REGION ONE BLACK BEAR
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Montana Fish, Wildlife, & Parks

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PART 1 - BLACK BEAR HARVESTS IN REGION 1

TABLE 1. Region 1 Total Black Bear Harvest, from Mandatory Report Program (1985 – 2013).

YEAR	TOT. BEARS	FEM.	MALE
1985	583	225	352
1986	585	220	357
1987	458	162	292
1988	365	123	237
1989	552	200	341
1990	561	221	332
1991	382	130	244
1992	674	223	445
1993	465	139	322
1994	441	115	317
1995	539	195	329
1996	526	147	379
1997	736	215	521
1998	742	218	524
1999	638	211	427
2000	490	143	347
2001	378	103	275
2002	552	129	423
2003	544	168	359
2004	642	218	408
2005	487	168	302
2006	504	154	335
2007	568	194	359
2008	445	162	283
2009	490	170	320
2010	526	182	344
2011	512	173	339
2012	593	193	400
2013	493	167	326
Avg.	**533**	**175**	**353**
Total	**15421**	**5018**	**10240**

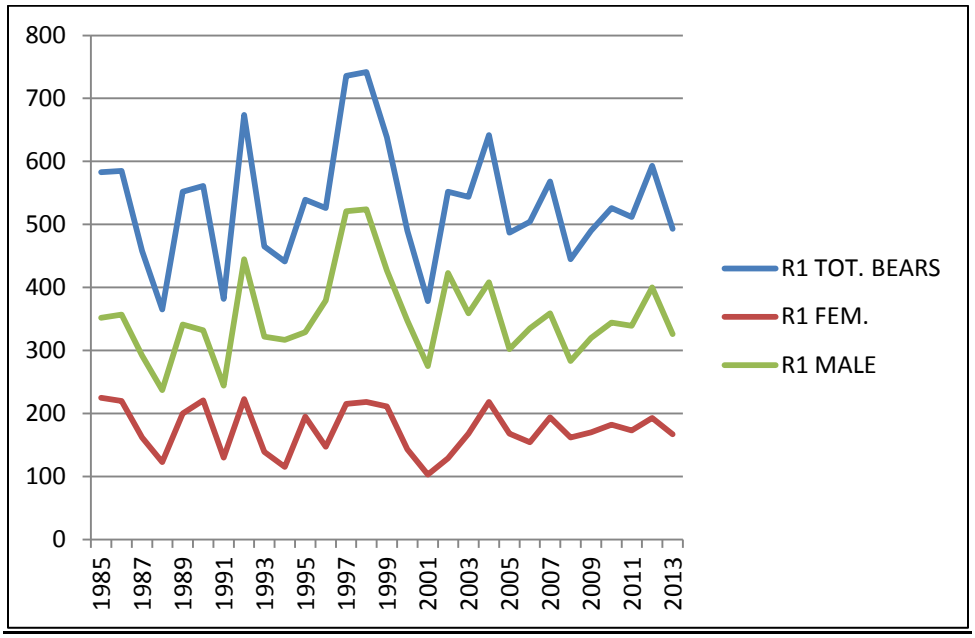

FIGURE 1. MFWP Region 1 female, male, and total black bear harvest numbers (1985 – 2013).

TABLE 2. Black Bear Harvest History for Region 1 Hunting Districts, from Mandatory Report Program (1985 – 2013).

Bear Management Unit (BMU) 100

YEAR	TOTAL BEARS	FEM.	MALE
1985	96	44	52
1986	74	24	50
1987	51	13	37
1988	46	15	30
1989	74	19	52
1990	96	34	59
1991	52	15	36
1992	94	20	74
1993	57	17	39
1994	82	19	63
1995	81	33	48
1996	66	19	47
1997	99	24	75
1998	120	38	82
1999	87	25	62
2000	69	19	50
2001	26	7	19
2002	64	23	41
2003	65	15	49
2004	64	21	41
2005	50	18	31
2006	59	20	38
2007	74	20	52
2008	45	18	27
2009	37	13	24
2010	43	15	28
2011	34	10	24
2012	67	16	51
2013	64	17	47
Total	**1936**	**591**	**1328**
Annual Avg.	**67**	**20**	**46**

