STATUS OF MINNESOTA BLACK BEARS, 2009

Final Report to Bear Committee

March 2, 2010

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

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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.
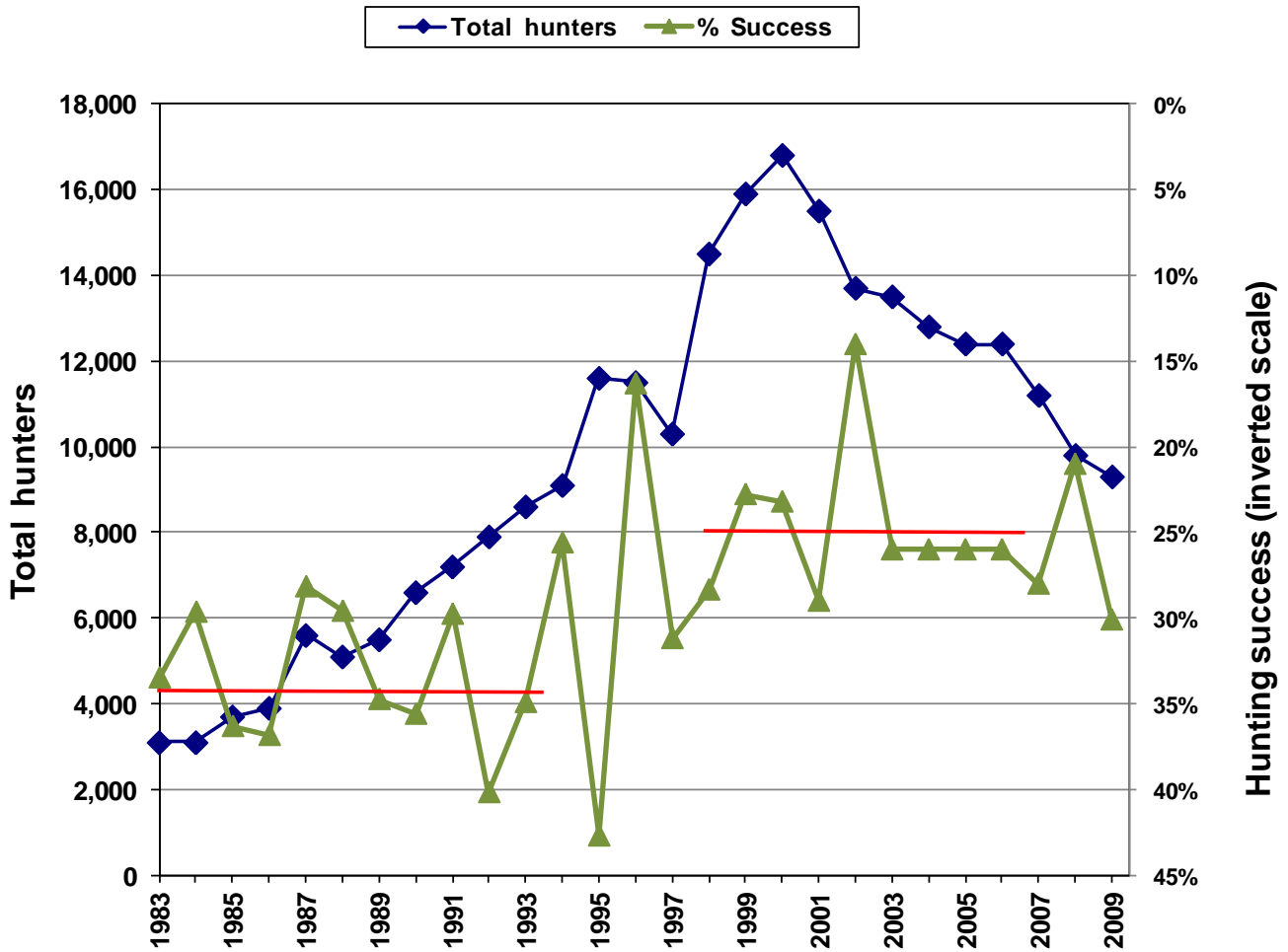
Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.
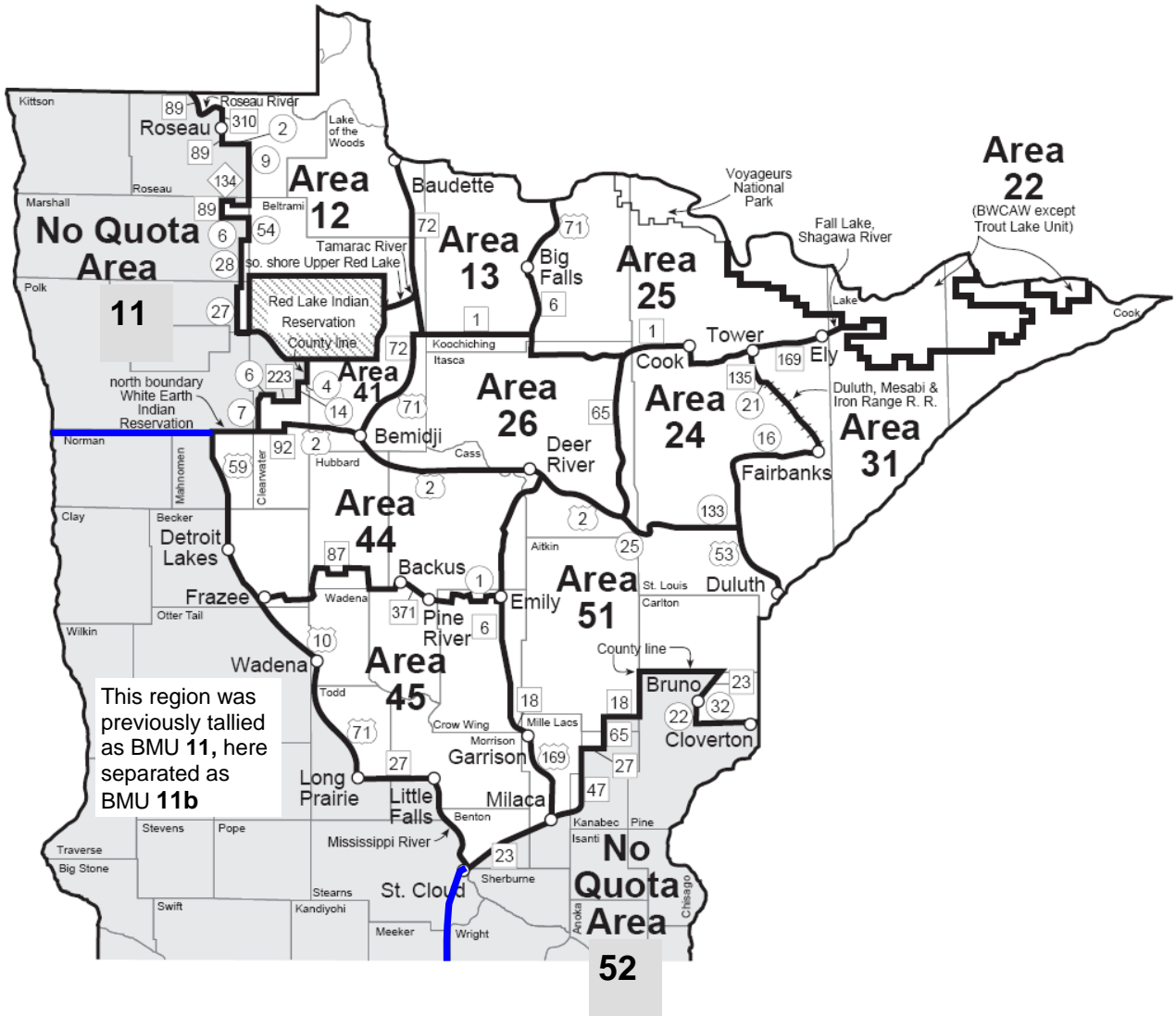
Table 2. Number of bear hunting permits available per year, 2005–2009 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

