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TITLE: Furbearer Population and Harvest Monitoring

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ABSTRACT Annual Furtaker Survey and Wildlife Conservation Officer (WCO) Furbearer Questionnaire information has been used to determine trends in the number of furtakers and furbearer harvests since 1990 and monitor furbearer population relative abundance, distribution, nuisance levels, and harvest characteristics since 1995. Furtaker license sales increased steadily, then stabilized since 1999. During the 2016 license year, 43,735 furtaker licenses were sold, a slight decrease from last year. The estimated statewide furtaker harvest decreased for all furbearers except fishers and weasels, which produced very slight harvest increases. Three-year average harvests of raccoons, gray foxes, skunks, opossums, weasels, mink, and muskrats decreased by over 10%. Significant decreases in 3-year average pelt prices were -44% for raccoons, -44% for muskrats, -43% for red foxes, -35% for mink, -32% for opossums, -31% for gray foxes, -27% for beavers, -23% for bobcats, and -18% for coyotes. Reduced pelt prices undoubtedly affected trapper and fur hunter effort, resulting in lower harvest of nearly all furbearers. Bobcat populations appear well established on a statewide basis with reported increasing or stable bobcat populations in 75% of WCO districts. Greater expansion of fisher distribution was observed during the past year especially into southeastern counties. Counts of fisher sighting and incidental captures decreased slightly. Otter populations showed slight range expansion statewide. River otters occupied 90% of WCO districts this year. Coyote complaints decreased slightly from previous years. WCOs in 79 districts (61%) reported coyote complaints. Complaints related to concerns for human safety were most common, comprising 58% of all coyote complaints. Poultry and domestic waterfowl depredation remains the most common livestock loss from coyotes. The beaver population status remained relatively unchanged and secure in most areas, with 92% of WCO districts reporting increasing or stable populations. Beaver damage and nuisance complaints decreased by 7% statewide. Nuisance raccoon, skunk, and fox complaints remained most common among WCOs during 2016. Porcupine populations decreased in 3% of WCO districts. Nuisance porcupine complaints decreased from previous years. We collected age and sex data from 3,212 Pennsylvania

muskrat pelts to help identify whether reproduction and/or recruitment have changed. The muskrat population sample was composed of 9% adults. The number of juveniles/adult was 10.1. When compared to data from previous years, we observed a decrease in the proportion of adults and an increase in juveniles/adult.

OBJECTIVES

1. Determine trends in the annual harvest of furbearing animals and numbers of trappers.
2. Monitor changes in furbearer population distribution and abundance.

METHODS

Fur Harvest

The annual fur harvest was estimated from the Furtaker Survey conducted each April. Due to budget constraints, this survey was not conducted during 2004, but has been implemented in subsequent years. Harvest estimates were presented by species and Wildlife Management Unit (WMU). Combination license holders have been extended furtaker privileges since 1999, but harvest totals for each species did not include them during 1999-2010, representing a sampling bias (Boyd and Weaver 2010). Beginning with the 2011-12 season, junior combination license holders were included in calculating harvest totals. The fur harvest success of both junior and senior combination license holders were included in harvest estimates beginning in 2012 (Johnson 2015).

Average pelt prices of furbearers sold at the Pennsylvania Trappers Association's District fur sales were obtained to monitor trends in pelt value. Pelt values were averaged each year among several districts reporting fur sale results. An estimated minimum 5% of all furbearers harvested in Pennsylvania were sold at these fur sales. Pelt value trends since 1986 were assessed for each furbearer species.

During 2000-2003, the reported estimates of coyote harvest included only those animals recorded by furtakers and did not account for the incidental harvest recorded in the Game Take Survey. Starting in 2005, coyote harvests were combined and represent total take by all hunters and trappers.

To provide all-inclusive furbearer harvest results, harvest totals were included for bobcat, fisher, and river otters. The Furtaker survey does not provide harvest information for these species. Analysis of the bobcat and river otter harvests occurs in annual project reports with job codes 63005 and 70001, respectively.

Wildlife Conservation Officer Furbearer Questionnaire

Questionnaires were electronically mailed annually to all Wildlife Conservation Officers (WCOs) to collect a variety of furbearer information. Accidental captures and sightings of otter and fisher and numbers and types of coyote damage complaints during the previous calendar year were reported by WCOs via this survey. Numbers of beaver complaints received and assessments of beaver, otter, fisher, bobcat, and porcupine populations were also queried. In an effort to monitor

the frequency of nuisance complaints of other furbearers, WCOs were asked to record numbers of bobcat, fisher, fox, weasel, river otter, mink, muskrat, raccoon, opossum, and skunk complaints. The 2016-2017 WCO Furbearer Questionnaire (Fig. 1) was distributed electronically on 10 May 2017. Survey data were scheduled for return from the Regional Wildlife Management Supervisors on 9 June 2017.

Porcupine status and distribution was assessed using the WCO Furbearer Questionnaire. Interest in monitoring porcupine populations stemmed from the 2011 regulation change allowing limited take of this species. We believed pre- and post-harvest population assessments would be valuable in harvest management. Porcupine mortality along highways was measured by asking WCOs to categorize highway accident and shooting frequency within their districts.

Vehicle-caused mortalities and incidental trapping mortalities for bobcat, otter, and fisher were recorded annually by WCOs using standardized kill report forms. Mandatory WCO reporting of these mortalities was a year-round activity. Much of this mortality information is also captured in the annual WCO furbearer survey.

Muskrat Monitoring

In an effort to revive muskrat status monitoring in the northeast-region of North America, the Northeast Furbearer Resources Technical Committee member jurisdictions agreed to collect basic reproductive and recruitment data as resources permitted. Differences in muskrat abundance may be related to changes in population structure. Decreasing trends in fecundity or juvenile survival to adulthood may provide evidence needed to identify the cause or causes of the muskrat decline. A regional approach to detecting changes in muskrat population age and gender structure was prudent, since the muskrat decline was suspected throughout the northeastern United States and Canada. Our intent was not to identify the causes of the apparent muskrat decline, but to detect possible changes in recruitment and reproduction resulting from the causes of population decrease. Knowing how muskrat populations were being affected will help identify the root causes of decline.

During 1980-1991, the Pennsylvania Game Commission monitored gender and age ratios of harvested muskrats in Pennsylvania based on pelt primness patterns and characteristics of dried pelts. Hayden (1994) found that age ratios changed after 1983 in response to decreased trapping pressure. The immature:adult female ratio increased suggesting high productivity and recruitment. He also monitored fecundity and found that adult females averaged 12.1 young from 2 litters per year. By comparing the current muskrat population structure and productivity to that of the 1980s, we could determine the direction of change in these parameters, if any.

Prepared muskrat pelts (stretched and dried) at Pennsylvania Trappers Association fur sales and at a North American Fur Auction collection depot were examined and separated into gender and age classes. Adult and immature muskrats were differentiated using pelt primeness patterns of the flesh side of the prepared skin (Shanks 1948, Moses and Boutin 1986). Gender was determined from the presence or absence of nipples visible on the pelt.

The proportion of juveniles to adults in the harvest was used as a measure of reproductive performance and recruitment. This ratio was a function of both natality and survival of juveniles

and adults over the summer and fall.

RESULTS

Fur Harvest

In 1985, a furtaker license was created with sales of an estimated 64,000 licenses. Furtaker license sales decreased during the late 1980s, fluctuated between 17,591 and 27,413 during 1990-2005, and steadily increased after 2005 (Table 1). Starting in 1999, combination license holders were extended furtaking privileges, which resulted in initial reduced furtaker license sales. Since 1999, the number of furtaker licenses sold increased steadily ($r = 0.98$, $P < 0.01$) (Table 1). During the 2016 license year, 43,735 furtaker licenses were sold. Junior and senior combination license holders numbered 123,476. Furtaker license sales stabilized at an average of 43,568 during 2012-2016. Variable local pelt values and international changes in fur demand continue to affect the number of furtakers in Pennsylvania.

During the 2016 license year, the estimated statewide furtaker harvest decreased for all furbearers except fishers and weasels, which produced very slight harvest increases (Table 2). Three-year average harvests of raccoons, gray foxes, skunks, opossums, weasels, mink, and muskrats decreased by over 10% (Table 2). Species harvest totals by WMU were provided for regional comparison of relative species abundance and harvest intensity (Table 3).

During December 2010, the Pennsylvania Game Commission implemented its first regulated fisher trapping season. This first season was limited to 4 WMUs, 2C, 2D, 2E, and 2F. Furtakers were required to purchase a fisher permit prior to participating in the season and to report their harvest within 48 hours of trapping a fisher. Areas where fisher trapping was allowed expanded with the addition of WMUs 2G and 4D in 2012, WMUs 2H, 3A, 3D, and 4E in 2013, and WMUs 1B, 3B, and 3C. During the 2016 season, 6,789 fisher permits were purchased. Harvest reports for 422 fishers were received among all WMUs open to fisher trapping (Table 3).

