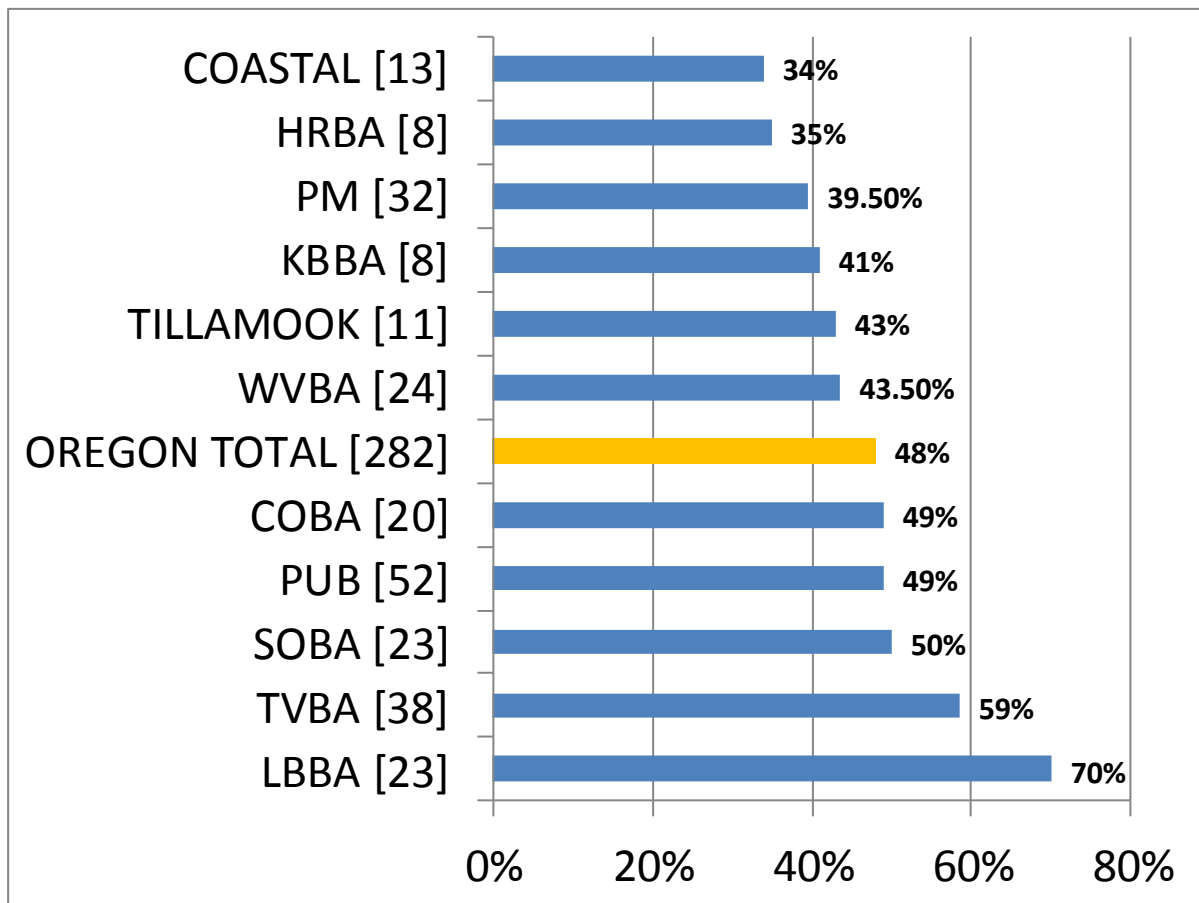


## 2016-17 PUB Winter Loss by Dewey M. Caron and Jenai Fitzpatrick

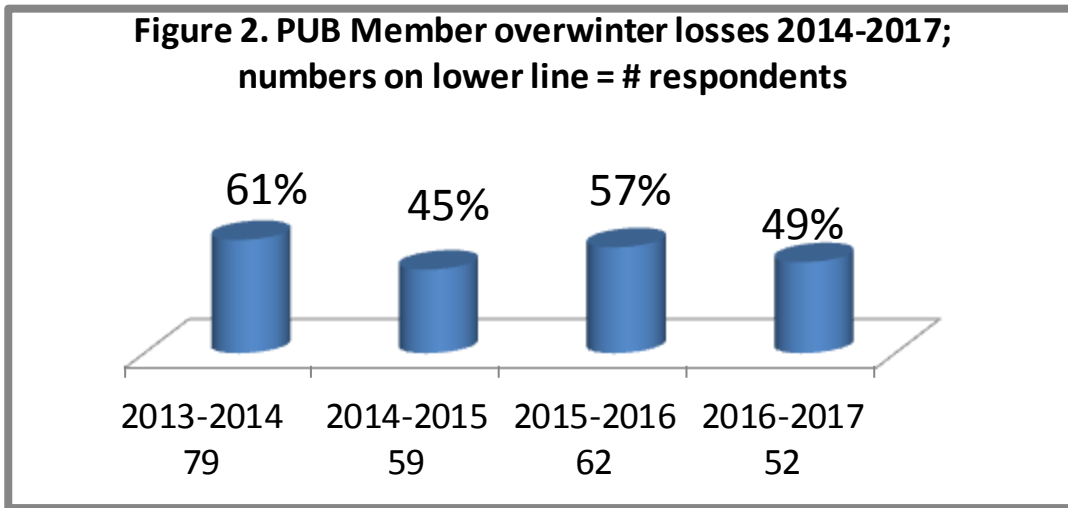
Overwintering losses of small scale Oregon backyard beekeepers was elevated 8 percentage points in 2016-2017, to 48%, compared with the previous season loss of 40%. During the 2016-2017 overwintering period, 52 PUB members supplied information on winter losses and several managements related to bee health with an electronic honey bee survey instrument developed within the PUB bee group [www.pnwhoneybeesurvey.com](http://www.pnwhoneybeesurvey.com).

