Maps and statistics

Hunting & trapping

- Main page
- Seasons
- Regulations
- Licenses
- Hunter education & safety training
- Hunter Recruitment & Retention
- Licensed shooting preserves PDF
- Shooting ranges
- Accessible Outdoors
- Maps
- Turn in Poachers (TIP)
- Stamp contests
- National Hunting & Fishing Day

Hunting tips

- Hunting safety
- Legal & safe hunting
- Meth lab awareness

Bear hunting

Bear hunt

Lottery:

- Check 2013 bear hunt lottery results

Hunting information:

- 2013 bear hunting regulations PDF
- Tooth samples PDF
- Hunting in the BWCAW PDF
- Handling meat and trophy PDF
- State forest OHV use & bear hunting PDF
- Don't shoot tagged or collared bears PDF
- Legal big game cartridges
- Bear outfitters PDF

Bait Registration:

- Bait registration station forms PDF | Bear bait registration online

Bear registration stations:

- Listed by town PDF | Listed by county PDF

Hunting licenses - find license agents, get applications or purchase licenses by phone or the Internet.

Sunrise and sunset data

Seasons:

Printable version

09/01/13 - 10/13/13	Bear season

Hunting Seasons

Black bear management

- Learn more

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- 2012 Harvest Report PDF
- 2011 Harvest Report PDF

- 2010 Harvest Report
- 2009 Harvest Report PDF
- 2008 Harvest Report PDF
- 2007 Harvest Report PDF
- 2006 Harvest Report PDF

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- 2012 bear harvest density PDF
- 2011 bear harvest density PDF
- 2010 bear harvest density PDF
- 2009 bear harvest density PDF
- 2008 bear harvest density PDF
- 2007 bear harvest density PDF
- 2006 bear harvest density PDF

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09/01/13 - 10/13/13	Bear season

Hunting Seasons

STATUS OF MINNESOTA BLACK BEARS, 2006

Report to Bear Committee

26 February 2007

Dave Garshelis

with contributions from

Karen Noyce

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

TABLE OF CONTENTS

Key points: 2006 bear harvest, nuisance activity, foods & population status

Table 1	The number of permit applications was the lowest since 1984. Applications have been declining since 1998. The estimated number of hunters in the field (12,400) was the same as last year.
Tables 2-3	Permits were reduced in 2006 in 4 BMUs that have consistently been undersubscribed, mainly to reduce hunter crowding. Six of 11 BMUs were still undersubscribed, but nearly all surplus licenses were purchased.
Table 4	Estimated harvest (accounting for lost registration data) was 3290, which is close to the 5-year (3436) and 10-year (3389) means. The harvest has been much more stable in the past 4 years than in other 4-year periods. However, harvest by BMU has fluctuated greatly from year-to-year. In 2005, the northwestern no-quota zone (BMU 11) had a record harvest; this year (2006) the harvest was low in that area. However, this year the southern no-quota area (BMU 52) had a record high harvest of 400 bears.
Table 5	Statewide hunting success (25-26% depending on how it is measured; see also Table 1) has been the same for the past 4 years. Within the quota zone, hunting success was significantly higher than normal in BMUs 22, 31 & 51, and lower than normal in 12, 13, 41 & 44 (western areas).
Table 6	As typical for a year with overall “average” fall food abundance, ~70% of the harvest occurred during the first week of the season (this does not vary with the day of the week for opening day).
Tables 7-8	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was about normal. However, the number of bear complaints investigated on-site was the lowest ever recorded (57; down from >1500 in 1995), as was the number of bears killed as nuisances (21, including early hunting kills).
Tables 9-11	Overall food conditions (summer–fall) were not particularly high or low in any parts of the bear range. However, several summer foods tended to have low fruit abundance (due to drought conditions in June-July), whereas a few fall foods had above-average production. The various fruits differ in their impacts on harvest and nuisance activity.
Fig. 1	Three primary fall foods tended, as a group, to be lowest in the northeast and highest in the central part of the state. Especially high acorn production in the northwest accounted for poor hunting success in that area, whereas poor oak production in the southeastern bear range accounted for the record harvest there.

Fig. 2	A combination of two key factors, fall food abundance and number of hunters, accounts for 88% of the yearly variation in the harvest. In each of the past 5 years, however, the regression based on these 2 variables predicted a slightly higher harvest than actually occurred.
Fig. 3	Sex ratios of harvested bears reflect both the sex ratio of the living population as well as the relative vulnerability of the sexes to hunters. Harvest sex ratios tend to be more male-dominated and also more variable in the northwestern part of the range (BMUs 11,12,13). BMU 41 also is particularly variable because of its small size and because many bears there are killed near cropfields. In years with poor natural foods, more bears are attracted to cropfields and hunters' baits, and the harvest is less male-biased. In 2006, natural foods were exceptionally good in the area around BMU 41 (Fig. 1), so the harvest there was very male-biased.
Fig. 4	Ages of harvested bears also reflect both the age structure of the living population as well as the relative vulnerability of bears to hunters (including hunter selection for larger, older bears). Harvest ages of females (shown in this figure) are more variable than for males, reflecting differing vulnerability to hunting by food conditions (older females increasing in vulnerability in poorer food years). The more heavily-hunted, southerly BMUs have a younger age structure. The northern BMUs show high year-to-year variation due to fluctuating food resources.
Fig. 5-6	Ages of harvested bears of both sexes steadily declined for about 2 decades (decline in median age and increase in proportion of 1-2 year olds in the harvest), reflecting increasingly higher harvest levels over this period. More consistent harvests of about 3400 bears during the past 4 years (Table 1) seem to have stabilized the age structure (with the hint of a recent slight increase in ages of harvested bears).

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1985–2006.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Permit applications	22954	20694	19687	25879	24096	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725
Permits available	4290	4730	4810	5310	5520	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850
Licenses purchased (total) [a]	3948	4188	6054	5643	5901	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164
Quota area [a]	3948	4188	4213	4297	4628	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169
Quota surplus/military [a]																	235	209	2554	1356	1591	1561
No-quota area [a]			1841	1346	1273	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434
% Licenses bought [b]																						
Of permits available [b]	92.0	88.5	87.6	80.9	83.8	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3
Of permits issued [b]														84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9
Estimated no. hunters [c]	3700	3900	5600	5100	5500	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13700	13500	12800	12400	12400
Harvest	1340	1438	1577	1509	1930	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340[d]	3290[d]
Harvest sex ratio (%M) [e]	53	59	60	58	57	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58
Success rate (%) [f]																						
Total harvest/hunters	36	37	28	30	35	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26
Quota harvest/licenses			33	28	36	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25

[a] Quota area established in 1982. No-quota area 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. Total licenses = quota + quota surplus + no-quota + military (no permit needed).

[b] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3).

[c] 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%), and 2001(93.9%).

[d] Harvest estimated from tallied registration + lost registration data (ascertained from tooth envelopes received without matching registration data)..

[e] 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.

[f] Success rates in 2001–2004 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. This was complicated even more in 2005 and 2006 because the total harvest was estimated (footnote d), and hunters could take 1 bear in the quota area plus 2 bears in the no-quota area. From the registration tally and tooth envelopes received in 2006, 50 hunters took more than 1 bear (45 took 2 bears on NQ license, 2 hunters took 1 quota and 1 NQ bear, and 3 hunters took 2 bears on a quota license [illegally]): thus, there were 3290-50 = 3240 successful hunters.

Table 2. Number of bear hunting permits available per year, 2002–2006 (aligned with permit applications in Table 3 below; highlighted numbers show drop from previous year).

BMU	2006	2005	2004	2003	2002
12	550	550	700	700	700
13	800	900	900	1100	1100
22	150	150	150	250	250
24	1000	1200	1200	1500	1500
25	1900	1900	1900	2400	2400
26	1500	1500	1500	1500	1500
31	2100	2100	2100	2660	2660
41	450	450	500	500	500
44	1700	1700	2000	2500	3000
45	1200	1500	1500	2000	2000
51	3500	4000	4000	5000	5000
Total	14850	15950	16450	20110	20610

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2002–2006[a].

BMU	2006		2005		2004		2003		2002	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	1005		864		808		837		1061	
13	680	120 100%	714	186 100%	670	129 56%	668	167 39%	831	41 18%
22	92	58 100%	65	46 54%	73	47 61%	88	26 16%	124	5 4%
24	624	367 98%	749	270 60%	766	259 60%	756	193 26%	979	40 8%
25	1789	112 100%	1923		1793	111 100%	1716	317 46%	1985	41 11%
26	1915		1997		2110		2280		2873	
31	2290		2097	4 100%	2006	92 100%	1996	412 62%	2503	26 23%
41	683		653		601		688		810	
44	2838		2884		2934		2855		4043	
45	840	360 100%	927	346 60%	1092	332 81%	1069	461 50%	1535	56 14%
51	2969	531 100%	3276	726 100%	3613	386 100%	3467	978 64%	5141	
None	0		0		0		2		1	
Total	15725	1548 ~100%	16149	1578 78%	16466	1356 78%	16431	2554 50%	21886	209 12%

[a] Surplus licenses available beginning in 2001, but restricted to permit applicants in 2001 & 2002.

Undersubscribed | Nearly undersubscribed

Table 4. Minnesota bear harvest tally[a] for 2006 by Bear Management Unit (BMU) and sex compared to harvests during 2001-2005 and record high harvests.

	2006											
BMU	M	(%M)	F	U	Total	2005	2004	2003	2002	2001	5 year mean	Record high harvest (yr)
Quota												
12	48	(69)	22	0	70	165	165	174	104	263	174	263 (01)
13	98	(65)	53	0	151	205	197	185	116	241	189	258 (95)
22	6	(40)	9	0	15	8	10	3	7	6	7	41 (89)
24	102	(53)	92	0	194	144	212	163	101	273	179	288 (95)
25	196	(47)	225	0	421	404	546	510	328	584	474	584 (01)
26	189	(60)	124	1	314	285	320	303	171	397	295	513 (95)
31	320	(66)	162	0	482	445	484	436	301	697	473	697 (01)
41	27	(68)	13	0	40	104	83	100	51	201	108	201 (01)
44	120	(62)	72	0	192	273	283	444	183	553	347	643 (95)
45	60	(51)	57	1	118	107	118	143	36	178	116	178 (01)
51	411	(57)	308	2	721	505	544	667	300	895	582	895 (01)
Total	1577	(58)	1137	4	2718	2759[b]	2962	3128	1698	4288	2967	4288 (01)
No Quota[c]												
11	87	(72)	33	0	120	335	177	200	112	321	229	351 (05)
52	216	(54)	183	1	400[d]	223	252	270	105	327	235	382 (93)
Total	303	(58)	216	1	520	581[b]	429	470	217	648	469	678 (95)
State	1880	(58)	1353	5	3290[b]	3340[b]	3391	3598	1915	4936	3436	4956 (95)

[a] Harvest data were obtained from registration slips electronic registration, and tooth envelopes. The following table shows the number of tooth envelopes that had no corresponding registration slip or e-registration.

Year	Quota area	No-quota area
2001	56	7
2002	46	7
2003	84	13
2004	96	39
2005	179	31
2006	63	15

[b] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value for 2006 does not match column or row total because other data on table are uncorrected for estimated lost registration data.

[c] Some hunters with no-quota licenses hunted in the quota area. Some were drawn for the quota area but received NQ licenses. Others hunted in the wrong area purposefully or out of ignorance (*n* = 48 in 2006).

[d] Record high harvest in area 52 in 2006. Last column on this line shows previous record.

Table 5. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2001–2006.

BMU	Mean success 2001-2005	2006		2005[b]		2004		2003		2002		2001	
		% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]
Quota	24	25	—	25	—	26	—	25	—	14	—	28	(11)
12	35	19	—	41	—	33	—	35	—	22	—	44	(17)
13	29	24	—	32	—	33	—	31	—	19	—	31	(9)
22	8	14	—	10	—	11	—	4	—	8	—	7	(0)
24	23	25	—	20	—	27	—	25	—	15	—	28	(8)
25	32	30	—	30	—	38	—	34	—	23	—	34	(11)
26	29	30	—	34	—	31	—	29	—	17	—	32	(10)
31	28	33	—	31	—	33	—	25	—	17	—	34	(15)
41	27	13	—	31	—	23	—	29	—	14	—	40	(16)
44	21	16	—	24	—	20	—	26	—	9	—	23	(10)
45	11	14	—	13	—	12	—	13	—	4	—	13	(7)
51	18	28	—	18	—	19	—	21	—	9	—	24	(10)
No Quota	19	22[d]	(9)	23	(9)	18	(7)	21	(10)	10	(7)	23	(9)
Statewide	23	25	—	25	—	25	—	25	—	13	—	27	(11)

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal statewide in 2001, but only in the no-quota area in 2002–2006.

[d] Although BMU 52 had a record harvest (see Table 1), there is no way to split BMUs 11 and 52 to examine hunting success because the number of hunters in each area is unknown (a single NQ license covers both BMUs).

Table 6. Cumulative bear harvest (% of total harvest) by date, 1990–2006.

Year	Day of week for opener	Aug 22/23 – Aug 31 (9–10 days)	Sep 1 – Sep 7 (7 days)	Sep 8 – Sep 14 (7 days)	Sep 15 – Sep 30 (16 days)
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56	70	87[a]
1997	Mon		76	88	97
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	69	90[a]
2003	Mon		72	84	96
2004	Wed		68	82	95
2005	Thu		72	81	94
2006	Fri		69	83	96

[a] The large proportion of the harvest taken late in the season in 1996 and 2002 (e.g., >10% in October) was related to the high abundance of food in those years.

Table 7. Number of people participating in nuisance bear survey, 1985[a] – 2006.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1985	17	29	37	30	26	23	20
1986	37	52	52	51	47	46	32
1987	45	71	75	65	62	52	37
1988	68	74	77	75	73	68	69
1989	67	84	80	85	81	79	66
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [b]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24

[a] Monthly tallies of complaints were required of Conservation Officers and Wildlife Managers beginning in 1984.

[b] Electronic submission of monthly complaint tally beginning in 2001.

Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1985–2006, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of personnel participating in survey [a]	37	52	75	77	85	81	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46
Complaints examined on site [b]	1115	972	789	771	1117	1890	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57
Complaints handled by phone [c]	1744											959	2196	743	987	618	660	550	424	507	451	426
Total complaints received	2859											1296	2857	969	1176	723	782	625	505	582	512	483
• % Handled by phone	61%											74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%
Bears killed by:																						
• Private party or DNR	364	221	150	134	157	321	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11
• Hunter before season [d]																						
– from nuisance survey	15	21	9	44	27	69	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2
– from registration file	15	11	9	35	15	50	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6
• Hunter during/after season [e]	4	3	6	11	15	21	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0
• Permittee [f]							20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4
Bears translocated	116	123	152	109	257	358	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3
• % bears translocated [g]	10	13	19	14	23	19	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5
Bears killed by cars	119	95	75	46	69	74	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22 [h]	17 [h]

Table 8 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Adjusted for low and variable survey participation during 1981–86.

[c] Tallies of complaints handled by phone were made only during the indicated years.

[d] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data.

[e] Data only from nuisance survey because registration slips do not indicate whether bear was a nuisance.

[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.

[g] Percent of on-site investigations resulting in a bear being captured and translocated.

[h] Car kill data were reported on the monthly nuisance form for the first time in 2005 (value shown). In all previous years, car kill data were from confiscation records. Confiscation records in 2005 indicated 18 car kills.

Table 9. Bear food index values for five survey areas (see map below) in northern Minnesota's bear range, 1984 – 2006. Pink-shaded blocks indicate particularly low index values (<45); green blocks indicate particularly high index values (>70).

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

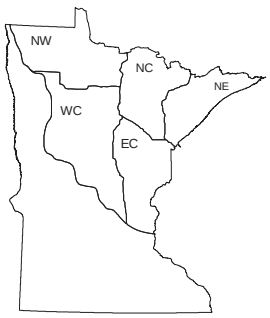


Table 10. Index values of bear food abundance[a] in 2006 compared to the previous 22-year mean (1984-2005) in 5 survey areas across Minnesota's bear range. Pink-shaded blocks indicate poor fruit abundance (abundance index ≥1 point lower than average); green blocks indicate high fruit abundance (≥1 point higher than average).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	22yr $\bar{x}$	20066 *n* = 10[b]	22yr $\bar{x}$	2006 *n* =15	22yr $\bar{x}$	2006 *n* = 16	22yr $\bar{x}$	2006 *n* = 13	22yr $\bar{x}$	2006 *n* = 12	22yr $\bar{x}$	2006 *n*=56[b]
SUMMER												
Sarsaparilla	4.2	3.3	5.9	5.6	5.4	4.9	4.7	3.3	5.7	4.6	5.1	4.7
Pincherry	3.2	4.0	4.4	4.9	4.1	3.1	4.0	4.0	3.7	3.1	3.8	3.8
Chokecherry	5.5	3.8	5.1	4.3	4.2	3.3	5.5	3.8	4.6	3.2	5.0	3.6
Juneberry	4.7	3.6	4.6	4.6	4.7	4.3	3.6	3.6	4.0	2.5	4.2	3.9
Elderberry	1.5	1.6	3.0	5.5	3.5	3.6	3.3	1.6	3.3	3.3	3.0	3.7
Blueberry	4.9	2.6	5.2	2.3	4.7	2.2	3.6	2.6	3.7	1.1	4.3	2.2
Raspberry	6.5	4.8	8.0	5.9	8.0	5.4	7.1	4.8	7.0	4.5	7.3	5.5
Blackberry	1.4	0.8	2.3	3.1	0.8	1.6	3.5	0.8	4.6	3.1	2.8	2.8
FALL												
Wild Plum	1.9	1.9	1.7	2.0	0.8	1.8	2.6	1.9	2.3	2.0	2.0	2.0
HB Cranberry	5.2	3.6	4.2	4.7	3.4	3.7	3.7	3.6	3.5	3.3	3.9	3.5
Dogwood	5.8	5.0	5.8	5.5	5.1	4.1	5.7	5.0	6.1	5.3	5.6	4.9
Oak	3.2	5.3	2.7	3.3	1.4	2.3	5.8	5.3	6.0	2.9	4.3	4.4
Mountain Ash	1.4	3.2	2.3	5.7	4.3	5.4	1.7	3.2	1.9	5.5	2.4	4.2
Hazel	6.0	7.5	7.5	7.5	7.2	7.7	8.2	7.5	7.8	7.7	7.4	7.7
TOTAL	55.4	51.0	62.7	64.9	57.6	53.4	63.0	51.0	64.2	52.1	61.1	56.9

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

[b] *n* = Number of surveys used to calculate 2006 mean index values.

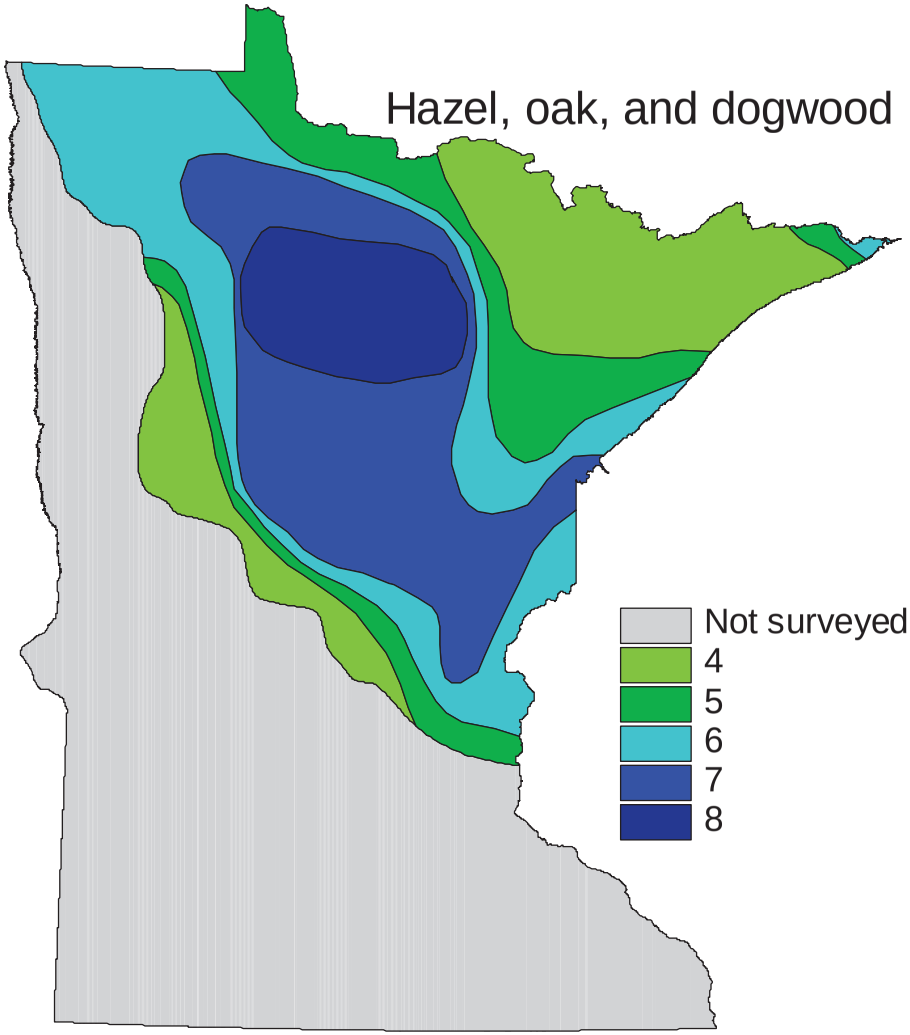
[C] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 11. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2006. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥7.5, tan) fall food productivity.

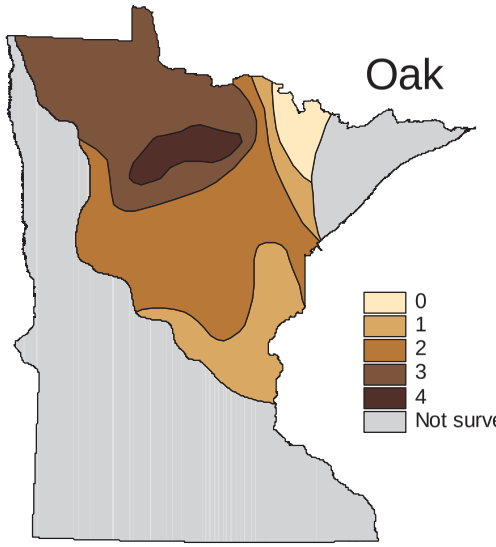
	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	4.2	4.7	5.3	4.4
1986	7.2	5.0	4.0	7.0	6.2	6.2
1987	8.0	7.8	7.3	7.6	8.0	7.7
1988	5.5	7.2	7.3	6.8	6.1	6.7
1989	6.0	5.3	4.1	5.7	6.4	5.8
1990	3.3	4.2	6.4	5.7	6.4	5.2
1991	6.2	6.2	5.4	7.2	7.7	6.7
1992	4.7	5.0	4.4	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

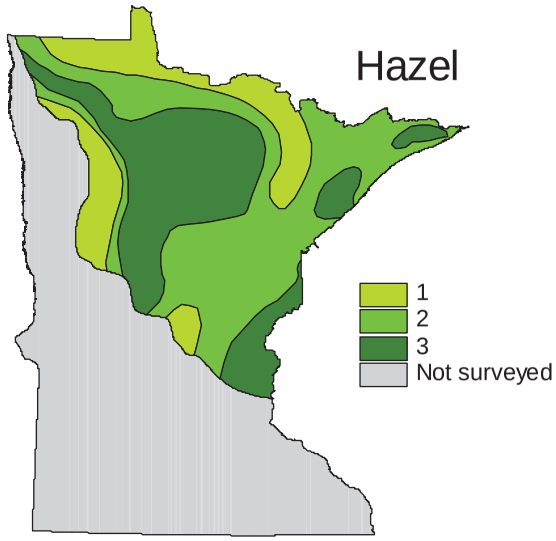
[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 1. Fall production of primary bear foods, 2006.



Values represent the sum of hazel, oak, and dogwood productivity ratings; a rating of "2" represents average fruit production for a species.





A value of "2" represents average nut production

Fig 2. Number of bears killed vs. number predicted, based on fall food abundance and hunter numbers. Prediction for 2006 based on regression from 1984–2005 ($R^2 = 0.88$).

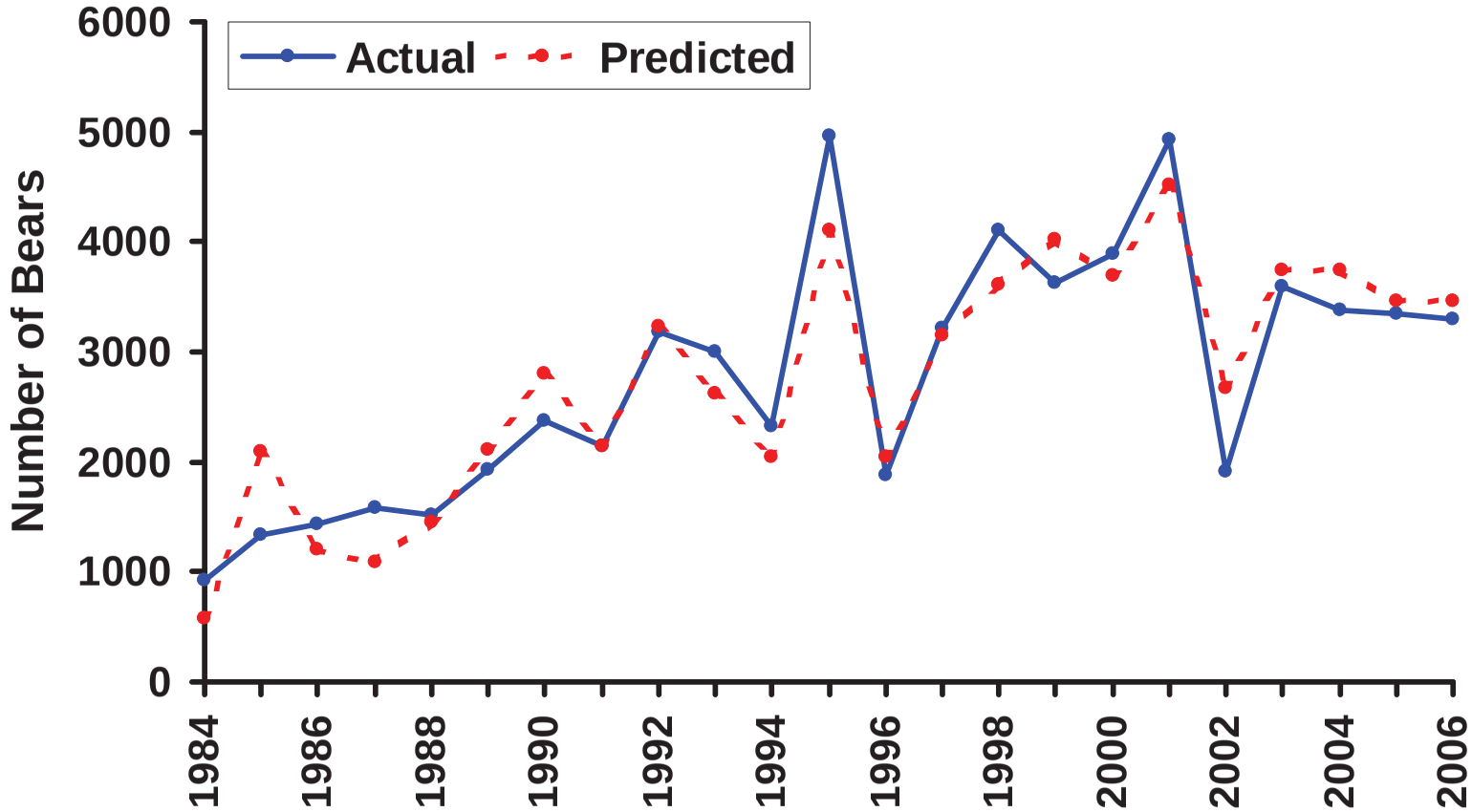


Fig 3. Sex ratios of harvested bears by BMU, 2000–2006

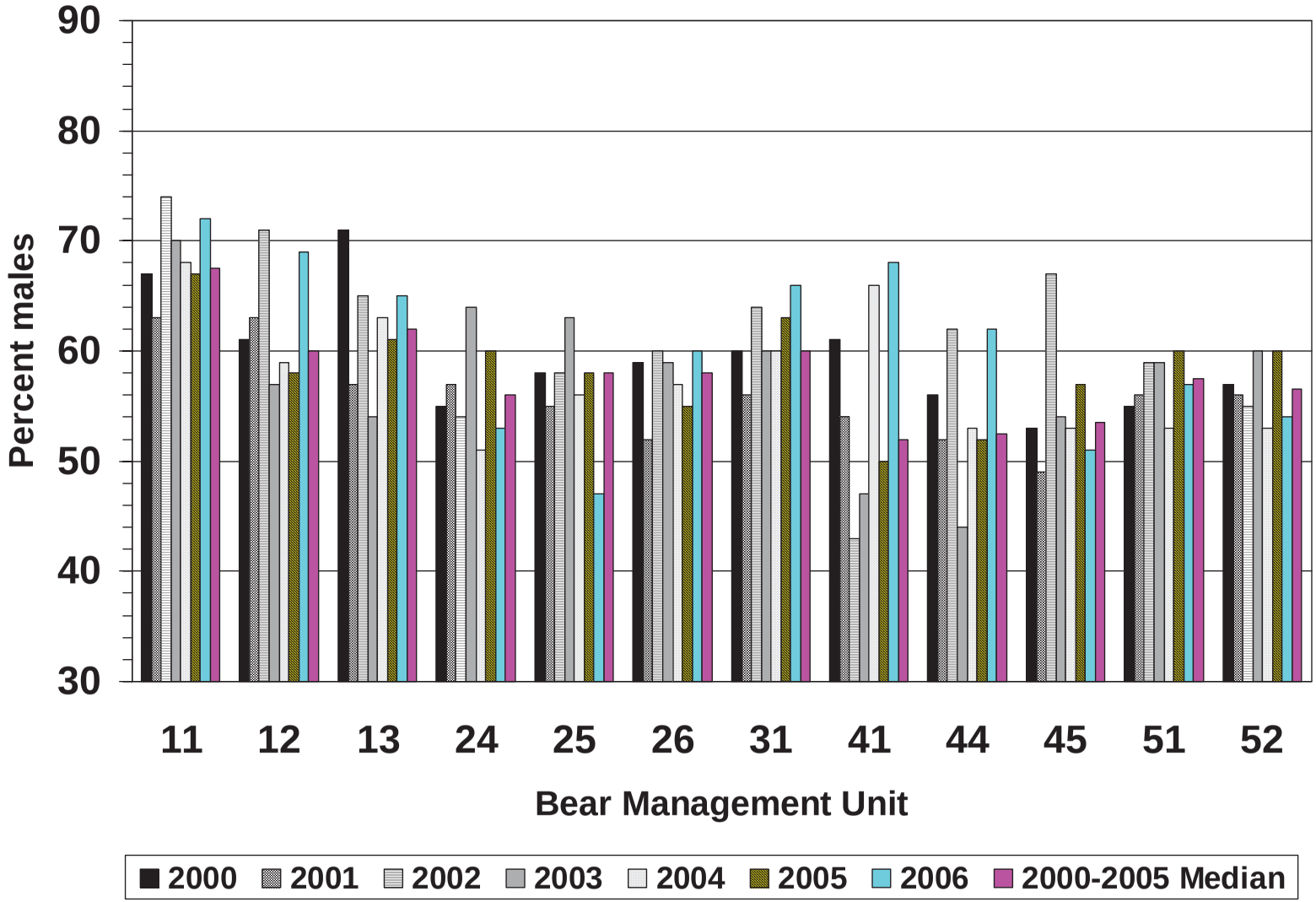
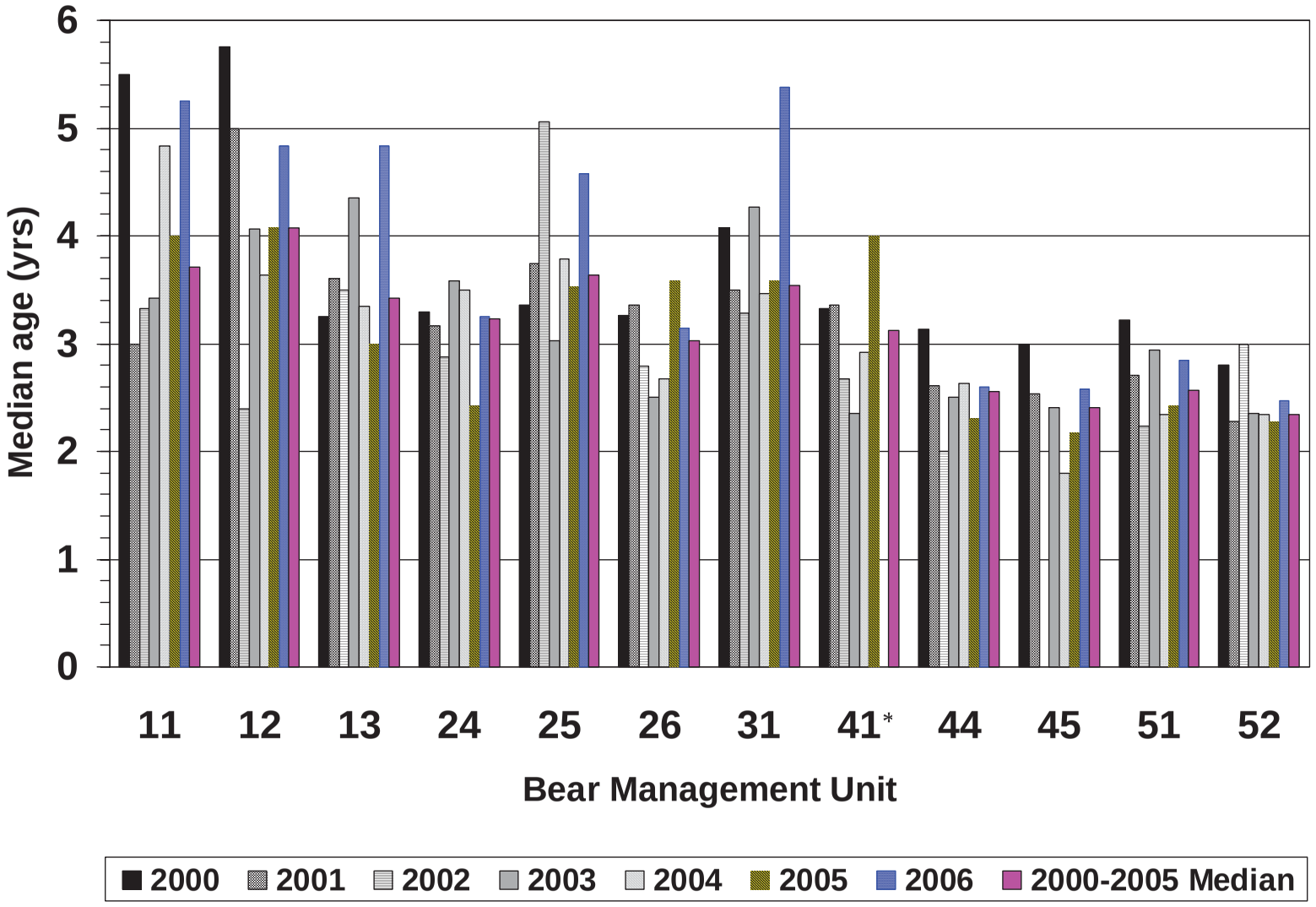


Fig 4. Median ages of harvested female bears by BMU, 2000–2006



* Sample size too small in 2006

Fig 5. Statewide harvest age structure: median ages by sex, 1982–2006

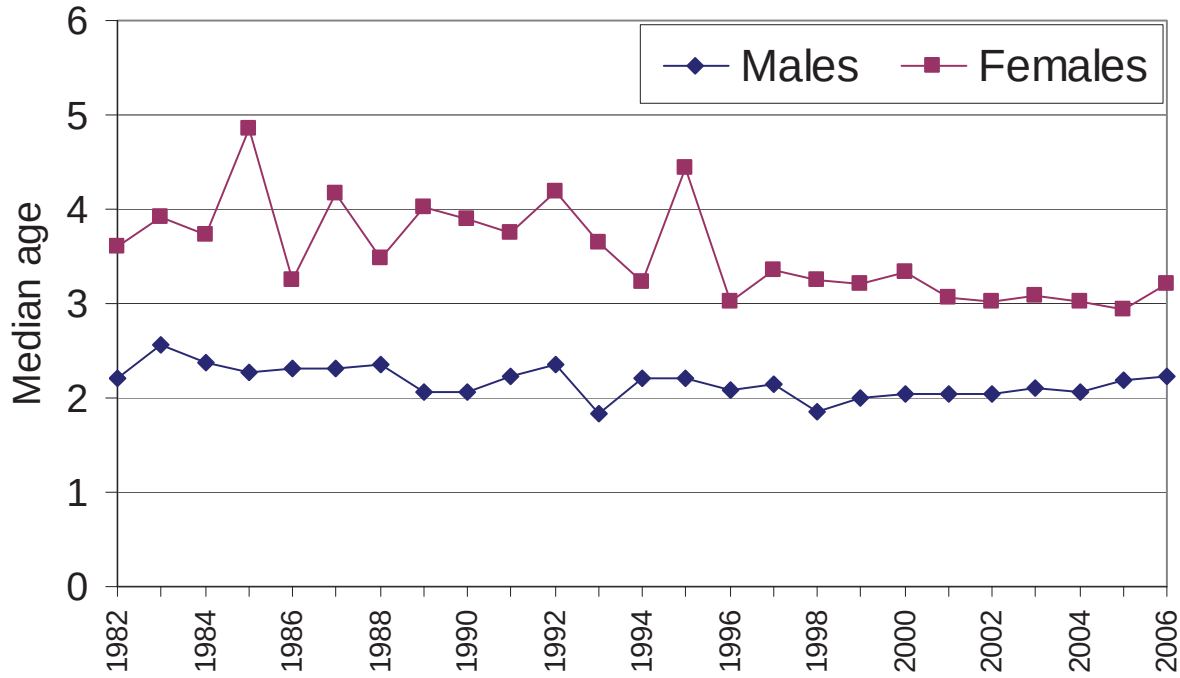
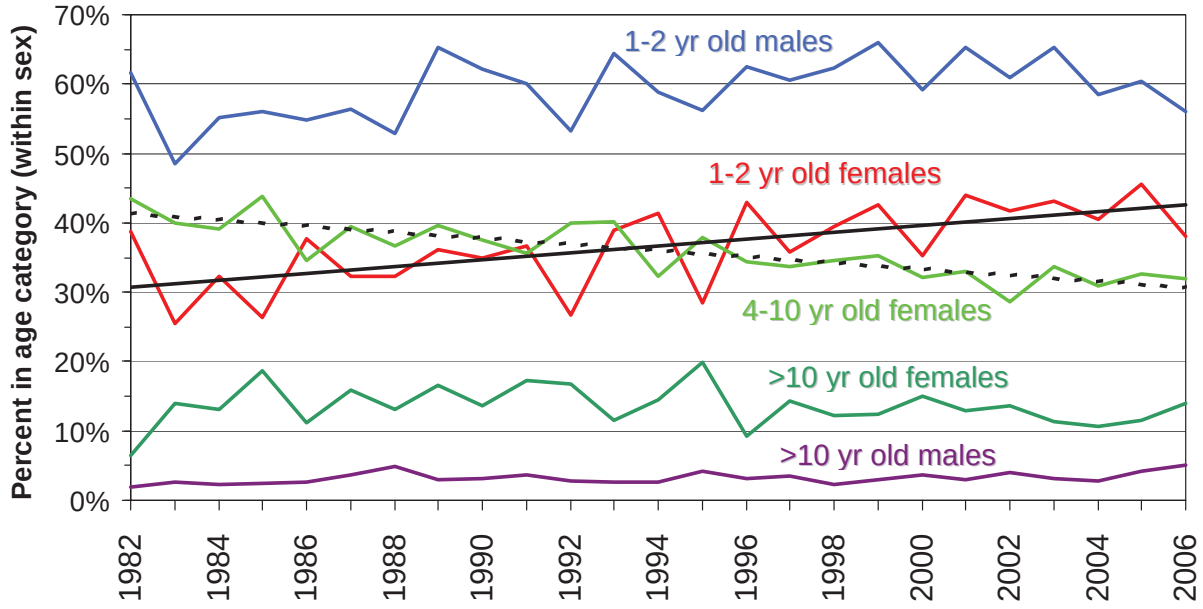


Fig 6. Statewide harvest age structure: proportion of each sex in age category sex, 1982–2006



STATUS OF MINNESOTA BLACK BEARS, 2007

Report to Bear Committee

26 February 2008

Dave Garshelis

with contributions from

Karen Noyce

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

TABLE OF CONTENTS

Key points: 2007 bear harvest, nuisance activity, foods & population status

Table 1	Permit applications have been declining since 1998, but increased slightly in 2007, compared to 2006. This may have been in response to the diminished number of permits available. No-quota license sales were the second-highest since the no-quota area was established in 1987. The estimated number of hunters in the field (11,200) was the lowest since 1995.
Fig. 1, Tables 2-3	Permits were reduced in 2007 in 9 of 11 BMUs in the Quota Zone, to reduce hunter crowding and also harvest pressure. Due to this reduction, only 3 of 11 BMUs were undersubscribed. Nearly all surplus licenses were purchased (except BMU 22, BWCAW).
Table 4	Total harvest (3172) for 2007 was close to the 5-year mean (~3100) , although was the lowest in the past 4 years. Harvest by BMU has fluctuated greatly from year-to-year in response to variable food conditions (and hence attraction of bears to bait), as well as varying numbers of hunters. In 2005, the northwestern no-quota area (BMU 11) had a record harvest; in 2007 this area had its second-highest harvest, suggesting an increasing population at this edge of the bear range. BMU 22 had a slightly higher-than-usual harvest, which was highly skewed to females (5M:10F). Of the remaining BMUs, 6 were above and 5 were below their 5-year mean harvest.
Table 5	Statewide hunting success (26-28%, depending on how it is measured; see also Table 1) has been consistent over the past 5 years. Within the quota zone, hunting success was equal to or higher than the previous 5-year mean in all BMUs (in part due to poor success in 2002, when natural food was very abundant). Compared to 2006, 4 BMUs were significantly lower and 4 were higher; in all of these BMUs, the number of hunters was lower than in 2006.
Table 6	As typical for a year with overall “average” fall food abundance, ~70% of the harvest occurred during the first week of the season. This does not vary with the day of the week for opening day (this year opened on a Saturday).
Tables 7-8	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was about normal. The number of bear complaints investigated on-site (63) was typical of the past 6 years, whereas the total number of complaints statewide was an all-time low (443; 86% were handled by phone). The number of nuisance bears killed by hunters before the season (25) was higher than during the past 5 years (mean = 8), and more typical of what it was during 1996-2001. Car kills were typical of the past 5 years (mean ~20).

