

Colorado Parks and Wildlife
Furbearer Management Report
2012-2013 Harvest Year



Report By:

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In July 2011, the Colorado Parks and Wildlife Commission directed staff to review the management priorities, data collection processes, and management approaches for furbearer species in a consultative process with interested stakeholders. Subsequent recommendations on priorities, processes, and management guidelines were forwarded to the Parks and Wildlife Commission in a 2 step public review process and were finalized in July 2012.

The review process prioritized furbearer species for enhanced harvest data collection and for development of species specific management guidelines. Priority species identified for improved harvest data collection are: gray fox, swift fox, and pine marten. Priority species identified for development of management guidelines priority species are: bobcat, gray fox, and swift fox.

Harvest data collection improvements: for gray fox, swift fox, and pine marten Colorado Parks and Wildlife (CPW) decided to use the Harvest Information Program (HIP) as a means of “pre-registering” fur harvester’s intent to take these species. Doing so allows stratification of survey samples in an effort to improve the confidence in harvest estimates and the location of harvest. Bobcats were also identified as a high priority species for harvest data collection; although the mandatory check process was deemed adequate for obtaining harvest data. We did however revise the mandatory bobcat check form to include information to estimate bobcat harvest per unit effort, which is one of the management guidelines developed for bobcats.

In July 2012, following the program review process the Parks and Wildlife Commission approved the data collection processes and new management guidelines for bobcat, gray fox, and swift fox. Those guidelines and their corresponding data results are summarized in specific sections of this report.

This report contains several sections:

- Section I Historic and recent harvest data
- Section II Bobcat management guideline analysis
- Section III Swift fox guideline analysis
- Section IV Gray fox management guideline analysis
- Section V Pine Marten harvest data analysis
- Section VI Summary and critique of harvest data collection and management guideline analysis and recommendations for improvement

SECTION I: Recreational Harvest Data

HISTORIC HARVEST DATA

	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	
Badger	230	143	65	697	158	159	110	n/s	135	n/s	n/s	225	n/s	102	550	
Beaver	672	664	713	4033	1576	896	238	n/s	1072	n/s	n/s	356	n/s	782	1147	
Bobcat (Total Mortality)	242	271	390	461	644	766	796	1261	1708	1845	1783	1399	1578	1686	1917	
Bobcat (Harvest Only)	175	178	314	387	562	680	717	1163	1605	1743	1668	1303	1489	1628	1854	
Coyote	24951	25920	21058	34413	39610	45912	38211	n/s	34943	31204	42427	n/s	49974	64294	41337	
Gray Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	109	n/s	510	763
Red Fox	749	520	340	1540	1517	997	457	n/s	n/s	n/s	n/s	1925	n/s	n/s	n/s	
Swift Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	153	n/s	107	381
Mink	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	15	n/s	n/s	n/s	
Muskrat	326	338	405	1870	1300	87	439	n/s	1230	1230	n/s	n/s	n/s	n/s	n/s	
Opossum	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	45	n/s	n/s	n/s
Pine Marten	CS	CS	CS	CS	CS	CS	CS	CS	175	n/s	n/s	52	n/s	139	940	
Raccoon	2189	1054	373	3703	2777	2153	293	n/s	n/s	n/s	n/s	5299	n/s	n/s	n/s	
Ring-tailed Cat	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	9	74
Striped Skunk	576	872	437	1668	2482	896	274	n/s	n/s	n/s	n/s	948	n/s	n/s	n/s	
Western Spotted Skunk	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s
Long-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s
Short-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s

CS = closed season n/s = not surveyed

SECTION I: Recreational Harvest Data

2009 – 2010 Harvest Data

Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Badger	206	103 – 411	2,919	679 – 12,556	225	81 – 623
Beaver	122	49 – 304	2,048	559 – 7,510	356	167 – 760
Bobcat	-		-		1,303	
Gray Fox	207	90 – 478	2,583	1,095 – 6,093	109	34 – 351
Red Fox	860	573 – 1,291	8,507	4,930 – 14,678	1,925	730 – 5,079
Swift Fox	126	43 – 368	3,504	946 – 12,974	153	43 – 553
Mink	6	2 – 21	219	53 – 907	15	4 – 61
Opossum	26	6 – 114	64	18 – 232	45	9 – 231
Pine Marten	51	16 – 158	455	145 – 1,425	52	15 – 183
Raccoon	641	405 – 1,012	7,118	3,154 – 16,066	5,299	1,457 – 19,269
Ring-tailed Cat	23	4 – 115	45	9 – 231	0	0 – 0
Striped Skunk	264	131 – 534	4,789	1,616 – 14,195	948	265 – 3,390
Western Spotted Skunk	0	0 – 0	0	0 – 0	0	0 – 0
Long-tailed Weasel	0	0 – 0	0	0 – 0	0	0 – 0
Short-tailed Weasel	3	1 – 15	177	35 – 907	0	0 – 0

Not Surveyed: Coyote, Muskrat

2010 – 2011 Harvest Data

Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Bobcat	-		-		1,489	
Coyote	10,378	9,707 – 11,095	209,683	172,241 – 255,263	49,974	41,607 – 60,024

