

STATUS OF MINNESOTA BLACK BEARS, 2019

Harvests, Complaints, Foods & Population Trends

Report to Bear Committee

February 27, 2020

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*All data contained herein are subject to revision,
due to updated information, improved analysis
techniques, and/or regrouping of data for analysis.*

Key points

<p>Table 1 & Fig. 1</p>	<p><i>Overview: Permits, licenses, harvest, and success rates</i></p> <p>Permit applications for bear licenses exceeded 20,000 for the third straight year (although a slight drop from 2017 and 2018). Of these, >3,400 (16%), a record high number, applied for area 99, meaning that they only sought to raise their preference level for the permit system, but not hunt this year. Permit availability was higher than 2018 (increased in BMUs 41 and 45). Hunting success in the quota zone was the second-highest ever. Hunting success is inversely related to the number of hunters but also strongly affected by fall foods.</p>
<p>Fig. 2</p>	<p><i>Bear Management Units</i></p> <p>There are currently 13 Bear Management Units (BMUs) where license sales are limited by a quota, and 4 BMUs with no quota. The BMU divisions in the no-quota zone are for internal data analysis purposes only: hunters do not have to choose a BMU in which to hunt within this zone. In the quota zone, hunters must apply for a certain BMU and are drawn through a preference lottery based on their number of previously unsuccessful applications (Table 4). The first digit in each BMU (1–5) refers to 5 larger BMUs in which each was previously a part (when numbering began in 1985). Since then several BMUs have been split, to better adjust hunting pressure. The most recent split was in 2016, when BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). This split, along former BMU lines, allows current data to be regrouped into these former BMUs and thereby compared to older data (which is done in this report).</p>
<p>Tables 2 & 3</p>	<p><i>Quota zone permits and licenses</i></p> <p>The number of quota zone permits available in 2019 was slightly higher than in 2017 and 2018 (25 permit increase in each of BMUs 41 and 45). This is the 7th year (since 2013) that permits have been kept low (<3,900). This was the 9th year (since 2011) of a system whereby licenses for the quota zone that were not purchased by permittees selected in the lottery (>400) could be purchased later as surplus.</p>
<p>Fig. 3</p>	<p><i>Quota zone applicants</i></p> <p>Statewide, quota zone applications increased 11% over the past 10 years, but much of that increase was for area 99 (preference level application). Among applications for specific BMUs, only BMU 45 showed a significant, steady increase over the past 10 years, but this too has leveled out since 2017.</p>

<p>Table 4</p>	<p><i>Quota zone lottery</i></p> <p>The low quota zone permit availability over the past 7 years has made it increasingly difficult to succeed in the lottery. This year, although quotas were about the same as last year, a higher level of preference was needed to secure a permit because a large number of hunters who had accumulated preference points by previously applying to area 99 entered the lottery for a BMU. First-time and second-time applicants were successful only in BMU 22 (wilderness area hunt). Four BMUs required a preference level of at least 4 for a chance of success, and BMU 45 required a preference level of 5 or above. This high threshold for BMU 45 is due to the increasing number of applicants (Fig. 3), not a reduced number of available permits (Table 2).</p>
<p>Table 5</p>	<p><i>Harvest by BMU</i></p> <p>The statewide harvest in 2019 was 33% higher than 2018. Most of this increase occurred in the southern portion of the bear range (BMUs 45, 51, and 52); harvest in these BMUs was 2–3 times higher than in 2018. The sex ratio of the harvest was $\geq 60\%$ males in all BMUs except BMUs 45, 46, 47, and 51. BMUs with the highest increases in harvests tended to have a higher proportion of females in the harvest. The statewide harvest sex ratio has exceeded 60% in all years since 2013 (Table 1), when permits were reduced. However, these same highly male-biased sex ratios have also occurred in the no-quota area, suggesting that it is not just due to low hunter density.</p>
<p>Fig. 4</p>	<p><i>Harvest by quota vs no-quota zones</i></p> <p>Permit availability continuously declined during the decade 2003–2013 (Table 1), and with that, total harvests declined and the percent of the harvest in the no-quota zone increased. The percent harvest in the no-quota zone has leveled off in recent years, with stabilization of the number of quota-zone permits available, but nevertheless was a record high this year (29%), most of it occurring in BMU 52 (16% of statewide harvest; Table 5). Nearly half the bear hunters were hunting with a no-quota license since 2017.</p>
<p>Table 6</p>	<p><i>Hunting success by BMU</i></p> <p>Record-breaking success was experienced by hunters in 2016 and 2017, but dipped for most BMUs in 2018. In 2019, success was generally higher, reaching record or near-record levels in all but a few northern BMUs of the quota zone (>50% in BMUs 25, 27, 41, 45, 46, and 47; 65% in BMU 28 [which has a high proportion of guided hunters]). Success rate in the no-quota zone as a whole (20%) was less than one-half that in the quota zone (49%). The distribution of hunters within the no-quota zone is gleaned from where they said they would hunt when they purchased their license: a growing proportion indicated that they planned to hunt in BMU 10 (although the hunting success rate in this area is lowest in the state).</p>

<p>Fig. 5</p>	<p><i>Spatial distribution of hunters' baits</i></p> <p>Hunters placed 6,785 baits on the landscape during the 2019 hunt. Highest hunter bait densities occurred on public land near the Chengwatana and Namadji forests in BMU 52 (no-quota), the Paul Bunyan State Forest in BMU 46, the Chippewa National Forest in BMU 27, and on the edges of the no-quota zone where hunters may have attempted to lure bears from the quota zone. Of note, a few hunters set baits outside of primary bear range.</p>
<p>Table 7</p>	<p><i>Harvest by date</i></p> <p>During years of normal fall food abundance, about 70% of the harvest occurs during the 1st week of the bear season, and ~83% occurs by the end of the 2nd week. This year followed this normal pattern (whereas the harvest was delayed in 2018, due to more abundant foods).</p>
<p>Table 8 & Fig. 6</p>	<p><i>Nuisance complaints and kills</i></p> <p>The total number of recorded bear complaints slowly increased over the past decade, reaching a peak in 2015 and 2016. Number of complaints declined in 2017, despite a higher number of DNR personnel recording complaints, and declined again in 2018, with abundant natural foods all summer (Tables 9 & 10). Average or below-average foods during the summer of 2019 led to higher numbers of complaints. A new recording system was instituted in 2017 whereby Wildlife Managers recorded all bear complaints online as they were received, instead of submitting reports at the end of each month (thus, unlike previous years, Managers who had no complaints were not counted in the number of personnel participating). Conservation Officers implemented a similar system beginning July 2019. This dramatically increased the number of officers reporting bear complaints. Also, a relatively high number of the reports from officers involved a bear being killed by a private party. In 2018 and 2019, a list was distributed of "area 88" hunters, who expressed interest in taking a nuisance bear in the quota area on a no-quota license. Only 13 hunters purchased an "88" license and 3 hunters were successful (23% success rate).</p>
<p>Figs. 7–9</p>	<p><i>Spatial distribution of bear complaints</i></p> <p>All bear complaints, whether handled by phone or at an on-site visit, are now recorded spatially. Complaint calls regarding a perceived threat to humans and/or property damage most commonly occurred in the Brainerd, Cloquet, and Bemidji work areas. Agricultural complaints (livestock, beehives, and crop damage) were concentrated in the Brainerd, Little Falls, and Bemidji work areas. Garbage and bird feeder damage was widespread across the state, but was most intense around Brainerd, Bemidji, and Cloquet. Interestingly, the Cambridge work area had a large cluster of bird feeder complaints, considering that the work area falls on the edge of primary bear range. A similar pattern, but with fewer complaints, occurred in the Detroit Lakes work area, which is on the western extent of Minnesota bear range.</p>

<p>Tables 9–11 & Fig 10</p>	<p><i>Food abundance</i></p> <p>The composite range-wide, all-season abundance of natural bear foods (fruits and nuts) in 2019 was comparable to 2017 and significantly lower than 2018. Abundance of many summer foods was below the long-term (35-year) average in all but the northwest region. In general, summer food conditions were average and patchy across the state; in many areas, especially in the northeast and north-central, summer foods were delayed 2–3 weeks. On the other hand, fall foods tended to be average across the state. The statewide fall food index (productivity of dogwood+oak+hazel), which helps predict annual harvest after accounting for hunter effort (Fig. 11), was average in all regions. Hazelnut production was above average in much of the state (with patches near Bemidji, Grand Rapids, and Cloquet with exceptional production). Dogwood production was generally average to above-average across the range. Oak production was average across the state with patches of above-average production near Detroit Lakes and Cloquet. Stations in the North-Central and East-Central regions reported acorn drop nearly 2 weeks later than last year, which may have contributed to the high hunting success (and higher than expected harvest).</p>
<p>Fig. 11</p>	<p><i>Predictions of harvest from food abundance</i></p> <p>The 2019 statewide harvest was nearly 20% higher than expected (2340 actual vs. 1959 predicted), based on regression of harvest as a function of hunter numbers and the fall food productivity index. This regression is nearly as strong (and has accurately predicted previous harvests) when only the past 15 years are considered. For the quota zone, the actual harvest in 2019 was also nearly 20% higher (1659 actual vs. 1391 predicted) than predicted by this regression.</p>
<p>Fig. 12</p>	<p><i>Harvest sex ratios</i></p> <p>Harvest sex ratios within BMUs varied considerably year-to-year over the past 2 decades. In 2019, four BMUs in the northwestern part of the state (BMU 11, 12, 13, 41) all had harvest sex ratios very skewed to males (68–73%). Four BMUs farther east (BMU 24, 25, 26 [now 27, 28]), 31) had consistently lower sex ratios (62–63%), yet still much higher than a decade ago, when it rarely exceeded 60% male. The southern tier of BMUs (BMU 44 [now 46, 47], 45, 51, 52) all had much lower harvest sex ratios in 2019 than in 2018. Statewide, the percent males in the harvest has been climbing since the late 1990s; it has exceeded 60% in all years since 2013. Sex ratios of harvested bears reflect both the sex ratio of the living population (which varies with harvest pressure) as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions, hunter selectivity, and possibly density of baits).</p>

<p>Figs. 13–15</p>	<p><i>Harvest ages</i></p> <p>On a BMU-basis, median ages of harvested females has not shown an obvious temporal trend over the past 20 years. In 2019, median ages of females harvested in northwestern BMUs (BMU 11, 12, 13, 41) was only about 3 years old, whereas those farther east (BMU 24, 25, 26 [now 27, 28], 31) were 0.5–1.5 years older, and those in the southern tier of BMUs (BMU 44 [now 46, 47], 45, 51, 52) were about a half year younger (all <3 years old). Statewide, the median age of harvested females showed a steady drop until 2014. Since then it has climbed to 3.0 years old. Likewise, the proportion of harvested females aged 4–10 years has risen since 2014, while the proportion 1–2 years old has declined. The median age of harvested males has been creeping upward since 2013 (2.3 years in 2019).</p>
<p>Figs. 16–17</p>	<p><i>Submission of bear teeth for aging</i></p> <p>Ages of harvested bears are used as the principal means of monitoring population trends. Although hunters are required to submit a tooth from their harvested bear, historically >25% did not comply. Reminder notices were sent to non-compliant hunters each year during 2014–2017, which spurred a higher initial compliance the following years (>80%). Since 2018, with no reminder mailing, compliance has been 85–87%. Since 2013, hunters could register by phone or internet, and pick up a tooth submission envelope later: tooth submission compliance by these hunters has been significantly less (83%) than for hunters who registered their bear in person and picked up a tooth envelope at that time (92% compliance). A decreasing proportion of hunters are registering their bear at a registration station. Compliance with tooth submission was higher in the quota zones than in the no-quota area, but was especially low (<80%) in BMUs 10 and 41 (in both 2018 and 2019).</p>
<p>Fig. 18</p>	<p><i>Population trend statewide</i></p> <p>Ages of harvested bears accumulated since 1980 were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting) using a technique formulated by Downing. This was scaled upwards (to include bears that died of other causes), using 4 statewide tetracycline mark–recapture estimates as a guide. One trajectory, which assumed non-harvest mortality was 23% of total mortality (curves elevated x1.3) matched the 1991 tetracycline estimate, but fell below the other tet-estimates. Another trajectory, which assumed non-harvest mortality was 44% of all mortality (curves elevated x1.8) matched the 1997, 2002, and 2008 tet-estimates. The curves show an increasing population from the early 1980s to mid-1990s, leveling off in the late 1990s, followed by a steep decline through the 2000s. Since 2013, quotas were maintained at a low and consistent level (Table 1) in an attempt to reverse the population decline (and also to allow the models to perform better, without the confounding issue of changing hunter effort). The reduced harvest pressure stabilized the population.</p>

<p>Fig. 19</p>	<p><i>Population trend: quota vs no-quota zones</i></p> <p>Downing population reconstruction indicated that the quota zone population declined by ~50% from 2000 to 2014. With reduced quotas and lower harvests since then, the quota zone population increased over 10% from 2014 to 2016, according to this model, but then dipped following the higher than expected harvest in 2016. The Downing model does not produce population estimates for the most recent 2 years, so the effects of lower harvests in 2017–2019 is not yet reflected.</p> <p>A new Bayesian model developed by Allen et al. (2018) for bear monitoring in Wisconsin includes not only the sex-age composition of harvested bears (like the Downing), but also reproductive and survival parameters (obtained from data collected from long-term monitoring of radio-collared bears in different study sites across Minnesota). This model does not have a lag time (so projections are available to pre-hunt 2020). The trajectory of this model was remarkably similar to that of the Downing model for the quota zone, and indicated that the population there is slowly recovering.</p> <p>Meanwhile, despite a surge in “overflow” hunters in the no-quota zone (Fig. 4) prompted by the more restrictive quota zone permit allocations, harvests in the no-quota zone have not increased, and both the Downing and Allen models show a recent population increase.</p>
<p>Fig. 20</p>	<p><i>Trends in harvest rates</i></p> <p>The sex ratio of harvested bears varies by age. Male bears are more vulnerable to harvest than females, so males always predominate among harvested 1-year-olds (67–75%). Males also predominate, but less strongly among 2 and 3-year-old harvested bears. However, older-aged harvested bears (≥ 8 years) are nearly always dominated by females, because, although old females continue to be less vulnerable as individuals, there are far more of them than old males in the living population. The age at which the line fitted to these proportions crosses the 50:50 sex ratio is approximately the inverse of the harvest rate. Segregating the data into time blocks showed harvest rates increasing from 1980–1999, then declining with reductions in hunter numbers (Fig. 1). Based on this method, harvest rates since 2015 have been significantly less than what they were in the early 1980s, when the bear population was increasing (Fig. 18).</p> <p>One problem in using this very simple method is that it assumes that the relative difference for males versus females in their vulnerability to harvest does not change systematically through time. This may not be true, given the steadily increasing male-skewed harvests since the late 1990s, and especially in recent years (Fig. 14).</p>

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1998–2019.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Permit applications ^a	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362	17571	18647	19184	18103	18107	18885	18422	19958	21034	21184	20632
Permits available ^b	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050	6000	3750	3750	3700	3850	3350	3350	3400
Licenses purchased (total)	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589	6620	6962	7177	6655	6550	6801
Quota zone ^c	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188	3177	3257	3420	2954	2922	2988
Quota surplus/military ^c			235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578	583	446	441	401	428	417
No-quota zone ^c	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965	2823	2860	3259	3316	3300	3200	3396 ^h
% Licenses bought																					
Of permits available ^d	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6	100	100	100	100	100	100	100	100	100
Of permits issued ^d	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2	73.8	74.5	80.7	82.7	85.0	84.7	87.9	88.7	88.2	87.2	87.8
Estimated no. hunters ^e	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9200	8600	6300	6300	6700	6900	6400	6300	6700
Harvest	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866	1627	1971	2641	2040	1766	2340
Harvest sex ratio (%M) ^f	53	58	56	61	58	57	59	58	57	62	59	59	61	59	62	62	66 ⁱ	61	63	66 ⁱ	61
Success rate (%)																					
Total harvest/hunters ^g	23	23	29	14	26	26	26	26	28	21	30	29	23	30	30	26	30	38	32	28	35
Quota harvest/licenses	20	20	28	14	25	26	25	25	28	21	30	30	24	33	37	33	39 ^j	50 ^j	46	38	49 ^j

^a From 2008 to 2019, includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907; 2013 = 2129; 2014=2377; 2015=2455; 2016=2641; 2017=2803; 2018=3254, 2019=3450 (record high); additionally, area 88 nuisance-only bear license applications counted in this total in 2017=3, 2018=6, 2019= 5 (people who selected area 88 as 1st preference).

