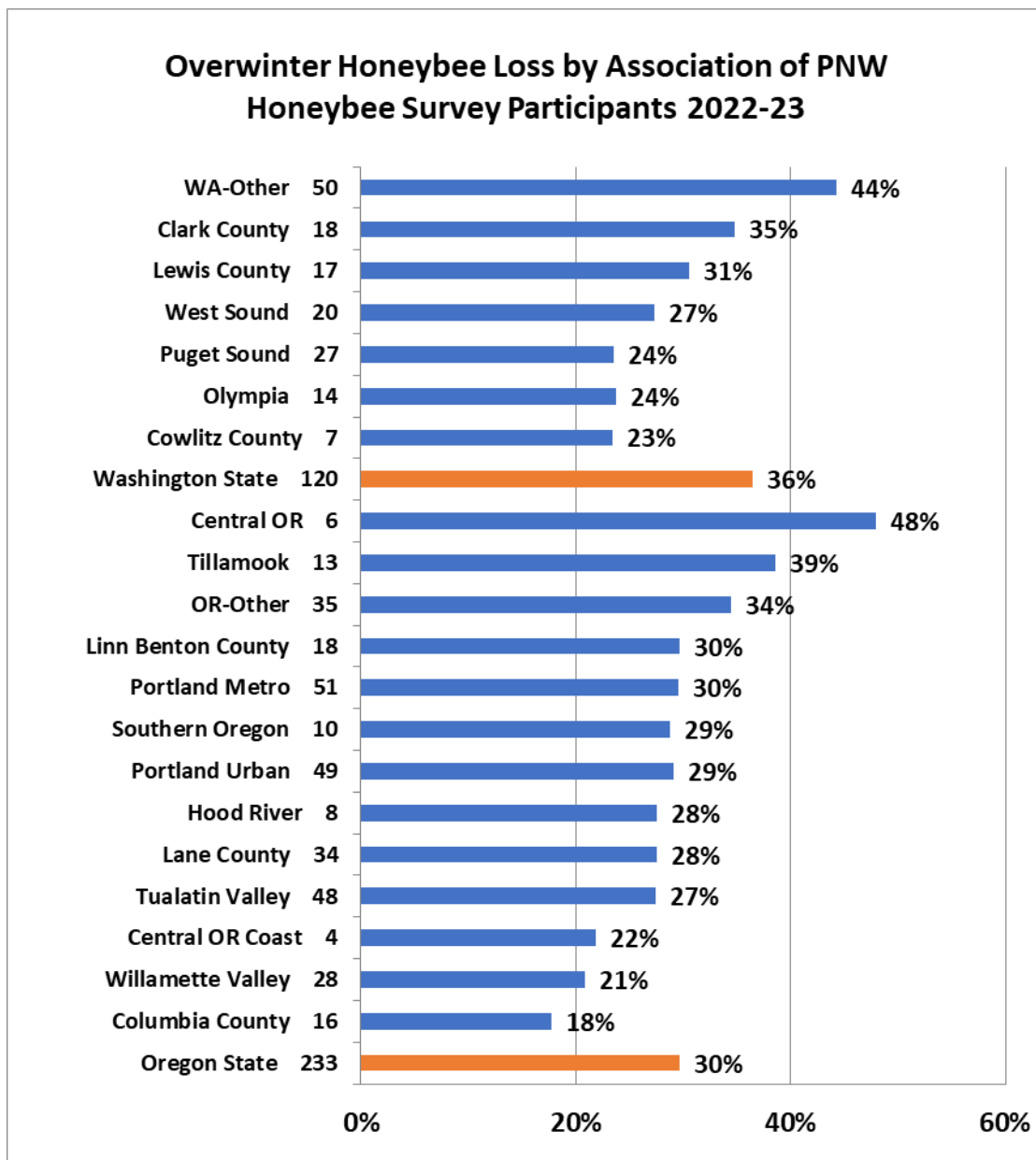


Winter Bee Losses of Oregon Backyard Beekeepers for 2022-2023

by Dewey M. Caron with Jenai Fitzpatrick

Overwintering losses of small-scale Oregon backyard beekeepers increased slightly to 30% this winter two percentage points higher than last year. This report presents the results of our 14th season of Oregon hobbyist/backyard beekeeper surveys. This annual survey: www.pnwhoneybeesurvey.com. Herein we discuss the data provided by 233 Oregon beekeepers, 10 fewer than last year. Results of the 120 Washington respondents completing surveys (increase of 40 over last year) are included in a separate loss report. Washington average loss was 36%.



2022 -23 State/Club Losses

Club results of 12 local Oregon associations and both Oregon and Washington state-wide (+ “other” category for Oregon) are shown in Figure 1. Colony numbers ranged from 1 to 48 colonies in Oregon (average 5.7 colonies slightly higher (0.26) than last year; medium number = 4 colonies, one more than last year) and 1 to 38 in Washington (Average 5.8 down 0.4 percentage point from last year; Median number = 4 up one from last year). The number of respondent individuals is listed next to the association name. The bar length is the average club loss percentage for the year.

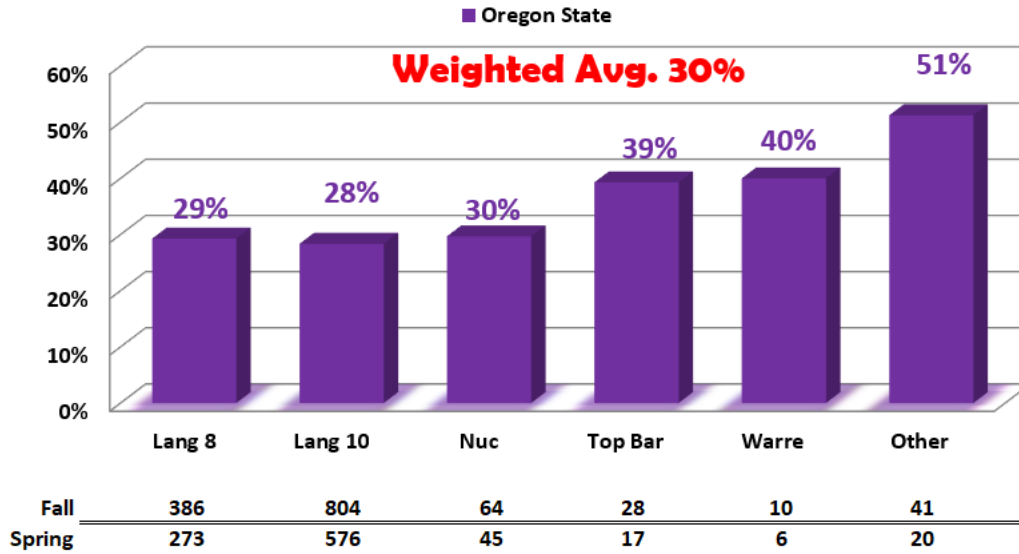
Overwinter losses of members of different organizations varied from a low of 18% for the 16 Columbia County beekeeper respondents to a high of 48% for the 6 central Oregon Association. The 3X range of losses was the same as last year but less than the previous year (4X difference). The difference between the two states – 30 percentage point average loss in Oregon (233 respondents) versus 36% average loss for 120 respondents in Washington has occurred most years – last year it was a seven percentage point difference . The 35 “OR-other” includes respondents from Central and South Coastal, Coos Co, Klamath Basin, Douglas Co and Southern Oregon. Approximately 86% of respondents are roughly along the I-5 corridor between California and Washington.

2022-2023 Overwinter Losses by Hive Type

The loss statistic was developed by asking number of fall colonies and surviving number in the spring by hive type. Respondents had 1,333 fall hives (within 10 of the respondent number last year) of which 937 survived to spring (396 lost), equating to a 30% loss (70% survival rate). This was two percentage point greater loss over the previous winter loss rate. Ninety-one percent of hives were 8-frame or 10-frame Langstroth hives or (21) long hives which had an overall survival rate of 29%. There were 64 fall nucs (30% loss rate). Among non-traditional hive types were 28 top bar hives (39% loss) and 10 Warré hives (40% loss). Other hive types included Layens, log, Apamaye, pagoda and Slovenian and 11 not identified.

The winter losses of PNW 8-frame Langstroth hives was a single percentage point greater compared to the loss rate of 10-frame Langstroth hives. The loss rates of Langstroth 8 and 10 frame hives over the past 8 years has averaged 36% for 8 frame Langstroth hives and 40% loss for 10 frame hives respectively. Nuc losses are typically higher than losses of 8 or 10 frame Langstroth hives, this year only a single percentage point greater. The Nuc 9-year average loss is 45%. This year’s Top Bar hive loss of 11 colonies (39%) is below the 9-year average top bar hive loss of 52%. The 2023 Warré hive loss rate of 40% is close to the 8-year average of 42.6%.

