



# ***Pennsylvania Game Commission***

***Status and Management of Bobcat (*Lynx Rufus*) in Pennsylvania***

## **Status and Management of Bobcat (*Lynx Rufus*) in Pennsylvania**

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## Section I: Introduction

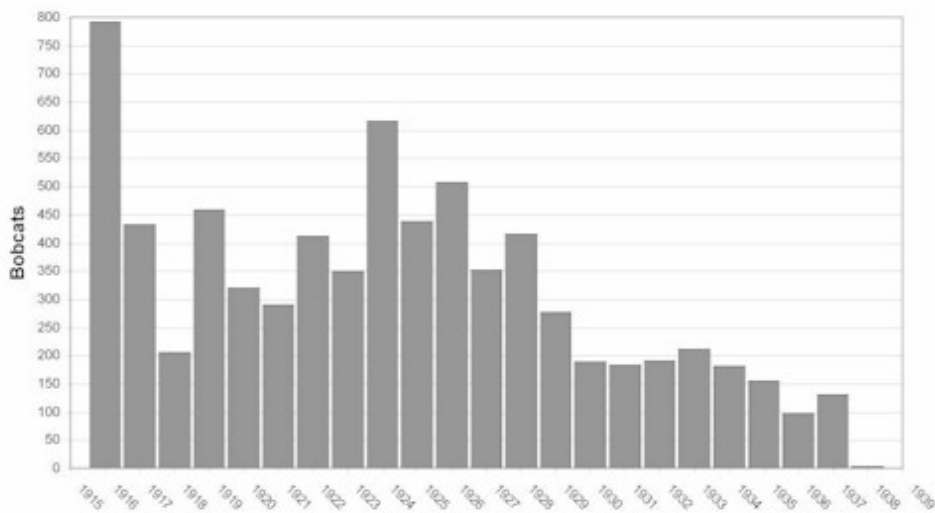
### Taxonomy and Morphology

There are 12 recognized subspecies of bobcat (*Lynx rufus*) in North and Central America; *L. r. rufus*, the subspecies occurring in Pennsylvania, is significantly larger than those in southern and southwestern states (Hall 1981). Bobcats, particularly northern subspecies, exhibit sex-related size dimorphism. Males are typically 40-60% larger than females. The average weight of adult males in Pennsylvania is 24 lbs. (SD = 5.3), whereas the average weight of adult females is 18 lbs. (SD = 4.1). Total body length of adults ranges from 32-37 inches for males and from 28-33 inches for females. Bobcat fur is dense and relatively short, and there is considerable color variation among regions. The base coloration of the fur varies from light gray to a reddish brown. Pelage often exhibits a dorsal band of dark guard hairs and the extent of black spotting in the fur varies considerably. A ruff of fur is evident on the face which is frequently streaked with black bars. Ears are tipped with short black tufts and have prominent black spots on their back. The tail is often barred and is usually 5-7 inches in length. The skull of the bobcat is most similar to that of the Canadian lynx (*Lynx canadensis*); both lack a second upper premolar and have only 28 teeth (dental formula: I 3/3, C 1/1, P2/2, M1/1 X 2 = 28).

### Historical Perspective

Public attitudes concerning predators and the management of the bobcat in Pennsylvania have changed dramatically during the last century. Bobcats, and other predators, were considered vermin in the 1700s and 1800s. As early as 1819 a \$1 bounty was established to encourage the killing of bobcats in the Commonwealth. Greater than 7,000 bobcats were killed for bounty during 1916-1937; the majority of these were reported during the 1920's (Fig.1). A realization that bounties were ineffective for controlling predator populations resulted in the removal or reduction of bounties on many predators. The bounty was removed from bobcats in 1937, but they remained unprotected and were widely persecuted until classified as a game animal in 1970. This reclassification empowered PGC to set regulations to manage bobcat populations. There has been no legal harvest of bobcats in Pennsylvania since 1970.

Figure 1



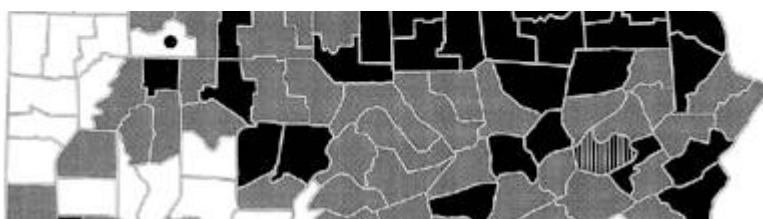
Number of bobcats reported for bounty in Pennsylvania during 1916 - 1938

The harvest of bobcats by hunters and trappers was the focus of intense biological and political debate throughout the United States during the 1970s and early 1980s. The Endangered Species Conservation Act prohibited the import of fur from endangered cats in the late 1960s. This restriction resulted in increased harvest pressure on non-threatened spotted cats, such as bobcat and lynx, and the harvest of these species rose dramatically throughout the United States and Canada (Anderson 1987). In 1975, The United States joined the Convention on International Trade in Endangered Species (CITES) to protect internationally endangered felids. The bobcat was listed in Appendix II, which required member countries to prove that harvest would not be detrimental to established bobcat populations prior to allowing the export of pelts. Although export bans were lifted by the Endangered Species Scientific Authority in 1978, a CITES permit is currently required to export bobcat pelts.

### Distribution

The geographic range of the bobcat includes most of the contiguous United States, with the exception of major agricultural regions of the Midwest, and Mexico (Anderson 1987) ([Fig. 2](#)). Pennsylvania's bobcat population is important regionally as it provides a critical link between established populations in New York to those of West Virginia, Virginia, and southern Ohio. Recent reports of bobcat abundance and distribution in Pennsylvania suggest that established populations extend throughout the northern, central, and southwest regions and that the range of established populations has increased since 1970 (Giles 1986, Merrit 1987, Lovallo 1999) ([Fig 3](#)).

**Figure 2**



**Figure 3**

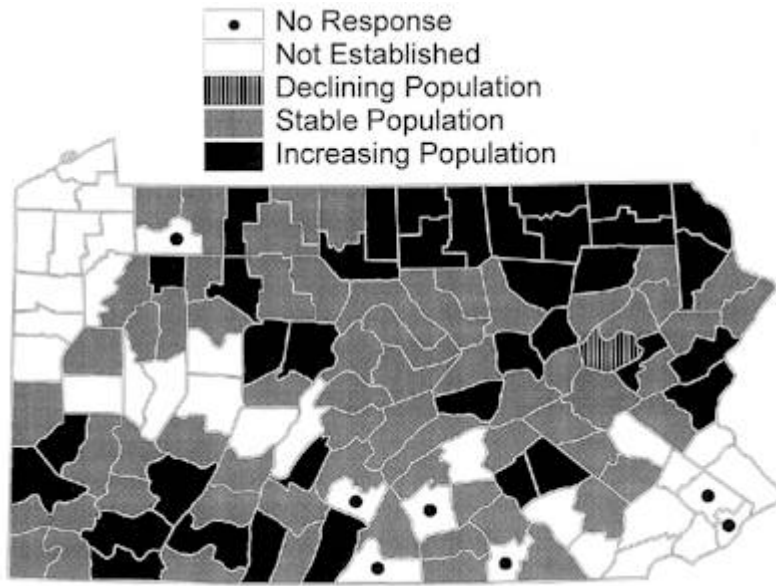


Figure 3 WCO Estimates (1998) of bobcat distribution and populations trends

## Section II: Bobcat Behavior

### Bobcat-Habitat Relationships

Bobcat-habitat Relationships Bobcats occupy a wide range of habitats throughout their range and are often referred to as "habitat generalists." They prefer bottomland hardwoods in the Southeast, deserts in the Southwest, rocky bluffs in the West and lower Midwest, and conifer forests in the North (Lovallo and Anderson 1995). The Pennsylvania Game Commission recently completed field research studies to estimate bobcat habitat selection and home range use by radio-telemetry equipped bobcats. Sixty-one bobcats (27 female, 34 male) were captured, radio-tagged, and monitored in northcentral Pennsylvania during 1986-1995.