No Furbearer Harvest Survey, Coyotes Surveyed in the Small Game Survey

2011 – 2012 Harvest Data

Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Badger	144	104 – 201	2,097	1,350 – 3,258	102	66 – 156
Beaver	223	162 – 307	1,824	1,316 – 2,527	782	480 – 1,274
Bobcat	-		-		1,628	
Coyote	15,119	14,100 – 16,213	329,465	258,896 – 419,269	64,294	49,947 – 82,763
Gray Fox	228	152 – 342	3,610	2,543 – 5,125	510	294 – 884
Swift Fox	88	55 – 143	1,267	763 – 2,105	107	53 – 218
Pine Marten	24	14 – 43	243	106 – 558	139	49 – 399
Ring-tailed Cat	9	4 – 12	190	57 – 637	9	3 – 27

Not Surveyed: Red Fox, Mink, Opossum, Raccoon, Striped Skunk, Western Spotted Skunk, Long-tailed Weasel, Short-tailed Weasel

SECTION I: Recreational Harvest Data

2012 – 2013 Harvest Data

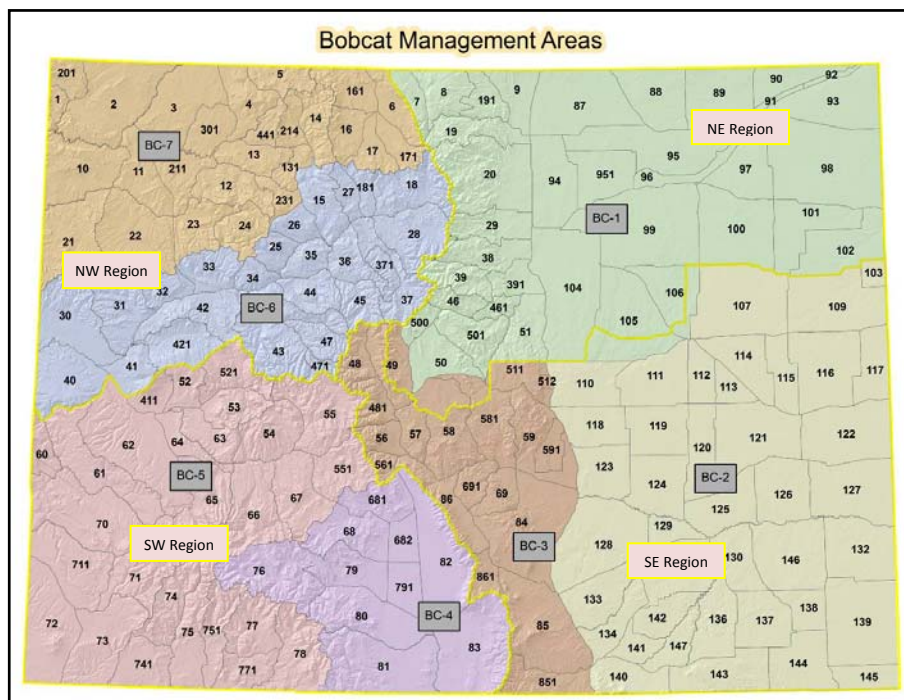
Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Badger	285	182 – 445	3,301	2,162 – 5,039	550	278 – 1,091
Beaver	299	207 – 432	3,737	2,198 – 6,353	1,147	690 – 1,907
Bobcat	-		-		1,854	
Coyote	9,782	pending	156,768	pending	41,337	pending
Gray Fox	214	146 – 313	6,109	3,646 – 10,238	763	396 – 1,470
Swift Fox	318	106 – 956	1,980	901 – 4,355	381	116 – 1,248
Pine Marten	235	60 – 927	5,102	1,271 – 20,476	940	310 – 2,850
Ring-tailed Cat	23	4 – 115	45	9 – 231	0	0 – 0

Bobcat Mortality Summary

	Total Mortality	Gender			Mortality Type							
		Male	Female	Unk	Hunt	Live Trap	30-day Permit	Road Kill	Game Dmg	Misc	Unk	
2012/13	1917	1052	839	26	648	1206	2	36	2	5	18	
2011/12	1686	942	718	26	607	1021	13	26	4	4	11	
2010/11	1578	851	700	21	676	813	8	43	5	2	25	
2009/10	1399	727	644	28	782	521	18	42	15		21	
2008/09	1783	952	797	34	884	784	14	56	16		29	
2007/08	1845	1063	760	22	974	769	14	44	5		39	
2006/07	1708	966	705	37	797	808	2	62	3		36	
2005/06	1261	732	508	21	656	507	33	53	5		7	
2004/05	796	457	334	5	469	248	32	33	13		1	
2003/04	766	456	289	20	453	227	7	54	22		3	
2002/03	644	369	258	17	439	123	1	28	48		14	
2001/02	461	247	197	17	336	51	1	32	25		16	
2000/01	390	190	179	20	279	35	1	38	28		9	
1999/00	271	131	127	13	162	16	0	24	54		15	
1998/99	242	145	93	4	127	48	9	22	26		10	

From 1998 through the early 2000s about 60%-70% of bobcat harvest came through hunting methods of take. Since then this has nearly completely switched to live traps representing 65% and hunting methods 35% of all harvest. Aside from this the other obvious trend is increasing harvest and total mortality. Although not shown on the tables, this increasing harvest trend follows trends in prices for bobcat pelts. Given these increases monitoring bobcat through established management guidelines is increasingly important.