BMU 102

YEAR	TOTAL BEARS	FEM.	MALE
1985	51	21	30
1986	63	29	33
1987	39	15	23
1988	35	12	23
1989	60	29	31
1990	57	28	27
1991	38	11	27
1992	79	31	47
1993	54	21	33
1994	42	5	36
1995	70	27	38
1996	26	7	19
1997	91	23	68
1998	62	17	45
1999	74	28	46
2000	57	14	43
2001	44	12	32
2002	57	13	44
2003	47	17	28
2004	71	25	45
2005	54	16	36
2006	50	15	35
2007	52	N/A	N/A
2008	43	16	27
2009	42	18	24
2010	51	12	39
2011	45	23	22
2012	77	22	55
2013	61	24	37
Total	**1592**	**531**	**993**
Annual Avg.	**55**	**19**	**35**

BMU 103

YEAR	TOTAL BEARS	FEM.	MALE
1985	60	26	33
1986	60	23	37
1987	66	29	37
1988	52	20	32
1989	93	36	55
1990	68	32	36
1991	46	16	30
1992	72	18	54
1993	56	14	41
1994	42	14	27
1995	66	24	37
1996	58	16	42
1997	88	28	60
1998	52	9	43
1999	54	18	36
2000	37	7	30
2001	39	14	25
2002	41	5	36
2003	47	12	34
2004	91	29	61
2005	56	20	34
2006	51	14	35
2007	55	15	39
2008	45	27	18
2009	49	18	31
2010	66	19	47
2011	44	9	35
2012	73	22	51
2013	47	17	30
Total	**1674**	**551**	**1106**
Annual Avg.	**58**	**19**	**38**

BMU 104

YEAR	TOTAL BEARS	FEM.	MALE
1985	97	33	62
1986	136	48	84
1987	74	25	48
1988	57	14	40
1989	92	29	63
1990	99	32	65
1991	67	26	40
1992	132	49	82
1993	81	28	53
1994	83	27	56
1995	74	26	48
1996	68	21	47
1997	85	26	59
1998	113	32	81
1999	93	36	57
2000	84	26	58
2001	34	9	25
2002	103	28	75
2003	87	31	56
2004	92	29	62
2005	84	34	47
2006	81	19	61
2007	84	27	55
2008	45	9	36
2009	67	25	42
2010	78	27	51
2011	69	19	50
2012	77	24	53
2013	54	13	41
Total	**2390**	**772**	**1597**
Annual Avg.	**82**	**27**	**55**

BMU 105

YEAR	TOTAL BEARS	FEM.	MALE
1985	131	53	76
1986	86	33	52
1987	50	17	32
1988	41	16	25
1989	64	25	39
1990	57	27	30
1991	55	26	28
1992	99	36	61
1993	75	20	55
1994	64	17	43
1995	99	30	65
1996	70	21	49
1997	117	26	91
1998	89	25	64
1999	95	36	59
2000	65	28	37
2001	86	24	62
2002	75	26	49
2003	128	38	80
2004	115	36	78
2005	89	28	57
2006	107	42	59
2007	127	52	75
2008	63	23	40
2009	89	33	56
2010	115	41	74
2011	120	43	77
2012	132	48	84
2013	133	44	89
Total	**2636**	**914**	**1686**
Annual Avg.	**91**	**32**	**58**

BMU 106

YEAR	TOTAL BEARS	FEM.	MALE
1985	91	25	66
1986	96	40	56
1987	91	26	65
1988	94	30	63
1989	111	42	63
1990	103	35	68
1991	64	18	42
1992	141	55	85
1993	84	16	67
1994	93	23	69
1995	99	32	66
1996	138	42	96
1997	86	26	60
1998	105	29	76
1999	119	30	89
2000	92	25	67
2001	81	12	69
2002	65	6	59
2003	101	33	66
2004	147	52	87
2005	97	39	56
2006	90	23	64
2007	97	30	64
2008	87	32	55
2009	76	25	51
2010	99	41	58
2011	111	31	80
2012	91	30	61
2013	94	33	61
Total	**2843**	**881**	**1929**
Annual Avg.	**98**	**30**	**67**