Analyses of bobcat habitat selection revealed intersexual differences in habitat selection; males used a wider range of habitat conditions than females (Lovallo 1999). Both males and females selected stands of broadleaf deciduous forest (e.g., *Acer saccharum*, *Betula alleghaniensis*, *Fagus grandifolia*, *Tilia americana*, *Fraxinus americana*) and mixed conifer forest (*Pinus strobus*, *Tsuga canadensis*) during summer and winter periods. Radio-tagged bobcats frequently used forested areas with a dense understory of mountain laurel (*Kalmia latifolia*). Female bobcats avoided herbaceous openings, agricultural lands, and unvegetated areas during both summer and winter. Male bobcats avoided herbaceous areas during summer and avoided herbaceous openings and unvegetated areas during winter. Early successional areas (e.g., old field habitats and regenerating clearcuts) were used frequently by several radio-tagged individuals, but the availability of the habitats was limited within the study areas.

Radio-tagged bobcats exhibited strong aspect and slope associations. Both males and females were frequently located on seven-to eight-degree slopes on eastern to southeastern exposures. Other researchers have detected aspect and slope associations by bobcats and have correlated physiographic associations to the density of understory vegetation and prey availability (Litvaitis et al. 1986). Hamilton (1982) found that bobcats in Missouri preferred rocky bluffs and McCord (1974) noted that rocky cliffs were important landscape features in Massachusetts. The physiographic associations exhibited by bobcats in Pennsylvania may have been attributed to prey density or the availability of suitable den sites.

### Statewide Habitat Distribution

The statewide distribution of suitable bobcat habitat was estimated through a cooperative research project between the Pennsylvania Cooperative Fish and Wildlife Research Unit (U.S.G.S.), The Pennsylvania State University, and the Pennsylvania Game Commission. This approach was based on radio-telemetry determined bobcat locations, remotely-sensed land cover and physiographic data, and multivariate modeling techniques, and used a geographic information system to determine the amounts and spatial distribution of suitable habitat conditions throughout Pennsylvania (Fig. 4) (Lovallo 1999).



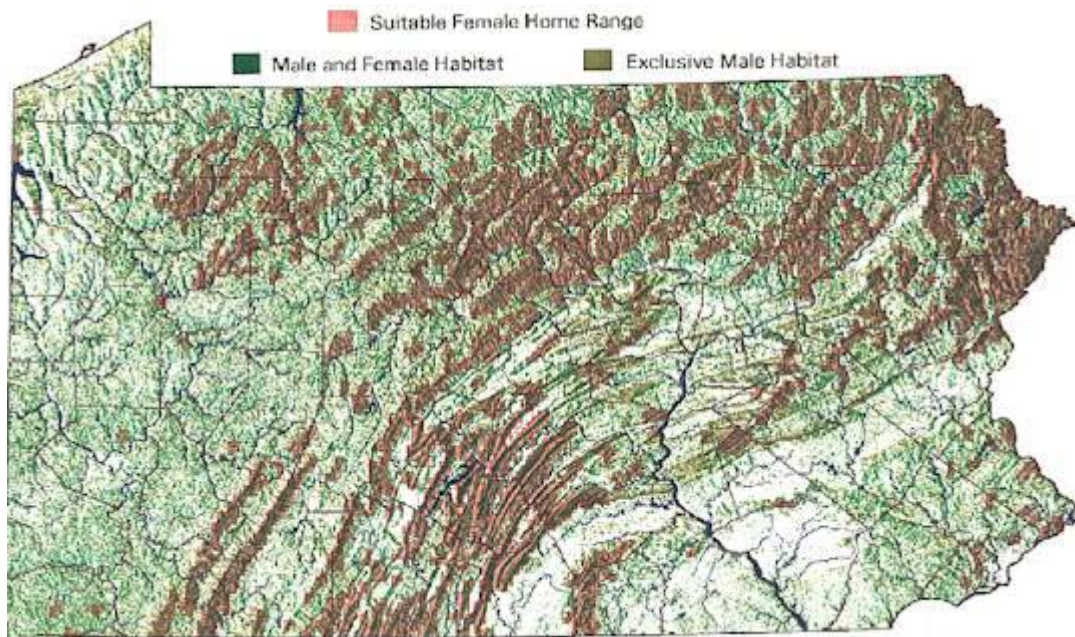


Figure 4 Distribution of sex-specific habitat suitability predictions and optimal home range conditions for female bobcats (Lovallo 1999)

Habitat suitability models identified 18,564 km<sup>2</sup> (15.8 percent) of Pennsylvania as suitable for both male and female bobcats, whereas 39,067 km<sup>2</sup> (33.3 percent) was suitable for males but not for females. Female habitat was a subset of a broader spectrum of male habitat; only 2,791 km<sup>2</sup> (2.4 percent) of exclusive female habitat was identified. Total area of 56,875 km<sup>2</sup> (48.5 percent) of Pennsylvania was classified as unsuitable habitat for either male or female bobcats.

Total areas classified as suitable female habitat within each county ranged from 29.5 km<sup>2</sup> in Montour Co., to greater than 737 km<sup>2</sup> in Lycoming Co. (Table 1). Other counties containing large areas (greater than 600 km<sup>2</sup>) of suitable female habitat included: Bradford, Tioga, Blair, Bedford, and Potter.

### Home Range Size

Home range size of both male and female bobcats varied with the availability and spatial distribution of suitable habitat components (selected cover-types and favorable physiographic conditions). Male home range size (median estimate = 42.2 km<sup>2</sup>) was 2.5 times larger than that of females (median estimate = 17.2 km<sup>2</sup>). Home range size was highly variable; several males occupied home ranges larger than 300 km<sup>2</sup> and several females occupied home ranges larger than 100 km<sup>2</sup>. Home range estimates were comparable to reports from other northeastern states. Fox (1982) reported male home ranges varied from 36 km<sup>2</sup> to 326 km<sup>2</sup> in New York, and estimates of male bobcat home range size in Massachusetts ranged from 71 km<sup>2</sup> to 112 km<sup>2</sup> (Berendzen 1984, Litvaitis et al. 1986). Major (1983) reported female home ranges of 28-33 km<sup>2</sup> in Maine.

Analyses of home range size relative to habitat availability revealed that home range size, particularly for females, was inversely correlated ( $r = -0.67$ ,  $P = 0.004$ ) with percent composition of areas classified as suitable habitat. Percent suitable habitat ranged from 17.9 percent to 46.4 percent within female home ranges but home range size of females with less than 25 percent composition of suitable habitat was highly variable. For example, three female home ranges contained less than 25 percent suitable habitat and were greater than 100 km<sup>2</sup>. We used these relationships to evaluate home range potentials for female bobcats throughout the Commonwealth and to identify optimum habitat configurations for female bobcats (Fig. 4). Estimates of home range size relative to habitat composition relate to bobcat density in that females typically maintain home



males and females (Gittleman 1989).