^b Beginning in 2011 a procedure was implemented that ensures that all available licenses are purchased (see Table 2).

^c Quota zone established in 1982. No-quota zone established in 1987. Surplus licenses from undersubscribed quota areas sold beginning in 2000; originally open only to unsuccessful permit applicants, but beginning in 2003, open to all. In 2011, surplus licenses offered for all lottery licenses not purchased by August 1. Free licenses for 10 and 11 year-olds were available beginning 2009.

^d Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued. Beginning in 2008, some permits were issued for area 99; these are no-hunt permits, just to increase preference, and are not included in this calculation. In 2011–19, all unpurchased licenses were put up for sale and were bought.

^e Number of licensed hunters x percent of license-holders hunting. Percent hunting is based on data from bear hunter surveys conducted during 1981–91, 1998 (86.8%), 2001 (93.9%), 2009 (95.3%), and 2018 (92.7%). Beginning in 2011 all unpurchased quota licenses were sold as “surplus” in August, and this process is quick and competitive; thus, for 2011–19 all Surplus and Military license-holders were considered to have hunted.

^f Sex ratio as reported by hunters; hunters classify about 10% of female bears as males, so the actual harvest has a lower %M than shown here. In good food years, the harvest is more male-biased.

^g Success rates in 2001–2012 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because no-quota hunters could take 2 bears. After 2012, hunters could take 2 bears only if they bought 2 licenses (1 quota + 1 no-quota). In both 2016 and 2017, 5 hunters legally killed 2 bears. In 2018, 3 hunters shot 2 bears. In 2019, 2 hunters shot 2 bears.

^h Record high number of no-quota zone licenses purchased in 2019; record high % of licenses in no-quota zone in 2017 (nearly 50%; see Fig. 4).

ⁱ Record high % males in statewide harvest.

^j 2015: highest success rate in quota zone since very poor food year of 1995; 2016: record high success rate; 2019: second-highest success rate.

Fig. 1. Relationship between licenses sold and hunting success (*note inverted scale*) in quota zone, 1987–2019 (quota and no-quota zones first partitioned in 1987). Number of licenses explains 53% of variation in hunting success during this period. Large variation in hunting success is also attributable to food conditions (e.g., during 2013–2019, when licenses were held relatively constant).

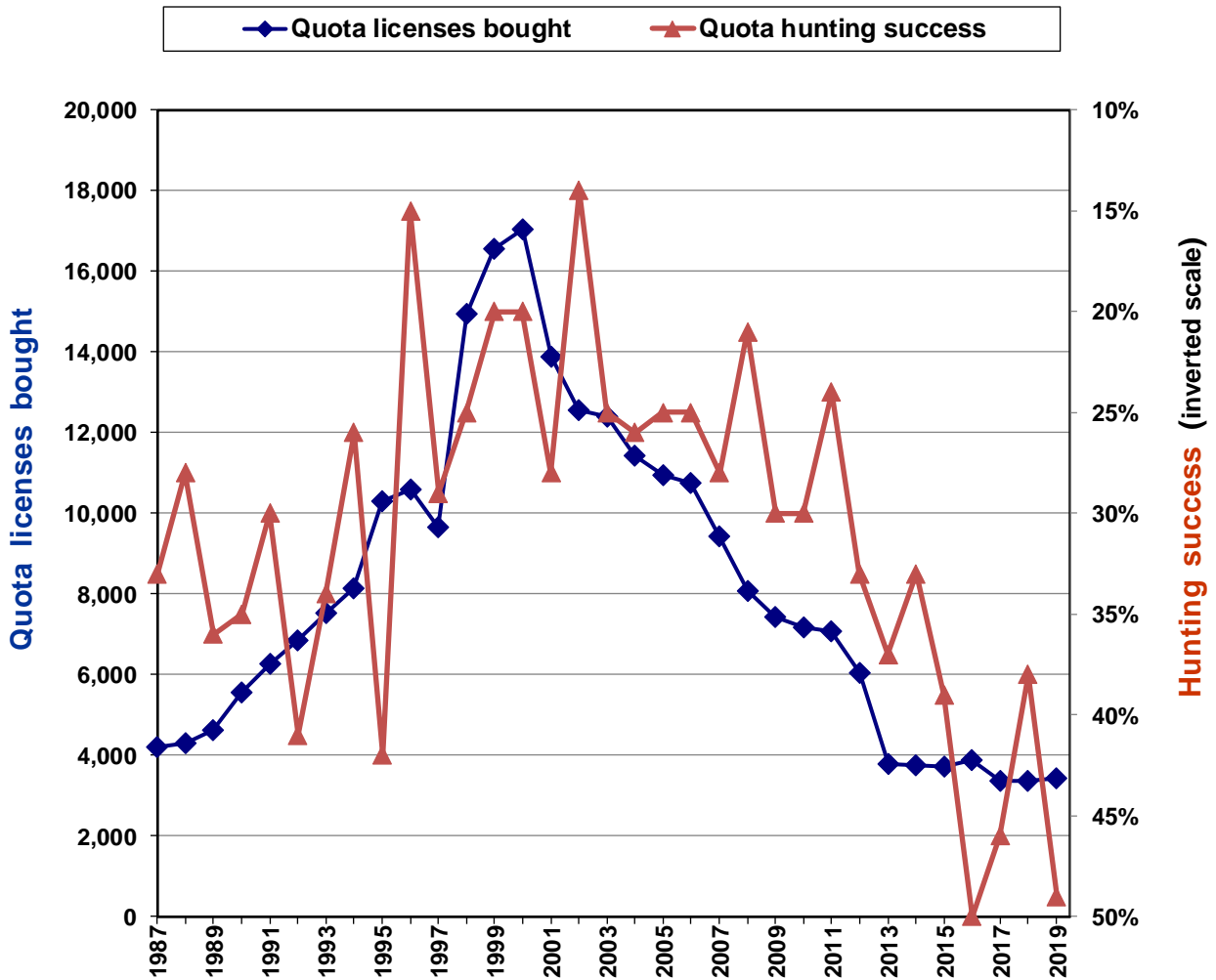


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU. In 2016, BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). No-quota hunters can hunt anywhere within the gray-colored zone, including the southeast corner of Minnesota (not shown; designated area 60).

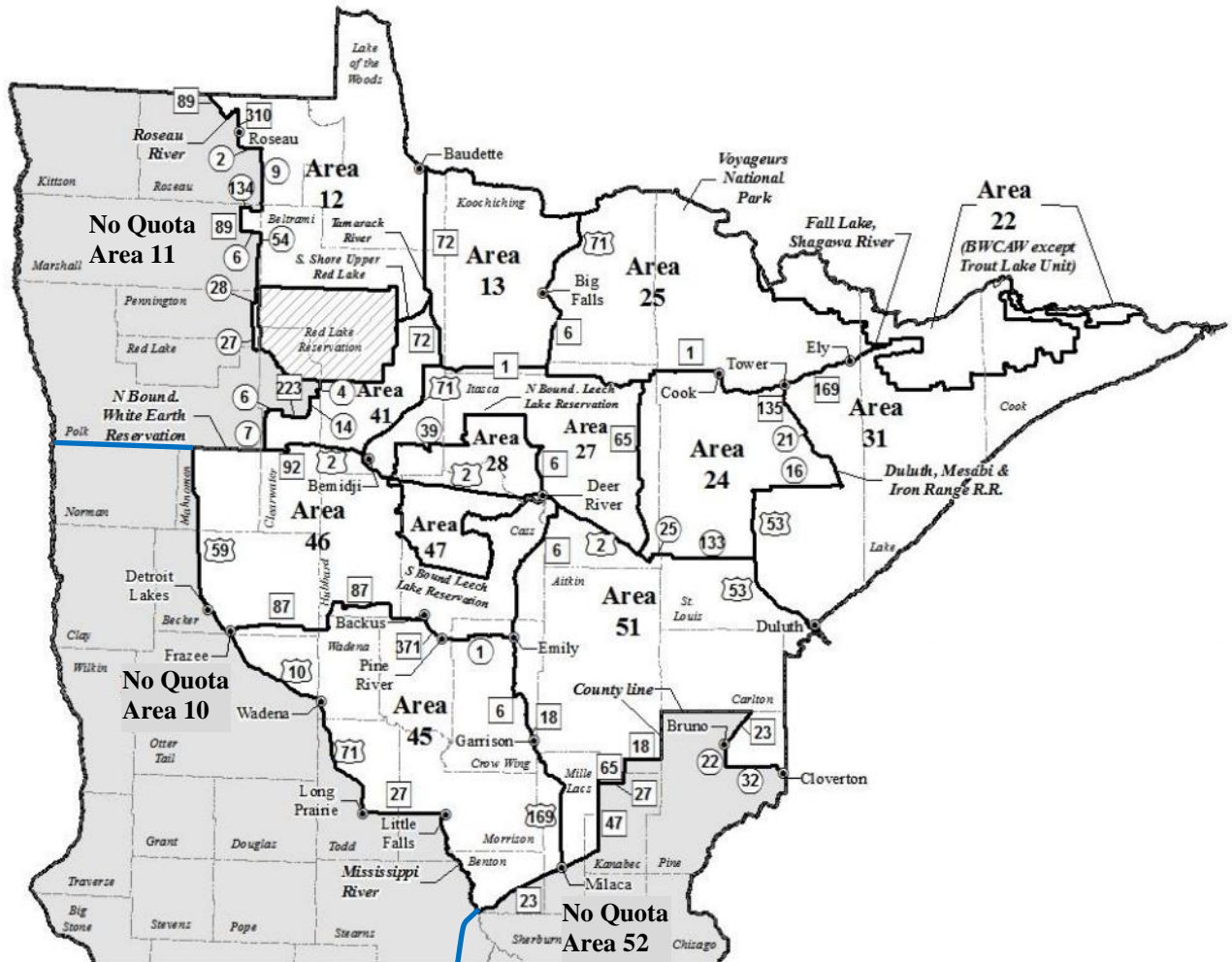


Table 2. Number of bear hunting quota area permits available, 2013–2019. Highlighted values show a change from the previous year. BMUs 26 and 44 were divided into 27/28 and 46/47, respectively, in 2016.

BMU	2014	2015	2016		2017	2018	2019
			Before BMU split ^a	After BMU split			
12	200	150	150	150	125	125	125
13	250	250	250	250	225	225	225
22	50	50	50	50	50	50	50
24	200	200	200	200	175	175	175
25	500	500	500	500	400	400	400
26	350	350	325				
27				250	225	225	225
28				75	60	60	60
31	550	550	550	550	500	500	500
41	150	150	125	125	125	125	150
44	450	450	450				
46				400	350	350	350
47				50	40	40	40
45	150	150	250	250	175	175	200
51	900	900	1000	1000	900	900	900
Total	3750	3700	3850	3850	3350	3350	3400

^a In 2016, the Leech Lake Reservation was split from BMUs 26 and 44 to form BMUs 28 (north) and 47 (south), with the remaining area of BMU 26 renamed BMU 28 and remaining area of BMU 44 renamed BMU 46. The column shows permit allocation before the split in order to compare with previous years.

Table 3. Number of quota BMU permit applicants (Apps), licenses bought (after permits drawn) and surplus licenses bought, 2014–2019^a. Shaded values indicate undersubscribed (applications less than permits available).

BMU	2014			2015			2016			2017			2018			2019		
	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought
12	661	164	36	612	130	20	624	133	17	774	113	12	703	109	16	711	104	21
13	703	218	32	692	210	40	716	221	29	772	200	25	682	177	47	712	199	26
22	65	33	17	48	36	9 ^b	52	37	13	47	34	16	76	36	14	61	35	14
24	875	174	26	771	171	29	884	173	27	945	158	17	928	155	20	840	153	22
25	1533	424	76	1396	433	67	1443	440	60	1651	354	46	1561	355	44	1250	348	52
26	1696	298	52	1650	309	42												
27							1224	219	31	1297	197	28	1265	204	21	1280	200	25
28							325	72	3	330	52	8	309	52	8	318	51	9
31	2257	468	82	2021	488	62	2180	489	62	2076	441	59	2074	428	71	1907	432	67
41	561	129	21	570	129	21	618	114	11	614	109	16	648	114	11	661	143	7
44	2751	393	57	2626	402	48												
46							2690	370	30	2774	319	31	2769	317	33	2662	313	37
47							194	45	5	214	33	7	182	35	5	198	34	6
45	1403	127	23	1703	139	11	2046	227	23	2323	161	14	2383	160	15	2351	178	22
51	4003	748	152	3878	810	90	4321	880	121	4411	783	117	4344	779	123	3956	798	102
Total^c	16508	3176	574	15967	3257	439	17317	3420	432	18228	2954	396	17924	2921	428	16907	2988	410

^a Beginning in 2011, all licenses not purchased by permittees were sold as “surplus”. In all cases but three (see footnote b), all of the surplus licenses were purchased. Surplus = Permits available (Table 2) minus Bought licenses (±5 to account for groups applying together).

^b Even after purchase of surplus licenses, this BMU remained undersubscribed.

^c Beginning in 2008, applicants could apply for area 99 in order to increase future preference, but not buy a license; these are not included in the total number of applications (unlike Table 1, where they are included).

Fig 3. Trends in number of applicants for quota zone permits by BMU over past 10 years, 2010–2019. For 2016–2019, BMUs 27 and 28 were grouped into old BMU 26 and BMUs 46 and 47 were grouped into old BMU 44. BMU 45 is highlighted because applications there surged over this time period.

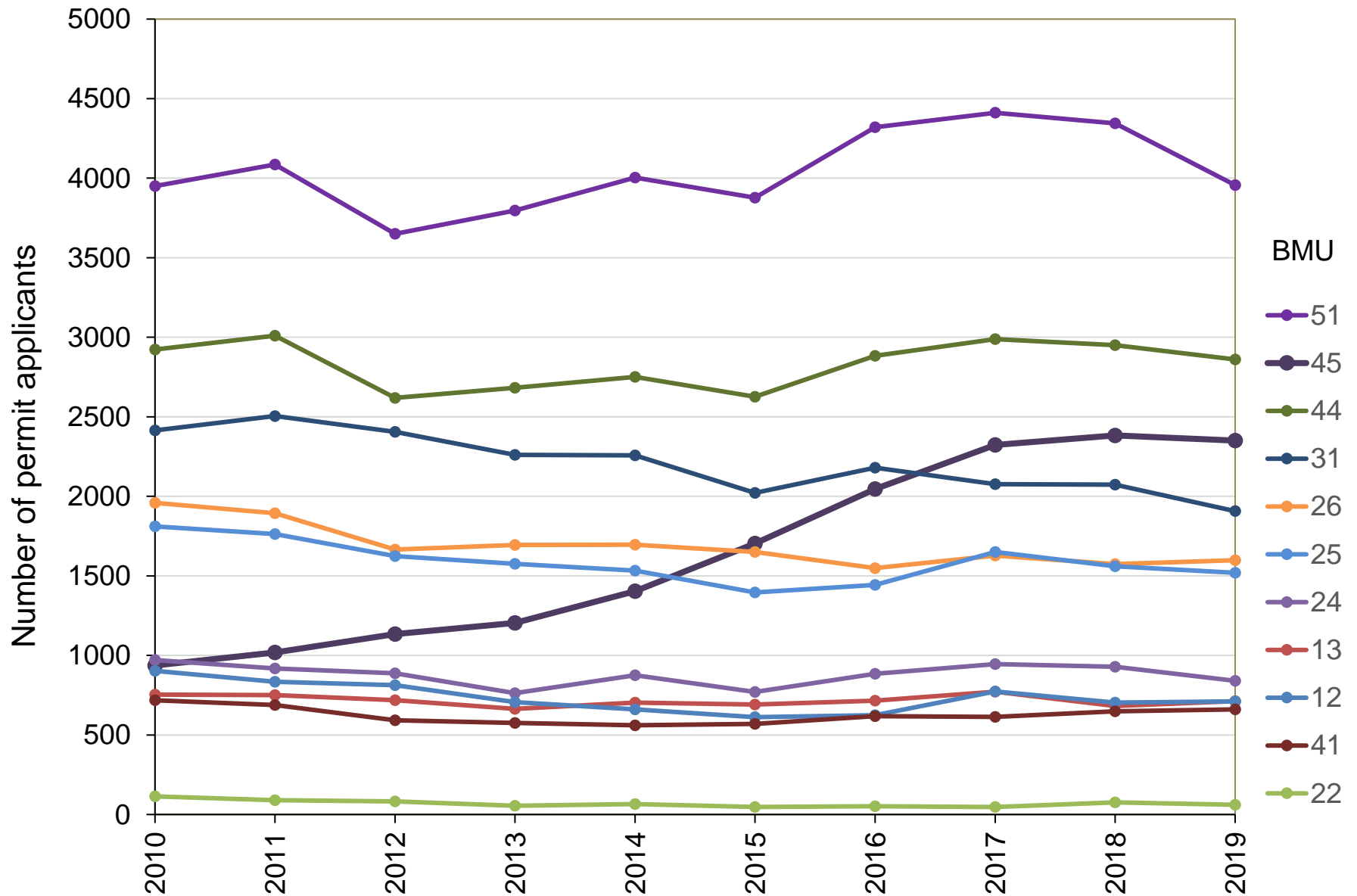


Table 4. Percent of quota BMU lottery applicants with preference levels 1 (1st-year applicants), 2, 3, 4, and 5 who were drawn for a bear permit during 2013–2019. Blank spaces indicate 100% of applicants were drawn. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn. Likewise, all preference level 3 applicants were drawn, except where 0 preference level 2 applicants were drawn^a.