Historic low pelt values occurred during the 1989 and 1990 trapping seasons. Fur prices during the 1990s were relatively stable with the lowest values observed during the 1998-1999 season. The demand and prices paid for furs recently decreased sharply for nearly all furbearer species. Average pelt values decreased for all furbearer species with little exception during 2016-2017 (Table 4). Skunk, muskrat, and mink fur values increased very slightly. Significant decreases in 3-year average pelt prices were -44% for raccoons, -44% for muskrats, -43% for red foxes, -35% for mink, -32% for opossums, -31% for gray foxes, -27% for beavers, -23% for bobcats, and -18% for coyotes. Only skunk pelt prices increased yielding a 12% gain in the 3-year average. Reduced pelt prices undoubtedly affected trapper and fur hunter effort, resulting in lower harvest of nearly all furbearers.

Population Monitoring

Bobcats.--The number of incidental bobcat captures, estimated from the annual Furtaker Survey, increased steadily during 1990-2008 (Table 5). After 2008, incidental bobcat captures decreased slightly then leveled between an estimated 1,300-1,900 captures. The 3-year moving average of incidental captures was 1,633 (Table 5). During 1990-2015, we recorded an increasing trend ($r = 0.83$, $P < 0.05$) in incidental bobcat captures (Table 5). However, incidental captures

decreased during the past two years.

Based on results from the WCO furbearer questionnaire, bobcat populations continue to be well established. WCOs reported increasing or stable bobcat populations in 75% of districts (Fig. 2). Bobcats were absent in 20% of WCO districts in 1995, but were absent in 6% of districts during 2016. Bobcats continue to slowly expand their range into the northwest and southeast portions of Pennsylvania.

Fishers.--Greater expansion of fisher distribution was observed during the past year especially into southeastern counties. The number of incidental fisher captures reported on the furtakers survey has been increasing steadily since 1999 ($r = 0.89$, $P < 0.05$) (Table 6). The estimated number of fisher captures and subsequent release was 3,751 fishers during the 2016-2017 season.

The annual number of fisher observations and incidental captures reported to WCOs trended slightly downward during 2016 (Table 7). WCOs received 90 reports of fishers that were captured and released by licensed trappers and 881 reports of fisher observations. During 2016, 94% of WCOs surveyed reported fisher populations existing within their districts, as compared to only 65% in 2004 (Fig. 3).

River Otters.--River otter populations continue to slowly expand throughout Pennsylvania. Numbers of incidental otter captures, primarily by beaver trappers, remained stable at 40-61 incidental captures during the past 13 years (Table 7). The majority of these captures occurred in the northeast region. Sustained otter populations continue to exist throughout the Susquehanna River drainage. Based on results of the 1995 WCO furbearer questionnaire, otters occurred in 49% of WCO districts. In 2016, otters occupied 90% of WCO districts (Fig. 4).

Since 2000, the annual hunting and trapping digest has provided trappers with additional information regarding the avoidance of otter while trapping beavers. Reports from WCOs indicate that trappers in high-density otter areas were using these techniques to avoid otter captures.

Coyotes.--Reports of coyote-caused damage to livestock and domestic pets have shown a slow, upward trend since 1993. Numbers of coyote complaints during 2016 decreased slightly from previous years. WCOs in 79 districts (61%) reported complaints during the most recent survey period. Complaints related to concerns for human safety were most common, comprising 58% of all complaints. In addition to concern for human safety, the public also expressed concern for safety of pets, livestock, and wildlife. Losses of poultry, sheep, and calves were stable (Table 8). Poultry and domestic waterfowl depredation remains the most common livestock loss from coyotes.

Beavers.--The overall status of beaver populations remained relatively unchanged in most areas, with 92% of WCO districts reporting increasing or stable populations in 2016 (Fig. 5). WCOs observed decreases in established populations within 2% of districts. Poorly-established populations comprised 7% of WCO districts during 2016. For the first time in the recent past, beavers occurred in all WCO districts. On a statewide basis, beavers increased their range and population numbers during 2016 (Fig. 5).

This year, beaver damage and nuisance complaints decreased by 7% statewide. Since 1996 when beaver complaints peaked at 1,140, reports of problem beavers gradually decreased. WCOs received 666 beaver complaints during 2016. WCO districts in the northwest, northeast, and southeast regions of Pennsylvania continue to experience relatively high beaver complaint totals (Fig. 6).

Other furbearers.--Statewide nuisance furbearer complaints, excluding coyotes and beavers, did not change significantly for any furbearer species. Raccoon, skunk, and fox complaints were most common during 2016 (Table 9). We will continue to monitor nuisance complaint levels of these furbearers in subsequent years.

Porcupines.--WCO survey responses established baseline information on porcupine population status and distribution. In 2016, porcupines remained absent from 22% of WCO districts, located mainly in southwestern and southeastern Pennsylvania (Fig. 7). Porcupine populations decreased in 3% of WCO districts. We will closely monitor statewide porcupine population changes as regulated harvest methods are proposed and implemented.

Officers responded to 54 nuisance porcupine complaints, which was a decrease from previous years. No porcupines or less than 1 per month were found dead along highways in 49% of WCO districts (Fig. 8). Some officers (17%) reported seeing 1 or more dead porcupines per week.

Musk rats.--We collected age and sex data from 3,212 muskrat pelts at fur sales, collection points, and fur dealers across Pennsylvania. In the past, age structure data showed little variability among WMUs or broad regions of the state. So, the data were pooled into one statewide measure. From muskrat pelts sold, the population was composed of about 9% adults and 91% juveniles (Table 10). The number of juveniles/adult was 10.1 and juveniles/adult female was 24.9. When compared to data collected approximately 20-30 years ago (Table 10), we observed a decrease in the proportion of adults (15% in 1984-91; 11% in 2011; 9% in 2016), an increase in juveniles/adult (5.6 in 1984-91; 8.3 in 2011; 10.1 in 2016), and an increase in juveniles/adult female (12.7 in 1984-91; 20.2 in 2011; 24.9 in 2016). These results suggest that recruitment appears to be occurring at normal rates. However, the proportion of adult muskrats in the fall population continues to be heavily skewed toward juveniles.

If adults comprised an increased proportion of the age ratio, production and/or recruitment would likely be inadequate, causing the population to decrease. If a specific age or gender group was decreased by some mortality factor, we would have seen this difference. Muskrat reproduction and recruitment appear normal or slightly elevated. It appears that mortality factors not related to reproduction or recruitment are affecting muskrat populations. This information will help direct our efforts in identifying the causes of the muskrat decline. Annual monitoring of reproduction and recruitment is not necessary. Monitoring at 5-year intervals is probably adequate unless population numbers noticeably change.

RECOMMENDATIONS

1. The fur harvest should continue to be reported by species and WMU to monitor area-specific harvest trends.
2. Pelt price information should be collected annually to monitor trends in fur value relative to regional harvest trends.
3. Current methods for monitoring changes in density and distribution of bobcat, otter, and fisher should be continued to detect population trend changes.
4. Increased numbers of coyote-related complaints should be addressed through educational programs in rural and suburban communities.
5. Muskrat age ratio and reproductive information should be collected every 5 years to monitor fecundity and recruitment unless noticeable changes in population numbers occur. The next year of sampling should be 2021.

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Table 1. Number of furtaker and combination (combined hunting and trapping) licenses sold in Pennsylvania.

License Year	Furtaker licenses sold	Combination licenses sold
1985	64,000	
1986	44,087	
1987	42,000	
1988	36,000	
1989	29,000	
1990	20,377	
1991	20,251	
1992	20,345	
1993	19,458	
1994	22,376	
1995	21,376	
1996	25,636	
1997	27,413	
1998	25,877	
1999	17,591 ^a	
2000	18,551 ^a	
2001	19,410 ^a	
2002	20,676 ^a	
2003	22,454 ^a	
2004	24,094 ^a	
2005	23,941 ^a	
2006	26,589 ^a	
2007	28,033 ^a	
2008	29,717 ^a	
2009	31,122 ^a	
2010	35,279 ^a	
2011	36,192 ^a	
2012	39,913	104,883
2013	44,591	112,875
2014	45,069	118,434
2015	44,534	121,767
2016	43,735	123,476

^a Combination license holders were extended furtaker privileges since 1999, but the number who pursue furbearers was not determined until the 2012 season. Therefore, prior to 2012, the number of licenses sold misrepresented to an unknown degree the number of furtakers in Pennsylvania.

Table 2. Annual harvest and percent change (% Δ) of 3-year moving average by species in Pennsylvania since 2000.

