Colorado Parks and Wildlife

Furbearer Management Report

2014-2015 Harvest Year

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November 20, 2015

Introduction

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

HISTORIC HARVEST DATA

	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	14-15
Badger	65	697	158	159	110	n/s	135	n/s	n/s	225	n/s	102	550	n/s	n/s
Beaver	713	4033	1576	896	238	n/s	1072	n/s	n/s	356	n/s	782	1147	n/s	n/s
Bobcat (Total Mortality)	390	461	644	766	796	1261	1708	1845	1783	1399	1578	1686	1917	2022	1695
Bobcat (Harvest Only)	314	387	562	680	717	1163	1605	1743	1668	1303	1489	1628	1854	1945	1634
Coyote	21058	34413	39610	45912	38211	n/s	34943	31204	42427	n/s	49974	64294	41337	n/s	28529
Gray Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	109	n/s	510	763	1047	164
Red Fox	340	1540	1517	997	457	n/s	n/s	n/s	n/s	1925	n/s	n/s	n/s	n/s	n/s
Swift Fox	CS	CS	CS	CS	CS	CS	CS	CS	CS	153	n/s	107	381	416	609
Mink	CS	CS	CS	CS	CS	CS	0	n/s	n/s	15	n/s	n/s	n/s	n/s	n/s
Muskrat	405	1870	1300	87	439	n/s	1230	1230	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Opossum	CS	CS	CS	CS	CS	CS	CS	CS	CS	45	n/s	n/s	n/s	n/s	n/s
Pine Marten	CS	CS	CS	CS	CS	CS	175	n/s	n/s	52	n/s	139	940	1569	2018
Raccoon	373	3703	2777	2153	293	n/s	n/s	n/s	n/s	5299	n/s	n/s	n/s	n/s	n/s
Ring-tailed Cat	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	9	74	n/s	n/s
Striped Skunk	437	1668	2482	896	274	n/s	n/s	n/s	n/s	948	n/s	n/s	n/s	n/s	n/s
Western Spotted Skunk	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s	n/s	n/s
Long-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	n/s	n/s	n/s	n/s
Short-tailed Weasel	CS	CS	CS	CS	CS	CS	CS	CS	CS	0	n/s	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

2014– 2015 Harvest Data

Species	Hunters	Hunters Low – High Confidence Range	Days Hunted	Days Hunted Low – High Confidence Range	Harvest	Harvest Low – High Confidence Range
Bobcat	-		-		1,634	
Gray Fox	479	249– 920	not asked		164	82 – 329
Swift Fox	519	321 – 839	not asked		609	287 – 1,293
Pine Marten	802	510 – 1,263	not asked		2,018	812 – 5,020

Bobcat Mortality Summary

		Gender			Mortality Type						
	Total Mortality	Male	Female	Unk	Hunt	Live Trap	30-day Permit	Road Kill	Game Dmg	Misc	Unk
2014-15	1695	1000	682	13	472	1162	2	36	2	1	20
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

From 1998 through 2005 about 60%-70% of bobcat harvest came through hunting methods of take. Since then this has completely switched and in the 2014 seasons to live traps represent 70% and hunting methods 30% 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 generally follows trends in prices for bobcat pelts. Given these increases, monitoring bobcat through established management guidelines is increasingly important.

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 1. Bobcat management areas and regional boundarys.