BMU 107

YEAR	TOTAL BEARS	FEM.	MALE
1985	11	4	7
1986	21	5	16
1987	26	10	16
1988	5	1	4
1989	14	5	9
1990	12	6	5
1991	12	2	10
1992	8	2	5
1993	11	7	3
1994	3	0	3
1995	13	3	10
1996	19	7	12
1997	11	2	9
1998	4	0	4
1999	9	0	9
2000	9	2	7
2001	12	5	7
2002	0	0	0
2003	6	0	6
2004	7	5	2
2005	3	2	1
2006	8	3	5
2007	7	1	6
2008	3	1	2
2009	6	1	5
2010	7	1	6
2011	8	2	6
2012	9	2	7
2013	4	2	2
Total	**268**	**81**	**184**
Annual Avg.	**9**	**3**	**6**

BMU 108

YEAR	TOTAL BEARS	FEM.	MALE
1985	46	19	26
1986	49	18	29
1987	61	27	34
1988	35	15	20
1989	44	15	29
1990	69	27	42
1991	48	16	31
1992	49	12	37
1993	47	16	31
1994	32	10	20
1995	37	20	17
1996	76	14	62
1997	139	54	85
1998	142	53	89
1999	96	31	65
2000	62	14	48
2001	54	17	37
2002	139	26	113
2003	63	22	40
2004	55	22	31
2005	54	11	40
2006	58	18	38
2007	66	27	38
2008	114	36	78
2009	124	37	87
2010	67	26	41
2011	81	36	45
2012	67	29	38
2013	47	17	30
Total	**2021**	**685**	**1321**
Annual Avg.	**70**	**24**	**46**

PART 2 - ESTIMATING SUSTAINABLE BLACK BEAR HARVESTS IN REGION 1

Introduction

Black bear hunting has a long tradition in Montana; black bears have been designated as a big game animal in Montana since 1923. Beginning in 1985, hunters were required to present their harvested black bear to MFWP personnel in order to collect accurate information on the number and sex of bears harvested in each Bear Management Unit (BMU). Since the mid-1990s, Montana's annual black bear harvest has remained 4th in the nation behind Washington, Oregon, and Idaho. Also in the mid-1990s, traditional black bear management was becoming increasingly controversial. Topics of concern included spring hunting, orphaning of dependent young through illegal harvest of females with cubs, use of dogs and artificial baits, and the level of mistaken identity with grizzly bears *(Ursus arctos horribilis)*.

In 1994, Montana biologists began using harvest criteria originally established in Idaho to safeguard against overharvest (MFWP 1994). Metrics including harvest <40% female black bears, female median age >7 years, and median male > 4 years were used. However, after having used the Idaho criteria, although black bear harvest numbers appeared sustainable, most criteria were not being met. Between 1987 and 2006, all 3 criteria were met only 17% of the time, statewide.

To help mitigate this problem, MFWP initiated the Montana State Black Bear Research Program (the Research Program) in 2000. Between 2000 and 2004, MFWP researchers trapped and collared black bears in the Swan Valley for the Research Program, and between 2002 and 2008, MFWP also used DNA-based methods at multiple sites across the state. MFWP's 2011 Final Black Bear Report (Final Report, Mace and Chilton-Radandt 2011) is the culmination of those efforts.

Using the methods as outlined in the Final Report, MFWP estimated statewide black bear density, population size, and harvest rates. The results of the Final Report also made it clear that the collection of teeth from harvested bears was not useful for determining population trends because it would take too many years of collection to be of practical value. However, Mace and Chilton-Radandt cautioned that the value of MFWP's mandatory check exists in accurately recording the number and verifying sex of harvested animals, to aid in estimating harvest trends, along with other information (such as age-at-harvest data) if desired.

