2011 Furbearer Program Annual Report

MISSOURI DEPARTMENT OF CONSERVATION

Resource Science Division

Jeff Beringer, Resource Scientist
Justan Blair, Resource Assistant

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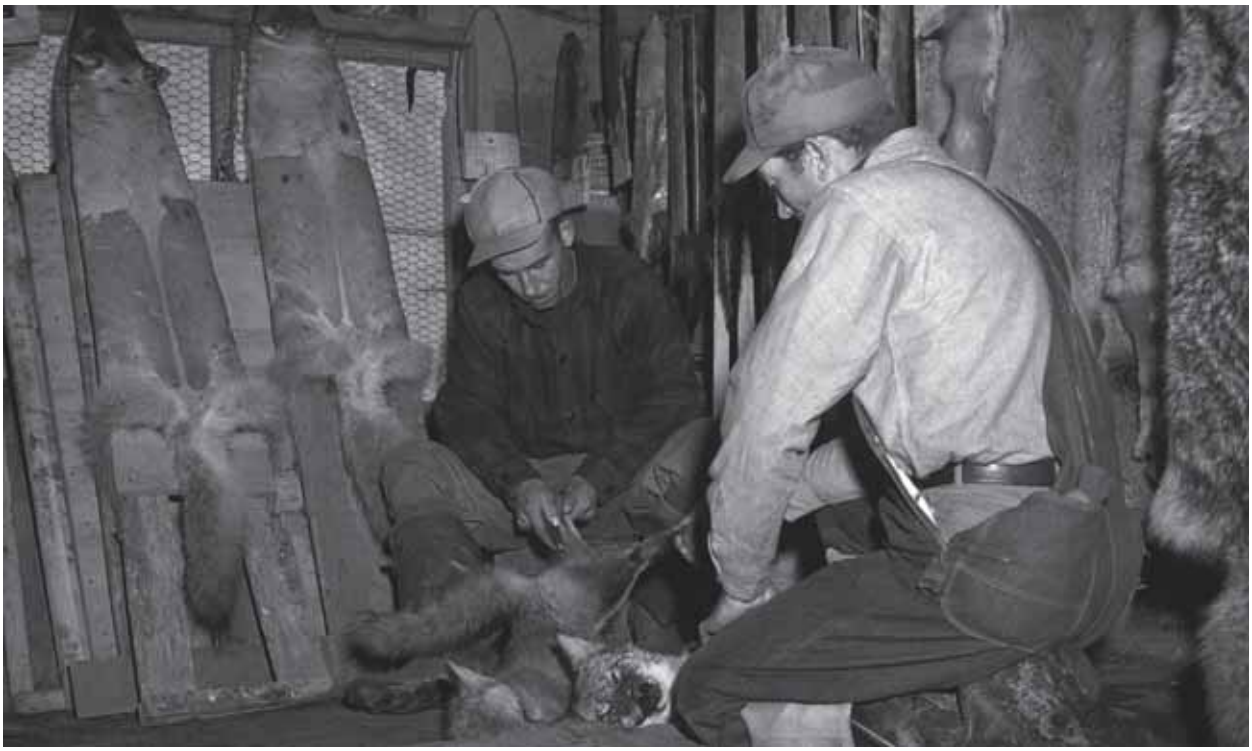
INTRODUCTION

Missouri's wild fur market has been monitored annually since 1940, with some information dating back to 1934. Over time, we have witnessed tremendous fluctuations in the harvests of Missouri's primary furbearing animals as both market and social trends change. We monitor the fur market using mandatory fur dealer and fur handler transaction records, interviews with fur dealers, mandatory pelt registration of bobcats (since 1980) and river otters (since 1996), and information gathered at fur auctions.

The number of Fur Dealer Permits issued by the Missouri Department of Conservation peaked at 1,192 during the 1945-46 season. In 2010, we sold 37 Resident and 4 Non-Resident Fur Dealer Permits. The number of Resident Trapping Permits sold peaked at 13,248 in 1980-81 (permits were first required in 1953), and reached a low of 2,050 in 2000. During the 2010-11 trapping season, we sold 5,618 Resident and 213 Non-Resident Trapping Permits (Table 1).



Fur trappers examine pelts near Orrick, Missouri, in 1947

Total pelts harvested reached 834,935 in 1940-41 (over 70% were opossum and skunk pelts), and again reached the second highest peak in 1979 at 634,338 when average raccoon pelt values were estimated at $27.50. The overall value of the furbearer harvest also peaked in 1979-80 at over $9 million. Pelt values declined dramatically during the late 1980s and through the mid 1990s, as a result the number of participants fell to all-time lows. Current market trends suggest that we may be witnessing another lengthy period of relatively low pelt values for many of the commonly hunted and trapped species.

In addition to harvest information, wildlife population trends are monitored using archer's indices and sign station surveys. Archer's indices are based on annual wildlife observation reports sent in by cooperating bow hunters. Sign station surveys are run each September by Conservation Department staff in 25 counties. A more detailed account of sign station surveys and archer's indices can be found in Section 2.

Also contained in Section 2 are updates and progress summaries for various furbearer-related research projects, monitoring efforts, or items of interest. These are only for informational purposes and should be considered draft reports. For more information on any of these draft reports please contact Jeff Beringer.

Changes for the 2011-12 furbearer trapping season include: trappers can now use their Conservation Number instead of their name and address on trap tags. Although not a change, we clarified by code wording, that only live red fox, gray fox, and coyotes may be taken with cable restraints from February 1 through the end of the month and that cable restraints may be used during the entire furbearer trapping season. Possession, transportation, and sale of furs throughout the year is now authorized with a valid trapping permit.

SECTION 1:
Missouri Furbearer Status 2010-2011

FUR HARVEST COMPARISONS

To buy and sell fur in Missouri, fur dealers must purchase a commercial permit from MDC. The permit requires fur dealers to record and submit records of all fur transactions. Since 2005, Fur Handler permits have been available to trappers to extend the normal possession date, giving them more flexibility in selling and shipping furs to auction houses. As a condition of the permit, fur handlers were required to submit by June 10 the number of pelts held. Starting in June of 2011 Fur Handler permits are no longer required and trappers can hold and sell fur throughout the year with a valid trapping permit. Data collected from fur dealers gives us an estimate of furbearer harvest. In addition, harvest numbers for bobcats and otters are gathered from mandatory pelt registration required by the Convention on International Trade of Endangered Species (CITES).

Table 1. Furbearer harvest and pelt prices in Missouri over the last three years.

Species	2010-11		2009-10		2008-09	
	Number of pelts sold or registered*	Pelt Prices from MTA Auctions	Number of pelts sold or registered*	Pelt Prices from MTA Auctions	Number of pelts sold or registered	Pelt Prices from MTA Auctions
Raccoon	109,586	$10.98	47,919	$12.20	109,085	$9.77
Opossum	9,295	$1.70	4,491	$2.22	9,600	$1.98
Muskrat	20,641	$6.21	9,877	$6.91	9,308	$3.08
Coyote	4,205	$11.04	1,520	$10.95	2,506	$8.75
Beaver	5,464	$9.94	3,535	$13.75	6,081	$11.84
Mink	1,085	$14.18(m) $7.21(f)	614	$10.67 (m) $5.41 (f)	702	$7.87 (m) $6.25 (f)
Red Fox	1,040	$16.78	479	$14.82	1,004	$13.30
Gray Fox	709	$18.02	325	$15.08	703	$17.85
Striped Skunk	383	$1.87	212	$2.75	614	$3.73
Badger	59	0.00	23	$3.50 (1 sold)	39	$17.50 (1 sold)
Bobcat*	3,888	$45.21	2,131	$36.30	3,333	$23.68
River Otter*	2,573	$46.95	1,159	$37.84	1,488	$26.91
Trapping permits sold (resident)	5,618		4,437		6,439	

* Pelts sold (except bobcat and otter where harvest is based on CITES registration) is based on reports received from the 41 Fur Buyer Permittees and 125 of 448 Fur Handler Permittees

MISSOURI FUR AUCTION PRICES

Fur auctions are held by the Missouri Trappers Association (MTA) two to three times yearly at the Boone County Fairgrounds. Prices are averaged from all fur sold, including green, finished and damaged (Table 2). Average pelt prices were higher this year for most species (Table 3). Opossum, skunk and beaver pelt prices declined 20 percent or more from last year.

Clay McDaniel, Missouri Trapper's Association

Table 2. Range of furbearer pelt prices in Missouri during the 2010-11 trapping season.

		2011 Auction Prices		Average Prices for 2011	Change in Price from Last season
	Total Number of Pelts Sold	28-Jan	12-Feb		
Species					
Raccoon	20,149	$11.35	$10.60	$10.98	-10.04%
Opossum	1,355	$1.87	$1.52	$1.70	-23.65%
Muskrat	3,456	$6.29	$6.12	$6.21	-10.20%
Coyote	441	$11.13	$10.95	$11.04	+0.82%
Beaver	702	$9.64	$10.24	$9.94	-27.71%
Mink – Male	133	$13.36	$15.00	$14.18	+32.90%
Mink – Female	23	$7.50	$6.92	$7.21	+33.27%
Red Fox	128	$16.62	$16.93	$16.78	+13.19%
Gray Fox	55	$18.75	$17.28	$18.02	+19.46%
Striped Skunk	66	$2.22	$1.52	$1.87	-32.00%
Badger	0	$0.00	$0.00	$0.00	
Bobcat	200	$43.77	$46.65	$45.21	+24.55%
Otter	392	$49.50	$44.40	$46.95	+24.08%

Table 3. Comparison of average furbearer auction prices over the last five trapping seasons.

Species	Average Price Per Season					5 year average
	2010-11	2009-10	2008-09	2007-08	2006-07	
Raccoon	$10.98	$12.20	$9.77	$17.95	$11.90	$12.56
Opossum	$1.70	$2.22	$1.98	$1.91	$1.65	$1.89
Muskrat	$11.04	$6.91	$3.08	$3.29	$5.72	$6.01
Coyote	$9.94	$10.95	$8.75	$13.34	$17.84	$12.16
Beaver	$14.18	$13.75	$11.84	$15.17	$18.10	$14.61
Mink (male)	$7.21	$10.67	$7.87	$10.59	$15.84	$10.44
Red Fox	$16.68	$14.82	$13.30	$15.46	$18.88	$15.83
Gray Fox	$18.02	$15.08	$17.85	$34.88	$32.86	$23.74
Str. Skunk	$1.87	$2.75	$3.73	$3.61	$5.47	$3.49
Badger		$3.50	$17.50	$13.17	$26.00	$15.04
Bobcat	$45.21	$36.30	$23.68	$56.93	$59.78	$44.38
Otter	$46.95	$37.84	$26.91	$32.00	$42.77	$37.29

RACCOON POPULATION AND HARVEST TRENDS

Raccoon harvest, including trapping, for the 2010-11 season was 109,586, up 122 percent from the 2009-10 season and up slightly from the 2008-09 season (Figure 1). Trapping permit sales increased this year probably because raccoon pelt sales finished strong last year. In addition, many fur dealers were able to sell their inventory of stored fur and were again buying from local fur trappers.

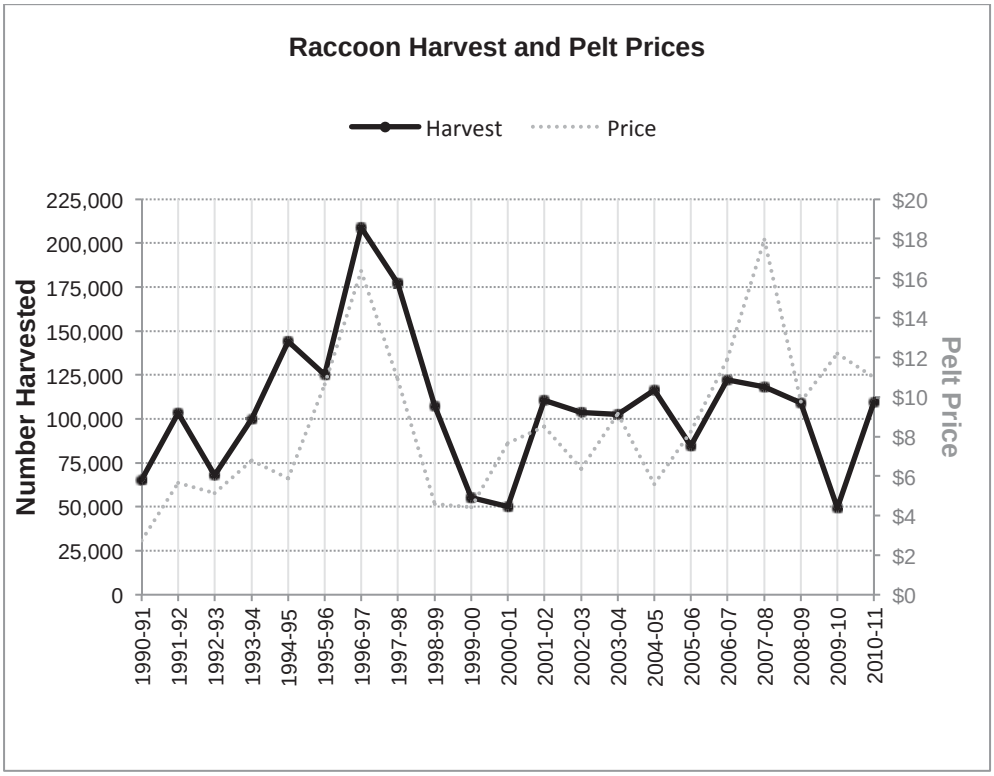


Figure 1. Comparison of raccoon harvest and pelt prices over the last 21 years.

Raccoon observations from bowhunters continue to increase. During 2010 we recorded the highest index for raccoon sightings since we started collecting data in 1983 (Figure 2). Despite some annual flux, long-term population trends seem to be increasing. The presence of raccoon tracks at furbearer sign stations reached its highest number ever in 2010. Overall, the number of raccoon visits per 1,000 operable stations has nearly tripled in the last 30 years as this adaptable generalist continues to thrive.

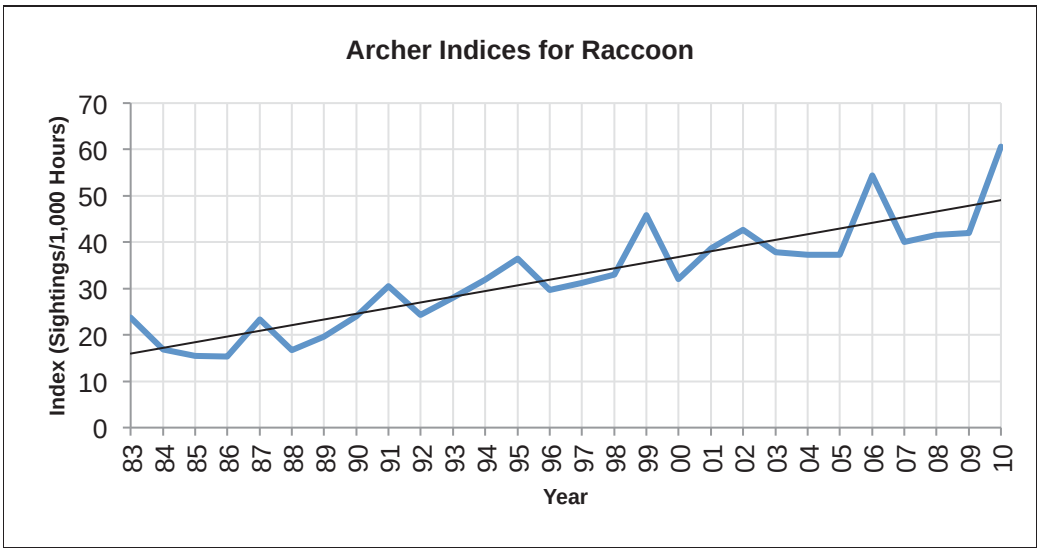


Figure 2. Raccoon population trends based on our bowhunter observation survey.

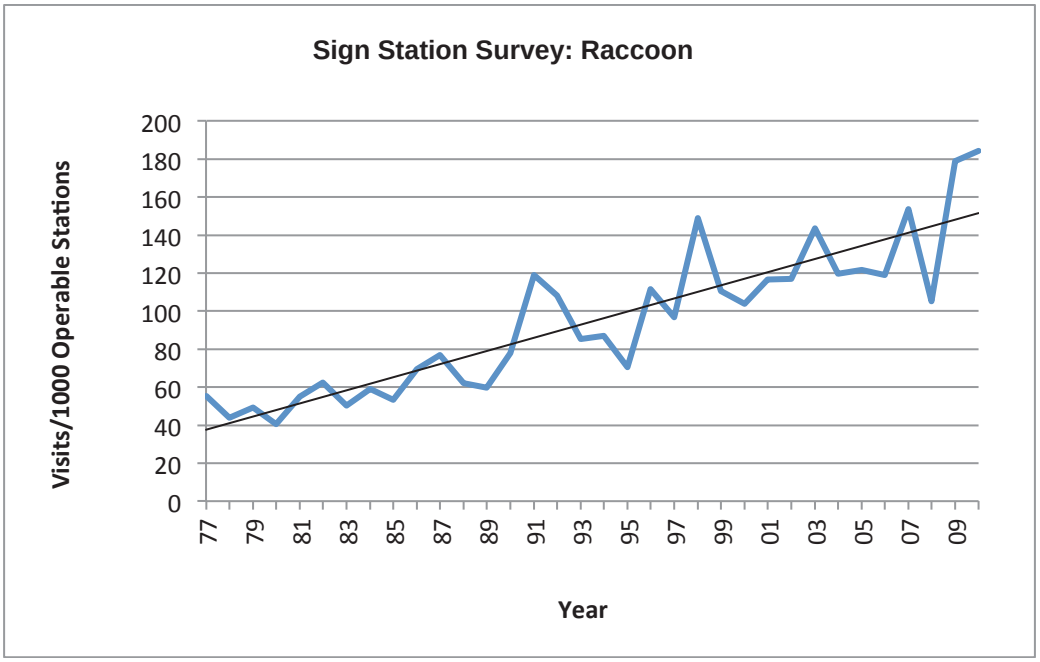


Figure 3. Raccoon population trends based on sign station surveys.

COYOTE POPULATION AND HARVEST TRENDS

Coyote harvest during the 2010-11 season (4,205) was up, increasing 167 percent from the 2009-10 season (Figure 4). I suspect weather played a large part in the harvest over last year as most land trappers were done trapping in early December of 2010. Although coyote pelt prices averaged only $13.00 many trappers still enjoy the challenge of catching coyotes. I suspect the use of cable restraints has increased coyote harvest for the fur market and for the live market associated with hound running pens. Trend data for coyotes suggest populations are stable but higher than those observed during the mid 1970s (Figure 5, Figure 6). Mange in both coyotes and red fox is reported each year but major outbreaks have not been confirmed.

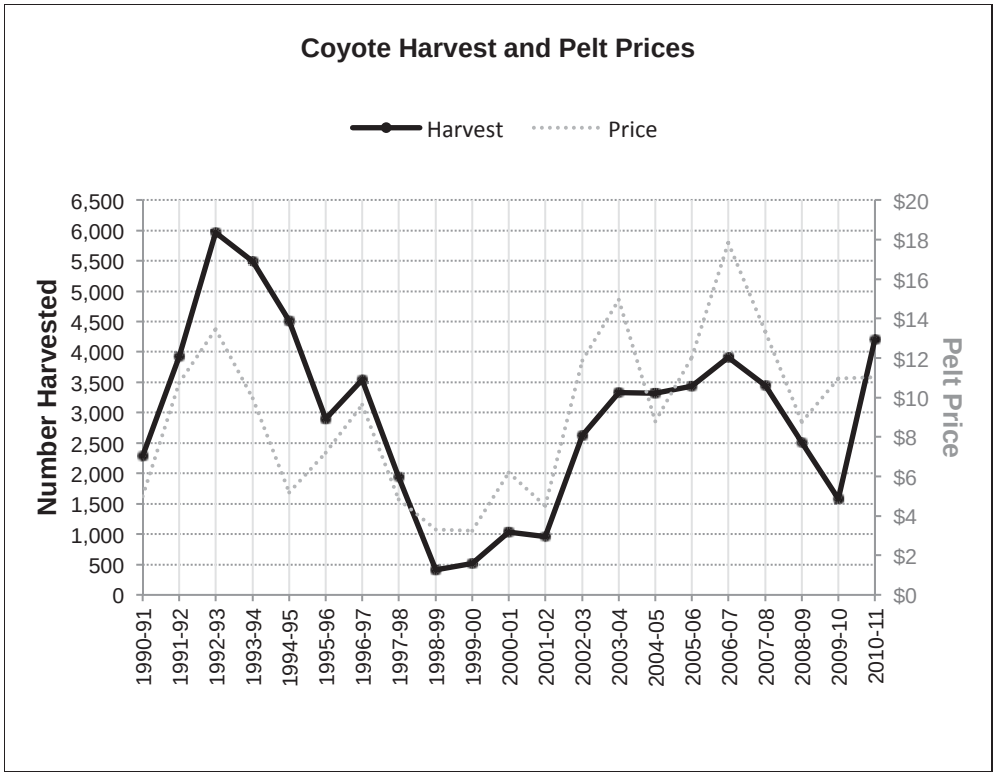


Figure 4. Comparison of coyote harvest and pelt prices over the last 21 years.