**Table 1 Predicted area (km<sup>2</sup>) of suitable habitat for male and female bobcats and percent composition of female habitat within each of 67 counties.**

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0.000	1,000.00	2000.00	3000.00	4000.00	5000.00	6000.00	7000.00
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Butler	1,168.65	602.73	258.58	29.07	287.65	(14.0)
Allegheny	1,086.22	556.83	259.84	24.13	283.96	(14.7)
Armstrong	930.18	513.30	234.35	44.54	278.89	(16.2)
Jefferson	848.83	571.69	218.23	57.58	275.80	(16.3)
Clarion	871.69	426.72	214.58	60.02	274.60	(17.5)
Cambria	946.64	576.62	241.82	31.25	273.07	(15.2)
Forest	360.64	487.66	223.86	47.07	270.93	(24.2)
Sullivan	384.19	525.14	234.45	27.41	261.85	(22.4)
Wyoming	367.04	427.03	233.98	20.92	254.90	(24.3)
Mifflin	527.22	298.01	221.80	24.53	246.32	(23.0)
Berks	1,396.59	598.10	225.99	20.32	246.31	(11.0)
Lackawanna	548.44	409.86	218.27	27.64	245.91	(20.4)
Adams	831.07	274.43	181.31	64.02	245.33	(18.2)
Cameron	301.49	488.31	230.04	15.13	245.18	(23.7)
Chester	1,142.94	579.25	225.83	18.47	244.30	(12.4)
York	1,740.36	400.72	169.98	51.58	221.56	(9.4)
Juniata	468.99	329.70	190.39	29.76	220.15	(21.6)
Montgomery	655.35	413.80	146.67	45.94	192.61	(15.3)
Columbia	640.46	443.51	157.37	26.68	184.04	(14.5)
Erie	1,293.78	595.76	156.09	25.99	182.08	(8.8)
Mercer	1,128.50	460.18	161.97	15.71	177.68	(10.1)
Carbon	369.96	460.71	146.77	28.77	175.54	(17.4)
Beaver	620.14	362.20	153.26	15.03	168.29	(14.6)
Cumberland	945.30	318.61	125.38	36.98	162.37	(11.4)
Northampton	608.63	221.41	127.63	18.28	145.91	(15.0)
Dauphin	851.20	450.80	107.29	27.62	134.91	(9.4)
Union	318.99	373.49	116.71	17.43	134.14	(16.2)
Snyder	430.71	304.68	99.37	26.23	125.59	(14.6)
Lancaster	2,161.29	263.03	85.86	35.02	120.89	(4.7)
Northumberland	686.76	435.12	81.09	28.07	109.16	(8.9)
Lehigh	595.17	204.49	90.76	11.49	102.25	(11.3)
Lawrence	628.94	210.49	86.20	13.96	100.16	(10.7)
Delaware	246.61	151.88	64.27	30.03	94.31	(19.1)
Lebanon	675.78	175.96	78.24	10.19	88.42	(9.4)
Philadelphia	284.46	46.60	15.40	22.68	38.08	(10.3)
Montour	221.62	91.47	24.75	4.71	29.46	(8.6)

<sup>a</sup> Percent of county area

### Section III: Bobcat Demographics

#### Population Structure

The sex ratio (male:female) at birth is usually 1:1. The sex ratio of bobcats collected in Pennsylvania due to bobcat-vehicle mortalities during 1986-1995 was 1:1, whereas sex ratio estimates from harvested bobcat populations typically show a preponderance of males (Anderson 1987). Sex ratios may be affected by density, but evidence to support this is lacking.

The age distribution of the bobcat population is important to monitor as it reflects relative levels of exploitation. The proportion of yearlings (less than 2 years old) in a bobcat population is closely related to the intensity of harvest and may result from high reproduction or high adult mortality (Anderson 1987). In harvested populations, the percentage of yearlings in the harvest sample generally exceeds 50% and may reach 76% in areas of relatively low bobcat density and high harvest pressure (Fredrickson and Rice 1979). Lembeck and Gould (1979) estimated 16% yearling composition in an unharvested population in California, compared to 43% yearlings in a harvested population occurring in similar habitats. Analyses of the age distribution of Pennsylvania's bobcat population suggest that less than 20% of the bobcat population consists of yearlings (Fig. 5). Age distributions for males and females were similar. This age distribution data and the occurrence of older individuals (e.g., greater than 10 years old) in the population is consistent with that of an unharvested population.

Figure 5

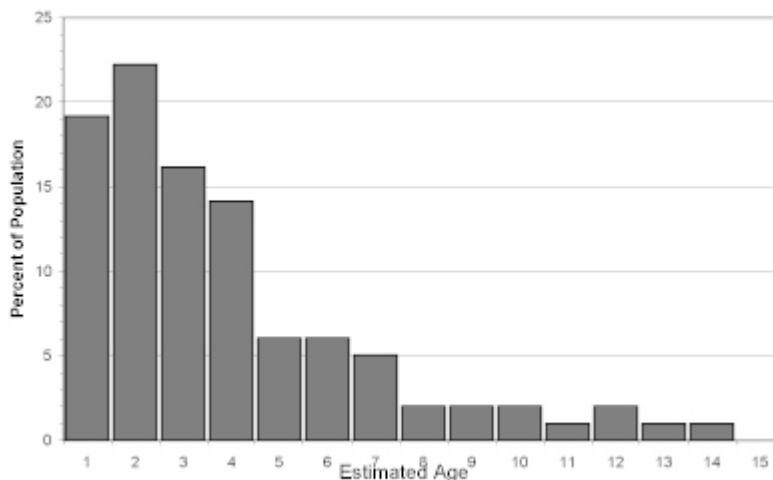


Figure 5 Estimated age distribution of bobcats in Pennsylvania (1985-1995)

#### Mortality

The primary cause of bobcat mortality, in both harvested and unharvested populations, is human-related. Predation, from coyotes (*Canis latrans*), wolves (*Lupus lupus*), and mountain lions (*Felis concolor*) has been reported, but is rare. Instances of cannibalism have also been reported (Gashwiler et al. 1961, Litvaitis 1984), and several studies have observed bobcat mortalities resulting from porcupine quills (Fuller et al. 1985). Bobcats are susceptible to a variety of diseases including rabies and panleukopenia (feline distemper). Fox (1983) reported that panleukopenia may be a significant mortality factor for bobcats in southern New York. Although cases of rabies and panleukopenia have been documented in Pennsylvania, the impact of disease on the bobcat population is unknown at this time. Vehicle collisions are thought to be a primary source of bobcat

monitoring).

## Survival

Annual estimates of adult survival range from 50%-70% in harvested populations. Adult survival has been estimated as 67% in Wyoming, 60% in South Dakota, 55-66% in Oklahoma, and 61% in Minnesota (Anderson 1987). Because survival estimates are often calculated from harvest-related data, there are very few reports from unharvested populations. However, Bailey (1974) reported 97% annual survival in an unharvested population in Idaho. Survival is generally lowest during winter periods (concurrent with trapping and hunting seasons), and late winter and early spring are most likely periods of starvation because prey populations are lowest (Petrauborg and Gunvalson 1962). The majority of vehicle-caused bobcat mortality in Pennsylvania occurs during September through November (Fig. 6).

Figure 6

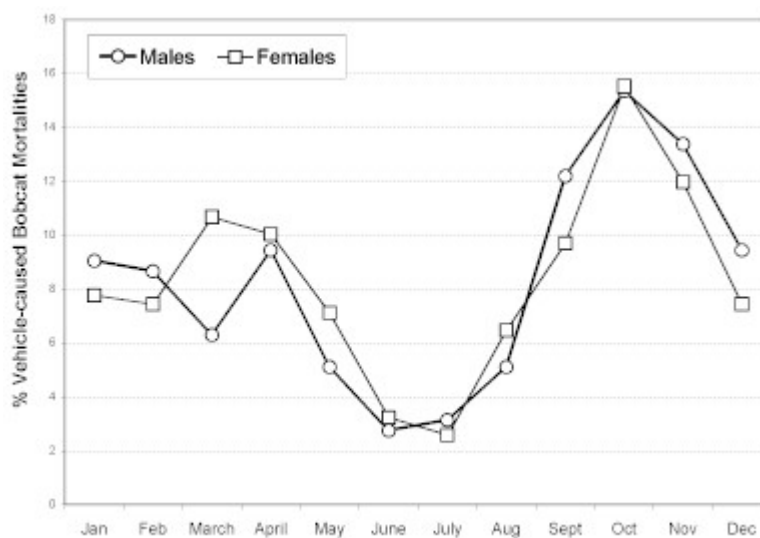


Figure 6 Timing of vehicle-caused bobcat mortality in Pennsylvania ( $n=574$ )

Juvenile survival is generally lower than that of adults. Hoppe (1979) estimated 33% survival of juveniles in Michigan. Juvenile survival can be estimated from harvest data, but Bailey (1981) suggested that juveniles are generally underrepresented in the harvest. Harvest data indicates that juvenile survival decreases as the trapping season progresses due to increasing independence from maternal care (Blankenship 1979, Parker and Smith 1983). Juvenile survival has been linked to prey abundance in some Western populations; e.g., a decline in rabbit populations in Idaho resulted in high kitten mortality (Bailey 1974).