Although the Final Report's population data were helpful to managers, they also desired a means of assessing total mortalities that would be sustainable in each of their districts. This is particularly important in years in which harvest levels change, such as in 2012 when 2 weeks were added to the total legal harvest period. Here, we use sex and other data (such as the black bear density, population size, and harvest rate information from the Final Report) to estimate sustainable harvest and nonharvest mortality in each BMU.

Methods

We used spreadsheets (Tables 3-6) to determine the sustainable number of female black bears that can be harvested in each BMU. First, we calculated the total area of black bear habitat in each BMU (km^2) by finding the total forested area (i.e., black bear habitat) in each BMU, and then using a surface area analysis to estimate the

total surface area, including vertical area, within each forested area (field 2 in Tables 3-6).

We also needed to calculate black bear densities in each BMU. *Because the true black bear density for each BMU is unknown, we used a different density (including a midpoint from each BMU, a minimum average midpoint, and maximum density estimated from across all BMUs) for each respective table below* (field 3, Tables 3-6). In Table 3, note that we used the midpoint black bear density for *each* respective BMU, as established in the Final Report (p. 36, Table 21). In Table 4, we used the *minimum* density (which equates to the minimum possible value of *all density values across all BMUs*, or 5 black bears per 100 km^2. A value of 5 was used, rather than the actual value of 1, to represent the more realistic minimum value) for all BMUs. The *average* of the midpoint density was used as the density value for all BMUs where hunting is regulated by MFWP, in Table 5 (12 black bears per 100 km^2). In Table 6, the *maximum* possible density of 27 black bears per 100 km^2 was used (which equates to the maximum possible value of all density values, across all BMUs). By varying the black bear density used, we anticipate that each area biologist will use their knowledge of existing conditions in their respective BMUs, to determine which density value/table to use.

We next assessed how many total black bears were in each forested area by multiplying the total surface area by its corresponding density value and dividing it by 100. This gave us the total number of black bears in each BMU (field 4, Tables 3-6).

We also needed to estimate the number of *female* black bears in the population. To do this, we used the proportion of females for each area (Final Report, p. 31, Table 13) and multiplied the total number of bears by this proportion. For areas in which we had used DNA methods to establish population size and/or harvest rate, we used the established ratios of female: male black bears. For Region 1 districts that we had not studied in the Research Program (BMUs 105, 106, 107, and 108), we estimated the average proportion of females across all areas studied and used this proportion (0.58) to determine the total number of female black bears in those areas.

Because not all of these females were legal to harvest (e.g., cubs of the year and females with cubs are not legal to harvest in Montana), these individuals were omitted from this sustainable mortality calculation. We used the proportion of female black bears that are legal to harvest (Final Report, p. 29, N=0.73), and multiplied the number of female black bears in a BMU (field 5, Tables 3-6), to the proportion of females that are legal to harvest to give us the total number of legally harvestable female black bears (field 6, Tables 3-6).

Using Bunnell and Tate's (1980) isoclines, the Final Report states that our female black bear population is decreasing if total mortality exceeds 16% (p. 37). We multiplied the number of legally harvestable female black bears by 0.16 to find the total number of legal female hunting mortalities allowed to maintain population stability (field 9, all Tables).

Subtracting a specific number of known harvests (e.g., fields 7 *or* 8, Tables 3-6) from the number of legal female hunting mortalities allowed to maintain population stability (field 9) gives us a total number of female black bear *non*harvest mortalities that would be allowed to maintain population stability (field 10, Tables 3-6). We suggest that

Biologists choose a representative value of past female harvests. Field 7 (Tables 3-6) displays some average female harvest values from the Final Report (p. 23, Table 4); we also found a representative value of females harvested from a specific year (i.e., the number of female black bears harvested for each BMU in 2010, field 8, Tables 3-6). Whatever representative harvest is selected, this value should be subtracted from the number of legal female black bear harvests allowed for population stability (field 9) to obtain the total number of female black bear *non*harvest mortalities allowed to maintain population stability.