Tables 9-11 Fig. 2	Overall, natural food abundance was above normal in the north-central, and east-central portions of the state. Most summer foods were abundant across the bear range. In fall, wild plum was unusually abundant, but this tree is not common. Among the key fall foods, dogwood was near normal, hazel above normal in much of the range, but oak was below normal in the east-central and especially northwest parts of the range. The paucity of this key food seems to be largely responsible for the high harvest in BMU 11.
Fig. 2	A combination of two key factors, fall food abundance and number of hunters, accounts for 88% of the yearly variation in the harvest. In each of the past 6 years, however, the regression based on these 2 variables predicted a slightly higher harvest than actually occurred.
Fig. 3	Sex ratios of harvested bears reflect both the sex ratio of the living population as well as the relative vulnerability of the sexes to hunters. The statewide harvest sex ratio has ranged from 56-61% male during the past 8 years (Table 1). Harvest sex ratios tend to be more male-dominated and also more variable in the northwestern part of the range (BMUs 11 &12). However, BMU 11 (northwest no-quota) had the lowest sex ratio (highest percent females) since 1995, the last extreme food failure. When foods are reasonably good, a higher proportion of males than females come to hunters' baits, whereas when foods are poor the harvest tends to be more reflective of the population at large.
Fig. 4	Ages of harvested bears also reflect both the age structure of the living population as well as the relative vulnerability of bears to hunters (including hunter selection for larger, older bears). Harvest ages of females (shown in this figure) are more variable than for males, reflecting effects of varying food conditions on vulnerability to hunting (older females increasing in vulnerability in poorer food years). The more heavily-hunted, southerly BMUs have a younger age structure. The northern BMUs show high year-to-year variation in harvest ages due to fluctuating food resources. The females killed in BMU 12 during 2006 were unusually old (median = 6 years; only 1 yearling of 32 females that were aged).
Fig. 5-6	Ages of harvested bears of both sexes steadily declined for about 2 decades (decline in median age and increase in proportion of 1-2 year olds in the harvest), reflecting increasingly higher harvest levels over this period. More consistent harvests during the past 5 years (Table 1) seem to have stabilized the age structure.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1986–2007.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Permit applications	20694	19687	25879	24096	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345
Permits available	4730	4810	5310	5520	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200
Licenses purchased (total)	4188	6054	5643	5901	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936
Quota area [a]	4188	4213	4297	4628	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905
Quota surplus/military [a]																235	209	2554	1356	1591	1561	526
No-quota area [a]		1841	1346	1273	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505
% Licenses bought [b]																						
Of permits available [b]	88.5	87.6	80.9	83.8	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4
Of permits issued [b]													84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0
Estimated no. hunters [c]	3900	5600	5100	5500	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13700	13500	12800	12400	12400	11200
Harvest	1438	1577	1509	1930	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340[d]	3290[d]	3172
Harvest sex ratio (%M) [e]	59	60	58	57	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57
Success rate (%) [f]																						
Total harvest/hunters	37	28	30	35	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28
Quota harvest/licenses		33	28	36	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28

[a] Quota area established in 1982. No-quota area 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. Total licenses = quota + quota surplus + no-quota + military (no permit needed).

[b] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3).

[c] 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%), and 2001(93.9%).

[d] Harvest estimated from tallied registration + lost registration data (ascertained from tooth envelopes received without matching registration data)..

[e] 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.

[f] Success rates in 2001–2007 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2007, 63 hunters took more than 1 bear (59 took 2 bears on NQ license, 1 hunter took 1 quota and 1 NQ bear, and 3 hunters took 2 bears on a quota license [illegally]): thus, there were 3172-63 = 3109 successful hunters/11200 total hunters = 28% success.

Fig. 1. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

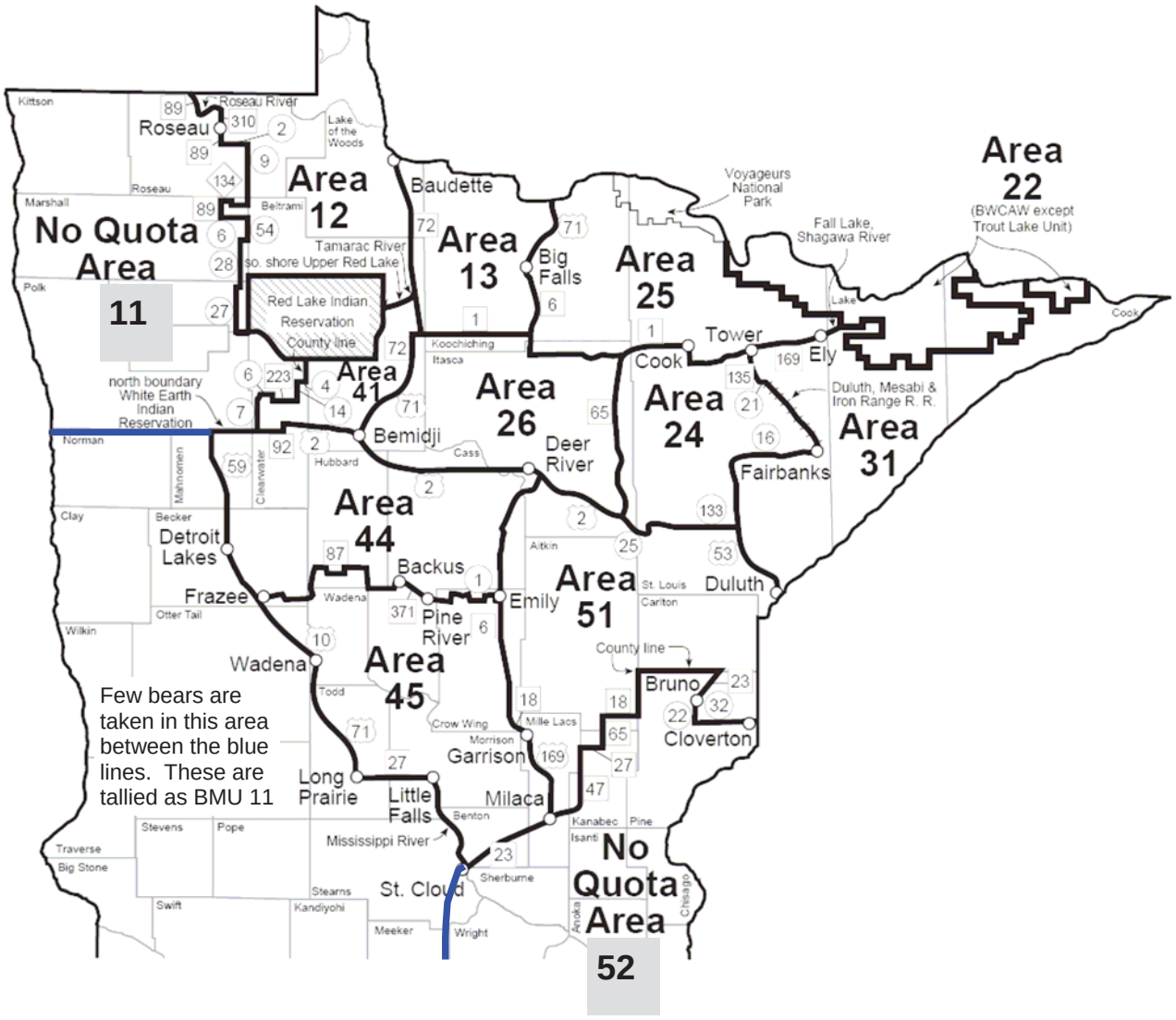


Table 2. Number of bear hunting permits available per year, 2003–2007 (aligned with permit applications in Table 3 below; highlighted numbers show drop from previous year).

BMU	2007	2006	2005	2004	2003
12	500	550	550	700	700
13	700	800	900	900	1100
22	150	150	150	150	250
24	900	1000	1200	1200	1500
25	1700	1900	1900	1900	2400
26	1250	1500	1500	1500	1500
31	1900	2100	2100	2100	2660
41	400	450	450	500	500
44	1500	1700	1700	2000	2500
45	1200	1200	1500	1500	2000
51	3000	3500	4000	4000	5000
Total	13200	14850	15950	16450	20110

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2003–2007[a].

BMU	2007		2006		2005		2004		2003	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	811		1005		864		808		837	
13	745		680	120 100%	714	186 100%	670	129 56%	668	167 39%
22	87	51 81%	92	58 100%	65	46 54%	73	47 61%	88	26 16%
24	742	159 100%	624	367 98%	749	270 60%	766	259 60%	756	193 26%
25	1799		1789	112 100%	1923		1793	111 100%	1716	317 46%
26	2028		1915		1997		2110		2280	
31	2383		2290		2097	4 100%	2006	92 100%	1996	412 62%
41	577		683		653		601		688	
44	2669		2838		2884		2934		2855	
45	936	266 100%	840	360 100%	927	346 60%	1092	332 81%	1069	461 50%
51	3568		2969	531 100%	3276	726 100%	3613	386 100%	3467	978 64%
Total	16345	476 98%	15725	1548 ~100%	16149	1578 78%	16466	1356 78%	16431	2554 50%

[a] Surplus licenses available beginning in 2001.

Undersubscribed

Table 4. Minnesota bear harvest tally[a] for 2007 by Bear Management Unit (BMU) and sex compared to harvests during 2002-2006 and record high harvests.

	2007										
BMU	M	(%M)	F	Total	2006	2005	2004	2003	2002	5 year mean	Record high harvest (yr)
Quota											
12	71	(57)	53	124	70	165	165	174	104	136	263 (01)
13	93	(57)	70	163	151	205	197	185	116	171	258 (95)
22	5	(33)	10[b]	15	15	8	10	3	7	9	41 (89)
24	75	(56)	59	134	194	144	212	163	101	163	288 (95)
25	201	(54)	168	369	421	404	546	510	328	442	584 (01)
26	167	(53)	148	315	314	285	320	303	171	279	513 (95)
31	229	(58)	169	398	482	445	484	436	301	430	697 (01)
41	55	(53)	49	104	40	104	83	100	51	76	201 (01)
44	191	(57)	142	333	192	273	283	444	183	275	643 (95)
45	59	(52)	54	113	118	107	118	143	36	104	178 (01)
51	314	(56)	243	557	721	505	544	667	300	547	895 (01)
Total	1460	(56)	1165	2625	2718	2759[c]	2962	3128	1698	2653	4288 (01)
No Quota[d]											
11	195	(60)	133	328[e]	120	335	177	200	112	189	351 (05)
52	139	(63)	80	219	400	223	252	270	105	250	400 (06)
Total	334	(61)	213	547	520	581[c]	429	470	217	443	678 (95)
State	1794	(57)	1378	3172	3290[c]	3340[c]	3391	3598	1915	3107	4956 (95)

[a] Harvest data were obtained from registration slips electronic registration, and tooth envelopes. All data for 2007 was e-registration. The following table shows the number of tooth envelopes that had no corresponding registration slip or e-registration (these were added to the harvest tally).

Year	Quota area	No-quota area
2002	46	7
2003	84	13
2004	96	39
2005	179	31
2006	63	15
2007	27	9

[b] Second consecutive year with an unusually high harvest of females in this BMU (BWCAW).

[c] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Values for 2006 do not match column total because other data on table are uncorrected for estimated lost registration data.

[d] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they hunted (*n*= 28 in 2006, 27 in 2007). Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear (*n*= 20 in 2006, 85 in 2007). However, some of these blocks may have been read wrong from the map, so all these were recorded in the BMU where they were assigned, not the BMU of the indicated harvest block.

[e] Second highest harvest for this area. Third highest was 321 bears in 2001.

Table 5. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2002–2007.

BMU	Mean success 2002-2006	2007		2006		2005[b]		2004		2003		2002	
		% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]	% Success	% Taking 2 bears[c]
Quota	23	28		25		25		26		25		14	
12	30	36		19		41		33		35		22	
13	28	31		24		32		33		31		19	
22	9	14		14		10		11		4		8	
24	22	20		25		20		27		25		15	
25	31	31		30		30		38		34		23	
26	28	36		30		34		31		29		17	
31	28	28		33		31		33		25		17	
41	22	35		13		31		23		29		14	
44	19	30		16		24		20		26		9	
45	11	14		14		13		12		13		4	
51	19	27		28		18		19		21		9	
No Quota	19	19	(11)	22	(9)	23	(9)	18	(7)	21	(10)	10	(7)
Statewide	23	26		25		25		25		25		13	

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area in 2002–2007.

Table 6. Cumulative bear harvest (% of total harvest) by date, 1990–2007.

Year	Day of week for opener	Aug 22/23 – Aug 31 (9–10 days)	Sep 1 – Sep 7 (7 days)	Sep 8 – Sep 14 (7 days)	Sep 15 – Sep 30 (16 days)
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56	70	87[a]
1997	Mon		76	88	97
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	69	90[a]
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

[a] The large proportion of the harvest taken late in the season in 1996 and 2002 (e.g., >10% in October) was related to the high abundance of food in those years.

Table 7. Number of people participating in nuisance bear survey, 1985 – 2007.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1985	17	29	37	30	26	23	20
1986	37	52	52	51	47	46	32
1987	45	71	75	65	62	52	37
1988	68	74	77	75	73	68	69
1989	67	84	80	85	81	79	66
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1985–2007, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of personnel participating in survey [a]	52	75	77	85	81	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46	46
Complaints examined on site [b]	972	789	771	1117	1890	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63
Complaints handled by phone [c]											959	2196	743	987	618	660	550	424	507	451	426	380
Total complaints received											1296	2857	969	1176	723	782	625	505	582	512	483	443
• % Handled by phone											74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%
Bears killed by:																						
• Private party or DNR	221	150	134	157	321	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21
• Hunter before season [d]																						
– from nuisance survey	21	9	44	27	69	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18
– from registration file	11	9	35	15	50	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25
• Hunter during/after season [e]	3	6	11	15	21	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0
• Permittee [f]						20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5
Bears translocated	123	152	109	257	358	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1
• % bears translocated [g]	13	19	14	23	19	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2
Bears killed by cars	95	75	46	69	74	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22 [h]	18 [h]	20 [h]

Table 8 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Adjusted for low and variable survey participation during 1981–86.

[c] Tallies of complaints handled by phone were made only during the indicated years.

[d] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data.

[e] Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

[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.

[g] Percent of on-site investigations resulting in a bear being captured and translocated.

[h] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2007 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

Table 9. Bear food index values for five survey areas (see map below) in northern Minnesota's bear range, 1984 – 2007. Pink-shaded blocks indicate particularly low index values (<45); green blocks indicate particularly high index values (≥70).

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

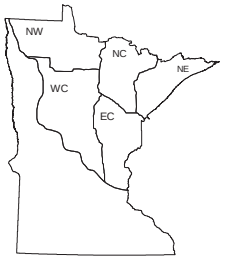


Table 10. Index values of bear food abundance[a] in 2007 compared to the previous 23-year mean (1984-2006) in 5 survey areas across Minnesota's bear range. Pink-shaded blocks indicate poor fruit abundance (abundance index ≥1 point lower than average); green blocks indicate high fruit abundance (≥1 point higher than average).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	23yr $\bar{x}$	2007 *n* = 14[b]	23yr $\bar{x}$	2007 *n* =16	23yr $\bar{x}$	2007 *n* = 13	23yr $\bar{x}$	2007 *n* = 10	23yr $\bar{x}$	2007 *n* = 9	23yr $\bar{x}$	2007 *n*=44[b]
SUMMER												
Sarsaparilla	4.2	5.4	5.9	6.5	5.4	5.1	4.6	3.6	5.7	5.6	5.0	5.0
Pincherry	3.2	4.0	4.4	6.3	4.0	5.3	4.1	3.4	3.7	4.7	3.8	5.0
Chokecherry	5.4	7.1	5.1	6.0	4.2	4.9	5.4	6.3	4.6	4.9	5.0	6.3
Juneberry	4.7	9.9	4.6	8.3	4.7	6.9	3.6	7.4	4.0	5.9	4.2	7.5
Elderberry	1.5	1.1	3.1	4.8	3.5	4.1	3.2	2.6	3.3	4.3	3.0	3.1
Blueberry	4.8	5.8	5.1	7.4	4.6	7.6	3.5	4.0	3.6	4.7	4.2	5.2
Raspberry	6.4	8.4	7.9	9.9	7.9	8.8	7.0	6.6	6.9	9.3	7.2	7.8
Blackberry	1.4	1.4	2.3	2.3	0.9	0.6	3.3	5.2	4.5	4.0	2.8	2.7
FALL												
Wild Plum	1.9	4.0	1.7	3.4	0.8	1.1	2.6	3.4	2.3	2.5	2.0	3.1
HB Cranberry	5.2	3.7	4.2	5.2	3.4	4.7	3.7	3.4	3.5	3.9	3.9	4.1
Dogwood	5.8	5.7	5.8	5.2	5.0	5.0	5.7	6.6	6.1	5.4	5.6	5.3
Oak	3.3	2.0	2.8	2.5	1.5	1.4	5.8	5.3	5.8	4.4	4.3	3.4
Mountain Ash	1.5	1.0	2.4	2.5	4.4	4.4	1.8	1.7	2.1	1.6	2.5	2.5
Hazel	6.1	8.9	7.5	8.7	7.2	7.4	8.2	8.1	7.8	8.8	7.4	8.4
TOTAL	55.4	68.4	62.8	79.0	57.5	67.3	62.5	67.6	63.9	70.0	60.9	69.4

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

[b] *n* = Number of surveys used to calculate 2007 area means.

[C] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 11. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2007. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥7.5, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 2. Fall production of primary bear foods, 2007.

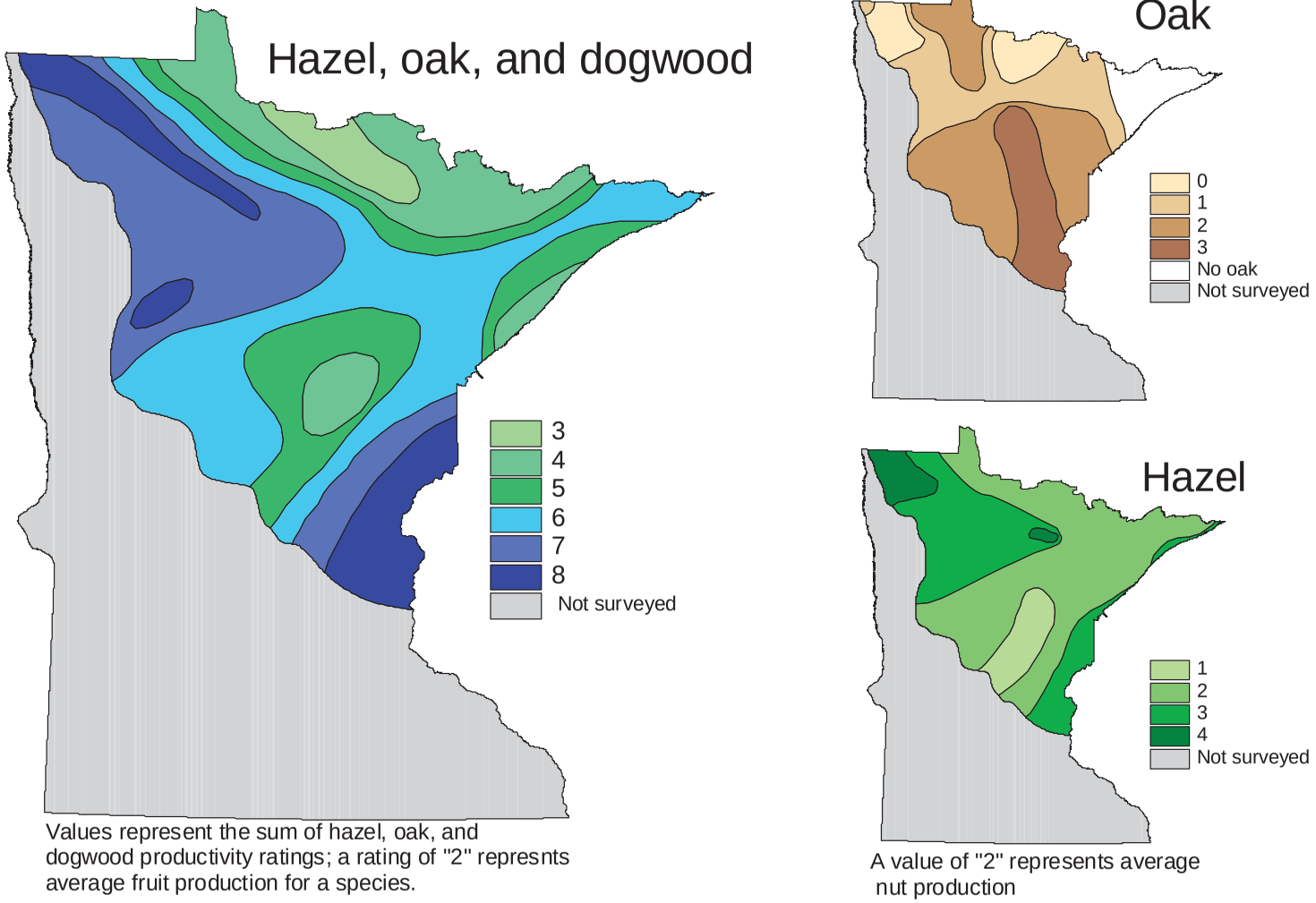


Fig 3. Number of bears killed vs. number predicted, based on fall food abundance and hunter numbers. Prediction for 2007 based on regression from 1984–2006 ($R^2 = 0.88$).

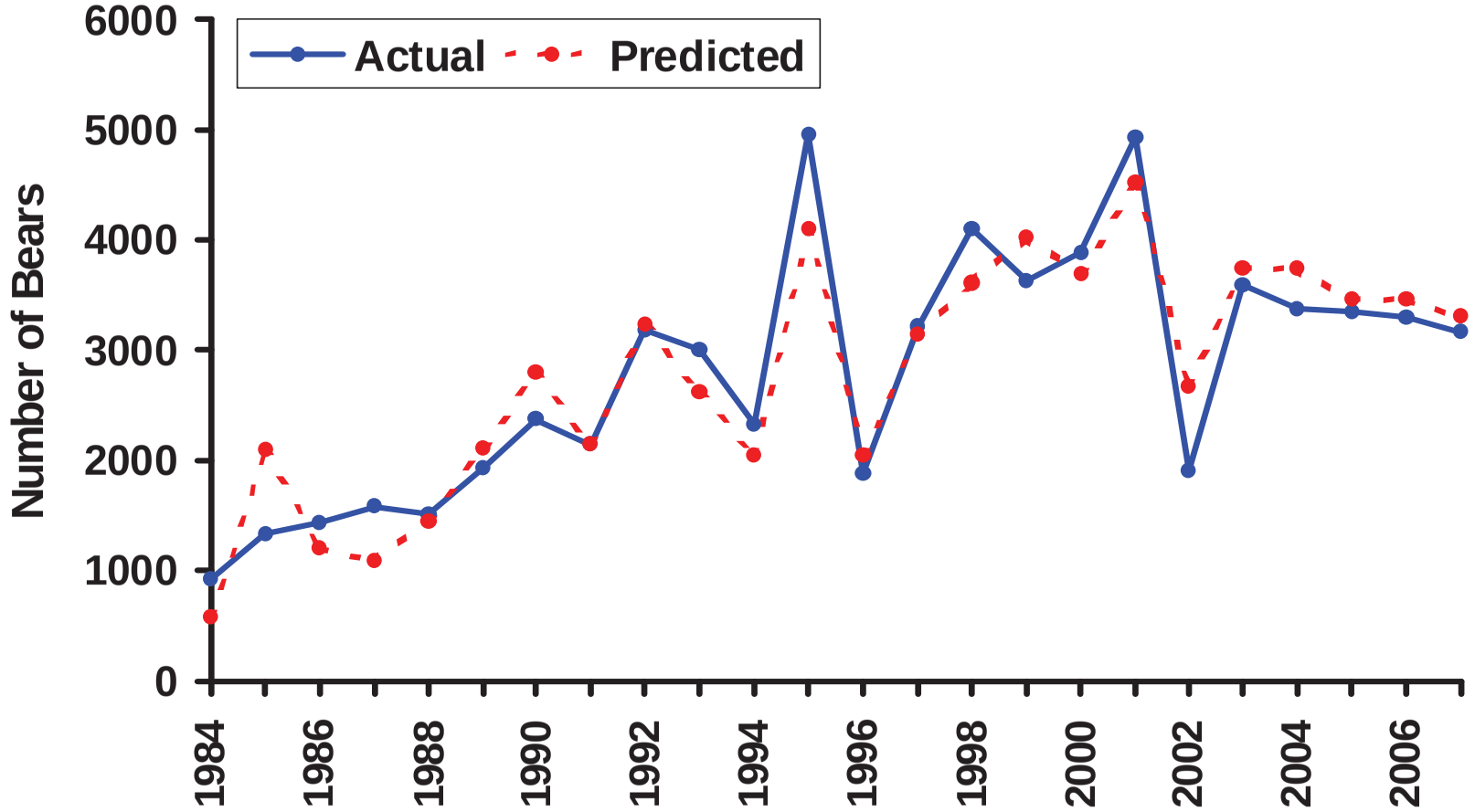


Fig 4. Sex ratios of harvested bears by BMU, 2001–2007

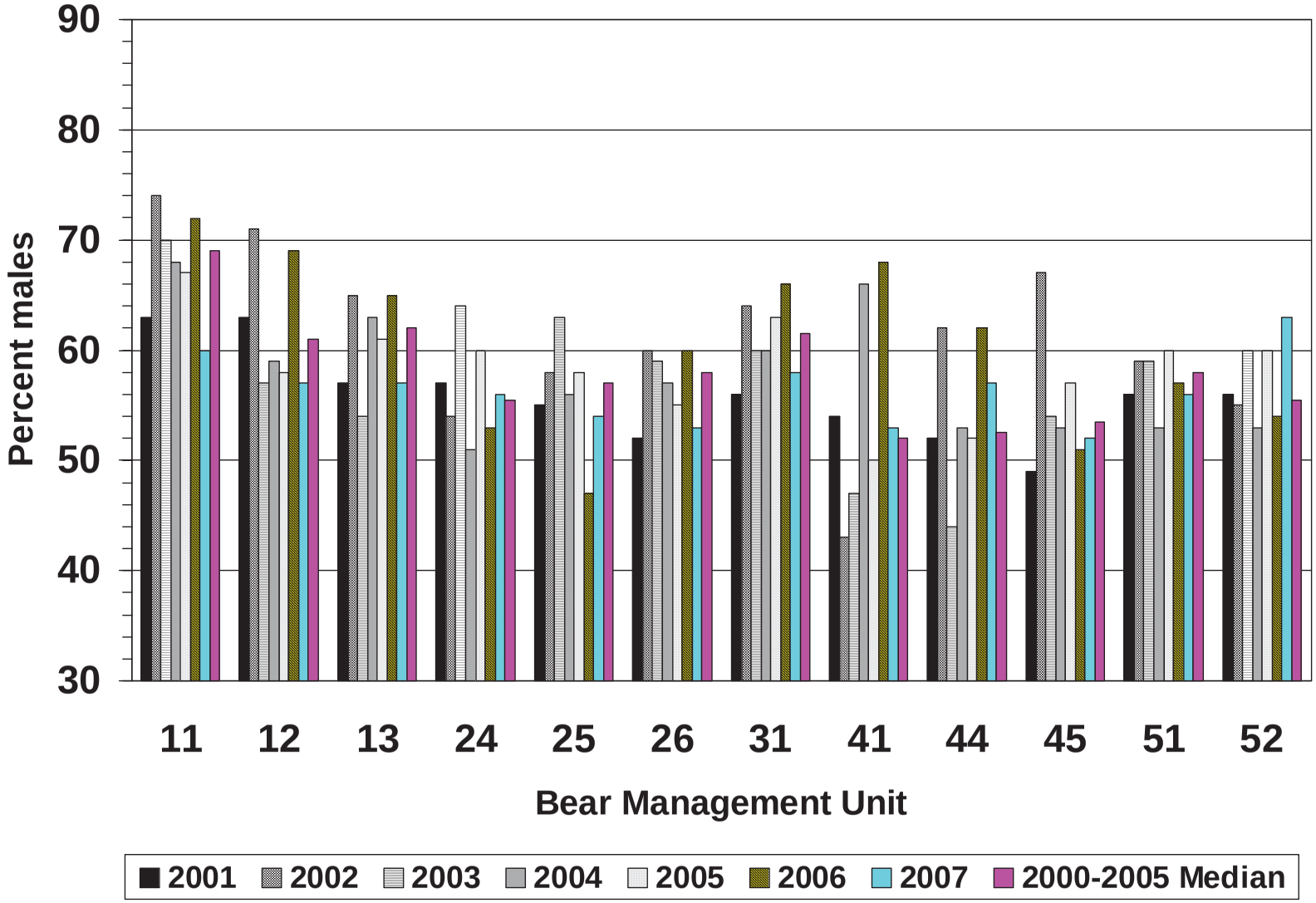
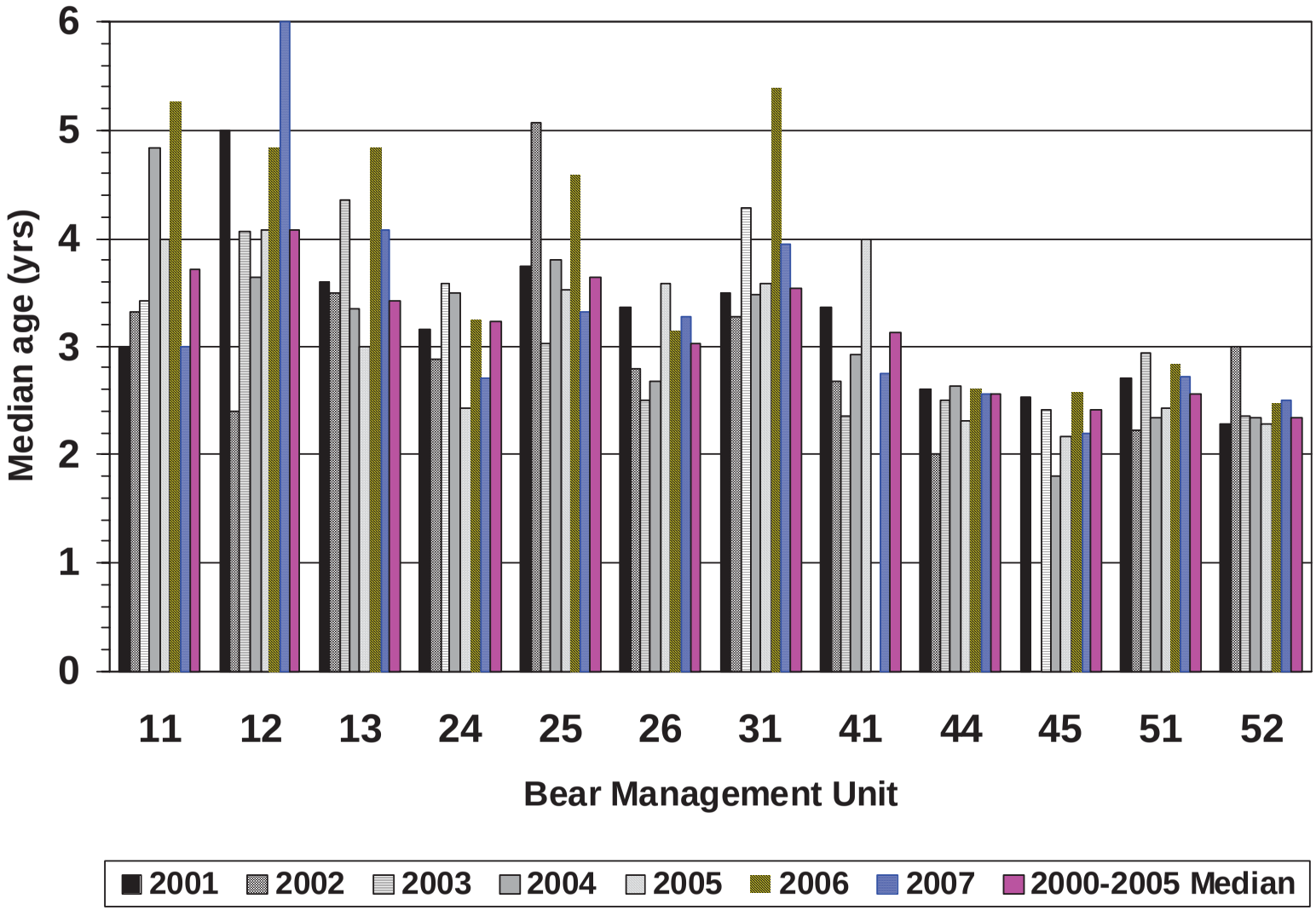


Fig 5. Median ages of harvested female bears by BMU, 2001–2007



Sample size too small in 2002 BMU 45 and 2006 BMU 41

Fig 6. Statewide harvest age structure: median ages by sex, 1982–2007

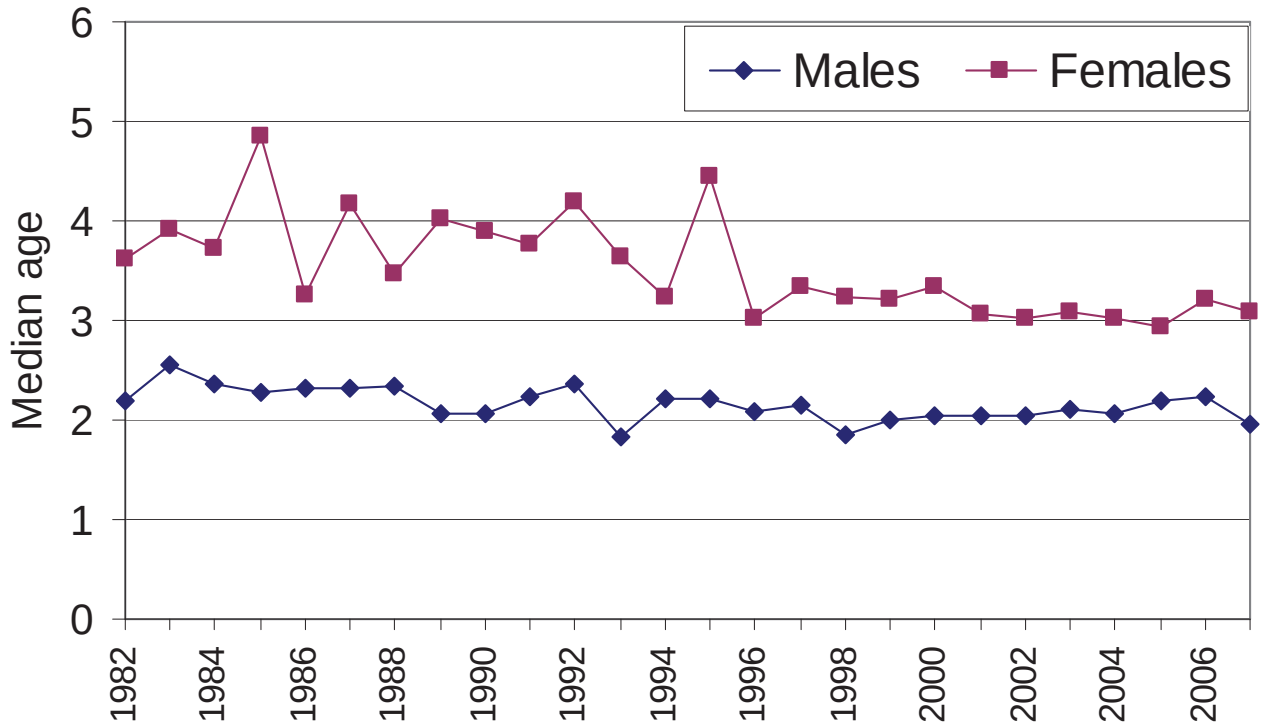
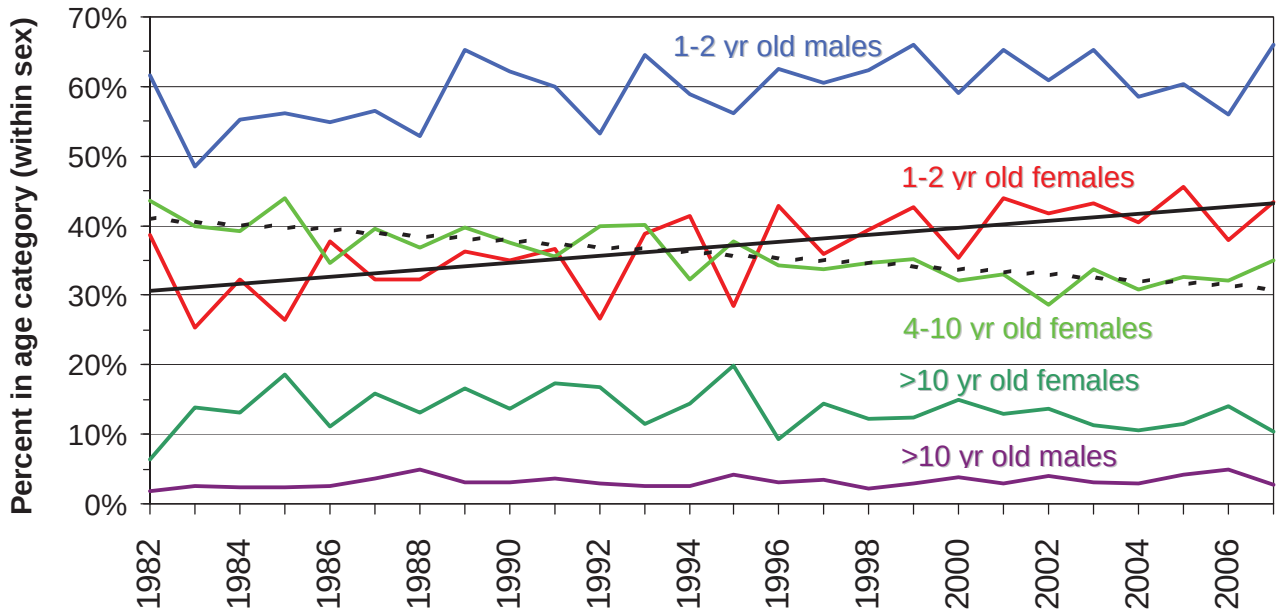


Fig 7. Statewide harvest age structure: proportion of each sex in age category, 1982–2007



STATUS OF MINNESOTA BLACK BEARS, 2008

Final Report to Bear Committee

25 February 2009

Dave Garshelis

& Karen Noyce

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

TABLE OF CONTENTS

Key points: 2008 bear harvest, nuisance activity, foods & population status

Table 1	Permit applications increased to the highest level in 6 years. This may have been in response to the diminished number of permits available, which was the lowest since 1998. The estimated number of hunters in the field (9,800) was the lowest since 1995. Harvest (2,135) was down by more than a thousand bears from the mean of the past 5 years (3,350). Harvest sex ratio was very skewed toward males (62%); the last time the harvest sex ratio was that skewed was 1996.
Fig. 1, Tables 2-3	Permits were reduced in 2008 in 9 of 11 BMUs in the Quota Zone, to reduce harvest pressure. Due to this reduction, only 2 of 11 BMUs were undersubscribed, and most surplus licenses were purchased (except BMU 22, BWCAW).
Table 4	Harvest in every BMU was below the previous 5-year mean. Harvest was particularly low (lowest since 1996) in BMUs 24, 25, 26 and 31 (northeast and north-central areas). The sex ratio was exceptionally skewed toward males in BMUs 12, 24, 31 and 51 (compared to historical records in these areas).
Table 5	Statewide hunting success was the lowest since 2002. In all BMUs except one (BMU 41), hunting success was below the previous 5-year mean.
Table 6	Harvest was low in the beginning of the season, with less than 60% of the total taken in the first week. This is often a reflection of abundant natural foods, making bears less apt to come to bait.
Tables 7-8	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was rather low, probably a reflection of the generally low nuisance activity . The number of on-site investigation (59) was typical of the previous 3 years, as was the number of complaints dealt with by phone (452; 88% were handled by phone). Across the state, 23 nuisance bears were reported killed by private parties, DNR, and permittees, and 3 were captured and moved.
Tables 9-11 & Fig. 2	Overall, natural food abundance was above normal in the north-central, and east-central portions of the state. Most summer foods were abundant across the bear range. Oak, dogwood and hazel, the three key fall foods, were all above normal in certain areas, and many summer fruits were still available in the early fall, when the hunting season began. However, overall fall food ratings were considerably higher than normal only for the east-central portion of the range (particularly high in no-quota area, BMU 52).

Fig. 3	A combination of two key factors, fall food abundance and number of hunters, accounts for 82% of the yearly variation in the female harvest. In each of the past 7 years, however, the regression based on these 2 variables predicted a higher harvest than actually occurred.
Fig. 4	Sex ratios of harvested bears reflect both the sex ratio of the living population as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions). The statewide harvest sex ratio was exceptionally male-dominated, and several BMUs (12, 24, 31, 51) had unusually high proportions of males in the harvest.
Fig. 5-6	Ages of harvested bears of both sexes steadily declined for about 2 decades (decline in median age and increase in proportion of 1-2 year olds in the harvest), reflecting increasingly higher harvest levels over this period. The proportion of old bears (>10 years) in the harvest has remained relatively constant over this period, suggesting that some animals (due to their behavior pr location) can avoid being hunted for a number of years.
Tables 12-14	Tetracycline biomarking baits set in the summer of 2008 were used to mark bears for a mark-recapture estimate. Baits were set throughout the bear range, and housed in wooden boxes. The boxes prevented visits by other animals, but also deterred visits by bears, due to reduced scent emanation: 489 of 3540 baits were eaten by bears, yielding ~480 marked bears (accounting for bears that took 2 baits). Ribs and teeth were collected from 71% of harvested bears and inspected for tetracycline marks; 57 (3.8%) of these were marked. The proportion of samples that were marked was very similar to that in 2002, the last time marking was done, but the number marked was much lower in 2008, so the resulting population estimate (=no. marked/proportion marked) was also much (~ 5,000 bears) lower. However, a final population estimate will not be available until a second sample of ribs and teeth can be obtained, because the first year's collection always yields an underestimate.
Fig. 7	BMUs in the northwest (11, 12, 13) showed little change, or a slight increase (BMU 11) in numbers of bears from 1997 to 2008. North-central BMUs (24, 25, 26) showed large swings in estimated numbers, apparently due to movements of marked bears (generally southward in fall) through this area – as a group, though, bear numbers in this area have declined. Significant declines were also observed in BMUs 44, 45, 51 and 52.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1987–2008.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Permit applications	19687	25879	24096	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]
Permits available	4810	5310	5520	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850
Licenses purchased (total)	6054	5643	5901	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404
Quota area [b]	4213	4297	4628	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842
Quota surplus/military [b]															235	209	2554	1356	1591	1561	526	233
No-quota area [b]	1841	1346	1273	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329
% Licenses bought [c]																						
Of permits available [c]	87.6	80.9	83.8	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7
Of permits issued [c]												84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2
Estimated no. hunters [d]	5600	5100	5500	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13700	13500	12800	12400	12400	11200	9800
Harvest	1577	1509	1930	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135
Harvest sex ratio (%M) [e]	60	58	57	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62 f
Success rate (%) [g]																						
Total harvest/hunters	28	30	35	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21
Quota harvest/licenses	33	28	36	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21

[a] Includes 528 applicants for area 99, a designation to increase preference but not to obtain a license.