A total of 282 responses, up 12% from 249 OR responses last year, were analyzed with the 2016-2017 statewide survey. PUB response numbers were down by 10 individuals (16%) from 62 members supplying information the previous year and are the fewest returns compared to previous years. The PUB member response, was once again the largest of 14 Oregon bee associations.. Twelve associations loss rates are show in Figure 1. The range of loss, from 34% to 70%, with Oregon average of 48%, was over a narrower range than in previous survey years. Last year there was 4-fold difference from 20% lowest loss to highest

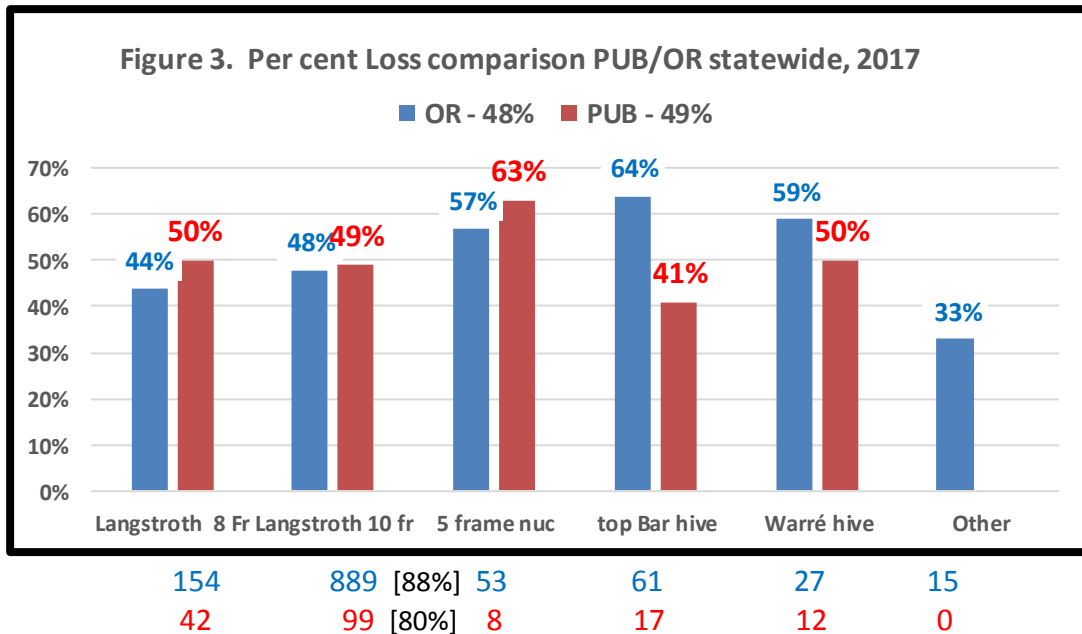


(80%) lost rate.

**Total overwintering losses of PUB respondents was 49%**, which was a single percentage point above the statewide loss of 4% (database of 282 OR backyarders). This loss, reduced 8 percentage points below the previous year, is 5 percentage points lower than the average loss of the three previous seasons. See Figure 2. PUB loss rate of 49% was not the highest of OR associations with 20 or more responses, as has been case in previous three years.

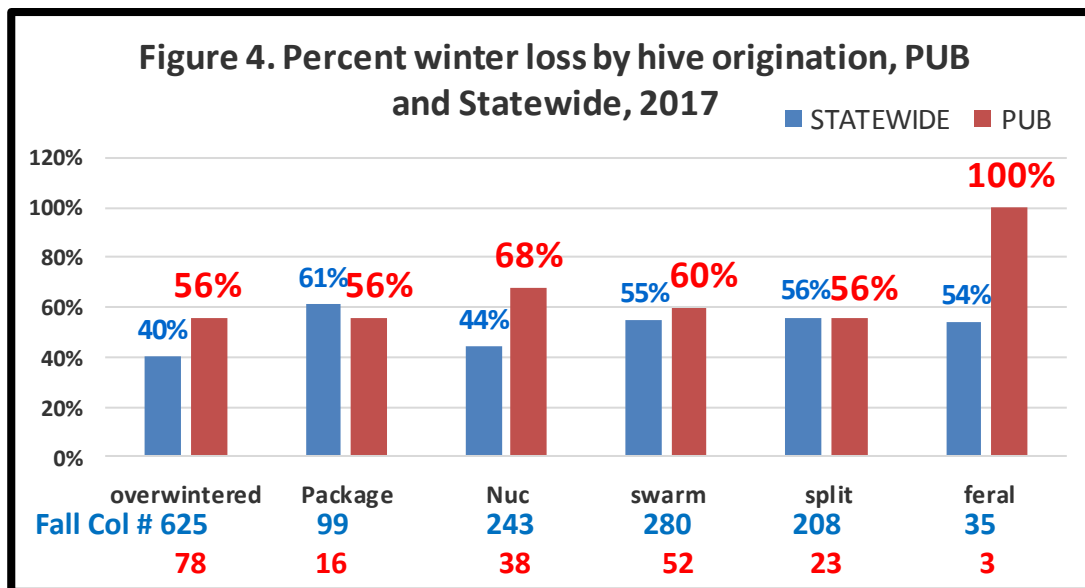


Loss statistics were based on response to survey question on winter loss by hive type. Categories included 8 and 10 frame Langstroth hives, 5-frame nucs, Top Bar hives, Warré hives and a category other hive types. PUB member respondents started winter with 99 Langstroth 10-frame hives and 42 Langstroth 8-frame hives (80% of total of PUB hives, 8 percentage points lower than statewide), 8 nucs (5-frame), 5 of which did not survive, 17 Top Bar hives (28% of total number statewide), 7 of which did not survive and 12 Warré hives (44% of total number statewide, ½ of which perished.) Figure 3 illustrates that loss rate. As expected, 5-frame nuc loss, was heaviest, both for PUB and OR beekeepers. PUB losses of Top bar and Warré hives were less than statewide levels. Number of fall colonies are shown in Figure 3 for statewide (blue) and PUB (red).

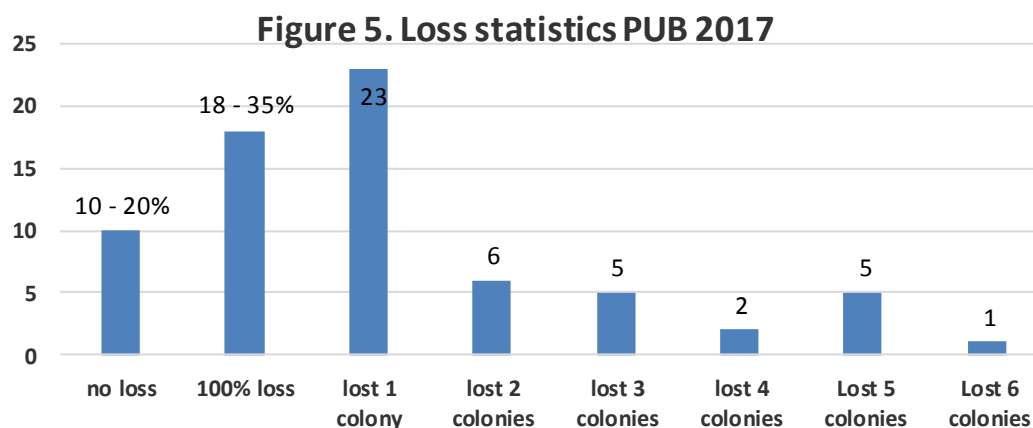


The survey also asked for **loss by hive origination**. Thirty eight of the 78 overwintered PUB member colonies were alive in the spring (56% loss rate), a slightly higher loss rate compared to statewide (40%) overwintering colony loss rate. Respondents reported highest losses (68%) for nucs; Overwintered colonies, package bees, and splits (each 56%) and swarm

losses (60%) were similar to overwintered colonies for PUB members. None of 3 feral hive cutouts survived; 54% were lost statewide. See Figure 4.