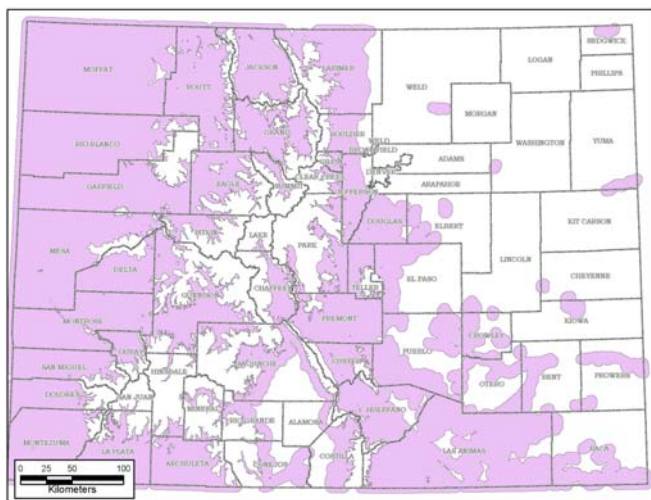
Figure 1. Bobcat management areas and regional boundaries.



A suite of management guidelines is used in evaluating the status of bobcats and management trajectory. Data is analyzed at three increasing spatial scales: bobcat management areas (Fig. 1), Colorado Parks and Wildlife regions, East/West of the continental divide, and statewide.

Mortality Thresholds

Figure 2. Modeled bobcat habitat used for mortality density analysis.



A habitat model was developed to represent core bobcat habitat within the state. While bobcat may occur anywhere in the state a core habitat model was considered more appropriate to conservatively represent essential bobcat habitat. Core habitat was constrained to less than 9,500 feet elevation; woodland and shrubland vegetation types identified in CPW Basinwide vegetation classifications buffered to about 7 km distance in order to smooth boundaries (Fig. 2).

Mortality Density

The mortality density threshold we developed is to not exceed 2.55 bobcat mortalities per 100 km². This is derived assuming an average population density of not more than 15 bobcat/100 km² across modeled habitat and a mortality threshold of not more than 17%. These are examined at the 4 spatial scales previously mentioned: bobcat management areas, regions, east/west of the continental divide (except that the San Luis Valley shall be included with west of the divide), and statewide.

The Bobcat Mortality Density Analysis Table below indicates that the established mortality thresholds have not been crossed at any of the spatial scales that analysis is performed.

Bobcat Harvest Density Analysis							
Management Threshold: 3-Year Average Mortality Should Not Exceed 2.55 bobcat/100 km ²							
Region	Bobcat Mgmt Area	Bobcat Core Habitat	2010-11 Harvest	2011-12 Harvest	2012-13 Harvest	3-Yr Average Harvest	Average Harvest Density per 100 km ²
NE	BC-1	12298	100	141	117	119	0.97
NW	BC-6	18969	331	342	306	326	1.72
	BC-7	29062	282	268	284	278	0.96
NW Region Total		48032	613	610	590	604	1.26
SE	BC-2	22015	215	283	345	281	1.28
	BC-3	15779	198	166	272	212	1.34
SE Region Total		37795	413	449	617	493	1.30
SW	BC-4	6785	97	113	103	104	1.54
	BC-5	33193	343	367	427	379	1.14
SW Region Total		39979	440	480	530	483	1.21
East Slope		50093	513	590	763	615	1.22
West Slope		88010	1053	1090	1154	1099	1.24
Statewide		138103	1566	1680	1917	1714	1.23

Harvest Gender Composition

As with other wild felids, data suggest males are more vulnerable to harvest and are usually more prevalent in harvest records. Thus, increasing amounts of females in harvest has been suggested as a means of monitoring population impacts. Colorado's management threshold on female harvest is that the female harvest composition should not equal or exceed 50% for more than two consecutive years.

The table on the following page indicates that this threshold is exceeded in the NE region, bobcat management area BC-1 where females comprise 56% of live trap and hunter harvest. At all other spatial scales female composition of harvest is below the 50% threshold.

SECTION II: Bobcat Management Guidelines Analysis#

2012-13 Bobcat Harvest Gender Composition								
Management Threshold: Females Should Not Exceed 50% of Harvest								
Region	Bobcat Mgmt Area	Method	Female	Male	Unknown	Grand Total	% Female & Unk	
NE	BC-1	Hunt	34	25	2	61	59%	
		Live Trap	29	26	0	55	53%	
	NE Region Total			63	51	2	116	56%
NW	BC-6	Hunt	32	37	0	69	46%	
		Live Trap	103	140	1	244	43%	
	BC-6 Total			135	177	1	313	43%
	BC-7	Hunt	54	72	0	126	43%	
		Live Trap	62	89	0	151	41%	
	BC-7 Total			116	161	0	277	42%
	Region	Hunt	86	109	0	195	43%	
Region	Live Trap	165	229	1	395	46%		
NW Region Total			251	338	1	590	43%	
SE	BC-2	Hunt	50	39	1	90	57%	
		Live Trap	103	146	7	256	43%	
	BC-2 Total			153	185	8	346	47%
	BC-3	Hunt	51	62	3	116	47%	
		Live Trap	66	89	1	156	43%	
	BC-3 Total			117	151	4	272	44%
	Region	Hunt	101	101	4	206	51%	
Region	Live Trap	169	235	8	412	43%		
SE Region Total			270	336	12	618	46%	
SW	BC-4	Hunt	20	17	0	37	54%	
		Live Trap	24	40	2	66	39%	
	BC-4 Total			44	57	2	103	45%
	BC-5	Hunt	66	82	1	149	45%	
		Live Trap	124	152	2	278	45%	
	BC-5 Total			190	234	3	427	45%
	Region	Hunt	86	99	1	186	47%	
Region	Live Trap	148	192	4	344	44%		
SW Region Total			234	291	5	530	45%	
East Slope	Hunt	135	126	6	267	53%		
	Live Trap	198	261	8	467	44%		
East Slope Total			333	387	14	734	47%	
West Slope	Hunt	172	208	1	381	45%		
	Live Trap	313	421	5	739	43%		
West Slope Total			485	629	6	1120	44%	
Statewide	Hunt	307	334	7	648	48%		
	Live Trap	511	682	13	1206	43%		
Statewide Grand Total			818	1016	20	1854	45%	

