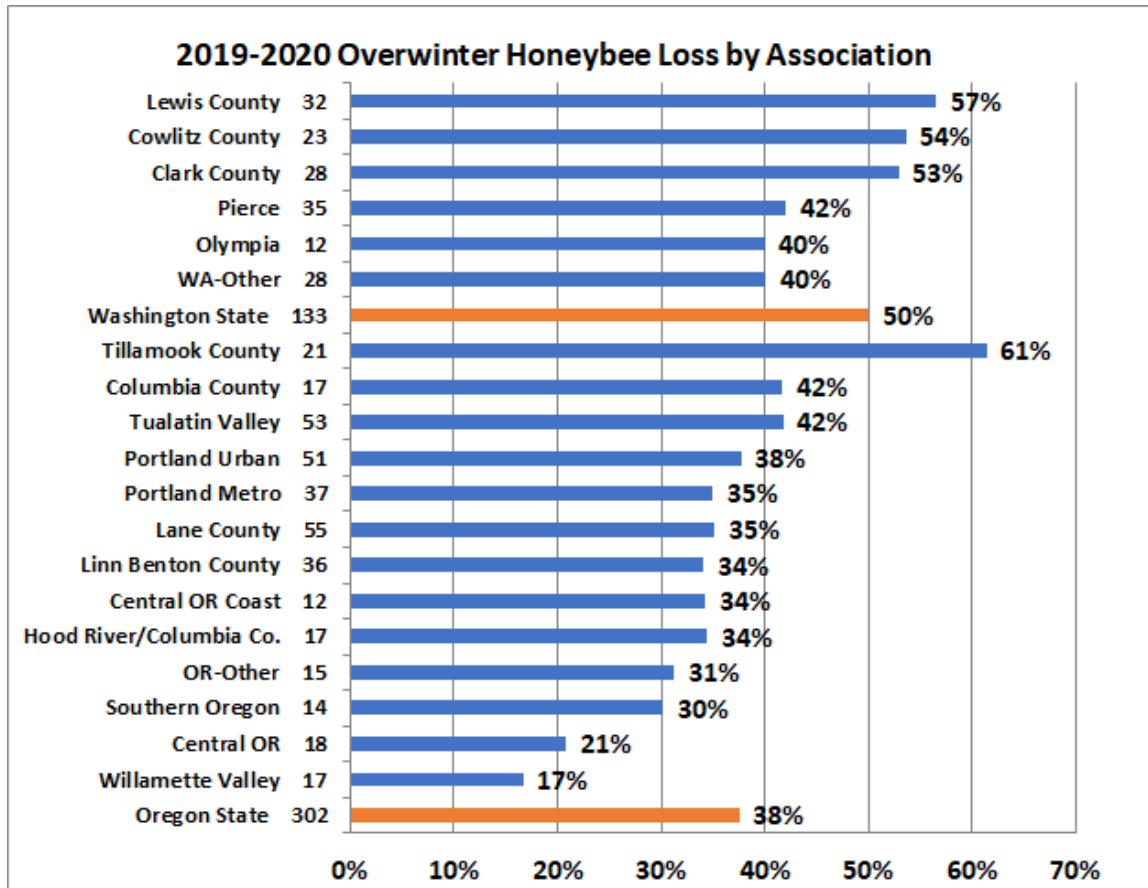


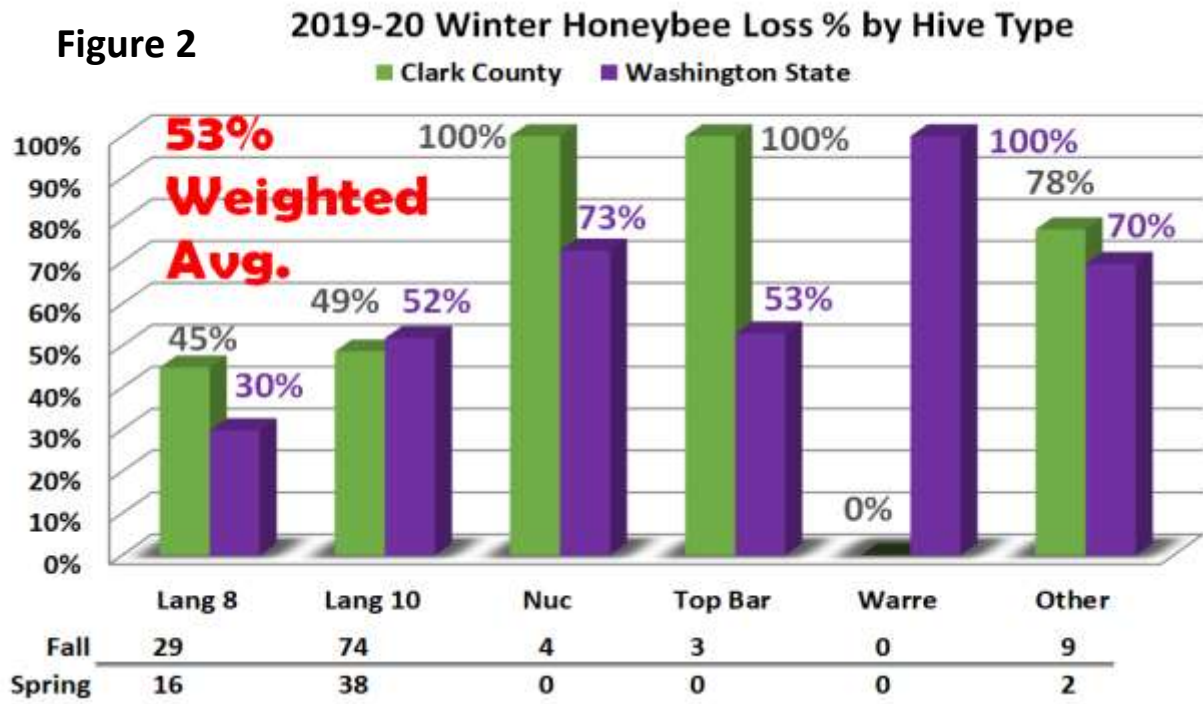
Clark Co beekeeper Losses 2019-20 by Dewey Caron

Overwintering losses of small scale Washington beekeepers was determined from information provided by 133 Washington backyard beekeepers with an electronic honey bee survey instrument www.pnwhoneybeesurvey.com. Statewide losses were 10 percentage points less than last winter. Clark Co losses were reduced from the elevated numbers last year and were one percentage point over 5 year average (54%). Twenty eight Clark beekeepers returned surveys reporting on 119 fall colonies. Figure 1 shows total WA & OR response. Or losses (38%) statewide were once again lower (by 12 percentage points) compared to those of Washington beekeepers.



