

STATUS OF MINNESOTA BLACK BEARS, 2010

Final Report to Bear Committee

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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.*

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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 1 st week and 84% by the end of the 2 nd 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.

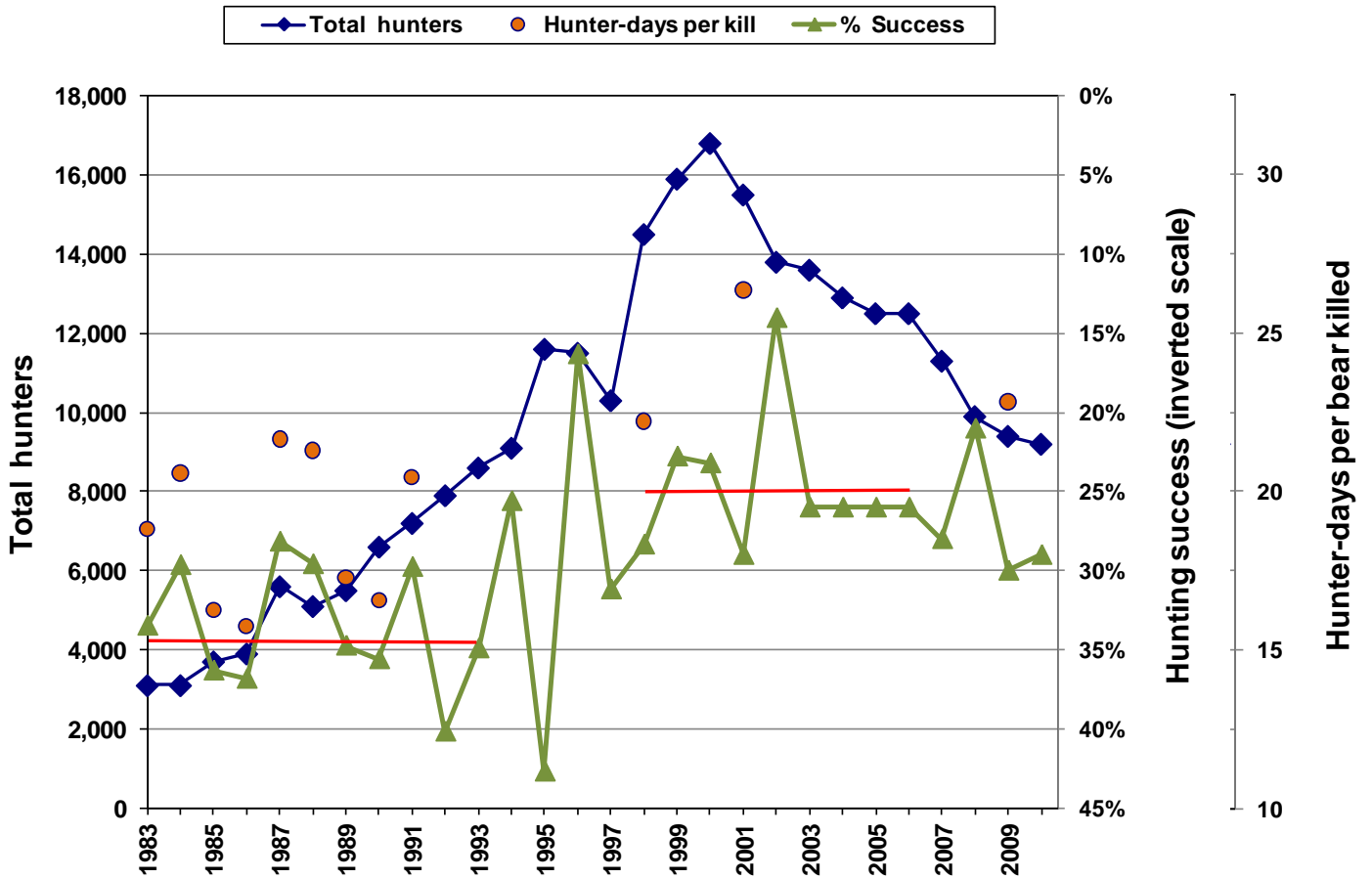


Table 2. Number of bear hunting permits available per year, 2006–2010 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

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.

BMU	2010					2009	2008	2007	2006	2005	5 year mean	Record high harvest (yr)
	M (%M)	F	U	Total								
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)→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:

- ^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).

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	69.5	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.

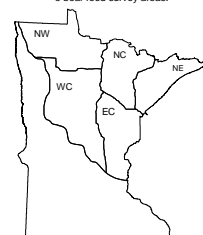


Table 11. Index values of bear food abundance^a in 2010 compared to the previous 26-year mean (1984-2009) in 5 survey areas across Minnesota’s bear range. Pink-shaded values indicate low fruit abundance and green-shaded values indicate high fruit abundance (≥1 point different than average).

