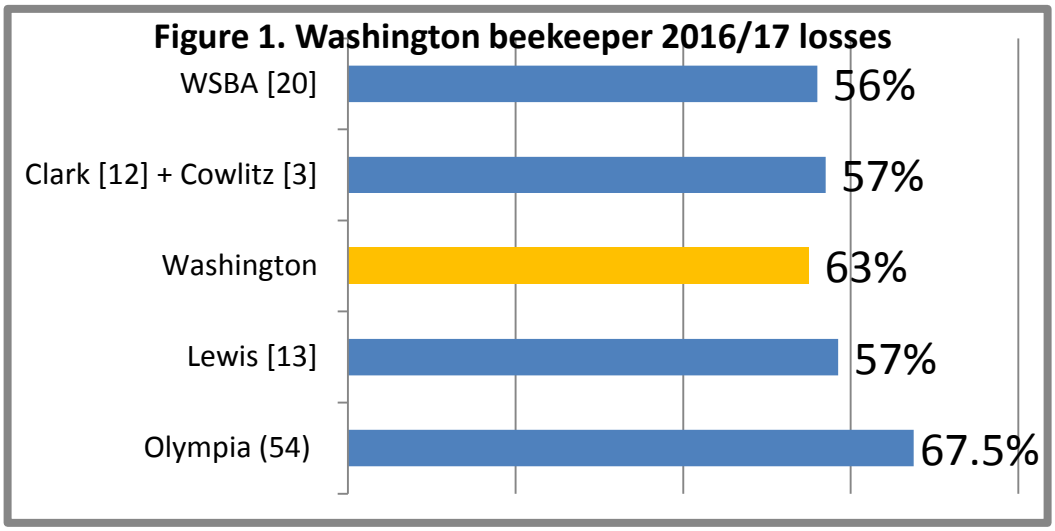
Washington backyard beekeeper Losses 2016-17 Winter Dewey Caron

Overwintering losses of small scale Washington beekeepers was reduced from the previous elevated loss levels in 2015-2016. Fifty WA beekeepers supplied information on winter losses and several managements related to bee health with an electronic honey bee survey instrument www.pnwhoneybeesurvey.com. An additional 49 Olympia Beekeeper Association members, surveyed by club President Mechele Linehan, are included in this report with data limited to winter loss data.

Figure 1 shows total WA response (48 total + 49 additional Olympic beekeepers). Number individuals ( ) to left of association name is number of individuals; % is overwinter losses by club. Total fall colony numbers was 198 + 301 colonies of Olympic beekeepers.



The vast majority of respondents to the electronic survey were new beekeepers. 51% of 48 WA respondents (data not collected for 49 Olympia beekeepers) had 1 to 3 years of experience; 23% had 4 to 6 years' experience, 13 (25%) had 8 to 10 years and a similar percentage reported 14 + years' experience; 35 was greatest number of years.

Of a total of 465 fall colonies, 172 survived to spring (63% loss rate); 53.5% of those returning a survey (both the electronic survey from pnwhoneybeesurvey and the Olympia association survey) had 1, or 2 or 3 fall colonies; 35.5% had 4 to 9 colonies, 11% had 10 or more colonies with 27 the largest number.

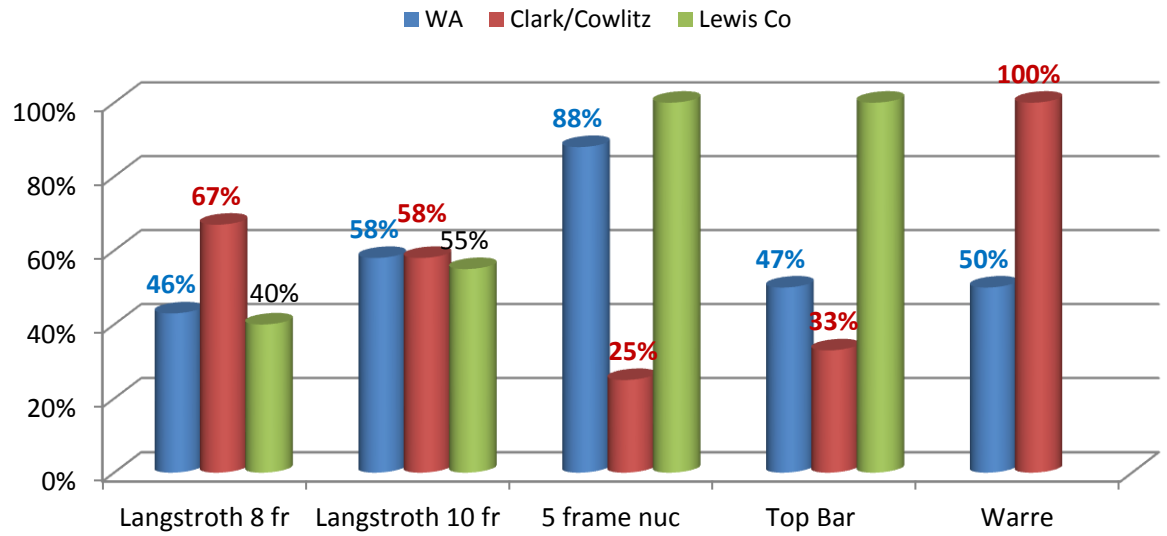
Last year 60% of 52 WA beekeepers had an experienced mentor available as they were learning beekeeping. This year 62% said they had a mentor available.

2015-2016 Overwinter Bee Losses

Total WA backyard beekeeper overwinter loss = 63% loss.

The WA survey overwintering loss 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 illustrate overwintering losses for total WA, Clark/Cowlitz Co, and Lewis Co beekeeper respondents. [Both Clark and Lewis Co losses last year were 47% but there were only 5 individual responses from Clark CO]. 2016-17 total WA losses (102 individuals) were 63%. Among 48 total WA beekeepers, 7 individuals (14.5%) maintained more than one hive type. Numbers of 5 frame nucs included in graph (8 stateside, 2 in Cowlitz and 2 in Lewis), Top bar hives (12 statewide, 6 Clark, 2 Lewis) and Warré hives (4 total in WA + 2 in Clark Co) represent 13% of total colonies in the survey analysis. Not included were two "other" hives (tree hives) reported for Clark. County; both survived.

Figure 2. Comparison of OR, WA & Lewis Co Beekeeper overwinter losses by hive type, 2016-2017



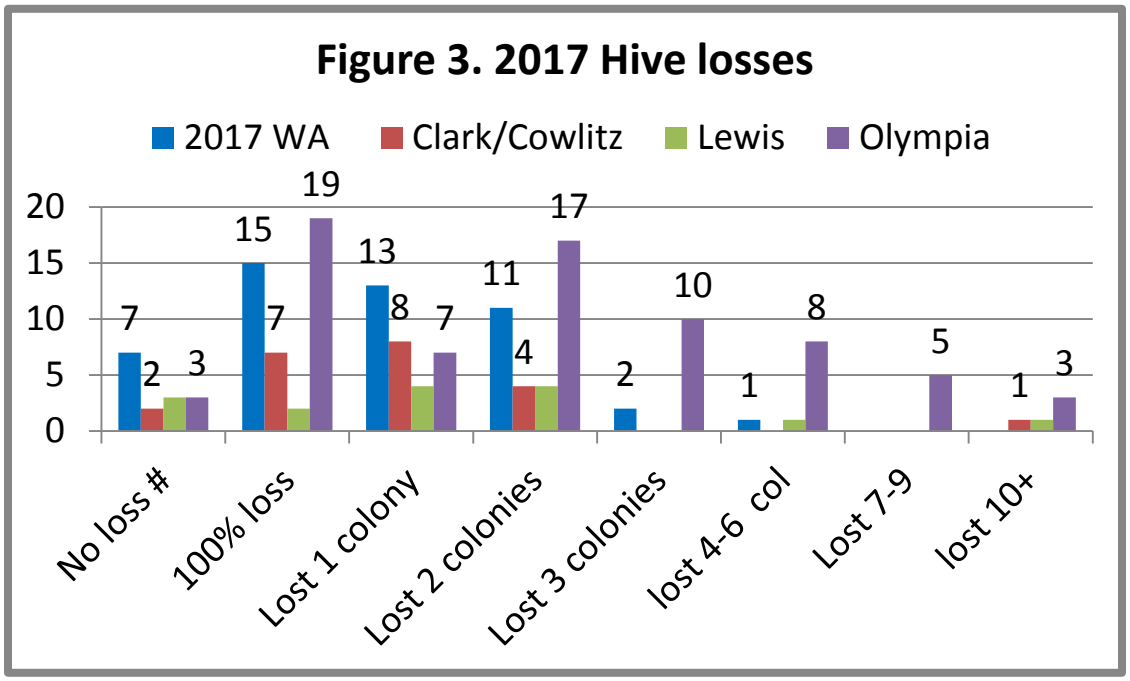
Fall colonies	35	3	5		132	48	42		8	4	2		14	6	2		4	2
spring colonies	19	1	3		56	20	19		1	1	0		8	4	0		2	0

For the 48 total WA beekeepers, 7 (14.5%) had no loss and double that number (15 individuals =31%) loss all their colonies. 13 statewide lost 1 colony, 11 lost 2 and greatest loss was 6 colonies.