BMU	2015				2016				2017				2018					2019				
	Pref 1	Pref 2	Pref 3	Pref 4	Pref 1	Pref 2	Pref 3	Pref 4	Pref 1	Pref 2	Pref 3	Pref 4	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5
12	0	17			0	0	98		0	0	57		0	0	41		0	0	13			
13	0	56			0	38			0	16			0	11			0	0	92			
22	100				98				100				60				76					
24	0	2			0	0	86		0	0	57		0	0	26		0	0	11			
25	0	44			0	42			0	6			0	0	80		0	0	58			
26 ^b	0	0	51																			
27					0	0	30		0	0	2		0	0	0	85	0	0	0	66		
28					0	0	0	99	0	0	0	76	0	0	0	46	0	0	0	5		
31	0	0	87		0	0	75		0	0	67		0	0	48		0	0	38			
41	0	0	99		0	0	77		0	0	56		0	0	27		0	0	6			
44 ^b	0	0	18																			
46					0	0	0	85	0	0	0	51	0	0	0	24	0	0	0	1		
47					0	0	10		0	0	0	49	0	0	0	26	0	0	0	50		
45	0	0	0	81	0	0	0	63	0	0	0	16	0	0	0	0	72	0	0	0	0	42
51	0	0	89		0	0	72		0	0	54		0	0	35		0	0	22			

^a As an example, in 2019: BMU 12: 0% of preference level 1 and 2 applicants were drawn, 13% of preference level 3, and 100% of preference level 4 and above were drawn for a permit; BMU 22: 76% preference level 1 applicants were selected, 100% all higher preference levels; BMU 45: no preference level 1–4 applicants were drawn, 42% of hunters with preference 5 were drawn, and 100% of hunters with preference level 6 and above were drawn.

^b BMU 26 was split into 27/28 and BMU 44 was split into 46/47 in 2016.

Table 5. Minnesota bear harvest tally for 2019 by Bear Management Unit (BMU)^a and sex^b compared to harvests during 2014–2018 and record high and low harvests (since establishment of each BMU, not counting current year).

BMU	2019				2018	2017	2016	2015	2014	5-year mean	Record low harvest (yr)	Record high harvest (yr)
	M (%M)	F	Total									
Quota												
12	45	73	17	62	66	54	78	60	38 ^d	59	38 (14)	263 (01)
13	71	68	34	105	119	100	147	72 ^e	91	106	71 (88)	258 (95)
22	2	67	1	3 ^f	4	8	5	7	5	6	3 (03)	41 (89)
24	53	62	33	86	60	81	96	97	50 ^f	77	50 (14)	288 (95)
25	142	63	82	224	223	212	287	227	168 ^g	223	149 (96)	584 (01)
26	105	62	64	[169]	[141]	[162]	[171]	121	117 ^h	142	117 (14)	513 (95)
27	77	60	51	128	105	120	131					
28	28	68	13	41	36	42	40					
31	132	62	80	212	211	262	312	307	221	260	157 (88)	697 (01)
41	52	68	24	76	58	61	57	35 ⁱ	36	46	35 (15)	201 (01)
44	116	57	87	[203]	[154]	[158]	[215]	158	170	176	130 (11)	643 (95)
46	103	57	78	181	139	141	190					
47	13	59	9	22	15	17	25					
45	54	50	54	108	51	77	102 ^m	55	54	67	32 (11)	178 (01)
51	226	55	185	411	185 ^d	372	463	302	291	355	185 (18)	895 (01)
Total	998	60	661	1659	1272	1547	1933	1441	1241 ^j	1507	1192 (88)	4288 (01)
No-Quota												
11	182	68	87	269	287	179	291	195	77 ^k	176	38 (87)	351 (05)
10	18	68	8	26 ⁿ	21	18	15	11	8	12		25 (19)
52	233	60	153	386	186 ^p	295	402	324	301	334	105 (02)	405 (12)
60 ^c	0		0	0	0	1	0	0	0			
Total	433	64	248	681	494	493	708 ⁿ	530	386	522	198 (87)	708 (16)
State	1431	61	909	2340	1766	2040	2641	1971	1627^j	2029	1509 (88)	4956 (95)

^a Some tooth envelopes were received from hunters who did not register their bear. These were added to the harvest tally:

2013:6; 2014:3; 2015:6; 2016:7; 2017:4; 2018:2; 2019:18

Some hunters with no-quota licenses hunted in the quota zone, and their kills were assigned to the BMU where they apparently hunted:

2013:11; 2014:4; 2015:12; 2016:9; 2017:2; 2018:4*; 2019:4

*None were authorized NQ license-holders hunting in quota zone.

Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear, but these were recorded in the BMU where they were assigned (presuming most were misreported kill locations).

^b Sex recorded on tooth envelopes may differ from the registered sex. Sex shown on table is the registered sex.

^c BMU 60 designates SE Minnesota, which is within No-quota zone. The only hunter-harvested bear in this area was in 2017.

Notable harvests:

^d Record low harvest since this area was established in 1987.

^e Lowest harvest since 1988.

^f Record low harvest since this area was established in 1989.

^g Lowest harvest since 1996.

^h Record low harvest since this area was established in 1991.

ⁱ Record low harvest since this area was established in 1990.

^j Lowest harvest since 1988 (quota—no-quota split in 1987).

^k Lowest harvest since 1999.

^m Highest harvest since 2007.

ⁿ Record high harvest.

^p Third lowest harvest since established as NQ area in 1987

^q Record high % males (or tie for record).

^r Tie for record low harvest.

Fig. 4. Trends in statewide bear harvest and proportions of harvest and licenses in the no-quota zones, 1987–2019.

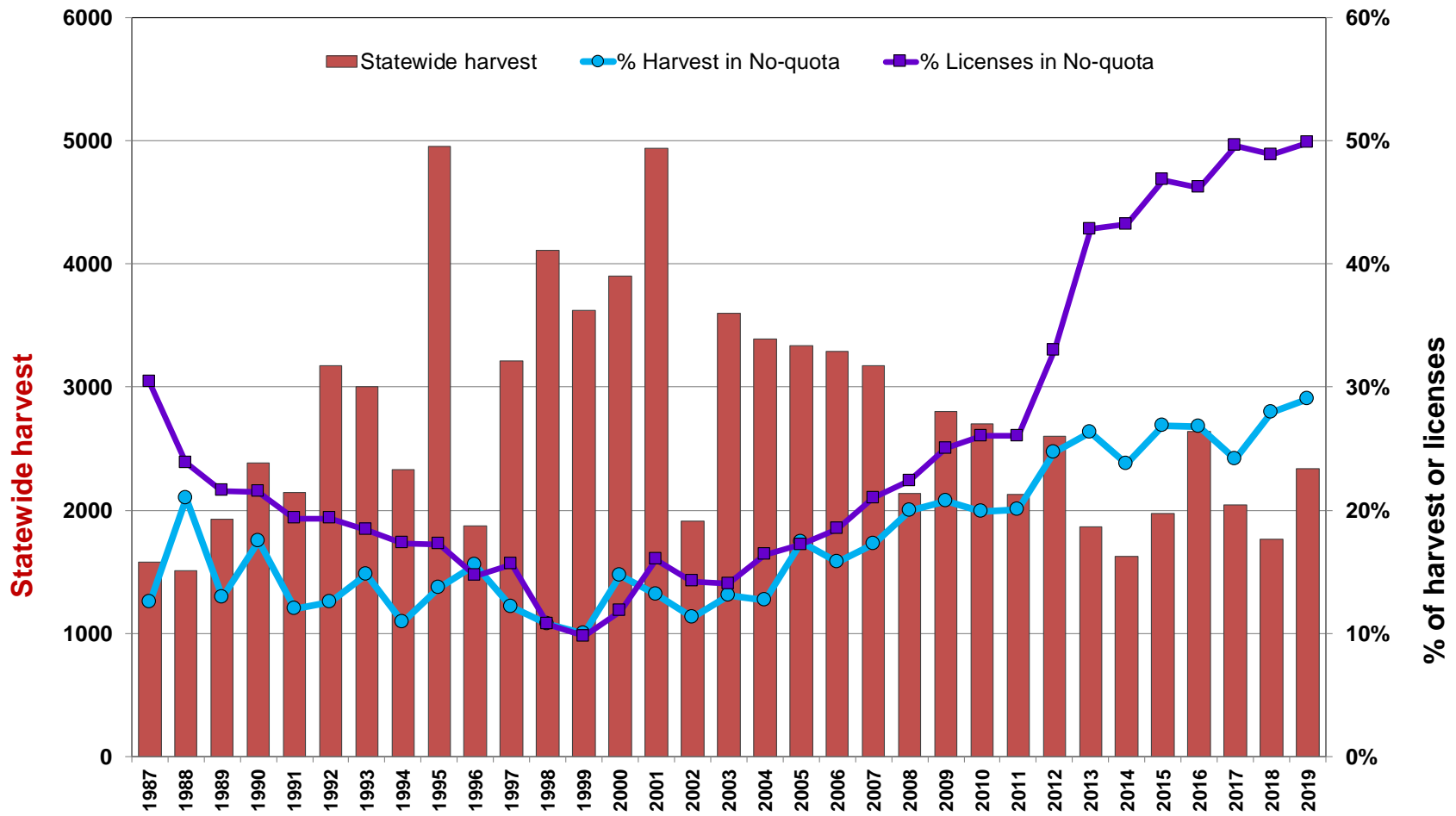


Table 6. Bear hunting success (%) by BMU, measured as the registered harvest divided by the number of licenses sold^a, 2014–2019.

BMU	Max success (yr) before 2019		Mean success 2014–2018	2019	2018	2017	2016	2015	2014
12	53	(18)	41	50	53 ^b	43	52 ^c	40	19 ^e
13	59	(95,16)	43	46	53 ^c	45	59 ^b	29	36
22	18	(92)	11	6	8	16	10	13	10
24	48	(15,16)	43	49 ^b	34	46 ^c	48	48	25
25	57	(16)	49	56 ^c	56 ^c	53	57 ^b	45	34
26	59	(95)	47	59 ^b	49	57	52	34	33
27				57 ^b	47	53	52		
28				65 ^c	60	70 ^d	53		
31	56	(15,16)	49	42	42	52	56 ^b	56 ^b	40
41	50	(95)	38	51 ^b	46	49 ^c	46	23	24
44	48	(16)	42	52 ^b	39	41	48 ^c	35	38
46				51 ^b	39	40	47		
47				55 ^b	38	43	50		
45	44	(17)	42	53 ^b	29	44 ^c	40	36	36
51	46	(16)	40	46 ^b	21	41 ^c	46 ^b	33	32
Quota	50	(16)	43	49 ^c	38	46 ^c	50 ^b	39	33
11 ^f			20	23	25	17	28	20	9
10 ^f			8	12	9	8	9	7	7
52 ^f			15	19	10	14	19	15	16
No Quota	32	(95)	16	20	15	15	21	16	13
Statewide	40	(95)	30	34	27	31	37 ^c	28	25

^a Registered harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the proportion of license-holders that hunted are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

^b Record high (or tied record high) success.

^c Second highest (or tied second highest) success.

^d Highest success ever for any BMU.

^e Tied record lowest success.

^f Since 2013, an attempt was made to differentiate the number of no-quota (NQ) hunters by BMU in order to estimate success rates. When no-quota hunters bought licenses, they recorded the deer block where they anticipated hunting. A significant number chose blocks in the quota zone; those who did not harvest a bear in the quota zone were divided up into NQ-BMUs in proportion to those who chose blocks in or adjacent to NQ-BMUs. A few chose BMU 60 (SE Minnesota); the first bear was harvested there in 2017. Table shows % indicating where they planned to hunt (number of hunters in parentheses for BMU 60 and Quota zone):

BMU	2019	2018	2017	2016	2015	2014
11	30.9	34.6	29.8	30.3	29.3	28.5
10	14.3	7.4	6.6	4.9	4.4	4.1
52	52.0	55.3	59.2	61.2	63.9	64.7
60 (n)	0.3 (11)	0.1 (4)	0.1 (4)	0.4 (12)	0.2 (8)	0.6 (17)
Quota zone (n)	2.5 (94)	2.6 (83)	4.2 (137)	3.2 (105)	3.1 (101)	2.1 (60)

Fig. 5. Number of hunters' baits per township within each BMU (6785 total baits) in 2019.

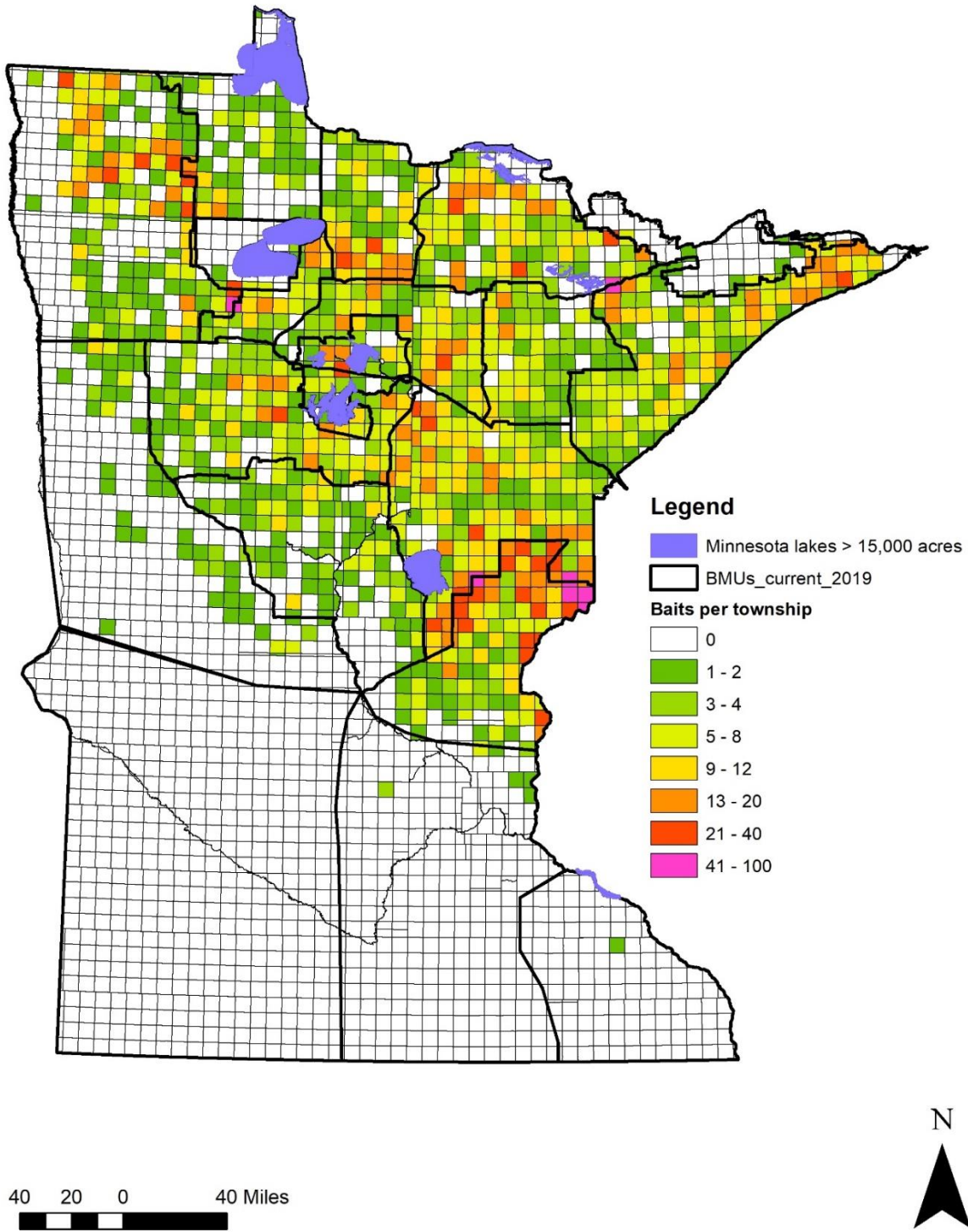


Table 7. Cumulative bear harvest (% of total harvest) by date, 1998–2019.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1998	Tue		76	87	96
1999	Wed		69	81	95
2000	Wed	57	72	82	96
2001	Wed	67	82	88	98
2002	Sun		57 ^a	69 ^a	90
2003	Mon		72	84	96
2004	Wed		68	82	95
2005	Thu		72	81	94
2006	Fri		69	83	96
2007	Sat		69	82	96
2008	Mon		58 ^a	71 ^a	92
2009	Tue		74	86	96
2010	Wed		69	84	96
2011	Thu		65	78	93
2012	Sat		68	83	96
2013	Sun		61	76	94
2014	Mon		60	75	92
2015	Tue		58 ^b	75	91
2016	Thu		68	83	95
2017	Fri		69	83	93
2018	Sat		59 ^a	75	91
2019	Sun		71	83	95

^a The low proportion of total harvest taken during the opening week (<60%) reflects a high abundance of natural foods.

