DEPARTMENT OF NATURAL RESOURCES

STATUS OF MINNESOTA BLACK BEARS, 2021

Harvests, Complaints, Foods, & Population Trends

December 30, 2021

Final Report to Bear Committee

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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

Table 1 & Fig. 1	***Overview: Permits, licenses, harvest, and success rates*** Permit applications for bear licenses exceeded 20,000 for the fifth straight year. Applications have not been this high since 2001. Of these, >4,100 (17%), 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 the same as 2020. Hunting success in the quota zone was the third highest ever and overall statewide harvest was the second highest since 2007. Hunting success is inversely related to the number of hunters but also strongly affected by fall foods. A record number of people bought no-quota licenses (4,643 hunters or 52% of the overall license sales). The total number of hunters were nearly a 30% increase over the 5-year average and is similar to the increase we saw in 2020.
Fig. 2	***Bear Management Units*** There are currently 13 Bear Management Units (BMUs) where license sales are limited by a quota, 1 where the number of permits is unlimited, and 4 BMUs with no quota at all. 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 adjust hunting pressure and meet different management goals. 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). 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). BMU 451 was split from BMU 45 this year as an experimental unit to understand if we could reduce crop damage through hunting. The results for this BMU are reported under the quota zone but were not remerged with BMU 45. This is because of the unlimited number of tags in BMU 451, so BMU-level results would not be comparable with previous years.
Tables 2 & 3	***Quota zone permits and licenses*** The number of quota zone permits available in 2021 was the same as 2021. This is the 9th year (since 2013) that permits have been kept low (<3,900). This was the 10th 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. BMU 451 (new in 2020) had an unlimited number of permits but was still part of the quota zone (768 sold, all listed as surplus license sales). This experimental zone was created to test the hypothesis that hunters can effectively reduce nuisance complaints and crop damage. This area will exist for at least 3 years to understand if there are any reductions in crop damage.

Fig. 3	***Quota zone applicants*** Statewide, quota zone applications have been relatively stable over the past 10 years, but this year, applications increased in almost all BMUs. As in year's past, BMU 45 showed a significant, two-fold increase over the past 10 years. This year BMU 44 (current BMUs 46 and 47) received ~1500 more applicants than 2020 and ~800 more applicants than 2019.
Table 4	***Quota zone lottery*** We do not have (nor have we ever had) a bear population that can sustain levels of harvest where everyone who applies for a tag is successful. The low quota zone permit availability over the past 8 years has made it increasingly difficult to succeed in the lottery and wait times increased again in 2021. The trade-off is that the quality of the hunt and the success rates are exceedingly high in the quota zone (Table 1, Figure 1). 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). Six BMUs required a preference level of 4 for guaranteed success, and BMUs 28, 46, 47, and 45 required a preference level of 5 or above for any chance of drawing a tag. This high threshold for these BMUs is due to the increasing number of applicants this year (Fig. 3), not a reduced number of available permits (Table 2).
Table 5	***Harvest by BMU*** The statewide harvest in 2021 was 7% lower than 2020, but 27% higher than 2019. This was likely due to the range wide drought that caused low natural berry production and low abundance of natural bear foods for the second year in a row. The sex ratio of the harvest was ≥60% males in BMUs 13, 27, 45, 451, 46, and 47. All others had sex ratios closer to 50% male (mostly in NE MN), which similar to 2020. The statewide harvest sex ratio has exceeded 60% in all years except 2021 and 2020 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. When natural foods are poor, reproductive females are far likelier to be shot than in average or good food years.
Fig. 4	***Harvest by quota vs no-quota zones*** Permit availability continuously declined during the decade 2003–2013 (Table 1), and commensurately, total harvests declined and the percent of the harvest in the no-quota zone increased. The percent harvest in the no-quota zone has continues to increase (34%, a record high), split evenly between BMUs 11 and 52 (Table 5). Over half of the bear hunters were hunting with a no-quota license this year (a record).

Table 6	***Hunting success by BMU*** In 2021, success was very high in the quota zone, reaching record or near-record levels in many BMUs in the quota zone (>50% in BMUs 12, 25, 28, 31,46, and 45; >60% in BMUs 27 and 47). Success rate in quota zone nearly 2.5 times higher than in the no-quota zone (51% vs. 21%, respectively). A growing proportion indicated that they planned to hunt in BMU 10 (although the hunting success rate in this area is one of the lowest in the state).
Fig. 5	***Spatial distribution of hunters' baits*** The bait registration system data has records for 7,893 baits placed on the landscape during the 2021 hunt. Bait placement is more dispersed across the state this year and there are fewer townships with >50 baits. Of note, a few hunters set baits outside of primary bear range. One note of caution when interpreting this map is that this is an underestimate of bait density; based on hunter surveys >90% of hunters set 2.5 baits on average, which means that a complete dataset would include the registration locations of nearly 20,000 baits rather than the nearly 8,000 we have.
Table 7	***Harvest by date*** 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 lagged behind this pattern somewhat, likely due to the unexpected crops of acorns in the western BMUs.
Table 8 & Fig. 6	***Nuisance complaints and kills*** The total number of recorded bear complaints has remained stable 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). Below-average foods during the summer of 2021 led to complaints, but complaints overall were 22% lower than in 2020, despite intense drought in bear range. This year, there was a perceived increase in the number of calls received by ENF; the total number of calls was similar to last year, but the number of on-site visits by Conservation Officers for bear calls has been increasing the past few years. 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. This year 41 hunters purchased an "88" license and 6 hunters were successful (15% success rate). Using validation letters (either an area 88 hunter or a hunter who had a license that was validated early on a nuisance bear), 96 licenses were validated and 45 were successful (47% success). It is not known how many licenses were validated because reporting is incomplete. The number of validated hunters is likely an underestimate.

Figs. 7–9	***Spatial distribution of bear complaints*** All bear complaints, whether handled by phone or at an on-site visit, are now recorded spatially. These maps represent the complaints taken by Wildlife Managers because these data have the most accurate spatial locations. Complaint calls most often occur on in the core of bear range, but there is a growing number of trash and birdfeeder complaints on the edge of bear range or in areas with low bear density. There also are a number of complaints where people feel threatened by bears. They are most common on the edge of bear range where people aren't used to bears, in cities, and along the north shore of Lake Superior (a popular tourist destination). The wildfires that occurred in Northeastern Minnesota due to the drought likely shifted a number of bears out of their home ranges, which sometimes results in increase bear-human conflict if attractants are not secured.
Tables 9–11 & Fig 10	***Food abundance*** The composite range-wide, all-season abundance of natural bear foods (fruits and nuts) in 2021 was the worst ever. Abundance of many summer foods was below the long-term (36-year) average all regions. In general, summer food conditions were exceptionally poor across the state, and in most regions rivaled the drought of the mid-1980s. Fall foods were also exceptionally poor, but not a total bust due to some surprising production of acorns locally (worst fall food year in our records statewide, but only the worst year on record in the northeast and west central parts of 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 the worst on record. Hazelnut production was almost non-existent across the state. Dogwood production was generally poor across the range. Oak production was below average across the state with patches of average production near Grand Rapids and in the Red River Valley. Note that due to the COVID-19 pandemic, DNR staff were not out as frequently as normal, and the data reported are a smaller sample of the landscape than normal.
Fig. 11	***Predictions of harvest from food abundance*** The 2021 statewide harvest was 15% lower than expected, 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 2020 was also only 6% lower than predicted by this regression. These discrepancies might be due to the changes in BMU 451 and limited time that staff spent in the field due to the COVID-19 pandemic.

Figs. 12–13	***Submission of bear teeth for aging*** 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 82–87%. Since 2013, hunters could register by phone or internet, and pick up a tooth submission envelope later: tooth submission compliance by these hunters has equalized across all registration types. A decreasing proportion of hunters are registering their bear at a registration station over the past years. Compliance with tooth submission was higher in the quota zones than in the no-quota area but was especially low (<80%) in a number of units (BMUs 10, 22, 41, and 52).
Fig. 14	***Population trend: Statewide and quota vs no-quota zones*** 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 like the Downing (so projections are available to post-hunt 2021, but the estimation method provides a "dampening" effect on the year-to-year variation in population estimates that results in a flatter curve than expected. The trajectory of this model is robust to assumption violations but is certainly an underestimate when considering our tetracycline estimates. The models for this year indicated that the statewide population has stabilized and is slowly recovering. Notably, the quota area as a whole has stabilized since 2012 and only had a minor decline after the past 2 years of increased harvest, but the no quota area has been increasing steadily for the last 20 years. The credible intervals for these 2 estimates are not included for ease of reading.

Fig. 16	***Trends in harvest rates*** 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 in recent years have been similar to the early 1980s when the population was similarly small (~15%). 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).

	Population trend: BMU-level estimates Using the Allen et al. (2018) population model, we were able to estimate population trend for each BMU. This has been something out of reach until this year due to limitations from small annual harvests over time and the insensitivity of the Downing model with small populations. The population estimates tended to follow what we know about bear reproduction in Minnesota. The poor soils in NE Minnesota BMUs produce less bear food and subsequently, have much worse bear reproduction (BMUs 12, 24, 25, 31) than areas farther south. In the western and southern BMUs (the periphery of bear range in Minnesota), oak forest and agriculture provide bears with abundant food. Bears in these BMUs (11, 46 and 47 [former 44], 45, 51, and 52) reproduce at younger ages and will be the quickest to recover from our population reduction in the 2000s. The remaining BMUs have reproduction levels between the north and south. They are the areas we would expect to stabilize and recover after the periphery of bear range. Acknowledging that these results are post-hunt 2021, caution in interpreting the estimates is needed. Modeled population trends are far more robust than population estimates for a given year. The scale (estimated population size) is not as accurate as the overall trend (increasing, decreasing, or stable). Furthermore, a way to evaluate our current management goals is to compare the most recent estimates with those in 2012–2013, when permits were cut dramatically. Harvest quotas have been essentially level since that point and comparing with that cut point will allow for a better understanding of recent trends.
Fig. 17	The drought in 2021 resulted in one of the worst bear food years on record. The drought, Memorial weekend killing frost, and large fires resulted in particularly hard effects of harvest on the population in the Northeastern BMUs. The harvest in 2021 was high in the northern BMUs for the second year in a row, and harvest statewide was the second highest it has been in 15 years. Our BMU-level results suggest that the populations in BMUs 12, 24, 25, and 31 have continued to decline after the 2012 permit drop, albeit at a slower rate than before permits were dropped. The steepest decline seems to be in BMU 31, where current population levels have declined 20% from when permits were steeply cut in 2012. BMU 13 shows a very slight decline since 2013. The good news is that populations in BMUs 26, 41, 44 (current BMUs 46 and 47), 45, and 51 seem to have stabilized since the permit cuts in 2012. All of the aforementioned BMUs have been stable since the permit cut, but BMU 41 has had a very minor decline over the past few years. BMU 44 had a minor increase prior to the 2020 hunt, but those gains were lost after the high harvest in 2020. The no-quota BMUs have been increasing rather quickly since 2012. Estimates of growth are 5.5% (BMU 11) and 2.3% (BMU 52) annually from 2012–2021. We do not have an explanation for why these areas with unlimited hunting are growing so quickly, but hypothesize that it is the high-quality habitat and relatively low/uneven hunting pressure across BMU 11 and 52. There are big tracts of public land in the no-quota areas (especially in BMU 11), but generally these WMAs are large wetland complexes and hard to access by hunters. The remainder of the areas are dominated by private land with limited access to hunters. The modeled population trend seems to match the perception among the public and area wildlife staff that bear populations are increasing quickly. Specifically in BMU 11, bears were non-existent in the early

	1990s, but bear range and population size have expanded since then. Commensurately in BMU 52, there are regular bear sightings in the northern suburbs of the Twin Cities in Anoka, Chisago, and Washington counties.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 2000–2021.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Permit applications[a]	26824	21886	16431	16466	16153	15725	16345	17362	17571	18647	19184	18103	18107	18885	18422	19958	21034	21184	20632	22279	24598
Permits available[b]	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050	6000	3750	3750	3700	3850	3350	3350	3400	3575	3575
Licenses purchased (total)	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589	6620	6962	7177	6655	6550	6801	8882	8990
Quota zone [c]	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188	3177	3257	3420	2954	2922	2988	3178	3187
Quota surplus/military [c]	235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578	583	446	441	401	428	417	398	392
Quota-no limit area-451																				1038	768
No-quota zone [c]	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965	2823	2860	3259	3316	3300	3200	3396	4262[h]	4643
% Licenses bought																					
Of permits available [d]	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	100	100
Of permits issued [d]	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	80.8	89.1
Residents in Quota [d]															86.3	88.1	76.6	88.9	87.6	86.6	87.5
Estimated no. hunters [e]	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9200	8600	6300	6300	6700	6900	6400	6300	6700	8400	8500
Harvest	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866	1627	1971	2641	2040	1766	2340	3203	2971
Harvest sex ratio (%M) [f]	56	61	58	57	59	58	57	62	59	59	61	59	62	62	66 [i]	61	63	66 [i]	61	56	59
Success rate (%)																					
Total harvest/hunters [g]	29	14	26	26	26	26	28	21	30	29	23	30	30	26	30	38	32	28	35	38	35
Quota harvest/licenses [k]	28	14	25	26	25	25	28	21	30	30	24	33	37	33	39[j]	50[j]	46	38	49[j]	57[j,k]	51[k]

[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, 2020=3691, 2021=4189(record high); additionally, area 88 nuisance-only bear license applications counted in this total in 2017=3, 2018=6, 2019=5, 2020=11, 2021=4 (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 2011–20, all unpurchased licenses were put up for sale and were bought. The percent of resident hunters in the quota area each year includes all license types (regular quota, youth, and surplus licenses). This statistic was added to the report in 2021 and was able to easily back-calculate to 2015.

[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. In 2020, 5 hunters shot 2 bears.

[h] Record high number of no-quota zone licenses purchased in 2020; record high % of licenses in no-quota zone in 2017 (nearly 50%; see Fig. 4).

[i] Record high % males in statewide harvest.

[j] 2020: highest success rate in quota zone ever; 2016: second highest success rate; 2019: third-highest success rate.

[k] In 2020, BMU 451 was broken out of BMU 45 and was an area in the quota zone with an unlimited number of licenses. The quota success rate is calculated without BMU 451 in it to make hunting success estimates comparable across years. The 2021 success rate for BMU 451 is listed in Table 6 and the success rate for the quota area with Area 451 included is 45%.

Fig. 1. Relationship between licenses sold and hunting success (*note inverted scale*) in quota zone, 1987–2021 (quota and no-quota zones first partitioned in 1987). Number of licenses explains 59% of variation in hunting success during this period. Large variation in hunting success is also attributable to food conditions (e.g., during 2013–2021, when licenses were held relatively constant). Statistics from BMU 451 are not included in this graph to allow for quota zone comparisons with the past.

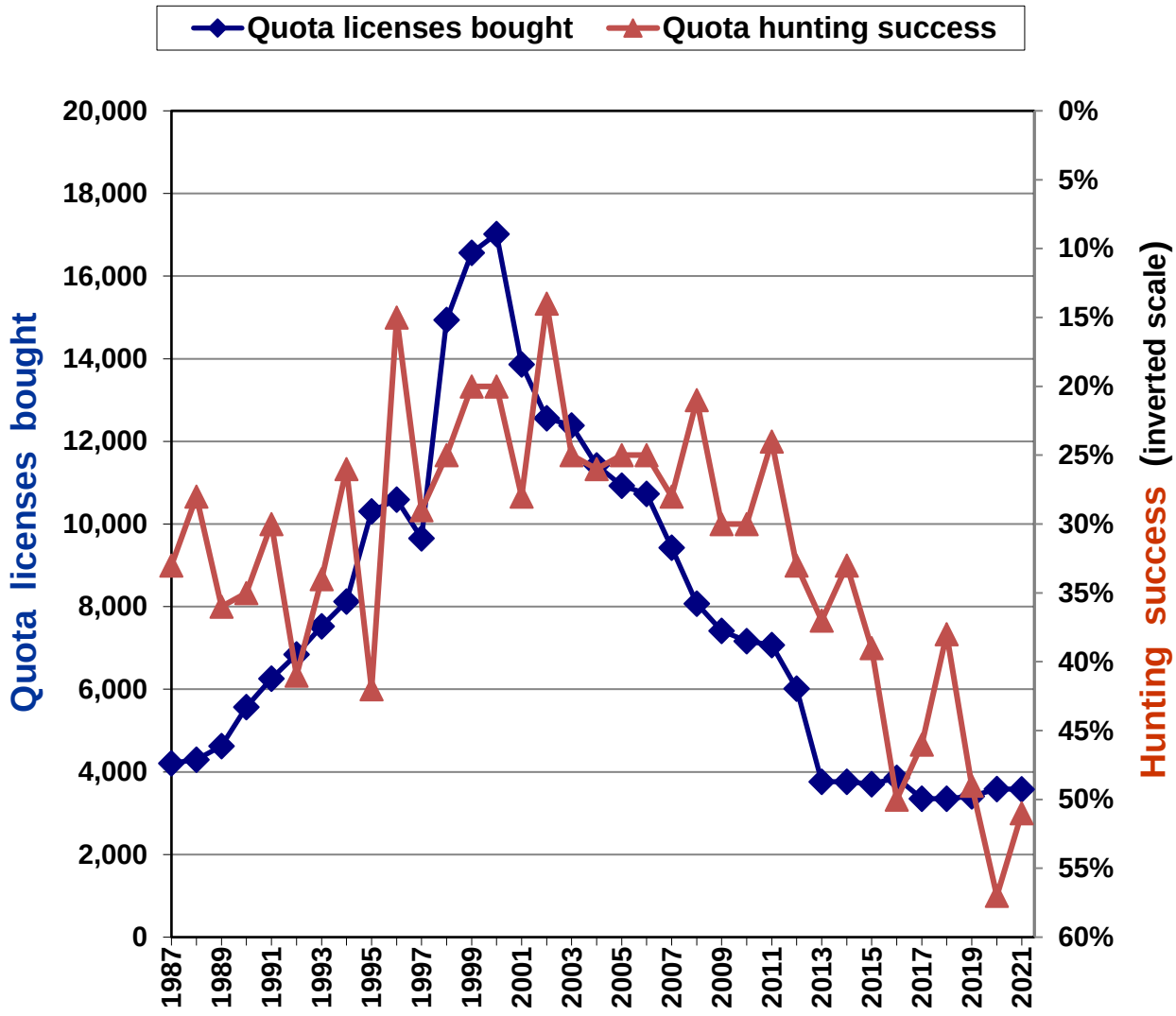


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU. In 2016, BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). No-quota hunters can hunt anywhere within the gray-colored zone, including the southeast corner of Minnesota (not shown; designated area 60). In 2020, zone 451 was split from 3 deer permit areas of 45 to relieve crop damage in the area. This area is in the quota-zone, but with an unlimited number of participants.