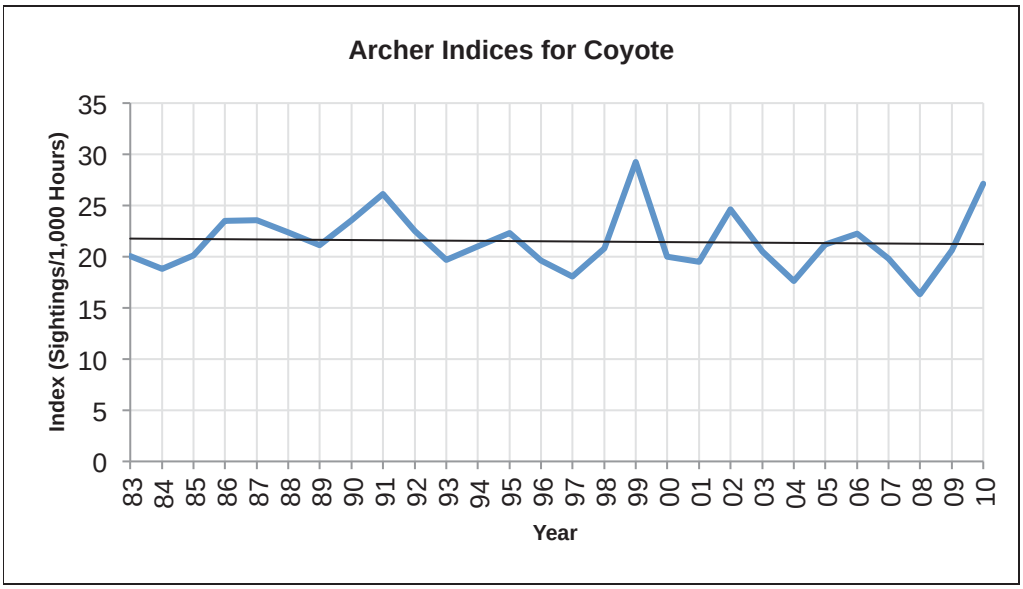


Figure 5. Coyote population trends based on our bowhunter observation survey.

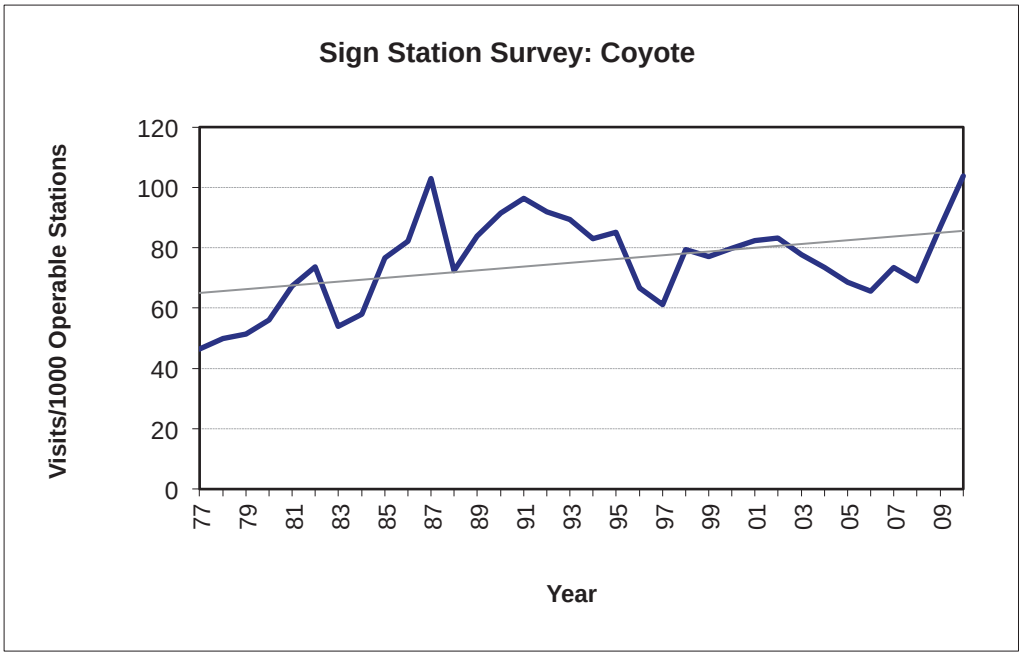


Figure 6. Coyote population trends based on sign station surveys.

FOX POPULATION AND HARVEST TRENDS

During the 2010-11 season, red fox harvest (1,040) increased113 percent and gray fox harvest (709) increased 112 percent when compared with last year's harvest (Figures 7 and 8). Both the archer observations and sign station surveys suggest a continual decline in both red and gray fox populations (Figures 9 and 10). Fox declines may be the result of interspecific competition with coyotes and bobcats. Another possibility, especially for gray fox could be the increasing population of raccoons and their associated distemper virus; gray fox seem especially vulnerable to distemper virus.

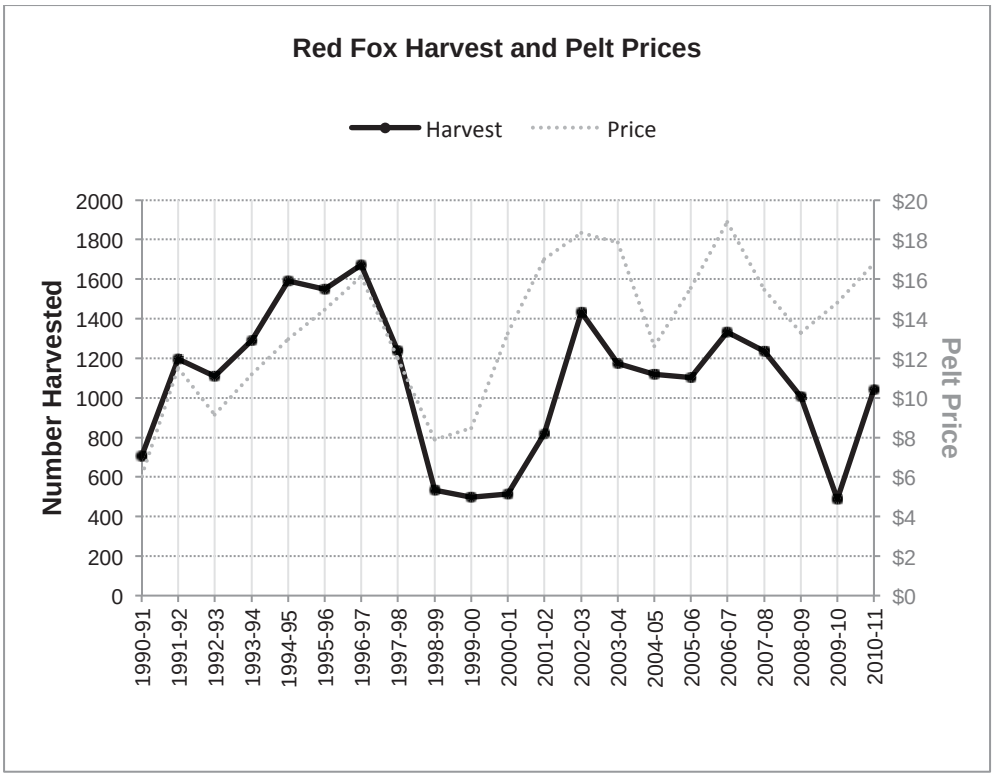


Figure 7. Comparison of red fox harvest and pelt prices over the last 21 years.

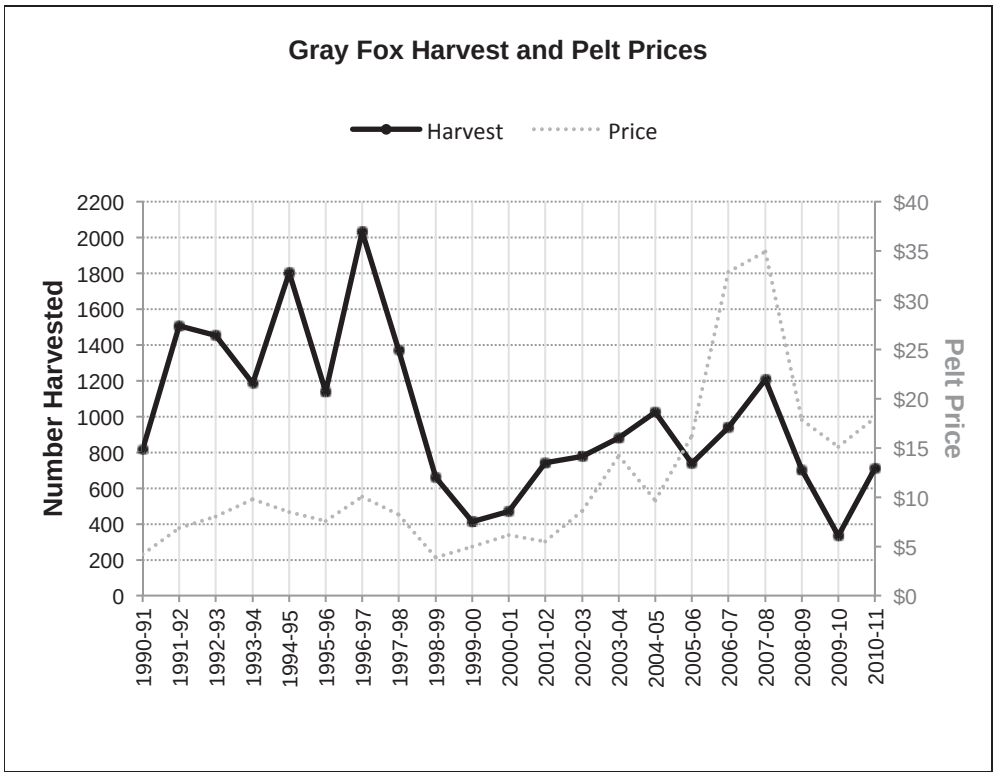


Figure 8. Comparison of gray fox harvest and pelt prices over the last 21 years.

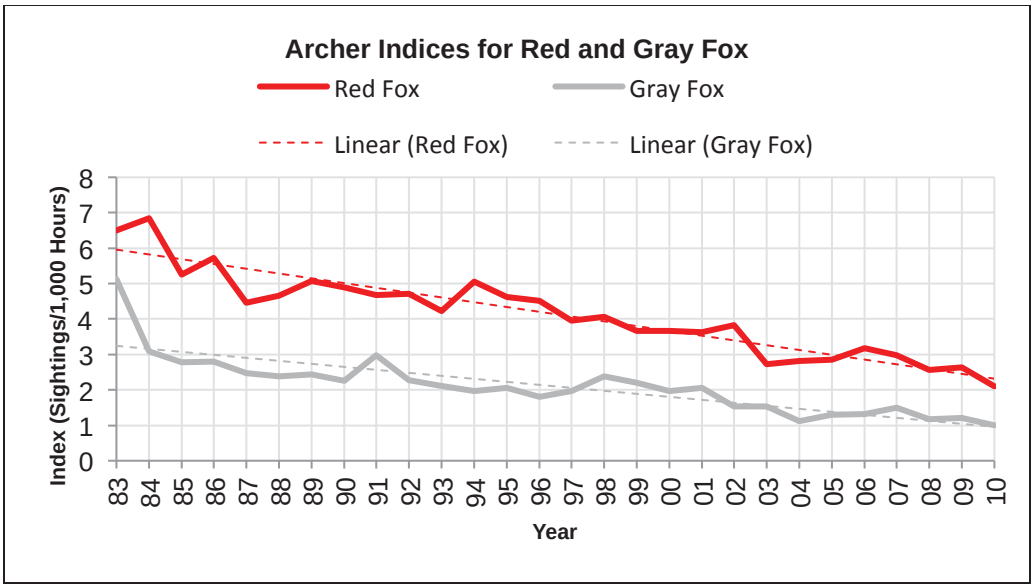


Figure 9. Fox population trends based on our bowhunter observation survey.

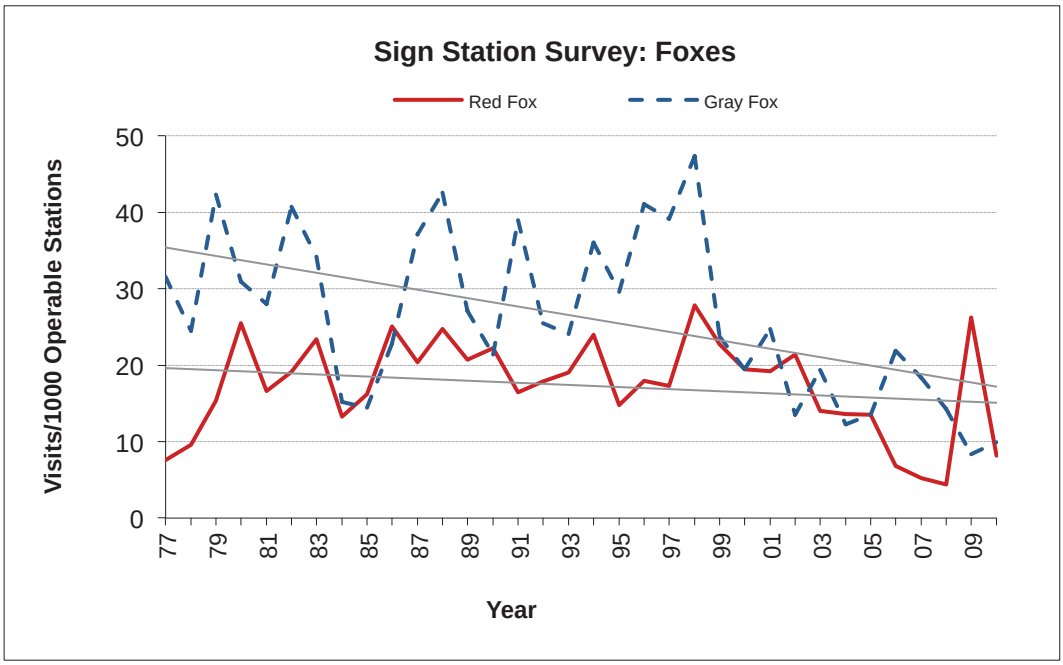


Figure 10. Fox population trends based on sign station surveys.

BOBCAT POPULATION AND HARVEST TRENDS

Trappers and hunters are required to check and seal bobcat carcasses or green pelts at MDC offices or with Conservation Agents. The data collected are used to monitor bobcat harvest in Missouri and to comply with CITES regulations.

The statewide harvest of bobcats during the 2010-11season was 3,888. This was up 83 percent from 2009-10, and 17 percent from 2008-09, (Figure 11). Bobcat harvest peaked during the 2006-07 season (4,453) when bobcat pelt prices averaged nearly 60 dollars (Figure 11). Comparatively, average pelt price in 2010-11 was 45 dollars. During 2010-11 we had a significant increase in trappers and weather conditions were more favorable for land trapping.

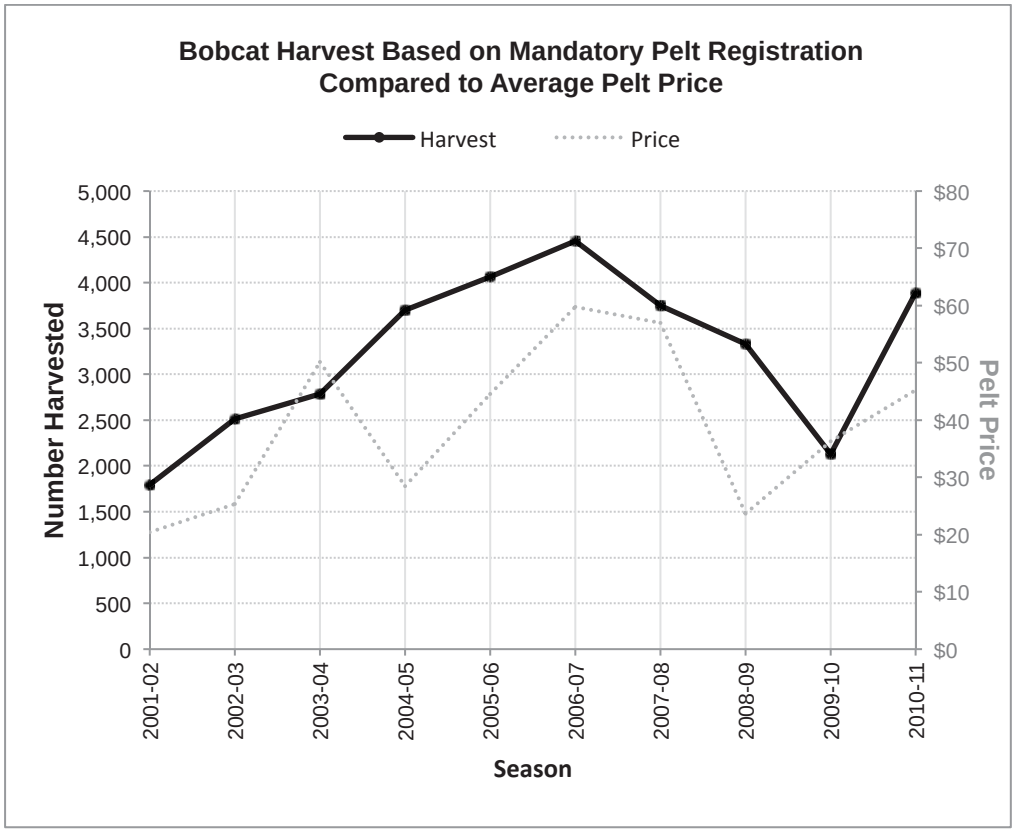


Figure 11. Bobcat harvest trends over the last 10 years compared to average pelt prices.

The number of bobcat pelts purchased by fur dealers (1,718) was significantly less than the number of bobcats checked by trappers as required by CITES (3,888). Instead of selling to fur buyers, trappers can make more money by selling carcasses to taxidermists or selling mounted bobcats on the internet. The significant drop in pelt sales to fur dealers is likely a reflection of this trend.

Archer Indices data suggest an increase in bobcat sightings while sign station data suggest bobcat populations may have dipped some over the last couple years – the overall trend appears to be stable to slightly increasing (Figure 12, Figure 13). We saw no specific trend in regional harvests (Table 4, Figure 14) throughout the state.

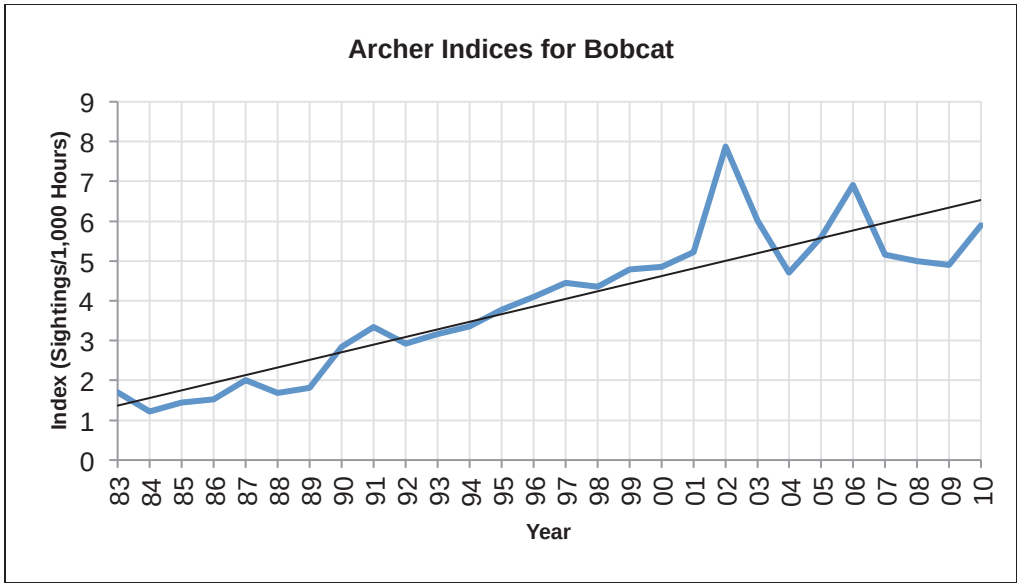


Figure 12. Bobcat population trends based on our bowhunter observation survey.