^b The slow start the first week was likely due to especially warm weather.

Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1999–2019, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 ^j	2018 ^j	2019 ^j
Number of personnel participating in survey ^a	52	60	54	50	39	34	42	46	46	37	51	40	34	56	63	64	61	55	86 (51,35)	78 (56,23)	126 (60,66)
Complaints examined on site	189	105	122	75	81	75	61	57	63	59	65	70	37	113	69	79	97	118	71 (22,49)	40 (21,19)	82 (37,45)
Complaints handled by phone ^b	987	618	660	550	424	507	451	426	380	452	535	514	396	722	623	570	840	780	644 (450,194)	438 (369,69)	736 (599,137)
Total complaints received	1176	723	782	625	505	582	512	483	443	511	600	584	433	835	692	649	937	898	715	478	818
• % Handled by phone	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%	91%	86%	90%	88%	90%	87%	90%	92%	90%
Bears killed by:																					
• Private party or DNR	25	25	22	12	13	25	28	11	21	22	23	22	9 ^k	16	24	26	45	53	22 (4,18)	9 ^k (4,5)	45 (5,40)
• Hunter before season ^c																					
– from nuisance survey	5	7	4	0	3	3	6	2	18	3	4	3	3	11	0	0	1	13	1	2	0
– from registration file	24	43	20	11	8	4	13	6	25	5	15	10	5	12	0	1	4	6	3	11	5
• Hunter during/after season ^d	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0
• Hunter by Area 88 license ^e																			1		3 ^m
• Permittee ^f	7	2	6	4	6	1	5	4	5	1	3	5	0	0	1	0	3	0	0	1	2

Table 8. (continued)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bears translocated	29	1	6	3	1	3	3	3	1	3	2	2	2	0	3	2	0	0	0	0	0
• % bears translocated ^g	15	1	5	4	1	4	5	5	2	5	3	3	5	0	4	3	0	0	0	0	0
Bears killed by cars ^h	60	39	43	26	25	16	22	18	20	27	18	28	15	33	32	28	47 ^h	27	9 (0,9) ^h	25 (15,10) ^h	16 (11,5) ^h

^a Maximum number of people turning in a nuisance bear report each month. Monthly reports were required beginning in 1984, and included cases of zero complaints. In 2017, the recording system was changed, where Wildlife Managers only recorded actual complaints (not zero complaints), generally at the time the complaint was received. Since then, the number reflects the total number of people receiving and recording at least 1 complaint during that year. For consistency, the records from Conservation Officers were handled the same way. Beginning July 2019, COs recorded complaints electronically and individually (as they occurred), similar to Wildlife Managers (but using a different recording system).

^b If a complaint was handled by phone, it means a site visit was not made.

^c The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data. Similarity between the two values does not necessarily mean the same bears were reported.

^d Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

^e In 2017, hunters could choose Area 88 in the quota lottery, and if drawn, could hunt for a nuisance bear, if authorized (11 were authorized, 1 killed a bear). In 2018, Area 88 was only a designation for hunters willing to take a nuisance bear in the quota area on a no-quota license, if so authorized; 116 hunters were on this list. However, none of the 4 hunters with NQ licenses who killed a bear in the quota area (Table 5) were authorized to do so. It is not known from these records if others were authorized but did not kill a bear.

^f A permit for non-landowners to take a nuisance bear before the bear season was officially implemented in 1992, but some COs individually implemented this program in 1991. Data are based on records from the nuisance survey, not directly from permit receipts. Only 7 bears have been killed by permittees since 2011. In 2019, 7 permits were issued but only 2 bears killed.

^g Percent of on-site investigations resulting in a bear being captured and translocated. According to DNR nuisance policy, trapped nuisance bears should not be translocated.

^h Car kill data were reported on the monthly nuisance form beginning in 2005. In all previous years, car kill data were from Enforcement's confiscation records. In 2015, confiscation records had more car-kills than the nuisance survey (47 vs 33), so the higher number is shown here. In 2017, only 1 car-kill was in the confiscation records, and in 2018 there were just 2. In 2017, the electronic system used by managers did not allow for recording of car kills. In 2018, an effort was made to increase car-kill reporting by managers, which was further increased in 2019 by adding a distinct coding for non-confiscated car kills that were either observed or reported by the public.

^j Beginning in 2017, Wildlife Managers recorded nuisance bear complaints on an all-species wildlife damage app, whereas Conservation Officers continued to submit monthly nuisance bear survey forms (April–Oct). Beginning in 2019, COs also used an electronic app to record bear complaints (but a different app than wildlife). Because the 2 survey tools are not exactly the same, data are presented separately for each in parenthesis (Wildlife Managers, COs). For consistency, only April–October data are included (in 2017 managers recorded 10 calls in other months, in 2018 14 calls were in other months, in 2019 16 calls were in other months).

^k Lowest number of nuisance bears were killed in 2011 and 2018, since recording began in 1982.

^m 13 NQ hunters were authorized to take nuisance bears in the quota area in 2019, of which 3 were successful.

Fig. 6. Trends in nuisance bear complaints, and nuisance bears killed and moved, 1981–2019, showing dramatic effect of change in nuisance bear policy, and slight increasing trend over past decade.

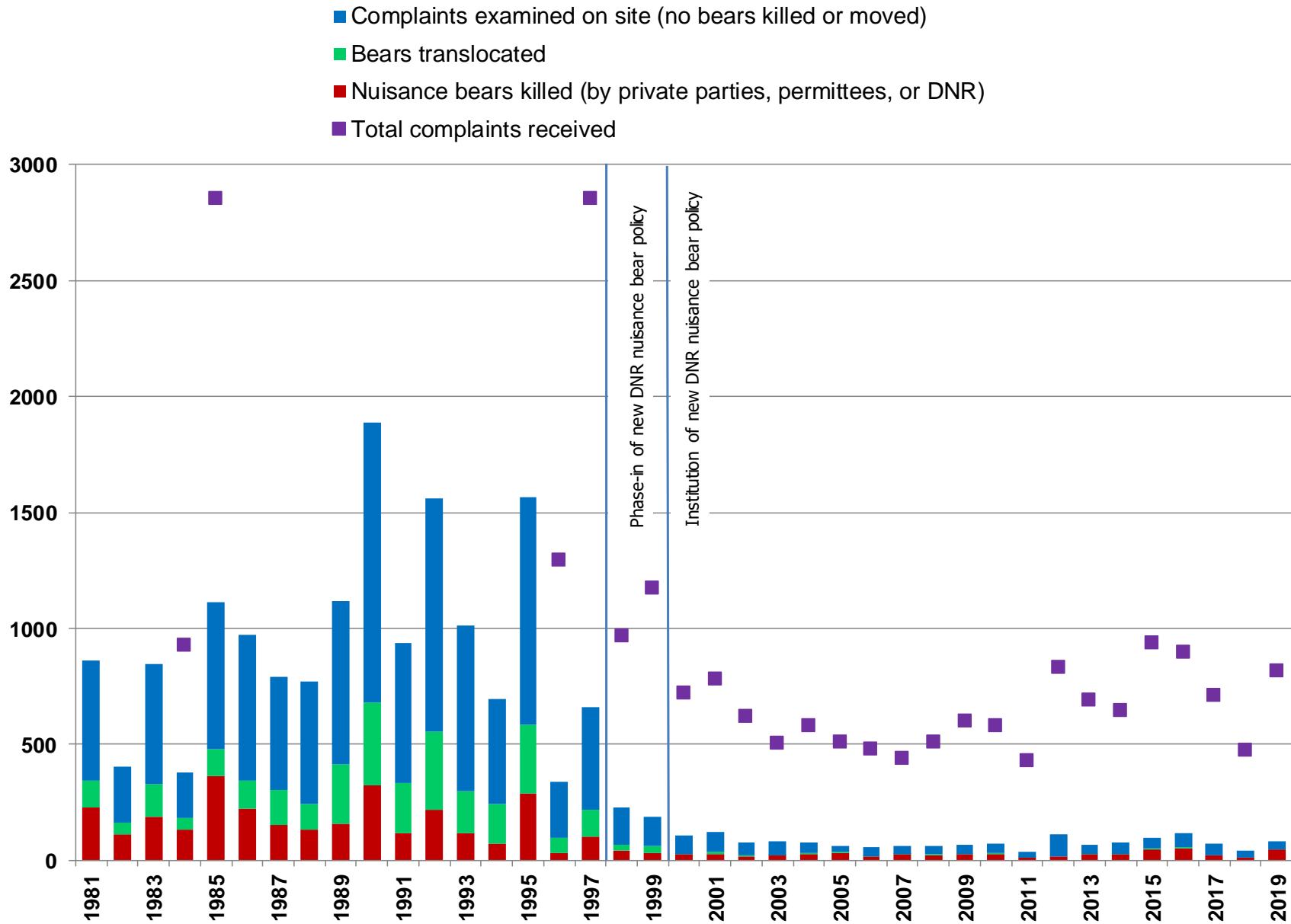


Fig. 7. Spatial distribution of nuisance bear complaints involving threat to humans or property damage in 2019. Complaints with circle symbol are from the Division of Enforcement; complaints with triangle symbols are from the Section of Wildlife.

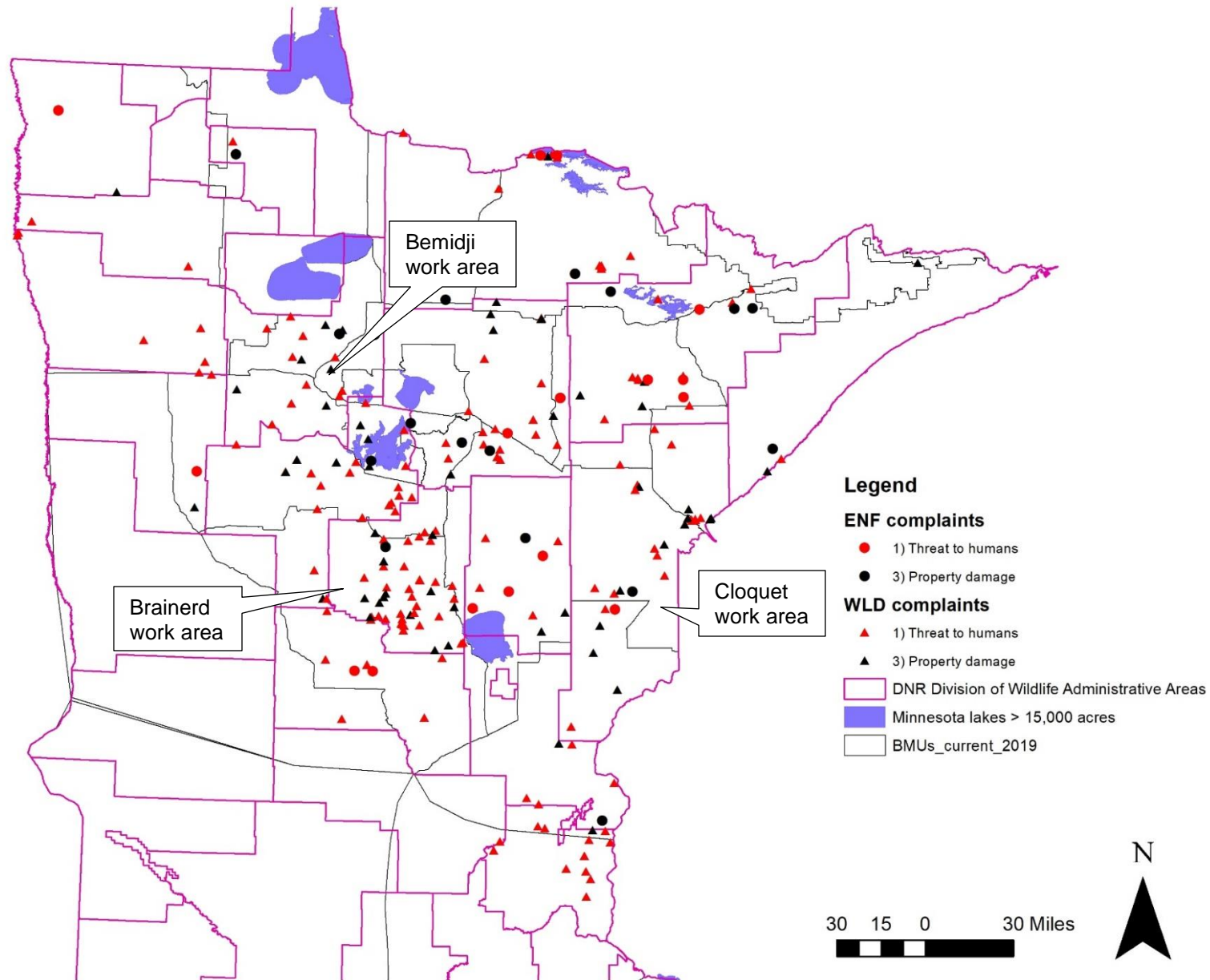


Fig. 8. Spatial distribution of nuisance bear complaints involving agriculture damage (threats to livestock, damage to apiaries or crops) in 2019. Complaints with circle symbol are from the Division of Enforcement; complaints with triangle symbols are from the Section of Wildlife.

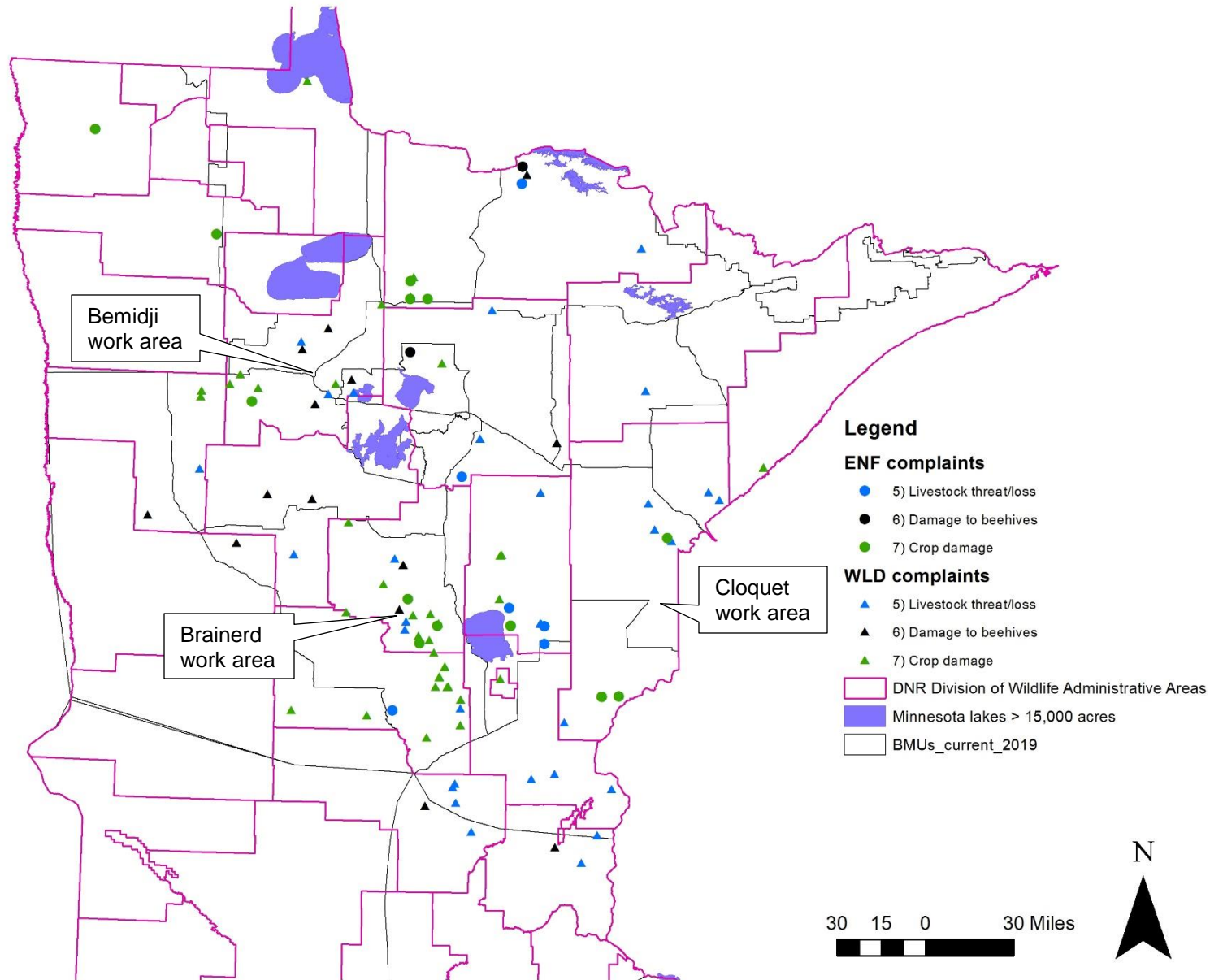


Fig. 9. Spatial distribution of nuisance bear complaints involving attraction to garbage or birdfeeders in 2019. Complaints with circle symbol are from the Division of Enforcement; complaints with triangle symbols are from the Section of Wildlife.