FRUIT	NW		NC		NE		WC		EC		Entire Range	
	26yr mean	2010 <i>n</i> = 10 ^b	26yr mean	2010 <i>n</i> = 13	26yr mean	2010 <i>n</i> = 10	26yr mean	2010 <i>n</i> = 5	26yr mean	2010 <i>n</i> = 7	26yr mean	2010 <i>n</i> = 36 ^c
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.

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

^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.

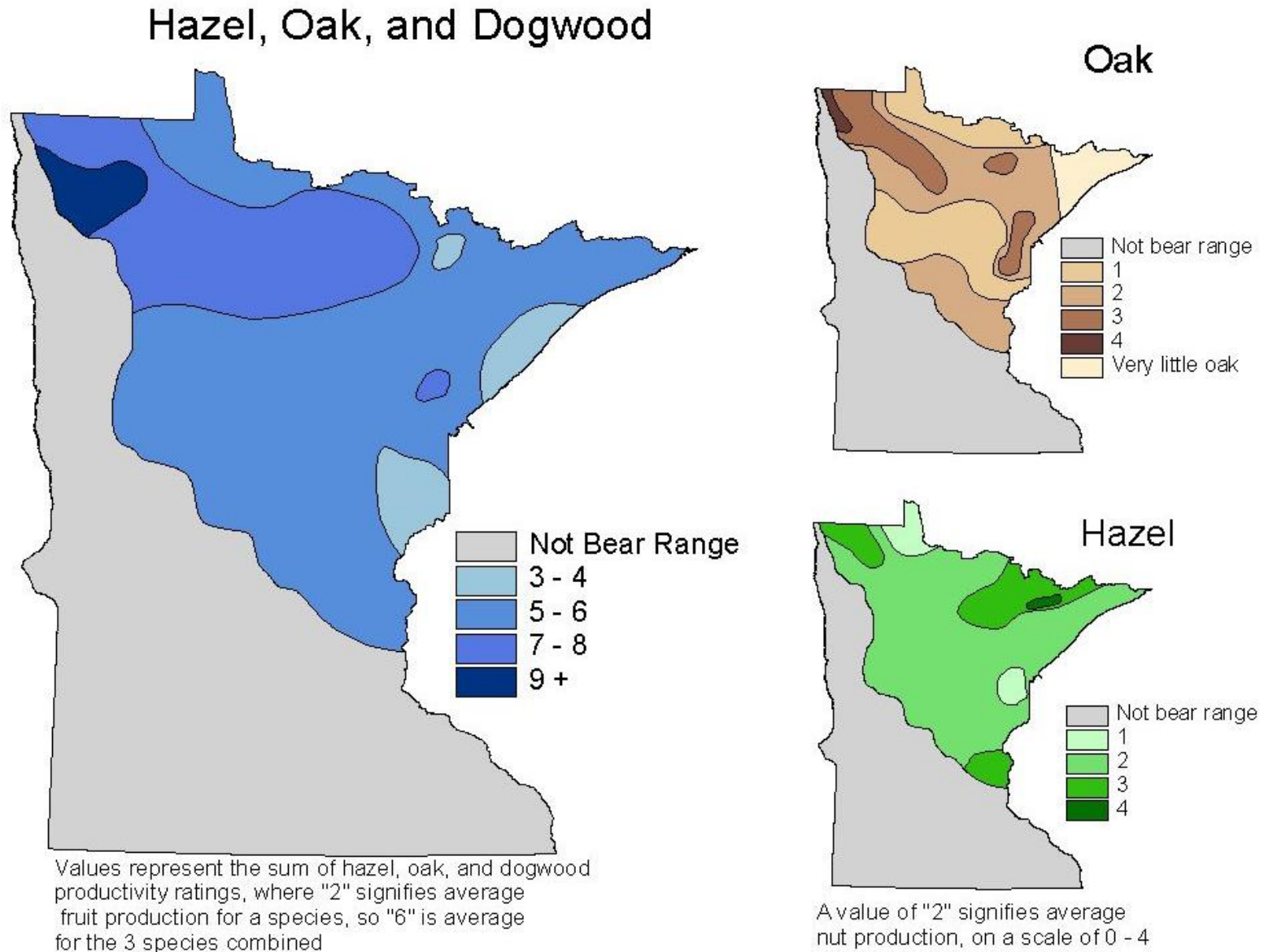


Fig 4. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984–2010 ($R^2=0.86$); (bottom graph) 2000–2010 ($R^2=0.96$).