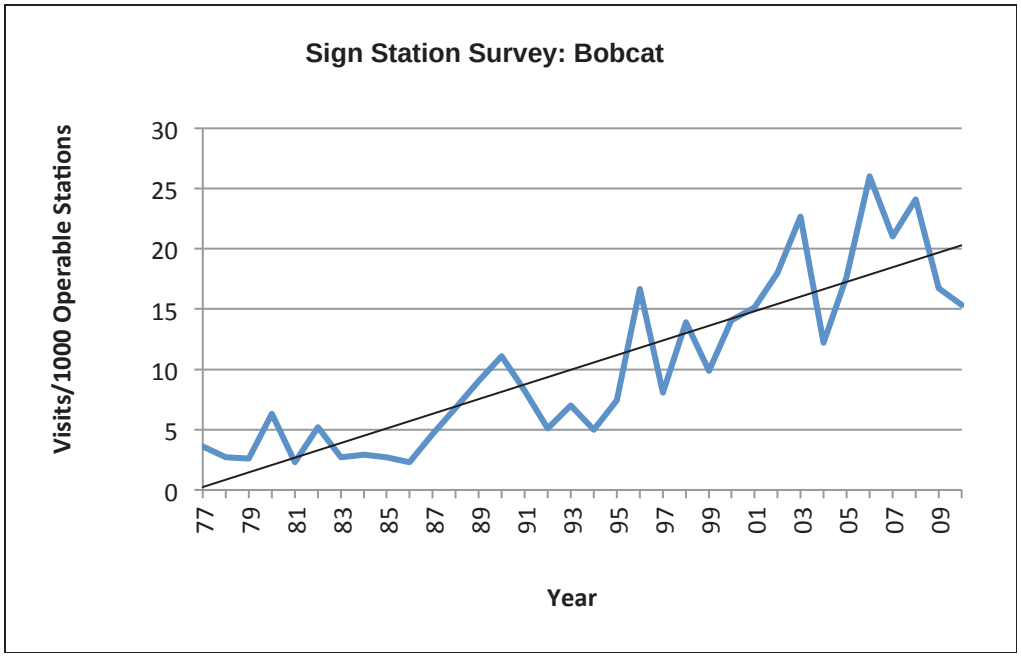


Figure 13. Bobcat population trends based on sign station surveys.

Table 4. Bobcat harvest (based on mandatory pelt registration) and pelt prices from 2001 – 2011, in Missouri, by Zoogeographic Regions.

	Bobcats Harvested per Season									
ZooRegion	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
Northwest Prairie	194	470	347	410	470	493	358	341	150	342
Northern Riverbreaks	166	294	387	552	604	636	373	404	192	412
Northeast Riverbreaks	92	126	150	446	558	678	521	492	379	608
Western Prairie	355	497	605	624	616	763	572	446	235	542
Western Ozark Border	212	298	297	364	473	431	377	312	223	453
Ozark Plateau	492	487	648	881	852	918	984	868	550	962
North and East Ozark Border	178	205	233	291	289	372	316	307	243	369
Mississippi Lowlands	98	113	116	133	208	158	159	157	154	185
Unknown	7	0	0	0	1	4	46	6	2	0
TOTAL	1,794	2,513	2,783	3,701	4,061	4,453	3,706	3,333	2,128	3,888
Bobcat Pelt Prices	$20.40	$25.38	$50.15	$28.50	$44.53	$59.78	$56.93	$23.68	$36.30	$45.21

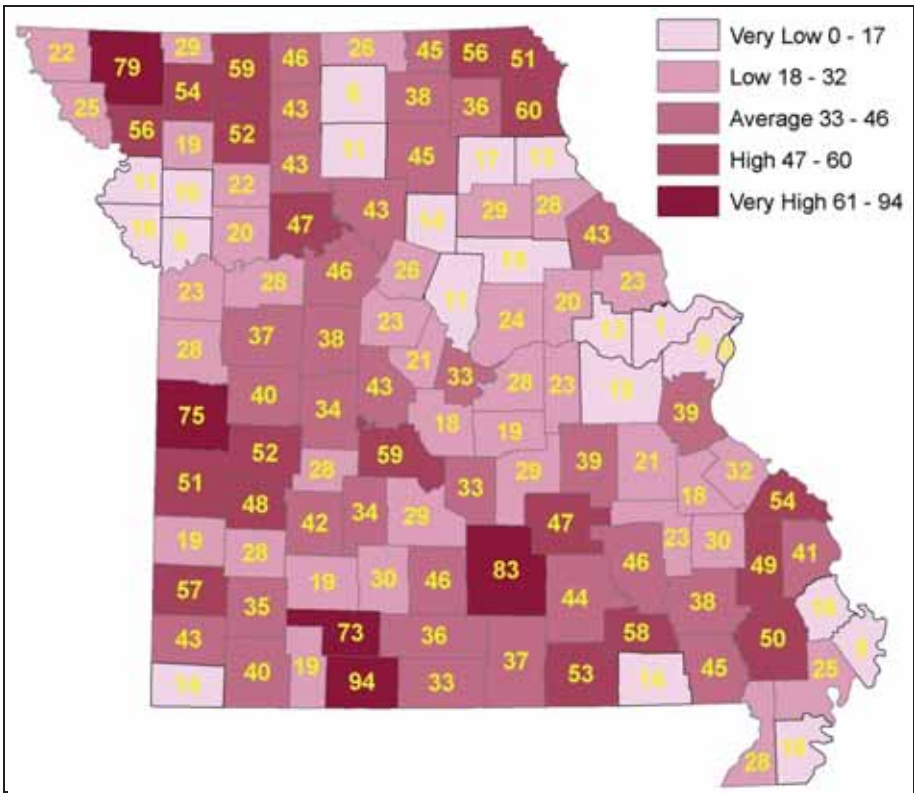


Figure 14. Bobcat harvest by county for 2010-2011 season.

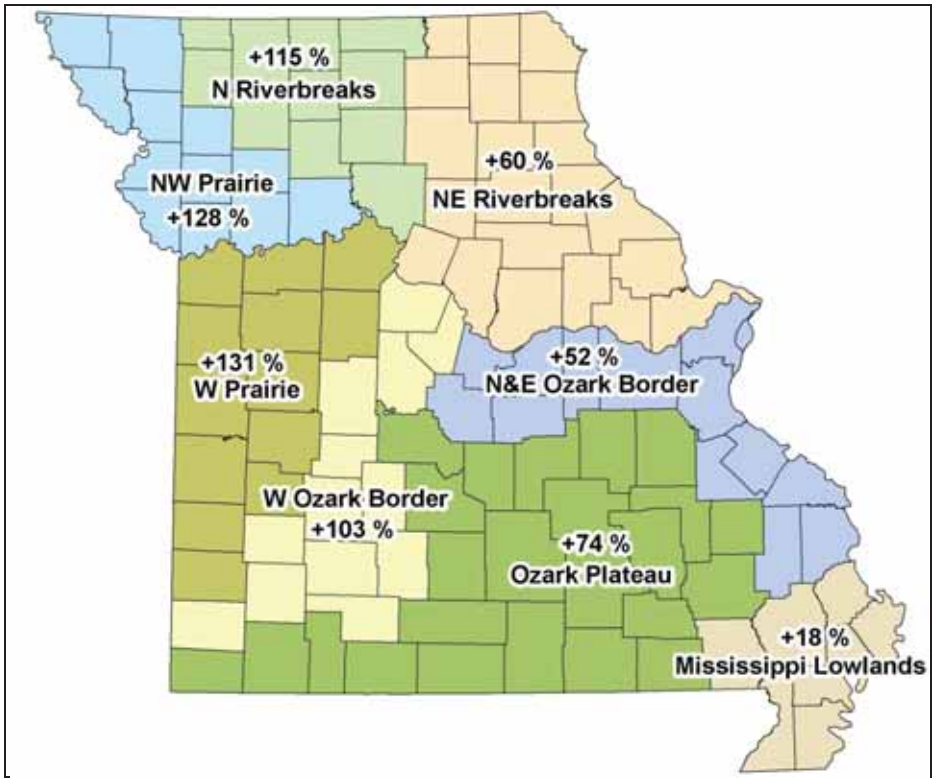


Figure 15. Comparison of bobcat harvest by zooregion between the 2009-10 and 2010-11 seasons.

OTTER POPULATION AND HARVEST TRENDS

Trappers are required to check and seal river otter carcasses or green hides at MDC offices or with Conservation Agents. The data collected are used to monitor statewide and regional otter harvest in Missouri and to comply with CITES regulations.

Based on otter check sheets, the 2010-11 statewide harvest was 2,573, about 122 percent higher than last year and 73 percent higher than the 2008-09 season (Tables 5 and 6). Otter pelt prices have increased over the past couple years and likely are the reason for increased harvest (Figure 16). Timing of otter and bobcat harvest are available as a result of CITES tagging and show that both species have a relatively long harvest season (Table 5).

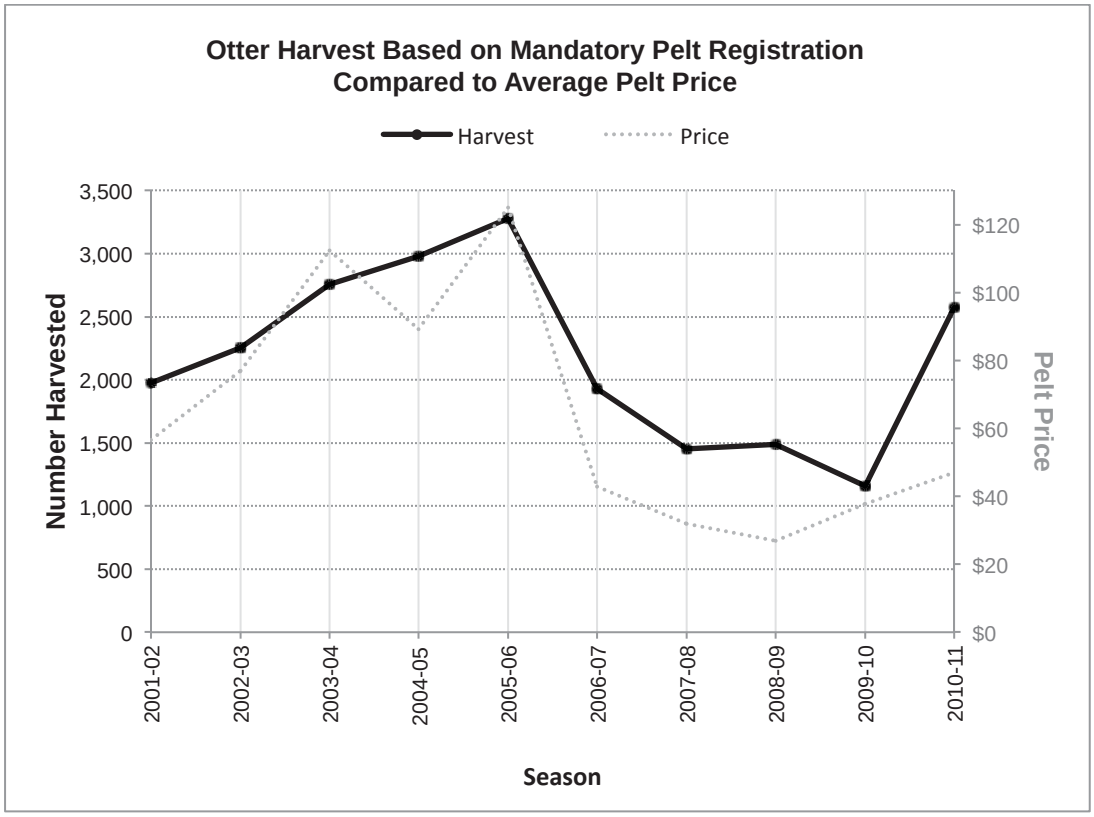


Figure 16. Otter harvest and pelt prices from 2001 – 2011.

Table 5. Bobcat and otter harvest during each week of the 2010-11 season.

Week of Season	Dates	Number of Bobcats Harvested	Number of Otters Harvested
---	Before Nov. 15	19	7
1	Nov.15 – 21	414	166
2	Nov. 22 – 28	309	224
3	Nov. 29 – Dec. 5	352	293
4	Dec. 6 – 12	282	234
5	Dec. 13 – 19	353	213
6	Dec. 20 – 26	424	235
7	Dec. 27 – Jan. 2	379	167
8	Jan. 3 – 9	383	200
9	Jan. 10 –16	374	155
10	Jan. 17 – 23	269	146
11	Jan. 24 – 30	241	104
12	Jan. 31 – Feb. 6	29	76
13	Feb 7 – 13	9	105
14	Feb. 14 – 20	8	170
---	After Feb 20	6	1
---	Unknown date	37	77
	TOTAL	3,888	2,573

In 2010 we removed the quota on otters for certain zones and eliminated harvest zones. Our goal for the change was to simplify regulations and encourage legal harvest to maintain otter densities that are compatible with Ozark fisheries. Although most otter harvest occurs during December and January (Table 5), a longer season does facilitate targeted harvests. From a county basis otter harvest was highest in Chariton and Pike counties with harvests of 102 and 96 respectively (Figure 17). Other areas of high harvest counties were in the Bootheel, west-central, and northeastern-regions of Missouri.

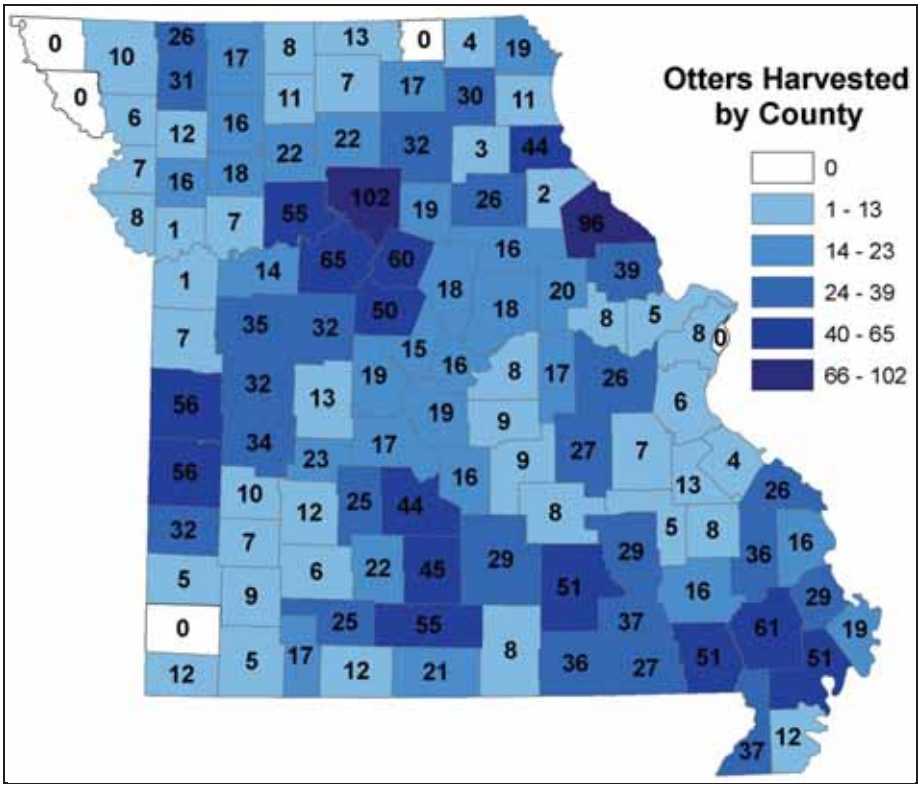


Figure 17. The number of otters harvested by county during the 2010-11 season.

Otter harvest during the 2010-11 season was highest in the Missouri River watershed (Figure 18, Table 7) and Grand River watershed. Eighteen percent (465) of the total otters harvested were in these two watersheds. Other watersheds with high harvest included the Gasconade, St. Francis, and Lower Mississippi.

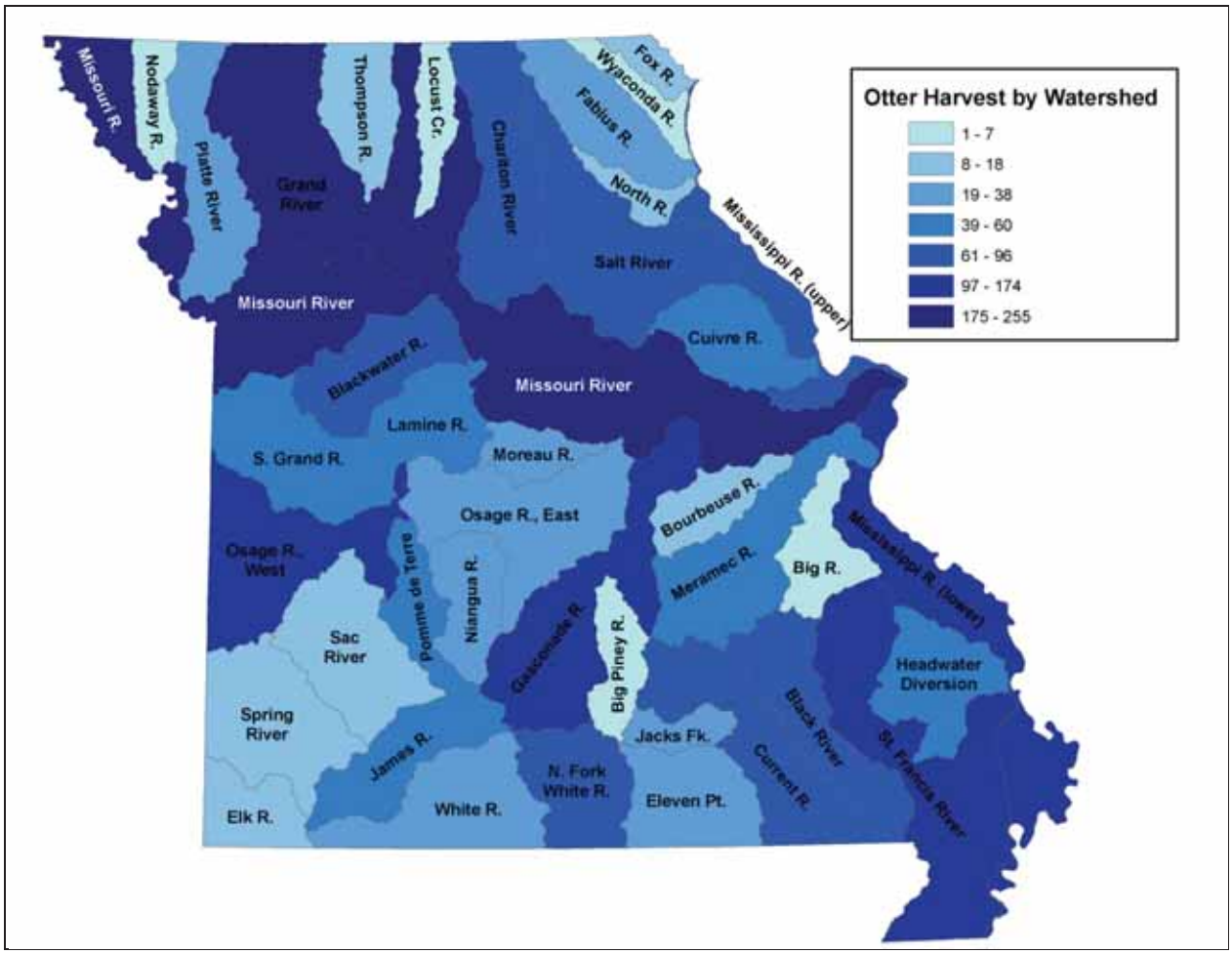


Figure 18. Otter harvest distribution among watersheds during the 2010-11 trapping season.

Table 7. Otter harvest distribution among watersheds during the 2010-11 trapping season.

Watershed	Number Harvested	Percent of Harvest
Big Piney River	6	0.23%
Big River	1	0.04%
Black River	80	3.11%
Blackwater River	75	2.91%
Bourbeuse River	15	0.58%
Chariton River	96	3.73%
Cuivre River	46	1.79%
Current River	96	3.73%
Eleven Point River	37	1.44%
Elk River	12	0.47%
Fabius River	38	1.48%
Fox River	15	0.58%
Gasconade River	149	5.79%
Grand River	210	8.16%
Headwater Diversion	60	2.33%
Jacks Fork River	22	0.86%
James River	60	2.33%
Lamine River	48	1.87%
Locust Creek	49	1.90%
Meramec River	49	1.90%
Mississippi R. (lower)	25	0.97%

Watershed	Number Harvested	Percent of Harvest
Mississippi R. (upper)	83	3.23%
Missouri River	255	9.91%
Moreau River	25	0.97%
N. Fork White River	94	3.65%
Niangua River	33	1.28%
Nodaway River	3	0.12%
North River	13	0.51%
Osage River East	25	0.97%
Osage River West	174	6.76%
Platte River	27	1.05%
Pomme de Terre River	46	1.79%
S. Grand River	48	1.87 %
Sac River	15	0.58%
Salt River	87	3.38%
Spring River	18	0.70%
St. Francis River	164	6.37%
Thompson River	15	0.58%
White River	22	0.86%
Wyaconda River	7	0.27%
Unknown	230	8.94%
TOTAL HARVEST	2573	100%

SECTION 2:
Research projects and monitoring efforts

FURBEARER SIGN STATION SURVEY

SUMMARY OF 2010 FURBEARER SIGN STATION SURVEY
Justan Blair, Resource Assistant, Missouri Department of Conservation

Background

The furbearer sign station survey occurs annually each September. The survey dates back to 1977 and gathers furbearer population trend information across the state. Currently there are twenty-five routes, each in a different county. Each route is broken into five segments with 10 sign stations each, for a total of 50 sign stations per route. Sign stations are 36-inch diameter circles of sifted soil, set up every 0.3 miles along shoulders of gravel roads. In the middle of each station is a scent disc infused with a fatty acid scent attractant. Stations are set up in a day and checked the next day for presence of animal tracks.