There is evidence of sex-related differences in survival in harvested populations; male survival is lower than females, particularly during the first several years. Males may be more susceptible to human-related mortality because of their extensive movements and larger home ranges. Knick et al. (1990) found that the proportion of males in the harvest increased throughout the harvest season and attributed this to increased movement by males prior to breeding. The 1:1 sex ratio observed for vehicle-caused bobcat mortalities in Pennsylvania does not suggest that sex-specific differential mortality is occurring.

Age-related differences in bobcat survival have also been reported in harvested populations. In harvested populations, annual survival rates generally increase after age one and continue to increase or remain constant until age 4 or 5 when survival decreases. Age distribution data from

when survival increases to greater than 80% and remains constant ([Fig. 5](#)).

### **Reproductive Biology**

Bobcats exhibit seasonal peaks in breeding and parturition, but may have young at any month of the year. Peak breeding generally occurs during February and March, although breeding occurs earlier and lasts longer in southern latitudes (Gashwiler et al. 1961, Fritts 1973, Crowe 1975). Bobcats ovulate spontaneously and may cycle through a maximum of three estrous periods per season. Gestation averages 62 days. Peak parturition is usually May and June, but litters as late as September have been reported (Fritts and Sealander 1978). Average litter size for adults ranges from 2.5 to 3.9 (McCord and Cordoza 1982). Females are physiologically capable of breeding at 9 months, but younger females generally have smaller litters (Crowe 1975, Fritts and Sealander 1978). Multiple litters have been reported but are rare (Winegarner and Winegarner 1982). Yearling pregnancy rates are generally lower than those of adults which range from 73-90% (Rolley 1985, Parker and Smith 1983).

## Section IV: Bobcat Management

During 1970-1999, bobcat management in Pennsylvania has consisted of monitoring the range and expansion of established populations. There has been no legal harvest of bobcats during this period. Under current regulations (Title 58), a tag from the Pennsylvania Game Commission is required to possess a bobcat pelt, regardless of its source (e.g., legal harvest in other state, road-kill). Annual management, research, and harvest recommendations should be consistent with the PGC bobcat management goal.

**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.*

This management goal requires annual assessment and refinement of both population and harvest objectives.

**Population Objective:** *To maintain stable or increasing bobcat populations in regions of Pennsylvania that provide suitable habitat conditions and that currently support established bobcat populations.*

### STEPS:

- Continue annual surveys to assess bobcat abundance and the range of established bobcat populations.
- Implement additional, independent, indices of bobcat abundance.
- Implement field research projects to refine parameter estimates used in the bobcat population model.

**Harvest Management Objective:** *To allow regulated harvest of bobcats in regions of Pennsylvania that support established bobcat populations at levels that are not detrimental to population stability.*

### STEPS:

- Annually evaluate season length and bag limits to meet the population objective.
- Annually monitor factors affecting harvest and hunter/trapper effort.
- Annually determine quota allocation based on harvest analysis, hunter and trapper success rates, and independent indices of bobcat abundance.

### Furbearer Management Zones.

The harvest and data collection for furbearers in Pennsylvania are currently managed according to six Furbearer Management Zones. Management zones 2, 3, and 5 contain the most extensive distribution of suitable habitat conditions and contain the greatest percentage of optimal home range conditions for female bobcats (Table 2) (Lovallo 1999).

Furbearer management zone boundaries generally coincide with gradients in habitat suitability and optimum home range conditions for female bobcats ([Fig. 7](#)). Management zone 5 contains considerably more suitable bobcat habitat in its southern region and may warrant special management consideration in the future.



Figure 7

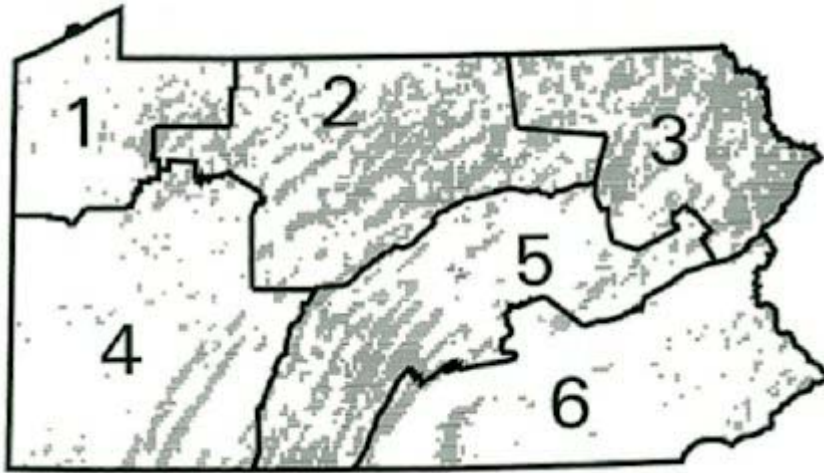


Figure 7 Furbearer Management zone boundaries and optional female home ranges (gray shading) as predicted by bobcat habitat models

### Bobcat Population Model

We used population modeling techniques to project population growth and to assess the potential impact of regulated harvest. Vital rates in the model (e.g., age-specific survival and fecundity) were estimated from field research studies in Pennsylvania or from available bobcat literature. When a range of parameter estimates was available, we chose the most conservative values (e.g., low survival and fecundity).

Initial population estimates (population size at time 0) were determined from geographically-based habitat suitability estimates, analyses of potential female home ranges, and statewide distribution data based on surveys of field personnel, incidental captures, and vehicle-caused bobcat mortalities. The model considered a maximum 80% occupancy rate of suitable habitats and potential female home ranges in areas (Wildlife Conservation Officer districts) known to support established bobcat populations. Based on these methods, we determined an initial population size of 3,156 adult resident bobcats. Initial estimates of population size were conservative; we have substantial evidence (observations, vehicle-caused mortalities, and incidental captures) that bobcats currently occupy habitats beyond the geographic extent identified in these analyses.

Age-specific survival rates for adult bobcats were estimated from age-distribution data collected from vehicle-caused bobcat mortalities (Crowe 1975). These data indicated that survival rates range from 50-87% until age 5 when survival increases to greater than 80% and then remains constant. The population model used a 33% survival rate for juveniles. This rate was based on values in the literature and is thought to be very conservative for an unharvested population.

Age-specific fecundity was estimated from available literature on litter size and pregnancy rates. The fecundity (number of offspring produced per female) is the product of the average litter size and the pregnancy rate. The bobcat population model used a 65% pregnancy rate and an average litter size of 1.5 kittens for yearling bobcats (<2 years old) and an 80% pregnancy rate and average litter size of 2.5 kittens for adult bobcats.

The population model incorporated stochastic parameters to develop confidence intervals for model projections. The model used a coefficient of variation to express the variation of vital parameters. The coefficient of variation was based on a standard deviation of  $\pm 5\%$  of parameter

distributions) in model output. The model was replicated 500 times to assess stochastic effects.