Finally, Region 1 coordinates with outside agencies (e.g., Glacier National Park, MDOT, MRL, BNSF, and USFS) to count total black bear mortalities. An MFWP representative contacts each agency at the beginning of every year, to request their annual total of black bear mortalities, and their locations. Sex and age is also requested if the information is available. These nonharvest mortalities can then be compared to our estimated sustainable nonharvest numbers (from Tables) to determine whether mortality levels are occurring at a sustainable level for each BMU.

Results

TABLE 3. Allowable harvest and nonharvest mortalities of female black bears in MFWP Region 1, based upon data from the 2011 Final Black Bear Report and the 2010 female black bear harvest from MRRE. Values in yellow-highlighted fields can be selected by Area Biologist.

BMU	Forested Area in BMU (km^2)	Midpoint Black Bear Density per 100 km^2	Black Bear Pop Size	Number Female Black Bears	Legally Harvestable Female Black Bears (females 1+ yrs old)	Avg Annual Num Female Black Bears Harvested (1987-2006)	2010 Female Black Bear Harvest (MRRE)	Legal Female Black Bear Harvests Allowed for Pop Stability	Female Black Bear NONharvests Allowed to Maintain Pop Stability (using 2010 harvest #s)
Location in Final Report		p. 36, Table 21		p. 31, Table 13	p. 29, last complete sentence	p. 23, Table 4		p. 37	
BMU100	3079.5	15	462	240	175	21	15	28	13
BMU102	2730.7	10	273	175	128	19	12	20	8
BMU103	2411.9	19	458	270	197	21	19	32	13
BMU104	3266.2	21	686	343	250	28	27	40	13
BMU105	3307.5	8	265	153	112	30	41	18	-23
BMU106	4412.3	20	882	512	374	35	41	60	19
BMU107	2803.0	23	645	374	273	3	1	44	43
BMU108	1942.8	15	291	169	123	25	26	20	-6

TABLE 4. Allowable Harvest and nonharvest mortalities of female black bears in MFWP Region 1, using an estimated *minimum* density from the 2011 Final Black Bear Report and the 2010 female black bear harvest from MRRE. Values in yellow-highlighted fields can be selected by Area Biologist.

Area	Forested Area in BMU (km^2)	*MINIMUM* Black Bear Density per 100 km^2 (from Final Report)	Black Bear Population Size	Number Female Black Bears (from Final Report)	Legally Harvestable Female Black Bears (females 1+ yrs old, from Final Report)	Avg Annual Num Female Black Bears Harvested (1987-2006, Final Report)	2010 Female Black Bear Harvest (MRRE)	Legal Female Black Bear Harvests Allowed for Pop Stability (from Final Report)	Female Black Bear NONharvests Allowed to Maintain Pop Stability (using 2010 harvest #s)
BMU100	3079.5	5	154	80	58	21	15	9	-6
BMU102	2730.7	5	137	87	64	19	12	10	-2
BMU103	2411.9	5	121	77	56	21	19	9	-10
BMU104	3266.2	5	163	105	76	28	27	12	-15
BMU105	3307.5	5	165	106	77	30	41	12	-29
BMU106	4412.3	5	221	141	103	35	41	16	-25
BMU107	2803.0	5	140	90	65	3	1	10	9
BMU108	1942.8	5	97	62	45	25	26	7	-19

TABLE 5. Allowable Harvest and nonharvest mortalities of female black bears in MFWP Region 1, using an estimated *average* of all midpoint densities in BMUs where hunting is regulated by MFWP from the 2011 Final Black Bear Report, and the 2010 female black bear harvest from MRRE. Values in yellow-highlighted fields can be selected by Area Biologist.