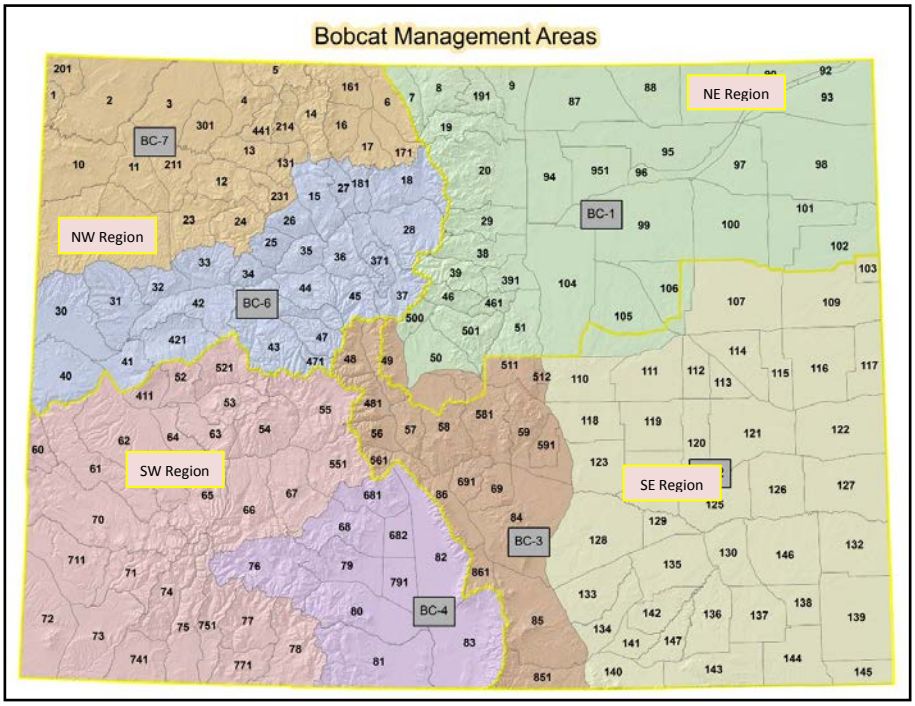
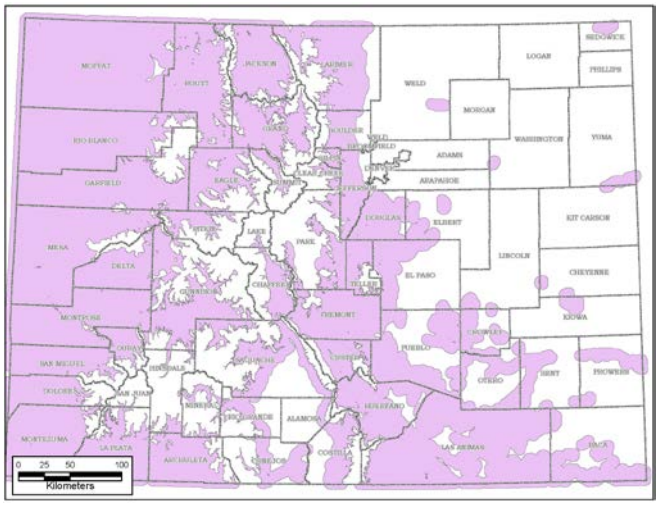


Figure 2. Modeled bobcat habitat used for mortality density analysis.



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 km^2. This is derived assuming an average population density of not more than 15 bobcat/100 km^2 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 in the NE and NW average bobcat mortality density decreased slightly 2014-15 compared to 2013-14. The change however, is negligible; between 1 and ½ bobcat per 1,000 km^2. In contrast, in the SE and SW the average mortality density increased slightly from the previous year. Here also the increase is less than 1 bobcat per 1000 km^2.

The established mortality thresholds have not been crossed at any of the spatial scales that analysis is performed.

Bobcat Mortality Density Analysis

Management Threshold: 3-Year Average Mortality Should Not Exceed 2.55 bobcat/100 km^2