When checking the stations, observers note whether or not stations are operable. If a station has been destroyed by a road grader or other vehicle, the station is deemed inoperable and not included in index calculations. If a station is operable, it is included in the calculation of indices regardless of the presence of tracks. Observers identify any tracks within the station but do not count the number of animals of any species visiting a station.

Results

In 2010, 24 of 25 routes (Figure 1) were completed with a total of 1108 operable stations out of a possible 1200. A breakdown of operable stations per Zooregion is shown in Table 1. Inoperable stations were due to tire tracks, mowers and road graders.

Table 1. Summary of operable and inoperable sign stations in 2010 by Zooregion.

Zooregion	Number of routes completed	Number of operable stations	Number of inoperable stations
Northwest Prairie	2	92	8
Northern Riverbreaks	3	129	21
Northeast Riverbreaks	4	192	8
Western Prairie	2	89	11
Western Ozark Border	3	139	11
Ozark Plateau	6	287	13
North & East Ozark Border	3	132	18
Mississippi Lowlands	1	48	2
TOTAL	24	1108	92

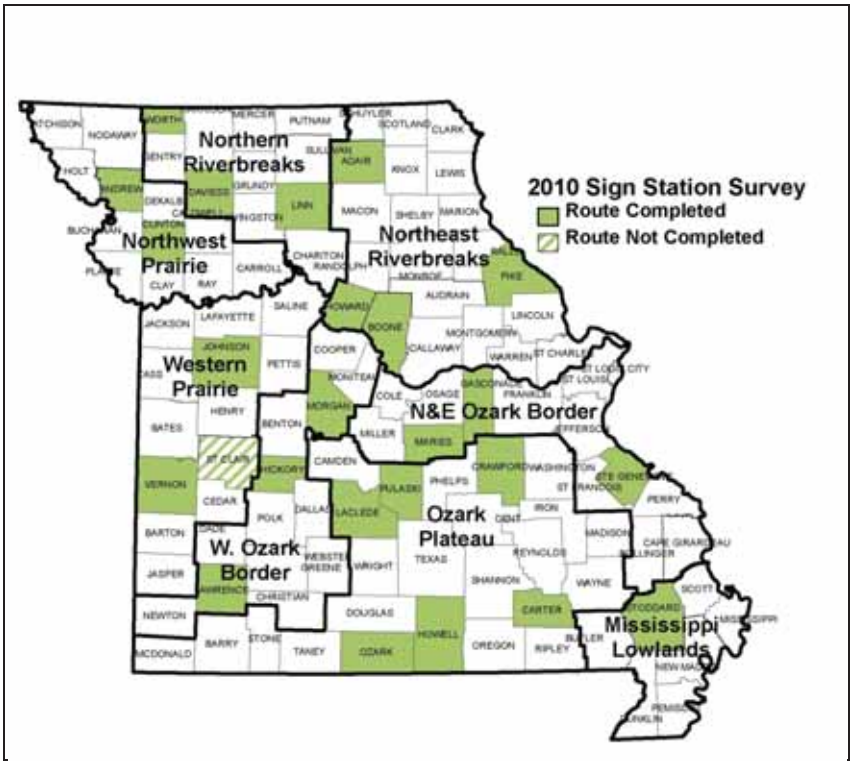


Figure 1. Map of Missouri showing counties with sign station routes within their respective Zooregion.

The most common furbearer species to visit sign stations include raccoon, opossum and coyote (Figure 2, Figure 3). Less common visitors include skunk, bobcat, red fox and gray fox. Birds such as sparrows, turkeys and quail are also attracted to the freshly sifted soil of the sign stations.

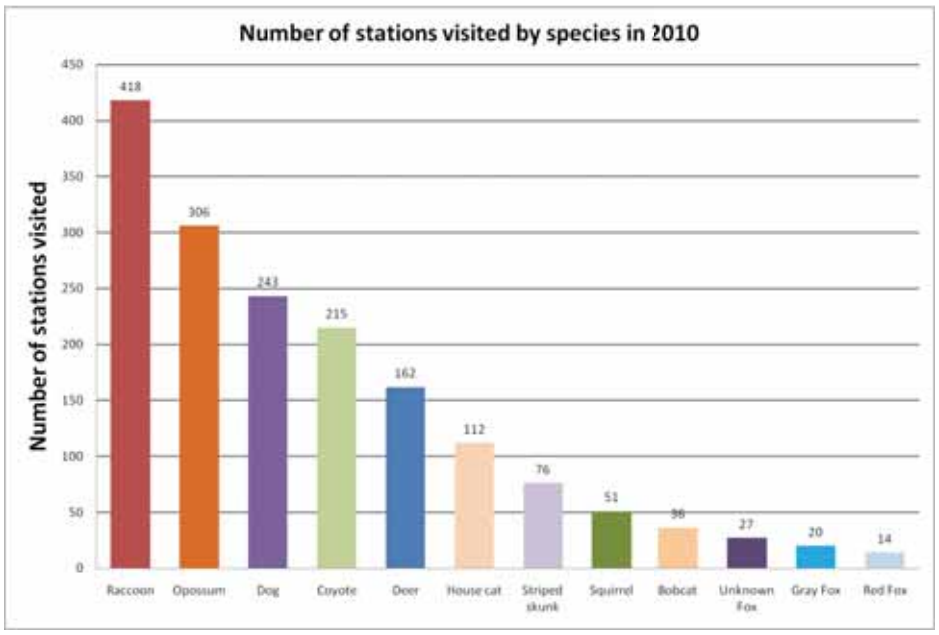


Figure 2. The number of stations visited by mammal species (including non-furbearers) out of 1108 operable stations in the 2010 survey.

Figures 3 through 6 show furbearer population trends based on the Furbearer Sign Station Survey, 1977-2010. Overall, trends indicate that most furbearer species have steady to slightly increasing populations. A slight downward trend is indicated for red and gray fox populations, which is also reflected in bowhunter observations and harvest records.

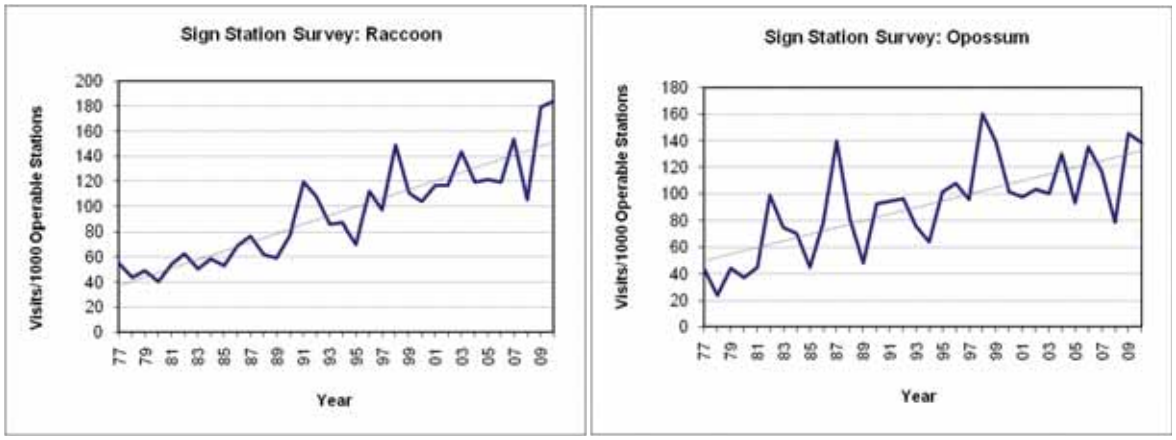


Figure 3. Raccoon and opossum population trends based on annual furbearer sign station survey.

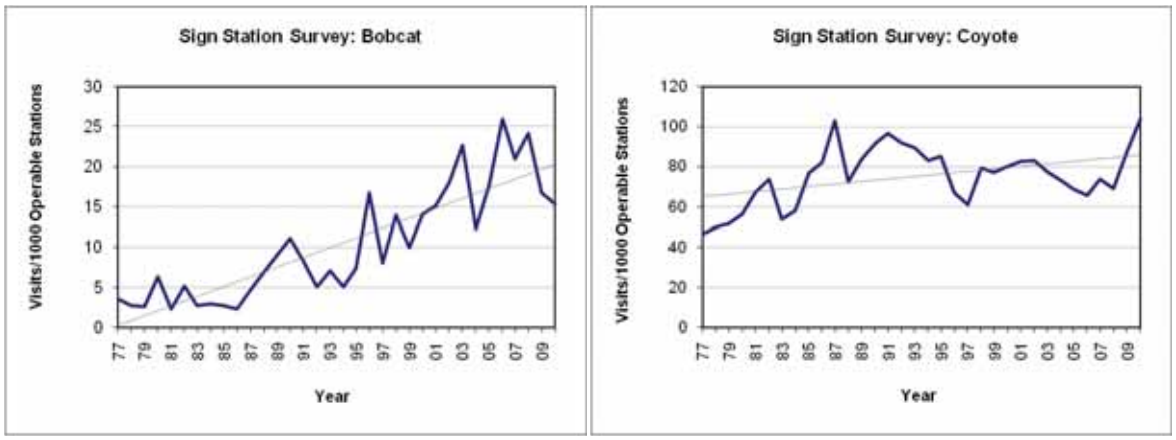


Figure 4. Bobcat and coyote population trends based on annual furbearer sign station survey.

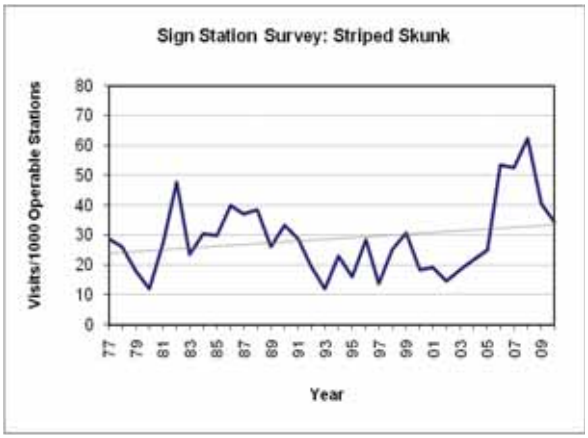


Figure 5. Skunk population trend based on annual furbearer sign station survey.

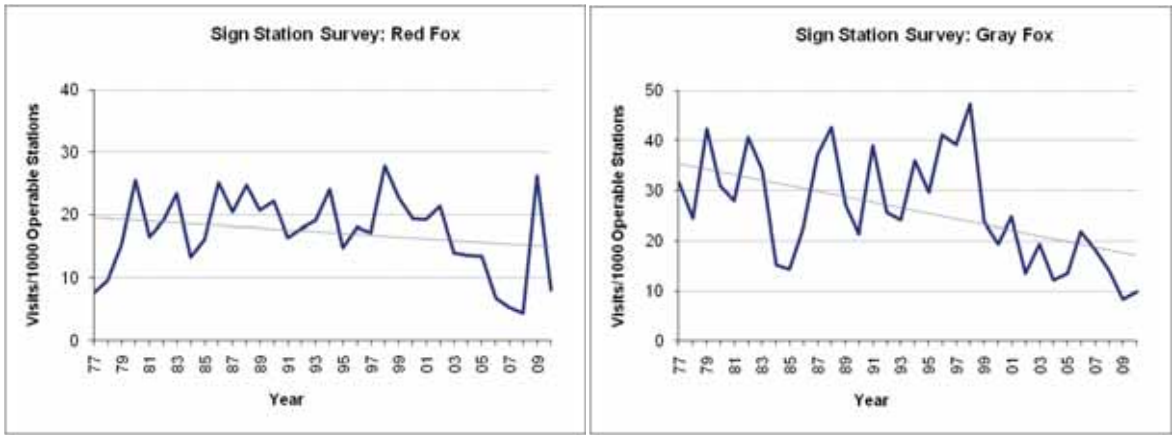


Figure 6. Red and gray fox population trends based on annual furbearer sign station survey.

ARCHER'S INDEX TO FURBEARER POPULATIONS

MONITORING FURBEARER TRENDS USING DATA
GATHERED FROM COOPERATOR BOWHUNTERS

Justan Blair, Resource Assistant, Missouri Department of Conservation

Introduction

For 28 consecutive years (1983-2010), we have conducted annual surveys of wildlife populations via the archer's diary survey. Each fall, several thousand archery deer and turkey hunters keep daily sighting records for furbearers, other small game animals, deer and wild turkeys. Archers volunteered to sign up through post-season surveys of archery deer and wild turkey permit holders, articles in the *Missouri Conservationist* magazine, and during sign-ups at bow hunter club meetings and other outdoor events. Archery hunters are asked to record the number of hours they hunted, during both morning and evening hunts, and to use a standardized daily diary to record hours and sightings of wildlife. We use the number of sightings of each species divided by the total number of hours hunted statewide to calculate a sighting rate, and this is then expressed as the number of sightings per 1,000 hunter hours to calculate population indices.

Wildlife population indices calculated from the archer's diary survey are likely more meaningful for high-density terrestrial wildlife such as squirrels, white-tailed deer, wild turkeys, coyotes, raccoons, foxes and bobcats. Hunter retention rates in the program are very high, and only occasional sign-ups are needed to maintain sufficient hunter hours. Hunters are well distributed statewide, with volunteer hunters in 112 of the 114 counties during most years. Hunter hours averaged 52,781 hours over the last 28 years, and they ranged from a low of 30,990 in 1985 and a high of 84,497 in 1988 (Table 1).

Table 1. Hunter hours and furbearer population indices based on archer diaries, 1983-2010.

Years	Hunter Hours	Coyote	Red Fox	Gray Fox	Bobcat	Raccoon	Opossum	Striped Skunk	Mink	Beaver	Muskrat	Weasel	Badger	Otter	Black Bear
1983	55,374	20.0	6.5	5.1	1.7	23.8	12.6	5.0	0.7	0.3	0.5	0.1	0.1	0.0	0.0
1984	32,746	18.8	6.8	3.1	1.2	16.9	6.4	3.5	0.3	0.3	0.1	0.0	0.1	0.0	0.0
1985	30,990	20.1	5.3	2.8	1.5	15.4	8.6	4.2	0.5	0.4	0.4	0.1	0.1	0.1	0.0
1986	51,727	23.5	5.7	2.8	1.5	15.3	6.9	3.5	0.3	0.4	0.0	0.0	0.0	0.0	0.0
1987	57,457	23.5	4.5	2.5	2.0	23.3	10.1	3.0	0.3	0.7	0.2	0.1	0.1	0.1	0.0
1988	84,497	22.4	4.7	2.4	1.7	16.7	4.8	2.7	0.3	0.6	0.1	0.0	0.1	0.1	0.0
1989	72,992	21.1	5.1	2.4	1.8	19.6	5.6	3.5	0.1	0.6	0.1	0.0	0.2	0.1	0.0
1990	72,227	23.6	4.9	2.3	2.9	24.0	7.2	3.5	0.2	0.4	0.1	0.0	0.1	0.1	0.0
1991	64,434	26.1	4.7	3.0	3.3	30.5	11.7	4.0	0.3	0.3	0.1	0.0	0.1	0.0	0.1
1992	64,452	22.5	4.7	2.3	2.9	24.3	8.9	2.8	0.6	0.7	0.1	0.0	0.1	0.3	0.0
1993	53,857	19.7	4.2	2.1	3.2	28.1	7.7	3.7	0.2	0.5	0.2	0.0	0.1	0.3	0.0
1994	49,102	21.0	5.1	2.0	3.4	32.0	7.6	3.2	0.1	0.5	0.2	0.0	0.2	0.2	0.0
1995	66,106	22.3	4.6	2.1	3.8	36.5	9.6	3.6	0.1	0.3	0.1	0.0	0.1	0.3	0.1

YEAR	Hunter Hours	Coyote	Red Fox	Gray Fox	Bobcat	Raccoon	Opossum	Striped Skunk	Mink	Beaver	Muskrat	Weasel	Badger	Otter	Black Bear
1996	60,077	19.6	4.5	1.8	4.1	29.7	6.6	2.7	0.0	0.3	0.0	0.0	0.1	0.5	0.0
1997	47,816	18.0	4.0	2.0	4.5	31.2	7.4	2.7	0.1	0.4	0.0	0.0	0.1	0.6	0.0
1998	43,152	20.8	4.1	2.4	4.4	33.0	10.6	4.2	0.1	0.3	0.1	0.0	0.2	0.3	0.1
1999	44,012	29.2	3.7	2.2	4.8	45.9	12.5	4.0	0.2	0.3	0.1	-	0.1	0.5	-
2000	50,795	20.0	3.7	2.0	4.9	32.1	8.1	3.3	0.0	0.2	0.0	0.0	0.1	0.3	0.0
2001	47,023	19.5	3.6	2.1	5.2	38.7	8.2	4.7	0.1	0.4	0.0	0.0	0.1	0.3	0.0
2002	42,826	24.6	3.8	1.5	7.9	42.6	14.4	5.6	0.3	0.1	0.0	0.0	0.1	0.8	0.1
2003	39,964	20.5	2.7	1.5	6.0	37.9	7.2	3.2	0.1	0.1	0.0	0.0	0.2	0.6	0.0
2004	35,071	17.6	2.8	1.1	4.7	37.3	7.9	2.6	0.1	0.1	0.1	0.0	0.1	1.2	0.0
2005	68,440	21.2	2.8	1.3	5.6	37.3	8.5	2.5	0.1	0.3	0.0	0.0	0.1	0.5	0.0
2006	60,040	22.2	3.2	1.3	6.9	54.4	14.4	3.8	0.3	0.2	0.0	0.0	0.1	0.5	0.0
2007	50,390	19.8	3.0	1.5	5.2	40.0	9.4	4.0	0.0	0.1	0.0	0.0	0.1	0.4	0.0
2008	44,471	16.3	2.6	1.2	5.0	41.5	7.8	3.7	0.1	0.1	0.1	0.0	0.4	0.3	0.0
2009	44,919	20.6	2.6	1.2	4.9	42.0	12.4	4.4	0.1	0.1	0.1	0.0	0.2	1.2	0.1
2010	42,907	27.1	2.1	1.0	5.9	60.6	12.9	3.1	0.2	0.1	0.0	0.0	0.2	0.7	0.0

Line graph representations of archer indices for several furbearer species are shown in Figure 1. Based on these indices, raccoon, bobcat and opossum populations show a steady rise. Striped skunk and coyote populations are holding relatively steady, while graphs indicate a downward trend for red and gray fox populations. Wildlife population indices by county are shown in Table 2. The data in this table is given to cooperator archery hunters when new diary surveys are mailed to them.

