

**PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
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TITLE: Bobcat Research/Management

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TITLE: Bobcat Harvest Management

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ABSTRACT During April 2001, the Pennsylvania Game Commission Board of Commissioners approved a highly regulated bobcat hunting and trapping season in areas throughout Northcentral and Northeastern regions. The allowable harvest area was subsequently expanded during later years to include Wildlife Management Units (WMUs) in the Southcentral and Southwestern regions. Bobcats are currently managed by harvest in approximately 28,528 mi² of land area open to bobcat hunting and trapping. Whereas limited permit allocations had been used to regulate harvest, current regulations and season structure provide bobcat trapping and hunting opportunities to a greater number of furtakers by limiting harvest pressure using 23 day independent hunting and trapping seasons. During 2016, a total of 16,247 permits were purchased by furtakers using the point of sale system. Hunters and trappers reported 844 bobcat harvests from within all WMUs that were open to harvest. United States Fish and Wildlife Service Convention on International Trade in Endangered Species tags were provided to all hunters and trappers who reported a bobcat harvest. A staff recommendation for 2017-2018 bobcat season is provided. This recommendation involves the continued use of season length rather than limited permits to manage the bobcat harvest.

OBJECTIVES

1. To administer, facilitate, and evaluate the use of season length and bobcat permits to sustainably manage bobcat populations.
2. To monitor bobcat harvest trends and harvest effort using hunter and trapper surveys.
3. To provide export tags and collect demographic info from harvested bobcats.

INTRODUCTION

Bobcats were considered vermin in Pennsylvania during the early 1900s, and during 1916 to 1937, greater than 7,000 bobcats were killed for bounty in Pennsylvania. The bounty on bobcats was removed in 1937, but populations remained unprotected until the Pennsylvania Game Commission classified the bobcat as a "game animal" in 1970 to allow populations to expand. During 1970-1999 the Pennsylvania Game Commission conducted field research to better understand factors affecting bobcat density and distribution and to monitor changes in Pennsylvania's bobcat population. Surveys of Wildlife Conservation Officers, reports of incidental captures by trappers, and data collected from vehicle-caused bobcat mortalities have been used annually to monitor the distribution of established bobcat populations and to assess bobcat population trends (Lovallo 2000).

During 1986-1995, the Pennsylvania Game Commission completed field studies designed to estimate habitat selection and home range use by radiotelemetry equipped bobcats (Lovallo et al. 2000). Results from these studies were used to model habitat requirements and to predict the statewide distribution of suitable habitat conditions. This approach was based on radiotelemetry-determined bobcat locations, remotely sensed land cover and physiographic data, multivariate modeling techniques, and used a geographic information system to determine the amounts and spatial distribution of suitable habitat conditions. Based on these analyses, the Pennsylvania Game Commission conservatively estimated Pennsylvania's bobcat population in 1999 to be greater than 3,000 adult resident animals. Subsequent analyses and field surveys suggest that Pennsylvania's statewide population likely exceeds these previous estimates.

During 2000, the Pennsylvania Game Commission completed a bobcat management plan that described potential impacts of regulated harvest on Pennsylvania's bobcat population. The Pennsylvania Game Commission Furbearer Section developed a population model to project population growth and to assess the potential impact of regulated harvest on sustainable population growth (Lovallo 2000). Based on these analyses, during April 2000 the Pennsylvania Game Commission Board of Commissioners approved a highly regulated hunting and trapping season for bobcats in Pennsylvania. The Pennsylvania Game Commission initiated a permit-based quota system to regulate the harvest of bobcats by hunters and trappers in the Commonwealth. Hunters and trappers were required to purchase a Pennsylvania furtaker's license or a combination license prior to submitting a completed permit application and a non-refundable \$5.00 application fee. The Pennsylvania Game Commission subsequently applied to The Office of Management Authority of the U.S. Fish and Wildlife Service (USFWS) to obtain Convention on International Trade in Endangered Species (CITES) multi-year export status for bobcats harvested in Pennsylvania.