Region	Bobcat Mgmt Area	Bobcat Core Habitat	2012-13 Mortality	2013-14 Mortality	2014-15 Mortality	3-Yr Average Mortality	2014-15 Average Mortality Density	2013-14 Results	2012-13 Results
NE	**BC-1**	**12101**	**121**	**133**	**113**	**122**	**1.01**	**1.07**	**0.97**
NW	BC-6	19988	327	370	333	343	1.72	1.74	1.72
	BC-7	28044	283	255	227	255	0.91	0.96	0.96
NW Region Total		**48032**	**610**	**610**	**560**	**593**	**1.24**	**1.26**	**1.28**
SE	BC-2	22212	357	315	229	300	1.35	1.44	1.28
	BC-3	15779	285	287	232	268	1.70	1.56	1.34
SE Region Total		**37991**	**456**	**642**	**461**	**520**	**1.37**	**1.3**	**1.49**
SW	BC-4	6785	105	105	99	103	1.52	1.59	1.54
	BC-5	33193	441	557	462	487	1.47	1.37	1.14
SW Region Total		**39978**	**440**	**546**	**561**	**516**	**1.29**	**1.21**	**1.41**
East Slope		50092	590	763	574	642	1.28	1.39	1.22
West Slope		88010	1050	1156	1121	1109	1.26	1.32	1.24
Statewide		**138103**	**1640**	**1919**	**1695**	**1751**	**1.27**	**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 was exceeded in the NE region in the preceding two consecutive years, but that female composition declined to well below management thresholds in 2014-15 bobcat mortality. In the SE Region female harvest composition remains high but has not

exceeded management thresholds. At the other spatial scales female composition of harvest is below the 50% threshold.

Bobcat Harvest Gender Composition

Management Threshold: Females Should Not Exceed 50% of Harvest

Region	Bobcat Mgmt Area	Method	Female	Male	Unk	Grand Total	2014-15 % Female and Unknown in Mortality	2013-14 Results	2012-13 Results
NE	BC-1	Hunt	17	27	1	45	40%	57%	59%
		Live Trap	22	39		61	36%	53%	53%
NE Region Total			**39**	**66**	**1**	**106**	**38%**	**54%**	**56%**
NW	BC-6	Hunt	24	27		51	47%	42%	46%
		Live Trap	96	171	1	268	36%	41%	43%
	BC-6 Total		**120**	**198**	**1**	**319**	**38%**	**41%**	**43%**
	BC-7	Hunt	22	27		49	45%	44%	43%
		Live Trap	61	111	1	173	36%	37%	41%
	BC-7 Total		**83**	**138**	**1**	**222**	**38%**	**40%**	**42%**
	Region	Hunt	46	54	0	100	46%	43%	44%
		Live Trap	157	282	2	441	36%	39%	42%
NW Region Total			**203**	**336**	**2**	**541**	**38%**	**41%**	**43%**
SE	BC-2	Hunt	19	25	1	45	44%	49%	57%
		Live Trap	81	91	3	175	48%	50%	43%
	BC-2 Total		**100**	**116**	**4**	**220**	**47%**	**50%**	**47%**
	BC-3	Hunt	56	46	1	103	55%	47%	47%
		Live Trap	45	72		117	38%	41%	43%
	BC-3 Total		**101**	**118**	**1**	**220**	**46%**	**43%**	**44%**
	Region	Hunt	75	71	2	148	52%	48%	51%
		Live Trap	126	163	3	292	44%	46%	43%
SE Region Total			**201**	**234**	**5**	**440**	**47%**	**47%**	**46%**
SW	BC-4	Hunt	15	26		41	37%	49%	54%
		Live Trap	21	36		57	37%	30%	39%
	BC-4 Total		36	62		98	37%	38%	45%
	BC-5	Hunt	56	81	1	138	41%	43%	45%
		Live Trap	116	194	1	311	38%	42%	45%
	BC-5 Total		172	275	2	449	39%	43%	45%
	Region	Hunt	71	107	1	179	40%	45%	47%
		Live Trap	137	230	1	368	38%	41%	44%
SW Region Total			**208**	**337**	**2**	**547**	**38%**	**42%**	**45%**
East Slope		Hunt	92	98	3	193	49%	50%	53%
		Live Trap	148	202	3	353	43%	47%	44%
East Slope Total			**240**	**300**	**6**	**546**	**45%**	**48%**	**46%**
West Slope		Hunt	117	161	1	279	42%	44%	45%
		Live Trap	294	512	3	809	37%	40%	43%
West Slope Total			**411**	**673**	**4**	**1088**	**38%**	**41%**	**44%**
Statewide		Hunt	209	259	4	472	45%	46%	48%
		Live Trap	442	714	6	1162	39%	43%	43%
Statewide Grand Total			**651**	**973**	**10**	**1634**	**40%**	**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. Colorado has collected this information only since 2012-13. 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 third year of data collection.

