

Colorado Parks and Wildlife
Furbearer Management Report
2013-2014 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. The survey contractor experienced technical difficulties during the 2013-14 harvest surveys which rendered county and Game Management Unit level analysis impossible. We did complete analysis at the statewide scale and learned from the problems that arose in order to avoid similar problems in the future.

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

	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	13-14
Badger	143	65	697	158	159	110	n/s	135	n/s	n/s	225	n/s	102	550	n/s
Beaver	664	713	4033	1576	896	238	n/s	1072	n/s	n/s	356	n/s	782	1147	n/s
Bobcat (Total Mortality)	271	390	461	644	766	796	1261	1708	1845	1783	1399	1578	1686	1917	2022
Bobcat (Harvest Only)	178	314	387	562	680	717	1163	1605	1743	1668	1303	1489	1628	1854	1945
Coyote	25920	21058	34413	39610	45912	38211	n/s	34943	31204	42427	n/s	49974	64294	41337	n/s
Gray Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	109	n/s	510	763	1047
Red Fox	520	340	1540	1517	997	457	n/s	n/s	n/s	n/s	1925	n/s	n/s	n/s	n/s
Swift Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	153	n/s	107	381	416
Mink	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	15	n/s	n/s	n/s	n/s
Muskrat	338	405	1870	1300	87	439	n/s	1230	1230	n/s	n/s	n/s	n/s	n/s	n/s
Opossum	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	45	n/s	n/s	n/s	n/s
Pine Marten	CS	CS	CS	CS	CS	CS	CS	175	n/s	n/s	52	n/s	139	940	1569
Raccoon	1054	373	3703	2777	2153	293	n/s	n/s	n/s	n/s	5299	n/s	n/s	n/s	n/s
Ring-tailed Cat	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	9	74	n/s
Striped Skunk	872	437	1668	2482	896	274	n/s	n/s	n/s	n/s	948	n/s	n/s	n/s	n/s
Western Spotted Skunk	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s	n/s
Long-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s	n/s
Short-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s	n/s

CS = closed season n/s = not surveyed

SECTION I: Recreational Harvest Data

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

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

SECTION I: Recreational Harvest Data

2013 – 2014 Harvest Data

Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Bobcat	-		-		1,945	
Gray Fox	1,419	991–2,032	not asked		1,047	610 – 1,798
Swift Fox	702	452 – 1,090	not asked		416	227 – 763
Pine Marten	979	627 – 1,530	not asked		1,569	769 – 3,202

Bobcat Mortality Summary

	Total Mortality	Gender			Mortality Type						
		Male	Female	Unk	Hunt	Live Trap	30-day Permit	Road Kill	Game Dmg	Misc	Unk
2013-14	2022	1127	868	27	595	1350	9	45	5	8	10
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

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 population 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.