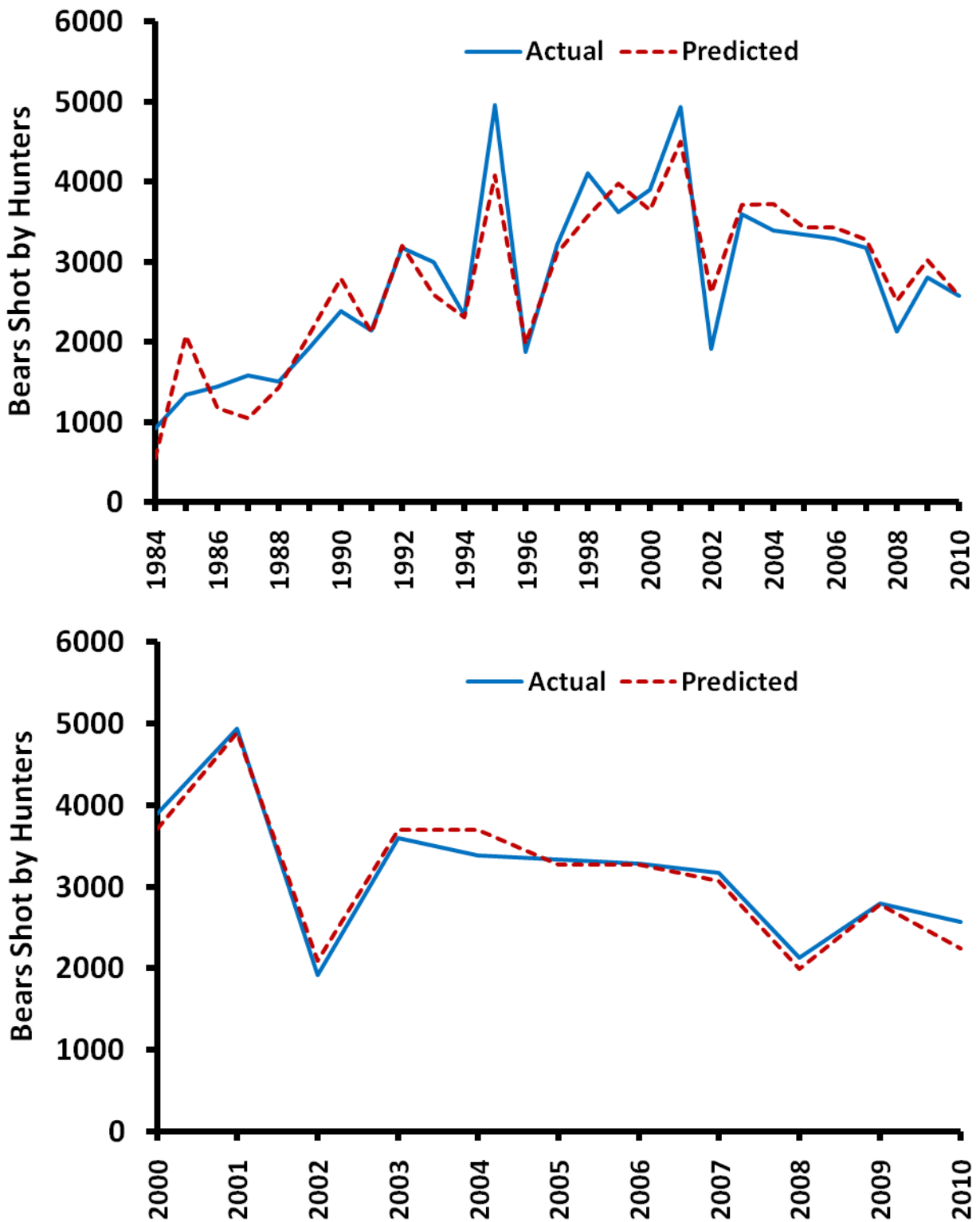


Fig 5. Sex ratios of harvested bears by BMU, 2004–2010.