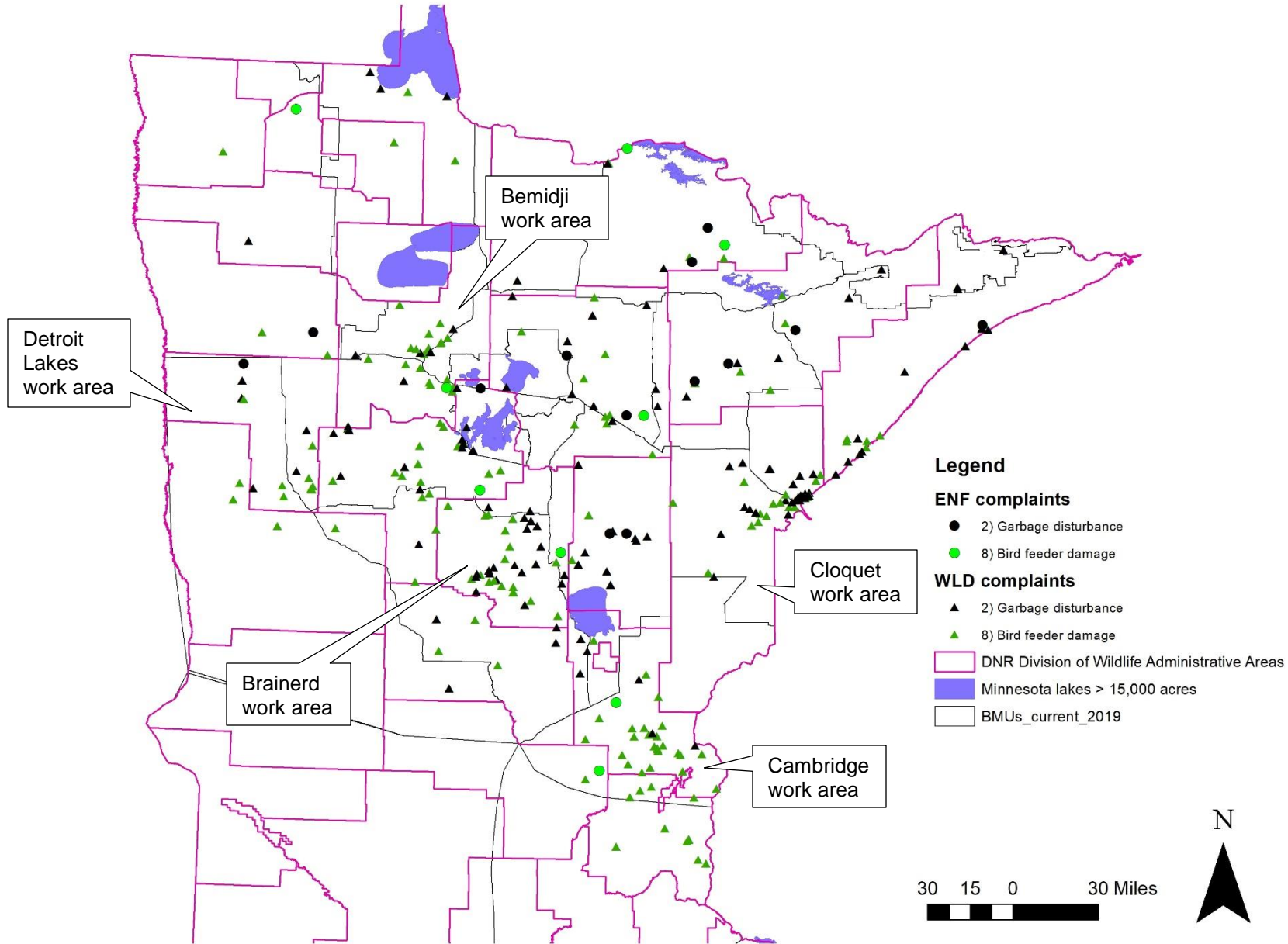
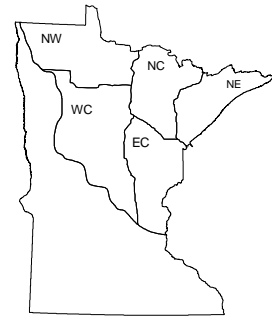


Table 9. Regional bear food indices^a in Minnesota's bear range, 1984–2019. Shaded blocks indicate particularly low (<45; pink) or high (≥70; green) values.

Year	Survey Area					Rangewide
	NW	NC	NE	WC	EC	
1984	32.3	66.8	48.9	51.4	45.4	51.8
1985	43.0	37.5	35.3	43.5	55.5	42.7
1986	83.9	66.0	54.7	74.7	61.1	67.7
1987	62.7	57.3	46.8	67.4	69.0	61.8
1988	51.2	61.1	62.7	54.4	47.3	56.0
1989	55.4	58.8	48.1	47.8	52.9	51.6
1990	29.1	39.4	55.4	44.0	47.9	44.1
1991	59.7	71.2	64.8	72.1	78.9	68.4
1992	52.3	59.9	48.6	48.1	63.3	58.2
1993	59.8	87.8	75.0	73.9	76.8	74.3
1994	68.6	82.3	61.3	81.5	68.2	72.3
1995	33.8	46.5	43.9	42.0	50.9	44.4
1996	89.5	93.2	88.4	92.2	82.1	87.6
1997	58.2	55.5	58.8	62.0	70.1	63.9
1998	56.9	72.8	66.4	72.3	84.5	71.1
1999	63.7	59.9	61.1	63.2	60.6	62.0
2000	57.7	68.0	54.7	69.2	67.4	62.3
2001	40.6	48.7	55.6	62.2	66.0	55.8
2002	53.1	63.4	60.4	68.6	68.3	66.8
2003	59.1	57.5	55.2	58.6	49.7	58.8
2004	57.0	60.5	61.1	70.3	67.9	64.4
2005	53.4	65.9	61.4	59.9	72.6	62.3
2006	51.0	64.9	53.4	51.0	52.1	56.9
2007	68.4	79.0	67.3	67.6	70.0	69.4
2008	58.6	74.1	64.7	66.6	71.4	65.4
2009	59.9	67.8	63.2	69.2	69.5	66.5
2010	70.0	71.3	79.0	60.8	57.3	68.0
2011	61.4	59.6	57.9	66.7	63.5	62.5
2012	49.1	50.3	59.4	50.5	41.5	50.7
2013	71.9	77.1	76.0	59.1	63.2	71.8
2014	71.4	70.7	71.4	61.0	66.5	70.2
2015	47.2	56.3	44.8	57.2	46.5	50.7
2016	79.5	64.3	75.8	64.4	60.6	70.3
2017	67.1	57.5	56.2	70.6	73.9	61.3
2018	72.6	82.4	101.8 ^b	71.5	88.3 ^b	83.9 ^b
2019	68.8	60.9	64.4	59.8	65.1	63.9



^a Each bear food index value represents the sum of the mean index values for 14 species, based on surveys conducted in that area. Range-wide mean is derived directly from all surveys conducted in the state (i.e., not by averaging survey area means).

^b Record high food rating in NE and EC regions, and second-highest statewide.

Table 10. Regional mean index values^a for bear food species in 2019 compared to the previous 35-year mean (1984-2018) in Minnesota’s bear range. Shading indicates particularly high (green) or low (pink) fruit abundance relative to average (≥ 1 point difference for individual foods; ≥ 5 points difference for totals).

FRUIT	NW		NC		NE		WC		EC		Rangewide	
	35yr mean	2019 (n = 10 ^b)	35yr mean	2019 (n = 8)	35yr mean	2019 (n = 6)	35yr mean	2019 (n = 10)	35yr mean	2019 (n = 8)	35yr mean	2019 (n = 33)
SUMMER												
Sarsaparilla	4.7	5.3	5.9	6.9	5.3	6.5	4.5	3.5	5.3	3.8	5.0	5.2
Pincherry	3.4	4.3	4.5	3.8	4.3	4.0	3.8	3.1	3.7	3.0	3.9	3.4
Chokecherry	5.8	6.2	5.5	4.0	4.7	4.3	5.4	4.4	4.7	5.0	5.3	4.6
Juneberry	5.2	5.1	4.9	2.6	5.1	3.8	3.7	2.6	4.0	3.8	4.5	3.9
Elderberry	1.6	2.3	3.0	2.6	3.6	5.5	3.1	3.5	3.2	4.3	3.0	3.1
Blueberry	5.1	4.6	5.5	3.7	5.1	6.2	3.7	5.1	3.9	5.0	4.5	4.9
Raspberry	6.5	7.1	7.9	5.9	8.0	7.7	7.1	8.1	7.1	7.1	7.2	6.9
Blackberry	1.3	2.3	2.4	2.6	1.2	0.0	3.6	3.5	4.4	3.2	2.9	2.9
FALL												
Wild Plum	2.3	3.4	1.9	1.6	1.3	1.5	2.7	1.9	2.4	1.1	2.3	2.3
HB Cranberry	5.3	6.9	4.4	4.4	4.0	4.4	3.8	3.5	3.8	6.1	4.2	4.7
Dogwood	6.2	6.9	5.7	4.6	4.9	5.2	5.9	3.9	5.9	4.3	5.8	5.1
Oak	3.5	3.8	3.2	3.9	2.0	2.0	5.9	5.9	5.7	6.9	4.5	5.1
Mountain Ash	1.6	2.5	2.6	3.0	4.7	6.0	1.8	2.5	2.4	4.2	2.7	4.0
Hazel	6.4	8.1	7.4	11.3	7.0	7.3	7.9	8.5	7.7	7.3	7.2	7.9
TOTAL^d	59.0	68.8	64.6	60.9	61.2	64.4	62.8	59.8	64.2	65.1	63.0	63.9

^a Food abundance indices were calculated by multiplying species abundance ratings x fruit production ratings.

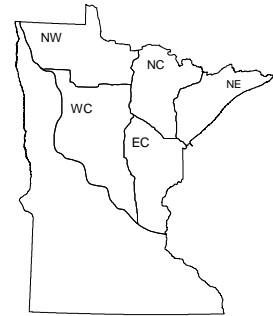
^b n = Number of surveys used to calculate area-specific means

^c Sample size for the entire range does not equal the sum of the sample sizes of 5 survey areas because some surveys were conducted on the border of 2 or more areas and were included in calculations for both.

^d Because of rounding error, these totals may be slightly different than the sum of adding down the columns.

Table 11. Regional productivity index^a for important fall bear foods (oak + hazel + dogwood), 1984–2019. Particularly low (≤ 5.0 ; yellow) or high (≥ 8.0 ; tan) values are shaded.

Year	Survey Area					Entire Range
	NW	NC	NE	WC	EC	
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8 ^b	4.2	4.7	5.3	4.4 ^b
1986	7.2	5.0	4.0	7.0	6.2	6.2
1987	8.0	7.8	7.3	7.6	8.0	7.7
1988	5.5	7.2	7.3	6.8	6.1	6.7
1989	6.0	5.3	4.1	5.7	6.4	5.8
1990	3.3 ^b	4.2	6.4	5.7	6.4	5.2
1991	6.2	6.2	5.4	7.2	7.7	6.7
1992	4.7	5.0	4.4	4.4 ^b	6.8	5.1
1993	5.3	7.1	6.7	6.2	7.7	6.5
1994	7.1	7.8	5.8	7.8	7.1	7.2
1995	4.8	4.8	5.1	4.6	5.3	4.9
1996	8.7	8.6	8.1	9.2	8.5	8.6
1997	5.8	5.4	5.1	6.8	6.5	6.2
1998	5.8	6.0	6.3	7.1	7.8	6.7
1999	6.4	5.1	5.9	6.6	6.0	6.2
2000	5.8	7.7	7.2	7.5	8.5	7.0
2001	3.4	4.1	5.7	6.0	6.5	5.2
2002	8.7	7.1	6.6	8.8	8.2	8.1
2003	6.3	6.0	5.5	6.2	6.0	6.1
2004	6.1	5.4	5.4	6.4	6.1	5.9
2005	5.8	5.8	6.1	6.4	7.0	6.2
2006	6.7	6.1	6.0	6.7	5.8	6.3
2007	6.0	5.8	5.7	6.6	6.4	6.2
2008	6.6	7.3	6.2	7.0	8.9	7.1
2009	5.1	6.2	5.3	6.3	6.5	6.0
2010	7.7	6.4	6.5	6.2	5.4	6.6
2011	5.8	6.5	6.2	7.0	7.4	6.5
2012	6.2	6.3	6.3	6.5	4.8	6.1
2013	6.8	6.0	5.7	6.7	6.9	6.3
2014	7.0	5.6	5.4	7.7	6.1	6.7
2015	5.8	5.9	3.5 ^b	8.2	3.7 ^b	5.6
2016	5.7	5.2	6.0	5.4	5.2	5.3
2017	6.8	5.6	5.1	7.4	7.1	6.5
2018	5.8	6.1	7.7	8.3	8.4	7.2
2019	6.2	7.1	6.6	6.5	7.1	6.7



^a Values represent the sum of mean production scores for hazel, oak, and dogwood, derived from surveys conducted in each survey area. Range-wide mean is for all surveys conducted in the state (i.e. not an average of survey area means).

^b Record low fall food score in survey area.

Fig. 10. Production of fall bear foods (dogwood, oak, hazel) across Minnesota, 2019.