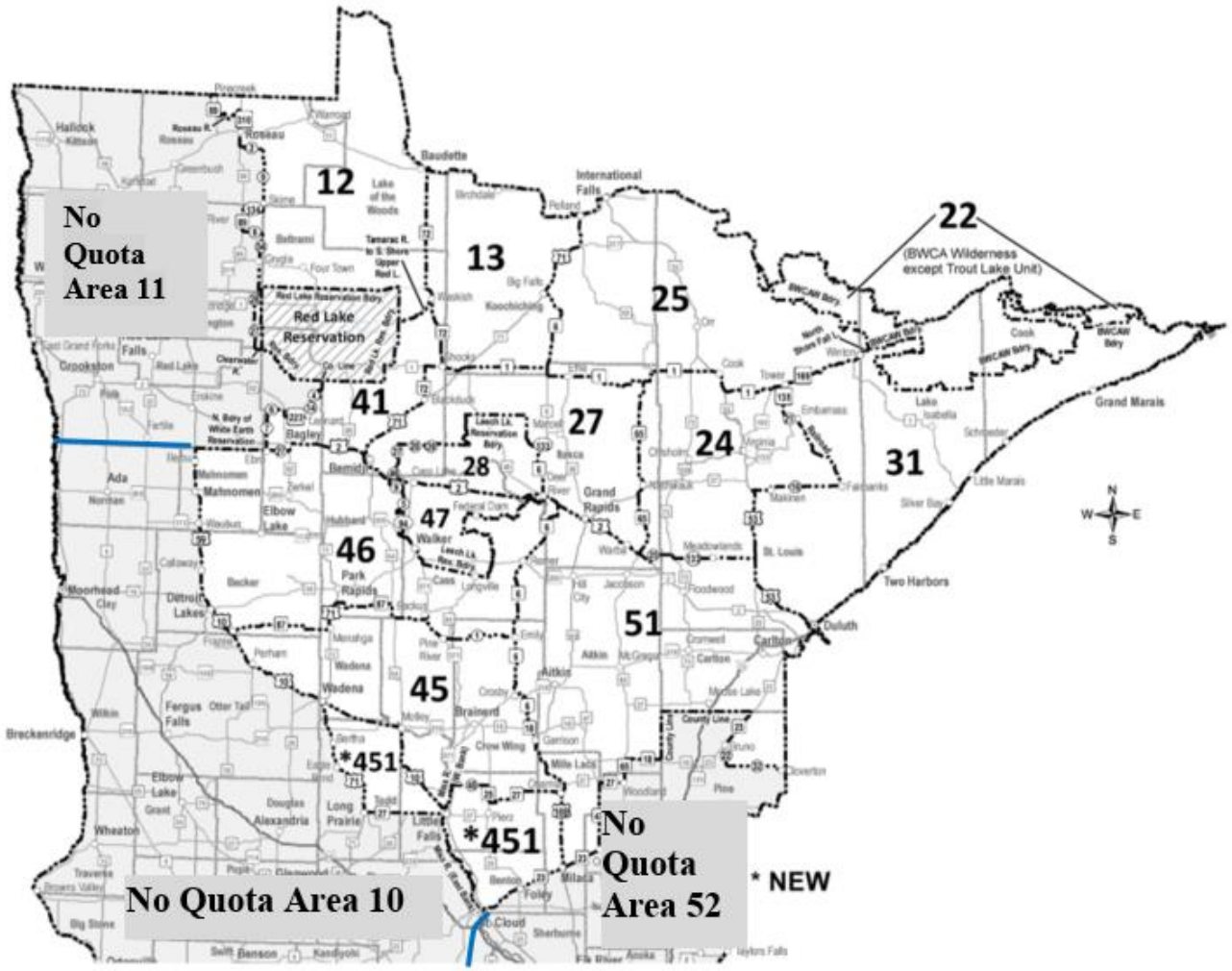


Table 2. Number of bear hunting quota area permits available, 2017–2021. Highlighted values show a change from the previous year. BMUs 26 and 44 were divided into 27/28 and 46/47, respectively, in 2016. No change occurred from 2020 to 2021.

BMU	2017	2018	2019	2020	2021
12	125	125	150	125	125
13	225	225	250	225	225
22	50	50	50	50	50
24	175	175	200	175	175
25	400	400	500	400	400
27	225	225	225	225	225
28	60	60	60	60	60
31	500	500	550	500	500
41	125	125	150	175	175
45	175	175	150	200	200
46	350	350	350	400	400
47	40	40	40	40	40
51	900	900	900	1000	1000
Total	**3350**	**3350**	**3700**	**3575**	**3575**

[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. Area 451 was created in 2020 to alleviate crop damage issues by having a permit area with an unlimited number of permit available (1046 in licenses sold in 451 during 2020).

Table 3. Number of quota BMU permit applicants (Apps), licenses bought (after permits drawn) and surplus licenses bought, 2016–2021[a]. Shaded values indicate undersubscribed (applications less than permits available).

BMU	2016			2017			2018			2019			2020			2021		
	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	624	133	17	774	113	12	703	109	16	711	104	21	751	107	18	891	110	15
13	716	221	29	772	200	25	682	177	47	712	199	26	734	195	30	944	198	27
22	52	37	13	47	34	16	76	36	14	61	35	14	69	32	18	73	40	10
24	884	173	27	945	158	17	928	155	20	840	153	22	909	155	20	1072	157	18
25	1443	440	60	1651	354	46	1561	355	44	1520	348	52	1627	367	33	1806	356	44
27	1224	219	31	1297	197	28	1265	204	21	1280	200	25	1338	207	18	1532	200	25
28	325	72	3	330	52	8	309	52	8	318	51	9	312	49	11	358	59	1
31	2180	489	62	2076	441	59	2074	428	71	1907	432	67	2022	444	57	2297	428	72
41	618	114	11	614	109	16	648	114	11	661	143	7	663	154	21	841	155	20
45	2046	227	23	2323	161	14	2383	160	15	2351	178	22	1978	186	14	2241	190	10
451[d]															1038			768
46	2690	370	30	2774	319	31	2769	317	33	2662	313	37	2853	364	36	3340	364	36
47	194	45	5	214	33	7	182	35	5	198	34	6	216	33	7	244	33	7
51	4321	880	121	4411	783	117	4344	779	123	3956	798	102	4058	885	115	4766	897	105
Total[c]	17317	3420	432	18228	2954	396	17924	2921	428	17177	2988	410	18577	3178	1454	20405	3187	1158

[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). This number also includes the permits sold in area 451 (1038 in 2020).

[d] Beginning in 2020, applicants could apply for area 451. This was an area in the quota zone with no limit on the quota and all licenses are considered surplus licenses. This is not an area for lottery or applications; only surplus licenses could be purchased.

Fig 3. Trends in number of applicants for quota zone permits by BMU over past 10 years, 2012–2021. For 2016–2021, 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 period. The number of applications in all areas (except 22) increased in 2021.

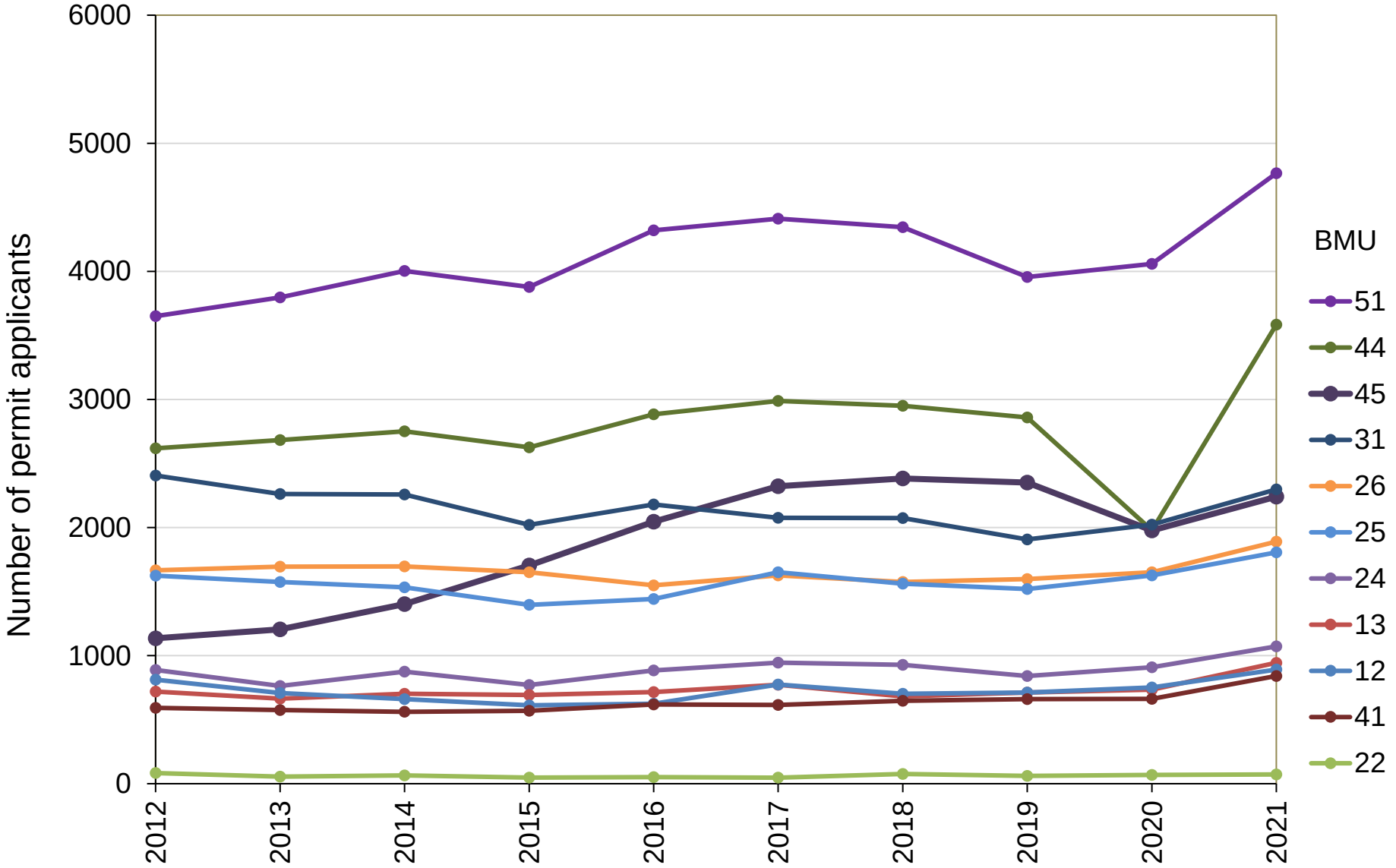


Table 4. Percent of quota BMU lottery applicants with preference levels 1 (1st-year applicants), 2, 3, 4, and 5 who were drawn for a bear permit during 2017–2021. Blank spaces indicate 100% of applicants were drawn. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn. Likewise, all preference level 3 applicants were drawn, except where 0 preference level 2 applicants were drawn[a].

BMU	2017				2018					2019					2020					2021				
	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	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5
12	0	0	57		0	0	41			0	0	13			0	0	0	72		0	0	58		
13	0	16			0	0	11			0	0	92			0	0	93			0	0	66		
22	100				60					76					65					56				
24	0	0	57		0	0	26			0	0	11			0	0	0	93		0	0	0	78	
25	0	6			0	0	80			0	0	58			0	0	45			0	0	32		
27[b]	0	0	2		0	0	0	36		0	0	0	66		0	0	0	49		0	0	0	20	
28[b]	0	0	0	76	0	0	0	42		0	0	0	5		0	0	0	2		0	0	0	0	77
31	0	0	67		0	0	48			0	0	38			0	0	33			0	0	9		
41	0	0	56		0	0	27			0	0	6			0	0	26			0	0	26		
46[b]	0	0	0	51	0	0	0	24		0	0	0	1		0	0	0	0	83	0	0	0	0	58
47[b]	0	0	0	49	0	0	0	29		0	0	0	50		0	0	0	18		0	0	0	0	72
45	0	0	0	16	0	0	0	0	31	0	0	0	0	42	0	0	0	0	23	0	0	0	0	5
51	0	0	54		0	0	35			0	0	0	22		0	0	24			0	0	18		

[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 2021 by Bear Management Unit (BMU)[a] and sex[b] compared to harvests during 2016–2020 and record high and low harvests (since establishment of each BMU, not counting current year).

	2021											
BMU	**M**	**(%M)**	**F**	**Total**	**2020**	**2019**	**2018**	**2017**	**2016**	**5-year mean**	**Record low harvest** (yr)	**Record high harvest** (yr)
Quota												
12	41	58	30	71	84	62	66	54	78	69	38 (14)	263 (01)
13	68	62	42	110	126	105	119	100	147	119	71 (88)	258 (95)
22	1	33	2	3	7	3[d]	4	8	5	5	3 (03)	41 (89)
24	44	54	37	81	97	86	60	81	96	84	50 (14)	288 (95)
25	107	50	108	215	251	224	223	212	287	239	149 (96)	584 (01)
26					[186]	[169]	[141]	[162]	[171]	162	117 (14)	513 (95)
27	86	61	54	140	148	128	105	120	131	126	105 (18)	148 (20)
28	24	71	10	34	38	41	36	42	40	39	36 (18)	42 (20)
31	159	54	137	296	325	212	211	262	312	264	157 (88)	697 (01)
41	51	68	24	75	74	76	58	61	57	65	35 (15)	201 (01)
44					[256]	[203]	[154]	[158]	[215]	187	130 (11)	643 (95)
46	126	63	75	201	231	181	139	141	190	176	139 (18)	231 (20)
47	20	74	7	27	25	22	15	17	25	21	15 (18)	25(16,20)
45	71	66	37	108	85	108	51	77	102[e]	85	32 (11)	178 (01)
451	66	60	44	110	168							
51	248	52	229	477	511	411	185[d]	372	463	388	185 (18)	895 (01)
Total	1112	57	836	1948	2210	1659	1272	1547	1933	1677	1192 (88)	4288 (01)
11	257	56	129	386	487[f]	269	287	179	291	303	38 (87)	351 (05)
10	28	67	22	50	29[f]	26	21	18	15	22	15 (16)	29 (20)
52	361	61	226	587	476[f]	386	186[p]	295	402	349	105 (02)	476 (20)
60[c]	0		0	0	1	0	0	1	0			
Total	646	63	377	1023	993[e]	681	494	493	708[n]	611	198 (87)	993 (20)
State	1758	59	1213	**2971**	3203	2340	1766	2040	2641	2225	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 other hunter-harvested bear in this area was in 2017.

Notable harvests:

[d] Tie for record low harvest.

[e] Highest harvest since 2007.

[f] Record high harvest for these no-quota zones.

Fig. 4. Trends in statewide bear harvest and proportions of harvest and licenses in the no-quota zones, 1987–2021.