During 2003, the Pennsylvania Game Commission received multi-year export status for bobcats harvested in Pennsylvania. The Pennsylvania Game Commission's bobcat harvest objectives are consistent with the current bobcat management goal: To maintain, conserve, and promote sustainable bobcat populations in regions of Pennsylvania that provide suitable habitat conditions and to provide recreational opportunities for consumptive and non-consumptive users of bobcats.

During 2003, The Pennsylvania Game Commission began awarding preference points to individuals who apply for and do not receive a bobcat harvest permit during a given year. This preference point system was designed to incrementally increase the probability of receiving a permit each year that an applicant is unsuccessful. Bobcat permits were awarded using a random computer drawing from an applicant database (maintained by the Bureau of Automated Technology Services). The number of preference points was a multiplier that is applied to the applicants name prior to the drawing. Thus, an applicant with 4 preference

points was placed into the pool 4 times whereas a person applying for the first time goes into the pool once. Under this system, the odds of being selected increased significantly as points were accrued, but new applicants always had some chance of being selected. Applicants who were selected and received a permit were prohibited from applying the following year and their preference points were set back to zero.

Because the selection process was random it was possible that a person could maintain maximum preference points and never be selected to receive a permit. During 2007, Game mammals section staff used the existing applicant database to examine trends and preference point patterns in the bobcat permit database as they related to future modifications to the bobcat permit system. Based on these analyses, it was determined that applicants with 6 preference points could be guaranteed a bobcat permit without significantly impacting the chances of other applicants being selected. This system was used until 2010 when the bobcat season was shortened and the number of bobcat permits was unlimited. The preference point database is being maintained in case it is needed for future drawings, but no points are accrued under the current system.

METHODS

During 2000-2009, bobcat harvest permits were awarded annually through a random public drawing held at the Harrisburg office during early September. During 2010, the bobcat season length was shortened and an unlimited number of permits were made available to licensed furtakers through the point of sale system. Furtakers were limited to 1 permit per season and each permit allowed for the harvest of 1 bobcat from within Wildlife Management Units (WMUs) 2A, 2C, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 4C, 4D, and 4E (combined). The 2013-2014 season consisted of independent hunting and trapping seasons. As during the previous season, an unlimited number of permits were made available to licensed furtakers through the point of sale system and furtakers were limited to 1 permit per season. Each permit allowed for the harvest of 1 bobcat from within WMUs 2A, 2C, 2E, 2F, 2G, 2H, 3A, 3B, 3C, 3D, 4C, 4D, and 4E (combined). Wildlife Management Unit 2H was created by the Pennsylvania Game Commission board of commissioners by extracting 999 miles from the northwest segment of WMU 2G. Successful hunters and trappers were instructed to contact the Pennsylvania Game Commission using the online reporting system, integrated voice recognition (IVR) system, or their nearest Region Office to report bobcat harvests. Region staff subsequently contacted personnel in the Bureau of Wildlife Management to arrange for pelt tagging.

Prior to the development and implementation of WMUs during 2003, Furbearer management zones were used to regulate furtaking seasons and bag limits. During the initial bobcat harvest season in 2000, bobcat hunting and trapping was restricted to Furbearer Management Zones 2 and 3 in Northcentral and northeastern Pennsylvania (Fig. 1). Once the WMU system was implemented, bobcat harvest opportunities were gradually expanded geographically as bobcat populations increased and the harvest management program was refined. Bobcats are currently managed by harvest in approximately 28,528 mi² of land area open to bobcat hunting and trapping (Fig. 2). Wildlife Management Units will be evaluated annually to assess management options and harvest opportunities, and it is unknown whether additional WMUs will be open to bobcat harvest during future seasons.

Harvest density (i.e., the number of bobcats harvested per 100 mi²) was estimated annually within WMUs open for harvest. Changes in harvest density in a specific WMU may occur due to a variety of factors such as changes in bobcat abundance, hunter trapper effort, or hunter/trapper efficiency. Without WMU specific population estimates, actual harvest densities may be difficult to interpret. However,

monitoring changes in harvest density over time provides a measure to evaluate management goals at the WMU scale.