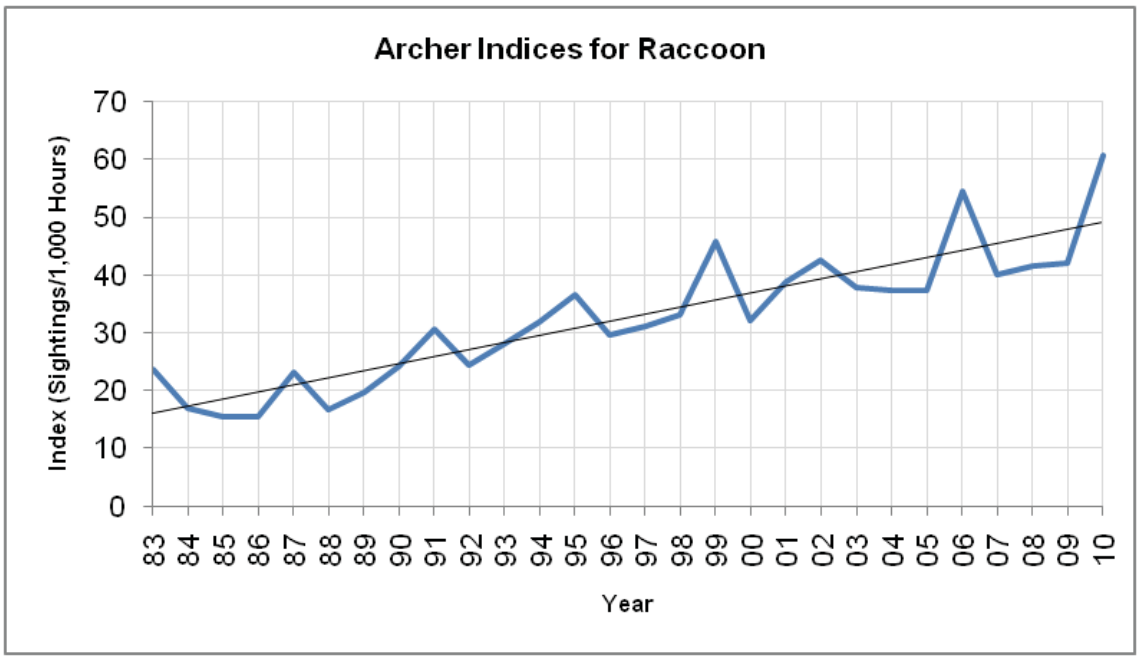
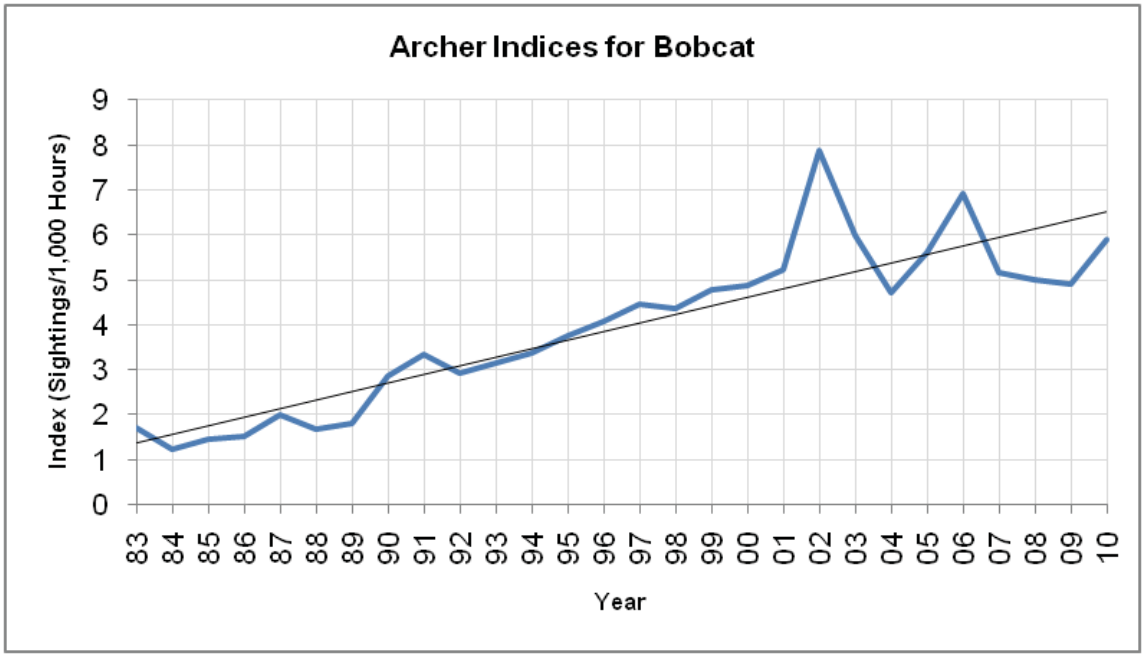


Figure 1. Population trends of some furbearing species based on archer indices.



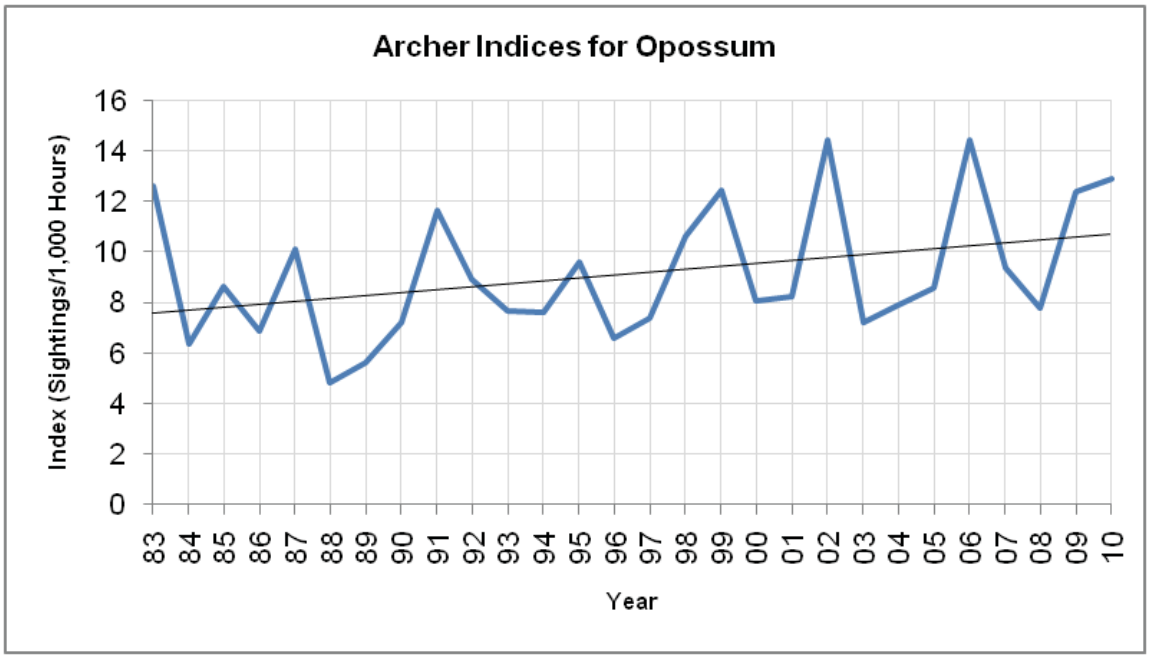
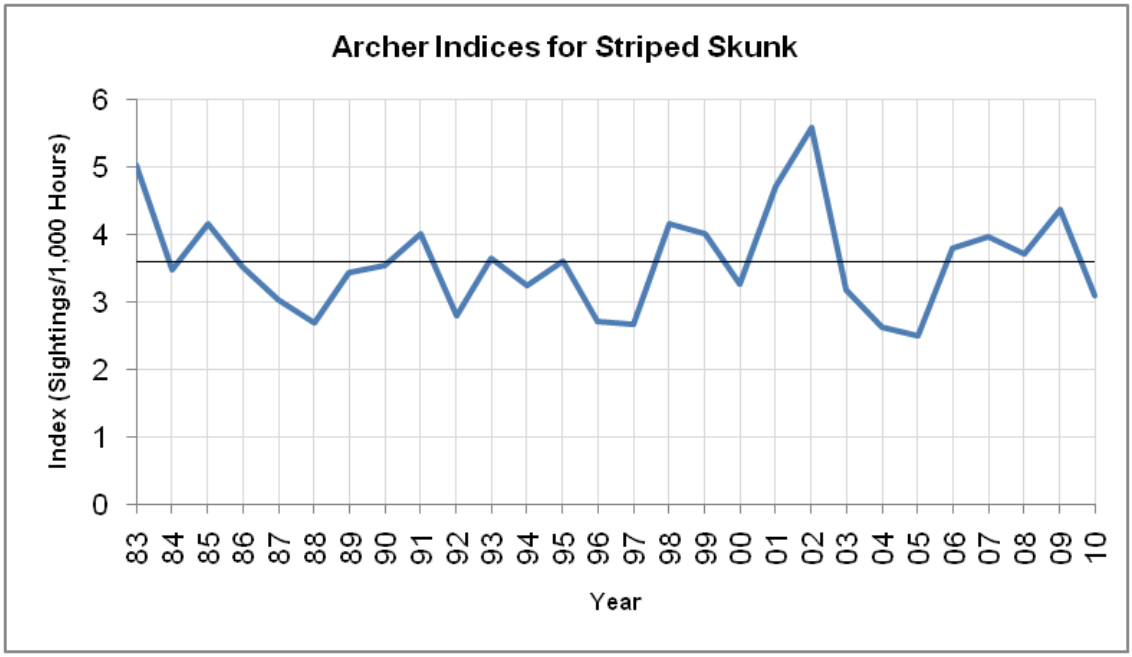


Figure 1(continued). Population trends of some furbearing species based on archer indices.



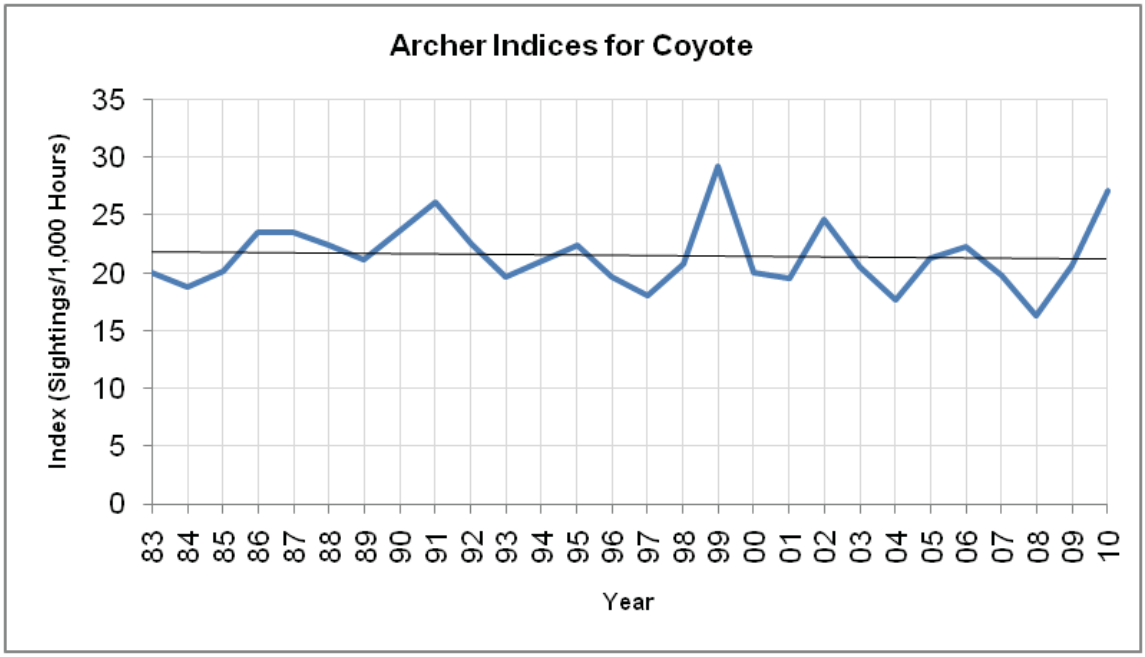
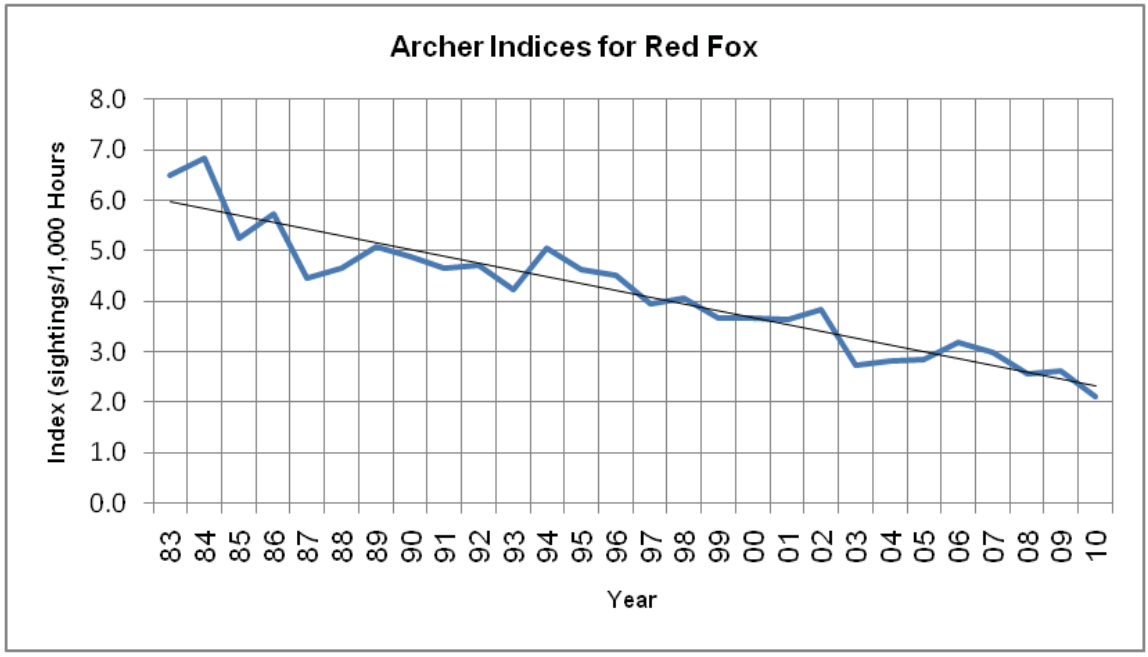


Figure 1(continued). Population trends of some furbearing species based on archer indices.



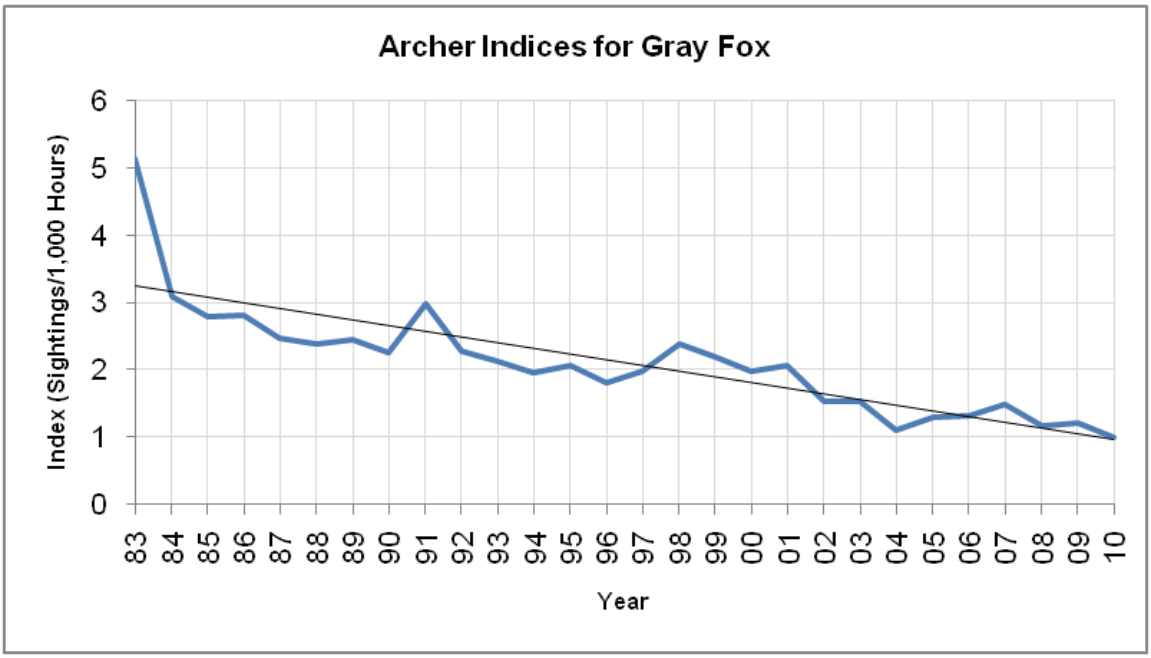


Figure 1 (continued). Population trends of some furbearing species based on archer indices.

Table 2. County wildlife indices for 2010 based on sightings by cooperator archery hunters (sightings/1,000 hours).

County	Coyote	Deer	Turkey	Raccoon	Opossum	Red Fox	Gray Fox	Bobcat	Badger	Bear
Adair	14	933	362	36	11	2	2	5	0	0
Andrew	107	1253	1040	120	0	0	0	13	0	0
Atchison	36	977	889	159	21	0	5	5	0	0
Audrain	45	833	304	118	42	3	3	6	0	0
Barry	35	563	21	36	17	5	7	17	0	0
Barton	72	1433	328	88	30	0	0	6	0	0
Bates	10	409	229	57	3	13	0	10	0	0
Benton	3	642	235	23	7	1	0	2	0	0
Bollinger	21	404	489	37	0	3	0	3	0	0
Boone	29	763	117	84	10	4	1	7	0	0
Buchanan	12	298	0	12	0	0	0	0	0	0
Butler	0	285	0	0	0	0	0	0	0	0
Caldwell	20	1707	231	163	7	0	0	14	0	0
Callaway	22	764	580	45	26	3	1	3	1	0
Camden	9	695	253	12	5	5	0	21	0	0
Cape Girardeau	53	472	94	49	9	0	4	13	9	0
Carroll	77	1127	885	145	12	0	0	8	0	0
Carter	0	277	6	6	0	6	0	0	0	0
Cass	89	635	581	131	55	0	0	0	0	0
Cedar	77	909	484	48	7	4	0	4	0	0
Chariton	48	949	177	222	12	2	0	3	0	0
Christian	16	720	385	9	0	0	0	13	0	0
Clark	30	534	128	112	4	0	0	8	0	0
Clay	30	777	444	137	19	0	4	0	0	0
Clinton	61	1186	357	189	29	11	0	4	0	0
Cole	59	775	78	20	0	0	0	0	0	0
Cooper	48	1299	419	75	12	0	0	27	0	0
Crawford	7	431	188	10	7	3	4	1	0	0
Dade	23	389	457	4	8	0	0	8	0	0
Dallas	16	857	857	47	0	0	0	16	0	0
Daviess	62	816	302	65	22	0	0	0	0	0
DeKalb	50	1015	897	91	6	0	0	0	0	0
Dent	12	304	196	12	0	0	2	0	0	0
Douglas	0	148	289	0	0	0	0	15	0	0

Dunklin	--	--	--	--	--	--	--	--	--	--
Franklin	28	360	197	63	6	4	3	7	0	0
Gasconade	18	520	371	30	15	0	3	3	0	0
Gentry	62	915	478	98	26	0	0	0	0	0
Greene	16	405	532	19	0	0	0	3	0	0
Grundy	0	0	0	0	0	0	0	0	0	0
Harrison	33	989	133	83	30	0	0	12	0	0
Henry	177	791	670	120	22	0	0	19	0	0
Hickory	3	596	284	20	8	0	3	8	0	0
Holt	0	388	848	0	0	12	0	12	0	0
Howard	20	549	221	38	6	1	1	6	1	0
Howell	16	426	134	7	0	0	1	0	0	0
Iron	0	205	102	0	0	0	0	0	0	0
Jackson	15	956	209	83	22	5	0	0	0	0
Jasper	67	1270	936	64	37	0	0	11	0	0
Jefferson	28	574	223	10	5	3	0	7	0	0
Johnson	34	1120	652	102	28	0	0	14	0	0
Knox	43	1238	582	144	23	2	0	15	0	0
Laclede	5	453	568	5	5	0	0	0	0	0
Lafayette	50	682	615	201	11	0	0	0	0	0
Lawrence	38	700	1863	63	25	25	0	75	0	0
Lewis	22	657	65	112	18	0	2	0	0	0
Lincoln	15	633	410	36	23	1	1	3	0	0
Linn	7	1178	357	164	26	4	0	0	0	0
Livingston	30	627	310	99	10	0	0	10	0	0
McDonald	0	816	0	0	0	0	0	41	0	0
Macon	51	812	332	56	13	2	0	2	1	0
Madison	10	172	182	7	0	2	2	2	0	0
Maries	6	343	159	6	11	0	0	15	0	0
Marion	19	1041	187	90	12	2	0	0	0	0
Mercer	18	983	1073	86	22	0	0	6	0	0
Miller	0	710	413	19	22	0	0	0	0	0
Mississippi	0	679	429	0	107	0	0	0	0	0
Moniteau	30	296	578	15	15	0	0	0	0	0
Monroe	29	678	386	62	32	5	2	4	0	0
Montgomery	20	566	262	53	18	0	3	14	0	0
Morgan	4	642	123	51	16	4	0	0	0	0

New Madrid	--	--	--	--	--	--	--	--	--	--
Newton	22	955	133	20	16	0	4	4	0	0
Nodaway	30	1074	721	371	19	13	0	3	5	0
Oregon	8	876	154	12	0	0	4	8	0	0
Osage	27	683	472	27	0	0	2	2	0	0
Ozark	9	760	220	0	0	0	0	5	0	0
Pemiscot	--	--	--	--	--	--	--	--	--	--
Perry	10	552	493	23	3	0	0	3	0	0
Pettis	22	1367	747	87	11	0	0	17	3	0
Phelps	6	320	160	17	2	0	3	3	0	0
Pike	12	892	331	28	9	3	4	5	0	0
Platte	65	1042	249	126	7	4	0	4	0	0
Polk	30	617	800	61	25	0	0	15	0	0
Pulaski	22	1151	686	0	5	0	0	11	0	0
Putnam	9	1189	191	84	20	0	0	6	0	0
Ralls	35	1127	189	81	18	7	0	5	2	0
Randolph	42	610	334	76	21	4	0	0	0	0
Ray	43	622	1750	134	18	6	0	0	0	0
Reynolds	3	192	63	7	7	0	0	7	0	0
Ripley	0	476	345	0	12	0	0	12	0	0
St. Charles	26	1058	244	67	18	9	0	0	0	0
St. Clair	31	661	279	47	16	0	5	0	0	0
St. Francois	23	187	341	8	5	3	0	3	0	0
Ste. Genevieve	25	587	423	27	10	2	0	6	0	0
St. Louis	20	1142	347	48	8	4	0	3	0	0
Saline	28	1000	353	60	20	0	0	16	0	0
Schuyler	5	720	175	65	11	0	0	0	0	0
Scotland	12	860	404	141	9	0	0	9	0	0
Scott	--	--	--	--	--	--	--	--	--	--
Shannon	6	353	207	6	0	0	0	11	0	0
Shelby	52	924	156	159	17	3	0	9	0	0
Stoddard	24	859	205	29	3	0	3	8	0	0
Stone	8	232	464	25	0	0	0	0	0	0
Sullivan	14	1155	420	39	8	0	0	8	0	0
Taney	39	694	855	16	0	0	4	0	0	0
Texas	8	412	214	4	4	0	0	0	0	0

Vernon	56	1079	688	79	28	0	0	42	0	0
Warren	9	382	150	12	15	0	0	1	0	0
Washington	16	214	57	16	16	0	0	0	0	0
Wayne	10	350	71	5	5	2	5	2	0	0
Webster	0	386	208	0	3	13	0	0	0	0
Worth	233	1600	333	1033	33	0	0	33	0	0
Wright	15	475	605	23	15	0	0	0	0	0
Statewide Index	27.1	730.4	342	60.6	12.9	2.1	1	5.9	0.2	0

BLACK BEAR DISTRIBUTION & STATUS

BLACK BEAR DISTRIBUTION AND STATUS

Jeff Beringer, Resource Scientist, Missouri Department of Conservation

Summary

We completed a new management plan for black bears in Missouri in 2008. The plan was drafted and approved by a multi-agency group of resource professionals from the Missouri Department of Conservation, U.S. Forest Service, National Park Service and Missouri Department of Natural Resources during summer of 2008 and signed and approved by MDC administration during fall of 2008.