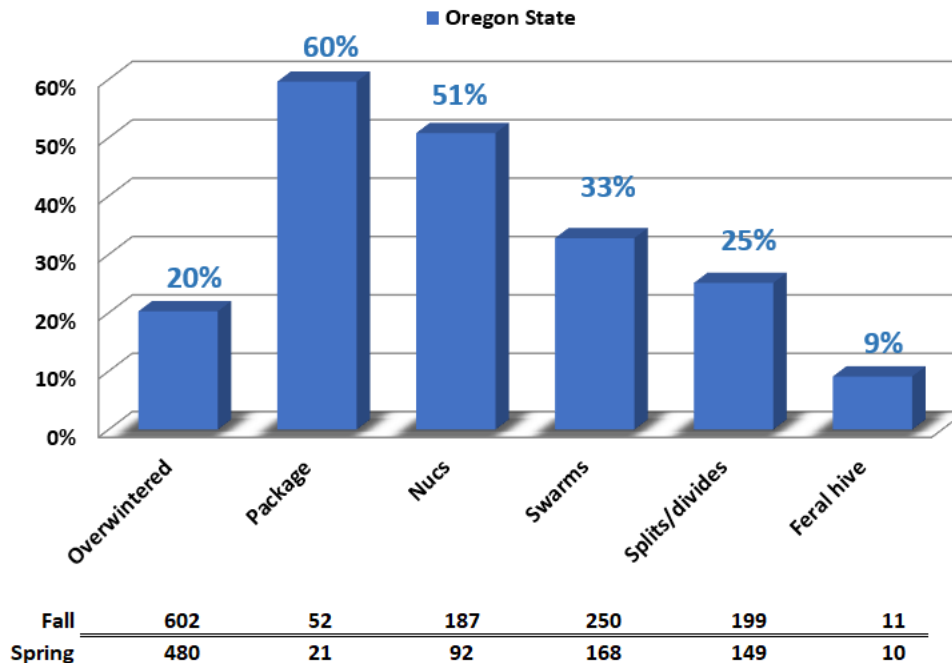
Winter Honeybee Loss % by Hive Type, 2022-23



2022-2023 Losses Based on Hive Origination

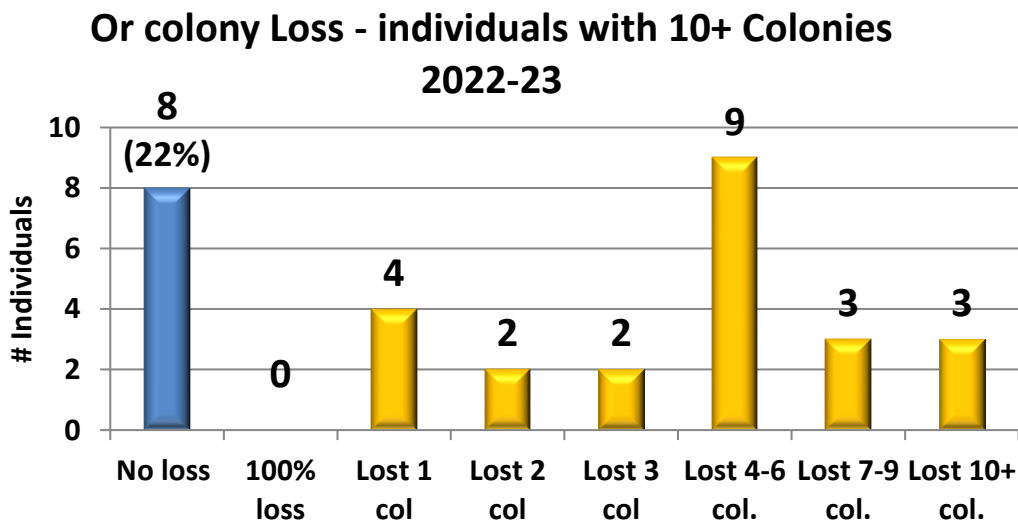
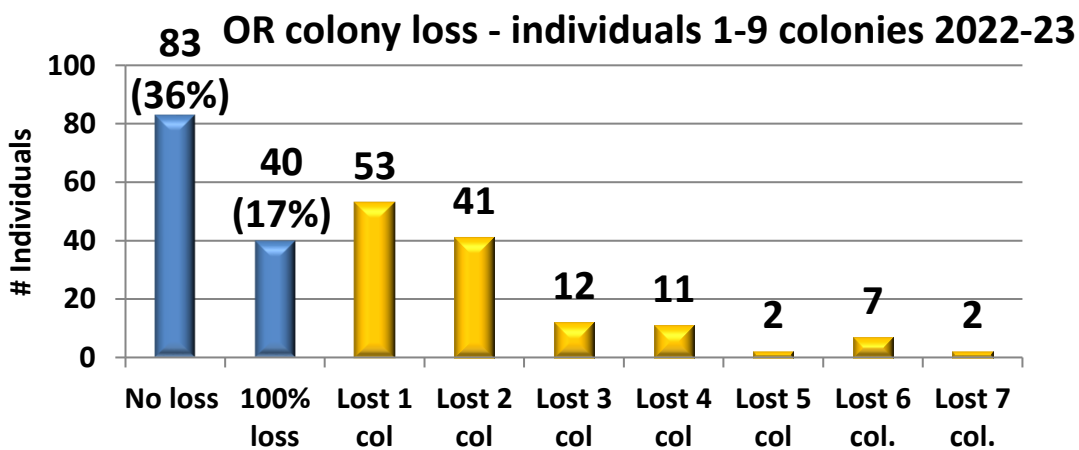
We also asked survey respondents to characterize their loss by hive origination. The result is graphically presented below. Overwintered colonies obviously had the best survival (20%) with the 199 splits/divides and 11 feral transfers also with excellent survival. Packages (60%) and nucs (51%) were higher with package bee survivals exhibiting triple the loss rate of the overwintered colonies. The origination loss percentages are relatively the same each year.

Winter Honeybee Loss % by Origination, 2022-23



2022 -23 Individual Hive Losses

Thirty-five and a half percent (83 individuals) of Oregon respondents had **NO LOSS overwinter**, whereas half that number, 17% (40 individuals) lost 100% of fall colonies. Figure 4 below shows loss of individuals with 1 to 9 colonies and figure 5 shows loss of 9.5% (22 individuals) individuals with 10+ colonies. The loss of a single colony (by 57 individuals) represents 38% of total individuals reporting loss. Eight individuals (5.5%) lost 7 or more colonies. The highest loss by a single beekeeper was 14 colonies. Loss numbers are reflective of the fact that the median number of bee colonies of backyarders was 4 colonies. Of 396 colonies lost in Oregon, individuals with 1, 2 or 3 colonies lost 114 colonies, 29% of total; overall individuals with 1-9 colonies lost 36.5% of their colonies while individuals with 10+ colony numbers lost ½ that level - 21% of their colonies.



Individuals who had 10 to 48 colonies lost 124 total colonies. These individuals lost anywhere from 1 to 14 colonies; 8 individuals with 10 or more colonies lost no colonies. This group lost a smaller

percentage of colonies (21%) than the overall statewide group (30%) and the individuals with 1-3 colonies (36.5% loss average).

Survey respondents are primarily small colony number beekeepers – 47% had 1-3 colonies but they vary considerably in their years of beekeeping experience. Looking at losses by colony holding numbers, the 110 individuals who had 1-3 colonies had 41% loss level, the 57 individuals with 4-6 fall colonies (24.5% of individuals) had a 39% loss level, the 30 individuals with 7-9 fall colonies (13% of individuals) had a 29% loss level and the 36 individuals with 10+ colonies (15.5% of respondents) lost 21% of their colonies. Numbers are close to those of last year.

By years of experience, the 79 individuals who had 1 to 3 years bee experience (34% of total respondents) had 37% colony loss level, the 65 individuals with 4-6 years experience (28% of survey takers) had a 26% loss level, the 37 individuals with 7-9 years experience (16% of respondents) had a 30% loss level and those 52 individuals (22% of respondents) with 10+ years experience had a 27% loss level. This is shown graphically in Figure 6. The arrows show that as colony numbers or years experience increase the percent loss level decreases.