2014-15 Bobcat Harvest Effort Analysis								
Management Threshold: pending 3-5 year data set								
Region	Bobcat Mgmt Area	Method	Cats Sealed	Days Hunted	No. of Traps Set	Days Traps Set	Hunt Days Per Harvest	Trap Days Per Harvest
NE Total	BC-1	Hunt	50	266			5.32	
		Live Trap	61		228	688		2572
NW	BC-6	Hunt	61	129			2.11	
		Live Trap	250		627	2515		6308
	BC-7	Hunt	51	75			1.47	
		Live Trap	165		440	1459		3891
NW Total		Hunt	112	204			1.82	
		Live Trap	415		1067	3974		10217
SE	BC-2	Hunt	47	114			2.43	
		Live Trap	169		461	1172		3197
	BC-3	Hunt	100	365			3.65	
		Live Trap	119		377	927		2937
SE Total		Hunt	147	479			3.26	
		Live Trap	288		838	2099		6108
SW	BC-4	Hunt	40	166			4.15	
		Live Trap	52		219	585		2464
	BC-5	Hunt	124	397			3.20	
		Live Trap	314		801	3296		8408
SW Total		Hunt	164	563			3.43	
		Live Trap	366		1020	3881		10816
East Slope		Hunt	197	745			3.78	
		Live Trap	349		1066	2787		8513
West Slope		Hunt	276	767			2.78	
		Live Trap	781		2087	7855		20990
Statewide		Hunt	473	1512			3.20	
		Live Trap	1130		3153	10642		29694

The following table displays HPUE for three years of data collection.

			2014-15		2013-14		2012-13	
Region	Bobcat Mgmt Area	Method	Hunt Days Per Harvest	Trap Days Per Harvest	Hunt Days Per Harvest	Trap Days Per Harvest	Hunt Days Per Harvest	Trap Days Per Harvest
NE Total	BC-1	Hunt	5.32		5.06		4.19	
		Live Trap		2572		4209		3468
NW	BC-6	Hunt	2.11		3.96		6.01	
		Live Trap		6308		14426		10099
	BC-7	Hunt	1.47		2.96		1.96	
		Live Trap		3891		4703		2879
NW Total		Hunt	1.82		3.42		3.37	
		Live Trap		10217		18977		13037
SE	BC-2	Hunt	2.43		3.80		2.71	
		Live Trap		3197		5406		10947
	BC-3	Hunt	3.65		5.21		3.71	
		Live Trap		2937		5943		3530
SE Total		Hunt	3.26		4.61		3.28	
		Live Trap		6108		11285		13716
SW	BC-4	Hunt	4.15		4.02		5.58	
		Live Trap		2464		2040		2416
	BC-5	Hunt	3.20		2.72		4.34	
		Live Trap		8408		11959		8570
SW Total		Hunt	3.43		3.05		4.60	
		Live Trap		10816		13965		16989
East Slope		Hunt	3.78		4.71		3.47	
		Live Trap		8513		15108		18479
West Slope		Hunt	2.78		3.23		3.93	
		Live Trap		20990		32620		24007
Statewide		Hunt	3.20		3.76		3.74	
		Live Trap		29694		47735		44665

It is evident that there is a high degree of variability in this dataset. There may be reporting errors and data analysis errors that create some of this variation. Nevertheless, at the larger geographic scales some trend appears evident. In general the number of trap and hunt days per harvest have declined from 2012 through 2014. This may seem contrary to declining numbers of harvested animals, but declining price of pelts (which has occurred 2012-2014) could play an influential role in how much effort a casual resource user may put forth. If fewer casual bobcat trappers and hunters actively participate in harvest activities, then trapping and hunting effort involves those with the most interest and dedication, and more likely better skilled resource users. These factors must be considered when weighing the results of HPUE analysis.