Program goals and objectives outlined in the management plan were:

Black bear goal/vision statement:
To encourage black bear population expansion within their natural range in Missouri, and to manage black bears consistent with the available habitat and within the limits of human tolerance.

Black bear program objectives:

- Increase knowledge about current black bear population status in Missouri.
- Increase knowledge of black bear ecology in Missouri, how they move, disperse and travel on a landscape level and identify source and sink populations.
- Develop black bear conservation and management strategies based on information gathered through research, monitoring, and surveys.
- Educate Missouri's public, the media, and other resource professionals in Missouri and the Midwest about black bears and Missouri's black bear management program.

Bear track next to shoe print.

The entire black bear management plan can be viewed on SharePoint at:
http://mdcsharepoint/sites/resourcescience/Documents/Terrestrial%20Fauna/Furbearers/Black%20Bear%20Management%20Plan%20November%2025%202008.pdf

Black bear research:

American black bears (*Ursus americanus*) are an important wildlife resource in Missouri, yet little information is known about their population status. Black bears were believed to be extirpated from Missouri by the early 1900s due to overharvest and deforestation; however, they have been naturally recolonizing and increasing in abundance in southern areas of the state since the 1960s. With increasing abundance has come increasing interest in black bears as well as nuisance complaints and safety concerns from the public. The Missouri Department of Conservation (MDC) is encouraging range expansion of black bears while managing the species consistent with available habitat and within limits of human tolerance. Our intent is to conduct research that will increase knowledge of black bear ecology critical for developing conservation and management strategies. The objectives of this project are to:
1. Develop synthesis of history, status, and management of black bears in Missouri.
2. Quantify occurrence and magnitude of heterogeneity in capture probabilities.
3. Estimate abundance and density of black bears in Missouri.

In a recently recovering population of black bears, such as in Missouri, establishing an accurate and robust baseline population estimate is critical for developing a reliable long-term conservation plan. The estimated population size derived from this overall study will influence decisions to implement a bear hunting season in the state. Understanding the sources of heterogeneity in Capture-Mark-Recapture studies is essential for producing sound population estimates to manage Missouri's black bear population.

Study Area:

The study area was derived from the 70% fixed kernel isopleth applied to black bear sightings (1989-2010) and comprises 29,775 km^2 in southern Missouri (Fig 1). The area will be divided into 2 regions to be surveyed in different years: the south-central region in 2011 (13,508 km^2) and the southeastern/east-central region in 2012 (16,267 km^2). Land ownership is private and public, including Mark Twain National Forest and Ozark National Scenic Riverways. Predominant land covers include cropland (30.9%), pastureland (24.3%), and forest land (27.8%; National Resources Inventory 2000). Forest cover in southern Missouri is dominated by oak-hickory (*Quercus alba, Quercus velutina, Quercus coccinea, Quercus rubra, Carya spp.*) and oak-pine (*Pinus echinata*) upland type forests (Missouri Department of Conservation 2011). Southern regions are rugged and mountainous with elevations ranging from 70-540 m (United States Geological Survey 2009). The Ozark Mountains are characterized by exposed formations of sandstone, chert, dolomite, limestone, and igneous rocks (Batek et al. 2001). Southern Missouri (Climate Division 4 and 5) temperatures average 23.8°C (June-July 1989-2010) and precipitation (June-July 1989-2010) averages 218 mm (National Climatic Data Center 2011).

Methods:

Physical capture and marking of black bears:

A minimum of 37 black bears will be captured during September-October 2010 and May-August 2011 using Aldrich foot snares and culvert traps. Captured bears will be immobilized with 7 mg/kg tiletamine-zolazepam administered using a CO_2-powered rifle or syringe pole. Temperature, heart rate, and respiration will be monitored every 10 minutes during immobilization for at least 20 minutes post-induction. Morphometric measurements and body weight will be recorded for each individual and an upper premolar tooth extracted for cementum aging analysis. Minor wounds caused by capture will be treated with Betadine. Male and female bears will be ear tagged and fitted with GPS collars (Northstar NSG-LD2, RASSL Globalstar, King George, Virginia, USA) programmed to collect locations every 10 minutes from 30 May to 28 July and one location per day thereafter. Ten minute locations were chosen to maximize detail of bear movements during hair snare sampling sessions and will be automatically

downloaded directly to an online database (Northstar Science and Technology, LLC) and illustrated using GIS.

Hair trapping experimental design:

We will collect hair samples from black bears using hair snares constructed using a double strand of 4-barbed, 15.5 gauge wire to create an enclosure around 3 or more trees, about 50 cm above ground. Anise oil will be sprayed on perimeter trees forming the enclosure, about 2 m above ground. Decaying logs will be placed in the center of the enclosure and saturated with 0.5 L of fish oil as an attractant. Hair snare stations will be re-lured every 10 days at the beginning of five consecutive sampling sessions, with the first session beginning late May or early June 2011 and 2012. DNA hair samples will be collected at the end of each sampling session. All hair found on a barb or single tree will be considered one sample. Each sample will be placed in separate paper envelopes, labeled, and air dried before processing. Each barb will be flamed to ensure DNA has been removed.

We have designed field methods to maximize detection of sex and temporal biases in black bear DNA collection with hair snares. About 350 hair snares will be deployed in the south-central region in 2011 (Fig 2) and about 350 hair snares in the south-eastern/east-central region in 2012. Hair snares will be distributed based on habitat characteristics and distribution of bear sightings (1989-2010). We overlaid a 9 x 9 km grid over the study area to generate a distribution of bear sightings per grid cell, excluding cells with zero bear sightings. Hair snares will be allocated proportionately to the number of sightings per cell. For the 2011 study area, cells containing 1-3 bear sightings will receive 1 snare per sighting. Each cell containing 4-5 bear sightings will receive 4 snares, cells with 6-7 sightings will receive 5 snares, cells with $\geq$8 sightings will receive 6 snares. Sightings were screened for probable resightings and the number of snares per cell adjusted accordingly. Cells with suitable habitat (e.g., forest) containing zero sightings adjacent to cells with similar habitat containing bear sightings will be allocated snares about comparable to adjacent cells. Allocation of snares for the 2012 survey area may vary depending on the distribution of sightings per grid cell. We used GIS to select approximate locations for hair snares using forest cover data (30m resolution, Missouri Spatial Data Information Service 2005) as initial criteria to maximize bear detection. We excluded open water, agricultural, and developed areas.

Final hair snare locations will be placed within about 300 m of initial random locations and out of sight from human trails or dwellings. Additionally, previous bear sightings, recent bear activity, and expert opinion of MDC staff will be used to select hair snare locations to maximize black bear capture. We will attempt to maintain a minimum distance of 3 km between hair snare sites to reduce sampling bias, and will conduct oversampling of snare locations in the event existing land use or ownership precludes snare placement. We anticipate establishing about 380 hair snare stations per year (1 snare/38.6 km^2 in 2011, 1 snare/46.5 km^2 in 2012).

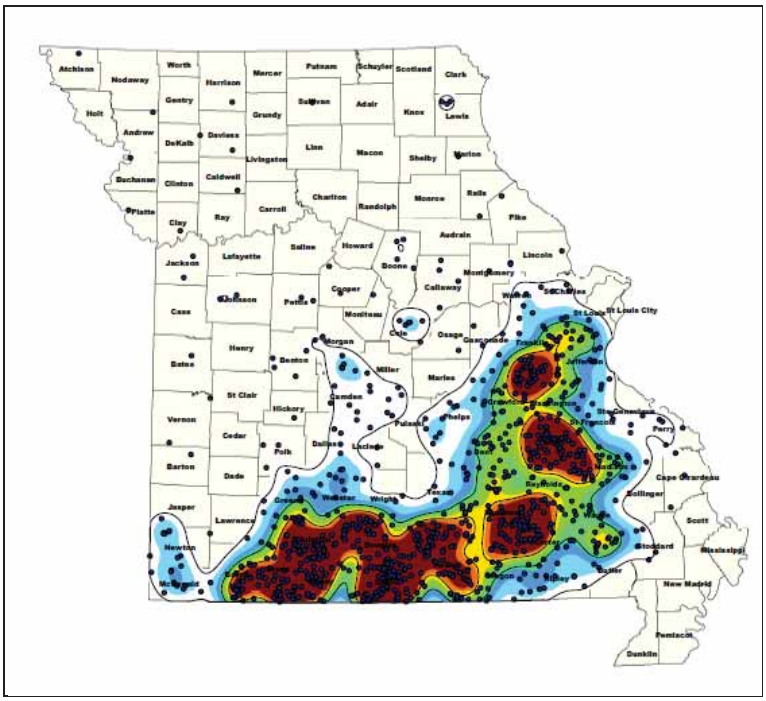


Figure 1. Kernel density estimation of black bear sightings (1989 – 2010) with 70% isopleth highlighted in light blue.

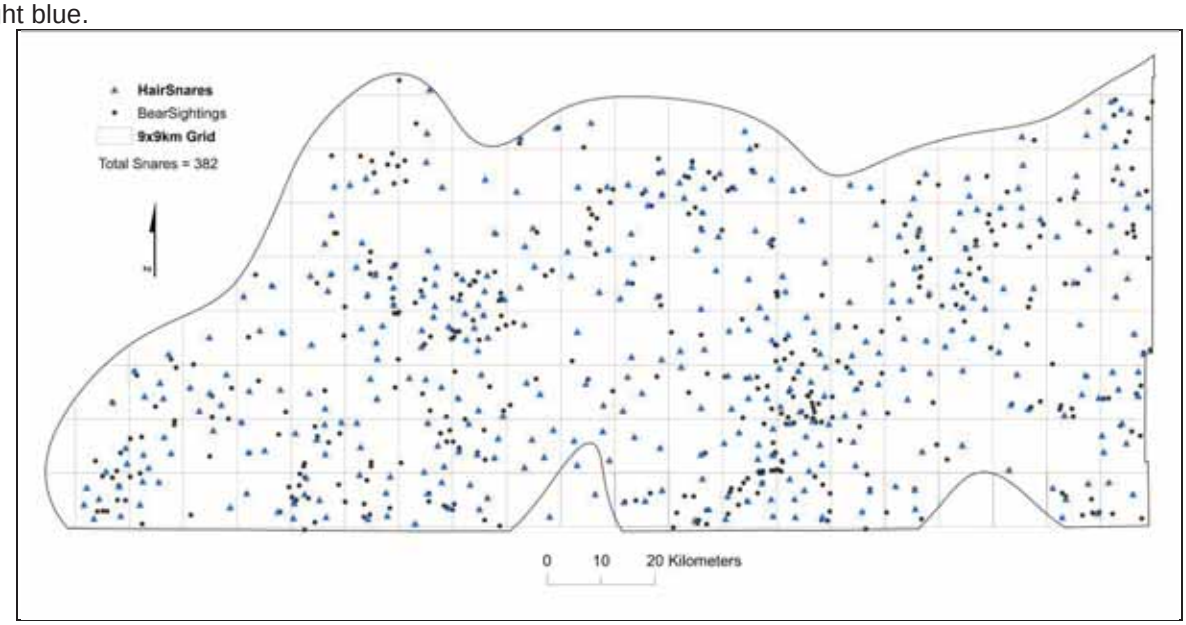


Figure 2. Distribution of hair snares and black bear sightings (1989-2010) for 2011 survey area, southcentral Missouri.

Progress to date

In September of 2010, the Missouri Department of Conservation, in cooperation with Mississippi State University and with funding from the Federal Aid in Wildlife Restoration Act, began the first ever black bear research project in Missouri. Personnel from multiple divisions assisted in the capturing and collaring of black bears across the southwest portion of the state.

Trapping yielded a total of twenty-five captures. Of those, thirteen bears (6 males and 7 females) were fitted with GPS radio collars (Table 1). Eight of the bears trapped were recaptures and four were cubs too small to be collared. All captured bears were outfitted with ear tags in both ears for identification. Males were outfitted with blue ear tags and females with yellow ear tags.

The weights of bears varied greatly. Cubs of the year weighed up to 70 pounds (a good indication of strong growth). Two adult males were trapped that weighed over 400 pounds. The largest bear trapped in the fall of 2010 was in Douglas County and weighed 485 pounds. The mean weight of adult male bears was 321 pounds. The mean weight of adult female bears was 185 pounds. Cubs of the year were not included in mean weights.

Table 1. Summary of black bears fitted with GPS radio collars, Missouri, 2010.

ID number	Weight	Sex	ID number	Weight	Sex
1001	478 lbs	Male	1010	390 lbs	Male
1002	185 lbs	Female	1014	132 lbs	Male
1004	202 lbs	Female	1015	170 lbs	Female
1005	218 lbs	Male	1016	131 lbs	Female
1007	220 lbs	Female	1017	485 lbs	Male
1008	180 lbs	Female	1018	224 lbs	Male
1009	210 lbs	Female	--	--	--

2011 Research:

Our first hair snare survey will take place from 01 May 2011 to 01 August 2011 in the south-central region in 2011 (13,508 km^2). We have identified 382 potential locations and 395 oversample locations. Five research technicians employed through Mississippi State University, MDC staff, and public volunteers will assist in the construction of hair snares. Snares will be constructed from about 01 May to 31 May, followed by 5 10-day sampling sessions from about 01 June to 01 August. In addition, about 100 motion-sensitive infrared triggered cameras will be set up at hair snares in estimated home ranges of GPS collared black bears.
We plan to deploy 9 GPS collars in the south-central region and 15 in the southeastern/east-central region. Trapping will begin about 01 May and continue until all 24 collars have been deployed. The 9 GPS collars will collect 10 minute locations from 01 May to 28 July and the 15 GPS collars will collect 1 location per day from 01 May 2011 to 29 May 2012 and will switch to 10 minute locations from 30 May to 28 July 2012.

Our current research proposal designed to quantify black bear numbers and sex ratios in parts of southern Missouri can be viewed on SharePoint at:
http://mdcsharepoint/sites/resourcescience/Documents/Division%20Administration/Programs%20and%20Projects/FY11%20Projects/One%20Page%20Proposals/Bearpopest_FY11%20One%20Pager.docx

TRAPPING MATTERS WORKSHOP

EVALUATION OF THE 2010 TRAPPING MATTERS WORKSHOP
Justan Blair, Resource Assistant, Missouri Department of Conservation

Background

Public opinion on trapping is often clouded by misinformation. The goal of the Trapping Matters Workshop is to provide wildlife professionals with the skills they need to communicate the importance of trapping as a wildlife management tool.

Since 2004, we have offered several Trapping Matters Workshops. The 2010 workshop was held on September 14 at the Missouri Department of Conservation (MDC) Southwest Regional office in Springfield. The workshop was attended by 30 MDC employees. Attendees included wildlife biologists, private land conservationists, naturalists and conservation agents.

The workshop, a joint effort by MDC and the Association of Fish and Wildlife Agencies (AFWA), was organized by Justan Blair (MDC Resource Science Division) and Bryant White (AFWA). Workshop presenters included:

- *Jeff Beringer*, a Resource Scientist with the Missouri Department of Conservation, discussed the benefits of regulated trapping as a wildlife management, conservation, and research tool.
- *Bryant White*, furbearer research coordinator with AFWA, covered the extensive scientific research in the development of Best Management Practices (BMPs), which recommend the most selective and humane traps.
- *Doren Miller*, president of the Missouri Trappers Association (MTA), talked about the role of the MTA. He also gave a skinning demonstration and discussed the preparation of fur for market.
- *Jim Braithwait*, a Damage Biologist with the Missouri Department of Conservation, gave a hands-on presentation covering the various traps such as cage, foothold, enclosed foothold, and body-gripping.

Evaluation Results and Discussion

At the end of the workshop, participants were asked to provide feedback through an evaluation form. Twenty-one evaluation forms were returned. Respondents rated each speaker from 1 (very poor) to 5 (very good), and all speakers received an average rating of 4.5 or higher.

Participants were asked about the knowledge they gained as a result of the workshop and if they would use this knowledge. A summary of the responses are shown in Table 1.

When asked what information they found surprising, participants mentioned how much science was involved in creating the BMPs for trapping, as well as the negative public opinion on trapping.

Doren Miller, President of the MTA, Demonstrates how to skin a raccoon

Table 1. Summary of responses regarding knowledge gained during the Trapping Matters Workshop.

	Number of Responses		
As a result of the workshop, do you feel you:	Yes	No	Unsure
Know the benefits of regulated trapping as a management tool?	20	0	0
Know how trapping is used to manage wildlife in your state?	20	0	0
Understand how to address trapping issues with stakeholders and the public?	20	0	0
Will use this information in your job?	20	0	0

Jim Braithwait demonstrates how to set a foot hold trap.

When reviewing responses to what other information should be added, trapping techniques and Missouri trapping regulations were mentioned repeatedly. While the purpose of the workshop was not to teach trapping techniques and regulations, future workshops could include a brief introduction to these topics.

Based on workshop evaluations, participants walked away with a solid understanding of how to convey the importance of trapping as a wildlife management tool. This knowledge will be useful whenever staff receive a wildlife damage complaint from the public or are questioned by the media about our agency's trapping policies.

Additional Trapping Matters Workshops are planned. Missourians look to MDC for answers about trapping issues, and the Trapping Matters Workshop is an effective way to provide staff with the background and skills they need to have these answers.

REDUCING OTTER USE OF SMALL PONDS

REDUCING OTTER USE OF FARM PONDS AND SMALL IMPOUNDMENTS
Dan Dobesh, Resource Assistant, Missouri Department of Conservation

Background:

Objectives of Otter Use of Farm Ponds and Small Impoundments in Missouri:

- Describe the extent and nature of otter depredations on fish in ponds and small impoundments in Missouri.
- Describe the biological and physiographic features of ponds and small impoundments in Missouri that have been depredated by otters and determine which variables are highly associated with otter depredation. This can be done in a variety of methods.
- Assess methods for pond and lake owners to use to reduce otter depredations on fish.
- A small pond located at the Charles A Green Conservation Area was selected as the primary research site for this project. A six-foot tall perimeter fence was constructed around the pond with the intent of keeping otters inside for observation.

Pond used for otter trap testing.

10 otters have been kept and observed in the pen at various times over the past four years. Scat counts of the captive otters conducted from January to June 2007 showed that each otter excreted approximately 5.5 scats per day. It was also noted that the pond had to be restocked every 3-4 weeks with 150-300 catfish. This is an indicator of the extent of depredation that can occur in small ponds.