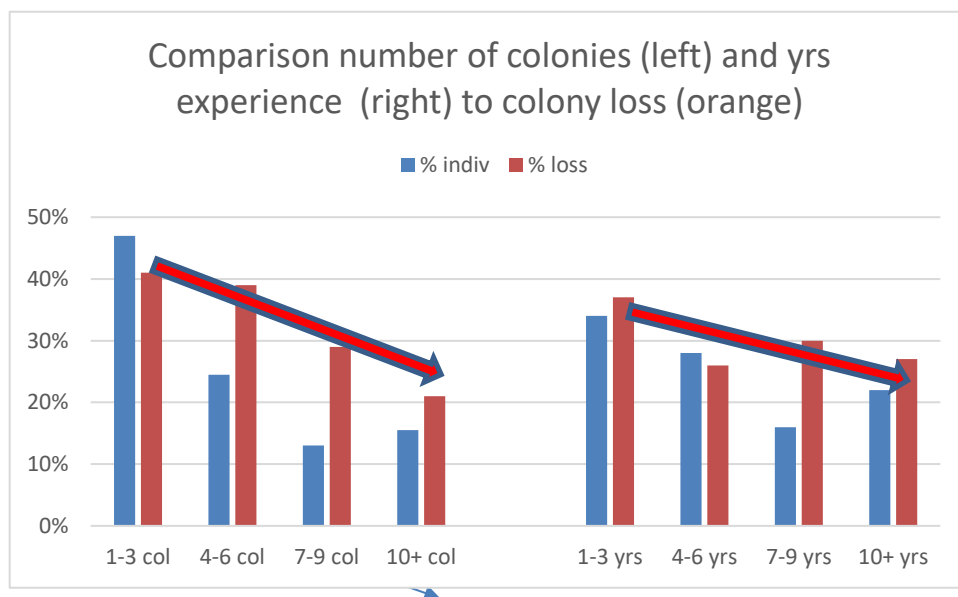
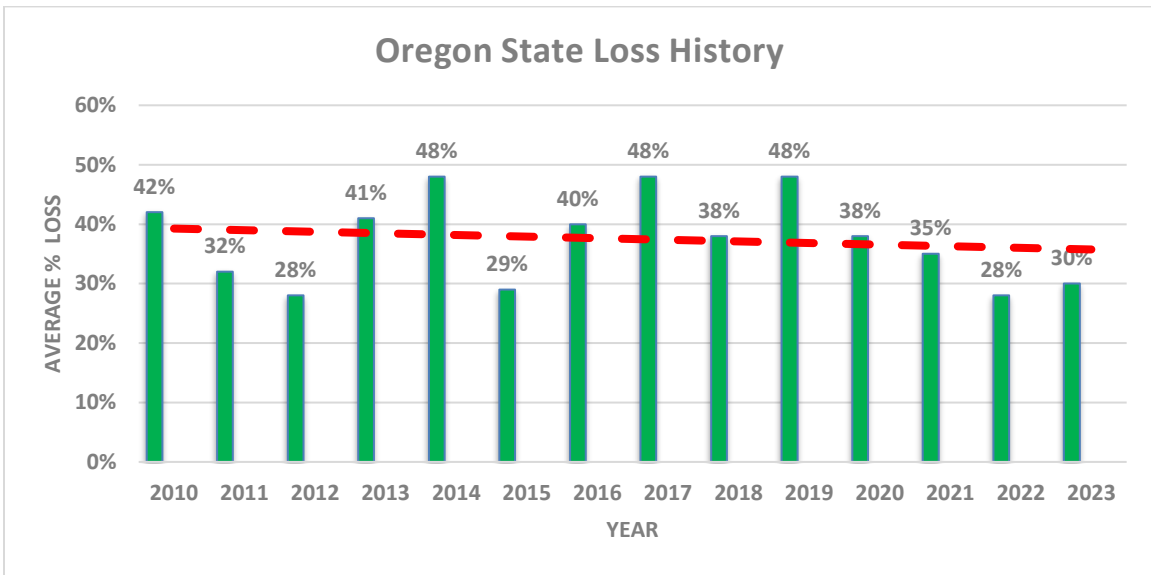


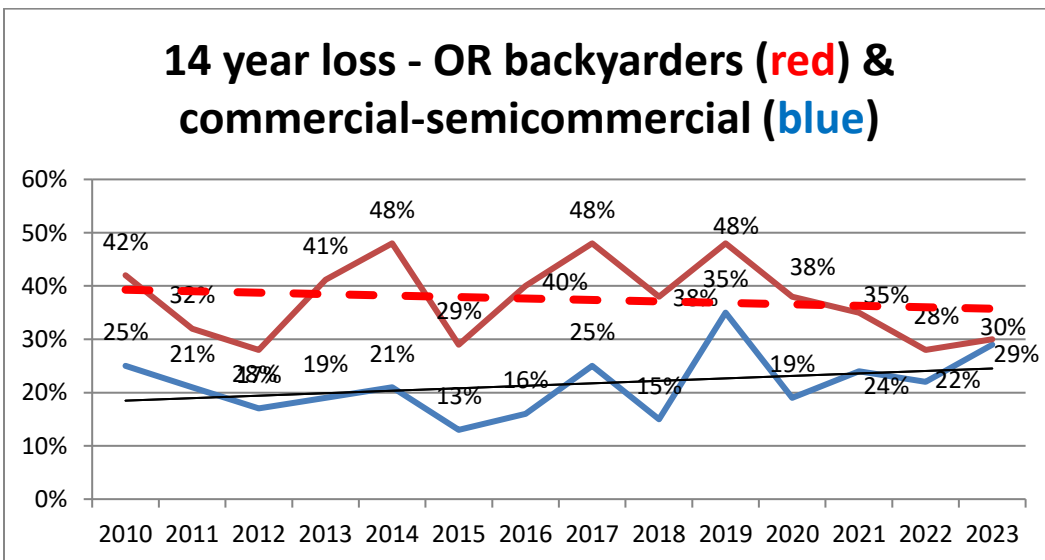
Figure 6

Overwinter Losses the Past 14 Seasons



The losses of the past 14 years are graphed above in Figure 7. Despite the lower losses the past 2 seasons, the average loss by Oregon beekeepers is 37.5%. Red dashed line is trend line. This average loss has changed little in the past 14 years, although seasons with heavier losses have occurred.

Comparison of the annual losses of backyarders with commercials is shown in Figure 8. The commercial losses are obtained from a different paper survey distributed by Oregon State University. Seven Oregon commercial and semi-commercial beekeepers, three fewer than last year with 25,855 fall colonies, (approximately 29% of the estimated total number of colonies in the state) reported overwinter losses of 29%. Small scale (backyard) beekeeper losses have ranged from six to 20 percentage points greater compared to losses of commercial/semi-commercial beekeepers over the last 14 years as shown below but were essentially equal this year. Fourteen-year average Backyard losses = 37.5% loss and 14-year commercial/semi-commercial loss = 21%. The dashed lines are loss trend.

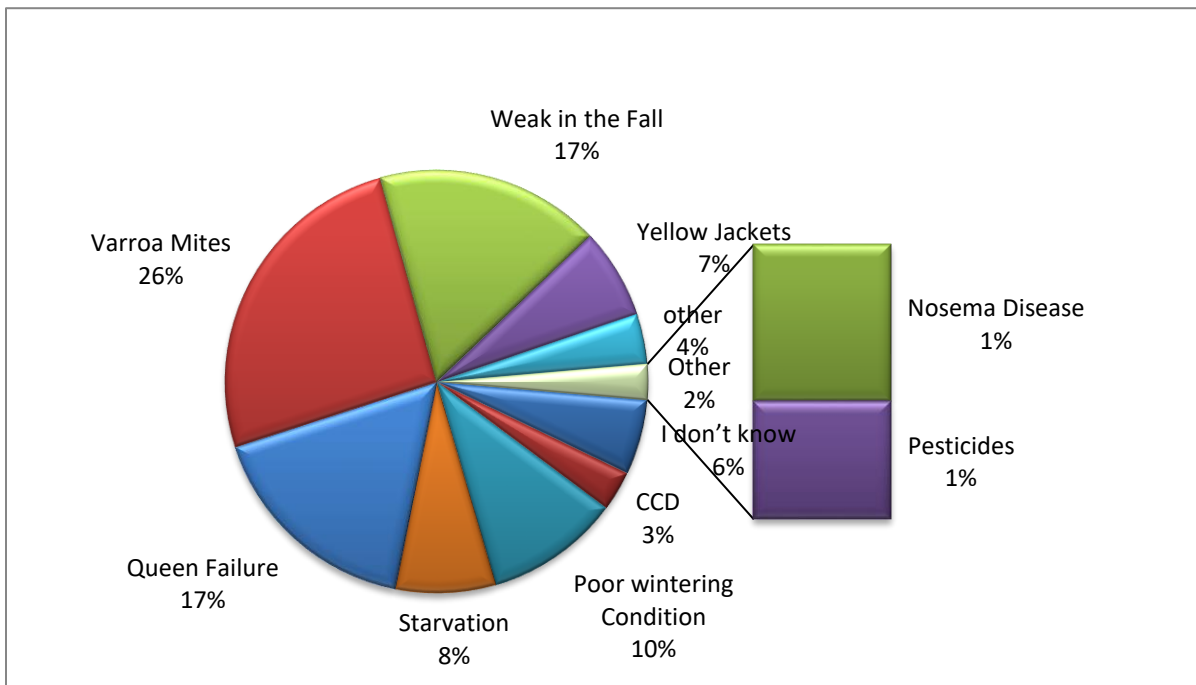


Some Other Numbers

Thirty-five individuals (15%) had more than a single apiary location. The loss level at 2nd apiary was only one percentage point poorer but the individuals who had a 3rd apiary had double the loss level. Seventy-four percent (74%) of respondents (2.5% below last year) said they had a mentor available as they were learning beekeeping. Nine percent (9%) had more than one hive type. And, finally, 18 individuals (8%) moved their bees. One was forced to move, one moved because other colonies were being robbed, one moved nucs and two indicated they moved for better honey production. Four moved for pollination and another two moved to a wintering yard at the end of season. Distances were within same property up to miles away (for relocation and pollination).