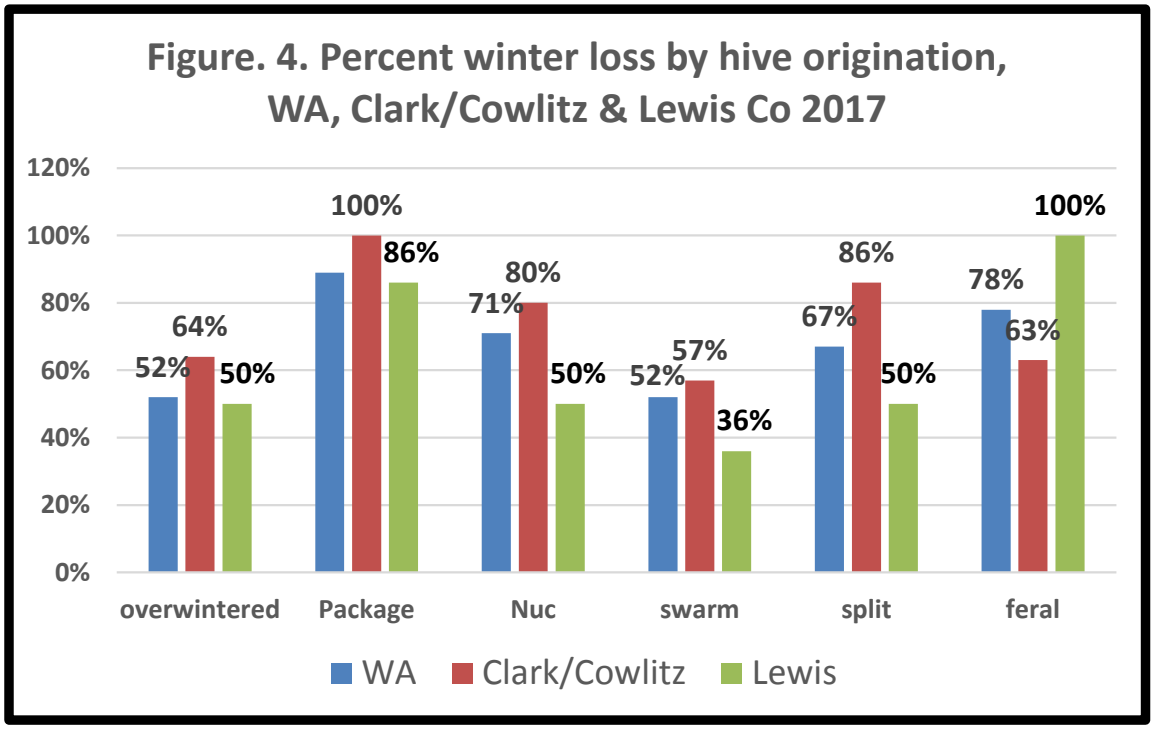
For **LEWIS Co** beekeepers 3 individuals (23%) had zero loss; unfortunately 2 (15%) had total loss. Four individuals each lost one and two colonies, while 2 individuals lost 6 or more colonies: heaviest loss was 9 colonies.

For **CLARK/COWLITZ**, two (13%) individuals had zero loss but 7 individuals (46%) had total loss. Eight individuals lost one colony and 4 lost 2. One individual lost 19 of 20 colonies.

For **OLYMPIA Co,** 3 individuals (6% had no loss while 19 individuals (38%) had total loss. Seven individuals lost one colony, 17 lost two, 10 lost 3 with 16 heaviest loss. Data shown in Figure 3.

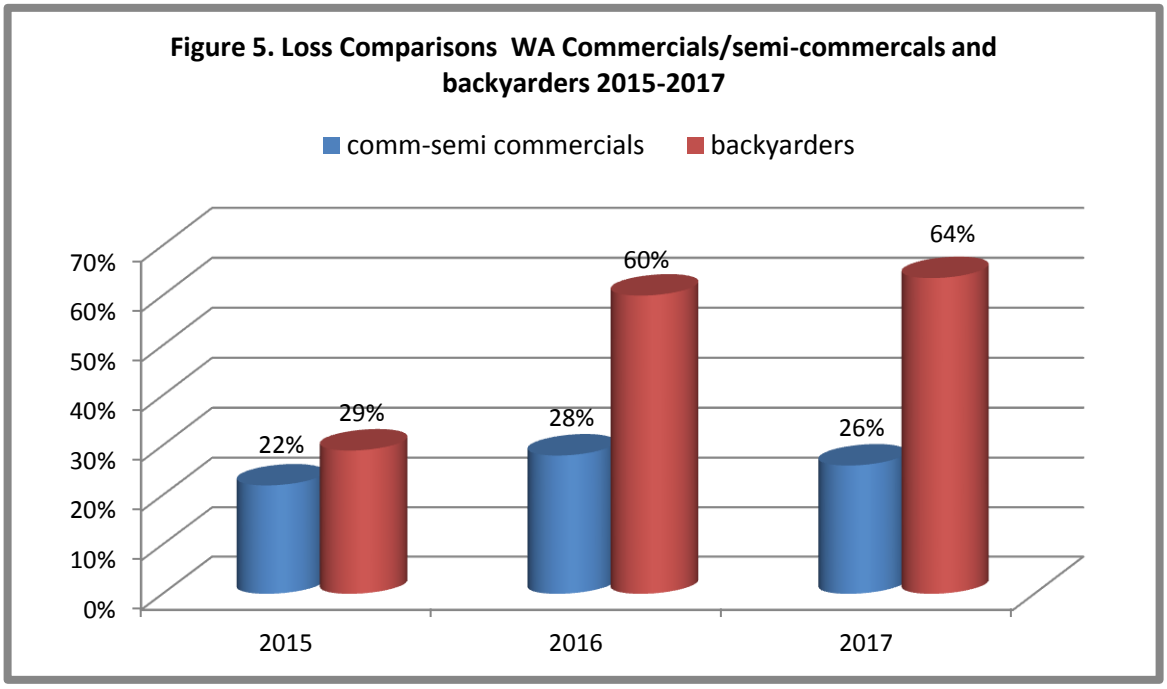


Loss by hive origination: We also asked survey respondents to list their loss by hive origination. The result is graphically presented below for WA, Clark/Cowlitz and Lewis Co beekeepers. Overwintered colonies, as expected, had the best survival. Swarm loses were comparable. Package losses were higher than nucs. Relative rates of loss by origination were the same for both survey years.



Comparison of backyarders and commercial/semi-commercial beekeepers

A different (paper) survey instrument was mailed to Pacific Northwest (PNW) semi-commercial (50-500 colonies) and commercial beekeepers (500+) asking about their overwintering losses. Comparison is shown in Figure 5 below with approximate number of hives represented by the commercial/semi-commercial beekeepers and number of backyarders.