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.

BMU	2009 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 underline 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).

Year	Survey Area					Entire Range[a]
	NW	NC	NE	WC	EC	
1984	32.3	66.8	48.9	51.4	45.4	51.8
1985	43.0	37.5	35.3	43.5	55.5	42.7
1986	83.9	66.0	54.7	74.7	61.1	67.7
1987	62.7	57.3	46.8	67.4	69.0	61.8
1988	51.2	61.1	62.7	54.4	47.3	56.0
1989	55.4	58.8	48.1	47.8	52.9	51.6
1990	29.1	39.4	55.4	44.0	47.9	44.1
1991	59.7	71.2	64.8	72.1	78.9	68.4
1992	52.3	59.9	48.6	48.1	63.3	58.2
1993	59.8	87.8	75.0	73.9	76.8	74.3
1994	68.6	82.3	61.3	81.5	68.2	72.3
1995	33.8	46.5	43.9	42.0	50.9	44.4
1996	89.5	93.2	88.4	92.2	82.1	87.6
1997	58.2	55.5	58.8	62.0	70.1	63.9
1998	56.9	72.8	66.4	72.3	84.5	71.1
1999	63.7	59.9	61.1	63.2	60.6	62.0
2000	57.7	68.0	54.7	69.2	67.4	62.3
2001	40.6	48.7	55.6	62.2	66.0	55.8
2002	53.1	63.4	60.4	68.6	68.3	66.8
2003	59.1	57.5	55.2	58.6	49.7	58.8
2004	57.0	60.5	61.1	70.3	67.9	64.4
2005	53.4	65.9	61.4	59.9	72.6	62.3
2006	51.0	64.9	53.4	51.0	52.1	56.9
2007	68.4	79.0	67.3	67.6	70.0	69.4
2008	58.6	74.1	64.7	66.6	71.4	65.4
2009	59.9	67.8	63.2	69.2	69.6	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.

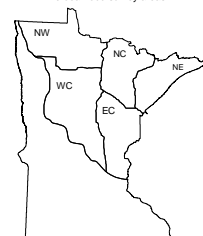Fig 1. Boundaries of Minnesota's 5 bear food survey areas.

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).

FRUIT	NW 25yr mean	NW 2009 n = 10[b]	NC 25yr mean	NC 2009 n =16	NE 25yr mean	NE 2009 n = 12	WC 25yr mean	WC 2009 n = 17	EC 25yr mean	EC 2009 n = 10	Entire Range 25yr mean	Entire Range 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 ($\leq$ 5.0, yellow) or high ($\geq$8.0, tan) fall food productivity.

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.

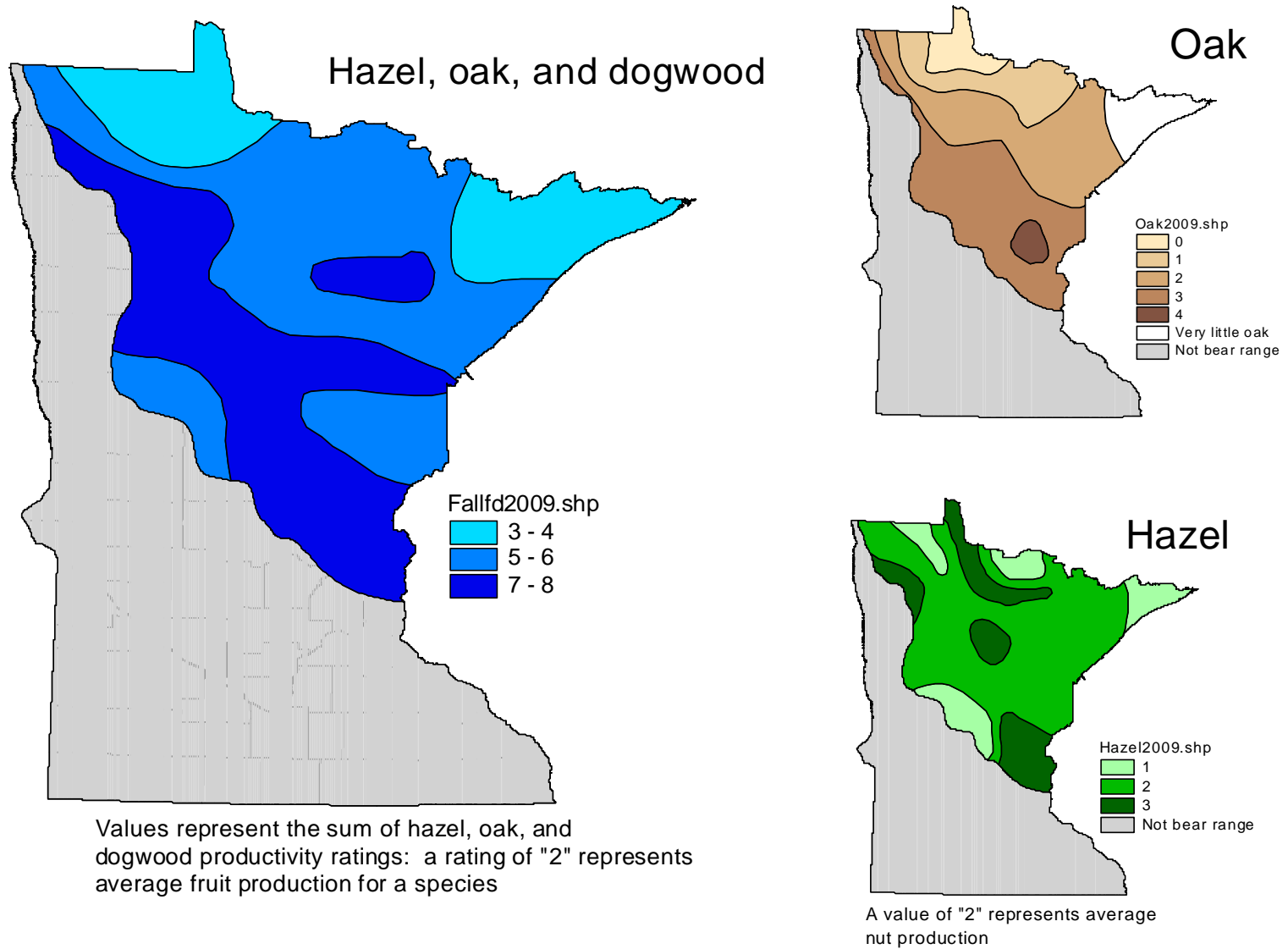**Fig. 3.** Productivity of key fall bear foods in Minnesota's bear range, 2009.