[b] Quota area established in 1982. No-quota area 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. Total licenses = quota + quota surplus + no-quota + military (no permit needed).

[c] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3). 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.

[d] 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%), and 2001(93.9%).

[e] 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.

[f] Record high percent males in harvest (equal only to 1992)

[g] Success rates in 2001–2008 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2008, 36 hunters took more than 1 bear (34 took 2 bears on NQ license, 1 hunter took 1 quota and 1 NQ bear, and 1 hunter took 1 quota and 2 NQ bears): thus, the 2135 bears were taken by 2098 different hunters, so success = 2098/9800 = 21%.

Fig. 1. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

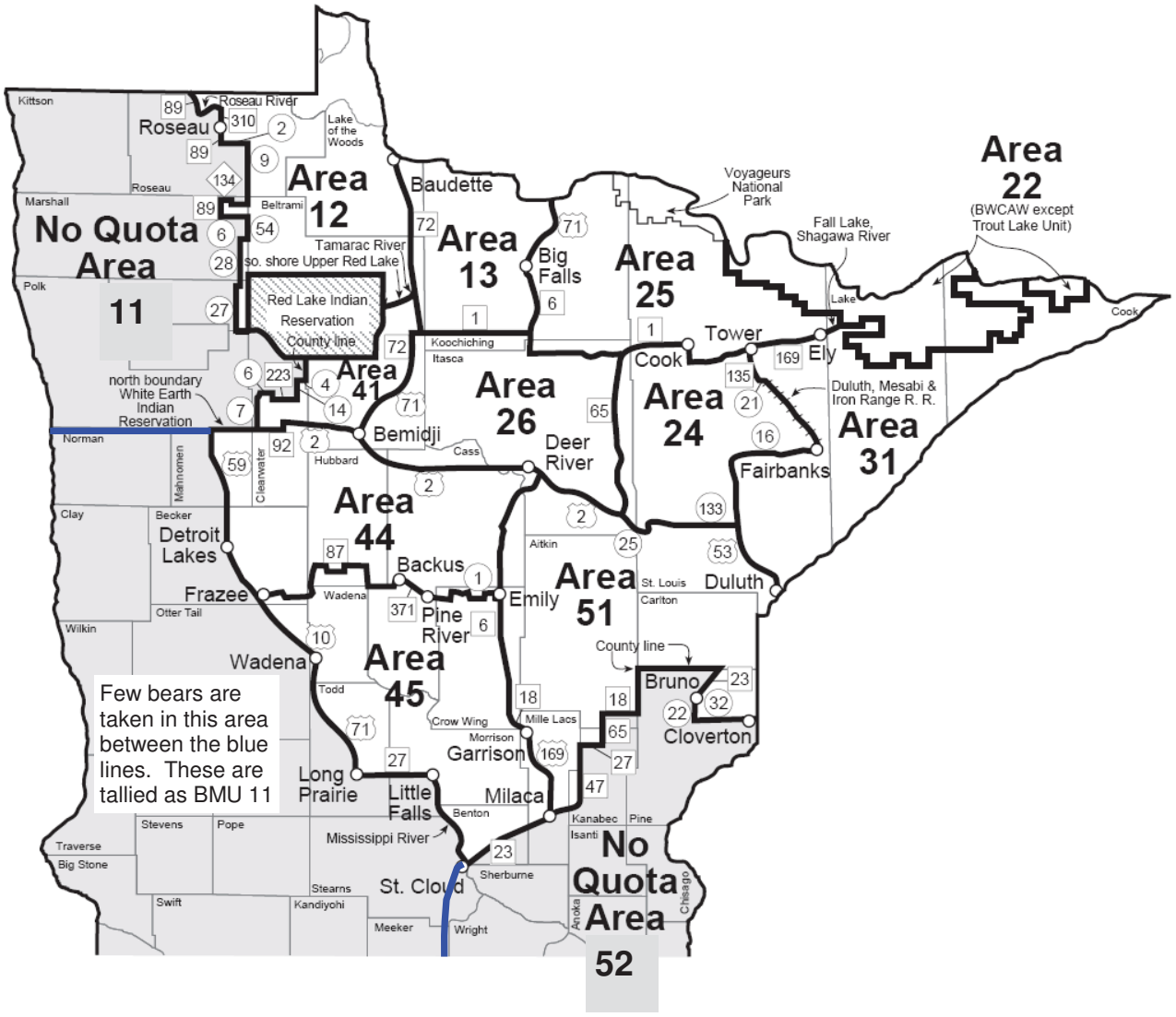


Table 2. Number of bear hunting permits available per year, 2004–2008 (aligned with permit applications in Table 3 below; highlighted numbers show drop from previous year).

BMU	2008	2007	2006	2005	2004
12	450	500	550	550	700
13	650	700	800	900	900
22	150	150	150	150	150
24	750	900	1000	1200	1200
25	1550	1700	1900	1900	1900
26	1150	1250	1500	1500	1500
31	1700	1900	2100	2100	2100
41	400	400	450	450	500
44	1350	1500	1700	1700	2000
45	1000	1200	1200	1500	1500
51	2700	3000	3500	4000	4000
Total	11850	13200	14850	15950	16450

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2004–2008[a].

BMU	2008		2007		2006		2005		2004	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	857		811		1005		864		808	
13	709		745		680	120 100%	714	186 100%	670	129 56%
22	85	50 77%	87	51 81%	92	58 100%	65	46 54%	73	47 61%
24	825		742	159 100%	624	367 98%	749	270 60%	766	259 60%
25	1793	4[c]	1799		1789	112 100%	1923		1793	111 100%
26	1999	2[c]	2028		1915		1997		2110	
31	2388	3[c]	2383		2290		2097	4 100%	2006	92 100%
41	656		577		683		653		601	
44	2821		2669		2838		2884		2934	
45	873	128 100%	936	266 100%	840	360 100%	927	346 60%	1092	332 81%
51	3828		3568		2969	531 100%	3276	726 100%	3613	386 100%
Total	16834[b]	178 92%	16345	476 98%	15725	1548 ~100%	16149	1578 78%	16466	1356 78%

[a] Surplus licenses available beginning in 2001.
[b] Beginning in 2008, applicants could apply for area 99 in order to receive preference, but not buy a license; these are not included in this total (528 chose this option in 2008).
[C] Courtesy licenses issued by Commissioner, not actual surplus.

Undersubscribed

Table 4. Minnesota bear harvest tally[a] for 2008 by Bear Management Unit (BMU) and sex compared to harvests during 2003-2007 and record high harvests.

	2008											
BMU	M	(%M)	F	U	**Total**	**2007**	**2006**	**2005**	**2004**	**2003**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	74	(74)[b]	26	1	101	124	70	165	165	174	140	263 (01)
13	80	(62)	49	0	129	163	151	205	197	185	180	258 (95)
22	5	(71)	2	0	7	15	15	8	10	3	10	41 (89)
24	73	(73)[b]	27	0	100[c]	134	194	144	212	163	169	288 (95)
25	165	(55)	133	0	298[c]	369	421	404	546	510	450	584 (01)
26	71	(52)	66	0	137[c]	315	314	285	320	303	307	513 (95)
31	168	(68)[b]	80	0	248[c]	398	482	445	484	436	449	697 (01)
41	44	(57)	33	0	77	104	40	104	83	100	86	201 (01)
44	119	(61)	77	0	196	333	192	273	283	444	305	643 (95)
45	35	(49)	37	0	72	113	118	107	118	143	120	178 (01)
51	217	(63)[b]	127	0	344	557	721	505	544	667	599	895 (01)
Total	1051	(62)	657	1	1709	2625	2718	2759[d]	2962	3128	2838	4288 (01)
No Quota[e]												
11	124	(71)	51	0	175	328[f]	120	335	177	200	232	351 (05)
52	148	(59)	103	0	251	219	400	223	252	270	273	400 (06)
Total	272	(64)	154	0	426	547	520	581[d]	429	470	509	678 (95)
State	1323	(62)	811	1	**2135**	3172	3290[d]	3340[d]	3391	3598	3358	4956 (95)

[a] Hunters receive tooth envelopes and registration stations. The following table shows the number of tooth envelopes that had no corresponding registration slip or e-registration. These were added to the harvest tally.

Year	Quota area	No-quota area
2003	84	13
2004	96	39
2005	179	31
2006	63	15
2007	27	9
2008	23	4

[b] Highest percent males ever recorded for BMUs 24, 31 and 51; second highest for BMU 12 (76% in 1992).

[c] Lowest harvest since 1996.

[d] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value does not match column total because other data on table are uncorrected for estimated lost registration data.

[e] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 28 in 2006, 27 in 2007, 14 in 2008). Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear. However, some of these blocks may have been read wrong from the map, so all these were recorded in the BMU where they were assigned, not the BMU of the indicated harvest block.

[f] Second highest harvest for this area. Third highest was 321 bears in 2001.

Table 5. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2003–2008.

BMU	Mean success 2003-2007	2008		2007		2006		2005[b]		2004		2003		2002
		% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success
Quota	26	21		28		25		25		26		25		14
12	33	32		36		19		41		33		35		22
13	30	28		31		24		32		33		31		19
22	11	8		14		14		10		11		4		8
24	23	20		20		25		20		27		25		15
25	33	28 [d]		31		30		30		38		34		23
26	32	17 [d]		36		30		34		31		29		17
31	30	21 [d]		28		33		31		33		25		17
41	26	27		35		13		31		23		29		14
44	23	21		30		16		24		20		26		9
45	13	11[d]		14		14		13		12		13		4
51	23	19		27		28		18		19		21		9
No Quota	21	17 [d]	(8)	19	(11)	22	(9)	23	(9)	18	(7)	21	(10)	10
Statewide	25	20		26		25		25		25		25		13

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area in 2002–2008.

[d] Lowest success since 2002.

Table 6. Cumulative bear harvest (% of total harvest) by date, 1990–2008.

Year	Day of week for opener	Aug 22/23 – Aug 31 (9–10 days)	Sep 1 – Sep 7 (7 days)	Sep 8 – Sep 14 (7 days)	Sep 15 – Sep 30 (16 days)
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56 [a]	70	87
1997	Mon		76	88	97
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	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	92

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

Table 7. Number of people participating in nuisance bear survey, 1987 – 2008.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1987	45	71	75	65	62	52	37
1988	68	74	77	75	73	68	69
1989	67	84	80	85	81	79	66
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1986–2008, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of personnel participating in survey [a]	75	77	85	81	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46	46	37
Complaints examined on site [b]	789	771	1117	1890	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59
Complaints handled by phone [c]										959	2196	743	987	618	660	550	424	507	451	426	380	452
Total complaints received										1296	2857	969	1176	723	782	625	505	582	512	483	443	511
• % Handled by phone										74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%
Bears killed by:																						
• Private party or DNR	150	134	157	321	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22
• Hunter before season [d]																						
– from nuisance survey	9	44	27	69	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3
– from registration file	9	35	15	50	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5
• Hunter during/after season [e]	6	11	15	21	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0
• Permittee [f]					20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1
Bears translocated	152	109	257	358	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3
• % bears translocated [g]	19	14	23	19	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5
Bears killed by cars	75	46	69	74	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22 [h]	18 [h]	20 [h]	27 [h]

Table 8 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Adjusted for low and variable survey participation during 1981–86.

[c] Tallies of complaints handled by phone were made only during the indicated years.

[d] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data.

[e] Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

[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.

[g] Percent of on-site investigations resulting in a bear being captured and translocated.

[h] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2008 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

Table 9. Bear food index values for five survey areas (see map below) in northern Minnesota's bear range, 1984 – 2008. Pink-shaded blocks indicate particularly low index values (<45); green blocks indicate particularly high index values (≥70).

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

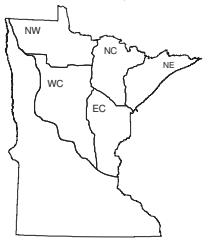


Table 10. Index values of bear food abundance[a] in 2008 compared to the previous 24-year mean (1984-2007) in 5 survey areas across Minnesota's bear range. Green-shaded blocks indicate high fruit abundance (≥1 point higher than average).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	24yr mean	2008 *n* = 10[b]	24yr mean	2008 *n* =16	24yr mean	2008 *n* = 12	24yr mean	2008 *n* = 17	24yr mean	2008 *n* = 10	24yr mean	2008 *n*=50[b]
SUMMER												
Sarsaparilla	4.0	5.6	5.7	6.8	5.3	5.2	4.4	5.4	5.0	6.1	4.8	5.6
Pincherry	3.0	2.4	4.3	4.4	4.0	5.1	3.9	3.9	3.5	2.9	3.7	3.6
Chokecherry	5.4	6.0	5.0	6.9	4.0	5.9	5.3	5.3	4.5	4.3	4.8	5.6
Juneberry	4.7	4.4	4.7	5.7	4.7	4.3	3.6	4.8	3.8	3.3	4.2	4.4
Elderberry	1.4	0.5	3.0	3.3	3.3	2.6	3.1	3.1	3.1	4.6	2.8	2.8
Blueberry	4.6	5.7	5.1	8.4	4.5	7.5	3.3	5.2	3.1	3.9	4.0	5.5
Raspberry	6.4	7.5	7.9	8.6	7.8	7.9	6.8	7.0	6.9	7.7	7.1	7.2
Blackberry	1.1	0.6	2.1	1.9	0.7	1.8	3.2	2.9	4.2	3.5	2.5	2.4
FALL												
Wild Plum	2.1	1.7	1.8	1.3	0.8	1.2	2.5	2.3	2.1	2.5	1.9	1.9
HB Cranberry	5.0	4.9	4.1	4.7	3.2	3.0	3.5	3.9	3.4	4.1	3.7	3.9
Dogwood	5.8	7.2	5.5	6.2	4.9	4.8	5.6	6.3	5.8	7.2	5.5	6.5
Oak	3.1	4.2	2.7	3.1	1.3	1.5	5.6	6.2	5.7	7.1	3.9	4.8
Mountain Ash	1.4	0.9	2.2	2.1	4.2	4.9	1.7	1.5	1.8	2.5	2.3	2.1
Hazel	6.1	7.2	7.4	10.9	7.1	9.1	8.1	9.0	7.8	11.9	7.3	9.1
TOTAL	54.1	58.6	61.3	74.1	55.8	64.7	60.5	66.6	60.6	71.4	58.3	65.4

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

[b] *n* = Number of surveys used to calculate 2008 area means.

[C] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 11. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2008. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥8.0, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 2. Fall production of primary bear foods, 2008.

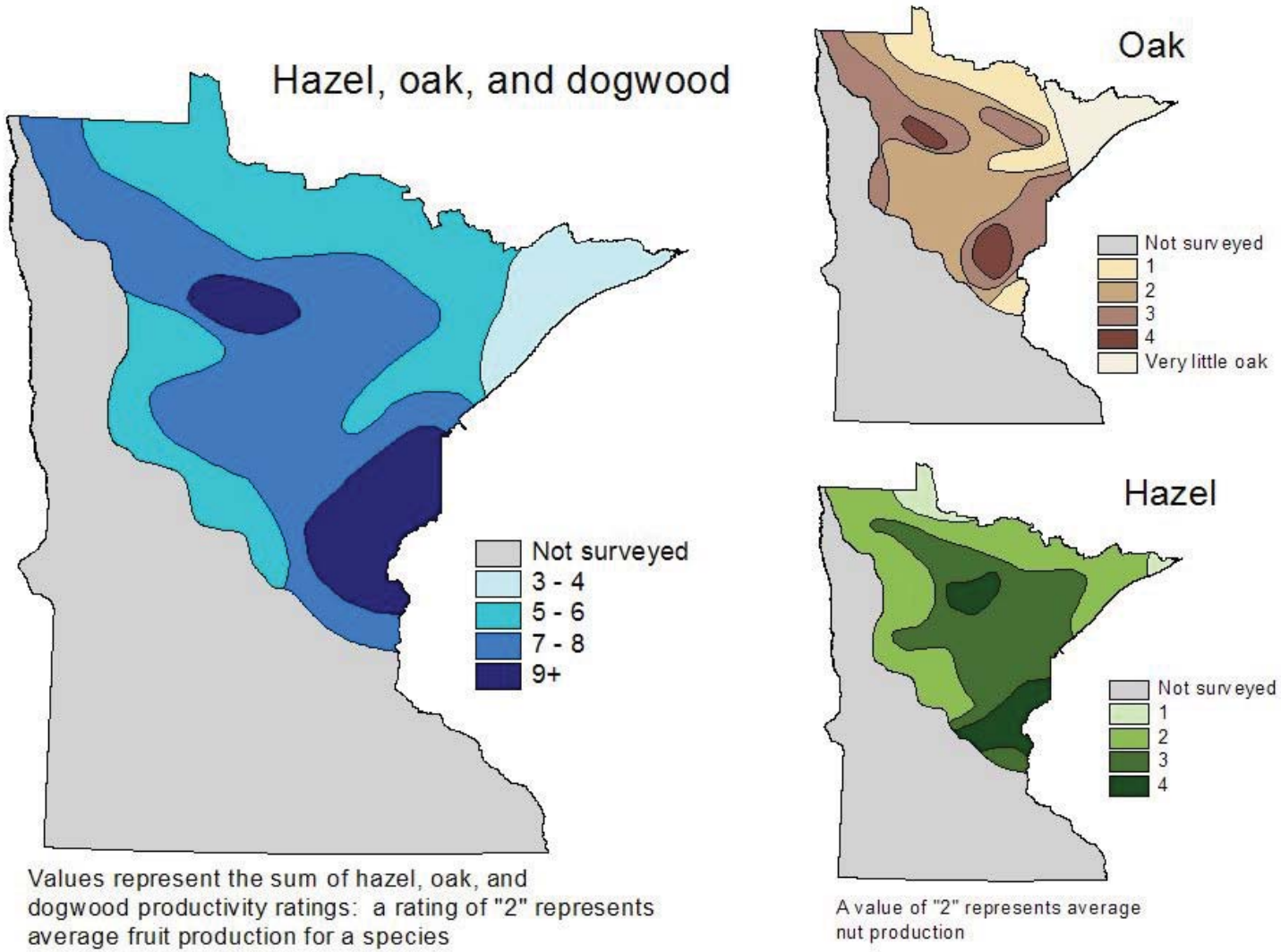


Fig 3. Number of female bears harvested vs. number predicted, based on fall food abundance and hunter numbers. Prediction for 2008 based on regression from 1984–2007 ($R^2 = 0.82$). Note that predictions exceed actual harvest for all years since 2002.

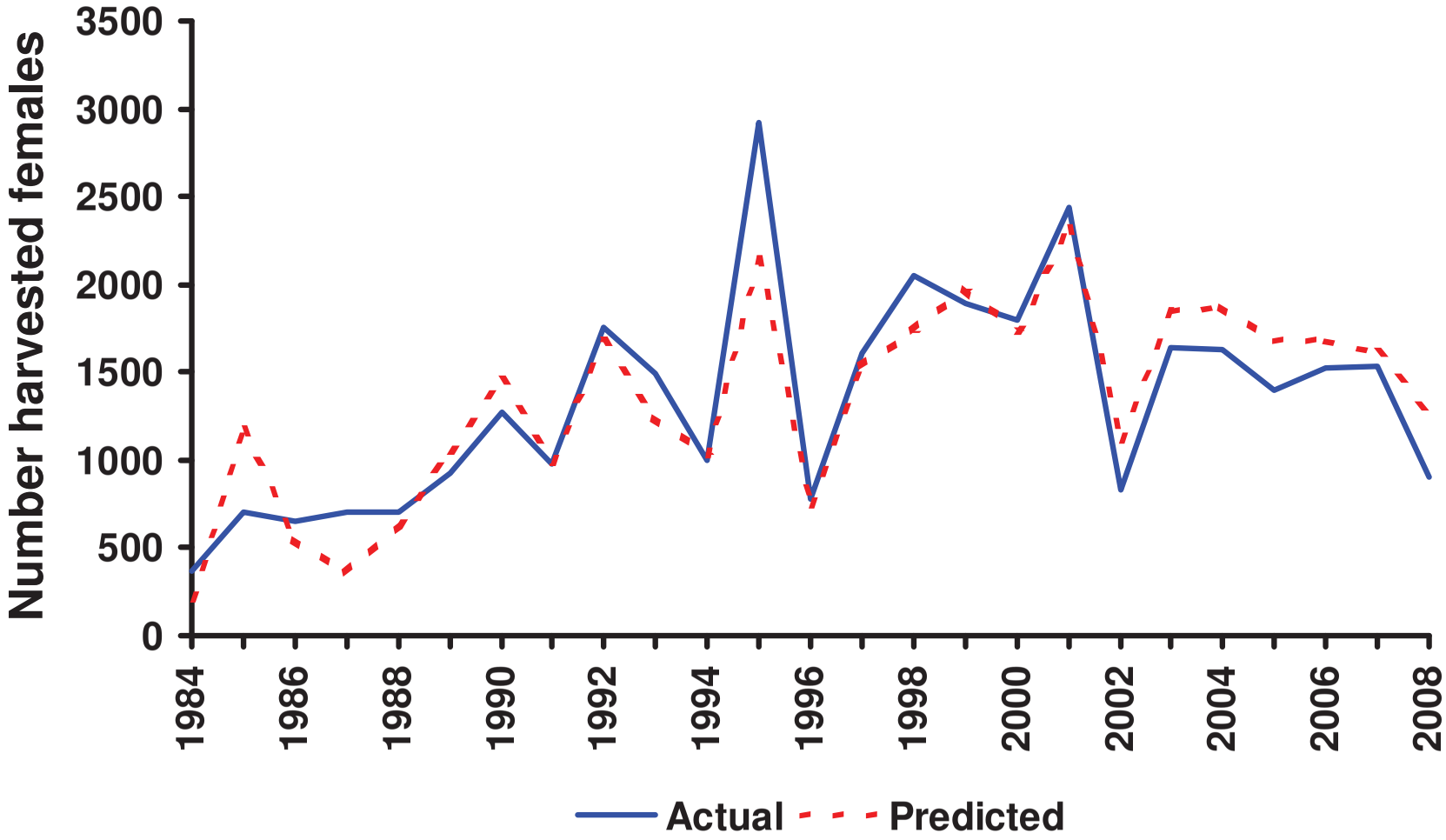


Fig 4. Sex ratios of harvested bears by BMU, 2002–2008.

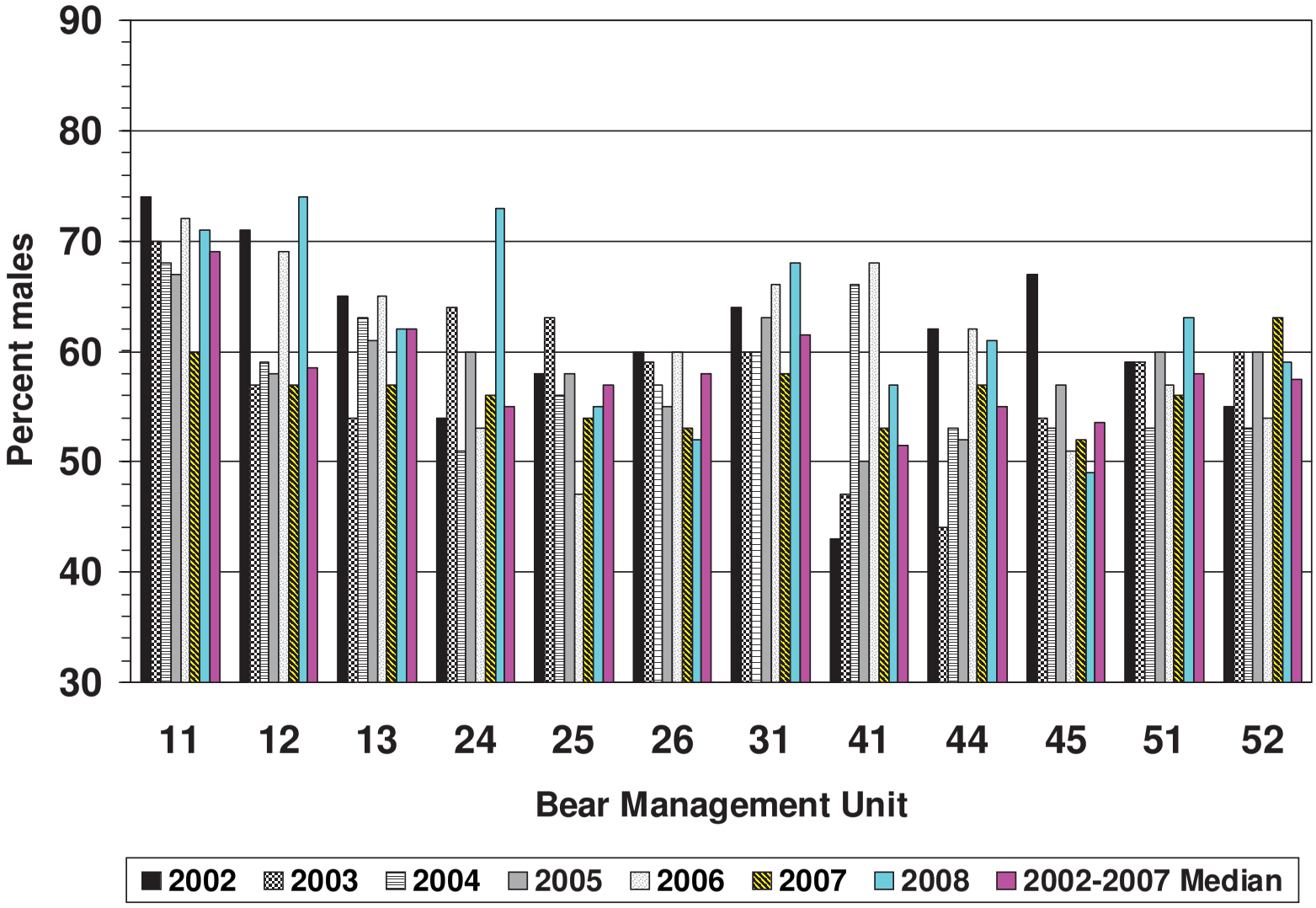


Fig 5. Statewide harvest age structure: median ages by sex, 1982–2008.

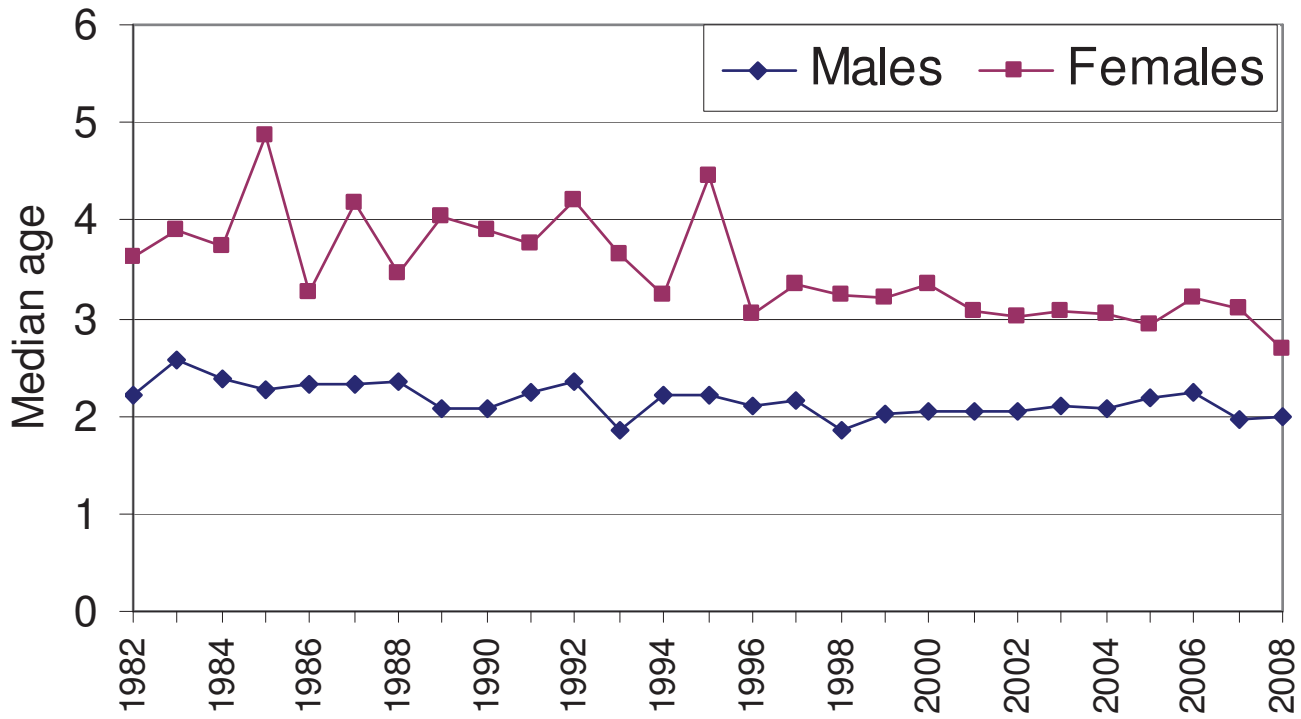


Fig 6. Statewide harvest age structure: proportion of each sex in age category, 1982–2008. Trend lines are significant, indicating a long-term change in age structure.

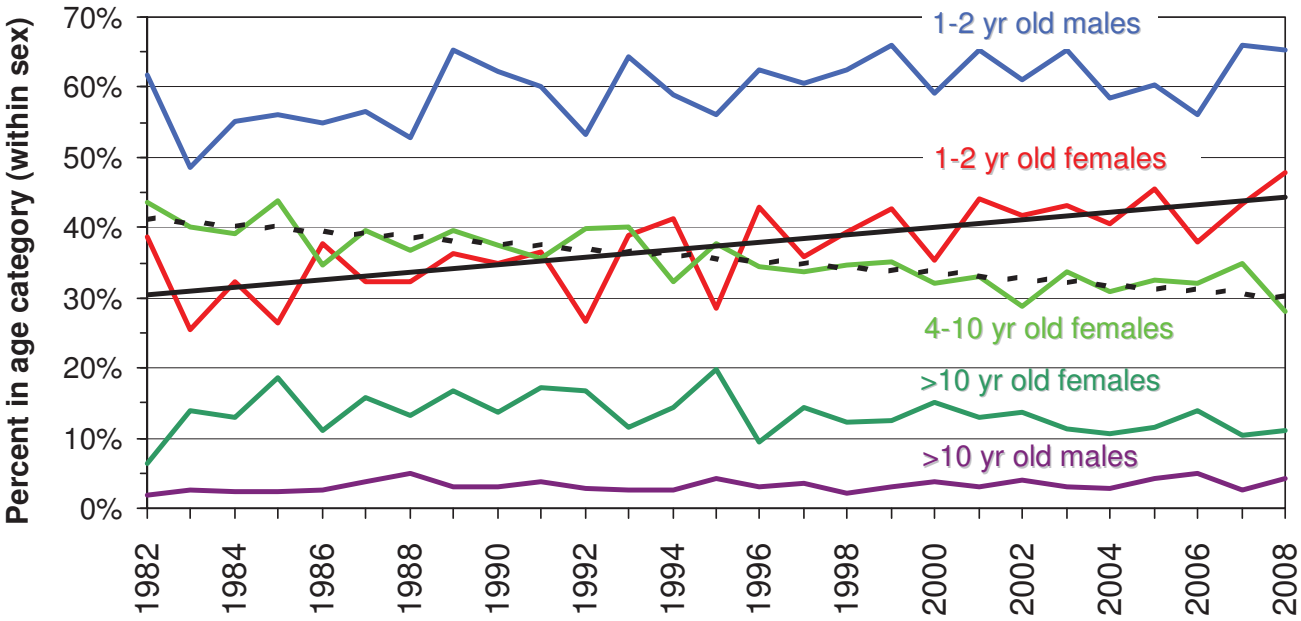


Table 12. Tetracycline-marking data: 1991, 1997, 2002, and 2008 (years of marking).

	1991	1997	2002	2008
Baits set	2905	2989	3122	3540
Baits not found	9	20	16	11
Baits checked	2896	2969	3106	3529
Baits visited by other mammal or bird [a]	507 (18%)	747 (25%)	1181 (38%)	218 (6%)
Baits taken by a person	0	6	9	0
Bait taken by animal, not a bear	---	---	1015	37
Bait taken by ambiguous – possibly bear	2	64	30[b]	16
Baits available for bears [c]	2701	2580	2572	3510
Baits visited by bears	1009	1214	755	594
Percent of available baits	(37%)	(47%)	(29%)	(17%)
Baits eaten by bears	998	1213	707	489
Percent of baits visited	(99%)	(100%)	(94%)	(82%)
Percent of available baits	(37%)	(47%)	(27%)	(14%)

[a] Includes all baits visited by small mammals and/or birds. Some of these were not consumed; others were also visited by bears, in which cases they were recorded as taken by bears.
[b] These ambiguous cases are considered first as non-bears, then as bears in population estimates.
[c] Baits taken by small mammals or birds are considered as available for bears half the time (1/2 bait).

Explanatory notes: More tetracycline baits were set in 2008 than in previous surveys. In 2008, baits were enclosed in wooden boxes to prevent consumption by raccoons, fishers, and martens; this technique has proven effective in previous studies in Wisconsin and Alaska. Boxes had holes drilled to allow scent to emanate. As an extra attractant to bears, two-thirds of boxes contained ½-lb patties of ground beaver in addition to standard bacon baits.

As desired, disturbance of baits by animals other than bears was nearly eliminated relative to all previous surveys. However, the number of visits to baits by bears also was much lower. This may have been due, in part, to the generally high availability of summer foods for bears, as during tetracycline marking in the summer of 2002. However, it also suggests that enclosing baits in boxes had a significant negative effect on bears' detection of baits. Boxes appeared to present a physical deterrent as well; 18% of bears that detected and visited baits did not remove the box from the tree, or in some cases, removed the box but did not eat the bait. It also appears likely that the decline in bait visits by bears reflected, at least in part, a decline in bear numbers.

Table 13. Tetracycline recapture data in years of marking: 1991, 1997, 2002, and 2008.

	1991	1997	2002	2008
Harvest	2143	3212	1916	2135
Ribs/teeth collected from harvest [d]	1958 (91%)	2594 (81%)	1417 (74%)	1511 (71%)
Ribs/teeth collected from nuisance or car-killed bears	0	17	12	10
Cub samples excluded		13	16	23
Total samples checked for tetracycline	1958	2611	1429	1498
Tetracycline-marked samples	122 (6.2%)	149 (5.7%)	56 (3.9%)	57 (3.8%)
Double-marked samples	11 (9.0%)	10 (6.7%)	2 (3.6%)	2 (3.5%)

[d] Excluding cubs, which are not counted in population estimates.

Explanatory notes: The 2008 bear harvest, though lower than the previous 5-year average (3360), was similar to the harvest in 2002, the year of the last tetracycline survey. Hunters submitted a similar number of usable tooth and rib samples in 2002 and 2008 and the number (and proportion) of samples that were positive for tetracycline were nearly identical.

Because fewer bears were marked in 2008 than in 2002, however, the 57 tetracycline-positive samples recovered in 2008 represents a larger proportion of the marked bears in the population than did the 56 positive samples in 2002, indicating a likely decrease in the bear population since 2002.

Table 14. Tetracycline-based population estimates: 1991, 1997, 2002, and 2008.

	1991	1997	2002	2008
No. marked bears				
Excluding ambiguous cases	916 (998/1.09)[a]	1134 (1213/1.07)	680 (707/1.04)	472 (489/1.035)
Including ambiguous cases		1193 (1277/1.07)	709 (737/1.04)	488 (505/1.035)
A. Population based on recaptures in year of marking (Yr 1)				
Mean: with and without ambiguous cases	14,600	20,300	17,500	12,400
95% CI				
Min	12,300	17,000	13,000	9,400
Max	16,900	24,000	22,200	15,600
B. Population based on recaptures in year after marking (Yr 2)				
Mean: with and without ambiguous cases	15,800	25,600	27,900	
95% CI				
Min	13,400	20,300	20,160	
Max	18,200	31,100	35,860	
C. Population based on 2-year cumulative recaptures (Yr 1 + Yr 2)				
Mean: with and without ambiguous cases	15,300	22,400	22,700	
95% CI				
Min	13,700	19,400	18,400	
Max	16,800	25,400	27,100	
% increase from first-year estimate	4.8%	10.3%	29.7%[b]	
D. Final estimate (mean of B and C)	15,600	24,000	25,300	
% increase from first-year estimate	6.8%	18.2%	44.6%	

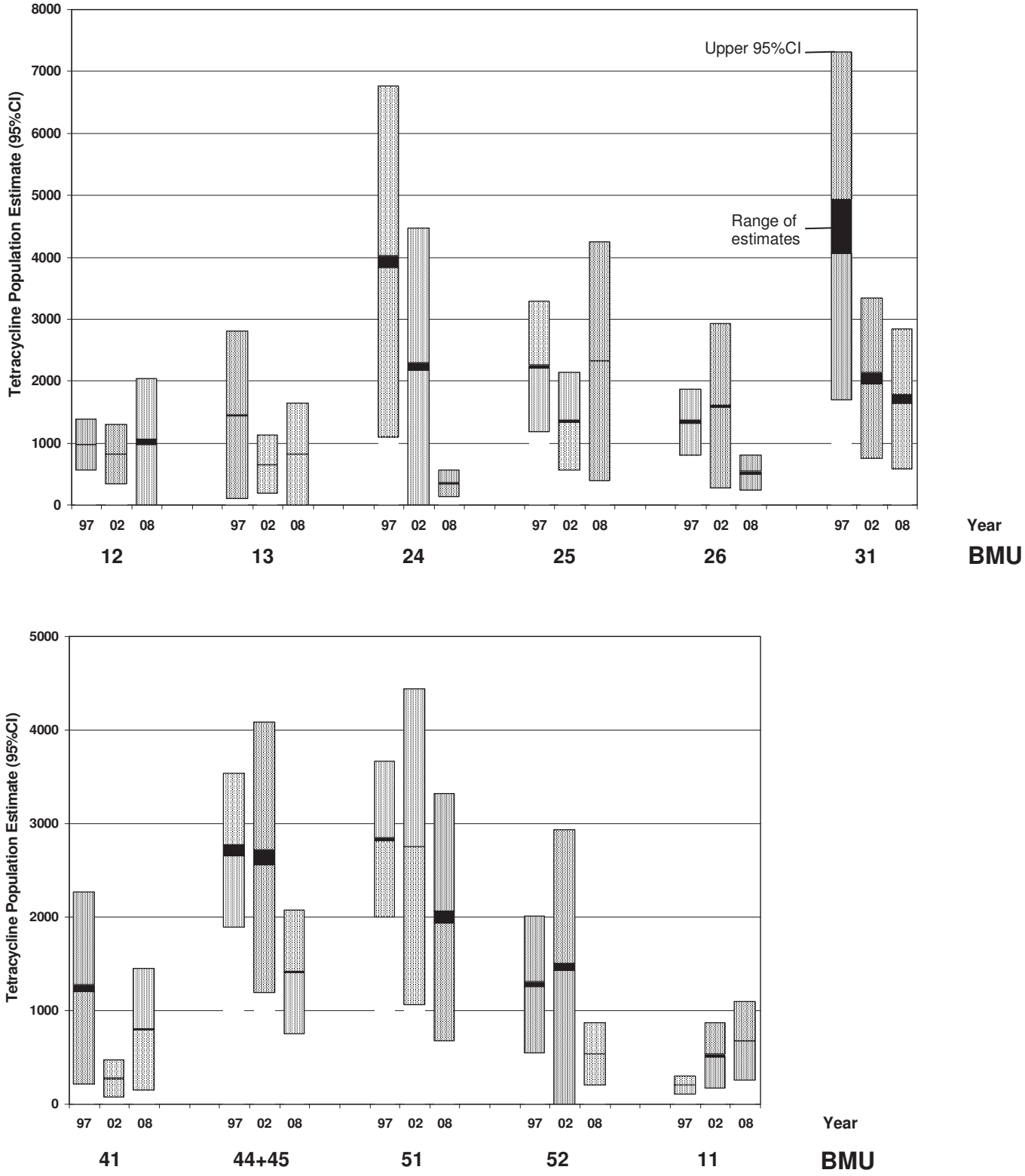
[a] Adjustment for double-marking: No. of tetracycline baits eaten by bears / (no. of marks in samples/no. of marked samples).
[b] Abundant fall foods and low hunter success rate in 2002 suggested that the low bias in the Yr 1 estimate would be exacerbated in 2002. Underestimates of population size based on mark-recapture data from radio-collared bears averaged about 20%.

Explanatory notes: Our initial population estimate derived from the 2008 tetracycline survey suggests a considerable decline in Minnesota's bear population since the last survey in 2002. The estimate is lower than any of the previous first-year estimates. However, experience and theory indicate that estimates based on one year of "recaptures" only – that is, based on ribs and teeth collected from hunter-killed bears during the fall immediately following tetracycline marking – are always biased low. This is because bears consuming tetracycline baits during the summer are somewhat more likely to be shot over hunters' baits that same fall than bears that did not take tetracycline baits in the summer. Addition of samples collected next year will yield a higher and a much less biased estimate. In 3 previous surveys, the amount by which population estimates increased with the addition of a second year of samples has varied considerably. In the last survey, using samples from both 2002 and 2003 hunting seasons

caused an increase of 45% in the population estimate relative to first-year results only. The previous 2 surveys had not displayed as great a change in the estimate from the first to the second year.

Good food conditions were responsible for the very low response to tetracycline baits seen in 2002. We believe that the same may have been at least partly the cause of the low visitation in 2008 as well. Therefore we expect that sampling in 2009 may result in a relatively large increase in the population estimate. Even if this is the case, however, the resulting estimate will likely still be below 20,000, indicating a significant downturn since the high population levels of the late 1990's.

Fig. 7. Population estimates by BMU derived from tetracycline marking, based on recoveries in the year of marking, 1997, 2002, and 2008. All first-year recoveries yield estimates that are biased low (due to a biased recovery – see explanation for Table 14), and the amount of this bias varies yearly. Moreover, movements of bears among BMUs, which varies due to food conditions, makes some of these estimates unreliable (especially BMUs 24, 25, 26).