Perceived Colony Death Reason and Acceptable Level

The survey asked individuals that had colony loss (83 individuals had no loss) to estimate what the reason might have been for their loss (multiple responses were permitted). There were 262 total listings, 1.7/individual. Varroa (67 individuals followed by Weak in the fall (45 choose) and queens, 44 individuals, were most common. Poor wintering (27 individuals), Starvation, 20 selections and yellow jackets respondent choices were next most common. 15 individuals didn't know. Among other 3 indicated extreme cold and rain, 3 excessive swarming or absconding. One individual said small hive beetle, 1 said covers left ajar another said ants and 1 said late treatment while one other said the mite treatment itself.



Acceptable loss: Survey respondents were asked reason for loss. Thirty-one (13%) indicated zero (no loss). Forty-two percent of individuals indicated 15% or less; 20% was medium choice, as has been case for several years. The most common response was 25%. Twelve percent said 50% or greater was an acceptable loss level; two each said 75 and 100% loss levels acceptable. See table below.

Oregon State during 2022-23											
Loss level	5%	10%	15%	20%	25%	33%	50%	75%	100%	None	Other
#	17	36	14	41	43	23	23	2	2	31	4
%	7%	15%	6%	18%	18%	10%	10%	1%	1%	13%	2%

Why colonies die?

There is no easy way to verify reason(s) for colony loss. Colonies in the same apiary may die for several 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. A dead colony necropsy can be of use. Opinions vary 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. Individual choices varied from zero to 100%, with medium of 20%.

Major factors in colony loss are thought to be mites and their enhancement of viruses especially DWV (deformed wing virus), VDV (Varroa destructor Virus (also termed DWV B) and chronic paralysis virus. But we do not have a test for these viruses; 2 individuals indicated virus as possible reason for loss. It was interesting in that varroa and queen problems were nearly equally indicated as were weak in the fall; poor wintering and starvation were other estimated reasons for loss.

Declining nutritional adequacy/forage and diseases, especially at certain apiary sites, are additional factors resulting in poor bee health. 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 them, 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 our honey bees face in the environment. It was encouraging to see from survey responses that losses this past year 30% were still at a low level. More attention to colony strength and possibility of mitigating winter starvation will help reduce some of the losses. Effectively controlling varroa mites will help reduce losses.

Colony Managements

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

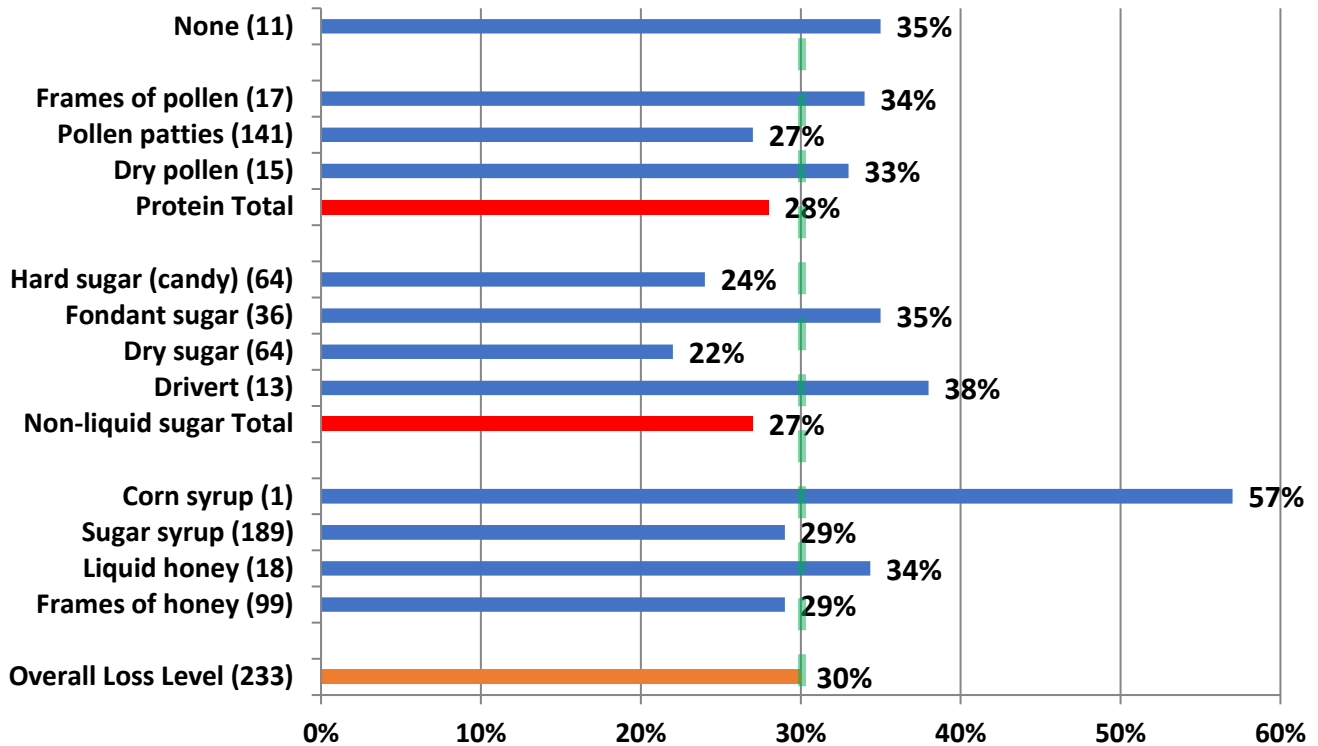
Most Oregon beekeepers do not perform just one management to their colony (ies) toward improving colony health and overwintering success. This analysis however is mainly of a single factor equated with loss level of those same individuals. Such analysis is correlative - doing a similar management as fellow beekeepers does not necessarily mean you too will improve success.

FEEDING: Oregon survey respondents checked 620 feeding options = 3.1/individual. Thirty - three individuals (15%), other than those who indicated no feeding, selected a single choice and had 33% loss, 60 (27% of respondents) indicated 2 choices (31%, loss), 74 (34% the greatest number and medium) indicated 3 choices (they had 26% loss), 39 individuals (20%) had 4 choices with 36% loss, 17 (8%) had 5 choices (24% loss), 8 individuals had 6 choices with 21% loss. And 1 had 7 and 1 had 8 choices with a 13% loss. The choices, with number of individuals making that selection is in () in Figure 10; bar length indicates loss level of individuals doing this management. Those bar lengths to left of 30% **green dashed** marker had better survival while those to right had greater loss level. Eleven individuals (same number as the previous year) said they did NO FEEDING. They had 55 fall colonies, lost 19 for a 35% loss. For individuals indicating one or more feeding managements, feeding sugar syrup was the most common feeding option of respondents (189 individuals, 86% of respondents who indicated feeding management). Their loss rate was 28.5%, essentially the same as the overall average. Individuals feeding protein had an overall better survival rate , with the pollen patty feeders (141 individuals, 64% of total respondents) showing a 3 per cent improvement over average loss. The non-liquid sugar feeders likewise had a 3 per cent improvement over average, mainly due to the 64 hard candy and 64 dry sugar feeders, 58% of total respondents.

See Figure 10 for Feeding information below.

Figure 10

**Feeding Options w/ Loss Record
(#) = number individuals**



Summary: Statewide for the last 7 years individuals doing no feeding had 6 percentage point higher losses (average 45%) i.e. poorer survival, compared to an average loss rate of 38%. The average percent doing no feeding = 7% of individuals – this year it was 5.7%). Individuals statewide that fed sugar syrup had a 4.3 percentage point lower loss level average for the 7 years; this year it was one percentage point greater survival. Those feeding honey (as frames or liquid) had lower loss only during 3 of the past years, this year it was a one point improvement. Individuals feeding non-liquid sugar (in any of the forms) had lower losses six of past 7 past winter seasons; this year it was a 3 percentage point difference, same as last year. Dry sugar feeders had slightly better or equal survival all 7 past winters while hard candy feeders had a much-improved survival 6 of 7 past winters, including this past winter. Fondant feeders had better survival 3 of the 7 past winters, but not this season.

For individuals feeding protein, the protein patty users showed better survival 6 of 7 years (this year losses were 2 percentage points better; dry pollen feeders had better survival in three of the past seven years. Pollen patty feeders had the best survival this year.