License			Coyote						Coyote											
Year	Raccoon	% Δ	Red Fox	% Δ	Gray Fox	% Δ	(furtakers ^a)	% Δ	(total ^b)	% Δ	Skunk	% Δ	Opossum	% Δ	Weasel	% Δ				
2000	108,890		33,060		24,452		10,383				7,534		29,093		340					
2001	121,810		33,003		23,275		12,363				9,245		27,192		657					
2002	106,485		33,007		18,805		11,444				7,207		34,787		406					
2003	104,781	-1.2	31,592	-1.5	15,956	-12.8	11,697	3.8			9,319	7.4	33,760	5.1	359	1.4				
2004 ^c	-		-		-		-		-		-		-		-					
2005	106,082	-4.7	40,551	7.7	17,616	-9.8	9,670	-7.6	20,377		9,997	2.9	43,770	17.3	567	-6.3				
2006	138,640	10.1	45,512	11.9	20,754	3.7	11,879	1.3	21,601		10,687	13.1	48,102	11.9	487	6.1				
2007	121,466	4.8	52,000	17.3	18,613	4.9	13,360	5.0	28,974		9,818	1.7	41,168	5.9	440	5.7				
2008	142,808	10.0	44,745	3.0	20,845	5.7	12,776	8.9	23,699	4.7	12,331	7.7	54,273	7.9	504	-4.2				
2009	112,550	-6.5	37,418	-5.7	13,793	-11.6	13,438	4.1	30,386	11.8	8,314	-7.2	37,270	-7.5	468	-1.3				
2010	125,423	1.1	54,661	2.0	15,691	-5.5	14,732	3.5	26,658	-2.8	8,935	-2.9	36,188	-3.8	436	-0.3				
2011	174,858	8.4	68,214	17.2	19,380	-2.9	15,924	7.7	32,202	10.5	13,057	2.5	49,626	-3.6	652	10.5				
2012	210,146	23.6	67,465	18.7	17,415	7.4	19,470	13.7	40,495	11.3	7,329	-3.3	78,024	33.1	604	8.7				
2013	197,380	14.1	61,392	3.5	15,700	0.0	16,256	3.0	40,956	14.4	7,733	-4.1	57,138	12.8	110	-19.3				
2014	203,311	4.9	55,659	-6.4	21,765	4.5	21,149	10.1	31,675	-0.5	13,969	3.2	59,643	5.4	372	-20.5				
2015	149,098	-10.0	65,158	-1.3	16,609	-1.5	25,344	10.3	38,611	-1.7	6,920	-1.4	36,218	-21.5	216	-35.7				
2016	92,013	-21.2	47,442	-6.7	10,725	-11.4	17,078	5.3	25,796	-9.1	6,133	-10.2	22,518	-32.4	278	-32.6				

Table 2. cont.

License												
Year	Muskrat	% Δ	Mink	% Δ	Beaver^c	% Δ	Bobcat^e	% Δ	Fisher^e	% Δ	Otter^e	% Δ
2000	79,880		8,614		8,408		58					
2001	121,994		13,214		10,934		146					
2002	75,340		10,069		4,538		135					
2003	71,368	-3.1	6,494	-6.6	7,874	-2.2	140	24.2				
2004 ^c	-		-		-		196	11.9				
2005	70,995	-19.0	9,335	-13.0	14,283	14.3	221	18.3				
2006	121,167	21.1	12,680	10.1	14,210	36.2	258	21.2				
2007	121,446	19.0	10,004	12.3	11,542	10.1	356	23.7				
2008	74,059	1.0	8,632	-2.2	9,942	-10.8	487	31.9				
2009	63,988	-18.1	7,261	-17.3	9,704	-12.6	506	22.5				
2010	58,296	-24.3	8,204	-7.0	9,254	-7.3	1,137	57.9	152			
2011	89,274	7.7	11,855	13.4	18,212	28.6	969	22.6	126			
2012	93,153	13.8	12,454	19.0	9,712	0.0	1,056	21.1	228			
2013	83,880	10.6	7,856	-1.1	15,134	15.8	1,164	0.9	341	37.4		
2014	115,742	9.9	14,532	8.3	17,607	-1.4	1,132	5.1	443	45.6		
2015	66,397	-9.1	8,530	-11.3	16,920	17.0	1,034	-0.7	401	17.1	46	
2016	43,436	-20.7	7,801	-16.7	7,888	1.7	844	-6.6	422	19.1	36	

^a Coyote harvest by furtaker license holders only (estimated from the Furtaker Survey).

^b Total coyote harvest by hunters and trappers estimated from the Furtaker Survey and the Game Take Survey.

^c Furtaker survey was not conducted during the 2004 license year.

^d Beaver harvest was based on mandatory pelt tagging totals until 2004. Harvest was estimated from furtaker surveys beginning with the 2005 license year.

^e Bobcat, fisher, and river otter harvests were based on mandatory reporting totals.

Table 3. Estimated harvests of furbearers by WMU during the 2016 hunting and trapping license year.

WMU	Raccoon	Red Fox	Gray Fox	Coyote^a	Skunk	Opossum	Weasel
1A	5,890	209	105	1,191	29	669	0
1B	8,051	562	209	703	248	966	27
2A	6,024	588	157	1,143	73	2,060	9
2B	6,053	288	144	548	44	1,094	0
2C	6,897	2,301	1,046	1,941	350	2,292	36
2D	3,892	471	562	679	248	695	0
2E	1,865	562	523	488	88	335	9
2F	1,021	588	536	453	15	245	18
2G	1,510	575	1,151	941	29	528	0
2H	725	222	262	476	0	90	0
3A	1,391	641	301	1,131	117	219	54
3B	3,019	1,203	1,347	869	292	2,382	27
3C	1,302	628	615	607	161	657	9
3D	1,376	680	157	381	175	90	18
4A	4,484	1,255	837	917	277	1,069	0
4B	3,374	2,563	301	464	277	863	0
4C	4,114	2,981	275	798	423	824	9
4D	4,336	1,491	916	750	423	824	36
4E	2,620	2,393	379	417	789	850	0
5A	6,038	3,583	222	429	219	1,081	0
5B	8,125	8,513	196	726	876	2,163	0
5C	6,068	11,965	105	524	380	657	0
5D	400	1,425	0	24	58	0	0
Unknown	3,438	1,755	379	478	542	1,869	26
Total	92,013	47,442	10,725	17,078	6,133	22,520	278

Table 3. cont.

WMU	Muskrat	Mink	Beaver	Bobcat^b	Fisher^b	Otter^b
1A	3,011	113	743			
1B	4,542	694	2,204		69	
2A	1,295	178	50	27		
2B	942	97	124			
2C	2,490	420	136	58	48	
2D	1,548	275	99		64	
2E	1,262	226	421	47	28	
2F	3,095	81	570	69	34	
2G	0	0	285	104	22	
2H	101	65	111	26	9	
3A	2,103	388	681	68	13	
3B	421	162	136	79	10	
3C	622	194	632	102	20	18
3D	976	65	706	45	33	18
4A	1,413	307	37	53		
4B	2,574	888	50			
4C	925	355	74	34		
4D	656	291	173	89	34	
4E	1,026	242	136	41	38	
5A	4,593	888	12			
5B	7,116	1,244	37			
5C	1,783	242	161			
5D	0	16	62			
Unknown	942	370	248	2		
Total	43,436	7,801	7,888	844	422	36

^a Coyote harvest by furtaker license holders only (estimated from the Furtaker Survey).

^b Bobcat, fisher, and river otter harvests were based on mandatory reporting totals.

Table 4. Average pelt prices paid and percent change (% Δ) of 3-year moving averages for furbearer species in Pennsylvania.

Trapping season	Average pelt price (\$) ^a											
	Raccoon	% Δ	Red Fox	% Δ	Gray Fox	% Δ	Coyote	% Δ	Skunk	% Δ	Opossum	% Δ
1986-87	19.89		29.15		33.76		31.57		1.00		3.05	
1987-88	9.78		17.20		31.93		13.50				1.99	
1988-89	5.29		15.97		11.58		19.00				1.28	
1989-90	3.40	-47.2	9.30	-31.9	8.79	-32.3	11.60	-31.2	1.92		1.11	-30.7
1990-91	3.35	-34.8	8.83	-19.7	8.43	-44.9	10.01	-7.9	1.00		0.96	-23.5
1991-92	7.12	15.2	13.55	-7.1	12.78	4.2	18.37	-1.6	2.25		2.17	26.6
1992-93	6.77	24.3	12.96	11.6	11.32	8.4	25.40	34.5			1.71	14.2
1993-94	8.54	30.1	15.44	18.7	11.02	8.0	24.15	26.3	2.66		1.88	19.0
1994-95	9.15	9.1	18.73	12.3	11.47	-3.7	24.70	9.3	2.21		1.51	-11.5
1995-96	10.27	14.3	16.30	7.1	9.40	-5.7	13.36	-16.2	3.00		1.74	0.6
1996-97	15.34	24.3	18.05	5.2	11.94	2.9	20.68	-5.6	3.92		1.83	-1.0
1997-98	12.07	8.4	13.18	-10.5	9.65	-5.5	9.72	-25.5			1.41	-2.0
1998-99	6.87	-9.0	9.73	-13.8	4.84	-14.7	6.40	-15.9			0.49	-25.1
1999-00	4.94	-30.3	10.72	-17.9	6.19	-21.8	15.43	-14.3			1.47	-9.7
2000-01	7.42	-19.5	16.58	10.1	8.61	-5.0	16.07	20.1			2.47	31.5
2001-02	8.34	7.6	20.14	28.1	10.05	26.5	17.16	28.4			1.54	23.7
2002-03	9.39	21.5	22.84	25.5	12.81	26.6	22.57	14.7			2.12	11.9
2003-04	10.15	10.9	19.92	5.6	18.74	32.2	25.29	16.5			2.03	-7.2
2005-06	10.11	6.3	16.48	-5.8	18.04	19.2	9.37	-12.0	3.14		2.51	17.0
2006-07	17.50	27.4	20.36	-4.2	26.54	27.7	24.50	3.4	4.50		5.05	44.0
2007-08	12.88	7.2	20.84	1.6	43.84	39.6	20.02	-8.9	4.04		2.45	4.4
2008-09	9.79	-0.8	11.58	-8.5	25.11	8.0	12.37	5.6	4.42	11.0	3.45	9.4
2009-10	11.58	-14.7	10.48	-18.7	20.76	-6.1	17.27	-12.7	4.62	0.9	2.62	-22.2
2010-11	12.38	-1.5	14.63	-14.5	19.59	-27.0	18.40	-3.3	3.62	-3.2	1.99	-5.4
2011-12	12.81	8.9	23.48	32.4	23.87	-1.9	15.52	6.6	3.30	-8.8	2.26	-14.8
2012-13	15.14	9.7	41.34	63.5	29.65	13.8	20.62	6.5	3.05	-13.6	3.23	8.9
2013-14	14.67	5.7	38.07	29.5	25.98	8.7	23.15	8.7	3.36	-2.7	4.09	28.0
2014-15	7.83	-11.7	20.80	-2.6	14.46	-11.8	18.82	5.6	4.28	10.1	2.08	-1.9
2015-16	3.61	-30.6	9.28	-32.0	10.24	-27.7	15.62	-8.0	3.14	0.8	1.69	-16.4
2016-17	3.30	-43.5	8.52	-43.4	10.21	-31.1	12.53	-18.4	4.63	11.8	1.60	-31.7