Also during this time, various trap designs were introduced to test their effectiveness at capturing otters. Most traps consisted of coated 1x1 in. wire cages attached to a dock. Frames of the cages were built with sealed PVC and floated well. A submerged entry method using a funnel design (similar to a minnow trap) proved ineffective, as otters were simply too powerful and nimble to be held by the close-behind wiring on the end of the funnel. One-way, spring loaded, submerged entry doors became the focus of much of the design work, and three different types were tried: Plexiglas doors, heavy wire doors (cage material), and iron welded doors with vertical bars. Another tested trap design was basically a floating platform (5x5 ft.) with a Plexiglas one-way entry in the center going down into the cage. The most successful traps were the Plexiglas and iron welded one-way submerged door designs. However, none of the designs met expectations and it was recommended that more traps be tested.

Based on the information gathered in 2007, we expanded our research efforts at the Charles A Green Conservation Area otter enclosure. In February 2008, Resource Science began working with Matthew

Dekar, a graduate student from the University of Arkansas. His doctoral project is studying the seasonal metabolic expenditures of river otter. Metabolic rates from free-living otters have not been calculated preventing accurate estimation of consumption in wild otters. Therefore, assisting with this project gave us the opportunity to learn more about the possible extent of otter depredation in small ponds.

For this study we trapped three otters, one from Eagle Bluffs Conservation Area and two from a private pond west of Columbia. Upon capture the otters were taken to a veterinarian, where they were injected with doubly-labeled water and background and initial blood samples were drawn. The otters were then released in the Green Area otter enclosure before being re-trapped three days later. Upon recapture, the otters were taken back to the veterinarian, where final blood samples were drawn. The blood samples were taken to Arkansas for analysis of CO_2 production and energy metabolism, which was translated into biomass consumption rates. Analysis showed that the largest male otter that was held in the enclosure consumed approximately 5.5 lb of biomass per day, which was approximately 27% of his body weight. To date, this is the only consumption rate that has been estimated. However, once the analysis is complete, a consumption model can be developed that will allow researchers and managers to estimate the amount of each prey type consumed throughout the year. In addition, consumption estimates will give insight into the ecological constraints regulating otter populations. Finally, data from the studies will highlight important interactions and impacts of otters on prey populations, including sport fishes.

The other aspect of research performed was the testing of another trap design. This trap was a floating, top-entry design. The trap was placed in the pond at the Green Area otter enclosure (un-baited) as well as at Blind Pony Lake (baited). Trail cameras were used to monitor how otters interacted with the trap at both locations. However, based on the photographic evidence, it appears that no otters approached the trap. We are unsure why the otters did not inspect the trap. It is possible they had seen traps before and therefore avoided it, or the otters were not using the areas where we placed the trap. Further testing will continue with this trap design at different locations.

Progress to Date:

A floating trap design was constructed and tested at the pond enclosure. The trap has an entry mechanism consisting of a hinged one-way Plexiglas door inside of an 8”-6” PVC pipe reducer. Otters seem to be less inclined to enter a trap if they cannot see through the door. In the new design, the Plexiglas door will be held out of the water so it does not get covered in algae (a problem in earlier trap designs). With this design, we are attempting to use all of the knowledge we have gathered to this point, that otters will go into a top-entry trap and have difficulty getting out of a Plexiglas door, to construct a trap that the otters will go into that is sealed in a way that they cannot escape.

Floating, top-entry otter trap design

We continue to test the floating, top-entry trap design as well as the side entry trap design at the Green Area and at a private pond. It appears that the otters will enter the trap when it is baited with live fish, but have found a way to get out of the top entry design. The original design used plastic fish throats, which are funnels of split plastic, as the entry mechanism. We thought the funnel-shape would inhibit the otters from getting out, but apparently they were able to widen the base of the funnel enough to exit. After re-working the entry design, we feel that these two traps have potential to be used in live trapping otters.

Otters are occasionally brought in to the Green Area enclosure from other conservation areas in the surrounding counties and their interactions with these traps are monitored.

BADGERS STATUS IN MISSOURI

AN EXPLORATORY ASSESSMENT OF BADGER DEMOGRAPHICS
AND CONSERVATION STATUS IN MISSOURI

MDC Project Leaders: Jeff Beringer and Justan Blair, Missouri Department of Conservation

Principle Investigator and Affiliation: Matt Gompper, University of Missouri

Team Members and Affiliations: Debby Fantz (RSD), John George (Wildlife), Greg Gremaud, (Wildlife), Daryl Damron (Private Lands), Nate Mechlin (Private Lands), Larry Rizzo (Wildlife)

Need/Justification

The badger is uncommon in Missouri and is considered a species of conservation concern. Its official rank is Unrankable (SU), however, as little data is available to allow an informed ranking. We propose an exploratory study to gain badger specimens from across the state. We will use these samples to better understand the demographics and distribution of badgers in Missouri, to provide data with which to refine the ranking of badgers in Missouri and in MDC's Natural Heritage Database, and to assess the need for additional research by which to better manage the species in Missouri.

The badger is a harvested species in Missouri, but harvest numbers have historically been low (generally fewer than 200 per year since the 1960s, and fewer than 100 per year since the 1990s). These low harvests, classification as SU, and general consideration of the badger as a species of conservation concern reflect the rankings of the species in surrounding states. Arkansas ranks the species as S1 (Critically Imperiled), Ohio and Indiana as S2 (Imperiled), and Kansas as S3 (Vulnerable). Iowa ranks the badger as S4 (Apparently Secure), reflecting their apparent increased abundance in the grassland and open habitats that dominate the state. This habitat preference is also seen in Missouri, as the majority of harvested animals are from the northern portion of the state, and especially from northwestern Missouri. However, relatively few occurrence locations are documented in Missouri's Natural Heritage Database.

Badger den site in Atchison County

There is widespread concern that the badger has declined substantially in areas converted from grassland to intensive agriculture and where colonial rodents such as prairie dogs and ground squirrels (as in Missouri, where both Franklin's and thirteen-lined ground squirrels are also species of conservation concern) have been reduced or eliminated. Assessing the validity of this concern in Missouri is hindered by a lack of information because 1) harvest data are insufficient to properly assess trends and 2) little baseline data are available on the

biology and demographics of the species. To fill these knowledge gaps, we have begun an exploratory study using verified sightings from the public and badger carcasses obtained from fur trappers or hit by cars. Information obtained from reported badger sightings and collected carcasses will be used to define the range of the badger in Missouri, to make initial and preliminary insights into the demographics of the Missouri population, and to better refine the status of the species in MDC's Heritage Database.

Preliminary Results

From September 2009 through May 2010, we received 161 reports of badgers in Missouri from staff and the public, see Figure 1. We included some historical reports from the last decade but most reports were current. We collected 68 carcasses (36 male, 25 female, 7 unknown pending necropsy) from trappers and the public from September 2009 to May 2010. Physical data for necropsied badgers are represented in Table 1. Reproductive and age data will be determined by flushing uterine tracts and tooth cementum analysis, respectively. Skulls from the carcasses have been defleshed and cleaned by the University of Missouri dermestid beetles.

From May 2010 to June 2011, we have received an additional 86 badger reports from the public to bring our total observation reports to 247. We have received 10 additional badger carcasses that are waiting to be necropsied.

Table 1. Physical data from badger carcasses collected in Missouri from November through May 2010.

	Average Lengths (n = sample size)	Average Weights (n = sample size)
Whole (unskinned) carcass	65.0 cm (n=5)	8.7 kg (n=9)
Skinned carcass	59.2 cm (n=43)	5.9 kg (n=47)

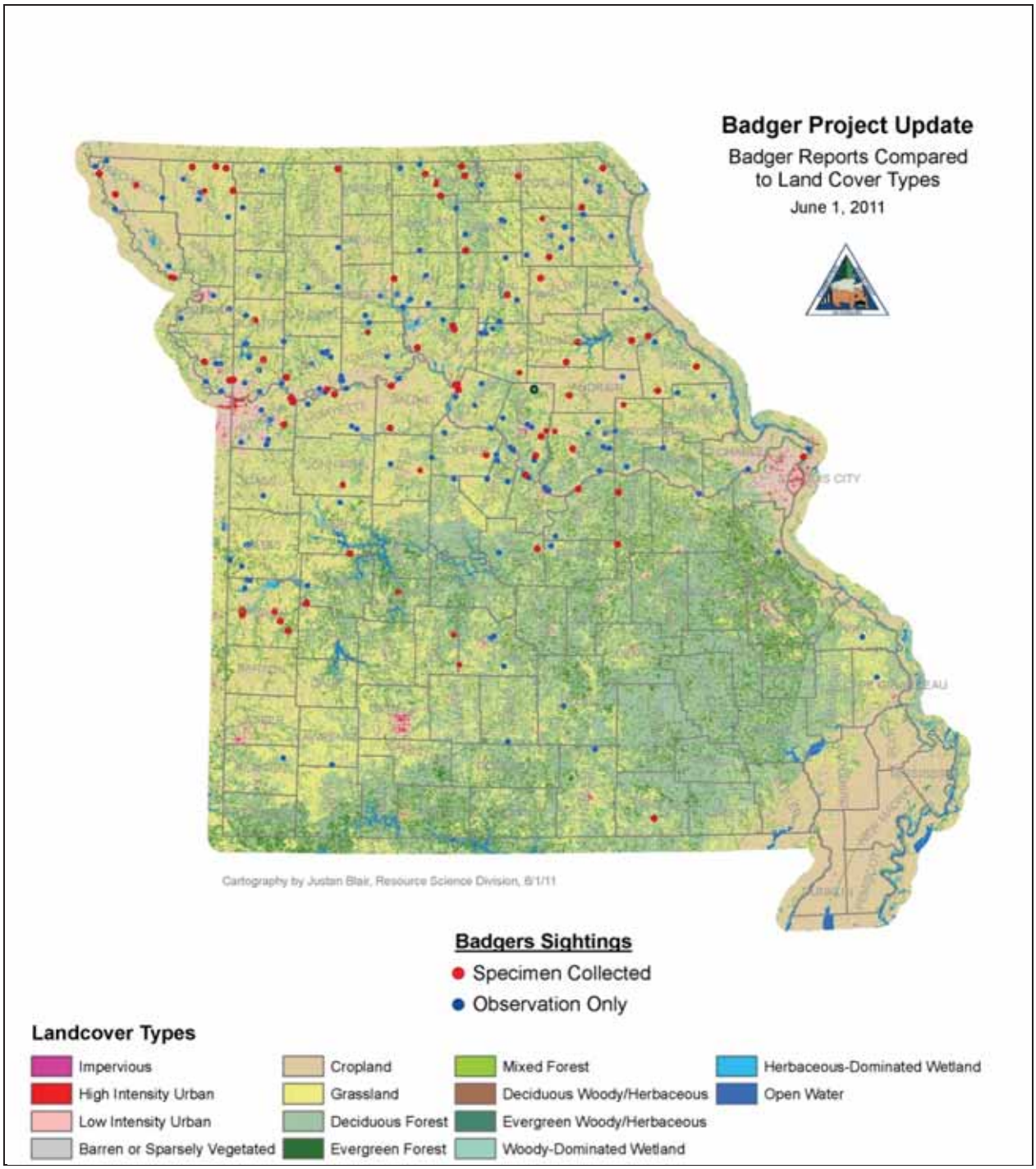


Figure 1. Badger locations based on reported sightings and carcass recoveries from trappers and road-killed animals.

Monitoring and Demographic Assessment of River Otters and Bobcats in Missouri

Currently, Missouri has no harvest level restrictions on river otters or bobcats. Past harvest data suggest these species are not in danger of being overharvested. Right now the harvest of these species is being challenged in Arizona and New Mexico. Our objective is to collect age, sex, and harvest effort data for otters and bobcats to be used for Statistical Population Reconstruction.

Research Implications and Benefits:

Statistical Population Reconstruction provides a broad scale assessment whereas most other techniques are applicable to only local areas. We will have a better understanding of the relationship between harvest rates and demographics of each species. Population reconstruction will also provide the MDC with solid harvest and population data which will be more defensible if ever challenged in the court system. This format will be our long-term monitoring plan. We will be collecting harvest effort and information from these two species for five years (2010-2014).

Survey packets will be sent out to Missouri trappers at the beginning of each trapping season. These packets contain a monthly journal asking how many traps were set for both river otters and bobcats, how many nights each trap was set, and how many of each species were trapped. This will reveal the amount of trapping pressure these species undergo each year. Trappers are also being asked to remove one of the lower canine teeth from each otter and bobcat they harvest. From the teeth collected we can determine the age of the harvested animals. This is important information for a population model to determine if the population is increasing, decreasing, or steady. Separate envelopes are included in this survey packet for this purpose. The survey, along with the teeth from each harvested animal, can be placed in a postage-paid envelope and sent back to the Resource Science Center.

Survey packets were sent to trappers at the end of October, 2010 for the 2010-2011 trapping season. In total, 760 lower canine teeth were collected from both river otters and bobcats. The samples consisted of 370 teeth being from river otters and 390 being from bobcats.

FERAL HOG RESEARCH PROJECT

FERAL HOG RESEARCH PROJECT
Account # 8103, WPI 754, Cooperative Agreement: USDA Feral Hog Management
Chuelo Arias, Resource Staff Scientist, Missouri Department of Conservation
Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Dr. Joshua Millspaugh, Professor, University of Missouri-Columbia
Dan McMurtry, Wildlife Biologist, United States Department of Agriculture

Researchers collar a sedated hog

Background:

Feral hogs are known to occur in approximately 40 counties in Missouri, with established populations in 19 counties. Feral hogs directly and indirectly damage natural communities, destroy agricultural crops, compete with native wildlife, and serve as reservoirs of disease (Bratton 1975, Graves 1984). Although MDC has been involved in feral hog control since the 1990s, almost no ecological data have been collected. The goal of this project is to provide the movement, survival, and reproduction data necessary to implement more efficient feral hog control measures in Missouri and to provide a scientific basis for future management decisions. The specific goals of the project are to:

Determine how resource selection and movement patterns of adult female feral hogs change in response to five specific population control measures (trapping, snaring, Judas pigs, hunting with dogs, and aerial

gunning) on public lands in Missouri by comparing utilization distributions of hogs equipped with GPS transmitters before and after each type of control measure.

- Measure control efficiency, in man-hours, of five control methods: trapping, snaring, Judas pigs, hunting with dogs, and aerial gunning.
- Measure survival and fecundity of female feral hogs killed by MDC staff.

All of the data that we collect will aid in making the ultimate management decision, which is, what we're going to do about feral hogs in the state. The movement data will tell us where feral hogs are at any given time of year and how they respond to our control efforts. The control method efficiency data will tell us which methods are most cost-effective. The biological data are collected during our control efforts; we collect sex and age data from all hogs killed, and reproductive information from sows. These data will be used to construct a population model, which will allow us to estimate the hog population size and reproductive rate.

When the research project started, we identified teams of personnel in each region that were already working on feral hog control and it was agreed that we would all work together to continue hog eradication activities and to accomplish the goals of the project. This work team involves personnel from Resource Science, Private Lands, Forestry, and Wildlife Divisions, as well as University of Missouri-Columbia and USDA- Wildlife Services. The research project officially began 1 June 2009. We originally had a cooperative agreement with MU, but during the course of the project it became clear that it would be more beneficial to work more closely with USDA, so in January 2011, we transferred our agreement with MU to USDA. However, we still plan to work with Dr. Millspaugh at MU for data analysis.

Progress to date:

Since the official start of the project, we have captured 502 and euthanized a total of 486 hogs as part of the hog eradication effort. The reason that there is a 16-hog difference between the number of hogs captured and the number killed is due to recaptures and some collared hogs still being alive. Twenty-two hogs that were captured are not included in the table below because they were either not taken by one of the methods being evaluated or time wasn't recorded accurately, but they were included in the total number killed mentioned above. Personnel from nearly all MDC resource divisions, as well as USDA, have cooperated in this effort. A summary of the capture effort and man-hours is presented in Table 1.

Table 1. Capture effort and efficiency in terms of man-hours.

Capture Technique	Man-hours 01 July 2009 - 31 March 2011	# Captured	Man-hours per hog
Traps	4084.5	313	13.0
Snares	397.0	15	26.5
Aerial Gunning	1379.5	144	9.6
Hunting with dogs	150.0	8	18.75
TOTALS	6011.0	479	12.5

The table above suggests that aerial gunning is by far the most cost-effective method of hog removal, but after running some preliminary analyses on total hog removal cost (including the additional costs of operating the helicopter, bait, and gas), we are seeing that trapping and aerial gunning have nearly identical total cost per captured hog (Table 2). Snaring and hunting with dogs are both much more expensive than either aerial gunning or trapping, but both methods have been useful in removing hogs that were difficult to capture any other way. This type of information will be critical in planning hog management activities in the future.

Table 2. Cost of hog removal by 4 different control methods

Technique	Man-hour cost (July '09 - March '11)	Extra costs	Total # of hogs captured	Total $/hog
Trapping	4084.5 hrs. X ave. salary ($18.50/hr) = $75,563.25	Gas: 300 miles of driving per trap event (69 successful events) X 14 miles/gallon X $3.00/gallon = $4435.71 Bait (corn): 200 lbs. per trap event (69 successful events) X $10/50 lb. bag = $2760	313	$264.40
Aerial gunning	1379.5 hrs. X ave. salary ($18.50/hr) = $25,520.75	Helicopter cost: $175/hr. for fuel, oil, and pilot salary X 92.5 hours of flight time = $16,187.50 Gas: 300 miles of driving per flight (15 flights) X 14 miles/gallon X $3.00/gallon = $964.28	144	$296.34
Snaring	397 hrs. X ave. salary ($18.50/hr) = $7344.50	Gas: 300 miles of driving per snare event (9 successful events) X 14 miles/gallon X $3.00/gallon = $578.57 Bait (corn): 86 lbs. per trap event (9 successful events) X $10/50 lb. bag = $154.80	15	$538.52
Hunting with dogs	142 hrs. X ave. salary ($18.50/hr) = $2775	Gas: 500 miles of driving per trap event (1 successful event) X 14 miles/gallon X $3.00/gallon = $107.14 Hog-hunter contract: $450/day X 5 days = $2250	8	$641.52

In addition to removing a further 238 hogs during FY11, we have also captured and released 14 hogs with tracking collars (see Table 3 for a full summary). The original collars that were going to be used for the project were purchased through Sirtrack, a GPS collar manufacturer out of New Zealand. However, in testing the collars on hogs, we found that the data being collected were insufficient to meet the needs of the project. So, in November 2009, we began testing a collar from another company, called North Star Science and Technology. We found the North Star collar to be far superior to the Sirtrack collars and thus began working toward transferring the contract from Sirtrack to North Star. As of 26 April 2010, the contract was successfully reassigned and manufacture of the new collars had begun. Unfortunately, dealing with these technical issues has set the movement analysis portion of the project behind an entire year, as we did not receive the new collars until mid-summer 2010. Trapping suitable hogs to collar requires a cooperative effort between all supervisors and field staff, but due to personnel reductions, logistical issues, and an abundance of food resources this year, we have not been able to successfully collar as many hogs as we would like. However, trapping efforts continue and we will likely continue to focus our efforts around Ketcherside/Taum Sauk/Proffit Mountain, Truman Lake/Roscoe, Hornersville Swamp, and Caney Mountain Conservation Areas; although recent hog activity in other locations has shifted our focus to also include property near Little Indian Creek Conservation Area, Mark Twain National Forest in Taney County, and Hawn State Park. As hog populations have emerged in new areas, we have adapted to incorporate the various control methods into these locations.

Table 3. Summary of hogs captured and fitted with GPS collars.

Capture Site	Capture Date	# GPS locations	Notes
Proffit Mountain	4/29/2009	6	We received a mortality signal from this collar, so Rich Blatz and Dave Hasenbeck went to find it and located the collar, without the hog, on 5/29/09. However, the hog was later re-captured with 8 other hogs and euthanized by Nick RiViello and Jay Simpson on 10/8/09.
Bell Mountain	7/2/2009	63	Hog collared on cooperating private landowner's property with Dan McMurtry from USDA. Tracking the movements of this hog led us to several other small groups. This hog was re-captured and euthanized by another cooperating landowner on 10/10/09.
Proffit Mountain	7/14/2009	42	Hog originally captured with a group of 14 other hogs. This hog was tracked and seen with a large group of approximately 30 other hogs on 10/7/09. This hog was also used as a Judas pig during the 12/11/09 aerial gunning exercise in which 4 of the hogs in her group were euthanized. Collar recovered 1/19/10.
Tumbling Creek/Aley property	8/5/2009	73	Hog originally captured on private property adjoining the Tumbling Creek Cave COA with James Dixon. Hog was re-captured alone by a neighboring landowner on 12/1/09.
Truman Reservoir/ Roscoe	11/20/2009	274	This hog was fitted with a demo collar from North Star, another collar manufacturer. Hog was originally captured with 7 other hogs on private property adjacent to Truman Reservoir Wildlife Area near Roscoe. This hog was used as a Judas pig during the 12/4/09 aerial gunning exercise in which 4 of the hogs associated with her were euthanized. Hog was pregnant when removed during 2/11/10 aerial gunning exercise.
Proffit Mountain	12/1/2009	0	Originally captured with 2 other hogs and was fitted with a new Sirtrack collar for testing purposes. Used as a Judas pig during the 12/11/09 aerial gunning exercise in which it was seen with 2 or 3 other hogs, but none were able to be euthanized. We have not received any data from this test collar and have lost radio communication as well. Helicopter attempted to find this collar during 2/1/10 aerial gunning, but could not pick up the signal.
Private property near Brixey	9/30/10	192	Originally captured with 7 other hogs, which tested positive for pseudorabies. Upon receiving the test results, we implemented a plan to retrieve the collared hog, in case it had also been exposed to the virus. On 12/7/10, we tracked the collared hog down and euthanized it, but later test results came back negative.
Mark Twain National Forest- Taney County	11/8/10	270	Originally captured with one pregnant female. Was seen on trail camera with up to five additional hogs and was ultimately recaptured with two others on 2/24/11.
Private property adjacent to Johnson Shut-Ins	12/15/10	239	Originally captured alone on private property adjacent to Johnson Shut-Ins State Park. This hog is still alive, as of 5/15/11, but we plan to retrieve the collar soon.