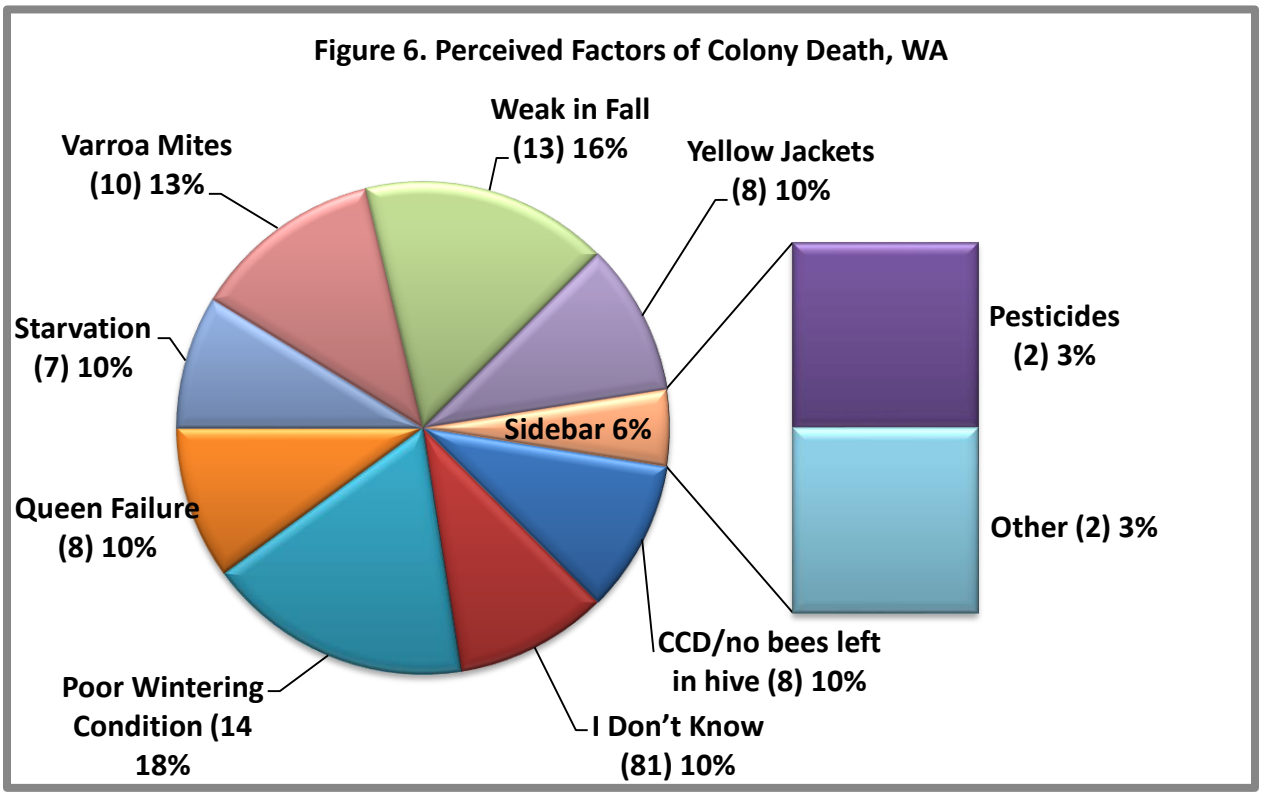


# Comm hives	~40,000	33,200	~16,600
# backyarders	31	52	102

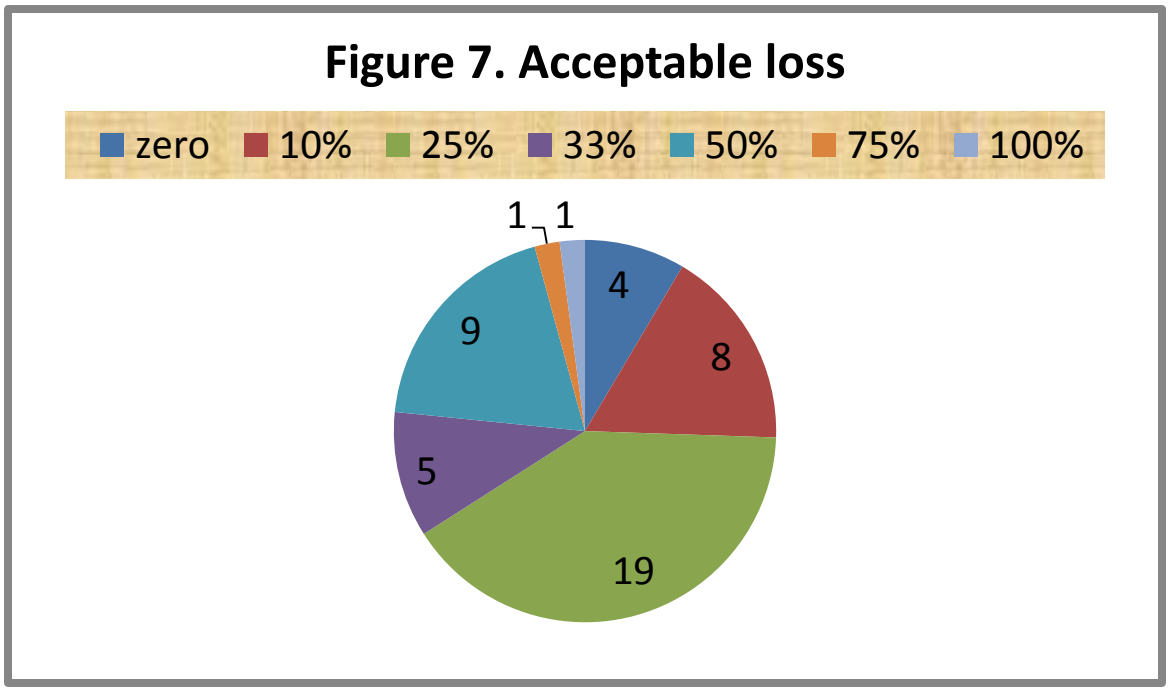
Backyard losses have consistently been higher, most years double the losses of larger-scale beekeepers, over 7 years of survey responses. The reasons why are complex, but commercial and semi-commercial beekeepers examine colonies more frequently and they examine them first thing in the spring as they take virtually all of their colonies to Almonds in February. They also are more likely to take losses in the fall and are more pro-active in varroa mite control management.

Self-reported "reasons" for colony losses: See the graphic below for the "reasons" WA respondents provided as the reasons for their overwintering losses. Weak in the fall and poor wintering conditions were the major factors listed, closely followed by varroa mites. Other responses (number of individuals) and percent (more than one response was permitted) shown in Figure 6.

There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for different reasons. **Doing the forensics is the first step in seeking to solve the heavy loss problem. More attention to colony strength and checking stores to help avoid winter starvation will help reduce some of the losses. Control of varroa mites will also help reduce losses**. Our survey, asked about managements, mite controls and queens as can be read in the following pages.



Respondents were asked to select an acceptable loss level, being offered several categories to check. Four individuals said zero, while 8 said 10% (25% for both responses) 19 said 25% (40%), 5 said 33% and 9 said 50% loss (19%) was acceptable. One individual each said 75% and 100% (=4%).



Why do colonies die? There appears to be no single reason for loss and 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. Major factors are thought to be mites, pesticides, declining nutrition adequacy of the environment and diseases, especially viruses and Nosema. Management, failure to do something or doing things incorrectly, remains a factor in our losses.

What effects our alteration to the bee's natural environment and other external factors play in colony losses are not at all clear.

Langstroth wrote about the importance of taking losses in fall management saying if the beekeeper neglects such attention to his/her colonies 45% loss levels may occur, depending upon variable environmental conditions. It can be argued that losses of 30, 40, 50% or more might be "normal." Older, more experienced beekeepers recall when loss levels were 15% or less. Honey production fluctuates each year but seem to be declining on average. Numbers of U.S. bee colonies have declined since the 1940s, returning to numbers for 100 years ago but worldwide numbers of bee colonies are steadily increasing.

So there is no simple answer to explain the levels of current losses nor is it possible to demonstrate that they are excessive for all the issues facing honey bees in the current environment.

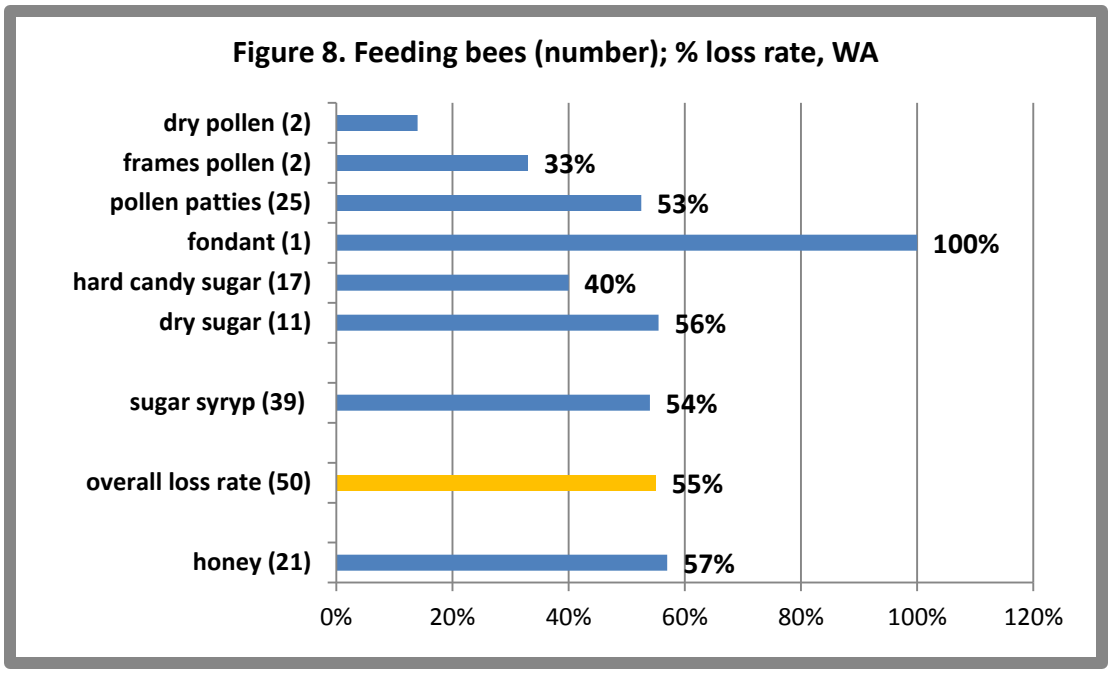
Pro-active Managements: Do you feed bee colonies in your care with sugar, honey or protein? Do you take extra measures for wintering preparation? Are we doing the sanitary practices we would in animal husbandry with our bees such as cleaning hive tools between inspecting different hives or check to confirm the donor colony is healthy when we take a frame from one colony to another?

The survey asks some basic questions to allow comparison of loss rates from beekeepers that may perform one management with those who don't do that management or with the average loss level. Basically how do management practices affect colony losses? Remember these will be correlations, not causation, since we know bee losses are due to multiple factors. It is not valid to assume that if you do xyz, you won't have losses; the data mean that some people doing xyz don't suffer heavy losses and have better survival. The survey data can help us think about what we are doing or, perhaps should be doing, in our management. CAUTION: We do NOT do just one thing yet these comparisons are for a single factor only. It may be the combination, but maybe when something is done that factor can result in a lower loss/better survival.

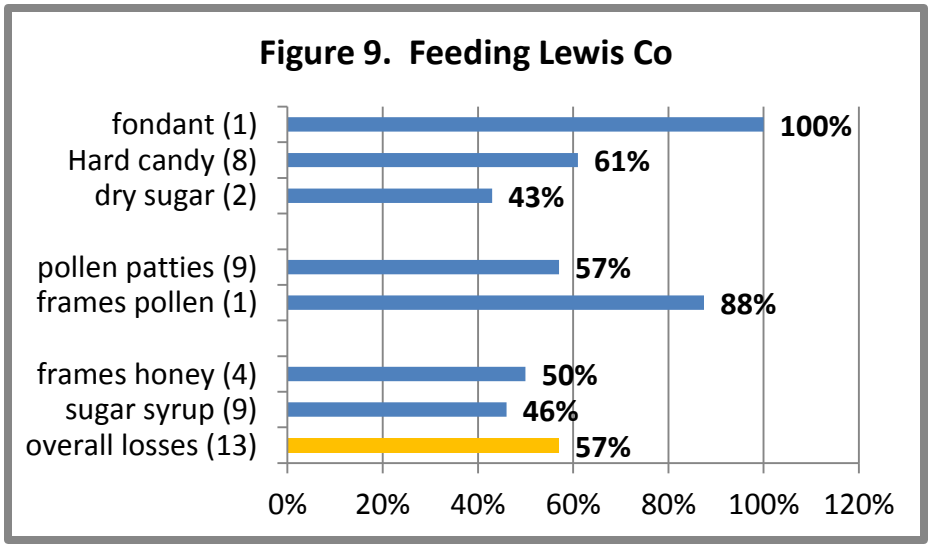
FEEDING PRACTICES: There were 121 selections of feeding managements by Washington beekeepers (2.4/individual). Seven individuals made 5 selections and 4 had 4 selections. Five had a single selection (all were Feeding sugar syrup). Feeding bees carbohydrate in form of sugar syrup was indicated by 39 individuals (85% of individuals) and frames of honey by 20 individual respondents

(43.5%). Feeding of hard sugar candy was done by 17 individuals, dry sugar by 11 and one individual fed fondant. Feeding of protein in form of pollen patties was indicated by 25 individuals (54%) but frames of pollen and dry pollen by only 2 individual each.