Table 4. cont.

Trapping Season	Average pelt price (\$) ^a									
	Muskrat	% Δ	Mink	% Δ	Beaver	% Δ	Bobcat	% Δ	Fisher	% Δ
1986-87	4.84		24.19		33.00					
1987-88	5.36		31.11		22.60					
1988-89	2.91		29.45		20.22					
1989-90	1.42	-26.1	22.29	-2.2	17.77	-20.1				
1990-91	1.61	-38.7	19.06	-14.5	9.71	-21.3				
1991-92	2.95	0.7	26.23	-4.5	13.14	-14.8				
1992-93	2.25	13.9	19.95	-3.5	10.63	-17.6				
1993-94	2.88	18.6	18.35	-1.1	19.03	27.8				
1994-95	3.09	1.7	14.08	-18.8	19.94	15.9				
1995-96	3.15	10.9	11.88	-15.4	19.65	18.2				
1996-97	6.03	34.5	19.06	1.6	29.37	17.6				
1997-98	3.44	2.9	11.66	-5.4	21.73	2.6				
1998-99	1.87	-10.1	9.48	-5.6	15.29	-6.2				
1999-00	3.16	-25.3	9.75	-23.2	16.08	-20.0				
2000-01	3.40	-0.5	9.64	-6.5	20.00	-3.3				
2001-02	3.85	23.5	8.47	-3.5	15.86	1.1				
2002-03	3.81	6.2	9.69	-0.2	14.33	-3.4				
2003-04	3.33	-0.6	10.50	3.1	15.84	-8.3				
2005-06	2.89	-8.7	12.84	15.2	16.11	0.5				
2006-07	6.10	22.8	17.42	23.4	17.18	6.2				
2007-08	3.20	-1.1	12.88	5.8	22.14	12.8				
2008-09	3.96	8.8	10.06	-6.4	18.05	3.5	26.36			
2009-10	7.35	9.4	11.02	-15.9	18.29	1.9	43.50			
2010-11	6.92	25.6	13.95	3.2	14.90	-12.4	36.83		41.60	
2011-12	11.00	38.6	19.48	26.9	21.36	6.5	46.52	18.9	36.42	
2012-13	13.38	23.9	24.86	31.1	22.32	7.4	76.12	25.7	52.15	
2013-14	12.56	18.0	18.89	8.5	21.26	10.9	81.72	28.2	74.00	24.9
2014-15	5.74	-14.2	10.71	-13.9	13.32	-12.4	60.64	6.9	51.00	9.0
2015-16	3.10	-32.4	5.60	-35.4	10.09	-21.5	43.09	-15.1	52.96	0.5
2016-17	3.14	-44.0	6.61	-34.9	9.15	-27.1	39.78	-22.6	27.78	-26.0

^a Average pelt prices paid at PA Trappers Association fur sales. Pelt price information was not collected during 2004-2005.

Table 5. Number of incidental bobcat captures estimated from the annual Furtaker Survey. This survey was not conducted during 2004-2005.

Trapping season	Survey respondents	Furtaker licenses sold^a	Bobcats^b captured and released	Extrapolated bobcat captures	3-year moving average^c (bobcat captures)
1990-1991	2,302	20,377	40	354	
1991-1992	2,361	20,215	24	205	
1992-1993	1,652	20,345	26	320	293
1993-1994	2,175	19,246	16	142	222
1994-1995	2,056	21,905	101	1,076	513
1995-1996	2,181	21,840	46	460	559
1996-1997	2,363	25,636	62	673	736
1997-1998	2,233	27,413	46	565	566
1998-1999	2,466	25,877	108	1,133	790
1999-2000	1,557	17,414	62	693	797
2000-2001	1,681	18,551	52	574	991
2001-2002	1,553	19,410	56	700	656
2002-2003	1,779	20,676	45	523	599
2003-2004	2,204	22,454	68	693	639
2005-2006	2,412	23,941	165	1,638	951
2006-2007	2,436	26,589	175	1,910	1,414
2007-2008	2,994	28,033	235	2,200	1,916
2008-2009	2,622	29,717	274	3,105	2,405
2009-2010	3,186	31,122	235	2,296	2,534
2010-2011	4,421	35,279	221	1,764	2,388
2011-2012	4,080	36,192	212	1,881	1,980
2012-2013	3,223	39,913	105	1,300	1,648
2013-2014	4,439	44,591	175	1,758	1,646
2014-2015	4,720	45,069	189	1,805	1,621
2015-2016	4,443	44,506	161	1,613	1,725
2016-2017	4,477	43,735	138	1,481	1,633

^a Excludes junior and senior combination license holders.

^b Does not include bobcats legally harvested by permit holders.

^c $r = 0.82$, $P < 0.05$

Table 6. Number of incidental fisher captures estimated from the annual Furtaker Survey. This survey was not conducted during 2004-2005.

Trapping season	Survey respondents	Furtaker licenses sold^a	Fishers^b captured and released	Extrapolated fisher captures	3-year moving average^c (fisher captures)
1999-2000	1,557	17,414	5	56	
2000-2001	1,681	18,551	1	11	
2001-2002	1,553	19,410	6	75	47
2002-2003	1,779	20,676	11	128	71
2003-2004	2,204	22,454	10	102	102
2005-2006	2,412	23,941	83	824	351
2006-2007	2,436	26,589	87	950	625
2007-2008	2,994	28,033	105	983	919
2008-2009	2,622	29,717	167	1,893	1,275
2009-2010	3,186	31,122	120	1,172	1,349
2010-2011	4,421	35,279	117	934	1,333
2011-2012	4,080	36,192	163	1,446	1,184
2012-2013	3,223	39,913	118	1,461	1,280
2013-2014	4,439	44,591	104	1,045	1,317
2014-2015	4,720	45,069	92	878	1,128
2015-2016	4,443	44,506	141	1,412	1,112
2016-2017	4,477	43,735	282	3,751	2,014

^a Excludes junior and senior combination license holders.

^b Does not include fishers legally harvested by permit holders.

^c $r = 0.89$, $P < 0.05$

Table 7. Reports of otter and fisher captures and fisher observations estimated from annual Wildlife Conservation Officer (WCO) questionnaires.

Survey Year	No. Districts Reporting	No. Incidental Otter Captures	No. Incidental Fisher Captures	No. Reported Fisher Observations
1995	123	15	-	-
1996	123	15	-	-
1997	123	31	10	60
1998	123	26	9	67
1999	127	30	6	94
2000	123	35	8	82
2001	137	25	6	105
2002	122	27	9	106
2003	133	26	20	206
2004	122	42	31	303
2005	123	50	49	341
2006	118	44	86	385
2007	133	57	132	481
2008	132	47	138	561
2009	125	36	106	615
2010	125	51	101	653
2011	131	59	130	837
2012	131	53	113	808
2013	132	45	94	999
2014	135	40	137	929
2015	136	61	109	1070
2016	130	52	90	881

Table 8. Types and numbers of coyote-related complaints reported to Wildlife Conservation Officers (WCO).

