2016-2023 Beekeeper Survey Summary

For the past seven seasons, beekeepers have reported their losses and management practices via an online survey administered by the Maine Apiary Program. This data has been important for identifying trends, recognizing when and how losses occur, and determining where to focus education/outreach activities. A summary of the yearly surveys can be found on the Maine State Apiary webpage and have been reported in past issues of the MSBA Bee Line. This report is a more in depth look at trends in hive losses, Varroa monitoring, and Varroa control.

Between 172 and 388 beekeepers (representing 1,122 and 2,688 hives, respectively) responded to the online beekeeper management survey over the past seven years. Average yearly losses ranged from a low of 33.7% during the 2021/2022 season to a high of 45.2% during the 2018/2019 beekeeping season (Table 1).

Table 1: Number of beekeeper responses, the number of hives managed by beekeepers who responded, and the overall percent hive loss by beekeeping season.

	Number of Responses	Number of Hives	Overall Loss (%)
2016/2017	172	1,122	45.0
2017/2018	212	1,156	43.4
2018/2019	360	1,915	45.2
2019/2020	312	1,875	35.8
2020/2021	388	2,688	43.9
2021/2022	329	2,129	33.7
2022/2023	304	1,957	37.4

The counties with the average highest losses from 2016-2023 were Aroostook (61.5%), Washington (59.7%), Oxford (49.6%), and Androscoggin (47.4%). The counties with the lowest average losses between 2016-2023 were Hancock (25.0%), Piscataquis (30.4%), Lincoln (32.4%), and Somerset (35.0%) (Table 2).

Table 2: Hive losses by county.

	2016/2017		2017/2018		2018/2019		2019/2020		2020/2021		2021/2022		2022/2023		2016-2023		
County	**N**	**Loss (%)**	**N**	**Loss (%)**	**N**	**Loss (%)**	**N**	**Loss (%)**	**N**	**Loss (%)**	**N**	**Loss (%)**	**N**	**Loss (%)**	**Summer Loss (%)**	**Winter Loss (%)**	**Total Loss (%)**
Androscoggin	7	52.7	9	26.4	13	88.7	11	23.7	12	64.9	14	21.6	8	35.7	3.8	43.6	47.4
Aroostook	1	100	5	72.7	7	77.6	4	62.1	9	40.5	3	25.0	4	75.0	15.4	46.2	61.5
Cumberland	57	47.8	57	40.9	94	54.6	72	37.5	86	57.7	87	37.1	80	43.9	9.0	37.0	46.0
Franklin	4	43.5	3	16	4	71.4	6	39.4	6	29.2	6	50.0	5	53.8	9.5	30.0	39.5
Hancock	9	50.1	9	24.6	16	25.9	19	32.8	21	16.7	17	21.8	7	31.9	3.1	22.0	25.0
Kennebec	13	53.9	19	43.8	26	30.4	31	38.6	39	41.6	27	32.7	33	36.9	6.9	30.8	37.7
Knox	3	3.0	12	38.9	20	38.2	20	50.0	25	53.6	16	35.6	14	29.0	10.4	31.2	41.5
Lincoln	2	75	11	46.2	34	26.2	22	23.0	36	46.4	28	27.2	17	29.8	5.9	26.5	32.4
Oxford	7	69	11	48.7	21	52.2	19	30.1	15	52.6	11	58.2	7	72.4	6.7	42.8	49.6
Penobscot	22	63.8	22	53.4	36	31	29	33.9	33	32.4	23	48.6	32	32.2	8.6	28.7	37.3
Piscataquis	1	50	1	0	4	44.4	4	19.0	10	32.6	1	50.0	0	ND	4.3	26.1	30.4
Sagadahoc	6	62.5	9	50	10	27.7	10	35.6	16	50.8	17	21.0	7	31.0	9.0	26.5	35.5
Somerset	5	85	2	100	13	36.4	9	46.7	12	35.7	16	27.7	15	32.6	4.0	31.0	35.0
Waldo	8	65.2	9	21.9	15	23.9	17	41.5	18	46.3	16	69.9	15	22.5	11.5	29.4	40.9
Washington	1	94.1	5	89.7	9	60	3	22.2	9	36.2	3	33.3	3	64.0	12.3	47.4	59.7
York	26	64.7	28	47.9	38	38.6	36	54.2	40	52.6	41	39.3	50	37.1	8.5	35.9	44.4

Varroa mites and their associated viruses was the number one reported cause of winter hive mortality every year except in the 2017/2018 survey where environmental factors were reported as the top cause of losses. While queen issues/loss is the number one reported cause of summer hive mortality, Varroa mites and their associated viruses has been cited as the second most common cause of summer hive losses for the past five seasons.

On average, those beekeepers monitoring for Varroa experienced lower average losses than those that did not monitor (33.5-44.6 vs 43.7-59.9%). Beekeepers using alcohol washes as a monitoring method experienced lower losses than those using other methods of monitoring (28.0-39.0% vs 33.4-51.8%). Other monitoring methods include counting bottom board drops, sugar shake, drone brood inspection, visual inspection, etc. (Table 3).

Table 3: Average losses experienced by beekeepers using different methods to monitor for Varroa mites.

	Average		No Varroa Monitoring		Varroa Monitoring		Alcohol Wash		Other Monitoring Method	
Year	n	%	n	%	n	%	n	%	n	%
2016/2017	172	45.0	77	45.8	95	44.6	19	39.0	76	49.7
2017/2018	212	43.4	74	59.9	136	38.8	40	28.0	96	47.5
2018/2019	360	45.2	119	47.1	236	44.6	112	38.0	124	51.0
2019/2020	312	35.8	83	43.7	230	33.5	111	32.7	201	39.1
2020/2021	388	43.9	85	57.0	303	42.3	179	38.7	124	51.8
2021/2022	326	33.7	61	50.5	263	34.9	176	31.2	87	33.4
2022/2023	297	37.4	53	52.2	244	35.5	157	36.1	87	33.8

Strategies to control varroa mites are often broken up into two categories: prevention and intervention. Prevention measures primarily rely on disrupting the mite lifecycle which slows mite population growth. These methods are not intended to eliminate all mites in a hive but can maintain mite populations at low levels. Prevention methods include drone brood sacrifice, brood interruption, using screened bottom boards, etc. Intervention methods are used when mite infestations have reached treatment level/threshold and include all registered miticide treatments.

Those beekeepers that treated for Varroa mites experienced lower losses (31.5-43.9%) than those that did not treat (61.3-77.6%). Beekeepers that used both preventative and intervention control methods (aka Integrated Pest Management) experienced lower losses (28.5-40.6%) than those using only preventative (36.4-86.7%) or intervention methods (31.6-47.0%) (Table 4).

Table 4: Losses experienced by beekeepers using different Varroa management strategies.

	Treated for Varroa		Did not Treat for Varroa		Prevention Only		Intervention Only		Integrated Pest Management	
Year	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
2016/2017	137	40.3	30	76.2	5	81.5	99	39.1	38	40.6
2017/2018	187	41.6	25	77.6	3	83.3	140	42.3	44	38.9
2018/2019	314	43.9	35	76.3	7	86.7	227	47.0	87	37.5
2019/2020	291	34.7	21	71.9	11	41.2	189	35.5	90	32.3
2020/2021	346	42.6	42	74.0	6	54.5	247	43.8	90	38.4
2021/2022	284	31.5	38	77.8	7	36.4	198	31.6	79	31.2
2022/2023	272	36.3	24	61.3	3	87.5	188	39.6	81	28.5