STATUS OF MINNESOTA BLACK BEARS, 2009

Final Report to Bear Committee

March 2, 2010

Dave Garshelis & Karen Noyce

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

TABLE OF CONTENTS

Key points

Table 1, Fig. 1	Permit applications increased to the highest level in 7 years. This may have been in response to the diminished number of permits available, which was the lowest since 1994. The estimated number of hunters in the field (9,300) also was the lowest since 1994. Total harvest (2,801) was higher than expected because the success rate (30%) was atypically high, compared to the past 6 years. The high success rate appears largely attributable to the reduced number of hunters. Success rates are inversely related both to food and to hunter numbers.
Fig. 2, Tables 2-3	Permits were reduced in 2009 in 8 of 11 BMUs in the Quota Zone, to reduce harvest pressure and hunter crowding. Due to this reduction, only 1 BMU (BWCAW) was undersubscribed. Surplus licenses were offered only to applicants who chose this BMU as a 2nd choice, but none of them elected to purchase a license.
Table 4	Harvest increased from 2008 to 2009 in every BMU except 22 and 45. The downward trend in BMU 45 may suggest a population decline. Other BMUs had harvests near the 5-year mean, or slightly below, simply reflecting the reduced number of hunters in most areas. BMU 11 (northwest no quota) continues to show a strong harvest, reflecting an increased density of bears.
Table 5	Hunting success was above the 5-year mean for all BMUs but one, and was especially high in BMUs 22, 24 and 31. Only BMU 45 had a lower than expected success rate.
Table 6	Chronology of the harvest was typical, with 74% of bears harvested in the 1st week.
Tables 7-8	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was somewhat higher than in the past few years, despite continued low nuisance activity. The number of on-site investigations (65) was typical of the previous several years, as was the number of complaints dealt with by phone (535; 89% were handled by phone). Across the state, 25 nuisance bears were reported killed by private parties, DNR, and permittees, and 2 were captured and moved.

Tables 9-11 & Fig. 3	Overall, natural food abundance was relatively normal in all parts of the state. However, several summer fruits, especially raspberry and chokecherry, tended to be higher than normal. Productivity of oak, dogwood and hazel, the 3 key fall foods for bears, was average or above average (especially east-central). Highbush cranberry and mountain ash, secondary fall foods, fruited unusually well.
Fig. 4	A combination of two key factors, fall food abundance and number of hunters, accounts for 86% of the yearly variation in the harvest from 1984 to 2009. The regression based on these 2 variables predicted a higher harvest than actually occurred during 2002–2008, but the prediction was accurate for 2009, probably because of reduced hunter numbers. A tighter fit for this regression is exhibited by the subset of data since 2000, indicating that the relationship among these variables has changed somewhat over time.
Fig. 5	Sex ratios of harvested bears reflect both the sex ratio of the living population as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions). In 2008, harvest sex ratios were heavily male-dominated in several BMUs (12, 24, 31, 51). The percent males declined from 2008 to 2009 in most areas. A longer term decline, possibly indicative of a population decline, is evident for BMUs 26 (50% male in 2009) and 45 (female-dominated harvest past 2 years).
Fig. 6	Tetracycline biomarking baits set in the summer of 2008 were used to mark bears for a statewide mark-recapture population estimate. Rib and teeth samples were collected from harvested bears (as well as some nuisance and car-killed bears) in 2008, and again in 2009, and examined for marks. Samples from bears that were cubs in 2008 (1-year-olds in 2009) were excluded. A total of ~470 bears were marked, and 3,182 samples examined, of which 90 were marked (2.8% in pooled sample). A range of population estimates is obtained, depending on which recovery sample (2008, 2009, or a combination of the 2) is used. Presently, the “best” estimate is ~20,000 ± 5,500, which is ~5,000 bears less than the 2002 estimate. We are planning to collect another sample for examination in 2011 to help refine this estimate.
Fig. 7	Tetracycline-based mark-recapture estimates for individual BMUs are hampered by small sample sizes and movements of bears (lack of closure). Combined with other data, however, these estimates may help inform assessment of trends. BMUs in the northwest (11, 12, 13) showed little change, or a slight increase (BMU 11) in numbers of bears from 1997 to 2008. North-central and northeastern BMUs (24, 25, 26, 31) showed declines. Significant declines were also observed in BMUs 44 & 45 (although sample sizes in BMU 45 were very small).

Table 12	Apparent harvest rates for each BMU, calculated from harvest/estimated population size, point to areas with high sustainable offtakes (BMU 11 – high rate of offtake, consistent harvest, and increasing population trend), versus overharvest (BMU 45 – increased rate of offtake, declining harvest, declining population estimates). Most areas show consistent harvest rates even with reduced harvest because population estimates have declined.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1988–2009.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Permit applications	25879	24096	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]
Permits available	5310	5520	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000
Licenses purchased (total)	5643	5901	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892
Quota area [b]	4297	4628	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342
Quota surplus/military [b]														235	209	2554	1356	1591	1561	526	233	77[c]
No-quota area [b]	1346	1273	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473
% Licenses bought [d]																						
Of permits available [d]	80.9	83.8	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4
Of permits issued [d]											84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2	73.8
Estimated no. hunters [e]	5100	5500	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13700	13500	12800	12400	12400	11200	9800	9300
Harvest	1509	1930	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801
Harvest sex ratio (%M) [f]	58	57	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59
Success rate (%) [g]																						
Total harvest/hunters	30	35	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30
Quota harvest/licenses	28	36	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008: *n* = 528, 2009 *n* = 835).

[b] Quota area established in 1982. No-quota area 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 2009, surplus permits available only to 2nd-choice applicants, but none purchased (see Table 3). Total licenses = quota + quota surplus + no-quota + military (no permit needed).

[c] Free licenses for 10 and 11 year-olds were available beginning 2009 (*n* = 45), and included here with military licenses.

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3). 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.

[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%), and 2001(93.9%).

[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 2001–2009 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2009, 52 hunters took more than 1 bear (46 took 2 bears on NQ license, 1 hunter took 1 quota and 1 NQ bear, and 5 hunters took 2 quota bears [illegally]): thus, the 2801 bears were taken by 2749 different hunters, so success = 2749/9300 = 30%.

Fig. 1. Relationship between hunting success (note inverted scale) and hunter numbers. Red horizontal lines show mean hunting success for periods with <9000 hunters vs >12,000 hunters. Other variation in hunting success is mainly attributable to food conditions.

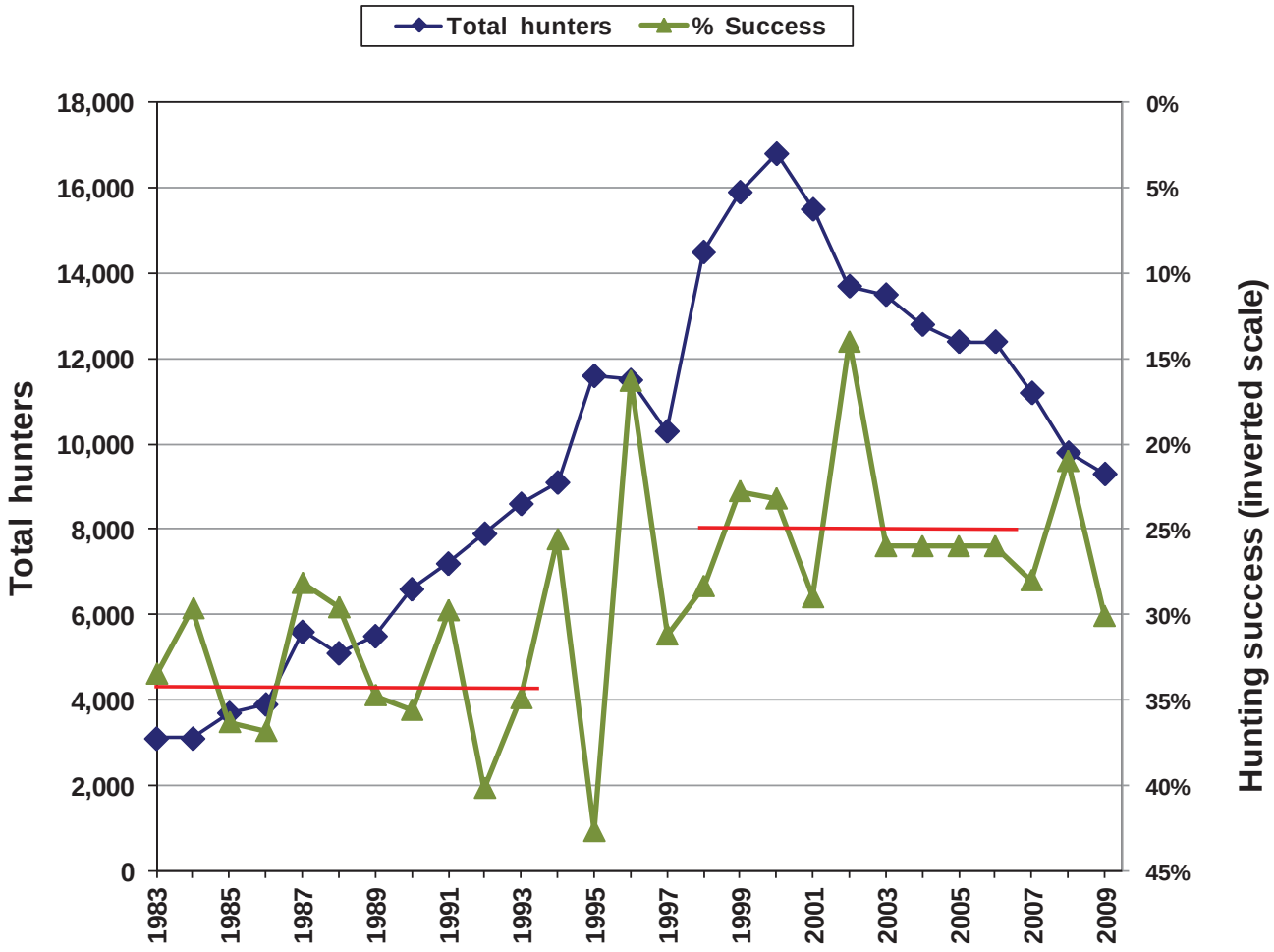


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

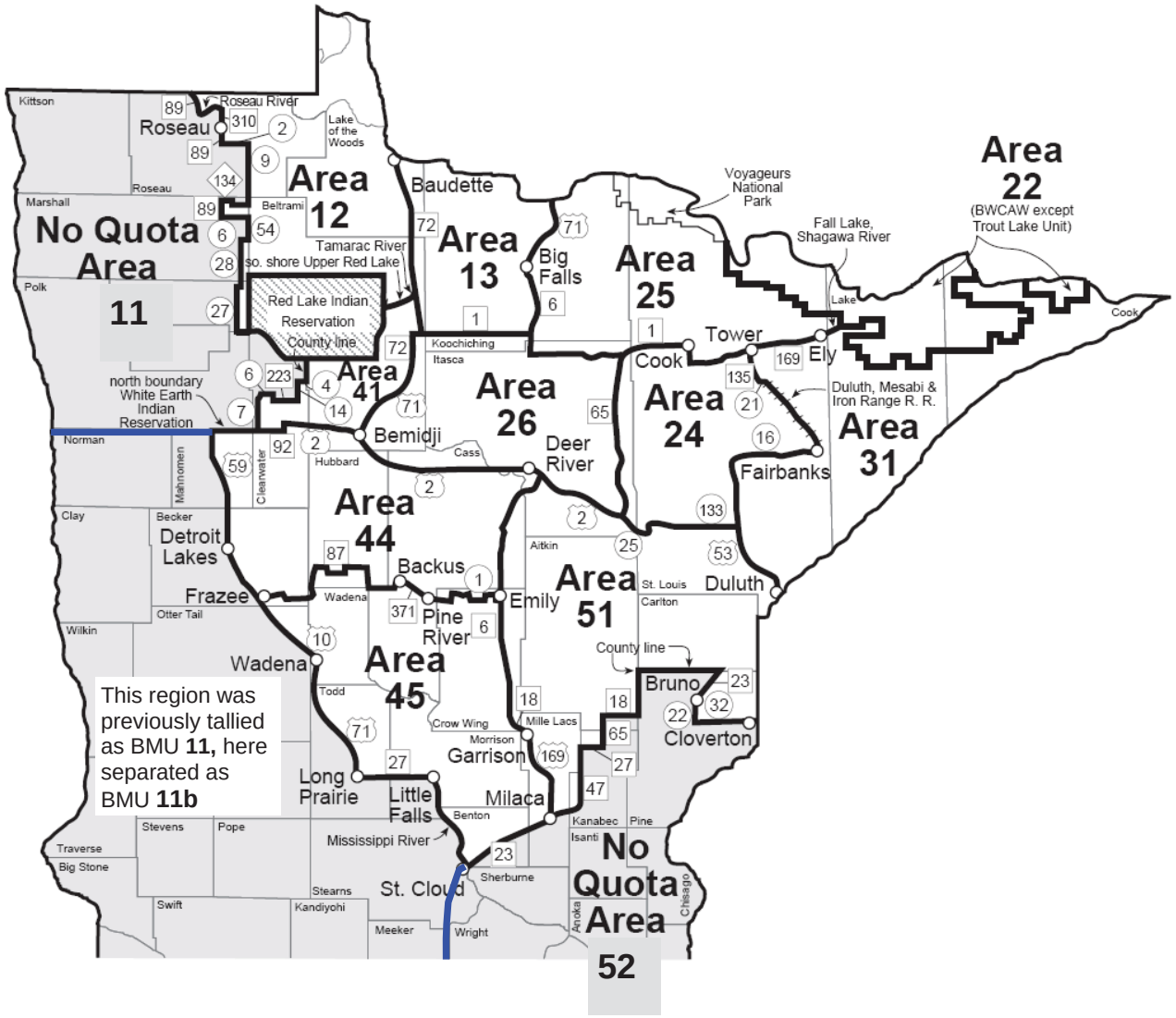


Table 2. Number of bear hunting permits available per year, 2005–2009 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2009	2008	2007	2006	2005
12	450	450	500	550	550
13	600	650	700	800	900
22	150	150	150	150	150
24	650	750	900	1000	1200
25	1250	1550	1700	1900	1900
26	1000	1150	1250	1500	1500
31	1300	1700	1900	2100	2100
41	400	400	400	450	450
44	1100	1350	1500	1700	1700
45	600	1000	1200	1200	1500
51	2500	2700	3000	3500	4000
Total	10000	11850	13200	14850	15950

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2005–2009[a]. Shaded values indicate undersubscribed areas.

BMU	2009		2008		2007		2006		2005	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	876		857		811		1005		864	
13	700		709		745		680	120 100%	714	186 100%
22	91	0[b]	85	50 77%	87	51 81%	92	58 100%	65	46 54%
24	843		825		742	159 100%	624	367 98%	749	270 60%
25	1694		1793	4[c]	1799		1789	112 100%	1923	
26	1874		1999	2[c]	2028		1915		1997	
31	2423		2388	3[c]	2383		2290		2097	4 100%
41	685		656		577		683		653	
44	2787		2821		2669		2838		2884	
45	941		873	128 100%	936	266 100%	840	360 100%	927	346 60%
51	3822		3828		3568		2969	531 100%	3276	726 100%
Total	16736[d]		16834[d]	178 92%	16345	476 98%	15725	1548 ~100%	16149	1578 78%

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[C] Courtesy licenses issued by Commissioner, not actual surplus.
[d] Beginning in 2008, applicants could apply for area 99 in order to receive preference, but not buy a license; these are not included in this total.

Table 4. Minnesota bear harvest tally[a] for 2009 by Bear Management Unit (BMU) and sex compared to harvests during 2004-2008 and record high harvests.

	2009											
BMU	M	(%M)	F	U	**Total**	**2008**	**2007**	**2006**	**2005**	**2004**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	81	(58)	59	0	140	101	124	70	165	165	125	263 (01)
13	101	(68)	48	0	149	129	163	151	205	197	169	258 (95)
22	3	(43)	4	0	7	7	15	15	8	10	11	41 (89)
24	77	(51)	74	0	151	100[b]	134	194	144	212	157	288 (95)
25	187	(54)	157	0	344	298[b]	369	421	404	546	408	584 (01)
26	114	(50)	112	2	228	137[b]	315	314	285	320	274	513 (95)
31	256	(67)	128	0	384	248[b]	398	482	445	484	411	697 (01)
41	55	(53)	49	0	104	77	104	40	104	83	82	201 (01)
44	142	(56)	113	0	255	196	333	192	273	283	255	643 (95)
45	20	(48)	22	0	42[c]	72	113	118	107	118	106	178 (01)
51	258	(62)	158	0	416	344	557	721	505	544	534	895 (01)
Total	1294	(58)	924	2	2220	1709	2625	2718	2759[d]	2962	2555	4288 (01)
No Quota[e]												
11	183	(58)	131	1	315	172	324[f]	114	334	175	224	351[d] (05)
11b[g]	8	(89)	1	0	9	3	4	6	1	2	3	
52	156	(61)	101	0	257	251	219	400	223	252	269	400 (06)
Total	347	(60)	233	1	581	426	547	520	581[d]	429	501	678 (95)
State	1641	(59)	1157	3	**2801**	2135	3172	3290[d]	3340[d]	3391	3066	4956 (95)

[a] Hunters receive tooth envelopes and registration stations. The following table shows the number of tooth envelopes that had no corresponding registration slip or e-registration. These were added to the harvest tally.

Year	Quota area	No-quota area
2004	96	39
2005	179	31
2006	63	15
2007	27	9
2008	23	4
2009	19	14

[b] Lowest harvest since 1996.

[c] Second lowest harvest in this BMU, since it was established in 1994.

[d] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value does not match column total because BMU data were uncorrected for lost registration data.

[e] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 28 in 2006, 27 in 2007, 14 in 2008, 3 in 2009). 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, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[f] Second highest harvest for this area. Third highest was 321 bears in 2001.

[g] Subset of BMU 11 south of the main harvest area (Fig 2).

Table 5. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2004–2009.

BMU	Mean success 2004-2008	2009		2008		2007		2006		2005[b]		2004	
		% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]
Quota	25	30		21		28		25		25		26	
12	32	39		32		36		19		41		33	
13	30	32		28		31		24		32		33	
22	11	16[d]		8		14		14		10		11	
24	22	31[d]		20		20		25		20		27	
25	32	36		28[e]		31		30		30		38	
26	30	31		17[e]		36		30		34		31	
31	29	38[d]		21[e]		28		33		31		33	
41	26	34		27		35		13		31		23	
44	22	30		21		30		16		24		20	
45	13	11[e]		11[e]		14		14		13		12	
51	22	23		19		27		28		18		19	
No Quota	20	22	(9)[f]	17[e]	(9)	19	(12)	22	(9)	23	(10)	18	(7)
Statewide	24	28[d]		20		26		25		25		25	

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area since 2002. A few hunters also apparently shot 2 bears in the quota area (and submitted 2 sets of teeth), but these are not shown here because the numbers are very low (see Table 1, footnote g).

[d] Highest success since 1997 (BMU 22, 31 & statewide) or 1995 (BMU 24).

[e] Lowest success since 2002.

[f] Of the no-quota hunters, 34 took 2 bears in BMU 11 versus only 11 in BMU 52.

Table 6. Cumulative bear harvest (% of total harvest) by date, 1990–2009.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56 [a]	70	87
1997	Mon		76	88	97
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	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	92
2009	Tue		74	86	96

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

Table 7. Number of people participating in nuisance bear survey, 1988 – 2009.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1988	68	74	77	75	73	68	69
1989	67	84	80	85	81	79	66
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1987–2009, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number of personnel participating in survey [a]	77	85	81	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51
Complaints examined on site [b]	771	1117	1890	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65
Complaints handled by phone [c]									959	2196	743	987	618	660	550	424	507	451	426	380	452	535
Total complaints received									1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600
• % Handled by phone									74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%
Bears killed by:																						
• Private party or DNR	134	157	321	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23
• Hunter before season [d]																						
– from nuisance survey	44	27	69	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4
– from registration file	35	15	50	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15
• Hunter during/after season [e]	11	15	21	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0
• Permittee [f]				20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	2
Bears translocated	109	257	358	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2
• % bears translocated [g]	14	23	19	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3
Bears killed by cars [h]	46	69	74	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18

Table 8 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Adjusted for low and variable survey participation during 1981–86.

[c] Tallies of complaints handled by phone were made only during the indicated years.

[d] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data.

[e] Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

[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.

[g] Percent of on-site investigations resulting in a bear being captured and translocated.

[h] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2009 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

Table 9. Bear food index values for five survey areas (see map below) in northern Minnesota's bear range, 1984 – 2009. Pink-shaded values indicate particularly low index values (<45); green-shaded values indicate particularly high index values (≥70).

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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	69.6	66.5

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

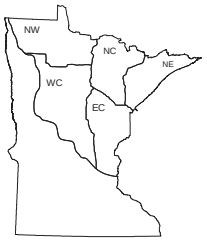


Table 10. Index values of bear food abundance[a] in 2009 compared to the previous 25-year mean (1984-2008) in 5 survey areas across Minnesota's bear range. Pink-shaded values indicate low fruit abundance and green-shaded values indicate high fruit abundance (≥1 point different than average).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	25yr mean	2009 *n* = 10[b]	25yr mean	2009 *n* =16	25yr mean	2009 *n* = 12	25yr mean	2009 *n* = 17	25yr mean	2009 *n* = 10	25yr mean	2009 *n*=40[b]
SUMMER												
Sarsaparilla	4.1	5.2	5.8	6.0	5.3	6.0	4.5	5.0	5.0	5.1	4.8	5.5
Pincherry	2.9	1.8	4.3	4.2	4.1	3.1	3.9	3.3	3.5	6.2	3.7	3.6
Chokecherry	5.4	6.5	5.1	5.8	4.1	4.9	5.3	7.3	4.5	6.0	4.9	6.1
Juneberry	4.7	4.1	4.7	4.3	4.7	5.3	3.7	3.0	3.8	3.0	4.2	4.0
Elderberry	1.4	1.2	3.0	3.1	3.2	3.6	3.1	2.3	3.2	3.2	2.8	2.8
Blueberry	4.7	6.3	5.2	5.5	4.6	5.0	3.4	3.4	3.2	3.3	4.0	4.9
Raspberry	6.5	8.2	7.9	10.2	7.8	9.4	6.8	10.6	6.9	8.9	7.1	9.3
Blackberry	1.1	1.4	2.1	1.6	0.8	1.4	3.2	3.7	4.2	2.5	2.5	2.4
FALL												
Wild Plum	2.1	2.8	1.7	1.8	0.8	2.0	2.5	3.4	2.2	2.6	1.9	2.6
HB Cranberry	5.0	6.4	4.1	5.4	3.2	4.3	3.5	5.2	3.4	4.9	3.7	5.2
Dogwood	5.9	5.9	5.5	6.4	4.9	4.3	5.6	5.8	5.8	6.0	5.5	6.1
Oak	3.2	2.5	2.7	3.0	1.3	1.1	5.7	6.4	5.8	6.3	4.0	4.0
Mountain Ash	1.4	1.0	2.2	3.4	4.2	6.3	1.7	2.0	1.9	3.8	2.3	3.1
Hazel	6.2	6.8	7.6	7.2	7.1	6.6	8.1	7.8	7.9	7.8	7.3	6.9
TOTAL	54.3	59.9	61.8	67.8	56.1	63.2	60.8	69.2	61.0	69.6	58.5	66.5

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

[b] *n* = Number of surveys used to calculate each area-specific mean index value for 2009.

[c] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 11. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2009. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥8.0, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 3. Productivity of key fall bear foods in Minnesota's bear range, 2009.

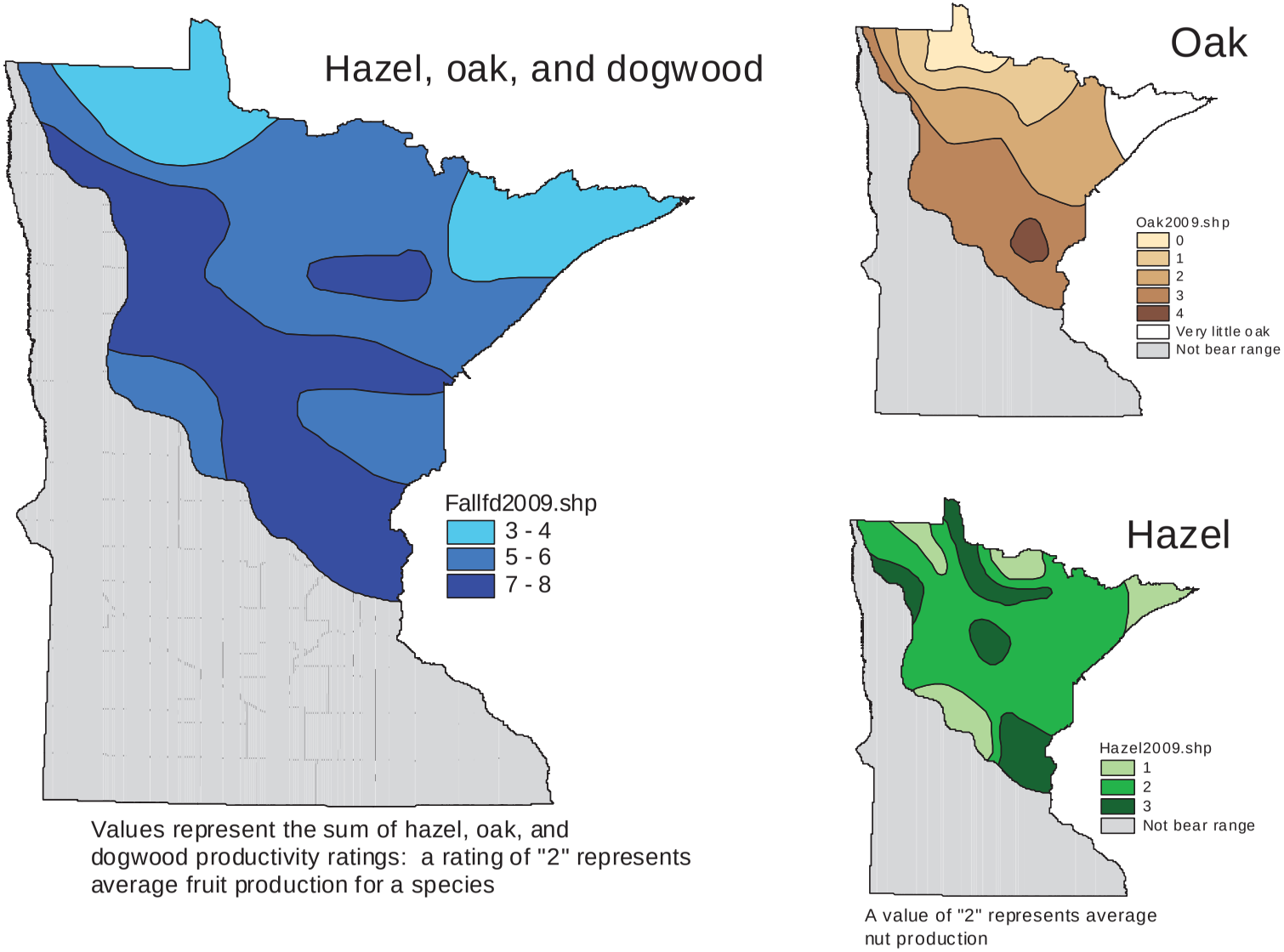
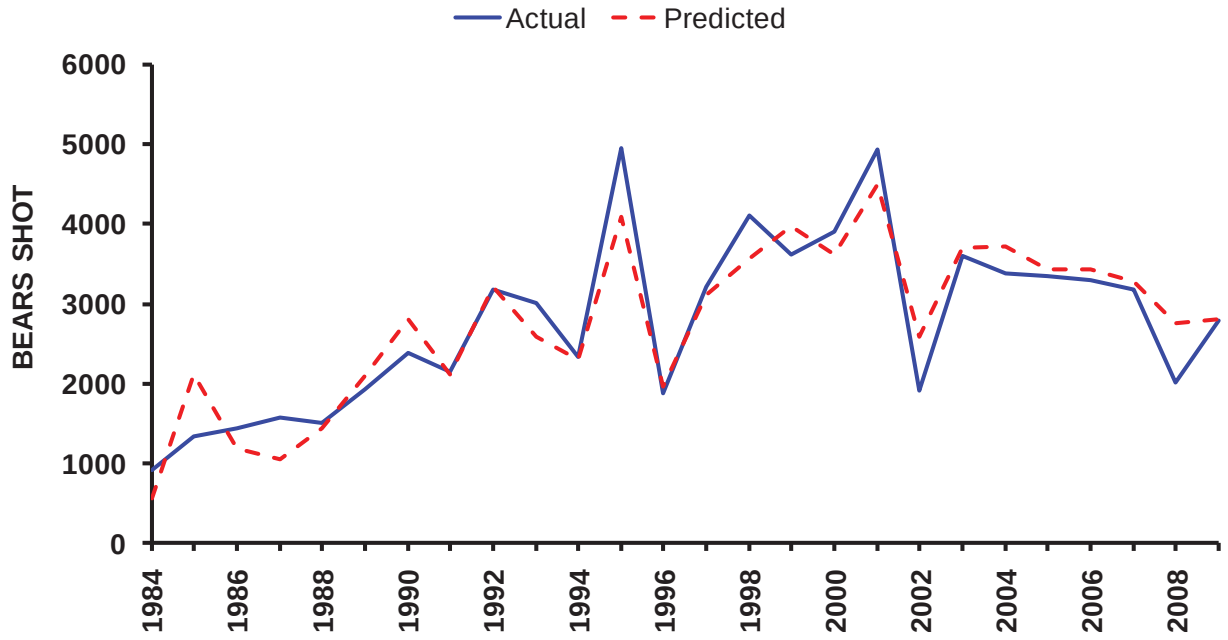


Fig 4. Number of bears harvested vs. number predicted, based on fall food abundance and hunter numbers. Prediction for 2009 based on regression from 1984–2008 (top graph; $R^2 = 0.86$) or 2000–2008 (bottom graph; $R^2 = 0.97$).



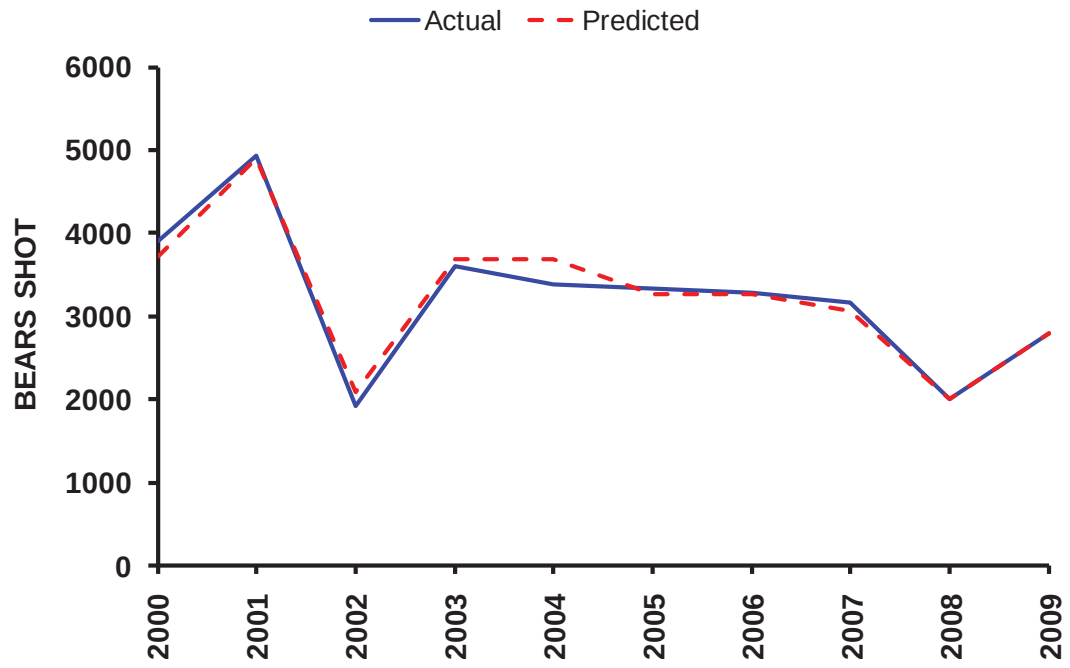


Fig 5. Sex ratios of harvested bears by BMU, 2003–2009.

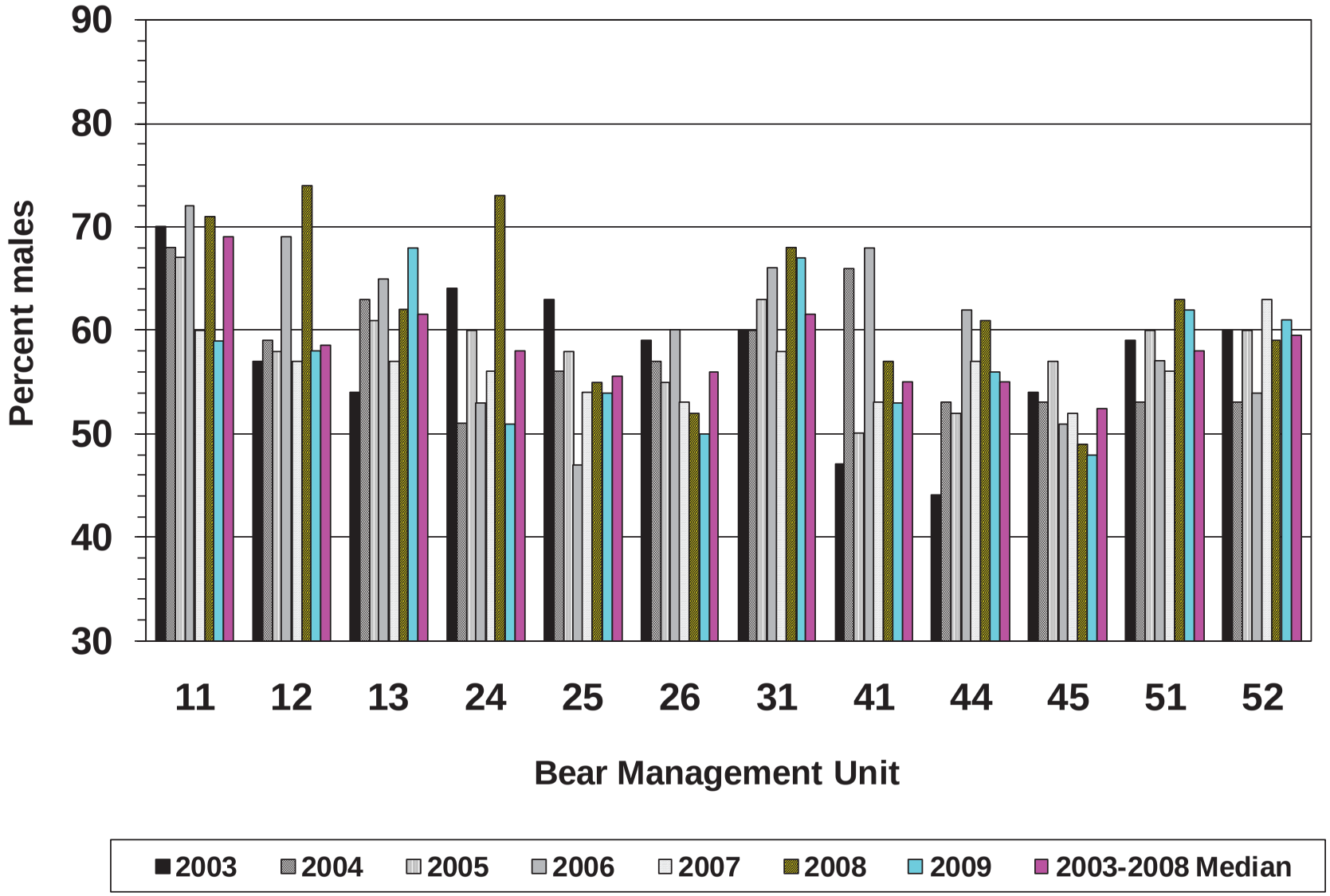


Fig. 6. Statewide population estimates derived from tetracycline marking in 1991, 1997, 2002, and 2008. Each cluster of estimates pertains to the year of marking, with each point (and associated 95% CI) representing a different recapture sample (yr 1 = year of marking, yr 2 = year after marking). Simulation modeling suggested that samples pooled from multiple years (yellow squares) are likely to be most accurate, but in the absence of many years of sampling, the mean of the estimate derived from yr 2 samples and the estimate derived from yr 1+2 samples may be most reliable; thus, a red trend line is drawn through those points.

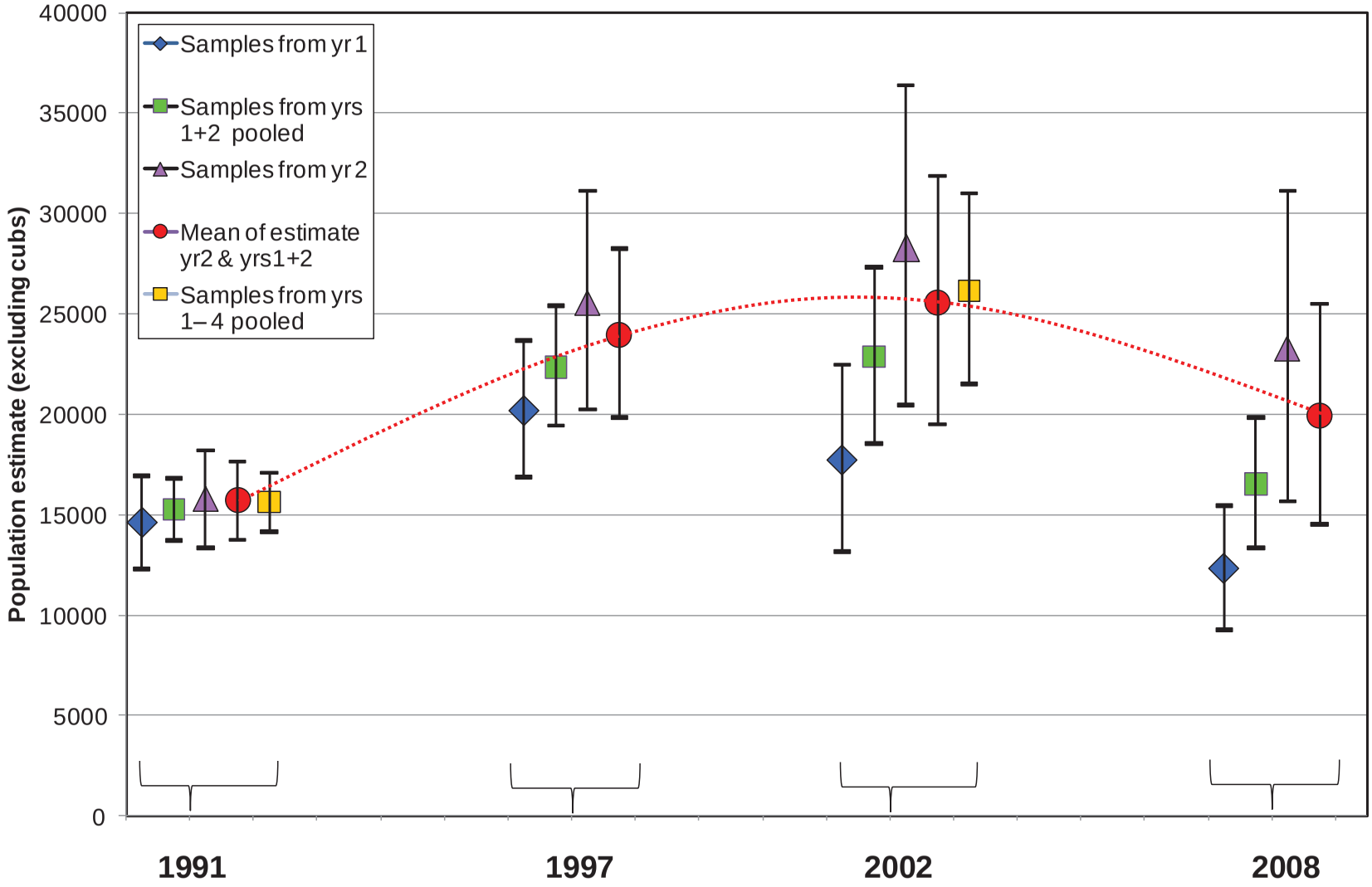
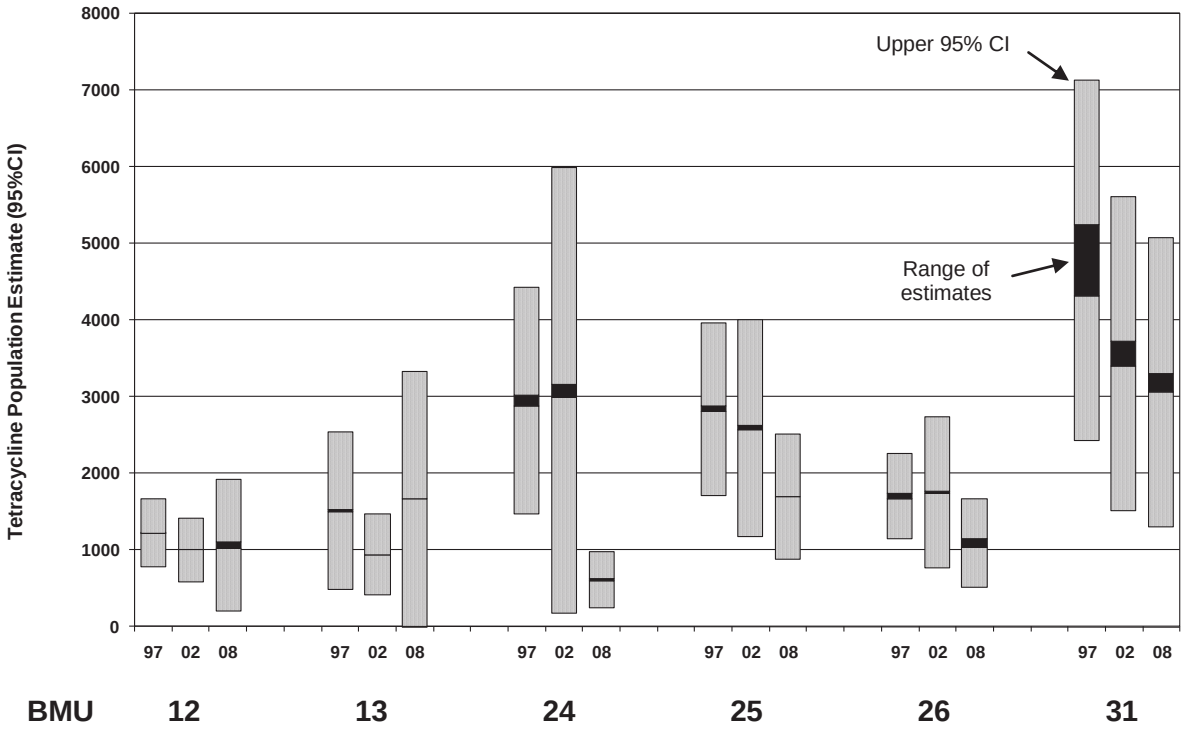


Fig. 7. Population estimates by BMU derived from tetracycline marking, based on pooled sample recoveries over 2 years (1997-98, 2002-3, 2008-9), with estimates applicable to the year of marking (97, 02, 08).