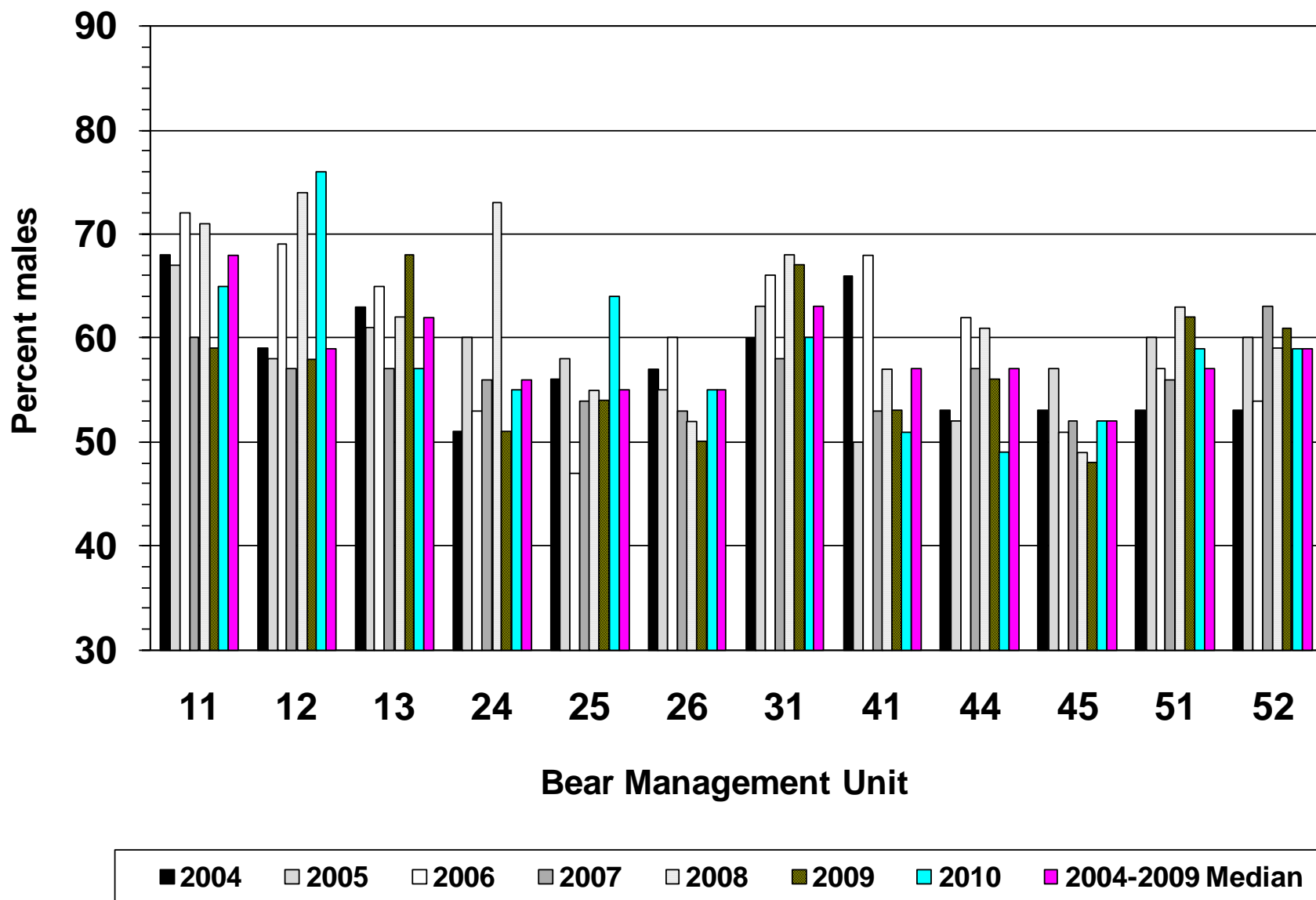


Fig 6. Median ages of harvested female bears by BMU, 2004–2010.