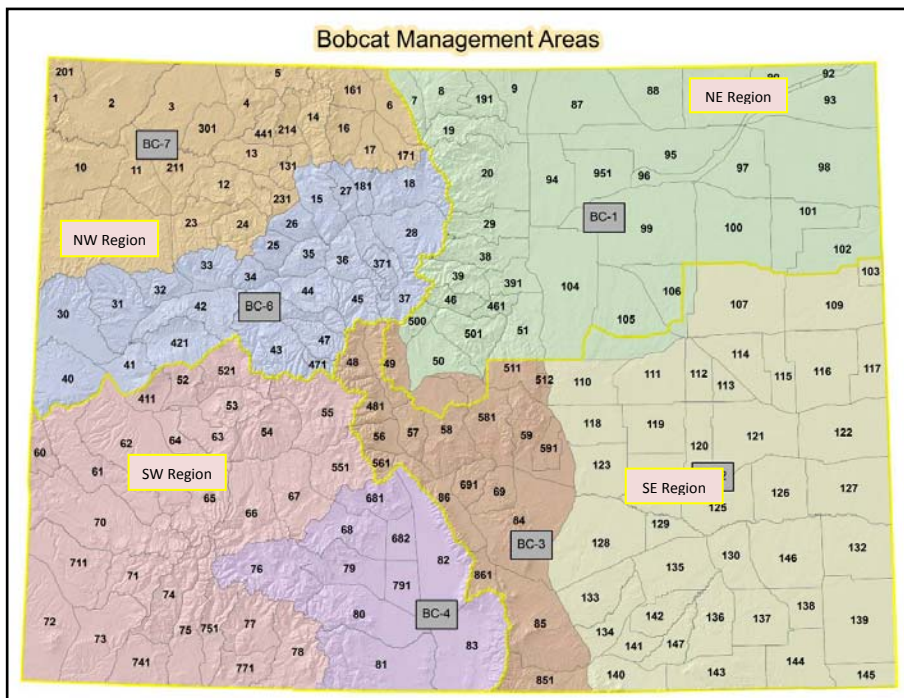
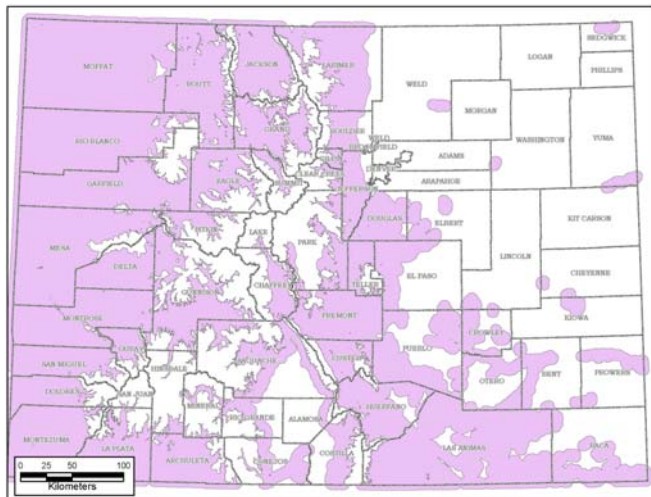


Figure 2. Modeled bobcat habitat used for mortality density analysis.



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 Thresholds

Mortality Density

The mortality density threshold 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 at almost each monitoring scale bobcat mortality density in 2013-14 increased slightly from 2012-13. However, the established mortality thresholds have not been crossed at any of the spatial scales that analysis is performed.

Bobcat Mortality Density Analysis 2013-14								2012-13 Results
Management Threshold: 3-Year Average Mortality Should Not Exceed 2.55 bobcat/100 km ²								
Region	Bobcat Mgmt Area	Bobcat Core Habitat	2011-12 Mortality	2012-13 Mortality	2013-14 Mortality	3-Yr Average Mortality	Average Mortality Density per 100 km ²	
NE	BC-1	12101	134	121	133	129	1.07	0.97
NW	BC-6	19988	344	327	370	347	1.74	1.72
	BC-7	28044	266	283	255	268	0.96	0.96
NW Region Total		48032	610	610	625	615	1.28	1.26
SE	BC-2	22212	290	357	315	321	1.44	1.28
	BC-3	15779	166	285	287	246	1.56	1.34
SE Region Total		37991	456	642	602	567	1.49	1.30
SW	BC-4	6785	113	105	105	108	1.59	1.54
	BC-5	33193	367	441	557	455	1.37	1.14
SW Region Total		39978	440	546	662	563	1.41	1.21
East Slope		50092	590	763	735	696	1.39	1.22
West Slope		88010	1050	1156	1287	1164	1.32	1.24
Statewide		138103	1640	1919	2022	1860	1.35	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 management threshold is exceeded in the NE region in the past two consecutive years. Bobcat management area BC-1 females have comprised 54% and 56% of harvest mortality in the past two years. In the SE Region female harvest composition has met the management threshold in Bobcat Management Area 2 for the first time. At other spatial scales female composition of harvest is below the 50% threshold.