Successful bobcat hunters and trappers are required to attach a temporary carcass tag to their bobcat in the field immediately after harvesting the animal. The tag must remain attached to the bobcat or pelt until a permanent CITES tag is provided. Requirements by USFWS regarding the administration of CITES tags has varied over the last 10 years. Initially, Pennsylvania Game Commission staff were required to physically attach the tag to harvested bobcat pelts. Currently bobcat CITES tags are mailed with attachment instructions to successful permit holders after they report their harvest (Fig. 3).

When possible, bobcat carcasses were examined directly by Pennsylvania Game Commission staff. Upon examination of bobcat carcasses, we determined sex, weight, and measurements (total length and chest girth), and collected a canine tooth from the lower jaw. Due to staff limitation, bobcat carcasses have not been collected consistently during recent seasons. Successful bobcat hunters and were surveyed to assess effort and methods of take as prescribed in the Bobcat Management Plan.

RESULTS

Interest in bobcat hunting and trapping has been increasing during the past decade. During 2000-2009, during which the Pennsylvania Game Commission allocated limited numbers of permits, the number of applicants for bobcat permits increased an average of 14% annually. During 2016, a total of 16,247 permits were purchased by furtakers using the point of sale system.

The total 2016-17 state-wide bobcat harvest was 844. Harvest totals by WMU were: 2A (28), 2C (58), 2E (47), 2F (69), 2G (104), 2H (26), 3A (68), 3B (79), 3C (103), 3D (45), 4A (53), 4C (34), 4D (59), and 4E (41) (Table 1). The number of bobcats harvested per 100 permit holders (5.2 during 2016-2017) has declined since the 2013-14 seasons. Harvest densities during the 2016-17 season were lower in all WMUs, with the exception of WMU 4C, than observed during the previous season (Table 1). The highest harvest density (4.7 bobcats/100mi²) occurred in WMU 3C during 2016. The proportion of the harvest attributed to hunters increased to just over 39% during the 2016-17 season (Table 4). United States Fish and Wildlife Service CITES tags were provided to all hunters and trappers who reported a bobcat harvest.

Bobcat harvests have been reported in every WMU open for harvest every year since the initial hunting and trapping season in 2000. Harvest densities are highly variable among WMUs open to hunting and trapping and have ranged from 0.17 bobcat per 100 mi² to 7.48 bobcats per 100 mi² (Table 3). Increases in harvest densities observed during 2005-2010 were the direct result of increased availability of bobcat permits to hunters and trappers and provide little insight regarding the impact of harvest in those units. Harvest densities observed since 2010 provide some insight regarding population impacts. Since 2010, the number of permit holders has remained relatively constant, and the permit holder success rate has been very consistent. In most WMUs, harvest densities have been stable to increasing during 2010-2015. However, in WMUs where the harvest rate exceeded 6 bobcats per 100 mi² (e.g., WMUs 2G, 3A, and 3B), harvest densities declined during each subsequent season. Further research will be needed to determine factors affecting WMU-specific thresholds relative to bobcat harvest density and potential impacts of harvest at the WMU scale.

Legally licensed bobcat permit holders may use a variety hunting and trapping methods to harvest bobcats during the established seasons. Prior to 2010, an average of 84% (SD=2.5%) of bobcats harvested were taken using trapping methods. Since 2010, when unlimited permits were provided, the proportion of the harvest attributed to hunting has generally increased (Table 4). During the 2016-2017 seasons, greater than 39% of bobcats harvested were taken by hunters. The Pennsylvania Game Commission does not currently have a management goal addressing how the harvest should be partitioned among hunters and trappers. However, this trend suggests that changes to the hunting season structure or timing may have increasingly greater impact on the overall harvest and harvest densities in particular WMUs.