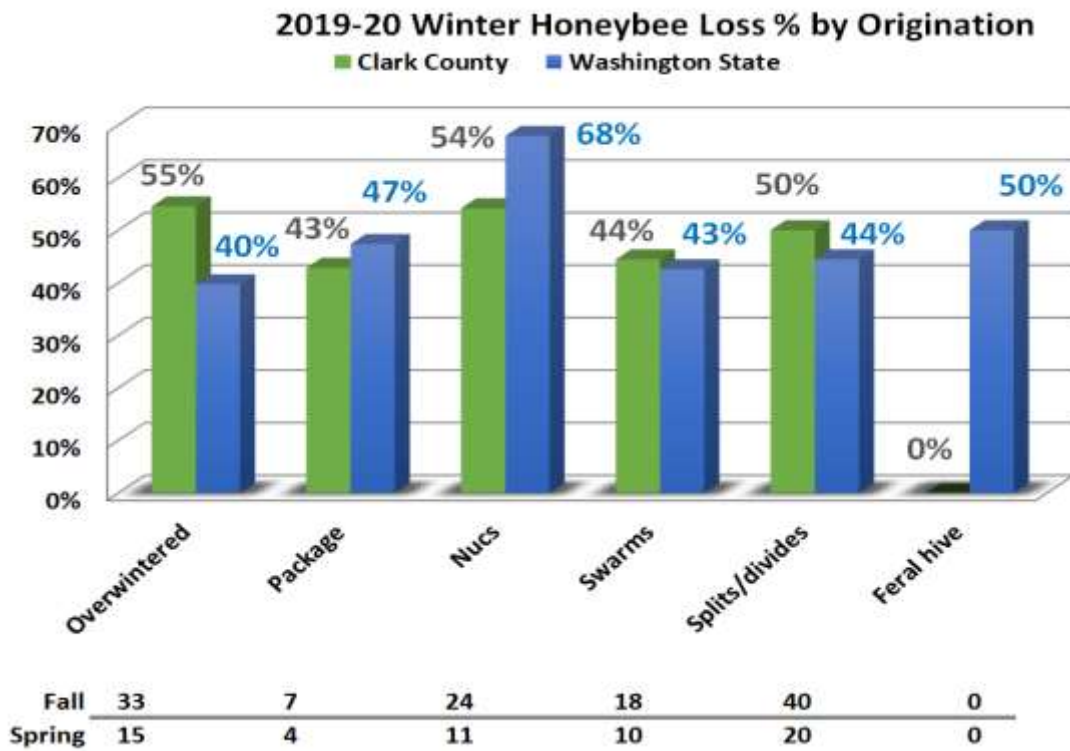
The loss survey overwintering statistic was developed by our asking number of fall colonies and surviving number in the spring by hive type. Results, shown in Figure 2 bar graph, illustrates overwintering losses in comparison with other Washington beekeepers. Nuc, op bar and the 9 other hives (16 total) did not fare well.

Figure 2



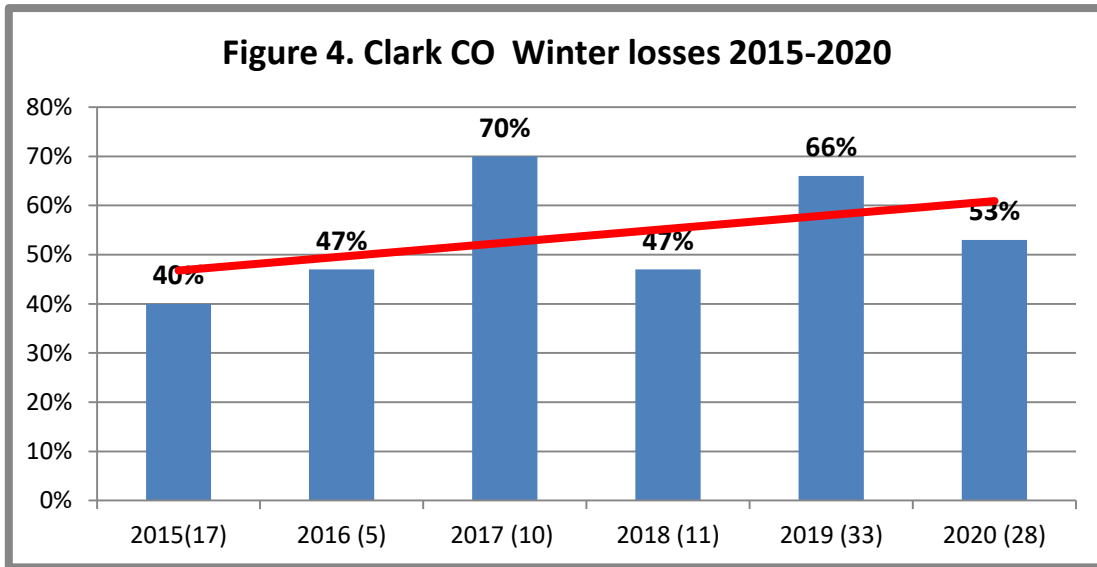
Loss by hive origination: We also asked survey respondents to list their loss by hive origination. The result is graphically presented below for the 28 Clark Co respondents alongside

Figure 3

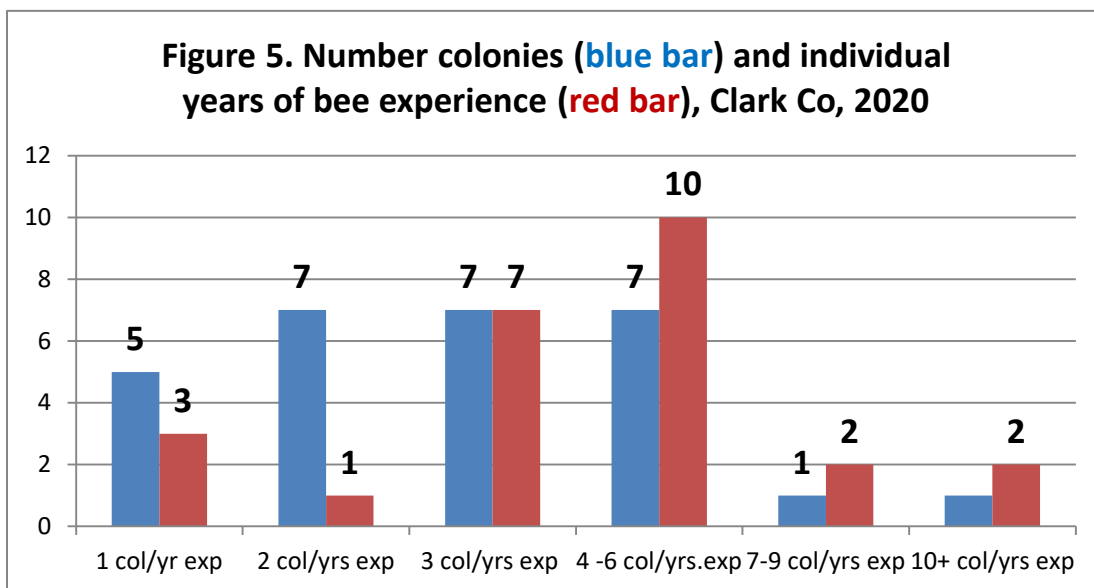


Washington State respondents. Overwintered colonies had higher loss level than statewide but other hive originations did better.

Loss History Losses this past overwinter were reduced and one percentage point lower than 5 year average. Figure 4 shows number of Clark Co responses () and percent loss for past five seasons. Trend line in red.