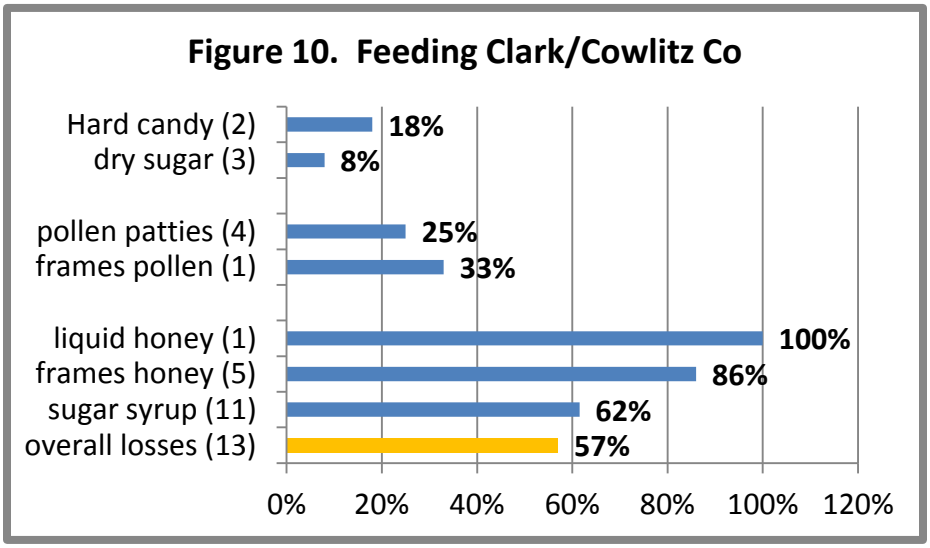
Feeding of hard sugar candy and the 4 individuals that fed pollen (2 as dry pollen (14% loss) and 2 as pollen frames, 33% loss) had greater overwintering success compared to the average WA loss of 55%. NOTE: Overall WA beekeeper loss was 63% but loss for those completing the total electronic survey was 55% (the Olympia beekeeper survey did not include the total survey questions.



LEWIS CO: Feeding was done by all but 2 individuals (33% loss). A total of 35 selections were made by the remaining 11 members (3.2/ individual). Two indicated 5 and another 2 reported 4 feeding managements, 3 individuals had 3 selections and 4 had 2. Most common were feeding of sugar syrup (9 of 11 individuals) and 9 individuals also said they fed pollen patties; 8 used hard candy. Dry sugar feeding (only 2 individuals) showed reduced loss (43% vs 57% overall), with sugar syrup and feeding frames of honey also had reduced losses.



CLARK/COWLITZ Co: Feeding was done by all but 2 individuals. A total of 28 selections were made by the remaining 13 members (2.2/ individual). One indicated 4 and 3 reported 3 feeding managements, 7 individuals had 2 selections and 3 had a single choice (all sugar syrup). Most common was feeding of sugar syrup (11 of 13 individuals). The 4 individuals feeding pollen patties and the single individual reporting feeding of pollen frame had greater survivorship than average as did those individuals feeding hard candy (4 individuals) and dry sugar (3 individuals).

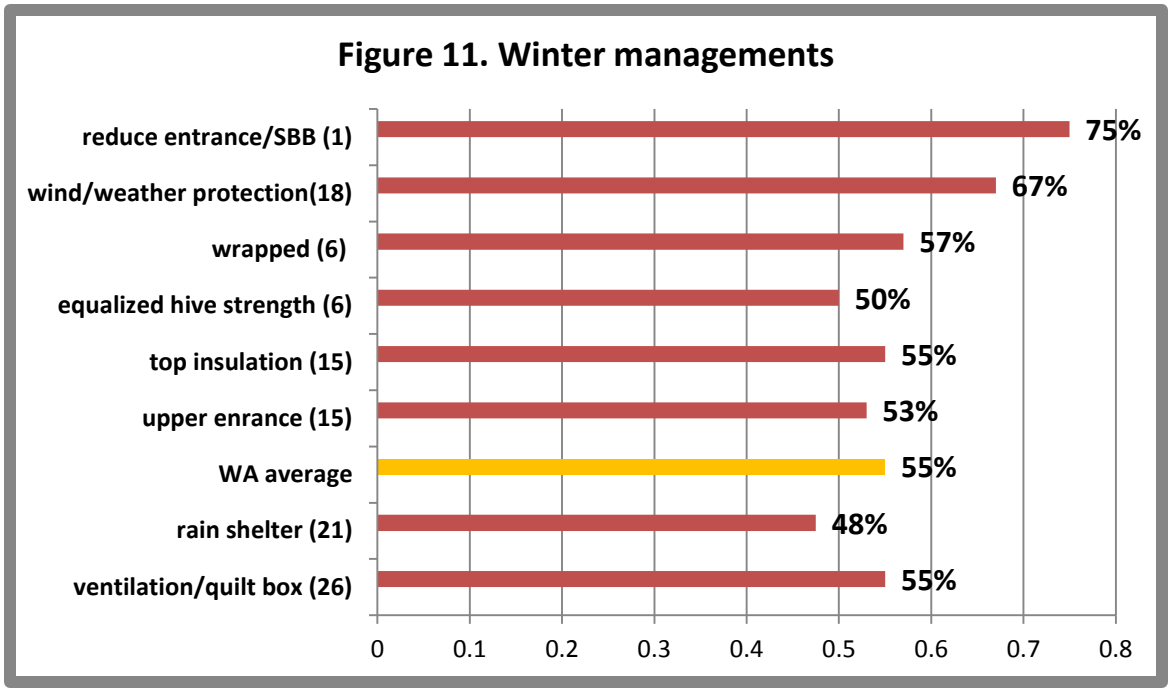


For the larger data base of 282 OR backyard beekeepers, the survey returns indicate a high level of feeding management of both sugars and supplemental protein. Sixty one percent of individuals did more than one thing, 28% checked two items and 34% did 3 or more feeding managements, including one individual who selected 7 different choices. Individuals feeding protein as dry pollen (17 individuals had 27% loss rate) and as pollen patties (184 individuals had a 41% loss rate) had lower loss levels. Individuals feeding hard candy (62 individuals) and dry sugar (60 individuals) also had losses below the overall average (39% and 40% respectively) – overall loss rate for the 282 OR beekeepers were 48%.

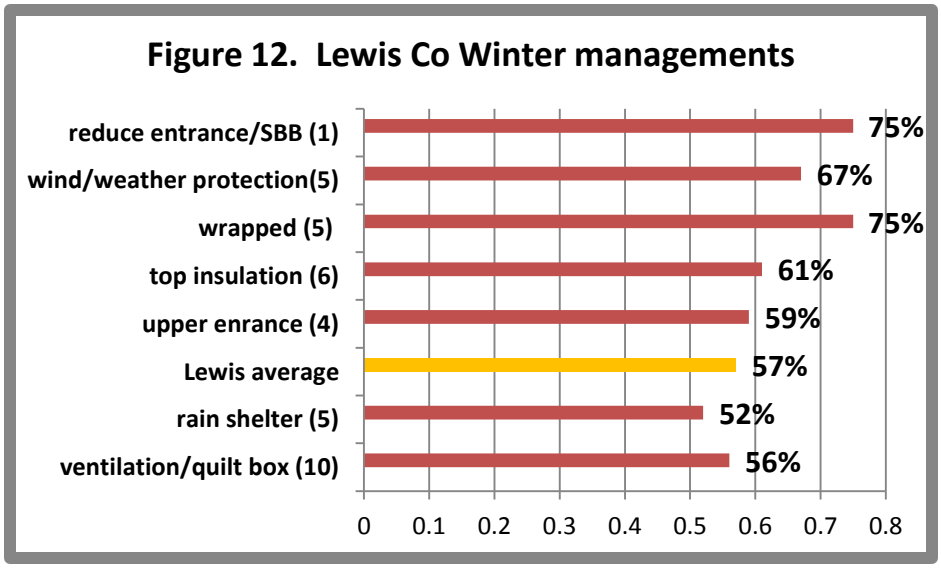
It appears feeding protein, either as dry or as pollen patties, improves survivorship. Also feeding dry sugar or a hard sugar candy improves survivorship. Feeding can make for better overwinter survival.

WINTERING: In all 5 WA individuals made no selectins. They had a 53% loss. The remaining 45 WA individuals made a total of 115 selections (2.5/individual). Six individuals indicated doing 5 selections and 5 had 4 choices. There were 10 individuals marking a single management.

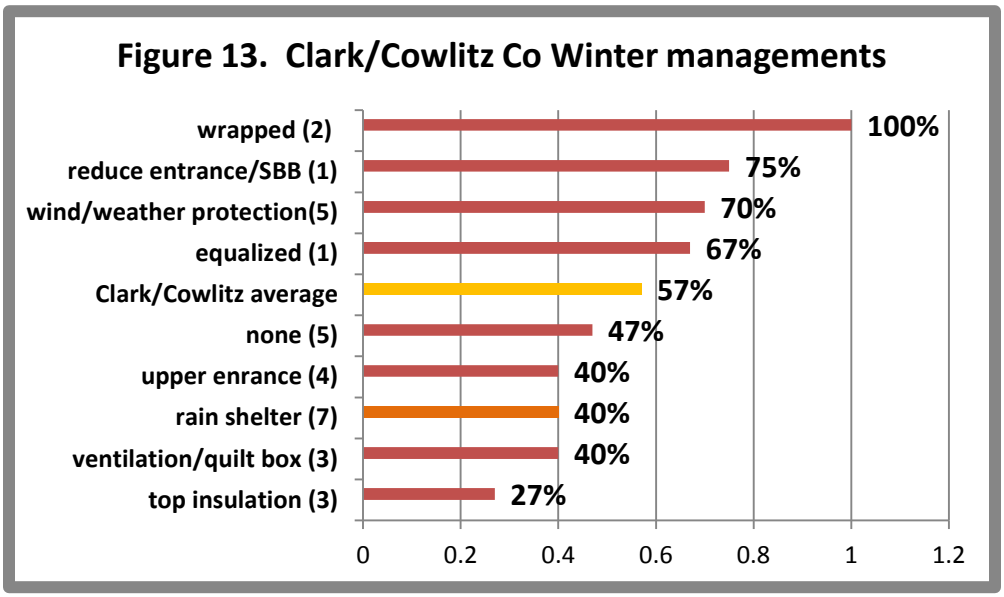
Use of a ventilation/quilt box was the most common management indicated by 26 individuals (58% of individuals). Use of a rain shelter (18 individuals) followed by top insulation and upper entrance (15 individuals each) were also popular managements. As shown In Figure 11, only use of rain shelter and equalizing colony strength managements had a lower loss among WA beekeepers.