SECTION II: Bobcat Management Guidelines Analysis#

Monitor Harvest per Unit Effort (HPUE)

This measures the amount of effort put forth to harvest each bobcat. Increasing or decreasing effort per bobcat harvested should be related on a broad scale to the relative abundance of bobcats. Since Colorado has not collected this information previously, it is anticipated that 3-5 years will be necessary to develop baseline HPUE data from which future benchmarks can be established. This represents the first year of data collection.

2012-2013 Bobcat Harvest Effort Analysis								
Management Threshold: pending 3-year data set minimum								
Region	Bobcat Mgmt Area	Method	# Bobcat Sealed	Days Hunted	# Traps Set	# Days Traps Set	Hunt Days/ Harvest	TrapDays/ Harvest
NE	BC-1	HUNT	58	243	6	99	4.19	10
		LIVE TRAP	55	415	217	879	7.55	3468
		NE Region Total	113	658	223	978	5.82	1930
NW	BC-6	HUNT	74	445	29	195	6.01	76
		LIVE TRAP	233	868	722	3259	3.73	10099
	BC-6 Total		307	1313	751	3454	4.28	8449
	BC-7	HUNT	139	272	102	79	1.96	58
		LIVE TRAP	131	419	419	900	3.20	2879
	BC-7 Total		270	691	521	979	2.56	1889
NW Region Total			577	2004	1272	4433	3.47	9773
SE	BC-2	HUNT	92	249	10	90	2.71	10
		LIVE TRAP	263	690	1612	1786	2.62	10947
	BC-2 Total		355	939	1622	1876	2.65	8571
	BC-3	HUNT	124	460	39	73	3.71	23
		LIVE TRAP	144	543	555	916	3.77	3530
	BC-3 Total		268	1003	524	949	3.74	1856
SE Region Total			623	1942	2146	2825	3.12	9731
SW	BC-4	HUNT	38	212	22	92	5.58	53
		LIVE TRAP	64	310	213	726	4.84	2416
	BC-4 Total		102	522	235	818	5.12	1885
	BC-5	HUNT	142	616	57	195	4.34	78
		LIVE TRAP	282	1906	765	3159	6.76	8570
	BC-5 Total		424	2522	822	3354	5.95	6502
SW Region Total			526	3044	1057	4172	5.79	8384
East Slope	HUNT	274	952	55	262	3.47	53	
	LIVE TRAP	462	1648	2384	3581	3.57	18479	
East Slope Total		736	2600	2439	3843	3.53	12735	
West Slope	HUNT	393	1545	210	561	3.93	300	
	LIVE TRAP	710	3503	2119	8044	4.93	24007	
West Slope Total		1103	5048	2329	8605	4.58	18170	
Statewide	HUNT	667	2497	265	823	3.74	327	
	LIVE TRAP	1172	5151	4503	11625	4.40	44665	
Statewide Grand Total			1839	7648	4768	12448	4.16	32274

Monitor Prey Abundance

Cottontail rabbits are a primary prey item for bobcat. Although a wide variety of factors can influence cottontail rabbit harvest amounts in Colorado, there is a moderate correlation between rabbit harvest and bobcat harvest. Rabbit harvest may provide an additional piece of information regarding food availability for bobcats and therefore some indication of influences on bobcat populations. Rabbit harvest is collected annually through the small game survey. If rabbit harvest declines and the other monitored indicators are below established thresholds, this would tend to corroborate a possible decline in bobcat populations. Cottontail harvests < 80,000 on a 3-year running average will be used to indicate potential negative stress on bobcat populations. This threshold is highly conservative in that in the past 15 years cottontail rabbit harvest has only exceeded 80,000 in 2 years. Prior to 1999 cottontail rabbit harvests and hunter numbers were considerably greater on average than in more recent years. However, harvest per hunter has been more consistent with perceived rabbit cycles. Therefore, over the next several years we will examine this monitoring index for possible modification to using the 15 year running average harvest amount and harvest per hunter as an alternate threshold.

In either case the following table demonstrates that cottontail rabbit abundance has likely been below average at about 47,100, well below the 80,000 threshold. Likewise, the 3-year running average rabbit harvest (47,100 vs 55,400) and harvest per hunter (4.80 vs 5.37) is well below the 15-year running average. This index suggests that bobcat populations may have been facing primary prey shortages and this may have impacted bobcat reproductive success during the past several years.