Area	Forested Area in BMU (km^2)	*AVG MIDPOINT* Black Bear Density per 100 km^2 (from Final Report)	Black Bear Population Size	Number Female Black Bears (from Final Report)	Legally Harvestable Female Black Bears (females 1+ yrs old, from Final Report)	Avg Annual Num Female Black Bears Harvested (1987-2006, Final Report)	2010 Female Black Bear Harvest (MRRE)	Legal Female Black Bear Harvests Allowed for Pop Stability (from Final Report)	Female Black Bear NONharvests Allowed to Maintain Pop Stability (using 2010 harvest #s)
BMU100	3079.5	12	370	192	140	21	15	22	7
BMU102	2730.7	12	328	210	153	19	12	24	12
BMU103	2411.9	12	289	171	124	21	19	20	1
BMU104	3266.2	12	392	196	143	28	27	23	-4
BMU105	3307.5	12	397	230	168	30	41	27	-14
BMU106	4412.3	12	529	307	224	35	41	36	-5
BMU107	2803.0	12	336	195	142	3	1	23	22
BMU108	1942.8	12	233	135	99	25	26	16	-10

TABLE 6. Allowable Harvest and nonharvest mortalities of female black bears in MFWP Region 1, using an estimated *maximum* density from the 2011 Final Black Bear Report and the 2010 female black bear harvest from MRRE. Values in yellow-highlighted fields can be selected by Area Biologist.

Area	Forested Area in BMU (km^2)	*MAXIMUM* Black Bear Density per 100 km^2 (from Final Report)	Black Bear Population Size	Number Female Black Bears (from Final Report)	Legally Harvestable Female Black Bears (females 1+ yrs old, from Final Report)	Avg Annual Num Female Black Bears Harvested (1987-2006, from Final Report)	2010 Female Black Bear Harvest (MRRE)	Legal Female Black Bear Harvests Allowed for Pop Stability (from Final Report)	Female Black Bear NONharvests Allowed to Maintain Pop Stability (using 2010 harvest #s)
BMU100	3079.5	27	831	432	316	21	15	51	36
BMU102	2730.7	27	737	472	344	19	12	55	43
BMU103	2411.9	27	651	384	280	21	19	45	26
BMU104	3266.2	27	882	441	322	28	27	52	25
BMU105	3307.5	27	893	518	378	30	41	60	19
BMU106	4412.3	27	1191	691	504	35	41	81	40
BMU107	2803.0	27	757	439	320	3	1	51	50
BMU108	1942.8	27	525	304	222	25	26	36	10

Conclusions

Black Bear Tooth Collection. As explained in the Final Report, Region 1 stopped taking teeth from harvested bears in 2011. In lieu of pulling teeth, Region 1 began a follow-up program to tabulate total black bear mortalities, including requesting black bear mortality records from other agencies. By the end of each year, agencies are now queried by a MFWP representative so that all black bear mortalities in their BMUs can be used to assess total sustainable mortality. We are assuming that these data are as close to true bear mortality numbers as possible.

Since we do not know whether or what age is important to managing black bear populations, it may be key to at least record the age class of each mortality. This requires only viewing the incisors from harvested bears. In addition, by collecting age class data, we can retain some knowledge relative to the age of harvested bears, which could be used to model harvest and population trends. As Fieberg et al (2010) suggest, age-at-harvest models are an inexpensive way to determine population trends, using data specific to the population in question. The decision to continue tooth collection should be left to individual regions, with the caveat that it is only useful when combined with information on hunter numbers and effort.

Sustainable Mortality of Black Bears. Area biologists can use their best judgment in selecting what values for: 1) population density and 2) previous year's harvest, to insert into the sustainable mortality table. In so doing, each area biologist can be assured of a more representative result that reflects the existing conditions in their BMU of interest.

It is important to note that the boundaries of BMU108 changed in 2010, which changes the sustainable harvest estimate for that area. Also, the habitat in BMU108 is comparatively different from other areas. Factors such as area (km^2) and habitat greenness can have effects on the final sustainable mortality calculations for each BMU.

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Wildlife Restoration