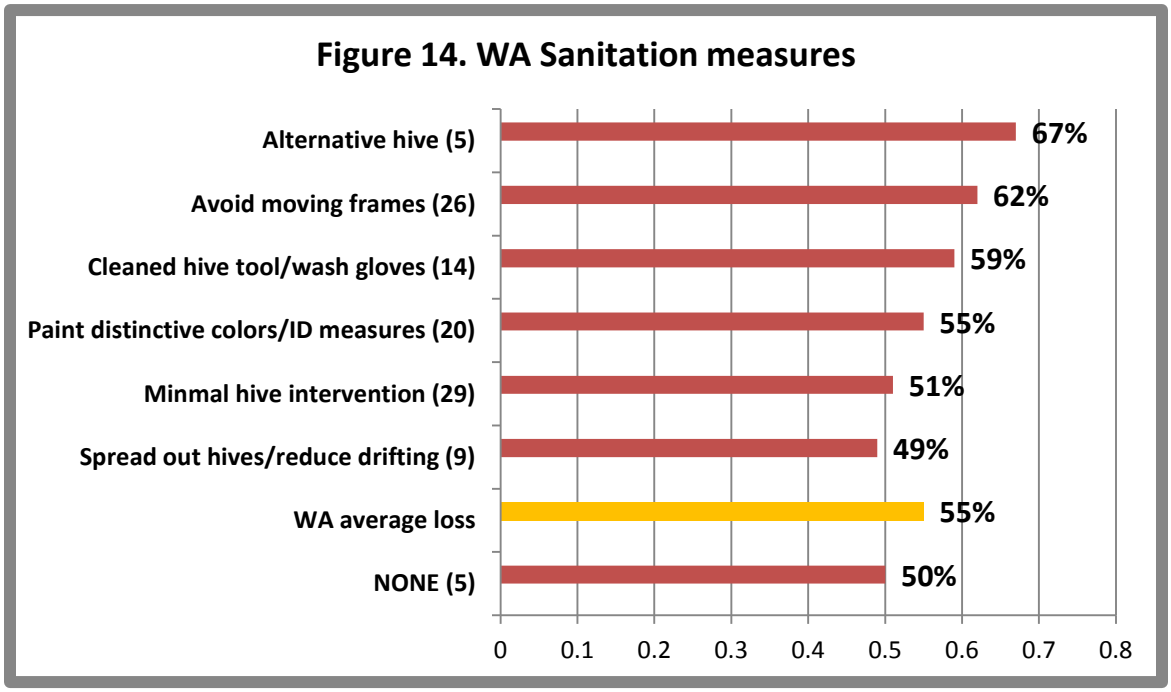
LEWIS CO. There were 36 choices by Lewis co respondents (2.8/individual). Three individuals had 5 selections, one had 4, two had 3 and there were 3 with a single selection (all ventilation/quilt box). The only selectin that showed a reduced loss was use of a rain shelter (5 individuals); they had a 52% loss rate.



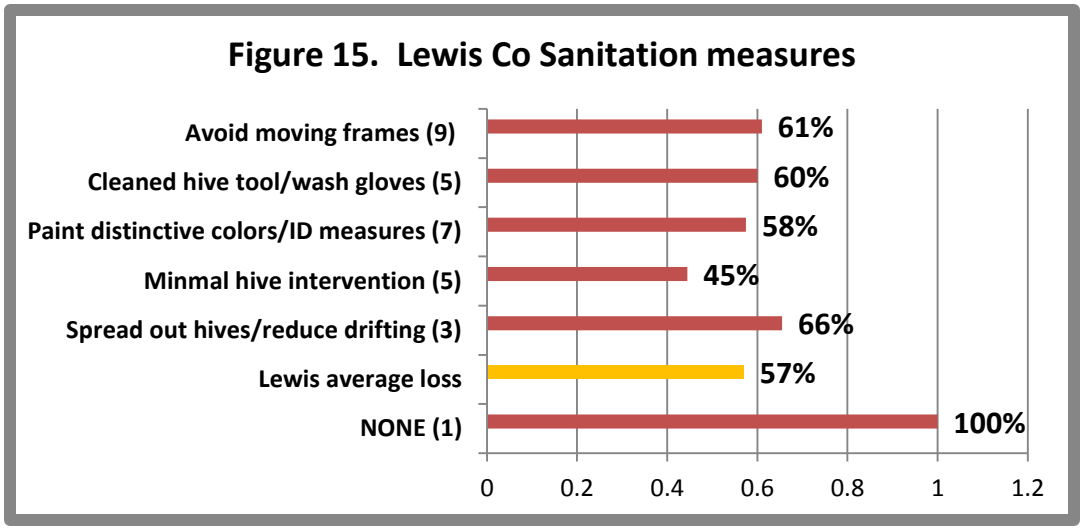
CLARK/COWLITZ CO. There were 5 individuals who had NO selections (had 47% loss). In total there were 23 selections (2.3/individual). One individual had 5 choices, two had 4 and there were 3 selections by 3 individuals. Four had a single selection. Four winter managements (top insulation, upper entrance, rain shelter and ventilation/quit box) managements had a lower loss rate compared to the average of the 2 clubs. Figure 13.



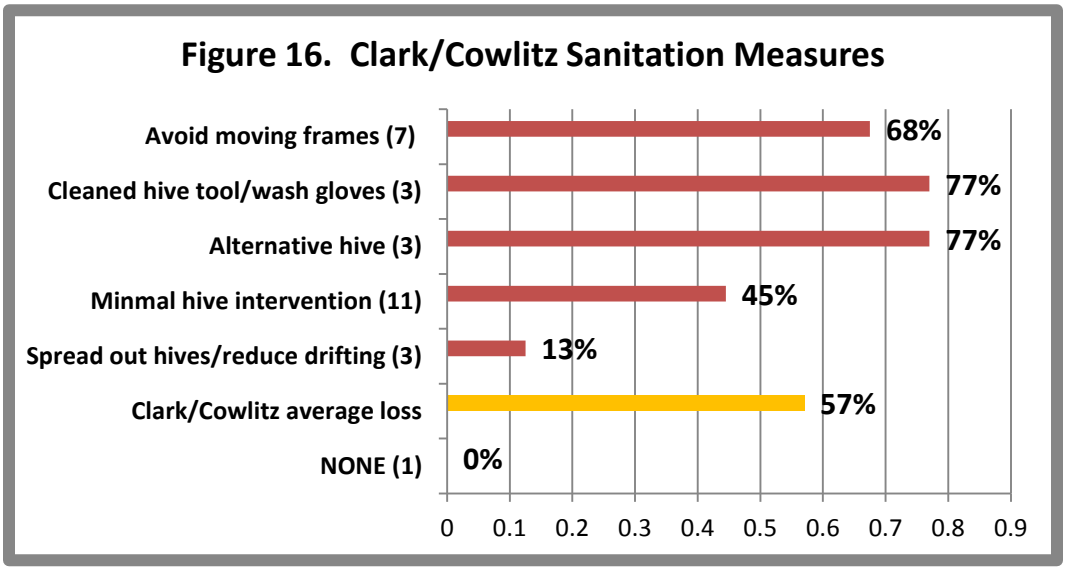
SANITATION PRACTICES: It is critical that we practice some basic sanitation (some prefer use of term bee biosecurity) in our bee care. We can do more basic sanitary practices to help insure healthy bees. Five individuals (10%) did not select any of the options listed under sanitation practices; they had a 50% loss rate. A total of 105 selections were marked (2.1/individual), 3 had 5 selections, eight had 4 and 9 a single choice only (all minimal hive intervention). Minimal hive intervention (29 individuals - 59%) was the most common option selected and avoid moving frames (26 individuals – 53%) was also commonly indicated. Only minimal hive intervention and spread hives out/other measures to reduce drifting showed losses below the statewide average.



LEWIS CO. There was one individual who had no choices and lost all 3 colonies (100% loss). There were a total of 29 selections by the remaining 12 individuals (2.4/individual). Four individuals had 4 selections, five had 2 and three had a single selectin (2 of the 3 were minimal hive intervention). Minimal hive intervention was the only selection with losses below county average.



CLARK/COWLITZ Co. One individual had no selections and their 4 colonies all survived (0% loss). The remaining 14 individuals had 54 choices (3.9/individual); two had 5 selections, one had 4, two had 3 and 2 each and 6 had a single selection (minimal hive intervention). As shown in Figure 16, two measures, spreading out hives/reduce drifting measures (3 individuals with only a 13% loss) and minimal hive intervention by 11 individuals, the most common selection, showed losses below the average for the two counties.



SCREEN BOTTOM BOARDS: In the survey we asked what percentage of hives had screen bottom boards and whether they were blocked during the winter. Eighteen percent of WA beekeepers said they did not use screened bottoms (had a 69% loss) compared to loss of 51% loss rate of those using SBB on all or some of their colonies. Statewide the majority of individuals (54.5%) left the bottom screens open (had a 49.5% loss) while those who closed them had a 54% loss rate. For 282 OR beekeepers loss rates of leaving open vs closing did not make a difference.

In **Lewis County** only 1 of 13 did not use a SBB (had a 67% loss) and for Clark/Cowlitz beekeepers, 5 of 15 did not use SBB; they had a73% loss. A majority of Lewis Co (58%) and equal numbers (5 and 5) of Clark/Cowlitz Co beekeepers left the screens open over the winter period (never response). In Both groups individuals leaving screens open had lower loss rates (Lewis Co 45% and Clark/Cowlitz (38.5%) compared to those closing them over winter.

There is no good science on whether open or closed bottoms make a difference in overwintering success but some beekeepers "feel" bees do better with them closed overwinter. An open bottom, at least part of the year, can assist the bees in keeping their hive cleaner. When SBB use is correlated with colony losses, a small (5 percentage points) advantage is gained with their use by OR and WA beekeepers.

Managements 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 frequently do not do only a single management nor do they necessarily do the same thing to all the colonies in their care. Smaller numbers, as in local associations, are sometimes widely skewed and it is more difficult to show significance of different managements with lower respondent numbers.

We do know moisture kills bees, not cold, so we recommend hives be located in the sun out of the wind and, when exposed, provided with some extra wind/weather/rain protection to improve survival. Using screened bottom boards and leaving them open (or closed as per your preference) for ventilation, helps improve survival. Use of insulted tops/quilt box with moisture collector such as burlap, straw, old towels, etc. with extra top ventilation and a top entrance to vent excess moisture is an apparent advantage.