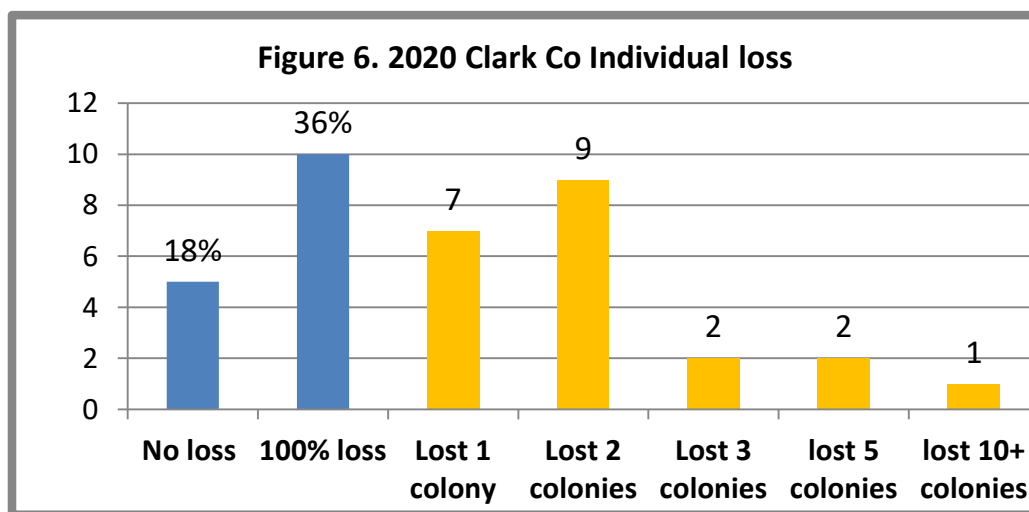


The 28 Clark Co respondents to the electronic survey (5 less than the previous year) were with one exception single digit colony. One individual had 9 colonies and one more than 10. Five individuals had 1 colony (they had 60% lose rate) and 7 each had 2 and 3 colonies (losses were 50% and 62 % for those with 3 fall colonies). The 19 members with 1, 2 or 3 colonies were 68% of Clark respondents and they lost on average 57% of their colonies. Figure 5 shows colony number in blue bar for Clark Co respondents.



In years experience 3 individuals had 1 year experience, one individual was in their 2nd year and 7 individuals listed 3 years experience. These 11 individuals collectively had 55% loss rate. Ten individuals had 4 to 6 years experience and had 36% loss rate. Greatest number beekeeping experience was 22 years. Figure 5 show years experience in red bars.

Colony Losses. For the 28 Clark beekeeper respondents, 5 individuals (18%) had no loss but double that - 10 individuals - 36% loss all their colonies. Seven individuals lost 1 colony, 9 individuals lost 2 colonies 2 each lost 3 and 5 colonies and one individual lost 10+ colonies. Three individuals lost 7 colonies and 2 lost 9. Heaviest loss was 24 colonies. Figure 6 below.



Self-reported “reasons” for colony losses: One survey question asked respondents to check the “reasons” for winter loss; multiple responses were possible. There were a total of 38 selections (1.7/individual) provided by Clark County respondents as the reasons for their overwintering losses. Weak in fall (8 individuals – 42% of individuals listing probably loss reason, followed by queen failure – 7 individuals and 5 individual listing Varroa mites were most commonly chosen by both Clark and statewide beekeepers. Under other, 3 individuals listed CCD and 1 each said Nosema and mice.

	Varroa mites	Poor wintering conditions	Weak in fall	Queen failure	Starvation	pesticides	Yellow jackets	Other
Cowlitz # Co %	5 (22%)	3 (13%)	8 (42%)	7 (30%)	3 (13%)	2 (9%)	5 (22%)	5 (22%)
Statewide %	18%	9%	17%	15%	9%	3%	10%	10%

Acceptable loss. When asked to choose an acceptable loss Clark Co mirrored statewide respondents. Greatest % selection was 25%, both for Clark Co and Statewide. Medium number for Clark was 15%; statewide 20%.

Don't know	None 0%	5%	10%	15%	20%	25%	33%	50%	75%	Total 100%
Clark CO 0	5	4	3	1 MED	4	6	2	2	1	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. Clark Co individual choices varied from zero to 75%, 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. Pesticide 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.

Part 2: Management selections and losses

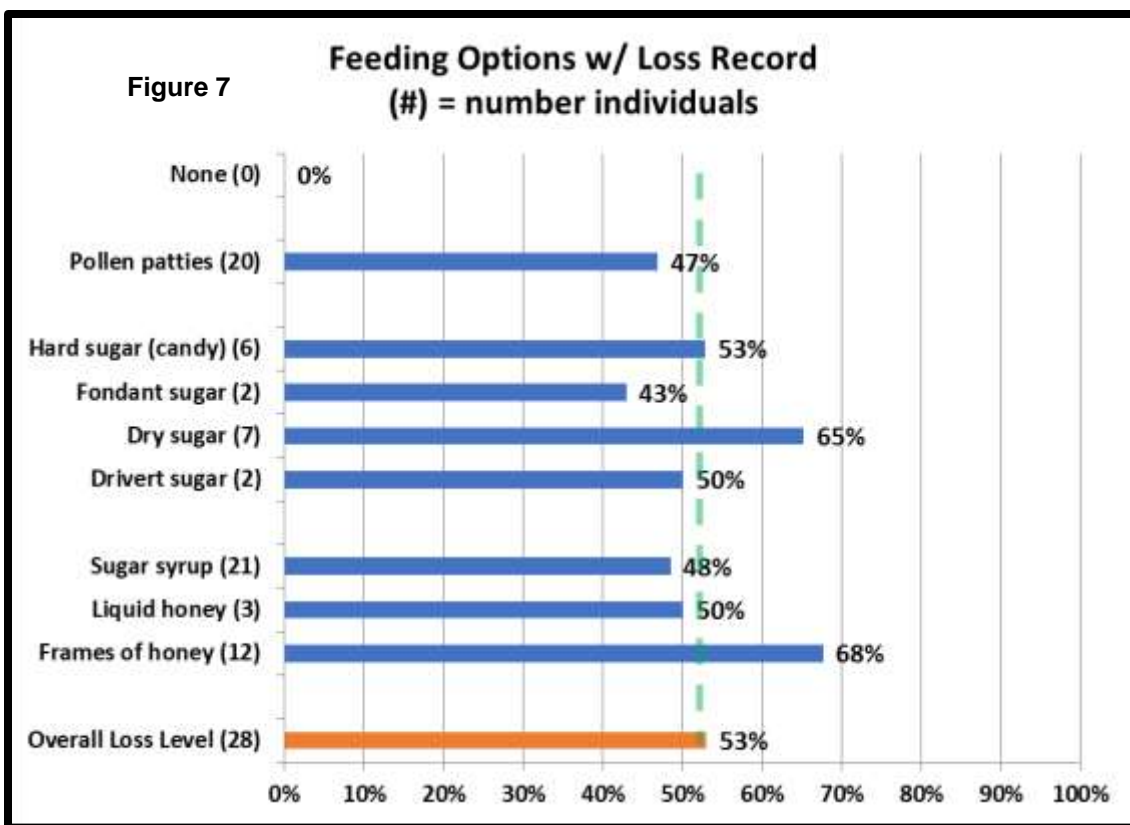
We asked in the survey for information about some managements practiced by respondents. The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, mite monitoring, both non-chemical and chemical mite control techniques and queens. Respondents could select multiple options and there was always a none and other selection possible.

Most Clark County beekeepers do not perform just one management to their colony (ies) toward improving colony health and overwintering success. This analysis however compares a single

factor equated with loss level. Such analysis is correlative and doing a similar management as fellow beekeepers does not necessarily mean you too will improve success.

FEEDING: Clark Co. survey respondents checked 73 feeding options = 2.6/individual. Three state individuals made no selections – they had 50% loss but all Clark Co members made at least one choice. Two selected a single choice and had 83% loss level, 10 indicated 2 choices and had a 36% loss, 13 (the greatest choice and also the median) made 3 choices and reported a 54% loss level. Three respondents had 4 choices with a 78% loss

The number of individuals making that selection is in (), bar length indicates loss level of individuals doing this management. Those bar lengths to left of 53% (**green dashed line**) had better survival while those to right had greater loss level.