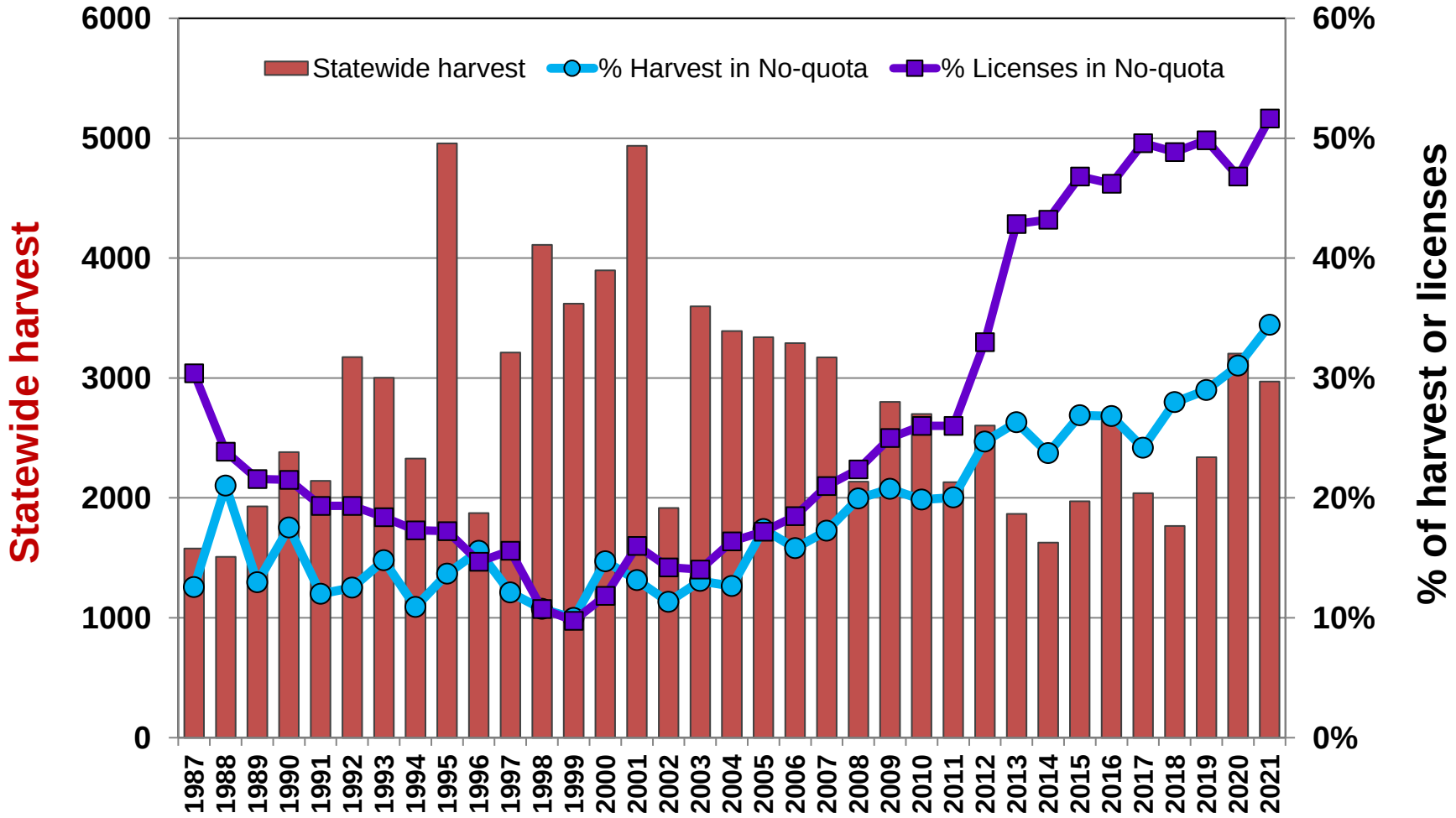


Table 6. Bear hunting success (%) by BMU, measured as the registered harvest divided by the number of licenses sold[a], 2016–2021[a].

BMU	Max success (yr) before 2021		Mean success 2016–2020	2021	2020	2019	2018	2017	2016
12	67	(20)	53	55[c]	67[b]	53[c]	43	52	40
13	59	(95,16)	52	49	56[c]	53	45	59[b]	29
22	18	(92)	11	6	14	8	16	10	13
24	55	(20)	46	46	55[b]	34	46	48[c]	48
25	63	(20)	57	54	63[b]	56[c]	53	57[c]	45
26	65	(20)	57	61[c]	65[b]	49	57	52	34
27	66	(20)		62[c]	66[b]	47	53[c]	52	
28	70	(18)		57	63[c]	60	70[d]	53	
31	65	(20)	52	59[c]	65[b]	42	52	56[c]	56[c]
41	50	(95)	51	43	42	46	49[c]	46	23
44	58	(20)	48	52[c]	58[b]	39	41	48[c]	35
46	58	(20)		50[c]	58[b]	39	40	47	
47	63	(20)		68[b]	63[b]	38	43	50	
45	44	(18)	41	54[b]	43	29	44[c]	40	36
451				14	16				
51	51	(20)	42	47[c]	51[b]	21	41	46[c]	33
Quota[f]	57	(20)	47	51[c]	57[b]	38	46[c]	50	39
11[g]			24	24	23	25	17	28	20
10[g]			12	12	12	9	8	9	7
52[g]			23	23	19	10	14	19	15
No Quota	32	(95)	21	22	24	15	15	21	16
Statewide	40	(95)	40	33	38[c]	27	31	37	28

[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] in 2020, BMU 451 was broken out of BMU 45 and was an area in the quota zone with an unlimited number of licenses. The quota success rate is calculated without BMU 451 in it to make hunting success estimates comparable across years. The success rate for BMU 451 is listed on it's own line in the table.

[g] 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, 1 more was killed there in 2020. Table shows % indicating where they planned to hunt (number of hunters in parentheses for BMU 60 and Quota zone):

BMU	2021	2020	2019	2018	2017
11	34.7	34.3	30.9	34.6	29.8
10	9.3	8.6	14.3	7.4	6.6
52	56.0	56.8	52.0	55.3	59.2
60 (n)	0	0.3 (13)	0.3 (11)	0.1 (4)	0.1 (4)
Quota zone (n)	0	0.6 (27)	2.5 (94)	2.6 (83)	4.2 (137)

Fig. 5. Number of hunters' baits per township within each BMU (7,893 total baits) in 2021.

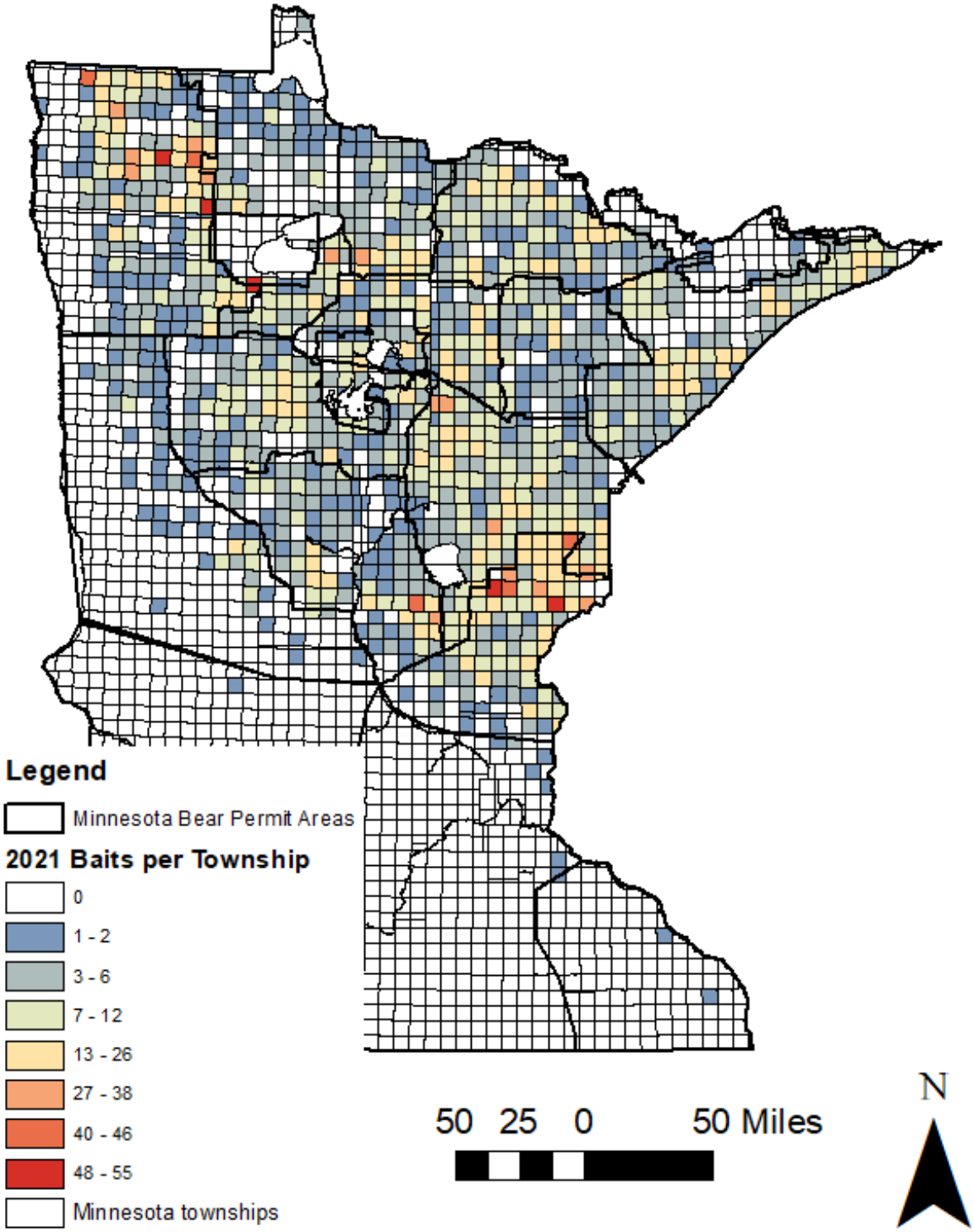


Table 7. Cumulative bear harvest (% of total harvest) by date, 1998–2021.

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
2020	Tues		70	83	94
2021	Wed		66	80	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 Wildlife Managers and Conservation Officers during April–October during 2002–2021, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 [j]	2018 [j]	2019 [j]	2020 [j]	2021 [j]
Number of personnel participating in survey [a]	50	39	34	42	46	46	37	51	40	34	56	63	64	61	55	86 (51,35)	78 (56,23)	126 (60,66)	112 (70,42)	94 (36,58)
Complaints examined on site	75	81	75	61	57	63	59	65	70	37	113	69	79	97	118	71 (22,49)	40 (21,19)	82 (37,45)	87 (3,84)	81 (6,75)
Complaints handled by phone [b]	550	424	507	451	426	380	452	535	514	396	722	623	570	840	780	644 (450,194)	438 (369,69)	736 (599,137)	784 (591,193)	593 (450,143)
Total complaints received [o]	625	505	582	512	483	443	511	600	584	433	835	692	649	937	898	715	478	818	871	674
• % Handled by phone	88	84	87	88	88	86	88	89	88	91	86	90	88	90	87	90	92	90	90	88
• Calls handled by the information center [n]																			281	364
Bears killed by:																				
• Private party or DNR	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)	42 (3,39)	36 (3,33)
• Hunter before season [c]																				
– from nuisance survey	0	3	3	6	2	18	3	4	3	3	11	0	0	1	13	1	2	0	20	4
– from registration file	11	8	4	13	6	25	5	15	10	5	12	0	1	4	6	3	11	5	34	24
• Hunter during/after season [d]	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	3	23
• Hunter by Area 88 license [e]																1		3 [m]	40 [m]	45 [m]
• Permittee [f]	4	6	1	5	4	5	1	3	5	0	0	1	0	3	0	0	1	2	5	2
Bears translocated [g]	3	1	3	3	3	1	3	2	2	2	0	3	2	0	0	0	0	0	3	2
Bears killed by cars [h]	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]	25 (23, 2)[h]	15 (10,5)

[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. In 2021, data included all validation letter information in this total.

[e] In 2017, hunters could choose Area 88 in the quota lottery, and if drawn, could hunt for a nuisance bear, if authorized. In 2021, 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; 41 hunters used the Area 88 designation. Only 23 of these hunters were authorized to do so. Other hunters were authorized to take a nuisance bear on a validated license (96 in total).

[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 14 bears have been killed by permittees since 2011. In 2020, 13 permits were issued but only 5 bears killed.

[g] According to DNR nuisance policy, trapped nuisance bears should not be translocated. In these cases, translocations were reports of orphaned cubs or animal welfare cases.

[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, in 2020 21 calls were in other months, in 2021, 17 calls were in other months). For the wildlife manager data, anytime a WCIL row was entered, it is considered an independent complaint, so there are some duplicates when there were repeat issues at the same.

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

[m] 96 hunters were authorized to take nuisance bears in the quota area in 2021, of which 45 (47%) were successful. Data are from the registration files only until 2020. After which, it was cross-validated with validation letters. 41 hunters bought area 88 licenses, only 25 had matching validation letters. 39 hunters were authorized in the quota area, the remainder of the 96 were in the no-quota or BMU 451.

[n] Although it is unknown when this started, the information center at Central Office has been fielding bear nuisance calls. We started to record these data in 2020. To date, some calls (~40%) are forwarded on to wildlife managers or conservation officers, but the rest are handled by the information center.

Fig. 6. Trends in nuisance bear complaints, and nuisance bears killed and moved, 1981–2021, showing dramatic effect of change in nuisance bear policy, and a stable number of bear complaints over the last decade. Total complaints received for 1981–2000 are interpolated in years that did not include a nuisance survey.

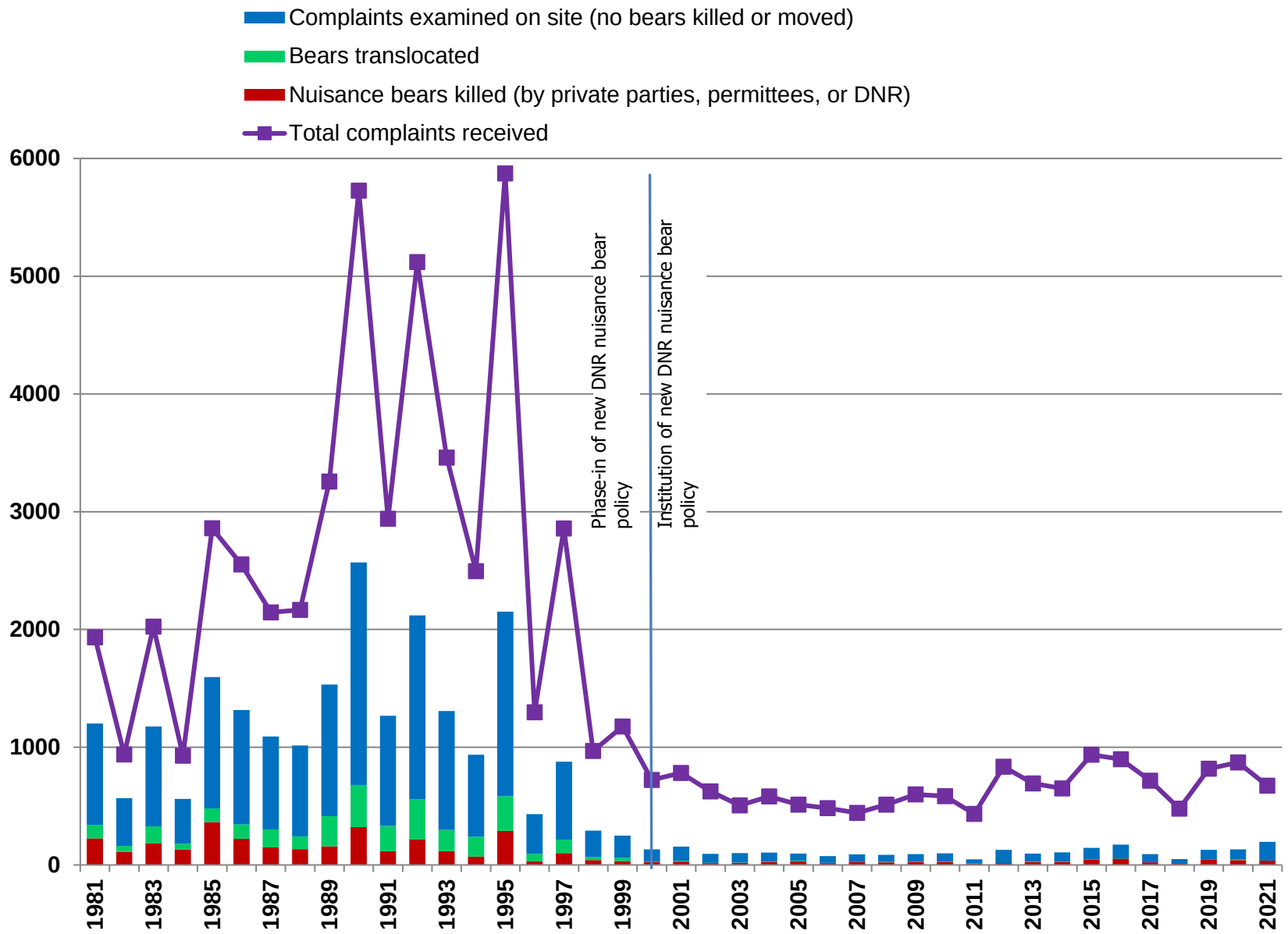


Fig. 7. Spatial distribution of nuisance bear complaints to wildlife managers involving agriculture, property damage, or non-anthropogenic food related complaints in 2021.