Hazel, oak, and dogwood

Oak

Oak2009.shp
- 0
- 1
- 2
- 3
- 4
- Very little oak
- Not bear range

Fallfd2009.shp
- 3 - 4
- 5 - 6
- 7 - 8

Hazel

Hazel2009.shp
- 1
- 2
- 3
- Not bear range

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 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; $R^2 = 0.97$).
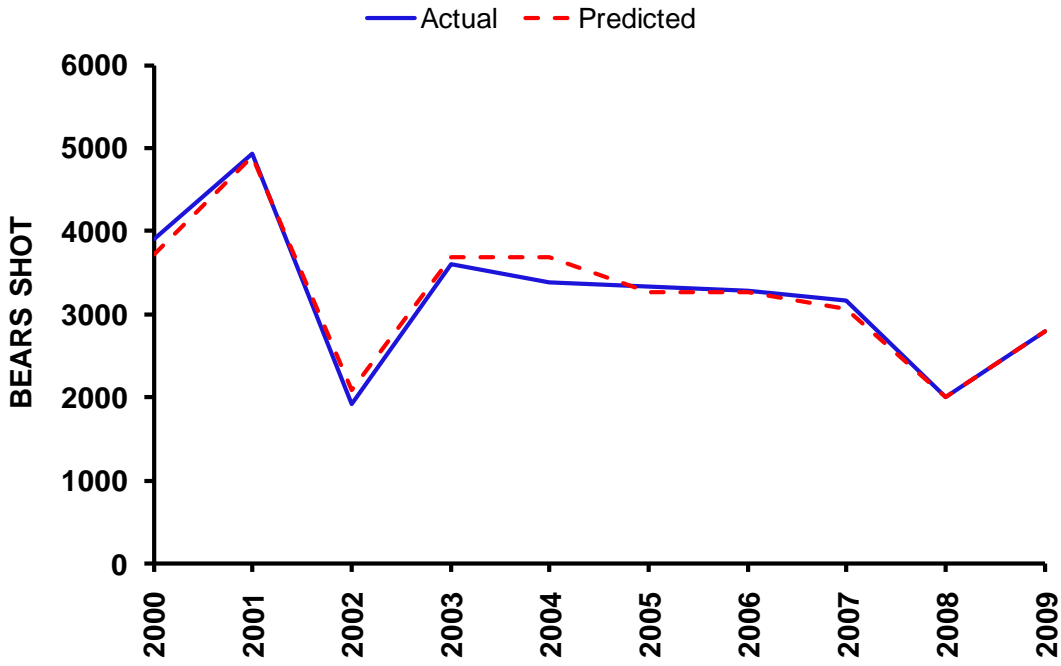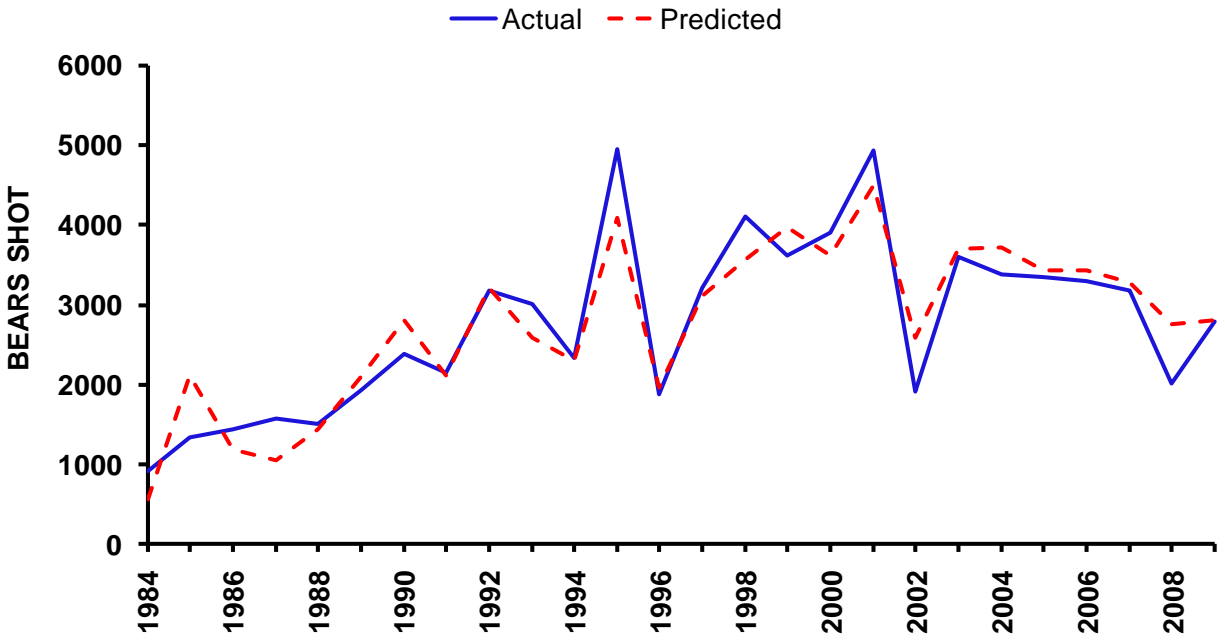
Fig 5. Sex ratios of harvested bears by BMU, 2003–2009.
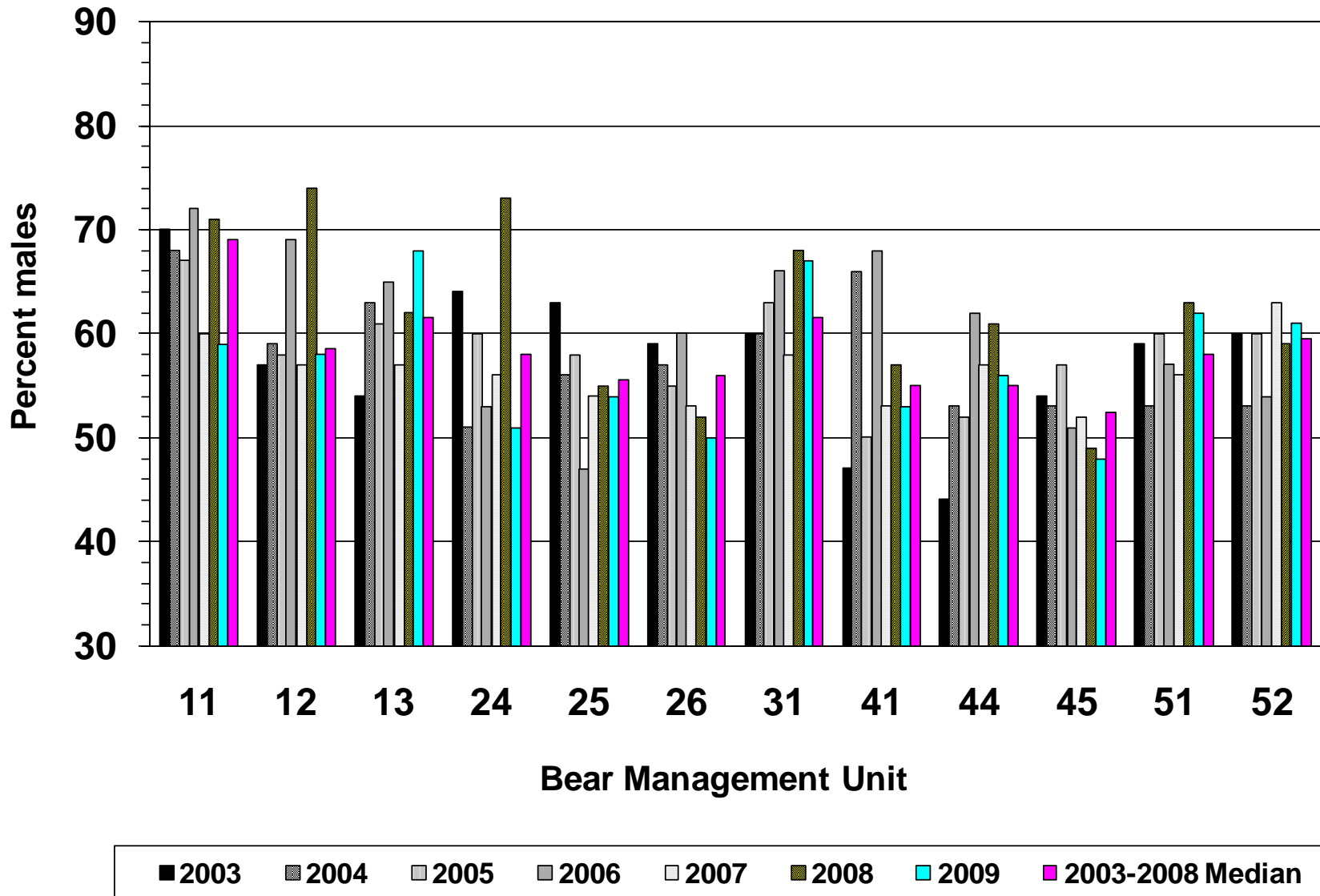
Fig. 6. Statewide population estimates derived from tetracycline marking in 1991, 1997, 2002, and 2008. Each cluster of estimates