PUB respondents (spring colony numbers) mostly keep 1, 2 or 3 colonies (59%); the largest number was 18. Not everyone had loss. **Ten PUB individuals (20%) reported total winter survival** while nearly double that percent, (35%), had total colony loss. Twenty three individuals lost one colony (over 50% of individuals with loss); largest loss was 6 colonies. See Figure 5.



Ten individuals (19%) had more than one apiary location. Bee loss at the 2<sup>nd</sup> apiary site was slightly larger (55% - 20 fall colonies). Three individuals had 3 apiary sites and one had four. Eight individuals reported they moved bees during the year; three moved due to neighbor issues/pet allergy and another for school conflict, three moved for better location, one within yard and other two up to 25 miles. One had to relocate, one moved for better nectar sources.

When asked to indicate where the majority of their beekeeping education was received, PUB respondent numbers varied only slightly from statewide response. For PUB members, online reading and videos (24%) was indicated slightly ahead of bee mentors (22%); club meetings and journals and magazines (19%) were also highly valued. 10% indicated MB program and 5% said other.

Sixty-four percent (64%) of PUB respondents said they had a mentor available as they were learning beekeeping, one percent less than the 65% statewide response and 3 percentage points above the percent indicated last year (61%).

PUB survey respondents reported a **range of beekeeping experience**. Eighteen individuals (35%) had 1 or 2 years of experience. Twenty-four individuals (46%) had 3, 4 or 5 years, five (10.5%) had 6, 7 or 8 years and 4 had from 13 to 37 years of experience, the largest number. One years' experience was the greatest numeral response and the median was 4, the same as the statewide response.

**Reason for loss:** We asked individuals that had colony loss to estimate what the reason might have been for their colony losses. Multiple responses were permitted. Of 107 PUB responses, 18 chose weak in the fall (17%), 17 selected Varroa mites (16%), 15 said starvation (14%), 12 poor wintering (11%) and 11 queen failure and don't know (10%). In a different survey section, thirty-one percent (31%) attributed at least some overwinter loss to queen failure.

Additionally, 9 PUB individuals selected yellow jackets, 2 pesticides and 1 each nosema, CCD and excess moisture as reason for loss.

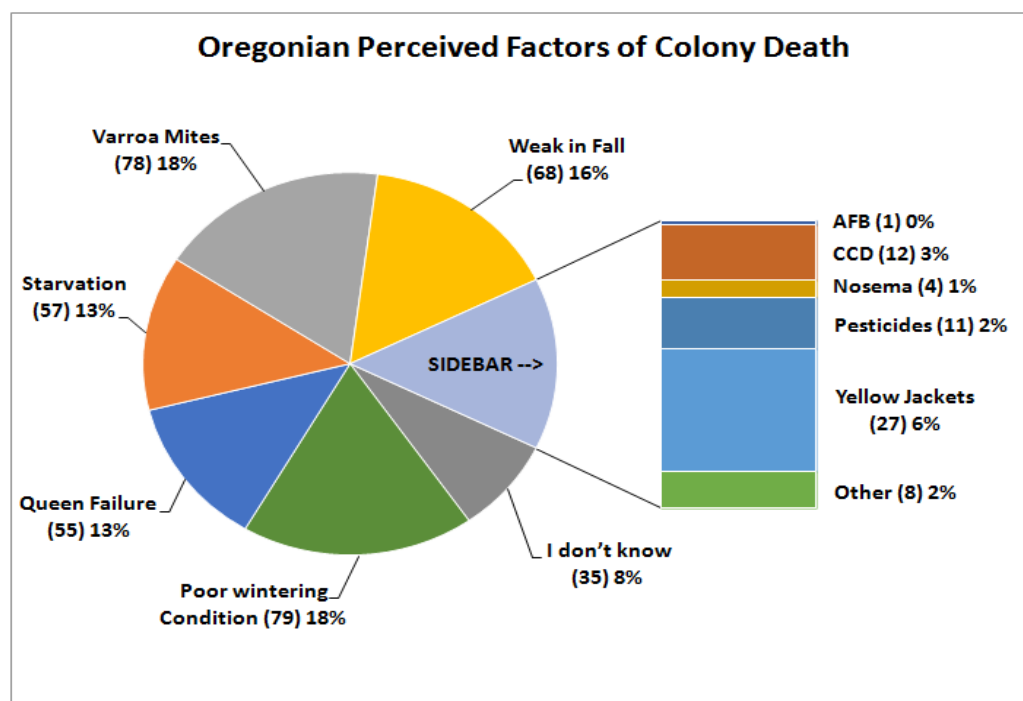


Figure 6. Statewide response

The companion question to reason for loss asked for an expression of an acceptable loss level. Comparison of Statewide and LCBA by percent is shown in Table 1.

	Zero	10%	25%	33%	50%	75%	100%
STATEWIDE	25%	22%	29.5%	12%	8.5%	<1%	2%
PUB	22%	10%	30%	18%	14%	2%	4%

There is no easy way to verify reason(s) for colony loss nor an acceptable loss level. 51% percent of PUB beekeepers felt 10% or less was acceptable while statewide 47% felt likewise. 10.5% statewide stated 50% or higher was acceptable while among PUB beekeepers 7% indicated the same thing. Colonies in the same apiary may die for different reasons. **Doing the forensics is the first step in seeking to resolve the heavy loss problem. More attention to colony strength and possibility of mitigating winter starvation will help reduce some of the losses. Effectively controlling varroa mites will definitely help reduce losses.**

## **Management selections and losses**

The survey inquired about feeding practices, wintering preparations, sanitation measures utilized, screen bottom board usage, queens, mite monitoring and both techniques (such as screen bottom board use, drone brood removal efforts, etc.) and chemical mite controls used. Individuals could check none or more than one response; most PUB and OR beekeepers often do not do just one thing/management to their colony (ies) to control mites, It takes effort to improve overwintering success.

For the larger data base of OR beekeepers, feeding dry sugar or candy board, as well as adding top insulation, a moisture absorbent feature at top of colony and/or an upper entrance resulted in significantly fewer losses. Screen bottom board usage, monitoring with alcohol wash or powdered sugar for mites and use of several of the chemical mite control options did likewise. See this analysis in the OR beekeeper report; [www.pnwhoneybeesurvey.com](http://www.pnwhoneybeesurvey.com). Comparisons to LCBA data results are included in this narrative.

For the PUB 2016-17 survey respondent data, I have partitioned the Langstroth hive data (8, 10 frame and 5 frame nucs) from the Top bar and Warré hive data in a number of instances since management concepts and ease of intervention of the alternative hives are different from moveable frame Langstroth hive beekeeping.