	Survey Year											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Proportion of WCO districts reporting coyote complaints (%)	66	64	44	54	62	50	59	61	58	58	66	61
Complaint nature/ species affected												
Cattle	18	24	9	12	12	11	13	13	17	16	11	10
Sheep	43	29	19	22	29	20	19	26	23	23	24	25
Goats	5	3	4	7	4	5	4	8	5	5	10	7
Poultry	24	11	19	16	14	21	24	25	20	35	34	38
Dogs	12	19	8	9	17	8	12	9	5	15	17	14
Cats	25	38	28	19	25	29	27	24	17	25	27	34
Afraid of Coyotes	263	199	155	171	219	193	258	229	221	249	337	320
Deer	73	36	61	74	39	53	53	65	37	50	63	41
Turkeys	31	12	12	21	17	14	23	18	15	17	29	13
Other	32	36	36	32	17	31	48	18	33	26	11	47
Total Complaints	526	407	351	383	393	385	481	435	393	461	563	549
Coyote-caused mortalities												
Cows	2	0	1	1	0	1	0	0	2	2	1	2
Calves	10	27	7	9	8	7	7	10	12	11	5	5
Sheep	30	47	28	47	57	25	22	49	41	44	24	42
Goats	0	2	3	4	3	4	5	6	5	3	7	4
Poultry	51	71	93	132	76	97	68	106	77	68	74	66
Dogs	3	3	1	2	1	1	7	3	0	4	6	4
Cats	16	33	15	34	19	18	53	28	25	23	19	24
Rabbits	8	12	2	8	16	6	7	5	7	22	4	2
Deer	13	10	8	10	7	6	8	6	11	18	13	9
Other	2	1	1	0	1	0	1	0	1	0	1	1
Total Depredation	135	206	159	247	188	165	178	213	181	195	154	159

Table 9. Frequency of furbearer complaints received by Wildlife Conservation Officers.

Species	2009	2010	2011	2012	2013	2014	2015	2016
Bobcat	50	37	52	75	63	62	65	50
Fisher	23	14	32	52	44	36	52	46
Fox	235	219	261	301	257	267	312	269
Weasel	17	12	22	20	26	20	20	30
River Otter	7	10	19	10	18	11	15	15
Mink	27	10	24	13	21	26	24	30
Muskrat	73	126	68	73	61	58	43	43
Raccoon	763	960	820	942	837	761	705	756
Opossum	139	121	97	117	90	74	91	134
Skunk	488	510	426	471	326	272	338	374
Coyote	393	386	481	435	393	461	563	549
Beaver	506	521	567	454	488	549	714	666

Table 10. Muskrat gender and age structure comparison based on pelt examinations during 1980-1983, 1984-1991, 2010, and 2016 in Pennsylvania.

Sampling period	Sample size	Average annual harvest	Gender ratio (male/female)	Age ratio		Percent adults
				(juveniles/adult)	(juveniles/adult female)	
1980-1983	14,559	727,213	1.5	3.4	8.4	23
1984-1991 ^a	29,756	301,329	1.4	5.6	12.7	15
2010	8,924	58,295	1.5	8.3	20.2	11
2016	3,212	43,436	1.3	10.1	24.9	9

^a Period of decreased trapping pressure (Hayden 1994).

2016-2017 Furbearer Questionnaire											
<p>All questions pertain to furbearer information within your district during May 2016 to April 2017. If you covered a portion of another district in addition to your own, please complete a separate (additional) questionnaire pertaining specifically to your added coverage area. If you are new to this district or cannot answer these questions, please electronically submit this form anyway (leaving unknown answers blank) or forward it to the WCO who previously occupied or covered your district. Please do not answer "many" or "a lot" to questions asking "How many?" Give us your best estimates. Please note that these types of questions will be asked annually.</p>											
<p>Navigating: Click on the blue boxes to enter text or numbers. Click on the option circles (O) to select your response. To advance, click on the next entry field.</p>											
<p>District No. <input style="width: 60px;" type="text"/> <small>(enter 4-digit district number)</small></p> <p>WCO Name <input style="width: 120px;" type="text"/></p> <p>Beavers</p> <p>1. How many beaver complaints were serviced within each WMU in your district? →</p> <p>2. How many problem beavers did you trap and transfer to a new location? <input style="width: 60px;" type="text"/></p> <p>3. How many problem beavers did you dispatch/euthanize? <input style="width: 60px;" type="text"/></p> <p>4. How would you describe beaver populations in your district? <i>Beaver populations are present each year and are ...</i> <input type="radio"/> increasing <input type="radio"/> decreasing <input type="radio"/> stable <i>----- or -----</i> <i>Beaver populations are <u>not</u> present each year and are ...</i> <input type="radio"/> poorly established <input type="radio"/> absent</p> <p>River Otters</p> <p>5. How many river otters were accidentally caught by trappers within your district? <input style="width: 60px;" type="text"/></p> <p>6. How would you describe river otter populations in your district? <i>Otter populations are present each year and are ...</i> <input type="radio"/> increasing <input type="radio"/> decreasing <input type="radio"/> stable <i>----- or -----</i> <i>Otter populations are <u>not</u> present each year and are ...</i> <input type="radio"/> poorly established <input type="radio"/> absent</p> <p>Fishers</p> <p>7. How many reliable reports of fishers have you received in your district? <input style="width: 60px;" type="text"/></p> <p>8. How many fishers were accidentally caught by trappers in your district? <input style="width: 60px;" type="text"/></p> <p>9. How would you describe fisher populations in your district? <i>Fisher populations are present each year and are ...</i> <input type="radio"/> increasing <input type="radio"/> decreasing <input type="radio"/> stable <i>----- or -----</i> <i>Fisher populations are <u>not</u> present each year and are ...</i> <input type="radio"/> poorly established <input type="radio"/> absent</p> <p>Bobcats</p> <p>10. How would you describe bobcat populations in your district? <i>Bobcat populations are present each year and are ...</i> <input type="radio"/> increasing <input type="radio"/> decreasing <input type="radio"/> stable <i>----- or -----</i> <i>Bobcat populations are <u>not</u> present each year and are ...</i> <input type="radio"/> poorly established <input type="radio"/> absent</p>	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">WMU</th> <th style="width: 50%;">Number of beaver complaints</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	WMU	Number of beaver complaints								
WMU	Number of beaver complaints										

Figure 1. Wildlife Conservation Officer Furbearer Questionnaire used for the 2016 survey period (page 1).

Coyotes

11. Did you receive any coyote-related complaints during this period?

☐ Yes ☐ No

If you received coyote complaints, please record the type and number of complaints and animals killed.

Omit any complaints that the Bureau of Dog Law Enforcement (PA Dept of Agriculture) serviced.

Number of Coyote **Complaints**:

<input type="text"/>	Cattle
<input type="text"/>	Sheep
<input type="text"/>	Goats
<input type="text"/>	Poultry/Waterfowl
<input type="text"/>	Attacked Dogs
<input type="text"/>	Attacked Cats
<input type="text"/>	Afraid of Coyotes
<input type="text"/>	Chased/Attacked Deer
<input type="text"/>	Chased/Attacked Wild Turkey
<input type="text"/>	Other ... <input type="text"/>

Number of **Animals Killed** by Coyotes:

<input type="text"/>	Cows
<input type="text"/>	Calves
<input type="text"/>	Sheep/Lambs
<input type="text"/>	Goats
<input type="text"/>	Poultry/Waterfowl
<input type="text"/>	Dogs
<input type="text"/>	Cats
<input type="text"/>	Rabbits
<input type="text"/>	Deer
<input type="text"/>	Other ... <input type="text"/>

Nuisance Complaints

12. If you received nuisance complaints concerning other furbearer species, how many occurred in your district?

<input type="text"/>	Bobcat
<input type="text"/>	Fisher
<input type="text"/>	Fox
<input type="text"/>	Weasel
<input type="text"/>	River Otter
<input type="text"/>	Mink
<input type="text"/>	Muskrat
<input type="text"/>	Raccoon
<input type="text"/>	Opossum
<input type="text"/>	Skunk
<input type="text"/>	Other ... <input type="text"/>

Other Mammals - Porcupines13. How many porcupine complaints did you receive in your district during the past year?

14. Excluding the winter months, approximately how many dead porcupines did you see on average along roadways within your district?

(unique/individual porcupines, not counted more than once)

- ☐ none
- ☐ less than one each month
- ☐ 1-3 each month
- ☐ 1-6 each week
- ☐ one or more each day

15. How would you describe porcupine populations in your district?

Porcupine populations are *present each year and are ...*☐ increasing ☐ decreasing ☐ stable----- *or* -----Porcupine populations are *not* present each year and are ...☐ poorly established ☐ absent**Thank you for your cooperation and assistance!**

Please return this questionnaire to your regional wildlife management supervisor
and other appropriate supervisors as an email attachment.

Figure 1 (cont.) Wildlife Conservation Officer Furbearer Questionnaire used for the 2016 survey period (page 2).