Cottontail Rabbit Harvest – Prey Abundance Index

Year	Hunters	Harvest	Harvest per Hunter
1998-99	14,886	81,461	5.47
1999-00	10,449	55,300	5.29
2000-01	9,914	46,571	4.70
2001-02	10,029	45,633	4.55
2002-03	9,907	39,629	4.00
2003-04	9,263	52,415	5.66
2004-05	10,938	58,057	5.31
2005-06	11,233	81,415	7.25
2006-07	10,112	69,263	6.85
2007-08	9,365	65,468	6.99
2008-09	8,869	38,693	4.36
2009-10	n/s	n/s	n/s
2010-11	7,442	30,580	4.11
2011-12	13,305	57,859	4.35
2012-13	8,706	52,851	6.07
3 Yr Avg	9818	47097	4.80
15 Yr Avg	10316	55371	5.37

CPW Manager Knowledge-Professional Judgment

During the course of work activities, wildlife managers and biologists gain anecdotal information about the status of bobcat populations based upon their own observations and the observations of landowners, hunters, trappers, other agency personnel, and other recreationists that CPW staff have contact with. On an annual basis CPW managers and biologists are polled regarding their perceptions of bobcat population status. The survey for 2012-13 is the first year of this effort. Responses are converted to numeric values for averaging and analysis at the different geographic scales. In general, east of the continental divide bobcat populations are perceived to have a stable to increasing population trend. On the west slope bobcat population trend is perceived to be stable to decreasing with southwest Colorado noting a somewhat stronger trend toward decreasing. All agency feedback indicated an upward swing in rabbit abundance in the past year and noted that they would expect positive bobcat reproduction to follow in the next several years.

Bobcat Population Status – Professional Assessment					
				Scale	
				+ 2	Increasing
				+ 1	Stable – Increasing
				0	Stable
				- 1	Stable – Decreasing
				- 2	Decreasing
Region	Bobcat Mgmt Area	Admin Units Reporting	2012-13 Bobcat Population Trend Compared to the Preceding 3 Years	Numeric Assessment Value	
NE	BC-1	6 of 6	Stable to Increasing	1.00	
NW	BC-6	5 of 5	Stable to Decreasing	- 0.80	
	BC-7	4 of 4	Stable	- 0.25	
NW Region Total		9 of 9	Stable to Decreasing	- 0.56	
SE	BC-2	4 of 4	Stable to Increasing	1.00	
	BC-3	4 of 4	Stable to Increasing	0.75	
SE Region Total		8 of 8	Stable to Increasing	0.88	
SW	BC-4	2 of 2	Stable to Decreasing	- 1.00	
	BC-5	4 of 4	Stable to Decreasing	- 0.50	
SW Region Total		6 of 6	Stable to Decreasing	- 0.67	
East Slope		14 of 14	Stable to Increasing	0.94	
West Slope		15 of 15	Stable to Decreasing	- 0.62	
Statewide		29 of 29	Stable	0.14	

Bobcat Monitoring Summary

Analysis of all monitoring information will be conducted annually and shall use a preponderance of the evidence standard. Not more than 2 bobcat management areas at any time may exceed more than half of the monitoring thresholds. If so, then the regulations governing bobcat seasons, harvest methods, and/or bag limits will be reexamined and adjustments to constrain harvest may be proposed. If adjustments are made in response to exceeding monitoring thresholds, they should be implemented for 2-3 consecutive years before returning to prior regulatory conditions.

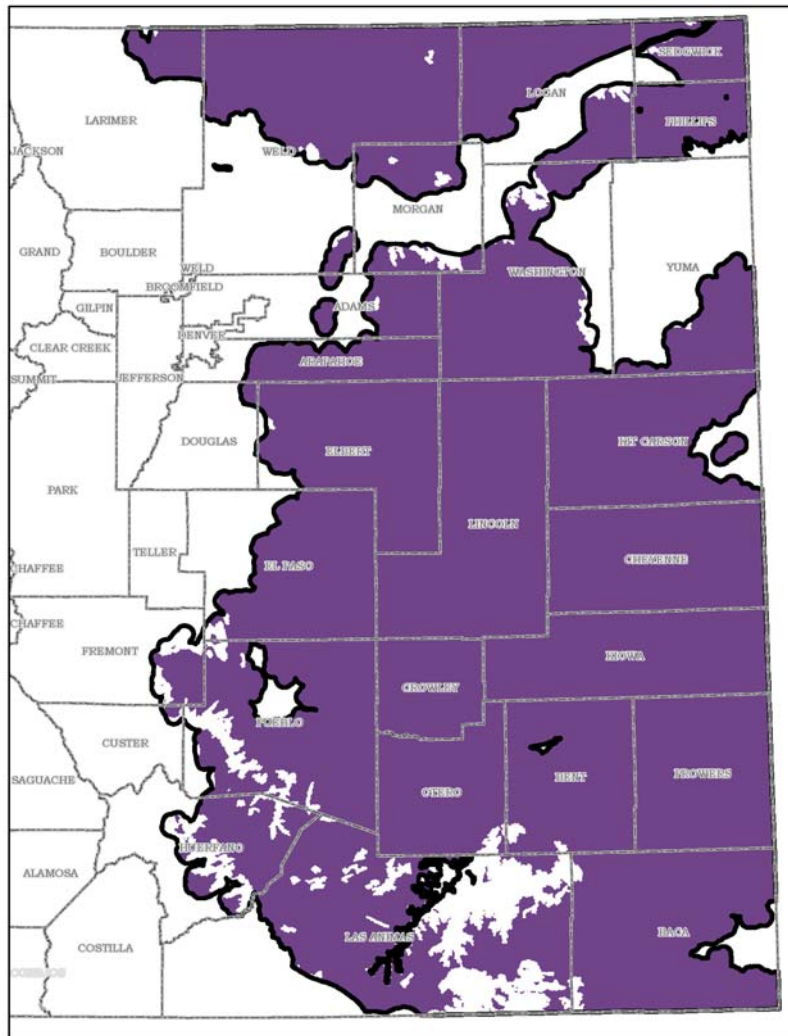
One monitoring threshold is exceeded for all bobcat management areas: this is the prey abundance index since it is calculated on a statewide basis. The harvest composition index threshold is exceeded only in the NE region, Bobcat Management Area 1. Not surprisingly, less selective hunting methods of take indicate higher proportions of female harvest and suggest that bobcat populations may have been facing some reproduction impacts due somewhat depressed prey base over the preceding 3 years and consequently a higher proportion of females showing in harvests. The mortality density threshold is not exceeded in any locations in Colorado. The harvest per unit effort index has applicable data for this first year; it therefore remains in development pending further data to develop a baseline. **The manager's assessment index is in progress at the time that this report is being written.** Future reports will more thoroughly incorporate these latter two indicators.