WINTERING PRACTICES: We received 552 responses (2.57/individual) about OR beekeeper wintering management practices (more than one option could be chosen). Eighteen individuals (8%) of the respondents indicated doing none of the several listed wintering practices; these individuals had an elevated 40% winter loss, 10 percentage points higher than overall loss. For those indicating some managements, 40 (19%) did one single thing, (21.5% loss), 59 did 2 (39% loss), 43 (median number) did three (17% loss), 25 did 4 (50% loss), 8 did 5 (36% loss) and 1 did 6 with 67% loss. Doing more did not

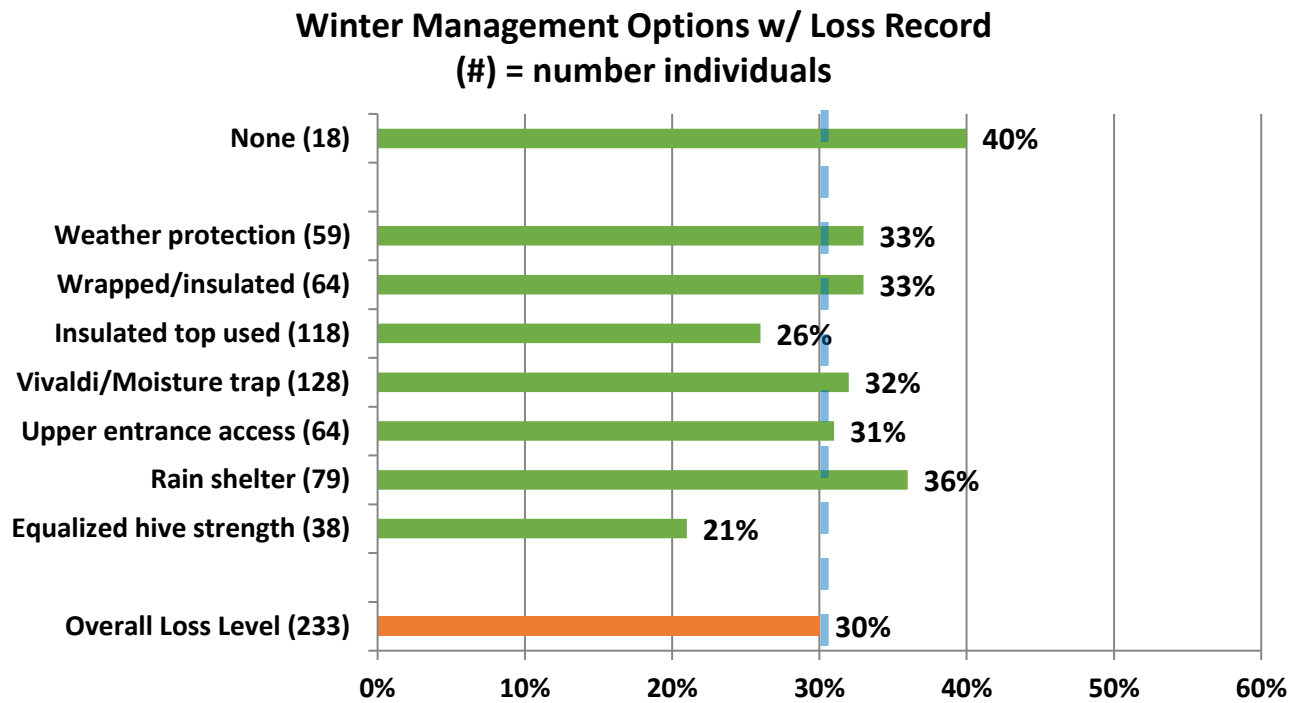


Figure 11

The most common wintering management selected was ventilation/use of a quilt box at colony top (128 individuals (59%), same percentage compared to previous year) followed by insulated top (118 individuals, 52% of respondents an increase of 2 percentage points from the previous year). The Vivaldi board had 2 percentage point poorer survival while those using the insulated top had 4 percentage point better survival. Figure 11 shows per cent of individual choices and bar length shows percent winter loss of each selection. Bars to left of green dashed line means better survival than overall. Only equalizing (along with insulated top) improved winter survival.

Over the past six years individuals that did no winterizing practice (average 11.3% of individuals) averaged 41.3% loss compared to 37.7% overall average loss of last 6 years, a 4.6 percentage point poorer survival rate. Only a single winterizing management improved survival all 6 years – insulated top (6 year average loss of 30%, a 7.7-percentage point improvement). Vivaldi/quilt box, upper entrance (most Vivaldi boards have an upper entrance built into the equipment), wrapping and wind/weather protection had only slightly improved survival rates and were not noted in all past 6

years. Equalizing hive strength was the best management to improve survival both this and the past year.

SANITATION PRACTICES: It is critical that we practice some basic bee sanitation (some prefer use of term bee biosecurity) in our bee care to help insure healthy bees. We received 483 responses for this survey question 2.4/individual. Thirty individuals said they did not use any of the 6 offered alternatives; they had a loss rate of 30% compared to the overall rate also 30%. Over past four-years those indicating doing none had a 42.9% percent loss rate, 5.5 percentage points higher than the average loss rate of 37.4% over the same time period. Ninety-five (47 %) individuals had 1 selection with 29% loss, 69 (34%) had 2 choices (the median number) with 32% loss level, 36 selected 3 managements (25% loss level), 25 had 4 (37% loss level), 7 had 5 selections with 30% loss level and one individual with 5 colonies had 5 selections and didn't lose any colonies.

Minimal hive intervention (98 individuals) was the most common option selected, as it has been for the last 4 years. 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 demonstrate improved winter survival; the loss rate for this group the past 6 years was 47%, eleven percentage points above the average 6-year loss of 36% loss rate compared to those individuals that did nothing.

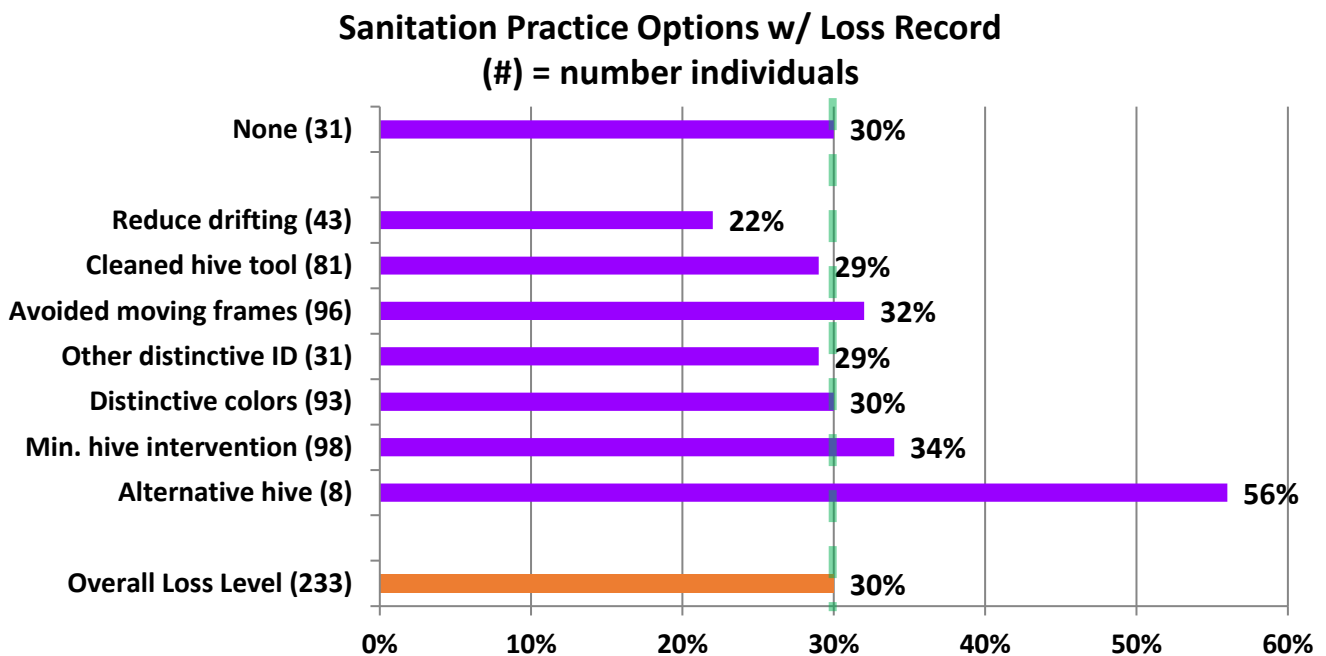
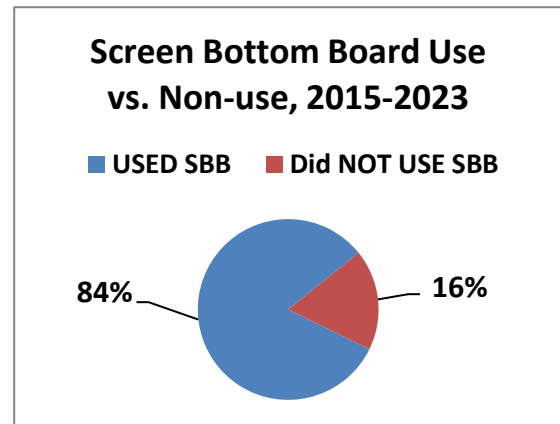


Figure 12

Avoiding moving frames and reducing drifting were the two sanitation choices that demonstrated better average survival the past six years – 6-year loss rate was 34.3% for not moving frames which is 1.7 percentage points better survival (this and last year it was 2 percentage points higher than average) and 30.5% for reducing drifting a 5.5 percentage point improvement in survival, the best management for reducing loss this year. Overall sanitation appears to be relatively minor toward improving survival.

SCREEN BOTTOM BOARDS (SBB)

Although many beekeepers use SBB to control varroa, BIP and PNW surveys clearly point out they are not a highly effective varroa mite control tool. In this recent survey, statewide 19 individuals (8%) said they did not use screen bottom boards. This is the lowest percentage of the last 3 years for non-use of a screened bottom – 25% said they used sometime. Average non-use for the last eight years is 16%, vs 84% use, on some or all colonies. Figure 13 right.