**FEEDING:** There were 101 total PUB responses to the inquiry on feeding colonies. Seven PUB individuals (13.5%) did not do any of the options offered; the loss level of this group was 71% for Langstroth hive owners and 75% (3 of 4 colonies lost) for Top bar and Warré hive owners (recall that PUB average loss level was 49%). Statewide, eighteen (18) individuals (10%) managing Langstroth hives did not do any of the options offered; they had a 75% loss of colonies (compared to 48% overall losses); 5 top bar hive owners who indicated doing no feedings lost 81% and 2 Warré hive owners who checked no feedings lost all of their Warré hives.

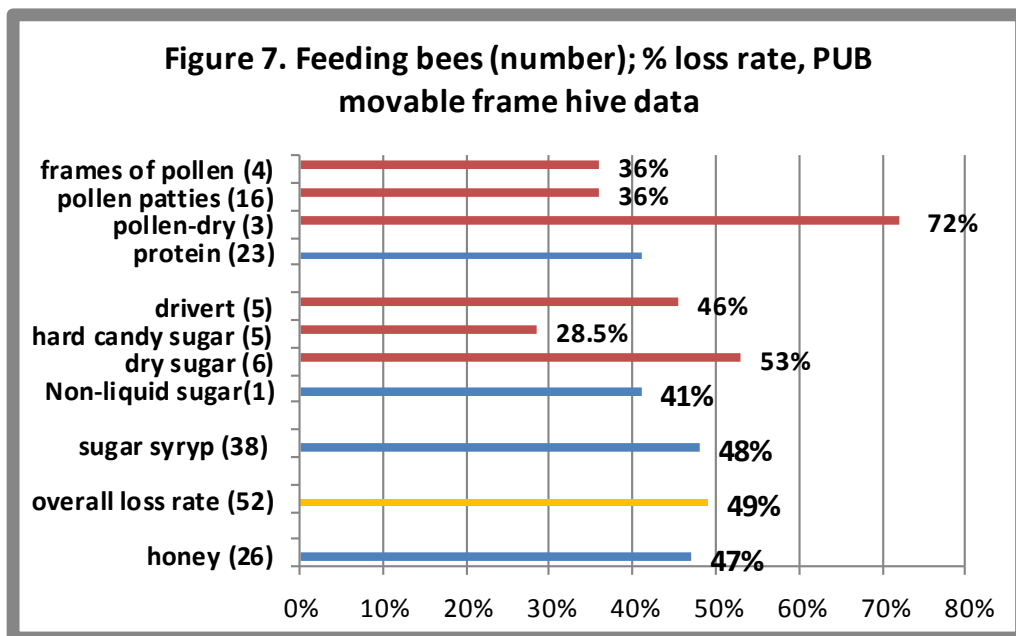
Of those PUB beekeepers who indicated doing feeding (average 2 choices/individual), 15 indicated doing only one of the choices, feeding sugar syrup accounting for 2/3rds of the single choices. One individual checked 5 managements and 4 did 4 of them. Feeding sugar syrup was the most common feeding management selected by 53% of total respondents. Those with Langstroth hives had a 49% loss and those individuals with 24 top bar and Warré hives total had a 42% loss, combined a 48% loss rate.

Twenty four individuals said they fed frames of honey and 4 fed liquid honey (2 doing both); their loss rate was 47%. The 5 Top bar/Warré hive owners had a 57% loss rate. The four individuals that fed liquid honey had loss rate of 40%.

For non-liquid sugar feeding, one Top bar hive owner fed dry sugar and lost the single colony (100% loss). Five individuals fed drivert (loss rate 45.5%), 6 fed dry sugar (loss rate 53%), 5 used hard candy (loss rate 28.5%) and one individual who fed fondant lost their colony, a 100% loss. Overall dry sugar feeding loss was 41%, an improvement in survival over other feeds.

PUB beekeepers who reported feeding protein had significantly better survival (41% loss rate vs 49% overall within PUB). There were three choices of methods of feeding protein. Four individuals indicated feeding frames of pollen; they had a 36% loss rate (one Top bar hive owner included who lost 1 of 3 colonies). The sixteen PUB respondents who reported feeding pollen patties also had a loss rate of 36% (includes one top bar hive owner who lost their single colony). Three individuals fed dry pollen and lost 72% of colonies.

These relationships of PUB individuals feeding protein mirrored the statewide results (41% loss of those feeding protein vs 48% overall). There was a difference between statewide and PUB protein feeding - statewide the 15 OR individuals feeding frames of pollen had a 60% loss and the 17 feeding dry pollen had a 27% loss rate. This was reversed among PUB members.

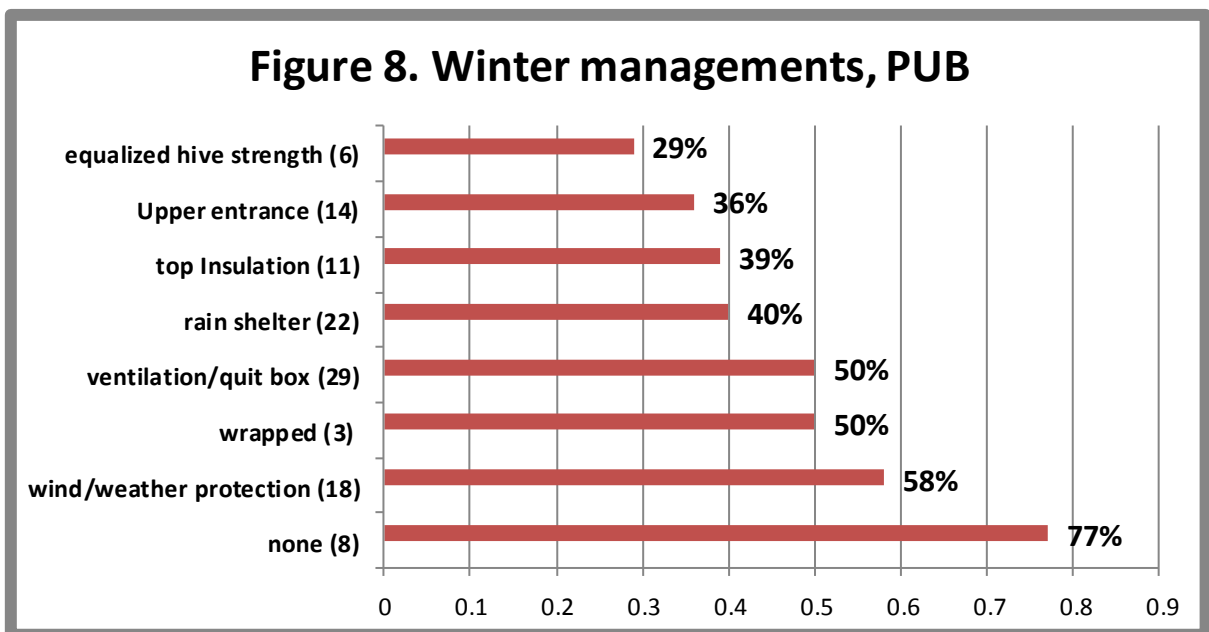


Analysis of results indicates a decent level of feeding management of both sugars and supplemental protein. **It appears feeding protein, especially as a pollen patty, improves survivorship. Also feeding dry sugar particularly as hard sugar candy, typically the sugar feeding method most appropriate during later fall or over the winter period, improves survivorship. Statewide and among PUB members feeding apparently improves overwinter survival.**