pertains to the year of marking, with each point (and associated 95% CI) representing a different recapture sample (yr 1 = year of marking, yr 2 = year after marking). Simulation 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.
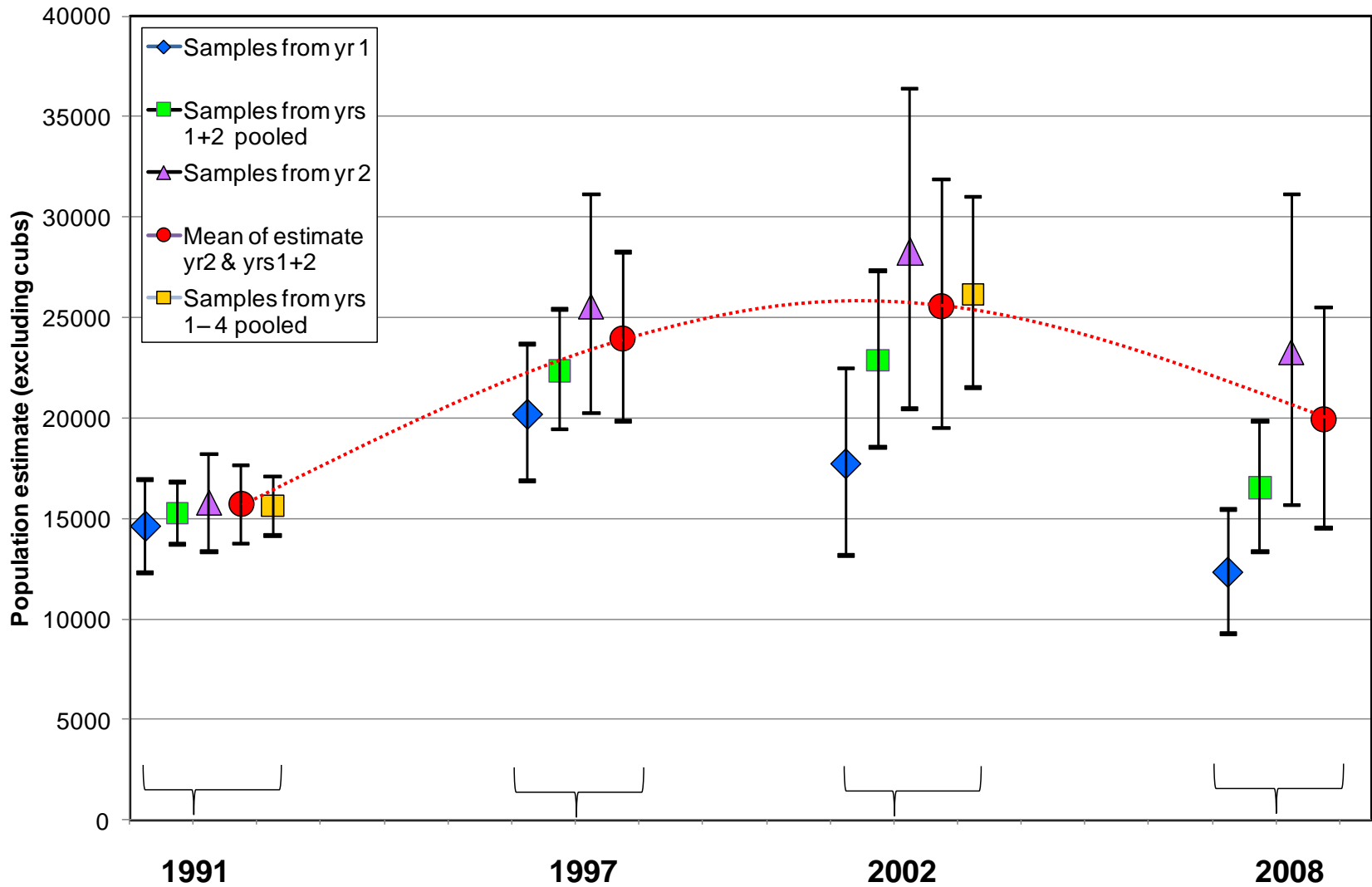