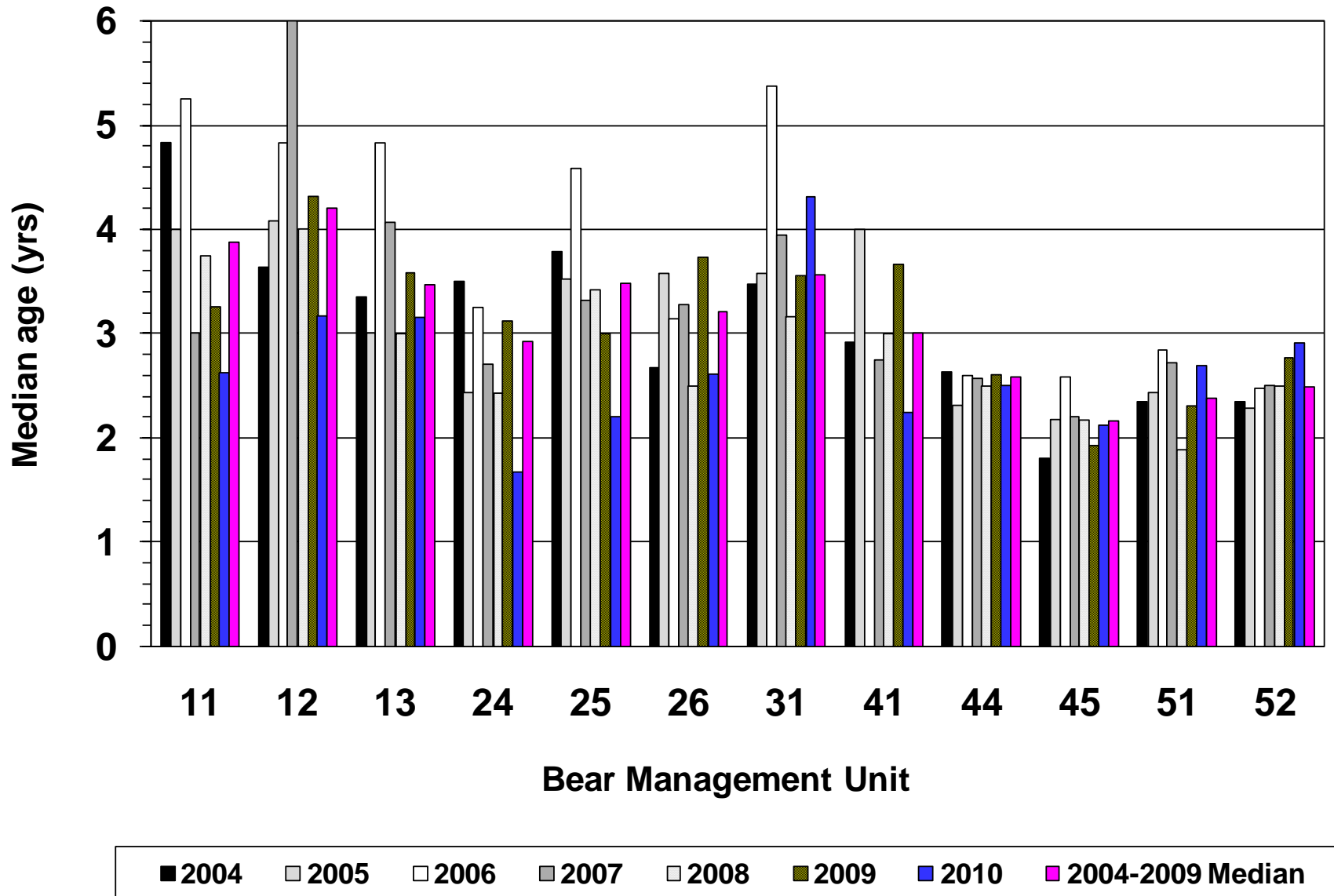


Fig. 7. Statewide harvest structure: median ages (yrs) by sex, 1982–2010.