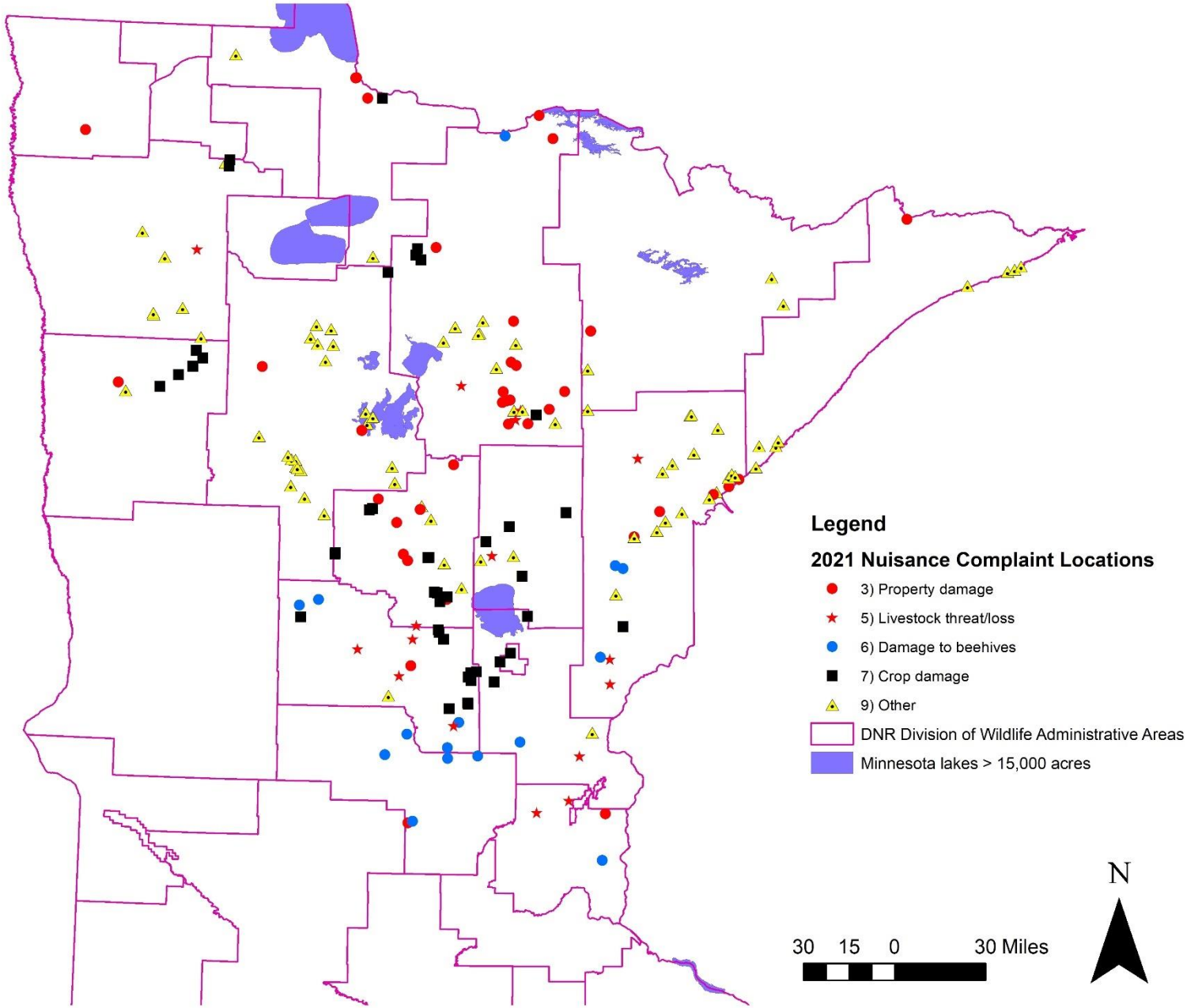


Fig. 8. Spatial distribution of nuisance bear complaints where people felt threatened by bear presence in 2021.

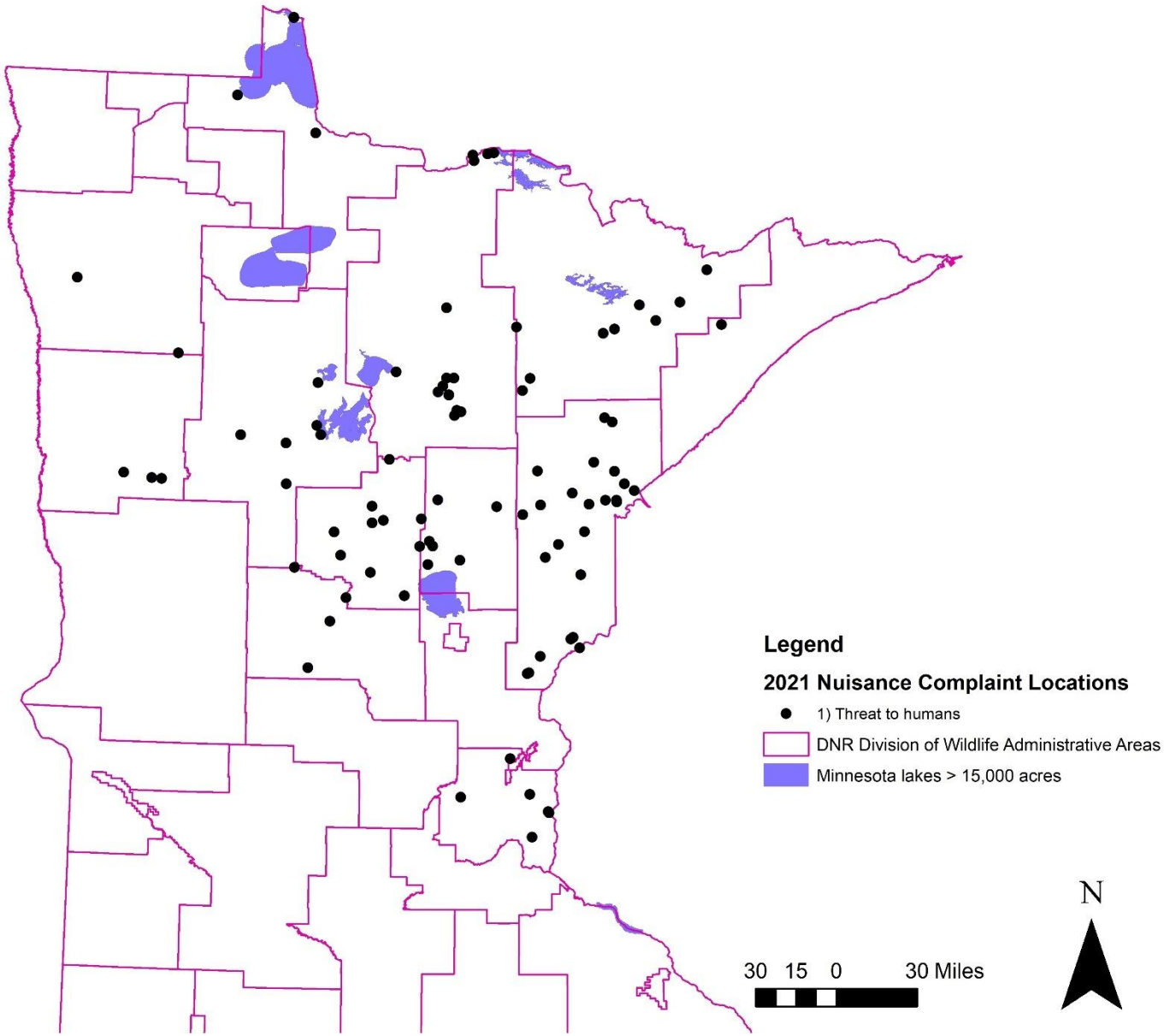


Fig. 9. Spatial distribution of nuisance bear complaints involving attraction to garbage or birdfeeders in 2021.

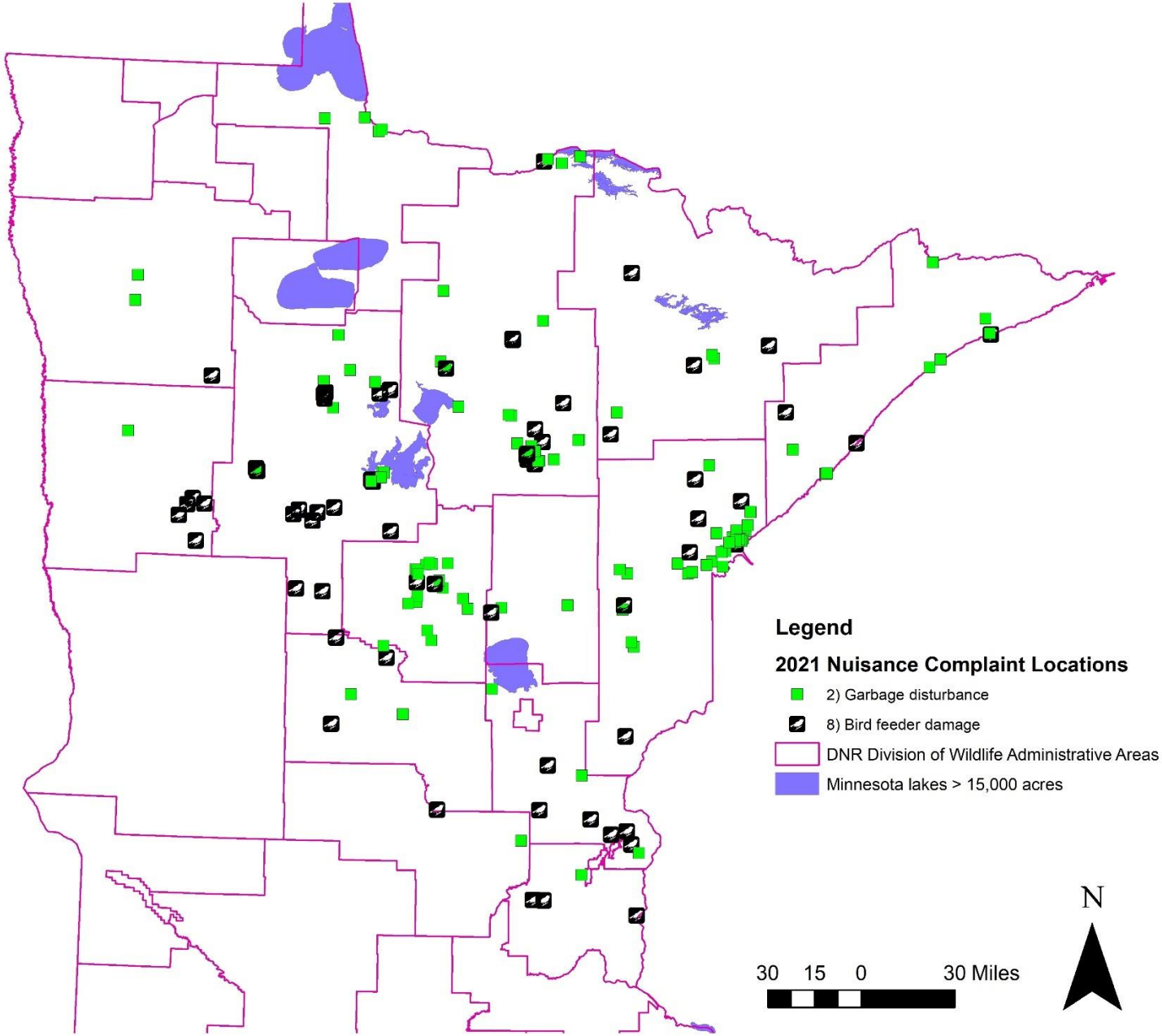


Table 9. Regional bear food indices[a] in Minnesota's bear range, 1984–2021. Shaded blocks indicate particularly low (<50; pink) or high (≥70; green) values.

	Survey Area					
Year	NW	NC	NE	WC	EC	Rangewide
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
2020	65.3	42.1	47.5	51.7	51.9	53.0
2021	28.8	38.0	34.7	32.0	42.1	35.2

[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 2021 compared to the previous 36-year mean (1984-2020) 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	
	36yr mean	2021 (*n* = 11[b])	36yr mean	2021 (*n* = 4)	36yr mean	2021 (*n* = 8)	36yr mean	2021 (*n* = 10)	36yr mean	2021 (*n* = 6)	36yr mean	2021 (*n* = 35)
SUMMER												
Sarsaparilla	4.7	3.0	5.8	5.8	5.3	2.4	4.5	2.0	5.2	3.5	5.0	3.4
Pincherry	3.4	1.2	4.4	2.0	4.3	2.4	3.8	1.6	3.7	2.5	3.9	1.7
Chokecherry	5.9	2.6	5.4	2.0	4.6	2.7	5.4	2.5	4.7	3.0	5.3	2.4
Juneberry	5.2	2.1	4.8	1.0	5.0	1.3	3.7	1.5	4.0	1.0	4.5	1.6
Elderberry	1.6	1.5	2.9	0.5	3.6	3.0	3.0	2.0	3.2	3.0	2.9	2.0
Blueberry	5.2	0.4	5.4	2.3	5.0	2.3	3.7	0.3	3.9	2.0	4.5	1.3
Raspberry	6.5	2.3	7.8	8.0	7.9	4.7	7.1	4.9	7.0	3.7	7.1	4.4
Blackberry	1.3	0.4	2.3	2.0	1.2	0.7	3.6	2.8	4.4	4.0	2.9	2.6
FALL												
Wild Plum	2.4	2.4	1.9	0.3	1.4	0.4	2.7	0.5	2.4	0.8	2.3	1.1
HB Cranberry	5.2	2.1	4.4	2.0	3.9	3.8	3.7	1.8	3.8	3.0	4.1	2.5
Dogwood	6.2	3.1	5.6	4.5	4.9	3.2	5.9	4.1	5.8	5.6	5.7	4.1
Oak	3.5	4.0	3.2	2.3	2.0	1.5	5.9	4.4	5.7	3.2	4.5	3.5
Mountain Ash	1.6	0.2	2.6	2.0	4.7	3.4	1.8	1.0	2.4	3.0	2.7	1.6
Hazel	6.4	3.4	7.4	3.5	6.9	2.8	7.8	2.7	7.5	3.8	7.2	3.1
TOTAL[d]	59.1	28.8	63.9	38.0	60.9	34.7	62.5	32.0	63.8	42.1	62.7	35.2

[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), 1984–2021. Particularly low (≤ 5.0; yellow) or high (≥8.0; tan) values are shaded.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range
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
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	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	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
2020	5.8	5.4	5.1	5.4	5.4	5.5
2021	3.8	4.3	3.3[b]	4.2[b]	4.4	4.2[b]

[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, 2021.