Private property adjacent to Little Indian Creek CA	12/28/10	106	Originally captured with eight other hogs and was recaptured alone 1/14/11.
Private property near Vulcan	12/30/10	37	Was originally captured with 12 other hogs. Was killed by a hunter 1/14/11.
Private property adjacent to Johnson Shut-Ins	1/4/11	302	Was originally captured with eight other hogs. Was recaptured 3/21/11 along with one other hog, but both hogs were released with collars. This hog is still alive as of 5/15/11, but we plan to retrieve the collar soon.
Hornersville Swamp CA	3/18/11	135	Was originally captured with one other hog. Immediately after capture it crossed the nearby border into Arkansas and has stayed there. It has been interesting to track the movements of this hog during the recent high water event. We plan to work with Arkansas Fish and Game and the Fish and Wildlife Service to retrieve this hog.
Private property adjacent to Johnson Shut-Ins	3/21/11	119	Was originally captured with one previously collared hog. As of 5/15/11, this hog is still alive.

Unfortunately, we still have not collected sufficient biological data to run the population model, but we anticipate being able to collect enough information in the next year of the project to be able to estimate population parameters.

We have been able to run a few preliminary analyses on movement patterns of collared hogs. Of the eight new collars that we deployed during FY11, four are still out on hogs, one was retrieved after the hog was killed two weeks after being collared, and we have retrieved three collars that were on hogs for at least two months, which provided sufficient data on which to run analyses. Temporal movement analysis has shown that hogs follow very different schedules, with some hogs being more active during daylight hours and others moving more at night (Figure 1). Another interesting comparison is between the overall area used by these three hogs. The hog in Mark Twain National Forest had the largest home range, based on minimum convex polygon analysis, covering an area of 20.47 mi^2, whereas the hog near Brixey covered 9.89 mi^2, and the hogs at Little Indian Creek only covered 1.95 mi^2. The hogs at Brixey and Mark Twain National Forest also used their home ranges more evenly than the hog at Little Indian Creek, which used several discrete areas within the home range (Figure 2). Further analysis will be necessary to determine feral hog movements in relation to control efforts.

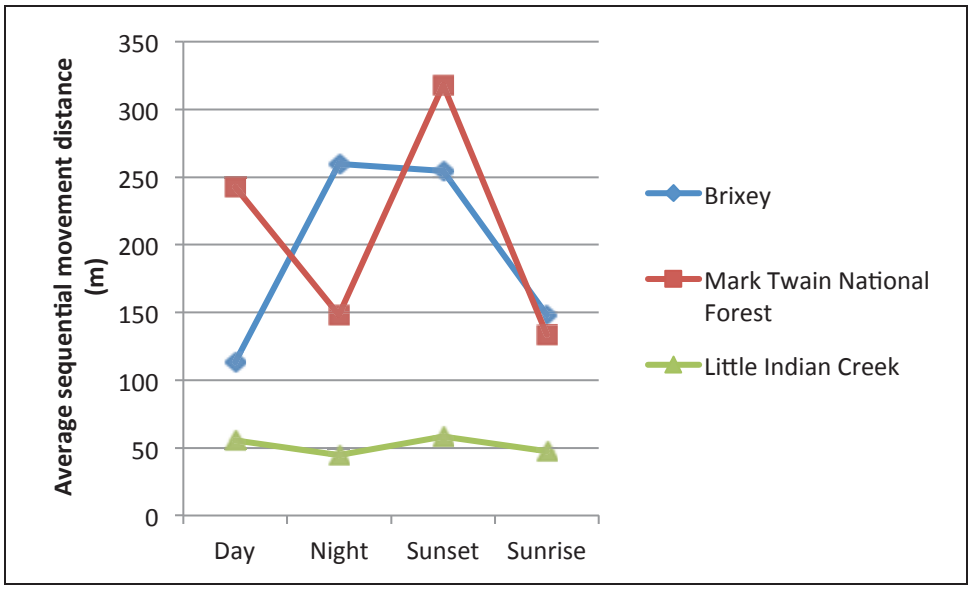


Figure 1. Average distance moved between sequential GPS points for three collared hogs at different times of day. Day: 0700 – 1700, Night: 1800 – 0600, Sunset: 1600 – 2000, Sunrise: 0500 – 0900.

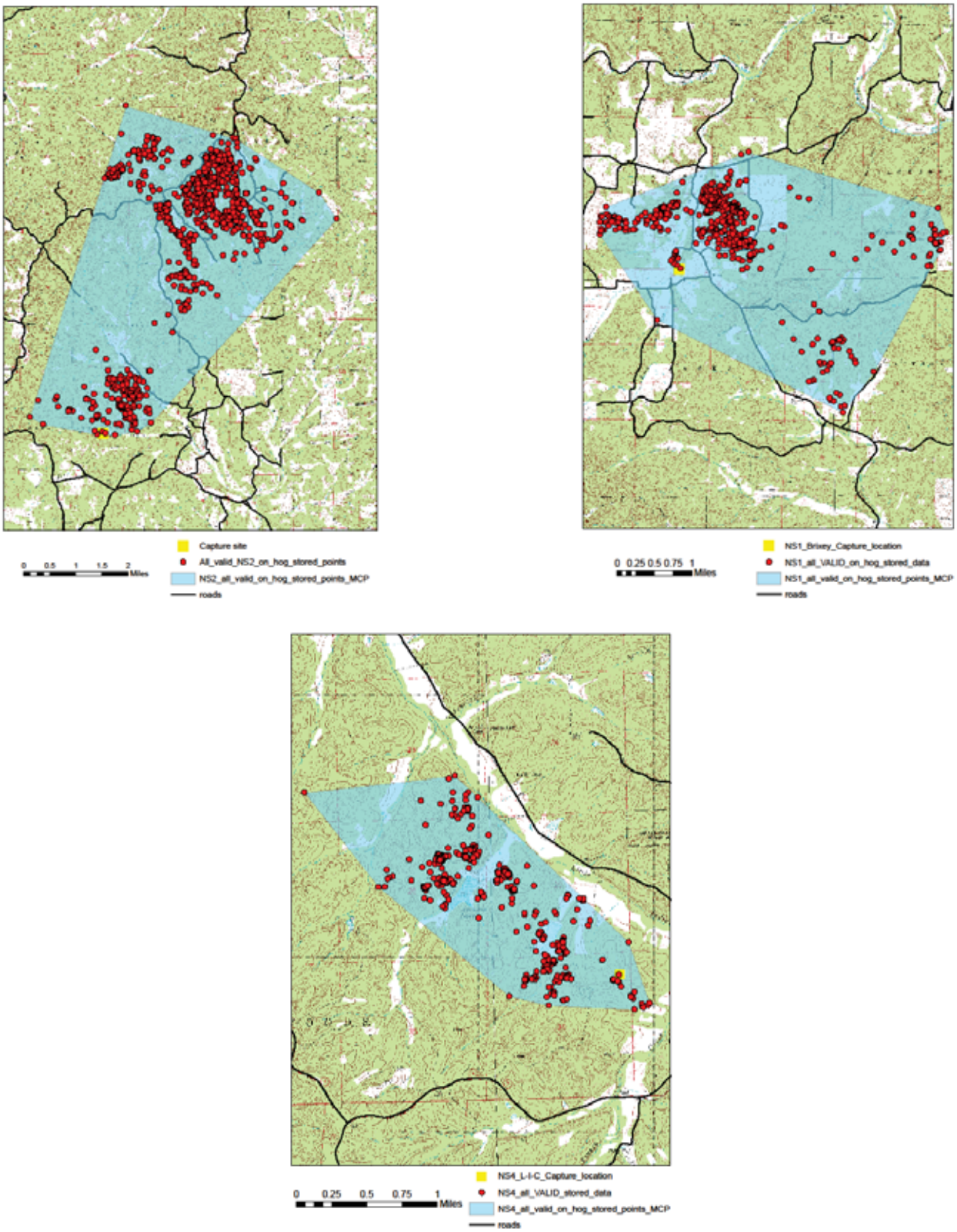


Figure 2. Home ranges of the hogs at Mark Twain National Forest (top right), Brixey (top left), and Little Indian Creek (bottom middle).

Another important aspect of this project was to increase communication between field staff involved in feral hog control across the state. To achieve this, we created an incident command structure and a website to facilitate communication. The website has been a valuable tool in sharing project information; so far, the website counter has recorded 197 visits. The website will become even more important in the coming months as we update everyone on the progress of putting collars out in the field.

FY12 Goals:

In FY12, we will continue to collect biological data and efficiency measures for our models. We will also be able, with our new GPS collars, to continue monitoring hog responses to control measures. This will involve capturing a suitable candidate, monitoring the hog's natural movements for a period of two months, and then implementing one of the control methods on the hog to see how it responds for an additional month. Tracking the hogs will require extensive field work, which will be carried out primarily by Cody Nickels, the new temporary hourly employee hired through the Cooperative Agreement with USDA. During the third year of this study, the main goal is to continue compiling and analyzing data that will ultimately be used to make a decision on what will be done about hogs in Missouri.

LARGE CARNIVORE INVENTORY

LARGE CARNIVORE INVENTORY AND MARKING STUDY: 2011 UPDATE
Dan Dobesh, Resource Assistant, Missouri Department of Conservation

Background:

Dangerous captive animals have recently come under public scrutiny. Because of the inherent danger and potential liability associated with the possession of large carnivores, an effective system was needed to verify ownership and better monitor the legitimate purchase, sale and trade of these animals. The Department of Agriculture is currently evaluating regulations for the possession of dangerous carnivores other than those regulated by MDC. The MDC has taken a proactive approach in response to the public demand for more accountability and to provide some consistency between us and the Department of Agriculture. The intent of these new provisions is to better enable our enforcement and record keeping obligations, safeguard permit holders from false claims of ownership, and satisfy public demand for higher accountability of these potentially dangerous animals. In addition, our Department would have the ability to distinguish captive animals from truly wild animals.

Captive mountain lion

Based on these issues, MDC made significant regulation changes pertaining to large carnivores owned under the Class II Wildlife Breeder Permit. The proposal to permanently mark all captive bears, mountain lions, wolves, and wolf hybrids was approved by the Regulations Committee and Conservation Commission in 2007. The regulation first appeared in the 2008 code book under code: 3 CSR 10-9.353 Privileges of Class I and Class II Wildlife Breeders, and had a 1 July 2008 compliance date. Effective July 1, 2008, all mountain lions, black bears, wolves and wolf-hybrids held under the privileges of a Class II Wildlife Breeder Permit were required to be uniquely identified with a permanent Passive Integrated Transponder (PIT) microchip. These microchips are about the size of a grain of rice and contain an electromagnetic code that can be used to identify animals. They can be injected under the skin to permanently mark animals without altering external appearance. Microchips are normally placed just under the skin along the back of the animal, between the shoulder blades. This standardized protocol allows animals to be searched quickly and efficiently. The regulation also requires owners to allow the Department to obtain, from each animal, a small blood or tissue sample sufficient for DNA analysis.

Progress to Date:

Surveys and interviews were completed for 33 of the then 50 captive carnivore owners in the state. Feedback from the interviews showed that a majority of owners are generally supportive of the new regulations, but have concerns about the welfare of their animals. An informational workshop was held in Jefferson City on February 9, 2008. The workshop provided a forum for MDC personnel, veterinarians, and captive carnivore owners to discuss the procedures for marking captive animals. The contract with Wildlife Genetics International for DNA testing was finalized in May 2008, renewed in April 2009, 2010, and again in April 2011. DNA samples will be stored at Resource Science in Columbia until all samples have been collected and then will be sent to Wildlife Genetics International for analysis.

Veterinarian inserts microchip into captive mountain lion

Department personnel have assisted in implanting microchips in and collecting DNA samples from 155 different animals at 44 facilities around the state. A total of 33 mountain lions, 27 black bears, 41 wolves and 54 wolf hybrids. As of May 2011, all owners of captive carnivores are in compliance with the regulation.

All permits to hold large carnivores expire June 30th of each year. The newest permit was issued January 26, 2010, for wolf hybrids to be held in Lawrence County. Renewal letters and applications were sent to all current permit holders in April and May 2011. If the permits are not renewed by their expiration date, the permit holder is considered to be in violation of Missouri Wildlife Code. Permit holders in violation may receive a citation from their local conservation agent if they wish to continue to hold large carnivores.

Anesthetized black bear

MOUNTAIN LION RESPONSE TEAM

MOUNTAIN LION RESPONSE TEAM
Jeff Beringer, Resource Scientist, Missouri Department of Conservation

The Missouri Department of Conservation developed a Mountain Lion Response Team (MLRT) in 1996 to address the concerns and reports from the public of mountain lions and the occasional confirmed occurrence of a mountain lion in the state. The MLRT consists of 12 employees across the state. MLRT members have special qualifications or have received training to address mountain lion concerns and conduct investigations when evidence is present.

Mountain lion sightings are categorized and entered into a long-term database. We also keep track of confirmed cases of mountain lions in Missouri when there is hard physical evidence to support a sighting; such as a track, carcass, photo, video, etc. We have over 1,700 sightings in the database since 1994. We have been able to confirm the presence of 17 mountain lions in the state (Table 1, Figure 1).

During this past fiscal year, we recorded over 160 reports of mountain lions in the state. This is a minimum number because many reports to local agency staff are not recorded. Most reports we receive are the result of our website reporting form and email account. We confirmed 7 mountain lion sightings this past year.

Table 1. Confirmed Instances of Mountain Lions in Missouri

2011-April Macon Co	17 Citizen reported mountain lion tracks in creek bed. MLRT investigation confirmed.
2011 – March Oregon Co.	16 Citizen reported observing a cat jump a fence. DNA analysis of hairs collected at the scene confirmed species, ancestry analysis underway.
2011 – January Macon Co.	15 Subadult male shot by coyote hunters. No obvious signs of confinement. DNA analysis indicated probable South Dakotan ancestry.

2011 – January St. Louis Co.	14 Photo of probable subadult disperser taken by motion-activated game camera.
2011 – January Ray Co.	13 Subadult male shot by raccoon hunter. No obvious signs of confinement. DNA analysis indicated probable South Dakotan ancestry.
2010 – December Linn Co.	12 Photo of probable subadult disperser taken by motion-activated game camera.
2010 – November Platte Co.	11 Photo of probable subadult disperser taken by landowner. DNA analysis of hairs collected at the scene could not confirm ancestry.
2006 – December Livingston Co.	10 Photo of probable subadult disperser taken by motion-activated game camera.
2006 – November Shannon Co.	9 Deer carcass characteristic of mountain lion kill with tracks found near by.
2003 – August Callaway Co.	8 Approximately 1½-year-old male road kill. No obvious signs of confinement. All four toes and pad of left forepaw missing but healed over (dewclaw present); cause of injury unknown, but did not appear to be trap-related. Stomach and intestines contained remains of squirrel, rabbit, and white-tailed deer. DNA analysis indicated North American heredity.

2002 – October Clay Co.	7 Two-to-three-year-old male road kill. No obvious signs of confinement. Intestines contained deer and raccoon hairs, and also man-made fibers. DNA analysis indicated North American heredity.
2001 – December Pulaski Co.	6 Photo of probable subadult disperser taken by motion-activated game camera.
2000 – December Lewis Co.	5 Video by deer hunter in a tree stand.
1999 – January Texas Co.	4 Animal treed by rabbit hunters' dogs. Tracks in snow, and two deer carcasses characteristic of mountain lion kills found near by.
1997 – January Christian Co.	3 Video by property owner (obtained through Dr. Lynn Robbins at Missouri State University in Springfield). Animal's behavior suggested possible former captive.
1996 – November Reynolds Co.	2 Night-time video by Conservation Agent of cat on deer carcass.
1994 – December Carter Co.	1 Small adult female treed and shot (through the eye with a .22) by two raccoon hunters near Peck Ranch Conservation Area. Carcass was never recovered, but obtained photo of animal on truck tailgate. Federal authorities fined each hunter $ 2,000. In November 1998 a deer hunter found the skinned pelt of a small adult female with head and feet attached by a remote Texas County road. Pelt showed signs of freezer burn, and x-ray of skull revealed bullet fragments. Although likely the same animal, it cannot be confirmed absolutely.

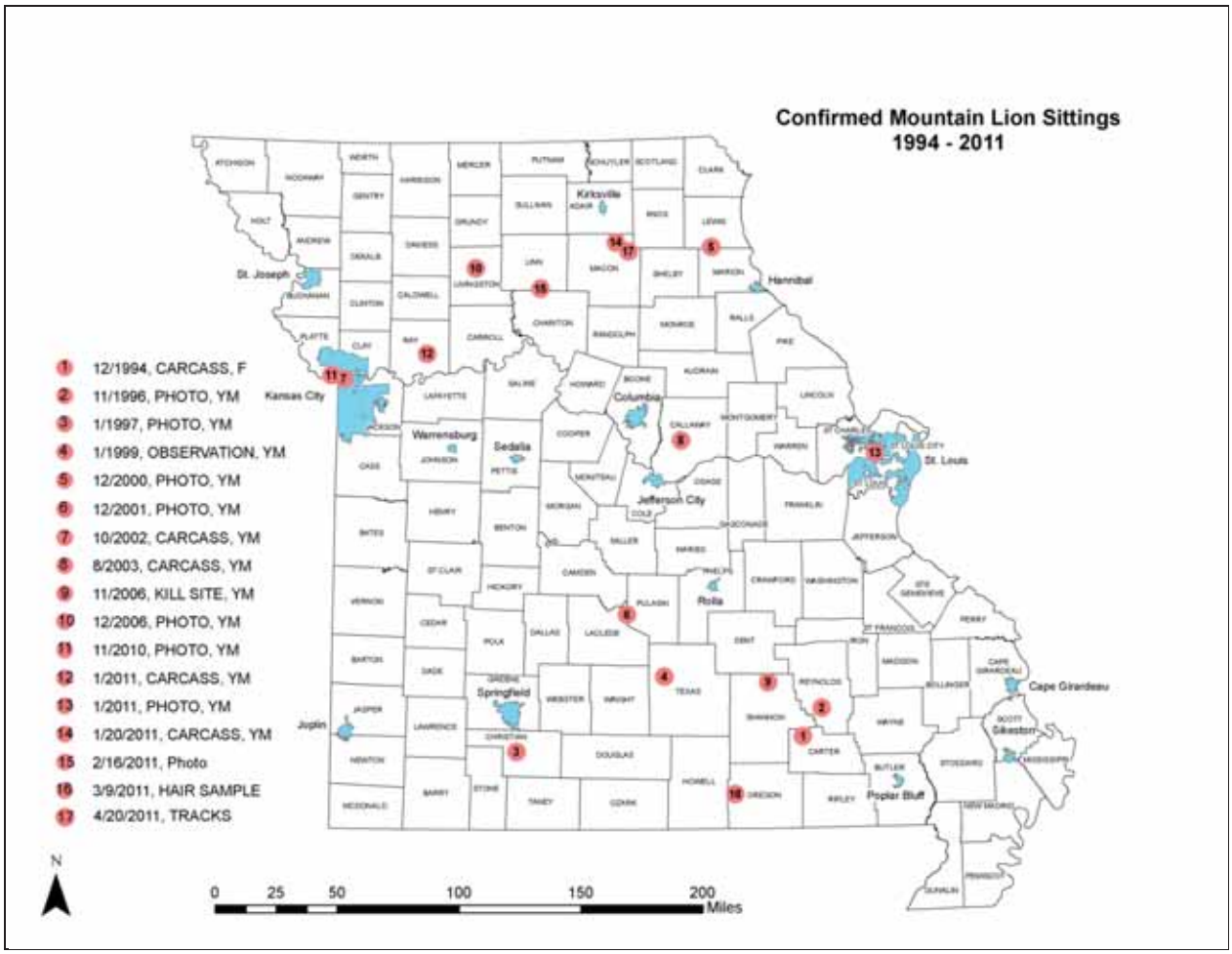


Figure 1. Confirmed locations and information for mountain lions in Missouri from 1994-2011.