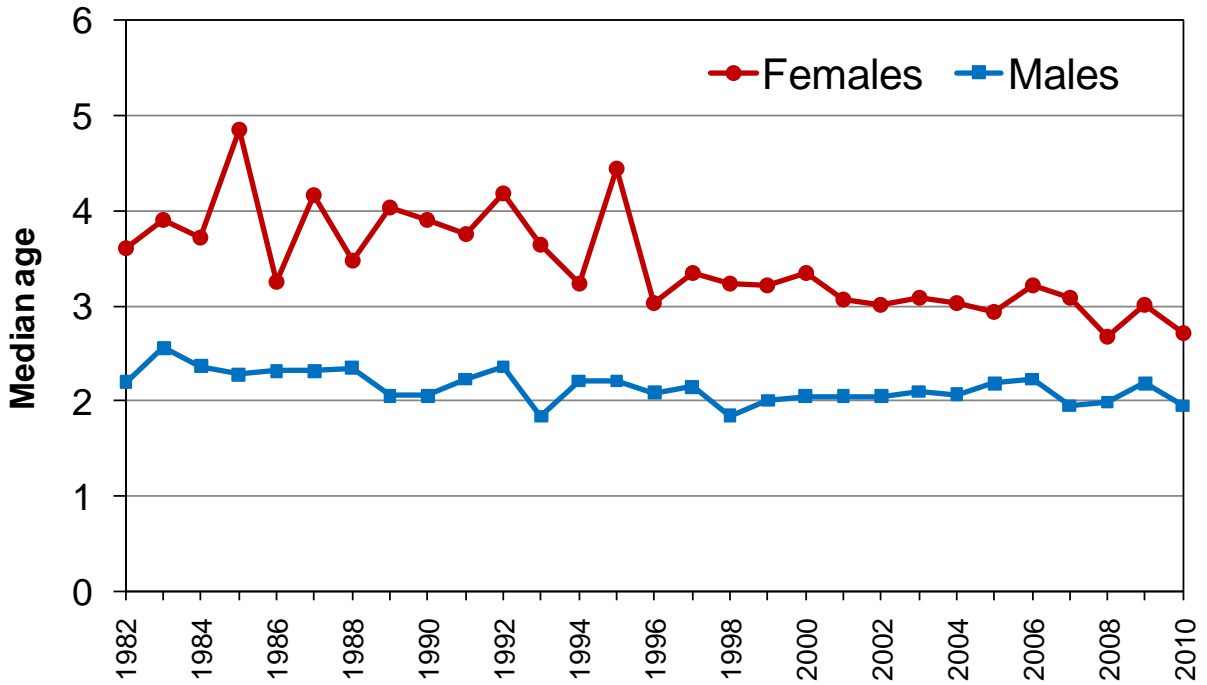


Fig. 8. Statewide harvest structure: proportion of each sex in age category, 1982–2010. Trend lines are significant.

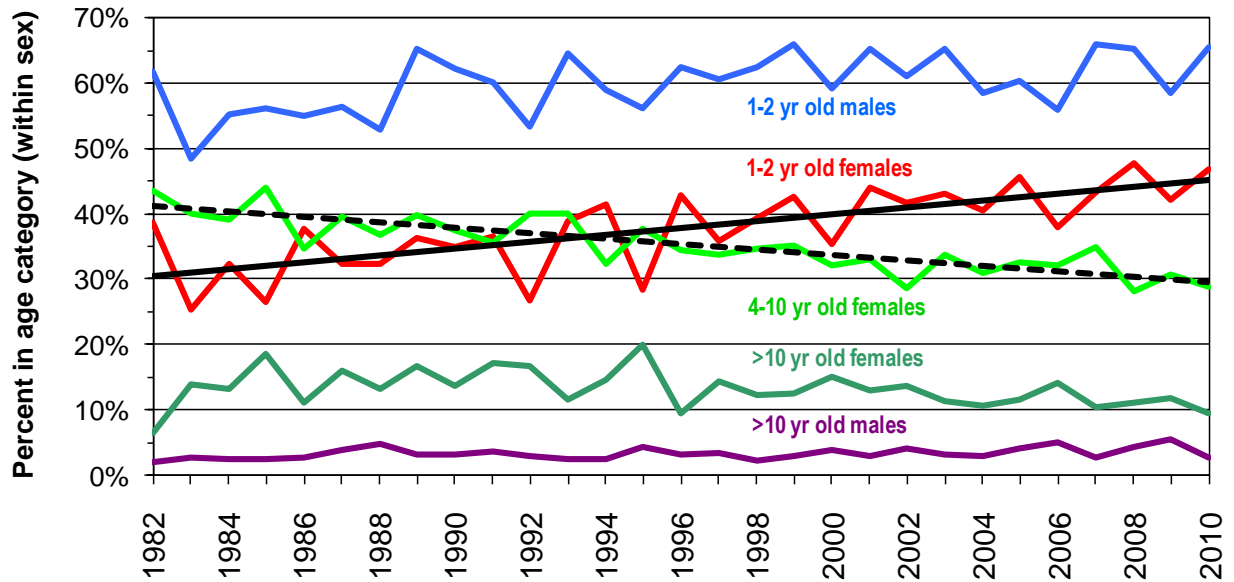


Fig. 9. Statewide population estimates derived from tetracycline marking in 1991, 1997, 2002, and 2008. Each cluster of estimates pertains to the year of marking, with each point (and associated 95% CI) representing a different recapture sample (yr 1 = year of marking, yr 2 = year after marking). Simulation 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.