The current bobcat population model suggests that Pennsylvania's bobcat population is increasing at an annual rate of 4-6%. The population model assumes no compensatory (density-dependent) response to increased mortality due to harvest although the potential for a compensatory response exists. Also, the model considers harvest mortality to be 100% additive to other causes (e.g., vehicle-caused mortalities). We simulated effects of varying harvest levels on population growth and determined that a harvest of less than 220 bobcats would result in stable to increasing populations. The proposed 2000/2001 harvest objective of 175 bobcats is consistent with the PGC population objective and will result in stable to increasing bobcat populations. ([Fig 8](#))

**Figure 8**

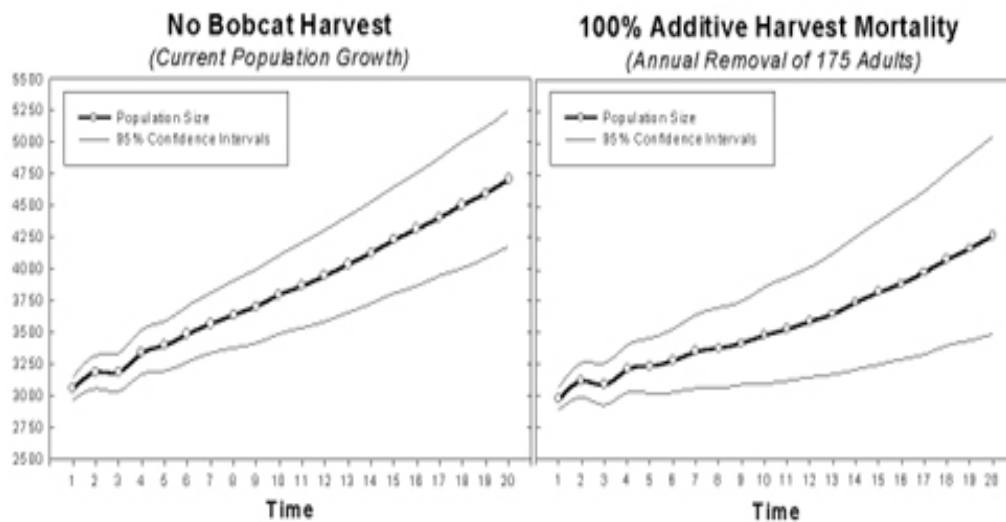


Figure 8 Predictions of state-wide bobcat population growth without harvest removal and with removal of 175 adult bobcats.

### Population Monitoring

The PGC uses a combination of mail surveys (licensed furtakers and PGC staff) and field methods to monitor the range of established bobcat populations and to assess bobcat population trends.

#### 1) Survey of Wildlife Conservation Officers:

For law enforcement efforts, 67 Pennsylvania counties are divided into 135 Wildlife Conservation Officer (WCO) districts. The Furbearer Management Section surveys WCOs periodically concerning their perceptions on the status, distribution, and population trends of bobcats in their respective districts (Appendix I). The survey is mailed to WCOs after trapping seasons to ensure that incidental captures attributed to trapping are reported. In districts where WCOs are relatively new, we request that advice be sought from the previous WCO, or from WCOs in surrounding districts.

During the most recent survey (1998), bobcat populations were reported as stable within 59 districts (49%), increasing within 36 districts (30%), and declining in 1 district (<1%)([Fig. 3](#), See Distribution). Nineteen of 35 districts in the northcentral and northeastern regions (Furbearer Management Zones 2 and 3) reported increasing bobcat populations.

## 2) Vehicle-Caused Bobcat Mortalities

Wildlife Conservation Officers use a kill report form (Appendix II) to provide information on observed bobcat mortalities (e.g., vehicle-caused, illegal harvest, disease). When possible, carcasses are collected and examined to determine sex, age, and productivity. There has been a steady increase in the number of reported roadkills each year since this effort began in 1986 (Fig. 9).

**Figure 9**



Figure 9 Numbers of vehicle-caused bobcat mortalities reported by Wildlife Conservation Officers during 1986 - 1999

## 3) Pennsylvania Game Take Survey

The Pennsylvania Game Commission uses a mail survey to poll approximately 2% of licensed hunters and 10% of licensed furtakers to assess hunter and trapper effort and to estimate harvest rates. During recent years, furtakers were asked to report the number of bobcats captured incidentally in traps set for other furbearers. There has been a general increase in the numbers of bobcats captured and released during 1990 to present (Table 3). If the number of bobcats captured/trapper is extrapolated to all licensed trappers, these survey results suggest that, during most years, trappers annually capture greater than 300 bobcats.

## 4) Winter Track Counts

Pilot projects of winter track counts have been initiated in northeastern Pennsylvania during previous years to develop effective protocols for statewide survey implementation. In order to collect additional regional data on population trends, the PGC has developed a winter track survey that will be conducted by cooperators along fixed survey routes in furbearer management zones 2, 3, and 5 beginning 2000/2001 (Appendix III).

## 5) Bobcat Hunter and Trapper Surveys

Upon completion of each bobcat harvest season, both unsuccessful and successful bobcat permit recipients will be surveyed to assess effort, methods of harvest, and to determine factors affecting hunter/trapper success rates (Appendix IV). These results will be used to increase the efficiency of the quota allocation process.

### **Regional Management Considerations**

Several surrounding states currently allow the regulated taking of bobcats using a variety of methods (Table 4). Bobcat seasons are generally concurrent with seasons for raccoon, fox, and coyote. Although several northeastern states do not have bag limits (e.g., Maine, New York, Vermont), these states use historical data on trapper success rates, harvest, and population demographics to insure against overharvest. Bobcat management in Pennsylvania should be consistent with objectives and management strategies of adjacent states.

### **Bobcat Harvest Regulation**

The PGC has initiated a permit-based quota system to regulate the harvest of bobcats by hunters and trappers in the Commonwealth. This permit is described in Chapter 147 of the Game Code (Appendix V).

### **Bobcat Quota Allocation**

The number of permits to be allocated each year is determined as the product of the harvest success rate (estimated from the previous year) and a harvest objective that is determined annually, based on habitat assessment, annual evaluation of abundance indices, and annual refinements to the bobcat population model. The initial 2000/2001 permit allocation of 290 permits was based on a harvest objective of 175 bobcats and an estimated 60% harvest success by permit holders.

### **Season Dates**

Because bobcats may be captured incidentally in traps set for other furbearers, the proposed bobcat harvest season is concurrent with coyotes, foxes, opossums, raccoons, skunks, and weasels (e.g., Oct. 15 - Feb. 24). Because a permit will be required to harvest a bobcat, liberal season dates cannot result in overharvest.

### **Harvest Zones**

The proposed 2000/2001 harvest is restricted to Furbearer Management Zones 2 and 3 (northcentral and northeastern regions) ([Fig. 10](#)). Furbearer Management Zones four and five, in central and southwestern Pennsylvania, also support large bobcat populations but are not currently being considered for harvest.

Figure 10

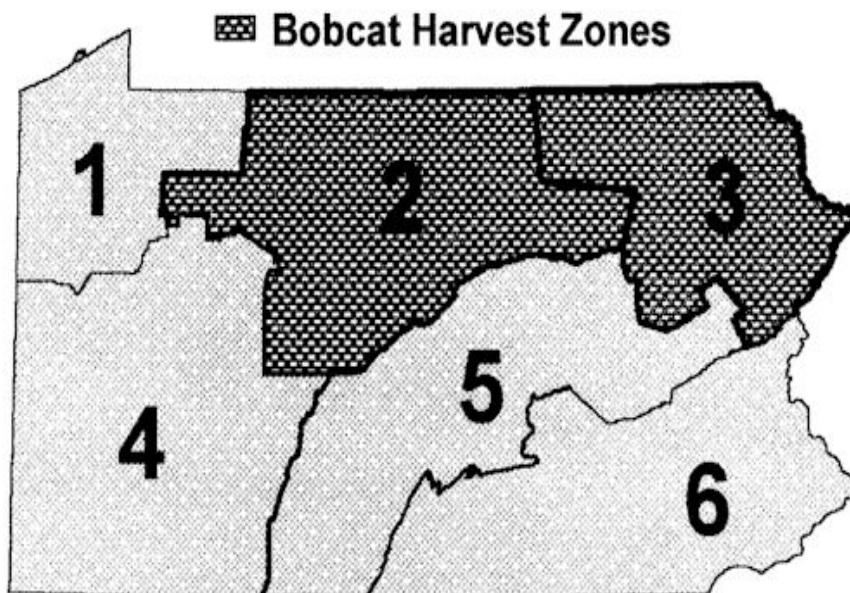


Figure 10 Proposed (2000/2001) bobcat harvest zones (2 and 3).