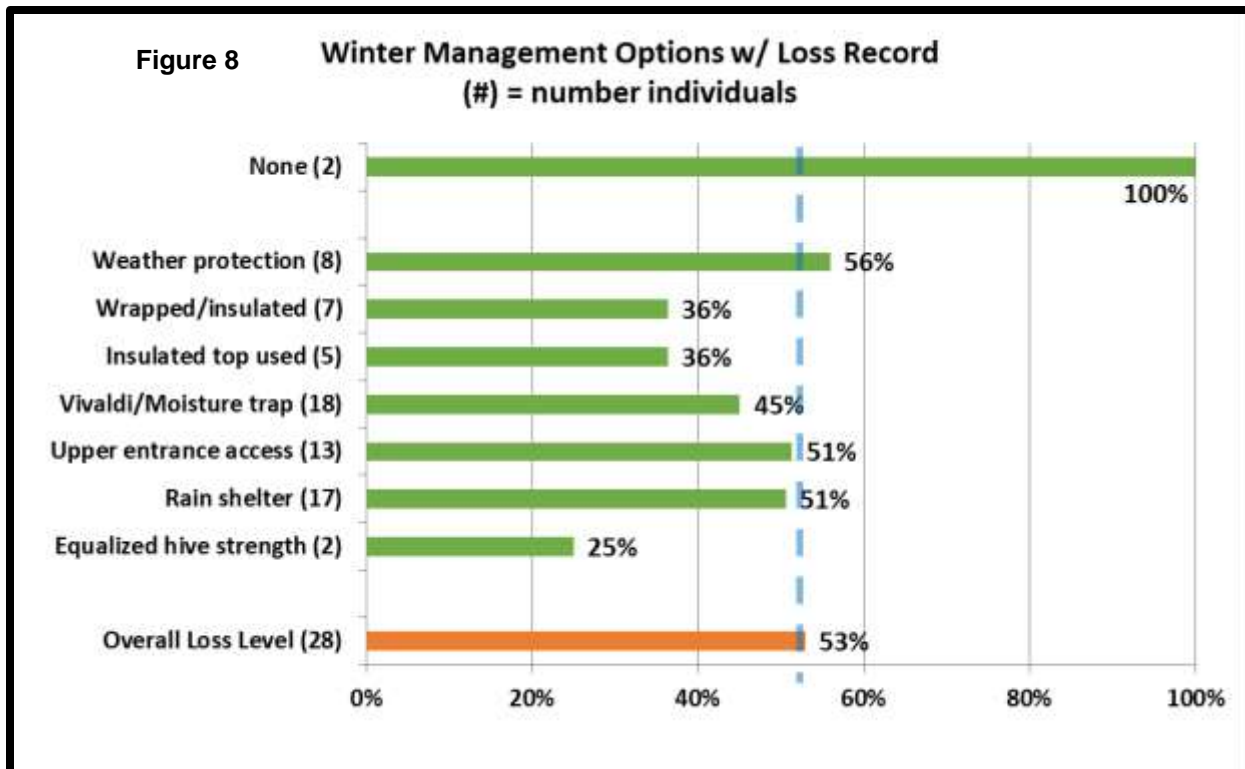
For individuals indicating one or more feeding managements, feeding sugar syrup was the most common feeding option of respondents (21 individuals, 75% of respondents). Their loss rate was 48%, five percentage points lower than overall Clark average. Twenty individuals fed pollen patties (71%) and had 6 percentage point better survival. One additional management that showed better survival included feeding fondant (2 individuals).

For the last 3 years of losses Washington statewide individuals doing no feeding had poorer survival all 3 years. Individuals that fed sugar syrup had marginal lower loss level in 3 of four years as did those using frames of honey to feed bees, which was not the case for Clark Co beekeepers this

year. Individuals feeding non-liquid sugar in the form of fondant and hard candy likewise had lower losses; hard candy improved survival in three of the four years. For individuals feeding protein, protein patty users showed slightly better survival in 3 of 4 years.

WINTERING PRACTICES: We received 64 responses (2.5/individual) about Clark Co beekeeper wintering management practices (more than one option could be chosen). Two individuals (7%) indicated none of the several listed wintering practices was done; these individuals had a 100% winter loss. For those indicating some managements, 6 did one single thing had 40% loss level, 6 respondents doing 2 had 59% loss, 6 had 3 choices with a 50% loss while 6 doing 4, 5 or 6 had 27% loss.

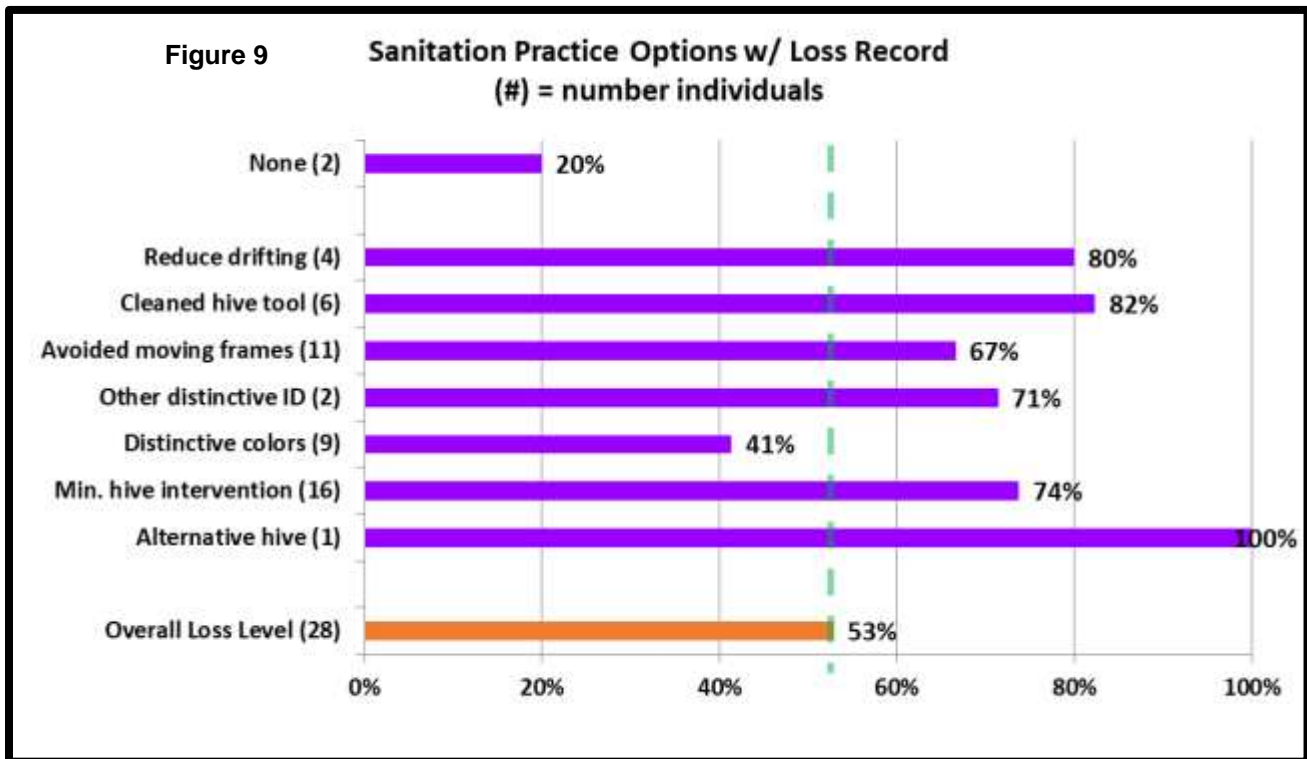
The most common wintering management selected was ventilation/use of a quilt box at colony top (18 individuals (45% loss), followed by rain shelter provision (17 individuals 51% loss) and upper entrance bee access (13 individuals, also 51% loss). Figure 8 shows number of individual choices and percent of each selection. Bar length below 53% (blue dashed line) had better than average winter survival.