SECTION II: Bobcat Management Guidelines Analysis#

2013-14 Bobcat Harvest Gender Composition								2012-13 Results
Management Threshold: Females Should Not Exceed 50% of Harvest								
Region	Bobcat Mgmt Area	Method	Female	Male	Unknow n	Grand Total	% of Female & Unknown in Mortality	
NE	BC-1	Hunt	26	20	0	46	57%	
		Live Trap	39	35	0	74	53%	
NE Region Total			65	55	0	120	54%	56%
NW	BC-6	Hunt	35	51	2	88	42%	
		Live Trap	106	158	2	266	41%	
	BC-6 Total		141	209	4	354	41%	43%
	BC-7	Hunt	44	56	0	100	44%	
		Live Trap	54	91	0	145	37%	
	BC-7 Total		98	147	0	245	40%	42%
Region	Hunt	79	107	2	188	43%		
	Live Trap	160	249	2	411	39%		
NW Region Total			239	356	4	599	41%	43%
SE	BC-2	Hunt	33	34	0	67	49%	
		Live Trap	112	114	4	230	50%	
	BC-2 Total		145	148	4	297	50%	47%
	BC-3	Hunt	45	52	2	99	47%	
		Live Trap	71	108	3	182	41%	
	BC-3 Total		116	160	5	281	43%	44%
Region	Hunt	78	86	2	166	48%		
	Live Trap	183	222	7	412	46%		
SE Region Total			261	308	9	578	47%	46%
SW	BC-4	Hunt	19	23	3	45	49%	
		Live Trap	15	40	2	57	30%	
	BC-4 Total		34	63	5	102	38%	45%
	BC-5	Hunt	65	85	0	150	43%	
		Live Trap	167	228	1	396	42%	
	BC-5 Total		232	313	1	546	43%	45%
Region	Hunt	84	108	3	195	45%		
	Live Trap	182	268	3	453	41%		
SW Region Total			266	376	6	648	42%	45%
East Slope	Hunt	104	106	2	212	50%		
	Live Trap	222	257	7	486	47%		
East Slope Total		326	363	9	698	48%	47%	
West Slope	Hunt	163	215	5	383	44%		
	Live Trap	342	517	5	864	40%		
West Slope Total		505	732	10	1247	41%	44%	
Statewide	Hunt	267	321	7	595	46%		
	Live Trap	564	774	12	1350	43%		
Statewide Grand Total			831	1095	19	1945	44%	45%

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 the initial baseline HPUE data from which future benchmarks can be established. This represents the just the second year of data collection.

2013-2014 Bobcat Harvest Effort Analysis									2012-13 HuntDays per Harvest	2012-13 TrapDay per Harvest
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	48	243	18	83	5.06	31		
		LIVE TRAP	69	408	307	946	5.91	4209		
		NE Region Total	117	651	325	1029	5.56	2858	5.82	1930
NW	BC-6	HUNT	83	329	44	79	3.96	42		
		LIVE TRAP	258	3367	901	4131	13.05	14426		
		BC-6 Total	341	3696	945	4210	10.84	11667	4.28	8449
	BC-7	HUNT	97	287	36	117	2.96	43		
		LIVE TRAP	142	188	454	1471	1.32	4703		
		BC-7 Total	239	475	490	1588	1.99	3256	2.56	1889
NW Region Total	580	4171	1435	5798	7.19	14345	3.47	9773		
SE	BC-2	HUNT	71	270	65	35	3.80	32		
		LIVE TRAP	229	422	589	2102	1.84	5406		
		BC-2 Total	300	692	654	2137	2.31	4659	2.65	8571
	BC-3	HUNT	96	500	3	21	5.21	1		
		LIVE TRAP	183	912	581	1872	4.98	5943		
		BC-3 Total	279	1412	584	1893	5.06	3962	3.74	1856
SE Region Total	579	2104	1238	4030	3.63	8617	3.12	9731		
SW	BC-4	HUNT	52	209	24	122	4.02	56		
		LIVE TRAP	49	108	151	662	2.20	2040		
		BC-4 Total	101	317	175	784	3.14	1358	5.12	1885
	BC-5	HUNT	151	411	53	106	2.72	37		
		LIVE TRAP	389	2255	1059	4393	5.80	11959		
		BC-5 Total	540	2666	1112	4499	4.94	9265	5.95	6502
SW Region Total	641	2983	1287	5283	4.65	10607	5.79	8384		
East Slope	HUNT	215	1013	86	139	4.71	56			
	LIVE TRAP	481	1742	1477	4920	3.62	15108			
	East Slope Total	696	2755	1563	5059	3.96	11361	3.53	12735	
West Slope	HUNT	383	1236	157	424	3.23	174			
	LIVE TRAP	838	5918	2565	10657	7.06	32620			
	West Slope Total	1221	7154	2722	11081	5.86	24703	4.58	18170	
Statewide	HUNT	598	2249	243	563	3.76	229			
	LIVE TRAP	1319	7660	4042	15577	5.81	47735			
	Statewide Grand Total	1917	9909	4285	16140	5.17	36077	4.16	32274	