**Bag Limit and Methods of Take**

Successful applicants will receive a permit to harvest one bobcat by legal hunting or trapping methods during the bobcat season. The daily possession limit and season bag limit is one bobcat.

**Carcass Tagging and Pelt Sealing**

Successful permit applicants receive a PGC carcass tag to be attached to the animal immediately upon taking possession (Appendix VI). The tag must remain attached to the bobcat until it is mounted, tanned, or otherwise prepared for sale or consumption. In addition to the PGC tag, bobcats pelts are to be sealed by a Commission representative within 10 days after the season. Application of a locking CITES tag (pending export status) is required prior to exporting a bobcat pelt. All bobcat carcasses will be surrendered to the Pennsylvania Game Commission for research purposes prior to the application of a CITES Tag.

Table 2

Unit	Unsuitable	Suitable Habitat				Total Female (%) <sup>a</sup>	Potential Home Range Area (km <sup>2</sup> )	
		Exclusive Male Habitat	Male and Female	Exclusive Female				
1	7,377.60	1,766.90	1,313.39	164.71	1,478.10	(12.2)	10,018.60	(8.4)
2	12,252.98	5,256.66	4,575.16	523.35	5,098.51	(18.4)	7,952.30	(28.7)
3	7,946.09	3,127.31	3,263.02	425.53	3,688.55	(20.0)	6,851.20	(37.1)
4	17,786.94	4,323.54	3,624.65	575.90	4,200.55	(13.8)	2,426.70	(8.0)
5	12,764.98	4,159.49	3,583.64	604.13	4,187.77	(16.6)	5,887.90	(23.3)
6	16,380.89	2,798.77	2,204.03	497.09	2,701.12	(11.0)	2,136.80	(8.7)

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*Percent of Furbearer Management Unit*

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Table 2. Predicted area (km<sup>2</sup>) of suitable habitat for male and female bobcats and percent composition female habitat and potential female home range within each of 6 PGC Furbearer Management Units in Pennsylvania. Management Unit.

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**Table 3**

Year	No. Survey Respondents	No. Furtaker Licenses	No. Bobcats Released	Projected No Bobcat Captures
------	------------------------	-----------------------	----------------------	------------------------------



<b>Pennsylvania<sup>a</sup></b>	<b>Oct. 15 - Feb. 24</b>	<b>Trapping and Hunting</b>	<b>1 (Quota)</b>
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<sup>a</sup> *Proposed 2000/2001*

Table 4. Season dates, bag limits, and methods for bobcat harvest in the Northeast.

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## Appendix I: Survey of Wildlife Conservation Officers

### 1995 Furbearer and Farmland Wildlife Questionnaire

Distributed During April 1996

Please fill out this questionnaire as completely and as accurately as possible and return it using the envelope provided. If you are new to this district and cannot answer these questions, please return this form anyway or forward it to the WCO who previously occupied your district. Please note that these types of questions will be asked annually.

County \_\_\_\_\_ District No. \_\_\_\_\_ WCO \_\_\_\_\_

#### FURBEARERS

1. How many beaver complaints did you service during this past year? \_\_\_\_\_  
Please list number of complaints within the following categories.

_____	Flooding fields	_____	Invaded farm pond
_____	Plugged up culverts	_____	Invaded urban area
_____	Flooded roads	_____	Housing project lake
_____	Flooded woodland	_____	Do not like beaver
_____	Giardia Problem	_____	Other _____
_____	Cutting down trees	_____	_____

2. How many beavers were moved or killed this past year as a result of beaver complaints?

\_\_\_\_\_ Beavers that you **moved**  
\_\_\_\_\_ Beavers that you **killed**  
\_\_\_\_\_ Beavers **killed by landowners** (estimated)

3. How many reliable reports of **river otter** have you received in your district? \_\_\_\_\_

4. Within your district, **river otter** populations are

\_\_\_\_\_ increasing \_\_\_\_\_ stable \_\_\_\_\_ decreasing \_\_\_\_\_ nonexistent.

5. Within your district, **bobcat** populations are

\_\_\_\_\_ increasing \_\_\_\_\_ stable \_\_\_\_\_ decreasing \_\_\_\_\_ nonexistent.

6. How many reliable reports of **fisher** have you received in your district? \_\_\_\_\_

7. Have you had any reliable reports of **spotted skunks** occurring in your district?

\_\_\_\_\_ Yes \_\_\_\_\_ No

8. If asked in a future survey, could you estimate **long-tailed** and **short-tailed weasel** abundance with a reasonable level of accuracy? \_\_\_\_\_ Yes \_\_\_\_\_ No

9. In your estimation, how many **coyotes** live within your district? \_\_\_\_\_

10. In your estimation, how many **coyotes** were harvested within your district this past year?

11. Within your district, **coyote** populations are \_\_\_\_\_ increasing \_\_\_\_\_ stable \_\_\_\_\_ declining

12. Did you have any **coyote** complaints this past year? \_\_\_\_\_ Yes \_\_\_\_\_ No

If yes, please complete the following:

No. of Coyote Complaints:		No. of Animals Killed by Coyotes	
_____	Cattle	_____	Cows
_____	Sheep	_____	Calves
_____	Goats	_____	Sheep/Lambs
_____	Poultry	_____	Goats
_____	Attacked Dogs	_____	Chickens or other fowl
_____	Attacked Cats	_____	Dogs
_____	Afraid of Coyotes	_____	Cats
_____	Chased/Attacked Deer	_____	Rabbits
_____	Chased/Attacked Wild Turkey	_____	Deer
		_____	Other _____

#### FARMLAND WILDLIFE

13. Have you seen or heard **bobwhite quail** within your district during **late spring or summer**? \_\_\_\_\_ Yes \_\_\_\_\_ No

14. Within your district, **cottontail rabbit** populations are

\_\_\_\_\_ increasing \_\_\_\_\_ stable \_\_\_\_\_ decreasing \_\_\_\_\_ nonexistent.

15. Within the past 3 years, have you had any reports of wild broods of young **pheasants** occurring within your district? \_\_\_\_\_ Yes \_\_\_\_\_ No

16. Do private **pheasant** releases (excluding regulated shooting grounds) occur within your district? \_\_\_\_\_ Yes \_\_\_\_\_ No

If yes, how many pheasants would you estimate are released by private individuals? \_\_\_\_\_

17. Based on your observations over the past few years, describe **pheasant** occurrence in your district using the 3 choices listed below.

1. \_\_\_\_\_ Pheasants do not survive the winter
2. \_\_\_\_\_ Pheasants occasionally survive the winter; natural reproduction is extremely rare
3. \_\_\_\_\_ Pheasants survive the winter; natural reproduction occurs

**If more than one of these choices apply to your area, please indicate on the attached map which portions of your district could be classified according to the categories listed above.** You may label these areas as 1, 2, or 3 on the map and use shading or crosshatching to depict these pheasant occurrence categories.