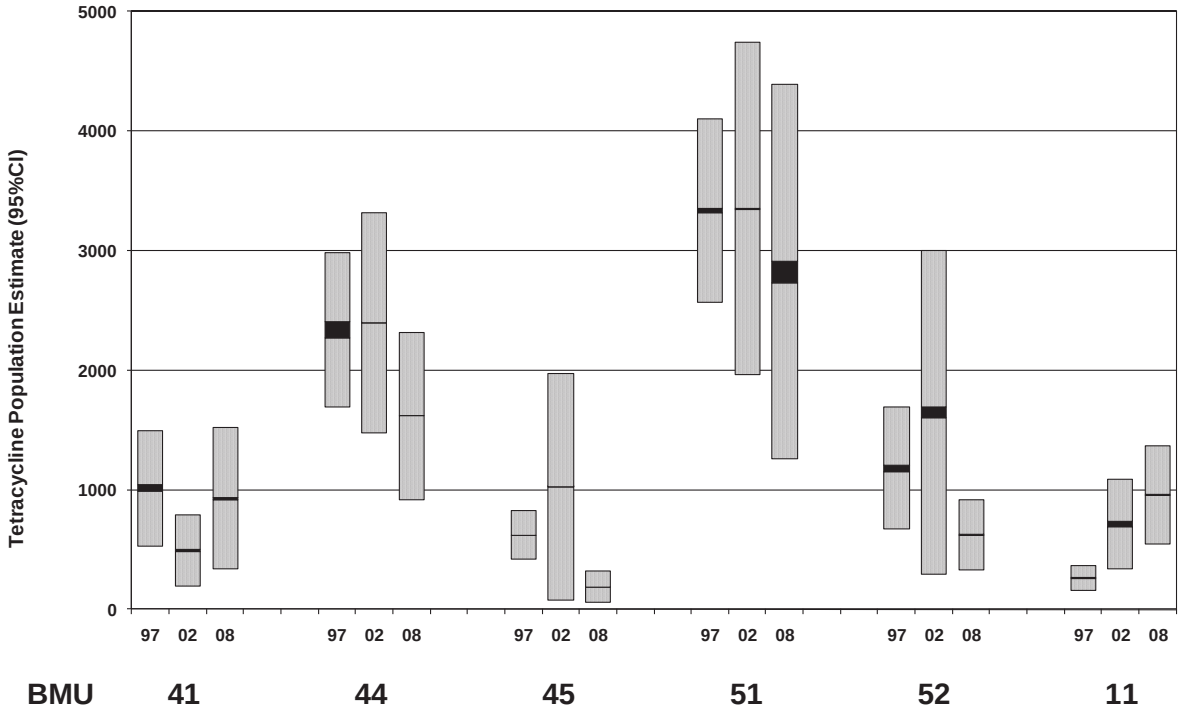


Table 12. Estimated rates of offtake (harvest rates) based on tetracycline estimates. Consistent harvests (compare column 2 vs 3) but extreme variation in harvest rates between 2009 and the previous 5 years (compare last 2 columns), or estimated harvest rates that are unreasonably high or low, are probably indicative of flawed tetracycline estimates for either 2002 or 2008, or both (e.g., BMUs 13, 24, 45, 52).

BMU	5-yr mean (2004-8) harvest	2009 harvest	Estimated harvest rate for previous 5 years (2004-8)[a]	Estimated harvest rate for 2009[b]
Quota				
12	125	140	12%	14%
13	169	149	18%	9%
24	157	151	5%	25%
25	408	344	16%	20%
26	274	228	16%	21%
31	411	384	12%	12%
41	82	104	17%	11%
44	255	255	10%	16%
45	106	42	10%	22%
51	534	416	16%	15%
No quota				
11	224	315	32%	33%
52	269	257	17%	41%

[a] 5-year mean harvest vs 2002 tetracycline point estimate.

[b] 2009 harvest vs 2008 tetracycline point estimate.

STATUS OF MINNESOTA BLACK BEARS, 2010

Final Report to Bear Committee

February 24, 2011

Dave Garshelis & Karen Noyce

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

TABLE OF CONTENTS

Key points

Table 1 & Fig. 1	Permit applications in 2010 increased to the highest level in 8 years. This may have been in response to the diminished number of permits available, which was the lowest since 1994. The estimated number of hunters in the field (9,200) was equivalent to that of 1994. Total harvest (2,699) remained high, however, because success rate (29%) was high. The high success rate appears largely attributable to the reduced number of hunters. Success rates (and hunter effort to kill a bear) are inversely related both to abundance of natural foods and to hunter numbers.
Tables 2-3 & Fig. 2	Permits were reduced in 2010 in 5 of 11 BMUs in the Quota Zone, to reduce harvest pressure and increase hunting success (i.e., hunter satisfaction). Due to this reduction, no BMU was undersubscribed and thus no surplus licenses were offered.
Table 4	As permit allocations were significantly reduced in all BMUs over the past 5 years, the percentage of applicants drawn in the lottery diminished. In 2010, >50% of 1st-year applicants were selected in only 4 BMUs (13, 22, 25, 51); all second-year applicants were drawn, except in BMU 44.
Table 5	Because of reduced permits and hunter numbers, 2010 harvests were equal to or below the 5-year mean in all quota-area BMUs. However, BMU 45, which had shown a precipitous decline in 2009, increased in 2010. No-quota harvest equaled the 5-year mean. BMU 11 continued a pattern of high harvests in odd-numbered years, followed by a low harvest in even-numbered years. BMU 11b (no-quota zone between BMU 11 and 52) has few bears and few hunters, but harvests seem to be increasing.
Table 6	Hunting success was above the 5-year mean for all BMUs except 12 and 41, and was especially high in BMUs 13 and 45. Permits had been cut most severely in BMU 45 (1/3 of the 2007 permit allocation) because of a perceived decline in bear numbers. Increased hunting success there in 2010 may indicate a population rebound and/or less competition among hunters (fall foods were average).
Table 7	Chronology of the harvest was typical, with 69% of bears harvested in the 1st week and 84% by the end of the 2nd week.
Tables 8-9	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was less than last year, but the recorded number of complaints, on-site visits, and bears killed was about the same. Complaints have remained low, with on-site visits <100, since 2002.
Tables 10-12 & Fig. 3	Natural food abundance in 2010 was above average across the northern parts of the bear range, including both summer and some fall bear foods. Summer foods were somewhat below average in the west-central portion of the range, and fall foods (oak, hazel, and dogwood) were below average in the east-central. Low abundance of fall foods contributed to the high harvest in BMU 52.

Fig. 4	A combination of two key factors, fall food abundance and number of hunters, accounts for 86% of the yearly variation in the harvest since 1984. The regression based on these two variables predicted a higher harvest than actually occurred during 2002–2009, but the prediction was accurate for 2010, probably because of reduced hunter numbers. Above some threshold, increased hunter numbers (competition among hunters) disproportionately reduces hunting success. A tighter fit for this regression is exhibited by the subset of data since 2000, where variation in hunter numbers has been less extreme.
Fig. 5	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). A declining trend in percent males, possibly indicative of a population decline, occurred in BMUs 26 and 45, but increased in both of these areas this year. Harvest sex ratios were near 50:50 in BMUs 41, 44 and 45.
Fig. 6-8	Statewide, ages of harvested females have steadily declined for about 2 decades (decline in median age and increase in proportion of 1-2 year olds), reflecting increasingly higher harvest levels over this period. Conversely, the age of harvested males has remained fairly constant for >10 years. Sharp declines in female ages occurred in BMUs 24 and 25 in 2010. Increasing reproduction may be responsible for declining female ages in BMU 11.
Fig. 9	Tetracycline biomarking baits set in the summer of 2008 were used to mark bears for a statewide mark–recapture population estimate. Rib and teeth samples were collected from harvested bears (as well as some nuisance and car-killed bears) and examined for marks during 2008, 2009, and 2010. Samples from bears that were cubs in 2008 were excluded in all years. A total of ~470 bears were marked, and 4,023 samples examined, of which 113 (2.8%) were marked. A range of population estimates was obtained each year, depending on which recovery sample was used. The most reliable estimates indicate a population decline from 2002–2008.
Fig. 10	Tetracycline-based mark-recapture estimates for individual BMUs are hampered by small sample sizes and movements of bears (lack of closure). Combined with other data, however, these estimates may help inform assessment of trends. BMUs in the northwest (12, 13) showed little change, or a slight increase (BMU 11) in numbers of bears from 1997 to 2008. North-central BMUs (24, 25, 26) all showed declines in 2008, as did the southern-most BMUs (44, 45, 52).
Table 13	Harvest rates for each BMU, calculated from harvest/estimated population size, point to areas with apparent overharvest (BMUs 26 & 45). Most areas show consistent harvest rates even with reduced harvests because population estimates have declined.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1990–2010.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Permit applications	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]
Permits available	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500
Licenses purchased (total)	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689
Quota area [b]	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086
Quota surplus/military [b]												235	209	2554	1356	1591	1561	526	233	77[c]	83[c]
No-quota area [b]	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520
% Licenses bought [d]																					
Of permits available [d]	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6
Of permits issued [d]									84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2	73.8	74.5
Estimated no. hunters [e]	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200
Harvest	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699
Harvest sex ratio (%M) [f]	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59
Success rate (%) [g]																					
Total harvest/hunters	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29
Quota harvest/licenses	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008: *n* = 528, 2009 *n* = 835; 2010 *n* = 1194).

[b] Quota area established in 1982. No-quota area 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. Total licenses = quota + quota surplus + no-quota + military (no permit needed) + youth.

[c] Free licenses for 10 and 11 year-olds were available beginning 2009 (2009: *n* = 45; 2010: *n* = 86), and included here with military licenses.

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3). 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.

[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%) and 2009 (95.3%).

[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 2001–2010 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2010, 38 hunters took more than 1 bear (34 took 2 bears on NQ license, 4 took 1 quota and 1 NQ bear [on 2 separate licenses]): thus, the 2699 bears were taken by 2661 different hunters, so success = 2661/9200 = 29%.

Fig. 1. Relationship between hunting success (note inverted scale), hunter-days per bear killed, and hunter numbers, 1983–2010. Red horizontal lines show mean hunting success for periods with <9000 hunters vs >12,000 hunters. Other variation in hunting success is mainly attributable to food conditions.

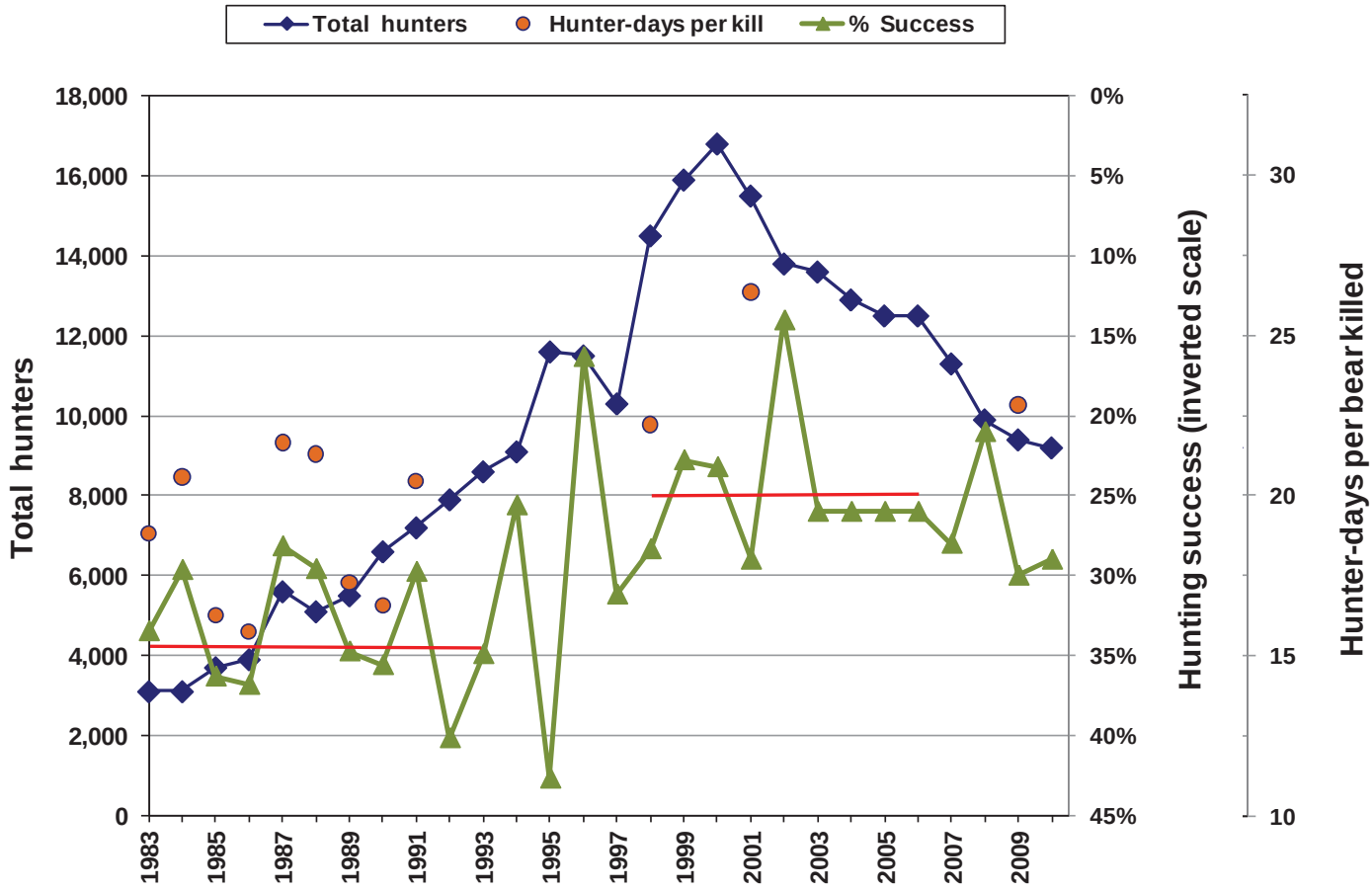


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

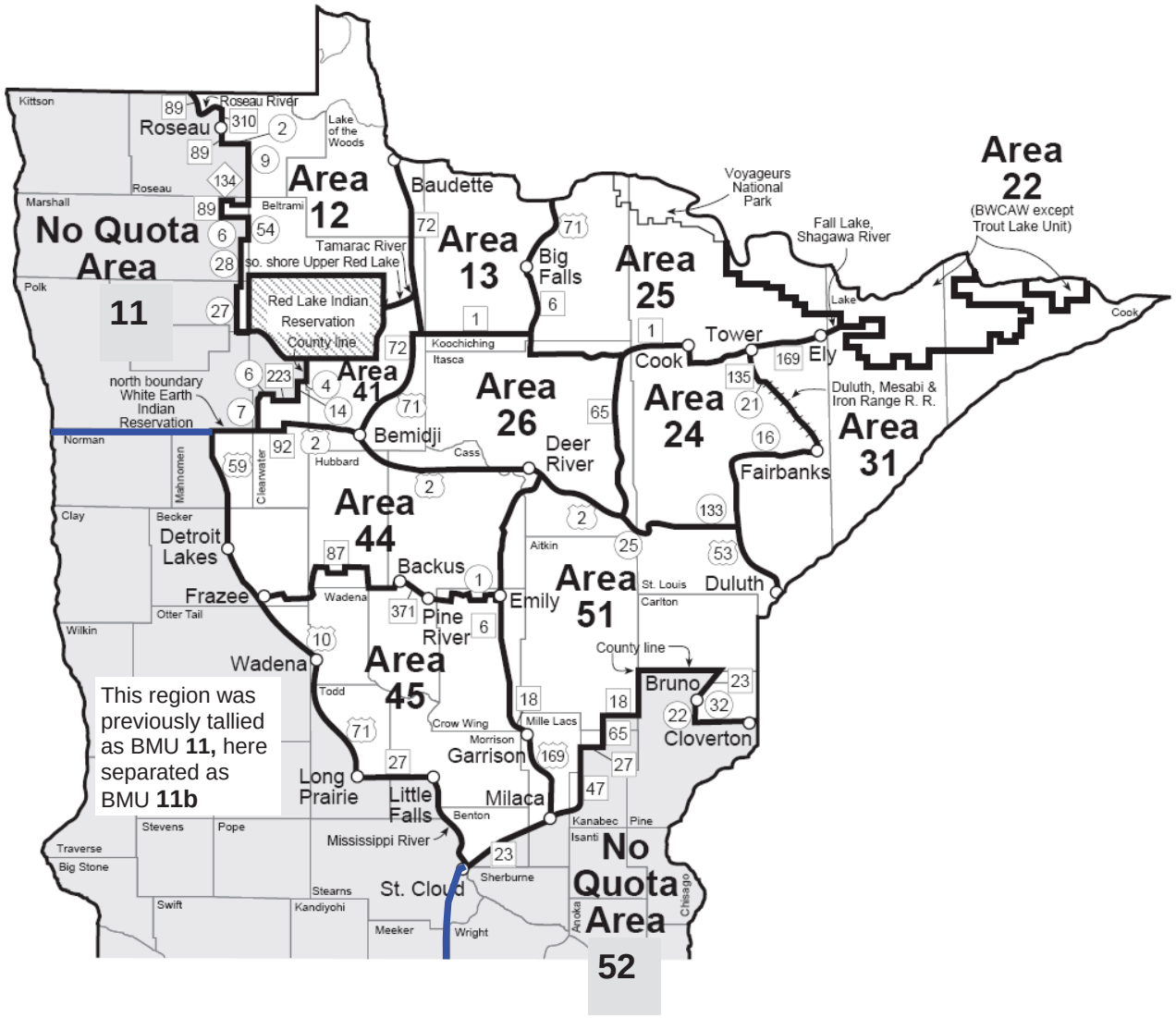


Table 2. Number of bear hunting permits available per year, 2006–2010 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2010	2009	2008	2007	2006
12	450	450	450	500	550
13	600	600	650	700	800
22	100	150	150	150	150
24	550	650	750	900	1000
25	1200	1250	1550	1700	1900
26	900	1000	1150	1250	1500
31	1300	1300	1700	1900	2100
41	400	400	400	400	450
44	1100	1100	1350	1500	1700
45	400	600	1000	1200	1200
51	2500	2500	2700	3000	3500
Total	9500	10000	11850	13200	14850

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2006–2010[a]. Shaded values indicate undersubscribed areas (none in 2010).

BMU	2010		2009		2008		2007		2006	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	903	5[c]	876		857		811		1005	
13	753		700		709		745		680	120 100%
22	114		91	0[b]	85	50 77%	87	51 81%	92	58 100%
24	971		843		825		742	159 100%	624	367 98%
25	1811	5[c]	1694		1793	4[c]	1799		1789	112 100%
26	1959		1874		1999	2[c]	2028		1915	
31	2414		2423		2388	3[c]	2383		2290	
41	718		685		656		577		683	
44	2923		2787		2821		2669		2838	
45	937		941		873	128 100%	936	266 100%	840	360 100%
51	3950	1[c]	3822		3828		3568		2969	531 100%
Total	17453[d]		16736[d]		16834[d]	178 92%	16345	476 98%	15725	1548 ~100%

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[C] Courtesy licenses issued by Commissioner, not actual surplus.
[d] Beginning in 2008, applicants could apply for area 99 in order to receive preference, but not buy a license; these are not included in this total.

Table 4. Percentage of lottery applicants with preference level 1 (1st-year applicant) that were drawn for a bear permit, 2006–2010. All preference level 2 applicants were drawn, except as indicated.

BMU	2010	2009	2008	2007	2006
12	23	29	37	46	43
13	77	84	92	94	100
22	88	100	100	100	100
24	49	75	91	100	100
25	60	72	86	94	100
26	15	32	43	53	72
31	35	43	68	79	92
41	31	37	47	59	56
44	0[a]	3	26	38	44
45	24	61	100	100	100
51	52	58	67	84	100

[a] 90% of preference level 2 applicants selected.

Table 5. Minnesota bear harvest tally[a] for 2010 by Bear Management Unit (BMU) and sex compared to harvests during 2005–2009 and record high harvests.

	2010											
BMU	M	(%M)	F	U	**Total**	**2009**	**2008**	**2007**	**2006**	**2005**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	72	(76)	23	0	95	140	101	124	70	165	120	263 (01)
13	89	(57)	66	0	155	149	129	163	151	205	159	258 (95)
22	5	(56)	4	0	9	7	7	15	15	8	10	41 (89)
24	68	(55)	56	0	124	151	100[b]	134	194	144	145	288 (95)
25	197	(64)	110	0	307	344	298[b]	369	421	404	367	584 (01)
26	128	(55)	104	0	232	228	137[b]	315	314	285	256	513 (95)
31	217	(60)	146	0	363	384	248[b]	398	482	445	391	697 (01)
41	36	(51)	35	0	71	104	77	104	40	104	86	201 (01)
44	122	(49)	126	0	248	255	196	333	192	273	250	643 (95)
45	30	(52)	28	0	58	42[c]	72	113	118	107	90	178 (01)
51	294	(59)	207	0	501	416	344	557	721	505	509	895 (01)
Total	1258	(58)	905	0	2163	2220	1709	2625	2718	2759[d]	2406	4288 (01)
No Quota[e]												
11	114	(64)	64	0	178	315	172	324[f]	114	334	252	351[d] (05)
11b[g]	8	(73)	3	0	11	9	3	4	6	1	5	
52	204	(59)	142	1	347	257	251	219	400	223	270	400 (06)
Total	326	(61)	209	1	536	581	426	547	520	581[d]	531	678 (95)
State	1584	(59)	1114	1	**2699**	2801	2135	3172	3290[d]	3340[d]	2948	4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes sometimes differs from the registered sex (2010: 1876 [96%] unchanged; 43 $M_{(reg)} \rightarrow F_{(tooth)}$; 28 F→M). Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2010: 1981 of 2699 = 73%). Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally:

Year	Quota area	No-quota area
2005	179	31
2006	63	15
2007	27	9
2008	23	4
2009	19	14
2010	20	8

[b] Lowest harvest since 1996.

[c] Second lowest harvest in this BMU, since it was established in 1994.

[d] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value does not match column total because BMU data were uncorrected for lost registration data.

[e] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 28 in 2006, 27 in 2007, 14 in 2008, 3 in 2009, 14 in 2010). 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, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[f] Second highest harvest for this area. Third highest was 321 bears in 2001.

[g] Subset of BMU 11 south of the main harvest area (Fig 2). Harvest trend increasing.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2005–2010.

BMU	Mean success 2005-2009	2010		2009		2008		2007		2006		2005[b]	
		% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]
Quota	26	30		30		21		28		25		25	
12	33	30		39		32		36		19		41	
13	29	34[d]		32		28		31		24		32	
22	12	14		16[d]		8		14		14		10	
24	23	29		31[e]		20		20		25		20	
25	31	34		36		28[f]		31		30		30	
26	30	34		31		17[f]		36		30		34	
31	30	36		38[d]		21[f]		28		33		31	
41	28	25		34		27		35		13		31	
44	24	28		30		21		30		16		24	
45	12	21[e]		11[f]		11[f]		14		14		13	
51	23	27		23		19		27		28		18	
No Quota	21	20	(7)[g]	22[h]	(9)	17[f]	(9)	19	(12)	22	(9)	23	(10)
Statewide	25	27		28[d]		20		26		25		25	

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area since 2002.

[d] Highest success since 1997

[e] Highest success since 1995.

[f] Lowest success since 2002.

[g] Of the no-quota hunters in 2010, 11 took 2 bears in BMU 11 and 23 took 2 bears in BMU 52.

[h] Success rates in different parts of the no-quota area (Fig. 1) are not distinguishable from harvest records because the number of people that hunted in each BMU is unknown. However, a hunter survey conducted following the 2009 hunting season indicated the following success rates: BMU 11 – 42%; BMU 11b – 17%; BMU 52 – 19%. These values are not directly comparable to values tabulated here due to a non-response bias in the survey (non-successful hunters are less likely to respond; respondents indicated overall success rate of 31% vs 22% calculated from harvest/licenses); nevertheless, they reflect differences in success rates among these BMUs that year (notably a year when harvest was high in BMU 11).

Table 7. Cumulative bear harvest (% of total harvest) by date, 1990–2010.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56 [a]	70	87
1997	Mon		76	88	97
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	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	92
2009	Tue		74	86	96
2010	Wed		69	84	96

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

Table 8. Number of people participating in nuisance bear survey, 1990–2010.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28
2010	36	40	33	27	28	23	16

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 9. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1990–2010, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of personnel participating in survey [a]	81	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51	40
Complaints examined on site	1890	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65	70
Complaints handled by phone [b]							959	2196	743	987	618	660	550	424	507	451	426	380	452	535	514
Total complaints received							1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600	584
• % Handled by phone							74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%
Bears killed by:																					
• Private party or DNR	321	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23	22
• Hunter before season [c]																					
– from nuisance survey	69	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4	3
– from registration file	50	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15	10
• Hunter during/after season [d]	21	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0	0
• Permittee [e]		20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	3	5
Bears translocated	358	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2	2
• % bears translocated [f]	19	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3	3
Bears killed by cars [g]	74	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18	28

Table 9 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Tallies of complaints handled by phone were made only during the indicated years.

[c] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data.

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

[e] 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.

[f] Percent of on-site investigations resulting in a bear being captured and translocated.

[g] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2010 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

Table 10. Bear food index values for five survey areas (see map below) in northern Minnesota's bear range, 1984–2010. Pink-shaded values indicate particularly low index values (<45); green-shaded values indicate particularly high index values (≥70).

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

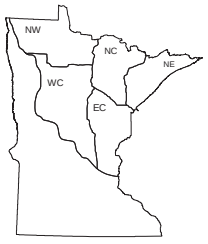


Table 11. Index values of bear food abundance[a] in 2010 compared to the previous 26-year mean (1984-2009) in 5 survey areas across Minnesota's bear range. Pink-shaded values indicate low fruit abundance and green-shaded values indicate high fruit abundance (≥1 point different than average).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	26yr mean	2010 *n* = 10[b]	26yr mean	2010 *n* = 13	26yr mean	2010 *n* = 10	26yr mean	2010 *n* = 5	26yr mean	2010 *n* = 7	26yr mean	2010 *n* =36[b]
SUMMER												
Sarsaparilla	4.4	5.2	6.0	4.3	5.4	6.0	4.6	4.0	5.7	5.3	5.1	5.0
Pincherry	3.2	4.4	4.4	4.8	4.1	3.9	4.0	2.6	3.8	3.7	3.9	4.0
Chokecherry	5.5	6.8	5.2	8.2	4.3	7.4	5.6	3.4	4.6	5.0	5.1	6.5
Juneberry	4.8	6.6	4.8	4.0	4.8	4.5	3.7	2.8	4.0	3.7	4.4	4.6
Elderberry	1.4	1.0	3.2	3.4	3.5	4.5	3.2	2.3	3.2	4.0	3.0	3.2
Blueberry	5.0	6.1	5.3	8.8	4.8	8.3	3.6	6.2	3.7	4.0	4.4	6.7
Raspberry	6.6	7.5	8.1	9.5	8.0	9.3	7.1	6.0	7.1	6.4	7.3	8.1
Blackberry	1.3	0.0	2.3	2.0	1.0	2.0	3.4	3.7	4.4	2.9	2.8	2.6
FALL												
Wild Plum	2.0	1.9	1.8	1.9	0.9	2.3	2.7	1.8	2.3	3.8	2.1	2.2
HB Cranberry	5.2	5.8	4.3	5.1	3.5	4.8	3.7	3.4	3.6	3.6	4.0	4.7
Dogwood	5.9	9.7	5.8	6.0	5.0	5.0	5.8	6.0	6.1	4.1	5.7	6.3
Oak	3.3	6.2	2.8	3.1	1.5	3.7	5.8	5.4	5.8	4.4	4.3	4.9
Mountain Ash	1.5	2.0	2.5	4.8	4.5	6.1	1.8	2.0	2.2	3.7	2.6	4.3
Hazel	6.3	7.7	7.7	8.9	7.2	9.0	8.2	7.4	8.0	6.3	7.5	7.6
TOTAL	56.4	70.9	64.2	75.0	58.5	76.8	63.2	57.0	64.5	60.8	62.2	70.6

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

[b] *n* = Number of surveys used to calculate each area-specific mean index value for 2010.

[C] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 12. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2010. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥8.0, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 3. Productivity of key fall bear foods in Minnesota's bear range, 2010.

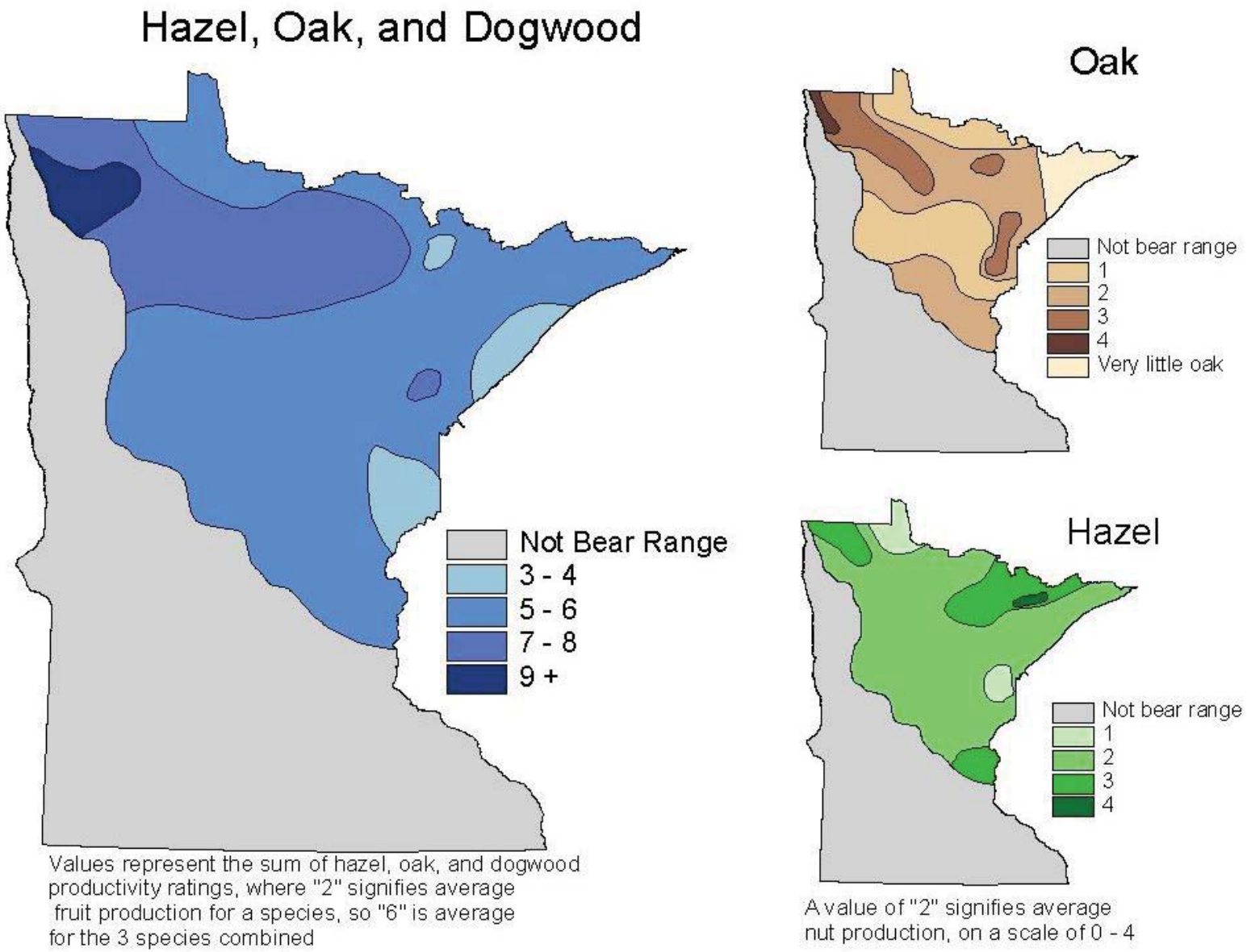


Fig 4. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984–2010 (R^2=0.86); (bottom graph) 2000–2010 (R^2=0.96).

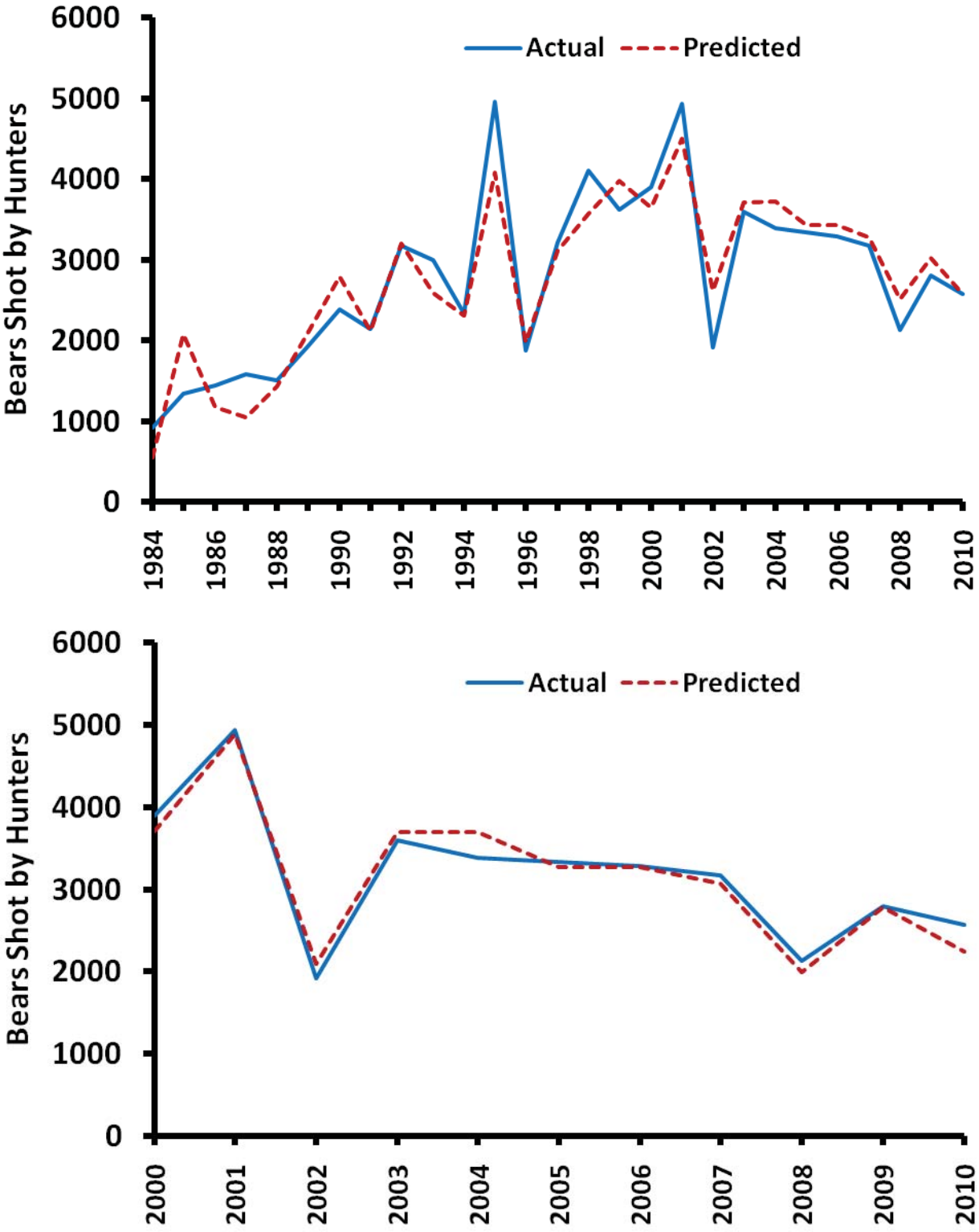


Fig 5. Sex ratios of harvested bears by BMU, 2004–2010.

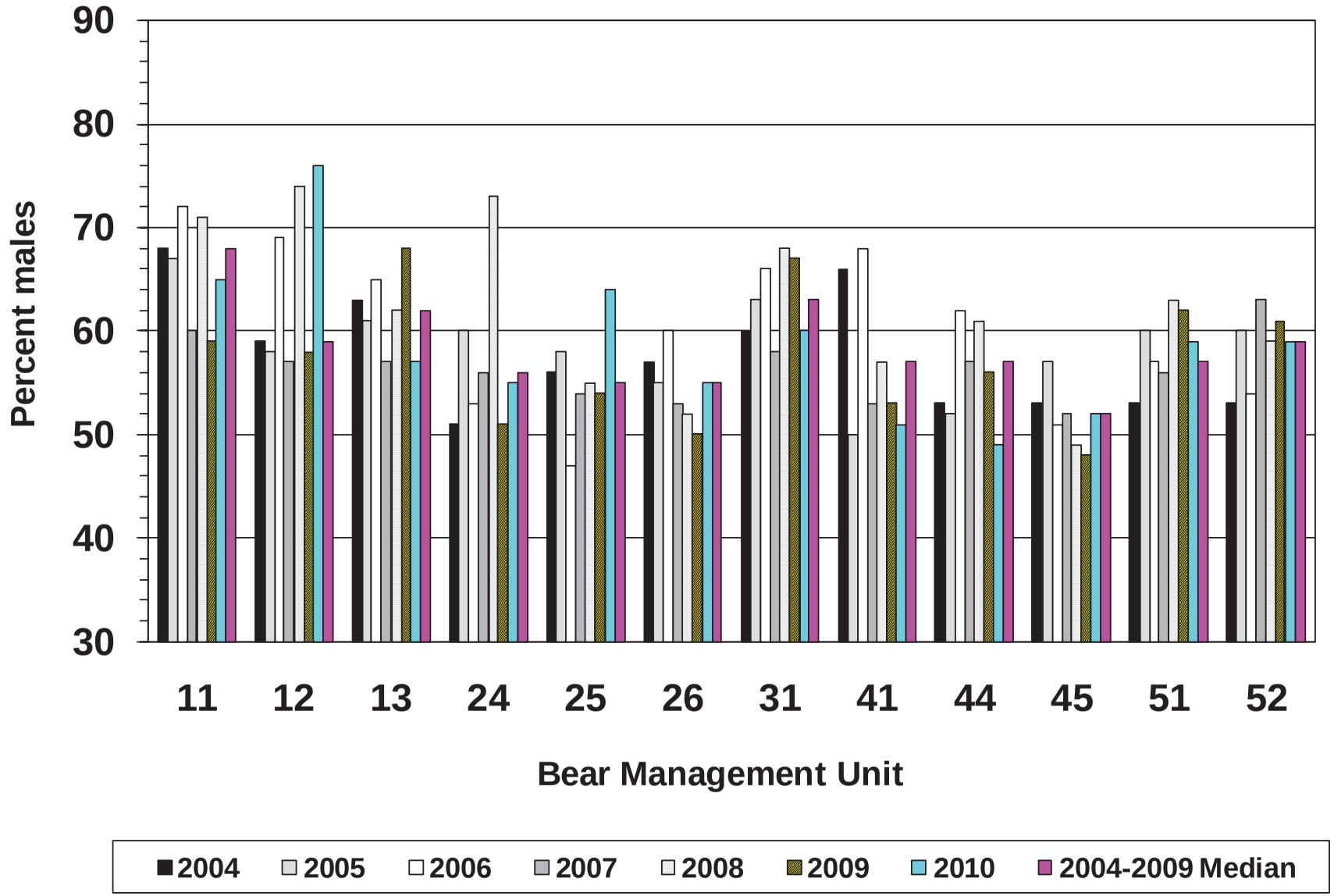


Fig 6. Median ages of harvested female bears by BMU, 2004–2010.

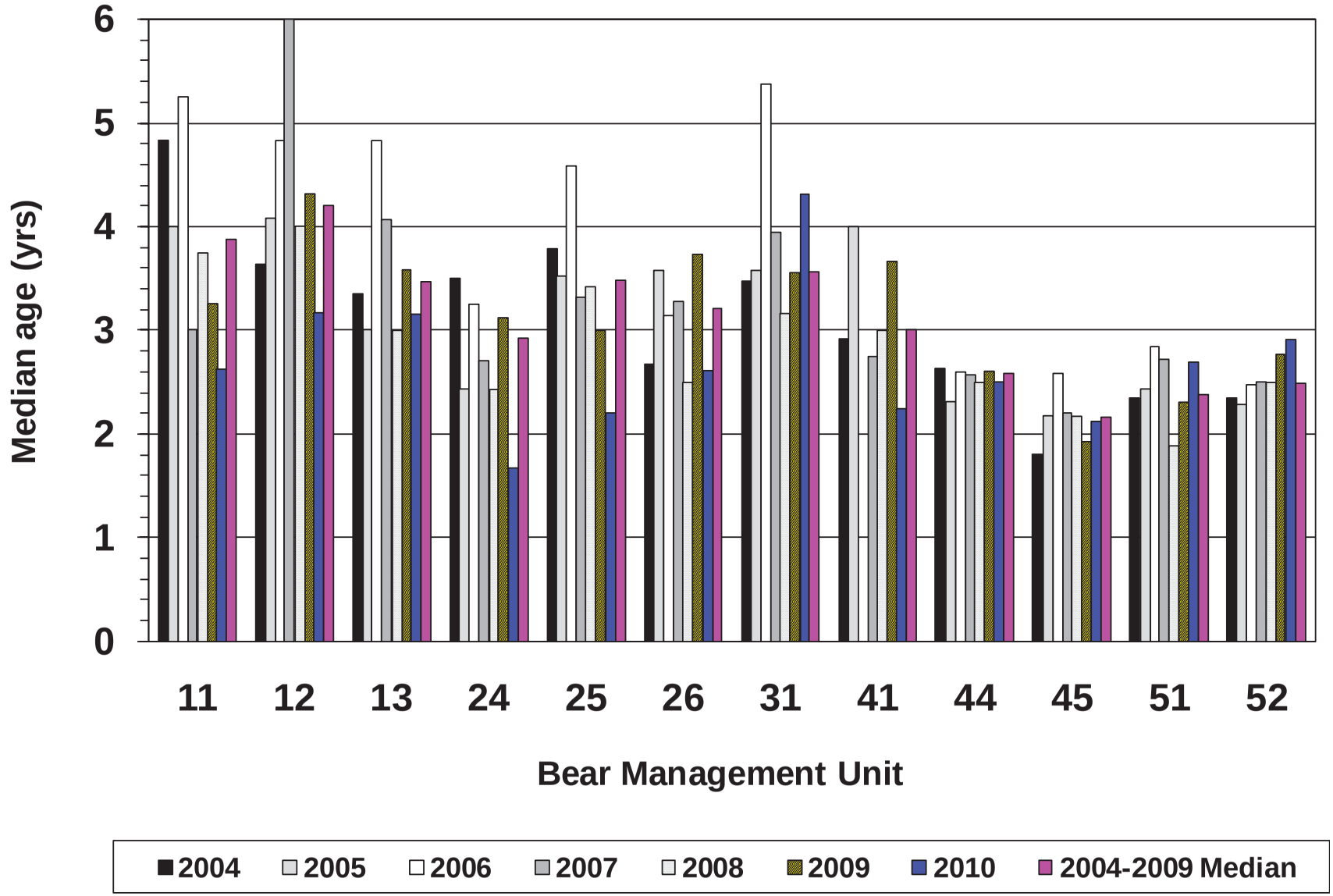


Fig. 7. Statewide harvest structure: median ages (yrs) by sex, 1982–2010.

