonies had 37% loss. This was the greatest difference between non-users and users in past 5 years. **Examining the five year average of SBB use, loss level of those using SBB on all or some of their colonies was 41% whereas those not using SBB had loss rate of 36%, a 5 percentage point positive survival gain for those using SBB versus those not using them, a very minor in improvement in overwinter survival.**

We asked if the SBB was left open (always response) or blocked during winter. This past season 48% of individuals said they always blocked SBB during winter; among PUB respondents 21 individuals (44%) always blocked. Statewide those who blocked always or sometimes blocked had a 36% loss rate; those who never blocked (62 individuals statewide, 20 individuals in PUB) had a 48% winter loss (47% in PUB) a 12 percentage point difference (9 points in PUB). **Comparing the always and**

Figure 11. SBB blocked in winter 2020.



sometimes left open with the closed in winter (all closed + some closed) response reveals an 12 percentage point difference in favor of closing the SBB among statewide beekeepers over the winter period to improve survival See Figure 11.

Summary: Screen bottom board use has a slight survival advantage. For those using SBB the advantage appears to be to close, partially or completely 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. PUB 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 moisture kills bees, not cold, so we recommend hives be located in the sun out of the wind. If exposed, providing some extra wind/weather protection might improve survival.

Feeding, a common management appears to be of some help for beekeepers in reducing losses. Feeding fondant sugar, a hard sugar candy or dry sugar during the winter means lower loss levels. Providing frames of honey and feeding sugar syrup also meant lower loses for some individuals and such feeding management is of great value for the spring development and/or development of new/weaker colonies. Feeding protein in form of dry pollen and pollen patties did slightly improve survival. The supplemental feeding of protein (pollen patties) might be of assistance earlier in the season to build strong colonies and in the fall to build the fat bee population needed for successful overwintering.

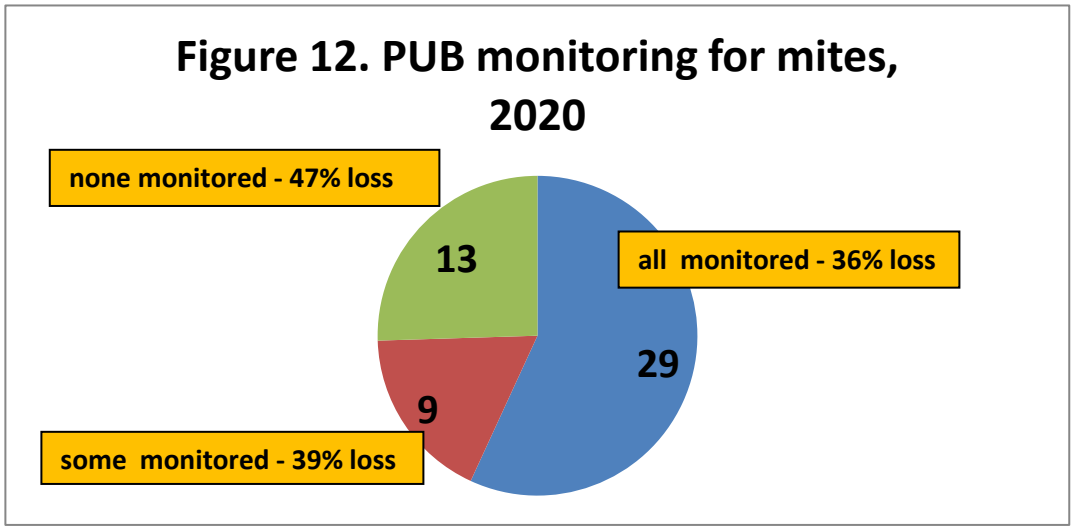
Winterizing measures that apparently helped lower losses for some beekeepers were a moisture trap (Vivaldi board or quilt box), upper insulation and wrapping the colonies (or otherwise adding some insulation to provide added protection against the elements). Spreading colonies out in the apiary and doing 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.

It is clear that doing no feeding, winterizing or sanitation resulted in the heaviest overwinter losses.