Over the past three years a couple of winterizing management improved survival. Those doing no winterizing had higher losses all 4 years. Equalizing hive strength in the fall demonstrated lower loss levels in all four recent winter periods (only 25% loss this past winter). Top insulation has demonstrated lower loss in three of the four years, in the most recent winter 5 Clark Co. individuals realized a 17 percentage point improvement. Ventilation above the colony (Vivaldi Board/quilt box) demonstrated improved survival two of the four winters.

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. We received 49 responses for this survey question 1.9/individual. Two individuals (7%) said they did not practice any of the 6 offered alternatives; they only had a loss rate of 20% compared to overall Clark rate of 53%. Eleven individuals had 1 selection and had 40% loss, 61 had 2 choices with 50% loss, 7 selected 3 and one 4 and they had 83% loss.

In three of four years doing none of these managements resulted in improved survival; this was the case this past winter when the 2 Clark individuals doing nothing had losses of 20%. Using an alternative hive resulted in lower losses in two of four winters but for the single individual doing this not this past year. Providing hives with color and distinctive hive ID measures were helpful managements some seasons – distinctive colors of hives helped reduce lose for 9 Clark Co individuals.

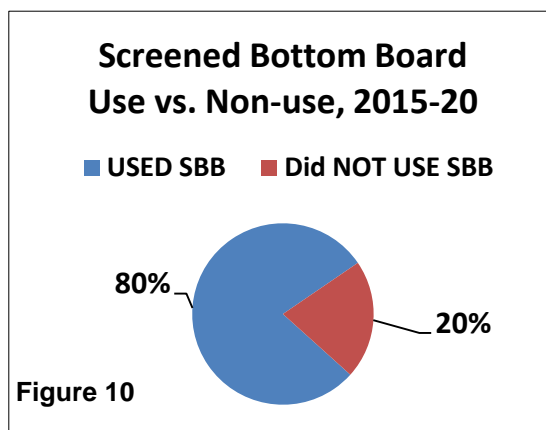


SCREEN BOTTOM BOARDS (SBB)

Although many beekeepers use SBB to control varroa mites, BIP and PNW surveys clearly point out they are not or at best not a very effective varroa mite control tool. In this recent survey 20 Washington individuals (16%) said they did not use screen bottom boards; they lost 78% of their colonies. Those 80 beekeepers using SBB on all of their colonies had 60% loss. The 24 individuals using SBB on some of their colonies had 34% loss. For Clark Co. 16 individuals used SBB on all their colonies and had 49% loss while the 10 not using them had 55% loss.

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

Examining the five year average of SBB use, loss level of those using SBB on all or some of their colonies had a 42.8% loss level whereas for those not using SBB had loss rate of 44.2% (a 3% positive survival gain for those using SBB versus those not using them). They are very minor in improving overwinter survival.



We asked if the SBB was left open (always response) or blocked during winter. This past season 66 individuals (53%) said they always blocked SBB during winter. They had a 44% loss rate, average loss rate for statewide beekeepers. Thirty six individuals (29%) said they never blocked SBB and had loss rate of 60%. Thirteen individuals (10%) blocked them on some of their colonies. Their loss rate was 79%. Ten Clark Co beekeepers said they always block and had 42% loss while the 11 individuals who never blocked had 59% loss

There is no good science on whether open or closed bottoms make a difference overwinter but some beekeepers "feel" bees do better with it closed overwinter. **Comparing the always and sometimes left open with the closed in winter response reveals a 16 percentage point difference in favor of closing the SBB over the winter period.. This relationship has been consistent over the past five years averaging nearly a 10 percentage point advantage when the SBB is closed during the winter.** An open bottom, at least during the active brood rearing season, can assist the bees in keeping their hive cleaner and promote good hive ventilation.

Things that seem to improve winter success: It should be emphasized that these comparisons are correlations not causation. They are single comparisons of one item with loss numbers. Individual beekeepers do not do only one management option nor do they necessarily do the same thing to all the colonies in their care. We do know moisture kills bees, not cold, so we recommend hives be located in the sun out of the wind. If exposed, providing some extra wind/weather protection might improve survival.

Feeding, a common management appears to be of some help in reducing losses. Feeding fondant sugar or a hard sugar candy during the winter meant lower loss levels. Providing frames of honey or sugar syrup, the most common selection, also meant slightly lower losses for some individuals but these basic managements are useful in other ways such as for spring development and/or development of new/weaker colonies besides insuring better winter survival.

Feeding protein in form of pollen patties did slightly improve survival. The supplemental feeding of protein (pollen patties), might be of assistance earlier in the season to build strong colonies.

Winterizing measures that apparently helped lower losses for some beekeepers was equalizing strength, providing an upper entrance, a moisture trap (Vivaldi board or quilt box) and some attention to adding protection against the elements. Spreading colonies out in the apiary and painting distinctive colors or doing other measures to reduce drifting also appeared to be of some value in reducing winter losses. Avoiding movement of frames from one colony to another might also improve survival but the gain over what this interchange might accomplish might be greater than a minor advantage in survival.

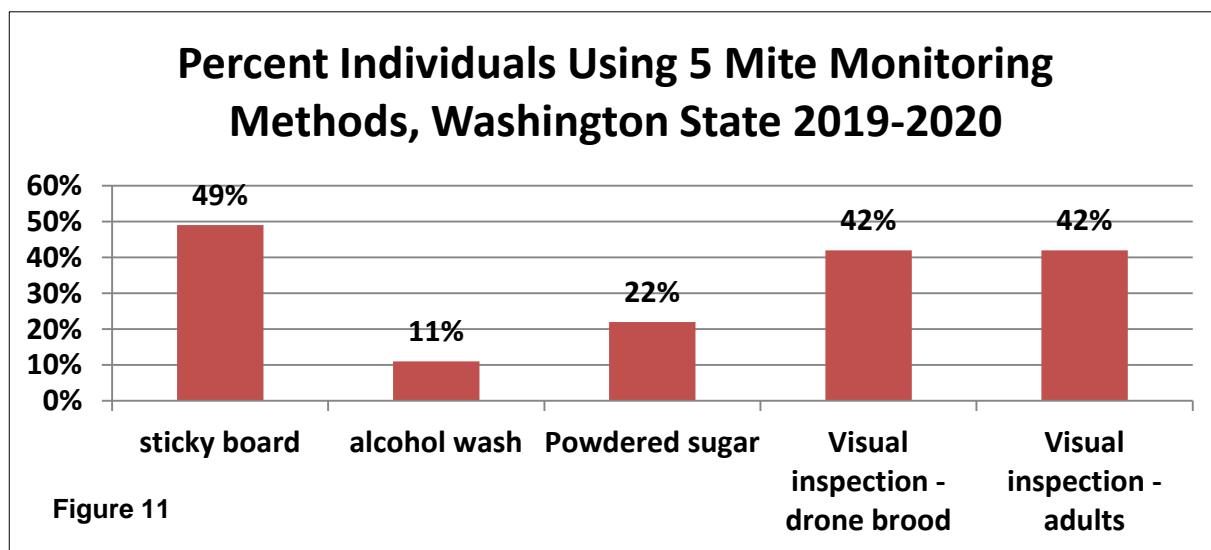
It is clear that doing nothing for feeding or winterizing or this past season in sanitation resulted in the heaviest overwinter losses.