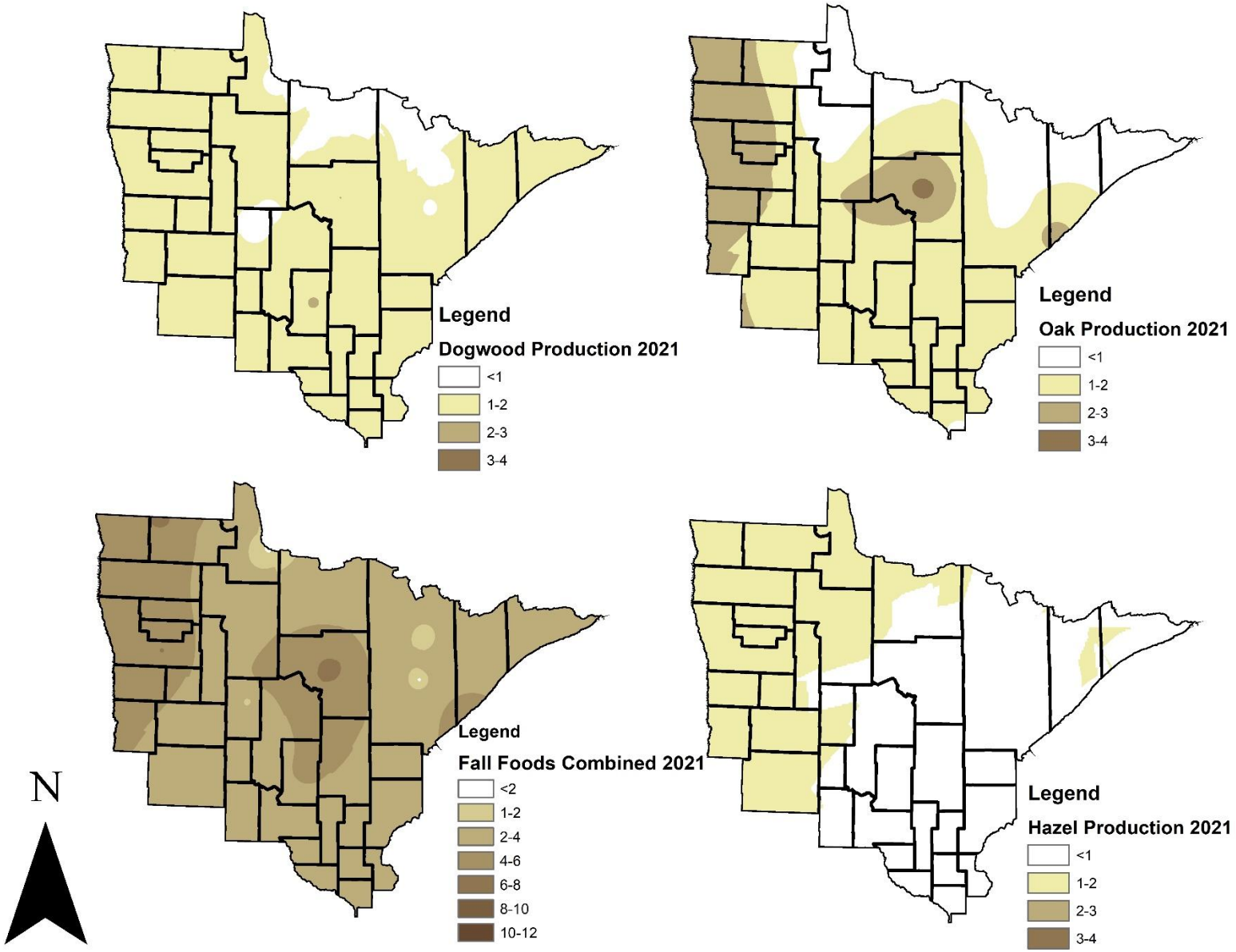


Fig. 11. Number of bears harvested vs. number predicted to be harvested based on number of hunters and fall food production — top panel: statewide 1984–2021; bottom panel: quota zone only (including area 451 hunters and harvest), most recent 15 years. Regression for both datasets included an interaction term between food and hunters to better predict the drastic changes in harvest when fall foods were extremely high or low.

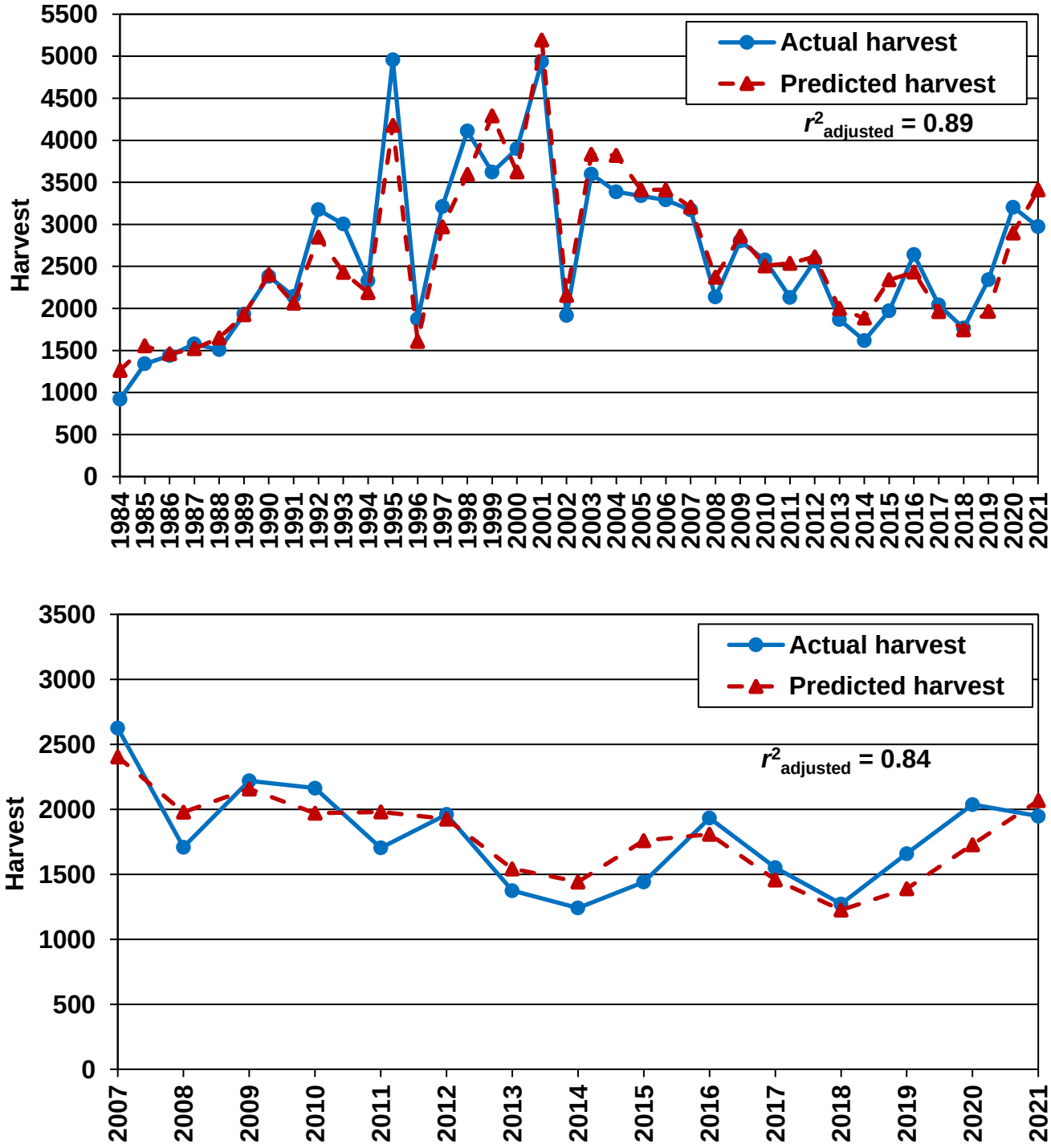


Fig 12. Percent of hunters submitting useable bear teeth for aging (vital for population monitoring, see Figs. 14–17). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993), and in recent years after a series of reminder letters (no letter was sent after 2017).

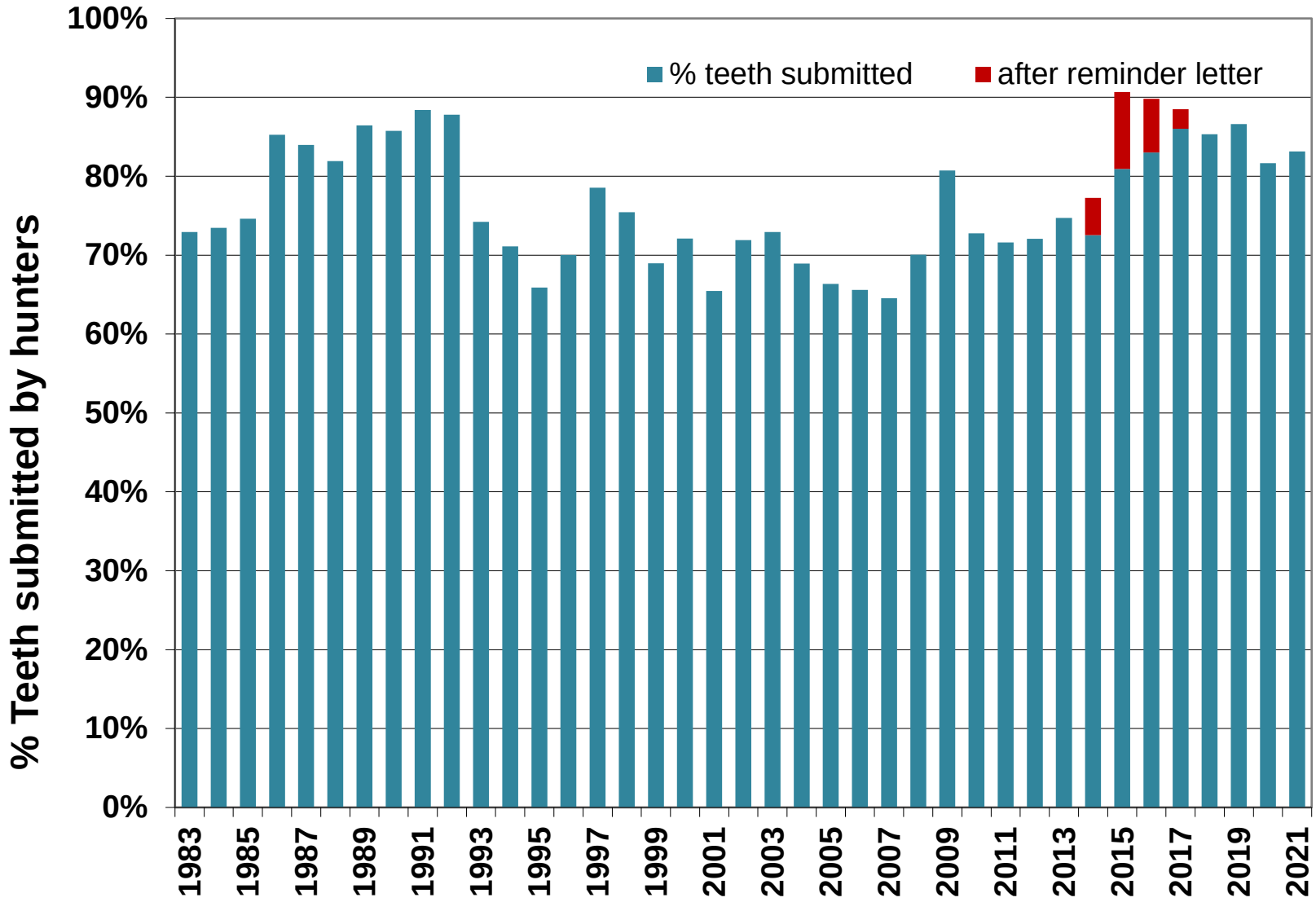
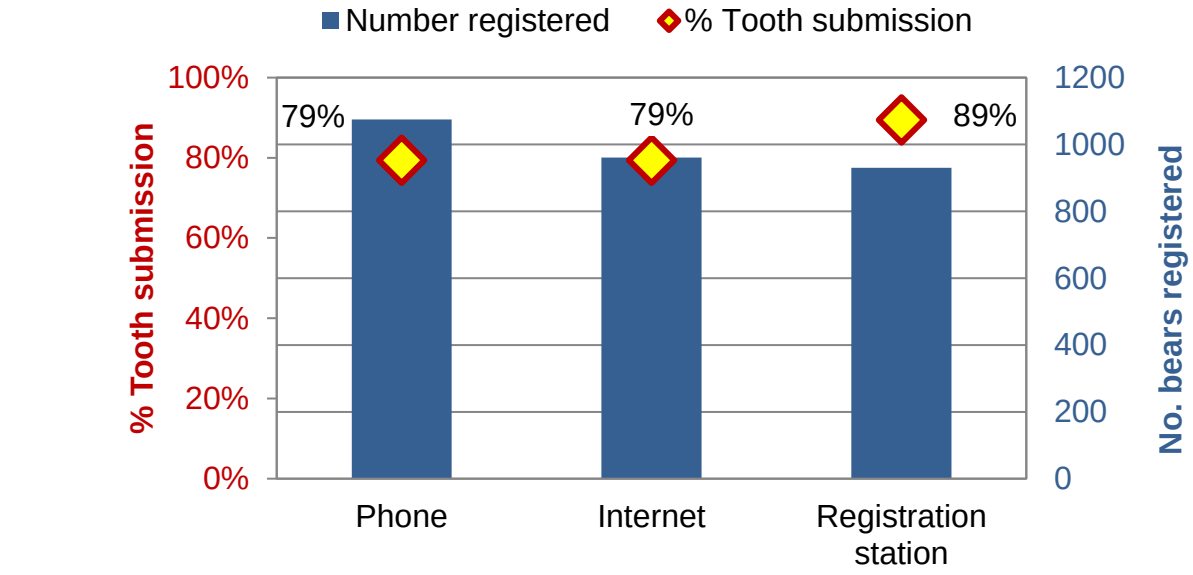


Fig. 13. Percent of hunters who submitted a bear tooth in 2021 by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet, as well as in person at a station. The 2021 statewide submission average (83%) was above the long-term average (76%).



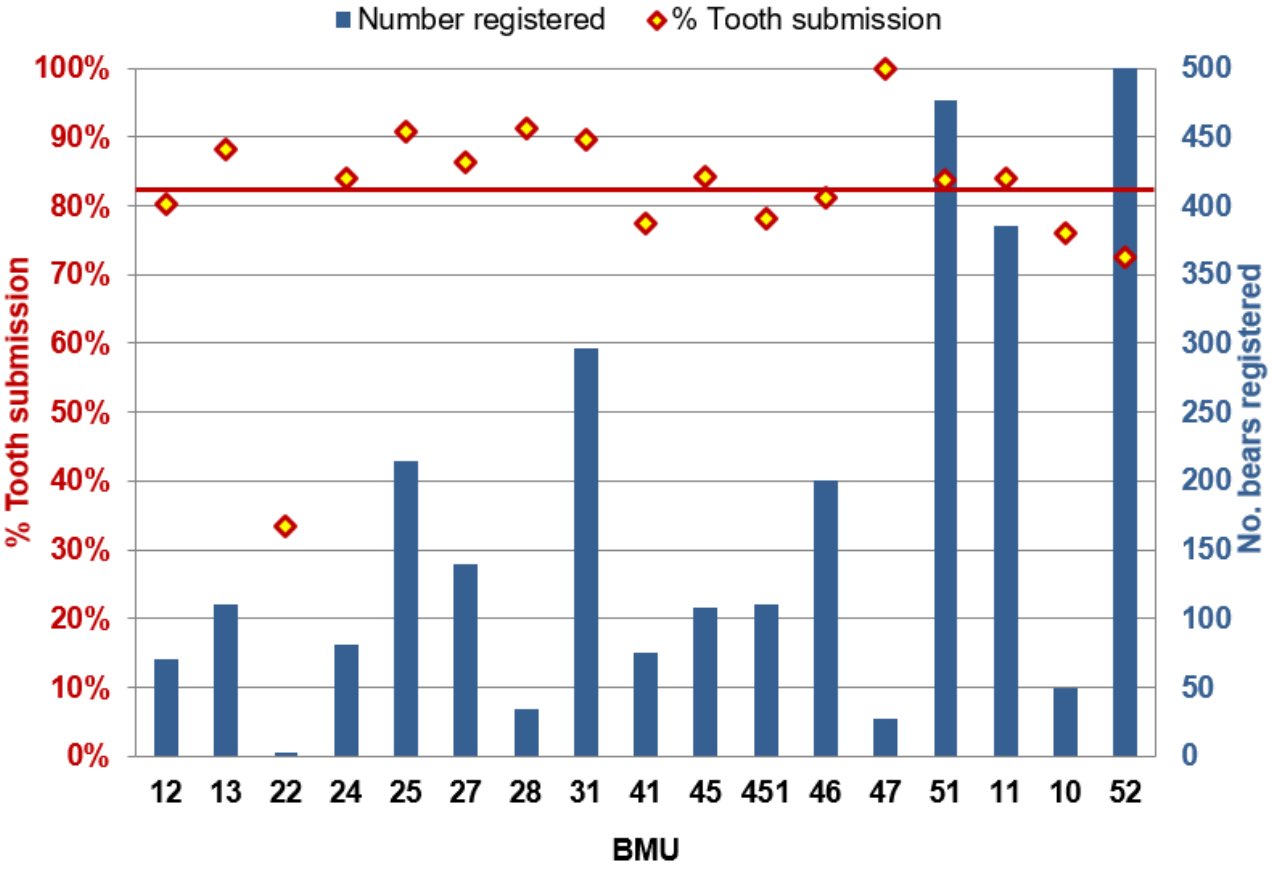


Fig. 14. Population trends during 2000s derived from Allen model statewide estimates (± 95% credible intervals) and population estimates for quota and no-quota zones. Note the actual scale of the population estimates is an underestimate to true population size (based on previous tetracycline estimates), but population trend seems consistent with the BMU-level models and the Downing.