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

Mite Monitoring/Sampling and Control Management

We asked percentage of Oregon hives monitored for mites during the 2019 year and/or overwinter 2019-20, whether sampling was pre- or post-treatment or both and, of the 5 possible mite sampling methods, what method was used and when it was employed. Among PUB, 29 individuals (57%) monitored all colonies; they had 36% loss. Thirteen individuals (25%) did no monitoring and they had a 47% loss. Statewide 277 individual respondents (67%) said they monitored all their hives. Losses of those individuals monitoring was 51%. Seventy six (18%) statewide reported no monitoring; they had a higher loss rate of 59%. 63 individuals reported monitoring some of their colonies; they had a 50% loss. See Figure 12.

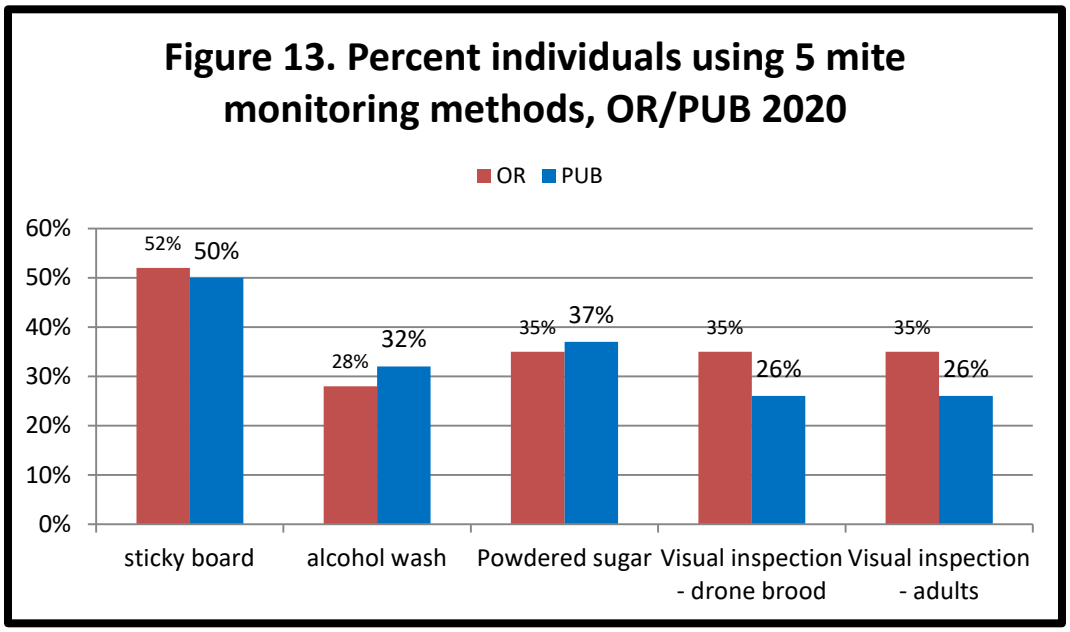


It is obvious that monitoring alone is a means towards improved winter survival. The table below compares % individuals and % winter loss for individuals statewide who monitored all colonies compared with those who monitored none. The 14-15% who monitored some colonies was variable but 4 year average mirrors those who monitored all colonies.

	ALL Colonies Monitored % individuals	% loss	SOME Colonies Monitored % individuals	% loss	No colonies Monitored % individuals	% loss
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%
3 year loss age		41%		38%		51%

In order of popularity of use, Sticky boards were used by 50% of total PUB respondents (of those who monitored - as shown above, 25% did no monitoring), 32% of individuals used alcohol monitoring and 37% used powdered sugar monitoring. Drone and adult visual methods

were both 26%. In past 5 years, the use of sticky boards has decreased in use statewide and both alcohol wash and powdered sugar shake have increased in use. Figure 13 red bars are statewide responses and blue bars are PUB for 2020.