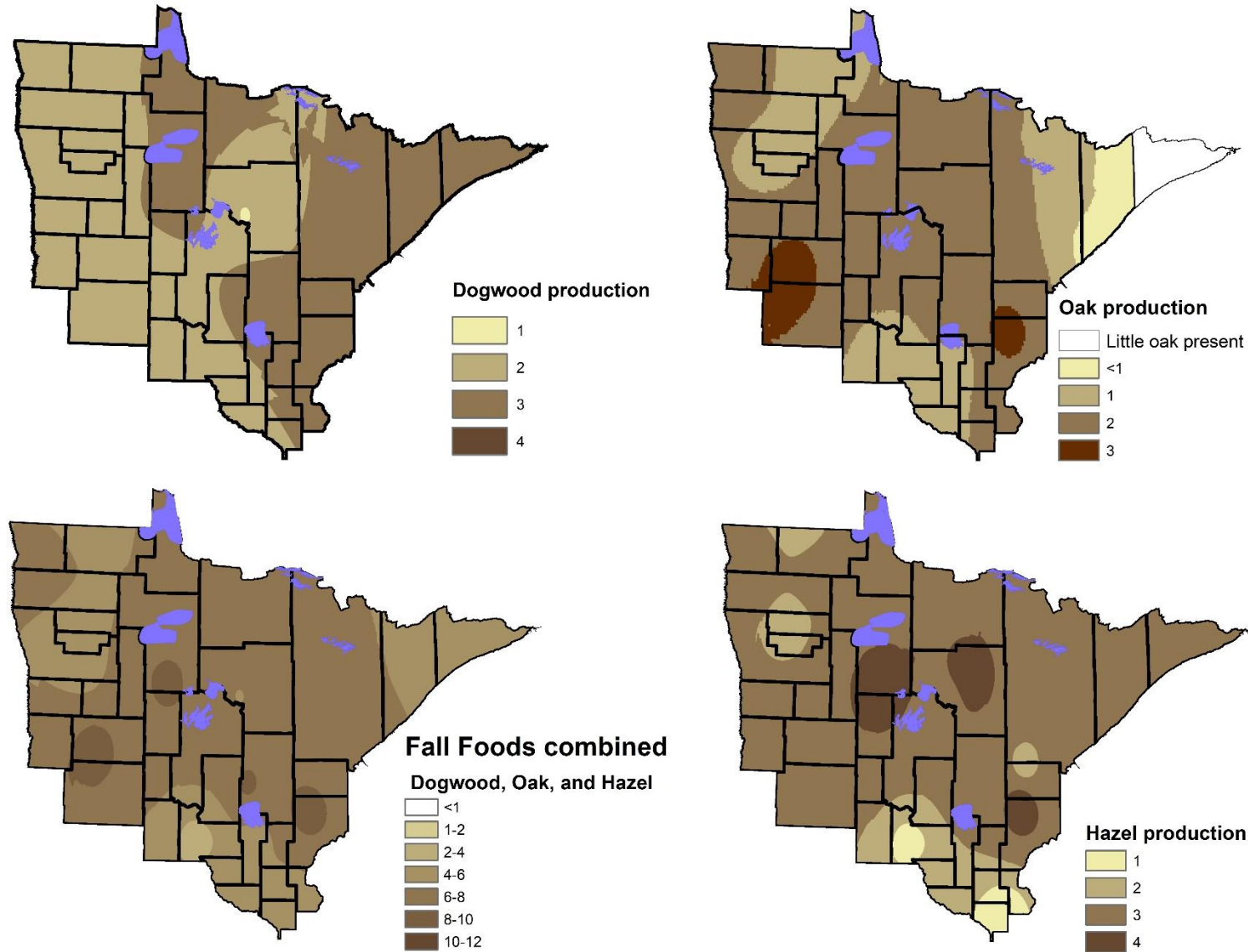


Fig. 11. Number of bears harvested vs. number predicted to be harvested based on number of hunters and fall food production — top panel: statewide 1984–2019; bottom panel: quota zone only, most recent 15 years. Regression for both datasets included an interaction term between food and hunters to better predict the drastic changes in harvest when fall foods were extremely high or low.

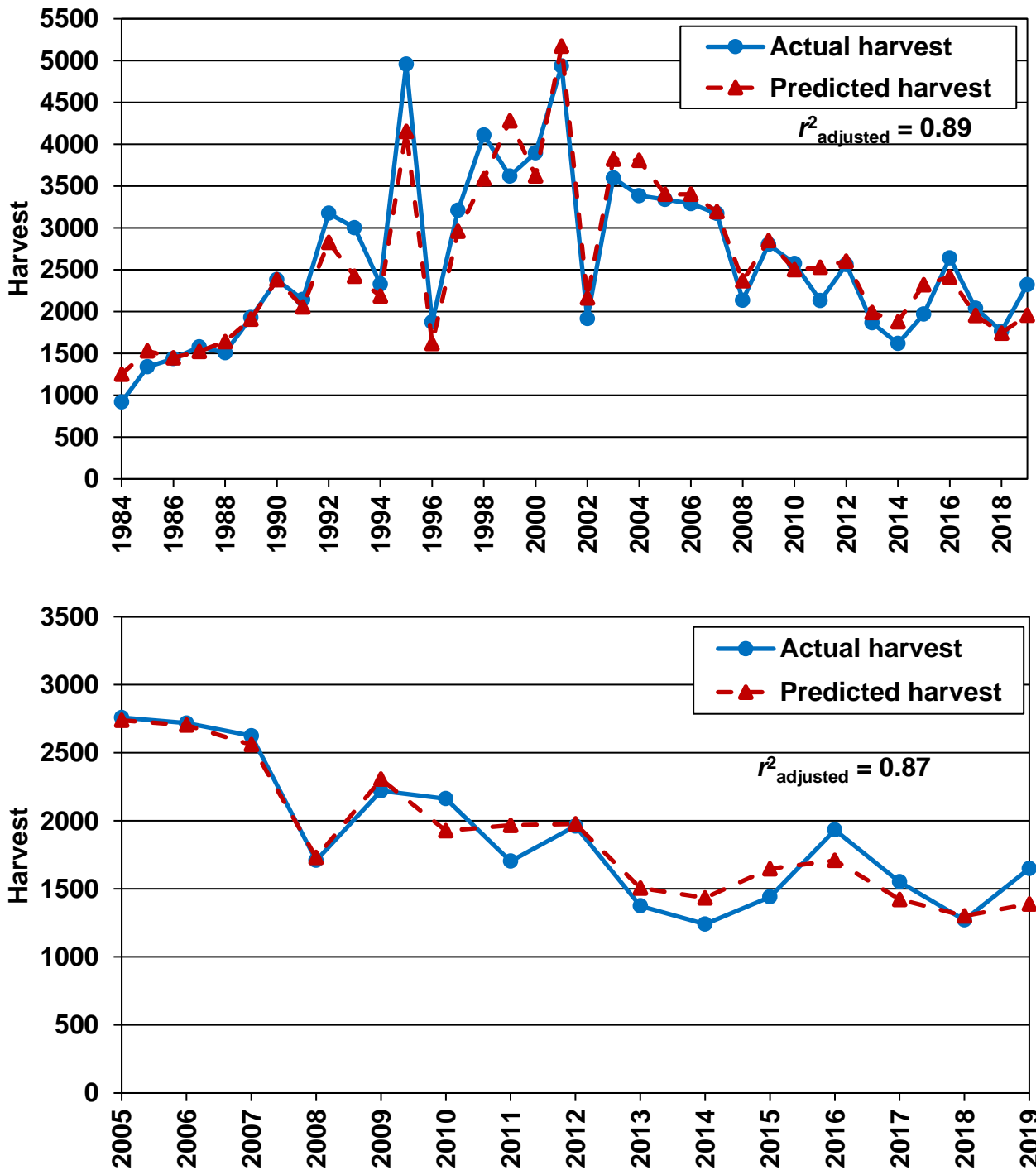


Fig 12. Sex ratios of harvested bears by BMU, 1999–2019. Thick lines show significant increasing trend across this period.

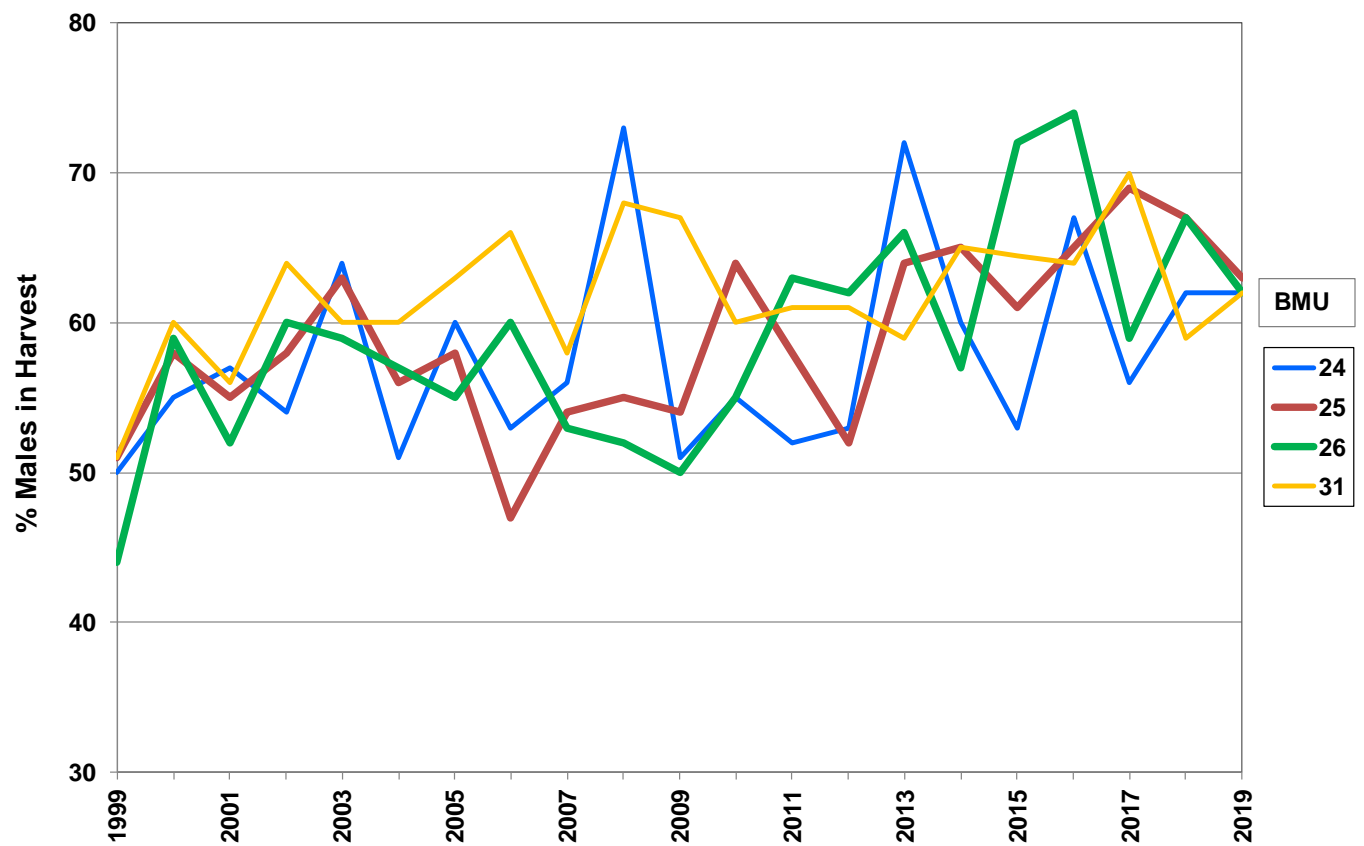
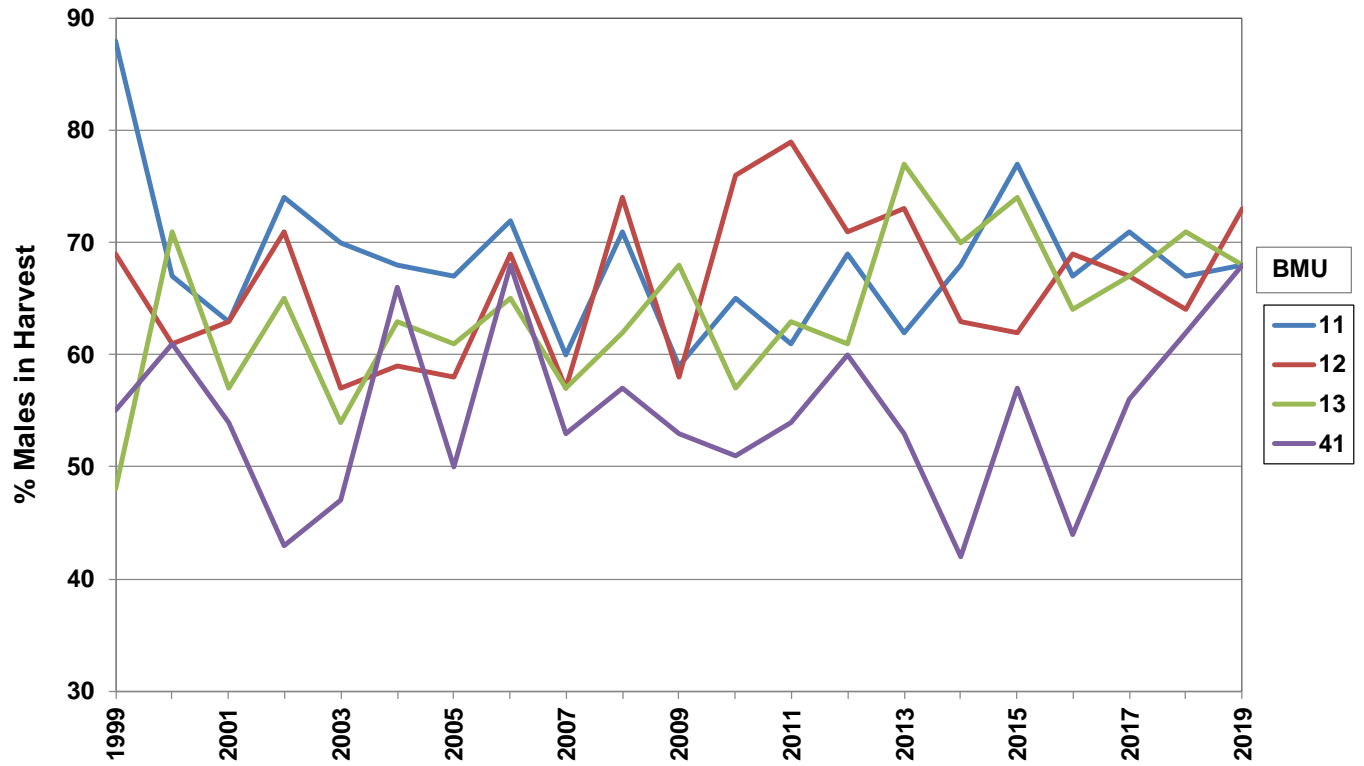


Fig 12. (continued)

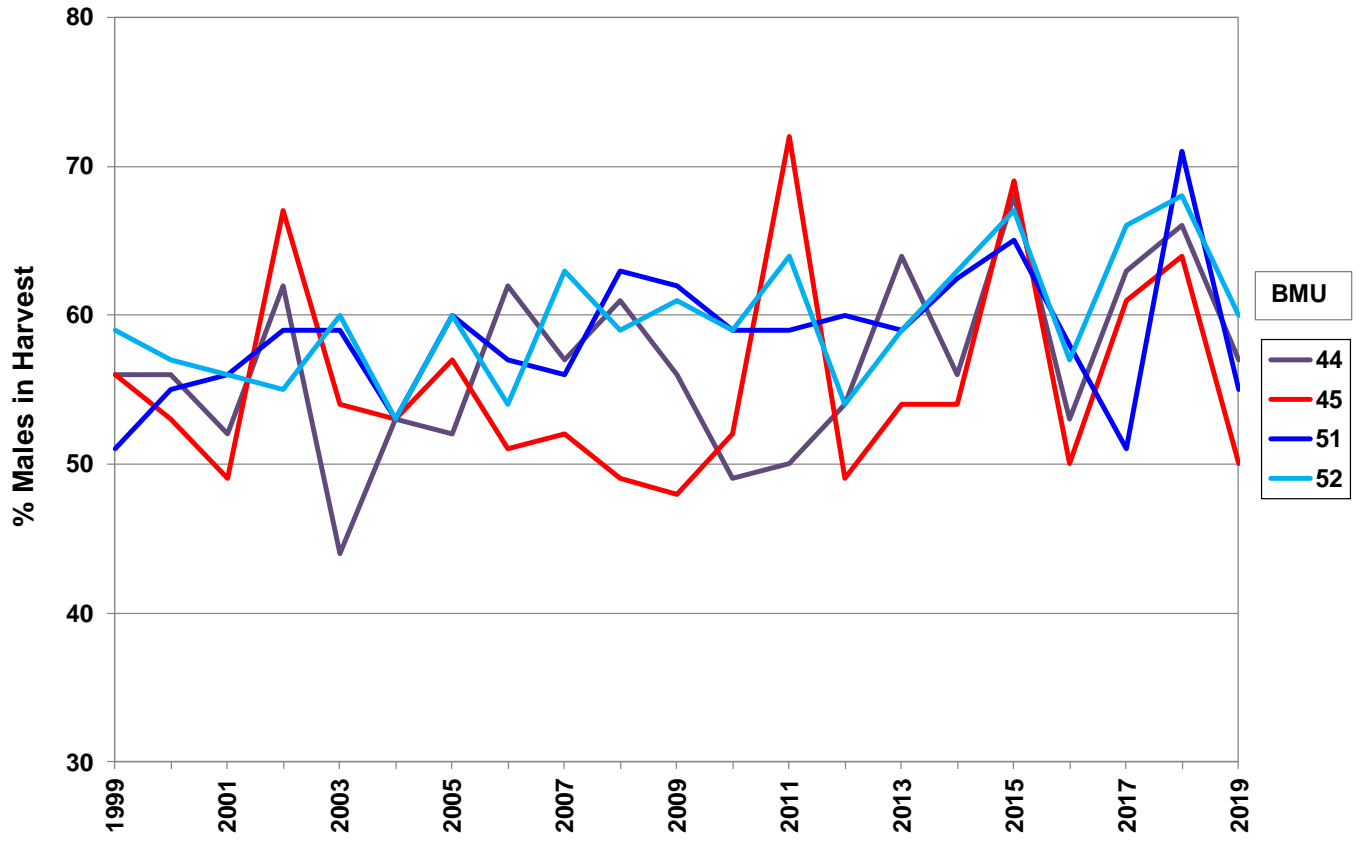


Fig 13. Median ages of harvested female bears by BMU, 1999–2019. Breaks in line occur when sample sizes were too small to calculate a meaningful median.