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. No rabbit harvest survey was conducted in 2009-10 or 2013-14.

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
2013-14	n/s	n/s	n/s
3 Yr Avg	9818	47097	!Zero Divide
15 Yr Avg	10316	55371	4.80

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 2013-14 is the second 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 be mostly stable to possibly slightly increasing in 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. These results are consistent with the results from last year.

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	2013-14 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	- 0.40	
	BC-7	3 of 4	Stable	0	
NW Region Total		8 of 9	Stable to Decreasing	- 0.25	
SE	BC-2	3 of 4	Stable	0	
	BC-3	3 of 4	Stable	0	
SE Region Total		6 of 8	Stable	0	
SW	BC-4	1 of 2	Stable to Decreasing	- 1.00	
	BC-5	3 of 4	Stable to Decreasing	- 0.50	
SW Region Total		4 of 6	Stable to Decreasing	- 0.60	
East Slope		12 of 14	Stable to Increasing	0.50	
West Slope		12 of 15	Stable to Decreasing	- 0.38	
Statewide		24 of 29	Stable	0.04	

Bobcat Monitoring Summary

Analysis of all monitoring information is conducted annually and uses 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.

SECTION II: Bobcat Management Guidelines Analysis#

- The mortality density threshold is not exceeded in any locations in Colorado.
- The harvest composition index threshold is exceeded for the second consecutive year in the in the NE region, Bobcat Management Area 1. The harvest composition index threshold is met for the first time in the SE region, Bobcat Management Area 2.

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 in preceding years.

- The harvest per unit effort index has obtained applicable data 2 consecutive years; it therefore remains in development pending further data to develop a baseline.
- Rabbit harvest data was not collected in 2013-14, therefore analysis from last year remains applicable. The prey abundance index threshold is exceeded in all monitoring areas since it is calculated on a statewide basis. It suggests that during the preceding 3-4 years prey base as indicated by rabbit abundance may have been depressed, having subsequent impacts on bobcat reproduction and abundance. Yet when the prey abundance index is examined as a function of harvest of rabbits per hunter, it suggests a recent increase in rabbit abundance that should result in increased reproductive success in bobcat.
- The manager's assessment index suggests that bobcat populations may have declined slightly in southwest and northwest Colorado. But on a statewide basis bobcat are likely stable.

Bobcat Mgmt Guideline Analysis 2013-14					
Region	Bobcat Mgmt Area	Guideline			
		Harvest Density	Harvest Composition	Prey Abundance	Manager Assessment
NE	BC-1	+	-	-	+
NW	BC-6	+	+	-	-
	BC-7	+	+	-	+
SE	BC-2	+	-	-	+
	BC-3	+	+	-	+
SW	BC-4	+	+	-	-
	BC-5	+	+	-	-
East Slope		+	+	-	+
West Slope		+	+	-	-
Statewide		+	+	-	+

+ Meets the guideline

- Does not meet the guideline.