The impact of the recent changes in season structure and corresponding increase in bobcat harvest on bobcat population distribution and abundance are unknown at this time. The indices currently used to monitor populations suggest stabilization or slight declines in bobcat populations. (Lovallo and Hardisky 2014). Bobcats are currently managed by harvest in approximately 28,528 mi² of land area open to bobcat hunting and trapping. Current regulations and season structure provide bobcat trapping and hunting opportunities to a greater number of furtakers by limiting harvest pressure using a much shorter season than used previously. The current season lengths for either hunting or trapping opportunities are 23 days as compared to the 120 day season that was open when numbers of permits were limited.

RECOMMENDATIONS

1. The Game Mammals Section of the Bureau of Wildlife Management recommends that bobcat taking be constrained to a 3 week seasons including a trapping season beginning in mid-December and extending into the first week of January and a hunting season beginning in mid January and ending in early February. Bobcat taking should be extended to all licensed furtakers in possession of a bobcat permit. The number of bobcat permits should be unlimited and the season bag limit should be 1 bobcat within WMUs: 2A, 2C, 2E, 2F, 2G, 2H, 3A, 3B, 3C, 3D, 4C, 4D, and 4E (combined). We believe that this recommendation is consistent with the continued conservative approach that the Pennsylvania Game Commission has taken to provide bobcat harvest opportunities in the Commonwealth. The Pennsylvania Game Commission will continue to use CITES export tags as legal possession tags for harvested bobcats which will be exported for sale or commercial use.

2. Harvest reporting should be mandatory and should utilize all available technologies such as online or automated phone reporting to insure accurate estimates of harvest.

3. Successful bobcat permit holders should be surveyed to assess harvest per unit effort.

4. Because the Pennsylvania Game Commission may revert to limited bobcat permits if harvest is excessive or deemed unsustainable at some point, the preference point system should be maintained and applicants should retain their current preference point status.

LITERATURE CITED

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Table 1. Harvest density (bobcats harvested/100 mi²) by Wildlife Management Unit (WMU) during the 2016-2017 bobcat harvest season.

WMU	2016-2017 Bobcat Harvest	Harvest Density (Bobcats/100mi²)	Annual Change In Harvest Density (Bobcats/100mi²)
2A	28	1.5	-1.6
2C	58	1.8	-0.4
2E	47	3.7	-2.1
2F	69	2.9	-0.8
2G	104	3.3	-0.7
2Ha	26	2.6	-0.2
3A	68	4.4	-0.5
3B	79	3.5	-0.7
3C	103	4.7	-1.4
3D	45	2.0	-0.6
4A	53	3.0	-0.2
4C	34	1.8	0.3
4D	89	3.2	-0.5
4E	41	2.3	-0.1

^a WMU 2H was newly created in 2013 by extracting 999 sq. mi. from WMU 2G.

Table 2. Bobcat permit allocations and adjusted success rates, 2000-2014.

Season	Permits Issued	Bobcats Harvested	Adj. Success Rate	Harvest/100 permits
2000-2001	290	58	22%	20.0
2001-2002	520	146	32%	28.1
2002-2003	545	135	28%	24.8
2003-2004	570	140	29%	24.6
2004-2005	615	196	35%	31.9
2005-2006	615	221	40%	35.9
2006-2007	720	258	42%	35.8
2007-2008	1,010	356	39%	35.3
2008-2009	1,443	487	40%	33.8
2009-2010	1,783	506	34%	28.4
2010-2011 ^a	15,963	1,137	NA ^b	7.1
2011-2012 ^a	13,134	969	NA ^b	7.3
2012-2013 ^a	15,244	1,056	NA ^b	6.9
2013-2014 ^a	16,687	1,164	NA ^b	6.9
2014-2015 ^a	17,134	1,132	NA ^b	6.6
2015-2016 ^a	16,778	1,034	NA ^b	6.2
2016-2017 ^a	16,247	844	NA ^b	5.2

^a Unlimited permits, 23 day season.

^b No method in place to adjust for non-participation to estimate success rate.

Table 3. Bobcat harvest density by Wildlife Management Unit WMU (2005-2016). Bobcat Permits were limited by a lottery system until 2010.