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

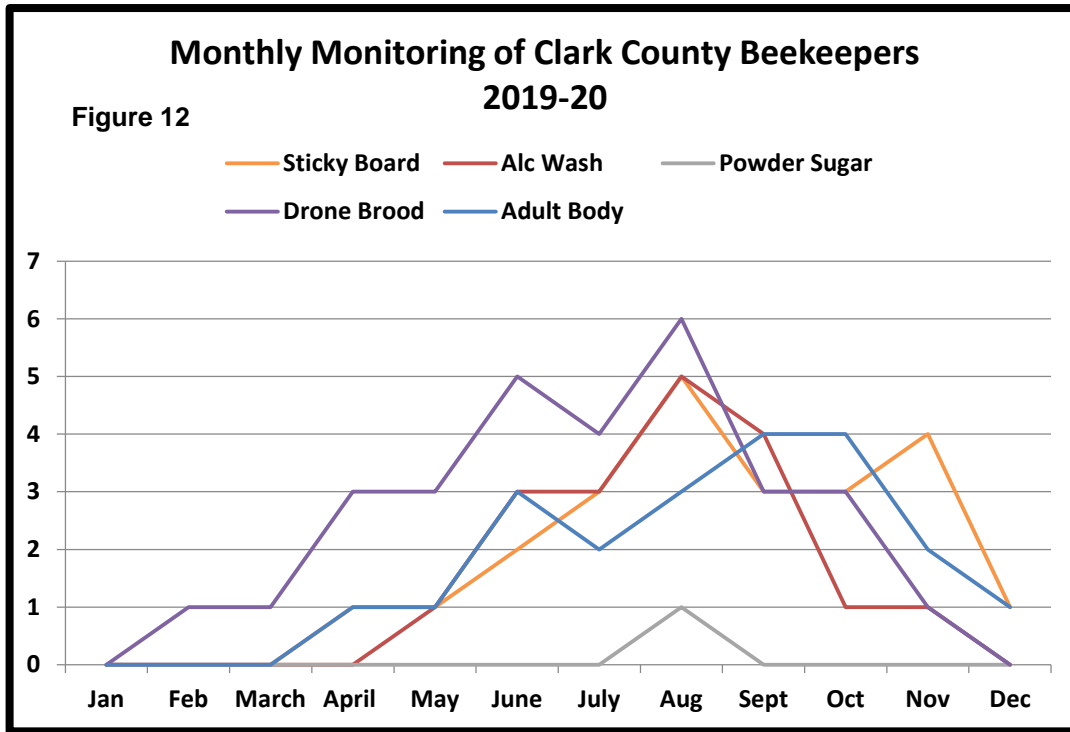
Mite monitoring/sampling and control management

We asked percentage of Washington hives monitored for mites during the 2019 year and/or overwinter 2019-20, whether sampling was pre- or post-treatment or both and, of the 5 possible mite sampling methods, what method was used and when it was employed. Eighty six individual respondents statewide (65%) said they monitored their hives. Losses of those individuals monitoring was 44%. Thirty three (25%), reported no monitoring; they had a higher but only single percentage point higher loss rate of 45%. Thirteen individuals monitored some with loss rate 70%. For Clark Co 19 monitored all and had 55% loss while the 9 that did no monitoring reported only a 50% loss.

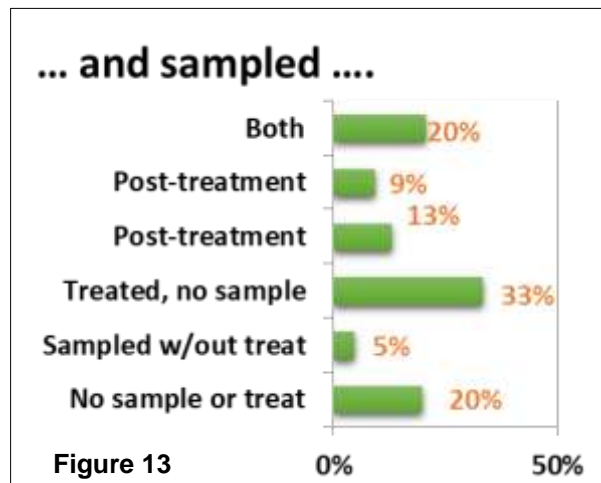
In order of popularity of use, Sticky boards were used by 8 individuals, 42% of total 19 respondents who did some monitoring of colonies, followed by 42 individuals, 7 individuals used alcohol wash, only 1 said they used powdered sugar shake. Eight individuals looked at drone brood and 5 said they looked on adults. The two most accurate means of determining mite load is alcohol wash and powdered sugar was employed by 8 respondents (42% of total members). Figure 11.



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



The most common sampling of respondents in 2019-20 was treated but did not sample (33% individuals) followed by both and not sampling nor treating. Thirteen indicated sampling pre and 9% post. Selections shown in Figure 13 to right are statewide; for Clark treated but not sampled was 13 individuals, Sampling both pre and post was 6 individuals - post alone was 3 individuals and pre alone a single individual. A single individual sampled but then did not treat.

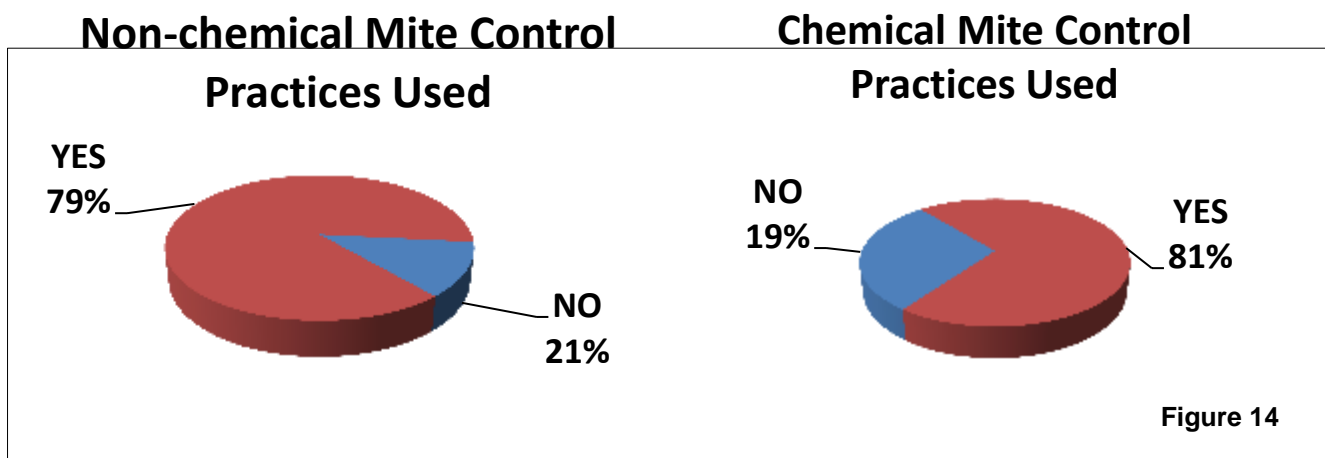


It is important to KNOW mite numbers. Less effective mite monitoring methods include sticky (detritus) boards below the colony (often so much detritus drops onto a sticky board that picking out the mites can be hard, especially for new beekeepers) but sticky boards used for a day can help confirm the usefulness of a treatment when inserted post treatment. Visual sampling is not accurate: most mites are not on the adult bees, but in the brood. Unfortunately looking for mites on drone brood is also not effective as a predictive number but can be used as an early warning that mites are present; if done, look at what percentage of drone cells had mites.