We intend to continue collecting this information and evaluate its utility in 2018.

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.

The former threshold (cottontail harvest less than 80,000 on a 3-year running average indicate negative stress on bobcat populations) is rejected and will no longer be used. This threshold was highly conservative in that during the past 15 years cottontail rabbit harvest has only exceeded 80,000 in a single year. Prior to 1999 cottontail rabbit harvests and hunter numbers were considerably greater on average than in more recent years.

Harvest per hunter has been more consistent with perceived rabbit cycles. Therefore, henceforth two aspects of cottontail harvest shall be used to provide an indicator to bobcat prey abundance. We will compare total bobcat harvest in the most recent 3 years to the 15 year average. Likewise, we will compare the most recent 3 years harvest per hunter to the 15 year average. Harvest and harvest per hunter greater than 10% above and below the 15 year average will suggest positive and negative stress on bobcat populations respectively.

Cottontail Rabbit Harvest – Prey Abundance Index

Year	Hunters	Harvest	Harvest per Hunter
2000-01	9,914	46,571	4.70
2001-02	10,029	45,633	4.55
2002-03	10,912	39,629	4.00
2003-04	10,000	52,299	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
2014-15	11,000	54,083	4.92
3 Yr Avg	11,004	54,931	4.99
15 Yr Avg	10,140	53,262	5.25

The cottontail rabbit abundance appears to be more or less average, in that the 3-year average total harvest and harvest per hunter is within 10% of the 15-year average.

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 2014-15 is the third 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 somewhat increasing in abundance. On the west slope the professional assessment is divided between the NW and at least a portion

of the SW. In the NW bobcat population trend is perceived to be stable. Whereas in the SW our field staff perceive bobcat populations to be slightly declining; excluding the San Luis Valley where bobcat are perceived to be stable.

In examining status across years the NE and SE consistently perceived bobcat populations to be stable to increasing, whereas the NW and SW viewed bobcat populations as stable to decreasing.

The number of administrative units reporting professional perceptions declined this year for the third consecutive year. This may be due to changes in staffing whereby new officers have little prior experience upon which to base their perceptions, it may also be partly due to vacancies in positions, and partly due to annual survey weariness. Regardless, as an important component to the evaluation of bobcat management status, improved efforts at gaining field staff perceptions should occur.

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	2014-15 Bobcat Population Trend Compared to the Preceding 3 Years	2014-15 Numeric Assessment Value	2013-14 Numeric Assessment Value	2012-13 Numeric Assessment Value
NE	**BC-1**	**3 of 6**	**Stable to Increasing**	**0.33**	**1.00**	**1.00**
NW	BC-6	3 of 5	Stable	0.00	-0.40	-0.80
	BC-7	3 of 4	Stable	0.00	0	-0.25
NW Region Total		**6 of 9**	**Stable**	**0.00**	**-0.25**	**- 0.56**
SE	BC-2	3 of 4	Stable to Increasing	0.67	0	1.00
	BC-3	4 of 4	Stable to Increasing	0.25	0	0.75
SE Region Total		**7 of 8**	**Stable to Increasing**	**0.43**	**0**	**0.88**
SW	BC-4	1 of 2	Stable	0.00	-1.00	-1.00
	BC-5	3 of 4	Stable to Decreasing	-0.33	-0.50	-0.50
SW Region Total		**4 of 6**	**Stable to Decreasing**	**-0.25**	**-0.60**	**-0.67**
East Slope		10 of 14	Stable to Increasing	0.40	0.50	0.94
West Slope		10 of 15	Stable to Decreasing	-0.10	-0.38	-0.62
Statewide		**20 of 29**	**Stable to Increasing**	**0.15**	**0.04**	**0.14**

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.