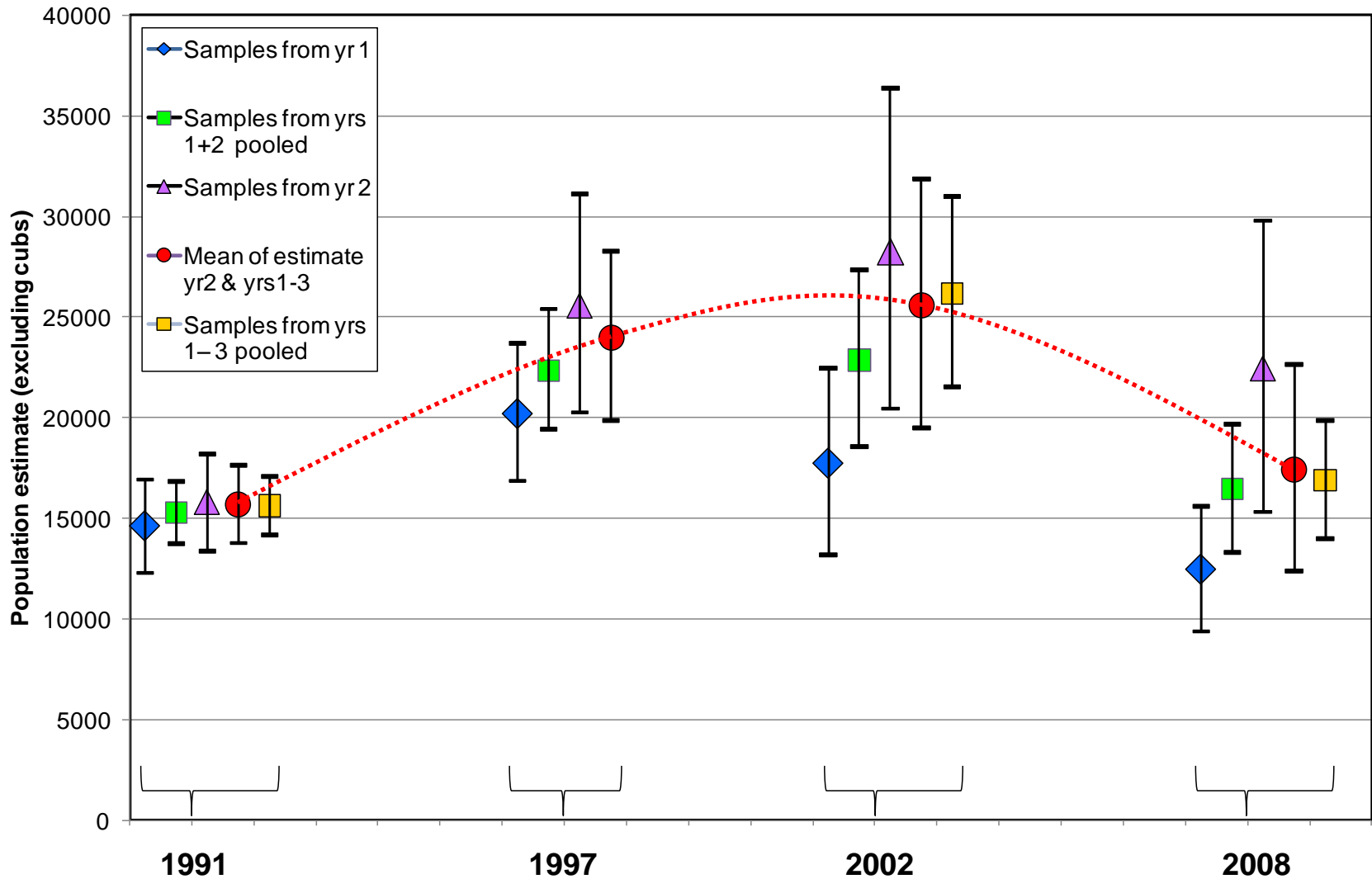


Fig. 10. Population estimates by BMU derived from tetracycline marking, based on pooled sample recoveries over 2–3 years (1997-1998, 2002-2004, 2008-2010), with estimates applicable to the year of marking (1997, 2002, 2008).