This past overwintering season, the 38 non-SBB users had winter losses of 27 colonies a 28.5% loss. **Examining the eight-year average of SBB use, loss level of the 84% using SBB on all or some of their colonies had a 33.9% loss level whereas the 16% not using SBB had loss rate of 36.8%, a 3.1-percentage point positive survival gain for those using SBB versus those not using them. Screen bottom boards offer a minor improvement for overwinter survival.**

We asked if the SBB was left open (always response) or blocked during winter. This past season, 67%, 150 individuals, said they always blocked SBB during winter; 22 individuals statewide said they blocked some of the SBBs. Statewide those who blocked always or sometimes had 999 colonies in the fall and lost 717, a 28.2% loss rate. Those 51 who never blocked had a 28.5% winter loss, a mere 0.3-percentage point difference. As in past years, there was a slight advantage **in favor of closing the SBB over the winter period to improve survival.**

Screen bottom board use has a slight survival advantage. For those using SBB, the advantage appears to be to close, partially or completely, the screen over the winter period.

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

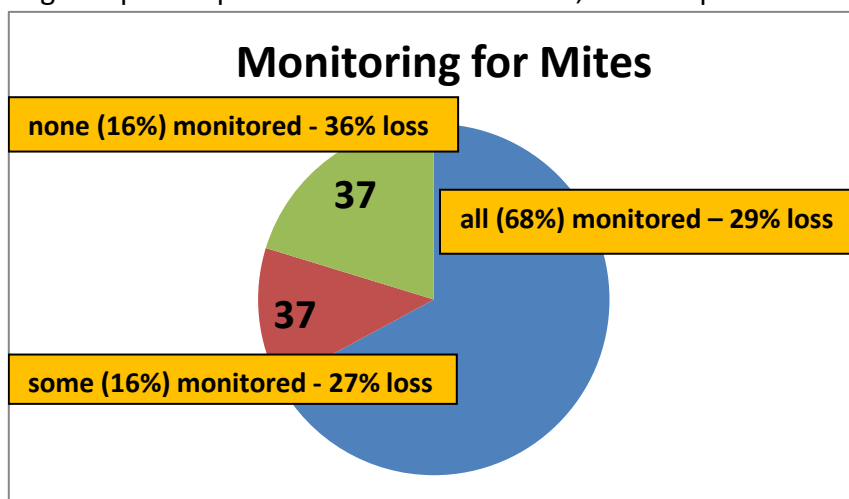
Feeding, a basic management for all livestock, appears to be of some help statewide in reducing losses. Feeding a hard sugar candy or dry sugar during the winter means lower loss levels. Providing frames of honey and feeding sugar syrup also yields lower losses for some individuals. Such feeding management is of great value for spring development and/or development of new/weaker colonies as well as for colony rearing of bees to overwinter. Feeding protein in any form did slightly improve survival. The supplemental feeding of protein (pollen patties) might additionally be of assistance earlier in the season to build strong colonies and in the fall to build the fat bee population needed for successful overwintering. To determine if feeding might help monitor what sources your bees are visiting and manage accordingly.

Winterizing measures that apparently helped lower losses for some statewide beekeepers were top insulation and wrapping the colonies (or otherwise adding some insulation to provide added protection against the elements). Spreading colonies out in the apiary and doing other measures to reduce drifting also appeared to be of some value in reducing winter losses. Avoiding movement of frames from one colony to another might also improve survival but the gain over what this interchange might accomplish to bolster weak colonies and start new divides might be greater than a minor advantage in survival.

Replacing standard bottom boards for screened bottoms marginally improved winter survival. It is apparently advantageous to close the bottom screens during winter. It is clear that doing no feeding, winterizing or sanitation resulted in the heaviest overwinter losses.

Mite monitoring/Sampling and Control Management

We asked the percentage of Oregon hives monitored for mites during the 2022 year and/or overwinter 2022-23, 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. 159 individual respondents (68%), two percentage points above the previous year, said they monitored all their hives. The losses of those individuals monitoring was 29%. Thirty seven individuals (16%) reported no monitoring; they had a higher loss rate of 43% loss. 37 individuals reported monitoring some of their colonies; they had a 23.6% loss.

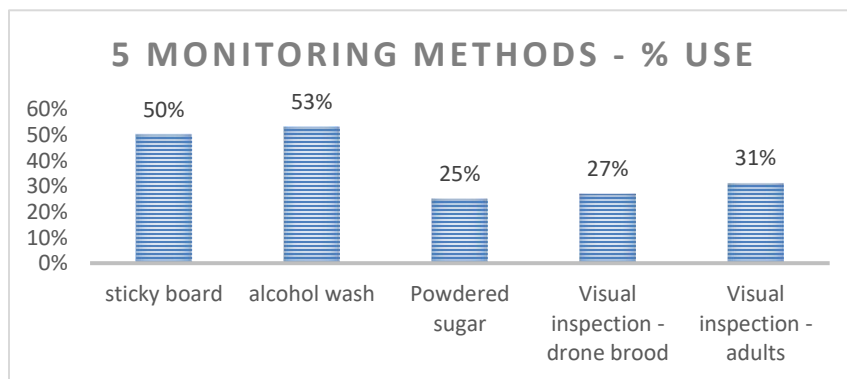


Monitoring alone is a means towards improved winter survival. The table below compares % individuals and % winter loss for individuals who monitored all colonies compared with those who

monitored none. Seven-year difference is 8 percentage point better survival monitoring all colonies. The loss rate of 13-15% who monitored some colonies was variable, averaging 4 percentage points lower than those monitoring all colonies.

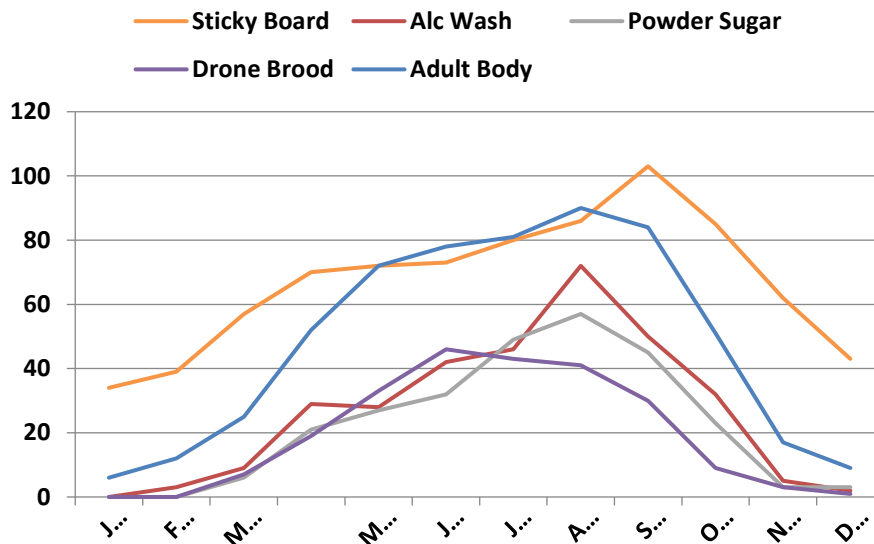
	ALL Colonies Monitored % individuals	% Loss	SOME Colonies Monitored % individuals	% loss	No colonies Monitored % individuals	% loss
2023	68%	29%	16%	27%	16%	36%
2022	66%	37%	15%	27%	18%	42%
2021	73%	34 %	11%	36%	17%	36%
2020	67%	33%	13%	16%	20%	49%
2019	67%	51%	15%	50%	18%	59%
2018	63%	38%	14%	26%	26%	49%
2017	63%	43%	15%	60%	22%	48%
7 year loss avg		38%		35%		46%

Individuals indicated use of 1.85 monitoring techniques on average. In total choices, in order of popularity of use, 104 individuals used alcohol wash and 98 individuals used Sticky boards (53 and 50% respectively of those responding to using a monitoring technique. 48 individuals used powdered sugar monitoring; visual inspection of drones (53 individuals) and visual inspection of adults (60 individuals) were also indicated. In the past 5 years, the use of sticky boards has decreased in use and alcohol wash has increased in use. This was the first year Alcohol use monitoring was the major monitoring technique.



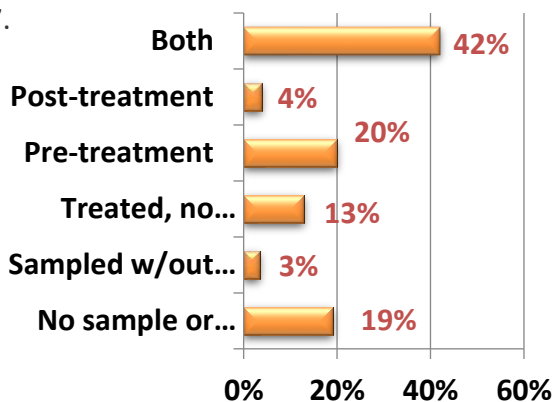
Whatever technique used, most sampling to monitor mites was done in July – September, as might be expected since mite numbers change most quickly during these months and sampling results can be used to key control decisions. Figure 16 illustrates monthly sampling with five methods.