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

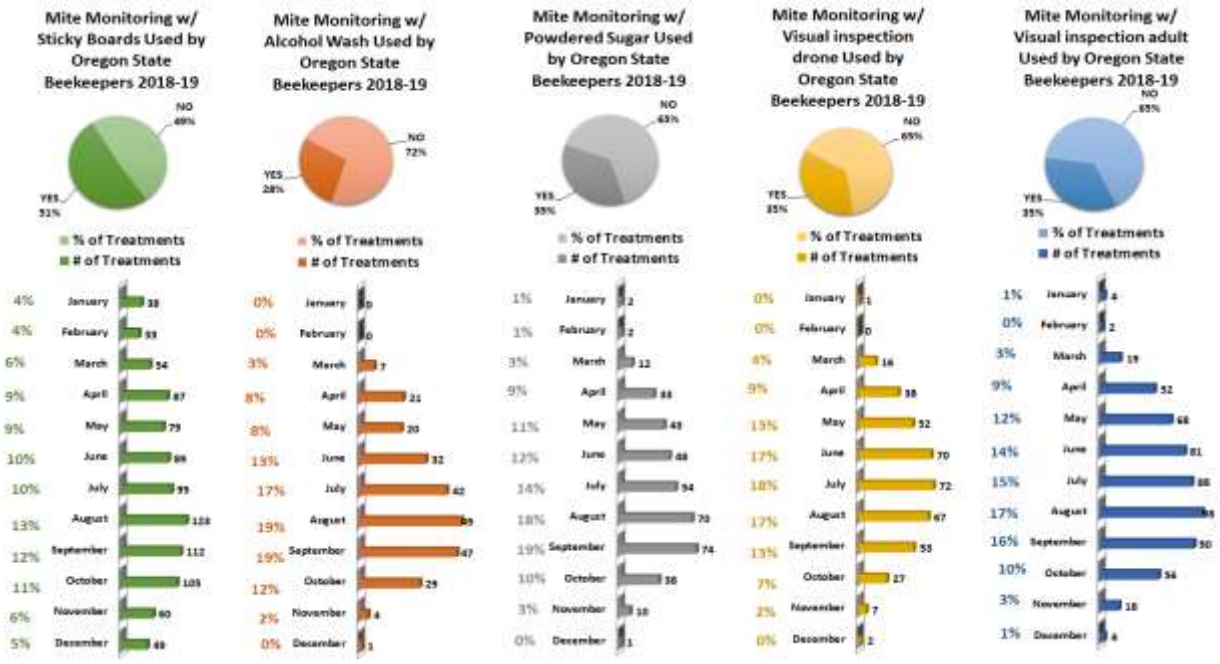


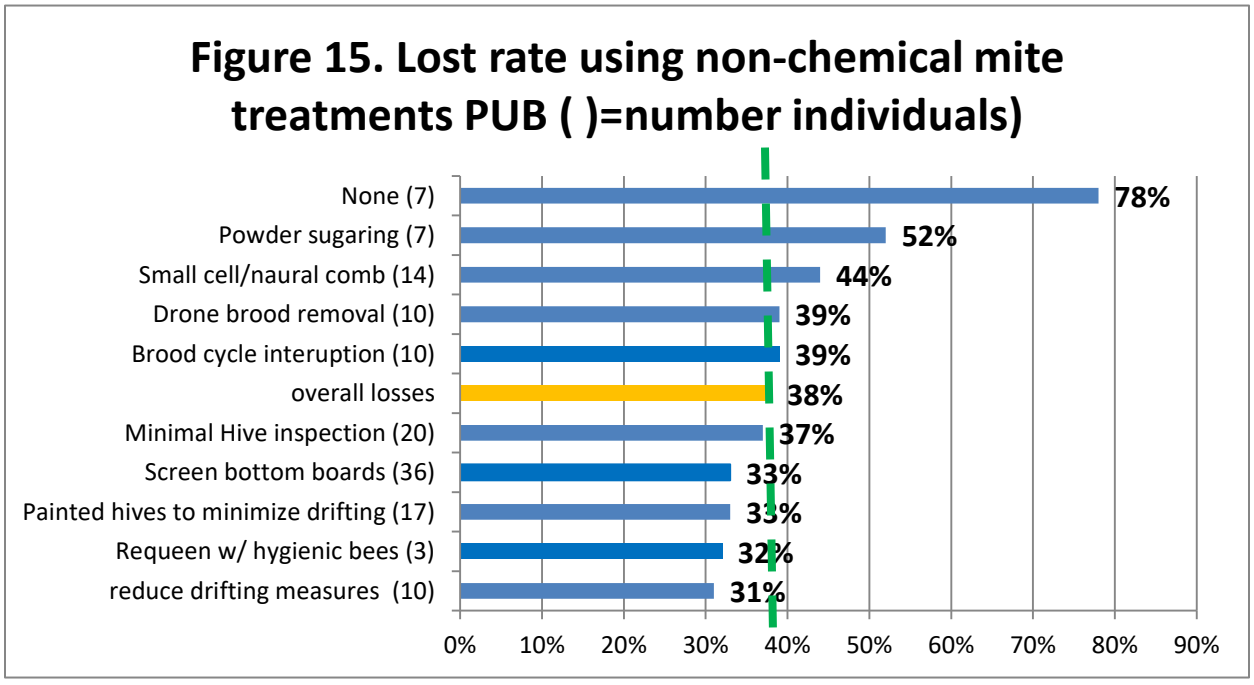
Figure 14

The most common sampling of respondents was both pre and post-treatment (29%) and did not sample or treat (29%). Eight individuals (16%) treated but did not sample and 8 sampled pre-treatment. Three individuals sampled but did not treat and 2 checked post-treatment sampling.

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 use 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 2-3% 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.