Feeding bees either sugar syrup or honey from other disease-free hives, helps insure enough food stores during early fall management and is useful spring stimulation. Once fall rains start, we should halt syrup feeding and switch to feed dry sugar or a hard sugar candy to avoid adding additional moisture stress to colonies. Feeding protein, including dry pollen and pollen patties helped survival.

Finally, it would seem prudent to review basic sanitation measures, as anything we can do to help reduce sick bees and improve colony health, will improve overall survival.

Mite monitoring/sampling and control management

All WA bee hives have or will have varroa mites. It is important to know how many mites are present. Knowing how many mites provides an estimate of approximate risk of mites elevating colony losses for the time of year the sampling is done and, when sampling is started in July and continued into October, for the overwintering period. Mites are not the only pest/predator/pathogen than can seriously weaken or kill colonies but studies point to their being the most significant.

MITE MONITORING: To know how many mites, beekeepers need monitor/sample hives for mites. The PNWhoneybeesurvey asks percentage of WA hives monitored for mites during the 2016 year and/or 2016-17 overwinter, whether sampling was pre- or post-treatment or both and, of the five possible mite sampling methods, what method was used, including when (month) it was employed.

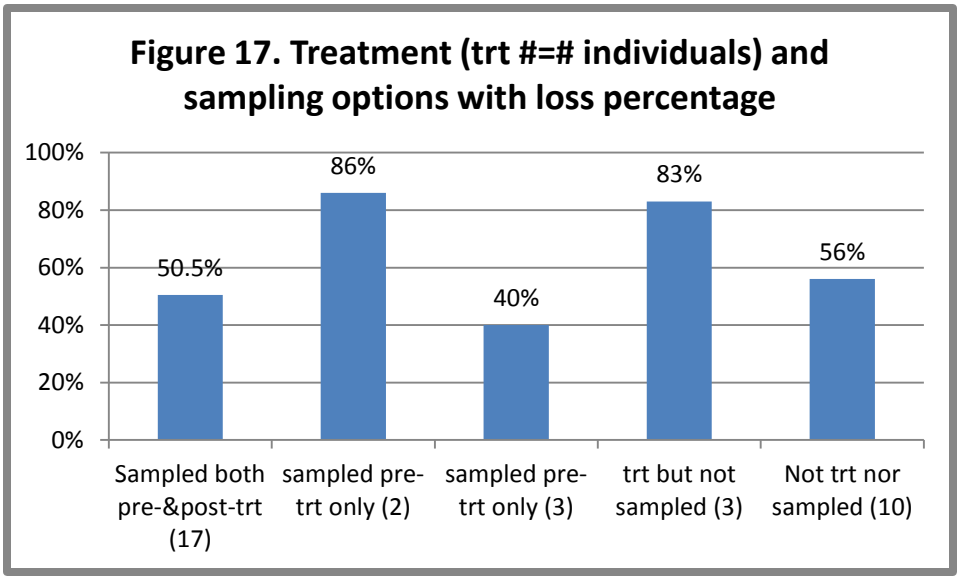
Statewide, 28 individual respondents (57%) said they monitored all their hives and an additional 6 monitored some of their colonies. Comparing losses of those individuals monitoring all their hives, alongside those not monitoring, as well as those who indicated they monitored some of their hives, reveals a 58% loss of those 34 individuals monitoring some or all their hives while the 15 individuals (30.5%) who said they did NO monitoring lost 44% of their hives.

Loss rates were exactly opposite the results for the 282 OR beekeepers. In OR 230 individuals monitored some or all their hives and had a 45% loss compared to the 62 individuals (22%) who reported they did no monitoring and had the statewide average loss of 48% loss. I believe the explanation is that most of the monitoring was done with the three most ineffective techniques of sticky boards and visually looking for mites in drone brood and on adults (see below).

LEWIS & CLARK/COWLITZ Co: For Lewis Co beekeepers, 6 individuals (46%) who did no monitoring had a 41.5% loss and the 6 who monitored all or some (1 individual) colonies had a 59.5% loss. For Clark/Cowlitz Co beekeeper respondents, 5 individuals (33%) who did no monitoring had 33% loss while the 10 who monitored all or some of their colonies had a 67% loss

When asked how the hives were monitored, the 34 WA individuals who indicated they did monitor had five choices. Six individuals selected only a single method while the remainder selected two or more methods. Most popular was sticky boards (18 individuals, 59% of WA beekeepers), followed by visually looking at drone brood (20 individuals) and on adults (18 individuals). Four individuals used alcohol wash and 13 used powdered sugar but losses of both were 81% and 72% respectively. In OR the opposite was again found with individuals using alcohol wash and/or powdered sugar having lower than normal losses. See the OR state report on the website pnwhoneybeesurvey.com.

For WA beekeepers the most common response was sampling both pre- and post-treatment (17 individuals had 50.5% loss). Two individuals indicated only pre-treatment and three post-treatment (these three had the best survival – 40% loss only). Ten individuals did not sample or treat (56% loss) and those who treated but did not sample had an 83% loss rate. Sampling both pre- and post-treatment as well as pre-treatment was the most effective with a (slightly) reduced loss rate. Figure 17.



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 seeing number of mites collected can be difficult). Sticky boards are however helpful for a post-treatment sampling – if after a day of sticky board use mites are obvious means the treatment was not entirely effective.

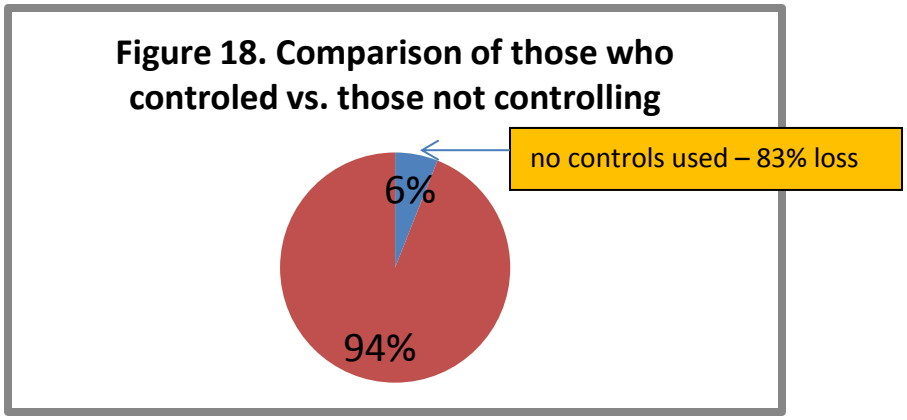
Visually sampling of adults is not accurate: most mites present in the colony are not phoretic on the adult bees, but are reproducing within capped brood cells. Likewise looking at drone brood for mites is not effective to determine how many mites are present but looking at some drones during colony exam can be useful if, when we see mites in drone brood, we then use a more reliable adult washing technique.

See Tools for Varroa Monitoring Guide www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and 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% in spring (i.e. 2 mites/100 adult bees) and below 5% (no more than 5 mites to 100 adults) when at its largest size during nectar flow following buildup. 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.

Individuals who did monitor in OR, but not those in WA, had a slightly improved survival percentage when their losses were compared to individuals who said they did not monitor. **Pre-treatment can help with control decisions and checking on control effectiveness by post-treatment monitoring is important. Most effective sampling methods are the sugar shake and alcohol wash methods, and OR beekeepers using these two methods had lower losses.**

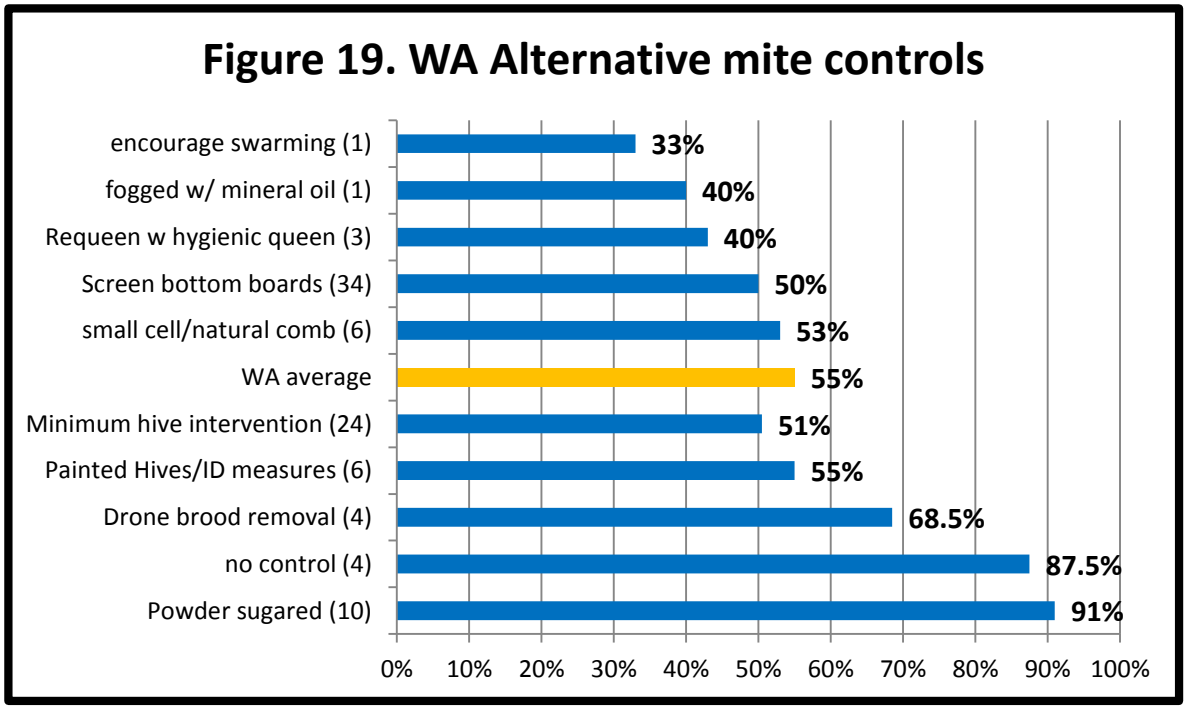
Use of treatments and chemical and control treatments

We asked about general non-chemical mite treatments and also about use of chemicals for mite control. **Three individuals said they did employ a mite control (alternative or chemical).** Figure 18. These individuals lost 5 of 6 colonies, 83% loss rate. The 4 individuals (8%) who did not use a non-chemical treatment had an 87.5% loss (lost 7 of 8 colonies) and the 25 WA individuals (51%) not using a chemical control had a 58% loss. See specific controls utilized below.