Fig. 7. Population estimates by BMU derived from tetracycline marking, based on pooled sample recoveries over 2 years (1997-98, 2002-3, 2008-9), with estimates applicable to the year of marking (97, 02, 08).
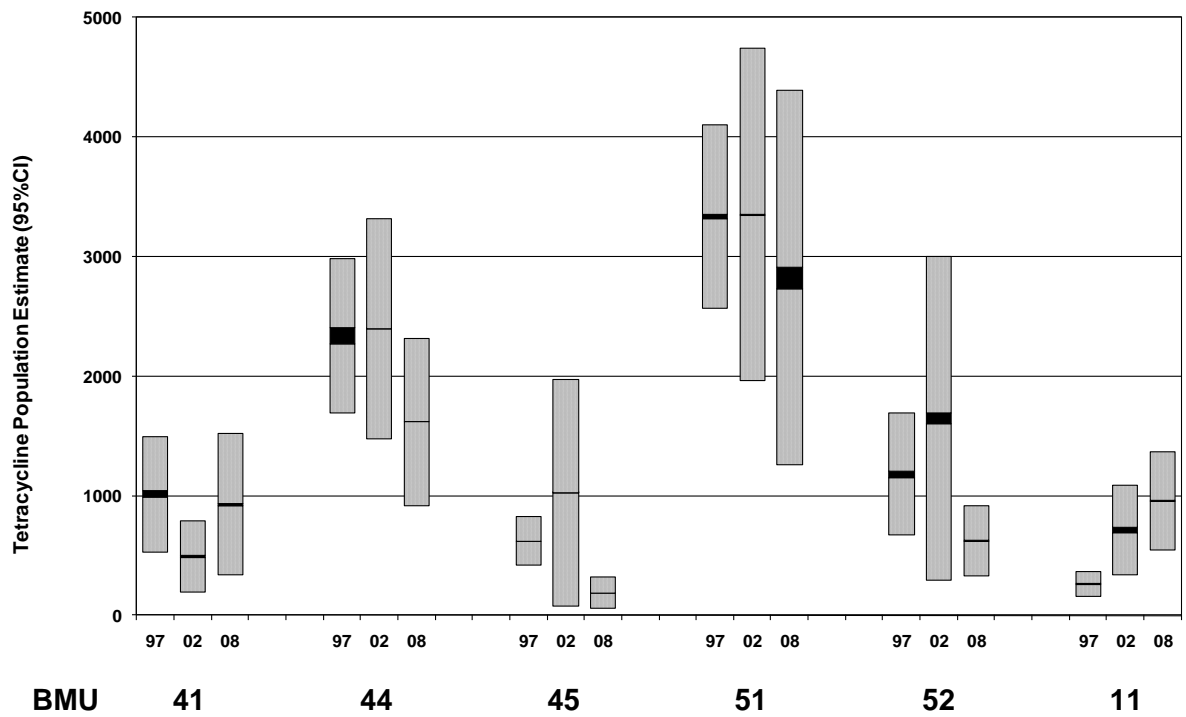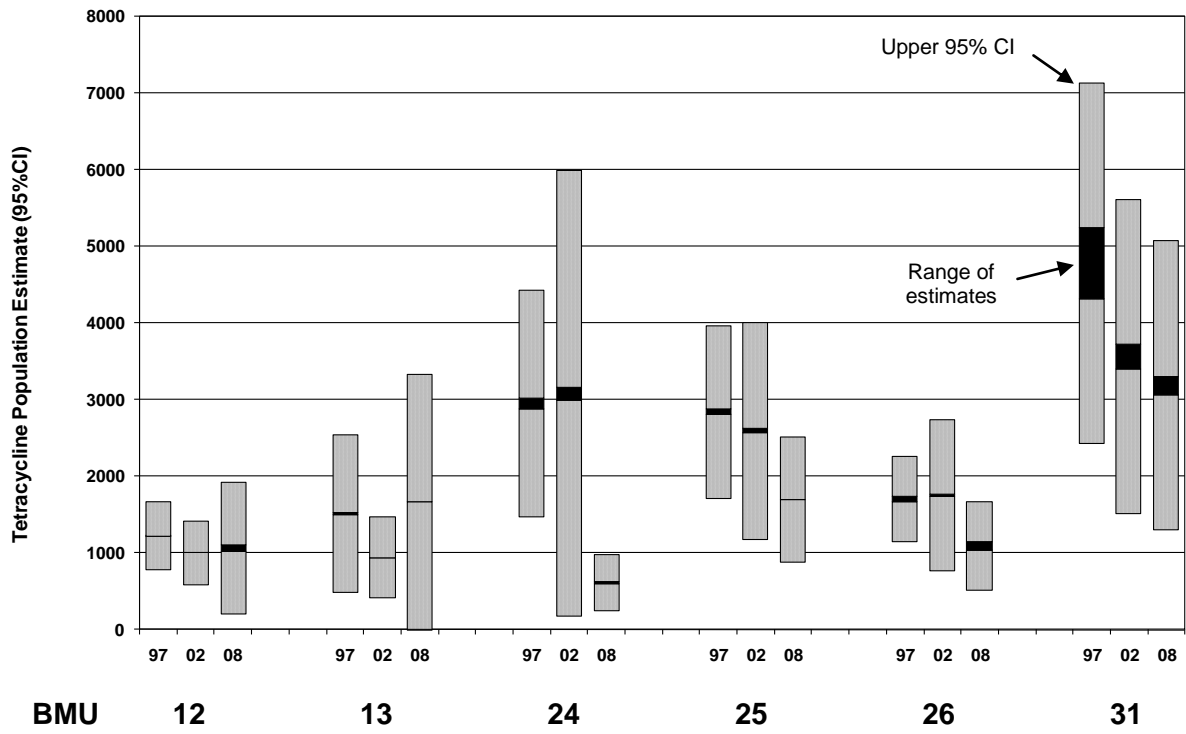
Table 12. Estimated rates of offtake (harvest rates) based on tetracycline estimates. Consistent harvests (compare column 2 vs 3) but extreme variation in harvest rates between 2009 and the previous 5 years (compare last 2 columns), or estimated harvest rates that are unreasonably high or low, are probably 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.