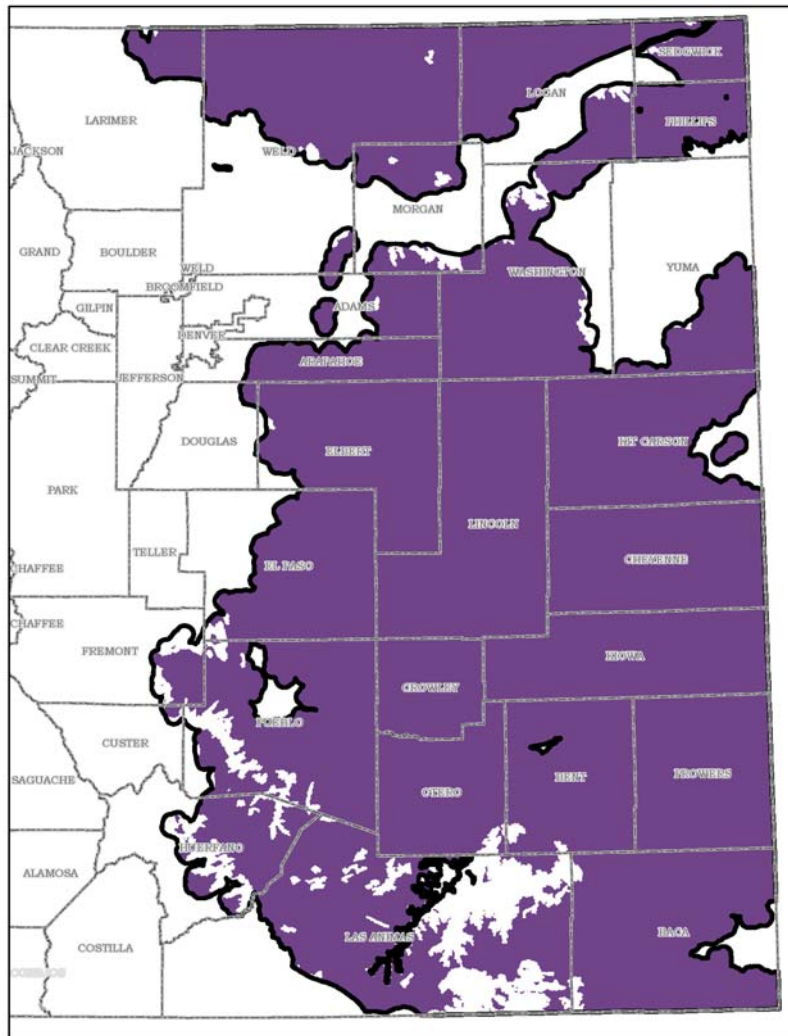
When examined on a preponderance of evidence basis, we conclude that bobcat populations statewide are most likely stable, though fairly heavily exploited with annual production mostly off-setting human and natural mortality.

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.

For the 2013-2014 harvest survey, the company which was contracted to conduct surveys encountered several technical failures in data collection. These problems rendered harvest data at the county scale unusable. Therefore, we analyzed harvest density only at the range wide scale.