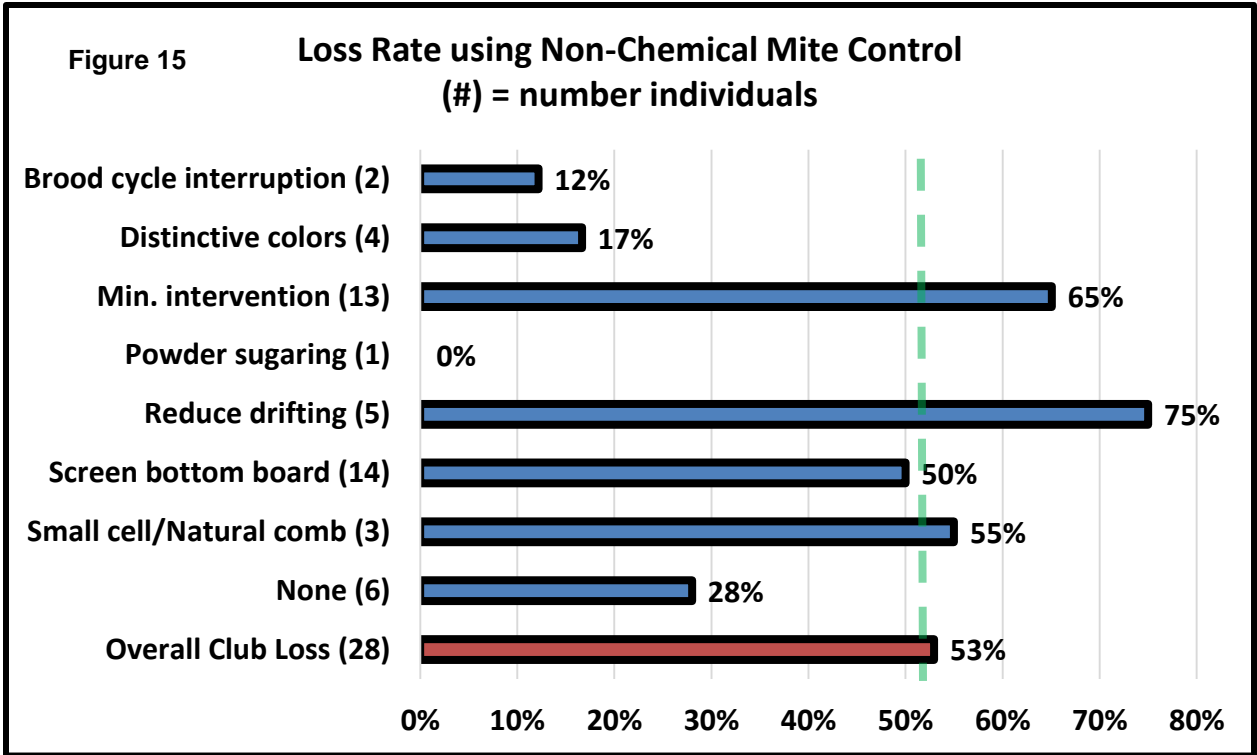
See *Tools for Varroa Monitoring Guide* www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes suggested mite level to use to base control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

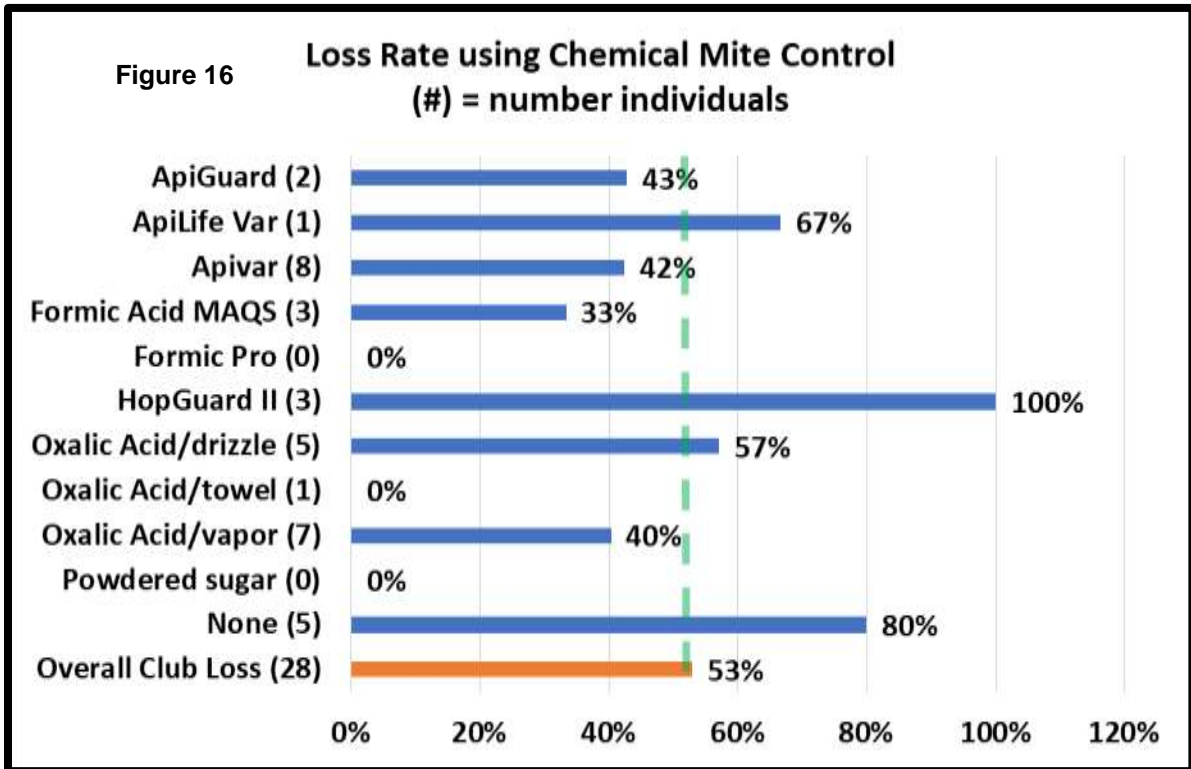
The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Six Clark Co. individuals (21%) said they did not employ a non-chemical mite control and 5 individuals (19%) did not use a chemical for mite control. See Figure 14. Those 6 individuals who did not use a non-chemical treatment reported a 28% winter loss, while those who did not use a chemical control lost 80% of their colonies. 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,) 8 individuals used one method and had a 42% loss, 6 used two (41% loss level), 6 used three and one used 4 (59% loss). Total selections were 43, 2/individual. Use of screened bottom board was listed by 14 individuals. They had losses 3 percentage points below Clark average. The next most common selection was minimal hive inspection (13 individuals) and they had 12 percentage point higher losses. The use of the remaining 7 selections are shown in Figure 15; number of individuals in (), bar length represents average loss level of those individuals using each method. Those to left of **green dashed line** had better than average survival. Drone brood removal and painting hives distinctive colors has resulted in better survival in each of past two survey years. Other managements were helpful one year but not the other years.