**WINTERING PRACTICES:** Statewide OR beekeepers selected 538 responses about wintering management practices (1.9 average/individual) -more than one option could be chosen. Forty-six individuals, 17.5% of the respondents, indicated not doing any of the several listed wintering practices; these individuals had a 49.5% winter loss compared to overall of 48%. Among the PUB respondents there were 104 selections; two individual chose 5, 7 members selected 4 and 12 one only (7 were use of quilt box). Eight PUB individuals (15%) checked none; their winter loss rate was 77%, considerably higher than overall 49% PUB loss.

The most common wintering management selected was ventilation/use of a quilt box at colony top (29 PUB members) followed by rain shelter (22 individuals), many of which also additionally checked wind/weather protection (18 total). Statewide, using a quilt/ventilation box slightly improved survival (45% loss rate versus 48% overall) but not for PUB beekeepers (50% loss rate). Use of rain shelter by PUB did reduce loss rate (to 40%, 1 individual of which was a Top bar hive beekeeper) but not for the total OR beekeepers (103 individuals – 48% loss rate). Wind/weather protection likewise did not reduce loss with PUB members (47% - but 5 individual top bar/Warré hive beekeepers reporting use of the rain shelter had a better survival (31% loss rate). Figure 8 shows number of individual choices and loss percent of each selection.

Individuals who equalized hive strength (5 individuals, 29% loss) or used top insulation (11 individuals, 39% loss rate for PUB Langstroth hive keepers but 75% loss rate for 5 individuals with Top bar/Warré hives), or used an upper entrance (14 individuals had loss rate of 36%, including 3 individuals who lost all their non-Langstroth hives) all showed improved winter survival. Three individuals who wrapped their hives for winter had a 50% loss. Beside rain shelter, equalizing hive strength, upper entrance and top insulation had lower winter losses.

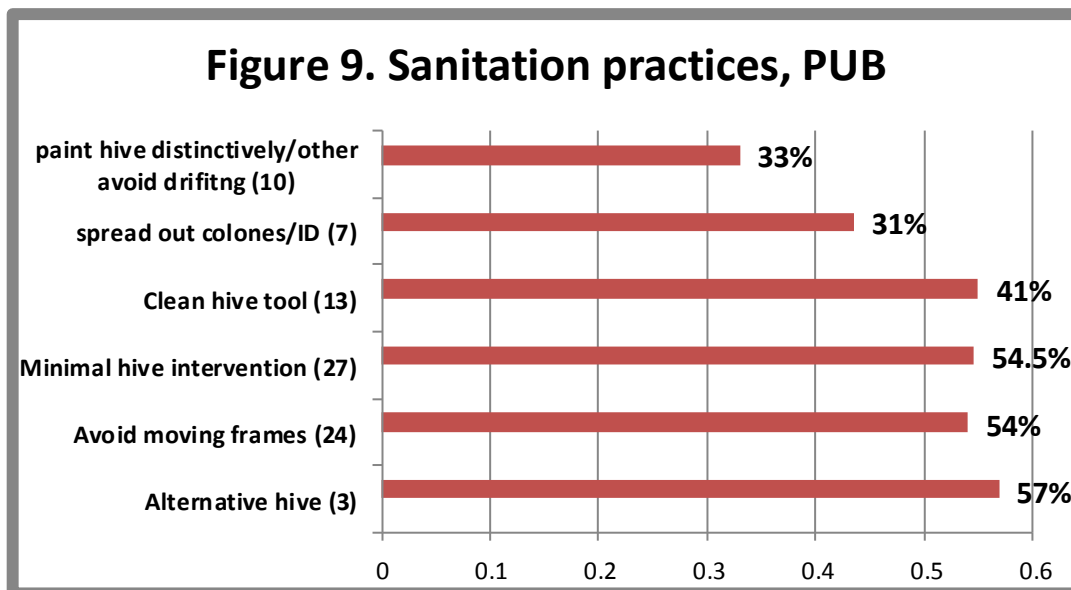


The varieties of choices of these wintering selections demonstrate that backyard beekeepers are being pro-active and taking extra measures to help colonies survive winter conditions. It would appear that several winterizing managements might improve winter survival and reduce beekeeper losses.

**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. We received 396 PNW responses for this survey question. Twenty-four percent (65 individuals) said they did not practice any of the 8 offered alternatives; 15% of PUB respondents (8 individuals) said they did not practice any of the 6 offered alternatives (no other practices were added in the other blank).

**Minimal hive intervention (138 individuals statewide) was the most common option selected.** It could be argued that less intervention might mean reduced opportunity to compromise bee sanitation efforts of the bees themselves and that excessive inspections/manipulations can potentially interfere with what the bees are doing to stay healthy. This option however did not improve winter survival - the loss rate for this group was 51%.

There were 57 selections by the 43 PUB members returning a survey (eliminating the 8 none selections). One selected 5, and another 4, while 19 made a single selection (12 of which were minimum hive intervention). Minimal hive intervention was also the most common PUB selection (27 individuals – 52% of total PUB respondents) but likewise, it did not yield a lower loss – these 27 individuals had a 54.5% loss rate; 4 individual Top bar/Warré hive beekeepers (each with single hive), included with the Langstroth keepers, had a 75% loss.



Apiary site selection and colony configuration within the apiary, although not commonly used by PUB or PNW beekeepers, are important sanitation choices because giving colonies a distinctive “addresses” has been shown to reduce drifting of adult bees and help to reduce incidence of disease and mites. 10 PUB individuals selected the choice of painting their hives distinctively/other ID measures and they had a 33% loss rate, including 2 individual top bar keepers who had a 50% loss (2 of 4 colonies). Statewide the loss for this management was 45%, a slight improvement over the statewide average loss of 48%.

As beekeeper we sometimes get complacent about the livestock in our care. Some of the sanitation seems to help as individuals have lower losses with some choices over others. I believe we should be more sanitary to improve overall bee health.



**SCREEN BOTTOM BOARDS:** Thirty PUB individuals said they used screen bottom boards on all their Langstroth hives; their loss rate was 45%. The 10 members with Langstroth hives who did not use SBB had a 44% loss (compared to 50% overall loss rate) while the 11 individuals who said they used them on some of their Langstroth colonies had a 55% loss level. Statewide the 50 individuals not using a SBB, had a higher winter loss rate, 58%, compared to those using them on 100% of their colonies - they had a loss rate of 45%.