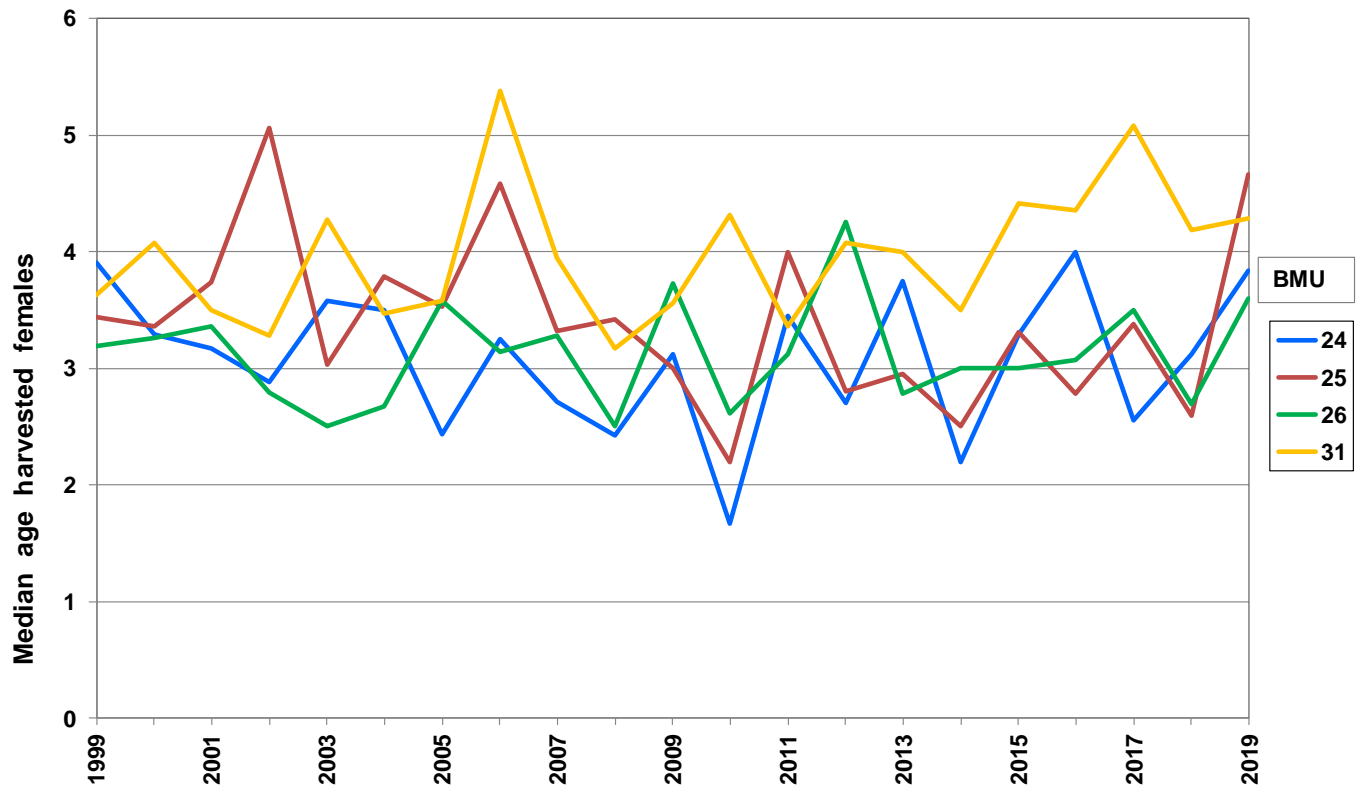
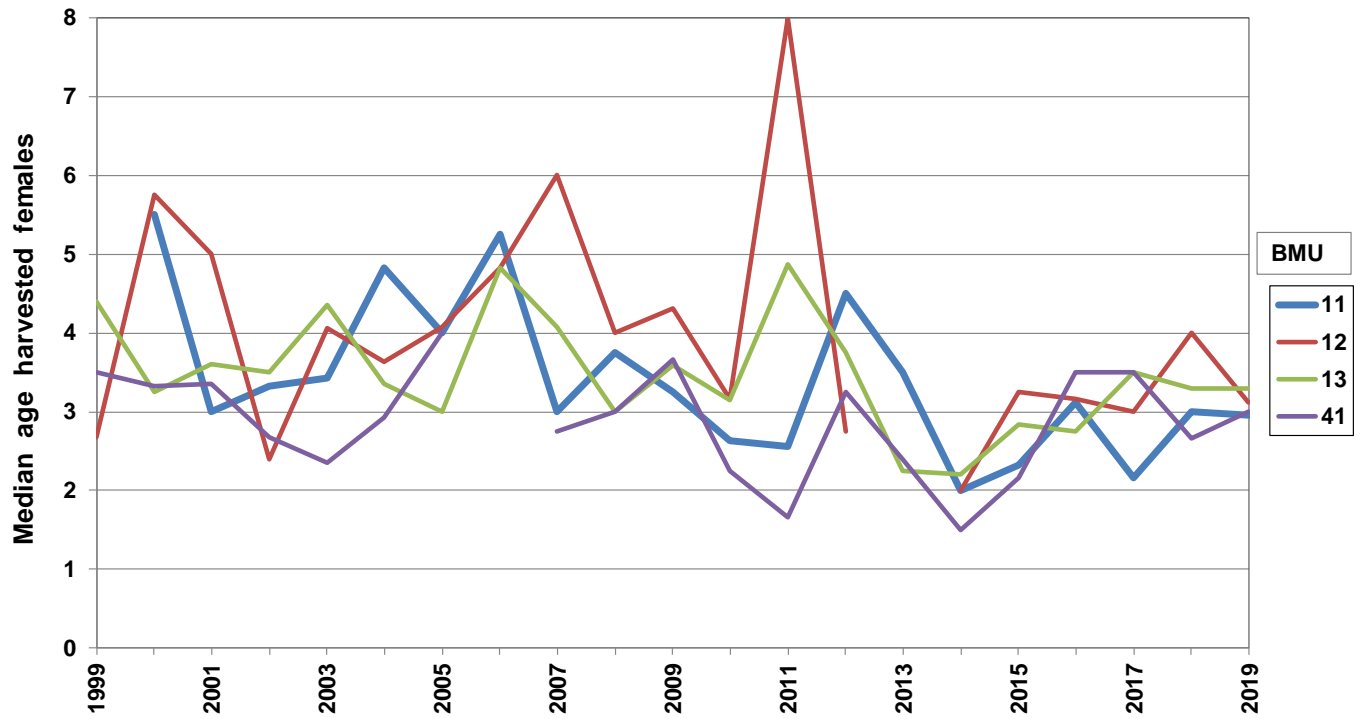


Fig 13. (continued)

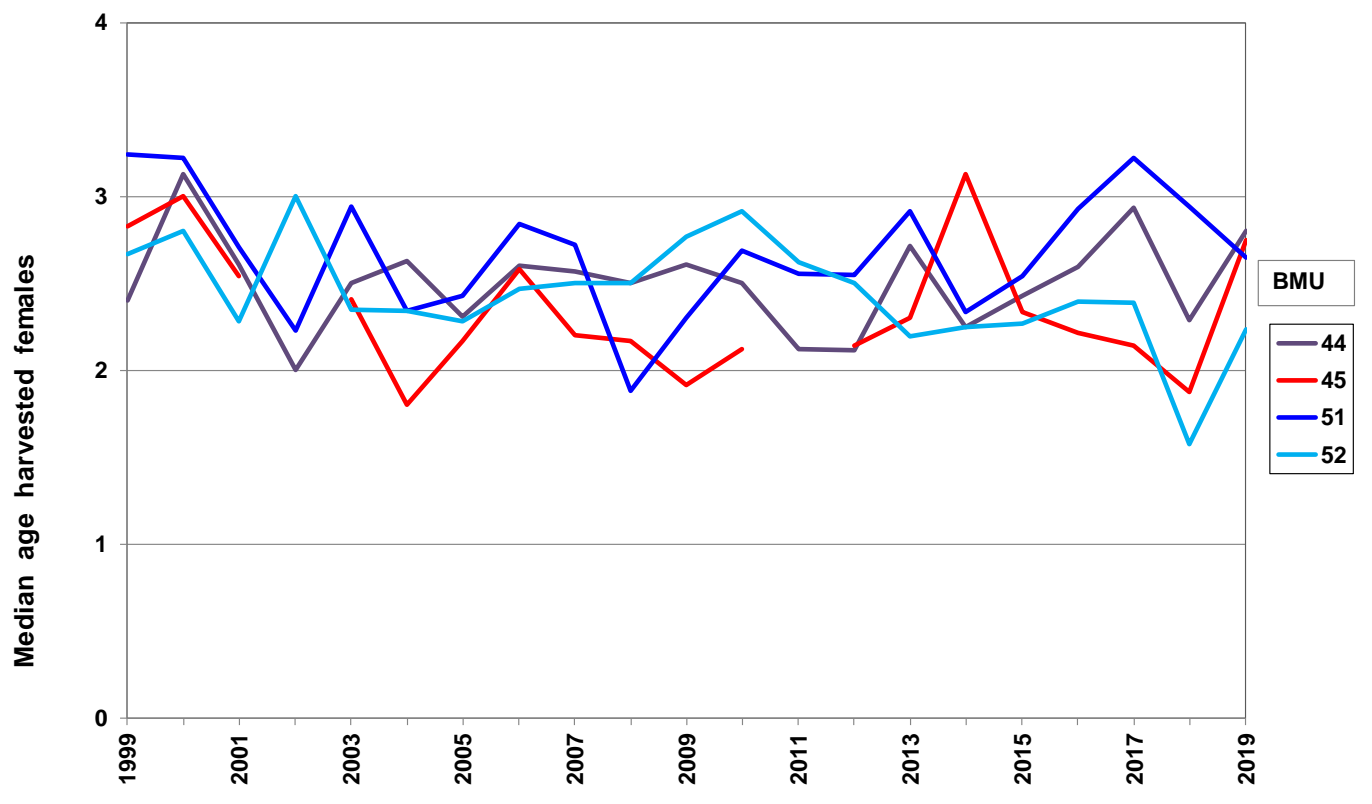


Fig. 14. Statewide median ages (years) and sex ratio of harvested bears, 1982–2019.

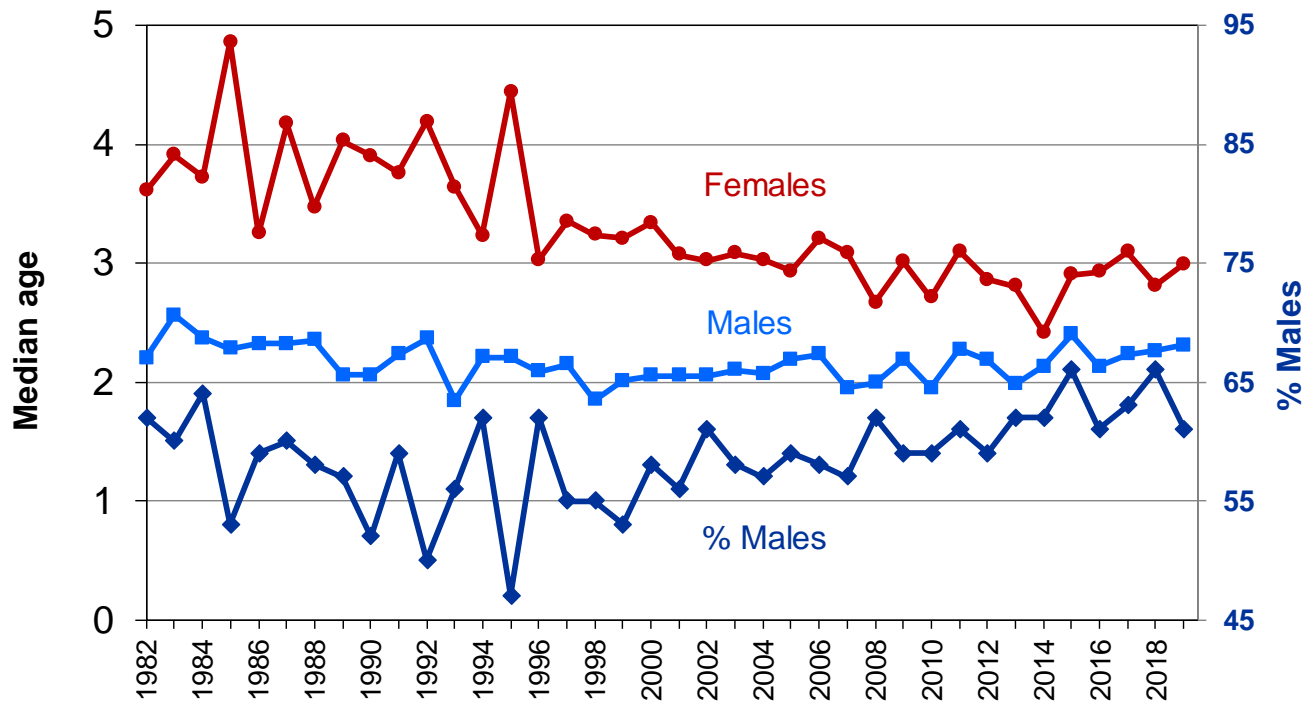


Fig. 15. Statewide harvest structure: proportion of each sex in age category, 1982–2019.

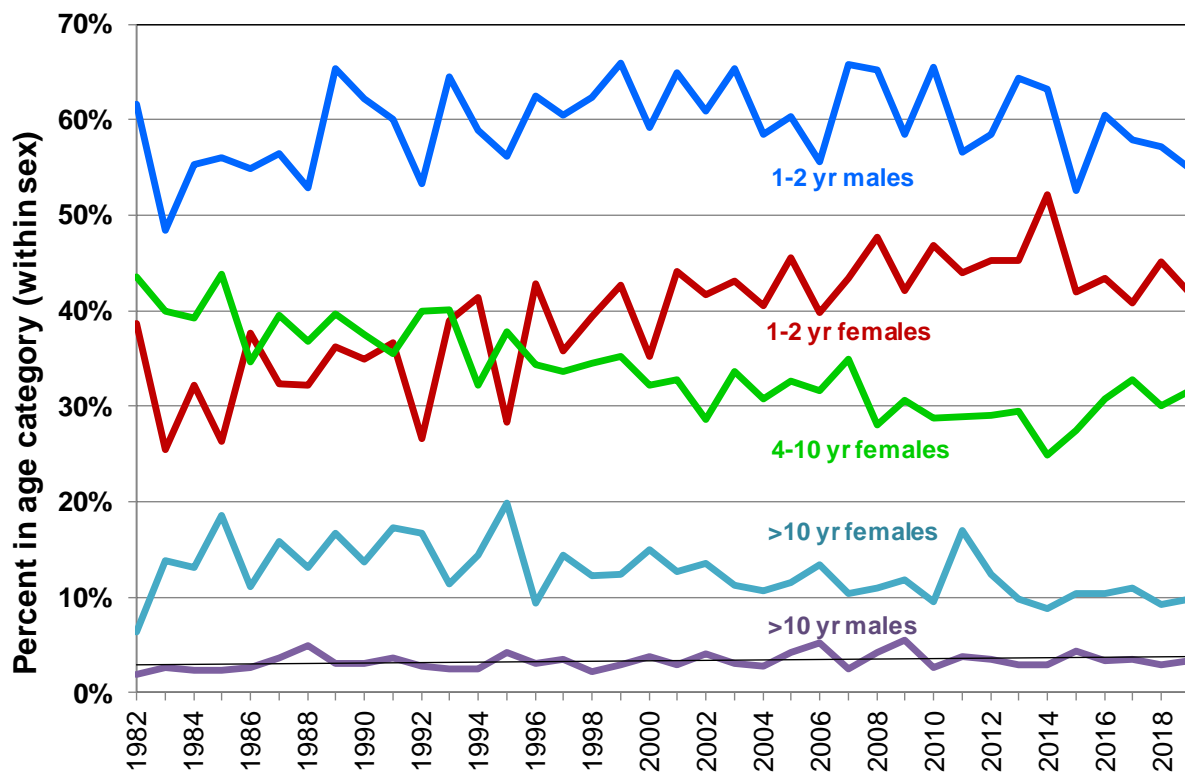


Fig. 16. Percent of hunters submitting useable bear teeth for aging (vital for population monitoring, see Figs. 18–20). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993), and in recent years after a series of reminder letters (no letter was sent in 2018 or 2019).