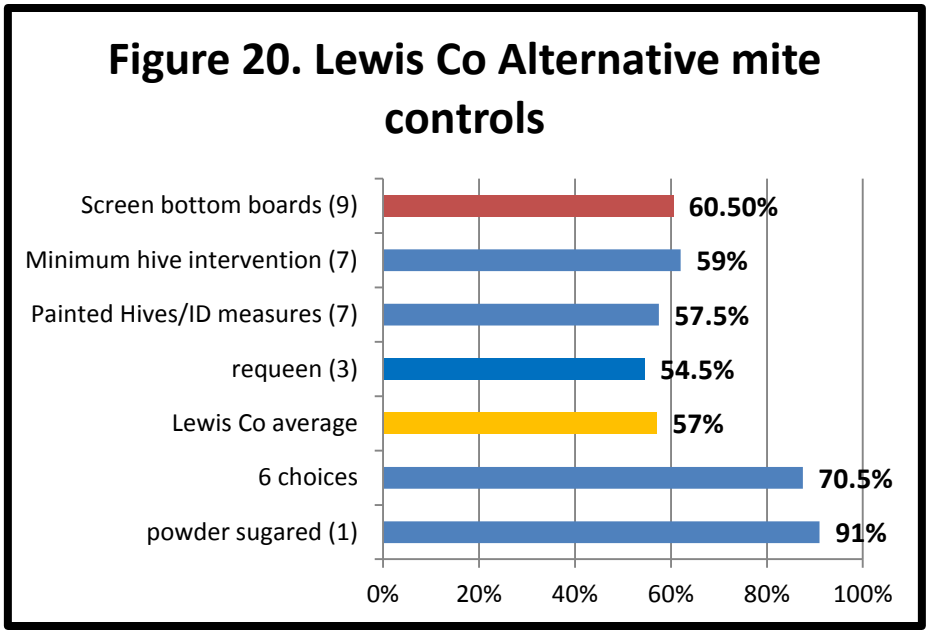
Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey, 4 WA respondents (8%) indicated they did not use any of the choices. These individuals had an 87.5% winter loss. In all 105 treatments were selected (2.3/individual); one individual had 5 selections, four choices were selected by 9 individuals and 3 indicated by 16 beekeepers. There were three that had a single selection.

For the respondents who checked at least one choice other than none (more than one selection was permitted), the most common selections were use of screened bottom board, indicated by 34 individuals (69%) and minimal hive intervention by 24 individuals (49%). Painting hives a

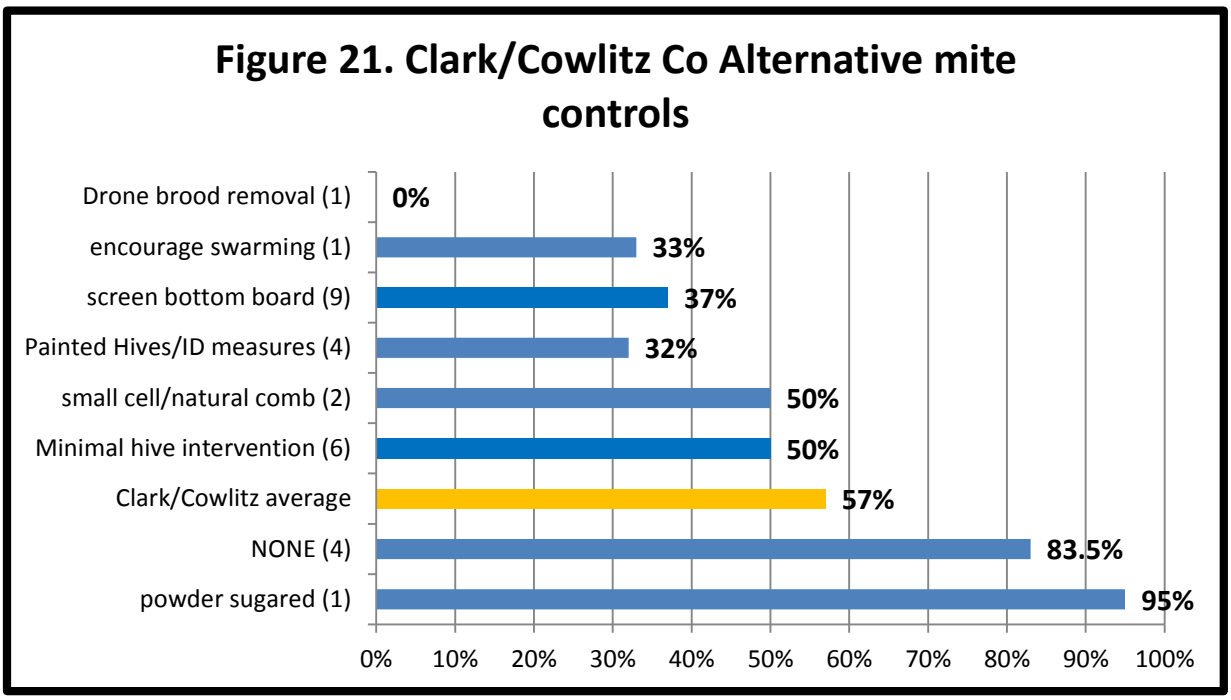


color/distinctive ID measures (16 individuals) and powder sugaring (10 individuals) were also popular; the remaining selections were chosen by 6 or fewer individuals**.** The highly interventive and difficult management of requeening with hygienic queen stock used by 6 individuals showed better survival along with two managements both used ONLY by one individual. Information show in Figure 19 **Timing and proper application of alternatives is critical to successful completion. Bees need time to properly prepare for winter following successful mite reduction.**

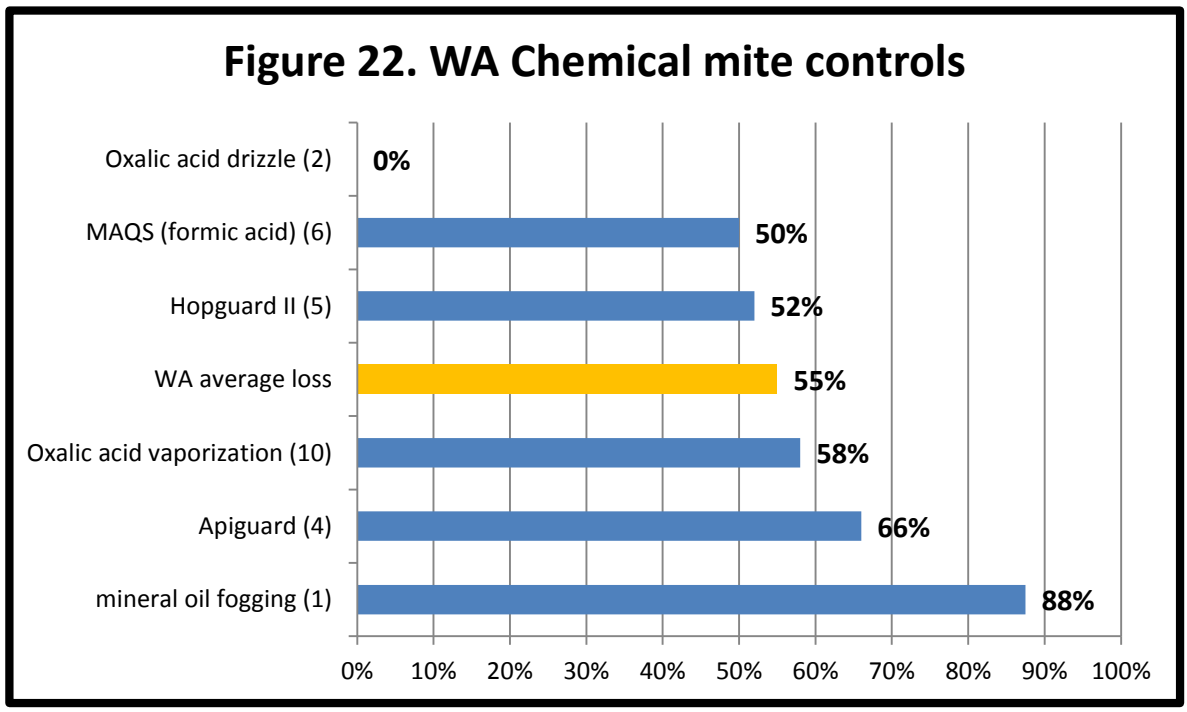
LEWIS Co: A single Lewis Co beekeeper did none of these alternative managements and lost both of their colonies (100% loss). One individual made 6 choices, one had 4 and two had three and a single choice. In all there were 30 selections (2.5/individual). The one individual who used 6 managements (including only individual using Drone brood removal, small cell/natural comb and brood cycle disruption) lost 7 of 8 hives (87.5% loss). None of the other choices improved survival for Lewis Co beekeepers, although 3 individuals requeening with hygienic queens had slightly lower loss.