There is no good science on whether open or closed bottoms make a difference in overwintering success. There was no difference among the larger data base of 282 OR beekeepers between the never, always or sometimes responses. For PUB beekeepers the 13 who said they cover the SBB during winter had a 38% loss, those who sometimes covered had a 43.5% loss while the 22 who said they left the SBB open during winter had a 62.5% loss. The result this season for PUB members would suggest beekeepers should determine what the best overwintering strategy is when screen bottom boards are used for their apiary site(s). Some beekeepers “feel” bees do better with it closed overwinter, and in early spring development. An open bottom, at least part of the year, can assist the bees in keeping their hive cleaner.

**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 do not necessarily 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 out of the wind, in the sun, and, when exposed, providing some extra wind/weather/rain protection might improve survival. Use screened bottom boards leaving them open (or closed) as per your preference for ventilation. Use of insulated tops/quilt box with moisture collector such as burlap, straw, old towels, etc. with extra top ventilation and a top entrance, especially as it may help vent the moisture, is a good idea.

Feeding bees either sugar syrup or honey from other disease-free hives, helps insure enough food stores during early fall management. Once fall rains start, halt syrup feeding and switch to feed dry sugar or a hard sugar candy to avoid adding additional moisture stress to colonies. 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.

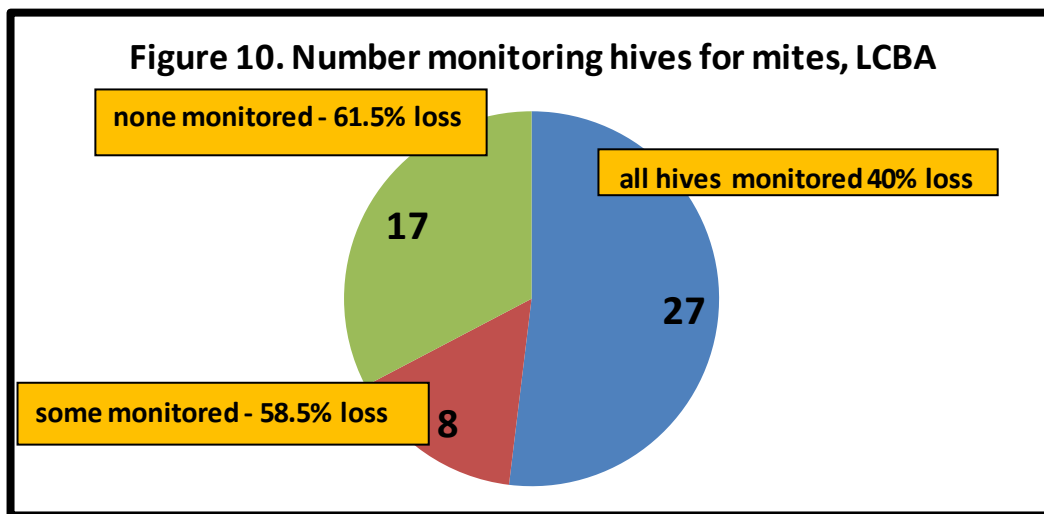
## **Mite monitoring/sampling and control management**

**All OR bee hives have or will have varroa mites.** It is important to know **how many mites are present** for the current time of the season. Knowing how many mites provides an estimate of approximate risk of mites elevating colony losses. Mites are not the only pest/predator/pathogen than can seriously weaken or kill colonies but studies point to their being the most significant.

To know how many, beekeepers need monitor/sample hives for mites. The PNWhoneybeesurvey asks percentage of OR 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 5 possible mite sampling methods, what method was used, including when (month) it was

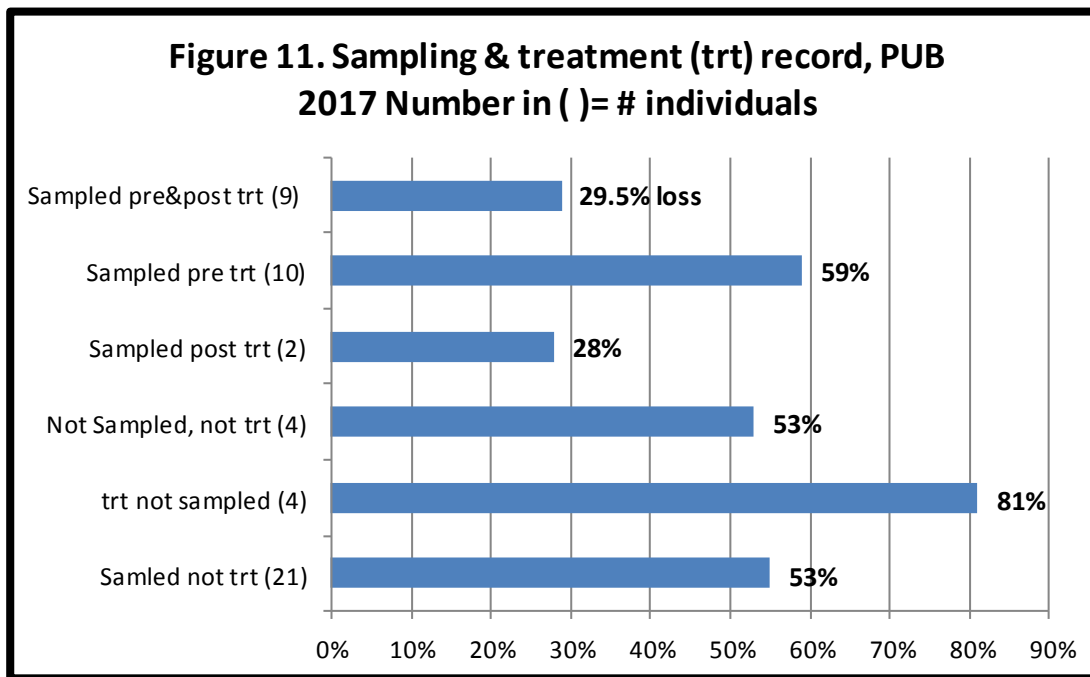
employed. Statewide, 178 individual respondents (63%) said they monitored all their hives. Comparison of losses of those individuals monitoring all their hives alongside those not monitoring as well as those who indicated they monitored some of their hives, reveals a 43% loss of those 178 individuals monitoring all their hives, the 62 individuals (22%) who reported they did no monitoring had the statewide average loss of 48% loss; the 43 individuals who monitoring some of their colonies had a 60% loss.