Management guidelines for swift fox include monitoring habitat occupancy rates in the plains short grass prairie habitats. The other guideline is to annually monitor harvest density by county and range wide with provisions to reduce the frequency of harvest data collection to every other or every third year if harvests remain substantially below thresholds. In order to conduct harvest density analysis CPW developed a more conservative model of swift fox habitat than that used in formulating our occupancy survey grids.

Swift Fox – Short Grass Prairie Habitat Occupancy

Previous occupancy surveys in Colorado conducted detection efforts in short grass prairie habitats but used different methods than applied in a 2011 survey effort. By comparison, the 2011 occupancy survey was more efficient and yielded an occupancy estimate in > 50% short grass prairie habitat in eastern Colorado at 77%. Martin et al. (2007) estimated occupancy in > 50% short grass prairie habitat at 71%. Just examining occupancy in the survey grids Finley et al. (2005) estimated the occupancy in the survey grids of 1995 at 82%. By comparison Martin et. al (2007) estimated the survey grid occupancy rate at 78%, whereas the 2011 survey estimated occupancy in the survey grids at 86%. Thus occupancy does not appear to have changed in short grass prairie habitats since 1995 and the increase noted in the 2011 surveys is likely a result of the increased efficiency of the methods used.

Modeled swift fox habitat for harvest density analysis (purple) compared to boundaries of swift fox habitat for occupancy monitoring (heavy black line).



Although not relevant to short grass prairie occupancy monitoring we note that CPW personnel confirmed the presence of swift fox in the extreme southern end of the San Luis Valley in habitat that has similar structure as short grass in eastern Colorado. Further survey efforts are underway to document the extent of swift fox occupancy in the San Luis Valley.

Harvest Density

The harvest density threshold we developed is to not exceed more than 3.6 fox harvested per 100 km². This harvest density is derived from an assumed swift fox population density of not more than 24/100 km² and an upper off-take rate of not more than 15% annually. This will be monitored on county and range wide scale.

Habitat amounts and harvest are displayed only in those counties where harvest was reported.

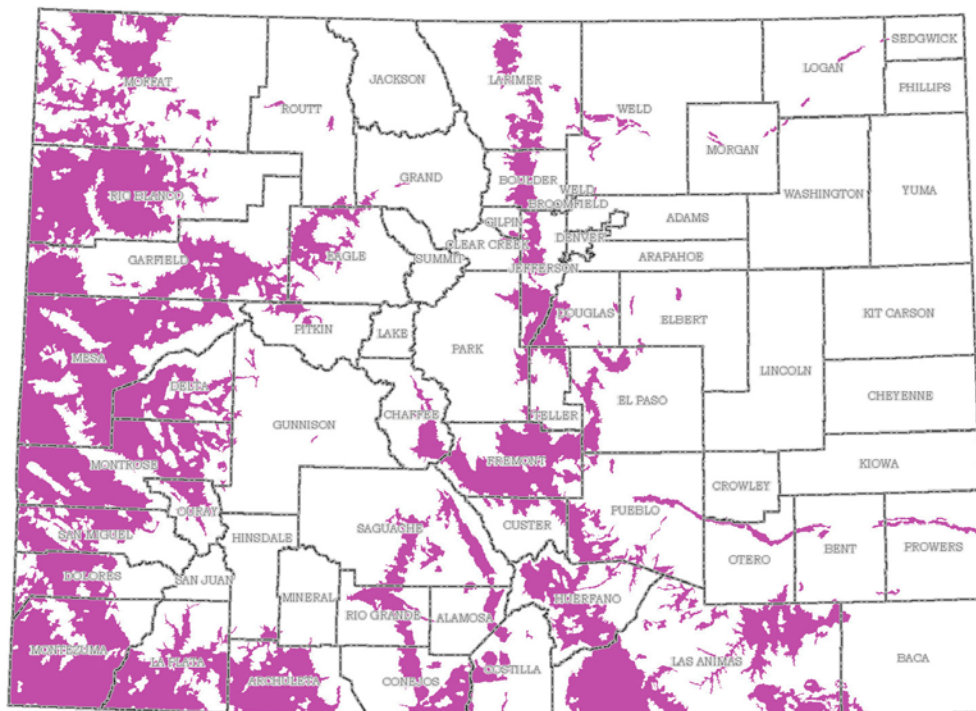
Swift Fox Harvest Density							
Management Threshold: Annual Harvest Mortality Should Not Exceed 3.6 swift fox/100 km ²							
County	Modeled Habitat km ²	2012-13 LCL Harvest	2012-13 UCL Harvest	2012-13 Harvest Estimate	Harvest Density per 100 km ²		
					LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
Bent	3,887	0	12	2	0.0	0.3	0.1
Elbert	4,567	3	86	17	0.1	1.9	0.4
Kiowa	4,626	1	34	7	0.0	0.7	0.1
Las Animas	5,937	13	343	67	0.2	5.8	1.1
Logan	3,291	46	1,200	235	1.4	36.4	7.1
Morgan	1,320	2	20	6	0.0	0.9	0.2
Phillips	1,552	1	34	7	0.1	2.2	0.4
Prowers	4,260	0	12	2	0.0	0.3	0.1
Pueblo	4,909	8	179	39	0.2	4.0	0.8
Range Wide – County Sum	84,082	74	1,920	382	0.1	2.3	0.5
Pooled Data – No Strata	84,082	116	1,248	381	0.1	1.5	0.5