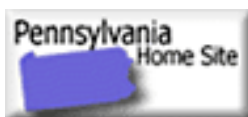
<b>Age</b>	Juveniles include carnivores that possess milk canines or partially-erupted permanent canines. Juvenile rodents are identified by obvious size and/or pelage coloration differences. Older age classes (subadult, yearling) should be grouped into the "adult" category.
<b>Weight</b>	Round weights to the nearest pound.
<b>Previous Tags</b>	Inspect each furbearer for tags (usually on ears or tail), neck collar, or tattoos on inner lip or in groin area. If tag, collar, or tattoo numbers are unreadable, write "not readable" in the space provided for tag numbers. If you have a scanner, check for an implanted microchip and record transmitter frequency.
<b>New tags/ markings applied</b>	Record all tag/collar/tattoo numbers and/or microchip frequency for all identification markings applied.
<b>Kill tag number</b>	This number represents the identification number (ID) for the dead furbearer. This ID may be taken from the red plastic kill tag, legal harvest tag, or CITES tag. If this furbearer is skinned, be sure to securely label the carcass with this ID. If no kill tag of any type is applied to the furbearer carcass, assign the animal a unique number or code. Your initials, district or radio number, or incident number followed by hyphen and a sequential count would suffice (for example, TSH-01, 324-01, 3182-01).
<b>Cause of death</b>	Use the "other" category to describe causes of death not listed.
<b>Carcass storage location</b>	If a furbearer is sold and taken to a taxidermist, please try to make arrangements to retain the carcass, including the skull.
<b>Carcass description</b>	Describe all parts saved.
<b>Investigator</b>	List your name and phone number.
<b>Remarks</b>	List any noteworthy observation or more detailed information about the capture or kill data. If an estimated date or date found was listed for the capture/kill date, note that information here.

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Please send technical comments and problems to [webmaster@state.pa.us](mailto:webmaster@state.pa.us).

## Appendix III: Report Form and Instructions for the Winter Track Survey

### Winter Track Survey (Information and Instructions)

Thank you for your interest in conducting a Winter Track Survey! The data you collect will be used to assess population trends and to refine distribution maps for furbearers within the Commonwealth. It is important that we maintain consistency among Winter Track Survey participants to ensure reliability of this technique. Please try to adhere to the following protocol while conducting your survey. Please use the "comments" field to indicate deviations from this protocol or to suggest changes in how the survey is conducted.

- Winter track surveys should be conducted during daylight with a period of 12-48 hours after a snowfall event during November 1<sup>st</sup> through March 15<sup>th</sup>.
- One to three inches of fresh snow provides optimum conditions for track identification. Please DO NOT conduct a Winter Track Survey when total snow depth exceeds 15" as this may restrict the movements of many species. Please record the "Total Snow Depth" and recent accumulation ("Snowfall Amount") separately on the survey form.
- Drive slowly (5-10 mph) with your hazard lights on while conducting the survey. If possible, conduct the survey with the aid of an observer. You may conduct the survey using two passes (one for each side of the road), but please be careful not to count the same set of tracks twice.
- Get out of the truck and follow tracks a short distance to assure correct identification. As snow depth accumulates, you will often observe bobcat and coyote tracks within deer trails. Although it is not necessary to inspect every set of deer tracks, please take a moment to observe tracks in heavily used deer trails.
- Do your best to determine whether tracks in close proximity to one another were made by the same individual. You can often make this determination based on the size of tracks or their direction of travel. If you can't make a determination, assume that all tracks within 0.2 miles of one another were made by the same individual. Tracks of individuals that travel into the next 0.5 mile segment on the survey form should only be recorded once.
- You may repeat surveys along the same route after new snowfall events, but please do not survey a route more than three times during a given year. Please be sure to use the same starting point each time.
- The survey form is designed for a 10 mile route, but your route may not traverse a full 10 miles. If this is the case, please draw a horizontal line across the page within distance intervals that were not sampled.

<b>Winter Track Survey Report Form</b>	
Survey Date: ___/___/___ Time: (Start: _____ End: _____)	Observer(s):(1) _____  (2) _____
Route No.: ___ County: _____ Township(s): _____	(1) _____ (2) _____  (3) _____ (4) _____
SNOW CONDITIONS:	SURVEY CONDITIONS
Total Snow Depth: _____ ( _____ inches, _____ cm)	Temperature: ___ Above 32° ___ Below 32° Actual: _____ F°

Last Snowfall Date: ___/___/___    ___ Unknown	Precipitation: ___ None ___ Rain ___ Fog ___ Snow ___ Sleet
Snowfall Amount: _____ ( _____ inches, _____ cm)	Comments: _____

**Please enter an "X" for each set of tracks within each distance interval.**

Mileage:	Bobcat	Coyote	Gray Fox	Red Fox	Fisher	Other*
0.0 - 0.5						
0.5 - 1.0						
1.0 - 1.5						
1.5 - 2.0						
2.0 - 2.5						
2.5 - 3.0						
3.0 - 3.5						
3.5 - 4.0						
4.0 - 4.5						
4.5 - 5.0						
5.0 - 5.5						
5.5 - 6.0						
6.0 - 6.5						
6.5 - 7.0						
7.0 - 7.5						
7.5 - 8.0						
8.0 - 8.5						
8.5 - 9.0						
9.0 - 9.5						
9.5 - 10.0						

<i>*Please indicate species and number of sets of tracks</i>	<i>(e.g., "OTTER - X")</i>
--	----------------------------

Comments:

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## Appendix IV: Bobcat Permit Recipient Surveys

### Bobcat Harvester Survey

Name: \_\_\_\_\_ Date Harvested: \_\_\_/\_\_\_/\_\_\_ Bobcat Permit No. \_\_\_\_\_

Furtaker License No.: \_\_\_\_\_ Date Sealed: \_\_\_/\_\_\_/\_\_\_ Seal No. \_\_\_\_\_

1) Where was the bobcat harvested?

Township: \_\_\_\_\_ County: \_\_\_\_\_ Furbearer Management Unit: \_\_\_\_\_

2) What method did you use to harvest this bobcat?

Trapping

Hunting with Dogs

Predator Calling

Other: (Please list method used): \_\_\_\_\_

3) Please respond to the following if **you set traps** during the bobcat season.

*Please estimate the number of days you spent land trapping this year : \_\_\_\_\_ days.*

*Did you capture and release additional bobcats after harvesting this one? [ \_\_\_ No, \_\_\_ Yes (how many?\_\_\_)]*

*Did you set traps specifically to capture a bobcat? [ \_\_\_ Yes, \_\_\_ No]*

*If Yes,*

*A. Did you purchase special equipment or travel beyond the extent of your normal trapline to harvest this bobcat? [ \_\_\_ No, \_\_\_ Yes (Est. equipment costs: \$\_\_\_\_; Additional travel: \_\_\_\_\_ miles)*

*B. Please estimate the number of days you were specifically trying to capture a bobcat: \_\_\_\_\_ days.*

4) Please respond to the following if you **hunted for bobcat** during the bobcat season.

*Did you use dogs to attempt to harvest a bobcat? [ \_\_\_ No, \_\_\_ Yes (Number of days? \_\_\_ days)]*

*Did you use predator calls to try to harvest a bobcat? [ \_\_\_ No, \_\_\_ Yes (Number of days? \_\_\_ days)]*

*Did you use other methods (e.g., driving, stalking) to try to harvest a bobcat? [ \_\_\_ No, \_\_\_ Yes]*

*If Yes, Please list methods and number of days spent:*

(method: \_\_\_\_\_, days: \_\_\_ )

(method: \_\_\_\_\_, days: \_\_\_ )

*Were you hunting deer or bear when you shot the bobcat? [ \_\_\_ No, \_\_\_ Deer hunting, \_\_\_ Bear hunting]*

5. What do you plan to do with the bobcat?

I plan to have the bobcat mounted.

I plan to have the pelt tanned.

I plan to sell the pelt.

I am undecided.

6) Was this the first year you received a bobcat harvest permit in Pennsylvania? [ \_\_\_ Yes, \_\_\_ No]

7) Was this the first bobcat you harvested in Pennsylvania since 1999? [ \_\_\_ Yes, \_\_\_ No]

8) Will you apply for a bobcat permit again next year? [ \_\_\_ Yes, \_\_\_ No]

*Thank you for answering these questions This information will be used by PGC to manage the bobcat harvest in future seasons. The data you provided is confidential, and will only be available to PGC biologists.*

### Bobcat Hunter and Trapper Survey

The Pennsylvania Game Commission is interested in learning more about your participation in the 2000/2001 bobcat harvest season

The information you provide will play an important role in the future management of bobcats in the Commonwealth. Please take a moment to fill out the questionnaire and drop it in the mail. No postage is required and your response will be totally confidential.