WMU	Harvest Density (Bobcats/100mi ²)											
	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
2A	NA	NA	0.25	0.17	0.27	0.72	1.03	1.80	2.86	3.08	3.11	1.52
2C	0.51	0.54	0.78	1.16	0.64	1.76	1.57	2.42	2.00	2.06	2.20	1.85
2E	0.7	1.01	1.63	1.09	1.25	4.01	4.11	4.65	4.10	4.73	5.72	3.73
2F	0.65	0.77	1.26	1.67	2.26	3.66	4.17	4.37	4.73	3.29	3.65	2.87
2G	1.73	2.04	3.05	3.03	3.39	6.43	5.10	4.52	5.49	4.82	3.03	3.30
2H ^a	NA	NA	NA	NA	NA	NA	NA	NA	4.30	4.70	2.80	2.60
3A	1.78	1.91	2.17	3.68	3.74	7.48	7.15	5.70	6.94	5.24	4.92	4.44
3B	2.45	2.67	3.15	5.38	4.22	7.09	5.86	5.46	5.38	6.08	4.22	3.46
3C	0.69	1.01	1.24	1.94	2.06	5.71	3.88	4.43	4.99	6.41	6.09	4.72
3D	0.49	0.58	0.62	1.02	0.77	2.20	1.81	1.84	1.99	2.58	2.63	2.02
4A	NA	NA	NA	NA	0.63	2.61	1.67	2.44	4.47	3.06	3.25	2.98
4C	NA	NA	NA	NA	NA	NA	NA	2.52	1.77	2.38	1.53	1.82
4D	NA	NA	NA	0.54	0.65	3.87	2.81	3.80	4.07	4.03	3.67	3.23
4E	NA	NA	NA	NA	1.37	3.29	3.40	2.82	3.52	2.67	2.45	2.29

^a WMU 2H was newly created in 2013 by extracting 999 sq. mi. from WMU 2G.

Table 4. Methods of take for bobcats harvested in Pennsylvania during 2000-2012.

Season	Total Harvest	% Trapped	% Hunted
2000-2001	58	77.6	22.4
2001-2002	146	83.6	16.4
2002-2003	135	81.2	18.8
2003-2004	140	82.0	18.0
2004-2005	196	87.6	12.4
2005-2006	221	87.7	12.3
2006-2007	258	85.4	14.6
2007-2008	356	82.7	17.3
2008-2009	487	82.6	17.4
2009-2010	1,136	77.9	22.1
2011-2012	969	75.2	24.8
2012-2013	1,056	64.9	35.1
2013-2014	1,164	71.0	29.0
2014-2015	1,132	74.0	26.0
2015-2016	1,034	70.4	29.6
2016-2017	844	60.7	39.3