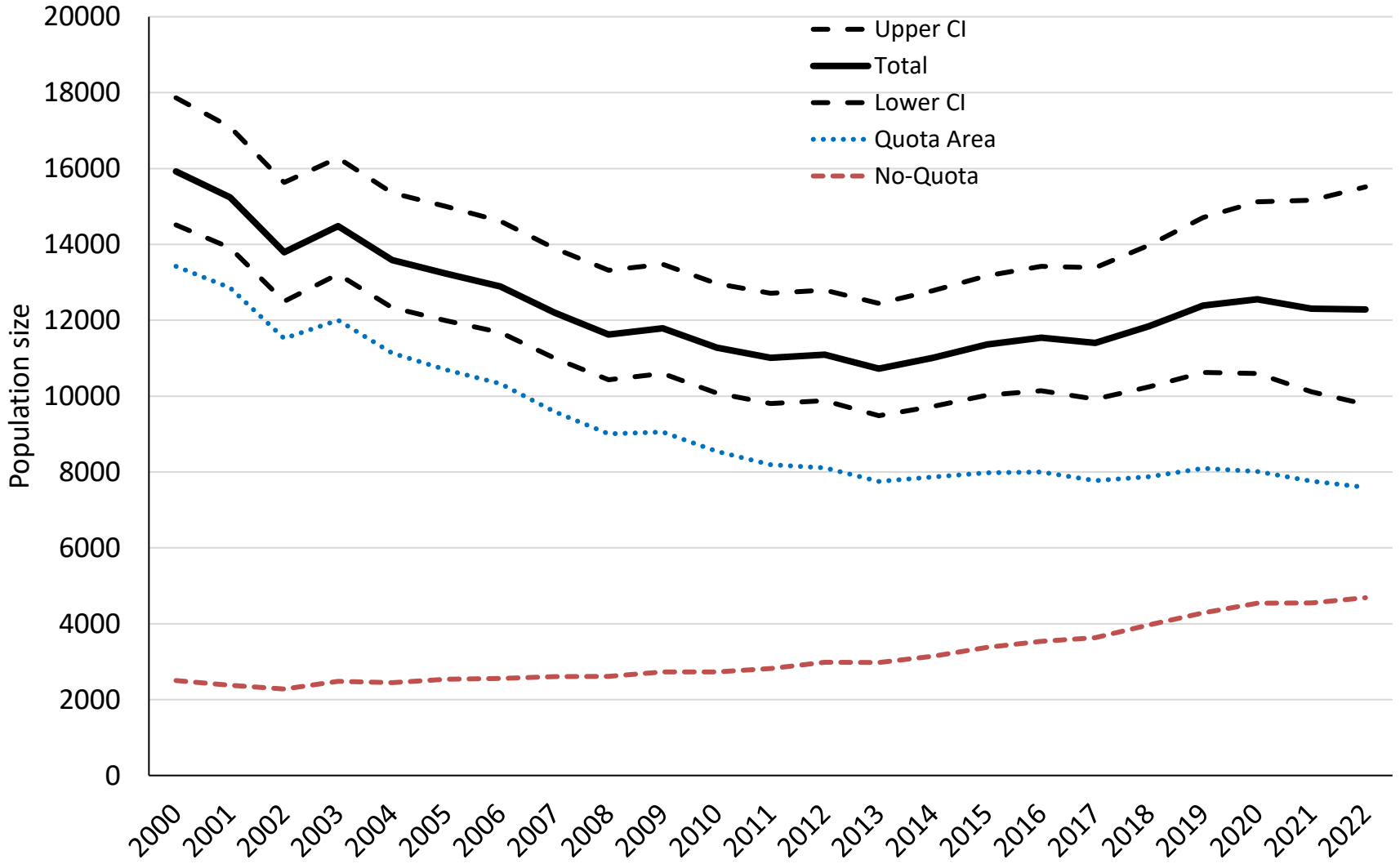


Fig. 15. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1980–2020. Higher harvest rates result in steeper curves because males in the living population are reduced faster than females. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male (dashed orange 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 (e.g., 2015–20 lower than 1980–84), but a slight increase in recent years.

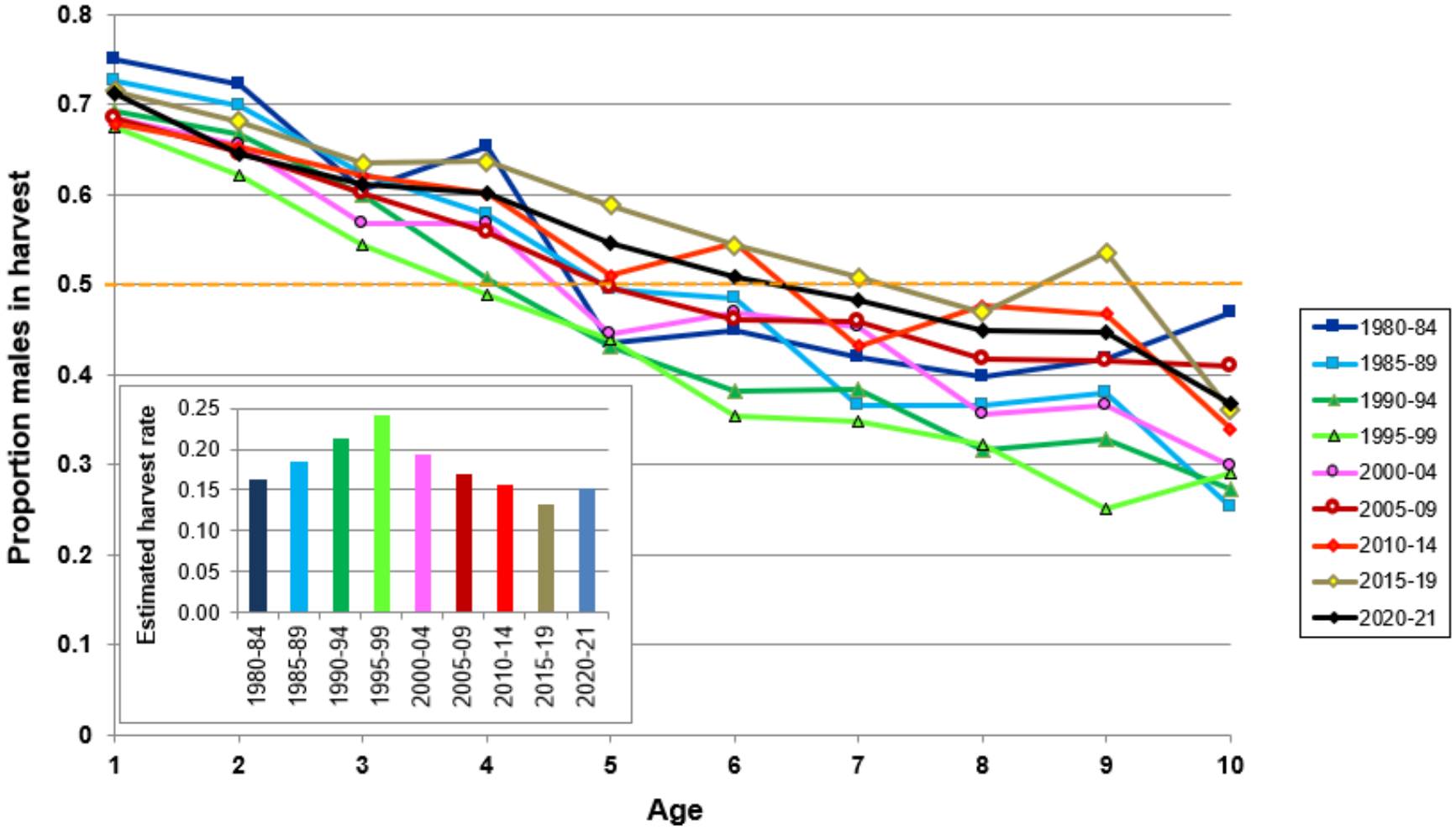


Fig 16. Allen et. al (2017) BMU-level, pre-hunt estimates 2000–2021. The vertical black line in 2012-2013 represents when quota permits were cut by >50% and have remained stable at low levels since then. The dashed lines represent the 95% pointwise credible intervals of the population estimate. With the small population size at BMU level, estimates of population trend are more reliable than actual population size. BMU harvest in area 22 is too small to reliably model. BMU population estimates are compiled into pre-2017 BMUs (e.g., BMU 27 and 28 are aggregated into BMU 26; BMU 46 and 47 are aggregated into BMU 44).

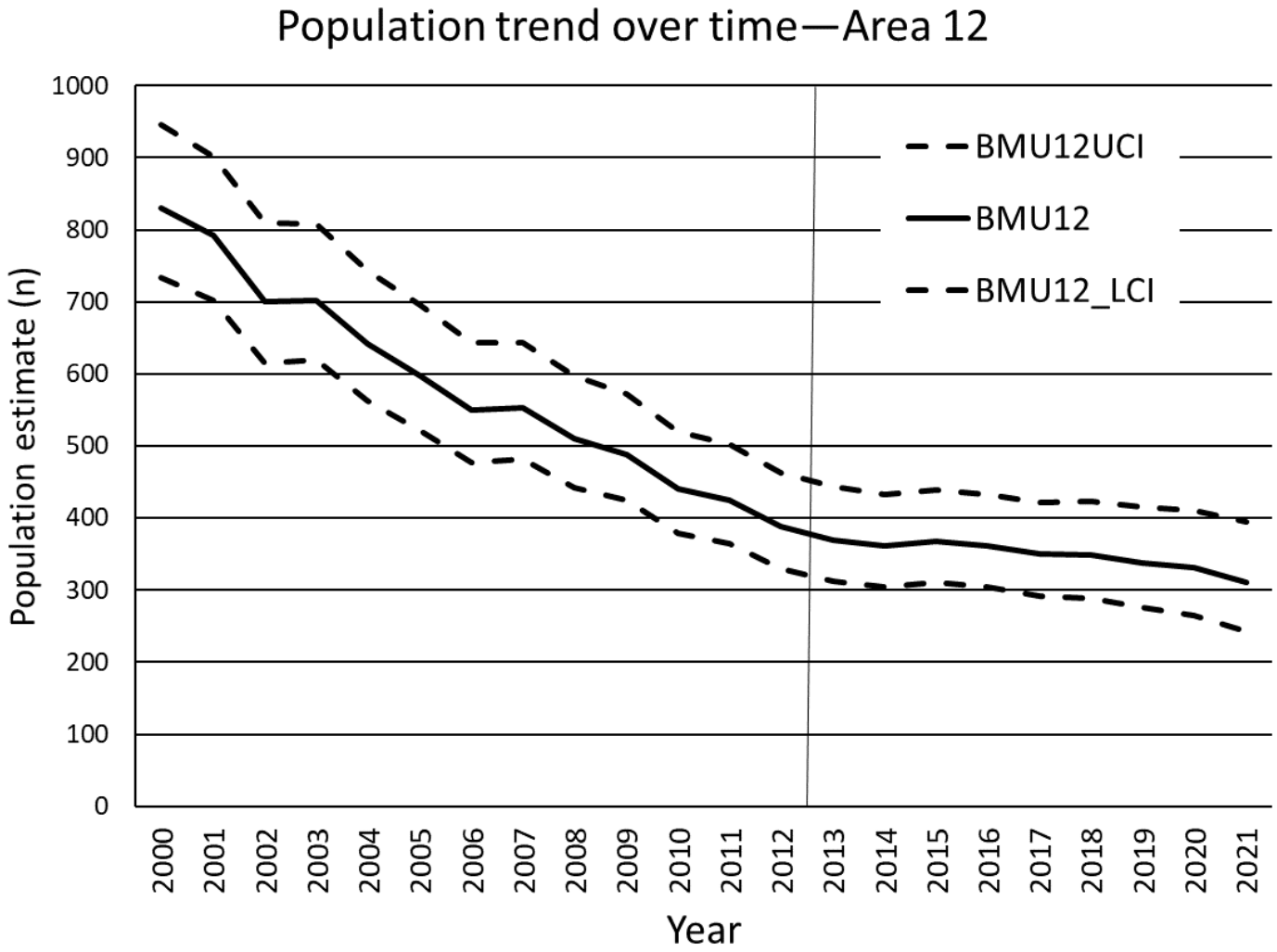


Fig. 16 cont'd.

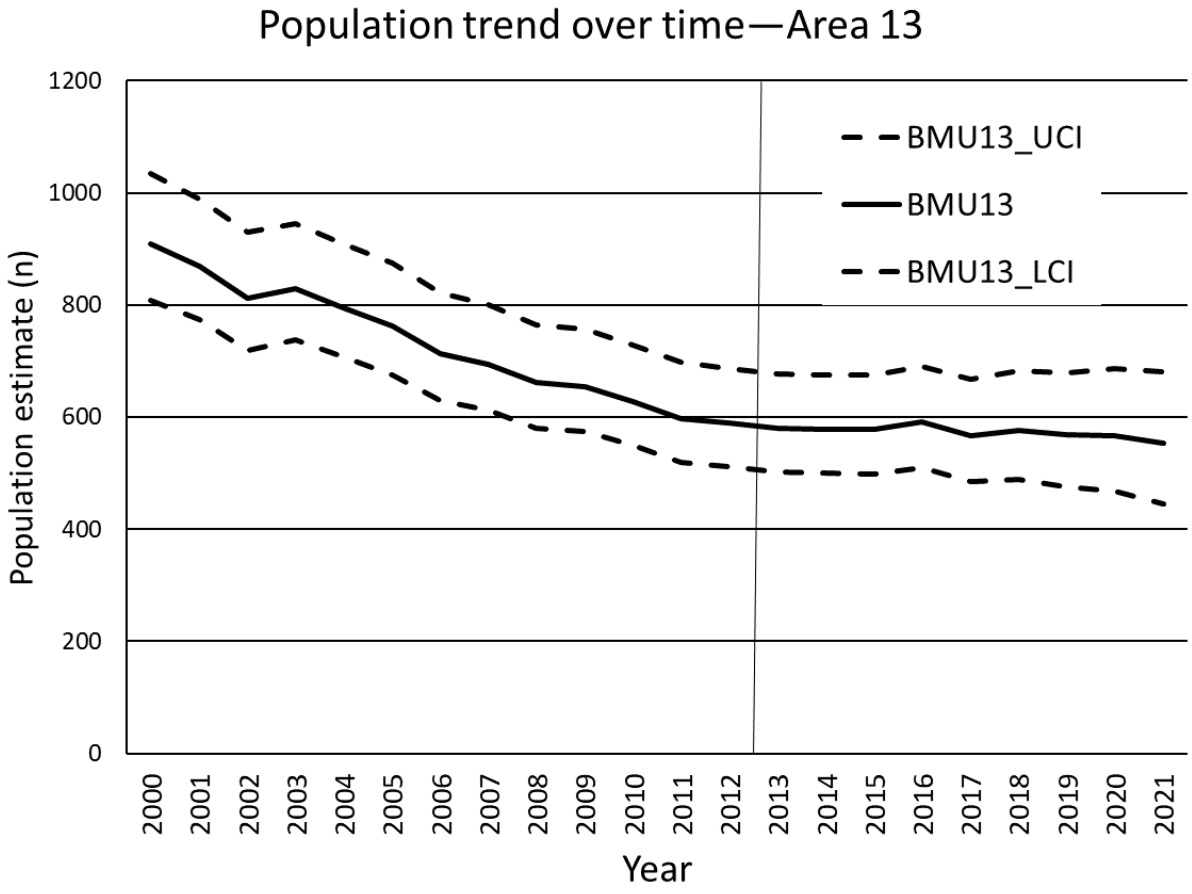

Population trend over time—Area 13
Population estimate (n)
1200
1000
800
600
400
200
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year
BMU13_UCI
BMU13
BMU13_LCI

Fig. 16 cont'd.

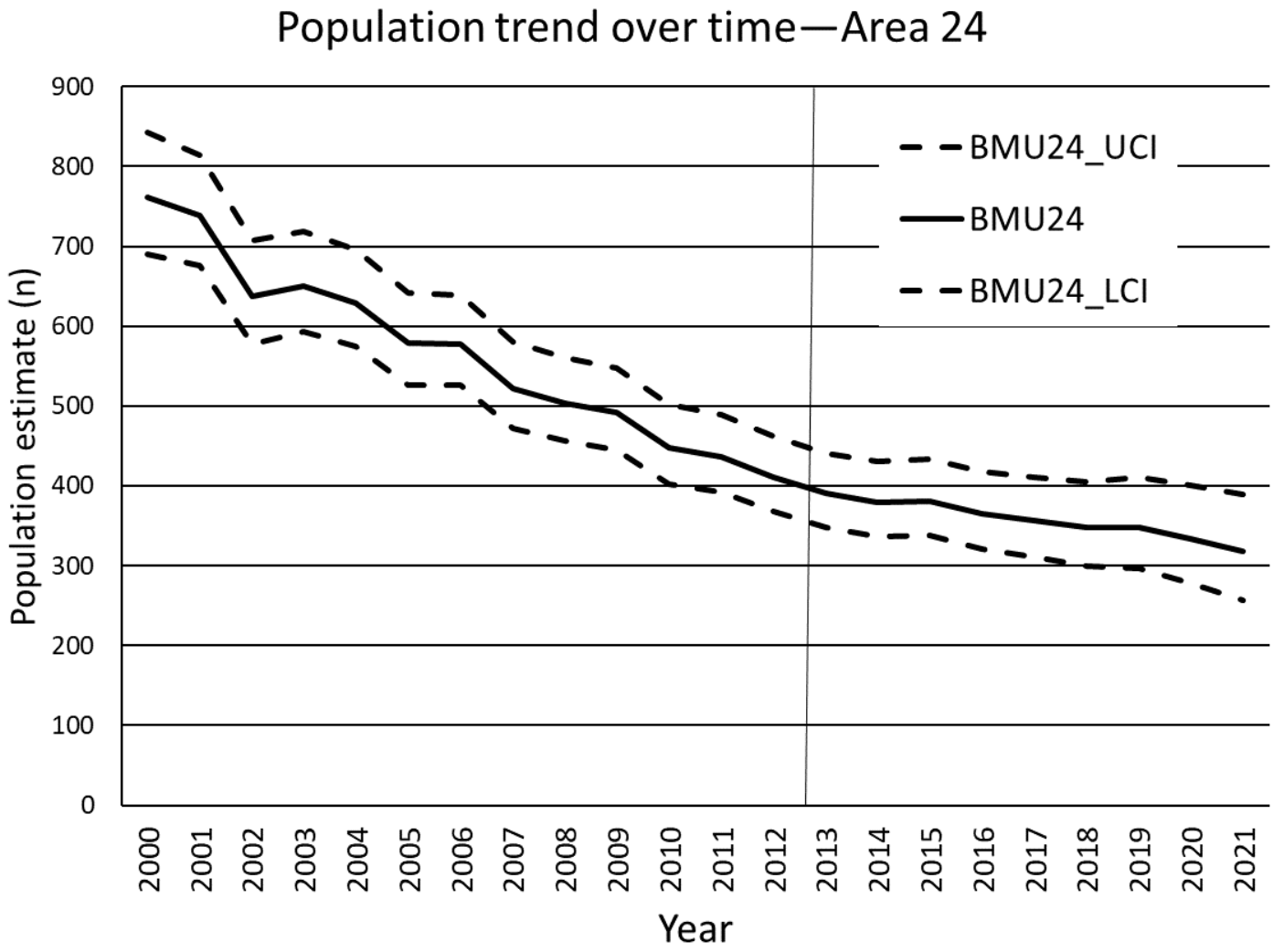

Population trend over time—Area 24
Population estimate (n)
900
800
700
600
500
400
300
200
100
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year
BMU24_UCI
BMU24
BMU24_LCI

Fig. 16 cont'd.