Thank  
You!

1) Our records indicate that you received a bobcat permit but did not harvest a bobcat during the 2000/2001 season. Is this correct?

- Yes**, I received a permit, but I did not harvest a bobcat during the bobcat season.  
 **No**, I harvested a bobcat during the bobcat season but **the pelt has not been sealed**.\*  
 **No**, I harvested a bobcat during the bobcat season and **the pelt has been sealed**.

2) Which of the following describes your efforts to harvest a bobcat (*check more than one if needed*)

- I did not attempt to harvest a bobcat.  
 I set traps during the bobcat season.  
 I hunted bobcats during the bobcat season.

3) Please respond to the following if you **set traps** during the bobcat season.

Did you set traps specifically to capture a bobcat? [  Yes,  No]  
Please estimate the number of days you spent land trapping this year : \_\_\_\_ days.  
Please estimate the number of days you spent specifically trying to capture a bobcat: \_\_\_\_ days.

4) Please respond to the following if you **hunted for bobcat** during the bobcat season.

Did you use dogs to attempt to harvest a bobcat? [  No,  Yes (Number of days? \_\_\_\_days)]  
Did you use predator calls to try to harvest a bobcat? [  No,  Yes (Number of days ? \_\_\_\_days)]  
Did you use other methods (e.g., driving, stalking) to try to harvest a bobcat? [  No,  Yes]  
If Yes, Please list methods and number of days spent:

(method: \_\_\_\_\_, days: \_\_\_\_ )

(method: \_\_\_\_\_, days: \_\_\_\_ )

Were you hoping to harvest a bobcat while hunting other species? [  Yes,  No]

5) Was this the first year you received a bobcat harvest permit in Pennsylvania? [  Yes,  No]

6) Have you harvested a bobcat in Pennsylvania since 1999? [  Yes,  No]

7) Will you apply for a bobcat permit again next year? [  Yes,  No]

\* All bobcats must be sealed by PGC within 10 days of the season close. If you harvested a bobcat but have not contacted PGC, please call 1-800-###-#### immediately to arrange for pelt sealing.

## Appendix V: Regulations for the Bobcat Harvest Permit

### CHAPTER 147. SPECIAL PERMITS

#### Subchapter S. BOBCAT HUNTING-TRAPPING PERMIT

Sec.

147.701. General.

147.702. Unlawful Acts.

§147.701. General.

(1) A permit will only be issued to residents of this Commonwealth who possess a valid resident furtakers license, junior combination license, senior combination license or qualify for license and fee exemptions under Section 2706 of the Act (relating to resident license and fee exemptions) or to persons who qualify under Section 2363 of the Act (relating to trapping exception for certain persons).

(2) The fee for a permit application to take a bobcat is \$5.00.

(3) Applications shall be submitted on a form supplied by the Commission and shall contain the required information as requested. A check or money order in the amount of \$5.00 payable to the Pennsylvania Game Commission shall accompany the application and is non-refundable. Applications shall be mailed to the Commission's Bureau of Wildlife Management, 2001 Elmerton Avenue, Harrisburg, PA 17110-9797.

(4) Applications may only be submitted by mail between July 1 and August 31. Applications received later than August 31 will be rejected.

(5) Only one application per person may be submitted. Anyone submitting more than one application for a permit will have all applications rejected.

(6) The selection of mailed application forms will be made by random drawing from all eligible applications submitted. The drawing will be held at the Commission's Harrisburg Headquarters on the second Friday in September and shall be open to the public.

(7) A special permit authorizing the lawful taking of one (1) bobcat will be delivered to successful applicants by standard first class mail through and by the United States Postal Service. Permits shall be mailed no later than the first Friday in October and will be limited to the first 290 valid applications drawn.

(8) Tagging requirements.

(i) Any permitted person taking a bobcat shall immediately, before removing the bobcat from the location of the taking, fully complete a temporary carcass tag furnished with the permit, which contains in English the person's name, address, special permit number, date of harvest, county and township of harvest, furbearer management zone of harvest and method of harvest. The bobcat carcass shall remain intact, i.e., with entrails, until examined and tagged by a Commission representative. The temporary carcass tag shall remain attached to the animal until it is tagged with a numbered permanent interlocking tag.

(ii) Any permitted person taking a bobcat shall contact the Commission within forty-eight (48) hours of the taking by telephoning the number specified on the permit to arrange for carcass examination, data collection and tagging.

(iii) Any bobcat taken under authority of a special permit shall be tagged with a numbered permanent interlocking tag no later than 4pm on the 10th day following the closing of the bobcat

season.

(iv) The tag shall remain attached to the bobcat until it is mounted, tanned, made into a commercial fur or prepared for consumption.



Appendix VI: Sample Bobcat Harvest Permit and Carcass Tag

FRONT OF PERMIT:

**2000/2001 PA BOBCAT HARVEST PERMIT**  
**PERMIT NO. 00001 FURTAKE LICENSE NO. 000001**

SIGNATURE OF BOBCAT PERMIT HOLDER: \_\_\_\_\_

**IF YOU HARVEST A BOBCAT:**  
1) IMMEDIATELY FILL OUT THE FOLLOWING:  
DATE KILLED: \_\_\_\_\_ TIME KILLED: \_\_\_\_\_  AM  PM SEX:  MALE  FEMALE  
COUNTY: \_\_\_\_\_ TOWNSHIP: \_\_\_\_\_ FUR AREA MANAGEMENT UNIT: \_\_\_\_\_  
HARVEST METHOD:  TRAPPED  SHOT

2) IMMEDIATELY, SIGN AND DATE THE BOBCAT CARCASS TAG, DETACH IT FROM THIS PERMIT, AND ATTACH THE TAG TO THE CARCASS.

3) CALL PGC (1-800-###-####) WITHIN 48 HOURS TO ARRANGE FOR PELT SEALING AND CARCASS COLLECTION.

4) KEEP THIS PERMIT; YOU WILL BE ASKED FOR IT WHEN THE PELT IS SEALED.

**2000/2001 - BOBCAT CARCASS TAG**  
**PERMIT NO. 00001 FURTAKE LICENSE NO. 000001**

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

BACK OF PERMIT

**2000/2001 PA BOBCAT HARVEST PERMIT**

Hunters and trappers receiving this permit are allowed to harvest one bobcat per season using devices and methods approved by The Pennsylvania Game Commission. The use of this permit is restricted by bobcat season dates and harvest zones as described in the current Hunting and Trapping Digest. Please review the bobcat harvest regulations prior to attempting to harvest a bobcat.

- Please sign this permit (upper portion only) upon receiving it. This permit must be signed and in your possession while attempting to harvest a bobcat. This permit does not need to be displayed.
- If you harvest a bobcat, you must immediately: 1) Fill in the requested information on the harvest permit, 2) Sign and date the bobcat carcass tag with the carcass tag from the permit, and 3) Attach the carcass tag to the ear or nose of the bobcat. The bobcat carcass must remain intact (DO NOT remove entrails from the carcass).
- You must call The Pennsylvania Game Commission (1-800-###-####) within 48 hours of harvesting the bobcat to arrange for pelt sealing and carcass collection. There is no fee for pelt sealing. All pelts must be sealed prior to 10:00 PM on the day of collection.
- The carcass tag must remain attached to the bobcat pelt after skinning. If you plan to have the bobcat mounted, please provide contact information for the taxidermist who will handle the bobcat.

**PLEASE CALL 1-800-###-#### WITHIN 48 HOURS OF HARVESTING THIS BOBCAT TO ARRANGE FOR PELT SEALING AND CARCASS COLLECTION**