- The mortality density threshold is not exceeded in any locations in Colorado.
- The harvest composition index threshold not exceeded in any locations in Colorado.
- The harvest per unit effort index has obtained applicable data 3 consecutive years; it therefore remains in development pending further data to develop a baseline.
- The prey abundance index indicates that there was an average abundance of prey in 2014-15.
- The manager's assessment index suggests that bobcat populations are stable to increasing in most locations in Colorado and may be stable to decreasing still in the SW part of the state, excluding the San Luis Valley.

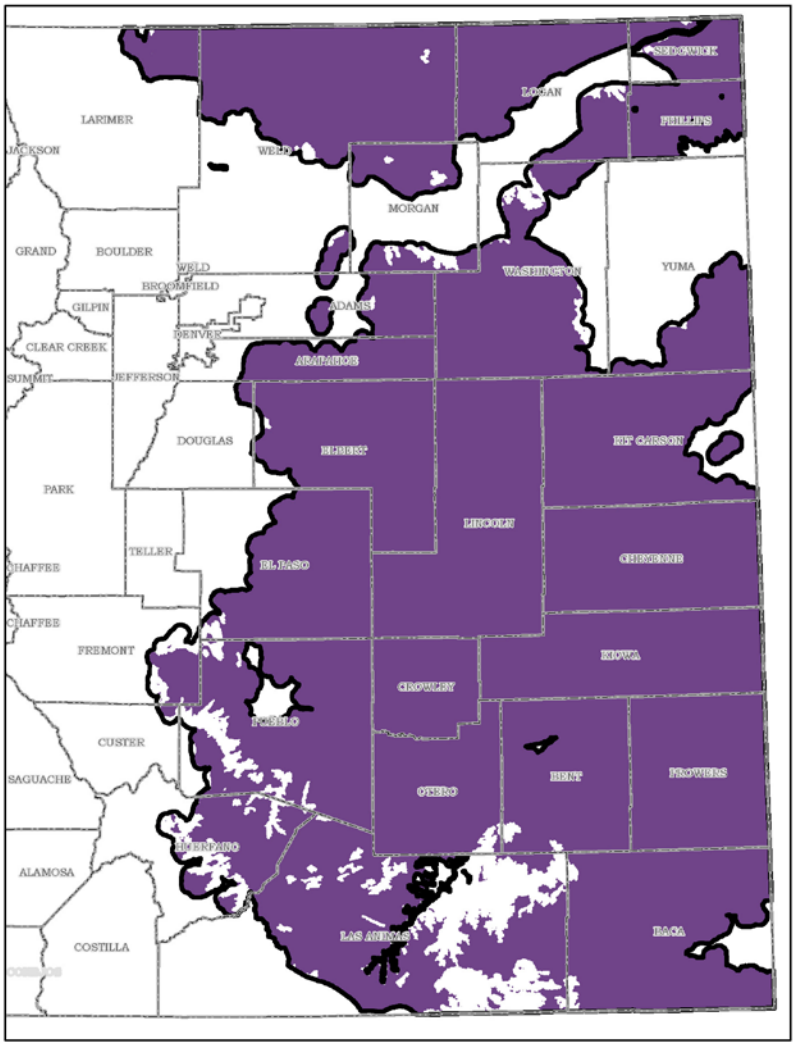
Bobcat Mgmt Guideline Analysis 2014-15					
		Guideline			
Region	Bobcat Mgmt Area	**Harvest Density**	**Harvest Composition**	**Prey Abundance**	**Manager Assessment**
NE	**BC-1**	+	+	+	+
NW	**BC-6**	+	+	+	+
	BC-7	+	+	+	+
SE	**BC-2**	+	+	+	+
	BC-3	+	+	+	+
SW	**BC-4**	+	+	+	+
	BC-5	+	+	+	-
East Slope		+	+	+	+
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, but that certain indicators suggest that it may be slightly increasing largely as a function of increasing prey abundance. Bobcats likely remain relatively heavily exploited, but mortality during 2014-15 declined. Coupled with increasing prey abundance, it is possible that annual production will exceed human and natural mortality, leading to somewhat increased abundance within the next several years.