The results in the foregoing table demonstrate that on a range wide scale and in most counties swift fox harvest is well under mortality thresholds even when the upper confidence limit of the harvest estimate is applied to modeled swift fox habitat. Only in Logan County does the mean estimated amount of harvest exceed the management threshold. There are three possible explanations for this: 1. Actual harvest is extraordinarily high and does exceed management thresholds 2. Harvest(s) that occurred elsewhere was erroneously reported as having occurred within the county of residence of the reporting party(ies) or 3. Harvest survey stratification methods amplify reported harvest for certain survey strata. Close examination of the survey results within strata for swift fox, gray fox, and pine marten (the species for which survey stratification is conducted) leads us to believe that the error most likely is a function of the stratification methods and possibly erroneous location reporting combined with stratification methods. Evidence of this is demonstrated by pooling the data range wide without stratification. One would expect that a statewide or range wide analysis without stratification would have wider confidence intervals. Instead, the intervals narrow. For 2013-14 seasons, CPW has revised survey stratification methods in an attempt to correct amplification bias.

SECTION IV: Gray Fox Management Guidelines Analysis#

The management guideline for gray fox is to annually monitor harvest density by county and range wide with provisions to reduce the frequency of harvest data collection to every other year or every third year if harvests remain substantially below thresholds. In order to conduct harvest density analysis CPW developed a conservative model of gray fox habitat. The harvest density threshold we developed is to not exceed more than 4.5 gray fox harvested per 100 km². This harvest density is derived from an assumed gray fox population density of not more than 30/100 km² and an upper off-take rate of not more than 15% annually. This will be monitored on county and range wide scale.

Gray fox modeled habitat (magenta).



SECTION IV: Gray Fox Management Guidelines Analysis#

Habitat amounts and harvest are displayed only in those counties where harvest was reported.

Gray Fox Harvest Density							
Management Threshold: Annual Harvest Mortality Should Not Exceed 4.5 gray fox/100 km ²							
County	Modeled Habitat km ²	2012-13 LCL Harvest	2012-13 UCL Harvest	2012-13 Harvest Estimate	Harvest Density per 100 km ²		
					LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
Archuleta	2190	1	36	7	0.1	1.6	0.3
Chaffee	468	16	358	75	3.4	76.5	15.9
Delta	1539	2	28	8	0.1	1.8	0.5
Dolores	1329	1	34	7	0.1	2.6	0.5
Fremont	2553	58	424	158	2.3	16.6	6.2
Jefferson	947	30	725	148	3.2	76.6	15.7
La Plata	2375	2	23	7	0.1	1.0	0.3
Las Animas	4903	28	274	87	0.6	5.6	1.8
Mesa	6220	7	44	17	0.1	0.7	0.3
Montezuma	4000	25	116	54	0.6	2.9	1.4
Montrose	3869	1	17	3	0.0	0.4	0.1
Park	285	2	35	9	0.8	12.3	3.2
Pueblo	997	4	96	19	0.4	9.6	1.9
Rio Blanco	4658	0	12	2	0.0	0.3	0.1
Routt	111	17	323	74	15.2	290.6	66.4
Teller	270	1	24	5	0.3	8.8	1.7
Range Wide – County Sum	55,641	196	2569	680	0.4	4.6	1.2
Pooled Data – No Strata	55,641	396	1470	763	0.7	2.6	1.4

The results in the foregoing table demonstrate that on a range wide scale and in most counties gray fox harvest is well under mortality thresholds. On a range wide basis, only when the upper confidence limit of the harvest estimate is applied to modeled gray fox habitat does the harvest exceed the harvest density threshold. The apparent problem with survey stratification in swift fox is once again demonstrated with gray fox. In this case, mean harvest in Chaffee, Jefferson, and Routt counties appear to exceed the harvest density threshold by wide margins. Here again the root of the problem is likely stratification methods or erroneous reporting based on place of residence of the survey respondent. This may also be a consequence of the way the survey questions are asked or the survey questions themselves. Once again when stratification is removed and data is pooled for a statewide (range wide) analysis we expect wider confidence intervals. Instead, the intervals narrow. Moreover, under the latter analysis harvest estimates and the high confidence harvest density remain well below the management threshold.

SECTION V: Pine Marten Harvest Monitoring#

No management guidelines were developed for pine marten management. However, there is the potential for rapid landscape scale habitat alteration in subalpine forests from disease and insect infestations. Consequently, CPW decided to improve monitoring of pine marten harvest through the stratified survey process. We closely examined the harvest survey results and here as with swift and gray fox we noted problems with the stratification method. In particular one respondent indicated harvests in Gunnison County which due to the respondent's strata class amplified the estimated harvest in Gunnison County. When we examined the pooled survey results the point estimate of harvest did not change but the confidence intervals narrowed considerably. Once again, this indicates that stratification is the likely source of survey error and poorer confidence.