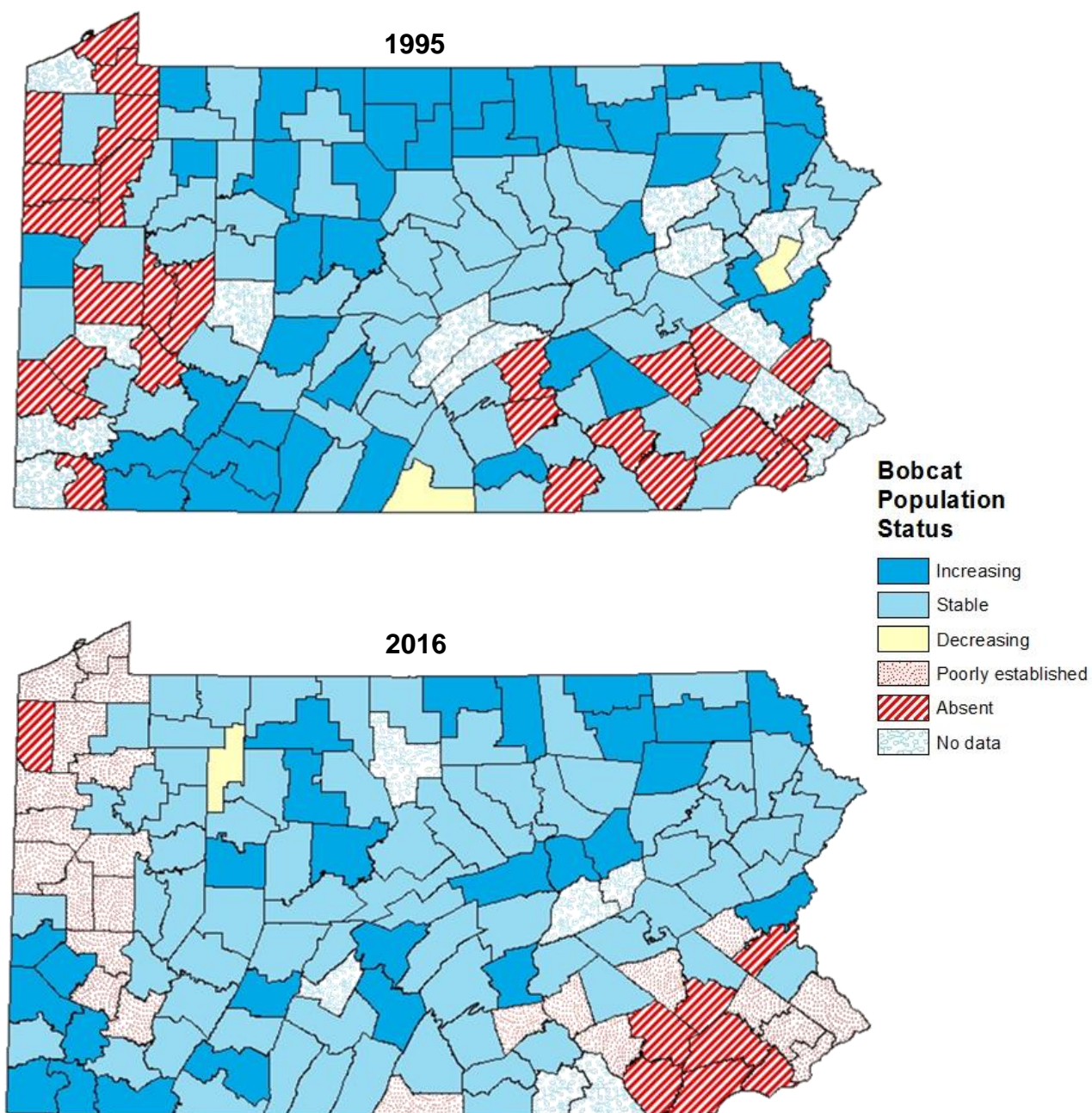


Figure 2. Bobcat population status and distribution based on Wildlife Conservation Officer observations during 1995 and 2016.

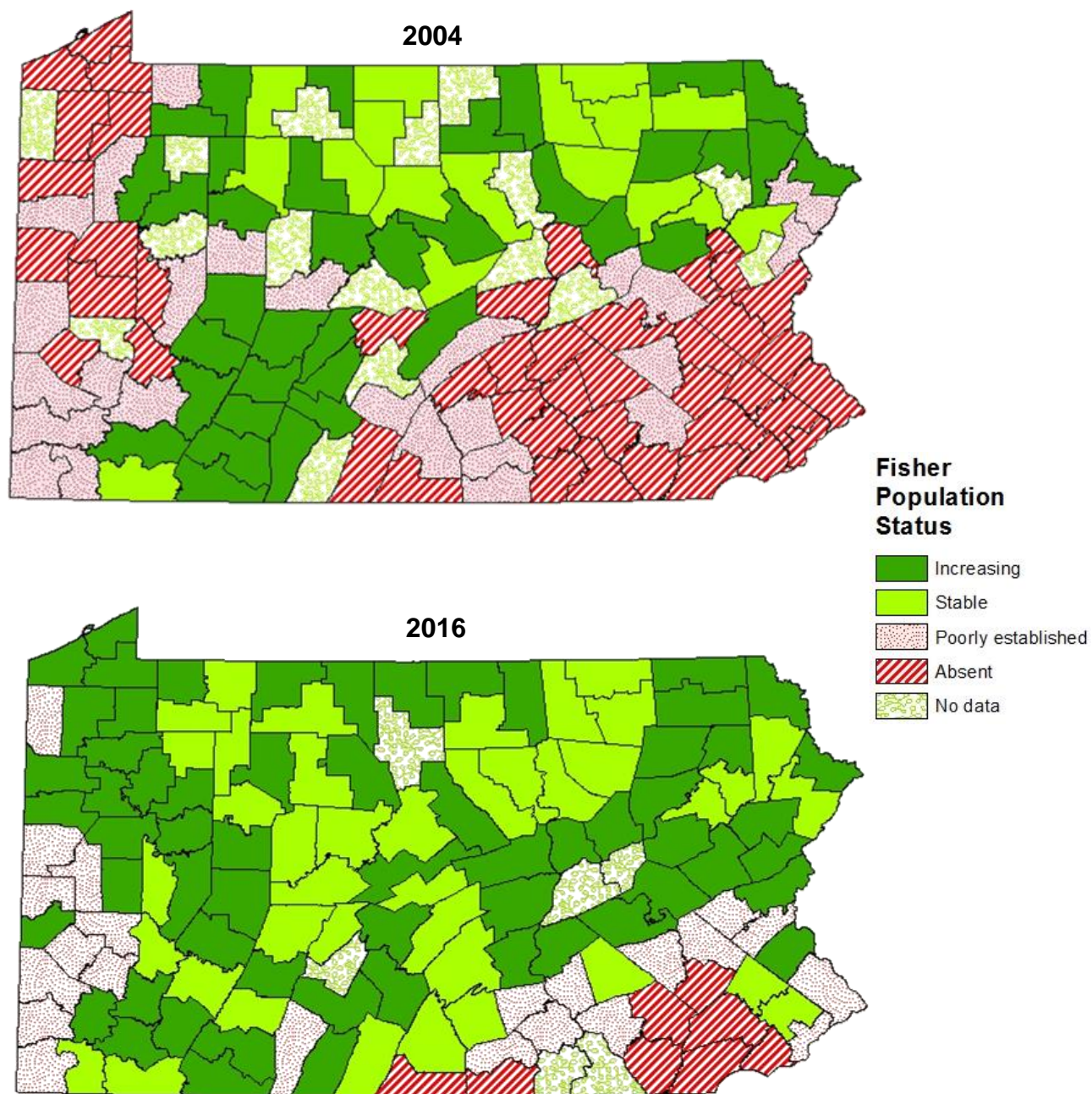


Figure 3. Fisher population status based on Wildlife Conservation Officer observations during 2004 and 2016.