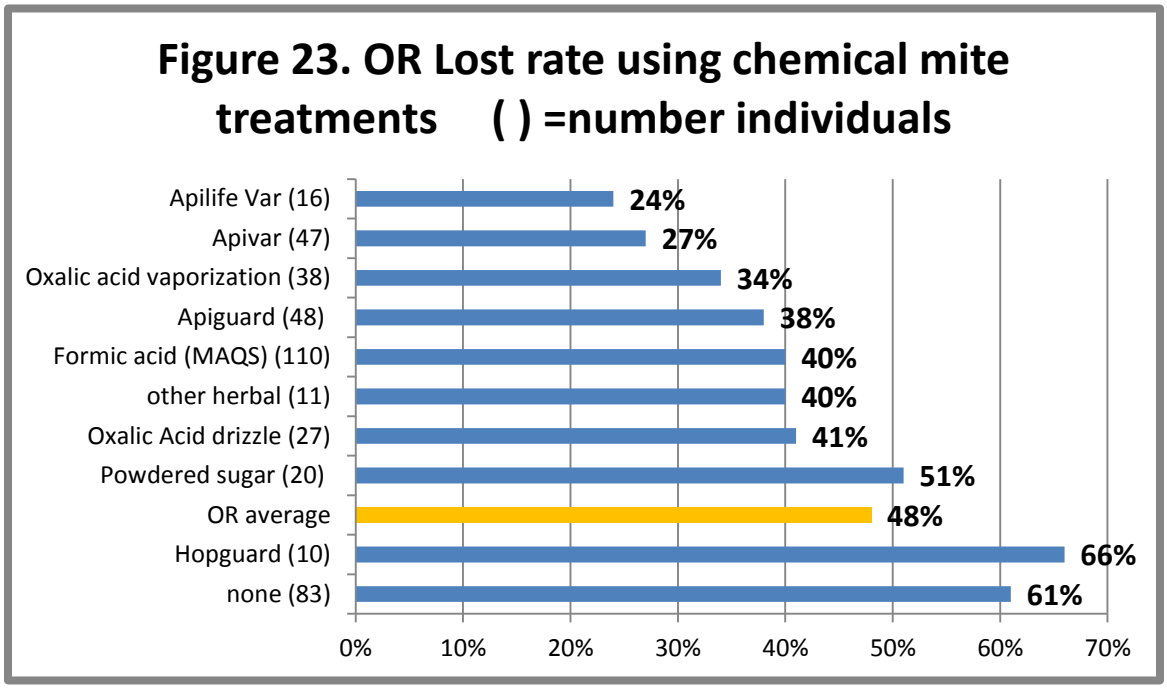
CLARK/COWLITZ Co: Four Co individuals had no selections and they had an 83.5% loss. The remaining individuals had 26 total choices (2.2/individual). Three individual had 3 choices while 5 had a single selection. The single individual who used drone brood removal (they also used a SBB) had no loss of 4 total colonies (0% loss). The one individual who indicated in "other" that they encouraged swarming (also used minimal hive intervention and small cell/natural comb) lost one of 3 fall colonies (33% loss). Four individuals who painted their hives different colors/did other distinctive colony ID measures had a 32% loss level). The 9 members using Screen bottom boards also had reduced loss. Figure 21.



Chemical Control: Twenty five WA beekeepers did NOT use a chemical control –they had a 58% loss. The 24 who did use a chemical had a loss of 53.5%. In all, 35 selections were made (1.5/individual). Two individuals made 3 choices and 8 had two. Fourteen individuals had a single choice. The choices and the loss rate are show in Figure 20. Only the 2 individuals who used oxalic acid dribble had no loss of colonies but none of the remaining chemical alternatives improved losses.



For comparison, 199 OR beekeepers (71%) indicated they used a chemical control. The 29% not using a chemical had a 61% loss, significantly above the average loss of 48% for the 282 OR respondents. The 16 individuals using ApiLife Var had the best survival (24% loss) and the 47 using Apivar had a reduced loss rate of 27%. Losses below average were also evident for users of oxalic acid vaporization (38 individuals – 40% loss) and Oxalic acid drizzle (27 individuals, 41% loss) as did Apiguard (48 individuals also 40% loss). It is not known why chemical controls were less successful for WA compared to OR beekeepers.



LEWIS CO: Seven Lewis Co respondents (58%) used a chemical control. Numbers are too small to have meaning to list individually by loss. There were 11 chemicals used (1.6/individual); one individual used 3 chemicals (had 87.5% loss) and two used 2 materials (55.5% loss). Five individuals used Oxalic acid vaporization with an 80% loss. Oher materials used included mineral oil, ApiLife Var, Powdered sugar and Hopguard II, all by a single individual (and all in combination with another material.

CLARK/COWLITZ CO: Six individuals (40% of members) used 10 chemical treatments (1.7/individual). One individual did 3 materials and 2 did two materials. Oxalic acid vaporization was used by 3 individuals and they lost 2 colonies of 13 (15% loss) and three also did Apivar losing 3 of 8 total colonies (37.5% loss). Two individuals used MAQS (formic acid0 but had a 70% loss). Other two materials used were Apiguard and Hopguard II; both had 95% loss rate.

Two individuals, one in Lewis and one in Clark Co indicated they fed Terramycin for foul-brood disease and four used Fumigillan for Nosema disease control; one in Lewis Co and one individual who used both materials in Clark Co (but had very heavy losses - 95%).

What works: Drone brood removal is a non-chemical treatment that helps slow mite development in most colonies during spring buildup. You can buy a drone foundation frame or put a shallow frame into a standard brood box and have bees construct drone cells below the shallow bottom bar. A female mite in a drone cell can reproduce 3 daughters, as opposed to 1 in a worker cell. It is critical to harvest the drones at capping stage before they emerge as adults, to suppress mite growth. Feed the drone brood to your chickens. The colony doesn't need that many drones. For northern beekeepers, drone brood removal reduced winter losses 10 to 33% according to BIP data but did not make a difference for 42 Oregon beekeepers; the one WA beekeeper using the technique did not lose any of their 4 colonies. This technique can only be utilized during spring buildup.

Breaking the brood cycle, with requeening, especially if hygienic queen stock or local selected stock is substituted, can also keep mite numbers at educed levels in most bee colonies. Both are a lot of work and new beekeepers should not seek to use such techniques until they have a better understanding of bee colony life cycles and queen event behaviors in colonies. This technique was used by 28 beekeepers in OR but did not reduced losses; none indicated its use in WA.

There is a wide array of chemical treatments available to treat varroa mites. They are often the best choice when mite populations are high as they can be very effective. Materials that can be used include acids such as formic acid (Mite-Away Quick Strips, or MAQS) and oxalic acid), essential oils [Apiguard or ApiLife Var] and the highly effective synthetic miticide, Apivar (amitraz). All have possible serious negative effects to the beekeeper applicator and they can contaminate the beeswax and honey of the hive. They work best under certain conditions. A number of chemicals seemed to help reduce losses for OR beekeepers (Figure 23) but not in WA except for 2 individuals using Oxalic acid dribble.

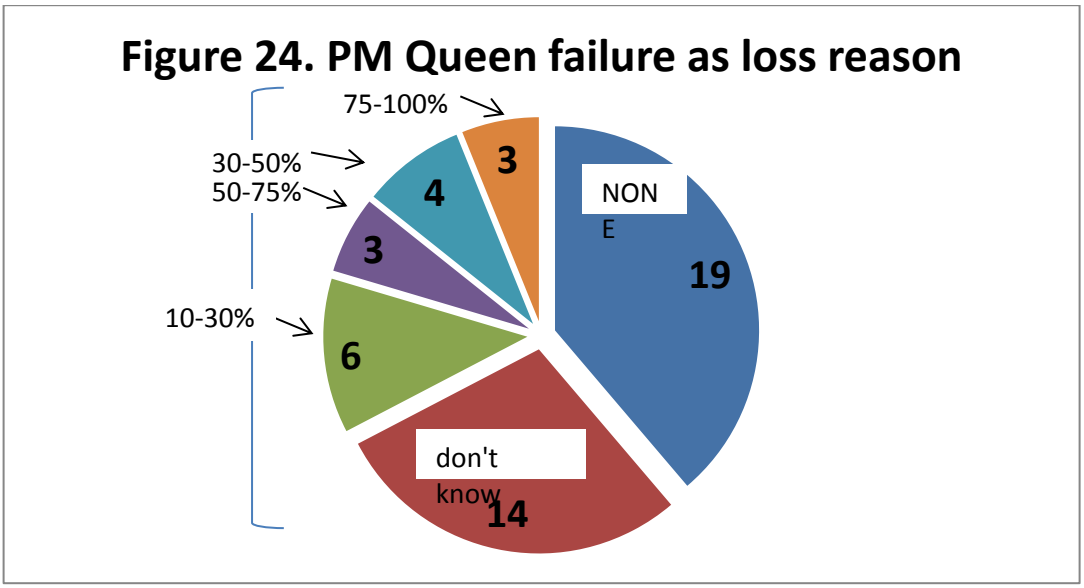
QUEENS, QUEENS

The PNW honey bee survey asks individuals with overwinter loss to what they attribute their loss. Fifty-five of the 282 OR respondents (13%) attributed at least some of the loss of their colonies to queen failure; among WA respondents, 8 individuals (16%) listed queen failure as one of the contributing reasons for their losses.

However, with the health and welfare of the queen (the 'heart of the hive') critical to bee hive development and success, we also have a survey section just covering queens. We ask specifically what percentage of colonies might have been lost to queen related issues. For the total OR respondents, 127 (47%) said none and 66 respondents (24%) checked 'I don't know.' Twenty-nine percent (29%), double the number who listed it as a possible reason for winter loss, responded that queen loss might have been a factor in colony losses.

Among WA respondents, 19 individuals (39%) said none of their losses were likely due to queen failure and 14 (28.5%) said they did not know. Sixteen WA individuals (32.5%), also double the number compared to the previous self-reported reasons for loss, did attribute possible winter losses to queen failure. This last response required an estimate of the approximate percent of colony loss

that might be attributable to queen failure. Six individuals (25%) said 10-30%, 3 indicated 30-50%, four said 50-75% and 3 felt 75-100% of their loss could be due to queen failure. See Figure 15



One non-chemical management technique to reduce mite buildup in a colony is to requeen/break the brood cycle so we also asked about how managed colonies are requeened. Nineteen WA individuals said their colony (ies) did not requeen and 10 said they did not know if their colony (ies) requeened; these 29 individuals reported a 72.5% loss. For the 20 WA respondents (69%) reported their colony (ies) did requeen their loss level was 38%.

Two individuals said colony queen replacement was via swarming and 3 others said it was via supersedure (5 = 25%); these 5 colony owners had a 41% loss. Eleven individuals (55%) said they requeened by introduction of a mated queen (with 22% loss rate). One said requeening was via a virgin queen introduction (0% loss) and two via introduction of queen cells (51% loss). One said they split hives to allow the bees to requeen themselves with 29% loss.

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. Reports for individual bee groups are customized. As they are completed they will be posted by the name of the group. Additionally analysis will be performed and these reports will be posted to pnwhoneybeesurvey as they are completed.

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 July 2017