The comparable numbers for PUB respondents was 27 (52%) monitored all their hives, with a 36% loss rate (for Langstroth hive keepers but top bar/Warré hive owners lost all 5 of their hives=100% loss), 8 individuals (langstroth hives) doing some monitoring had a 81% loss (Top bar/Warré hive owners lost only 3 of 15 hives = 20% loss) while the 17 who said they did no monitoring had a 63% loss rate for the Langstroth hives and 55.5% loss of Top bar/Warré hives. See Figure 11 which shows numbers (both Langstroth and alternative hives) and loss rate as insert.



Twenty PUB individuals monitoring with mite (debris) sticky boards had 47.5% loss rate, 20 who used powdered sugar to monitor had a 44% (langstroth) loss, 8 using alcohol wash had 47.5% loss, while for both visual methods (drone brood=48% loss rate and adult = 55%). Those with Top bar and Warré hives who indicated they monitored had a 27.5% loss. Statewide, the two monitoring techniques that seemed more effective in mite monitoring (i.e. losses below the 48% overall level) were alcohol wash (42% loss level) and powdered sugar, a 44% loss rate.

Survey asked about the relationship of treatments to monitoring with several options. Sampling both pre and post as well as post treatment was the most effective relative to a reduced loss rate.



**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). Visual 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 it can be useful, when we see mites in drone brood, to guide us to a more reliable adult washing technique.

See Tools for Varroa Monitoring Guide [www.honeybeehealthcoalition.org/varroa](http://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 (large amount of fat body) fall bees that will overwinter.

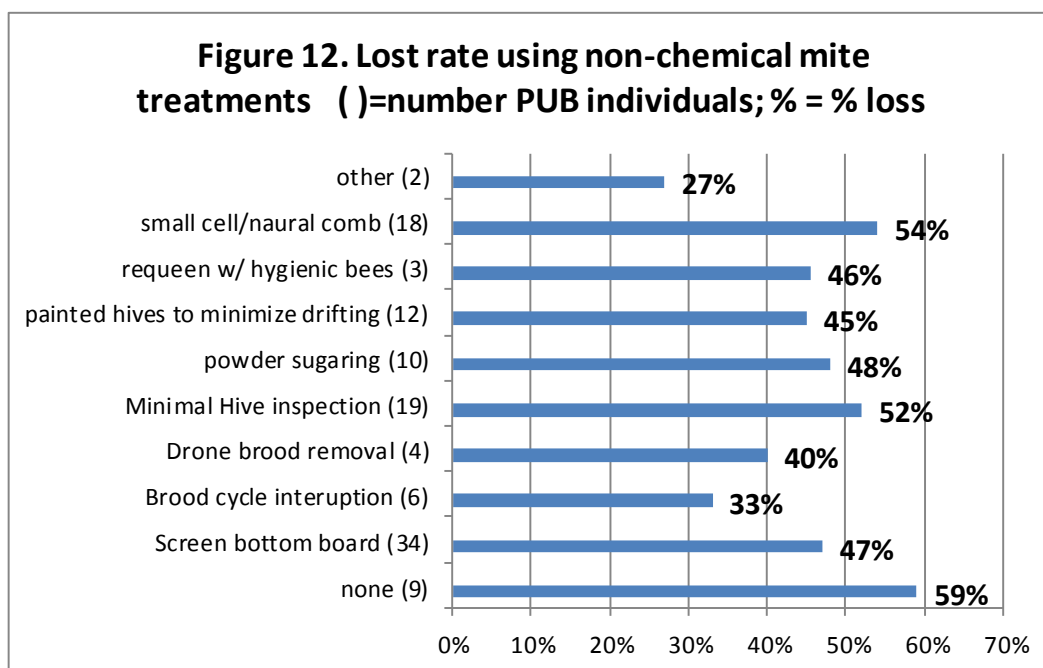
### **Use of medications and control treatments**

We asked about general non-chemical mite treatments and also about use of chemicals for mite control. **Eight PUB individuals, 15%, did not use any control - 9 (17%) did not use a non-chemical technique and 27 (52%) did not use a chemical.**

**Non-Chemical control:** Respondents were asked about alternative, non-chemical mite treatments employed. Of seven non-chemical alternatives offered on the survey **use of screened bottom board was listed by 200 individuals (71%) statewide.** They may offer a slight

advantage in slightly lower losses (46%). Nine individuals (17%) of PUB member respondents said none of the 9 alternative controls were used; their loss level was 59%.

For the respondents who checked at least one choice (more than one selection was permitted), minimal hive intervention was, after screen bottom boards, the next most popular choice (as it was statewide) – 19 PUB individuals (36.5%) checked this choice but had a 52% loss. (Figure 12). PUB members using brood cycle interruption (6 individuals), and drone brood removal (4 individuals), had lower losses (33% for brood cycle interruption and 40% for drone brood removal).



Eighteen PUB individuals indicated greater use of small cell/natural comb compared to other Oregon individuals but, like statewide losses, their losses were higher (65% for Langstroth hive owners, 28.5% for 5 alternative hive owners). Three PUB individuals said they requeened with hygienic queens but losses were not lower. The two “other” choices were encourage swarming and let the bees do by themselves.

**What works?** The non-chemical technique alternative of drone brood removal is a non-chemical treatment that works in most colonies during spring buildup. You can buy a drone foundation frame or put a shallow frame into a standard brood box so the bees construct drone cells below the shallow frame bottom bar. The colony doesn’t need that many drones so you harvest them in capped stage to discard with their mites. This technique only works during spring buildup.

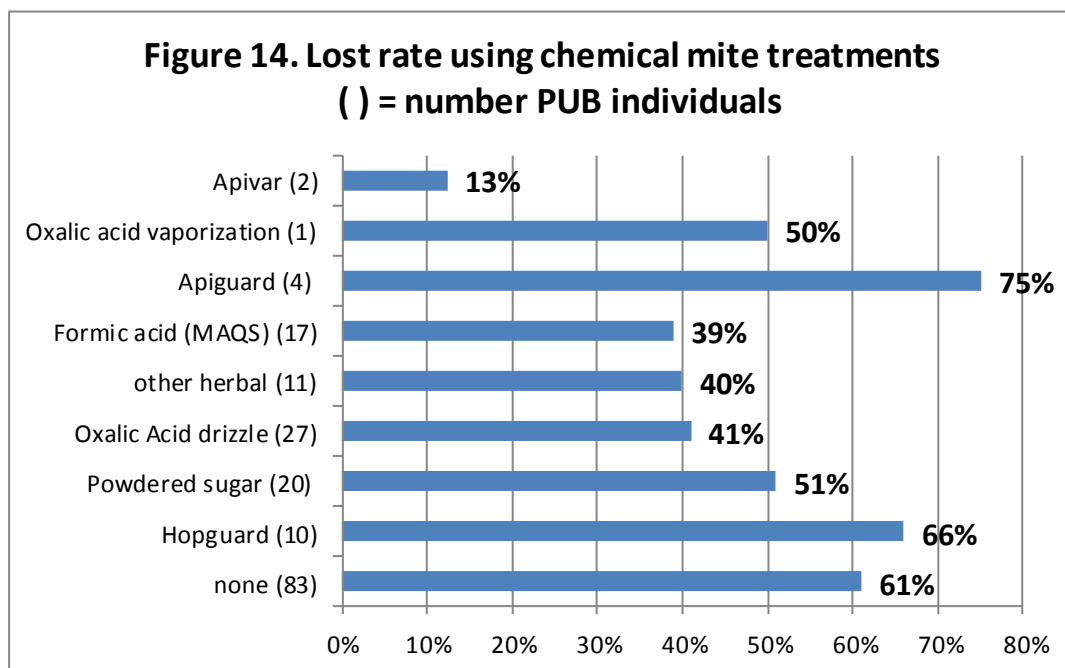
Breaking the brood cycle, with requeening, especially if hygienic queen stock or local selected stock is used to requeen to replace removed queens, can also keep mite numbers at manageable levels in most bee colonies. Both the drone brood removal and especially breaking the brood cycle are a lot of work 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. Screen bottom boards help reduce losses some. Other techniques may or may not help under individual circumstances.