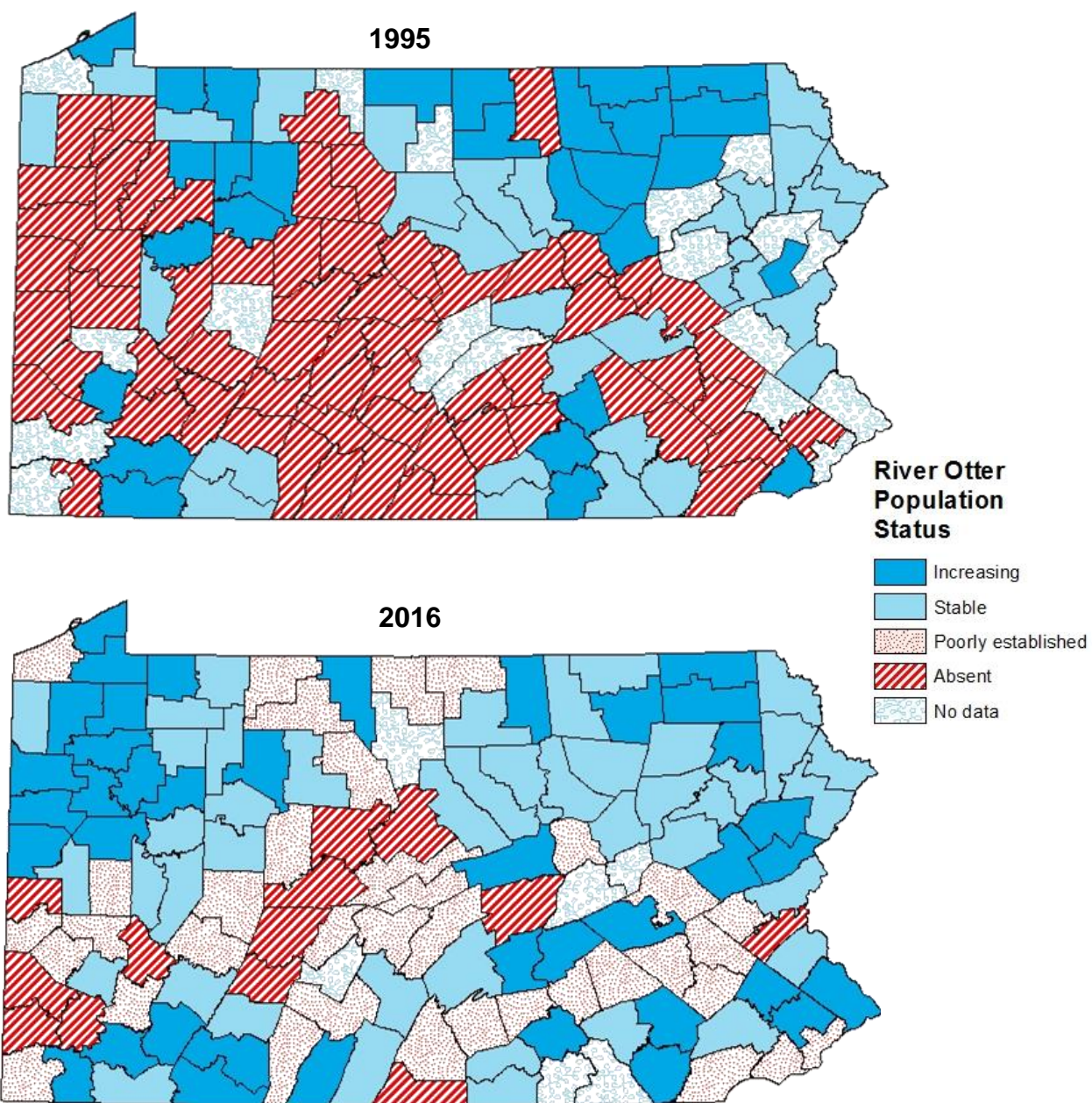


Figure 4. River otter population status based on Wildlife Conservation Officer observations during 1995 and 2016.

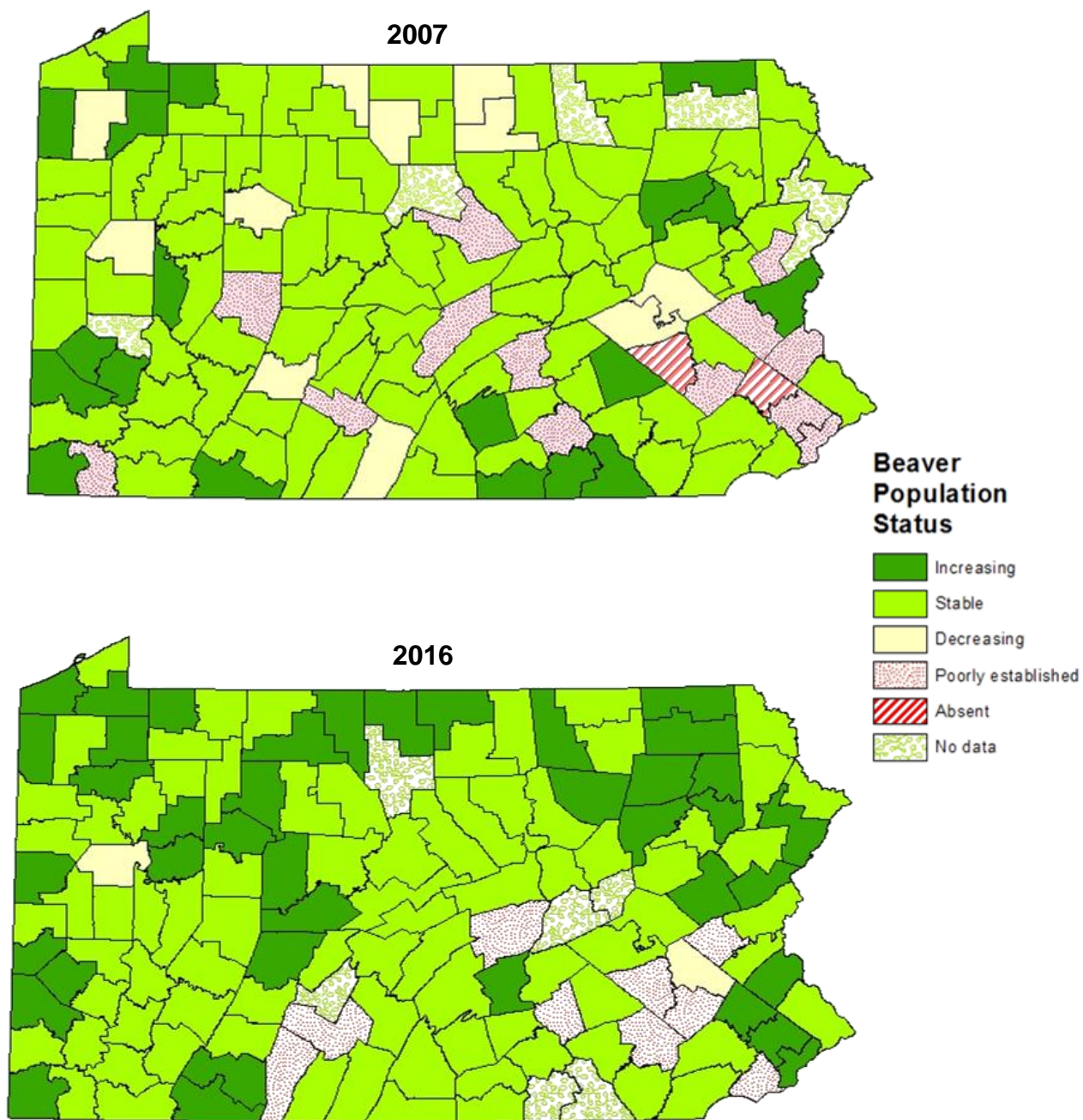


Figure 5. Beaver population status based on Wildlife Conservation Officer observations during 2007 and 2016.

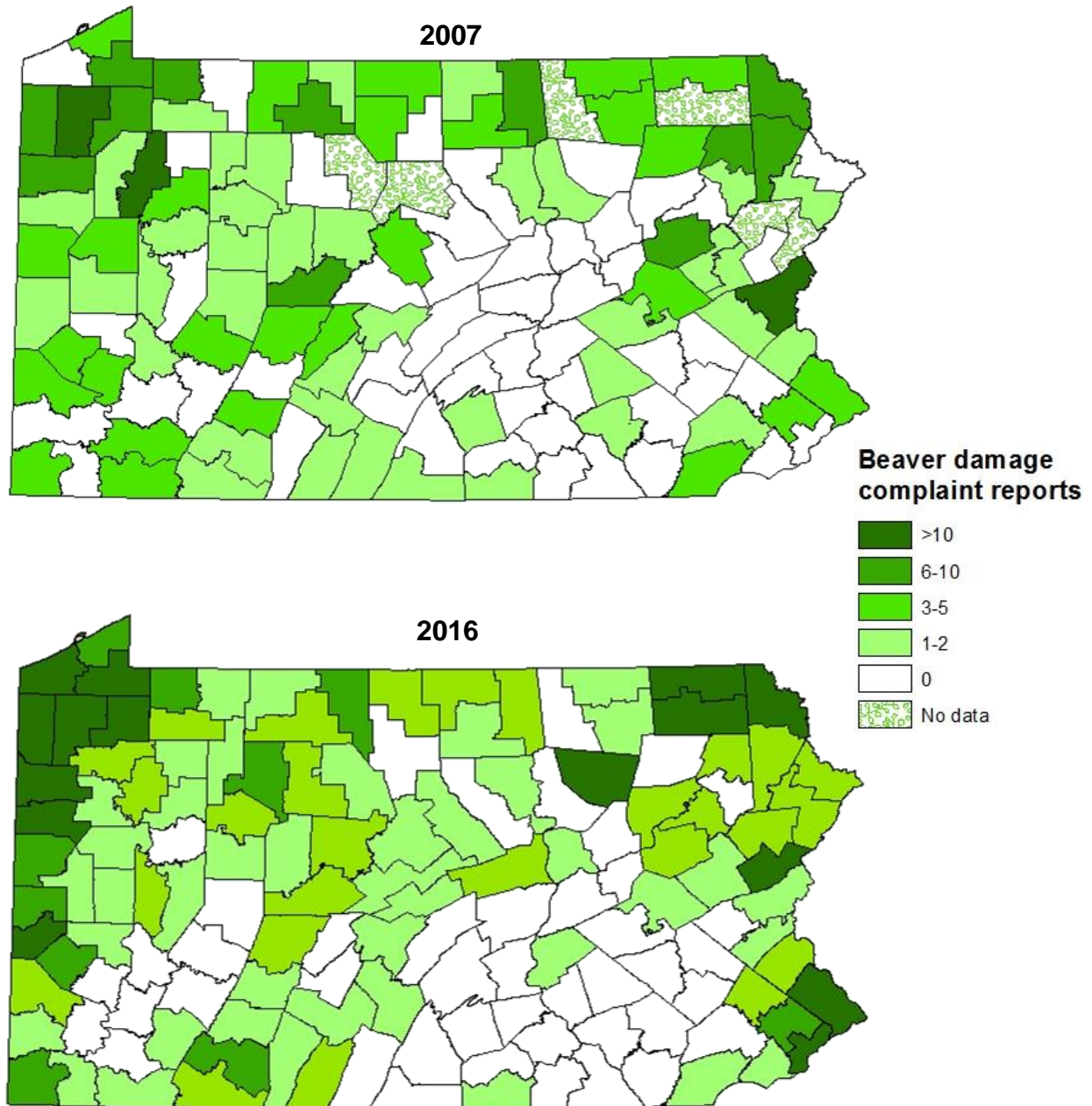


Figure 6. Distribution and frequency of beaver complaints reported to Wildlife Conservation Officers during 2007 and 2016.