Figure 16



The most common sampling of respondents is both pre- and post-treatment (42% average). The sampling pre-treatment percentage has been decreasing while post treatment sampling has slowly been increasing. It is important to know if the treatment works so post treatment shouldn't be avoided. Treatment without sampling was 13%, (last year it was 28% an anomaly, double the more typical percentage of this year). Figure 17.

Figure 17



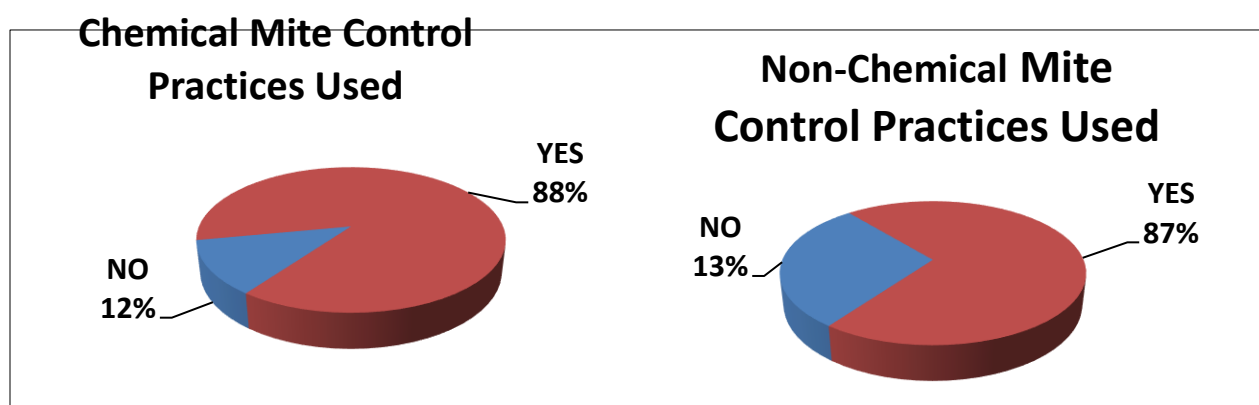
It is important to KNOW mite numbers. Less effective mite monitoring methods include sticky (detritus) boards below the colony. Often so much detritus drops onto a sticky board that counting the mites can be hard, especially for new beekeepers). Sticky boards used for a single day pre- and post-treatment can help confirm the effectiveness of a treatment, if numbers drop post treatment. Visual sampling is not accurate: most mites are not on the adult bees, but in the brood, especially when there is a lot of brood and the adult mites are NOT on the adult body where they can be observed (over 90%

are on the lower abdomen, tucked within the overlapping bee sternites). Sampling for mites on drone brood is also not effective as a predictive number but can be used as an early warning that mites are present; if done, look at what percentage of drone cells had mites.

See **Tools for Varroa Monitoring Guide** www.honeybeehealthcoalition.org/varroa on the Honey Bee Health Coalition website for a description of and to view videos demonstrating how best to do sugar shake or alcohol wash sampling. The Tools guide also includes suggested mite level to use to base control decisions based on the adult bee sampling. A colony is holding its own against mites if the mite sample is below 2%. It is critical to not allow mite levels to exceed 2-3% during the fall months when bees are rearing the fat fall bees that will overwinter. It is also the most challenging 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.

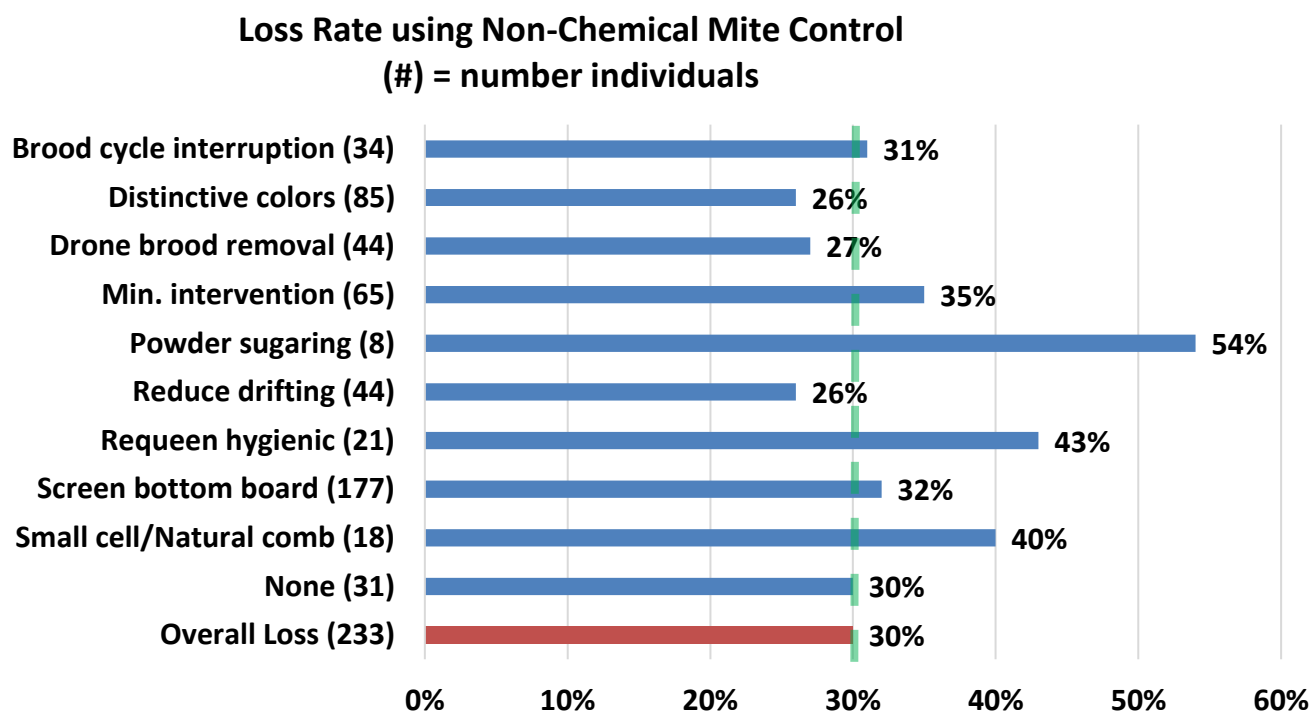
Mite Control Treatments

The survey asked about non-chemical mite treatments and also about use of chemicals for mite control. Thirty-one individuals (13%), four percentage lower than last year, said they did not employ a non-chemical mite control and 29 individuals (12%), the same percentage as last year, did not use a chemical control. Those 41 individuals who did not use a non-chemical treatment reported a 30% winter loss, same as overall, while those who did not use a chemical control lost 48% of their colonies, 18 percentage point difference. The individual options chosen for non-chemical control are discussed below.



Non-Chemical Mite Control: Of nine non-chemical alternatives offered on the survey (+ other category,) 51 individuals (28%) used one method, 68 used two, 45 used three, 26 used 4, 9 used 5 and 3 individuals used 6 plus one used or 7. Individuals using a single method had 35% loss rate, those using 2 had a 24.5% loss rate, those with 3 had a 25.5% loss, the 26 using 4 had 36% loss and the smaller number using 5 (44%), 6 (91%) and 7 had 100% loss. Clearly using more than one method/tool improves success.

Figure 19



177 individuals (76% of total respondents) listed use of screened bottom board. The next most common selection was distinctive colors (84 individuals). The use of the remaining selections is shown in Figure 19; number of individuals in (), bar length represents average loss level of those individuals using each method. Those left of **green dashed** line had improved survival.

Three of the non-chemical alternatives have demonstrated reduced losses over past 6 years. Reducing drifting such as spreading colonies (30% loss average for 5 years – question not asked in 2016-17 survey) and brood cycle break (33.9% average) have consistently year after year demonstrated somewhat better survival than average loss (35.6% average loss last 5 years and 37.5% loss last 6 years respectively). Different colony colors in apiary 36% average loss and drone brood removal (37% average loss) were just slightly better than average 6-year loss (38%).

Chemical Control: For mite chemical control, 29 individuals (12% of total respondents) used NO chemical treatment. They had a loss level of 48%. Those using chemicals used at rate of 3.3/individual. Thirty-eight individuals (17%) used one chemical (had 50% loss level), 42 used two and 3 (median number), 44 used 4, 18 used 5, 17 used 6 and 8 individuals used 7. Loss levels declined for those using 2, (loss 32%), 3 (loss 27%) and 4 (losses of 20%) but were higher for the 18 individuals indicating 6 chemicals used (38%) before falling for the 17 and 8 respectively who use 6 (24%) and 7 chemicals (loss 18%).

New to the survey this year we asked how many times a chemical was used in addition to which chemicals were used. For example, 55 individuals indicated they used the synthetic chemical Apivar (amitraz). The overall loss level was 28%. 42 used Apivar once and lost 27%; 12 used it twice, losing 37%. One individual used Apivar 3 times (label permits use twice per year) and lost 2 of 8 colonies overwinter – a 25% loss level.