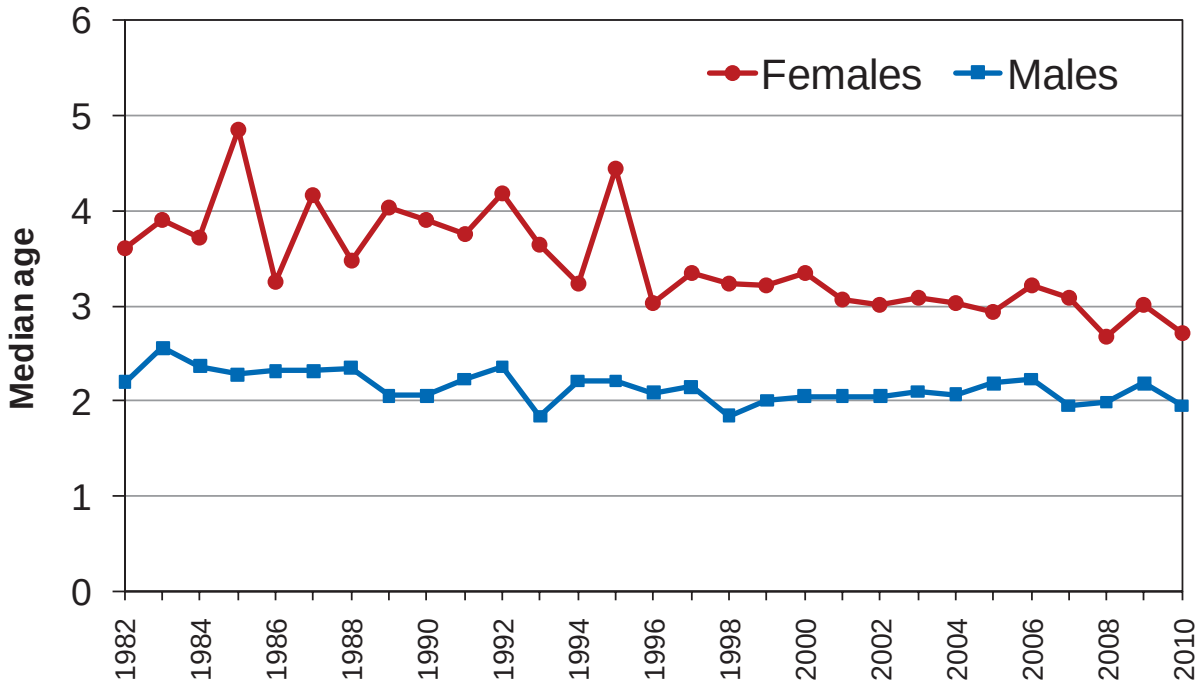


Fig. 8. Statewide harvest structure: proportion of each sex in age category, 1982–2010. Trend lines are significant.

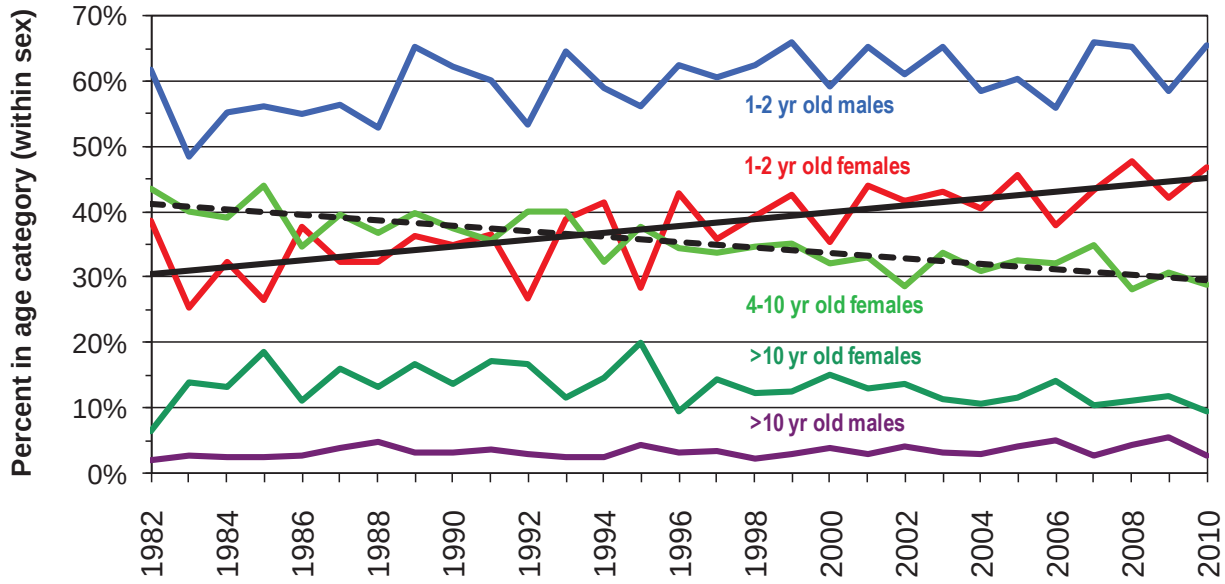


Fig. 9. Statewide population estimates derived from tetracycline marking in 1991, 1997, 2002, and 2008. Each cluster of estimates pertains to the year of marking, with each point (and associated 95% CI) representing a different recapture sample (yr 1 = year of marking, yr 2 = year after marking). Simulation modeling suggested that estimates derived from samples pooled from multiple years (yellow squares),or the mean estimate from multiple years and yr 2 samples (red circles), are likely to be most accurate; a red trend line is drawn through the points presumed to be most accurate.

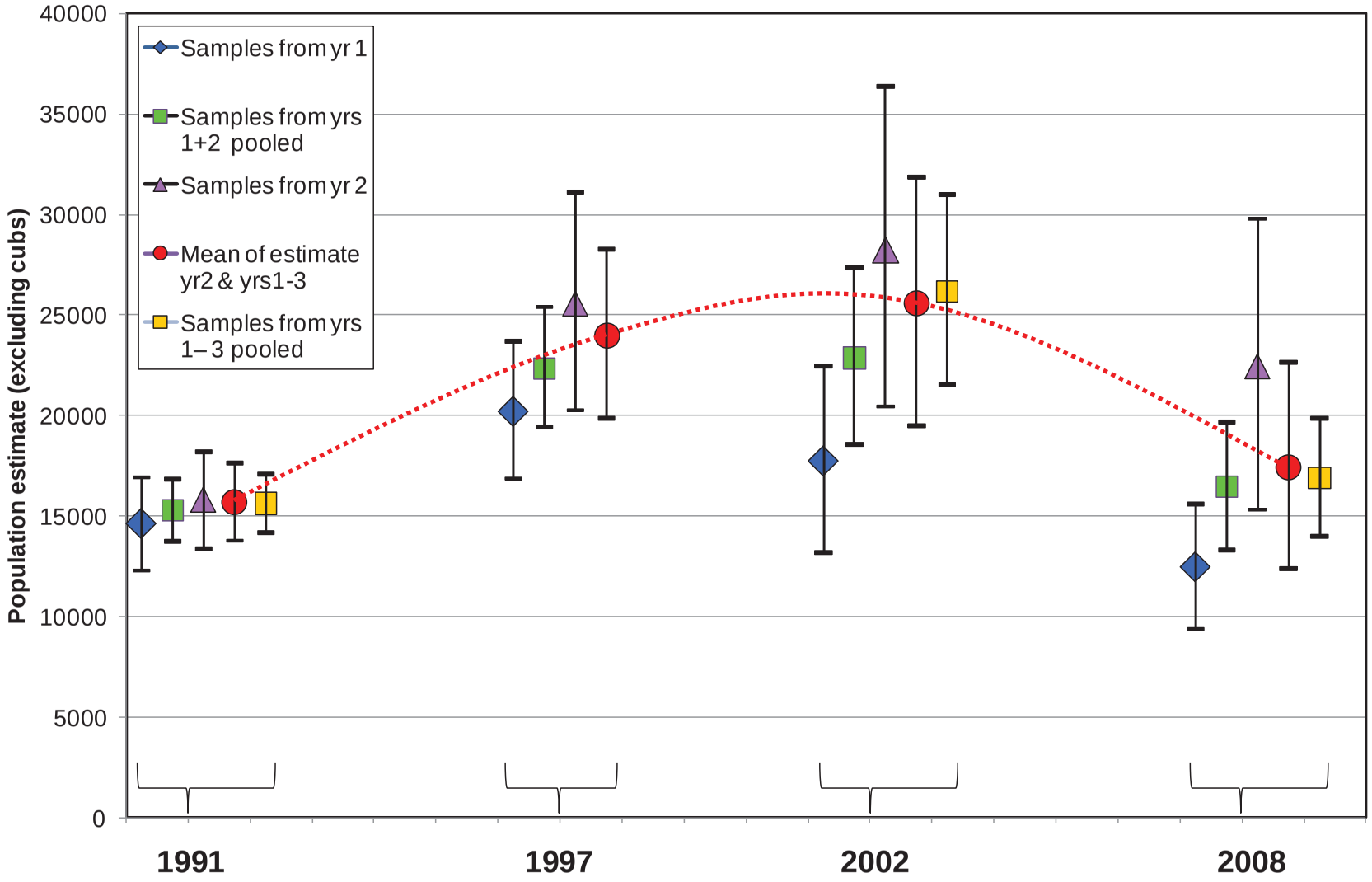
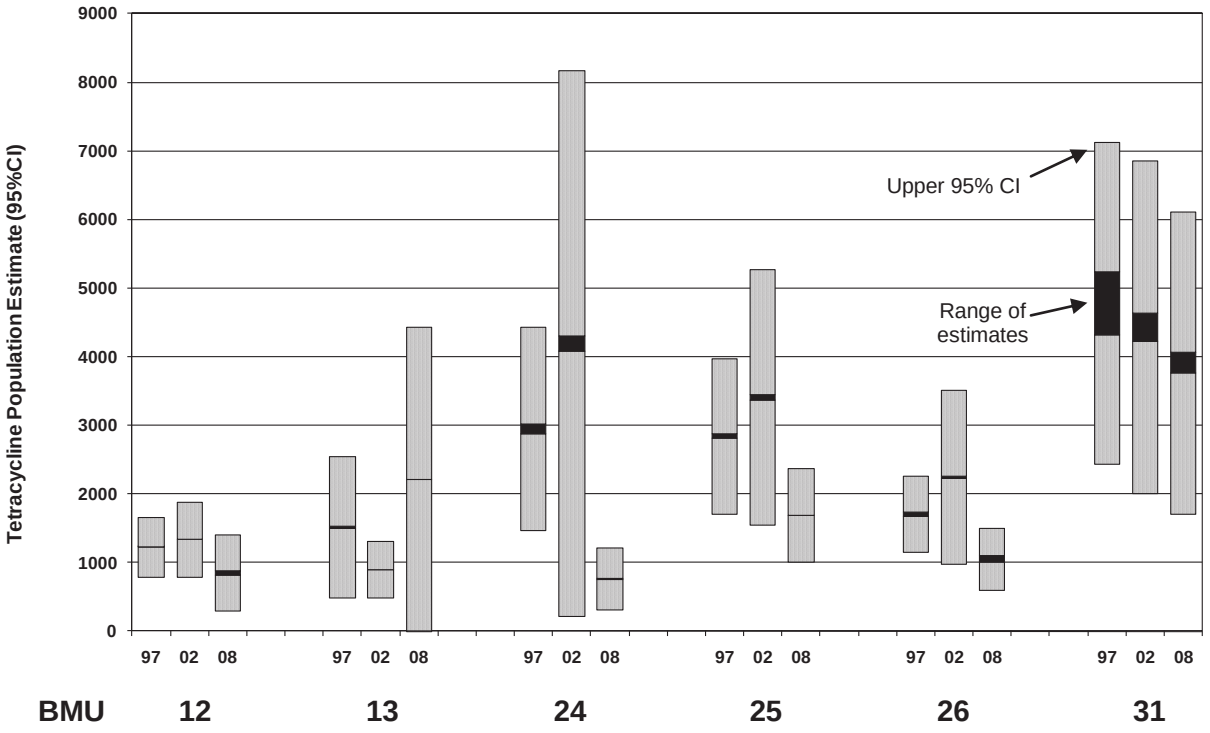


Fig. 10. Population estimates by BMU derived from tetracycline marking, based on pooled sample recoveries over 2–3 years (1997-1998, 2002-2004, 2008-2010), with estimates applicable to the year of marking (1997, 2002, 2008).



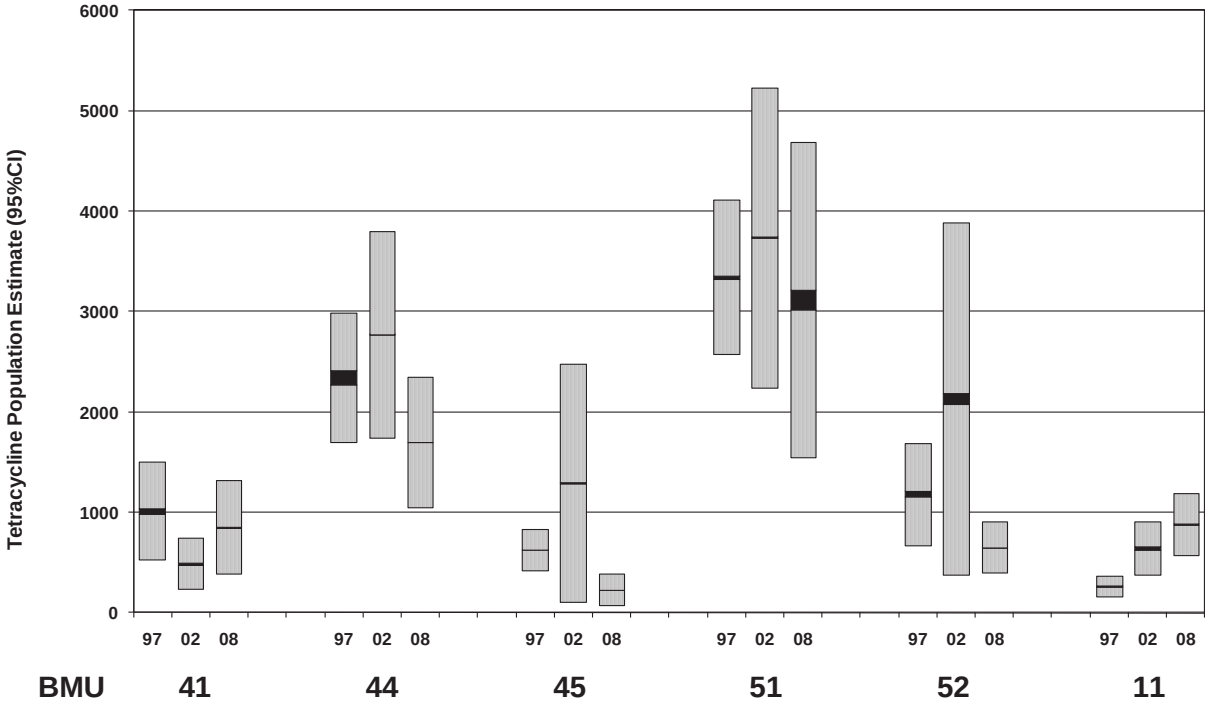


Table 13. Estimated harvest rates derived from tetracycline estimates. Extreme variation in harvest rates among years within BMUs (last 3 columns), or harvest rates that are unreasonably high or low, are probably indicative of flawed tetracycline estimates for either 2002 or 2008, or both (e.g., BMUs 13, 24, 45, 52).

BMU	2002 Tet estimate	2008 Tet estimate	2003–2007 mean harvest	2008–2010 mean harvest	2003–2007 derived harvest rate[a]	2008–2010 derived harvest rate[a]	2010 derived harvest rate[a]
12	1300	800	140	112	10%	14%	12%
13	900	2100	180	144	20%	7%	7%
24	4100	700	169	125	4%	17%	17%
25	3400	1700	450	316	13%	19%	18%
26	2200	1000	307	199	14%	20%	23%
31	4300	3800	449	332	10%	9%	9%
41	500	800	86	84	18%	10%	8%
44	2800	1700	305	233	11%	14%	15%
45	1300	200	120	57	9%	25%	25%
51	3700	3100	599	420	16%	14%	16%
Quota zone	24300	15900	2838	2031	12%	13%	14%
11	600	900	232	229	37%	26%	22%
52	2100	600	273	285	13%	44%	54%
Statewide	26000	17000	3358	2545	13%	15%	16%

[a] Harvest rate derived from registered harvest/tet-based population estimate (point estimate).

STATUS OF MINNESOTA BLACK BEARS, 2011

Final Report to Bear Committee

February 13, 2012

Dave Garshelis & Karen Noyce

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	Permit applications for bear licenses in 2011 increased to the highest level in 9 years. This may have been in response to the diminished number of permits available. The estimated number of hunters in the field (9,100) was equal to that of 1994, and not much different than 2010 (9,200). However, the total harvest (2,131) was lower because success rate (23%) was low. Success rate is generally higher with reduced numbers of hunters, but declines with abundant natural foods. Harvest sex ratios of >60% male (the case this year) tend to be indicative of abundant natural foods.
Tables 2 & Fig. 2	Normally, >25% of quota area licenses are not purchased, and this is factored into the allocation of permits. However, a new procedure was established this year to ensure that all licenses that were not purchased by permittees would be available for purchase by unsuccessful lottery applicants. Accordingly, permits were reduced in all areas by about 25% so the number of hunters would remain about the same. Prior to this reduction, permits were reduced in only one area (BMU 24).
Table 3	Only BMU 22 (BWCAW) was undersubscribed. However, all quota areas had unpurchased licenses, which went on sale Aug 4. All (1,373) were purchased within 24 hours.
Table 4	As permit allocations were significantly reduced in all BMUs over the past 5 years, the percentage of applicants drawn in the lottery diminished. In 2011, >50% of 1st-year applicants were selected in only 2 BMUs (13, 22). Three BMUs (26, 44, 45) required a drawing among 2nd-year applicants (55–77% were selected).
Table 5	Harvests were equivalent to the previous 5-year average in 3 BMUs (11, 12, 22) and lower than average in all other BMUs. Especially low harvests occurred in the southern BMUs: 44 & 45 (lowest since these were established in 1994), 51 (lowest since 1991), and 52 (lowest since 2002).
Table 6	Hunting success was much higher in the northern parts of the bear range than in the southern parts of the range. Success rates <20% occurred in BMUs 41, 44, 45 & 51, whereas success ≥30% occurred in BMUs 12, 24, 25 & 31. BMU 24 had the highest hunter success since 1992. Conversely, BMUs 44 and 51 had the lowest success since 2002. Hunting success varies geographically and year-to-year with abundance of natural foods, hunter density, and bear density.
Table 7	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. These percentages tend to be lower during years with more abundant fall foods. In 2011, 65% and 78% of the harvest occurred after weeks 1 and 2, respectively.

Tables 8-9	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was low, probably because complaints were very low. For the first time since records have been kept on both phoned-in complaints as well as on-site visits, >90% of complaints were handled by phone. Only 37 complaints prompted an on-site visit, the lowest recorded since this survey began in 1981. Likewise, a record low number of nuisance bears (n=9) were reported killed by DNR personnel or private parties (other than hunters) this year, and a record low number were killed in car collisions.
Tables 10-12 & Fig. 3	Blueberry and raspberry production were lower than normal in the northwest and north-central parts of the state. Other summer foods were variable, but tended to be near normal overall. Fall foods (particularly oak and dogwood) were highly productive in the east-central (EC) and west-central (WC) regions, explaining the low hunting success there. Surprisingly, though, hunting success was even lower than in 2008 in most of this area (BMUs 41, 44 & 51), yet the fall food index (combined ratings for oak, hazel and dogwood) in 2011 was equivalent to 2008 in the WC and lower than 2008 in the EC. However, a strong band of fall foods cut through those BMUs with especially low hunting success. Notably, hunting success in each of these BMUs was not nearly as low as in 2002, when the fall food index was especially high. Abundance of fall foods does not seem to explain this year's high hunting success in BMU 24.
Fig. 4	A combination of two key factors, fall food abundance and number of hunters, accounts for 84% of the yearly variation in the bear harvest since 1984 and 95% of the variation in harvest since 2000. These regression models predicted a slightly higher harvest in 2011 than actually occurred.
Fig. 5	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). In 2011, record high harvest sex ratios (%M) occurred in BMUs 12 & 45. In BMU 45, this may be indicative of a population recovery attributable to reduced hunting pressure since 2009. BMU 12 has shown extreme year-to-year swings in harvest sex ratios. BMUs 51 & 52 show the least year-to-year variability.
Fig. 6-8	Statewide, ages of harvested females declined dramatically during the 1980s–90s, as evidenced by a declining median age and increasing proportion of the harvest composed of 1–2 year-olds. However, the trend during the past decade has been equivocal: median age of harvested females has remained at about 3.0 years old (3.1 in 2011) and the proportion of the female harvest composed of 1–2 year olds has remained near 44% (44% in 2011). Male harvest ages have been younger (~60% were 1–2 years old) and less variable. Female harvest ages have been youngest and least variable in the southern BMUs (44, 45, 51, 52). As with harvest sex ratio, extreme variation in harvest ages have occurred in BMU 12 (especially in 2011).

Fig. 9-10	Ages of harvested bears accumulated over 32 years were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting). This was scaled upwards (to include bears that died of other causes), using tetracycline mark–recapture estimates as a guide. Whereas both the tetracycline and reconstructed populations showed an increase during the 1990s, followed by a decline during the 2000s, the shapes of the 2 trajectories differed. Therefore, it was impossible to match the curve from the reconstruction to all 4 tet-based estimates, so several curves were scaled to differing degrees to intersect different sets of tet-estimates. Both the tetracycline and age-reconstructed estimates showed a population decline of ~30% from 2001 to 2008. Males and females showed somewhat different trajectories, with female numbers dropping earlier (late 1990s) and more precipitously than males (early 2000s), resulting in a population that is now less female-biased than it was a decade ago. Recent data (2009) shows a possible population increase (due to reduced harvests), but this is uncertain. Reconstructed populations rely on several years of age data, so population estimates for 2010 and 2011 are not yet available.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1991–2011.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Permit applications	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]	19184[a]
Permits available	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050[b]
Licenses purchased (total)	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555
Quota area [c]	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684
Quota surplus/military [c]											235	209	2554	1356	1591	1561	526	233	77[c]	83[c]	1385
No-quota area [c]	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486
% Licenses bought																					
Of permits available [d]	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	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
Of permits issued [d]								84.4	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
Estimated no. hunters [e]	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9100
Harvest	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131
Harvest sex ratio (%M) [f]	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59	61
Success rate (%)																					
Total harvest/hunters [g]	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29	23
Quota harvest/licenses	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30	24

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626).

[b] Permits reduced because of a new procedure in 2011 that ensures that all available licenses are purchased (see Table 2).

[c] Quota area established in 1982. No-quota area 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 July 31. Free licenses for 10 and 11 year-olds were available beginning 2009 (2009 = 45; 2010 = 86; 2011 = 72 [including surplus youth]). Youth licenses included here with surplus and military licenses. Total licenses = quota + quota surplus + no-quota + military (no permit needed) + youth.

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3). 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, all unpurchased licenses were put up for sale, and all 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%) and 2009 (95.3%). The estimated no. of hunters in 2011 may be under-estimated because a large no. of people bought surplus licenses 1 month before the season, so they were more apt to hunt.

[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 2001–2011 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2011, 52 hunters took >1 bear (49 took 2 bears on NQ license, 2 hunters took 1 bear on NQ + 1 on quota license, 2 took 2 bears on NQ and 1 on quota license): thus, the 2131 bears were taken by 2078 different hunters, so success = 2078/9100 = 23%.

Fig. 1. Relationship between hunter numbers and hunting success (note inverted scale), 1983–2011. Red horizontal lines show mean hunting success for periods with <9000 hunters vs >12,000 hunters. Large variation in hunting success is also attributable to food conditions.

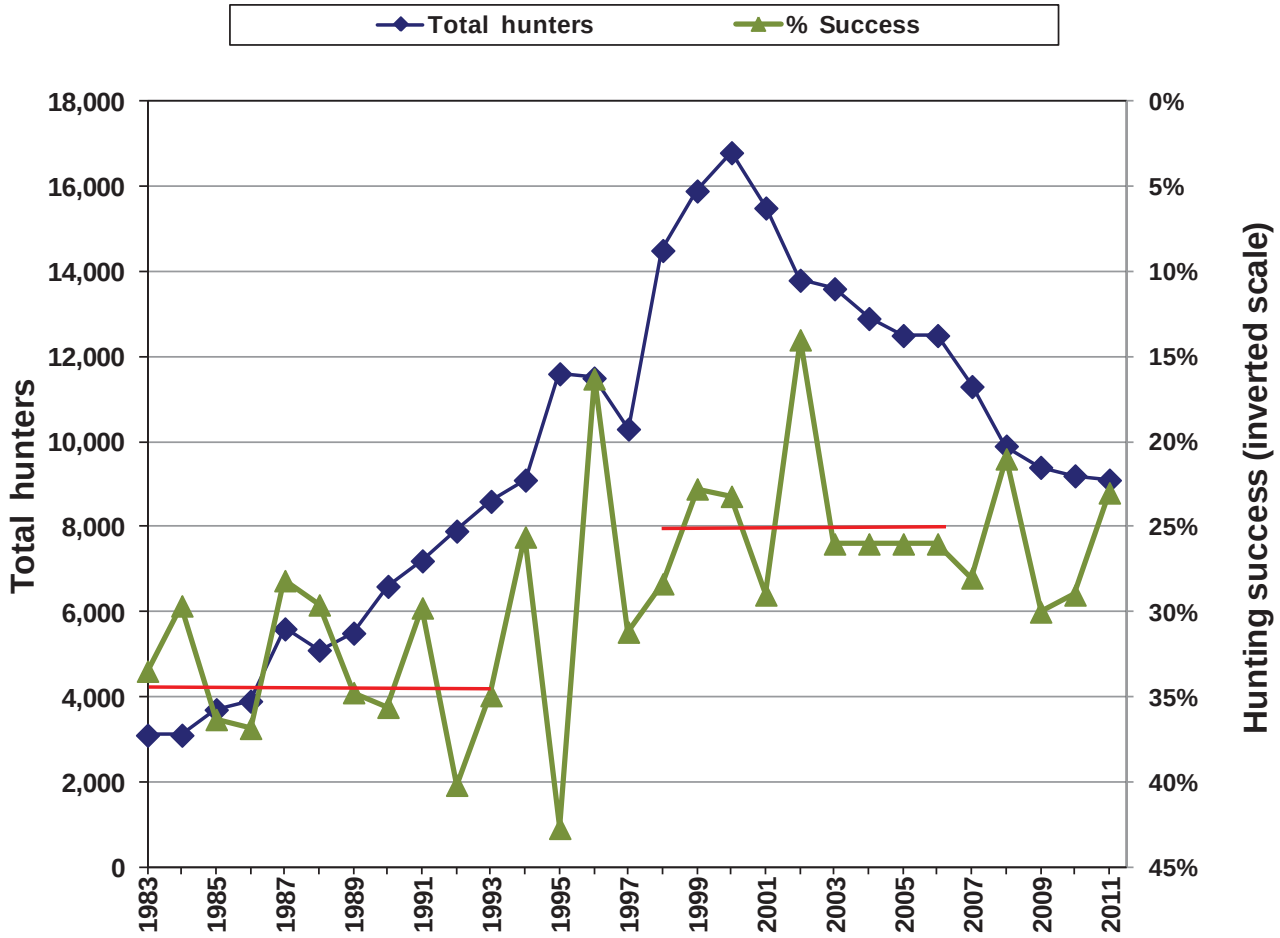


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

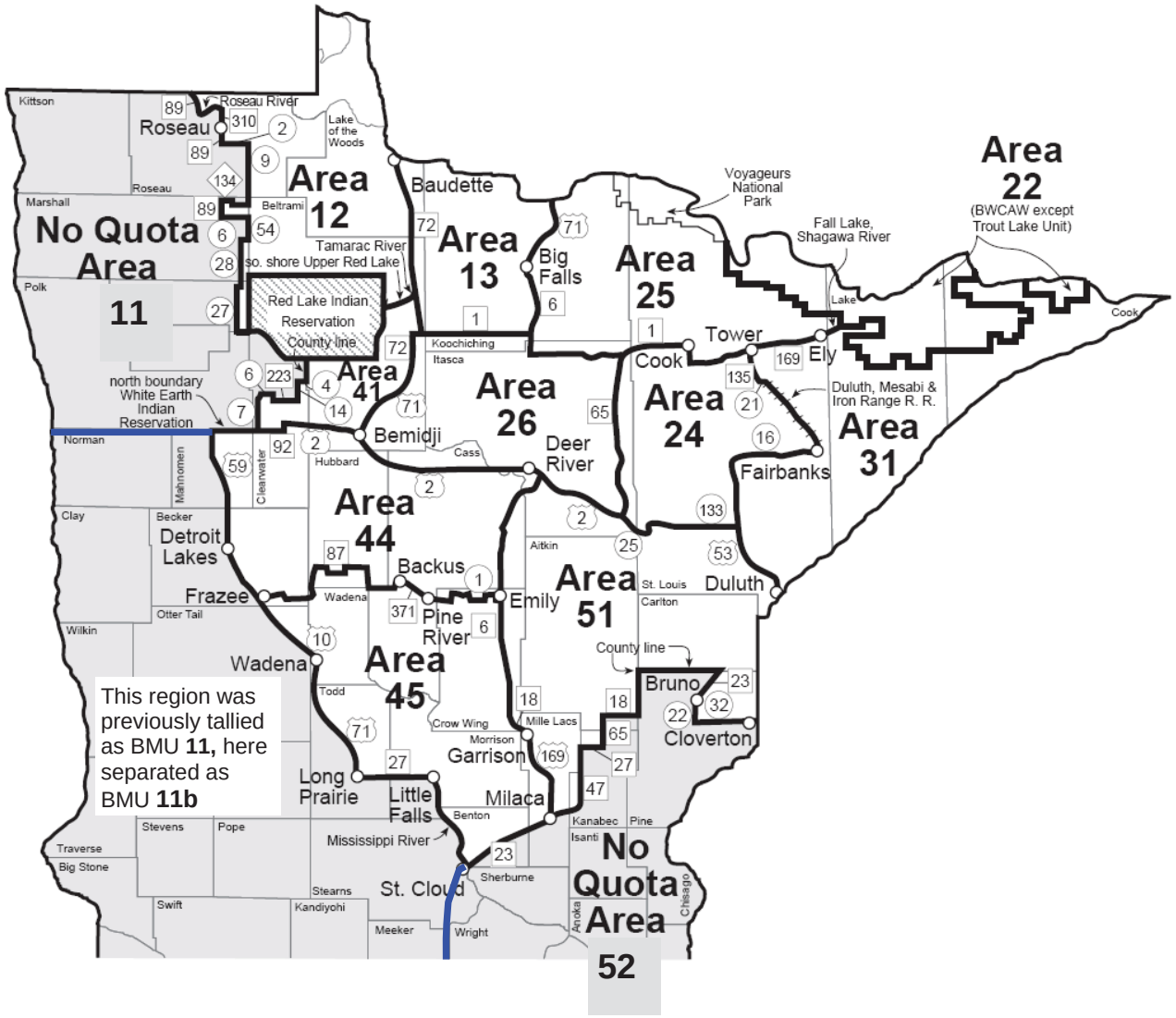


Table 2. Number of bear hunting quota area permits available, 2007–2011 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2011		2010	2009	2008	2007
	After reduct.[a]	Before reduct.				
12	350	450	450	450	450	500
13	450	600	600	600	650	700
22	100	125	100	150	150	150
24	350	500	550	650	750	900
25	900	1200	1200	1250	1550	1700
26	650	900	900	1000	1150	1250
31	1000	1300	1300	1300	1700	1900
41	300	400	400	400	400	400
44	850	1100	1100	1100	1350	1500
45	250	400	400	600	1000	1200
51	1850	2500	2500	2500	2700	3000
Total	7050	9475	9500	10000	11850	13200

[a] Prior to 2011, <75% of permittees purchased a license (Table 1). This was factored into the allocation of permits. In 2011, under a new procedure, all licenses not purchased by permittees were sold (Table 3). In order not to increase the number of hunters, 2011 permit allocations were reduced by the mean percentage of licenses that were purchased in each BMU in 2009–2010. The table shows the permit allocation before and after this reduction.

Table 3. Number of bear hunting permit applicants and surplus licenses bought, 2007–2011[a]. Shaded values indicate undersubscribed areas.

BMU	2011[b]			2010		2009		2008			2007		
	Apps	Bought license	Surplus bought	Apps	Surplus	Apps	Surplus	Apps	Surplus	bought	Apps	Surplus	bought
12	834	267	84	903	5[c]	876		857			811		
13	751	366	84	753		700		709			745		
22	90	71	31	114		91	0[d]	85	50	77%	87	51	81%
24	918	294	56	971		843		825			742	159	100%
25	1763	712	190	1811	5[c]	1694		1793	4[c]		1799		
26	1894	512	139	1959		1874		1999	2[c]		2028		
31	2505	826	174	2414		2423		2388	3[c]		2383		
41	688	253	47	718		685		656			577		
44	3010	697	154	2923		2787		2821			2669		
45	1019	208	42	937		941		873	128	100%	936	266	100%
51	4086	1478	372	3950	1[c]	3822		3828			3568		
Total	17558[e]	5684	1373	17453[e]		16736[e]		16834[e]	178	92%	16345	476	98%

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] In 2011, all licenses not purchased by permittees were sold as "surplus". Surplus = Permits available (Table 2) minus Bought license (±2 to account for groups applying together).
[c] Courtesy licenses issued by Commissioner, not actual surplus.
[d] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[e] 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 this total.

Table 4. Percentage of lottery applicants with preference level 1 (1st-year applicant) that were drawn for a bear permit, 2007–2011. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn, in which case the success of preference level 2 applicants is shown parenthetically.

BMU	2011	2010	2009	2008	2007
12	2	23	29	37	46
13	51	77	84	92	94
22	100	88	100	100	100
24	14	49	75	91	100
25	35	60	72	86	94
26	0 (77)	15	32	43	53
31	11	35	43	68	79
41	6	31	37	47	59
44	0 (55)	0 (90)	3	26	38
45	0 (67)	24	61	100	100
51	25	52	58	67	84

Table 5. Minnesota bear harvest tally[a] for 2011 by Bear Management Unit (BMU) and sex compared to harvests during 2006–2010 and record high harvests.

	2011											
BMU	M	(%M)	F	U	**Total**	**2010**	**2009**	**2008**	**2007**	**2006**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	84	(79)[c]	22	0	106	95	140	101	124	70	106	263 (01)
13	75	(63)	44	0	119	155	149	129	163	151	149	258 (95)
22	9	(82)	2	0	11	9	7	7	15	15	11	41 (89)
24	64	(52)	58	0	122	124	151	100	134	194	141	288 (95)
25	185	(58)	132	0	317	307	344	298	369	421	348	584 (01)
26	105	(63)	62	0	167	232	228	137	315	314	245	513 (95)
31	219	(61)	139	0	358	363	384	248	398	482	375	697 (01)
41	29	(54)	25	0	54	71	104	77	104	40	79	201 (01)
44	65	(50)	65	0	130[d]	248	255	196	333	192	245	643 (95)
45	23	(72)[c]	9	0	32[d]	58	42	72	113	118	81	178 (01)
51	171	(59)	117	0	288[e]	501	416	344	557	721	508	895 (01)
Total	1029	(60)	675	0	1704[f]	2163	2220	1709	2625	2718	2287	4288 (01)
No Quota [b]												
11	134	(61)	85	0	219	178	315	172	324	114	221	351[h] (05)
11b	1		2	0	3	11	9	3	4	6		
52	131	(64)	74	0	205[g]	347	257	251	219	400	295	400 (06)
Total	266	(63)	161	0	427	536	581	426	547	520	522	678 (95)
State	1295	(61)	836	0	**2131**	2699	2801	2135	3172	3290[h]	2819	4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes sometimes differs from the registered sex (2011: 1450 [97%] unchanged; 12 $M_{(reg)} \rightarrow F_{(tooth)}$; 38 F→M). Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2011: 1535 of 2131 = 72%). Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally:

Year	Quota area	No-quota area
2006	63	15
2007	27	9
2008	23	4
2009	19	14
2010	20	8
2011	11	2

[b] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 28 in 2006, 27 in 2007, 14 in 2008, 3 in 2009, 14 in 2010, 14 in 2011). 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, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[c] Record high sex ratio (%M).

[d] Lowest harvest since BMU was established in 1994.
[e] Lowest harvest since 1991.
[f] Lowest harvest since 1996.
[g] Lowest harvest since 2002.

[h] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value does not match column total because BMU data were uncorrected for lost registration data.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2006–2011.

BMU	Mean success 2006-2010	2011		2010		2009		2008		2007		2006	
		% Success	% 2 bears[b]	% Success	% 2 bears[b]	% Success	% 2 bears[b]	% Success	% 2 bears[b]	% Success	% 2 bears[b]	% Success	% 2 bears[b]
Quota	27	24		30		30		21		28		25	
12	31	30		30		39		32		36		19	
13	30	26		34[c]		32		28		31		24	
22	13	11		14		16[c]		8		14		14	
24	25	35[e]		29		31[d]		20		20		25	
25	32	35		34		36		28[f]		31		30	
26	30	26		34		31		17[f]		36		30	
31	31	36		36		38[c]		21[f]		28		33	
41	27	18		25		34		27		35		13	
44	25	15[f]		28		30		21		30		16	
45	14	13		21[d]		11[f]		11[f]		14		14	
51	25	16[f]		27		23		19		27		28	
No Quota	20	15[f]	(13)	20	(7)	22[h]	(9)	17[f]	(9)	19	(12)	22	(9)
Statewide	25	22		27		28[c]		20		26		25	

[a] 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] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area since 2002.

[c] Highest success since 1997 (until this year).

[d] Highest success since 1995 (until this year).

[e] Highest success since 1992.

[f] Lowest success since 2002 (until this year).

[g] Of the no-quota hunters in 2011, 30 took 2 bears in BMU 11 and 20 took 2 bears in BMU 52.

[h] Success rates in different parts of the no-quota area (Fig. 1) are not distinguishable from harvest records because the number of people that hunted in each BMU is unknown. However, a hunter survey conducted following the 2009 hunting season indicated the following success rates: BMU 11 – 42%; BMU 11b – 17%; BMU 52 – 19%. These values are not directly comparable to values tabulated here due to a non-response bias in the survey (non-successful hunters are less likely to respond; respondents indicated overall success rate of 31% vs 22% calculated from harvest/licenses); nevertheless, they reflect differences in success rates among these BMUs that year (notably a year when harvest was high in BMU 11).

Table 7. Cumulative bear harvest (% of total harvest) by date, 1990–2011.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56[a]	70	87
1997	Mon		76	88	97
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	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	92
2009	Tue		74	86	96
2010	Wed		69	84	96
2011	Thu		65	78	93

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

Table 8. Number of people participating in nuisance bear survey, 1990–2011.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1990	75	79	80	81	78	74	70
1991	82	83	87	85	82	85	67
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28
2010	36	40	33	27	28	23	16
2011	30	34	29	31	29	27	21

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 9. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1990–2011, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of personnel participating in survey [a]	87	85	88	86	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51	40	34
Complaints examined on site	935	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65	70	37 [h]
Complaints handled by phone [b]						959	2196	743	987	618	660	550	424	507	451	426	380	452	535	514	396 [h]
Total complaints received						1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600	584	433 [h]
• % Handled by phone						74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%	91%
Bears killed by:																					
• Private party or DNR	97	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23	22	9 [h]
• Hunter before season [c]																					
– from nuisance survey	14	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4	3	3
– from registration file	15	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15	10	5
• Hunter during/after season [d]	16	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0	0	0
• Permittee [e]	20	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	3	5	0
Bears translocated	214	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2	2	2
• % bears translocated [f]	23	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3	3	5
Bears killed by cars [g]	50	90	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18	28	15 [h]

Table 9 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Tallies of complaints handled by phone were made only during the indicated years.

[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] 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.

[f] Percent of on-site investigations resulting in a bear being captured and translocated.

[g] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2011 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

[h] Lowest since record-keeping began (1981 for on-site complaints, nuisance bears killed and car-kills). However, participation in this survey may have affected the results. In 2011, 2 known nuisance kills of radio-collared bears, which were handled by COs, were not tallied here because these 2 COs did not participate in this survey.