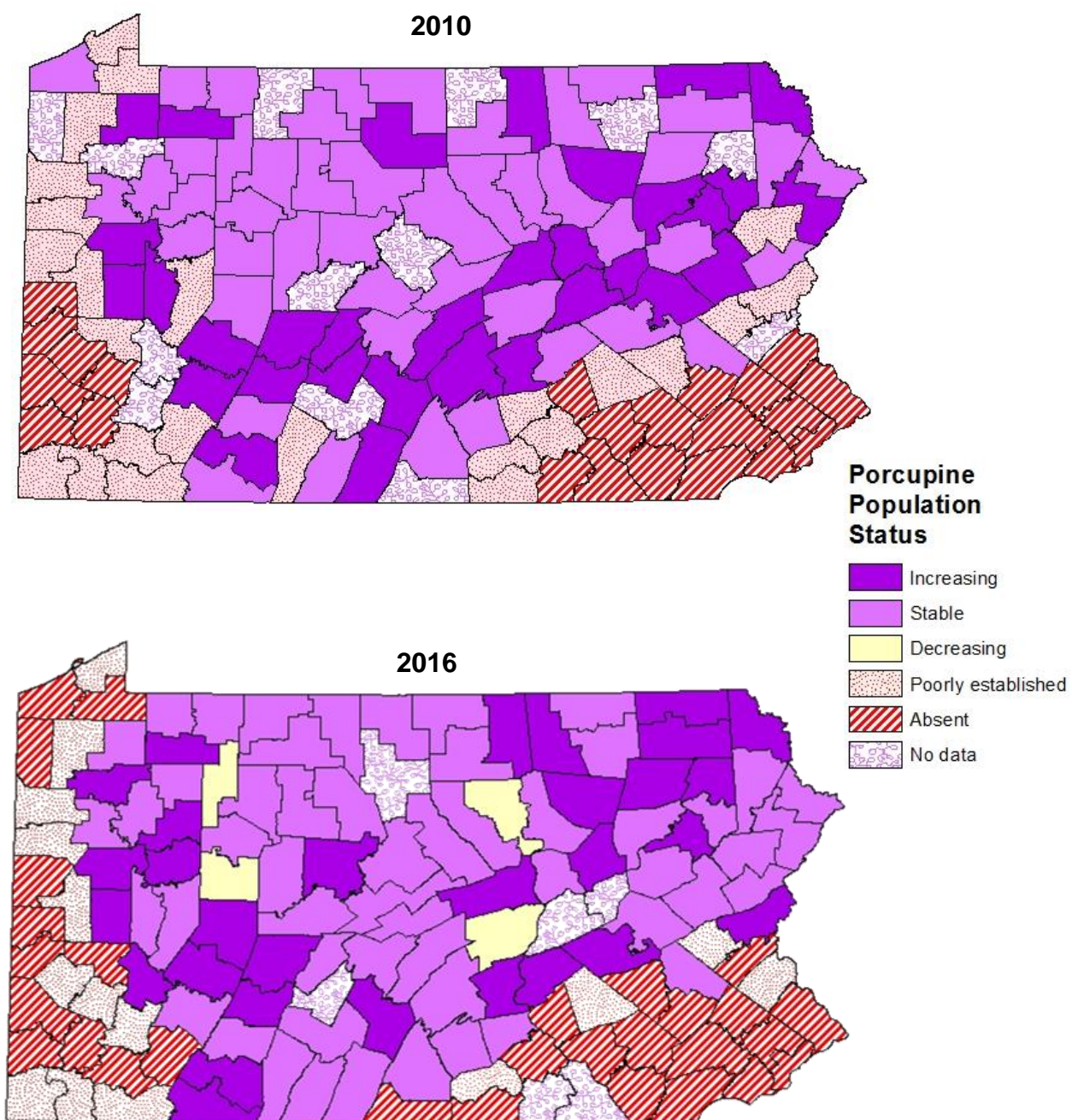


Figure 7. Porcupine population status based on Wildlife Conservation Officer observations during 2010 and 2016.

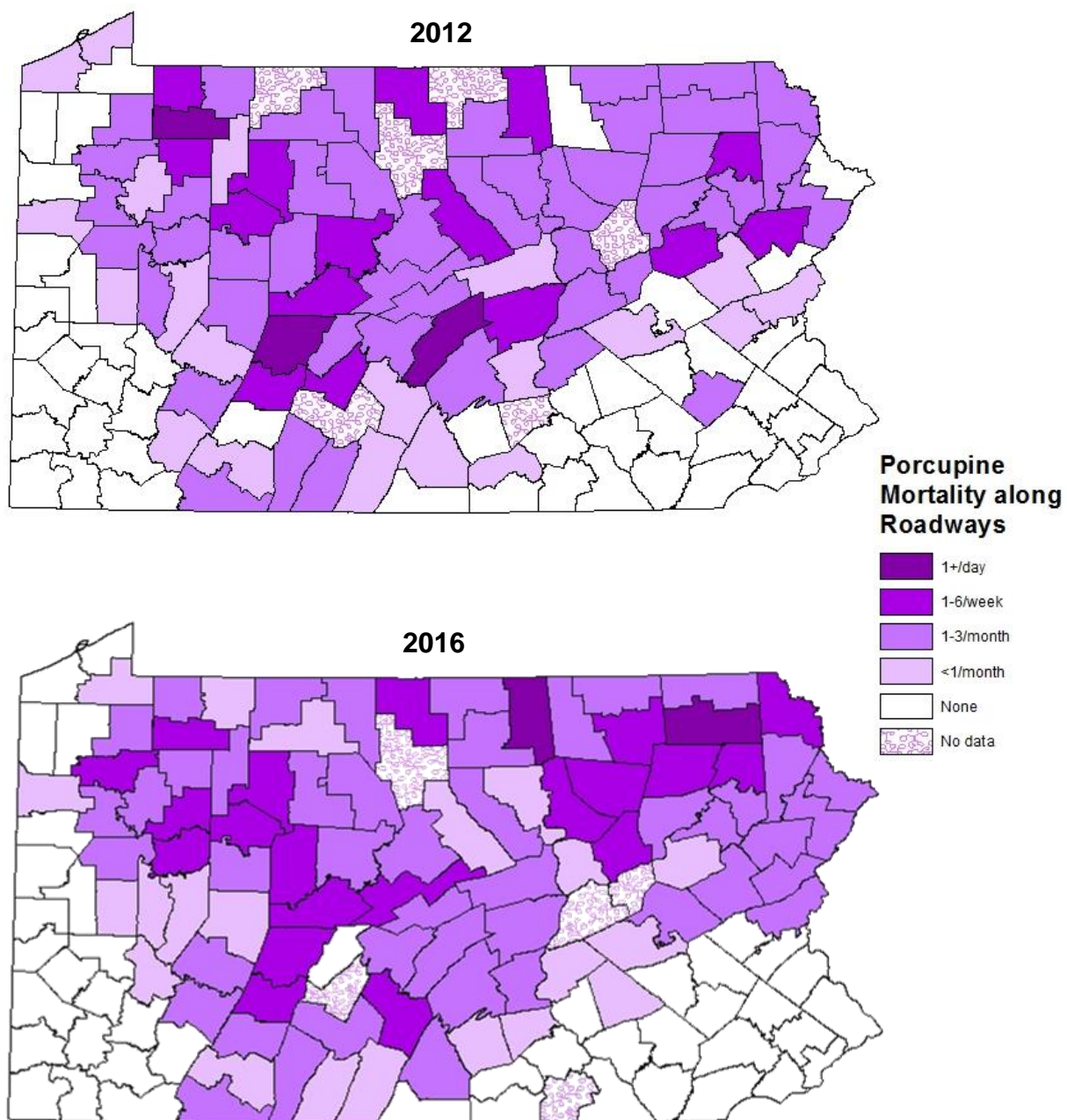


Figure 8. Wildlife Conservation Officer rates of porcupine mortality observation along roadways during 2012 and 2016.