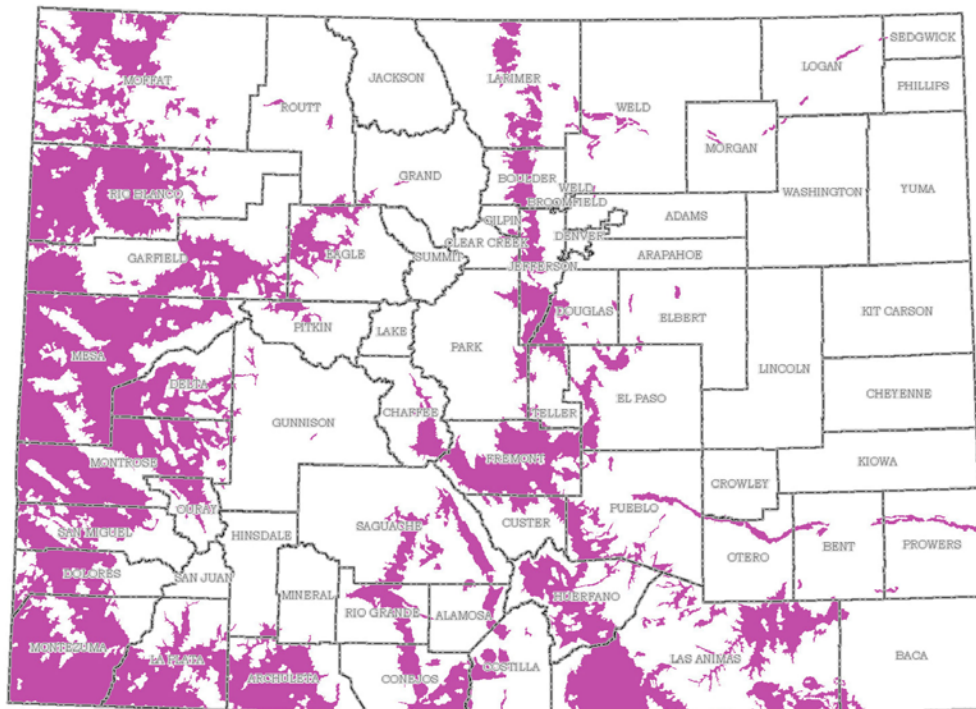
Swift Fox Harvest Density							
Management Threshold: Annual Harvest Mortality Should Not Exceed 3.6 swift fox/100 km ²							
County	Modeled Habitat km ²	2013-14 LCL Harvest	2013-14 UCL Harvest	2013-14 Harvest Estimate	Harvest Density per 100 km ²		
					LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
Range Wide – County Sum	84,082	227	763	416	0.3	0.9	0.5

The results in the foregoing table demonstrate that on a range wide scale 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.

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#

For the 2013-2014 harvest survey, the company which was contracted to conduct surveys encountered several technical failures in data collection. These problems rendered harvest data at the county scale unusable. Therefore, we analyzed harvest density only at the range wide scale.

Gray Fox Harvest Density							
Management Threshold: Annual Harvest Mortality Should Not Exceed 4.5 gray fox/100 km ²							
County	Modeled Habitat km ²	2013-14 LCL Harvest	2013-14 UCL Harvest	2013-14 Harvest Estimate	Harvest Density per 100 km ²		
					LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
Range Wide – County Sum	55,641	610	1,798	1,047	1.1	3.2	1.9

The results in the foregoing table demonstrate that on a range wide scale gray fox harvest is well under mortality thresholds.

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. For the 2013-2014 harvest survey, the company which was contracted to conduct surveys encountered several technical failures in data collection. These problems rendered harvest data at the county scale unusable. Therefore, we analyzed harvest density only at the range wide scale.

Pine Marten – Hunters, Recreation Days, and Harvest					
	Hunters	Days	2013-14 LCL Harvest	2013-14 UCL Harvest	2013-14 Harvest Estimate
Statewide	979	not asked	769	3,202	1,569

Colorado Parks and Wildlife continues occupancy investigations into how pine marten use changes over time in lodgepole pine and spruce forests damaged by beetles. The first year of field observations have been completed and are in the process of being analyzed. Further data collection will occur with greater focus on population demographics in select habitat types to help inform questions unanswered by the occupancy investigations.

In order to prioritize management and harvest data collection needs CPW examined furbearer species for their relative reproductive potential, habitat needs and risks to habitat, as well as relative amounts of historic harvest. This examination resulted in development of management guidelines for 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.

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.

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.

Technical problems experienced by the survey contractor in 2013-14 will be corrected prior to implementing the 2014-15 surveys.

For 2014-15 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 unlikely that we would seek harvest regulation at anything less than a regional or larger scale, if such regulatory action were deemed necessary.

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.