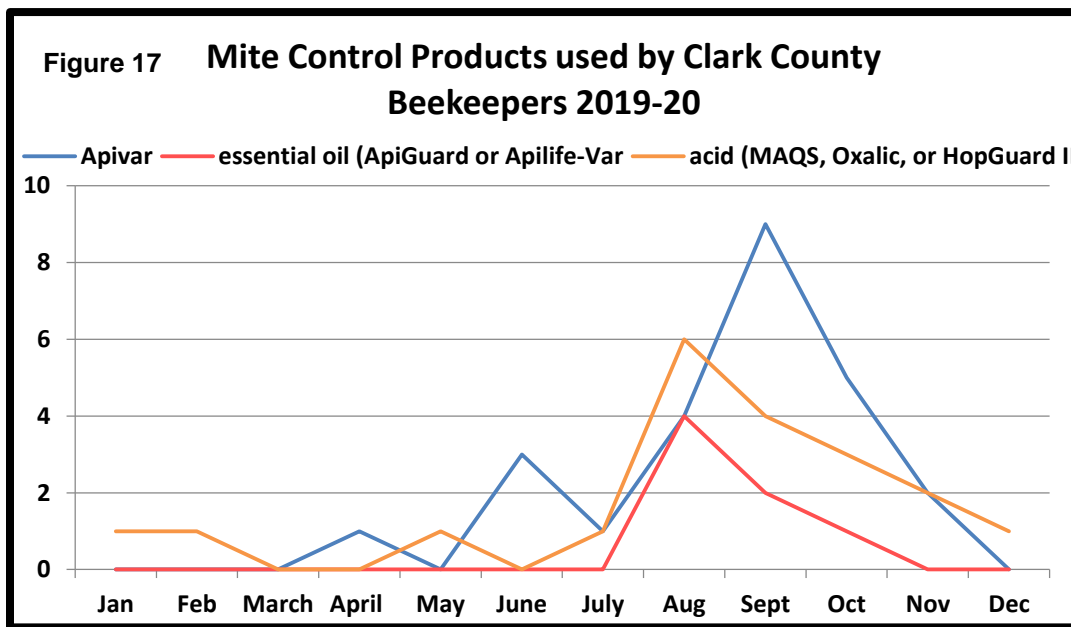
Chemical Control: For mite chemical control, 5 individuals (18% of total respondents) used NO chemical treatment; these individuals had an 80% loss level. Those using chemicals used at rate of 1.3/individual. Seventeen individuals (74%) used one chemical and had 58% loss, five used two and 1 used 3; they had a 26% loss. Clearly it takes more than one chemical to improve success.



The two most common choices were Apivar and Oxalic acid vaporization (8 and 7 individuals respectively) and both improved overwintering success by 10+ percentage points. Apiguard and Formic acid also improved Clark Co user overwintering success. Figure 16 illustrates number of uses () and bar length indicates the loss rate for those using that chemical.

Consistently the last 3-4 years five different chemicals have helped beekeepers realize better survival. The essential oils Apiguard and ApiLifeVar have consistently demonstrated the lowest loss level. Apiguard has a 31% better survival and ApiLifeVar has a 30% better survival record over past 4 years. Apivar use, the synthetic (amitraz), has demonstrated a 29% better survival over past 4 years (2016-19). Oxalic acid vaporization over past 3 years has a 13% better survival. Formic acid demonstrated a 14% better survival but this product has changed and how we use it is changing so this information is more difficult to tease out of the data.

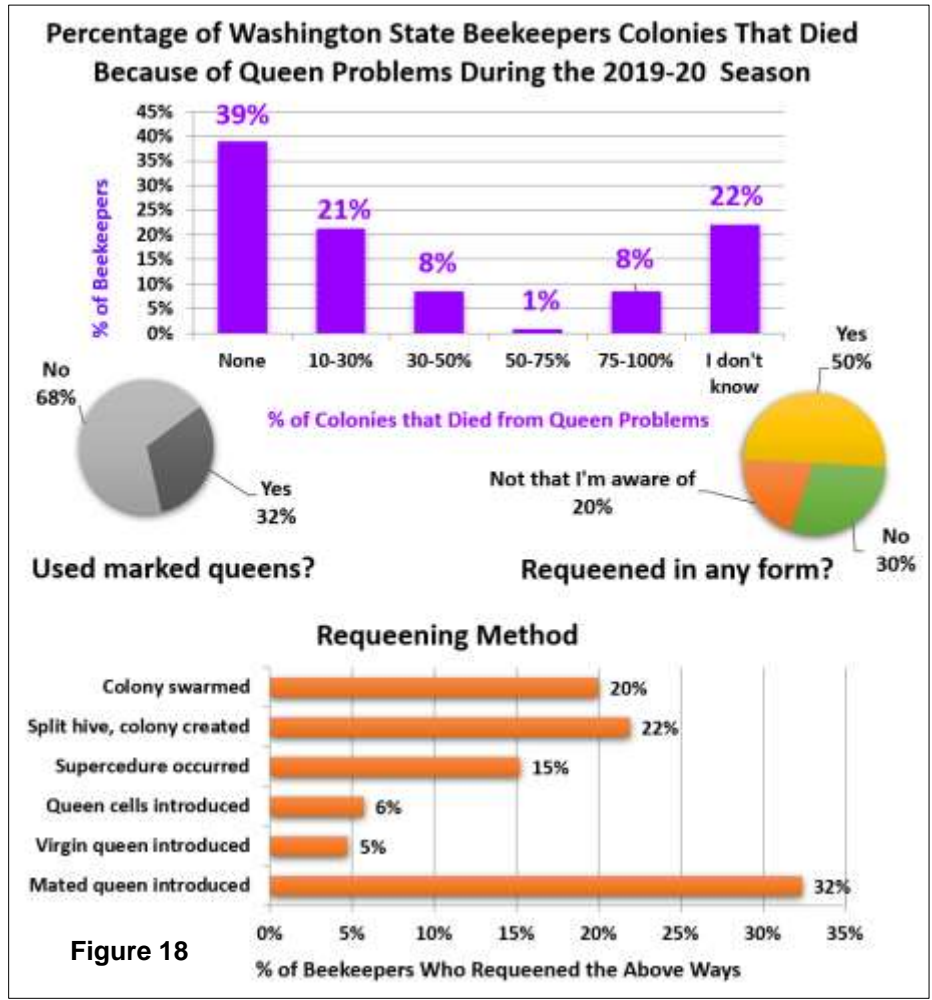
The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in Figure 17. Further review is needed to determine if the timing of treatments was more effective than at other times for the various chemicals.



Queens

We hear lots of issues related to queen “problems”. In Section 8 of the survey we asked what percentage of loss could be attributed to queen problems. Statewide forty six individuals (39%) subdivided queen related issues from 10 to 100% of their hives; the majority (25 individuals) indicated 10 to 30%. Forty six individuals also said none; an additional 26 individuals (22%) said they didn’t know. The number of respondents and percent losses statewide of each is shown in Figure 18 to left. For Clark Co. 10 Individuals said no queen issues and 7 didn’t know. The majority of those with losses relating to queens (6 individuals) close 10—30% queen loss issue

Queen events can be a significant factor contributing to a colony not performing as expected. We asked if you had marked queens in your hives. Only 28% said yes; 43% of Clark Co members said they had marked queens. The related question then was 'were your hives requeened in any form?' to which 50% (64 individuals) said yes, 30% said no, and the remainder 'not that that I am aware of; in Clark it was evenly split between yes and no with 6 saying not that they were 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 92 responses (more than one option could be checked), as illustrated in Figure 18. Twenty three individuals indicated they requeened with a mated queen and they had a 51% loss level, seven used a virgin queen (43% loss) and 8 used a queen cell (45% loss). A higher percentage (54 instances vs 38) said the bees requeened via Supersedure (15 instances, 46% loss), splitting (21 individuals, 63% loss) or swarming (18 individuals, 42% loss). With the exception of use of mated queen and splitting, loss levels were very similar. For Clark Co respondents 6 used mated queens 1 used a virgin queen and 4 indicated use of queen cells. An equal number (8) said their bees requeened via supersedure (2 persons), splitting and allowing bees to raise new queen and 3 colonies requeened via swarming.

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 reporting losses of the larger scale WA beekeepers not the backyarders (Figure 5). Reports for individual bee groups with 18 or more respondents are customized and posted to the PNW website.

We intend to continue to refine this instrument each season and hope you will join in response next April. If you would like a reminder when survey is open please email us at info@pnwhoneybeesurvey.com 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 June 2020