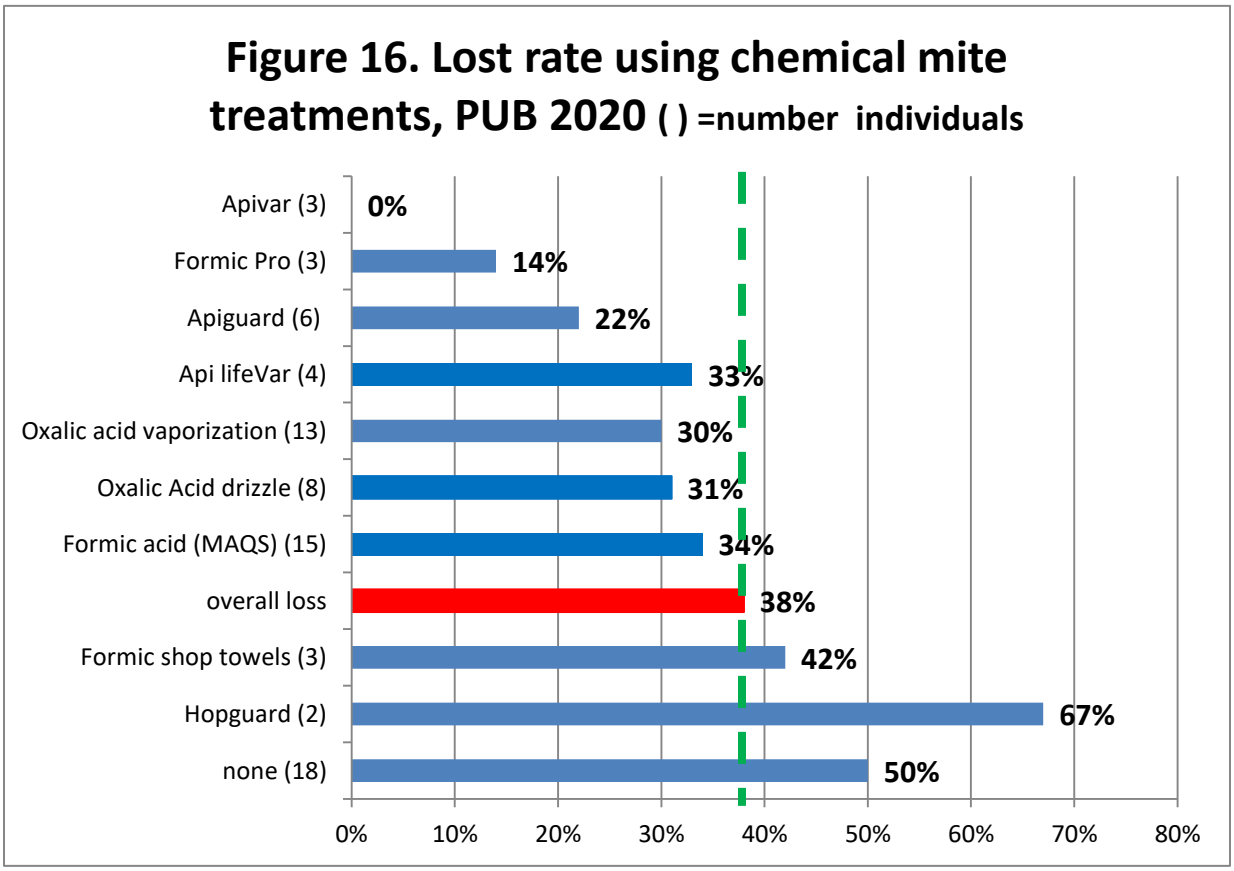
Mite Control Treatments



Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category), 7 PUB individuals used one method, 12 used two, 14 used three, 5 used 4 and 6 used 5; loss rate of those using one selection was 32% and the 11 using 4 or5 choices was 38%. **Use of screened bottom board was listed by 36 individuals with providing hives with distinct colors ½ as common (17 individuals).** Loss rates of both were just below 38%, 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 (10 PUB individuals – 31% loss level) and different colony colors in apiary has demonstrated a 13% better survival over past 3 years. Both were the methods, along with requeening with hygienic stock, 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 slightly higher loss this past season for PUB members.

Chemical Control: For mite chemical control, 18 PUB individuals used No Chemical treatment (50% of total PUB respondents; statewide 24% used NO chemical -these 26



individuals had 55% loss Those 33 using chemicals used at rate of 1.8/individual; 16 used a single chemical (had 55% loss rate), 10 used 2 (32% loss); 6 used 3 and one indicated use of 4 chemicals. These 7 individuals using 3 and 4 choices had a 25% loss rate.

The chemicals listed above the overall loss rate to the left of the **green dashed line** had losses below the PUB level of 38%. For PUB members virtually all the common legal treatments provided better survival. The 3 individuals using Apivar had no loss (11 colonies), Formic Pro, also 3 individuals, did very well – had 14% loss level. Six members using Apiguard had 22% loss level.

Consistently the last 3-4 years, five different chemicals have helped statewide beekeepers improve survival. The essential oils Apiguard and ApiLifeVar have demonstrated the lowest loss level; this year Apiguard performed well for PUB members, Apiguard statewide demonstrates a 31% better survival and ApiLifeVar 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); the 3 (of 51 PUB members) using it had no loss. Oxalic acid