Table 10. Bear food index values for five survey areas (see map in lower right) in northern Minnesota's bear range, 1984–2011. Shaded boxes denote particularly low (<45; pink) and high (≥70; green) fruit abundance.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

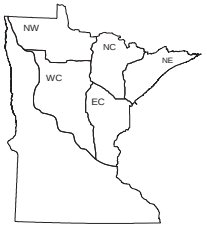


Table 11. Index values of bear food abundance[a] in 2011 compared to the previous 27-year mean (1985–2010) in 5 survey areas across Minnesota's bear range. Shaded values indicate particularly low (pink) and high (green) fruit abundance (≥1 point difference from mean for individual species, ≥5 point difference for total).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	27yr mean	2011 *n* = 11[b]	27yr mean	2011 *n* = 12	27yr mean	2011 *n* = 6	27yr mean	2011 *n* =12	27yr mean	2011 *n* = 7	27yr mean	2011 *n* =38[b]
SUMMER												
Sarsaparilla	4.4	7.0	5.9	7.2	5.4	4.8	4.6	6.7	5.7	4.3	5.1	6.0
Pincherry	3.2	3.3	4.5	3.5	4.1	3.7	4.0	2.7	3.8	4.4	3.9	3.7
Chokecherry	5.5	5.3	5.3	5.8	4.4	3.8	5.5	5.8	4.7	5.8	5.1	5.3
Juneberry	4.9	5.0	4.7	2.5	4.8	4.7	3.7	4.8	4.0	3.0	4.4	3.8
Elderberry	1.4	2.0	3.2	2.3	3.6	4.3	3.2	3.6	3.4	3.3	3.0	3.5
Blueberry	5.0	3.8	5.5	3.3	5.0	3.3	3.7	3.3	3.7	2.8	4.5	3.1
Raspberry	6.6	5.5	8.2	6.4	8.0	7.0	7.1	7.3	7.1	6.2	7.3	6.3
Blackberry	1.3	1.0	2.3	1.9	1.0	0.8	3.4	4.3	4.3	5.0	2.8	3.5
FALL												
Wild Plum	2.0	2.6	1.8	2.0	1.0	0.8	2.6	2.1	2.4	2.8	2.1	2.2
HB Cranberry	5.2	5.2	4.4	4.3	3.6	4.5	3.7	3.7	3.6	3.3	4.0	4.0
Dogwood	6.0	7.2	5.8	4.7	5.0	4.3	5.8	6.5	6.0	7.7	5.7	6.2
Oak	3.4	3.9	2.8	6.3	1.6	4.2	5.8	7.0	5.8	7.0	4.3	5.6
Mountain Ash	1.5	3.8	2.6	2.9	4.6	5.2	1.8	1.6	2.2	0.5	2.6	2.8
Hazel	6.3	5.9	7.7	6.6	7.3	6.6	8.2	7.3	7.9	6.3	7.5	6.4
TOTAL	56.7	61.4	64.7	59.6	59.1	57.9	63.1	66.7	64.5	63.5	62.2	62.5

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

[b] *n* = Number of surveys used to calculate each area-specific mean index value for 2011.

[C] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 12. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2011. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥8.0, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 3. Productivity of key fall bear foods in Minnesota's bear range, 2011.

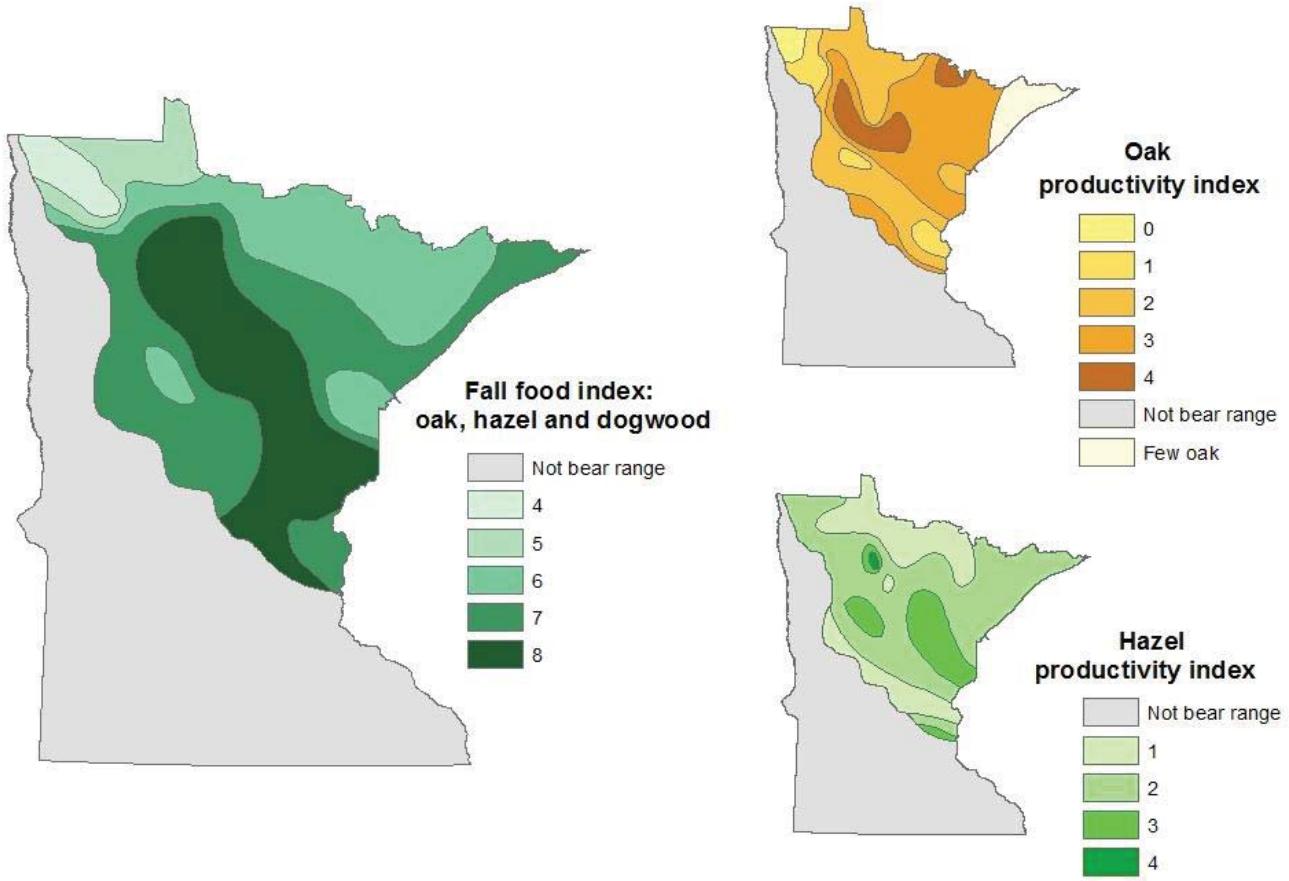


Fig 4. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984–2011 (R^2=0.84); (bottom graph) 2000–2011 (R^2=0.95).

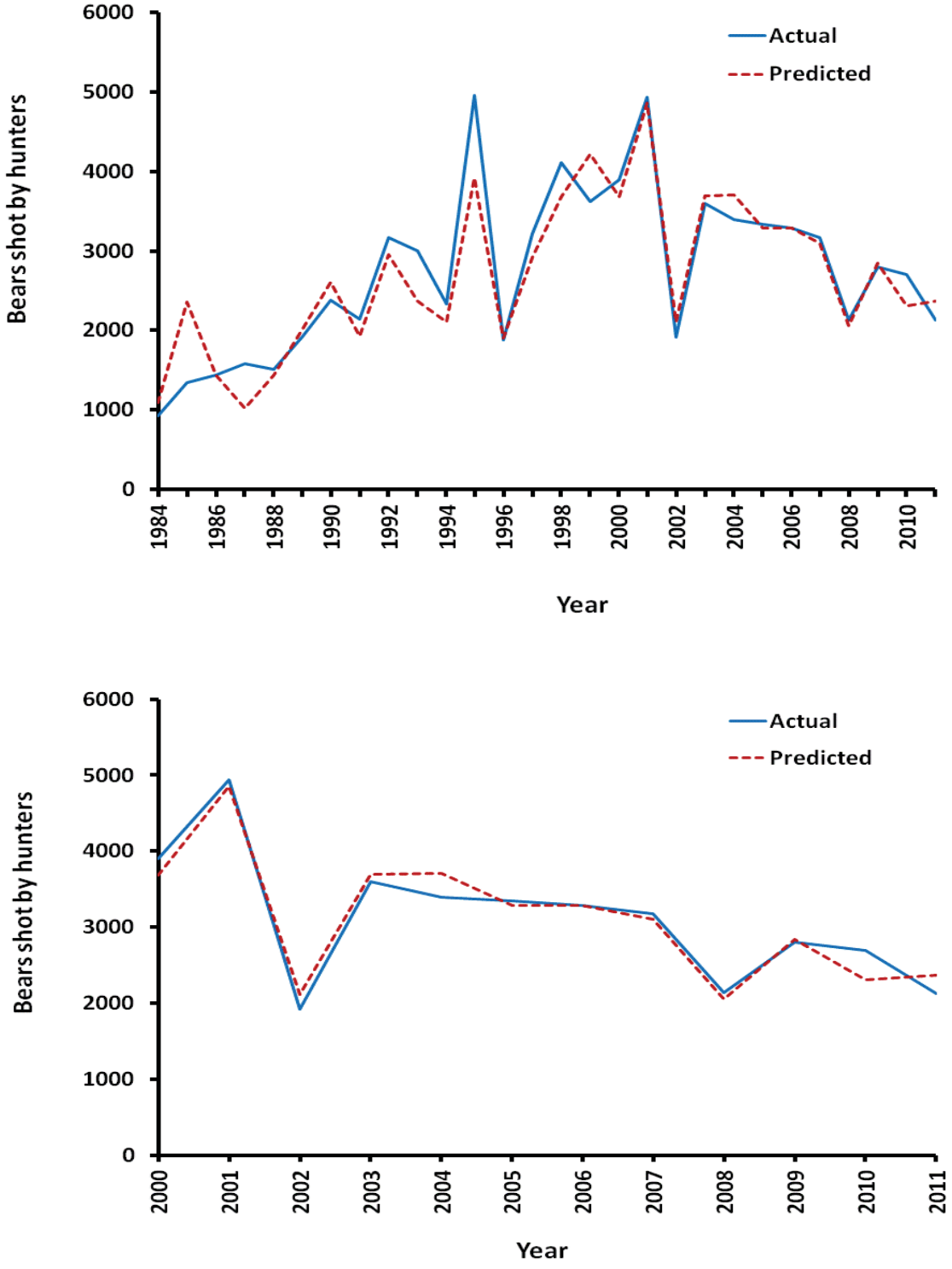


Fig 5. Sex ratios of harvested bears by BMU, 2005–2011.

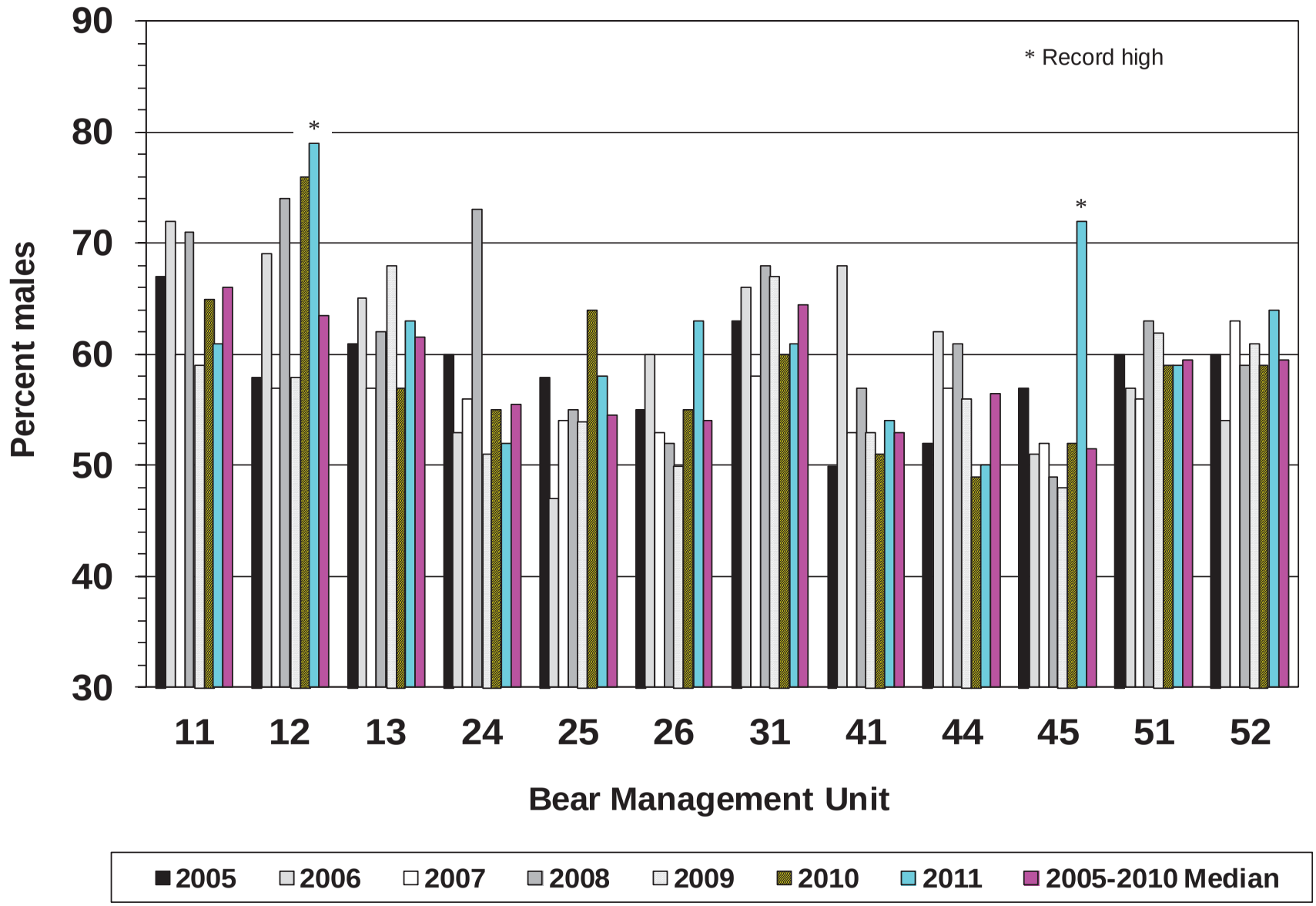


Fig 6. Median ages of harvested female bears by BMU, 2005–2011.

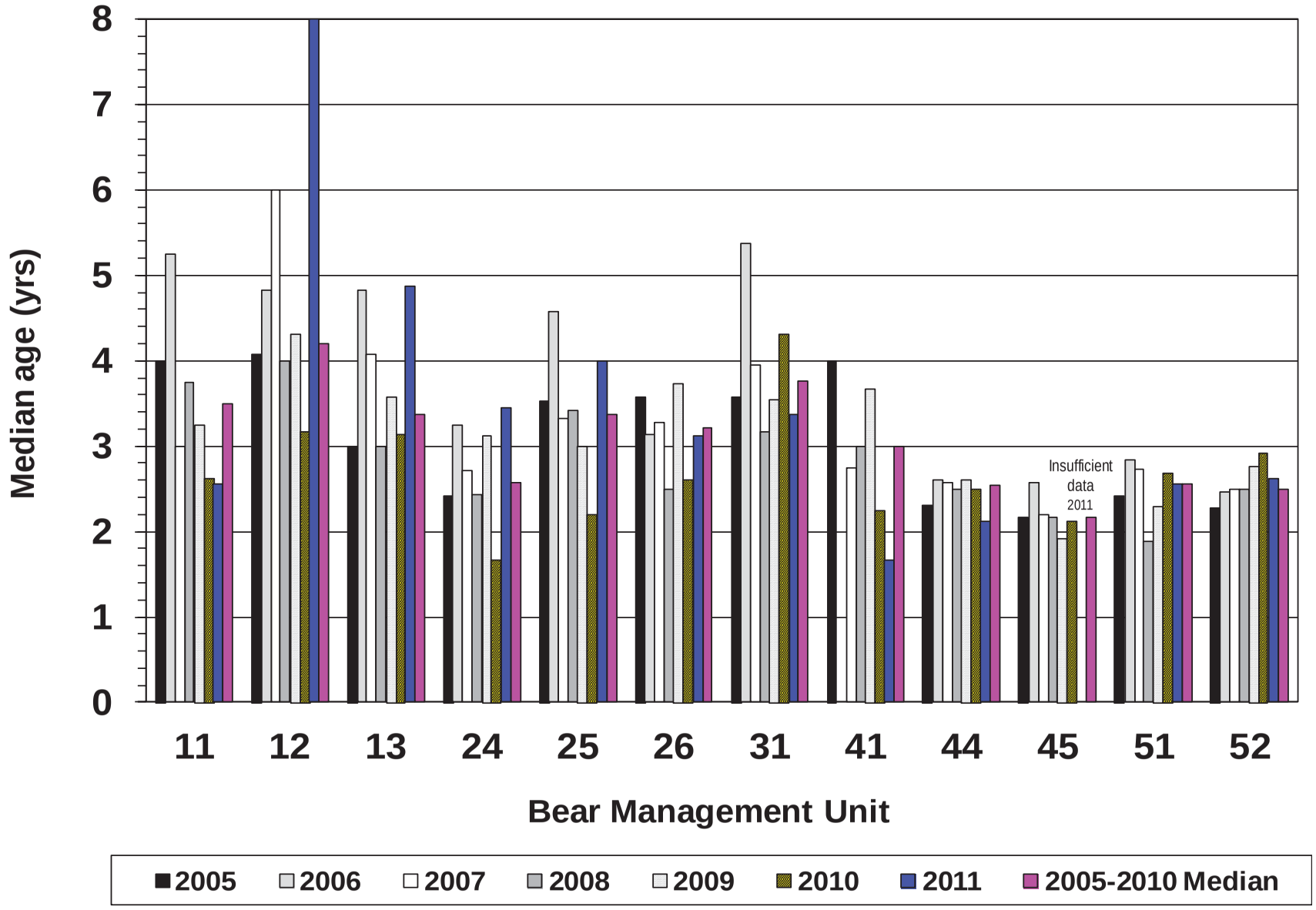


Fig. 7. Statewide harvest structure: median ages (yrs) by sex, 1982–2011.

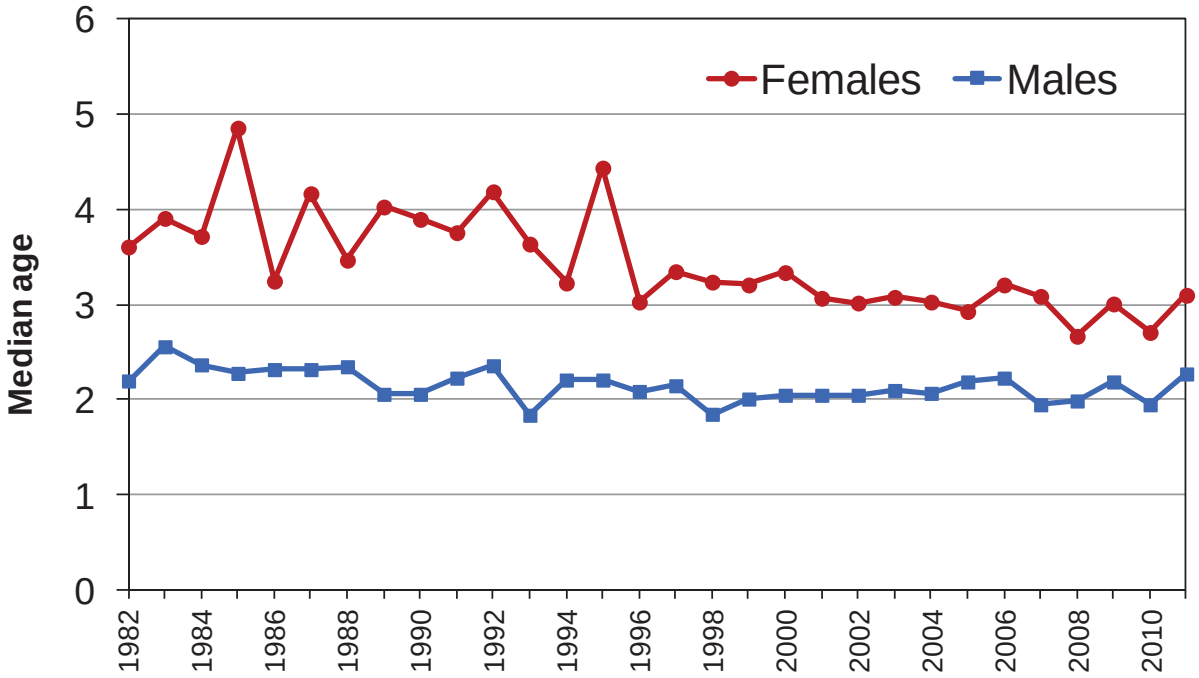


Fig. 8. Statewide harvest structure: proportion of each sex in age category, 1982–2011. Trend lines are significant.

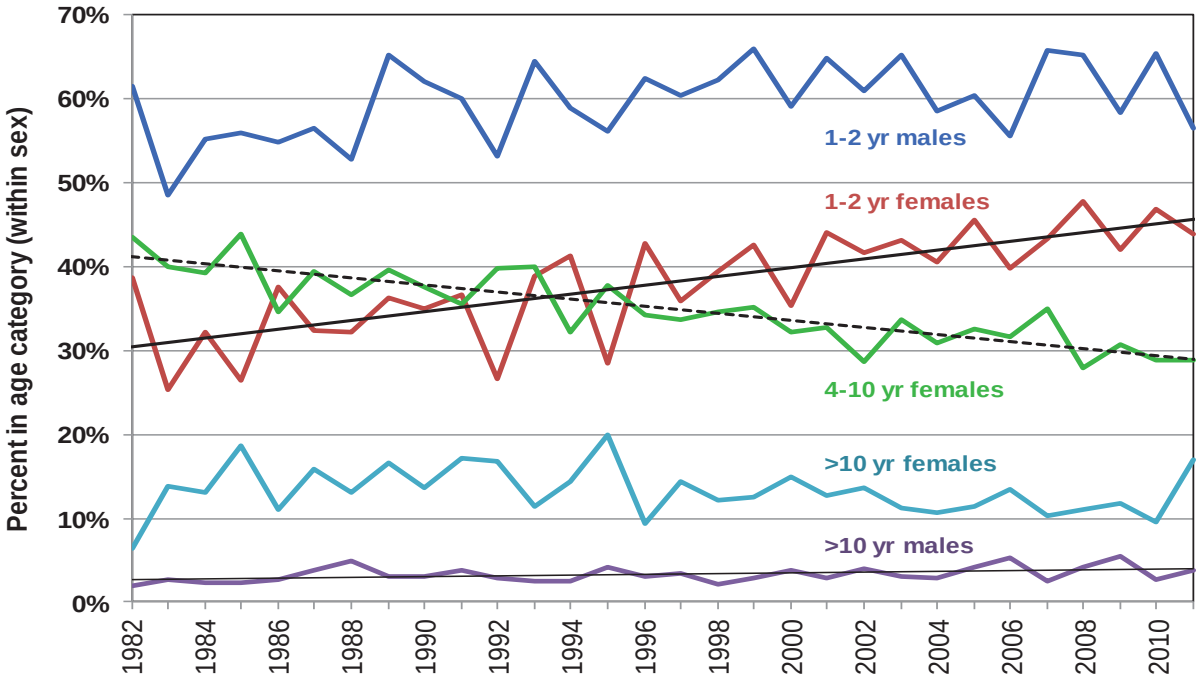


Fig. 9. Statewide population trend derived from Downing reconstruction using the harvest age structure. Curves were scaled (elevated) to various degrees to match the tetracycline-based mark–recapture estimates.

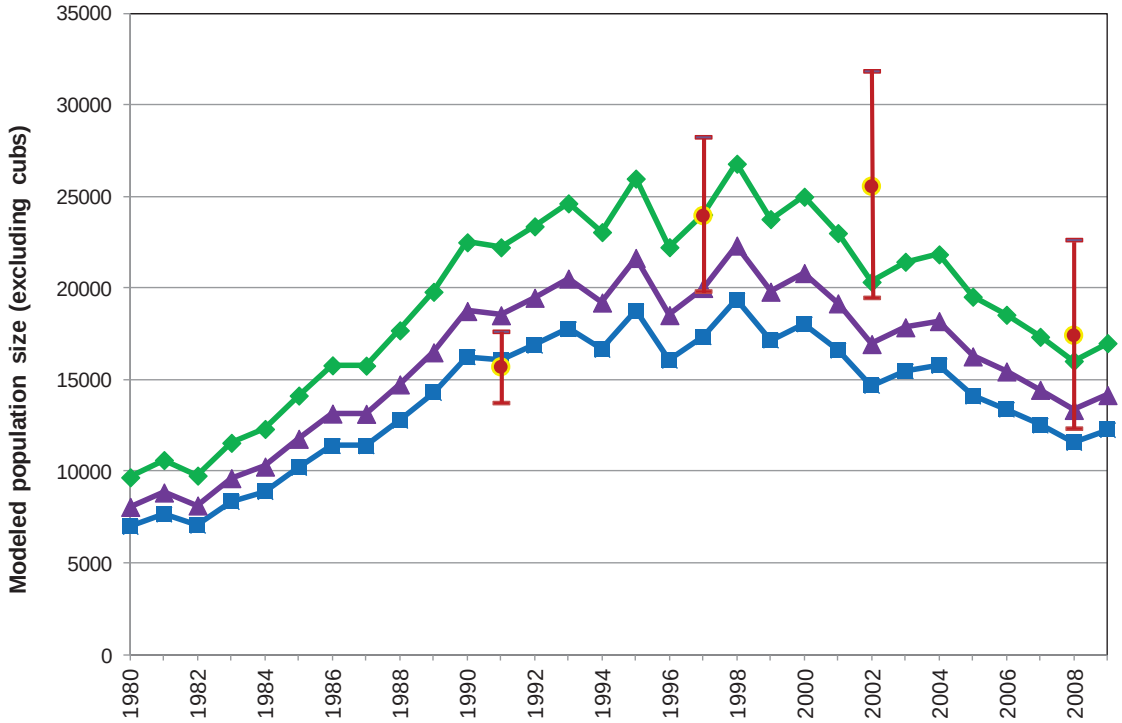
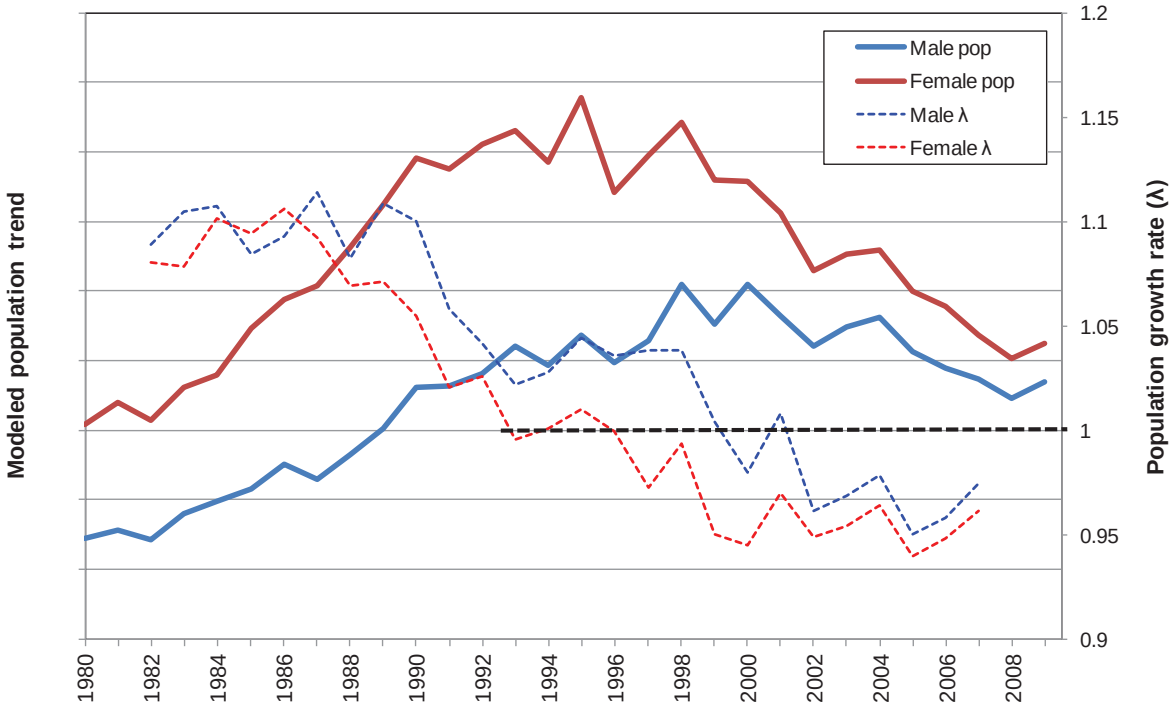


Fig. 10. Population trajectories (unscaled) of the male and female segments of the population derived from reconstructed harvest ages. Population grown rates (λ) are 5-year running averages of N_{t+1}/N_t (λ=1 is a stable population).



STATUS OF MINNESOTA BLACK BEARS

Final Report to Bear Committee

February 19, 2013

Dave Garshelis & Karen Noyce

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	Permit applications for bear licenses seem to have stabilized at a higher level during 2010-2012 than before that, when permit availability was higher. The reduced permit availability seems to have driven up sales of no-quota licenses, which were the highest on record in 2012.The estimated number of hunters in the field (8,600) was the lowest since 1993. However, the total harvest (2,604) was substantially higher than last year because success rate (30%) was up. Success rate may have increased in part due to reduced numbers of hunters (i.e., competition), and in part due to poorer fall foods.
Tables 2,3 & Fig. 2	This was the second year of a system whereby all available licenses for the quota area were sold (those not purchased by permittees selected in the lottery were purchased later as surplus). Number of available permits was reduced 15% from 2011 to 2012. All BMUs except 22 were reduced. BMU 22 was the only BMU undersubscribed.
Table 4	As permit allocations were significantly reduced in all BMUs over the past 5 years, the percentage of 1st-year applicants drawn in the lottery diminished. In 2008 and 2009, some 1st-year applicants (preference level 1) were drawn in all BMUs. By 2012, 1st – year applicants were not drawn in most BMUs. Less than 50% of 2nd-year applicants were drawn in 3 BMUs (26, 44, 45).
Table 5	Despite 5% fewer hunters statewide compared to 2011, the total harvest was 22% higher. Most of the increased harvest occurred in the southern BMUs: 45, 51, and 52. BMU 52 had a record harvest, likely due both to a high number of hunters and poor natural foods. Northern BMUs 13 and 25 had especially low harvests (lowest since 1996).
Table 6	Hunting success was the highest since 1995 in the quota area as a whole, and notably high in BMUs 24, 26, 31, 51, and 45; it was a record high in BMU 45 (33%, versus previous high of 24% in 1995). The bear population in this BMU appears to be recovering. Also, hunter density was quite low in BMU 45 due to severely reduced permits over the past few years .
Table 7	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 (2012) was normal in that respect, even though the season opened on a Saturday.

Tables 8-9	The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was higher than in the past few years, possibly because complaints were higher than normal. An unusually high number of complaints were registered shortly after bears emerged from dens in April, and remained high through the year (120-180 each month, May–Aug). The total number of complaints received in 2012 was the highest since 1999 (following a record low in 2011). However, only 16 nuisance bears were killed by private parties (excluding hunters) or DNR personnel, and for the first time, no bears were caught and moved. The number hit by cars was more than double that of 2011, but still half that of the 1990s.
Tables 10-12 & Fig. 3	Wild fruit crops were, overall, the worst documented since the catastrophic food failure of 1995; composite bear food index was well below average in 4 of 5 regions. Summer and fall berries produced poorly, due to erratic weather during May–July. An early warm spring encouraged early and prolific flowering, so early species (e.g., Juneberry and sarsaparilla) produced some fruit, but they dried up early due to heat and lack of moisture in mid-summer. Species flowering slightly later (e.g. cherries, plums) were likely damaged by cool temperatures, wind, and rain during peak flowering that froze flowers and/or prevented effective insect pollination. Blueberries were almost non-existent across the state, except in the far northeast, where snow cover during winter 2011–2012 was adequate to protect buds. Only red oak acorns were abundant across most of the bear range, resulting in near-average fall food indices. Hazel nuts and dogwood berries, also important fall foods, did not produce well.
Fig. 4	Year-to-year variability in the abundance of wild bear foods was much greater during 1984–1996 than in the ensuing 15 years. This year, 2012, was an outlier in that regard. Food abundance was not only low, but was outside the normal range of year-to-year variation since 1997. The reason for lower fruit crop variability in recent years is unknown, but may be related to generally warmer winter and summer temperatures.
Fig. 5	A combination of two key factors, fall food abundance and number of hunters, accounts for 84% of the yearly variation in the bear harvest since 1984. Predictions of the number of bears killed by hunters, based solely on these 2 factors, have been particularly accurate since 2000 ($R^2 = 0.95$). Since then, actual bear harvest has only once differed from predicted harvest by >10%.
Fig. 6	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). In 2011, record high harvest sex ratios (%M) occurred in BMUs 12 & 45. In 2012 BMU 12 continued to have the highest %M in the state (typical of this BMU), whereas BMU 45 had a near equal sex ratio.

Fig. 7-9	Statewide, ages of harvested females declined dramatically during the past 3 decades, as evidenced by a declining median age and increasing proportion of the harvest composed of 1–2 year-olds. Median age of harvested females was 2.9 years old in 2012, closer to the age of harvested males (2.2 years) than in the past. This declining age structure coincided with both a period of population increase, and then a decline (Fig. 10). Variation in median age within individual BMUs is too great to discern short-term trends. The greatest variation is in the northern BMUs. The southern no-quota area (BMU 52), which likely has the highest harvest pressure, has the most consistent female age structure; ages of harvested females in this area are equivalent to BMU 44 and older than BMU 45.
Fig. 10-11	Ages of harvested bears accumulated over 33 years were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting). This was scaled upwards (to include bears that died of other causes), using tetracycline mark–recapture estimates as a guide. Whereas both the tetracycline and reconstructed populations showed an increase during the 1990s, followed by a decline during the 2000s, the shapes of the 2 trajectories differed somewhat. Therefore, it was not possible to exactly match the curve from the reconstruction to all 4 tet-based estimates, so several curves were scaled to differing degrees to intersect different sets of tet-estimates. Both the tetracycline and age-reconstructed estimates showed a population decline of ~30% from 2001 to 2008. A light harvest in 2008 enabled the population to grow slightly, but it declined again after a heavier harvest in 2009. Reconstructed populations rely on several years of age data, so population estimates for 2011 and 2012 are not yet available.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1992–2012.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Permit applications	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]	19184[a]	18103[a]
Permits available	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050[b]	6000
Licenses purchased (total)	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986
Quota area [c]	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951
Quota surplus/military [c]										235	209	2554	1356	1591	1561	526	233	77	83	1385	1070
No-quota area [c]	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965[h]
% Licenses bought																					
Of permits available [d]	86.4	87.2	86.4	86.2	88.0	84.9	82.0	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
Of permits issued [d]							84.4	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
Estimated no. hunters [e]	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9100	8600
Harvest	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604
Harvest sex ratio (%M) [f]	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59	61	59
Success rate (%)																					
Total harvest/hunters [g]	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29	23	30
Quota harvest/licenses	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30	24	33

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907).

[b] Permits reduced because of a new procedure in 2011 that ensures that all available licenses are purchased (see Table 2).

[c] Quota area established in 1982. No-quota area 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 July 31. Free licenses for 10 and 11 year-olds were available beginning 2009 (2009 = 45; 2010 = 86; 2011 = 72 [including surplus youth; 2012 = 67]). Youth licenses included here with surplus and military licenses. Total licenses = quota + quota surplus + no-quota + military (no permit needed) + youth.

[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 2011-12, all unpurchased licenses were put up for sale, and all 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%) and 2009 (95.3%). The estimated no. of hunters in 2011-12 may be under-estimated because a large no. of people bought surplus licenses 1 month before the season, so they were more apt to hunt.

[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 hunters could take 2 bears. In 2012, 55 hunters took >1 bear (52 took 2 bears on NQ license, 2 hunters took 1 bear on NQ + 1 on quota license, 1 took 2 bears on NQ and 1 on quota license): thus, the 2604 bears were taken by 2548 different hunters, so success = 2548/8600 = 30%.

[h] Record high number of no-quota area licenses purchased (cannot distinguish where they hunted: BMUs 11, 11b, 52).

Fig. 1. Relationship between licenses sold and hunting success (note inverted scale) in quota zone, 1987–2012 (non-quota zone first partitioned out in 1987). Number of licenses explains 31% of variation in hunting success during this period (P = 0.003). Large variation in hunting success is also attributable to food conditions.

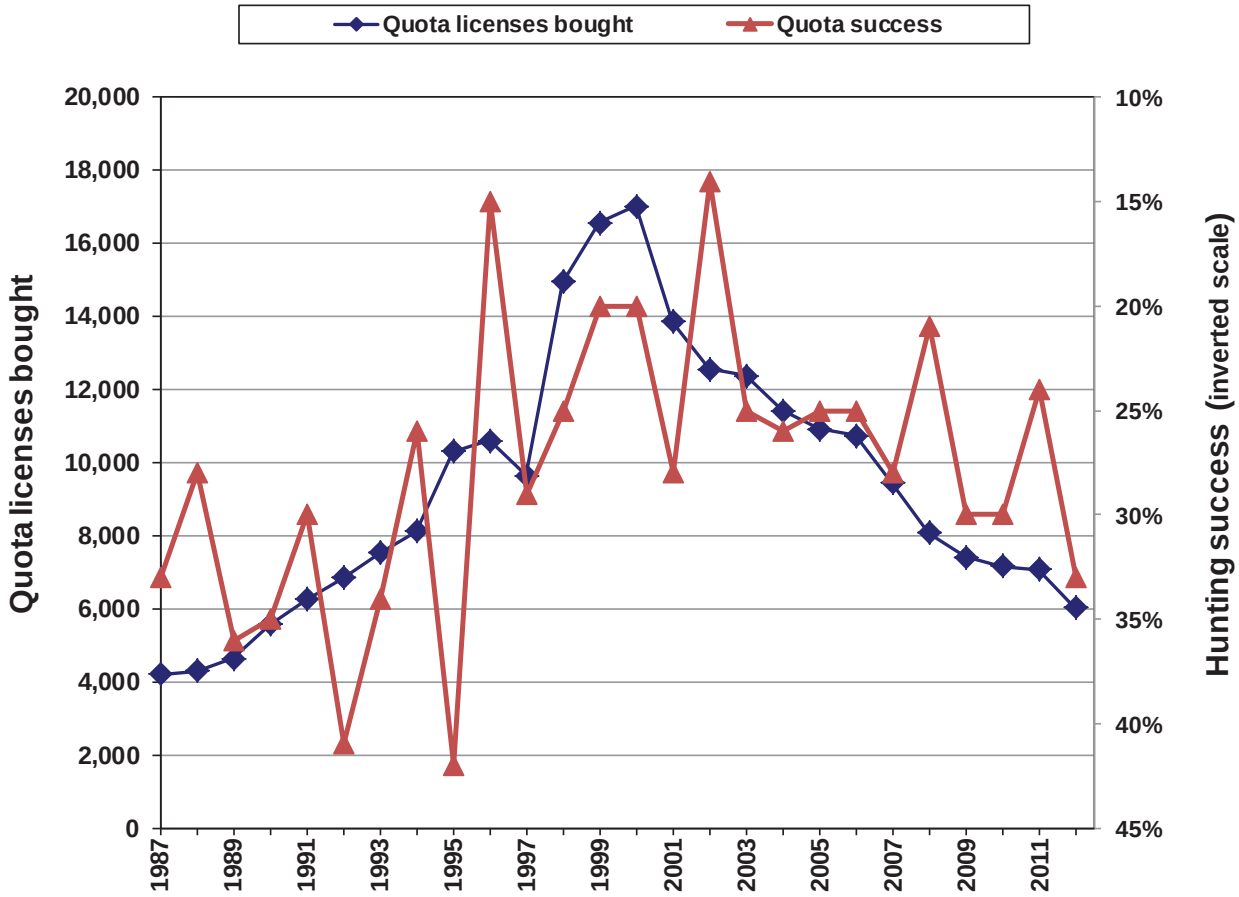


Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

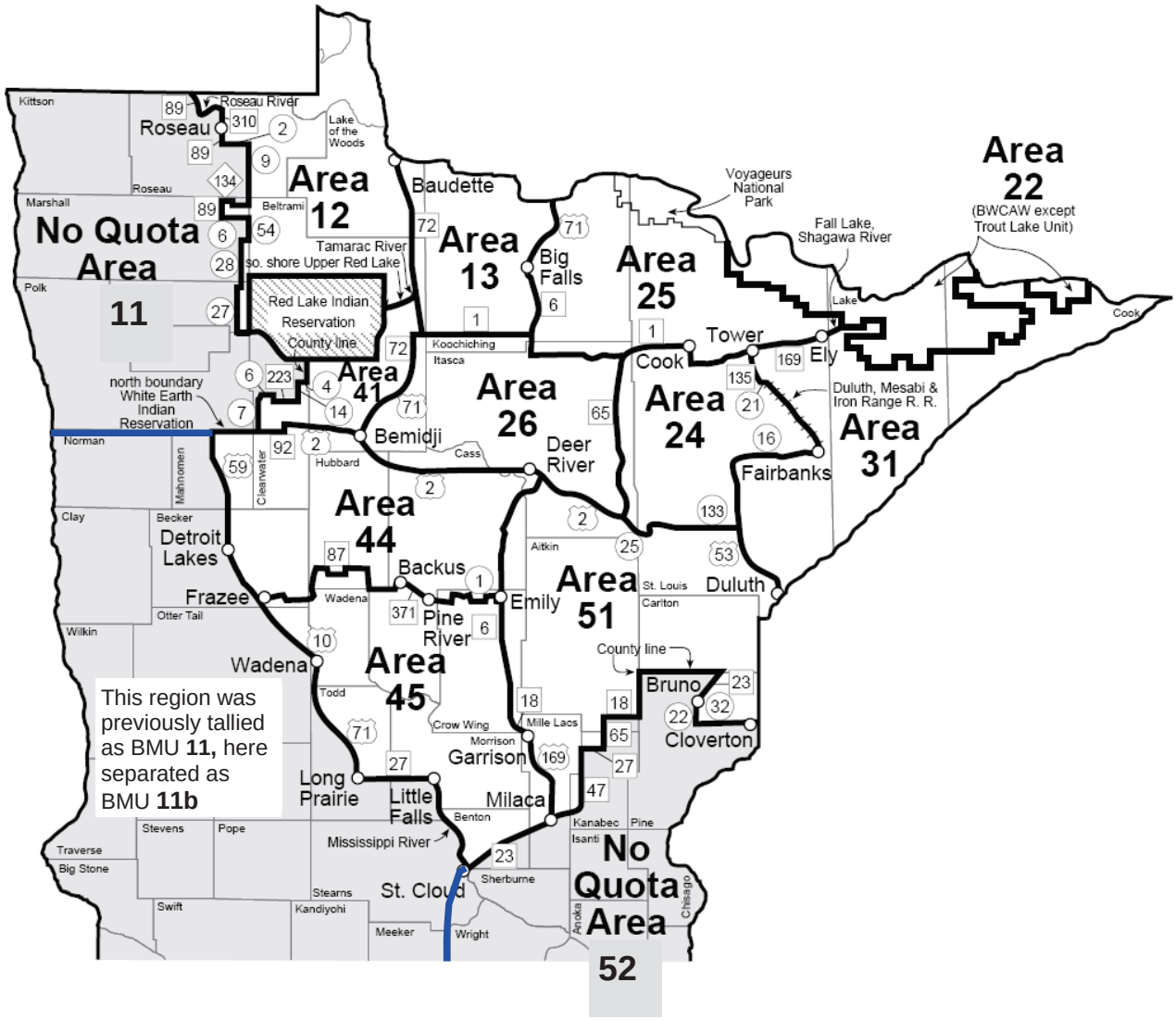


Table 2. Number of bear hunting quota area permits available, 2008–2012 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2012	2011		2010	2009	2008
		After reduct.[a]	Before reduct.			
12	300	350	450	450	450	450
13	400	450	600	600	600	650
22	100	100	125	100	150	150
24	300	350	500	550	650	750
25	850	900	1200	1200	1250	1550
26	550	650	900	900	1000	1150
31	900	1000	1300	1300	1300	1700
41	250	300	400	400	400	400
44	700	850	1100	1100	1100	1350
45	200	250	400	400	600	1000
51	1450	1850	2500	2500	2500	2700
Total	6000	7050	9475	9500	10000	11850

[a] In 2011, under a new procedure, all licenses not purchased by permittees were sold (Table 3). In order not to increase the number of hunters, 2011 permit allocations were reduced by the mean percentage of licenses that were purchased in each BMU in 2009–2010. The table shows the permit allocation before and after this reduction. In 2012, permits were allocated based on what had been offered in 2011.