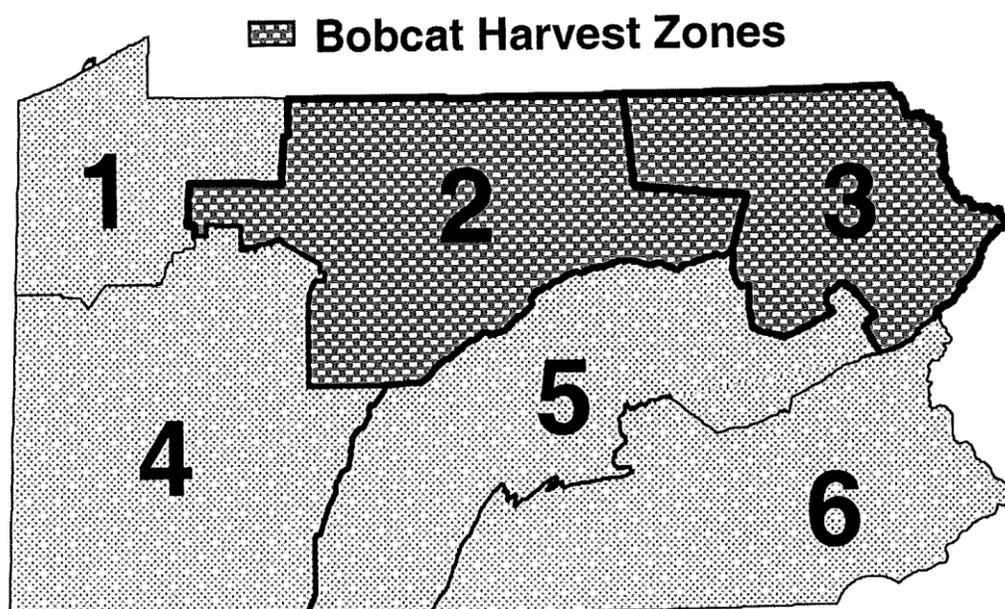


Figure 1. Furbearer management zones open to bobcat harvest during the initial 2000-2002 bobcat hunting and trapping seasons.

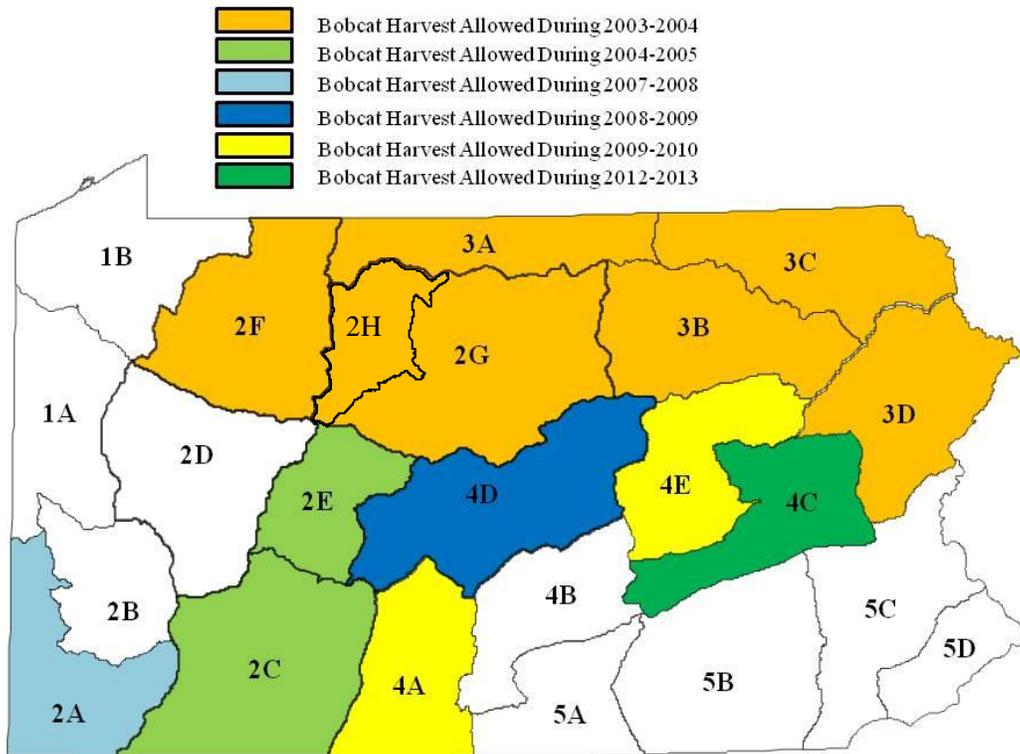


Figure 2. Expansion of bobcat harvest opportunities during 2000-2013.

Congratulations on your successful bobcat season!!!

Enclosed is a 2012 Convention on International Trade in Endangered Species (CITES) tag for your bobcat. To fulfill bobcat tagging requirements in the state's furbearer regulations, please attach this CITES tag through the eye and mouth of your bobcat pelt and lock the tag securely. This tag must stay with your bobcat pelt until it is mounted, tanned, made into a commercial fur or prepared for consumption.



Figure 3. Instructions provided to permit holders for attaching CITES tags to harvested bobcats.