vaporization over past 3 years has demonstrated a 13% better survival (the survey did not differentiate Oxalic vaporization from drizzle in 2016) and showed an eight point better survival for PUB members. Oxalic acid drizzle did better for 8 PUB members this year. Three PUB members indicated using oxalic acid in a "shop towel" delivery but they had higher (42%) than average losses.

Formic acid has been the most popular chemical for OR beekeepers (both PUB and statewide). Statewide ii 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 performed better than the traditional formic MAQs pads.

Queens

We hear lots of issues related to queen "problems". Sixteen PUB individuals (36%) said they did not have any queen issues and 11 (25%) said they didn't know. Eight individuals of the 17 individuals (39%) who said they did have queen issues checked 10-30% level of problems and another 7 checked 30-50%. One said 50-75% and 2 indicated 75-100%. Statewide 50% said none and 19% said they didn't know.

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. Eleven individuals said yes (22%) and 40 said no. Statewide 31% said yes. The related question then was did you or your bees replace their colony queen? Nineteen (37%) said yes, eleven did not know and 21 (41%) said no; statewide 45% said yes, 33% said no.

One technique to reduce mite buildup in a colony is to requeen/break the brood cycle. Response to "How did bees/you requeen" included five individuals who used a mated queen, 1 a virgin queen and 3 queen cells (26% total). The remainder said their bees requeened naturally via supersedure (5 individuals), 8 individuals split so colonies raised their own queens and 9 said their colonies swarmed as queen replacement method. Statewide one-third of respondents indicated their bees were requeened with a mated queen and 58% indicated it was the bees that requeened via swarming (22%), supersedure (16%) or emergency rearing (20%). That means too few were seeking to use this valuable tool for mite control.

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.