Table 3. Number of bear hunting permit applicants and surplus licenses bought, 2008–2012[a]. Shaded values indicate undersubscribed areas (applications < permits available).

BMU	2012			2011[b]			2010		2009		2008	
	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Surplus	Apps	Surplus	Apps	Surplus
12	813	244	60	834	267	84	903	5[c]	876		857	
13	719	325	76	751	366	84	753		700		709	
22	83	56	43	90	71	31	114		91	0[d]	85	50
24	888	253	47	918	294	56	971		843		825	
25	1625	713	137	1763	712	190	1811	5[c]	1694		1793	4[c]
26	1666	458	92	1894	512	139	1959		1874		1999	2[c]
31	2406	758	146	2505	826	174	2414		2423		2388	3[c]
41	592	208	42	688	253	47	718		685		656	
44	2619	612	88	3010	697	154	2923		2787		2821	
45	1135	170	30	1019	208	42	937		941		873	128
51	3650	1154	296	4086	1478	372	3950	1[c]	3822		3828	
Total[e]	16196	4951	1057	17558	5684	1373	17453		16736		16834	178

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] In 2011-12, all licenses not purchased by permittees were sold as "surplus". Surplus = Permits available (Table 2) minus Bought license (±4 to account for groups applying together).
[c] Courtesy licenses issued by Commissioner, not actual surplus.
[d] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[e] 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 this total.

Table 4. Percentage of lottery applicants with preference level 1 (1st-year applicants) who were drawn for a bear permit, 2008–2012. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn, in which case the success of preference level 2 lottery applicants is also shown.

BMU	2012		2011		2010		2009	2008
	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 1
12	0	80	2		23		29	37
13	33		51		77		84	92
22	100		100		88		100	100
24	0	75	14		49		75	91
25	28		35		60		72	86
26	0	49	0	77	15		32	43
31	0	84	11		35		43	68
41	0	86	6		31		37	47
44	0	28	0	55	0	90	3	26
45	0	29	0	67	24		61	100
51	1		25		52		58	67

Table 5. Minnesota bear harvest tally[a] for 2012 by Bear Management Unit (BMU) and sex compared to harvests during 2007–2011 and record high harvests.

	2012											
BMU	M	(%M)	F	U	**Total**	**2011**	**2010**	**2009**	**2008**	**2007**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	58	(71)	24	0	82	106	95	140	101	124	113	263 (01)
13	68	(61)	44	0	112[f]	119	155	149	129	163	143	258 (95)
22	3	(38)	5	0	8	11	9	7	7	15	10	41 (89)
24	57	(53)	51	0	108	122	124	151	100	134	126	288 (95)
25	133	(52)	121	0	254[f]	317	307	344	298	369	327	584 (01)
26	148	(62)	90	0	238	167	232	228	137	315	216	513 (95)
31	220	(61)	143	0	363	358	363	384	248	398	350	697 (01)
41	42	(60)	28	0	70	54	71	104	77	104	82	201 (01)
44	102	(54)	86	0	188	130[d]	248	255	196	333	232	643 (95)
45	33	(49)	34	0	67	32[d]	58	42	72	113	63	178 (01)
51	284	(60)	187	0	471	288[e]	501	416	344	557	421	895 (01)
Total	1148	(59)	813	0	1961	1704[f]	2163	2220	1709	2625	2084	4288 (01)
11	155	(69)	69	0	224	219	178	315	172	324	242	351[h] (05)
11b	9	(64)	5	0	14	3	11	9	3	4	6	
52	218	(54)	187	0	405[c]	205[g]	347	257	251	219	256	400 (06)
Total	382	(59)	261	0	643	427	536	581	426	547	503	678 (95)
State	1530	(59)	1074	0	**2604**	2131	2699	2801	2135	3172	2588	4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes sometimes differs from the registered sex (2011: 1450 [97%] unchanged; 12 $M_{(reg)} \rightarrow F_{(tooth)}$; 38 F→M; 2012: 1821 [98%] unchanged; 15 $M_{(reg)} \rightarrow F_{(tooth)}$; 28 F→M). Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2011: 1535 of 2131 = 72%; 2012: 1897 of 2604 = 73%). Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally. The number of missing registrations was greatly reduced in 2011 and 2012.

Year	Quota area	No-quota area
2007	27	9
2008	23	4
2009	19	14
2010	20	8
2011	11	2
2012	6	1

[b] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 27 in 2007, 14 in 2008, 3 in 2009, 14 in 2010, 14 in 2011, 8 in 2012). 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, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[c] Record high harvest.

[d] Lowest harvest since BMU was established in 1994.
[e] Lowest harvest since 1991.
[f] Lowest harvest since 1996.
[g] Lowest harvest since 2002.

[h] Estimated registered harvest, including those in which registration data were lost and no tooth envelope was received.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2007–2012.

BMU	Max success (yr) (excl 2012)		Mean success 2007-2011	2012	2011	2010	2009	2008	2007
12	49	(95)	33	27	30	30	39	32	36
13	59	(95)	30	28	26	34[c]	32	28	31
22	21	(92)	13	8	11	14	16[c]	8	14
24	45	(92)	27	36[e]	35[e]	29	31[d]	20	20
25	47	(92)	33	30	35	34	36	28[f]	31
26	59	(95)	29	43[d]	26	34	31	17[f]	36
31	55	(92)	32	40[d]	36	36	38[c]	21[f]	28
41	50	(95)	28	28	18	25	34	27	35
44	43	(95)	25	27	15[f]	28	30	21	30
45	24	(95)	14	33[b]	13	21[d]	11[f]	11[f]	14
51	37	(95)	22	32[d]	16[f]	27	23	19	27
Quota	42	(95)	27	33[d]	24	30	30	21	28
No Quota[g]	35	(95)	19	20	15[f]	20	22	17[f]	19
Statewide	40	(95)	25	28	22	27	28[c]	20	26

[a] 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] Highest success since establishment of this BMU in 1994
[c] Highest success since 1997 (until this year).
[d] Highest success since 1995 (until this year).
[e] Highest success since 1992 (until this year)
[f] Lowest success since 2002 (until this year).

[g] Success rates in different parts of the no-quota area (Fig. 1) are not distinguishable from harvest records because the number of people that hunted in each BMU is unknown. However, a hunter survey conducted following the 2009 hunting season indicated the following success rates: BMU 11 – 42%; BMU 11b – 17%; BMU 52 – 19%. These values are not directly comparable to values tabulated here due to a non-response bias in the survey (non-successful hunters are less likely to respond; respondents indicated overall success rate of 31% vs 22% calculated from harvest/licenses); nevertheless, they reflect differences in success rates among these BMUs that year (notably a year when harvest was high in BMU 11).

Table 7. Cumulative bear harvest (% of total harvest) by date, 1992–2012.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56[a]	70	87
1997	Mon		76	88	97
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	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	92
2009	Tue		74	86	96
2010	Wed		69	84	96
2011	Thu		65	78	93
2012	Sat		68	83	96

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

Table 8. Number of people participating in nuisance bear survey, 1992–2012.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28
2010	36	40	33	27	28	23	16
2011	30	34	29	31	29	27	21
2012	56	52	47	40	38	32	23

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 9. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1992–2012, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of personnel participating in survey [a]	85	88	88	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51	40	34	56
Complaints examined on site	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65	70	37 [h]	113
Complaints handled by phone [b]					959	2196	743	987	618	660	550	424	507	451	426	380	452	535	514	396 [h]	722 [i]
Total complaints received					1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600	584	433 [h]	835
• % Handled by phone					74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%	91%	86%
Bears killed by:																					
• Private party or DNR	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23	22	9 [h]	16
• Hunter before season [c]																					
– from nuisance survey	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4	3	3	11
– from registration file	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15	10	5	12
• Hunter during/after season [d]	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0	0	0	0
• Permittee [e]	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	3	5	0	0 [j]
Bears translocated	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2	2	2	0
• % bears translocated [f]	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3	3	5	0
Bears killed by cars [g]	90	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18	28	15 [h]	33

Table 9 footnotes:

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[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Tallies of complaints handled by phone were made only during the indicated years.

[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] 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.

[f] Percent of on-site investigations resulting in a bear being captured and translocated.

[g] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2011 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

[h] Lowest since record-keeping began (1981 for on-site complaints, nuisance bears killed and car-kills). However, participation in this survey may have affected the results. In 2011, 2 known nuisance kills of radio-collared bears, which were handled by COs, were not tallied here because these 2 COs did not participate in this survey.

[l] 120-180 calls in each month, May–Aug.

[j] 12 permits issued, but no bears killed.

Table 10. Bear food index values for five survey areas (see map in lower right) in northern Minnesota's bear range, 1984–2012. Shaded boxes denote particularly low (<45; pink) and high (≥70; green) fruit abundance.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range[a]
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

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

Table 11. Index values of bear food abundance[a] in 2012 compared to the previous 28-year mean (1985–2011) in 5 survey areas across Minnesota's bear range. Shaded values indicate particularly low (pink) and high (green) fruit abundance (≥1 point difference for individual foods; ≥5 points difference for composite scores).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	28yr mean	2012 *n* =20[b]	28yr mean	2012 *n* = 15	28yr mean	2012 *n* = 8	28yr mean	2012 *n* = 14	28yr mean	2012 *n* = 9	28yr mean	2012 *n* =45[b]
SUMMER												
Sarsaparilla	4.5	4.8	5.9	5.6	5.4	5.4	4.7	4.5	5.7	2.4	5.1	4.2
Pincherry	3.2	2.5	4.4	2.3	4.1	3.2	3.9	3.1	3.8	2.4	3.9	2.7
Chokecherry	5.5	4.2	5.3	3.1	4.4	3.5	5.5	3.3	4.7	2.9	5.2	3.7
Juneberry	4.9	4.6	4.7	6.0	4.8	7.0	3.8	3.8	4.0	2.6	4.4	4.3
Elderberry	1.4	1.2	3.2	1.5	3.6	4.5	3.2	1.4	3.4	0.8	3.0	2.1
Blueberry	5.0	1.2	5.4	1.7	4.9	2.6	3.7	1.8	3.7	2.3	4.4	1.8
Raspberry	6.6	6.4	8.1	7.1	8.0	6.0	7.1	5.4	7.1	5.0	7.3	5.9
Blackberry	1.3	1.5	2.3	2.5	1.0	1.3	3.5	3.1	4.3	4.0	2.9	2.9
FALL												
Wild Plum	2.1	2.0	1.8	1.3	1.0	1.0	2.6	1.8	2.4	2.3	2.1	1.7
HB Cranberry	5.2	3.0	4.4	2.6	3.6	4.6	3.7	2.7	3.6	2.2	4.0	2.9
Dogwood	6.0	3.3	5.8	3.6	5.0	5.2	5.8	3.9	6.0	1.3	5.7	3.5
Oak	3.4	6.4	2.9	5.0	1.6	3.0	5.8	7.1	5.8	6.7	4.3	6.2
Mountain Ash	1.5	1.4	2.6	1.1	4.6	4.7	1.8	1.2	2.2	1.6	2.6	2.1
Hazel	6.3	6.7	7.7	6.9	7.3	7.5	8.1	7.5	7.9	5.0	7.4	6.7
TOTAL	56.9	49.1	64.7	50.3	59.1	59.4	63.1	50.5	64.5	41.5	62.2	50.7

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

[b] *n* = Number of surveys used to calculate each area-specific mean index value for 2011.

[c] Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 12. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984 – 2012. Shaded blocks indicate particularly low (≤ 5.0, yellow) or high (≥8.0, tan) fall food productivity.

Year	Survey Area					Entire Range[a]
	NW	NC	NE	WC	EC	
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	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	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

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Fig. 3. Productivity of key fall bear foods in Minnesota's bear range, 2012.

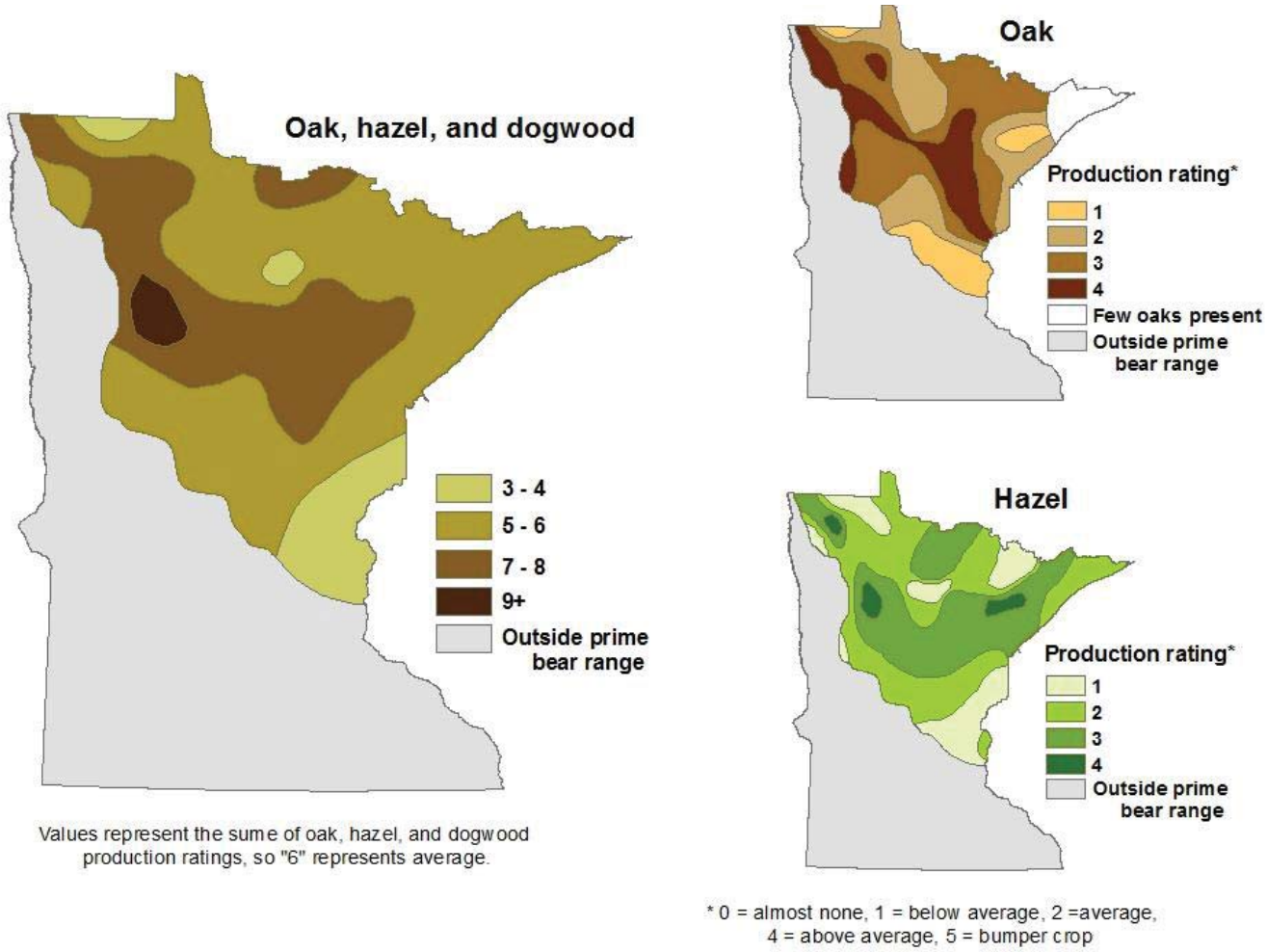

Fig 4. Summed bear food index (from Table 10) across Minnesota's bear range, comparing range of year-to-year variability during 1984–1996 versus 1997–2011, and 2012.

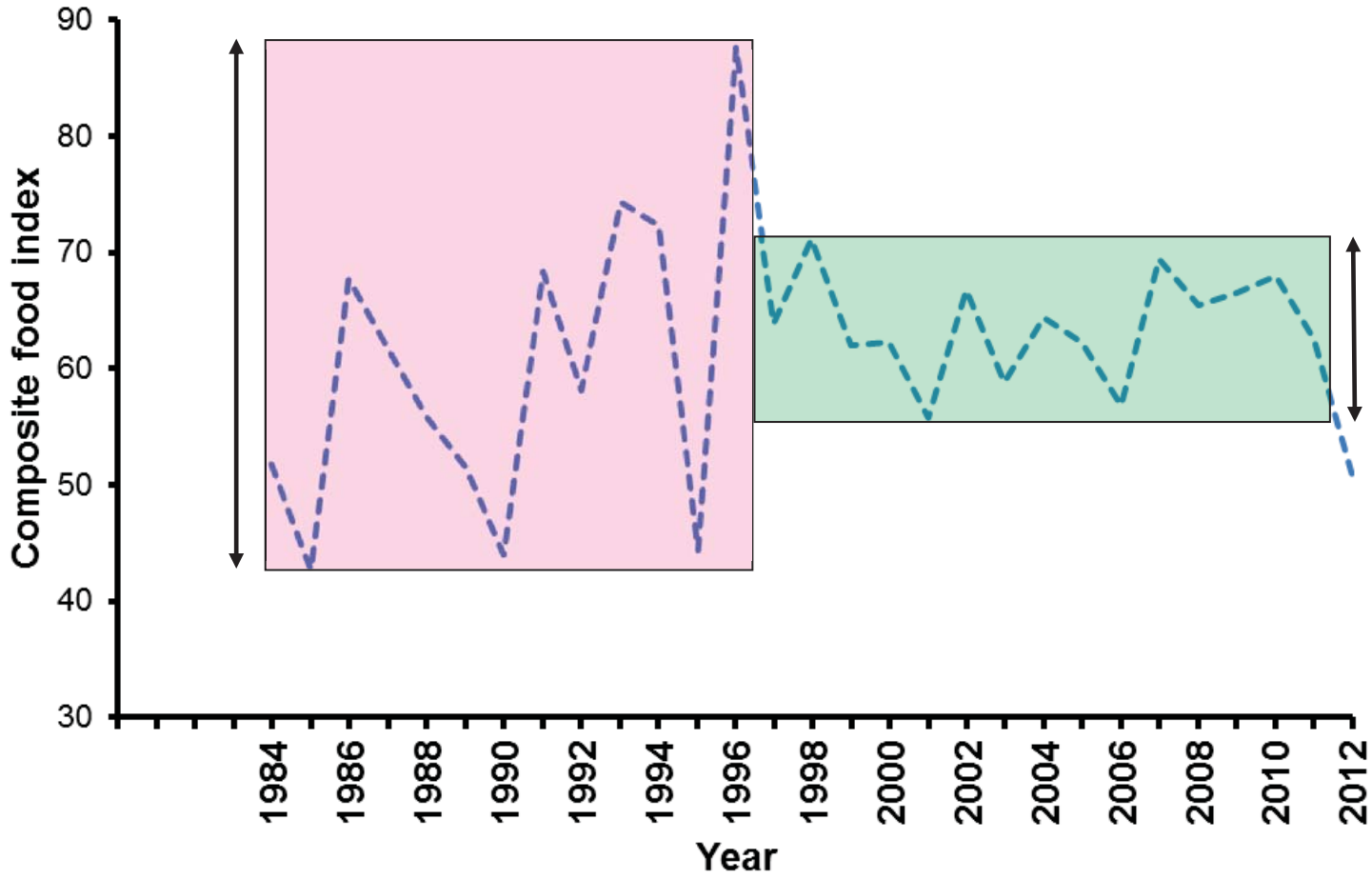

Fig 5. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984–2012 (R^2=0.84); (bottom graph) 2000–2012 (R^2=0.95).

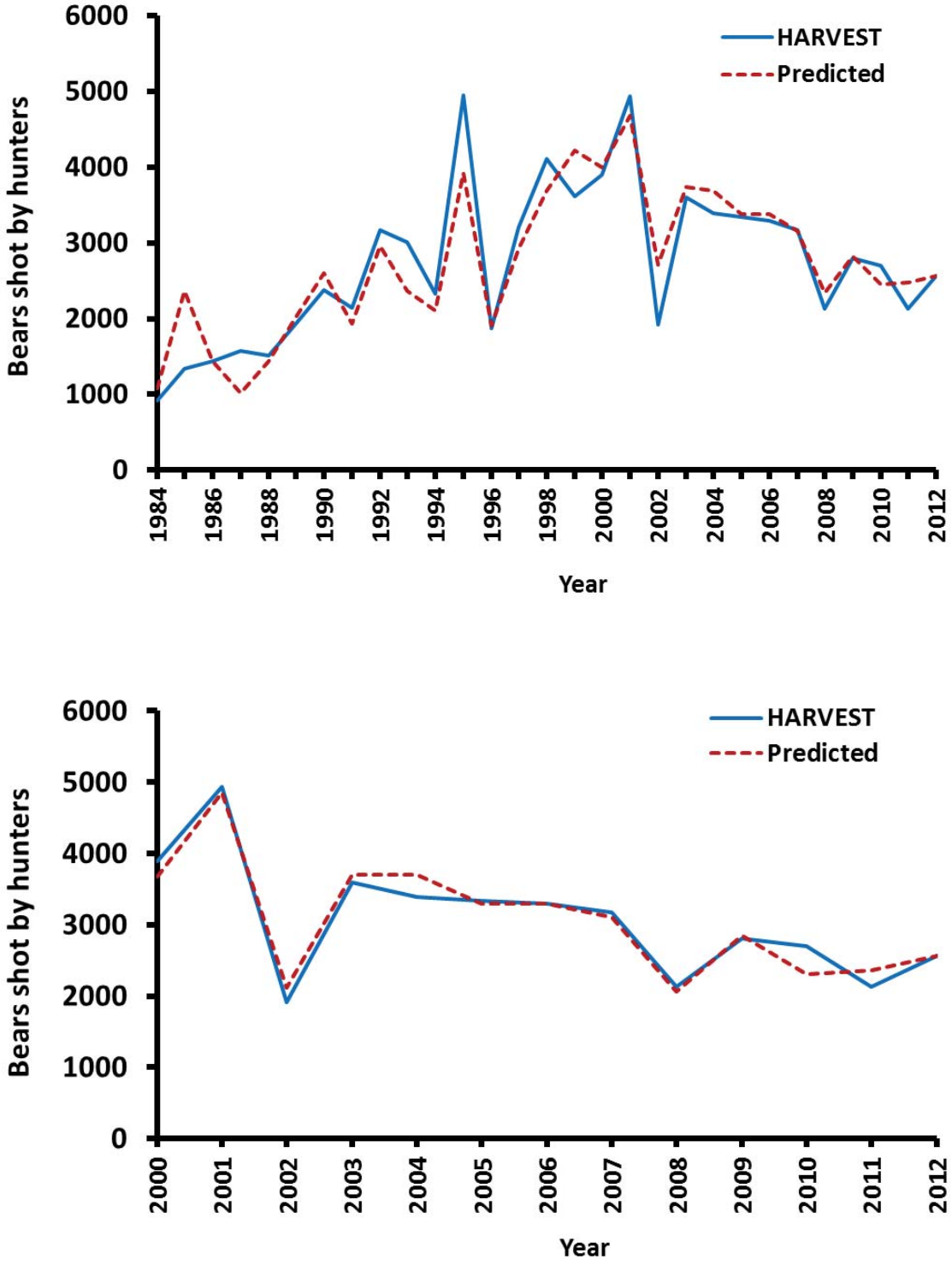

Fig 6. Sex ratios of harvested bears by BMU, 2006–2012.

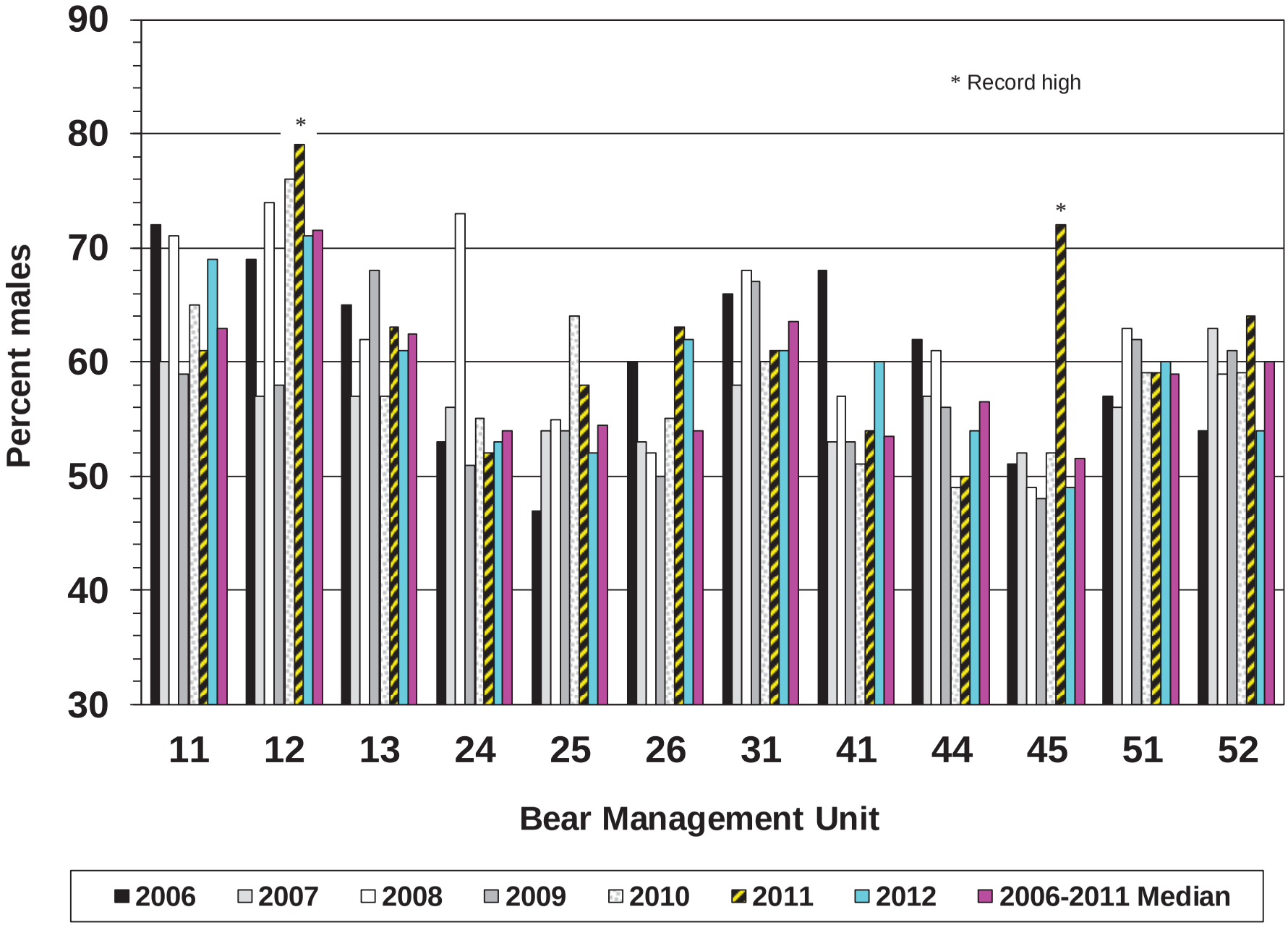

Fig 7. Median ages of harvested bears by BMU, 2006–2012.

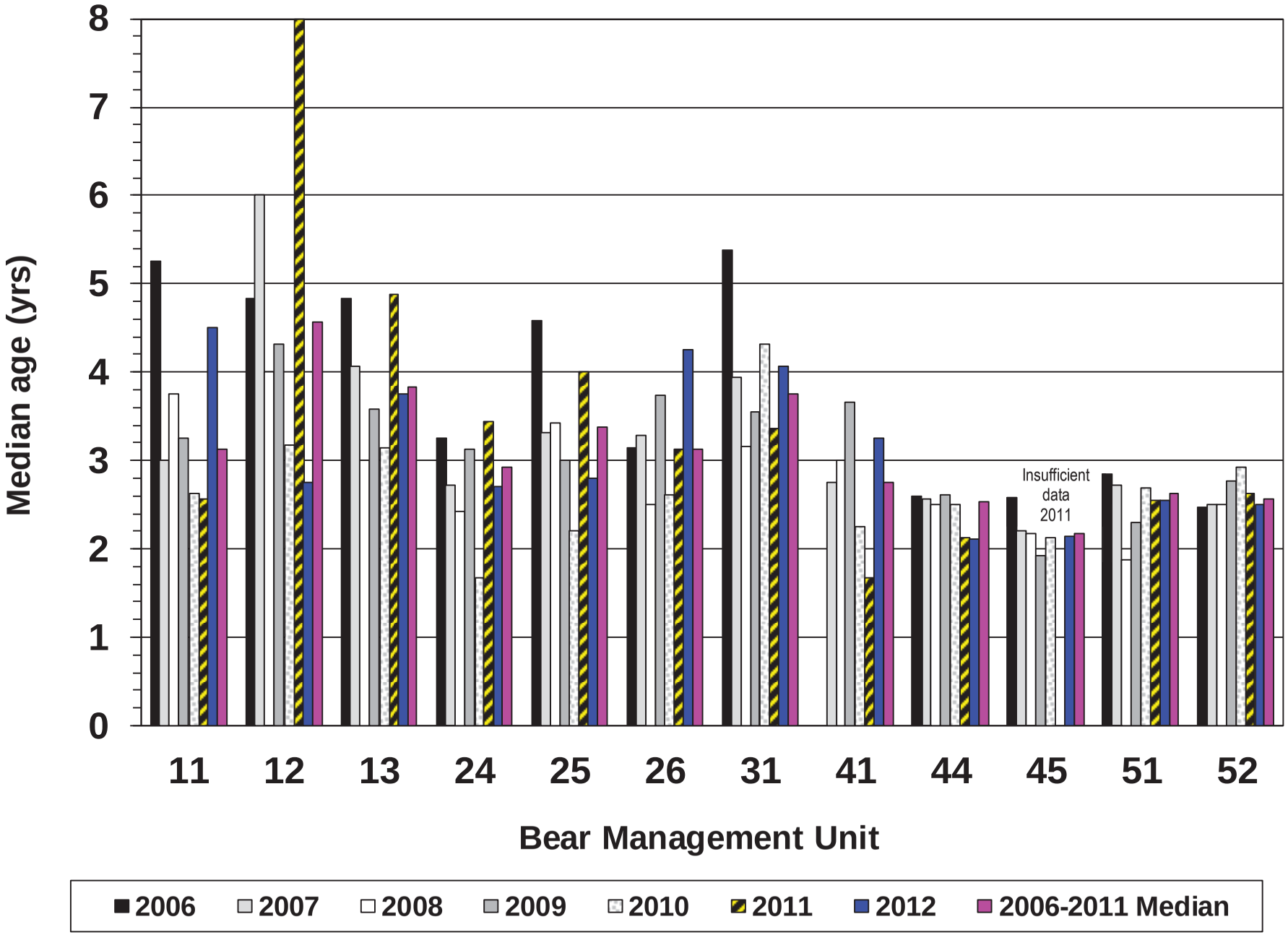

Fig. 8. Statewide harvest structure: median ages (yrs) by sex, 1982–2012.

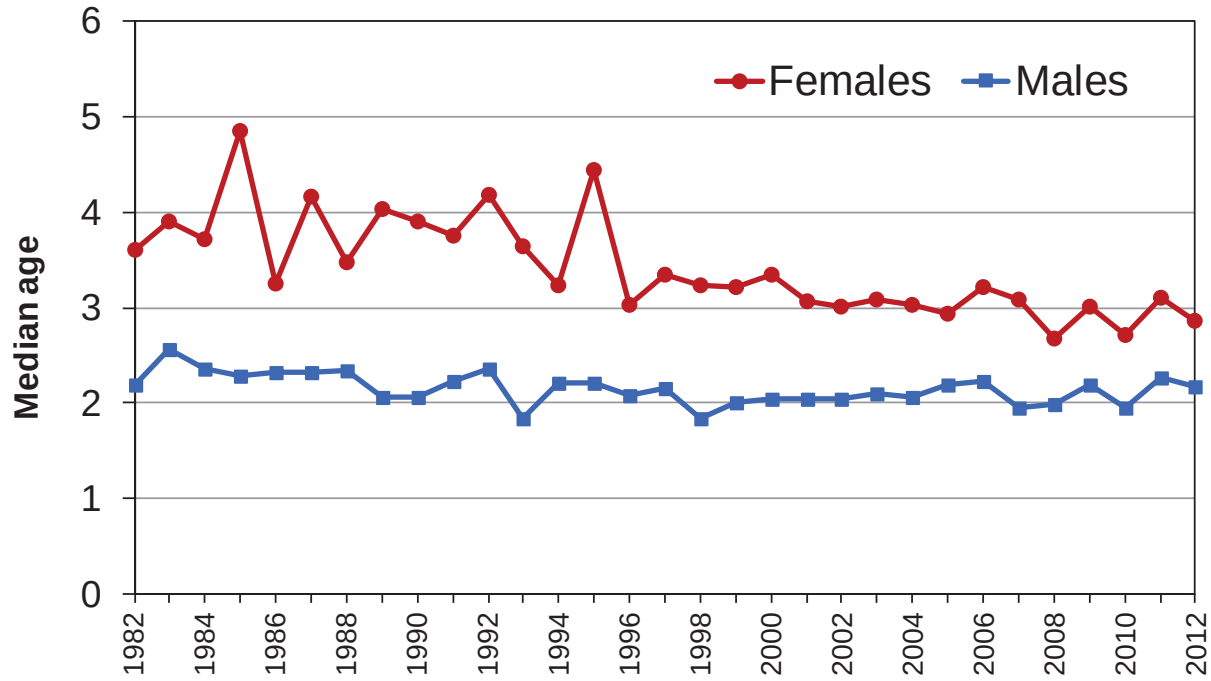

Fig. 9. Statewide harvest structure: proportion of each sex in age category, 1982–2012. Trend lines are significant.

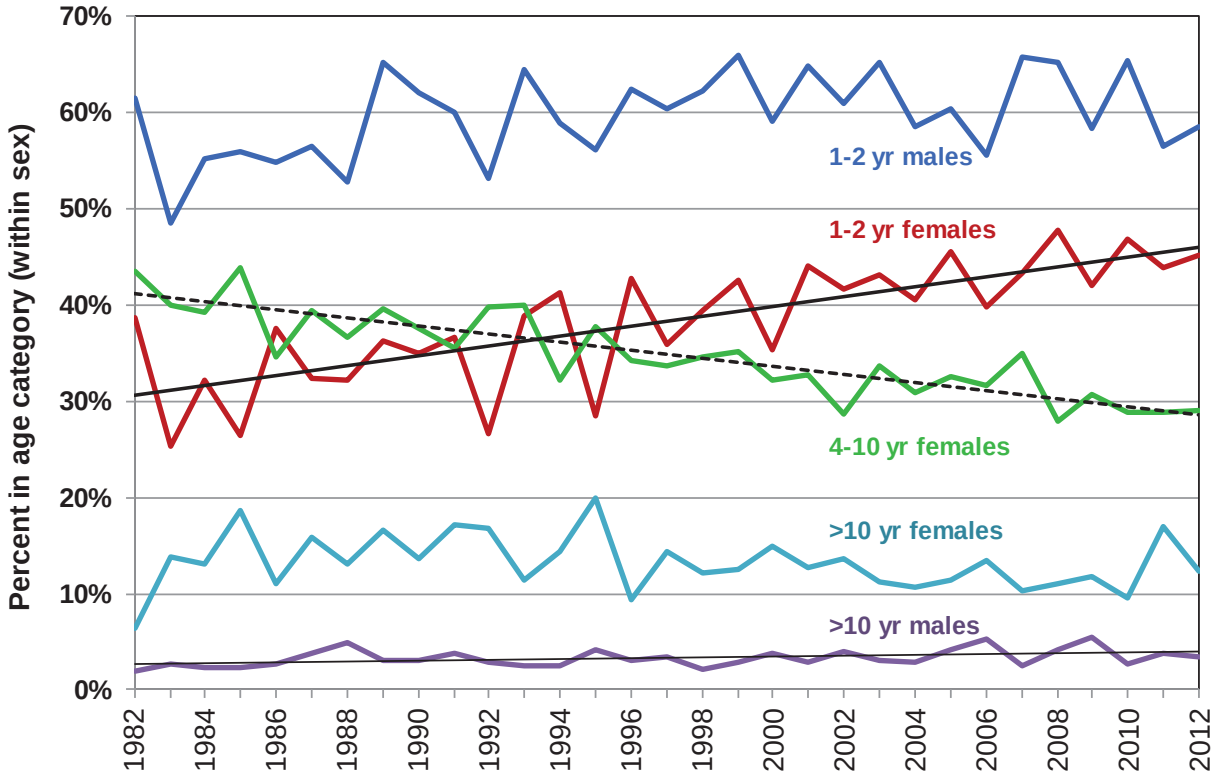

Fig. 10. Statewide population trend derived from Downing reconstruction using the harvest age structures from 1980−2012. Curves were scaled (elevated) to various degrees to match the tetracycline-based mark–recapture estimates.

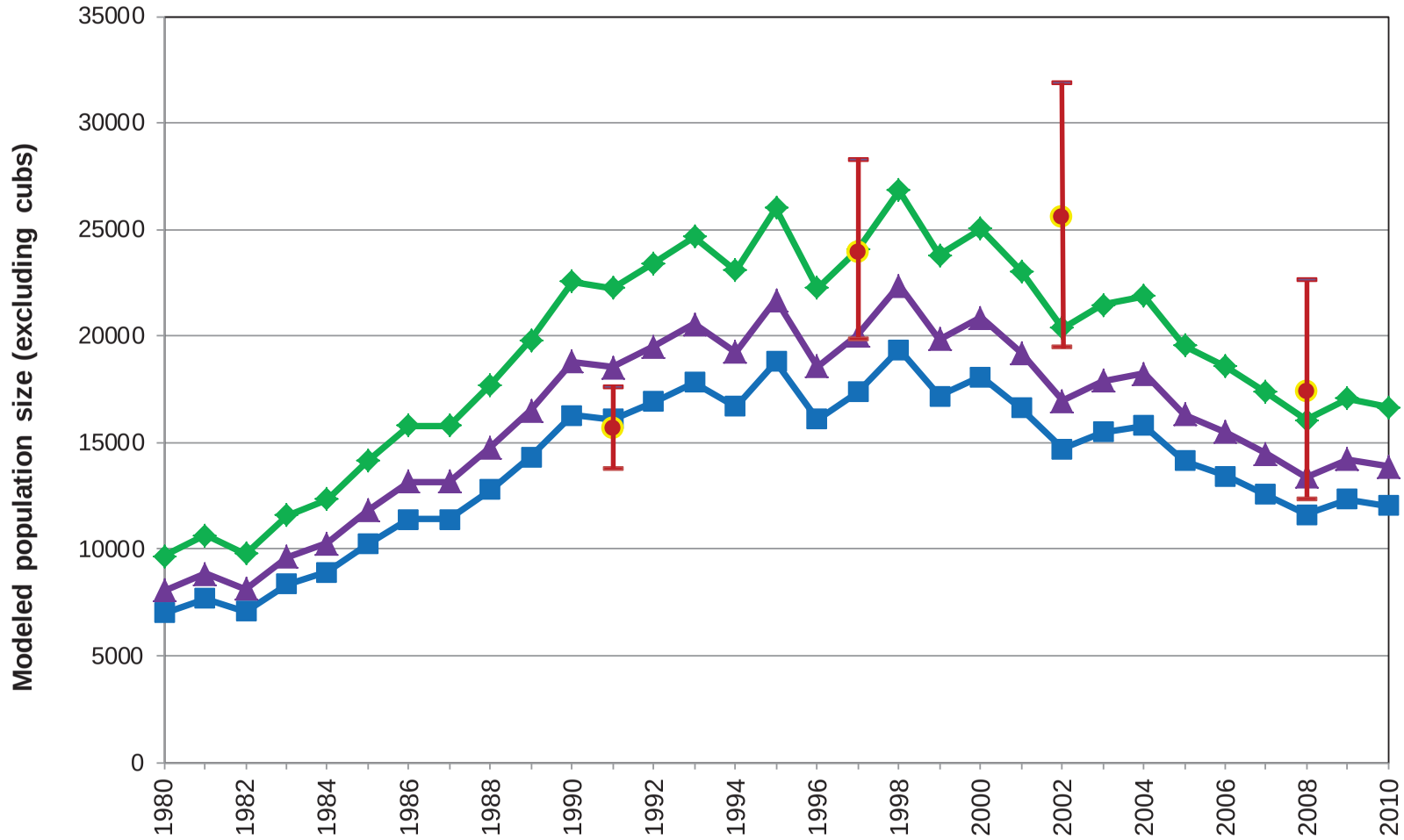

Fig. 11. Statewide population trend derived from Downing reconstruction versus total harvest and harvest as a percent of reconstructed population size. The reconstructed population consists only of bears eventually harvested, not bears that died of other causes. Thus, the actual population size is larger than the reconstructed population.