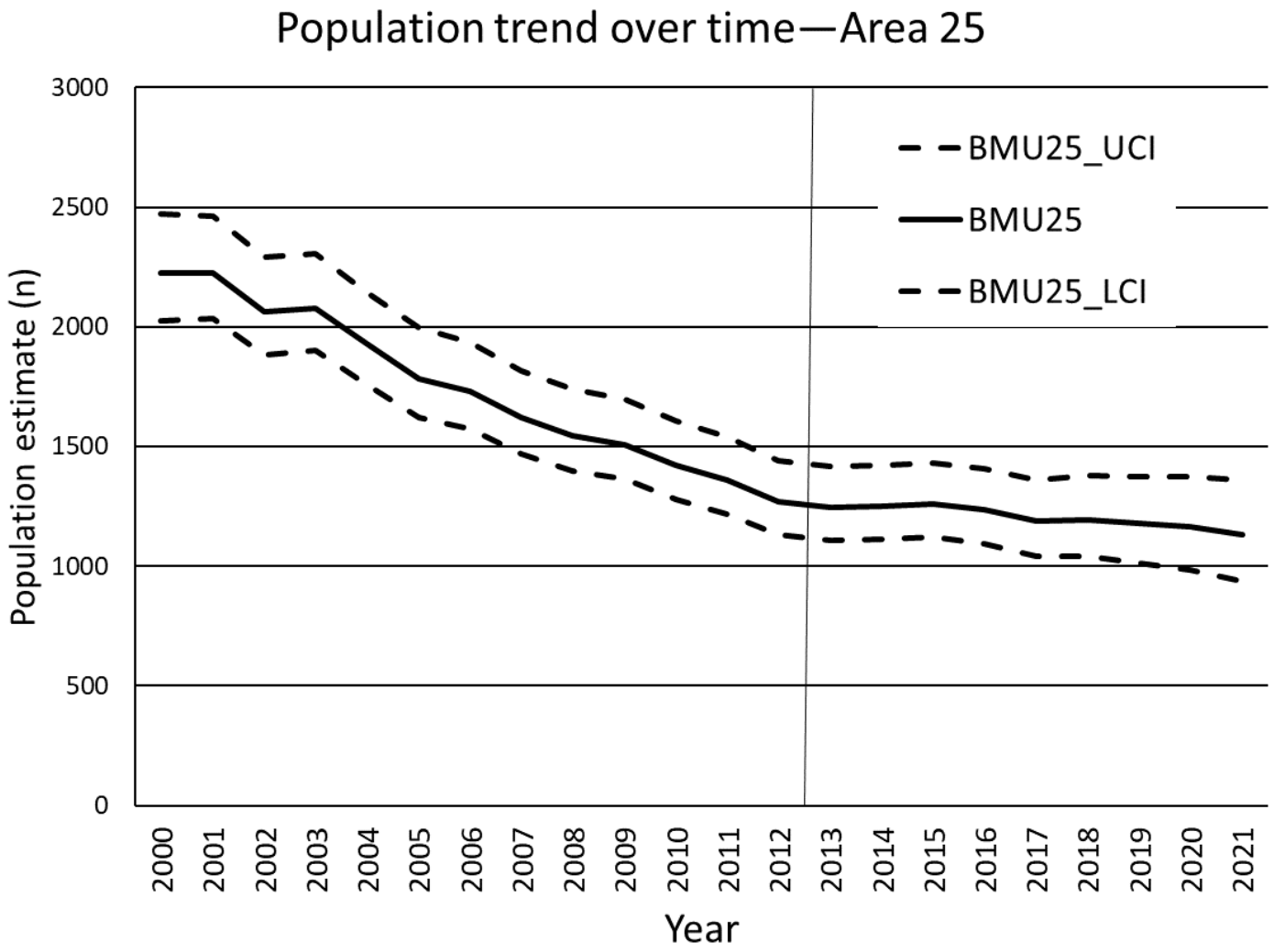

Population trend over time—Area 25
Population estimate (n)
3000
2500
2000
1500
1000
500
0
BMU25_UCI
BMU25
BMU25_LCI
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year

Fig. 16 cont'd.

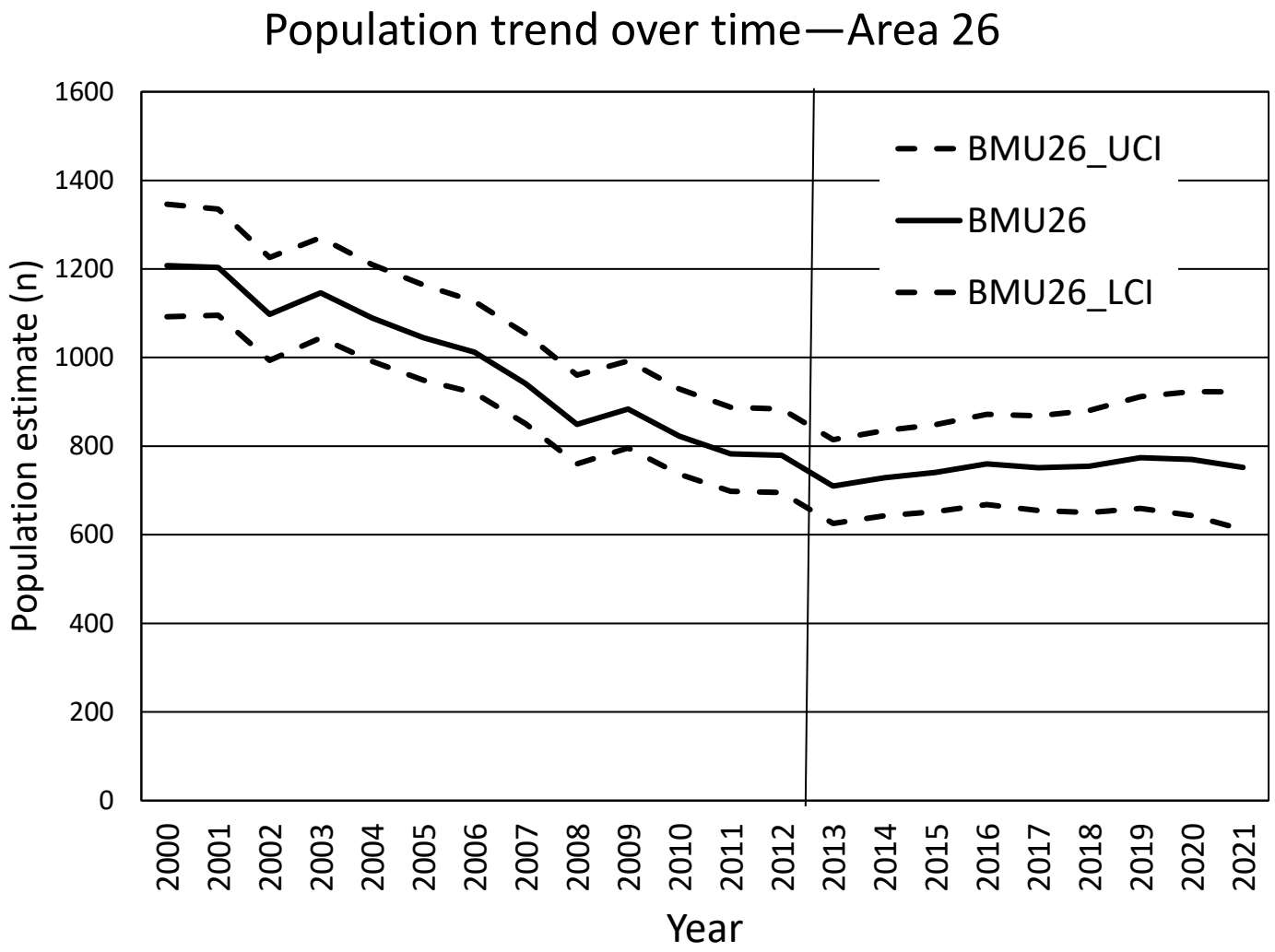

Population trend over time—Area 26
Population estimate (n)
1600
1400
1200
1000
800
600
400
200
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year
BMU26_UCI
BMU26
BMU26_LCI

Fig. 16 cont'd.

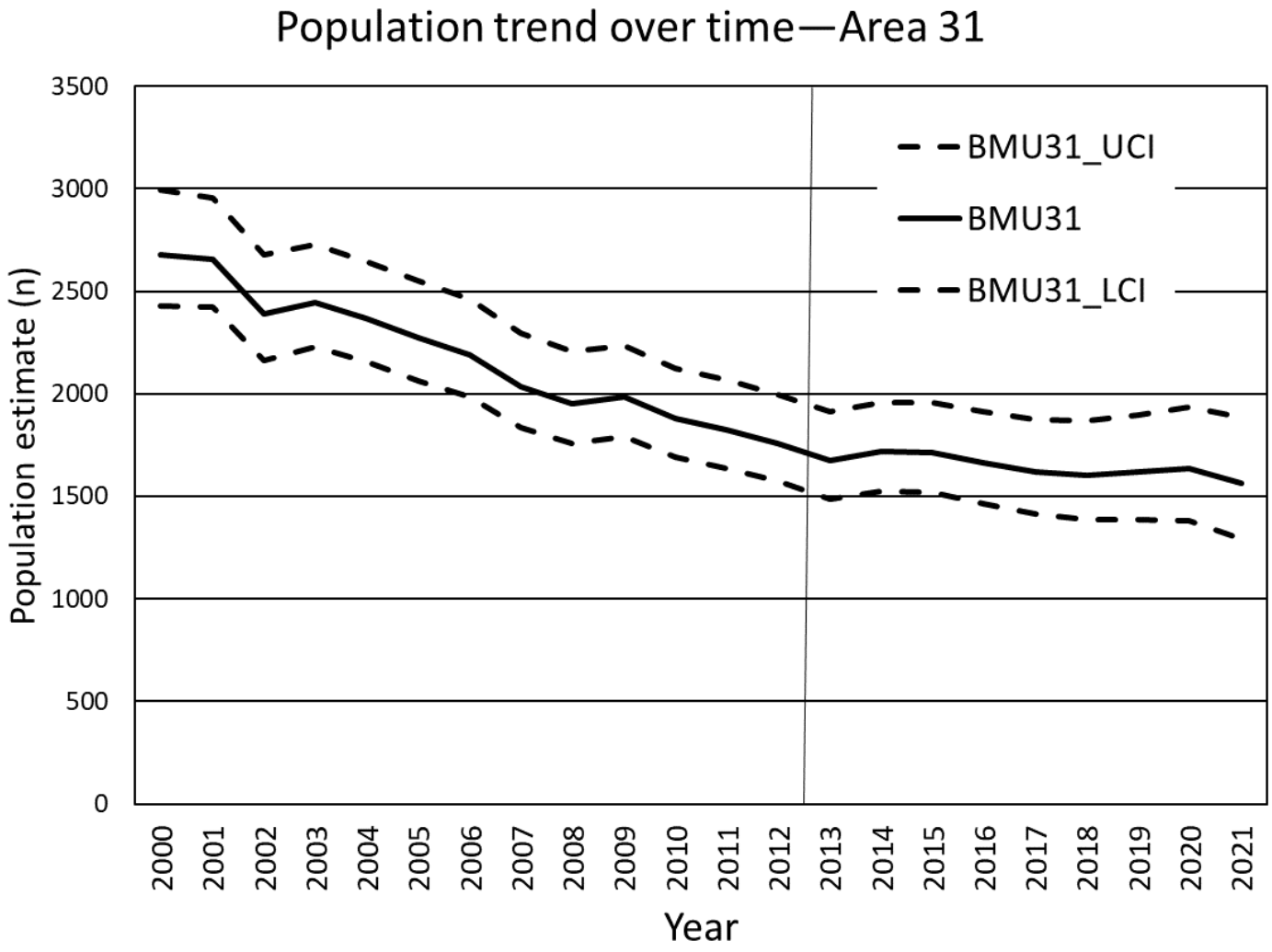

Population trend over time—Area 31
Population estimate (n)
3500
3000
2500
2000
1500
1000
500
0
BMU31_UCI
BMU31
BMU31_LCI
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year

Fig. 16 cont'd.

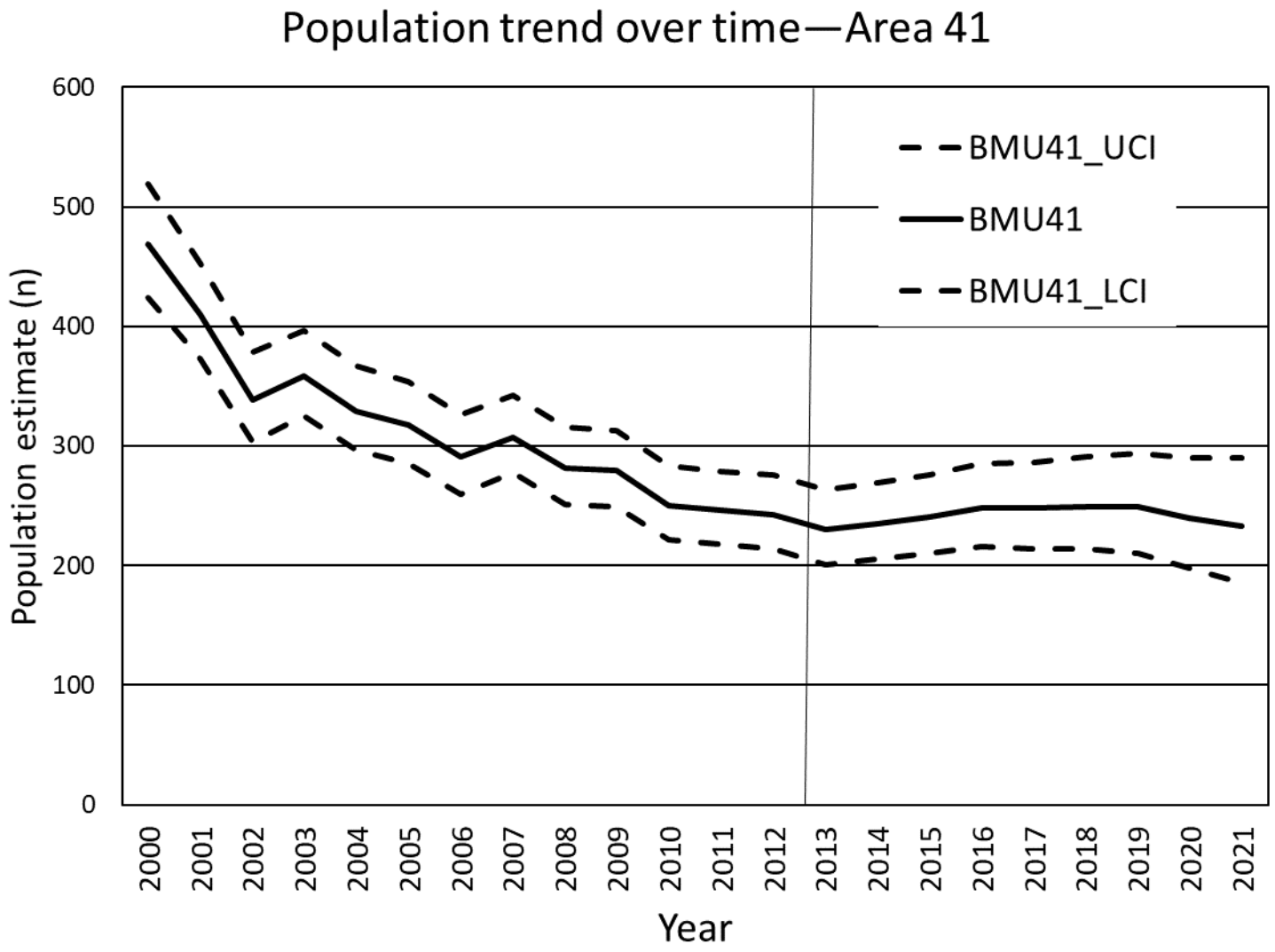

Population trend over time—Area 41
600
500
400
300
200
100
0
Population estimate (n)
BMU41_UCI
BMU41
BMU41_LCI
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year

Fig. 16 cont'd.