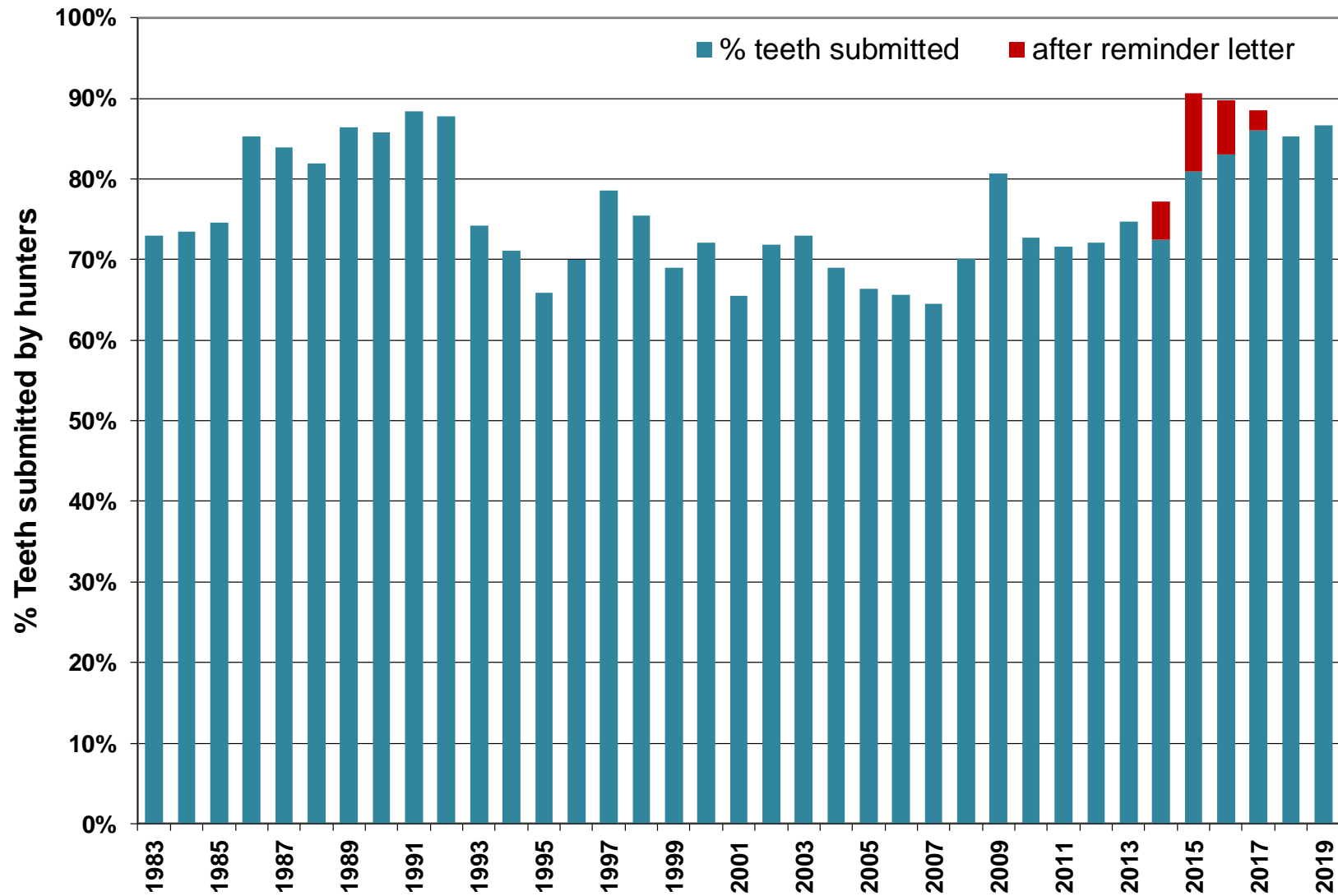


Fig. 17. Percent of hunters who submitted a bear tooth in 2019 by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet, as well as in person at a station.

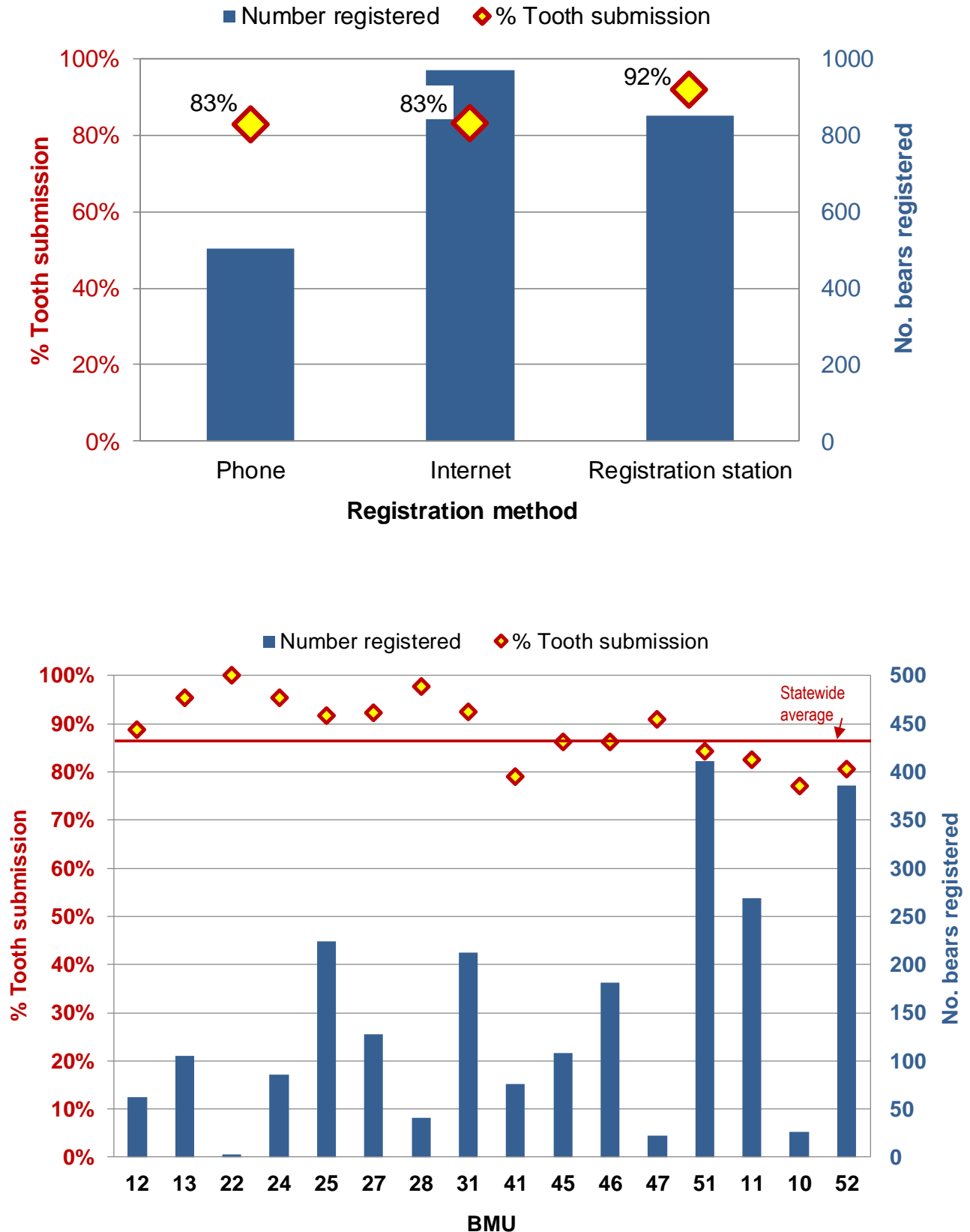


Fig. 18. Statewide bear population trend (pre-hunt) derived from Downing reconstruction, scaled (elevated to account for non-harvest mortality) to various degrees to attempt to match the tetracycline-based mark–recapture estimates (2 such curves shown here; estimates beyond 2017 are unreliable).

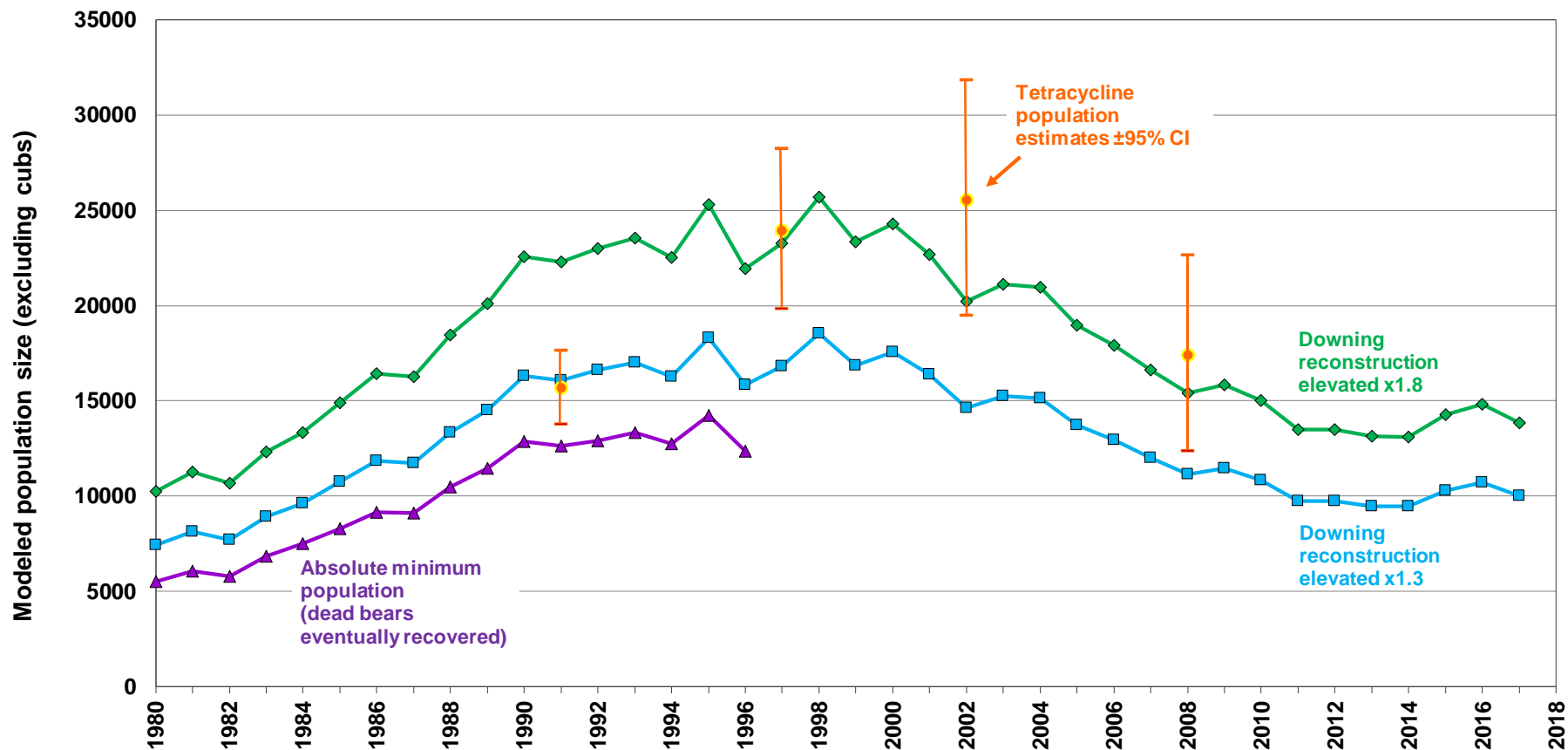


Fig. 19. Population trends during 2000s derived from two independent population models (Downing and Allen) for quota and no-quota zones, compared to respective harvests. Downing reconstruction-based estimates <2 years from the most recent harvest age data are unreliable (hence these curves terminate 2017). Downing curves were scaled (elevated to account for non-harvest mortality) to fall between the two curves in Fig. 18 (i.e., the actual scale of the population estimates is not empirically-based, but happens to approximately match the magnitude of the Allen estimates).

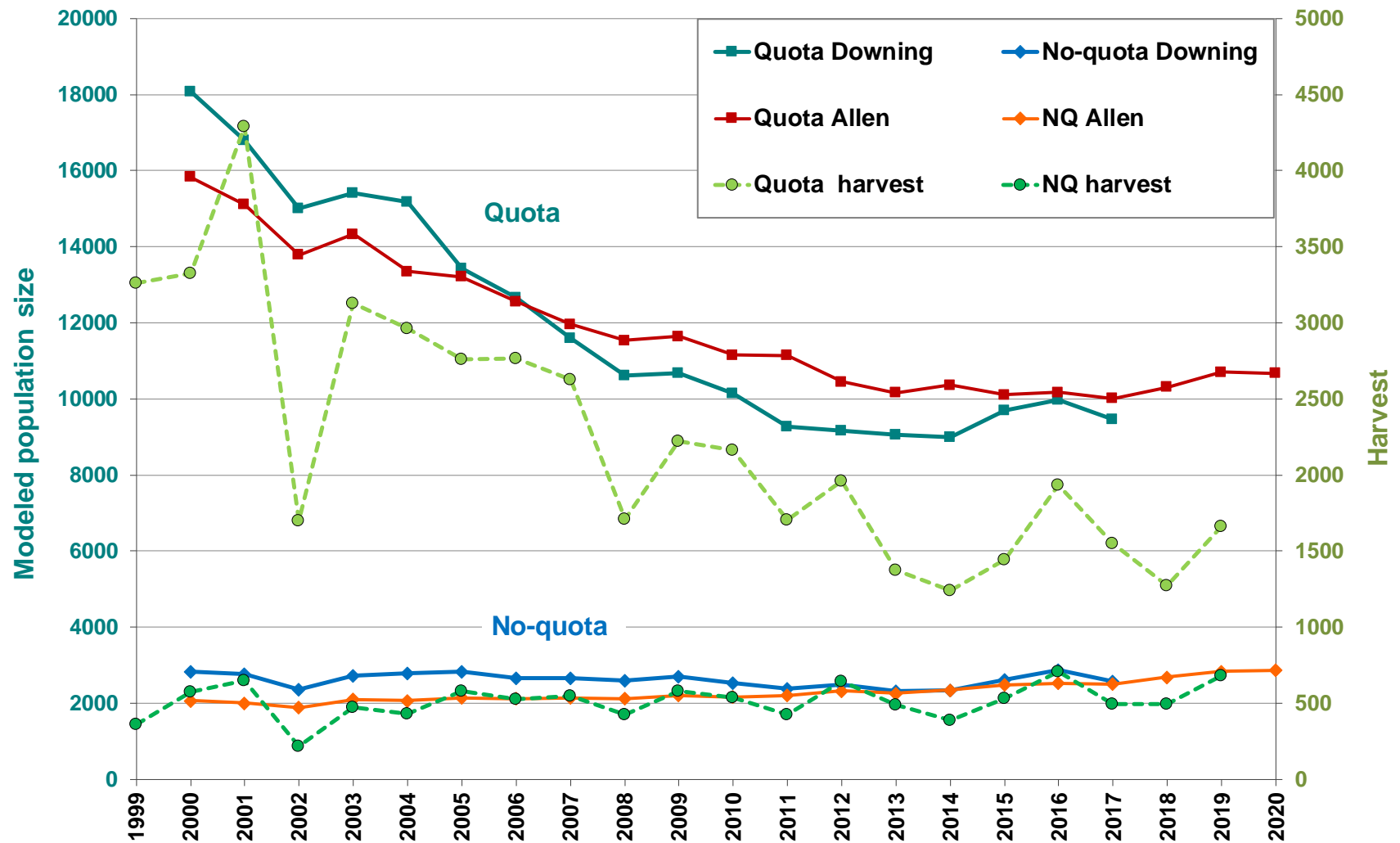


Fig. 20. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1980–2019. Higher harvest rates result in steeper curves because males in the living population are reduced faster than females. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male (dashed tan horizontal line) yields approximately the inverse of the harvest rate (derived rates are shown in inset). Flatter curves in recent years indicate lower harvest rates (2015–19 lower than 1980–84).