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.

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



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.

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 were conducted in the fall of 2013 and 2014. Trail cameras were set for 100 trap nights at 4 separate plots in the fall of 2013 and 93 trap nights at 5 separate

plots in the fall of 2014. Results of those survey efforts found swift fox presence in the same area they were found in 2012, but in other areas of similar habitat swift fox were not detected.

Harvest Density

The harvest density threshold we developed is to not exceed more than 3.6 fox harvested per 100 km^2. This harvest density is derived from an assumed swift fox population density of not more than 24/100 km^2 and an upper off-take rate of not more than 15% annually. This will be monitored on county and range wide scale.

After the 2013-14 surveys CPW biologists determined that the quality of data provided at the county scale had such broad confidence intervals that they weren't useful for management analysis. For the 2014-2015 harvest survey data, analysis at regional scales is the smallest geographic scale that CPW will apply for swift fox. It is more realistic to conclude that if monitoring thresholds were exceeded, management actions would be applied at nothing smaller than regional scale. Therefore, we analyzed harvest density at the region and range wide scale.

Swift Fox Harvest Density

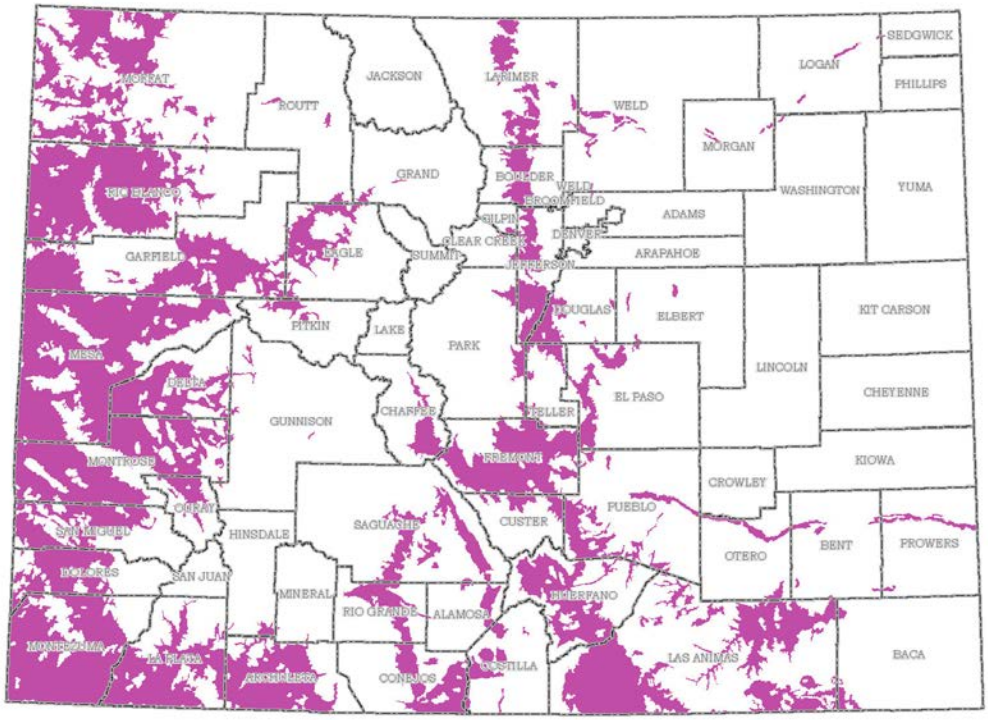
Management Threshold: Annual Harvest Mortality Should Not Exceed 3.6 swift fox/100 km^2