Pine Marten – Hunters, Recreation Days, and Harvest					
County	Hunters	Days	2012-13 LCL Harvest	2012-13 UCL Harvest	2012-13 Harvest Estimate
Gunnison	187	4104	109	2862	560
Montezuma	7	453	24	427	101
Routt	6	191	23	289	82
Grand	3	70	15	394	77
Mesa	3	17	9	240	47
Lake	2	24	6	144	28
Park	3	17	3	86	17
Garfield	6	49	3	72	14
Larimer	6	50	3	72	14
Jackson	3	3	NA	NA	0
Summit	3	17	NA	NA	0
Unknown	3	101	NA	NA	0
Range Wide - County Sum	233	5095	195	4586	940
Pooled Data - No Strata	235	5102	310	2850	940

CPW examined furbearer species for their relative reproductive potential, habitat needs and risks to habitat, as well as relative amounts of harvest. This examination resulted in management guidelines for monitoring bobcat, swift fox, and gray fox harvest and efforts toward improving confidence in harvest survey results for swift fox, gray fox, and pine marten.

Bobcat – The prey abundance indicator examined on a statewide scale suggests that bobcat may have had depressed prey availability during the past 3 year which may have had some impacts on bobcat reproduction. In the NE region gender composition shows increased female composition; an indicator of depressed bobcat populations. In other Regions or bobcat management areas gender composition indices are not exceeded. Harvest per unit effort results were compiled but need more data years to establish baselines. **Manager surveys are in progress and this report will be updated when complete.**

Swift Fox – Surveys indicate no significant changes in habitat occupancy between 1995 and 2011. Harvest density is well within thresholds.

Gray Fox – Harvest density thresholds are not exceeded range wide or in most counties.

Pine Marten – The harvest estimate of 940 marten taken statewide is probably biased high as a result of survey methods.

Harvest Survey – The harvest survey methods applied in 2012-13 using the Harvest Information Program (HIP) sought to improve the precision of estimates. The concept was to stratify the survey based on the respondents self reported propensity to take select furbearer species. This process coupled with very small sample sizes at the County scale appears to risk amplifying some results and widen confidence intervals. The reality is that there are relatively few fur harvesters in the state and when broken down to take at the county level combined with a survey methodology that samples even smaller subsets within strata; biased results and wide confidence intervals may be inevitable.

For 2013-14 the surveys will be modified to examine harvest results at regional scales. Since most fur harvesters don't know our agency regional boundaries we will mainly use Interstates 25 and 70 to divide the state into quadrants and we intend to examine harvest at scales no finer than those quadrants for all surveyed species. The stratification will still be used but we intend to test to see if sample sizes are sufficient at this scale. This also makes sense from the standpoint of plausible scales at which a regulatory response might be taken if determined to be necessary... it is highly unlikely that we would seek harvest regulation at anything less than a regional or larger scale.

Finally, we reassessed the appropriate scale and frequency for harvest surveys for all furbearer species. We concluded that no harvest surveys were necessary until or unless management considerations change for the following species: badger, mink, muskrat, opossum, striped skunk, western-spotted skunk, long-tailed and short tailed weasels. Scale, survey frequency, type of survey, and rationale are presented as follows:

Species	Harvest Survey Method					Scale
	Mandatory Check of Harvest	Single Species Survey (Annual)	Multi-Species Survey (Bi or Tri Annual)	Small Game Survey (Annual)	No Survey	
Badger					X	
Beaver			X			I-25 & I-70
Bobcat	X					GMU
Coyote				X		County
Gray Fox		X				I-25 & I-70
Red Fox			X			I-25 & I-70
Swift Fox		X				E of Mtns & I-70
Mink					X	
Muskrat					X	
Opossum					X	
Pine Marten		X				I-25 & I-70
Raccoon			X			W of I-25 & I-70
Ring-tailed Cat			X			I-25 & I-70
River Otter	X (if reclassified)					GMU
Striped Skunk					X	
Western-spotted Skunk					X	
Long-tailed Weasel					X	
Short-tailed Weasel					X	
Cottontail Rabbit*				X		

- Although cottontail rabbit are not furbearers, their harvest levels are an indicator of bobcat prey abundance and bobcat reproductive success and is one of the bobcat management guidelines.
- Coyote harvest should be surveyed annually due to real or perceived damage concerns and socio-political influences. In the absence of survey data we risk unsupported opinions and allegations relative to harvest levels, species jeopardy, and agriculture impacts.
- Species listed for no survey have the following characteristics: high reproductive potential and/or high levels of natural annual mortality - thus harvest would be highly compensatory and/or have very low levels historic and most recently documented harvest. Placement in the non-survey category may be reconsidered if the number of pelts sold at local annual fur markets markedly increases.
- Species listed for the periodic survey have relatively lower reproductive potential and/or harvest may be less compensatory and/or have higher conflict potential to human structures.
- Species listed for the annual single species survey were identified in the 2012 furbearer program review as high priority species. Swift and gray fox have management guidelines which require harvest monitoring. Pine marten were designated for increased harvest monitoring due to potential for habitat changes. If harvest remains persistently low, however, they may be moved to another category.
- If river otter are reclassified as game species; harvest should be limited and harvest documentation mandatory.