There are two essential oil products on the market. Apiguard, the thymol gel was used by 64 individuals. They had loss level was 20.5%. The 44 individuals that used it once had a 20% loss, the 12 using it twice had loss of 24%, the 6 using it 3 times had a 19% loss level and the 2 individuals (6 colonies total, with one lost overwinter) had a 17% loss. ApiLifeVar, the wafer thymol product was used by 23 individuals - their overall loss was 22%. Those who used it once lost 17%, the 3 individuals using it twice had double the loss level of 33% while the 4 individuals that used ApiLifeVar 3 or 4 times had no loss of 13 overwintered colonies.

One hundred twenty-six respondents (62%) indicated they used oxalic acid vapor (OAV), 28 used oxalic acid dribble (OAD) and 14 used oxalic acid extended (OAE). Loss rates were 27% for OAV, 28% for OAD and 20.5 for OAE. For OAD 22 used it once with 27% loss,, 5 individuals used it twice but had 31% loss and the single individual who used it 5 times had 67% loss (lost 2 of 3 colonies). Overall loss for OAD was 28%.

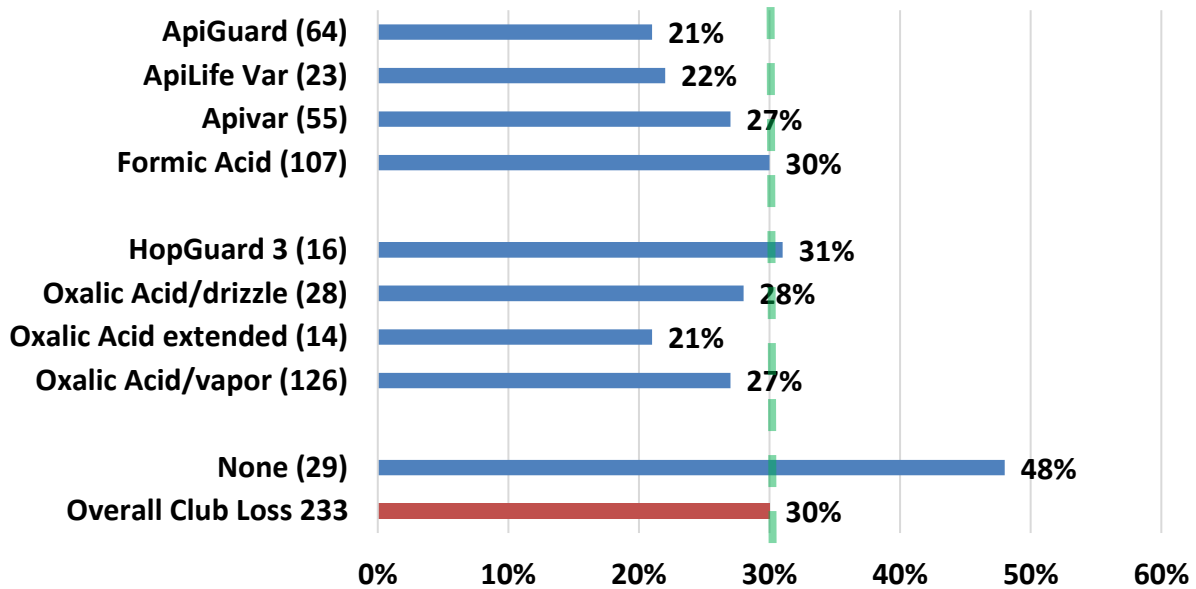
For Oxalic acid extended (OAE) – and the actual method used could have varied a great deal as everyone was experimenting on their bees as there is no approved product, or even application method, for OAE) – 18 individuals used it once with 25% loss, 8 said they used it twice (13.5% loss level), 5 indicated using it 3 times (19% loss) and one individual used it 5 times and lost 1 of 4 colonies overwinter (25%).

For oxalic acid vaporization, I sorted the data differently. 26 individuals used it once and had 23% loss, 28 used it twice with 22.5 % loss and 20 said they used it 3 times with 28% loss. This group using it one to 3 times, 84 individuals, had a 24% loss level. Additionally, 13 individuals said they used it 4 times with 30.5% loss and 10 individuals used it 5 times with 39.5% loss. Another group of 18 individuals used it 6+ times and had 31.5% loss. This group of 31 individuals using oxalic 4 to 6+ times had 33.5% loss. All oxalic acid users, a sum total of 125 individuals had a loss level of 26.5 percent.

Not shown in the figure below were 4 individuals who indicated “other” with total of 22 colonies – they had losses of 45.5%. At least one with 6 colonies, lost 1/3rd, said they used thyme with mineral oil; one other mineral oil user with a single colony lost that colony. The 8 individuals using powder sugar as control were included in the non-chemical data above. They had 26 colonies but lost 12 overwinter for 54% loss level. Finally, 2 individuals indicated they used fluvalinate - they lost all 6 of their colonies for 100% loss. See figure 20.

Figure 20

**Loss Rate using Chemical Mite Control
(#) = number individuals**



Consistently over the last 6 years four different chemicals have helped beekeepers improve survival. These were essential oils Apiguard (average 7-year loss level 29.1%), Apivar (30.6% average 7-year loss level), ApiLifeVar (32.6% average loss level over last seven years) and Oxalic acid vaporization (30.7% average loss level over last 7 years). The average loss level has been 37.9% the last 6 years. Formic acid too has done better than average the last 7 years but the product has changed from MAGS to Formic Pro. And this year the survey did not specify Formic Pro (listed was formic acid MAQS which no longer is on market), so I cannot be sure what was used as Formic acid by the 107 respondents who reported using it. Oxalic acid drizzle average of last 6 years is 36.2%, same as overall loss level of same time frame, 6 years. The extended OAE (absorbing oxalic acid and glycerin into sponges) did very well in promoting better than average survival but last year was only slightly better than average.

The monthly use of Apivar (blue line), essential oil (red line) or an acid (green line) is shown in Figure 21 for 2021-22 season. Further review is needed to determine if the timing of treatments was more effective than at other times for the various chemicals.

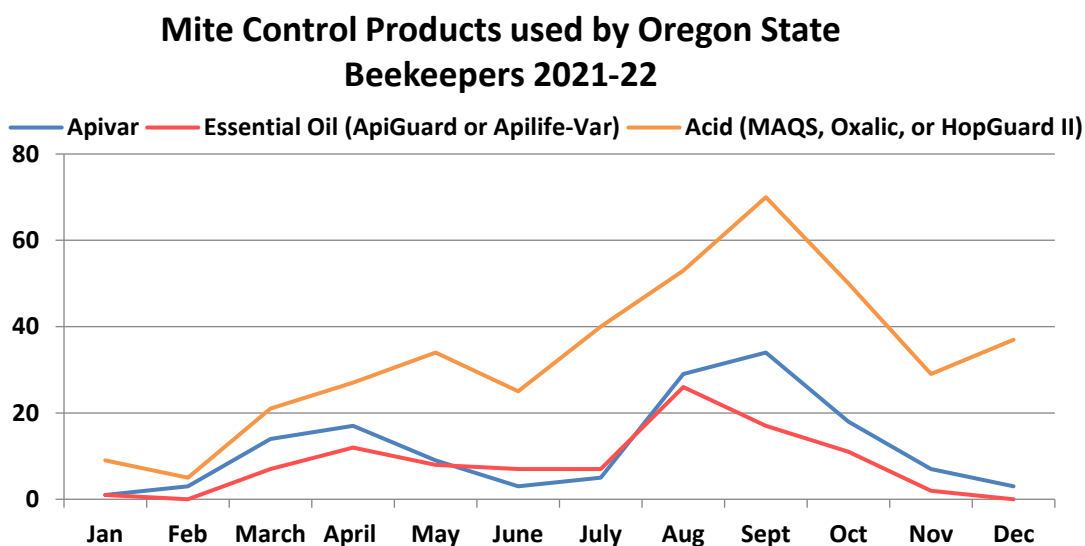


Figure 21

Antibiotic use

Three individuals (<1%) used Fumagillin (for Nosema control) and 2 individuals indicated use of terramycin. The 2 terramycin users had a 27% loss level (lost 3 of 11 colonies) and those who used fumagillin had a 28.5% loss (lost 4 of 14 colonies). One nosevet user lost all 4 colonies overwinter.

Queens

We hear lots of issues related to queen “problems”. Queen events can be a significant factor contributing to a colony not performing as expected. We asked if you had marked queens in your hives. Eighty-five individuals (36.5%), same percentage as last year, said yes. The related question then was ‘were your hives requeened in any form?’ to which 58% (135 individuals) said yes and essentially equal numbers said no or not that they were aware of.

Closing comments

This survey is designed to ‘ground truth’ the larger, national Bee Informed loss survey. Some similar information is additionally available on the BeeInformed website www.beeinformed.org and individuals are encouraged to examine that data base as well. Recall that the BeeInformed survey is measuring the larger scale OR beekeepers not the backyarders (See *American Bee Journal* April 2020 article by Dewey). Reports for individual bee groups are customized and posted to the PNW website.

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

info@pnwhoneybeesurvey.com with “REMINDER” in the subject line. We have a blog on the pnwhoneybeesurvey.com and will respond to any questions or concerns you might have.

Thank You to all who participated. If you find any of this information of value, please consider adding your voice to the survey in a subsequent season.

Dewey Caron with Jenai Fitzpatrick, June 2023