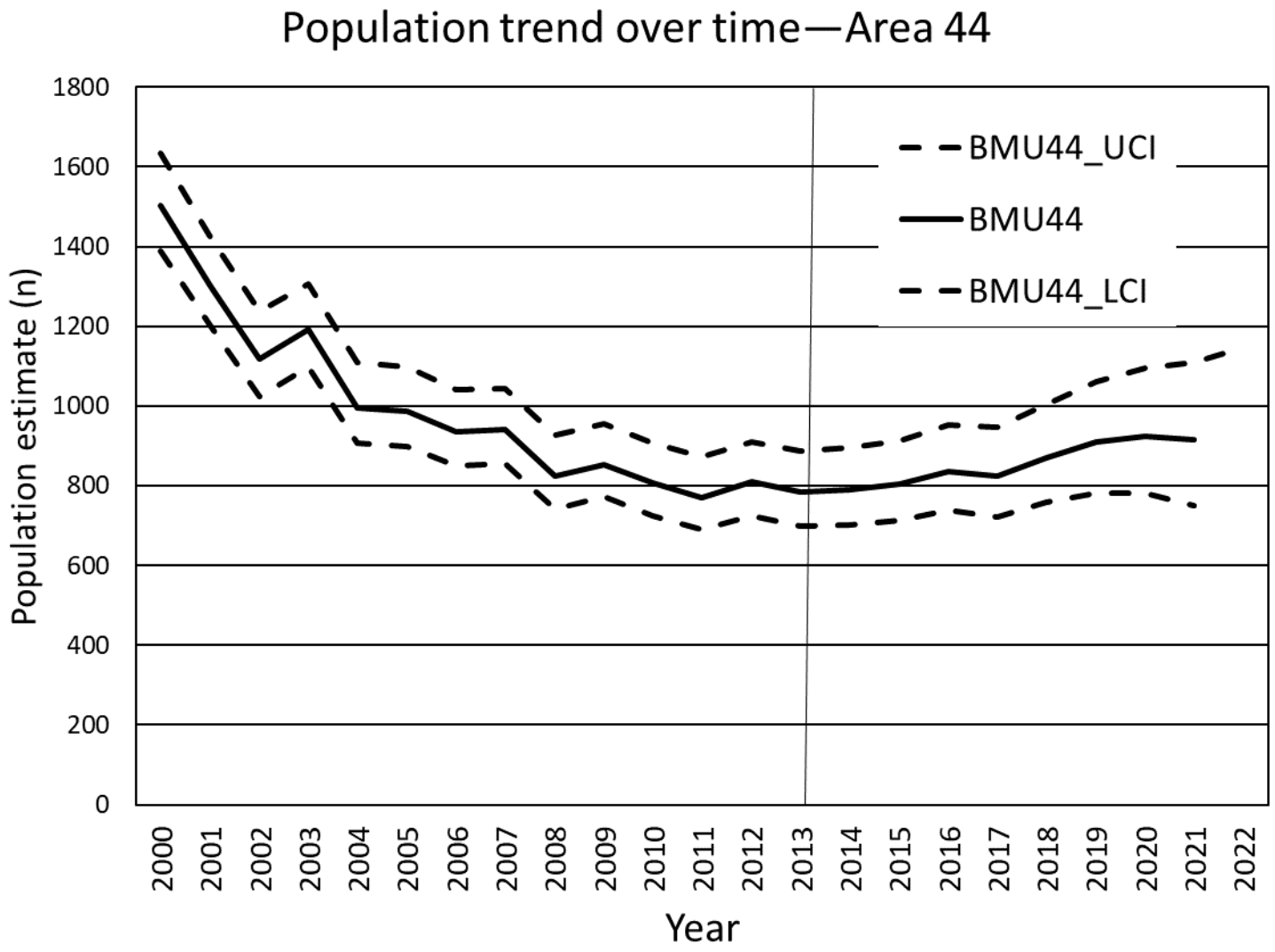

Population trend over time—Area 44
Population estimate (n)
1800
1600
1400
1200
1000
800
600
400
200
0
BMU44_UCI
BMU44
BMU44_LCI
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

Fig. 16 cont'd

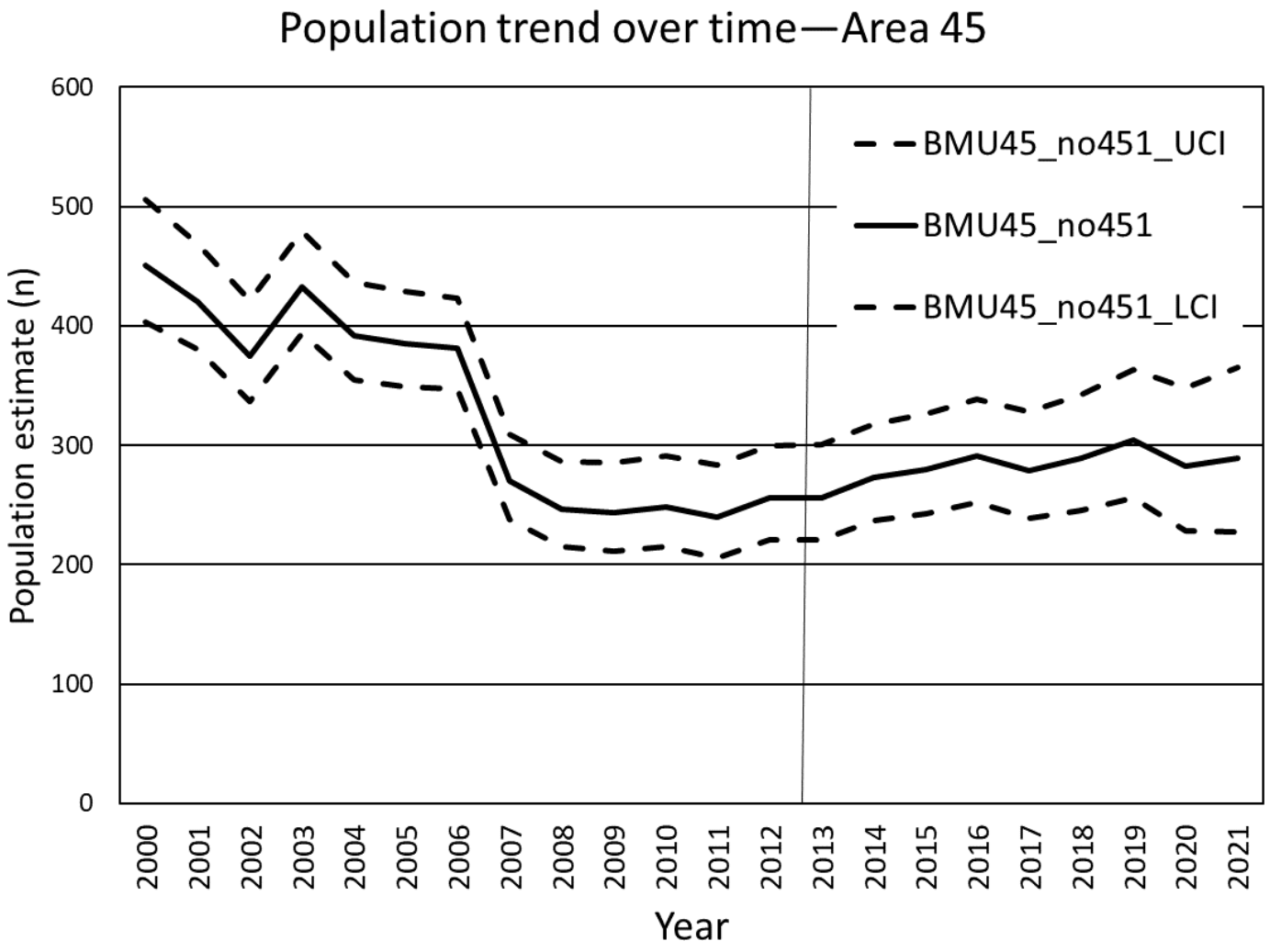

Population trend over time—Area 45
BMU45_no451_UCI
BMU45_no451
BMU45_no451_LCI
Population estimate (n)
600
500
400
300
200
100
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year

Fig. 16 cont'd

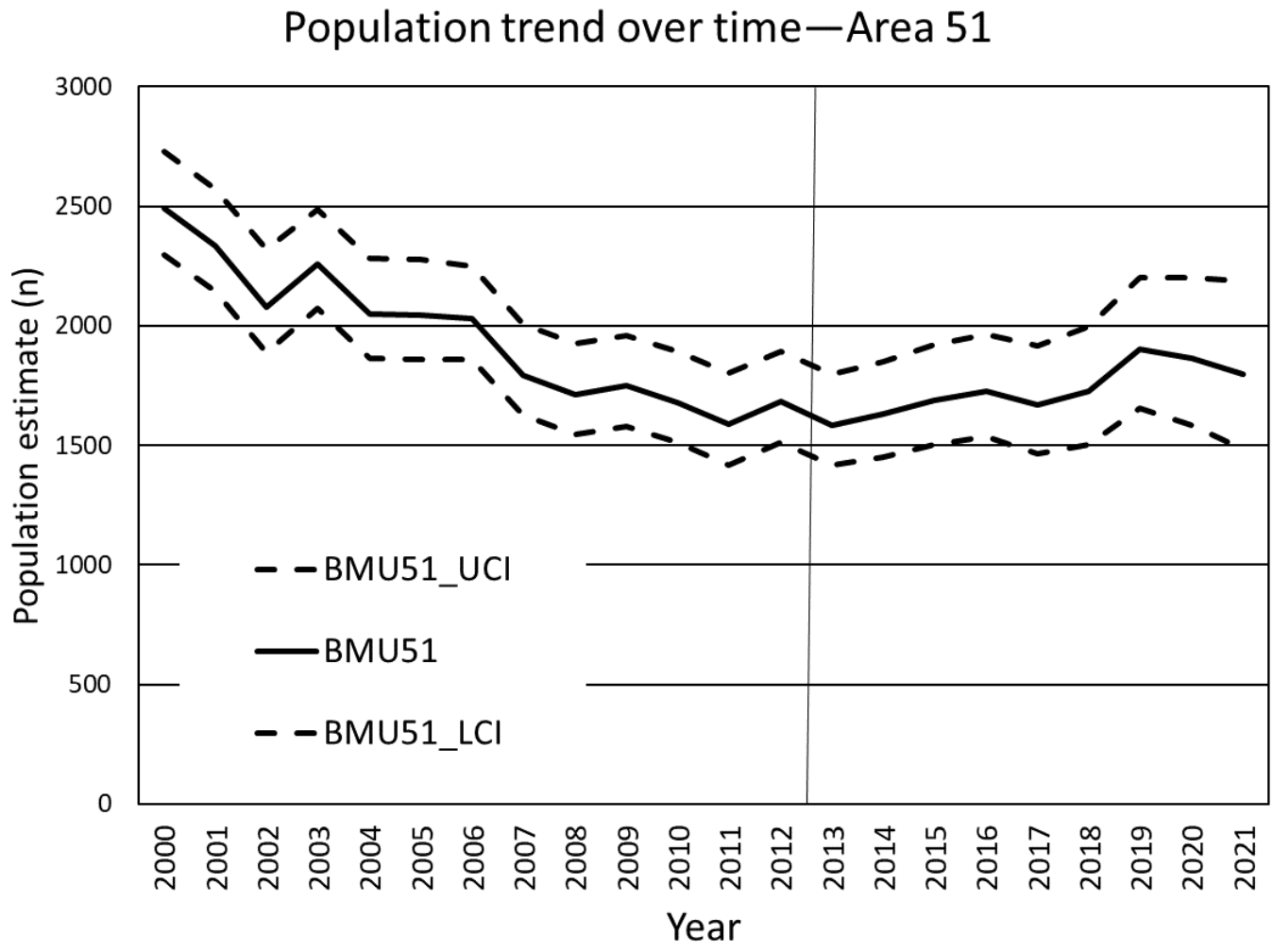
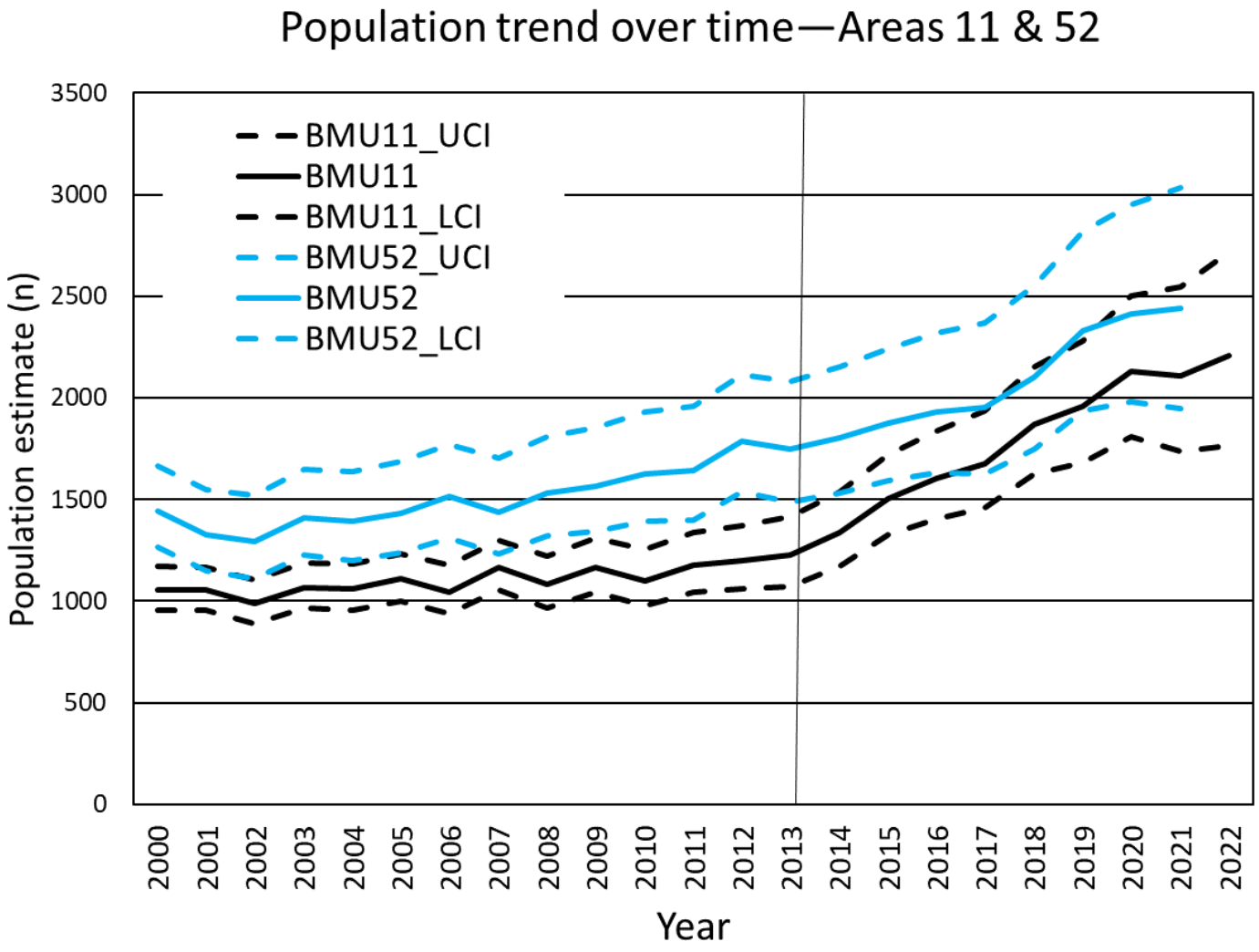

Population trend over time—Area 51
Population estimate (n)
3000
2500
2000
1500
1000
500
0
BMU51_UCI
BMU51
BMU51_LCI
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Year

Fig. 16 cont'd


Population trend over time—Areas 11 & 52
BMU11_UCI
BMU11
BMU11_LCI
BMU52_UCI
BMU52
BMU52_LCI
Population estimate (n)
3500
3000
2500
2000
1500
1000
500
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year