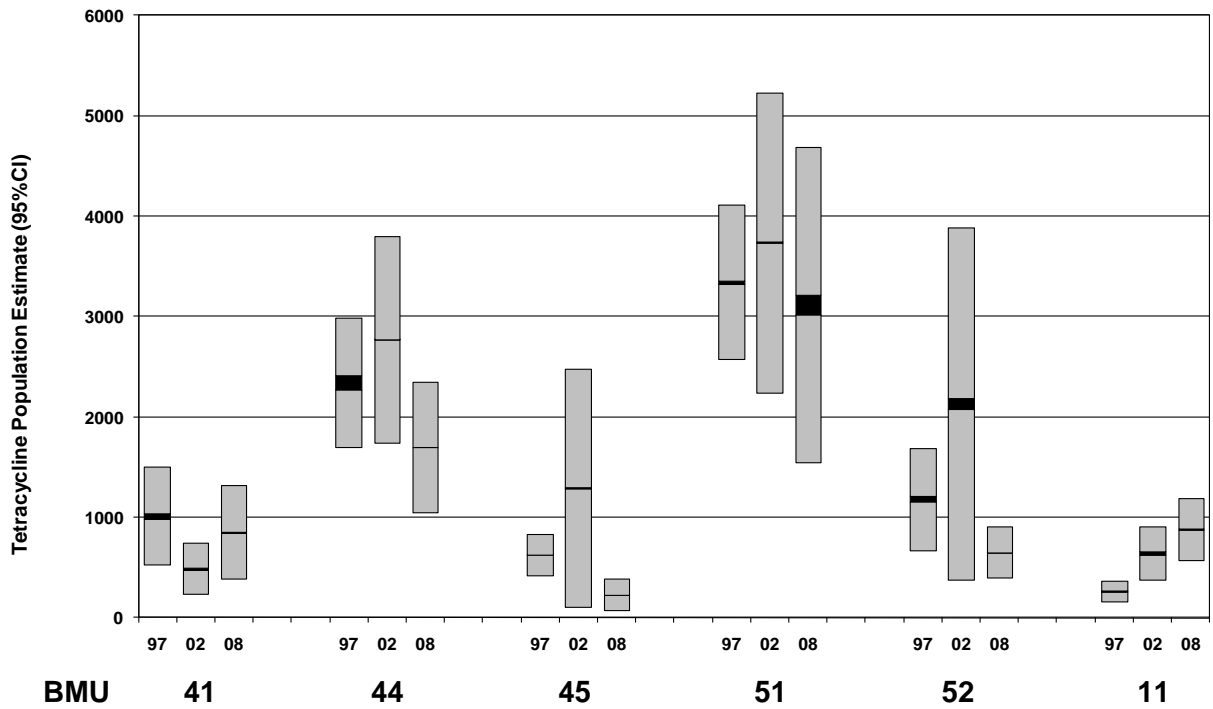
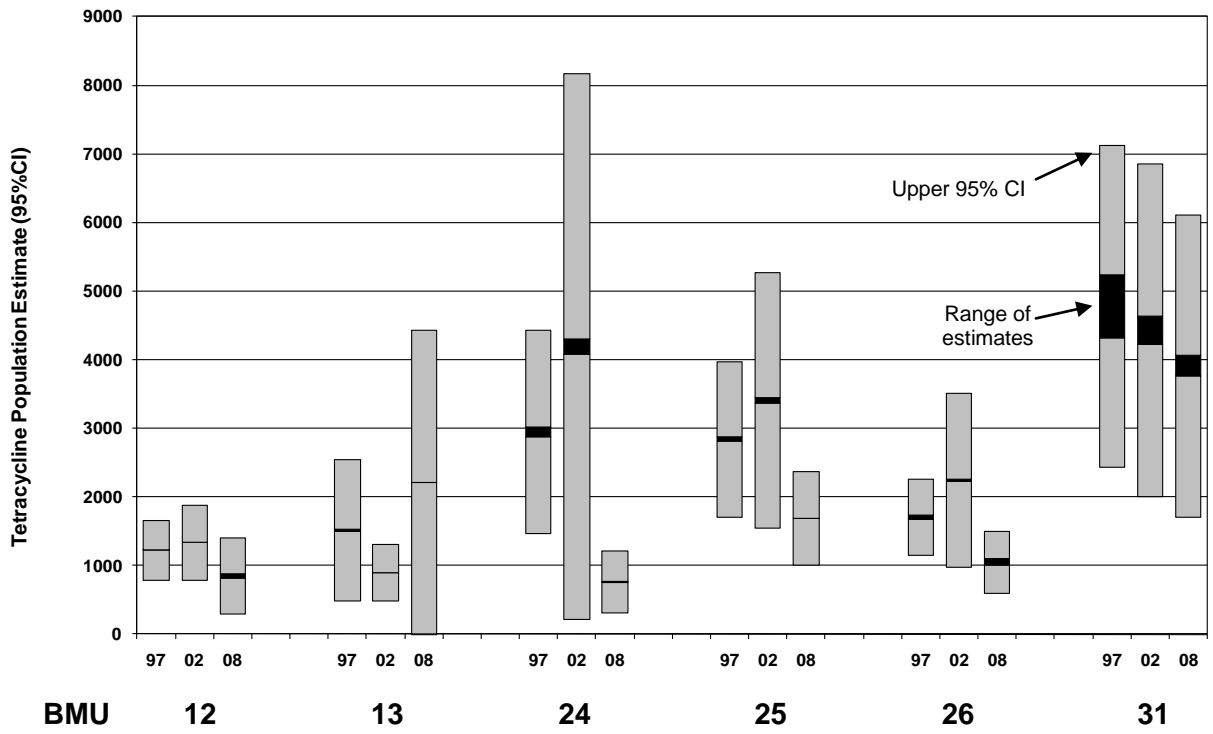


Table 13. Estimated harvest rates derived from tetracycline estimates. Extreme variation in harvest rates among years within BMUs (last 3 columns), or harvest rates that are unreasonably high or low, are probably indicative of flawed tetracycline estimates for either 2002 or 2008, or both (e.g., BMUs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