Monitoring Area	Modeled Habitat km^2	2014-15 LCL Harvest	2014-15 UCL Harvest	2014-15 Harvest Estimate	Harvest Density per 100 km^2		
					LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
North of I-25	24,507	22	139	55	0.09	0.6	0.2
South of I-25	59,575	247	1,211	547	0.4	2.0	0.9
Range Wide	84,082	287	1,293	609	0.3	1.5	0.7

The results in the foregoing table demonstrate that on regionwide and range wide scales 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.

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 km^2. This harvest density is derived from an assumed gray fox population density of not more than 30/100 km^2 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).



After the 2013-14 surveys CPW biologists determined that the quality of data provided at the county scale had such broad confidence intervals that they weren't useful for management analysis. For the 2014-2015 harvest survey data, analysis at regional scales is the smallest geographic scale that CPW will apply for gray fox. It is more realistic to conclude that if monitoring thresholds were exceeded, management actions would be applied at nothing smaller than regional scale. Therefore, we analyzed harvest density at the region and range wide scale.

Gray Fox Harvest Density							
Management Threshold: Annual Harvest Mortality Should Not Exceed 4.5 gray fox/100 km^2							
					Harvest Density per 100 km^2		
Quadrant	**Modeled Habitat km^2**	**2014-15 LCL Harvest**	**2014-15 UCL Harvest**	**2014-15 Harvest Estimate**	LCL Harvest Density	UCL Harvest Density	Harvest Density Estimate
Northeast	3,515	5	76	20	0.1	2.2	0.6
Northwest	17,056	n/a	n/a	0	0	0	0
Southeast	12,634	2	62	12	0.02	0.5	0.09
Southwest	22,436	61	286	132	0.3	1.3	0.6
Range Wide	55,641	82	329	164	0.1	0.6	0.3

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. After the 2013-14 surveys CPW biologists determined that the quality of data provided at the county scale had such broad confidence intervals that they weren't useful for management analysis. For the 2014-2015 harvest survey data, analysis at regional scales is the smallest geographic scale that CPW will apply for marten.

Pine Marten – Hunters and Harvest

Quadrant	Hunters	2014-15 LCL Harvest	2014-15 UCL Harvest	2014-15 Harvest Estimate
Northeast	333	257	4,241	1,044
Northwest	388	236	2,427	757
Southeast	3	0	0	0
Southwest	136	82	575	217
Range Wide	802	812	5,020	2,018

Colorado Parks and Wildlife continues occupancy investigations into how pine marten use changes over time in lodgepole pine and spruce forests damaged by beetles. Following data collection in 2013 and 2014 some early data analysis and interpretation suggests that marten may slightly favor selection for spruce-fir vegetation complexes over lodgepole pine, but the difference in use is small. Marten appear to use forest stands largely independent of the extensive damage inflicted on forest stands by insects. This suggests that marten may not be as vulnerable to forest alteration resulting from insect damage as previously thought.

SECTION VI: Summary

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 – At all spatial scales bobcat are meeting the management thresholds. Some information suggests that bobcat may be stable to somewhat increasing in the eastern portions of Colorado. Throughout the state, in most cases female composition has declined which supports the notion of stabilizing or increasing bobcat populations. Prey abundance appears to be at or exceeding average levels. 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 were 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 examined harvest at scales no finer than those quadrants for all surveyed species. The stratification was used to test if sample size is sufficient at this scale. Confidence intervals remained very broad and, as expected, wider at smaller scales than at larger scales. The wide confidence limits, however, strain the value of harvest data collection using such an insensitive mechanism as the Harvest Information Program (HIP) registration and survey process. ***Managers should revisit data collection methods and refine the mechanisms and/or the regulatory requirements on fur harvesters in order to improve the quality of harvest data.***

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.