**Timing of use of alternatives is critical to successful mite reduction.**

**Chemical control:** The survey asked about chemical treatments. There were 27 PUB members who did no chemical control treatment. Langstroth hive users had loss of 58% and alternative hive owners had a 36% loss (combined 51% loss.) Four individuals used Apiguard and had 75% loss. Seventeen individuals used MAQS (formic acid) and had 39% loss; all 4 top bar/Warré hive owners using MAQS lost all their colonies (100% loss). Two individuals using Apivar with Langstroth hives had a 12.5% loss.

There were 210 statewide individuals using chemical controls (74%) but only 25 PUB members (48%) said they used a chemical. Three used two materials, combining MAQS with Apiguard (2 individuals) and Apivar (one individual).The remainder used a single material, 28 choices in all (multiple choices were permitted). **Formic acid (MAQS) followed by Apiguard were the more utilized options among PUB members, same as statewide.** Apivar, the synthetic miticide that is the most effective treatment, was used by only two individuals (and they had the best winter survival), while Oxalic acid, the newest control, effective when used correctly, was used by a single individual; 41% loss was below the PUB average of 49%.



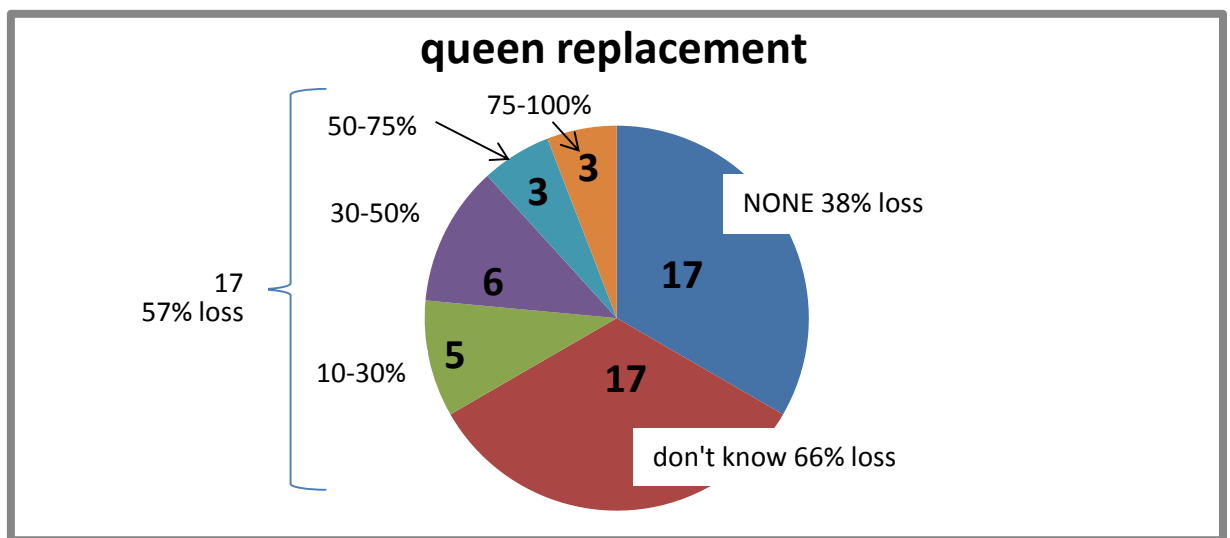
**Statewide use of several chemical mite control materials reduced overwinter losses and improved survival but only Apivar use (by only two individuals) reduced losses for PUB beekeepers. The non-chemical techniques may help reduce losses but to a lesser extent. As for using more than one, and which ones and when to use during a season, is still not precisely known. There appears to be NO one best combination. Control choices should be driven by monitoring, seasonal considerations and an estimation of size of mite population.**

## QUEENS

We hear lots of issues related to queen “problems.” Queen replacement can be beneficial in there will be a break in the brood cycle but it seldom is convenient for the beekeeper. The PNW honey bee survey asks individuals with overwinter loss to what they attribute their loss. Fifty-five of the 282 OR respondents (13%) attribute at least some of the loss of their colonies to queen failure; among PUB respondents, 11 (10%) indicated queen failure was 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%) responded that queen loss might have been a factor in colony losses.

Among PUB respondents, equal numbers of individuals (17 - 33% each) said none of their losses were likely due to queen failure, they did not know or queen failure did affect winter losses. This last response required an estimate of the approximate percent of colony loss that might be attributable to queen failure. Five individuals (29%) said 10-30%, 6 (35%) indicated 30-50%, and 3 each (17.5%) checked 50-75% and 75-100% of their loss could be due to queen failure. Even with small numbers, the corresponding loss rates make sense. For the selections of percent loss however, they are mixed; 10-30 % attribution=45% loss, 30-50% =71% loss, 50-75=50% loss and 75-100 = 27% loss.



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. Twenty PUB individuals said their colony (ies) did not requeen and 12 said No not that they

were aware of and 20 (38.5%) of respondents indicated their colony (ies) did requeen. Nine individuals said colony queen replacement was via swarming, another 2 said supersedure occurred. Four individuals said they split their hive to allow it to requeen and 6 said they introduced a mated queen to accomplish requeening.

We asked if queens were marked. Six PUB individuals (11.5%) said yes. Marked queens are more expensive but are easier to find in a colony. Marked queens are also a means of tracking queen replacement. It would be difficult to be able to say yes or no if a hive requeened, with absence of queen marking, unless requeening was done by the beekeeper.

### **Concluding comments**

This survey is designed to 'ground truth' the larger, national Bee Informed loss survey. Some similar information is additionally available on the BeelInformed website [www.beeinformed.org](http://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](mailto: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.